



US009129271B2

(12) **United States Patent**
Jenrick et al.

(10) **Patent No.:** US 9,129,271 B2
(45) **Date of Patent:** Sep. 8, 2015

(54) **SYSTEM AND METHOD FOR PROCESSING CASINO TICKETS**(71) Applicant: **Cummins-Allison Corp.**, Mt. Prospect, IL (US)(72) Inventors: **Charles P. Jenrick**, Schaumburg, IL (US); **Robert J. Klein**, Chicago, IL (US); **Curtis W. Hallowell**, Palatine, IL (US); **Douglas U. Mennie**, Barrington, IL (US)(73) Assignee: **Cummins-Allison Corp.**, Mt. Prospect, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/193,790**(22) Filed: **Feb. 28, 2014**(65) **Prior Publication Data**

US 2014/0175173 A1 Jun. 26, 2014

Related U.S. Application Data

(60) Continuation of application No. 12/260,973, filed on Oct. 29, 2008, now Pat. No. 8,701,857, which is a continuation-in-part of application No. 12/058,370, filed on Mar. 28, 2008, now Pat. No. 8,396,586, which

(Continued)

(51) **Int. Cl.****G06Q 20/18** (2012.01)
G07D 7/00 (2006.01)

(Continued)

(52) **U.S. Cl.**CPC **G06Q 20/18** (2013.01); **G06K 5/00** (2013.01);
G07D 3/125 (2013.01); **G07D 7/00** (2013.01);
G07D 7/0026 (2013.01); **G07D 11/0051** (2013.01); **G07D 11/0084** (2013.01)(58) **Field of Classification Search**CPC G06K 7/10; G07F 7/00; G07F 19/00
USPC 194/205, 206, 207; 235/379, 462.01,
235/462.11, 462.41; 902/6, 23; 209/534;700/215, 224; 382/112, 135, 137, 138,
382/140; 250/559.44, 559.45, 559.46, 556,
705/16, 17

See application file for complete search history.

(56)

References Cited

U.S. PATENT DOCUMENTS

446,303 A 2/1891 Tompson
2,570,920 A 10/1951 Clough et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CA 2235925 11/1995
CA 2189330 12/2000

(Continued)

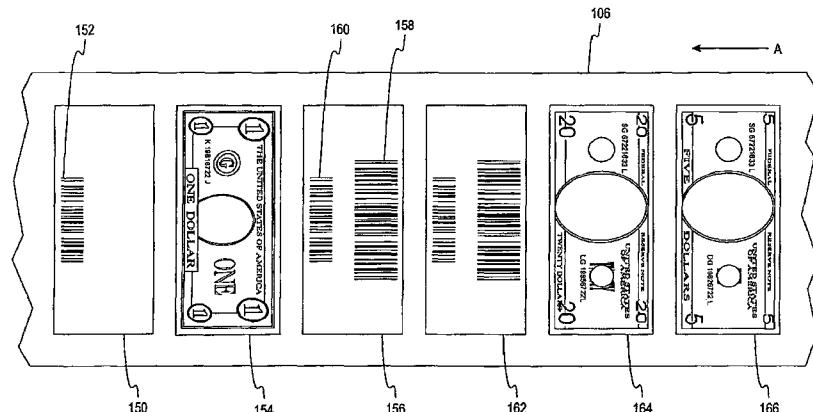
OTHER PUBLICATIONS

Applied Communications Inc.: BASE24 software, "Applied Communications Announces Joint Venture," Business Wire, 4 pages (Jan. 6, 1989).

(Continued)

Primary Examiner — Mark Beauchaine(74) *Attorney, Agent, or Firm* — Nixon & Peabody LLP**ABSTRACT**

A method of processing documents includes receiving a stack of documents including currency bills and substitute currency media. Each substitute currency medium has at least one barcode. The method further includes transporting the stack of documents via a transport mechanism, one document at a time, along a transport path and denominating with a currency detector each of the currency bills in the stack of documents. The currency detector is positioned adjacent to the transport path. The method further includes scanning with a barcode scanner a barcode on each substitute currency medium in the stack of documents. The barcode scanner is positioned adjacent to the transport path. The method further includes imaging with an image scanner each substitute currency medium in the stack of documents to generate a raw image file of the substitute currency medium. The image scanner is positioned adjacent to the transport path.

27 Claims, 58 Drawing Sheets

Related U.S. Application Data

is a division of application No. 10/939,938, filed on Sep. 13, 2004, now abandoned, said application No. 12/260,973 is a continuation-in-part of application No. 11/544,228, filed on Oct. 5, 2006, now Pat. No. 7,978,899, and a continuation-in-part of application No. 10/638,231, filed on Aug. 7, 2003, now Pat. No. 7,903,863, which is a continuation-in-part of application No. 09/965,428, filed on Sep. 27, 2001, now Pat. No. 7,187,795, said application No. 12/260,973 is a continuation-in-part of application No. 09/967,232, filed on Sep. 28, 2001, now abandoned, which is a continuation-in-part of application No. 09/562,231, filed on Apr. 28, 2000, now Pat. No. 6,318,537, and a continuation-in-part of application No. 09/502,666, filed on Feb. 11, 2000, now Pat. No. 6,398,000.

- (60) Provisional application No. 60/502,924, filed on Sep. 15, 2003, provisional application No. 60/723,652, filed on Oct. 5, 2005.

(51) Int. Cl.

G07D 11/00 (2006.01)
G06K 5/00 (2006.01)
G07D 3/12 (2006.01)

(56) References Cited**U.S. PATENT DOCUMENTS**

2,669,998 A	2/1954	Buchholz	133/8	3,966,047 A	6/1976	Steiner	209/75
2,750,949 A	6/1956	Kulo et al.	133/8	3,976,198 A	8/1976	Carnes, Jr. et al.	209/111.7 T
2,835,260 A	5/1958	Buchholz	133/8	3,984,094 A	10/1976	Stocker	
2,865,561 A	12/1958	Rosapepe		3,998,237 A	12/1976	Kressin	
2,936,684 A	5/1960	Simjian	95/1.1	3,998,379 A	12/1976	Myers et al.	
3,104,314 A	9/1963	Simjian	235/61.9	4,023,011 A	5/1977	Nakajima et al.	235/61.11 R
3,132,654 A	5/1964	Adams		4,025,420 A	5/1977	Horino	
3,148,932 A	9/1964	Simjian	346/22	4,027,142 A	5/1977	Paup et al.	235/61.9 R
3,150,912 A	9/1964	Simjian	346/22	4,040,010 A	8/1977	Crane	340/146.3 SY
3,173,742 A	3/1965	Simjian		4,041,456 A	8/1977	Ott et al.	340/146.3 R
3,222,057 A	12/1965	Couri		4,050,218 A	9/1977	Call	
3,245,534 A	4/1966	Smith et al.		4,059,122 A	11/1977	Kinoshita	
3,246,295 A	4/1966	DeClaris et al.	340/146.3	4,075,460 A	2/1978	Gorgens	
3,280,974 A	10/1966	Riddle et al.	209/111.8	4,081,131 A	3/1978	Sand et al.	
3,304,080 A	2/1967	Greenblott et al.		4,096,991 A	6/1978	Iguchi	235/419
3,376,970 A	4/1968	Roseberg		4,109,238 A	8/1978	Creekmore	340/149 A
3,443,107 A	5/1969	Modglin	250/219	4,114,027 A	9/1978	Slater	235/419
3,480,785 A	11/1969	Aufderheide	250/219	4,114,804 A	9/1978	Jones et al.	235/476
3,496,370 A	2/1970	Haville et al.	250/219	RE29,796 E	10/1978	Yamamoto et al.	
3,509,535 A	4/1970	Berube	340/149	4,124,111 A	11/1978	Hayashi	
3,612,835 A	10/1971	Andrews et al.	235/61.11 D	4,147,430 A	4/1979	Gorgone et al.	356/51
3,618,765 A	11/1971	Cooper et al.	209/122	4,150,740 A	4/1979	Douno	
3,656,615 A	4/1972	Ptacek	209/73	4,164,770 A	8/1979	Jeffers	
3,679,314 A	7/1972	Mustert	356/71	4,166,945 A	9/1979	Inoyama et al.	235/379
3,715,031 A	2/1973	Okkonen	209/75	4,167,458 A	9/1979	Louzou et al.	
3,725,667 A	4/1973	Schwartz	250/219	4,172,462 A	10/1979	Uchida et al.	
3,759,382 A	9/1973	Walkley et al.		4,179,685 A	12/1979	O'Maley	340/146.3 H
3,764,899 A	10/1973	Peterson	324/61	4,179,723 A	12/1979	Spencer	
3,771,583 A	11/1973	Bottemiller		4,180,798 A	12/1979	Komori et al.	340/146.3 H
3,778,595 A	12/1973	Hatanaka et al.		4,184,366 A	1/1980	Butler	
3,778,628 A	12/1973	Novak et al.	250/556	4,187,463 A	2/1980	Kivenson	324/228
3,782,543 A	1/1974	Martelli et al.	209/75	4,187,498 A	2/1980	Creekmore	340/149 A
3,798,603 A	3/1974	Wahlberg	340/149	4,197,986 A	4/1980	Nagata	235/379
3,800,078 A	3/1974	Cochran et al.	178/7.1	4,201,978 A	5/1980	Nally	340/146.3 C
3,806,710 A	4/1974	Shigemori et al.	235/92	4,205,780 A	6/1980	Burns et al.	235/454
3,815,021 A	6/1974	Kerr	324/61 R	4,208,549 A	6/1980	Polillo et al.	
3,842,281 A	10/1974	Goodrich	250/461	4,228,812 A	10/1980	Marti	
3,870,629 A	3/1975	Carter et al.	209/111.8	4,231,014 A	10/1980	Ponzi	340/146.3 Y
3,876,864 A	4/1975	Clark et al.	235/61.7 B	4,231,561 A	11/1980	Kaneko et al.	271/3.1
3,906,449 A	9/1975	Marchak	340/149	4,232,295 A	11/1980	McConnell	
3,916,922 A	11/1975	Prumm		4,234,003 A	11/1980	Ristvedt et al.	
3,930,582 A	1/1976	Gartner et al.	209/88	4,237,378 A	12/1980	Jones	250/223 R
3,932,272 A	1/1976	Carnes, Jr. et al.		4,249,552 A	* 2/1981	Margolin et al.	194/207
3,949,363 A	* 4/1976	Holm	382/140	4,250,806 A	2/1981	Boyson et al.	101/2
				4,251,867 A	2/1981	Uchida et al.	
				4,255,651 A	3/1981	Phillips	235/92 SB
				4,264,808 A	4/1981	Owens et al.	235/379
				4,266,121 A	5/1981	Hirose	
				4,275,874 A	6/1981	DiBlasio	271/4
				4,277,774 A	7/1981	Fujii et al.	340/146.3 Q
				4,283,708 A	8/1981	Lee	340/146.3 Z
				4,286,703 A	9/1981	Schuller et al.	
				4,288,781 A	9/1981	Sellner et al.	340/146.3 Q
				RE30,773 E	10/1981	Glaser et al.	
				4,302,781 A	11/1981	Ikeda et al.	358/288
				4,310,885 A	1/1982	Azcue et al.	364/405
				4,311,914 A	1/1982	Huber	250/556
				4,313,598 A	2/1982	DiBlasio	271/124
				4,317,957 A	3/1982	Sendrow	
				4,321,672 A	3/1982	Braun et al.	364/408
				4,326,636 A	4/1982	Kawakami	209/534
				4,332,348 A	6/1982	Nordin	
				4,334,619 A	6/1982	Horino et al.	209/551
				4,337,864 A	7/1982	McLean	209/534
				4,341,951 A	7/1982	Benton	
				4,348,656 A	9/1982	Gorgone et al.	340/146.3 R
				4,349,111 A	9/1982	Shah et al.	209/534
				4,352,988 A	10/1982	Ishida	250/559
				4,355,300 A	10/1982	Weber	340/146.3 C
				4,355,369 A	10/1982	Garvin	364/900
				4,356,473 A	10/1982	Freudenthal	340/146.3 H
				4,357,528 A	11/1982	Smith et al.	
				4,360,034 A	11/1982	Davila et al.	133/3 D
				4,365,700 A	12/1982	Arimoto et al.	
				4,369,442 A	1/1983	Werth et al.	
				4,376,364 A	3/1983	Horino et al.	
				4,380,316 A	4/1983	Glinka et al.	
				4,381,447 A	4/1983	Horvath et al.	250/223 R
				4,383,540 A	5/1983	De Meyer et al.	133/3 H

(56)

References Cited**U.S. PATENT DOCUMENTS**

4,385,285 A	5/1983	Horst et al.	4,611,205 A	9/1986	Eglise
4,386,432 A	5/1983	Nakamura et al.	4,611,345 A	9/1986	Ohnishi et al.
4,388,662 A	6/1983	Jeffers et al.	4,617,457 A	10/1986	Granzow et al.
4,396,902 A	8/1983	Warthan et al.	4,617,458 A	10/1986	Bryce
4,398,088 A	8/1983	Hirose et al.	4,620,559 A	11/1986	Childers et al.
4,412,292 A	10/1983	Sedam et al.	4,622,456 A	11/1986	Naruto et al.
4,413,296 A	11/1983	Jeffers	4,623,975 A	11/1986	Kagami
4,416,299 A	11/1983	Bergman	4,625,870 A	12/1986	Nao et al.
4,417,136 A	11/1983	Rushby et al.	4,628,194 A	12/1986	Dobbins et al.
4,420,153 A	12/1983	Winkler et al.	4,629,382 A	12/1986	Ueshin
4,423,316 A	12/1983	Sano et al.	4,630,813 A	*	Watanabe et al.
4,429,991 A	2/1984	Williams	4,632,252 A	12/1986	Haruki et al.
4,434,359 A	2/1984	Watanabe	4,638,988 A	1/1987	Kershaw
4,435,834 A	3/1984	Pauli et al.	4,641,239 A	2/1987	Takesako
4,436,103 A	3/1984	Dick	4,645,936 A	2/1987	Gorgone
4,441,205 A	4/1984	Berkin et al.	4,653,647 A	3/1987	Hashimoto
4,442,541 A	4/1984	Finkel et al.	4,658,289 A	4/1987	Nagano et al.
4,449,240 A	5/1984	Yoshida	4,674,260 A	6/1987	Rasmussen et al.
4,454,414 A	6/1984	Benton	4,676,343 A	6/1987	Humble et al.
4,458,816 A	7/1984	Horino et al.	4,677,682 A	6/1987	Miyagawa et al.
4,461,028 A	7/1984	Okubo	4,678,072 A	7/1987	Kobayashi et al.
4,464,786 A	8/1984	Nishito et al.	4,680,803 A	7/1987	Dilella
4,464,787 A	8/1984	Fish et al.	4,681,128 A	7/1987	Ristvedt et al.
4,465,192 A	8/1984	Ohba et al.	4,681,229 A	7/1987	Uesaka et al.
4,470,496 A	9/1984	Steiner	4,683,508 A	7/1987	Jeffers et al.
4,470,590 A	9/1984	Ariga et al.	4,685,141 A	8/1987	Hoque et al.
RE31,692 E	10/1984	Tyburksi et al.	4,686,357 A	8/1987	Douno et al.
4,474,197 A	10/1984	Kinoshita et al.	4,690,268 A	9/1987	Ueshin
4,479,049 A	10/1984	Hirose	4,694,963 A	9/1987	Takesako
4,480,177 A	10/1984	Allen	4,697,071 A	9/1987	Hiraoka et al.
4,482,058 A	11/1984	Steiner	4,700,368 A	10/1987	Munn et al.
4,487,306 A	12/1984	Nao et al.	4,705,154 A	11/1987	Masho et al.
4,488,116 A	12/1984	Plesko	4,706,577 A	11/1987	Jones
4,490,846 A	12/1984	Ishida et al.	4,707,843 A	11/1987	McDonald et al.
4,501,418 A	2/1985	Ariga et al.	4,716,456 A	12/1987	Hosaka
4,503,963 A	3/1985	Steiner	4,718,218 A	1/1988	Ristvedt
4,513,439 A	4/1985	Gorgone et al.	4,731,043 A	3/1988	Ristvedt et al.
4,521,008 A	6/1985	Granzow et al.	4,733,308 A	3/1988	Nakamura et al.
4,523,330 A	6/1985	Cain	4,733,765 A	3/1988	Watanabe
4,530,067 A	7/1985	Dorr	4,735,289 A	4/1988	Kenyon
4,531,531 A	7/1985	Johnson et al.	4,743,743 A	5/1988	Fukatsu
4,532,641 A	7/1985	Nishimura	4,743,974 A	5/1988	Lockwood
4,538,719 A	9/1985	Gray et al.	4,747,492 A	5/1988	Saito et al.
4,539,702 A	9/1985	Oka	4,748,679 A	5/1988	Gold et al.
4,542,829 A	9/1985	Emery et al.	4,749,074 A	6/1988	Ueki et al.
4,543,969 A	10/1985	Rasmussen	4,749,087 A	6/1988	Buttifant
4,544,266 A	10/1985	Antes	4,753,624 A	6/1988	Adams et al.
4,547,896 A	10/1985	Ohtombe et al.	4,753,625 A	6/1988	Okada
4,549,561 A	10/1985	Johnson et al.	4,764,725 A	8/1988	Bryce
4,553,222 A	11/1985	Kurland et al.	4,764,976 A	8/1988	Kallin et al.
4,553,846 A	11/1985	Hilton et al.	4,765,464 A	8/1988	Ristvedt
4,556,140 A	12/1985	Okada	4,766,548 A	8/1988	Cedrone et al.
4,557,597 A	12/1985	Iwama	4,768,100 A	8/1988	Kunishima et al.
4,558,224 A	12/1985	Gober	4,774,663 A	9/1988	Musmanno et al.
4,558,711 A	12/1985	Yoshiaki et al.	4,775,353 A	10/1988	Childers et al.
4,559,451 A	12/1985	Curl	4,775,354 A	10/1988	Rasmussen et al.
4,559,452 A	12/1985	Igaki et al.	4,778,983 A	10/1988	Ushikubo
4,563,771 A	1/1986	Gorgone et al.	4,782,328 A	11/1988	Denlinger
4,564,036 A	1/1986	Ristvedt	4,784,274 A	11/1988	Mori et al.
4,567,370 A	1/1986	Falls	4,787,518 A	11/1988	Yuge et al.
4,569,421 A	2/1986	Sandstedt	4,803,347 A	2/1989	Sugahara et al.
4,570,655 A	2/1986	Raterman	4,804,830 A	2/1989	Miyagisima et al.
4,582,172 A	4/1986	Takeuchi et al.	4,804,998 A	2/1989	Miyawaki
4,584,529 A	4/1986	Aoyama	4,806,709 A	2/1989	Evans
4,585,928 A	4/1986	Watanabe	4,807,736 A	2/1989	Kondo et al.
4,587,412 A	5/1986	Apisdorf	4,811,004 A	3/1989	Person et al.
4,587,434 A	5/1986	Roes et al.	4,812,629 A	3/1989	O'Neil et al.
4,590,606 A	5/1986	Rohrer	4,817,176 A	3/1989	Marshall et al.
4,592,090 A	5/1986	Curl et al.	4,820,909 A	4/1989	Kawauchi et al.
4,593,184 A	6/1986	Bryce	4,821,332 A	4/1989	Durham
4,594,664 A	6/1986	Hashimoto	4,823,393 A	4/1989	Kawakami
4,602,332 A	7/1986	Hirose et al.	4,825,246 A	4/1989	Fukuchi et al.
D285,095 S	8/1986	Lundgren et al.	4,827,531 A	5/1989	Milford
4,605,926 A	8/1986	Onishi et al.	4,834,230 A	5/1989	Kondo et al.
4,607,649 A	8/1986	Taipale et al.	4,837,840 A	6/1989	Goldman
			4,837,842 A	6/1989	Holt
			4,839,505 A	6/1989	Bradt et al.
			4,841,358 A	6/1989	Kammoto et al.
			4,843,219 A	6/1989	Franchi

(56)

References Cited**U.S. PATENT DOCUMENTS**

4,844,369 A	7/1989	Kanayachi	5,091,713 A	2/1992	Horne et al.
4,844,446 A	7/1989	Thie et al.	5,091,961 A	2/1992	Baus, Jr. 382/7
4,848,556 A	7/1989	Shah et al.	5,097,517 A	3/1992	Horiguchi et al. 382/7
4,851,616 A	7/1989	Wales et al. 178/18	5,104,353 A	4/1992	Ristvedt et al.
4,863,414 A	9/1989	Ristvedt et al.	5,105,364 A	4/1992	Kawamura et al. 364/478
4,875,670 A	10/1989	Petersen et al.	5,105,601 A	4/1992	Horiguchi et al. 53/465
4,877,230 A	10/1989	Winkler et al. 271/3	5,106,338 A	4/1992	Rasmussen et al.
4,880,096 A	11/1989	Kobayashi et al. 194/206	5,111,927 A	5/1992	Schulze
4,881,268 A	11/1989	Uchida et al. 382/7	5,114,381 A	5/1992	Ueda et al. 453/57
4,883,158 A	11/1989	Kobayashi et al.	5,119,025 A	6/1992	Smith et al.
4,883,181 A	11/1989	Yoshikawa 209/534	5,119,433 A	6/1992	Will 382/7
4,884,212 A	11/1989	Stutsman	5,120,944 A	6/1992	Kern et al. 235/379
4,888,812 A	12/1989	Dinan et al. 382/7	5,120,945 A	6/1992	Nishibe et al.
4,900,909 A	2/1990	Nagashima et al.	5,122,754 A	6/1992	Gotaas 324/676
4,903,953 A	2/1990	Winkler et al. 271/4	5,123,873 A	6/1992	Rasmussen
4,905,839 A	3/1990	Yuge et al. 209/534	5,129,205 A	7/1992	Rasmussen
4,905,840 A	3/1990	Yuge et al. 209/534	5,134,663 A	7/1992	Kozlowski 382/7
4,906,988 A	3/1990	Copella	5,135,115 A	8/1992	Miller et al. 209/564
4,908,516 A	3/1990	West 250/556	5,135,435 A	8/1992	Rasmussen
4,917,371 A	4/1990	Bastow et al.	5,140,517 A	8/1992	Nagata et al.
4,921,463 A	5/1990	Primdahl et al.	5,141,443 A	8/1992	Rasmussen et al.
4,922,109 A	5/1990	Bercovitz et al. 250/556	5,141,472 A	8/1992	Todd et al.
4,928,094 A	5/1990	Smith 340/712	5,144,115 A	9/1992	Yoshida 235/379
4,931,782 A	6/1990	Jackson 340/706	5,145,455 A	9/1992	Todd
4,936,435 A	6/1990	Griner	5,146,067 A	9/1992	Sloan et al. 235/381
4,947,441 A	8/1990	Hara et al. 382/7	5,146,512 A	9/1992	Weideman et al. 382/30
4,948,174 A	8/1990	Thomson et al. 283/58	5,151,607 A	9/1992	Crane et al. 250/556
4,953,086 A	8/1990	Fukatsu	5,154,272 A	10/1992	Nishiumi et al. 194/318
4,954,697 A	9/1990	Kokubun et al. 235/381	5,159,548 A	10/1992	Caslavka 364/408
4,958,235 A	9/1990	Sims et al. 358/402	5,163,672 A	11/1992	Mennie 271/187
4,960,981 A	10/1990	Benton et al. 235/379	5,163,866 A	11/1992	Rasmussen
4,964,495 A	10/1990	Rasmussen	5,163,867 A	11/1992	Rasmussen
4,966,570 A	10/1990	Ristvedt et al.	5,163,868 A	11/1992	Adams et al. 453/11
4,970,655 A	11/1990	Winn et al. 364/479	5,167,313 A	12/1992	Dobbins et al. 194/317
4,971,187 A	11/1990	Furuya et al.	5,167,314 A	12/1992	Levesseur
4,973,851 A	11/1990	Lee 250/556	5,172,907 A	12/1992	Kalisiak
4,980,543 A	12/1990	Hara et al. 235/379	5,174,454 A	12/1992	Parkander
4,984,280 A	1/1991	Abe 382/7	5,175,416 A	12/1992	Mansvelt et al.
4,984,692 A	1/1991	Obara	5,176,565 A	1/1993	Ristvedt et al.
4,985,614 A	1/1991	Pease et al.	5,179,517 A	1/1993	Sarbin et al. 364/410
4,988,849 A	1/1991	Sasaki et al.	5,183,142 A	2/1993	Latchinian et al. 194/206
4,992,647 A	2/1991	Konishi et al.	5,184,115 A	2/1993	Black et al. 340/708
4,992,860 A	2/1991	Hamaguchi et al. 358/75	5,184,709 A	2/1993	Nishiumi et al. 194/318
4,995,848 A	2/1991	Goh	5,186,334 A	2/1993	Fukudome et al. 209/534
4,996,604 A	2/1991	Ogawa et al. 358/474	5,187,750 A	2/1993	Behera 382/7
5,001,766 A	3/1991	Baird	5,191,525 A	3/1993	LeBrun et al. 364/419
5,009,627 A	4/1991	Rasmussen	5,193,121 A	3/1993	Elischer et al. 382/7
5,010,238 A	4/1991	Kadono et al. 235/379	5,194,037 A	3/1993	Jones et al.
5,010,485 A	4/1991	Bigari	5,197,919 A	3/1993	Geib et al.
5,011,455 A	4/1991	Rasmussen	5,198,976 A	3/1993	Form et al. 364/410
5,012,932 A	5/1991	Omura et al.	5,199,543 A	4/1993	Kamagami et al. 194/207
5,020,787 A	6/1991	Arikawa	5,201,395 A	4/1993	Takizawa et al. 194/206
5,022,531 A	6/1991	Horino et al.	5,204,811 A	4/1993	Bednar et al. 364/406
5,022,889 A	6/1991	Ristvedt et al.	5,205,780 A	4/1993	Rasmussen
5,023,782 A	6/1991	Lutz et al. 364/405	5,206,915 A	4/1993	Kern et al. 382/7
5,025,139 A	6/1991	Halliburton, Jr.	5,207,784 A	5/1993	Schwartzendruber
5,025,483 A	6/1991	Dinan et al. 382/58	5,207,788 A	5/1993	Geib 271/122
5,026,320 A	6/1991	Rasmussen	5,209,696 A	5/1993	Rasmussen et al.
5,027,415 A	6/1991	Hara et al. 382/7	5,216,915 A	6/1993	Sakamoto
5,031,098 A	7/1991	Miller et al.	5,220,395 A	6/1993	Yamashita et al.
5,033,602 A	7/1991	Saarinen et al.	5,220,501 A	6/1993	Lawlor et al. 364/408
5,039,847 A *	8/1991	Morii et al. 235/379	5,231,381 A	7/1993	Duwaer 340/712
5,039,848 A	8/1991	Stoken	5,232,216 A	8/1993	Bybee
5,040,226 A	8/1991	Elischer et al. 382/7	5,236,071 A	8/1993	Lee
5,047,871 A	9/1991	Meyer et al. 358/486	5,236,072 A	8/1993	Cargill
5,053,607 A	10/1991	Carlson et al. 235/379	5,237,158 A	8/1993	Kern et al. 235/379
5,054,621 A	10/1991	Murphy et al. 209/534	5,237,159 A	8/1993	Stephens et al. 235/379
5,055,086 A	10/1991	Raterman et al.	5,239,593 A	8/1993	Wittner et al. 382/14
5,055,657 A	10/1991	Miller et al.	5,240,116 A	8/1993	Stevens et al.
5,055,834 A	10/1991	Chiba 340/825.34	5,243,174 A	9/1993	Veeneman et al.
5,063,599 A	11/1991	Concannon et al. 382/7	5,247,159 A	9/1993	Yuge et al.
5,064,999 A	11/1991	Okamoto et al. 235/379	5,251,273 A	10/1993	Betts et al. 382/57
5,068,519 A	11/1991	Bryce 235/449	5,251,738 A	10/1993	Dabrowski 194/206
5,076,441 A	12/1991	Gerlier 209/534	5,252,811 A	10/1993	Henochowicz et al. 235/379
5,080,633 A	1/1992	Ristvedt et al.	5,253,167 A	10/1993	Yoshida et al.
			5,258,855 A	11/1993	Lech et al. 358/462
			5,261,518 A	11/1993	Bryce 194/206
			5,263,566 A	11/1993	Nara et al.
			5,265,008 A	11/1993	Benton et al. 364/408

(56)

References Cited

U.S. PATENT DOCUMENTS

5,265,874 A	11/1993	Dickinson et al.	5,442,162 A	8/1995	Armel	235/381	
5,268,561 A	12/1993	Kimura et al.	5,444,793 A	8/1995	Kelland	382/138	
5,272,641 A	12/1993	Ford et al.	364/468	5/1995	Uhland, Sr.	382/137	
5,274,641 A	12/1993	Shobatake et al.	370/94.1	5,444,794 A	8/1995	Takemoto et al.	
5,277,292 A	1/1994	Boxall	5,445,277 A	8/1995			
5,277,651 A	1/1994	Rasmussen et al.	5,450,938 A	9/1995	Rademacher		
5,279,403 A	1/1994	Harbaugh et al.	194/207	5,453,047 A	9/1995	Mazur et al.	
5,282,127 A	1/1994	Mii	5,453,601 A	9/1995	Rosen	235/379	
5,286,226 A	2/1994	Rasmussen	5,459,304 A	10/1995	Eisenmann	235/380	
5,286,954 A	2/1994	Sato et al.	235/379	5,465,301 A	11/1995	Jotcham et al.	380/54
5,290,033 A	3/1994	Bittner et al.	5,465,821 A	11/1995	Akioka	194/207	
5,291,003 A	3/1994	Avnet et al.	5,467,405 A	11/1995	Raterman et al.	382/135	
5,291,560 A	3/1994	Daugman	5,467,406 A	11/1995	Graves et al.	382/135	
5,293,033 A	3/1994	Yamashita	5,468,182 A	11/1995	Geib		
5,293,981 A	3/1994	Abe et al.	5,468,941 A	11/1995	Sasaki	235/379	
5,295,196 A	3/1994	Raterman et al.	382/7	5,468,971 A	11/1995	Ebstein et al.	250/556
5,297,030 A	3/1994	Vassigh et al.	364/405	5,469,241 A	11/1995	Takahashi et al.	355/64
5,297,598 A	3/1994	Rasmussen	5,470,079 A	11/1995	LeStrange et al.		
5,297,986 A	3/1994	Ristvedt et al.	5,471,039 A	11/1995	Irwin et al.	235/441	
5,299,977 A	4/1994	Mazur et al.	5,474,495 A	12/1995	Geib et al.		
5,304,813 A	4/1994	De Man	5,474,497 A	12/1995	Jones et al.		
5,308,992 A	5/1994	Crane et al.	250/556	5,476,169 A	12/1995	Takarada et al.	194/207
5,309,515 A	5/1994	Troung et al.	382/7	5,478,992 A	12/1995	Hamada et al.	
5,316,279 A	5/1994	Corona et al.	270/1.1	5,480,348 A	1/1996	Mazur et al.	
5,317,140 A	5/1994	Dunthorn	5,481,377 A	1/1996	Udagawa et al.	358/501	
5,321,238 A	6/1994	Kamata et al.	235/379	5,488,671 A	1/1996	Kern	382/138
5,324,922 A	6/1994	Roberts	5,489,237 A	2/1996	Geib et al.		
5,326,104 A	7/1994	Pease et al.	5,491,325 A	2/1996	Huang et al.	235/379	
5,335,292 A	8/1994	Lovelady et al.	382/17	5,500,514 A	3/1996	Veeneman et al.	
5,340,971 A	8/1994	Rockstein et al.	5,501,631 A	3/1996	Mennie et al.		
5,341,408 A	8/1994	Melcher et al.	377/8	5,504,822 A	4/1996	Holt	382/218
5,342,165 A	8/1994	Graef et al.	414/788.9	5,506,691 A	4/1996	Bednar et al.	358/402
5,358,088 A	10/1994	Barnes et al.	5,507,379 A	4/1996	Mazur et al.		
5,363,949 A	11/1994	Matsubayashi	5,509,692 A	4/1996	Oz	283/70	
5,367,577 A	11/1994	Gotoa	D369,984 S	5/1996	Larsen	D10/97	
5,368,147 A	11/1994	Menke et al.	194/206	5,514,034 A	5/1996	Jones et al.	
5,370,575 A	12/1994	Geib et al.	5,520,577 A	5/1996	Rasmussen		
5,371,345 A	12/1994	LeStrange et al.	235/380	5,523,575 A	6/1996	Machida et al.	250/208.1
5,371,798 A	12/1994	McWhortor	5,530,772 A	6/1996	Storey	382/135	
5,372,542 A	12/1994	Geib et al.	5,530,773 A	6/1996	Thompson	382/138	
5,373,550 A	12/1994	Campbell et al.	379/100	5,532,464 A	7/1996	Josephson et al.	235/379
5,374,814 A	12/1994	Kako et al.	5,537,486 A	7/1996	Stratigos et al.	382/137	
5,379,344 A	1/1995	Larsson et al.	380/23	5,538,468 A	7/1996	Ristvedt et al.	
5,379,875 A	1/1995	Shames et al.	5,539,825 A	7/1996	Akiyama et al.	380/24	
5,381,019 A	1/1995	Sato	5,542,880 A	8/1996	Geib et al.		
5,382,191 A	1/1995	Rasmussen	5,542,881 A	8/1996	Geib		
5,383,754 A	1/1995	Sumida et al.	412/11	5,544,043 A	8/1996	Miki et al.	364/406
5,390,776 A	2/1995	Thompson	5,544,086 A	8/1996	Davis et al.	364/408	
5,394,969 A	3/1995	Harbaugh	5,545,885 A	8/1996	Jagielinski	235/449	
5,394,992 A	3/1995	Winkler	5,548,110 A	8/1996	Storch et al.		
5,397,003 A	3/1995	Stevens et al.	5,553,320 A	9/1996	Matsuura et al.		
5,399,874 A	3/1995	Gonsalves et al.	250/556	5,559,887 A	9/1996	Davis et al.	
5,401,211 A	3/1995	Geib et al.	5,564,546 A	10/1996	Molbak et al.	194/216	
5,402,895 A	4/1995	Mikkelsen et al.	209/534	5,564,974 A	10/1996	Mazur et al.	
5,404,986 A	4/1995	Hossfield et al.	5,564,978 A	10/1996	Jones et al.		
5,408,417 A	4/1995	Wilder	5,570,465 A	10/1996	Tsakanikas		
5,410,590 A	4/1995	Blood et al.	5,573,457 A	11/1996	Watts et al.		
RE34,934 E	5/1995	Raterman et al.	5,574,790 A	11/1996	Liang et al.		
5,412,190 A	5/1995	Josephson et al.	235/379	5,584,758 A	12/1996	Geib	
5,416,307 A	5/1995	Danek et al.	235/449	5,586,036 A	12/1996	Pintsov	364/464.02
5,417,316 A	5/1995	Harbaugh	5,590,196 A	12/1996	Moreau	380/18	
5,418,458 A	5/1995	Jeffers	5,592,377 A	1/1997	Lipkin	395/242	
5,418,855 A	5/1995	Liang et al.	5,592,561 A	1/1997	Moore	382/103	
5,419,424 A	5/1995	Harbaugh	5,594,225 A	1/1997	Botvin	235/379	
5,419,440 A	5/1995	Picoult	5,600,704 A	2/1997	Ahlberg et al.	379/58	
5,420,406 A	5/1995	Izawa et al.	5,600,732 A	2/1997	Ott et al.	382/112	
5,421,443 A	6/1995	Hatamachi et al.	194/206	5,602,933 A	2/1997	Blackwell et al.	382/116
5,422,467 A	6/1995	Graef et al.	235/379	5,602,936 A	2/1997	Green et al.	382/140
5,425,669 A	6/1995	Geib et al.	5,607,040 A	3/1997	Mathurin, Sr.	194/207	
5,429,550 A	7/1995	Mazur et al.	5,615,280 A	3/1997	Izawa et al.	382/135	
5,430,664 A	7/1995	Cargill et al.	364/550	5,616,902 A	4/1997	Cooley	235/380
5,434,427 A	7/1995	Crane et al.	250/556	5,616,915 A	4/1997	Simpkins et al.	
5,437,357 A	8/1995	Ota et al.	194/206	5,620,079 A	4/1997	Molbak	194/217
5,438,184 A	8/1995	Roberts et al.	235/380	5,623,547 A	4/1997	Jones et al.	
5,440,108 A	8/1995	Tran et al.	5,625,562 A	4/1997	Veeneman et al.		
			5,630,494 A	5/1997	Strauts		
			5,633,949 A	5/1997	Graves et al.	382/135	
			5,639,081 A	6/1997	Hatamachi et al.		
			5,640,463 A	6/1997	Csulits	382/135	
			5,641,050 A	6/1997	Smith et al.		

US 9,129,271 B2

Page 6

(56)

References Cited

U.S. PATENT DOCUMENTS

5,650,605 A	7/1997	Morioka et al.	5,913,399 A	6/1999	Takemoto et al.
5,650,761 A	7/1997	Gomm et al.	5,914,930 A	6/1999	Sasaki et al.
5,652,421 A	7/1997	Veeneman et al.	5,915,685 A	6/1999	Bausch et al.
5,652,802 A	7/1997	Graves et al.	5,917,930 A	6/1999	Kayani et al.
5,657,846 A	8/1997	Schwartz	5,918,748 A	7/1999	382/135
5,665,952 A	9/1997	Ziarno	5,923,413 A	7/1999	Clark et al.
5,666,417 A	9/1997	Liang et al.	5,926,392 A	7/1999	Laskowski
5,671,282 A	9/1997	Wolff et al.	5,926,550 A	7/1999	356/71
5,678,046 A	10/1997	Cahill et al.	5,930,778 A	7/1999	York et al.
5,679,070 A	10/1997	Ishida et al.	5,932,219 A	8/1999	364/478.11
5,680,472 A	10/1997	Conant	5,938,044 A	8/1999	Davis
5,684,597 A	11/1997	Hossfield et al.	5,940,623 A	8/1999	380/25
5,687,963 A	11/1997	Mennie	5,940,844 A	8/1999	Geer
5,692,067 A	11/1997	Raterman et al.	5,942,255 A	8/1999	705/45
5,692,742 A	12/1997	Tranquilla	5,942,743 A	8/1999	Yoshida et al.
5,696,366 A	12/1997	Ziarno	5,943,655 A	8/1999	235/379
5,703,344 A	12/1997	Bezy et al.	5,944,600 A	8/1999	Wegesser
5,704,491 A	1/1998	Graves	5,947,255 A	9/1999	395/712
5,708,810 A	1/1998	Kern et al.	5,951,476 A	9/1999	Shimada et al.
5,719,948 A	2/1998	Liang	5,957,262 A	9/1999	194/207
5,724,438 A	3/1998	Graves	5,959,296 A	9/1999	Beach et al.
5,727,667 A	3/1998	Nye	5,960,103 A	9/1999	Molbak et al.
5,729,623 A	3/1998	Omatu et al.	5,966,456 A	10/1999	Cyr et al.
5,743,373 A	4/1998	Strauts	5,982,918 A	11/1999	Graves et al.
5,746,299 A	5/1998	Molbak et al.	5,988,348 A	11/1999	382/135
5,751,840 A	5/1998	Raterman et al.	6,002,832 A	11/1999	Jones et al.
5,751,842 A	5/1998	Riach et al.	6,017,270 A	11/1999	382/135
5,754,673 A	5/1998	Brooks et al.	6,021,883 A	12/2000	Mennie et al.
5,754,674 A *	5/1998	Ott et al.	6,023,684 A	1/2000	382/135
5,755,437 A *	5/1998	Ek	6,026,175 A	1/2000	Martin et al.
5,761,089 A	6/1998	McInerny	6,028,951 A	1/2000	194/207
5,768,416 A	6/1998	Lech et al.	D422,016 S	1/2000	Harres et al.
5,774,874 A	6/1998	Veeneman et al.	6,032,859 A	1/2000	Molbak et al.
5,777,314 A	7/1998	Roustaei	6,036,232 A	1/2000	Casanova et al.
5,781,654 A	7/1998	Carney	6,036,344 A	1/2000	194/217
5,782,686 A	7/1998	Geib et al.	6,038,553 A	1/2000	Pearson
5,790,693 A	8/1998	Graves et al.	6,039,644 A	1/2000	705/35
5,790,697 A	8/1998	Munro et al.	6,039,645 A	1/2000	Mazur
5,799,767 A	9/1998	Molbak	6,042,470 A	1/2000	Geib et al.
5,806,650 A	9/1998	Mennie et al.	6,044,952 A	1/2000	Haggerty et al.
5,813,510 A	9/1998	Rademacher	6,045,039 A	1/2000	Stinson et al.
5,815,592 A	9/1998	Mennie et al.	6,047,807 A	1/2000	235/379
5,822,448 A	10/1998	Graves et al.	6,047,808 A	1/2000	Molbak
5,823,315 A	10/1998	Hoffman et al.	6,048,269 A	1/2000	Neubarth et al.
5,829,742 A	11/1998	Rabindran et al.	6,056,104 A	1/2000	Burns et al.
5,830,054 A	11/1998	Petri	6,065,672 A	1/2000	Neubarth et al.
5,832,104 A	11/1998	Graves et al.	6,068,194 A	1/2000	Haycock
5,832,460 A	11/1998	Bednar et al.	6,072,896 A	1/2000	235/492
5,832,463 A	11/1998	Funk	6,073,744 A	1/2000	Graves et al.
5,838,812 A	11/1998	Pare, Jr. et al.	6,074,334 A	1/2000	382/135
5,838,814 A	11/1998	Moore	6,076,826 A	1/2000	Raterman et al.
5,842,188 A	11/1998	Ramsey et al.	6,078,683 A	1/2000	194/207
5,842,916 A	12/1998	Gerrity et al.	6,080,056 A	1/2000	493/438
5,848,784 A	12/1998	Tranquilla	D427,623 S	1/2000	Mazur
5,850,076 A	12/1998	Morioka et al.	6,082,519 A	1/2000	Denison et al.
5,852,811 A	12/1998	Atkins	6,086,471 A	1/2000	Karlsson
5,854,581 A	12/1998	Mori et al.	6,095,313 A	1/2000	Kuwada
5,865,673 A	2/1999	Geib et al.	6,097,834 A	1/2000	D18/3
5,867,589 A	2/1999	Graves et al.	6,101,266 A	1/2000	Martinet al.
5,870,487 A	2/1999	Graves et al.	6,105,007 A	1/2000	Zimmermann
5,870,725 A	2/1999	Bellinger et al.	6,109,522 A	1/2000	8/2000
5,874,717 A	2/1999	Kern et al.	6,112,982 A	1/2000	8/2000
5,875,259 A	2/1999	Mennie et al.	6,116,402 A	1/2000	8/2000
5,880,444 A	3/1999	Shibata et al.	6,119,946 A	1/2000	Teicher
5,892,211 A	4/1999	Davis et al.	6,128,402 A	1/2000	382/135
5,892,827 A	4/1999	Beach et al.	6,131,625 A	1/2000	382/135
5,894,937 A	4/1999	Schmidt	6,131,718 A	1/2000	Witschorik
5,905,810 A	5/1999	Jones et al.	6,139,418 A	1/2000	194/206
5,909,502 A	6/1999	Mazur	6,141,438 A	1/2000	Geib et al.
5,909,503 A	6/1999	Graves et al.	6,142,285 A	1/2000	Blanchester
5,909,793 A	6/1999	Beach et al.	6,144,459 A	1/2000	358/1.15
5,909,794 A	6/1999	Molbak et al.	6,145,738 A	1/2000	Stinson et al.
5,912,451 A	6/1999	Gurevich et al.	6,154,879 A	1/2000	235/379
5,912,979 A	6/1999	Gavrilos			
5,912,982 A	6/1999	Munro et al.			

(56)

References Cited

U.S. PATENT DOCUMENTS

6,168,001 B1	1/2001	Davis	6,588,569 B1	7/2003	Jenrick et al.	194/206	
6,171,182 B1	1/2001	Geib et al.	6,601,687 B1	8/2003	Jenrick et al.	194/206	
6,174,230 B1	1/2001	Gerrity et al.	6,602,125 B2	8/2003	Martin		
6,181,837 B1	1/2001	Cahill et al.	382/305	6,603,580 B1	8/2003	Taillie	358/474
6,196,371 B1	3/2001	Martin et al.	6,603,872 B2	8/2003	Jones et al.	382/135	
6,196,913 B1	3/2001	Geib et al.	6,609,604 B1	8/2003	Jones et al.		
6,220,419 B1	4/2001	Mennie	382/135	6,611,351 B1	8/2003	Simonoff	358/1.18
6,230,928 B1	5/2001	Hanna et al.	6,612,500 B2	9/2003	Myer, Sr.		
6,234,294 B1	5/2001	Defeo et al.	6,612,921 B2	9/2003	Geib et al.		
6,237,739 B1	5/2001	Mazur et al.	382/207	6,621,919 B2	9/2003	Mennie et al.	382/135
6,241,069 B1	6/2001	Mazur et al.	382/207	6,628,816 B2	9/2003	Mennie et al.	382/135
6,244,508 B1	6/2001	Straub	6,636,624 B2	10/2003	Raterman et al.	382/135	
6,256,407 B1	7/2001	Mennie et al.	382/135	6,637,576 B1	10/2003	Jones et al.	194/216
6,264,101 B1	7/2001	Ryan et al.	235/379	6,640,956 B1	11/2003	Zwieg et al.	
6,264,545 B1	7/2001	Magee et al.	6,644,696 B2	11/2003	Brown et al.		
6,264,556 B1	7/2001	Izawa et al.	6,647,136 B2	11/2003	Jones et al.	382/137	
6,278,795 B1	8/2001	Anderson et al.	382/135	6,650,767 B2	11/2003	Jones et al.	382/135
6,282,523 B1	8/2001	Tedesco et al.	705/45	6,661,910 B2	12/2003	Pare, Jr. et al.	
6,283,366 B1	9/2001	Hills et al.	235/379	6,662,166 B2	12/2003	Blake et al.	
6,304,660 B1	10/2001	Ehrhart et al.	6,663,675 B2	12/2003	Jones et al.	382/135	
6,308,887 B1	10/2001	Korman et al.	6,665,431 B2	12/2003	Gerrity et al.		
6,311,819 B1	11/2001	Stromme et al.	382/135	6,666,318 B2	12/2003	Jones et al.	382/135
6,318,536 B1	11/2001	Korman et al.	6,678,401 B2	1/2004	Mennie et al.	382/135	
6,318,537 B1	11/2001	Jones et al.	382/135	6,678,402 B2	1/2004	Jones et al.	382/135
6,321,894 B1	11/2001	Johnsson	382/208	6,679,775 B1 *	1/2004	Luciano et al.	463/25
6,332,099 B1	12/2001	Heidel et al.	6,697,511 B1	2/2004	Haycock	382/135	
6,343,745 B1	2/2002	Bohm et al.	6,705,470 B2	3/2004	Klein et al.	209/534	
6,349,972 B1	2/2002	Geiger et al.	6,721,442 B1	4/2004	Mennie et al.	382/135	
6,351,551 B1	2/2002	Munro et al.	382/135	6,722,486 B2	4/2004	Shibata et al.	194/206
6,351,552 B1	2/2002	Weaver et al.	382/135	6,724,926 B2	4/2004	Jones et al.	382/135
6,354,491 B2	3/2002	Nichols et al.	235/379	6,724,927 B2	4/2004	Jones et al.	382/135
6,363,164 B1	3/2002	Jones et al.	382/135	6,731,785 B1	5/2004	Mennie et al.	382/135
6,363,362 B1	3/2002	Burfield	705/40	6,731,786 B2	5/2004	Jones et al.	382/135
6,371,303 B1	4/2002	Klein et al.	209/534	6,748,101 B1	6/2004	Jones et al.	382/135
6,373,965 B1	4/2002	Liang	382/112	6,754,636 B1	6/2004	Walker et al.	
6,378,683 B2	4/2002	Mennie	382/207	6,755,730 B2	6/2004	Geib et al.	
6,381,354 B1	4/2002	Mennie et al.	382/135	6,758,316 B2	7/2004	Molbak	
6,390,269 B1	5/2002	Billington et al.	6,761,308 B1	7/2004	Hanna et al.		
6,398,000 B1	6/2002	Jenrick et al.	382/200	6,766,892 B2	7/2004	Martin et al.	
6,412,619 B1	7/2002	Ito et al.	6,778,693 B2	8/2004	Jones et al.	382/135	
6,412,620 B1	7/2002	Imura	6,783,065 B2	8/2004	Spitz et al.	235/380	
6,415,983 B1	7/2002	Ulvr et al.	235/487	6,783,452 B2	8/2004	Hino et al.	
6,430,320 B1	8/2002	Jia et al.	382/289	6,783,785 B1	8/2004	Raghavan et al.	
6,431,342 B1	8/2002	Schwartz	6,785,405 B2	8/2004	Tuttle et al.	382/112	
6,438,230 B1	8/2002	Moore	6,786,398 B1	9/2004	Stinson et al.	235/379	
6,439,395 B1	8/2002	Voellmer et al.	209/534	6,798,899 B2	9/2004	Mennie et al.	382/135
6,456,928 B1	9/2002	Johnson	6,810,137 B2	10/2004	Jones et al.	382/135	
6,459,806 B1	10/2002	Raterman et al.	382/135	RE38,663 E	11/2004	Kayani et al.	
6,460,705 B1	10/2002	Hallowell	209/534	6,843,418 B2	1/2005	Jones et al.	235/462.01
6,471,030 B1	10/2002	Neubarth et al.	6,848,561 B2	2/2005	Bao	194/207	
6,473,519 B1	10/2002	Pidhirny et al.	382/140	6,854,581 B2	2/2005	Molbak	
6,474,548 B1	11/2002	Montross et al.	6,854,640 B2	2/2005	Peklo		
6,484,863 B1	11/2002	Molbak	6,860,375 B2	3/2005	Hallowell et al.	194/328	
6,484,884 B1	11/2002	Gerrity et al.	6,863,168 B1	3/2005	Gerrity et al.		
6,493,461 B1	12/2002	Mennie et al.	382/135	6,863,214 B2	3/2005	Garner et al.	235/379
6,494,776 B1	12/2002	Molbak	6,866,134 B2	3/2005	Stromme et al.	194/207	
6,499,277 B1	12/2002	Warner et al.	6,868,954 B2	3/2005	Stromme et al.	194/207	
6,503,138 B2	1/2003	Spoehr et al.	6,880,692 B1	4/2005	Mazur et al.	194/207	
6,510,238 B2	1/2003	Haycock	382/135	6,883,706 B2	4/2005	Mastie et al.	235/379
6,516,078 B1	2/2003	Yang et al.	382/100	6,883,707 B2	4/2005	Nagasaki et al.	235/379
6,520,308 B1	2/2003	Martin et al.	6,892,871 B2	5/2005	Strauts et al.		
6,522,772 B1	2/2003	Morrison et al.	6,896,118 B2	5/2005	Jones et al.		
6,539,104 B1	3/2003	Raterman et al.	382/135	6,913,130 B1	7/2005	Mazur et al.	194/207
6,540,090 B1	4/2003	Sakai et al.	209/534	6,913,260 B2	7/2005	Maier et al.	271/265.04
6,546,351 B1	4/2003	Haycock et al.	702/127	6,915,893 B2	7/2005	Mennie	194/207
6,547,131 B1	4/2003	Foodman et al.	6,928,546 B1	8/2005	Nanavati et al.		
6,550,671 B1	4/2003	Brown et al.	235/379	6,929,109 B1	8/2005	Klein et al.	194/206
6,552,781 B1	4/2003	Rompel et al.	6,950,810 B2	9/2005	Lapsley et al.		
6,554,185 B1	4/2003	Montross et al.	6,953,150 B2	10/2005	Shepley et al.		
6,560,355 B2	5/2003	Graves et al.	382/135	6,955,253 B1	10/2005	Mazur et al.	194/207
6,573,983 B1	6/2003	Laskowski	356/71	6,955,263 B2	10/2005	Steinkogler et al.	
6,574,377 B1	6/2003	Cahill et al.	382/305	6,957,733 B2	10/2005	Mazur et al.	194/215
6,578,735 B1	6/2003	Mothwurf	6,957,746 B2	10/2005	Martin et al.		
6,579,165 B2	6/2003	Kuhlin et al.	6,959,800 B1	11/2005	Mazur et al.	194/207	
6,581,042 B2	6/2003	Pare, Jr. et al.	6,962,247 B2	11/2005	Maier et al.	194/207	

(56)

References Cited**U.S. PATENT DOCUMENTS**

6,966,417 B2	11/2005	Peklo et al.	7,552,810 B2	6/2009	Mecklenburg
6,976,570 B2	12/2005	Molbak	7,567,698 B2	7/2009	Paraskevakos
6,980,684 B1	12/2005	Munro et al.	382/135	382/135	382/135
6,988,606 B2	1/2006	Geib et al.	7,574,377 B2	8/2009	Carapelli
6,991,530 B2	1/2006	Hino et al.	7,580,859 B2	8/2009	Economy
6,994,200 B2	2/2006	Jenrick et al.	194/206	9/2009	Raterman et al.
6,996,263 B2	2/2006	Jones et al.	382/135	9/2009	Freeman et al.
7,000,828 B2	2/2006	Jones	235/379	10/2009	Jones et al.
7,004,831 B2	2/2006	Hino et al.	7,600,626 B2	10/2009	Hallowell et al.
7,006,664 B2	2/2006	Paraskevakos	382/100	10/2009	Jones et al.
7,014,029 B2	3/2006	Winters	7,602,956 B2	10/2009	Jones et al.
7,014,108 B2	3/2006	Sorenson et al.	5,909,503 C1	11/2009	Graves et al.
7,016,767 B2	3/2006	Jones et al.	382/135	11/2009	Jones et al.
7,017,729 B2	3/2006	Gerrity et al.	7,619,721 B2	11/2009	356/71
7,018,286 B2	3/2006	Blake et al.	7,620,231 B2	11/2009	Jones et al.
7,028,827 B1	4/2006	Molbak et al.	5,966,456 C1	12/2009	382/135
7,028,888 B2	4/2006	Laskowski	382/100	12/2009	382/135
7,034,324 B2	4/2006	Voser	6,381,354 C1	12/2009	Mennie et al.
7,036,651 B2	5/2006	Tam et al.	7,628,326 B2	12/2009	235/449
7,044,463 B2	5/2006	Brotherston et al.	7,635,082 B2	12/2009	Jones
7,082,216 B2	7/2006	Jones et al.	7,647,275 B2	1/2010	235/379
7,083,036 B2	8/2006	Adams	7,650,980 B2	1/2010	Jones
7,092,560 B2	8/2006	Jones et al.	7,654,450 B2	1/2010	Jenrick et al.
7,103,206 B2	9/2006	Graves et al.	7,658,270 B2	2/2010	Mateen et al.
7,103,438 B2	9/2006	Hallowell et al.	7,672,499 B2	3/2010	Bochonok et al.
7,113,615 B2	9/2006	Rhoads et al.	7,686,151 B2	3/2010	Raterman et al.
7,113,925 B2	9/2006	Waserstein et al.	7,724,938 B2	3/2010	194/206
7,113,929 B1	9/2006	Beach et al.	7,726,457 B2	5/2010	Pareskevakos
7,120,608 B1	10/2006	Gallagher et al.	7,735,621 B2	6/2010	194/206
7,124,113 B1	10/2006	Fairclough et al.	7,743,902 B2	6/2010	Hallowell et al.
7,131,580 B2	11/2006	Molbak	7,753,189 B2	7/2010	Wendell et al.
7,146,245 B2	12/2006	Jones et al.	7,757,940 B2	7/2010	Maier et al.
7,149,336 B2	12/2006	Jones et al.	7,762,380 B2	7/2010	Sawa
7,152,727 B2	12/2006	Waechter	7,778,456 B2	8/2010	Freeman et al.
7,158,662 B2	1/2007	Chiles	7,779,982 B2	8/2010	194/210
7,171,032 B2	1/2007	Jones et al.	7,792,753 B1	9/2010	Jones et al.
7,187,795 B2	3/2007	Jones et al.	7,806,317 B2	10/2010	382/135
7,188,720 B2	3/2007	Geib et al.	7,817,842 B2	10/2010	Laskowski
7,191,657 B2	3/2007	Maier et al.	7,819,308 B2	10/2010	382/135
7,197,173 B2	3/2007	Jones et al.	7,849,993 B2	12/2010	Osterberg et al.
7,200,255 B2	4/2007	Jones et al.	7,849,994 B2	12/2010	Finkenzeller et al.
7,201,320 B2	4/2007	Csulits et al.	7,873,576 B2	1/2011	194/206
7,201,340 B2	4/2007	Dietrich et al.	7,874,478 B2	1/2011	Klein et al.
7,213,697 B2	5/2007	Martin et al.	7,881,519 B2	2/2011	Jones et al.
7,216,106 B1	5/2007	Buchanan et al.	7,882,000 B2	2/2011	382/135
7,232,024 B2	6/2007	Mazur et al.	7,885,880 B1	2/2011	Prasad et al.
7,243,773 B2	7/2007	Bochonok et al.	7,886,890 B2	2/2011	705/35
7,248,730 B2	7/2007	Matsui et al.	7,896,231 B2	3/2011	Blake et al.
7,248,731 B2	7/2007	Raterman et al.	7,900,829 B1	3/2011	Dcosta et al.
7,256,874 B2	8/2007	Csulits et al.	7,903,863 B2	3/2011	194/210
7,269,279 B2	9/2007	Chiles	7,929,749 B1	4/2011	Folk et al.
7,303,119 B2	12/2007	Molbak	7,931,304 B2	4/2011	382/135
7,312,902 B2	12/2007	Mastie et al.	7,938,245 B2	5/2011	Jenrick et al.
7,331,521 B2	2/2008	Sorenson et al.	7,946,406 B2	5/2011	194/206
7,337,890 B2	3/2008	Bochonok et al.	7,949,582 B2	5/2011	Mennie et al.
7,349,566 B2	3/2008	Jones et al.	7,962,411 B1	6/2011	705/35
7,360,682 B2	4/2008	Shane et al.	7,974,899 B1	7/2011	Prasad et al.
7,362,891 B2	4/2008	Jones et al.	7,980,378 B2	7/2011	705/45
7,366,338 B2	4/2008	Jones et al.	8,011,581 B1	9/2011	Jones et al.
7,391,897 B2	6/2008	Jones et al.	8,023,715 B2	9/2011	382/135
7,419,088 B2	9/2008	Zhao et al.	8,041,098 B2	10/2011	Jones et al.
7,427,230 B2	9/2008	Blake et al.	8,047,427 B2	11/2011	382/135
7,438,172 B2	10/2008	Long et al.	8,103,084 B2	1/2012	Sanders et al.
7,441,712 B2	10/2008	Silverbrook et al.	8,125,624 B2	1/2012	382/140
7,454,049 B2	11/2008	Paraskevakos	8,126,793 B2	2/2012	Jones et al.
7,464,802 B2	12/2008	Gerrity et al.	8,141,772 B1	3/2012	356/71
7,494,052 B1	2/2009	Carpenter et al.	8,162,125 B1	4/2012	Folk et al.
7,505,831 B2	3/2009	Jones et al.	8,165,958 B1	4/2012	194/206
7,506,168 B2	3/2009	Silverbrook et al.	8,169,602 B2	5/2012	McLaughlin et al.
7,513,413 B2	4/2009	Graef et al.	8,171,567 B1	5/2012	705/40
7,520,374 B2	4/2009	Martin et al.	8,204,293 B2	6/2012	Jones et al.
7,520,375 B2	4/2009	Ina et al.	8,297,428 B2	10/2012	382/135
7,536,046 B2	5/2009	Raterman et al.	8,322,505 B2	12/2012	Renz et al.
7,542,598 B2	6/2009	Jones et al.	8,331,643 B2	12/2012	194/210
7,551,764 B2	6/2009	Chiles et al.	8,339,589 B2	12/2012	Yacoubian et al.
			8,346,610 B2	1/2013	382/135
			8,352,322 B2	1/2013	Mennie et al.
			8,380,573 B2	2/2013	705/16
			8,391,583 B1	3/2013	Jones et al.
			8,396,278 B2	3/2013	382/135
			8,396,586 B2	3/2013	Klein et al.
			8,401,268 B1	3/2013	700/224
			5,692,067 C1	4/2013	Yacoubian et al.

(56)

References Cited**U.S. PATENT DOCUMENTS**

8,413,888 B2	4/2013	Jones	235/379	2002/0154804 A1	10/2002	Jones et al.	382/135
8,417,017 B1	4/2013	Beutel et al.	382/135	2002/0154805 A1	10/2002	Jones et al.	382/135
8,428,332 B1	4/2013	Csulits et al.	382/135	2002/0154806 A1	10/2002	Jones et al.	382/135
8,433,123 B1	4/2013	Csulits et al.	382/135	2002/0154807 A1	10/2002	Jones et al.	382/135
8,433,126 B2	4/2013	Jones et al.	382/137	2002/0154808 A1	10/2002	Jones et al.	382/135
8,437,528 B1	5/2013	Csulits et al.	382/135	2002/0164021 A1	11/2002	Sandru	
8,437,529 B1	5/2013	Mennie et al.	382/135	2002/0174348 A1	11/2002	Ting	
8,437,530 B1	5/2013	Mennie et al.	382/135	2003/0005303 A1	1/2003	Auslander et al.	713/176
8,437,531 B2	5/2013	Jones et al.	382/137	2003/0006277 A1	1/2003	Maskatiya et al.	235/379
8,437,532 B1	5/2013	Jones et al.	382/138	2003/0009420 A1	1/2003	Jones	705/39
8,442,296 B2	5/2013	Jones et al.	382/137	2003/0013403 A1	1/2003	Blake et al.	
8,453,820 B2	6/2013	Hallowell et al.	194/207	2003/0015395 A1	1/2003	Hallowell et al.	194/206
8,459,436 B2	6/2013	Jenrick et al.	194/206	2003/0015396 A1	1/2003	Mennie	194/206
8,467,591 B1	6/2013	Csulits et al.	382/135	2003/0023342 A1	1/2003	Christl et al.	
8,478,019 B1	7/2013	Csulits et al.	382/135	2003/0023557 A1	1/2003	Moore	705/50
8,478,020 B1	7/2013	Jones et al.	382/137	2003/0059098 A1	3/2003	Jones et al.	382/135
8,514,379 B2	8/2013	Jones et al.	356/71	2003/0062242 A1	4/2003	Hallowell et al.	194/302
8,538,123 B1	9/2013	Csulits et al.	382/135	2003/0080032 A1	5/2003	Heidel et al.	209/534
8,542,904 B1	9/2013	Beutel et al.	382/133	2003/0081824 A1	5/2003	Mennie et al.	382/135
8,544,656 B2	10/2013	Mennie et al.	209/534	2003/0085271 A1	5/2003	Laskowski	235/379
8,559,694 B2	10/2013	Jenrick et al.	382/135	2003/0099379 A1	5/2003	Monk et al.	382/115
8,559,695 B1	10/2013	Csulits et al.	382/135	2003/0108233 A1	6/2003	Raterman et al.	382/135
8,594,414 B1	11/2013	Jones et al.	382/135	2003/0121752 A1	7/2003	Stromme et al.	194/207
8,625,875 B2	1/2014	Csulits et al.	382/135	2003/0121753 A1	7/2003	Stromme et al.	194/207
8,627,939 B1	1/2014	Jones et al.	194/207	2003/0127299 A1	7/2003	Jones et al.	
8,639,015 B1	1/2014	Mennie et al.	382/135	2003/0128240 A1	7/2003	Martinez et al.	345/764
8,644,583 B1	2/2014	Mennie et al.	382/135	2003/0132281 A1	7/2003	Jones et al.	235/379
8,644,584 B1	2/2014	Mennie et al.	382/135	2003/0139994 A1	7/2003	Jones	705/36
8,644,585 B1	2/2014	Mennie et al.	382/135	2003/0168308 A1	9/2003	Maier et al.	194/207
8,655,045 B2	2/2014	Jones et al.	382/135	2003/0168309 A1	9/2003	Geib et al.	
8,655,046 B1	2/2014	Csulits et al.	382/135	2003/0168310 A1	9/2003	Strauts et al.	
8,684,157 B2	4/2014	Freeman et al.	194/210	2003/0174874 A1	9/2003	Raterman et al.	382/135
8,701,857 B2	4/2014	Jenrick et al.	194/206	2003/0182217 A1	9/2003	Chiles	705/35
2001/0006556 A1	7/2001	Graves et al.		2003/0183685 A1	10/2003	Steele Moore et al.	235/379
2001/0006557 A1	7/2001	Mennie et al.	382/135	2003/0190882 A1	10/2003	Blake et al.	
2001/0015311 A1	8/2001	Mennie	194/207	2003/0198373 A1	10/2003	Raterman et al.	382/135
2001/0018739 A1	8/2001	Anderson et al.	713/176	2003/0202690 A1	10/2003	Jones et al.	382/139
2001/0019624 A1	9/2001	Raterman et al.	382/135	2003/0233317 A1	12/2003	Judd	705/39
2001/0034203 A1	10/2001	Geib et al.		2003/0234153 A1	12/2003	Blake et al.	
2001/0035603 A1	11/2001	Graves et al.	271/265.01	2004/0003980 A1	1/2004	Hallowell et al.	194/206
2001/0048025 A1	12/2001	Shinn		2004/0016621 A1	1/2004	Jenrick et al.	194/206
2001/0050247 A1	12/2001	Myer, Sr.		2004/0016797 A1	1/2004	Jones et al.	235/379
2001/0053241 A1	12/2001	Haycock	382/135	2004/0028266 A1	2/2004	Jones et al.	382/135
2002/0001393 A1	1/2002	Jones et al.	382/100	2004/0037456 A1	2/2004	Haycock	382/135
2002/0020603 A1	2/2002	Jones et al.	194/346	2004/0055902 A1	3/2004	Peklo	
2002/0026422 A1	2/2002	Kersten		2004/0083149 A1	4/2004	Jones	705/35
2002/0033359 A1	3/2002	Graef et al.	209/534	2004/0092222 A1	5/2004	Kowalczyk et al.	
2002/0034977 A1	3/2002	Burns et al.		2004/0099580 A1	5/2004	Brotherston et al.	
2002/0037097 A1	3/2002	Hoyos et al.	382/137	2004/0131230 A1	7/2004	Paraskevacos	382/100
2002/0056605 A1	5/2002	Mazur et al.	194/207	2004/0145726 A1	7/2004	Csulits et al.	356/71
2002/0065033 A1	5/2002	Geib et al.		2004/0149538 A1	8/2004	Sakowski	194/207
2002/0066637 A1	6/2002	Otsuka et al.	194/328	2004/0153406 A1	8/2004	Alarcon-Luther et al.	
2002/0069104 A1	6/2002	Beach et al.		2004/0153408 A1	8/2004	Jones et al.	705/43
2002/0074209 A1	6/2002	Karlsson		2004/0153421 A1	8/2004	Robinson	
2002/0082993 A1	6/2002	Hoyos et al.	705/43	2004/0154899 A1	8/2004	Peklo et al.	
2002/0085245 A1	7/2002	Mennie et al.	358/498	2004/0154964 A1	8/2004	Jones	209/534
2002/0085745 A1	7/2002	Jones et al.	382/135	2004/0173432 A1	9/2004	Jones	194/216
2002/0095587 A1	7/2002	Doyle et al.		2004/0182675 A1	9/2004	Long et al.	194/206
2002/0100660 A1	8/2002	Stieber et al.	194/215	2004/0188221 A1	9/2004	Carter	
2002/0103757 A1	8/2002	Jones et al.	705/45	2004/0200691 A1	10/2004	Geib et al.	
2002/0104785 A1	8/2002	Klein et al.	209/534	2004/0211829 A1	10/2004	Steinkogler et al.	
2002/0107738 A1	8/2002	Beach et al.		2004/0238619 A1	12/2004	Nagasaki et al.	235/379
2002/0107801 A1	8/2002	Jones et al.	705/45	2004/0251110 A1	12/2004	Jenrick et al.	194/207
2002/0118871 A1	8/2002	Jones et al.	382/137	2004/0256197 A1	12/2004	Blake et al.	
2002/0120572 A1	8/2002	Bellucci et al.	705/43	2005/0006197 A1	1/2005	Wendell et al.	
2002/0122580 A1	9/2002	Jones et al.	382/137	2005/0029168 A1	2/2005	Jones et al.	209/534
2002/0126885 A1	9/2002	Mennie et al.	382/135	2005/0035034 A1	2/2005	Long et al.	209/534
2002/0126886 A1	9/2002	Jones et al.	382/135	2005/0035140 A1	2/2005	Carter	
2002/0129012 A1	9/2002	Green	707/3	2005/0040007 A1	2/2005	Geib et al.	
2002/0130011 A1	9/2002	Casanova et al.		2005/0040225 A1	2/2005	Csulits et al.	235/379
2002/0131630 A1	9/2002	Jones et al.	382/137	2005/0045448 A1	3/2005	Sugano et al.	194/207
2002/0136442 A1	9/2002	Jones et al.	382/135	2005/0045450 A1	3/2005	Geib et al.	
2002/0145035 A1	10/2002	Jones	235/379	2005/0045531 A1	3/2005	Bretschneider et al.	
2002/0147588 A1	10/2002	Davis et al.		2005/0047642 A1	3/2005	Jones et al.	382/137
2002/0151267 A1	10/2002	Kuhlin et al.		2005/0060055 A1	3/2005	Hallowell et al.	700/95

(56)

References Cited

U.S. PATENT DOCUMENTS

2005/0060059 A1	3/2005 Klein et al.	700/213	2007/0095630 A1	5/2007 Mennie et al.	194/206
2005/0060061 A1	3/2005 Jones	700/226	2007/0095898 A1	5/2007 Uno et al.	
2005/0067305 A1	3/2005 Bochonok et al.		2007/0102863 A1	5/2007 Burns et al.	271/3.01
2005/0077142 A1	4/2005 Tam et al.	194/217	2007/0108015 A1	5/2007 Bochonok et al.	
2005/0086271 A1	4/2005 Jones et al.	707/200	2007/0112674 A1	5/2007 Jones et al.	705/45
2005/0087422 A1	4/2005 Maier et al.	194/207	2007/0119681 A1	5/2007 Blake et al.	
2005/0087425 A1	4/2005 Peklo		2007/0122023 A1	5/2007 Jenrick et al.	382/135
2005/0108164 A1	5/2005 Salafia et al.	705/42	2007/0172106 A1	7/2007 Paraskevakos	382/135
2005/0108165 A1	5/2005 Jones et al.	705/43	2007/0172107 A1	7/2007 Jones et al.	382/137
2005/0109836 A1	5/2005 Ben-Aissa		2007/0181676 A1	8/2007 Mateen et al.	
2005/0117791 A2	6/2005 Raterman et al.	382/135	2007/0187494 A1	8/2007 Hanna	
2005/0117792 A2	6/2005 Graves et al.	382/135	2007/0202526 A1	9/2007 Uno et al.	
2005/0124407 A1	6/2005 Rowe		2007/0209904 A1	9/2007 Freeman et al.	194/210
2005/0150738 A1	7/2005 Hallowell et al.	194/206	2007/0221470 A1	9/2007 Mennie et al.	194/216
2005/0150740 A1	7/2005 Finkenzeller et al.		2007/0237381 A1	10/2007 Mennie et al.	382/135
2005/0151995 A1	7/2005 Hauser et al.	358/1.15	2007/0258633 A1	11/2007 Jones et al.	382/135
2005/0156318 A1	7/2005 Douglas		2007/0269097 A1	11/2007 Chiles et al.	382/135
2005/0161501 A1	7/2005 Giering et al.		2007/0278064 A1	12/2007 Hallowell et al.	194/206
2005/0163361 A1	7/2005 Jones et al.	382/135	2007/0288382 A1	12/2007 Narayanan et al.	705/45
2005/0163362 A1	7/2005 Jones et al.	382/137	2008/0006505 A1	1/2008 Renz et al.	194/206
2005/0169511 A1	8/2005 Jones	382/135	2008/0033829 A1	2/2008 Mennie et al.	705/16
2005/0173221 A1	8/2005 Maier et al.	194/207	2008/0037856 A1	2/2008 Paraskevakos	382/140
2005/0183928 A1	8/2005 Jones et al.	194/207	2008/0044077 A1	2/2008 Mennie et al.	382/135
2005/0205654 A1	9/2005 Carter		2008/0052189 A1	2/2008 Walker et al.	705/26
2005/0205655 A1	9/2005 Carter		2008/0060906 A1	3/2008 Fitzgerald et al.	194/207
2005/0207634 A1	9/2005 Jones et al.	382/135	2008/0099555 A1	5/2008 Silva et al.	235/381
2005/0213803 A1	9/2005 Mennie et al.	382/135	2008/0123932 A1	5/2008 Jones et al.	382/135
2005/0228717 A1	10/2005 Gusler et al.		2008/0133411 A1	6/2008 Jones et al.	705/42
2005/0241909 A1	11/2005 Mazur et al.	194/207	2008/0141126 A1	6/2008 Johnson et al.	715/273
2005/0249394 A1	11/2005 Jones et al.	382/135	2008/0177420 A1	7/2008 Klein et al.	700/224
2005/0256792 A1	11/2005 Shimizu et al.		2008/0219543 A1	9/2008 Csultis et al.	382/135
2005/0258235 A1	11/2005 Silverbrook et al.	235/379	2008/0220707 A1	9/2008 Jones et al.	453/2
2005/0265591 A1	12/2005 Jones et al.	382/135	2008/0285838 A1	11/2008 Jones et al.	382/135
2005/0267843 A1	12/2005 Acharya et al.	705/42	2009/0001661 A1	1/2009 Klein et al.	271/258.01
2005/0276458 A1	12/2005 Jones et al.	382/135	2009/0013653 A1	1/2009 Sekiguchi et al.	53/531
2005/0278239 A1	12/2005 Jones et al.	705/35	2009/0018859 A1	1/2009 Doran et al.	
2005/0281450 A1	12/2005 Richardson	382/139	2009/0022390 A1	1/2009 Yacoubian et al.	382/135
2005/0289030 A1	12/2005 Smith	705/35	2009/0087076 A1	4/2009 Jenrick et al.	382/135
2006/0010071 A1	1/2006 Jones et al.	705/42	2009/0090779 A1	4/2009 Freeman et al.	235/450
2006/00166883 A1	1/2006 Silva et al.	235/381	2009/0141962 A1	6/2009 Borgia et al.	382/139
2006/0037835 A1	2/2006 Doran et al.		2009/0144620 A1	6/2009 Bauchot et al.	715/277
2006/0054454 A1	3/2006 Oh	194/207	2009/0148025 A1	6/2009 Calman	382/135
2006/0054455 A1	3/2006 Kuykendall et al.		2009/0148027 A1	6/2009 Paraskevakos	382/135
2006/0054457 A1	3/2006 Long et al.		2009/0183967 A1	7/2009 Hamasaki	194/320
2006/0060363 A2	3/2006 Carter		2009/0236201 A1	9/2009 Blake et al.	
2006/0064379 A1	3/2006 Doran et al.		2009/0239459 A1	9/2009 Watts et al.	
2006/0069654 A1	3/2006 Beach et al.		2009/0242626 A1	10/2009 Jones et al.	
2006/0078186 A1	4/2006 Freeman et al.	382/135	2009/0310188 A1	12/2009 Jones et al.	358/448
2006/0081509 A1	4/2006 Otsuka		2009/0313159 A1	12/2009 Jones et al.	705/35
2006/0106717 A1	5/2006 Randle et al.	705/45	2009/0320106 A1	12/2009 Jones et al.	
2006/0124724 A1	6/2006 Kotovich et al.	235/379	2010/0034454 A1	2/2010 Jones et al.	382/137
2006/0136317 A1	6/2006 Mizrah	705/35	2010/0038419 A1	2/2010 Blake et al.	
2006/0148394 A1	7/2006 Blake et al.		2010/0051687 A1	3/2010 Jones et al.	235/379
2006/0149415 A1	7/2006 Richards		2010/0057617 A1	3/2010 Jones et al.	705/44
2006/0151285 A1	7/2006 String		2010/0063916 A1	3/2010 Jones et al.	705/35
2006/0154589 A1	7/2006 String		2010/0092065 A1	4/2010 Jones et al.	382/135
2006/0157390 A1	7/2006 Otsuka		2010/0108463 A1	5/2010 Renz et al.	194/206
2006/0175176 A1	8/2006 Blake		2010/0116619 A1	5/2010 Jones	194/217
2006/0182330 A1	8/2006 Chiles	382/135	2010/0163366 A1	7/2010 Jenrick et al.	194/206
2006/0195567 A1	8/2006 Mody et al.	709/224	2010/0198726 A1	8/2010 Doran et al.	
2006/0196754 A1	9/2006 Bochonok et al.		2010/0236892 A1	9/2010 Jones et al.	194/206
2006/0205481 A1	9/2006 Dominelli		2010/0261421 A1	10/2010 Wendell et al.	
2006/0207856 A1	9/2006 Dean et al.		2010/0263984 A1	10/2010 Freeman et al.	194/206
2006/0210137 A1	9/2006 Raterman et al.	382/135	2010/0276485 A1	11/2010 Jones et al.	235/379
2006/0213979 A1	9/2006 Geller et al.	235/380	2010/0303111 A1	12/2010 Kupershmidt	372/32
2006/0219519 A1	10/2006 Molbak et al.		2010/0312705 A1	12/2010 Caruso et al.	705/45
2006/0274929 A1	12/2006 Jones et al.	382/135	2010/0327005 A1	12/2010 Martin et al.	
2006/0283685 A1	12/2006 Cousin		2011/0035316 A2	2/2011 Morgan et al.	705/39
2007/0000819 A1	1/2007 Yui		2011/0042178 A1	2/2011 Luecking	194/302
2007/0040014 A1	2/2007 Zhao et al.	235/379	2011/0087599 A1	4/2011 Jones	705/45
2007/0051582 A1	3/2007 Bochonok et al.		2011/0098845 A1	4/2011 Mennie et al.	
2007/0064991 A1	3/2007 Douglas et al.	382/137	2011/0099105 A1	4/2011 Mennie et al.	705/41
2007/0071302 A1	3/2007 Jones et al.	382/135	2011/0170761 A1	7/2011 Fu	382/135
2007/0076939 A1	4/2007 Jones et al.	382/135	2011/0206267 A1	8/2011 Jones et al.	382/139
2007/0078560 A1	4/2007 Jones et al.	700/224	2011/0215034 A1	9/2011 Mennie et al.	209/534
			2011/0220717 A1	9/2011 Jones et al.	235/380
			2011/0255767 A1	10/2011 Jenrick et al.	382/135
			2011/0258113 A1	10/2011 Jones et al.	705/39
			2012/0008131 A1	1/2012 Jones et al.	356/71

(56)	References Cited	EP	0 613 107 A1	8/1994 G07F 19/00
	U.S. PATENT DOCUMENTS	EP	0 616 296 A2	9/1994 G06K 9/20
		EP	0 632 415 A1	1/1995 G07F 7/10
		EP	0 633 533 A2	1/1995 G06F 15/00
2012/0008850 A1	1/2012 Jones et al. 382/135	EP	0 633 552 A2	1/1995 G07C 5/00
2012/0013891 A1	1/2012 Jones et al. 356/71	EP	0 633 553 A1	1/1995 G07D 7/00
2012/0013892 A1	1/2012 Jones et al. 356/71	EP	0 661 654 A2	7/1995 G06F 17/60
2012/0077476 A1	3/2012 Paraskevakos et al. 455/414.2	EP	0 671 696 A1	9/1995 G06F 17/30
2012/0101947 A1	4/2012 Hawkins 705/45	EP	0 686 292 A1	12/1995 G07D 7/00
2012/0150745 A1	6/2012 Csulits et al. 705/45	EP	0 708 419 A1	4/1996 G07D 7/00
2012/0185083 A1	7/2012 Klein et al. 700/223	EP	0 718 809 A2	6/1996 G07D 7/00
2012/0189186 A1	7/2012 Csulits et al. 382/135	EP	0 760 987 A1	3/1997 G07D 7/00
2012/0215689 A1	8/2012 Jones 705/40	EP	0 824 736 A1	2/1998 G07D 7/00
2012/0313316 A1	12/2012 Yamamoto et al. 271/220	EP	0926634 A2	12/1998	
2012/0321170 A2	12/2012 Jones 382/135	EP	0922504	6/1999	
2013/0068585 A1	3/2013 Freeman et al. 194/210	EP	0931300	7/1999	
2013/0098992 A1	4/2013 Jenrick et al. 235/375	EP	0 984 410 A1	3/2000 G07F 19/00
2013/0148874 A1	6/2013 Jones et al. 382/135	EP	1 004 089 A1	5/2000 G06K 9/00
2013/0193205 A1	8/2013 Jones et al. 235/379	EP	1 008 096 A2	6/2000	
2013/0213864 A1	8/2013 Mennie et al. 209/534	EP	1 019 869 A1	7/2000 G06K 9/78
2013/0327686 A1	12/2013 Mennie et al. 209/534	EP	1 028 359 A1	8/2000 G03H 1/18
		EP	1 041 523 A2	10/2000 G07F 7/10
	FOREIGN PATENT DOCUMENTS	EP	1062643	12/2000	
		EP	1104920	6/2001	
CA 2143943	3/2003	EP	1111553	6/2001	
CA 2 624 638 A1	12/2007 B65H 29/12	EP	1 134 704 A1	9/2001 G07D 7/00
CA 2 684 159 A1	4/2010 G07D 11/00	EP	1 160 737 A1	12/2001 G07D 3/00
DE 660354	5/1938	EP	1195725	4/2002	
DE 2446280	4/1975	EP	1199682 A2	4/2002	
DE 2659929 B2	5/1976	EP	1209639	5/2002	
DE 2528735	8/1976	EP	1253560 A2	10/2002	
DE 28 24 849 A1	12/1979 G07D 7/00	EP	1276080	1/2003	
DE 2935668 A1	5/1980	EP	1297498	4/2003	
DE 3021327 A1	12/1981	EP	1360655	11/2003	
DE 4407559	11/1995	EP	1 437 692 A1	7/2004 G07D 11/00
DE 19650875	10/1997	EP	1445740	8/2004	
DE 29817253	3/1999	EP	1458576	9/2004	
DE 19824435	5/1999	EP	1459267	9/2004	
DE 10049435	4/2002	EP	1515281	3/2005	
DE 10064009 A1	7/2002	EP	1516295	3/2005	
DE 10160585	7/2003	EP	1528513	5/2005	
DE 10344576	12/2004	EP	1643460	4/2006	
DE 102004022887	12/2005	EP	1699569	9/2006	
EP 0 030 413 A1	6/1981 G07F 7/02	EP	1730707	12/2006	
EP 0 071 421 A2	2/1983 G07D 7/00	EP	1762526	3/2007	
EP 0 077 464 A2	4/1983 G03H 1/08	EP	1785953	5/2007	
EP 0 083 062 A2	7/1983 G07D 7/00	EP	1 480 177 B1	11/2007 G07F 19/00
EP 0 101 115 A1	2/1984 G07D 7/00	FR	7011438	1/1971	
EP 0 109 743 A2	5/1984 G07D 1/00	FR	2042254	2/1971	
EP 0130824 A2	1/1985	FR	2 539 898 A1	7/1984 G07D 7/00
EP 0130825 A2	1/1985	FR	2 722 316 A1	1/1996 G07D 7/00
EP 0132329 A2	1/1985	GB	2824849	12/1979	
EP 0 185 200 A2	6/1986 G06F 3/14	GB	2035642	6/1980	
EP 0206675 B1	12/1986	GB	2 038 063 A	7/1980 G07D 7/00
EP 0 253 935 A2	1/1988 G06K 7/10	GB	2061232 A	9/1980	
EP 0264125 A1	4/1988	GB	2088832 A	6/1982	
EP 0 314 312 A2	5/1989 G07D 7/00	GB	2119138	2/1983	
EP 0 325 364 A2	7/1989 H04N 1/46	GB	2175427 A	11/1986	
EP 0351217 A2	7/1989	GB	2 190 996 A	12/1987 G06K 5/00
EP 0 338 123 A2	10/1989 G07D 7/00	GB	2198274 A	6/1988	
EP 0 342 647 A2	11/1989 G07D 7/00	GB	2 204 166 A	11/1988 G06M 9/02
EP 0 402 627 A1	12/1990 H01R 17/12	GB	2223872 A	4/1990	
EP 0 416 916 A2	3/1991 G07F 7/10	GB	2 272 762 A	5/1994 G01N 21/88
EP 0 416 960 A1	3/1991 G07F 7/10	GB	2278832	12/1994	
EP 0457558	11/1991	GB	2 355 522 A	4/2001 G07D 7/00
EP 0 473 106 A2	3/1992 G07D 1/00	GB	2439512	12/2007	
EP 0480684	4/1992	GB	2458387	9/2009	
EP 0482116	4/1992	GB	2 464 826 A	5/2010 G07D 11/00
EP 0 548 142 A1	6/1993 G06K 19/08	GB	2468783	9/2010	
EP 0552294	7/1993	JP	49058899	6/1974	
EP 0667973 B1	11/1993	JP	52014495	2/1977	
EP 0 578 875 A1	1/1994 G06F 15/68	JP	52071300	6/1977	
EP 0 583 526 A1	2/1994 G06K 7/00	JP	5471673	6/1979	
EP 0 583 723 A1	2/1994 G06K 7/00	JP	5471674	6/1979	
EP 0 593 209 A2	4/1994 H04L 29/06	JP	54118138	9/1979	
EP 0302458 B1	5/1994	JP	5616287	2/1981	
EP 0595596	5/1994	JP	56040992	4/1981	
EP 0 612 042 A2	8/1994 G07D 7/00	JP	56136689	10/1981	

(56)	References Cited							
FOREIGN PATENT DOCUMENTS								
JP	57117080	7/1982	WO	WO 93/23824 A1	11/1993	G06K 9/00	
JP	57212567 A2	12/1982	WO	WO 94-06101 A1	3/1994	G07D 7/00	
JP	59079392	5/1984	WO	WO 94-06102 A1	3/1994	G07D 7/00	
JP	59130581	7/1984	WO	WO 94-08319 A1	4/1994		
JP	60016271 U	2/1985	WO	WO 94/16412 A1	7/1994	G07D 7/00	
JP	60052454	3/1985	WO	WO 94/19773 A1	9/1994	G07D 7/00	
JP	6282493	10/1985	WO	WO 94-23397 A1	10/1994		
JP	6114557	4/1986	WO	WO 95-02226 A1	1/1995		
JP	6141439	9/1986	WO	WO 95-04978 A1	2/1995		
JP	62163195	7/1987	WO	WO 95-06920 A1	3/1995		
JP	62182995	8/1987	WO	WO 95-09406 A1	4/1995	G06F 15/30	
JP	62-220843 A	9/1987 G01N 21/89	WO	WO 95-10088 A1	4/1995	
JP	62221773	9/1987	WO	WO 95-13196	5/1995		
JP	62166562 U	10/1987	WO	WO 95-13596 A1	5/1995		
JP	63-073497 A	4/1988 G07D 9/00	WO	WO 95-19017 A1	7/1995	
JP	64035683	2/1989	WO	WO 95-19019 A2	7/1995	G07D 7/00	
JP	64042789	2/1989	WO	WO 95-23387 A1	8/1995		
JP	64067698	3/1989	WO	WO 95/24691 A1	9/1995	G06K 9/00	
JP	01118995	5/1989	WO	WO 96/03719 A1	2/1996	G07F 7/10	
JP	01307891	12/1989	WO	WO 96-07163 A1	3/1996		
JP	1307891	12/1989	WO	WO 96-07990 A1	3/1996		
JP	02-012492 A	1/1990 G07D 7/00	WO	WO 96/10800 A1	4/1996	G06K 9/00
JP	02050793	2/1990	WO	WO 96/12253 A1	4/1996		
JP	02252096	10/1990	WO	WO 96-27525 A1	9/1996		
JP	02302894	12/1990	WO	WO 96-27859 A1	9/1996		
JP	03012776	1/1991	WO	WO 96/29683 A1	9/1996	G07D 7/00	
JP	363795	3/1991	WO	WO 96/36021 A1	11/1996	G07D 7/00	
JP	03063795	3/1991	WO	WO 96/36933 A1	11/1996	G06K 9/00	
JP	392994	4/1991	WO	WO 97/05583 A1	2/1997	G07F 7/10	
JP	03092994	4/1991	WO	WO 97-25692 A1	7/1997		
JP	03098945	4/1991	WO	WO 97/29459 A1	8/1997	G07D 7/00	
JP	03111991	5/1991	WO	WO 97/30422 A1	8/1997	G07D 7/00	
JP	03156673	7/1991	WO	WO 97/43734 A1	11/1997	G06K 9/00	
JP	3188592	8/1991	WO	WO 97/45810 A1	12/1997	G07D 7/00	
JP	04275696	1/1992	WO	WO 98-05006	2/1998		
JP	04083695	3/1992	WO	WO 98/12662 A1	3/1998	G06K 9/00	
JP	04-131986 A	5/1992 G07D 9/00	WO	WO 98/13785 A1	4/1998	G06K 9/46
JP	04175993	6/1992	WO	WO 98/24041 A1	6/1998	G06F 17/60	
JP	04-243497 A	8/1992 G07D 9/00	WO	WO 98/24052 A1	6/1998	G06K 9/00
JP	4243497	8/1992	WO	WO 98/24067 A1	6/1998	G07D 3/14	
JP	05046839	2/1993	WO	WO 98/26364 A1	6/1998	G06F 17/60	
JP	05217048	8/1993	WO	WO 98/35323 A2	8/1998		
JP	05274527	10/1993	WO	WO 98/40839 A2	9/1998		
JP	06035946	2/1994	WO	WO 98/50892 A1	11/1998	G07D 7/00	
JP	06103285	4/1994	WO	WO 98/51082 A1	11/1998	H04N 7/18	
JP	06-203248 A	7/1994 G07D 9/00	WO	WO 98-59323	12/1998	
JP	07061417	3/1995	WO	WO 99/00776 A1	1/1999	G07F 9/06	
JP	07-168857 A	7/1995 G06F 17/40	WO	WO 99-06937 A1	2/1999	
JP	08217269	8/1996	WO	WO 99/09511 A1	2/1999	G06K 9/00	
JP	62134168 U	8/1997	WO	WO 99/14668 A1	3/1999	G06F 9/445	
JP	09251566	9/1997	WO	WO 99/23601 A1	5/1999	G06K 9/00	
JP	10143711	5/1998	WO	WO 99-33030	7/1999		
JP	10269396	10/1998	WO	WO 99/41695 A1	8/1999	G06K 5/00	
JP	2002117439	4/2002	WO	WO 99/48040 A1	9/1999	G06K 9/00	
JP	2003242287	8/2003	WO	WO 99/48042 A1	9/1999	G06K 9/20	
JP	2004213188	7/2004	WO	WO 99-48057 A1	9/1999		
SE	44244	9/1988	WO	WO 99-48058 A1	9/1999		
WO	WO 85-00909	2/1985	WO	WO 99-48060	9/1999		
WO	WO 85/02148 A1	5/1985 B42D 15/00	WO	WO 99/50795 A1	10/1999	G07D 1/00
WO	WO 87/06041 A1	10/1987 G07D 7/00	WO	WO 99/50796 A1	10/1999	G07D 7/00
WO	WO 90/07165 A1	6/1990 G07D 7/00	WO	WO 00-05688	2/2000	
WO	WO 91-06927 A1	5/1991	WO	WO 00/24572 A1	5/2000	B31F 1/00	
WO	WO 91-08952 A1	6/1991	WO	WO 00-48911	8/2000		
WO	WO 91/11778 A1	8/1991 G06K 9/00	WO	WO 00/58876 A1	10/2000	G06F 17/60
WO	WO 91-12594 A1	8/1991	WO	WO 00/65546 A1	11/2000	G07F 1/04	
WO	WO 91-18371 A1	11/1991	WO	WO 00-70540	11/2000		
WO	WO 92/04692 A1	3/1992 G06K 19/08	WO	WO 01/08108 A2	2/2001	
WO	WO 92-08212 A1	5/1992	WO	WO 01/59685 A2	8/2001	G06F 9/00	
WO	WO 92/14221 A1	8/1992 G07D 7/00	WO	WO 01/59723 A1	8/2001	G07F 7/04
WO	WO 92/16931 A2	10/1992	WO	WO 01-62650 A1	8/2001		
WO	WO 92/17394 A1	10/1992 B65H 3/06	WO	WO 01-63565	8/2001	
WO	WO 92-20043 A1	11/1992	WO	WO 01-99059 A1	12/2001		
WO	WO 92-20044 A1	11/1992	WO	WO 02/29735 A2	4/2002	G07D 7/00	
WO	WO 93-00660 A1	1/1993	WO	WO 02/31781	4/2002		
WO	WO 93-09621 A1	5/1993	WO	WO 02/054360 A2	7/2002	G07D 11/00	

(56)

References Cited

FOREIGN PATENT DOCUMENTS

WO	WO 02-071343	9/2002	
WO	WO 03/005312 A1	1/2003	G07F 19/00
WO	WO 03/028361 A2	4/2003	
WO	WO 03/029913 A2	4/2003	
WO	WO 03/030113 A1	4/2003	G07F 7/04
WO	WO 03-052700	6/2003	
WO	WO 03-054807	7/2003	
WO	WO 03-054808	7/2003	
WO	WO 03/067532 A1	8/2003	G07F 7/04
WO	WO 03-079300	9/2003	
WO	WO 03-085610	10/2003	
WO	WO 03-107279 A2	12/2003	
WO	WO 03-107280	12/2003	
WO	WO 03/107282 A2	12/2003	
WO	WO 2004/010367 A1	1/2004	G06K 5/00
WO	WO 2004/027717 A2	4/2004	
WO	WO 2004/036508 A2	4/2004	G07D 7/12
WO	WO 2004/038631 A2	5/2004	G06F 17/60
WO	WO 2004-044853	5/2004	
WO	WO 2004/068422 A1	8/2004	G07D 11/00
WO	WO 2005/013209 A2	2/2005	G07D 11/00
WO	WO 2005/017842 A1	2/2005	G07D 11/00
WO	WO 2005/028348 A2	3/2005	B65H 1/00
WO	WO 2005/029240 A2	3/2005	
WO	WO 2005/036445 A1	4/2005	G06F 19/00
WO	WO 2005/041134 A2	5/2005	
WO	WO 2005-053864	6/2005	
WO	WO 2005/076229 A1	8/2005	G07D 7/12
WO	WO 2005-088563	9/2005	
WO	WO 2005-096233	10/2005	
WO	WO 2005-118443	12/2005	
WO	WO 2006-012420	2/2006	
WO	WO 2006/039439 A2	4/2006	G06K 9/00
WO	WO 2006/076289 A2	7/2006	G07D 11/00
WO	WO 2006/076634 A2	7/2006	G06Q 90/00
WO	WO 2006-086531	8/2006	
WO	WO 2007/044570 A2	4/2007	G07D 11/00
WO	WO 2007/120825 A2	10/2007	G06K 9/00
WO	WO 2007/143128 A2	12/2007	B65H 29/12
WO	WO 2008/030356 A1	3/2008	G06K 7/00
WO	WO 2008/112132 A1	9/2008	G06K 9/00
WO	WO 2009/081085 A1	7/2009	G07D 11/00
WO	WO 2011/109569 A1	9/2011	G07D 11/00

OTHER PUBLICATIONS

- AFB: AFB Currency Recognition System, 1 page (1982).
- ASCOM: Cashflow Emerald, 2 pages, (date unknown, prior to Jan. 15, 2001).
- ATM Cardpay Corp: "ATM Cardpay Introduces New Bill Payment Idea," Retail Delivery Systems News, vol. 3, Iss. 1, p. 1; 2 pages (Jan. 16, 1998).
- ATM Cardpay Corp: "'The Next Generation of ATM Network Survival.' ATM Cardpay Shows Switches How to Win Bill Presentment/Payments Market," EFT Report, vol. 20, Iss. 17, p. 1; 3 pages (Aug. 27, 1997).
- AUI: Coinverter—"No More Lines . . . Self-Serve Cash-Out," by Cassius Elston, 1995 World Games Congress/Exposition Converter, 1 page (dated prior to 1995).
- BARS: 5000 Currency Sorter, 6 pages (estimated prior to Aug. 13, 2003).
- BARS: 5600 Currency Sorter, 6 pages (estimated prior to Aug. 12, 2003).
- BARS: 6000 Single Note Inspection System, 6 pages (estimated prior to Aug. 12, 2003).
- Barton, Louis L., "Check Processing Operations"—A Hands-On Guide to Developing and Managing a State-of-the-Art Check Processing Operation, Chp. 8 and App. 2, 31 pages (1994).
- Brandt: Mach 7 High-Speed Coin Sorter/Counter, 2 pages (1992).
- Brandt: Model 8904 Upfeed—"High Speed 4-Denomination Currency Dispenser," 2 pages (1989).
- Cummins: JetScan™ iFX i100 Series Currency Scanner brochure (Form 023-1789), 6 pages (May 2009).
- Cummins: JetScan™ iFX i100 Series Currency Scanner brochure (Form 023-1789, Rev. 1), 6 pages (Sep. 2009).
- Cummins: JetScan™ iFX i100 Series Currency Scanner brochure (Form 023-1789, Rev. 2), 6 pages (© 2010).
- Cummins: JetScan™ iFX Series i100 shell, "The Next Generation JetScan," (Form 023-1792), 2 pages (May 2009).
- Cummins: JetScan™ iFX i100 Series Currency Scanner brochure, "Ideal for Law Enforcement Applications," (Form 023-1798), 1 page (Sep. 2009).
- Cummins: JetScan™ iFX i100 Series Currency Scanner mailer, "Don't Let the Evidence Get Away!," (Form 023-1799), 2 pages (Sep. 2009).
- Cummins: JetScan™ iFX i100 Series Currency Scanner mailer, "Two departments just made large drug busts . . .," (Form 023-1820), 3 pages (Jun. 2010).
- Cummins: JetScan™ iFX i100 Series Currency Scanner, Operating Instructions (Form 022-7614-00), 108 pages (Oct. 2010).
- Cummins: JetScan™ iFX i100 Series Currency Scanner brochure, "Advanced Evidence Processing for Law Enforcement," (Form 023-1816), 6 pages (© 2010).
- Cummins: JetScan™ iFX Series i100 brochure, "The Next Generation JetScan," (Form 023-1792 Rev. 1), 2 pages (Mar. 2011).
- Cummins: JetScan™ iFX i100 Series, Quick Reference (022-7631-00), 28 pages (Mar. 2011).
- Cummins: JetScan™ iFX i100 Currency and Check Processor website, "Revolutionizing the way you process currency and checks," (<http://ifx.cumminsallison.com/models/i100>), 2 pages (Jul. 2011).
- Cummins: JetScan™ iFX Series i100 Currency and Check Solution brochure, "Never process a check or bill the same way again," (Form 023-1858), 6 pages (© 2011).
- Cummins: JetScan™ iFX Series i100 Currency and Check Scanner brochure, "Never process a check or bill the same way again," (Form 023-1858), 6 pages (© 2011) [downloaded Jul. 20, 2011].
- Cummins: JetScan™ iFX Series i100 Currency Scanner brochure, "Never Photocopy a Bill Again," (Form 023-1863), 4 pages (© 2011).
- Cummins: JetScan™ iFX Series i200 Currency Scanner brochure, "20%, 60% Fewer Rejects," (Form 023-1859), 6 pages (© 2011).
- Cummins: JetScan™ iFX i400 Series, Quick Reference (022-7669-00), 20 pages (May 2011).
- Cummins: JetScan™ iFX i400 Series Currency Scanner, Operating Instructions (Form 022-7666-00), 87 pages (May 2011).
- Cummins: JetScan™ iFX Series i400 Multi-Pocket Sorter brochure, "Smallest, fastest, most flexible multi-pocket sorter," (Form 023-1860), 6 pages (© 2011).
- Cummins: JetScan™ iFX Image-Management Software, Operating Instructions (022-7615-00), 58 pages (Jul. 2011).
- Cummins: JetScan™ Model 4060, Currency Scanner/Counter, Operator's Manual, 43 pages (Aug. 1991).
- Cummins: JetScan™ Model 4060, Sale of JetScan Currency Scanner/Counter, 1 page (Aug. 1991).
- Cummins: JetScan™ Model 4061, Currency Scanner/Counter—Operating Instructions, 47 pages (Apr. 20, 1993).
- Cummins: JetScan™ Model 4061, Sale of JetScan Currency Scanner/Counter, 1 page (Apr. 20, 1993).
- Cummins: JetScan™ Model 4062, Currency Scanner/Counter—Operating Instructions (022-7120-00), 53 pages (Nov. 28, 1994).
- Cummins: JetScan™ Model 4062, Sale of JetScan Currency Scanner/Counter, Model 4062, 1 page (Nov. 28, 1994).
- Cummins: JetSort® High Speed Sorter/Counter Kits I & J—Operating Instructions (Form 022-7123-00) 12 pages (1994).
- Currency Systems International: Mr. W. Kranister in Conversation with Richard Haycock, 5 pages (estimated 1994).
- Currency Systems International: CPS 300 Currency Processing System, 4 pages (® 1992).
- Currency Systems International: CPS 600/900, Medium Speed Currency Sorting Family, CPS 600 and CPS 900, 4 pages (© 1994).
- Currency Systems International: CPS 600/900, Description of CSI CPS 600 and CPS 900 devices, 1 page (date: estimated 1994).
- De La Rue: 2700 Currency Counting Machine—User Guide, Revision 1, 53 pages (Aug. 26, 1999).
- De La Rue: CDS 5700 and CDS 5800 Cash Deponier System (German) and translation, 7 pages (date unknown, prior to Aug. 13, 1996).

(56)

References Cited**OTHER PUBLICATIONS**

- Document Solutions Inc.: Image Solution, DialogWeb, "Bank Gets Big Response to Image Statements", Electronic Imaging Report, vol. 2, No. 9, 3 pages (May 6, 1992).
- EP App. No. 04 020 193.1 [claiming priority to U.S. Appl. No. 60/043,516], European Patent Office, Communication pursuant to Article 96(2), Discussion of FR 2 722 316, 4 pages (Jul. 18, 2005).
- Elcom International Inc: PECOS Internet Procurement Manager, "Elcom.com and Visa Announce Systems Link to Offer B2B Ecommerce Solutions," PRNewswire, 4 pages (Nov. 29, 1999).
- Glory: CRS-8000 Cash Redemption System, 2 pages (1996).
- Glory: GFB-200/210/220/230 DeskTop Bank Note Counter brochure, 2 pages (estimated before Aug. 9, 1994).
- Glory: GFF-8CF and GFF-8 Desktop Currency and Check Counter, 4 pages (date estimated Jan. 1994).
- Glory: GSA-500 Sortmaster brochure, 2 pages (estimated Jan. 14, 1994).
- Glory: System 8000 Recycle Currency Processing Teller System, p. 5 of General Catalogue of Glory Products, 2 pages (1995).
- Glory: UF-1D brochure and translation, 2 pages (estimated before Aug. 9, 1994).
- Hayosh, Thomas D, "The History of the Check and Standardization Efforts," 5 pages, dated Sep. 26, 1995, available at <http://home.comcast.net/~hayosh/HISTMICR.pdf> (visited Sep. 22, 2011).
- ISH Electronic: ISH 12005/500 Coin Counter (with translation), 4 pages (date unknown, prior to Aug. 1996).
- ISH Electronic: ISH 12005/501 Self-Service Unit (with translation), 4 pages (date unknown, prior to Aug. 1996).
- J&B Software Inc.: TMS Image, "J&B Software Announces New Successes for TMS Image™ Remittance," PRNewswire, 2 pages (Mar. 23, 1998).
- Litton Integrated Automation: Proceedings, SPIE—International Society for Optical Engineering, Optical Security and Anticounterfeiting Systems (vol. 1210), "High Speed Print Quality Inspection and Verification," by Cynthia Ott and Nagesh Chowla re MAVIS, 9 pages (Jan. 1990) [GL 010713-21].
- NCR: NCR 5685 ATM Deposit Processing Module, DialogWeb, "NCR's ATM Captures Images at the Point of Deposit. (NCR Corp.'s New Automated Teller Machine)", Financial Services Report, vol. 10, No. 2, p. 8(1), 2 pages (Jan. 20, 1993).
- NCR: Intelligent Deposit ATM's, "Mixes of cash, checks no problem with Regions Bank ATMs," article, 2 pages (Jun. 10, 2009).
- NGZ Geldzahlmaschinengesellschaft: NGZ 2100 Automated Coin Depository, 4 pages (date unknown, prior to Sep. 1996).
- Perconta: Cassomat A.C.S. Automated Cash System Types I and II, 6 pages (1998).
- Perconta: Contomat Coin Settlement Machine for Customer Self Service, 2 pages (date unknown, prior to Apr. 2003).
- Prema GmbH: Prema 405 (RE) Self Service Coin Deposit Facility, 2 pages (date unknown, prior to Apr. 2003).
- Reis Eurosystems: CRS 6501/Crs 6510 Cash Receipt Systems for Self-Service Area, 3 pages (date unknown, prior to Apr. 2003).
- Scan Coin: CDS 600 Cash Deposit System, 2 pages (1994).
- Scan Coin: CDS 640 Cash Deposit System, "With Scan Coin's customer operated coin deposit system . . .," 2 pages (date unknown, prior to Apr. 2003).
- ShieldSpec LLC: Currency Manager for Law Enforcement, 1 page (downloaded from www.shieldspec.com/product.html on Aug. 18, 2010).
- ShieldSpec LLC: Presentation on Currency Manager for Law Enforcement, 10 pages (downloaded from www.shieldspec.com/documents/CurrencyManagerLawEnforcement.pdf on Aug. 18, 2010), © 2005.
- Toshiba/(Mosler): CF-400 Series Fitness Sorter, 6 pages (estimated 1989 or earlier).
- (Toshiba)/Mosler: CF-420 Cash Management System—Operator's Manual, 137 pages (© 1989).
- Toshiba/Mosler: CF-420—Description of Toshiba/Mosler CF-420 Device, 1 page (date estimated 1989).
- Toshiba/Mosler: CF-420—Revised drawings of portions of Mosler CF-420 Cash Management System (Figs. A-C) and description of the same, 4 pages (1989).
- Vector: Miscellaneous meeting notes and communications between Cummins Allison Corp. and Vector Co. Ltd regarding Vector imager, 65 pages (Apr. 1, 1996 to Jun. 15, 1997).
- Pargh, Andy, "Vending Machines Dispense New Tricks It's a Breeze. Just Drop on your Money and Create a Card, Buy a Ticket or Even Pose for a Photo on the Moon," Orlando Sentinel, 2 pages (Nov. 1, 1993).
- Visa: Chargeback Management Guidelines for Visa Merchants, 30 pages (© 2011).
- Amiel Industries: AI-1500 'Pulsar' High Performance Sorting and Bagging Machine, 13 pages (date unknown—prior to 2010).
- ATS Money Systems, Inc: "The Cash Room is History," 4 pages (date unknown—prior to Aug. 2002).
- Billcon: D-202, D204 Operator's Manual—1st Translation, 10 pages (date unknown—prior to 2010).
- Billcon: D-202, D204 Operator's Manual—2nd Translation (Glory), 14 pages.
- Billcon: D-202, D204 Operator's Manual, 10 pages (cover marked 611215) (Japanese) (date unknown—prior to 2010).
- Billcon: D-202/204—Banking Machine Digest No. 31—1st Translation, 3 pages (last page has date of Dec. 5, 1988).
- Billcon: D-202/204—Banking Machine Digest No. 31, 3 pages (Japanese) (date uncertain—last page of 1st translation has date of Dec. 5, 1988).
- Billcon: D-202/204 Service Manual—1st Translation 25 pages (date uncertain).
- Billcon: D-202/204 Service Manual—2nd Translation (Glory), 25 pages (date uncertain) (cover marked 630229) [Nov. 15, 2002 Hoyo Ex. 2a from Cummins/Glory 2002 Litigation].
- Billcon: D-202/204 Service Manual—3rd Translation (SEL), 27 pages (date uncertain) (cover marked 630229).
- Billcon: D202/204 Service Manual (excerpts and corresponding translation thereof, 6 pages (date unknown—before Feb. 9, 2004) [GL025429-30].
- Billcon: D-202/204 Service Manual, 25 pages (cover marked 630229) (Japanese) (date unknown—prior to 2010).
- Billcon: D-202/204, Banking Machine Digest No. 31, 2nd Translation (Glory), 2 pages (first page has date of Dec. 5, 1988).
- Billcon: D-202/204, Banking Machine Digest No. 31, 3rd Translation, 3 pages (last page has date of Dec. 5, 1988).
- Billcon: K-100 Series Note Counter with Detection, 4 pages (prior to Aug. 2002).
- Brandt: 95 Series Coin Sorter Counter, 2 pages (1982).
- Brandt: Model 1205 Coin Sorter Counter, 2 pages (1986).
- Brandt: Model 1400 Coin Sorter Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 817 Automated Coin and Currency Ordering System, 2 pages (1983).
- Brandt: Model 920/925 Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 940-6 High Speed Sorter/Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 952 Coin Sorter/Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 954 Coin Sorter/Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 957 Coin Sorter/Counter, 2 pages (date unknown—prior to 2010).
- Brandt: Model 958 Coin Sorter/Counter, 5 pages (© 1982).
- Brandt: Model 960 High-Speed Coin Sorter & Counter, 2 pages (1984).
- Brandt: Model 966 Microsoft™ Coin Sorter and Counter, 4 pages (1979).
- Brandt: Model 970 Coin Sorter and Counter, 2 pages (1983).
- Brandt: Solving Problems, Pleasing Customers, Building Deposits, System 930 Electric counter sorter and Brandt Model 755 Security Stand 1 page (date unknown—prior to 2010).
- Brandt: System 945 High-Speed Sorter, 2 pages (date unknown—prior to 2010).

(56)

References Cited**OTHER PUBLICATIONS**

- Brochure for MLS Bank Machine; downloaded on Mar. 30, 2009; 4 pages.
- CA-750 JetSort Coin Processor; Item No. 50-152; Cummins; 1 page (date unknown—prior to 2010).
- Candian Office Action dated, Oct. 28, 2011, 3 pages.
- Case ICC Limited: CDS Automated Receipt Giving Cash Deposit System, 3 pages (date unknown—prior to 2010).
- Case Prema: Coinbank 405 Coin Deposit Machine, Case CDS 500 Coin Deposit Machine, RDC 4E/ST Rolled Coin Dispenser, “Kundenselbstbedienung,” 12 pages (date unknown—prior to 2010).
- Cash, Martin: Newspaper Article “Bank Blends New Technology With Service,” Winnipeg Free Press, 1 page (Sep. 4, 1992).
- Childers Corporation: Computerized Sorter/Counter, “To coin an old adage, time is money . . .,” 3 pages (1981).
- Comments regarding various references that may relate to separator cards, 11 pages (Feb. 24, 2010).
- CTcoin : CDS602 Cash Deposit System; 1 page (date unknown—prior to 2010).
- Cummins JetScan MPS Model 4100 Brochure (023-1661) 8 pages Jun. 2003.
- Cummins JetScan MPS Model 41016 _Operating Instructions, 152 pages (Jun. 2001).
- Cummins JetScan MPS Model 4200 Brochure (023-1674), 2 pages (Jun. 2003).
- Cummins JetScan MPS Models 4102 and 4103 (023-1639) 1 page (Sep. 2001).
- Cummins/Glory 1998 Litigation: *Cummins-Allison Corp. v. Glory U.S.A., Inc.*, N.D. III, 2 pages (1998).
- Cummins: Cash Information and Settlement Systems (Form 023-1408), 4 pages (date unknown—prior to Dec. 1991).
- Cummins: Declaration of Per Torling, 6 pages (Mar. 18, 1999).
- Cummins: JetScan™ MPS Bar Coded Ticket Processing Brochure (Form 023-1655 Rev 1), 2 pages (Sep. 2002).
- Cummins: JetScan™ MPS Brochure (Form 023-01614), 2 pages (Nov. 2000).
- Cummins: JetSort Models 701 and 750 , “State-of-the-art coin processing comes of age,” 2 pages (Feb. 1984).
- Cummins: JetSort® “High Speed Coin Sorter & Counter for Payphone Applications,” “CTOCS Ready”(Form 023-1365), 2 pages (Mar. 1989).
- Cummins: JetSort® “Time for a Change—JetSort® vs. Brandt X,” (Form 023-1330), 1 page (Jun. 1988).
- Cummins: JetSort® “Time for a Change—No Coins Sorted After 3:00 or on Saturday,” (Form 023-1327), 1 page (Aug. 1988).
- Cummins: JetSort® “Time for a Change, Be a smashing success!,” (Form 023-1328), 1 page (Jun. 1988).
- Cummins: JetSort® 2000 Series High Speed Coin Sorter/Counter, 2 pages (date unknown—prior to 2010).
- Cummins: JetSort® 700-01 Coin Sorter/Counter, Operating Instructions, 14 pages (1982).
- Cummins: JetSort® 700-01, Cummins Automated Money Systems (AMS) Case Study—First State Bank of Oregon, “JetSort® Gives Bank Coin Service Edge,” (Form 13C1196), 2 pages (Apr. 1982).
- Cummins: JetSort® 700-01/CA-118 Coin Wrapper, Cummins Automated Money Systems (AMS) Case Study—University State Bank, “Cummins Money Processing System Boosts Teller Service at University State Bank,” (Form 13C1192), 2 pages (Mar. 1982).
- Cummins: JetSort® 701, Cummins Automated Money Systems (AMS) Case Study—Convenco Vending, “High Speed Coin Sorter increases coin processing power at Convenco Vending,” (Form 13C1226), 2 pages (Jul. 1983).
- Cummins: JetSort® Coin Sorter Counter/CA-130XL Coin Wrapper, Cummins Automated Money Systems (AMS) Case Study—Fifth-Third, “6,000 Coin Per Minute Counter/Sorter Keeps pace With Fifth-Third Bank’s Money Processing Needs,” (Form 13C1180), 2 pages (Nov. 1981).
- Cummins: JetSort® mailer, “One moving part simplicity,” “Vendors—Are validators changing your coin and currency needs?” (Form 023-1297), 3 pages (Apr. 1987).
- Cummins: JetSort® Model 1701 with JetStops, Operating Instructions Manual (Form 022-1329-00), 16 pages (1984).
- Cummins: JetSort® Model 1760 brochure, (Form 023-1262-00), 2 pages (Jul. 1985).
- Cummins: JetSort® Model 1770, “JetSort® Speed and Accuracy, Now with Communications!”, (Form 023-1272) 1 page (Oct. 1986).
- Cummins: JetSort® Model CA-750 Coin Sorter/Counter and CA-4050 JetCount currency counter, “Money Processing Made Easy,” (Form 13C1221) 2 pages (Jul. 1983).
- Cummins: JetSort® Models 1770 and 3000, Communication Package specification and operating instructions, 10 pages (uncertain, possibly Nov. 1985).
- Cummins: JetSort® Series V High Speed Coin Sorter/Counter, (Form 023-1383), 2 pages (Sep. 1990).
- Cummins: JetSort®, “Vendors Love JetSort,” (13C1255), 1 page (Mar. 1987).
- Cummins: JetSort®, “What do all these Banks have in Common . . . ?”, JetSort, CA-130XL coin wrapper, CA-118 coin wrapper, CA-4000 JetCount, (13C1203), 3 pages (Aug. 1982).
- Cummins: JetSort®3000 Series High Speed Coin Sorter, 2 pages (date unknown—prior to 2010).
- Cummins: JetSort®3000 Series Options, “Talking JetSort 3000,” (Form 023-1338-00), 1 page (between Jan. 1989-Feb. 1989).
- Cummins: JetSort®3000, “3,000 Coins per Minute!,” (Form 023-1312), 1 page (date unknown, est. 1987).
- Cummins: JetSort®3200, Enhanced electronics for the JetSort® 3200 (Form 023-1350), 1 page (Apr. 1987).
- Cummins: Offer for Sale of Optical/Magnetic Detection, 1 page (Sep. 1992).
- Cummins: Sale of Doubles Detection, 1 page (Jun. 1992).
- Cummins: Sale of Magnetic Detection, 1 page (Aug. 1991).
- Cummins: Sale of Multiple Density Sensitivity Setting, 1 page (Apr. 1993).
- Cummins: Sale of Multiple Magnetic Sensitivity Setting, 1 page (Apr. 1993).
- Cummins: The Universal Solution to All Coin and Currency Processing Needs (Form 13C1218 3-83), 1 page (Mar. 1983).
- Currency Systems International: Cash Cat Desktop Sorter Webpages, url: <http://www.currencysystems.com/CashCat.html>, 2 pages (Oct. 1999).
- Currency Systems International: CPS 1200 brochure, 4 pages (® 1992).
- Currency Systems International: CPS 1200-1500-1800 Webpages, 4 pages, url: <http://www.currencysystems.com/1200.html> (Oct. 1999)
- Currency Systems International: CPS 300-600 Webpages, 4 pages, url: <http://www.currencysystems.com/300600.html> (Oct. 1999).
- Currency Systems International: CPS 900 Webpages, 4 pages, url: <http://www.currencysystems.com/900.html> (Oct. 1999).
- De La Rue: “The Processing of Money and Documents,” 4 pages (C)1987.
- De La Rue: 3120, Currency Sorting Machines With Pattern Recognition, 3120 User Guide, 2 pages (1987).
- De La Rue: CDS 500 Cash Deponier System, 6 pages (date unknown, p. 5 has date May 1994, p. 6 has date Dec. 1992) (German).
- Diebold: Merchant MicroBranch, “Merchant MicroBranch Combines ATM After-Hour Depository Rolled-Coin Dispenser,” Bank Technology News, 1 page (Nov. 1997).
- Discision of FR 2 722 316 in European Patent Office, Communication pursuant to Article 96(2), EP 04 020 193.1, Jul. 18, 2005, 4 pages.
- Duplo: NB-510 / NB-520 Barcode Document Readers, “Bar Code Readers, The On-Demand Duplicating / Finishing Solution” webpage Feb. 28, 2002.
- European Office Action dated Feb. 26, 2010, 2 pages.
- European Patent Office, Written Opinion of the International Searching Authority, dated Dec. 29, 2004, International Application No. PCT/2004/022397, filed Jul. 14, 2004.
- European Search Report dated Feb. 26, 2010, 3 pages.
- European Search Report dated Nov. 9, 2007 for PCT/02/30157 (EP 02 79 9607), 4 pages.
- Fa. GBS-Geldbearbeitungssysteme: GBS9401SB Technical Specification, 24 pages (date unknown—prior to 2010).
- Frisco Bay: Commercial Kiosk, 4 pages (date unknown—prior to 2010).

(56)

References Cited**OTHER PUBLICATIONS**

- G&D: BPS 500 Banknote Processing System brochure, 4 pages (date uncertain, prior to Nov. 7, 2002) (English) (GL002646-49).
- Glory: AMT Automated Merchant Teller, 4 pages (date unknown—prior to 2010).
- Glory: GFR-100 “Unstoppable” ReadMaster Currency Discriminator brochure, 2 pages (Aug. 6, 1998).
- Glory: GFR-100 and GFB-700—Tank Tough Currency Discriminators brochure, 2 pages (Aug. 6, 1998).
- Glory: GFR-100 Currency Reader Counter—Instruction Manual, 30 pages (Aug. 15, 1995).
- Glory: GFR-100 Currency Reader Counter—Instruction Manual, 32 pages (Aug. 20, 1998).
- Glory: GFR-110 & GFR-S80, Tank Currency Discrimination GFR-110 & GFR-S80 brochure, 2 pages (© 2000) (English) (GL002959-60).
- Glory: GFRT1 Currency Scanner, 1 page (Dec. 1994).
- Glory: GFR-X Banknote Counter with Denomination Recognition, 3 pages (estimated Dec. 1994).
- Glory: GFU-100 Desk Top Currency Fitness Sorter/Counter brochure, 2 pages (estimated Jan. 14, 1994).
- Glory: GUS-100 Desktop Scanner brochure, Accurate and Rapid Processing of Casion Barcode Tickets, 4 pages (2008).
- Glory: SR-700 Series—Cash Settlement System, 4 pages (1993).
- Glory: UW-100 Compact Currency Fitness Sorter, 2 pages (© 1999).
- Glory: UW-200 Multi-Purpose Compact Currency Sorter, 4 pages (© 1999).
- Glory: UW-500, UW-600 Currency Sorter brochure, “New High Performance . . . ,” 4 pages (last page “USA 020907”).
- Glory: UW-500, UW-600 Currency Sorter brochure, “New High Performance . . . ,” 2 pages (one page marked “WA020907”).
- Glory: UW-500USL Currency Sorter—Instruction Manual, 76 pages (Sep. 1, 2007).
- Hamilton: Hamilton’s Express Banking Center, In Less Space Than A Branch Manager’s Desk, 4 pages (date unknown—prior to 2010).
- Int’l Search Report for PCT/US04/26091 which claims priority to U.S. Appl. No. 10/662,930 (Dec. 3, 2004).
- Int’l Search Report for PCT/US2004/029914 which claims priority to U.S. Appl. No. 60/502,924 (Mar. 16, 2005).
- International Search Report, PCT/02/30157, dated Apr. 14, 2003.
- International Search Report, PCT/2004/022397, dated Dec. 17, 2004.
- International Search Report; International Application No. PCT/02/25662 dated Apr. 1, 2003 (3 pages).
- Multi-pocket sorter, (Form 023-1860), 6 pages (© 2011).
- MultiScan Corp.: Webpages MT 31—Ultra Fast Laser Barcoded Document Reader, url: <http://www.miu21.i-scau.co.jp/cortilertgli/shiproini3t.litati>, 2 pages (Apr. 2002).
- Namsys, Inc.: Namsys Express, Making currency management . . . more profitable, 2 pages (date unknown—prior to 2010).
- Pay By Touch: Secure ID News, “Piggly Wiggly Extends Biometric Payments Throughout the Southeast U.S.,” 2 pages, (Dec. 14, 2005).
- PCT International Search Report date Nov. 14, 2003 for international application No. PCT/US03/19790; 4 pages.
- Reis Eurosystems: CRS 6520/ CRS 6525 Standard-Class Coin Deposit Systems, 1 page (date unknown—prior to 2010).
- Reis Eurosystems: CS3510_Disc-Sorter Hgh—Capacity, High Speed Coin Sorter, 1 page (date unknown—prior to 2010).
- Response to Canadian Office Action dated Apr. 27, 2012, 26 pages.
- Response to European Office action dated Oct. 18, 2010, 5 pages.
- Royal Bank: Hemeon, Jade, “Royal’s Burlington drive-in bank provides customers 24-hour tellers,” The Toronto Star, 1 page (Aug. 21, 1991).
- Royal Bank: Leitch, Carolyn, “High-Tech Bank Counts Coins,” The Globe and Mail, 2 pages (Sep. 19, 1991).
- Royal Bank: Oxby, Murray, “Royal Bank Opens ‘Super Branch,’” The Gazette Montreal, 2 pages (Sep. 14, 1991).
- Royal Bank: SuperBranch, 2 pages (Feb. 1992).
- Scan Coin: CDS 600 & CDS 640 Cash Deposit System—Technical Manual, 45 pages (date unknown).
- Scan Coin: CDS 600 User’s Manual, 14 pages (date unknown, prior to Apr. 2003).
- Scan Coin: CDS 640 User’s Manual, 7 pages (date unknown, prior to Apr. 2003).
- Scan Coin: CDS Cash Deposit System, 6 pages (date unknown, prior to Apr. 2003) [SC].
- Scan Coin: CDS Coin Deposit System—Technical Referens Manual, 47 pages (1989).
- Scan Coin: CDS MK 1 Coin Deposit System—Technical Manual, 32 pages (1991).
- Scan Coin: International Report, 49 pages (Apr. 1987).
- Scan Coin: Money Processing Systems, 8 pages (date unknown—prior to 2010).
- Scan Coin: News, 2 pages (May 1991).
- Scan Coin: SC 102 Value Counter Technical Manual, 28 pages (date unknown—prior to 2010).
- Scan Coin: World, 2 pages (Feb. 1988).
- Search Report for PCT/US2006/039234 which claims priority to U.S. Appl. No. 60/723,652, 5 pages, (Jun. 12, 2007).
- Shinwoo: SB1000 Currency Discrimination brochure entitled MLS Banking Machine, 2 pages (downloaded Mar. 30, 2009).
- Shinwoo: SB1000 Currency Discrimination Counter webpages—url: http://shinwoot.en.ec21.com/SB_1000_Currency_Discrimination_Counter_520882_520884_, 3 pages (Mar. 30, 2009).
- Shinwoo: SB1000 Currency Discrimination Counter with Enhanced Image Recognition Technology brochure with name of SRS Systems, Inc., 1 page (downloaded Mar. 30, 2009).
- Shinwoo: SB1000 Currency Discrimination Counter With Intelligent Image Processing Technology brochure, 2 pages (Mar. 2002).
- Shinwoo: SB1000 Currency Discrimination Counter, 2 pages (Mar. 2002).
- Shinwoo: SB-1100/SB-1800, Shinwoo Banking Machine brochure SB Series, 2 pages (downloaded Mar. 30, 2009).
- Shinwoo: SB5000 Digital Fitness Sorter downloaded on Mar. 30, 2009; 3 pages.
- Siemens Nixdorf Informationssysteme AG: ProCash CRS, 4 pages (Nov. 1997).
- Third-Party Submission in a Published Application Under 37 C.F.R. § 1.99 submitted in U.S. Appl. No. 11/544,228 by Caroline D. Denison [Reg. No. 34,494] of Roberts Mlotkowski & Hobbes PC., McLean, Virginia, 2 pgs (Jul. 31, 2007).
- Toshiba /Mosler: CS-6600—Optical Currency Counter/Sorter, 4 pages (© 1992).
- Toshiba/(Mosler): CF-400 Series Currency Sorter, 4 pages (© 1983).
- Toshiba/Mosler: CS-601 and CS-700, “All in one pass”—product information printed from website, url: http://www3.toshiba.co.jp/sic/english/inf_com/labor/cash/index.htm, 6 pages (Jun. 28, 2002).
- Toshiba/Mosler: TouchSort Currency Processing System, 10 pages (© 1999).
- Toshiba-Mosler Operator’s Manual for CF-420 Cash Settlement System; pp. 1 to C-3; copyr. 1989 (See eg. pp. 3-10; 4-10; and 5-7).
- Toyocom: Model NS-100, “New Currency Counter with Denomination Recognition,” 2 pages (May. 14, 1998).
- Toyocom: Model NS-100, News Product News by Toyocom—“Toyocom Currency Counter Now Reads Denominations,” 1 page (Sep. 26, 1994).
- Toyocom: Model NS-100, Operation Guide Preliminary, 37 pages (Jun. 13, 1995).
- Toyocom: NC-50 Currency Counter brochure, 2 pages (estimated Aug. 1998).
- Toyocom: NS-200 Currency Recognizer brochure, 2 pages, (Mar. 1998).
- Western Money Systems: High Speed Bar Code and Cash Settlement for slot soft count webpage from casinoclassefied.com, 2 pages (Feb. 28, 2002).
- Western Money Systems: MT-31, Slot Ticket Settlement, webpage from www.westernmoney.com, 3 pages (Feb. 28, 2002).
- Western Money Systems: ticketXchangeTM, webpage from www.westernmoney.com regarding Nevada Gaming Control field test, 2 pages (Feb. 28, 2002).
- Written Opinion for PCT/US2006/039234 which claims priority to U.S. Appl. No. 60/723,652, 7 pages, (Jun. 12, 2007).
- Vector Tech.: Document Imaging Product Demonstration video on CD in .wmv format (Jun. 1996).

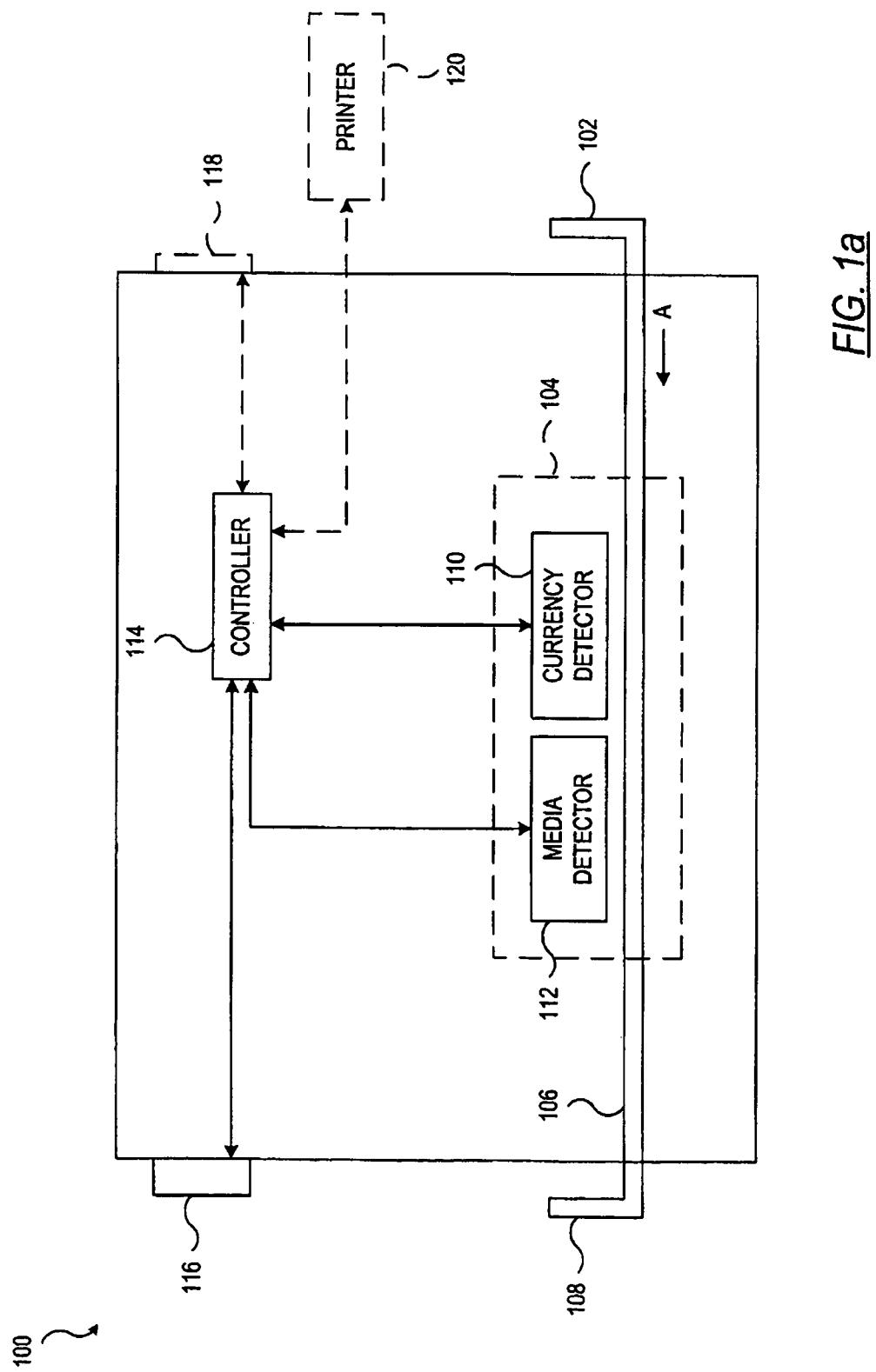
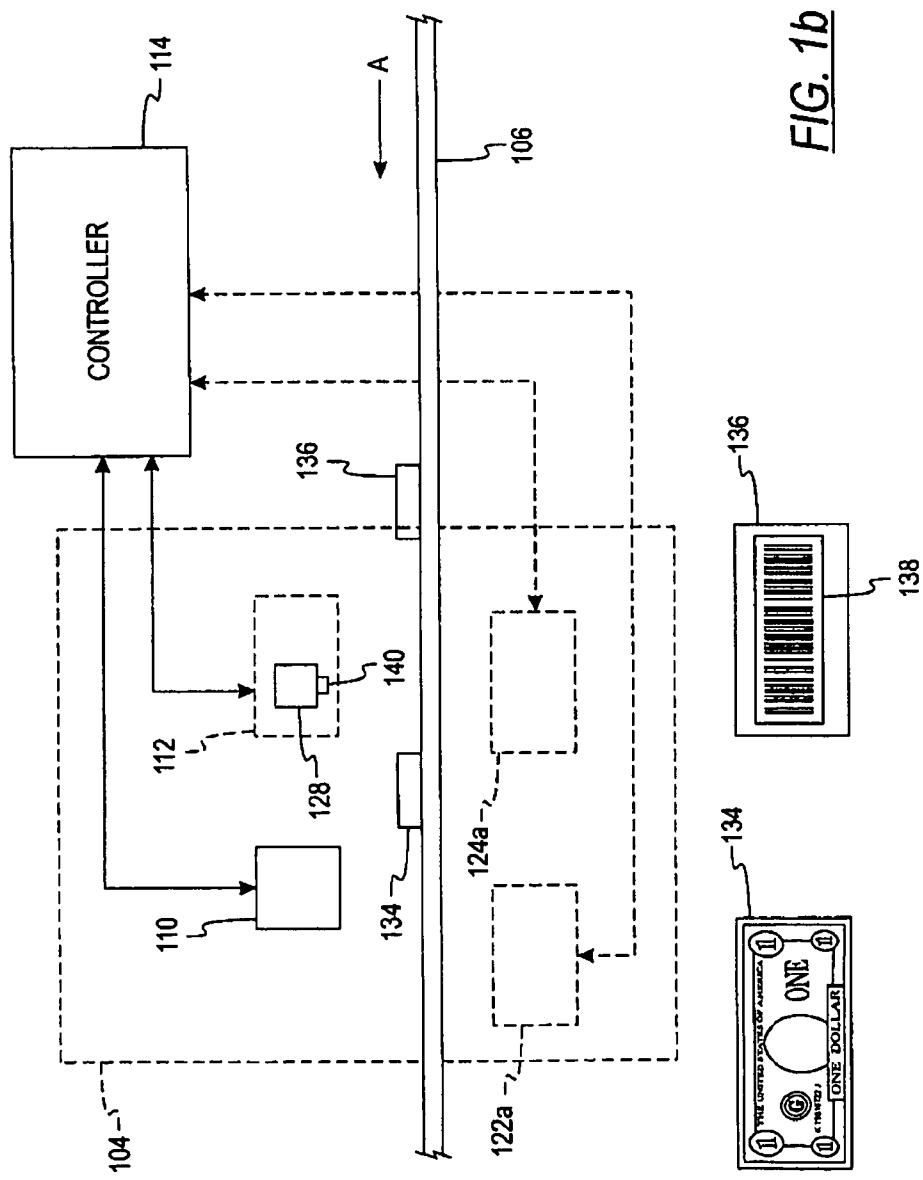
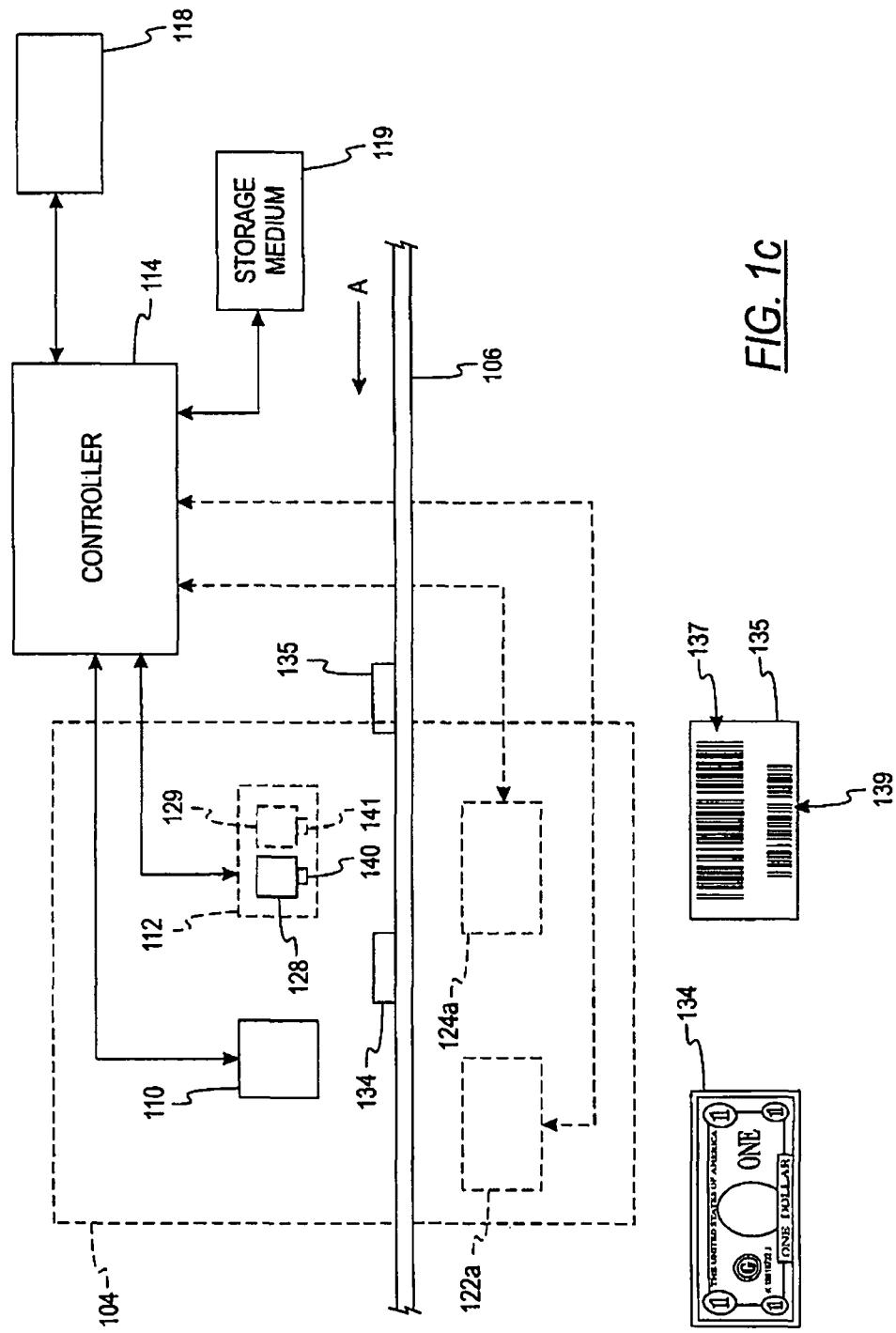


FIG. 1a





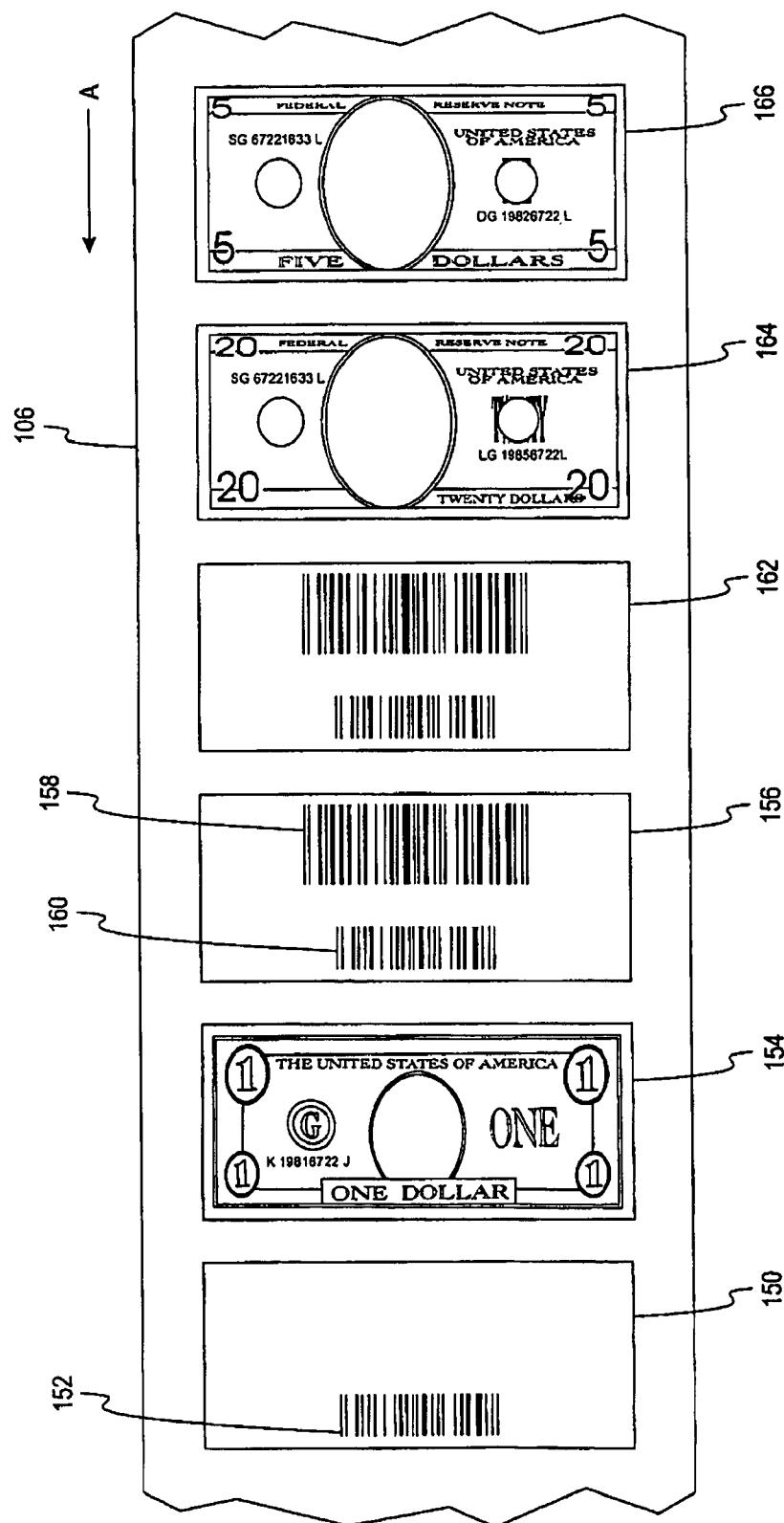
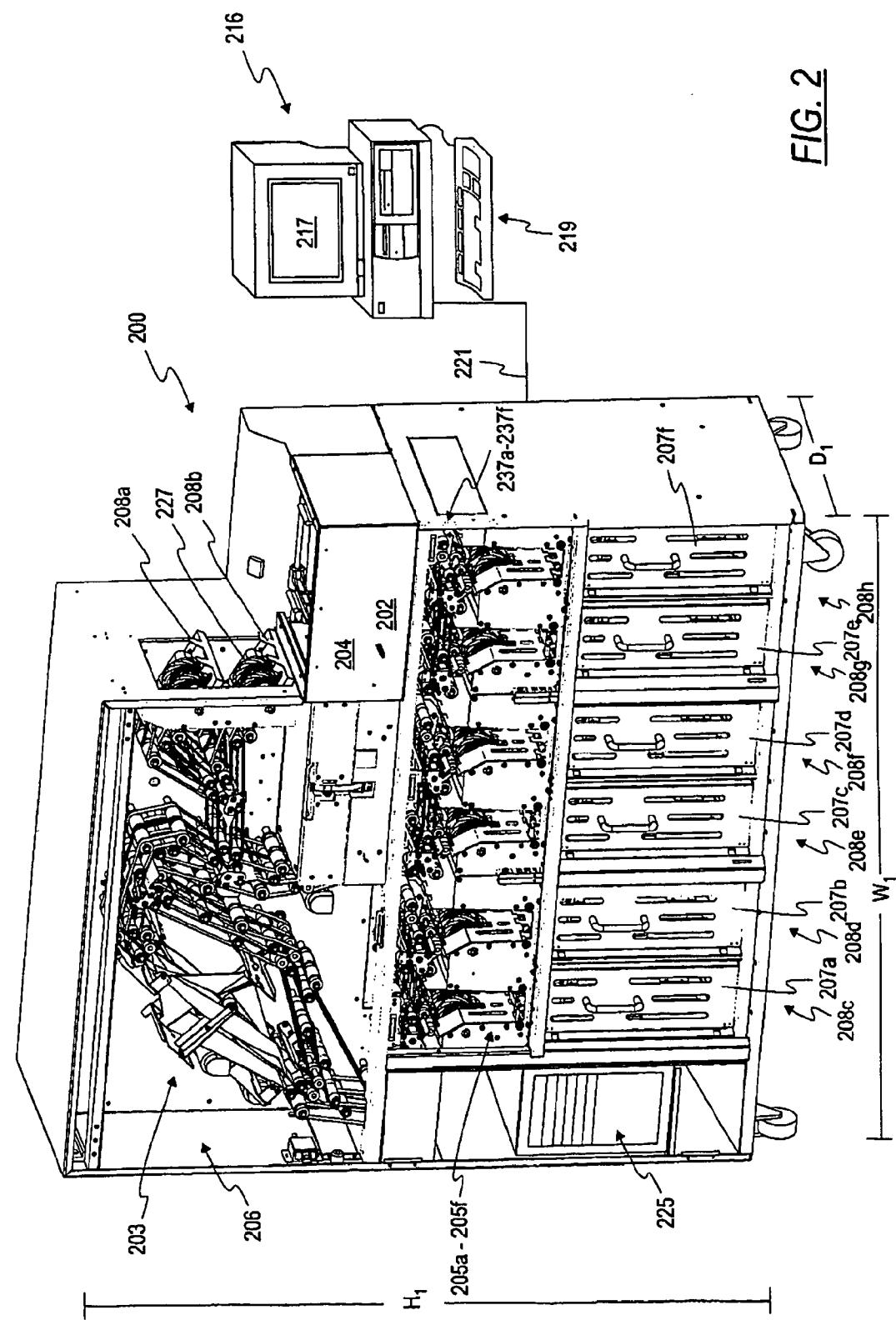


FIG. 1d



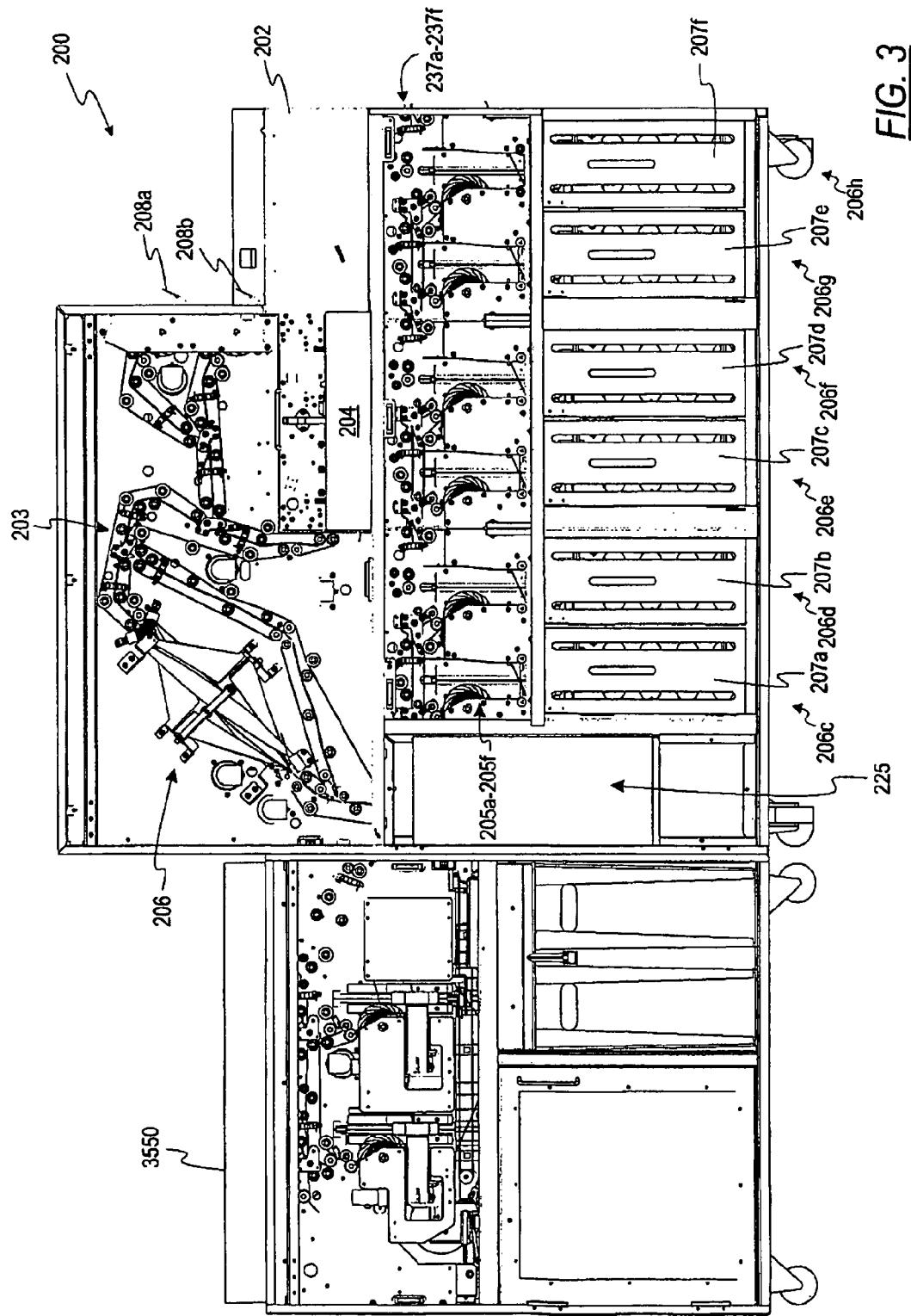
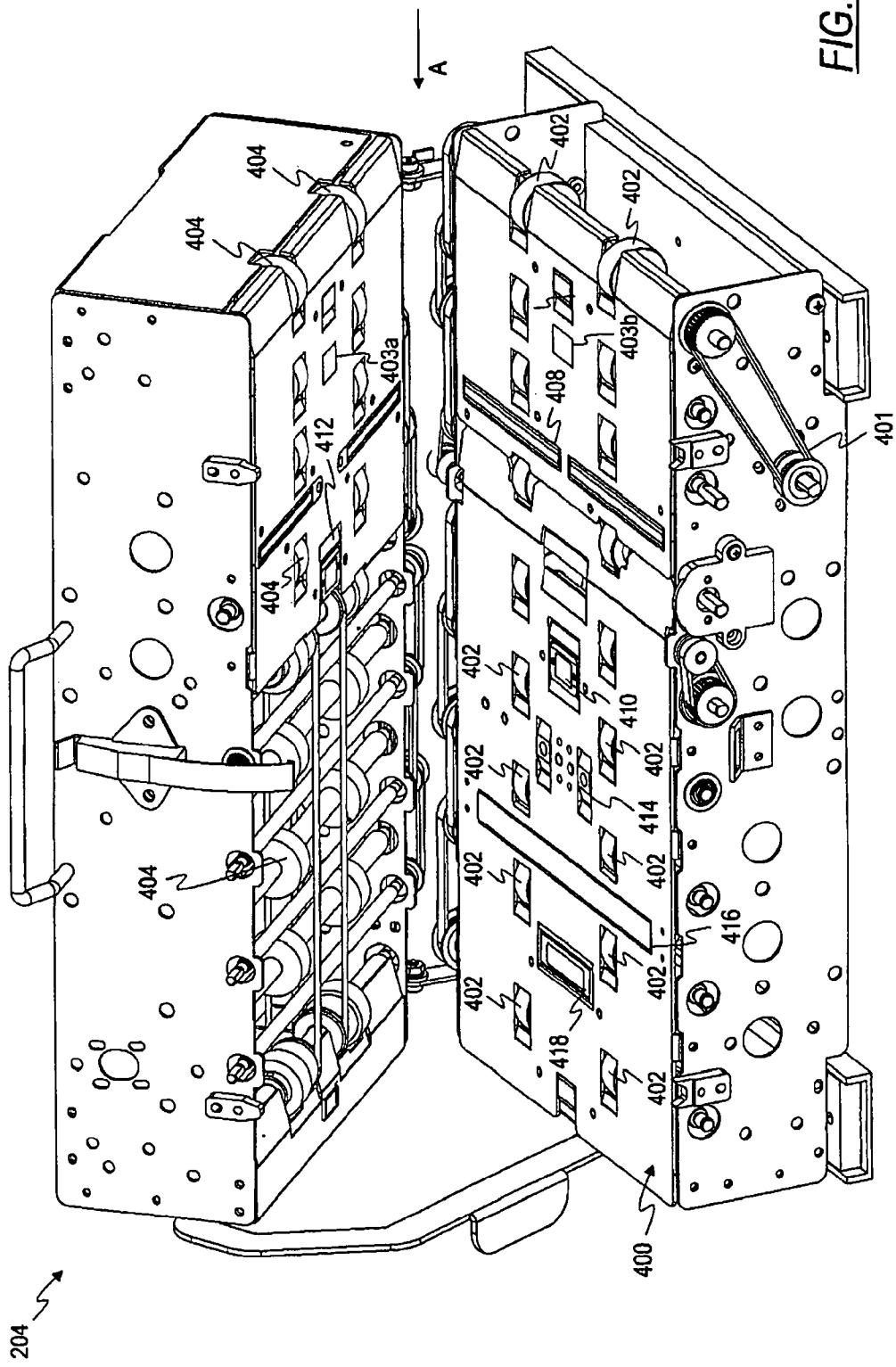
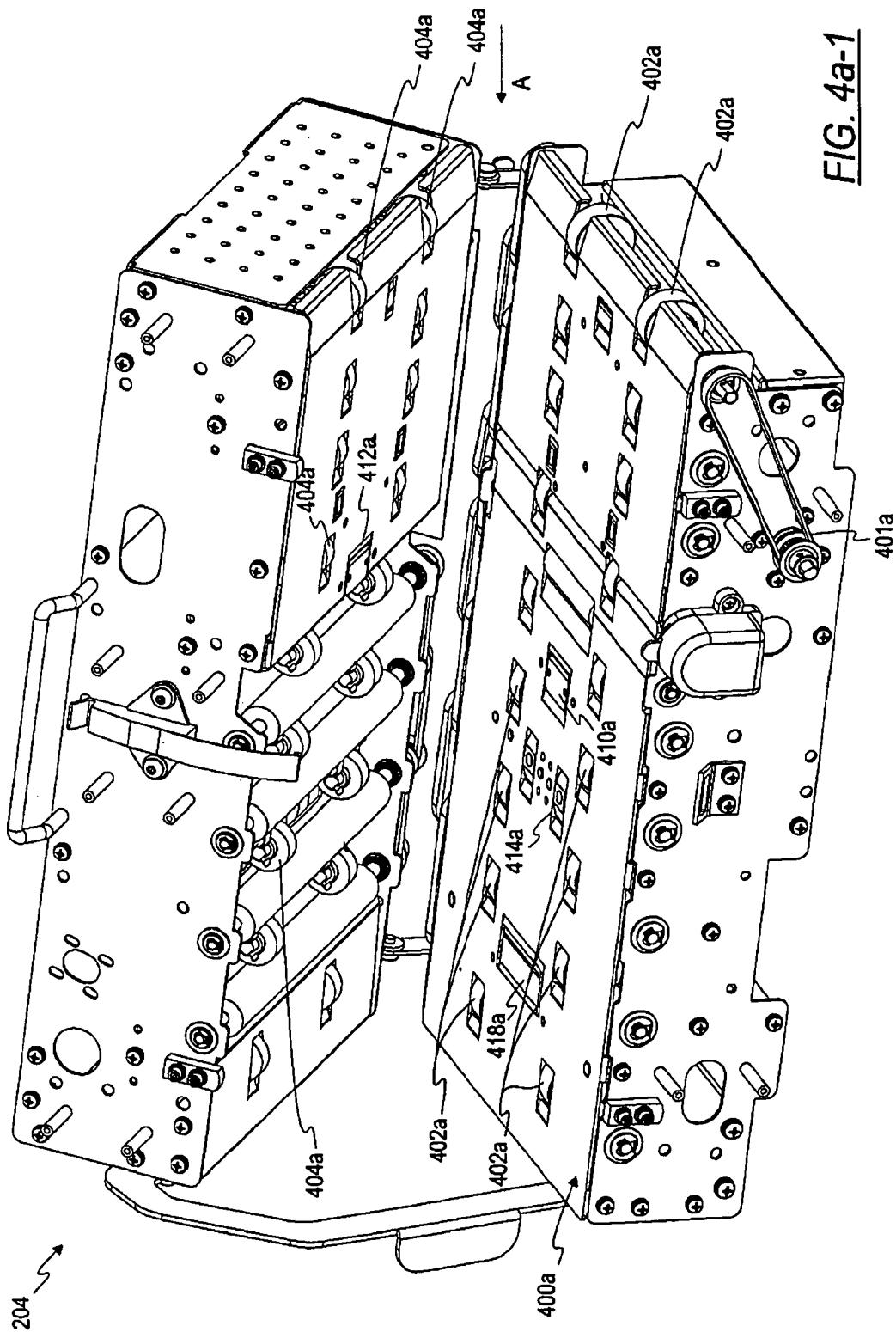


FIG. 3

FIG. 4a





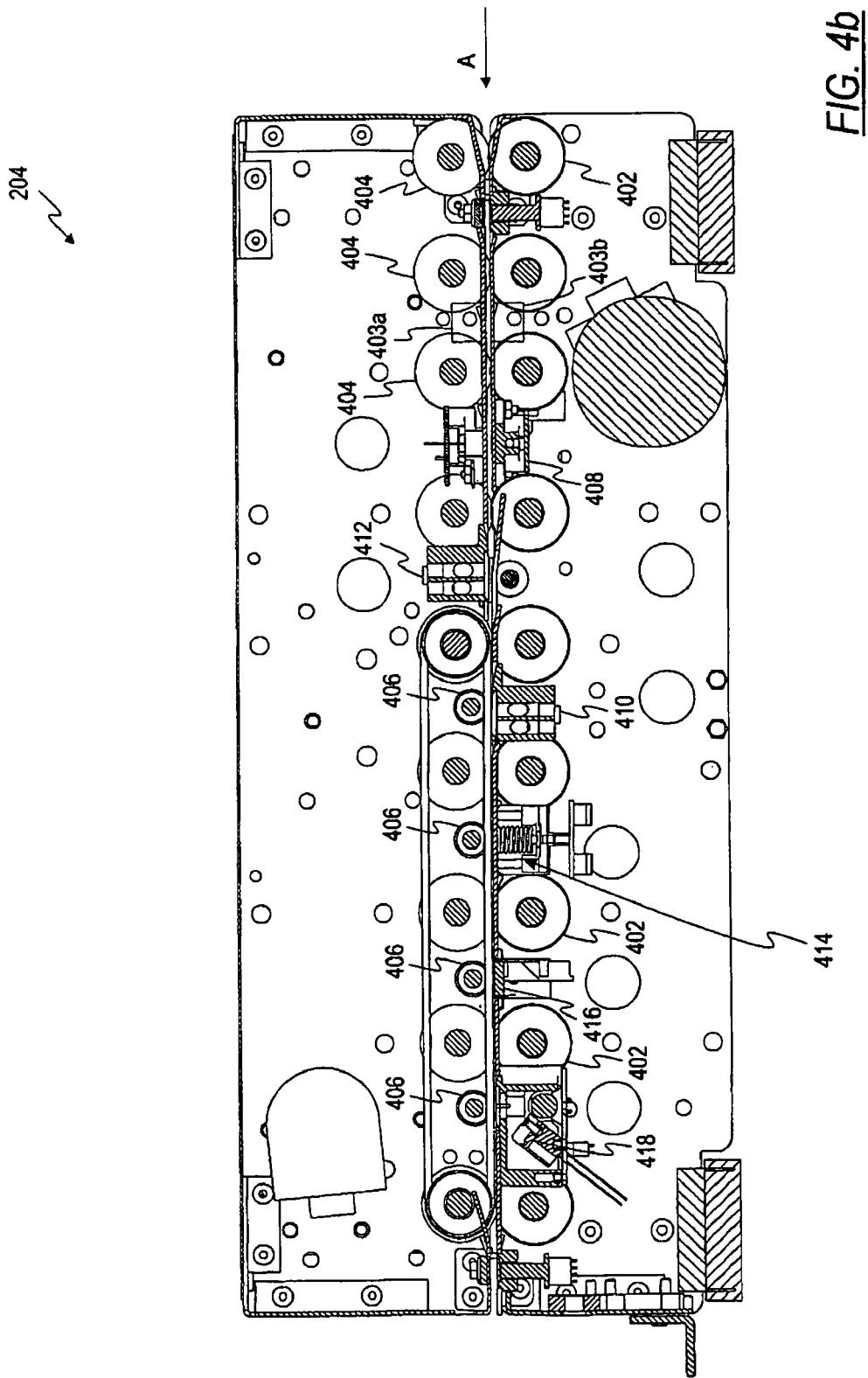


FIG. 4b

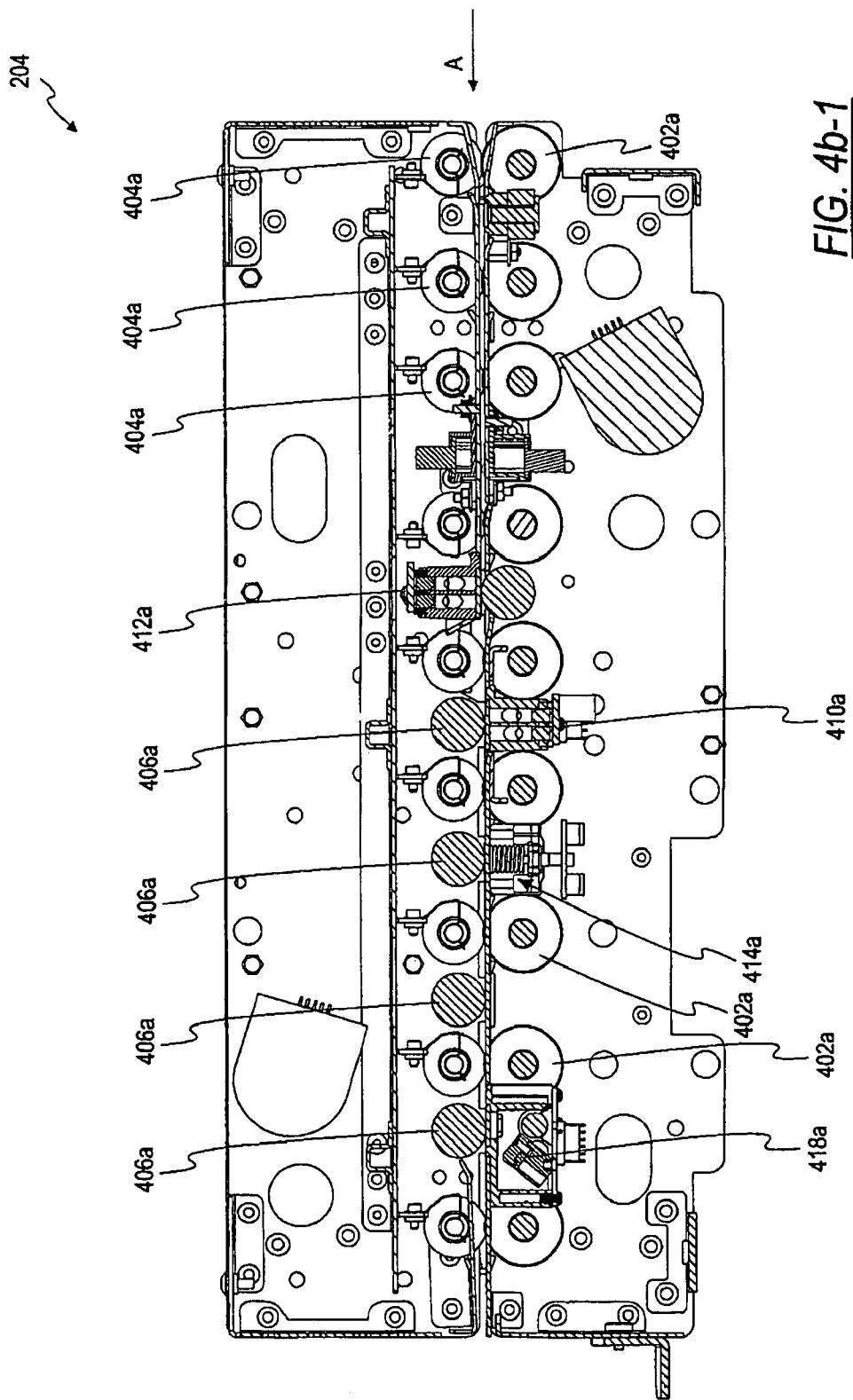


FIG. 4b-1

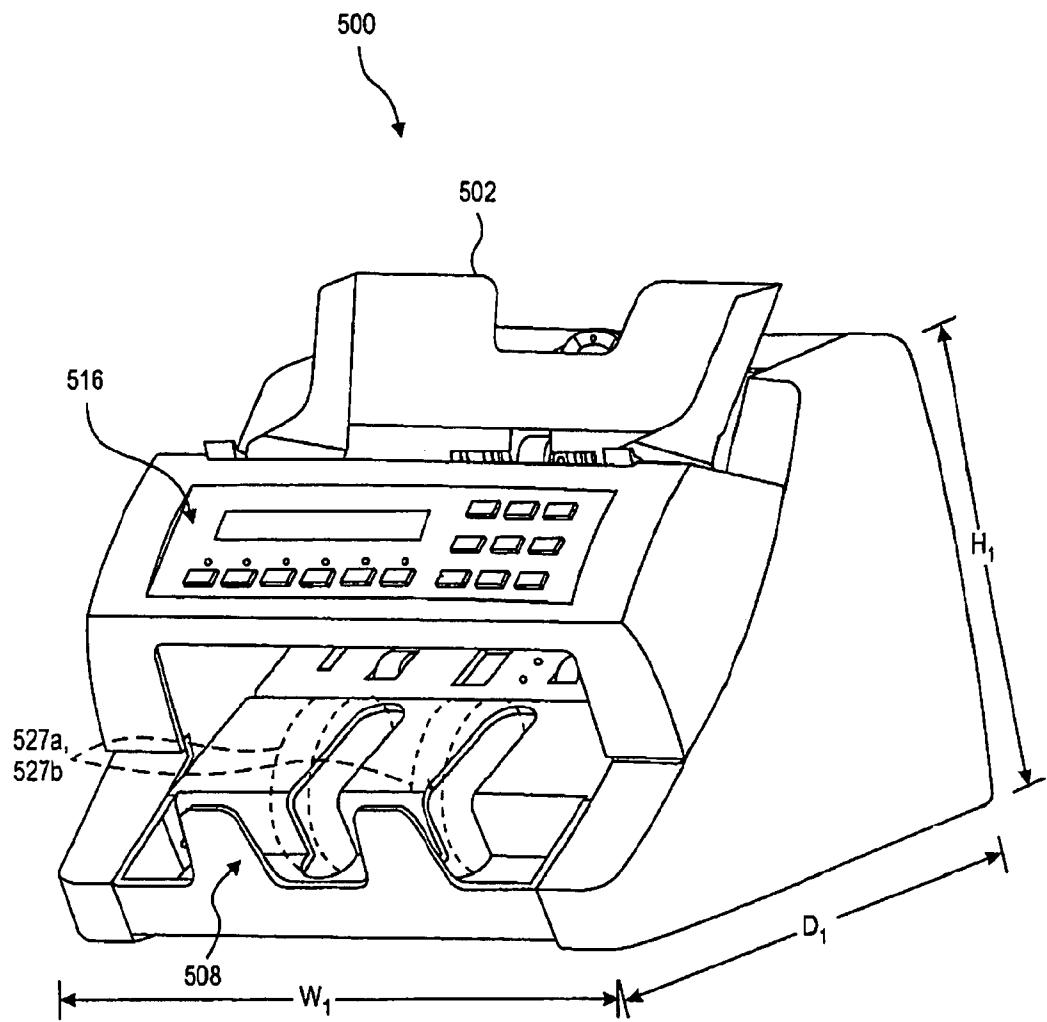
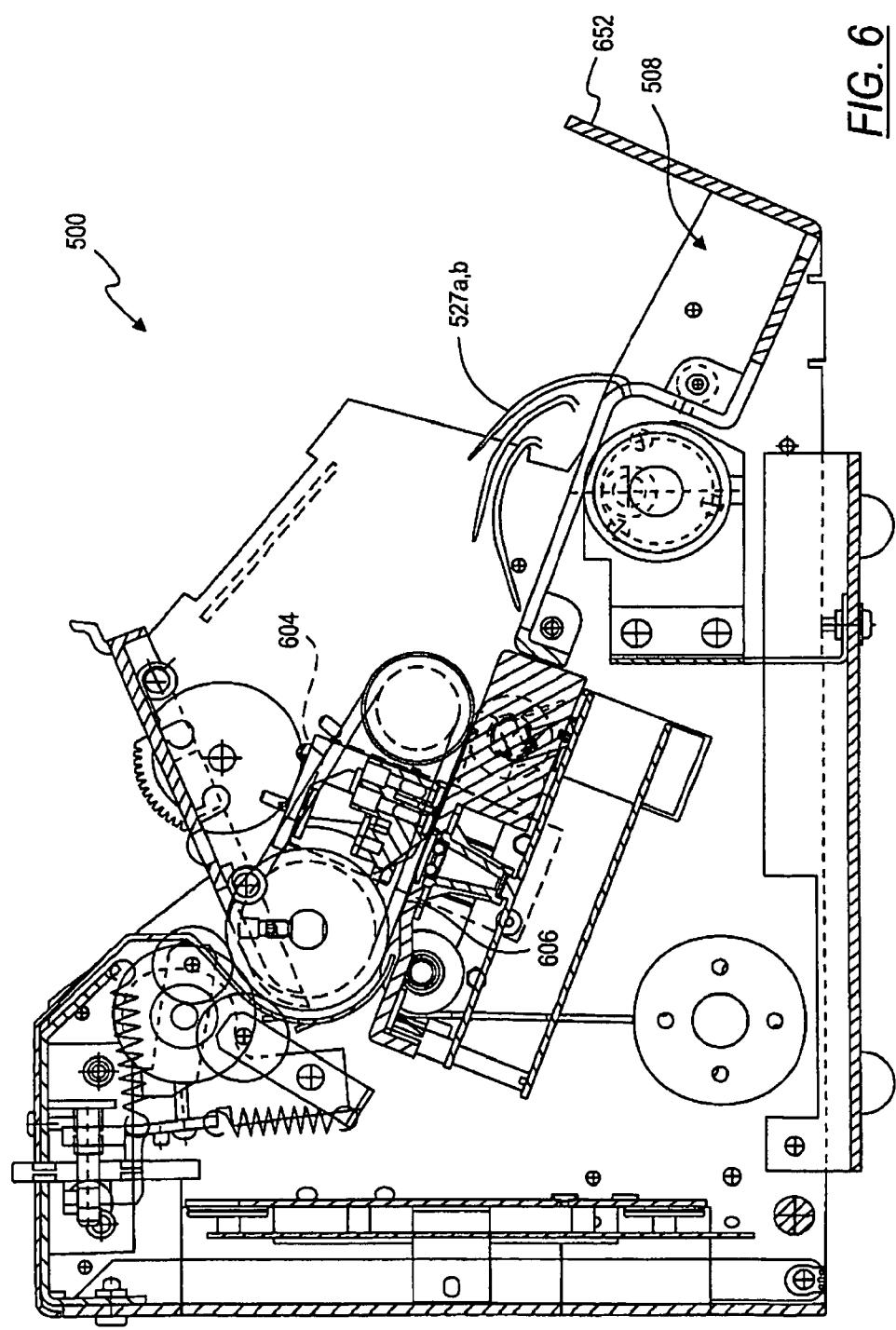


FIG. 5



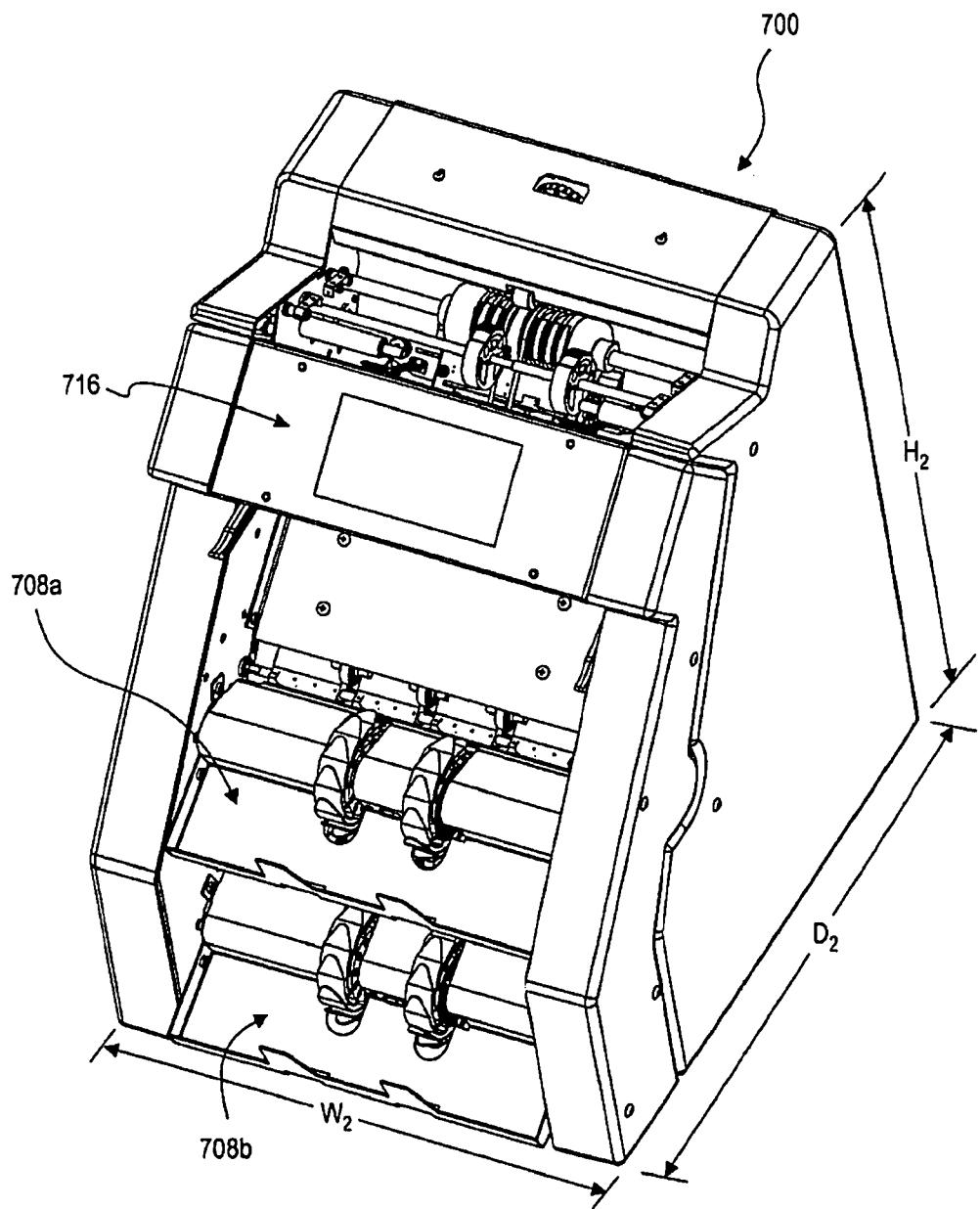


FIG. 7a

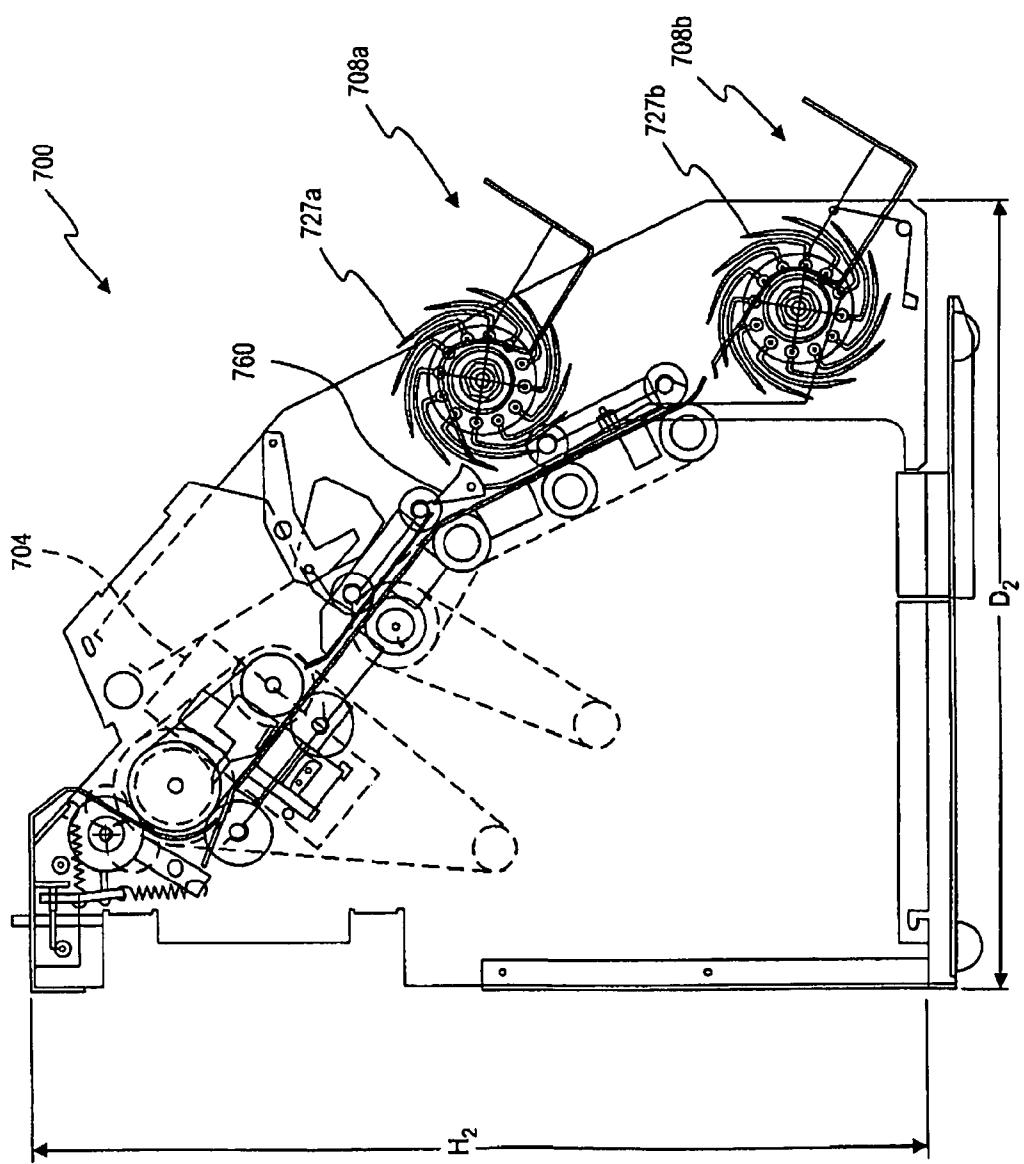
FIG. 7b

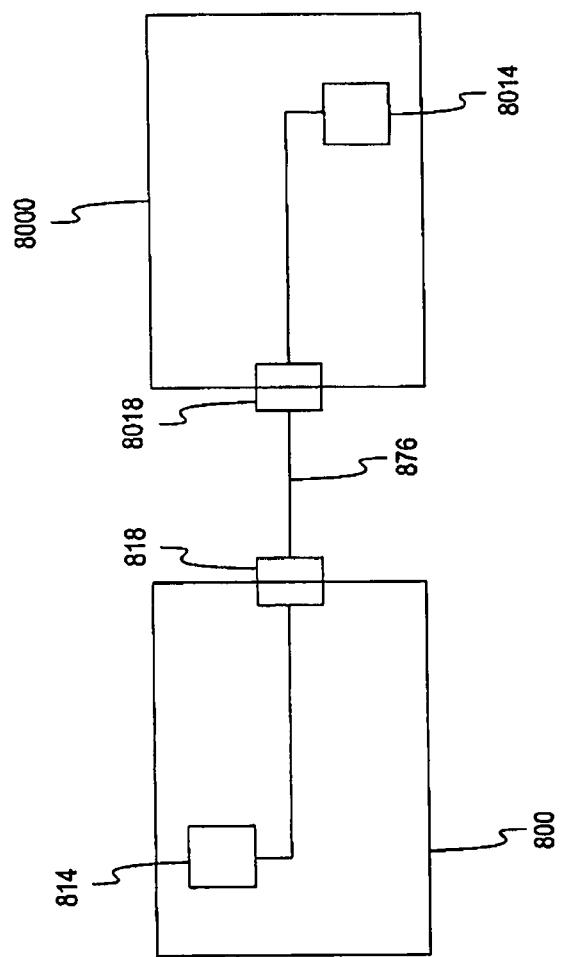
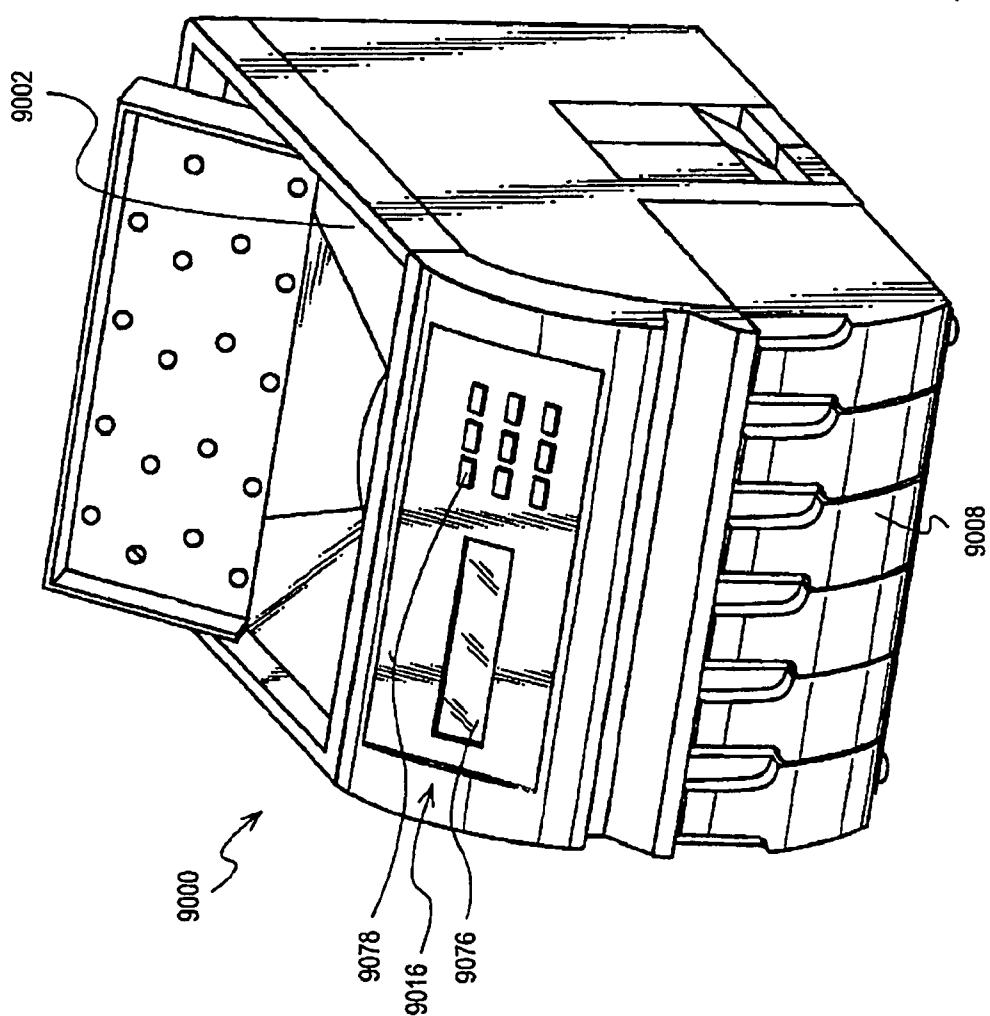
FIG. 8

FIG. 9

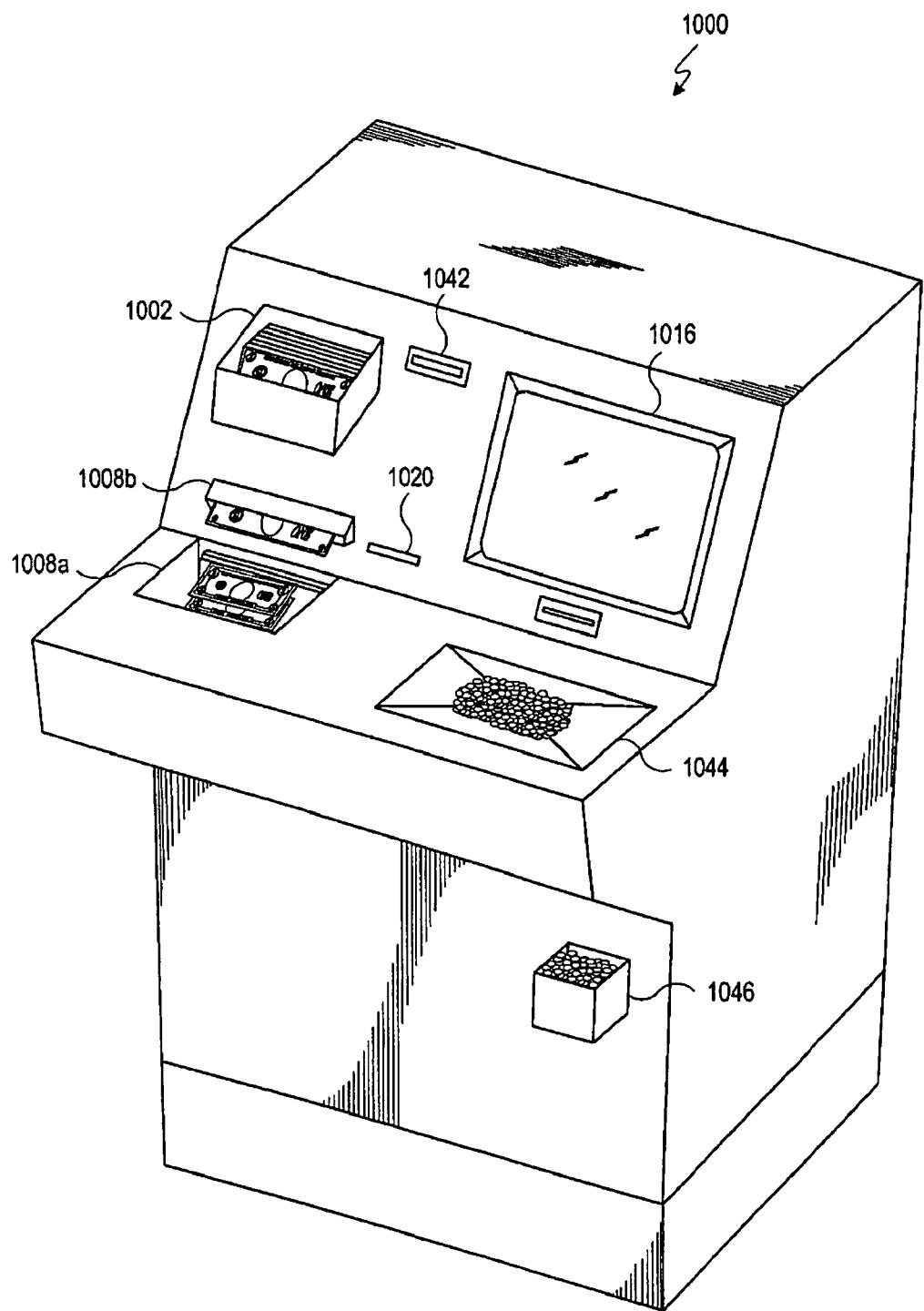


FIG. 10a

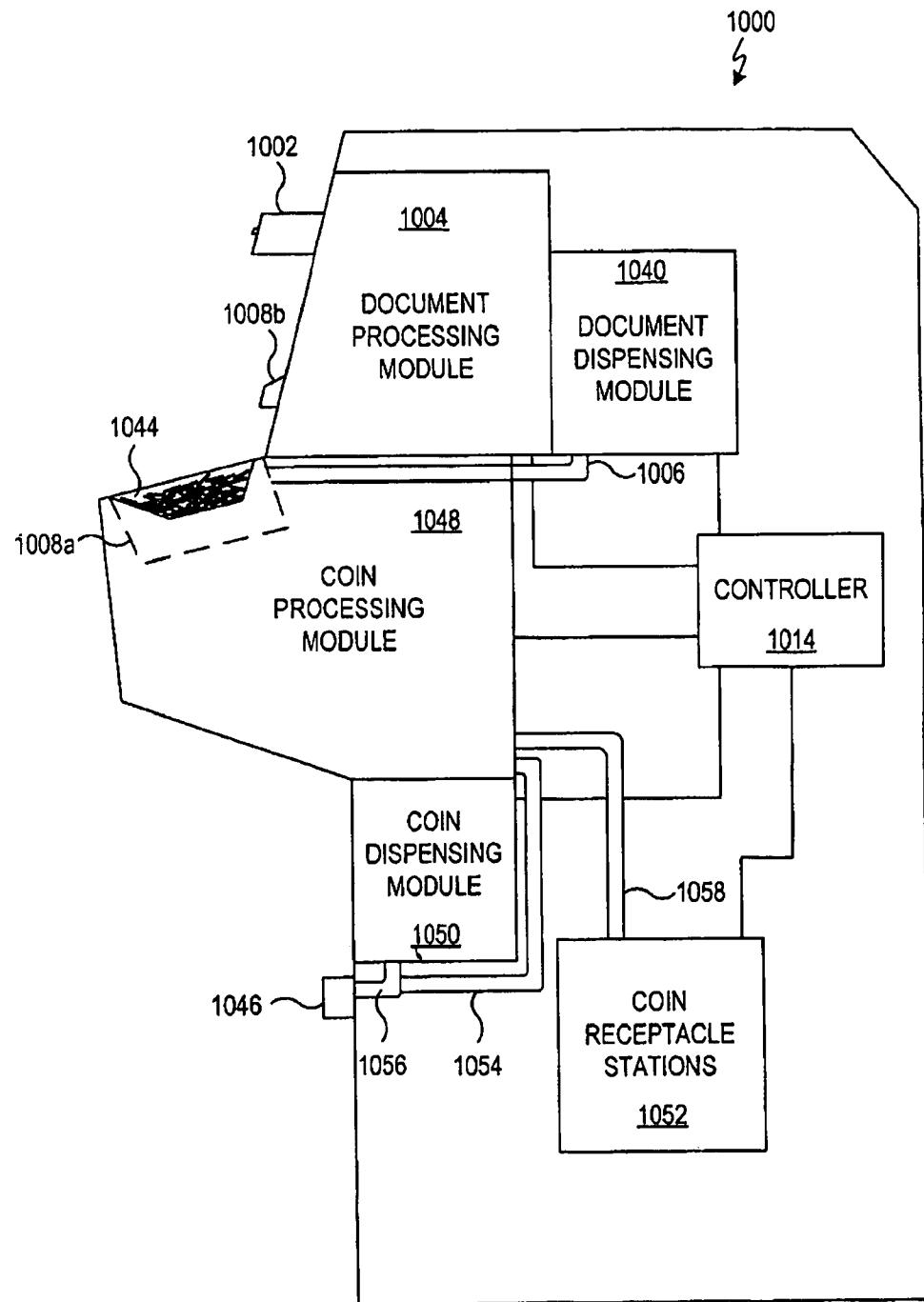


FIG. 10b

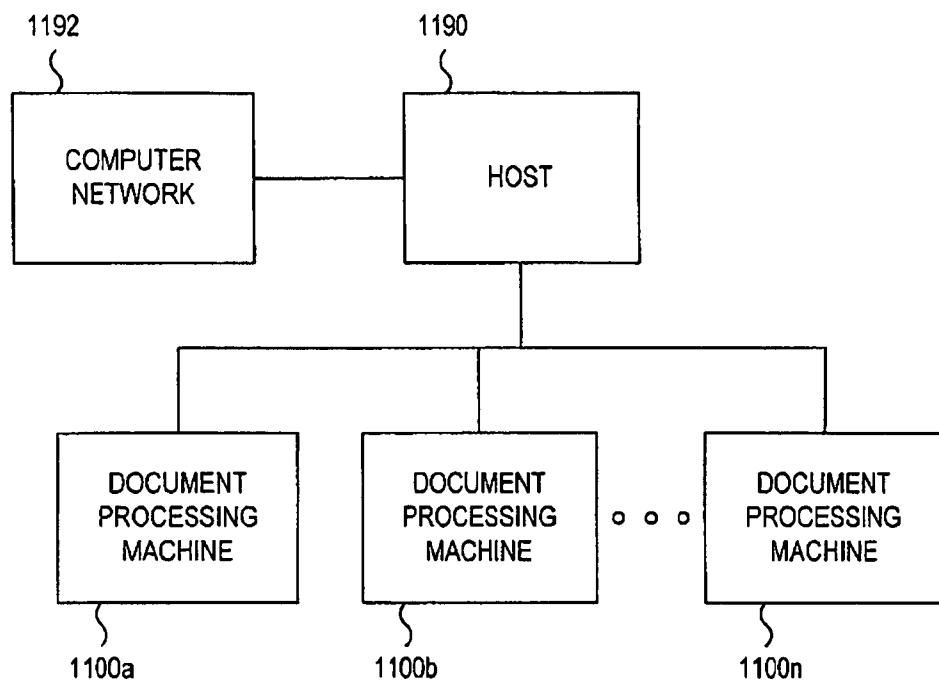


FIG. 11

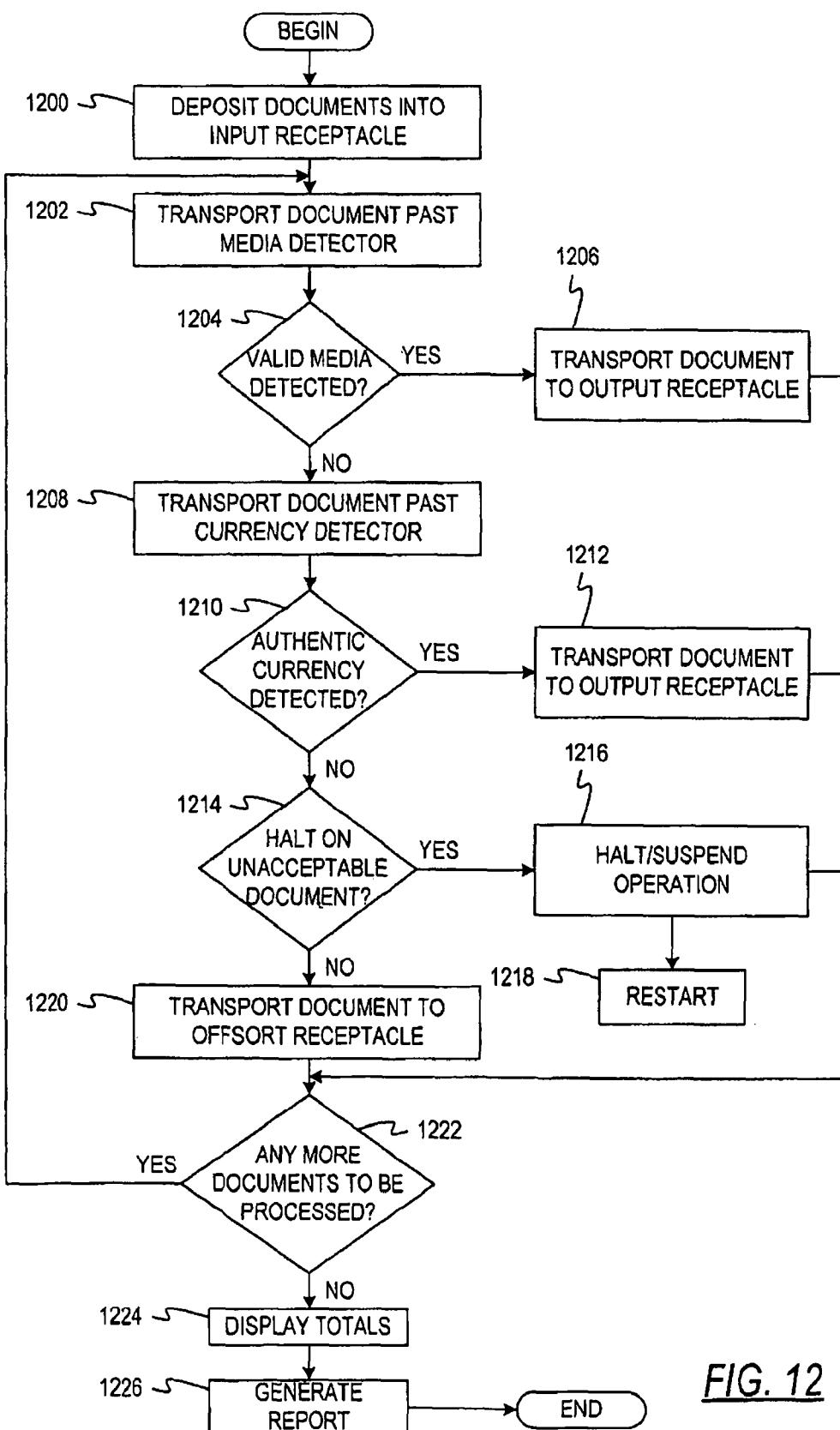
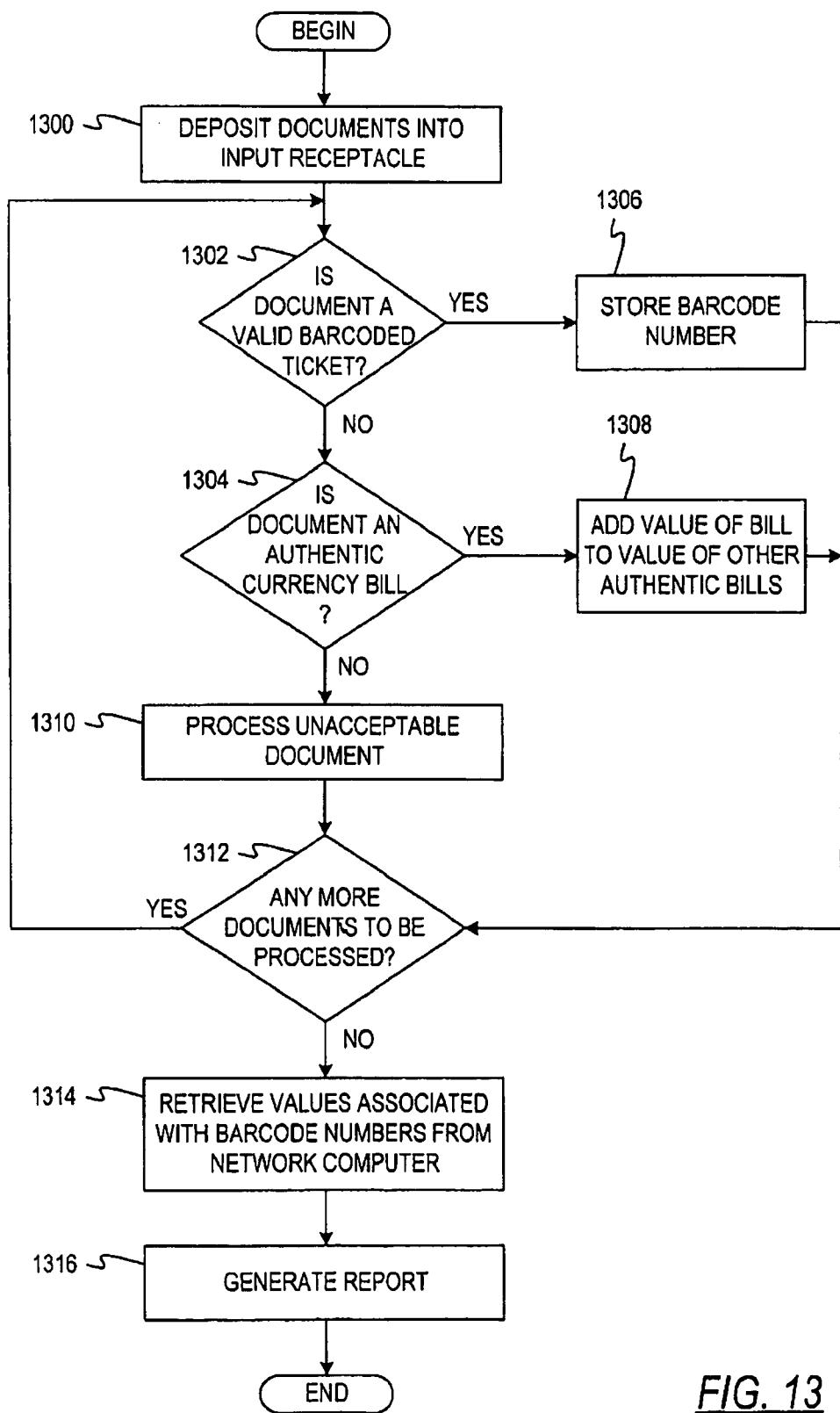


FIG. 12

FIG. 13

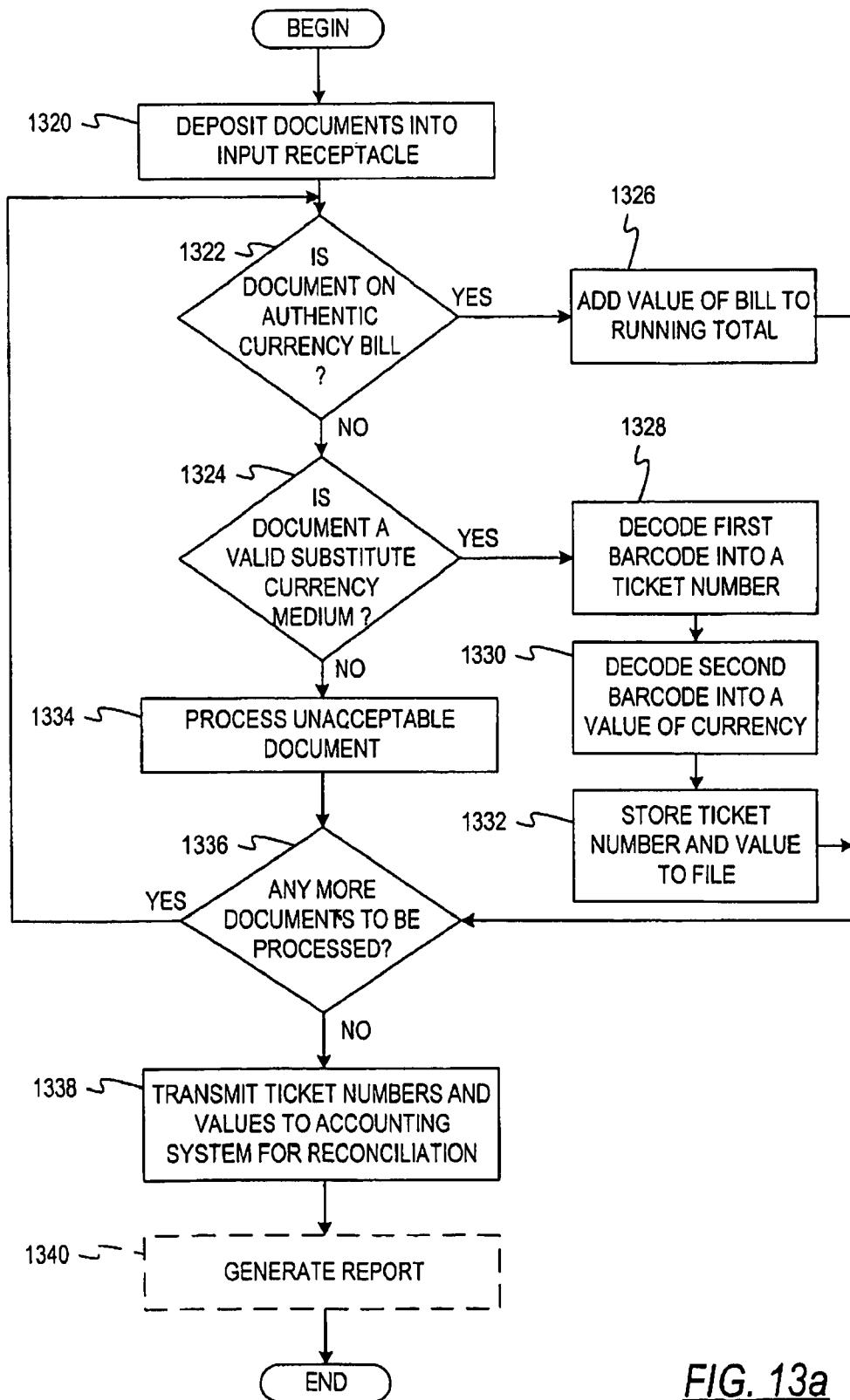


FIG. 13a

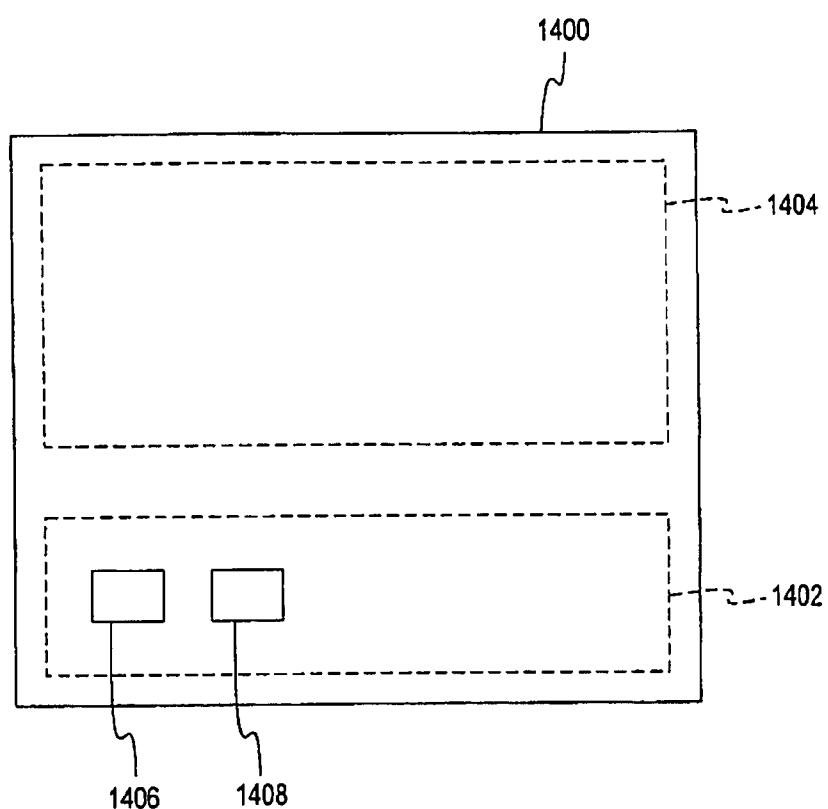
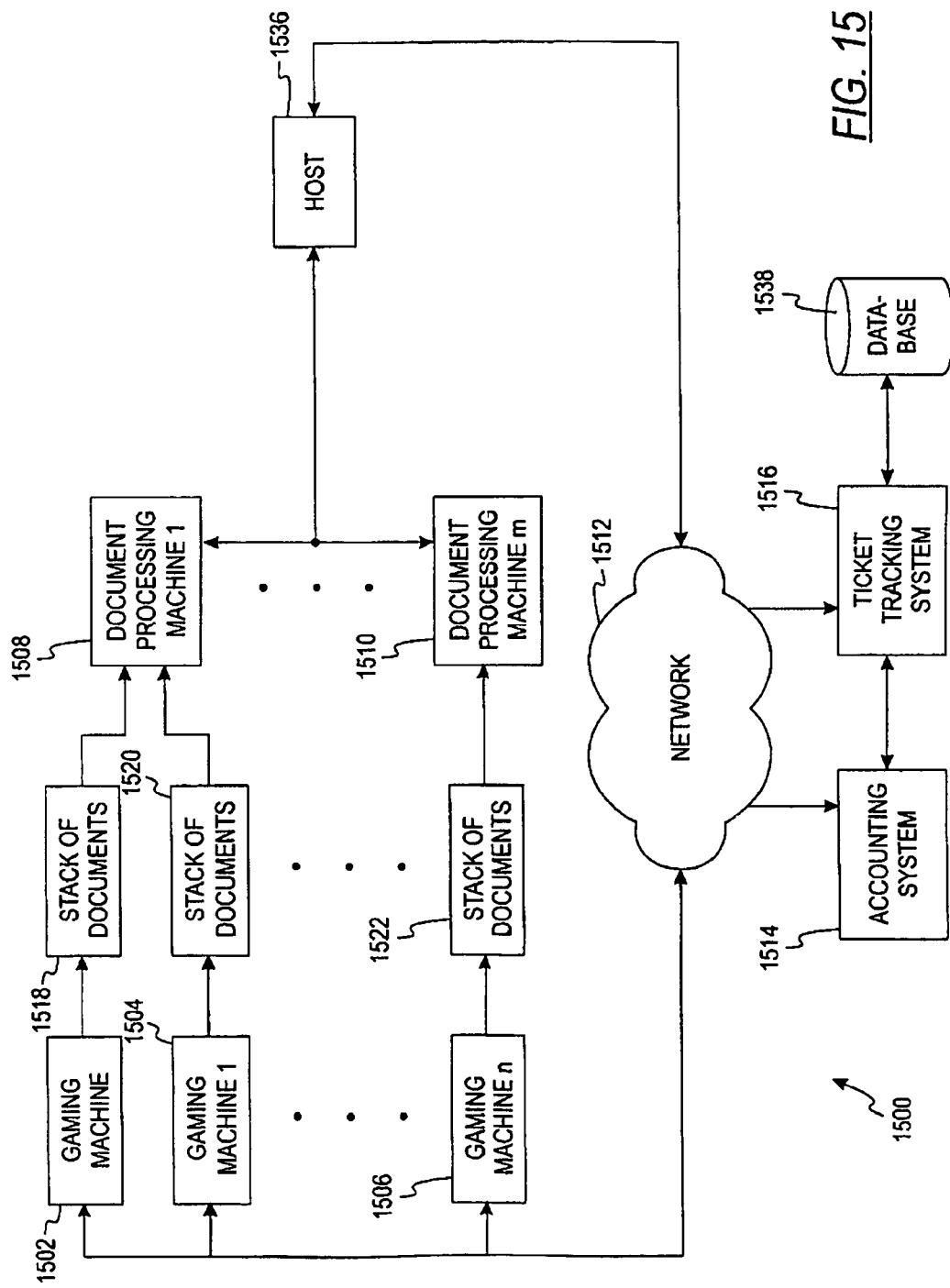


FIG. 14

FIG. 15



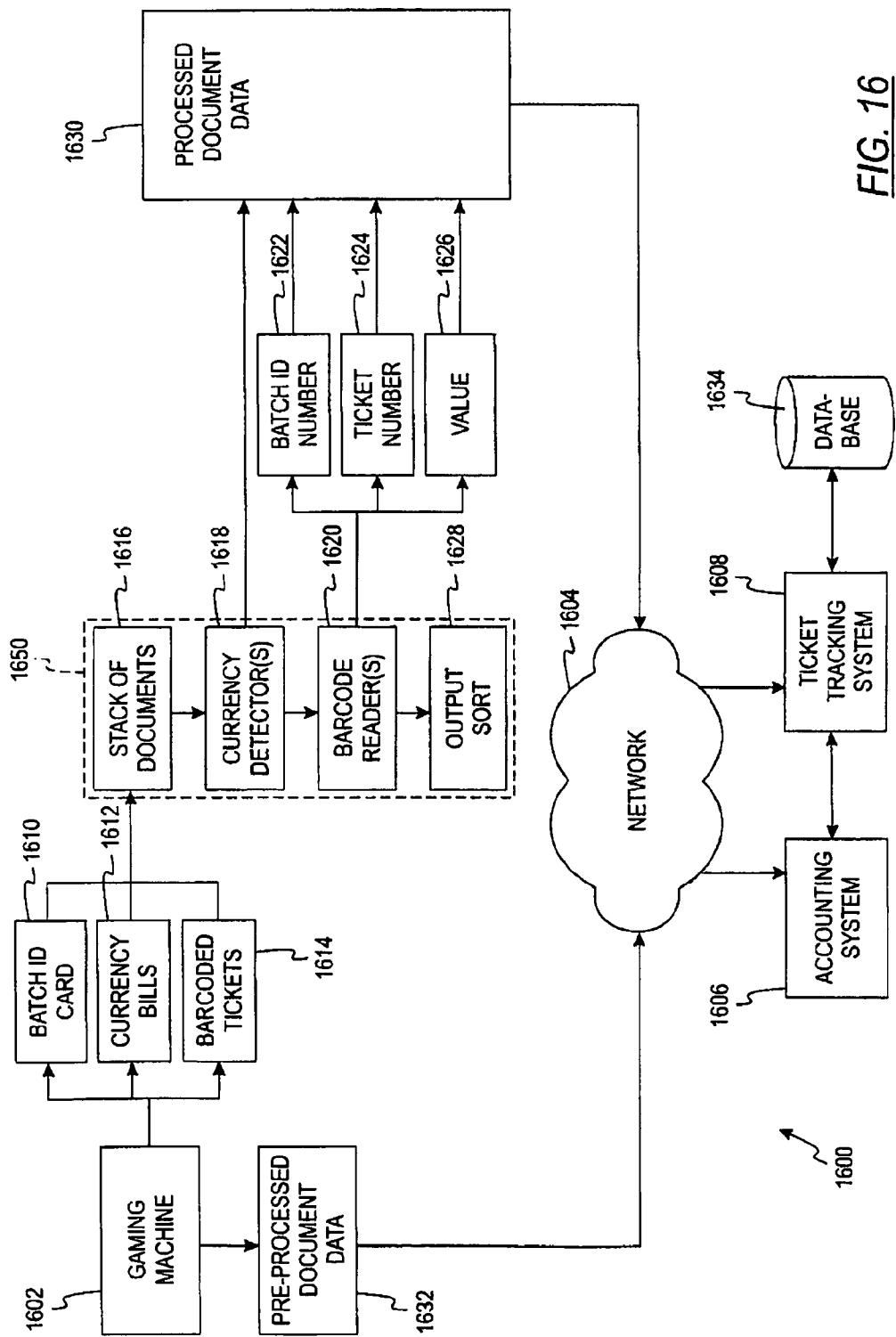


FIG. 16

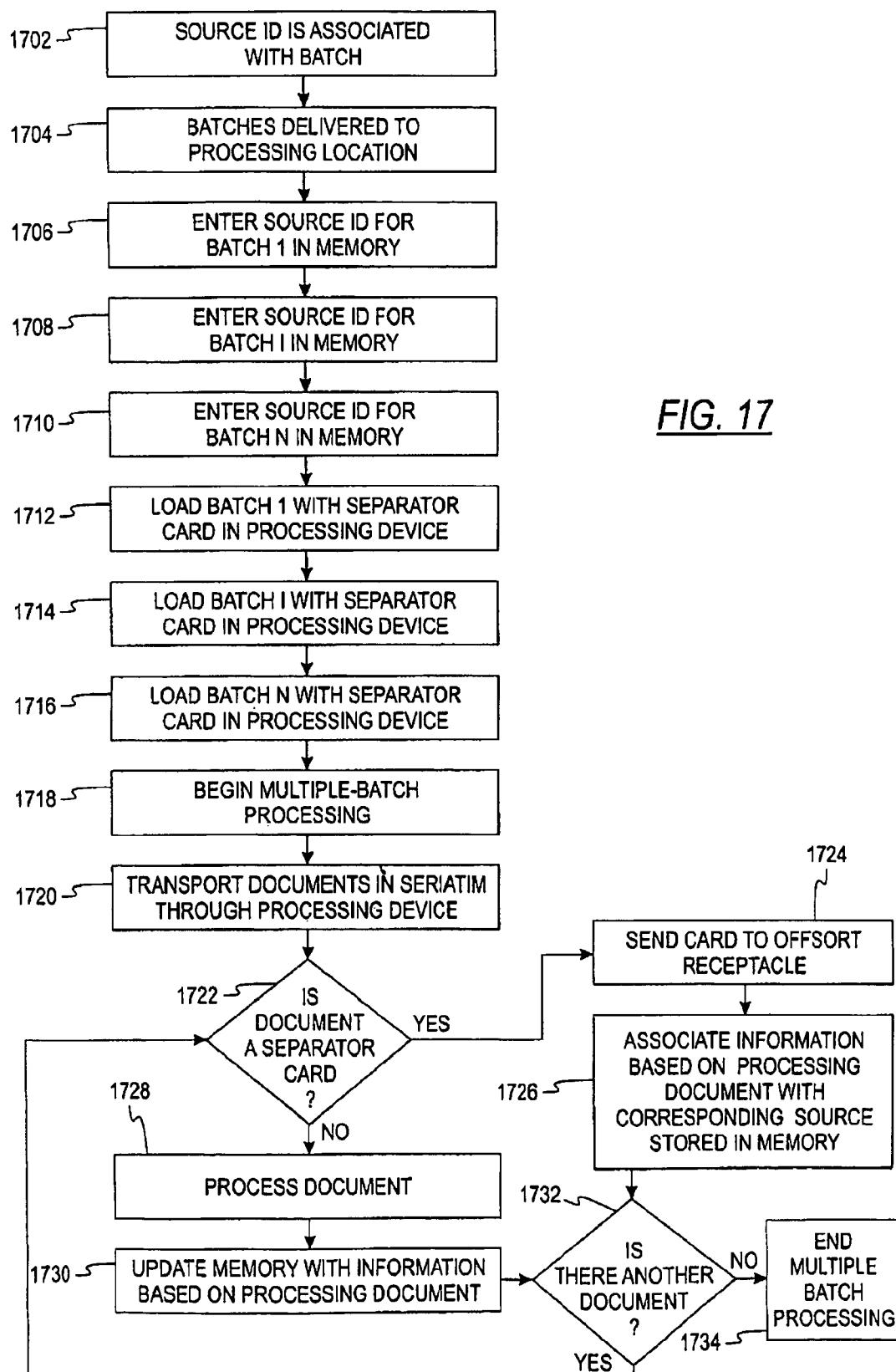


FIG. 17

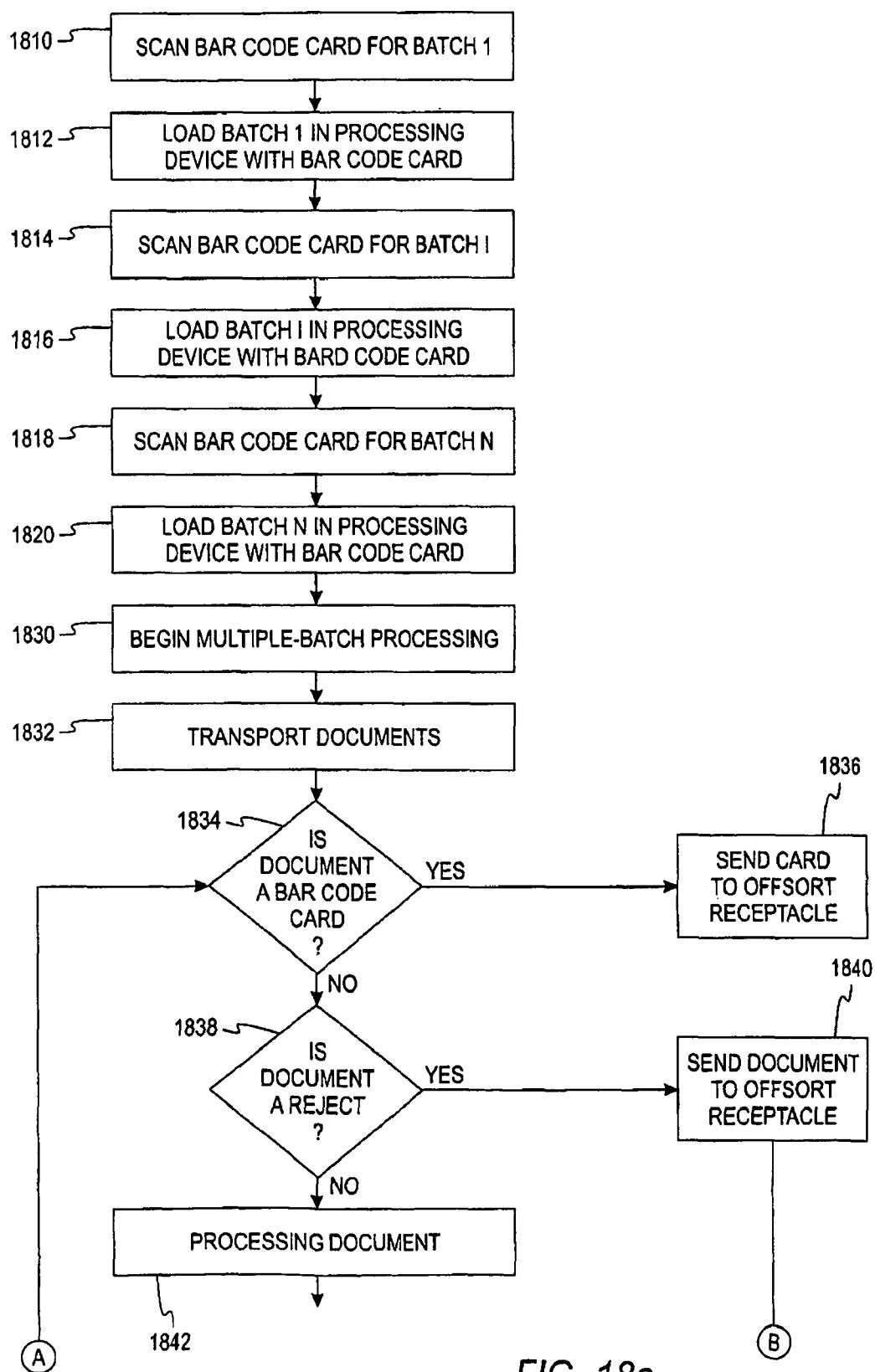


FIG. 18a

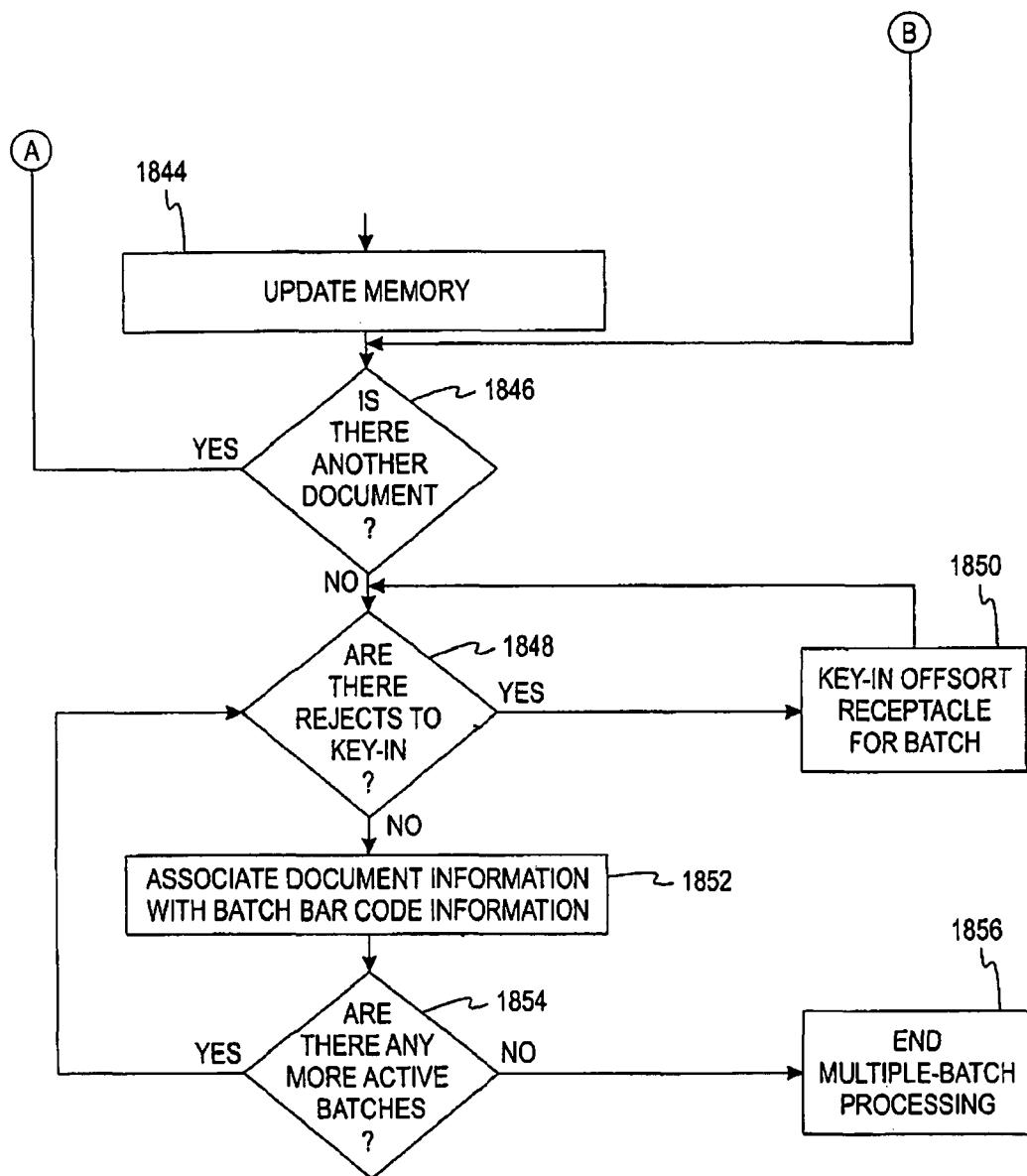
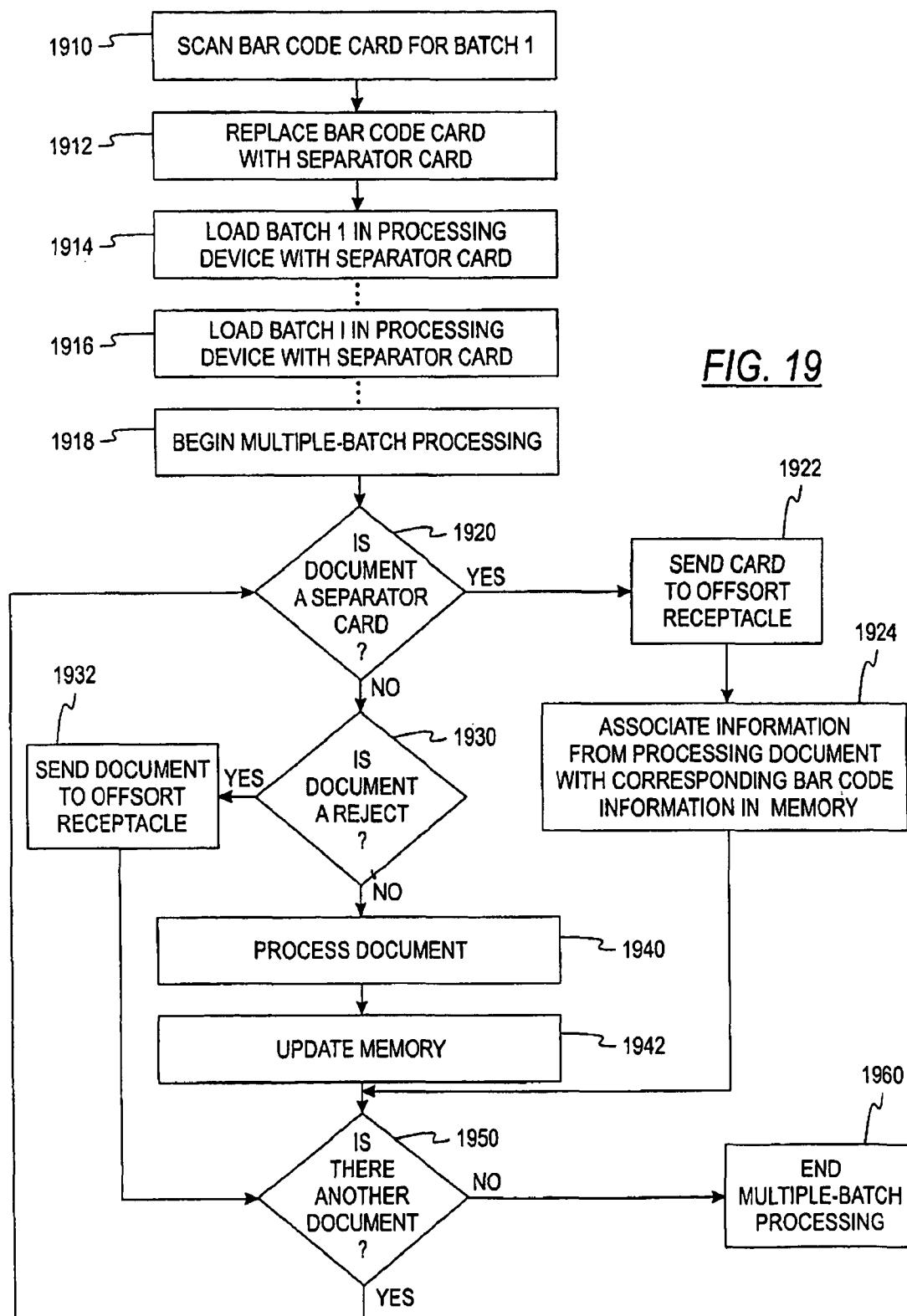
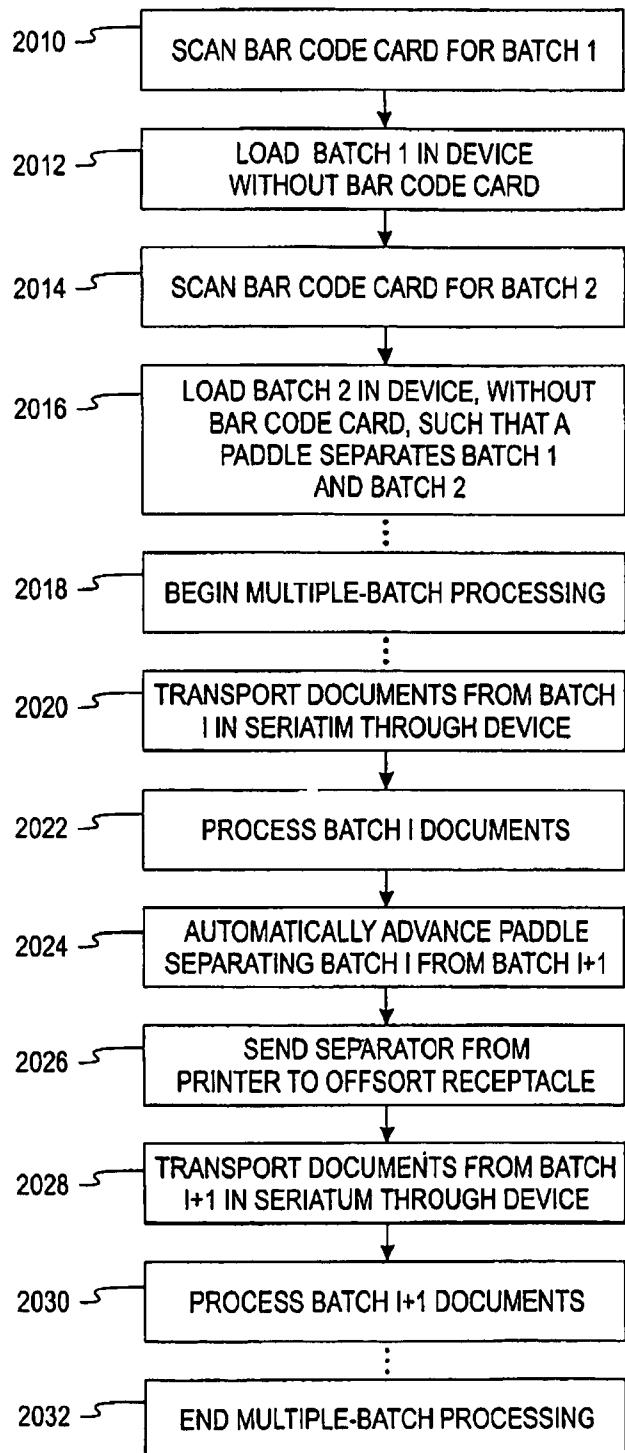
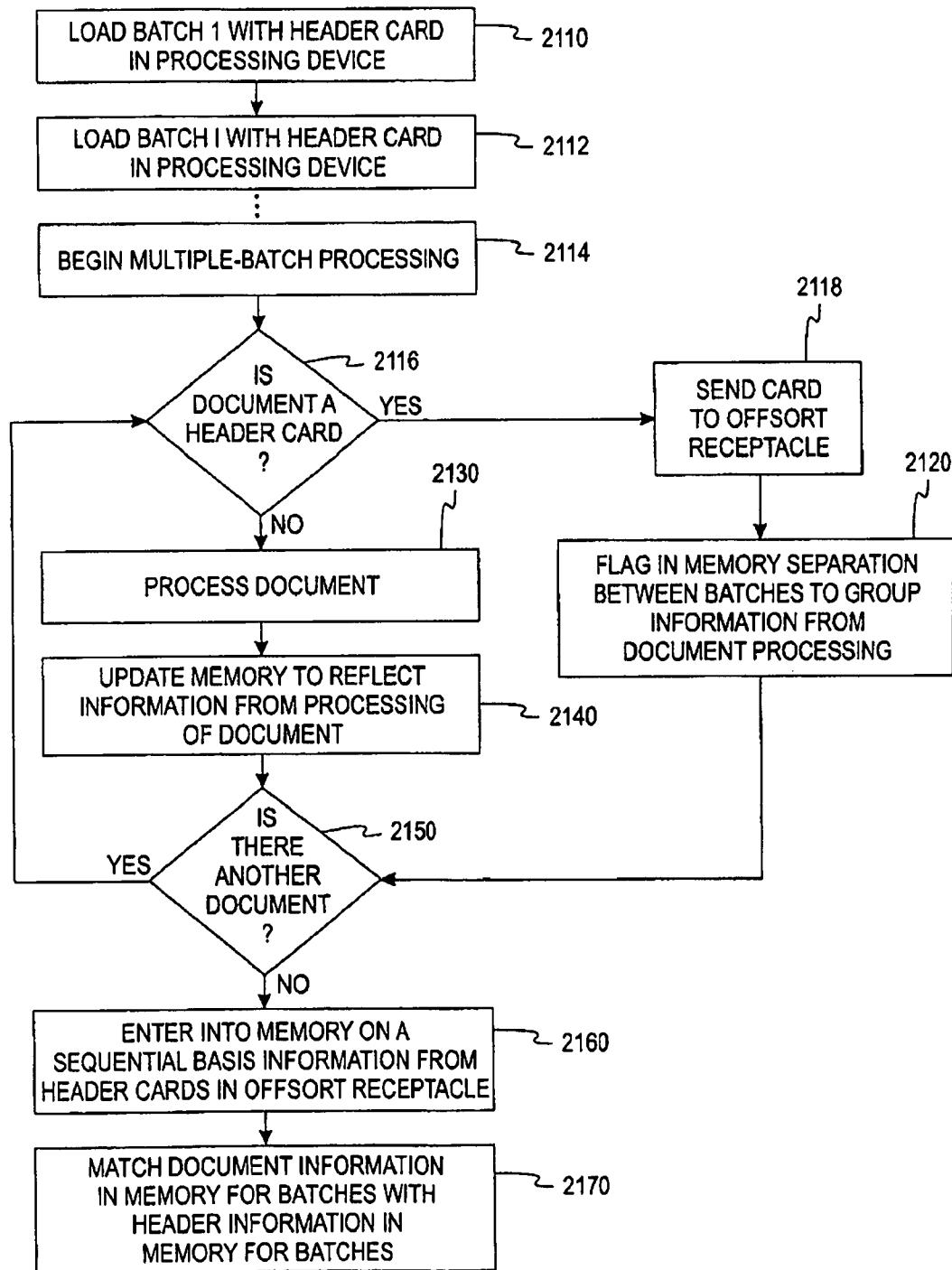


FIG. 18b



FIG. 20

FIG. 21

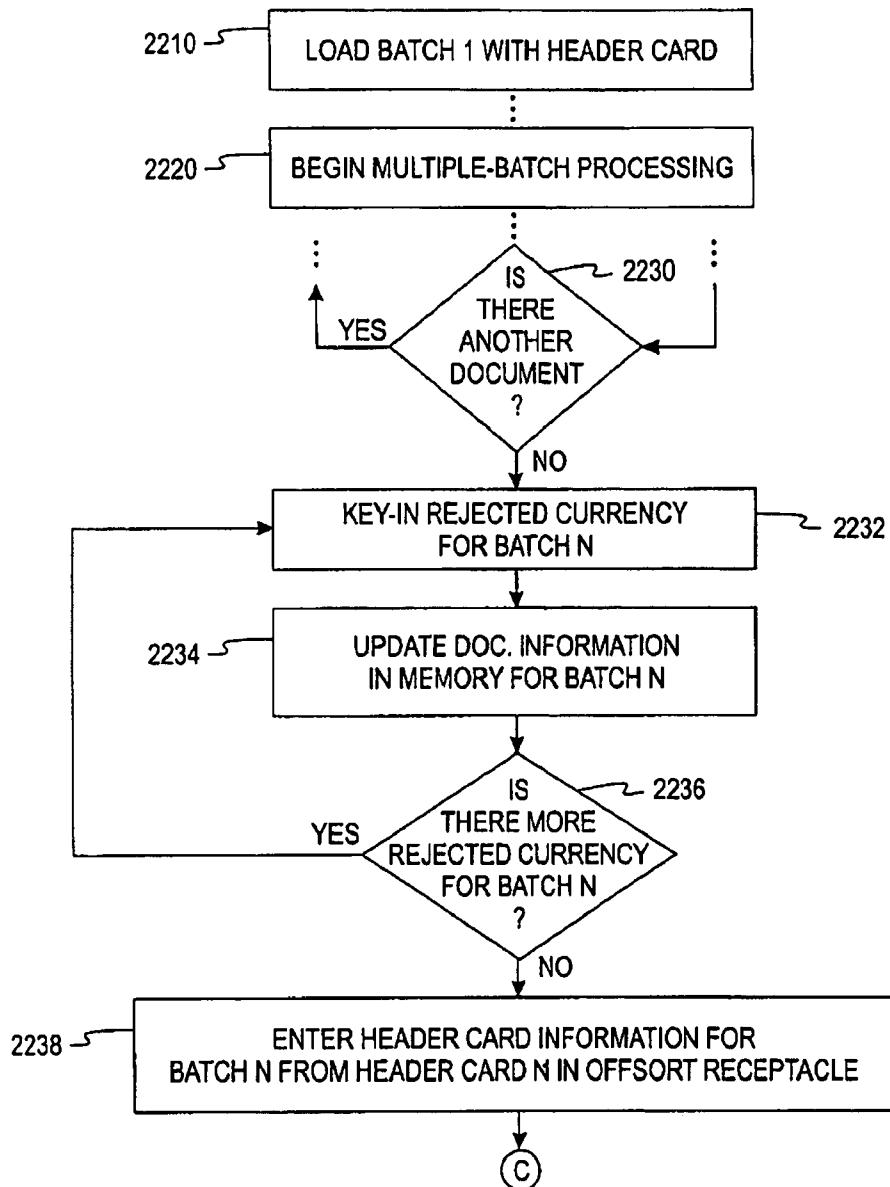
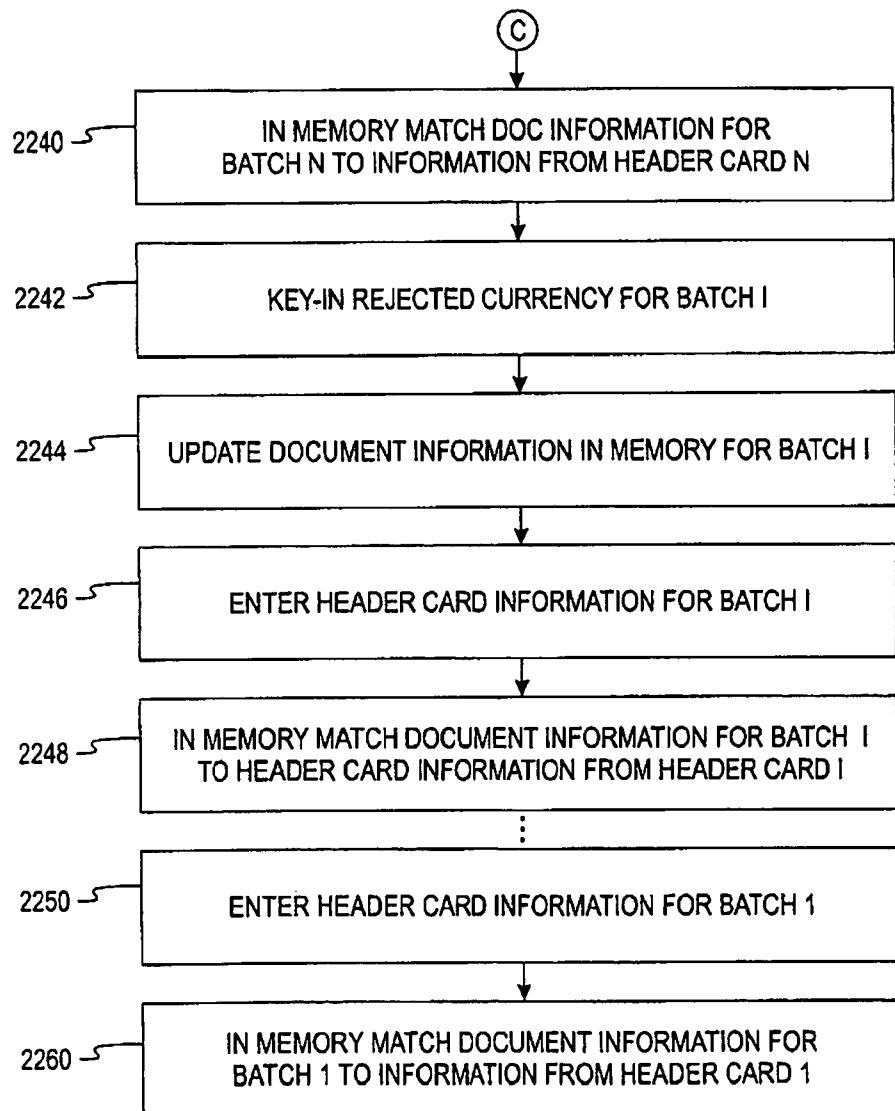
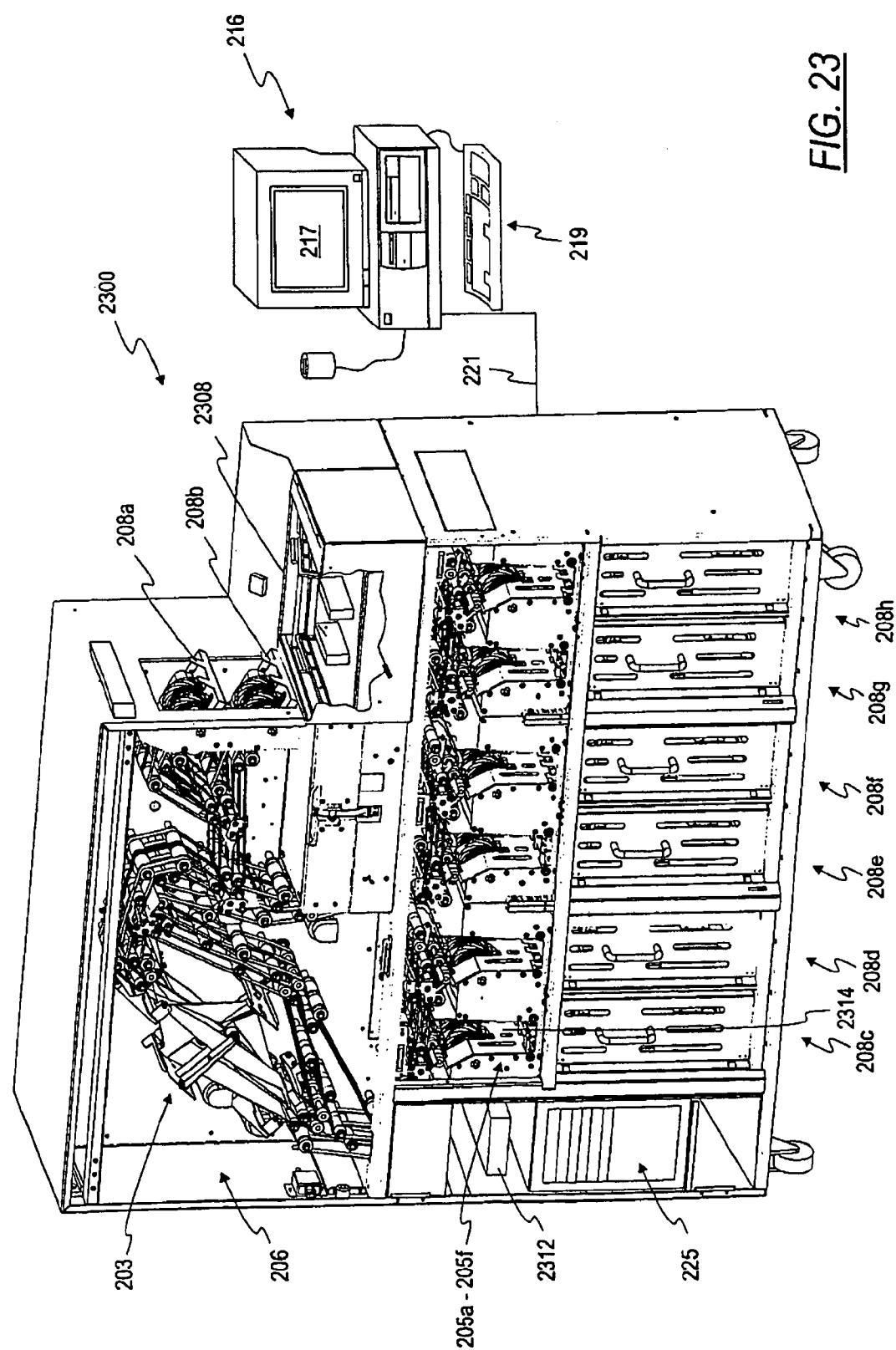


FIG. 22a

FIG. 22b



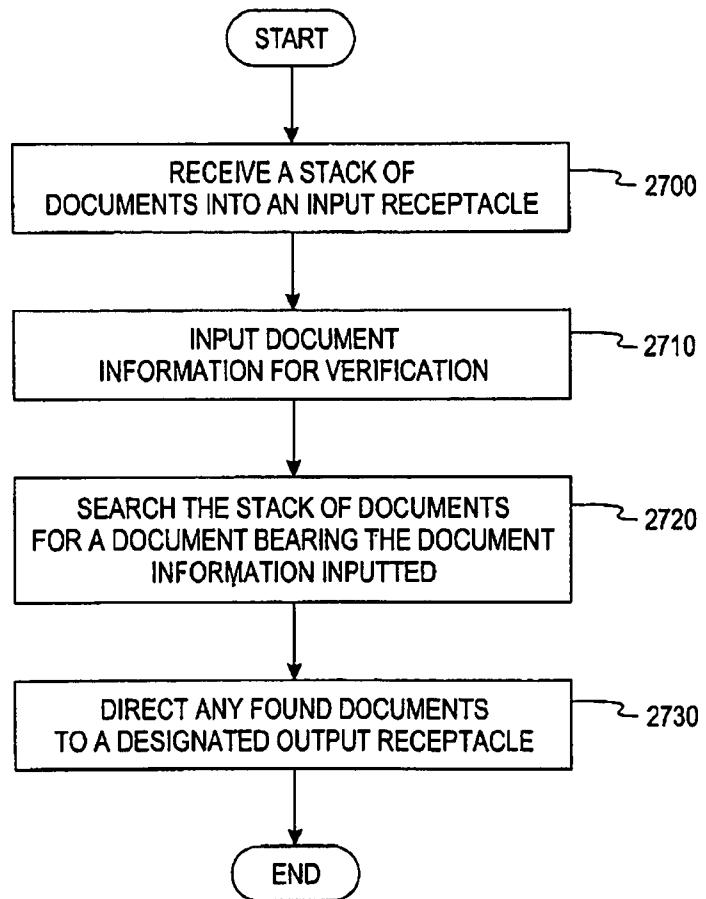
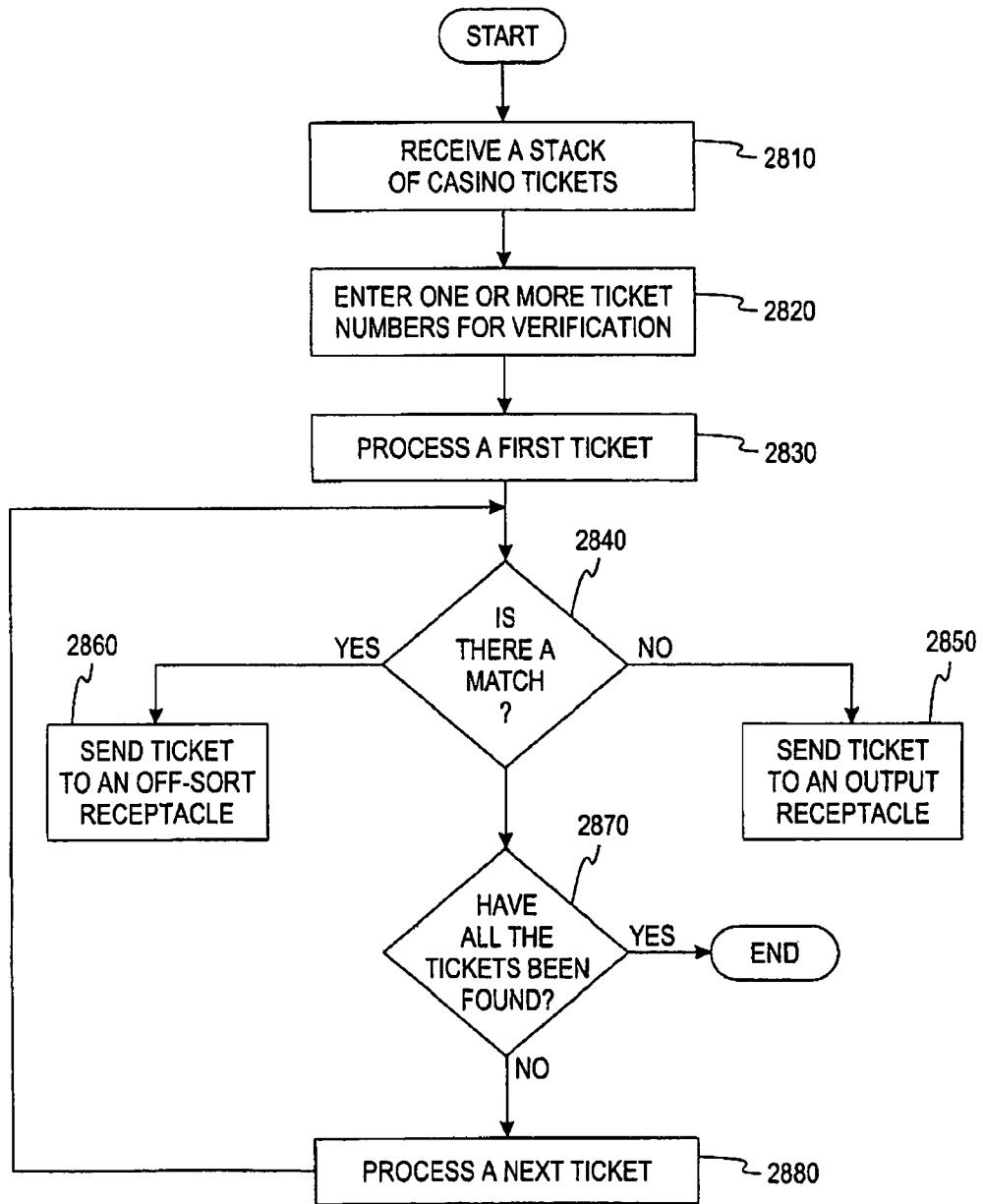


FIG. 24

FIG. 25

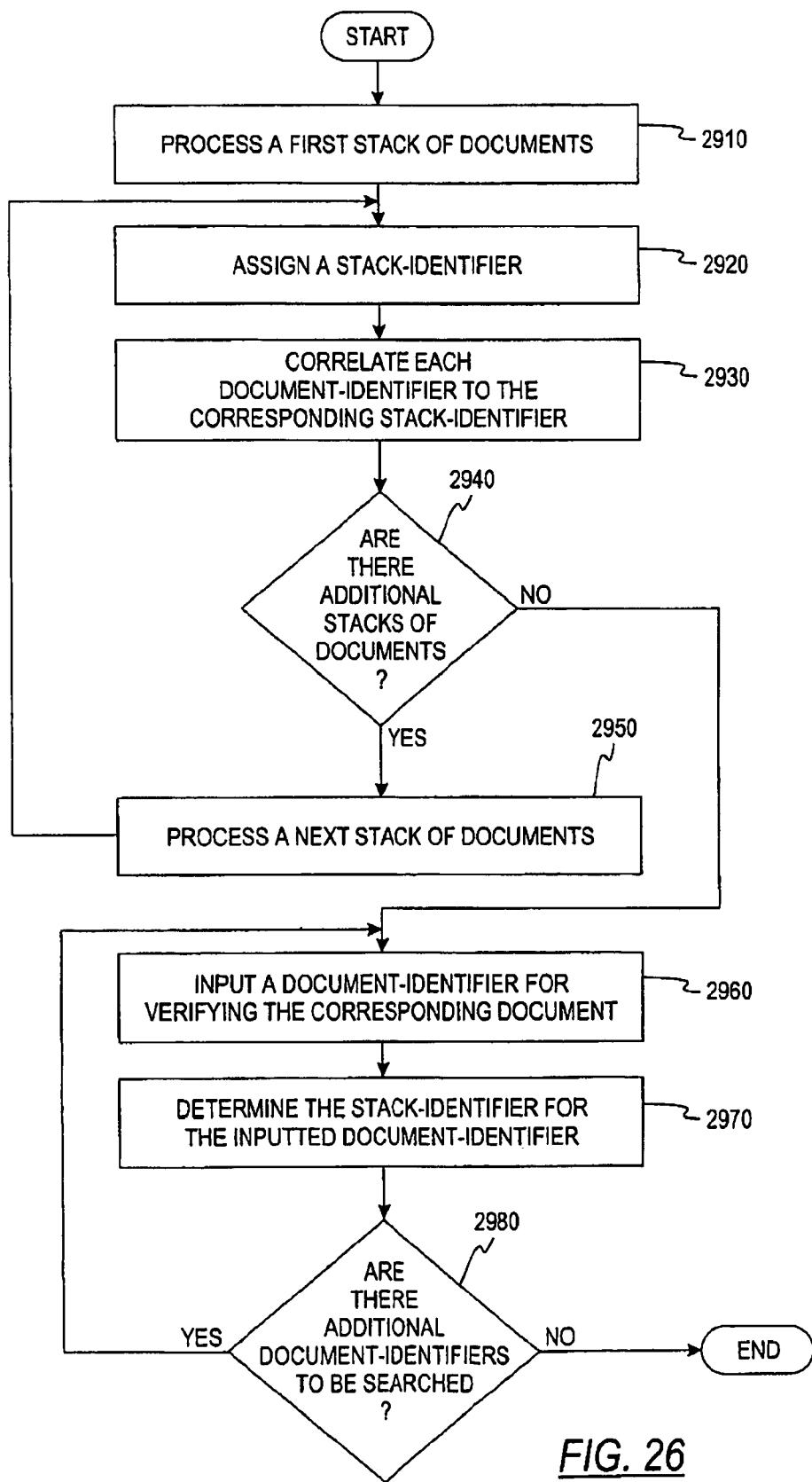


FIG. 26

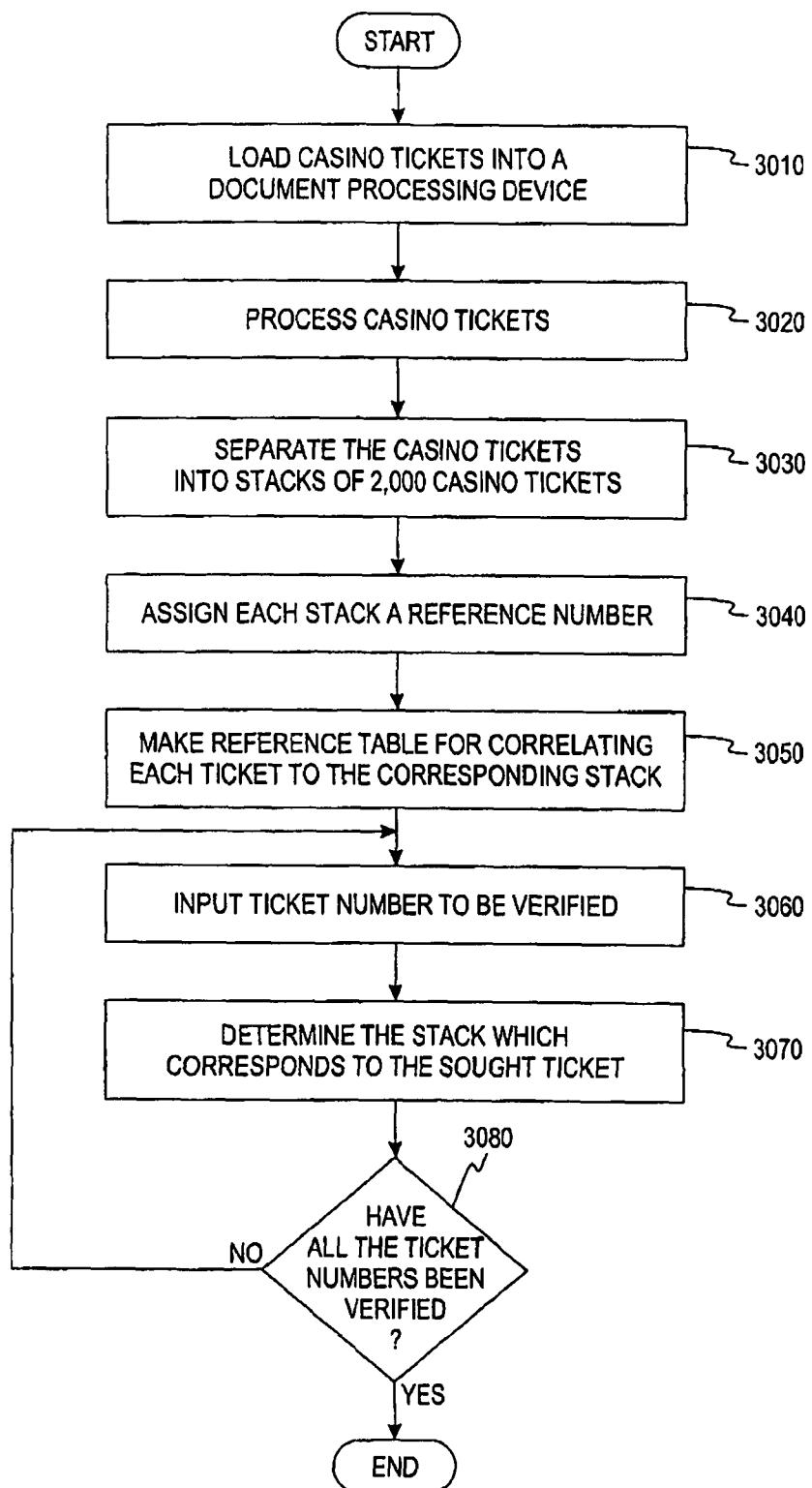


FIG. 27

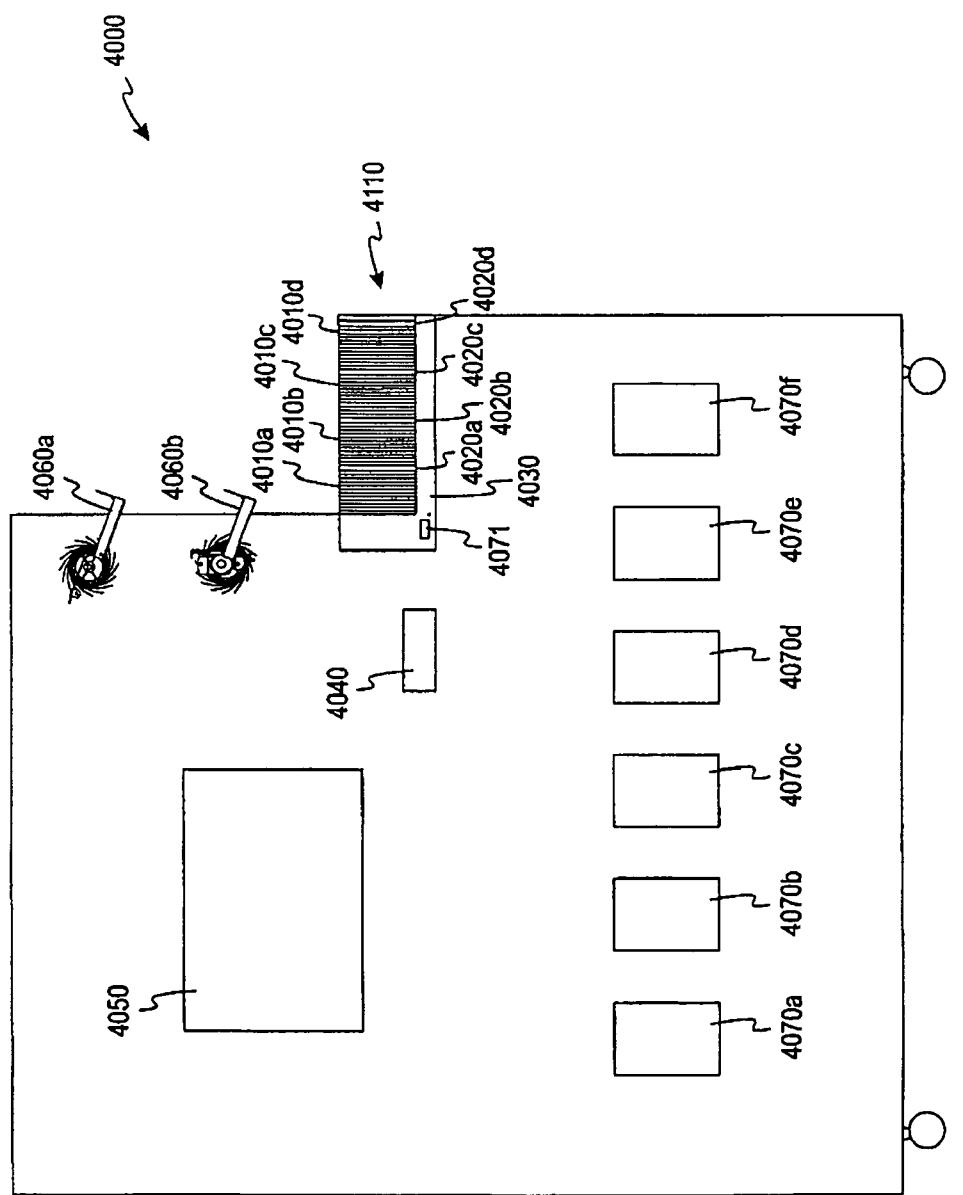


FIG. 28

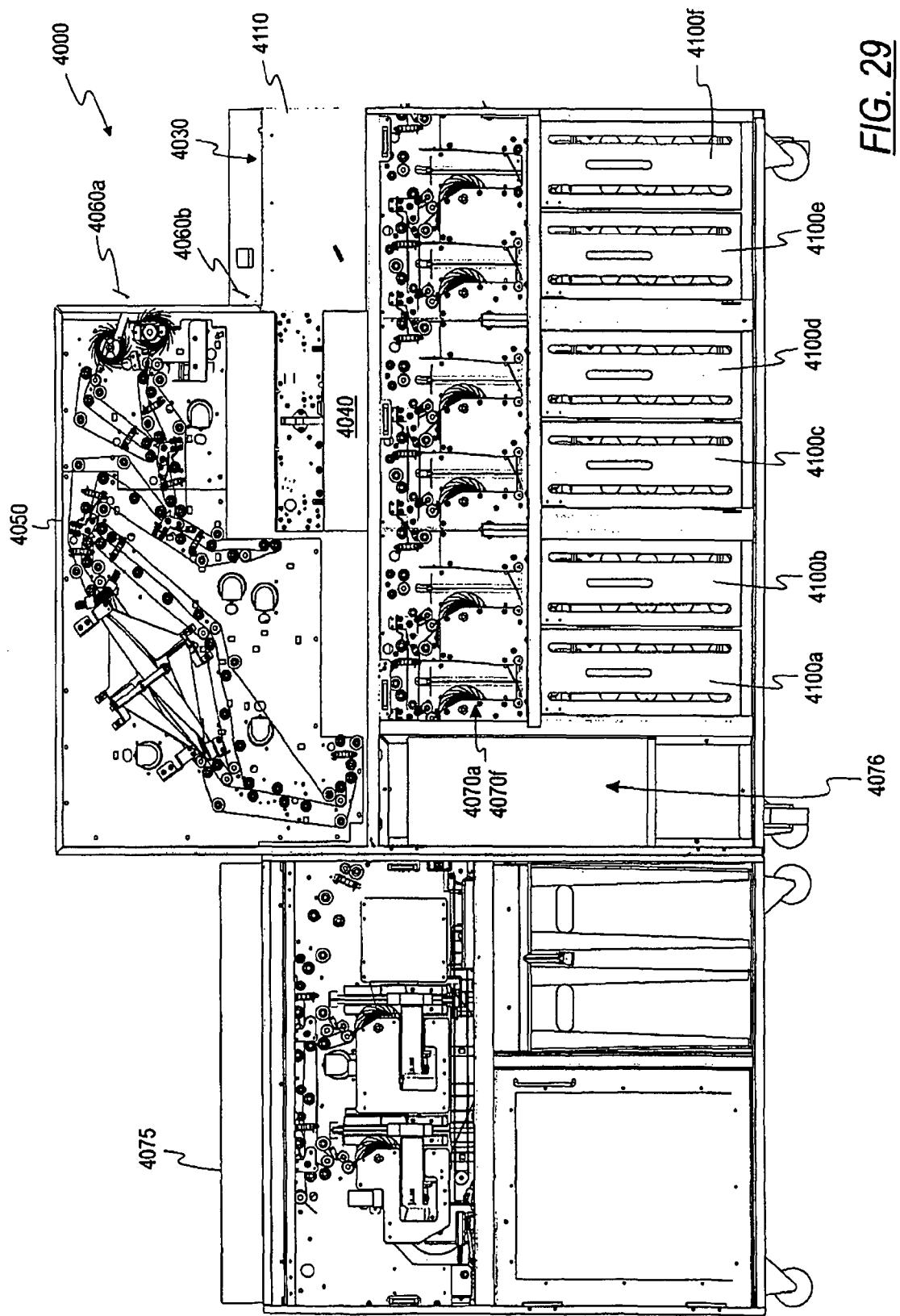


FIG. 29

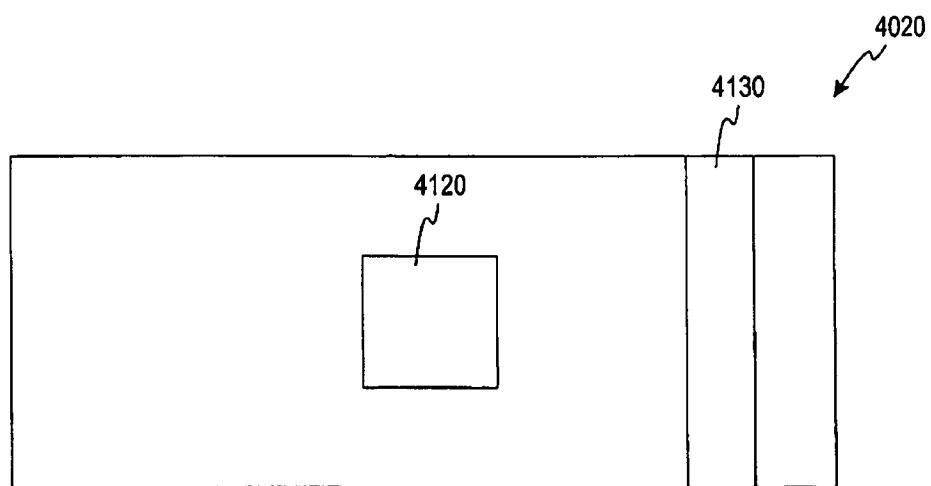


FIG. 30a

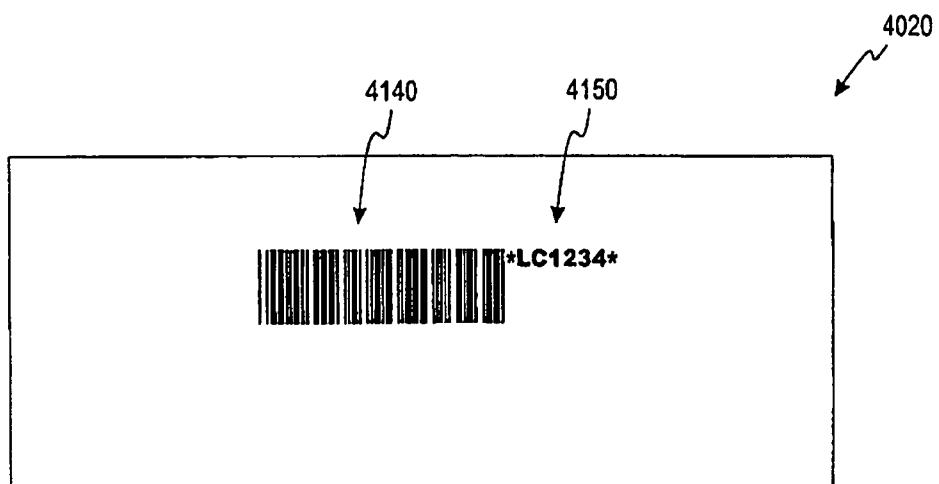


FIG. 30b

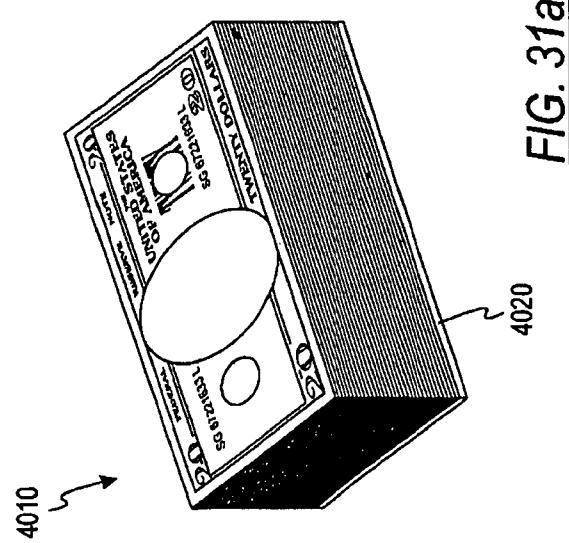
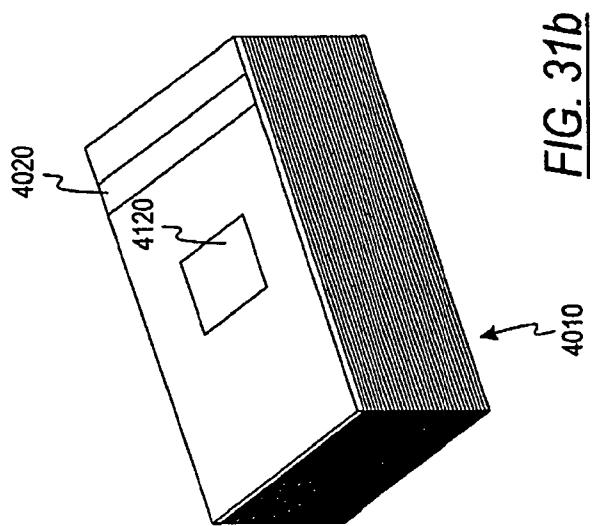
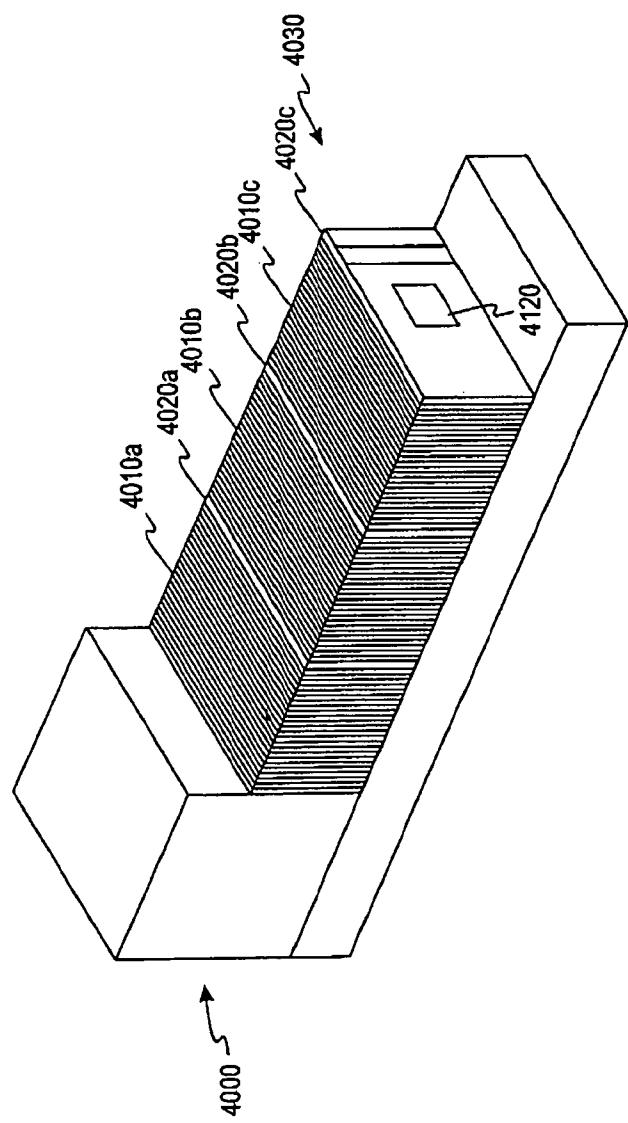


FIG. 32

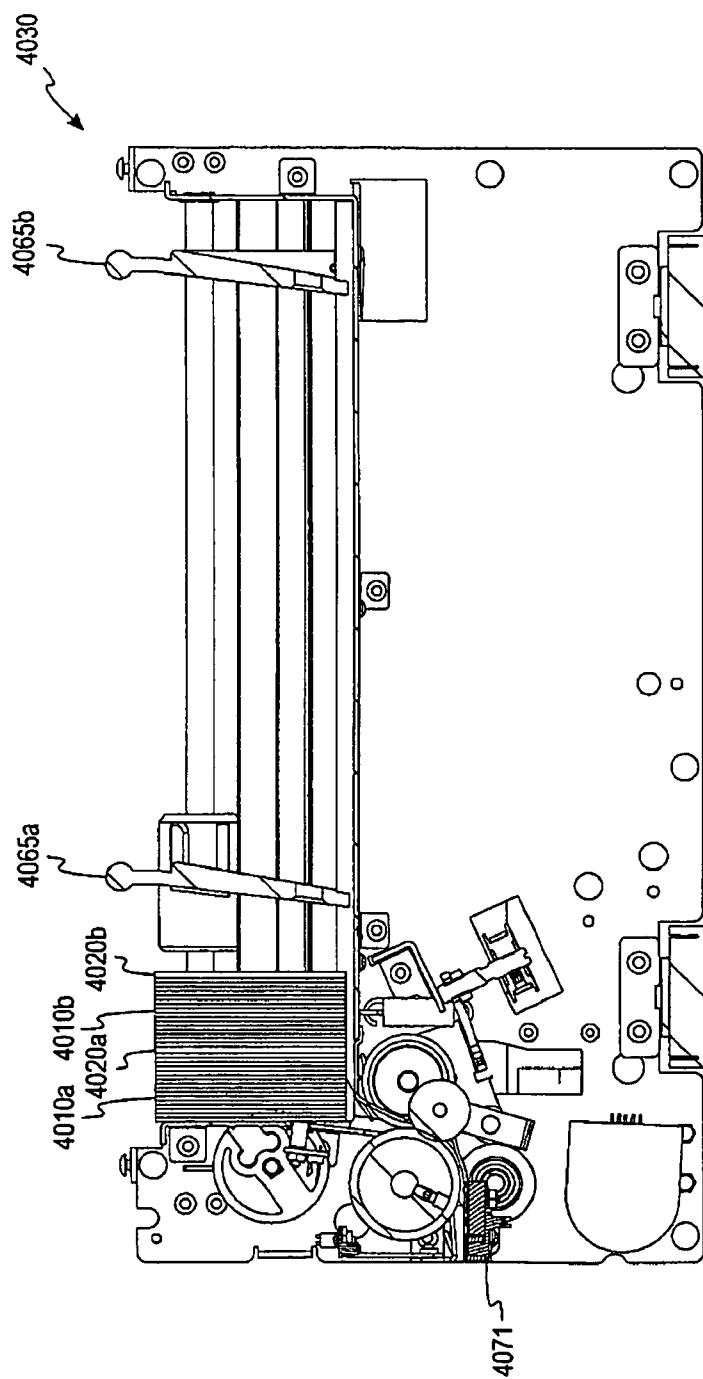


FIG. 33

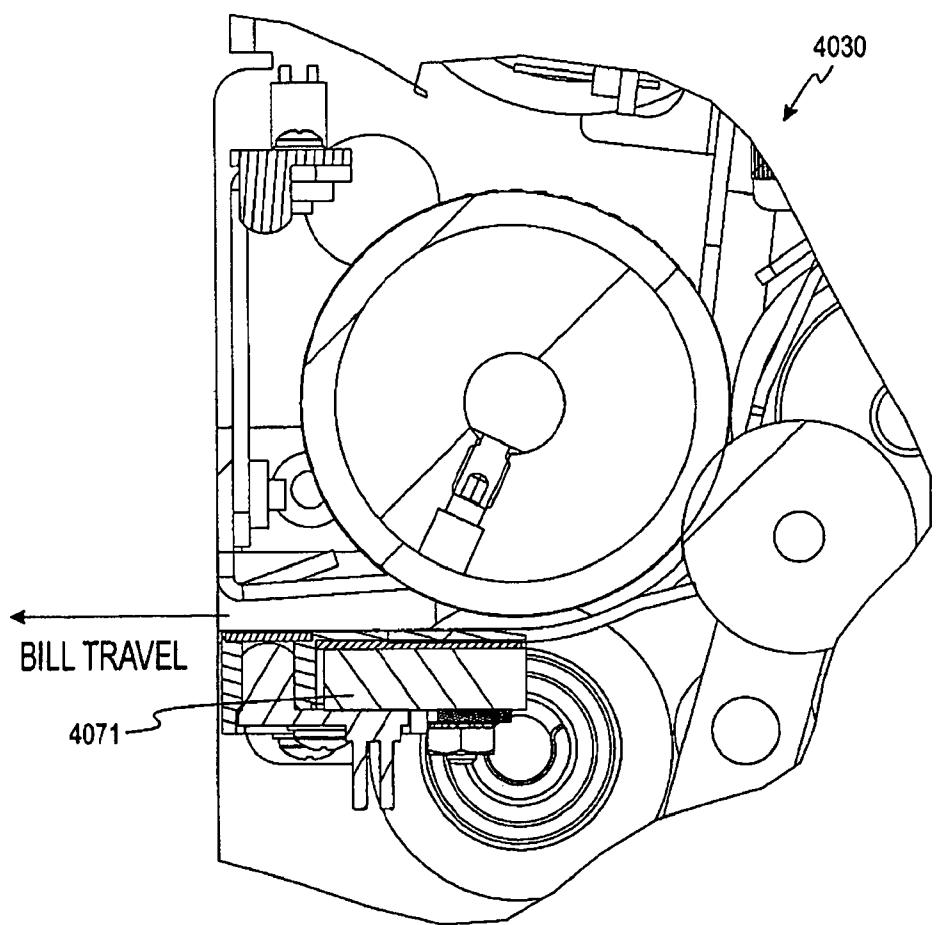


FIG. 34

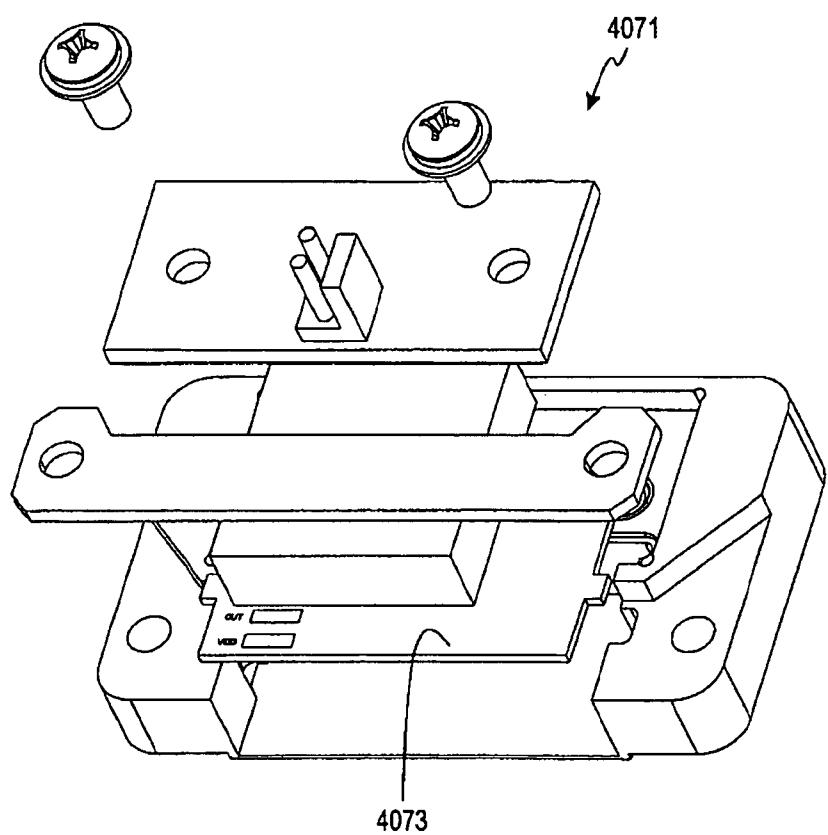
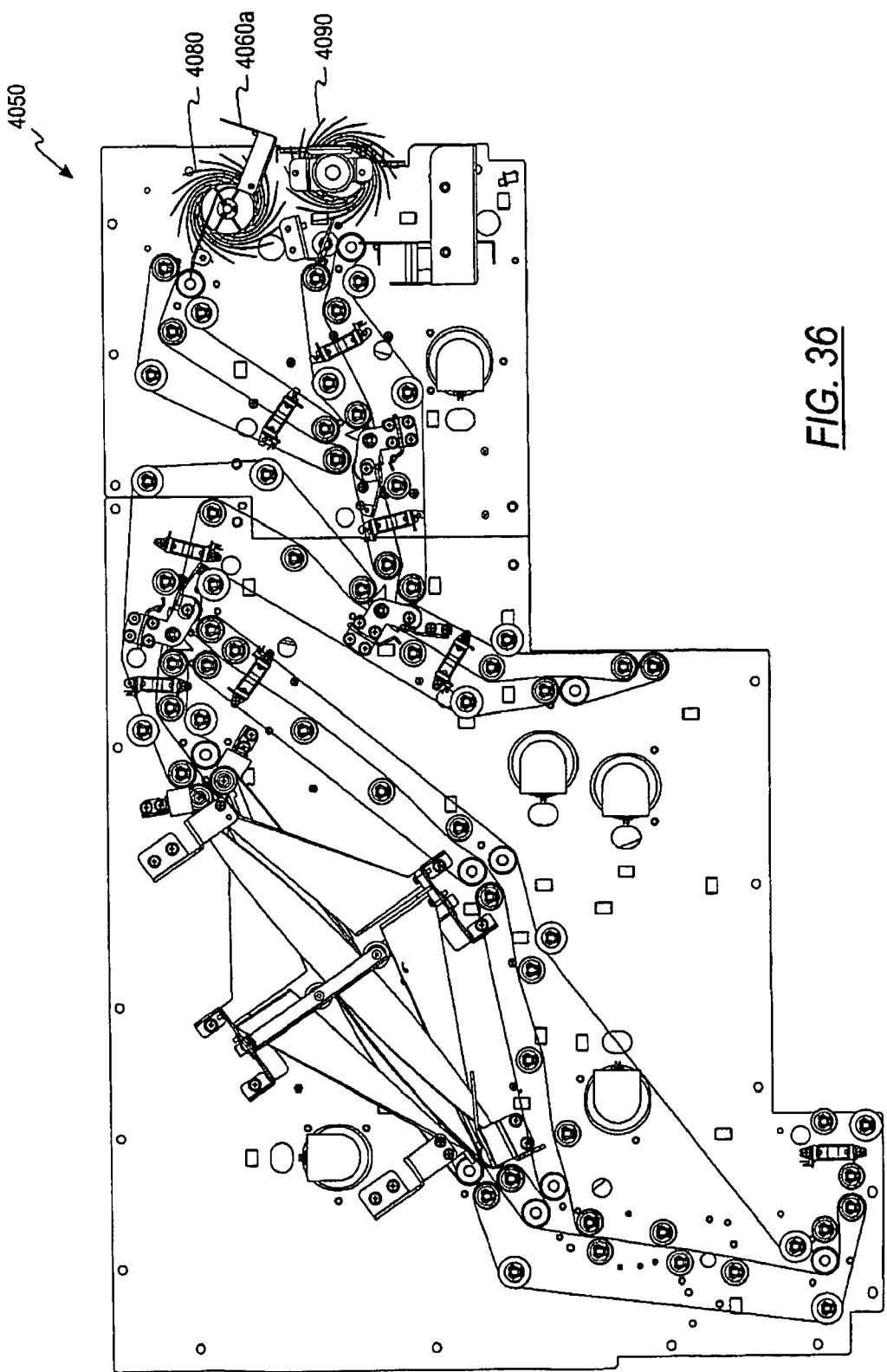
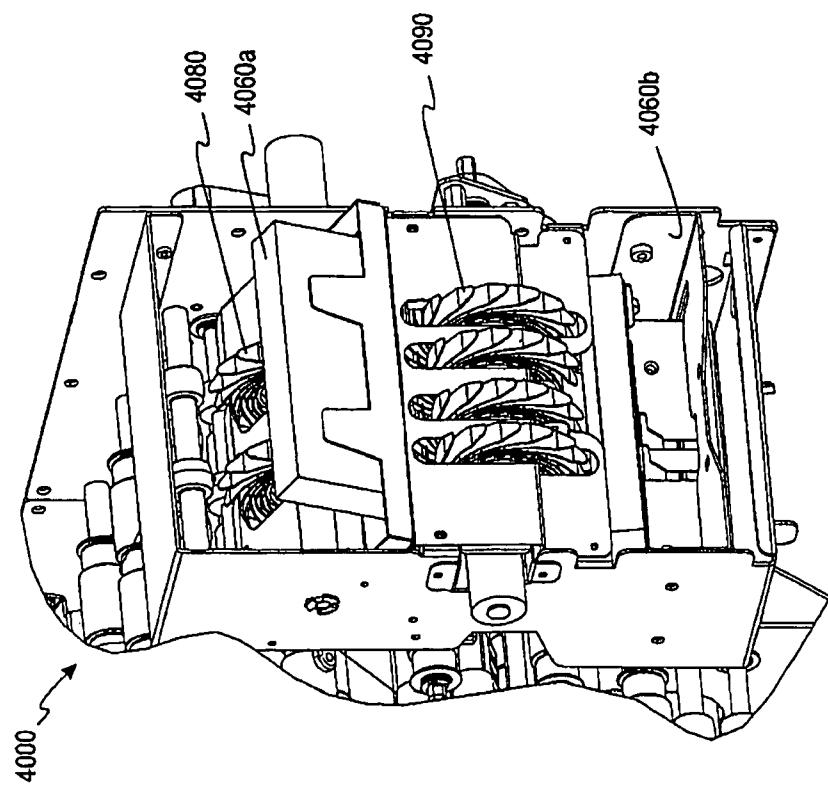
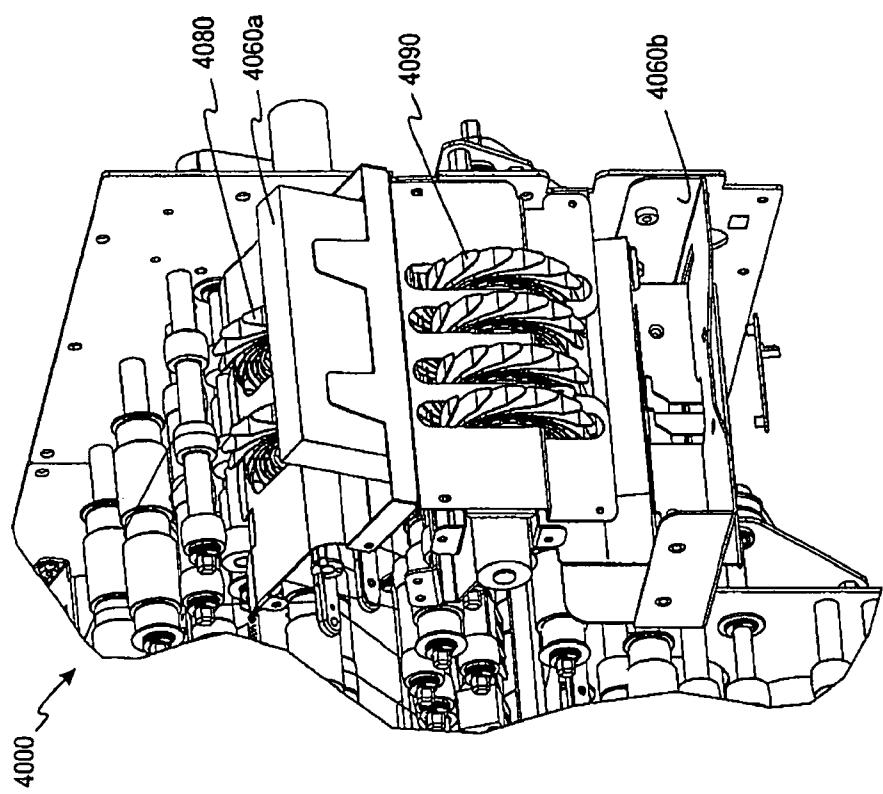


FIG. 35





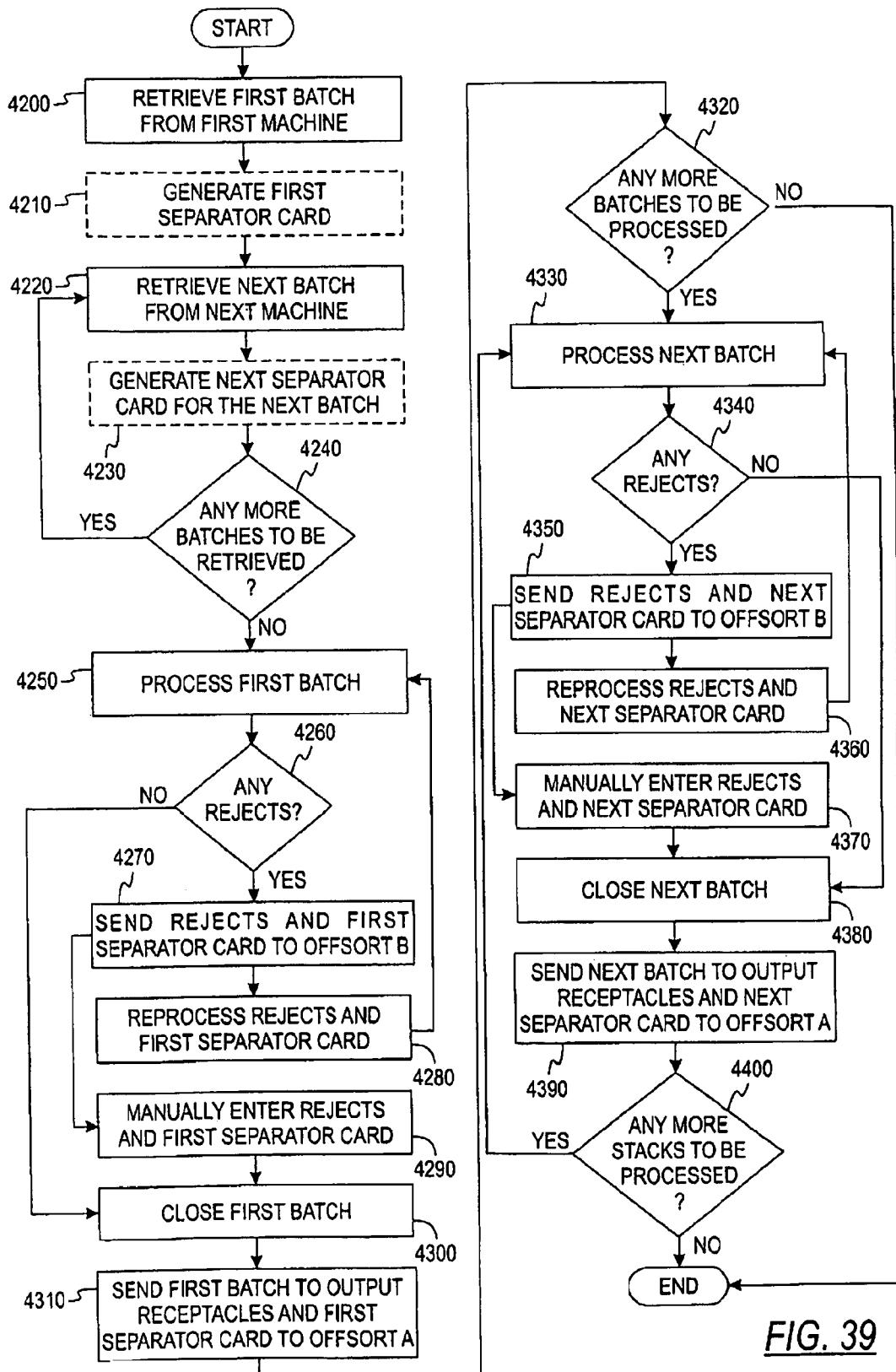
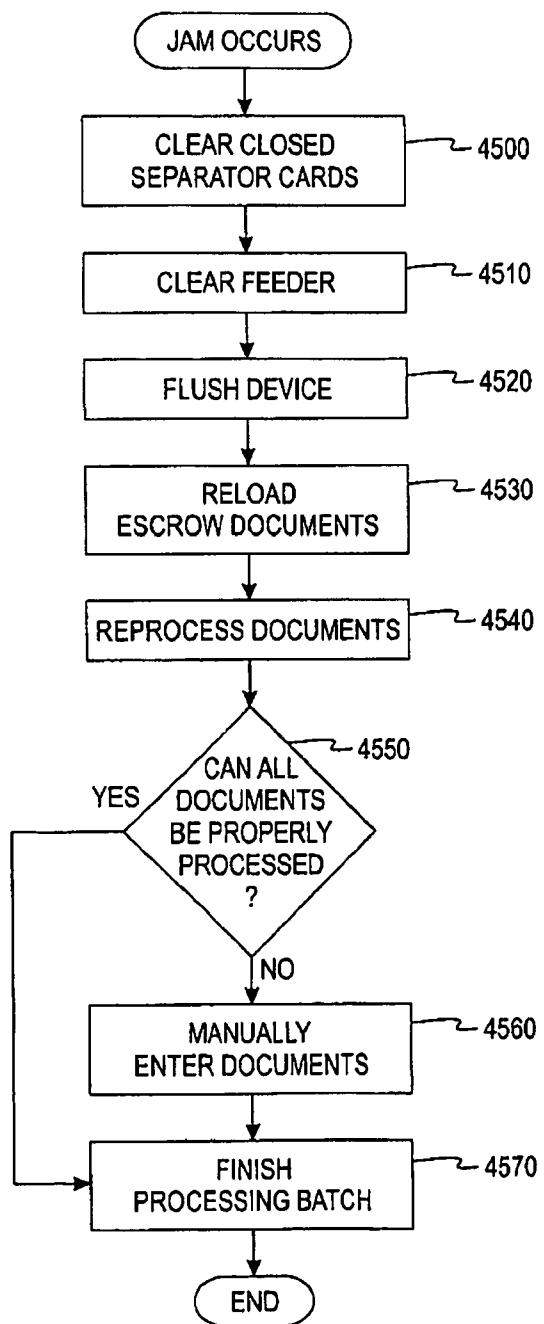


FIG. 39

FIG. 40a

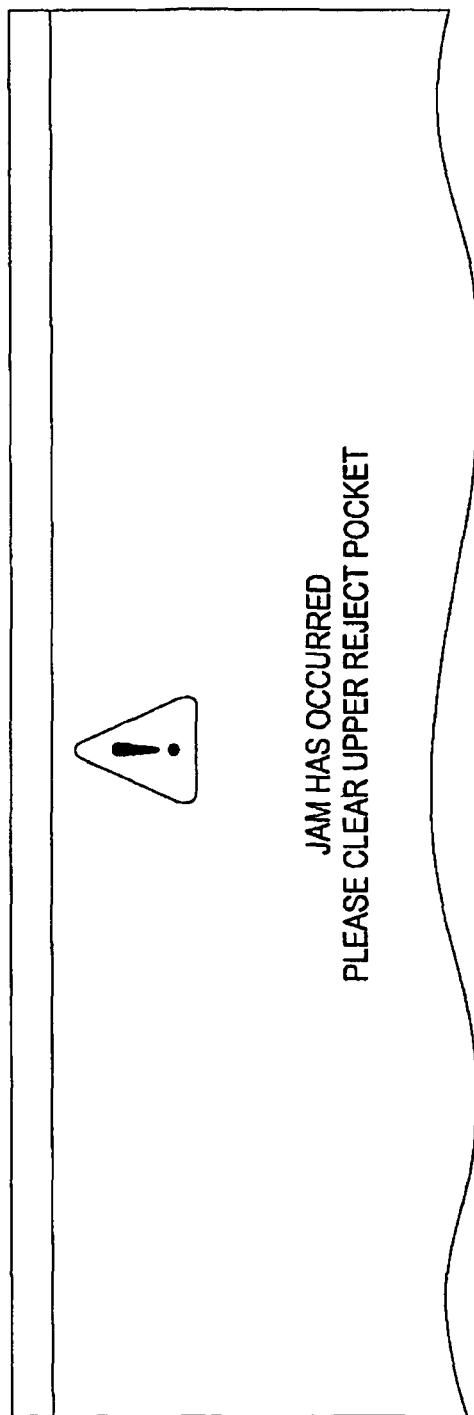


FIG. 40b

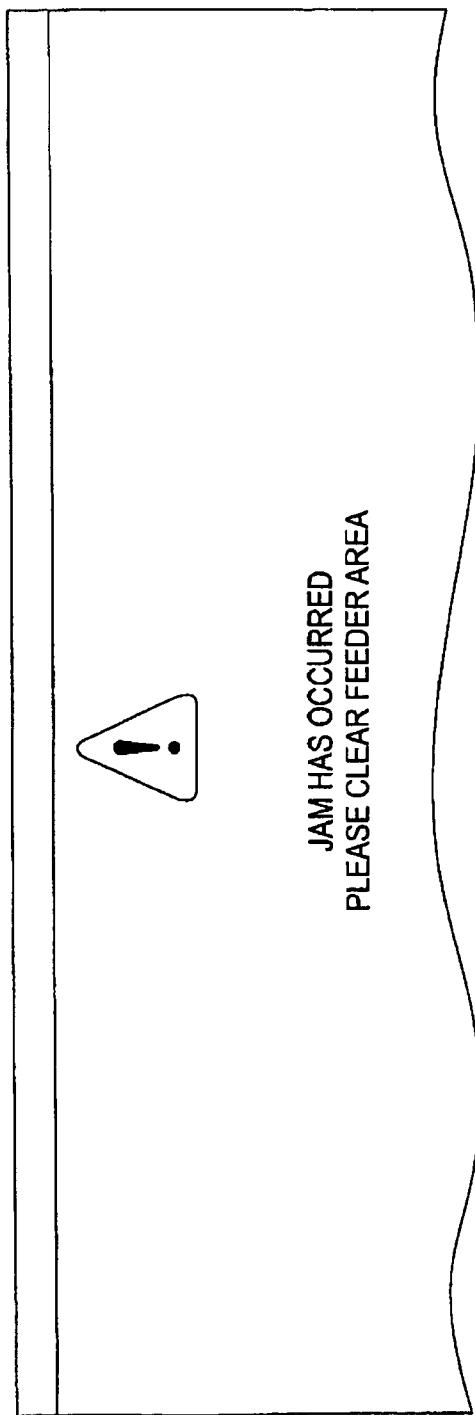


FIG. 40c

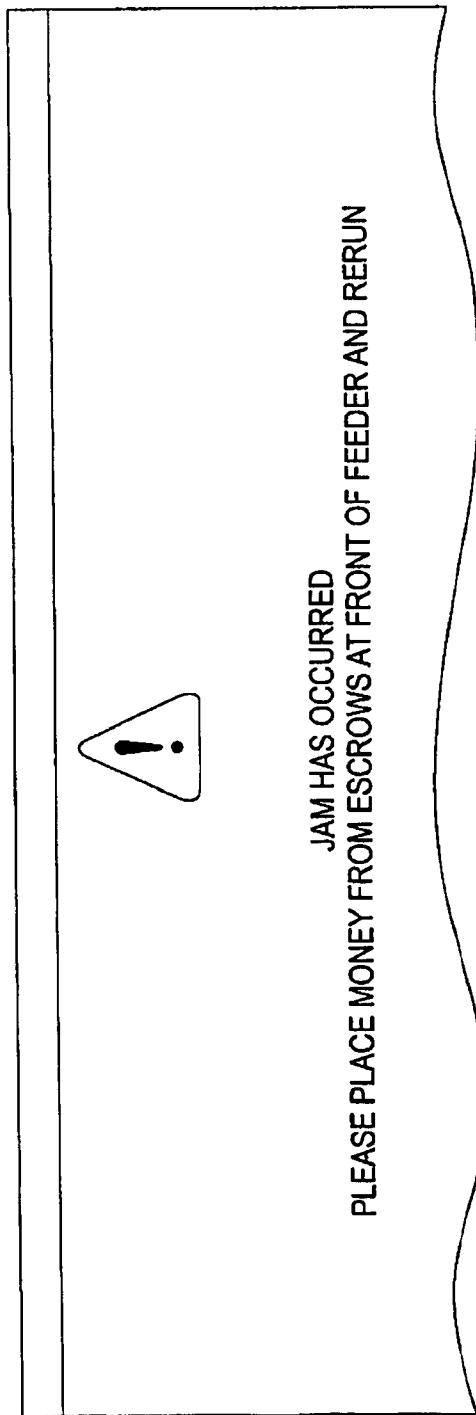


FIG. 40d

FIG. 40e

MANUAL CURRENCY MENU	
DENOMINATION	UNIT
\$ 1	\$ 0
\$ 5	\$ 0
\$ 10	\$ 0
\$ 20	\$ 0
\$ 50	\$ 0
\$ 100	\$ 0
2	\$ 0
TOTAL	\$ 0
BATCH	\$ 0.00

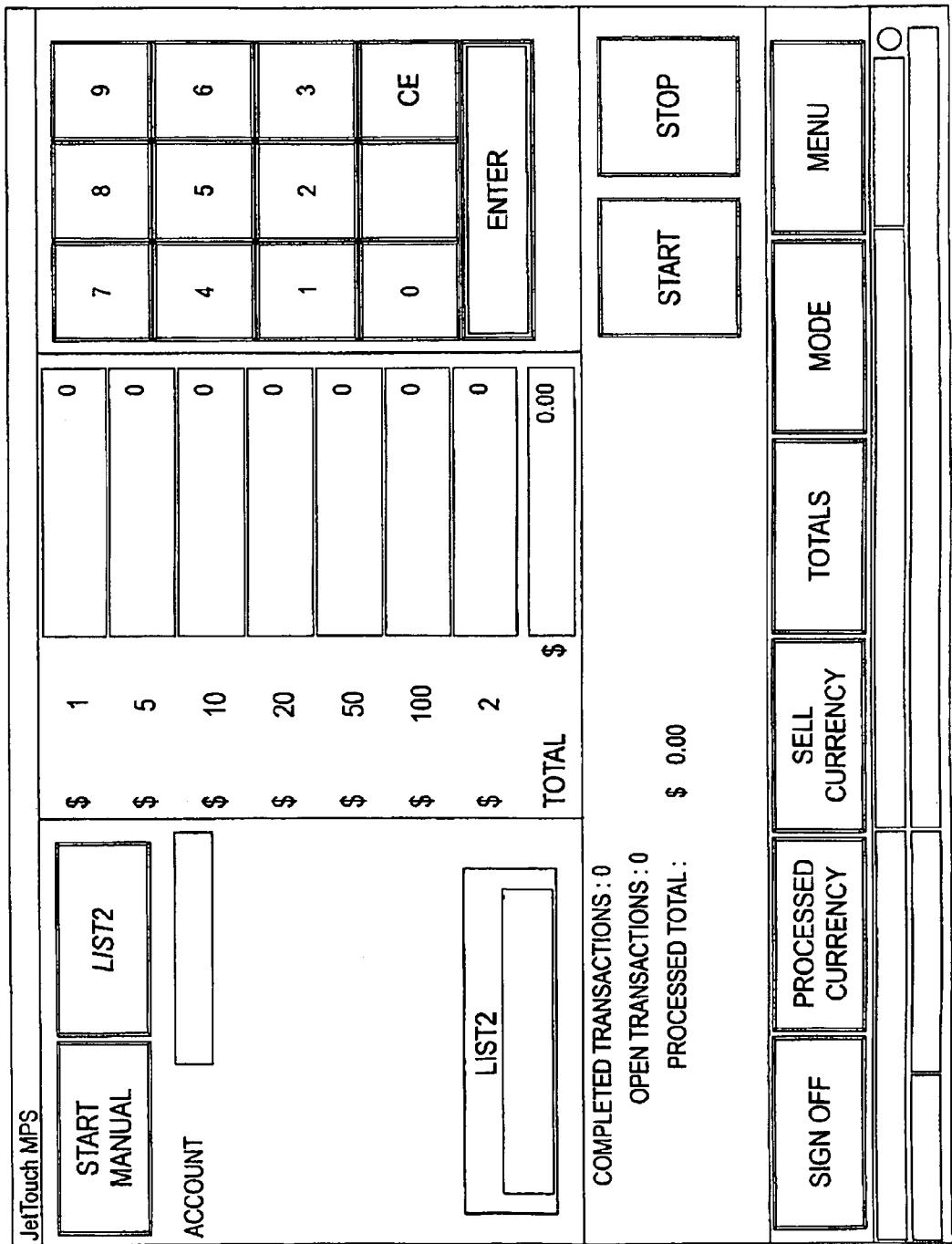
ENTER

STOP

CONT

CANCEL

OK

FIG. 4f

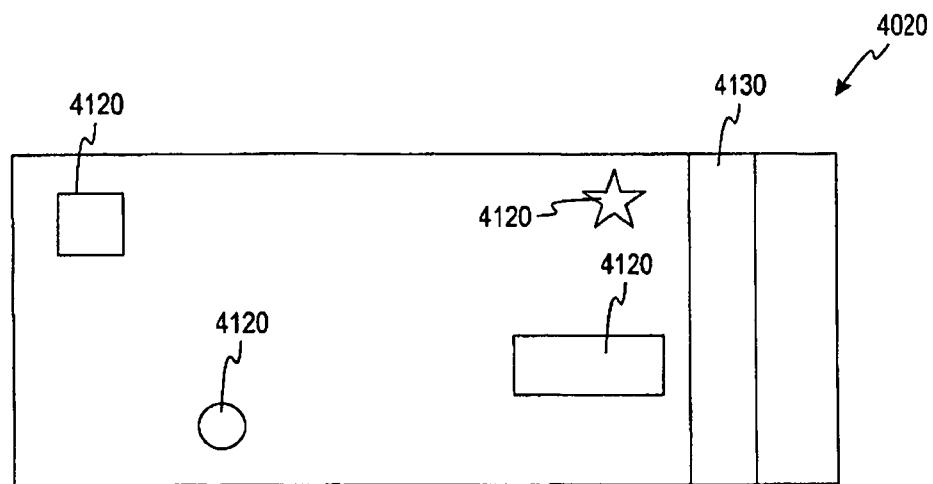


FIG. 41a

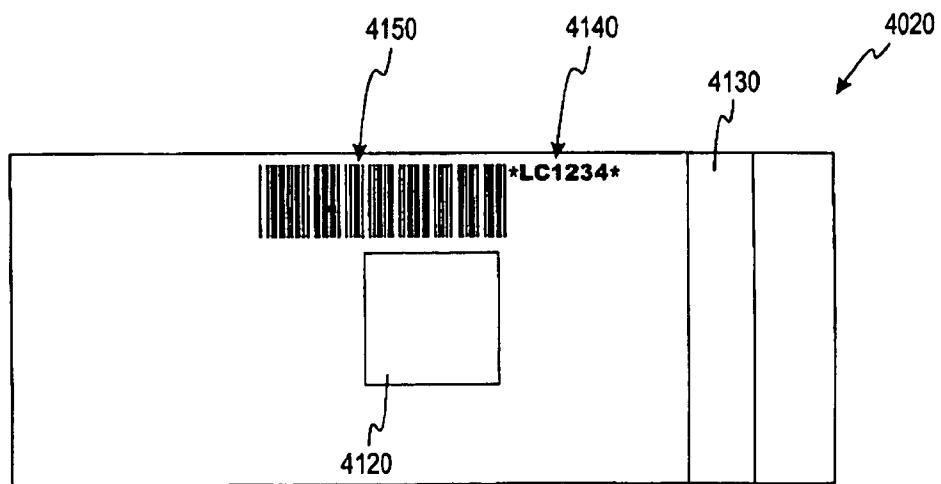


FIG. 41b

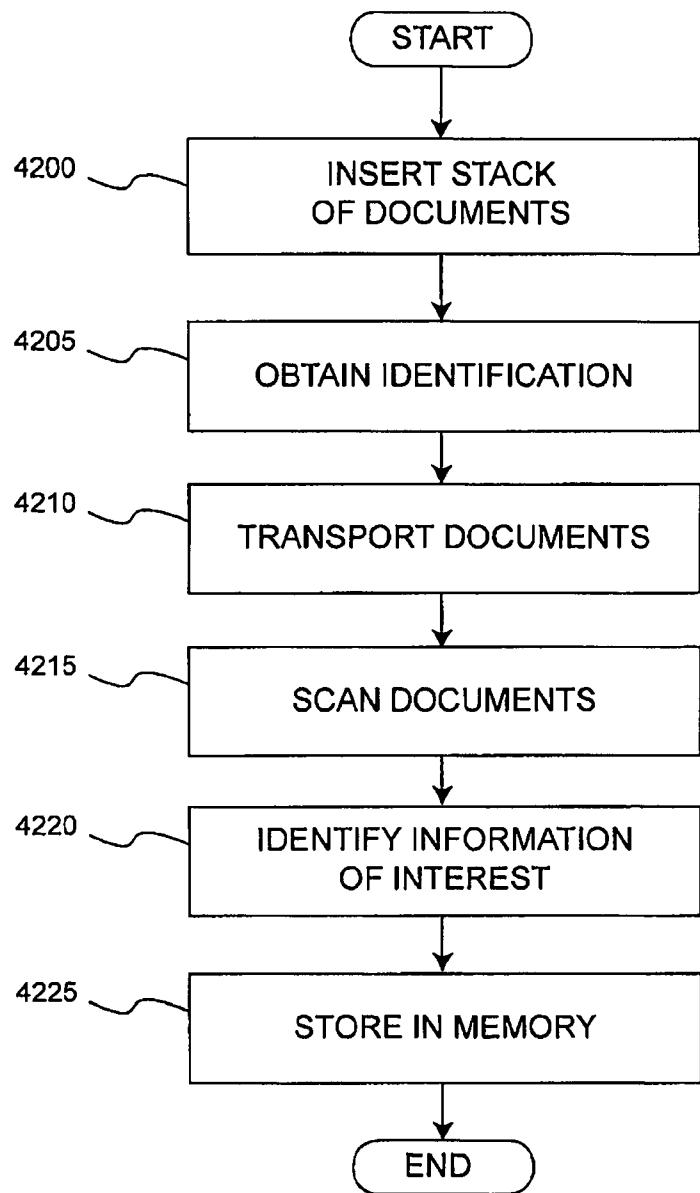


FIG. 42

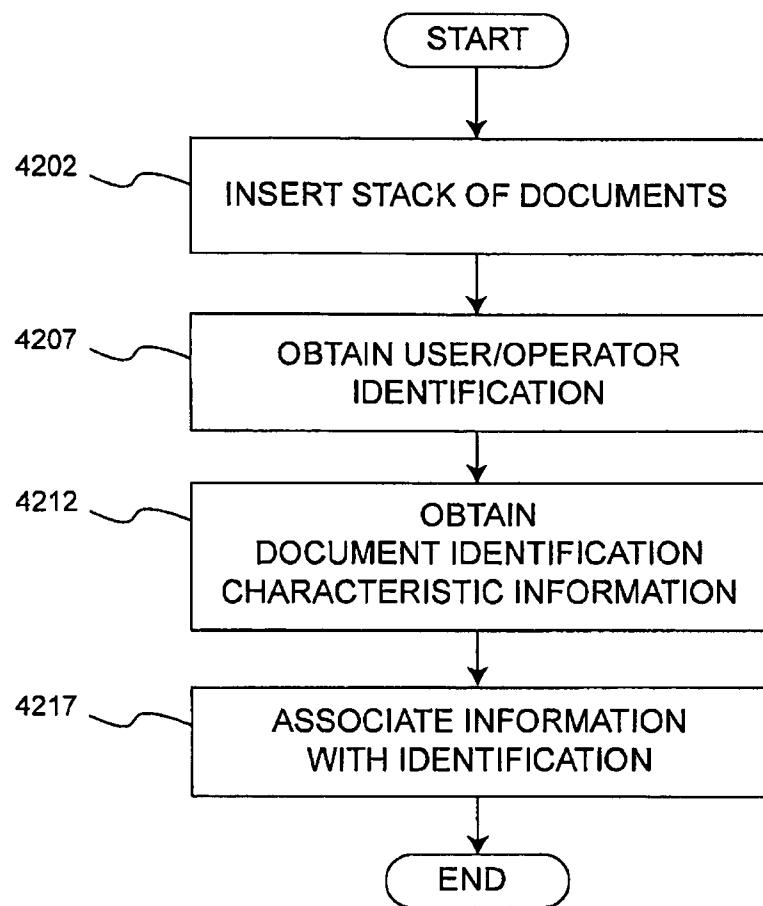


FIG. 43

SYSTEM AND METHOD FOR PROCESSING CASINO TICKETS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 12/260,973, filed Oct. 29, 2008, now U.S. Pat. No. 8,701,857, which is a continuation-in-part of U.S. patent application Ser. No. 12/058,370, filed Mar. 28, 2008, now U.S. Pat. No. 8,396,586, which is a divisional of U.S. patent application Ser. No. 10/939,938, filed Sep. 13, 2004, now abandoned, which claims the benefit of U.S. Provisional Application No. 60/502,924, filed Sep. 15, 2003; U.S. patent application Ser. No. 12/260,973 is a continuation-in-part of U.S. patent application Ser. No. 11/544,228, filed Oct. 5, 2006, now U.S. Pat. No. 7,978,899, which claims the benefit of U.S. Provisional Application No. 60/723,652, filed Oct. 5, 2005; U.S. patent application Ser. No. 12/260,973 is a continuation-in-part of U.S. patent application Ser. No. 10/638,231, filed Aug. 7, 2003, now U.S. Pat. No. 7,903,863, which is a continuation-in-part of U.S. patent application Ser. No. 09/965,428, filed Sep. 27, 2001, now U.S. Pat. No. 7,187,795; U.S. patent application Ser. No. 12/260,973 is a continuation-in-part of U.S. patent application Ser. No. 09/967,232, filed Sep. 28, 2001, now abandoned, which is a continuation-in-part of U.S. patent application Ser. No. 09/562,231, filed Apr. 28, 2000, now U.S. Pat. No. 6,318,537, and which is a continuation-in-part of U.S. patent application Ser. No. 09/502,666, filed Feb. 11, 2000, now U.S. Pat. No. 6,398,000; all of which are hereby incorporated by reference herein in their entireties.

FIELD OF THE INVENTION

The present invention relates generally to document processing systems and, more particularly, to systems and methods for processing and imaging currency bills and tickets.

BACKGROUND OF THE INVENTION

In a document processing environment it is highly desirable to achieve efficient means of processing documents. In general, higher efficiency in the processing of documents translates into lower business costs. Many businesses, such as banks, casinos, and retail stores, need to process large volumes of documents on a daily basis.

Manufacturers of slot machines used in casinos and other gaming establishments have developed coinless redemption slot machines. Lucky winners using these machines receive their payout in the form of a casino cashout ticket instead of coins or currency bills. The casino cashout ticket is encoded, typically in the form of a barcode, with a number that is associated with the payout amount. This type of barcoded casino cashout ticket is assigned a ticket number when it is dispensed to the game player, and this ticket number is printed as a barcode on the face of the ticket. The payout amount is not encoded on the ticket, but rather is stored, typically in a remote database, along with the ticket number. Another form of a casino cashout ticket includes two barcodes. One of the barcodes represents a ticket number, and another barcode represents the payout amount.

To redeem the payout, the winner may insert the casino cashout ticket into a slot box or validator of a slot machine or casino redemption machine, which validates the ticket and either dispenses the payout amount in cash or awards the winner a number of credits commensurate with the payout

amount. The slot box also accepts currency bills. When the casino operators empty the slot boxes, the cartridges may contain a combination of currency bills and cashout tickets.

Most casinos are equipped with currency processing devices which rapidly sort, count, and authenticate currency bills. However, these machines cannot handle or recognize casino cashout tickets, so the operator must manually hand-sort the currency bills from the casino cashout tickets so that they can be processed separately. The hand-sorting and manual-entry steps are both time and labor intensive. Additionally, some casinos retain the processed casino cashout tickets for a predetermined amount of time for record-keeping or other purposes, such as compliance with gaming regulations. The long-term or short-term storage and handling of these casino cashout tickets can be voluminous, burdensome, and costly.

Thus, there is a need for a document processing device that efficiently processes documents including currency bills and casino cashout tickets. There also exists a need for a document processing device that minimizes the handling of casino cashout tickets with minimal human intervention, lower costs, and decreases in the potential of human error.

SUMMARY OF THE INVENTION

According to some embodiments, a method of processing documents includes receiving a stack of documents including currency bills and substitute currency media. Each substitute currency medium has at least one barcode. The method further includes transporting the stack of documents via a transport mechanism, one document at a time, along a transport path and denominating with a currency detector each of the currency bills in the stack of documents. The currency detector is positioned adjacent to the transport path. The method further includes scanning with a barcode scanner a barcode on each substitute currency medium in the stack of documents. The barcode scanner is positioned adjacent to the transport path. The method further includes imaging with an image scanner each substitute currency medium in the stack of documents to generate a raw image file of the substitute currency medium. The image scanner is positioned adjacent to the transport path.

According to other embodiments, a method of processing documents includes receiving at least one batch of documents including currency bills and substitute currency media and transporting via a transport mechanism the at least one batch of documents, one document at a time, past an evaluation unit. The evaluation unit includes a currency detector and an image scanner. The method further includes denominating the currency bills in the at least one batch of documents with the currency detector and imaging the substitute currency media in the at least one batch of documents with the image scanner to produce an image file.

According to some embodiments, a document processing device includes an input receptacle for receiving a stack of documents, the stack of documents including currency bills and substitute currency media and a transport mechanism for transporting the documents, one at a time, from the input receptacle along a transport path. The device further includes a currency detector positioned adjacent the transport path, a media detector positioned adjacent the transport path, and an image scanner positioned adjacent the transport path. The currency detector is configured to denominate all of the currency bills in the stack of documents, the media detector is configured to scan an indicia located on each passing substi-

3

tute currency medium, and the image scanner is configured to image each of the substitute currency media to produce an image file.

According to other embodiments, a method of processing documents includes receiving a batch of documents including currency bills and substitute currency media. Each substitute currency medium has a barcoded pattern. The batch of documents are transported via a transport mechanism, one document at a time, along a transport path. The method further includes imaging each of the documents with an image scanner to generate a raw image file and using a controller to denominate each of the currency bills from the raw image file of each of the currency bills and to decode the barcoded pattern in the raw image file for each substitute currency medium. The image scanner is positioned adjacent to the transport path.

According to some embodiments, a method of processing substitute currency media includes receiving a stack of substitute currency media in an input receptacle, each substitute currency medium having a barcoded pattern. The stack of substitute currency media are transported via a transport mechanism, one substitute currency medium at a time, at a rate of at least 400 substitute currency media per minute, along a transport path. The method further includes imaging each substitute currency medium with an image scanner to generate a raw image file and using a controller to decode a barcoded pattern in the raw image file for each substitute currency medium. The image scanner is positioned adjacent to the transport path.

According to other embodiments, a method of processing substitute currency media includes receiving a stack of substitute currency media in an input receptacle, each substitute currency medium having a barcoded pattern. The stack of substitute currency media are transported via a transport mechanism, one substitute currency medium at a time, at a rate of at least 400 substitute currency media per minute, along a transport path. The method further includes imaging each substitute currency medium with an image scanner to generate a raw image file and using a controller to extract ticket data from the raw image file for each substitute currency medium. The image scanner is positioned adjacent to the transport path.

The above summary of the present disclosure is not intended to represent each embodiment, or every aspect, of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The advantages of the present disclosure will become apparent upon reading the following detailed description in conjunction with the drawings in which:

FIG. 1a is a block diagram of a document processing device according to one embodiment of the invention;

FIG. 1b is a block diagram of an evaluation region of a document processing device according to one embodiment of the present invention;

FIG. 1c is a block diagram of an evaluation region of a document processing device according to another embodiment of the present invention;

FIG. 1d is a top view of a transport path of a document processing device showing a sequence of exemplary documents to be processed;

FIG. 2 is a perspective view of a document processing device according to one embodiment of the present invention;

FIG. 3 is a front view of a document processing device according to one embodiment of the present invention;

4

FIG. 4a is a perspective view of an evaluation region according to one embodiment of the document processing device of the present invention;

FIG. 4a-1 is a perspective view of an evaluation region according to another embodiment of the document processing device of the present invention;

FIG. 4b is a side view of an evaluation region according to one embodiment of the document processing device of the present invention;

FIG. 4b-1 is a side view of an evaluation region according to another embodiment of the document processing device of the present invention;

FIG. 5 is a perspective view of a compact document processing device having a single output receptacle according to one embodiment of the present invention;

FIG. 6 is a side cross-sectional view of the device shown in FIG. 5;

FIG. 7a is a perspective view of a compact document processing device having dual output receptacles according to one embodiment of the present invention;

FIG. 7b is a side cross-sectional view of the device shown in FIG. 7a;

FIG. 8 is a block diagram of a document processing device coupled to a coin sorting device according to one embodiment of the present invention;

FIG. 9 is a perspective view of a compact coin sorting device according to one embodiment of the present invention;

FIG. 10a is a perspective view of a funds processing machine according to one embodiment of the present invention;

FIG. 10b is a side view of the funds processing machine of FIG. 10a which schematically illustrates the various modules present in the funds processing machine;

FIG. 11 is a block diagram of a network of document processing devices in communication with a computer network;

FIG. 12 is a flowchart describing the operation of a document processing device according to one embodiment of the present invention;

FIG. 13 is a flowchart further describing the operation of a document processing device according to any embodiment described in connection with FIG. 12;

FIG. 13a is a flowchart of a method for operating a document processing device according to any embodiment of the present invention in which the document processing device is adapted to process documents bearing more than one barcode;

FIG. 14 illustrates a block diagram of a touch/video display according to one embodiment of the present invention;

FIG. 15 is a flowchart of a method for processing documents according to one embodiment of the present invention;

FIG. 16 is a flowchart of a method for processing documents according to another embodiment of the present invention;

FIG. 17 is a flowchart of a method of multiple batch processing according to an embodiment of the invention;

FIG. 18a is a flowchart of a method of multiple batch processing according to another embodiment of the invention;

FIG. 18b is a continuation of the flowchart shown in FIG. 18a;

FIG. 19 is a flowchart of a method of multiple batch processing according to another embodiment of the invention;

FIG. 20 is a flowchart of a method of multiple batch processing according to another embodiment of the invention;

FIG. 21 is a flowchart of a method of multiple batch processing according to another embodiment of the invention;

FIG. 22a is a flowchart of a method of multiple batch processing according to another embodiment of the invention;

FIG. 22b is a continuation of the flowchart shown in FIG. 22a;

FIG. 23 illustrates a document processing according to an embodiment of the invention;

FIG. 24 is a flowchart of a method for finding a document according to one embodiment of the present invention;

FIG. 25 is a flowchart of a method for finding a document according to another embodiment of the present invention;

FIG. 26 is a flowchart of a method for finding a stack of documents according to one embodiment of the present invention;

FIG. 27 is a flowchart of a method for finding a stack of documents according to another embodiment of the present invention;

FIG. 28 is a front view illustration of a document processing device according to one embodiment of the present invention;

FIG. 29 is a front view of a document processing device according to one embodiment of the present invention;

FIG. 30a is an illustration of one side of a separator card according to one embodiment of the present invention;

FIG. 30b is a front view of the separator card shown in FIG. 30b;

FIG. 31a is a top perspective view of a batch of documents according to one embodiment of the present invention;

FIG. 31b is a bottom perspective view of the batch of documents shown in FIG. 31a;

FIG. 32 is perspective view illustration of a feeder assembly containing a batch of documents according to one embodiment of the present invention;

FIG. 33 is a side view of a feeder assembly according to one embodiment of the present invention;

FIG. 34 is an enlarged view of a portion of the feeder assembly shown in FIG. 33 illustrating a sensor assembly according to one embodiment of the present invention;

FIG. 35 is an exploded view of a sensor assembly according to one embodiment of the present invention;

FIG. 36 is a front view of a transport mechanism according to one embodiment of the present invention;

FIG. 37 is a perspective view of two offsort receptacles according to one embodiment of the present invention;

FIG. 38 is a perspective view of the two offsort receptacles shown in FIG. 37 revealing a portion of a transport mechanism according to one embodiment of the present invention;

FIG. 39 is a flowchart illustrating steps for processing at least one batch of documents according to one embodiment of the present invention;

FIG. 40a is a flowchart illustrating steps for clearing a document jam when processing at least one batch of documents according to one embodiment of the present invention;

FIG. 40b is an illustration of an exemplary computer screen shot of a jam reconciliation process according to one embodiment of the present invention;

FIG. 40c is another illustration of an exemplary computer screen shot of a jam reconciliation process according to one embodiment of the present invention;

FIG. 40d is yet another illustration of an exemplary computer screen shot of a jam reconciliation process according to one embodiment of the present invention;

FIG. 40e is an illustration of an exemplary computer screen shot of a manual currency menu according to one embodiment of the present invention;

FIG. 40f is an illustration of an exemplary computer screen shot of a currency processing device according to one embodiment of the present invention;

FIG. 41a is a back view of a separator card according to another embodiment of the present invention;

FIG. 41b is a back view of a separator card according to yet another embodiment of the present invention

FIG. 42 is a flowchart describing the operation of a document processing device according to some embodiments of the present disclosure; and

FIG. 43 is a flowchart describing other embodiments of the present disclosure.

While the present disclosure is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. It should be understood, however, that the present disclosure is not intended to be limited to the particular forms and embodiments disclosed. Rather, the present disclosure is to cover all modifications, equivalents, embodiments, and alternatives falling within the spirit and scope of the present disclosure as defined by the appended claims.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

FIG. 1a is a functional block diagram of a document processing device 100 according to one embodiment of the present invention. The document processing device 100 generally includes an input receptacle 102, an evaluation region 104, a transport mechanism 106, and an output receptacle 108. As explained below, in alternate embodiments, the device 100 includes more than one output receptacle 108. The output receptacle 108 may also be variously referred to as a reject or offsort pocket or receptacle. Disposed along the transport path 106 is a currency detector 110 and a media detector 112 as functionally illustrated in FIG. 1a. The currency detector 110 and a control unit 116 are connected to a controller 114, which is adapted to control the operation of the device 100 and to communicate information to and from the control unit 116. For example, the controller 114 may send display information to and receive operator input from the control unit 116. Optionally, the control unit 116 may comprise a touch screen which is coupled to the device 100, or it may comprise a combination of a desktop computer or laptop, display, and/or keyboard which are coupled to the device 100. An optional printer 120 is shown coupled to the device 100. In an alternate embodiment, the device 100 is not coupled to a printer 120.

In the illustrated embodiment, the device 100 optionally includes a communications port 118 which is coupled to the controller 114. The controller 114 may comprise one or more processors which are adapted to control specific components in the device 100 and to process information associated with specific components in the device 100, the control unit 116, or the communications port 118. The communications port 118 may optionally be a serial port, a parallel port, a USB port, a wireless port adapted for wireless communication with a remote device, or any other suitable I/O port. In an alternate embodiment, the device 100 does not include the communications port 118. The controller 114 may further comprise memory, such as random access memory or any other suitable memory.

Although the currency detector 110 is shown to be disposed on one side of the transport path 106, it is understood that the currency detector 110 may instead be disposed on the opposite side of the transport path 106 only or on both sides of

the transport path 106. In the same manner, the media detector 112 may be disposed on the opposite side of the transport path 106 only or on both sides of the transport path 106. These alternate embodiments are described in more detail in connection with FIG. 1b below.

In the illustrated embodiment of FIG. 1a, a stack of currency bills and substitute currency media is provided to the input receptacle 102 in any order or in a predetermined order. In one embodiment, the operator provides a mixed combination of currency bills and substitute currency media to the input receptacle 102, which are processed and delivered to one or more output receptacles. In another embodiment, the operator provides a stack of currency bills only to the input receptacle 102, which are processed and delivered to one or more output receptacles, and then a stack of substitute media only to the input receptacle 102, which are processed and delivered to one or more output receptacles, or vice versa. In this embodiment, the operator may further indicate via the control unit 116 which type of document is to be processed, and the controller 114 may "deactivate" one or more detectors in the evaluation region 104. For example, if the operator indicates that the type of documents to be processed is currency bills, the controller 114 may instruct the media detector 112 to ignore the document as it passes along the transport path 106. Alternatively, if the operator indicates that the type of documents to be processed is substitute currency media, the controller 114 may instruct the currency detector 110 to ignore the document as it passes along the transport path 106. Alternatively, the currency detector 110 and the substitute currency media 112 both detect characteristics of the document passing along the transport path, and the control unit 116 may alert the operator of an error condition, such as a substitute currency medium was detected in a stack of currency bills, or a currency bill was detected in a stack of substitute currency media. The operator may set aside the detected document for later processing.

As used herein, a U.S. currency bill refers to U.S. legal tender, such as a \$1, \$2, \$5, \$10, \$20, \$50, or \$100 note, and a foreign currency bill refers to any bank note issued by a non-U.S. governmental agency as legal tender, such as a Euro, Japanese Yen, or British Pound note. A "currency bill" can be either a U.S. or foreign currency bill. The terms "currency note" and "bank note," are synonymous with the term "currency bill."

The term "currency bills" or "currency bill" can also refer to bills, promotional media, substitute currency media or documents issued by casinos (e.g., casino script, casino tickets, cashout vouchers, coupons and the like such as "EZ Pay" tickets or "Quicket" tickets), other private entities such as "DISNEY DOLLARS®" (a registered trademark of Walt Disney Enterprises of Burbank, Calif.) or "GEOFFREY DOLLARS®" (a registered trademark of Toys 'R US), and entities which utilize bar coded transaction records (such as casino tickets, cashout tickets, retailer coupons, gift certificates and the like).

The term "substitute currency media" refers to redeemable documents. A redeemable document is a document that can be (a) redeemed for cash or (b) exchanged for goods or services or (c) both. Examples of substitute currency media include without limitation: casino cashout tickets (also variously called cashout vouchers or coupons) such as "EZ Pay" tickets issued by International Gaming Technology or "Quicket" tickets issued by Casino Data Systems or Cash-Free™ slot-machine tickets issued by Slot-Tickets.com; casino script, which is regularly issued by casinos in pre-set denominations such as \$5 casino script, \$20 casino script, for example; promotional media such as "DISNEY DOL-

LARS®" or Toys 'R Us "GEOFFREY DOLLARS®" or McDonald's Gift Certificates are also issued in pre-set denominations (e.g., a \$1 Disney Dollar). While some types of "substitute currency media" are regularly issued in pre-set denominations such as the above-mentioned Disney Dollars, other types of "substitute currency media" include manufacturer or retailer coupons, gift certificates, gift cards, or food stamps.

Substitute currency media may include a single barcode or 10 more than one barcode, and these types of substitute currency media are referred to herein as "barcoded tickets." Examples of barcoded tickets 135, 136 include casino cashout tickets such as "EZ Pay" Tickets and "Quicket" cashout tickets and CashFree™ slot-machine tickets, barcoded retailer coupons, barcoded gift certificates, or any other promotional media that includes a barcode. The singular form of "substitute currency media" is referred to as "substitute currency medium" or "medium" for short.

As used herein, a "document" includes a currency bill or a 20 substitute currency medium. Likewise, the term "documents" includes currency bills and/or substitute currency media.

The term "substitute funds" includes casino script, paper tokens, and barcoded tickets. The term substitute currency media encompasses substitute funds, such that the term substitute funds defines a subset of documents encompassed by the term substitute currency media.

As is known, the dimensions of a U.S. currency bill are about 2.5 inches×6 inches (6.5 cm×15.5 cm). All U.S. currency bills have the same dimensions, but in many foreign 30 countries, the dimensions from one denomination to another varies. In addition, certain types of substitute currency media such as "EZ Pay" tickets have approximately the same dimensions of U.S. currency, however, it is understood that the dimensions of substitute currency media may vary from type to type. The device 100 of the present invention according to any embodiment described herein is adapted to process documents having the same dimension or documents having varied dimensions.

Still referring to FIG. 1a, the transport mechanism 106 is 40 adapted to transport the documents, one at a time, through the device 100 in the direction of arrow A, past the currency detector 110 and the media detector 112, and to the output receptacle 108. The currency detector 110 is adapted to detect one or more predetermined characteristics on a currency bill or on a particular kind of substitute currency medium, such as a Disney Dollar, and the media detector 112 is adapted to detect one or more predetermined characteristics on a particular kind of substitute currency medium, such as a barcode on a barcoded ticket, as explained in more detail in connection with FIG. 1b. The currency detector 110 comprises one or 50 more sensors depending on a number of variables. The variables relate to whether the device 100 is authenticating, counting, or discriminating denominations of currency bills, and what distinguishing characteristics of the currency bills 55 are being examined, for example, size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, serial number, and so forth. The currency detector 110 may also employ a variety of detection means including, but not limited to, any combination of the following: a size detector, a density sensor, an upper optical scan head, a lower optical scan head, a single or plurality of magnetic sensors, a thread sensor, an infrared sensor, an ultraviolet/fluorescent light scan head, or an image scanner. These detection means and a host of others are disclosed in commonly 60 assigned U.S. Pat. No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," which is herein incorporated by reference in its entirety, and co-pending U.S. patent applica-

65

tion Ser. No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on Sep. 27, 2001, which is herein incorporated by reference in its entirety. Examples of discriminating denomination information from a currency bill are shown and disclosed in commonly assigned U.S. Pat. No. 5,815,592, which is herein incorporated by reference in its entirety.

In the specific case of substitute currency media, the variables may also relate to what distinguishing characteristics of the substitute currency media are being examined, such as any combination of the following without limitation: a barcode, a magnetic ink character recognition (MICR) pattern, characters readable by optical character recognition (OCR), including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an optical variable device (OVD) pattern such as a hologram, a magnetic or electrically conductive thread, conductive ink, magnetic ink, an electrically conductive polymer, perforations, a coded watermark, or other encoded information. The detection of these distinguishing characteristics may be carried out by the media detector 112, which, in alternate embodiments, may employ a variety of detection means including, but not limited to, any combination of the following: a barcode reader, an optical scan head, a magnetic sensor, a thread sensor, an infrared sensor, an ultraviolet/fluorescent light scan head, an image scanner, or an imaging camera. These detection means and a host of others are disclosed in commonly assigned U.S. Pat. No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," previously incorporated by reference, and co-pending U.S. patent application Ser. No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on Sep. 27, 2001, also previously incorporated by reference, and may be modified in accordance with the present invention to detect distinguishing characteristics associated with substitute currency media or to capture an electronic image of one or both sides of a medium.

Some environments, such as a casino environment, may desire to retain copies of processed substitute currency media for record-keeping or other purposes, such as compliance with gaming regulations. In such environments, the media detector 112 includes an imaging camera which captures an electronic image of one or both sides of a passing substitute currency medium and/or a currency bill. The electronic image may be analyzed by software for a barcoded pattern, and the barcoded pattern may be decoded by software. The use of software to analyze and decode the barcoded pattern eliminates the need to include a barcode reader in the media detector 112. After processing, the processed substitute currency medium can be discarded, and the electronic image is stored on one or more storage media, such as hard drives, CD-ROMs, or DVDs, for example. Accordingly, this embodiment eliminates the need for large physical storage space to house the processed substitute currency media. Moreover, the substitute currency media may also be electronically indexed or cross-referenced, simplifying future retrieval and archiving.

According to some embodiments, the document processing device 100 includes an image scanner. The image scanner can be a part of the currency detector 110, a part of the media detector 112, or the image scanner can be a separate device along the transport path 106. According to some embodiments, the document processing device 100 performs an image quality check. The image quality check can be used to determine if the images generated in the device 100 are of a sufficient predetermined quality. Quality characteristics can include, for example, image resolution, pixilation, blurriness, sharpness, and readability. In some embodiments, the quality of an image is determined based on whether a portion of the

image or an indicia in the image can be successfully decoded by a software program. The indicia can be, for example, a barcoded pattern on a casino cashout ticket.

According to some embodiments, the media detector 112 scans an indicia on a passing substitute currency medium, which generates an electrical signal representative of the indicia (e.g., a barcoded pattern) on the substitute currency medium. The media detector 112 transmits the electrical signal to the controller 114, which decodes the electrical signal into characters, such as, for example, alphanumeric or numeric characters. The characters represent at least a ticket number, which uniquely identifies the specific substitute currency medium being processed. The image scanner can also capture an electronic image of the passing substitute currency medium bearing the indicia. The image scanner transmits the electronic image to the controller 114. The electronic image is analyzed by software for the indicia (e.g., a barcoded pattern). In the case of the indicia being a barcoded pattern, the controller 114 analyzes the barcoded pattern and decodes the barcoded pattern using software. The decoded barcoded pattern results in characters that represent, for example, a ticket number. According to some embodiments, the controller 114 compares the ticket number obtained from the media detector 112 and the ticket number obtained from the image scanner, which again, can be a separate device along the transport path, a part of the media detector 112, or a part of the currency detector 110. If the ticket numbers match, then the electronic image generated by the image scanner is determined to be of a sufficient quality and the image can be saved into a memory. If the ticket numbers do not match, then the specific substitute currency medium can be off sorted or flagged for further processing by an operator. According to some embodiments, if the ticket numbers match, then the specific substitute currency medium is transported to a document destruction device.

In other embodiments it is contemplated that instead of or in addition to an imaging camera, an image scanner is employed to scan one or both sides of a substitute currency medium or currency bill and save the captured images to a storage medium.

According to some embodiments, the currency detector 110, the media detector 112, or both contain an image scanner, which captures an electronic image of one or both sides of a passing currency bill and/or a passing substitute currency medium. Alternatively, the document processing device 100 contains a currency detector 110, a media detector 112, and a separate image scanner. In some embodiments, the image scanner contains an optical processing functionality, such as, for example, an optical character recognition (OCR) capabilities for processing the image (full or partial) to identify the information of interest. If desired, such optical processing functionalities can instead be implemented in the controller 114. For example, the identified information of interest may comprise the characters printed in one or more fields of the documents as identified by the OCR capability. The identified information of interest may also comprise printed features, patterns or relationships on the currency bills as identified through optical signal processing techniques.

According to some embodiments, the OCR capability may recognize certain fields within a currency bill 134 or a bar-coded ticket 136. For example, the OCR may search the full or partial image for a serial number of the currency bill and extract the serial number once the field is located. In other embodiments, the OCR may search the full or partial image for a ticket number of the substitute currency medium and extract the ticket number once the field is located.

11

The imager/OCR implementation discussed above is not the only possible implementation for the image scanner of the device **100**. Other technological options for scanning the document(s) and extracting the certain information of interest are known to those skilled in the art. For example, instead of imaging all or a portion of the document(s), the image scanner may instead implement a line or strip reflective scanning operation like that disclosed in U.S. Pat. Nos. 5,815,592 and 5,982,918, the disclosures of which are each incorporated herein by reference in their entirety, to obtain scan data in the form of printed surface feature information such as that which may be obtained from detected reflectance data. Appropriate signal processing techniques, such as software-based pattern recognition algorithms, can then be applied to the scanned information by either the image scanner or the controller **114** in order to discern the printed features as the information of interest, such as, for example, serial numbers, ticket numbers, line widths, line directions, line relationships, and the like.

Other scanning modules and methods can be used in place of or in addition to the ones described above. These include CCD array systems, multi-cell arrays, contact image sensing, CMOS image sensors, and other well-known scanning techniques. Examples of these techniques and devices are described in U.S. Pat. Nos. 5,023,782, 5,237,158, 5,187,750, and 4,205,780, all of which are incorporated herein by reference in their entireties. The scanning module can also be a color image scanner such as the type described in U.S. Pat. No. 5,335,292, which is incorporated herein by reference in its entirety.

The information of interest collected from each scanned document is then saved in a memory (not shown). This information may be managed by a processing functionality for storage by and/or through the controller **114**. Alternatively, the image scanner may be linked for data transfer and delivery of information directly to the memory.

According to some embodiments, in which the image scanner operates to collect document images, the collected images are passed to the memory and stored therein as image files. The determined information of interest is also stored in the memory in association with its corresponding image using a process of tagging the information of interest as data to the image file.

According to some embodiments, the document images may not necessarily be collected, in which case, the determined information of interest is stored in the memory in a data file.

According to some embodiments, the information of interest is linked in some form or fashion known to those skilled in the art (for example, by database association) to other information and, if applicable, to the document image file.

Where the memory is used to store the images of the documents scanned by the image scanner, the memory may store the document as a full image of the document (e.g., a picture of the entire document). Alternatively, the memory may only store an image of a portion of the document (e.g., a partial picture of the document). It may be that the memory only needs to store an image of half of the document in order to obtain the fields needed for a given application. In another embodiment, the memory may only store data for a selected strip of the document, such as, for example, a horizontal or vertical strip.

According to some embodiments, the image scanner scans all documents, but only images of substitute currency media are passed to the memory for storage therein. In such embodiments, the images of the non-substitute-currency-media documents may be used, for example, to denominate and/or authenticate the non-substitute-currency-media documents.

12

According to other embodiments, the image scanner only scans substitute currency media and passes the images of the substitute currency media to the memory for storage therein. According to other embodiments, the image scanner scans all documents and passes the images of all of the documents to the memory for storage therein.

FIG. 1b shows a functional block diagram of a portion of an evaluation region **104** according to one embodiment of the present invention. The evaluation region **104** generally includes a currency detector **110**, a media detector **112**, and a controller **114**. The evaluation region **104** may optionally include a second currency detector **122a** and/or a second media detector **124a** which may be disposed on the opposite side of a transport mechanism **106** as shown in FIG. 1b. The currency detector **110** may include any combination of the detection means identified above. In the illustrated embodiment, the media detector **112** comprises a barcode reader **128** and a mirror (not shown). Barcode readers are well known in the art, and will not be described in detail herein. Generally, barcode readers typically use a light beam generated by a laser diode or LED light source **140** to illuminate a barcode label. The laser beam or LED beam is deflected in a certain pattern across the barcode label. The reflected light representing the light and dark bars on a barcode label are processed and then converted into a digital signal representing the bar-coded pattern. The digital signal is analyzed by a controller where the signal is decoded into characters (e.g., alphanumerics and/or punctuation).

In one embodiment, the barcode reader **128** is an MS-9 barcode reader manufactured by Microscan. In alternate embodiments, other barcode readers may be employed, such as, for example, the LM 520, LazerData 8000, LazerData 9000E, or LD12000 barcode readers manufactured by PSC, Inc., the MS-880, MS-7100 or MS-7180 barcode readers manufactured by Microscan, the Maxiscan 2100 or Maxiscan 3300 barcode readers manufactured by Intermec, or an LED barcode reader manufactured by Welch Allyn. It is understood that the present invention is not limited to any particular barcode reader. The selection of a particular barcode reader depends on a number of factors, including size constraints in the evaluation region **104** of the document processing device, the particular barcode symbology to be scanned, and the desired scan rate. For example, the LazerData 9000E, manufactured by PSC, Inc., has scan rates ranging from 500 scans per second to 2000 scans per second, and is adapted to scan a linear barcode. The dimensions of the LazerData 9000E are approximately 3.84" (D)×2.52" (L)×2.52" (W), or 97.5 mm (D)×64 mm (L)×64 mm (W). The MS-9 barcode reader has dimensions of approximately 3" (H)×2.13" (W)×1.63" (D), or 75 mm (H)×53.5 mm (W)×41 mm (D), and has a scan rate of up to 2000 scans per second.

In alternate embodiments, the barcode reader **128** reads less than 500 barcoded documents per minute, at least 500 barcoded documents per minute, 800 barcoded documents per minute, 1000 barcoded documents per minute, 1200 barcoded documents per minute, and 1500 barcoded documents per minute.

In the illustrated embodiment shown in FIG. 1b, the controller **114** controls the operation of the barcode reader **128**, but in alternate embodiments, a separate barcode controller (not shown) controls the operation of the barcode reader **128** and is coupled to the controller **114**. The controller **114** also controls other operations of the document processing device.

Still referring to FIG. 1b, the media detector **112** optionally includes the barcode reader **128** and the mirror (not shown). The mirror is positioned proximate the barcode reader **128** to "lengthen" the effective distance between the barcode reader

128 and the document to be scanned, in applications where the barcode reader 128 is placed too close to the document. As is known, some barcode readers require that they be placed within a range of distance from the scanning surface. If the distance is outside the distance range specifications, the barcode reader cannot obtain reliable and accurate readings. In such applications, the mirror may be positioned to deflect the light beam from the barcode reader 128 onto the document passing along the transport path 106. In alternate embodiments in which the barcode reader 128 is positioned within distance range specifications, the mirror is not included.

Still referring to FIG. 1b, the currency bill 134 and the barcoded ticket 136 are shown on the transport mechanism 106. In one embodiment, the barcode encodes characters, such as numbers, which are associated with certain information. For example, on a casino cashout ticket, the barcode number may be associated with any combination of the following: a payout amount; a ticket number; identification information associated with the slot machine that dispensed the casino cashout ticket, such as, for example, the slot machine number, the time of dispensation, and the amount of payout from the dispensing slot machine during a time period; identification information associated with the winner of the casino cashout ticket; and so forth. On a gift certificate, the barcode number may be associated with any combination of the following: a gift amount; a gift certificate number; information about a retailer dispensing the gift certificate; terms and conditions information; and so forth. In an alternate embodiment, the barcode encodes a number which is associated with a certain discount. For example, on a store coupon, the barcode number is typically associated with a promotional discount, such as fifty cents off, or buy one, get one free. The barcode numbers and their corresponding monetary and discount amounts are typically stored in a database. When the barcode number is scanned and identified, the corresponding amount or discount is queried from the database. The database may also include information indicative of whether a ticket has been redeemed. For example, to prevent fraudulent use of cashout tickets in the casino environment, the database may also keep track of whether a cashout ticket has been redeemed. In yet other embodiments, the barcode may encode any combination of numbers, letters, punctuation, or other characters. It is understood that a barcode in accordance with any embodiment shown or described herein may encode characters including any combination of numbers, letters, punctuation, or other characters.

Barcodes are well known in the art, and there are numerous barcode symbologies, such as, for example, Codabar, Code 3 of 9, Interleaved 2 of 5, UPC, EAN 8, EAN 13, Postnet, Planet Code, Aztec Code, Code 11, Code 16K, Code 49, Code 93, Code 128, Data Matrix, MaxiCode, 3D or bumpy barcode, to name just a few. These and other barcode symbologies encode characters such as numbers, letters, and/or punctuation. Barcodes can be linear, like the UPC code, 2-D like the MaxiCode, or 3-D like the bumpy barcode. Barcodes are typically black and white, but they may also be in color. In the illustrated embodiment of FIG. 1b, the barcode reader 128 is capable of scanning a linear barcode. A linear barcode typically comprises a series of parallel dark bars of varying widths with intervening light spaces, also of varying widths. It is expressly understood that the present invention is not limited to any particular barcode symbology or to any particular barcode reader. In alternate embodiments, multiple barcode readers may be disposed in the evaluation region 104 to identify different barcode symbologies. For example, a retailer may accept both store coupons and gift certificates, but the gift certificates may be encoded with a different bar-

code symbology than the store coupons. In such a case, the evaluation region 104 may include two barcode readers, one to identify barcodes disposed on the gift certificates, and one to identify barcodes disposed on the store coupons.

5 Still referring to FIG. 1b, the currency bill 134 and barcoded ticket 136 are transported along the transport mechanism 106 in the direction of arrow A. In the illustrated embodiment, the currency bill 134 and barcoded ticket 136 are first transported past the media detector 112 and then past the currency detector 110. However, in an alternate embodiment, a document may be first transported past the currency detector 110 and then past the media detector 112. Alternatively, the barcode reader 128 and the currency detector 110 may be incorporated into a single component, such as in a scanner that is adapted to scan one or more selected areas of a document or the entire area of a document. In this embodiment, the full image scanner scans for a characteristic associated with a currency bill and for a characteristic associated with a substitute currency medium.

10 As explained previously, the currency detector 110 may comprise one or more sensors disposed at various locations along the transport mechanism 106. In the alternative embodiment in which the barcode reader 128 is integrated into the currency detector 110, the barcode reader 128 may be positioned among the plurality of sensors at any location within the currency detector 110 and along the transport mechanism 106. Furthermore, as emphasized previously, the currency detector 110 may be disposed on either side or both sides of the transport mechanism 106.

15 If the barcode reader 128 does not identify a barcode on the currency bill 134, the barcode reader 128 provides a "no read" electrical signal to the controller 114 indicating that no barcode was read or identified in that scan. As used herein, a substitute currency medium having an unreadable or non-existent barcode may be considered an "invalid" substitute currency medium. In the illustrated embodiment of FIG. 1b, the transport mechanism 106 transports the currency bill 134 in the direction of arrow A towards the currency detector 110. The currency detector 110 evaluates one or more distinguishing characteristics, such as those specified above, of the currency bill 134. An optional second currency detector 122a disposed on the opposite side of the transport mechanism 106 may also evaluate one or more distinguishing characteristics of the currency bill 134.

20 In the direction of arrow A shown in FIG. 1b, the next document to be evaluated is the barcoded ticket 136. In FIG. 1b, the barcoded ticket 136 is scanned by the barcode reader 128. If the barcode reader 128 successfully reads the barcode 138 on the barcoded ticket 136, the barcode reader 128 provides a "good read" electrical signal to the controller 114 indicating that the barcode reader 128 read or identified the barcode 138. As used herein, the term "valid substitute currency medium" refers in general to a document having a barcode identified by the barcode reader 128. The barcode reader 128 also provides an electrical signal representative of the barcoded pattern 138 to the controller 114. The controller 114 decodes this electrical signal into characters, and stores these characters in memory which may optionally be integrated in the controller 114 or coupled to the controller 114.

25 In one embodiment, once the barcode reader 128 scans a valid barcode on the barcoded ticket 136, the controller 114 instructs the currency detector 110 to ignore the barcoded ticket 136. In an alternate embodiment, the controller 114 instructs the currency detector 110 to evaluate the barcoded ticket 136. In this alternate embodiment, if the controller 114 receives a signal from the media detector 124 that it has read a valid barcode and a signal from the currency detector 110

that it has detected an authentic currency, then the controller 114 provides an error signal to the operator alerting the operator that an unacceptable document has been detected. As used herein, the terms "operator," "user," and "customer" are interchangeable.

As stated above, the controller 114 may include a memory (not shown). In one embodiment, the memory includes master authenticating information. The master authenticating information includes information about authenticating characteristics of a currency bill, such as size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, serial number, and so forth. The memory may also include master denomination information. The master denomination information includes information about denomination characteristics of a currency bill. Examples of such characteristics are disclosed in commonly assigned U.S. Pat. No. 5,815,592, previously incorporated by reference. In another embodiment, the memory includes media information, which includes information about the substitute currency media. This information may include, in alternate embodiments, any combination of the following: an amount of money associated with a medium, a ticket number of a casino cashout ticket, the characters encoded on a barcode on a barcoded medium, self-checkout station identification information, casino gaming machine information, information about the identity of the person redeeming the redeemable document, or the time a medium was dispensed, for example. In this embodiment, the media information may be periodically updated in the memory via a computer network coupled to the document processing device 100, such as described in connection with FIG. 11, or the media information may be periodically updated in the memory via personnel, such as retailer or casino personnel. In the latter embodiment, an interface would be provided via the control unit 116 to the personnel to reprogram the memory. The memory may be random access memory, flash memory, EEPROM, or any other suitable rewriteable memory.

As explained above, the printer 120 may optionally be coupled to the device 100. When the device 100 is coupled to the printer 120, the printer 120 may print reports containing information about the documents processed by the device 100, such as the reports described in connection with FIGS. 12-13 below. The printer 120 may dispense a redeemable document to an operator of the device 100. For example, as explained below, an operator may deposit a stack of documents containing a mixed combination of currency bills and substitute currency media into the device 100. The device 100 processes the stack of documents, and, according to one embodiment, dispenses a barcoded ticket whose barcode is associated with the total value of documents processed. For example, an operator may deposit \$134 of currency bills into the device 100 and \$50 worth of redeemable documents. In this example, the device 100 would dispense a barcoded ticket to the operator with a barcode associated with an amount of \$184. In another embodiment, the printer 120 prints both reports and dispenses redeemable documents.

FIG. 1c shows an evaluation region 104 which is adapted to process currency bills and substitute currency media bearing more than one barcode. A barcoded ticket 135 includes a first barcoded pattern 137 and a second barcoded pattern 139 disposed on a surface of the barcoded ticket 135 in the same orientation. Note that the first barcoded pattern 137 and the second barcoded pattern 139 could be disposed on opposite surfaces of the barcoded ticket 135 or in different orientations. For example, one or both of the first and second barcoded patterns 137, 139 could be disposed in a vertical orientation instead of a horizontal orientation as shown.

In a preferred embodiment, the first barcoded pattern 137 and the second barcoded pattern 139 are encoded according to the same barcode symbology, though they may also be encoded according to different barcode symbologies, including any combination of the barcode symbologies mentioned above. Many commercially available barcode readers are capable of discerning among several different barcode symbologies, so the use of different barcode symbologies on a barcoded ticket would not necessarily call for multiple barcode readers. However, if multiple barcode readers are required, additional readers may be disposed in the media detector 112. An optional second barcode reader 129 is shown in the media detector 112 to scan for barcoded patterns on passing documents. Like the barcode reader 128, the optional second barcode reader 129 includes a light source 141 for illuminating the barcoded pattern. Barcode readers adapted to detect barcodes such as a bumpy barcode include an additional or alternate detection structure as is known in the art.

As explained in connection with FIG. 1b, the optional second barcode reader 129 may be disposed in the second media detector 124a on the opposite side of the transport mechanism 106. Such an arrangement would permit detection of a barcoded pattern regardless of the facing orientation of the document or would permit detection of a barcoded pattern disposed on both sides of a document. In other embodiments, two or more barcode readers may be disposed on each side of the transport mechanism 106.

In embodiments having only one media detector disposed on one side of the transport mechanism 106, the substitute currency media would have to be faced such that the barcode(s) could be detected by the barcode reader 128. This facing may be accomplished manually by the operator before depositing the documents into the document processing device. Alternately, a document facing mechanism coupled to the transport mechanism 106 may be employed to rotate a document 180° so that the face position of the document is reversed. Further details of a document facing mechanism which may be utilized for this purpose are disclosed in commonly assigned U.S. Pat. No. 6,074,334, entitled "Document Facing Method and Apparatus," which issued on Jun. 13, 2000, incorporated herein by reference in its entirety. Those skilled in the art will appreciate that the document facing mechanism disclosed in U.S. Pat. No. 6,074,334 can be positioned downstream or upstream of the evaluation region 104. In the case where the document facing mechanism is positioned upstream of the evaluation region 104, a suitable detector, such as a barcode reader (not shown), may be disposed upstream of the document facing mechanism to detect the orientation of a substitute currency medium before it is evaluated by the evaluation region 104.

In the case where the document facing mechanism is positioned downstream of the evaluation region 104, the documents are transported past the evaluation region 104 and those documents which are not properly faced are then rotated by the document facing mechanism. Next, the properly faced document is fed back to the evaluation region 104 either along the same transport path or along a different transport path for processing. This embodiment avoids the scenario where an operator must reprocess wrong-way facing documents.

According to some embodiments, the controller 114 shown in FIG. 1c is coupled to the communications port 118 and to a storage medium 119. The storage medium 119 may be a hard drive, a network drive, a floppy disk, a RAM, a CompactFlash card, a database, or any other suitable storage medium. In one embodiment, the controller 114 stores characteristic information associated with the documents being processed in the storage medium 119. In the case of a cur-

rency bill, the characteristic information may include information about the size, thickness, color, magnetism, reflectivity, absorbability, transmissivity, electrical conductivity, or serial number of the currency bill. The characteristic information may also include denomination discrimination information or any other information mentioned herein. In the case of a substitute currency medium, the characteristic information may include a barcoded pattern, a magnetic ink character recognition (MICR) pattern, characters readable by optical character recognition (OCR), including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an optical variable device (OVD) pattern such as a hologram, a magnetic or electrically conductive thread, conductive ink, magnetic ink, an electrically conductive polymer, perforations, a coded watermark, or other encoded information mentioned herein.

FIG. 1d depicts an exemplary set of documents that might be handled along a portion of the transport mechanism 106. The documents are transported in the direction of arrow A, and, in one embodiment, the first document to be transported is a batch identification card 150 or header card bearing a barcoded pattern 152. Except where distinction is warranted, the term header card is used interchangeably for both header card, which precedes a batch, and trailer card, which follows a batch. The barcoded pattern 152 disposed on the batch identification card 150 encodes a set of characters that is associated with the machine from which the documents that follow originated. For example, in a casino environment, there might be numerous slot machines, video-poker machines, and redemption machines which need to be emptied periodically and reconciled with the casino's accounting system. To identify from which machine a given batch of documents originated, a batch identification card is placed in the bill validator box of the machine A number is encoded in the form of a barcoded pattern 152 and imprinted or embedded on the batch identification card 150. The card 150 is then placed in the bill validator box such that when the contents of the box is emptied and placed into an input receptacle of a document processing device, the card 150 will be the first document processed by the document processing device. For the sake of example, the barcoded pattern 152 encodes the number 00123, which represents slot machine number 123.

According to some embodiments, the bill validator box of the machine, also known as a slot box, contains a permanently mounted or affixed indicia. In some embodiments, the permanently mounted indicia is a barcode. In these embodiments, an operator or user of the document processing device 100 can scan the barcode on the slot box using a barcode scanning device. The barcode scanning device employs similar technologies and techniques as the barcode reader 128 discussed above. The barcode scanning device also includes a printer or printing device. After the operator scans a barcode on a particular slot box, the printer prints a barcoded ticket. According to some embodiments, these barcoded tickets are used as header cards and/or trailer cards as described above in relation to FIG. 1d. In these embodiments, the printed ticket used as a header/trailer card is associated with a slot box number of the scanned slot box such that any documents processed before or after the header/trailer card, respectively, are associated with the slot box number on the slot box from which the documents came from.

The next documents to be processed are the currency bills and substitute currency media contained in the bill validator boxes of the machine identified by the batch identification card 150. For illustrative purposes only, a few currency bills and substitute currency media are shown in FIG. 1d. In practice, the documents will not necessarily face the same direc-

tion or have the same orientation, nor will necessarily they be presented in the order shown. In the example illustrated, a one-dollar bill 154 is the next document to be transported along the transport mechanism 106. The one-dollar bill 154 is followed by a first barcoded ticket 156 that bears two barcoded patterns 158, 160. The barcoded pattern 158 represents a multidigit ticket number such as 12345 and the barcoded pattern 160 represents a value such as \$100. The barcoded pattern 160 may include only numbers, such as 10000 to represent \$100.00. Alternately, the barcoded pattern 160 may be decoded into a symbol and a decimal number, such as \$100.00 to represent one-hundred dollars or £50.50 to represent fifty pounds and fifty pence. The latter approach permits barcoded tickets to be dispensed in domestic and foreign currency amounts. The barcoded pattern 158 may be decoded into a number having a fixed or variable number of digits or into alphanumeric characters and symbols.

The presence of the barcoded ticket 156 on the transport mechanism 106 means that a casino patron received the barcoded ticket 156, perhaps as part of a casino's promotion to entice the casino patron to play a game or perhaps because the patron won \$100 at a gaming machine. Then, the casino patron exchanged the barcoded ticket 156 either for \$100 cash or for game credits at a gaming machine. Thus, barcoded ticket 156 has been redeemed, and needs to be processed so that it can be reconciled with the casino's accounting system.

The next documents transported by the transport mechanism 106 are a second barcoded ticket 162, a twenty-dollar bill 164, and a five-dollar bill 166. Additional documents (not shown) will be transported by the transport mechanism 106 until there are no more documents in the input receptacle to be processed. If another batch identification card is detected, all subsequent documents (until another batch identification card is detected) will be associated with the batch identification card. In an alternate embodiment, batch identification cards are not used.

Although the documents shown in FIG. 1d have been discussed in connection with a casino environment, the same discussion applies equally to other environments where other types of documents are used, such as retailer stores where food coupons and gift certificates are used or amusement parks where promotional media are used.

According to some embodiments, subsequent to the processing of the documents, a separate process and apparatus for destroying documents may be provided. According to some embodiments, once substitute currency media have been imaged and an image file of each substitute currency medium is saved in a storage device and/or checked for quality, the substitute currency media can be destroyed. Imaging and saving image files of processed substitute currency media can eliminate the need for saving and storing the physical substitute currency media. Additionally, the direct destruction of the substitute currency media eliminates the need to remove sorted substitute currency media from the document processing device 100 for transport to storage or otherwise. For example, some casinos are required to keep records of each casino cashout ticket redeemed at the casino for a predetermined amount of time. The long-term or short-term storage and handling of these physical casino cashout tickets can be voluminous, burdensome, and costly. Thus, coupling a document destruction device to the document processing device 100 provides a direct path for each of the substitute currency medium successfully processed from the input receptacle 102 to the document destruction device.

According to some embodiments, a document is only destroyed after the document processing device 100 scans and images the document, saves an image file of the docu-

ment, and verifies that the quality of the image file meets a set of predetermined standards. If the image file does not meet the set of predetermined standards, then the document will be flagged and/or off-sorted for further processing that does not directly include destroying the document. In some embodiments, the document destruction device only destroys documents other than currency bills. In other embodiments, the document destruction device only destroys casino cashout tickets. Yet in other embodiments, the document processing device 100 and the document destruction device can be configured to destroy or preserve any combination of documents.

The document destruction device can include, for example, mechanical devices assuring complete destruction (e.g., shredding and/or disintegrating documents using a mechanical shredder, press, etc.) or mechanical devices for causing a less than complete obliteration of the documents (e.g., using a marking, perforation, or printing device which would leave the document substantially intact, but clearly not redeemable or capable of recirculation). In other aspects, it is contemplated that document destruction devices can include state-changing devices for producing an irreversible change of state to the documents by chemical and/or incendiary processes (e.g., laser incineration).

Now turning to FIG. 42, a flowchart illustrating some embodiments of the present disclosure is shown. At step 4200, a stack of documents is placed into the input receptacle of a document processing device. At step 4205, the document processing device obtains a transaction/user identification number.

The transaction/user identification number provides a mechanism to link the user or operator who is processing one or more batches of documents including, but not limited to, just currency bills, just substitute currency media, or both currency bills and substitute currency media, to the processed documents themselves. The transaction/user identification number may be any type of identifier, such as a casino name, time and/or date of transaction, employee name, an account number, PIN, merchant number, social security number, employee number, driver's license number, credit/debit/smart card number, and bar coded or other encoded number. The transaction/user identification number may be encoded based on user name or any other identifying number (such as driver's license number or social security number). The transaction/user identification number may also be an alphanumeric code, a fingerprint, or biometric scan. The transaction/user identification number may also be obtained by a video image of the user/operator or any other known way to identify a person. The transaction/user identification number may be obtained in any number of ways by an identification input device (such as entry through the operator control panel or customer control panel). Other options for the input device include a card reader or perhaps the image scanner itself. With respect to the latter option, the number may be read off an encoded sheet, such as a bar encoded slip or a MICR encoded slip, which is input for processing through the document processing device 100. For the control panel option, the number may be input into the device by the operator or by the user. If a card reader is available on the document processing device 100, the number may be read from an inserted debit/credit/smart card that is input into the document processing device 100. More generally, the transaction/user identification input device may be any known device capable of receiving commands, such as a keyboard, a keypad, a touch screen, or a mouse, and/or may also be any type of reader, such as a MICR reader, a bar code reader, an optical reader, biometric reader or others known in the art.

The documents are then transported by the transport mechanism one at a time (4210). Each transported document is then scanned in step 4215. As discussed above, this scanning operation may involve optically scanning each document to obtain a document image of one or both sides of the document. The document image may be an image of substantially the entire document (a "full image") or of selected portions (a "partial image") of the document. Alternatively or additionally, a line or strip reflective scanning operation may be performed. Other scanning operations may also be used. The performance of step 4215 produces scan data. At step 4220, this scan data is processed to identify certain information of interest with respect to each document. For example, the identified information of interest may comprise the characters printed in one or more fields of the document. The identified information of interest may also comprise printed features, patterns or relationships on the document. Even more specifically, the identified information of interest comprises currency bill serial number data or substitute currency media ticket number data.

In step 4225, the information of interest from the document is stored in memory in association with the transaction/user identification number. In this way, the information of interest is linked to a certain user or operator and that user's transaction.

Turning now to FIG. 43, a flowchart describing some embodiments of the present disclosure is now described. A stack of documents which includes currency bills and substitute currency media is inserted into the input receptacle at step 4202. Next, at step 4207, a user/operator identifier is obtained. The user/operator identifier may be, for example, any of the transaction/user identifications described above. Next, at step 4212, document identification characteristic information is obtained. The document identification characteristic information is any information that may uniquely identify the document that is being presented, such as a serial number, a ticket number, account number, document number, bar code, or another encoded or encrypted identifier. The document identification characteristic information may be encoded information. The document identification characteristic information may be in the form of numbers, letters, and/or symbols (e.g., barcode) as well as other printed or recognizable indicia.

As discussed above, the document identification characteristic information may be obtained by obtaining an image scan (full or partial) of the document. From the image scan, the characteristic information may be obtained by using optical character recognition (OCR) software for identifying the characters printed in the character information fields of the documents. For example, if the character information is the serial number, the OCR may search the full image for a serial number and then extract the serial number once the field is located. For another example, if the character information is the ticket number, the OCR may search the full image for a ticket number and then extract the ticket number once the field is located.

Next, in step 4217, the document identification characteristic information is associated with the user/operator identifier so that the document under examination can be linked for tracking and tracing purposes with the transaction. As discussed above, this can be accomplished by storing the data (characteristic information and customer identifier) in a memory. In the memory, the document is linked to the user/operator by tying the characteristic information to the user/operator identifier. For example, if the characteristic information is obtained via image scanning, the user/operator identifier, as well as the characteristic information, could be

tagged onto the image file. Alternatively, the characteristic information can be stored in a memory in a file dedicated to the user/operator (as identified by the user/operator identifier). This way, someone searching the memory for the document or characteristic information could see that it is stored under a specific user/operator's identifier.

The document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c processes documents at a rate equal to or greater than 600 documents per minute. In other embodiments, documents are processed at a rate equal to or greater than 800 documents per minute. In still other embodiments, documents are processed at a rate equal to or greater than 1000 documents per minute. In yet other embodiments, documents are processed at a rate equal to or greater than 1200 documents per minute. In still other embodiments, documents are processed at a rate equal to or greater than 1500 documents per minute. In yet other embodiments, documents are processed at a rate less than 600 documents per minute.

According to some embodiments, the document processing device 100 includes an input receptacle 102, a currency detector 110, a media detector 112, an image scanner, at least one authentication detector, a transport mechanism 106, and at least one output receptacle 108. According to some embodiments, the document processing device 100 processes documents at a rate of at least about 1000 documents per minute. According to some embodiments, the document processing device 100 processes documents at a rate of at least about 1500 documents per minute. According to some embodiments, the processing of documents at the above processing rates includes the following: (1) transporting documents including at least currency bills and substitute currency media, one document at a time, from the input receptacle 102 to the at least one output receptacle 108, (2) denominating all of the currency bills with the currency detector 110, (3) scanning barcodes on all of the substitute currency media with the media detector 112, (4) imaging all of the substitute currency media to produce a raw image file for each scanned substitute currency medium, the raw image file having an image resolution of approximately 100 DPI by approximately 100 DPI (5) authenticating all of the currency bills using the at least one authentication detector, and (6) saving an image file for each of the images of the substitute currency media to a storage device in the document processing device 100.

According to some embodiments, the raw image file has an image resolution of approximately 200 DPI by approximately 100 DPI. Yet according to some embodiments, the raw image file has an image resolution of approximately 200 DPI by approximately 200 DPI. It is contemplated that the above processing rates are also applicable to various combinations of image file resolutions less than approximately 200 DPI by approximately 200 DPI.

According to some embodiments, the processing of documents at the above rates can further include: (7) prior to saving the image file, cropping each of the raw image files, thereby reducing the electronic file size, (8) deskewing the raw image file to square-up or orientate the raw image file in a predetermined manner and/or direction, and (9) compressing the raw image file to further reduce the electronic file size. In some embodiments, compressing the raw image file converts the raw image file, sometimes called a TIFF file, into a JPEG file. Other file formats are contemplated including, but not limited to, GIF file format, MPEG file format, and BMP file format.

According to some embodiments, the processing of documents at the above rates can further include: (10) sorting the

substitute currency media from the currency bills and further sorting the currency bills by denomination into separate output receptacles.

According to some embodiments, the processing of documents at the above rates can further include: (11) after scanning and imaging each of the substitute currency medium, transporting the substitute media to a document destruction device to destroy each of the substitute currency medium.

According to some embodiments, the processing of documents at the above rates can further include: (12) prior to destroying each of the substitute currency medium, performing an image quality check of the image files of each of the substitute currency medium.

According to some embodiments, the document processing device 100 includes an input receptacle 102, an image scanner, a transport mechanism 106, and at least one output receptacle 108. According to some embodiments, the document processing device 100 processes documents at a rate of at least about 1000 documents per minute. According to some

embodiments, the document processing device 100 processes documents at a rate of at least about 1500 documents per minute. According to some embodiments, the processing of documents at the above processing rates includes at least the following:

(1) transporting documents including at least currency bills and substitute currency media, one document at a time, from the input receptacle 102 to the at least one output receptacle 108, (2) imaging all of the documents to produce a raw image file for each of the documents, the raw image file having an image resolution of approximately 100 DPI by approximately 100 DPI (3) denominating all of the currency bills from the raw image files, (4) using software to decode a barcoded pattern on each substitute currency medium raw image file, and (5) saving an image file for each of the images of the documents to a storage device in the document processing device 100.

It is contemplated that according to some embodiments the image resolution is sufficient to allow a controller and/or a processor to denominate the currency bills from the raw image file and/or from an image file created from the raw image file. It is also contemplated that according to some embodiments the image resolution is sufficient to allow a controller and/or a processor to decode a barcoded pattern in the raw image file and/or in an image file created from the raw image file.

For example, in some embodiments, the raw image file has an image resolution of approximately 200 DPI by approximately 100 DPI. Yet according to some embodiments, the raw image file has an image resolution of approximately 200 DPI by approximately 200 DPI. It is contemplated that the above processing rates are also applicable to various combinations of image file resolutions less than approximately 200 DPI by approximately 200 DPI.

According to some embodiments, the processing of documents at the above rates can further include: (6) prior to saving the image file, cropping each of the raw image files, thereby reducing the electronic file size, (7) deskewing the raw image file to square-up or orientate the raw image file in a predetermined manner and/or direction, and (8) compressing the raw image file to further reduce the electronic file size.

According to some embodiments, the processing of documents at the above rates can further include: (9) sorting the substitute currency media from the currency bills and further sorting the currency bills by denomination into separate output receptacles.

According to some embodiments, the processing of documents at the above rates can further include: (10) after scanning and imaging each of the substitute currency medium,

transporting the substitute media to a document destruction device to destroy each of the substitute currency medium.

According to some embodiments, the processing of documents at the above rates can further include: (11) prior to destroying each of the substitute currency medium, performing an image quality check of the image files of each of the substitute currency medium.

The document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c represents but one of numerous embodiments into which the evaluation region 104 may be incorporated. It is expressly understood that the document processing device 100 shown and described in connection with FIGS. 1a, 1b, and 1c may be modified in accordance with numerous other embodiments. For example, as explained next, the device 100 may be modified in accordance with any one or more of the following embodiments:

- (1) a multi-pocket document processing device having a plurality of output receptacles and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;
- (2) a document processing device having a single output receptacle and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;
- (3) a document processing device having dual output receptacles and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;
- (4) any of the foregoing embodiments (1)-(3) may be coupled to a coin sorting device;
- (5) a funds processing device capable of processing both documents and coins and incorporating any embodiment of the evaluation region 104 shown or described in connection with FIGS. 1a, 1b, and 1c;
- (6) any of the foregoing embodiments (1)-(5) may be communicatively coupled to a computer network, such as a casino gaming network or a retailer network;
- (7) any of the foregoing embodiments (1)-(6) may include a control unit for receiving operator instructions and displaying information to an operator;
- (8) any of the foregoing embodiments (1)-(7) may include a document destruction device;
- (9) any of the foregoing embodiments (1)-(8) may include an image quality check routine;
- (10) a system employing a plurality of document processing devices according to any of the foregoing embodiments (1)-(9); and
- (11) a system employing a document processing device according to any of the foregoing embodiments (1)-(9) capable of processing currency bills and barcoded tickets imprinted or embedded with at least two barcoded patterns.

Document Processing Device Having Multiple Output Receptacles

As discussed above, according to some embodiments, the evaluation region 104 shown and described in connection with FIG. 1b is incorporated into a document processing device having multiple output receptacles. In accordance with such embodiments, FIGS. 2 and 3 illustrate several views of a multi-pocket document processing device 200. A stack of currency bills and substitute currency media are provided to an input receptacle 202 in any order or in a predetermined order. The currency bills and substitute media may be facing one orientation or facing mixed orientations. The currency bills and substitute currency media are fed, one by one, into a transport mechanism 206. The transport mechanism 206 transports currency bills and substitute currency

media to one of a plurality of output receptacles 208a-208h, which may include upper output receptacles 208a, 208b, as well as lower output receptacles 208c-208h. Before a document reaches an output receptacle 208, the transport mechanism 206 guides it through an evaluation region 204 where a document can be, for example, analyzed, authenticated, denominated, counted, validated, and/or otherwise processed. In alternative embodiments of the device 200, the evaluation region 204 can determine document orientation, 10 document size, or whether documents are stacked upon one another. The results of the above process or processes may be used to determine to which output receptacle 208 a document is directed. The illustrated embodiment of the document processing device 200 has an overall width, W₁, of approximately 4.87 feet (1.46 meters), a height, H₁, of approximately 4.85 feet (1.45 meters), and a depth, D₁, of approximately 15 1.67 feet (0.50 meters).

In the illustrated embodiment, interposed in the transport mechanism 206, intermediate the evaluation region 204 and 20 the lower output receptacles 208c-208h, is a document facing mechanism designated generally by reference numeral 203. The document facing mechanism 203 is capable of rotating a document (i.e., a currency bill or substitute currency medium) 180° so that the face position of the document is reversed. That is, if a U.S. currency bill, for example, is initially presented with the surface bearing a portrait of a president facing down, it may be directed to the document facing mechanism 203, whereupon it will be rotated 180° so that the surface with the portrait faces up. The leading edge of the document 25 remains constant while the document is being rotated 180° by the document facing mechanism 203. The decision may be taken to send a document to the document facing mechanism 203 when the selected mode of operation or other operator 30 instructions call for maintaining a given face position of documents as they are processed by the device 200. For example, it may be desirable in certain circumstances for all of the currency bills ultimately delivered to the lower output receptacles 208c-208h to have the currency bill surface bearing the portrait of the president facing up. In such embodiments of the device 200, the evaluation region 204 is capable 35 of determining the face position of a bill, such that a bill not having the desired face position can first be directed to the document facing mechanism 203 before being delivered to the appropriate output receptacle 208. Further details of a 40 document facing mechanism which may be utilized for this purpose are disclosed in commonly assigned U.S. Pat. No. 6,074,334, entitled "Document Facing Method and Apparatus," which issued on Jun. 13, 2000, incorporated herein by reference in its entirety, and may be employed in conjunction 45 with the present invention such as the device illustrated in FIGS. 2 and 3. Another document facing mechanism which 50 may be employed in another embodiment is disclosed in commonly assigned, U.S. Pat. No. 6,371,303, entitled "Two Belt Bill Facing Mechanism," issued on Apr. 16, 2002, which 55 is herein incorporated by reference in its entirety. Alternative embodiments of the device 200 do not include the document facing mechanism 203.

The document processing device 200 in FIG. 2 may be controlled from a separate control unit 216 which has a display/user-interface 217. In one embodiment of the present invention, the display/user-interface 217 incorporates a touch panel display which displays information including "functional" keys when appropriate. The display/user-interface 217 may be a full graphics display. Alternatively, additional physical keys or buttons, such as a keyboard 219, may be employed. The control unit 216 may be a self-contained desktop or laptop computer which communicates with the device

25

200 via a cable **221**. In one embodiment, the device **200** includes a suitable communications port (not shown) for this purpose. In another embodiment, the control unit **216** communicates with the device **200** wirelessly via a wireless modem (not shown). In embodiments in which the control unit **216** is a desktop computer wherein the display/user-interface **217** and the desktop computer are physically separable, the desktop computer may be stored within a compartment **225** of the device **200**. In other alternative embodiments, the control unit **216** is integrated into the device **200** so that the control unit **216** is contained within the device **200**. In this embodiment, the display/user-interface **217** may comprise a touch screen or touch panel display that is coupled to the device **200**.

The operator can control the operation of the device **200** through the control unit **216**. By selecting various user-defined modes through the control unit **216**, such as via an input device such as a keyboard **219**, or a switch, button, or touch screen (not shown), the operator can direct currency bills and substitute media into specific output receptacles, such as output receptacles **208a-208h**. Note that fewer or more output receptacles may be employed in alternate embodiments. In still other embodiments, the user can select pre-programmed modes or create new user-defined modes based on the particular requirements of the application. For example, the operator may select a user-defined mode which instructs the device **200** to sort currency bills by denomination; accordingly, the evaluation region **204** would denominate the bills and direct one dollar bills into the first lower output receptacle **208c**, five dollar bills into the second lower output receptacle **108d**, ten dollar bills into the third lower output receptacle **208e**, twenty dollar bills into the forth lower output receptacle **208f**, fifty dollar bills into the fifth lower output receptacle **208g**, and one-hundred dollar bills into the sixth lower output receptacle **208h**. The operator may also instruct the device **200** to deliver those bills whose denomination was not determined, i.e., no call bills, to the first upper output receptacle **208a**. In such an embodiment, the upper output receptacle **208a** would function as a reject pocket. In an alternative embodiment, the operator may instruct the device **200** to also evaluate the authenticity of each currency bill. In such an embodiment, authentic bills would be directed to the appropriate lower output receptacles **208c-208h**. Those bills that were determined not to be authentic, i.e., suspect bills, would be delivered to the second upper output receptacle **208b**. A multitude of user defined modes are disclosed in commonly assigned U.S. Pat. No. 6,278,795, previously incorporated by reference, which may be employed in conjunction with the present invention such as the device illustrated in FIGS. 2 and 3. According to another embodiment, the device **200** is adapted to process documents according to a strapping mode of operation as shown and described in U.S. Pat. No. 6,460,705, entitled "Method of Creating Identifiable Smaller Stacks of Currency Bills Within a Larger Stack of Currency Bills," which is incorporated herein by reference in its entirety. According to another embodiment, the device **200** is adapted to process and strap documents using a strapping unit **3550** as shown and described in co-pending U.S. patent application Ser. No. 10/460,071, entitled "Currency Processing and Strapping Systems and Methods," which was filed on Jun. 12, 2003, and is incorporated herein by reference in its entirety. According to still another embodiment, the device **200** is adapted to process documents according to a disable-pockets mode of operation as shown and described in co-pending U.S. patent application Ser. No. 09/688,538, entitled "Currency

26

"Handling System Having Multiple Output Receptacles," which was filed on Oct. 16, 2000 and is incorporated herein by reference in its entirety.

It should be noted that the control unit **216** provides the operator with a broad range of flexibility in selecting which output receptacles receive which documents. For example, the operator may instruct the device **200** to sort the currency bills by denomination and to deliver authentic currency bills according to their denomination into selected ones of the output receptacles **208c-208h**. The operator may further instruct the device **200** to deliver no call bills and suspect bills into output receptacle **208a**, and to deliver substitute currency media into output receptacle **208b**. In addition, the device **200** may be unable to evaluate a particular document because, for example, it is damaged or excessively worn. The operator may instruct the device **200** to deliver any substitute currency media that cannot be evaluated to the output receptacle **108a**. Alternatively, additional output receptacles (not shown) may be employed to receive any combination of no call bills, suspect bills, valid substitute currency media, or invalid substitute currency media. The delivery of such documents may occur without suspension of operation of the device **200**, or with suspension of the operation of the device **200**, as explained next.

According to some embodiments, the device **200** is configured so that when the evaluation region **204** is unable to identify certain criteria regarding a currency bill or substitute currency medium, the unidentified document is flagged and "presented" in one of the output receptacles **208a-208h**, that is, the transport mechanism **206** is suspended or halted so that the unidentified document is located at a predetermined position within one of the output receptacles **208a-208h**, such as being the last document transported to one of the output receptacles. In the case of currency bills, such criteria can include denominating information, authenticating information, information indicative of the currency bill's series, or other information the evaluation region **204** is attempting to obtain pursuant to a mode of operation. In the case of substitute currency media, such criteria may include, in addition to or exclusive of the criteria mentioned above, whether information, such as a valid barcode, is detected on the substitute currency media.

The user may determine in which output receptacle **208a-208h** the flagged document is presented according to a selected mode of operation. For example, where the unidentified document is the last document transported to an output receptacle **208a-208h**, it may be positioned within a stacker wheel or positioned at the top of the documents already within the output receptacle **208a-208h**. While unidentified documents may be transported to any output receptacles **208a-208h**, it may be more convenient for the operator to have unidentified documents transported to one of the upper output receptacles **208a,b**, which are positioned such that the operator is able to easily see and/or inspect the document which has not been identified by the evaluation region **204**. The operator may then either visually inspect the flagged document while it is resting on the top of the stack, or the operator may decide to remove the document from the output receptacle **208** in order to examine the flagged document more closely. In an alternative embodiment of the device **200**, the control unit **216** may communicate to the user via the display/user-interface **217** information identifying which one of the output receptacles **108a-108h** a flagged document is presented.

The device **200** may be adapted to continue operation automatically when a flagged document is removed from the upper output receptacle **208a,b** or, according to one embodiment of the present invention, the device **200** may be adapted

to suspend or halt operation and require input from the operator via the control unit 216. Upon examination of a flagged document by the operator, it may be found that the flagged document is genuine or valid even though it was not identified as such by the evaluation region 204 or the evaluation region 204 may have been unable to denominate the flagged document. However, because the document was not identified, the total value and/or denomination counters will not reflect its value. According to one embodiment, such an unidentified document is removed from the output receptacles 208 and reprocessed or set aside. According to another embodiment, the flagged documents may accumulate in the upper output receptacles 208a,b until the batch of documents currently being processed is completed or the output receptacle 208a,b is full and then reprocessed or set aside. In yet another embodiment, the control unit 216 of the device 200 includes denomination keys, such as disclosed in commonly assigned U.S. Pat. No. 5,790,697, which is herein incorporated by reference in its entirety. Upon inspection of a flagged currency bill, such as a no call bill, the operator may manually key in the denomination of the bill via a denomination key, and resume operation. In the case of a substitute currency media, the operator may manually enter into the device 200 via the control unit 216 information about the substitute currency media. Such information may include the barcode number when the substitute currency media is a barcoded ticket, the "denomination" of the substitute currency media, such as a \$5 Disney Dollar, the value associated with the barcoded ticket, such as \$100, and other identifying information.

According to other embodiments, when a document is flagged, the transport mechanism may be stopped before the flagged document is transported to one of the output receptacles. Such an embodiment is particularly suited for situations in which the operator need not examine the document being flagged; for example, the device 200 is instructed to first process United States currency and then British currency pursuant to a selected mode of operation where the device 200 processes United States \$1, \$5, \$10, \$20, \$50, and \$100 currency bills into the lower output receptacles 208c-208h, respectively. Upon detection of the first British pound note, the device 200 may halt operation allowing the operator to empty the lower output receptacles 208c-208h and to make any spatial adjustments necessary to accommodate the British currency. A multitude of modes of operation which may be employed in conjunction with the present invention are described in conjunction with bill flagging, presenting, and/or transport halting in commonly assigned U.S. Pat. No. 6,311,819 entitled "Method and Apparatus for Document Processing," which is herein incorporated by reference in its entirety.

In the illustrated embodiment, with regard to the upper output receptacles 208a and 208b, the second upper output receptacle 208b is provided with a stacker wheel 227 for accumulating a number of documents, while the first upper output receptacle 208a is not provided with such a stacker wheel. Thus, when, pursuant to a preprogrammed mode of operation or a user-selected mode or other operator instructions, a document is to be fed to the first upper output receptacle 208a, there may be a further instruction to momentarily suspend operation of the device 200 for the operator to inspect and remove the document. On the other hand, it may be possible to allow a number of documents to accumulate in the first upper output receptacle 208a before operation is suspended or halted. Similarly, the second upper output receptacle 208b may be utilized initially as an additional one of the lower output receptacles 208c-208h. However, in the illustrated embodiment shown in FIG. 2, there is no storage cassette associated with the second upper output receptacle

208b. Therefore, when the second upper output receptacle 208b is full, operation may be suspended to remove the documents at such time as yet further documents are directed to the second upper output receptacle 208b in accordance with the selected mode of operation or other operator instructions. According to an alternative embodiment of the device 200, both the first and the second upper output receptacles 208a, 208b are equipped with a stacker wheel. According to such an embodiment both the upper output receptacles 208a, 208b may also function as the lower output receptacle 208c-208h, thereby allowing a number of documents to be stacked therein. In yet another embodiment, the first upper output receptacle 208a and the second upper output receptacle 208b are not provided with a stacker wheel 227.

FIGS. 4a and 4b illustrate the evaluation region 204 according to one embodiment of the device 200. The evaluation region 204 can be opened for service, access to sensors, to clear document jams, etc., as shown in FIG. 4a. Additional details of the evaluation region 204 are provided with reference to the evaluation region 104 shown and described in FIG. 1b. As previously explained, the evaluation region 204 shown in FIG. 4a may employ any combination of the following detection means without limitation in one or more alternate embodiments: a size detection and density sensor 408, a lower optical scan head 410, an upper optical scan head 412, a single or multitude of magnetic sensors 414, a thread sensor 416, an infrared sensor (not shown), an ultraviolet/fluorescent light scan head 418, an upper media detector 403a, or a lower media detector 403b. As noted in connection with FIG. 1b, these detection means may be disposed in any order and on either or both sides of the transport plate 400 without departing from the present invention. These detection means and a host of others are disclosed in commonly assigned U.S. Pat. No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," previously incorporated by reference, and U.S. patent application Ser. No. 09/965,428, entitled "A Document Processing System Using Full Image Scanning," filed on Sep. 27, 2001, also previously incorporated by reference. As noted above, in the specific case of substitute currency media, the variables may also relate to what distinguishing characteristics of the substitute currency media are being examined, such as any combination of the following without limitation: a barcode, a MICR pattern, OCR-readable information, including information printed according to the OCR-A and OCR-B fonts, a magnetic pattern, an OVD pattern such as a hologram, a magnetic thread or an electrically conductive thread, conductive ink, or an electrically conductive polymer.

The direction of document travel through the evaluation region 204 is indicated by arrow A in FIG. 4a. The documents (i.e., currency bills and/or substitute currency media) are positively driven along a transport plate 400 through the evaluation region 204 by means of a transport roll arrangement comprising both driven rollers 402 and passive rollers 404. The rollers 402 are driven by a motor (not shown) via a belt 401. Passive rollers 404 are mounted in such a manner as to be freewheeling about their respective axis and biased into counter-rotating contact with the corresponding driven rollers 402. The driven and passive rollers 402, 404 are mounted so that they are substantially coplanar with the transport plate 400. The transport roll arrangement also includes compressible rollers 406 to aid in maintaining the documents flat against the transport plate 400. Maintaining the document flat against the transport plate 400 so that the document lies flat when transported past the sensors enhances the overall reliability of the evaluation processes. A similar transport arrangement is disclosed in commonly-owned U.S. Pat. No.

5,687,963, entitled "Method and Apparatus for Discriminating and Counting Documents," which is incorporated herein by reference in its entirety.

Additional details concerning the input receptacle 202, transport mechanism 206, and diverters 237 are disclosed in commonly assigned U.S. Pat. No. 6,398,000, entitled "Currency Handling System Having Multiple Output Receptacles," issued on Jun. 4, 2002, which is herein incorporated by reference in its entirety.

FIGS. 4a-1 and 4b-1 illustrate the evaluation region 204 according to another embodiment of the device 200. Similar to the previous embodiment, the evaluation region 204 can be opened for service, access to sensors, to clear document jams, etc., as shown in FIG. 4a-1. Additional details of the evaluation region 204 are provided with reference to the evaluation region 104 shown and described in FIG. 1b. The evaluation region 204 shown in FIG. 4a-1 may employ any combination of the following detection means without limitation in one or more alternate embodiments: a density sensor 408a, a lower optical scan head 410a, an upper optical scan head 412a, a single or multitude of magnetic sensors 414a, an infrared sensor (not shown), an ultraviolet/fluorescent light scan head 418a. The density sensor 408a can detect both density and one dimension of a document. As noted in connection with FIG. 1b, these detection means may be disposed in any order and on either or both sides of the transport plate 400a without departing from the present invention.

The direction of document travel through the evaluation region 204 is indicated by arrow A in FIG. 4a. The documents (i.e., currency bills and/or substitute currency media) are positively driven along a transport plate 400a through the evaluation region 204 by means of a transport roll arrangement comprising both driven rollers 402a and passive rollers 404a. The rollers 402a are driven by a motor (not shown) via a belt 401a. Passive rollers 404a are mounted in such a manner as to be freewheeling about their respective axis and biased into counter-rotating contact with the corresponding driven rollers 402a. The driven and passive rollers 402a, 404a are mounted so that they are substantially coplanar with the transport plate 400a. The transport roll arrangement also includes compressible rollers 406a to aid in maintaining the documents flat against the transport plate 400a. Maintaining the document flat against the transport plate 400a so that the document lies flat when transported past the sensors enhances the overall reliability of the evaluation processes.

Referring back to FIG. 2, the illustrated embodiment of the device 200 includes a total of six lower output receptacles 208c-208h. More specifically, each of the lower output receptacles 208c-208h includes a first portion designated as an escrow compartment 205a-205f and a second portion designated as a storage cassette 207a-207f. Typically, documents are initially directed to the escrow compartments 205, and thereafter at specified times or upon the occurrence of specified events, which may be selected or programmed by an operator, documents are then fed to the storage cassettes 207. The storage cassettes 207 are removable and replaceable, such that stacks of documents totaling a predetermined number of documents or a predetermined monetary value may be accumulated in a given storage cassette 207, whereupon the cassette may be removed and replaced with an empty storage cassette. In the illustrated embodiment, there are six lower output receptacles 208c-208h which include escrow compartments 205 and storage cassettes 207a-207f. In alternative embodiments, the device 200 may contain more or less than six lower output receptacles which include escrow compartments 205 and storage cassettes 207. In other alternative embodiments, modular lower output receptacles 208 may be

implemented to add many more lower output receptacles to the device 200. Each modular unit may comprise two lower output receptacles. In other alternative embodiments, several modular units may be added at one time to the device 200.

A series of diverters 237a-237f, which are a part of the transport mechanism 206, direct the documents to one of the lower output receptacles 208c-208h. When the diverters 237 are in an upper position, the documents are directed to the adjacent lower output receptacle 208. When the diverters 237 are in a lower position, the documents proceed in the direction of the next diverter 237. Alternatively, the operator may instruct the device 200 to direct substitute currency media to one or more of the upper output receptacles 208a-208b such that only currency bills are presented to the diverters 237a-237f.

Additional details concerning the lower output receptacles 208c-208h, the escrow compartments 205, and the storage cassettes 207 are disclosed in commonly assigned U.S. Pat. No. 6,398,000, entitled "Currency Handling System Having Multiple Output Receptacles," incorporated by reference above. It should be emphasized that the operator may also instruct the device 200 to direct substitute currency media to one or more of the lower output receptacles 208. In the illustrated embodiment, only currency bills are directed to the lower output receptacles 208, however, in alternative embodiments, substitute currency media could also be directed to one or more of the lower output receptacles 208.

In some embodiments, the device 200 is dimensioned to process a stack of different sized currencies at the same time. In other embodiments, the device 200 can also be dimensioned to process a stack of different sized currencies and substitute currency media at the same time. For example, one application may require the processing of United States dollars (2.5 inches×6 inches, 6.5 cm×15.5 cm) and French currency (as large as 7.17 inches×3.82 inches, 18.2 cm×9.7 cm). The application may simply require the segregation of the U.S. currency from the French currency wherein the device 200 delivers U.S. currency to the first lower output receptacle 208c and the French currency to the second output receptacle 208d. In still other embodiments, the device 200 processes a mixed stack of U.S. ten and twenty dollar bills and French one hundred and two hundred Franc notes wherein the currency documents are denominated, counted, and authenticated. In such embodiments, the U.S. ten and twenty dollar bills are delivered to the first 208c and second 208d lower output receptacles, respectively, and the French one hundred and two hundred Franc notes are delivered to the third 208e and fourth 208f lower output receptacle, respectively. In yet other embodiments, the device 200 denominates, counts, and authenticates six different types of currency wherein, for example, Canadian currency is delivered to the first lower output receptacle 208c, United States currency is delivered to the second output receptacle 208d, Japanese currency is delivered to the third lower output receptacle 208e, British currency is delivered to the fourth lower output receptacle 208f, French currency is delivered to the fifth lower output receptacle 208g, and German currency is delivered to the sixth lower output receptacle 208h. In still other embodiments, no call bills or other denominations of foreign currency, such as Mexican currency for example, may be directed to the second upper output receptacle 208b. In other embodiments, suspect bills are delivered to the first upper output receptacle 208a. In still other embodiments, U.S. currency and cashout tickets are delivered to different output receptacles. These embodiments represent just a few examples of the numerous combinations of U.S. currency

bills, foreign currency bills, and substitute media that can be delivered to the output receptacles 208.

Additional details concerning the processing of foreign currency are disclosed in commonly assigned U.S. Pat. No. 5,875,259, entitled "Method and Apparatus for Discriminating and Counting Documents"; commonly assigned U.S. Pat. No. 5,960,103, entitled "Method and Apparatus for Authenticating and Discriminating Currency"; commonly assigned U.S. patent application Ser. No. 09/626,324, entitled "Currency Handling System Employing an Infrared Authenticating System," filed Jul. 26, 2000; and commonly assigned U.S. Pat. No. 6,493,461, entitled "Customizable International Note Counter," each of which is incorporated herein by reference in its entirety.

In other alternative embodiments of the device 200, the user can vary the type of documents delivered to the output receptacles 208. For example, in one alternative embodiment an operator can direct, via the control unit 216 (shown in FIG. 2), that a stack of one, five, ten, twenty, fifty, and one-hundred United States dollar bills be denominated, counted, authenticated, and directed into lower output receptacles 208c-208h, respectively. In still another alternative embodiment, the device 200 is also instructed to deliver other currency bills, such as a United States two dollar bill or foreign currency bills that have been mixed into the stack of documents, to the second upper output receptacle 208b. In still another alternative embodiment, the device 200 is also instructed to count the number and aggregate value of all the currency bills processed and the number and aggregate value of each individual denomination of currency bills processed. These values may be communicated to the user via the display/user-interface 217 of the device 200. In addition, or alternatively, these values are communicated to a remote device via a communications port (not shown).

In still other alternative embodiments, no call bills and bills that are stacked upon one another are directed to the second upper output receptacle 208b. In yet other alternative embodiments, the operator can direct that all documents failing an authentication test be delivered to the first upper output receptacle 208a. In still further embodiments, the operator instructs the device 200 to deliver no call bills, suspect bills, stacked bills, etc. to one of the lower output receptacles 208c-208h. In yet other alternative embodiments, the currency bills are directed to one or more of the lower output receptacles 208c-208h, no call bills and suspect bills are directed to the upper output receptacle 208a, and substitute currency media are directed to the upper output receptacle 208b. In still other embodiments, U.S. currency bills are directed to selected ones of the lower output receptacles 208, foreign currency bills are directed to other lower output receptacles 208, no call bills, suspect bills, and invalid substitute currency media (i.e., media which cannot be identified) are directed to the first upper output receptacle 208a, and valid substitute currency media are directed to the second upper output receptacle 208b. Alternatively, a third upper output receptacle (not shown) may receive invalid substitute currency media so as to keep all substitute currency media separate from currency bills.

In still other alternate embodiments, genuine U.S. currency bills and foreign currency bills and identified substitute currency are directed to selected ones of the lower output receptacles 208, unidentified substitute currency media are directed to the first upper output receptacle 208a, and no call currency bills and suspect currency bills are directed to the second upper output receptacle 208b. In short, the device 200 as illustrated having eight output receptacles 208a-208h provides a great deal of flexibility to the operator. And in other

alternative embodiments of the currency handling device 200 with a fewer or greater number of output receptacles 208, numerous different combinations for processing documents are available. What output receptacle receives which type of document, whether a U.S. currency bill, a foreign currency bill, or a substitute currency medium, is entirely customizable by the operator.

In the illustrated embodiment shown in FIG. 2, the various operations of the device 200 are controlled by processors disposed on a number of printed circuit boards (PCBs) located throughout the device 200. Further details concerning the PCBs are disclosed in commonly assigned U.S. Pat. No. 6,398,000, entitled "Currency Handling System Having Multiple Output Receptacles," previously incorporated by reference.

Document Processing Device Having a Single Output Receptacle

The evaluation region 104 shown and described in connection with FIGS. 1a and 1b can also be incorporated into a document processing device having a single output receptacle. FIGS. 5 and 6 illustrate a compact document processing device 500 according to one embodiment of the present invention. This device 500 is shown and described in more detail in commonly assigned U.S. Pat. No. 5,687,963 which is incorporated by reference in its entirety. In one embodiment, the device 500 is modified to include an evaluation region 104 as shown and described in connection with FIG. 1b. Documents are fed, one by one, from a stack of documents placed in an input receptacle 502 onto a transport mechanism. The transport mechanism includes a transport plate or guide plate 606 for guiding a document to an output receptacle 608. Before reaching the output receptacle 508, the document can be, for example, evaluated, analyzed, counted and/or otherwise processed by an evaluation region 604. In one embodiment of the device 500, documents are processed at a rate in excess of 600 documents per minute. In another embodiment, documents are processed at a rate in excess of 800 documents per minute. In yet another embodiment, documents are processed at a rate in excess of 1000 documents per minute. In another embodiment, documents are processed at a rate in excess of 1200 documents per minute. In still another embodiment, documents are processed at a rate in excess of 1500 documents per minute.

The device 500 in FIG. 5 has a touch panel display 516 in one embodiment of the present invention which displays "functional" keys when appropriate. The touch panel display 516 simplifies the operation of the device 500. Alternatively or additionally physical keys, switches, or buttons may be employed, such as, for example, a keypad. In one embodiment, the touch panel display 516 includes denomination keys, such as disclosed in commonly assigned U.S. Pat. No. 5,790,697, previously incorporated by reference. The operator may also manually enter, via the touch panel display 516, information about the substitute currency media, such as the information described above in connection with FIGS. 2-3.

A pair of driven stacking wheels 527a and 527b are located in the output receptacle 508 and come into contact with the documents as the documents are transported into the output receptacle 508. The stacking wheels 527a and 527b are supported for rotational movement about respective shafts journaled on a rigid frame and driven by a motor (not shown). Flexible blades of the stacker wheels 527a and 527b deliver the documents onto a forward end of a stacker plate 652 shown in FIG. 6. In an alternate embodiment, the device 500 includes a stacking wheel 527a only, a stacking wheel 527b only, or neither a stacking wheel 527a nor a stacking wheel 527b.

According to one embodiment, the document scanning device 500 is compact, having a height (H_1) of about 9½ to 10½ inches, width (W_1) of about 10¾ to 11¾ inches, and a depth (D_1) of about 12 to 16 inches.

Like the device 200 shown and described in connection with FIGS. 2-4b, the device 500 shown and described in connection with FIGS. 5, 6 is adapted to halt or suspend operation when a no call or a suspect bill or an invalid substitute currency medium is detected. An operator of the device 500 may specify via the touch panel display 516 the location of the unidentified document, such as the last document to be presented to the output receptacle 508 before operation is halted or suspended. The operator may further manually enter information about the invalid substitute currency medium, such as the information described above in connection with FIGS. 2-3. In an embodiment in which the device 500 includes denomination keys, the operator may select one of the denomination keys after inspection of a no call bill or a suspect bill, and resume operation as if the no call bill or suspect bill had not been flagged.

Document Processing Device Having Dual Output Receptacles

FIGS. 7a and 7b illustrate an exterior perspective view and a side cross-sectional view, respectively, of a compact, document processing device 700 having dual output receptacles. The process for carrying documents through the device 700 is the same as discussed above, except that the device 700 has first and second output receptacles, 708a, 708b, respectively. A diverter 760, shown in FIG. 7b, directs the documents to either the first or second output receptacle 708a, 708b. When the diverter 760 is in a lower position, documents are directed to the first output receptacle 708a. When the diverter 760 is in an upper position, documents proceed in the direction of the second output receptacle 708b. Details of devices with multiple output receptacles are described in WO 97/45810 which is incorporated by reference in its entirety.

FIG. 7b shows a pair of stacker wheels 727a, 727b for delivering documents to the first and second output receptacles 708a, 708b. However, in alternate embodiments, the device 700 includes the stacker wheel 727a only, the stacker wheel 727b only, or neither the stacker wheel 727a nor the stacker wheel 727b.

The device 700 includes an evaluation region 704, such as the evaluation region 104 shown and described in connection with FIGS. 1a and 1b.

According to one embodiment the device 700 is compact having a height (H_2) of about 17½ inches, width (W_2) of about 13½ inches, and a depth (D_2) of about 15 inches. According to another embodiment, the device 700 has dimensions of: a height (H_2) of about 18 inches; a width (W_2) of about 13¾ inches; and a depth (D_2) of about 16 inches. The device 700 may be rested upon a tabletop, countertop, desk, or the like.

Like the embodiments described above in connection with a device having multiple output receptacles, the device 700 may be instructed by an operator via a control unit 716, which may include a touch panel display or other suitable interface, to direct certain documents to one or the other of the first and second output receptacles 708a, 708b. These modes may be pre-programmed or operator-defined. For example, according to one embodiment, genuine currency bills and valid substitute currency media are directed to the first output receptacle 708a, whereas non-genuine currency bills and invalid substitute currency media are directed to the second output receptacle 708b. According to another embodiment, genuine currency bills are directed to the first output receptacle 708a, valid substitute currency media are directed to the

second output receptacle 708b, and the device 700 is programmed to halt or suspend operation when a non-genuine currency bill or invalid substitute currency medium is detected by the evaluation region of the device 700. In one embodiment, the control unit 716 may include denomination keys, such as explained above. The control unit 716 may also be adapted to permit the operator to manually enter information about a flagged substitute currency medium, such as the information described above in connection with FIGS. 2-3.

Document Processing Device Coupled to a Coin Sorting Device

In other embodiments, the evaluation region 104 shown and described in connection with FIGS. 1a and 1b may be employed in a document processing device according to any of the embodiments just described which is coupled to a coin sorting device. In different embodiments, the coin sorting device is adapted to sort coins only or a combination of coins and tokens.

FIG. 8 illustrates a functional block diagram of a document processing device 800 coupled to a coin sorting device 8000 in accordance with one embodiment of the present invention. The document processing device 800 includes a communications port 818 and a controller 814, and is communicatively coupled to the coin sorting device 8000 via a cable 876. The coin sorting device 8000 includes a communications port 8018 and a controller 8014. The communications ports 818, 8018 may be any suitable communications port such as a serial or parallel port, USB port, and the like. In an alternate embodiment, the document processing device 800 and the coin sorting device 8000 communicate wirelessly, and the cable 876 is not included. In this alternate embodiment, the communications ports 818, 8018 are adapted to receive and transmit information wirelessly.

An operator places a stack of documents into the document processing device 800 for processing, and places a plurality of coins and/or tokens into the coin sorting device 8000 for sorting and counting. The document processing device 800 processes the stack of documents, and the controller 814 in the document processing device 800 stores information representative of the documents being processed, such as the denomination of the currency bills, the value of the substitute currency media, the number of non-genuine currency bills, the number of invalid substitute currency media, and so forth. The coin sorting device 8000 sorts and counts the coins or tokens, and the controller 8014 in the coin sorting device 8000 stores information representative of the coins or tokens being sorted and counted, such as the value and denomination of the coins (penny, dime, nickel, etc.), the number and kind of tokens, and so forth.

In some embodiments, the stored information in the coin sorting device 8000 is transmitted to the controller 814 of the document processing device 800. The document processing device 800 organizes and presents the combined information to the operator via a display, such as a monitor or touch screen. In other embodiments, the stored information in the document processing device 800 is transmitted to the controller 8014 of the coin sorting device 8000, which organizes and presents the information combined from both devices to the operator via a display, such as a monitor or touch screen.

Referring now to FIG. 9, there is shown a coin sorter system 9000. The coin sorter system 9000 includes a coin tray 9002 which receives coins of mixed denominations. The coins are sorted, counted, and are captured in a plurality of coin bins 9008 positioned on the exterior of the coin sorter system 9000. In alternate embodiments, the coins are captured in a plurality of coin bags.

The coin sorter system **9000** includes a control panel **9016**. In the illustrated embodiment, the control panel **9016** includes a display **9076** for displaying information about the coin sorter system **9000** and a plurality of keys **9078** for allowing the operator to enter information to the coin sorter system **9000**. In some alternate embodiments, the control panel **9016** includes a touch screen.

Additional details concerning the coin sorter system **9000** are disclosed in commonly assigned U.S. Pat. No. 6,139,418, entitled "High Speed Coin Sorter Having a Reduced Size," and U.S. Pat. No. 5,997,395, entitled "High Speed Coin Sorter Having a Reduced Size," each of which is herein incorporated by reference in its entirety. In one embodiment, the coin sorter system **9000** shown in FIG. 9 is modified to include a communications port such as the communications port **8018** one described in connection with FIG. 8. The coin sorter system **9000** may be further modified to perform the coin sorting and authenticating functions disclosed in U.S. Pat. Nos. 5,299,977, 5,453,047, 5,507,379, 5,542,880, 5,865, 673 and 5,997,395, each of which is herein incorporated by reference in its entirety.

Funds Processing Machine

In some embodiments, the evaluation region **104** of FIG. 1b may be incorporated into a funds processing machine capable of processing both documents and coins.

Referring now to FIG. 10a, a funds processing machine **1000** includes a touch screen **1016** to provide inputs from a user and to display outputs to be viewed by the user. While the touch screen **1016** is the preferred mode to enter data from the user, the funds processing machine **1000** may also include a mechanical keyboard, in addition to or in lieu of the touch screen **1016**, to receive such inputs.

The funds processing machine **1000** includes a coin receptacle **1044** which receives coins of a single denomination or of mixed denominations from a user. Additionally, an input receptacle **1002** is included within the funds processing machine **1000**. The input receptacle **1002** is illustrated in its open position in FIG. 10a and may be retracted by the funds processing machine **1000** once the bulk currency has been placed therein by the user. These input devices **1044** and **1002** allow the user of the funds processing machine **1000** to input his or her funds which will ultimately be converted to some other sort of fund source that is available to the user. In addition to banknotes, the input receptacle **1002** of the funds processing machine **1000** can also accommodate casino script, paper tokens, or bar coded tickets.

The funds processing machine **1000** includes a dispenser **1008a** and a dispensed coin receptacle **1046** for dispensing to the user the desired amount of funds in both bank notes and coins. A return slot **1008b** may also be included within the funds processing machine **1000** to return currency bills or substitute currency media to the user which cannot be authenticated or otherwise processed. Coins which cannot be authenticated may be returned to the user via the dispensed coin receptacle **1046**. The funds processing machine **1000** further includes a document dispenser **1020** for providing a user with a receipt of the transaction that he or she has performed.

In its simplest form, the funds processing machine **1000** receives funds (currency, coins, substitute currency media) via the coin input receptacle **1044** and the input receptacle **1002**, and after these deposited funds have been authenticated and counted, the funds processing machine **1000** returns to the user an amount equal to the deposited funds but in a different variation of bank notes and coins. For example, the user of the funds processing machine **1000** may input \$102.99 in various small bank notes and pennies and in turn receive a

\$100 bank note, two \$1 bank notes, three quarters, two dimes, and four pennies. Alternatively, the funds processing machine **1000** may simply return a receipt of the transaction or a barcoded ticket through the document dispenser **1020** which the user can redeem for funds by an attendant of the funds processing machine **1000**. Alternatively, the funds processing machine **1000** can credit a user's account.

The funds processing machine **1000** may also include a media reader slot **1042** into which the user inserts his or her identification card so that the funds processing machine **1000** can identify the user. The touch screen **1016** typically provides the user with a menu of options which prompts the user to carry out a series of actions for identifying the user by displaying certain commands and requesting that the user depress touch keys on the touch screen **1016** (e.g., a user PIN). The funds processing machine **1000** includes a card media reader device which is capable of reading from or writing to one or more types of card media. This media may include various types of memory storage technology such as magnetic storage, solid state memory devices, and optical devices.

FIG. 10b illustrates the funds processing machine **1000** in a side view illustrating the various modules. The document processing module **1004** receives documents from the input receptacle **1002** for processing. The inward movement of the input receptacle **1002** positions a stack of documents at the feed station of the document scanning and counting device which automatically feeds, counts, scans, authenticates, and sorts the documents, one at a time at a high rate of speed (e.g., at least 350 documents per minute). In place of or in addition to the input receptacle **1002**, the funds processing machine **1000** may include a single document receptacle which receives and processes one document at a time. The documents that are recognized by the document processing module **1004** are delivered to a storage area such as a currency canister (not shown). When a document cannot be recognized by the document processing module **1004**, it is returned to the customer through the return slot **1008b**. Exemplary machines which scan, sort, count, and authenticate currency bills as required by the bank note processing module are described in U.S. Pat. Nos. 5,295,196, 5,870,487 and 5,875,259, each of which is incorporated by reference herein in its entirety.

In place of or in addition to the input receptacle **1002**, the funds processing machine **1000** may include an input receptacle slot which receives and processes one document at a time. Such an input receptacle slot would be placed at the front of the funds processing machine **1000**.

Additional details of the funds processing machine **1000** are disclosed in commonly assigned, co-pending U.S. Pat. No. 6,318,537, entitled "Currency Processing Machine with Multiple Internal Coin Receptacles," which is herein incorporated by reference in its entirety.

In accordance with the present invention, the document processing module **1004** of the funds processing machine **1000** shown in FIG. 10b and described in U.S. patent application Ser. No. 09/562,231 is modified to incorporate the evaluation region **104** shown and described in connection with FIGS. 1a and 1b. The user deposits currency bills and substitute currency media into the input receptacle **1002**. As described in more detail below, the funds processing machine **1000** may be communicatively coupled to a casino gaming network. In such an embodiment, a casino customer may deposit a stack of casino cashout tickets and currency bills into the input receptacle **1002**, and the machine **1000** queries the casino gaming network for the payout amounts associated with the casino cashout tickets. This payout amount may be added to the customer's total such that the customer is dis-

pensed (via the dispenser 1008a for example) the total amount of currency deposited plus the value of any payout associated with valid cashout tickets.

The funds processing machine 1000 also includes a coin processing module 1048. The coin processing module 1048 sorts, counts and authenticates the mixed coins which are deposited in the coin input receptacle 1044 which leads directly into the coin processing module 1048. The coins are sorted in the coin processing module 1048 in a variety of ways but the preferred method is a sorting based on the diameter of the coins. When a non-authenticated coin is determined by the coin processing module 1048, it is directed through a coin reject tube 1054 towards the dispensed coin receptacle 1046. Thus, the user who has entered such a non-authenticated coin can retrieve the coin by accessing the dispensed coin receptacle 1046. Coin sorting and authenticating devices which can perform the function of the coin processing module 1048 are disclosed in U.S. Pat. Nos. 5,299,977, 5,453,047, 5,507,379, 5,542,880, 5,865,673 and 5,997,395, previously incorporated by reference. Alternatively, other coins sorters such as a rail sorter can be used to perform the function of the coin processing module 1048.

The funds processing machine 1000 further includes a document dispensing module 1040 which is connected via transport mechanism 1006 to the dispenser 1008a that is accessible by the user. The document dispensing module 1040 typically dispenses loose bills in response to a request of the user for such bank notes. Also, the document dispensing module 1040 may be configured to dispense strapped notes into the dispenser 1008a if that is desired. In one embodiment of the present invention, the user may select the denomination of the loose or strapped bills dispensed to the user. As noted above, the document dispensing module 1040 is modified in one embodiment to dispense both currency bills and substitute currency media. For example, in one embodiment, the document dispensing module 1040 may return to the user invalid substitute currency media. In addition, as mentioned above, the document dispensing module 1040 may dispense a barcoded ticket which the customer may redeem for funds.

The funds processing machine 1000 also includes a coin dispensing module 1050 which dispenses loose coins to the user via the dispensed coin receptacle 1046. The coin dispensing module 1050 is connected to the dispensed coin receptacle 1046 via a coin tube 1056. Thus, the user of the funds processing machine 1000 has the ability to select the desired coin denominations that he or she will receive in response to a transaction.

The coins which have been sorted into their denomination by the coin processing module 1048 are sent to coin tubes 1058 which correspond to each specific denomination. The coin tubes 1058 lead to a coin receptacle station 1052 for each of the denominations that are to be sorted and authenticated by the coin processing module 1048.

The funds processing machine 1000 includes a controller 1014 which is coupled to each module 1004, 1040, 1048, 1050 and 1052 within the funds processing machine 1000 and controls the interaction between each module. For example, the controller 1014 may review the input totals from the funds processing modules 1004 and 1048 and direct an appropriate funds output via the funds dispensing modules 1040 and 1050. The controller 1014 also directs the operation of the coin receptacle stations 1052 as described below. While not shown, the controller 1014 may also be coupled to a media reader associated with the media reader slot 1042 and also to a printer at the document dispenser 1020, if these devices are present in the funds processing machine 1000. The printer, for example, may print a barcoded ticket representative of the

amount of funds deposited by the customer, or the printer may print a receipt of the transaction.

Document Processing Device Coupled to a Computer Network

According to some embodiments of the present invention, any of the foregoing systems may be communicatively coupled to a computer network, such as a casino gaming machine network or a retailer network. Examples of such embodiments will be discussed next.

FIG. 11 illustrates a host system 1190 coupled to a plurality of document processing devices 1100a, 1100b, . . . 1100n. The document processing devices 1100a, 1100b, . . . 1100n may be any device shown or described in connection with FIGS. 2-10b. The host system 1190 is further coupled to a computer network 1192. The computer network 1192 provides the host system 1190 with real time information, such as information relating to the demands for particular types of coin receptacles and information about the substitute currency media detected by the document processing devices 1100a-n. In alternate embodiments, the computer network 1192 may be a casino gaming machine network or a retailer network. Each of these embodiments is discussed next.

In one embodiment, the computer network 1192 is a casino gaming machine network and includes a database for storing information about barcoded tickets that have been dispensed by the casino's gaming machines. When a barcoded ticket is dispensed, the ticket number is stored in a database along with the payout amount. A barcode, such as barcode 138 shown in FIG. 1b, encodes the ticket number and the payout amount. When the barcoded ticket is deposited into the document processing device 1110, the evaluation unit 104 of the document processing device 1100 reads the barcode on the barcoded ticket. If a valid barcode is read, the document processing device 1100 transmits the barcode number to the host 1190. The host 1190 queries the computer network 1192 for the payout amount associated with the barcoded number, and transmits the payout amount back to the document processing device 1100. The document processing device 1100 adds the payout amount to the running total of currency deposited by the operator into the machine 1100.

Alternatively, the barcode numbers associated with barcoded tickets identified by the document processing device 1100 are stored in the document processing device 1100. These numbers are periodically provided to the casino gaming machine network 1192. The casino machine gaming network 1192 may include a casino accounting system. The numbers are matched up with the payout amounts stored in a database associated with the casino machine gaming network 1192, and the payout amounts may then be reconciled in the casino accounting system.

In another embodiment, the casino gaming machine network 1192 is a retailer network that includes a retailer database for storing information about promotional media. For example, a retailer customer may deposit both currency bills and substitute currency media such as store coupons or gift certificates into a self-checkout station at the point of sale. The documents deposited at the self-checkout stations are deposited into a document processing device 1100. Documents from cash register tills may also be deposited into a document processing device 1100. The document processing device 1100 rapidly processes the documents, and identifies the barcode numbers from the barcoded media. These barcode numbers are then transmitted to the retailer network which determines the values associated with the barcode numbers (such as fifty cents off, or a \$50 gift certificate) by querying the retailer database. These values are then reconciled in the retailer's accounting system. Optionally, these

values may be transmitted back to the document processing device 1100 for display to the customer.

Operation of Document Processing Device

Turning now to FIG. 12, there is shown a flowchart describing the operation of a document processing device according to one embodiment of the present invention. Operation begins when an operator deposits documents into an input receptacle of a document processing device (step 1200). Operation may commence automatically, such as when a sensor detects the presence of documents in the input receptacle, or manually, such as when the operator actuates a switch, key, or button on the document processing device. The documents may include a combination of mixed currency bills and substitute currency media, or the documents may include currency bills only or substitute currency media only.

In some embodiments, the input receptacle is adapted to receive a stack of documents. In other embodiments, the input receptacle is adapted to receive one document at a time. The deposited documents are transported, one at a time, along a transport mechanism in the document processing device. In step 1202, a first document is transported past a media detector. In some embodiments, the media detector comprises a barcode reader adapted to scan for barcodes on a document. In step 1204, the media detector provides a signal representative of whether a valid substitute currency medium was detected. For example, if the barcode reader provides a "good read" signal in response to scanning the first document, the first document is a valid medium. However, if the barcode provides a "no read" signal, the first document is not a valid medium. If the first document is a valid medium, the first document is transported to an output receptacle (step 1206). Which output receptacle receives the first document depends on which output receptacle has been specified according to a preprogrammed or operator-defined mode. If there is only one output receptacle on the document processing device, then the first document is transported to that output receptacle.

Note that between steps 1204 and 1206, in some embodiments, the first document may be first transported to a bill facing mechanism before being transported to an output receptacle. According to some of such embodiments, the document processing device is adapted to determine which orientation the first document is facing, and if the first document is facing the wrong orientation, it can be transported to a bill facing mechanism. Alternatively, the desired face orientation can be predetermined either by the manufacturer or the operator. In other embodiments, the first document is not transported to a bill facing mechanism.

If a valid medium is not detected at step 1204, the document is transported past a currency detector at step 1208. If the currency detector detects an authentic currency bill (step 1210), the first document is transported to a pre-selected or operator-defined output receptacle at step 1212. The document processing device can also determine the denomination of the currency bill, and transport the first document to the appropriate output receptacle according to operator-specified instructions or preprogrammed instructions. In some embodiments, a genuine currency bill may optionally be transported to a document facing mechanism, such as the document facing mechanism 203 shown in FIGS. 2 and 3, for proper orientation before being transported to an output receptacle if the currency detector determines that the currency bill is not properly oriented.

In other embodiments, steps 1208 and 1202 are reversed, such that a document is first transported past a currency detector and then past a media detector. In still other embodiments, steps 1202 and 1208 (or steps 1208 and 1202) are

performed before steps 1204 and 1210 (or steps 1210 and 1204). In other words, in these other embodiments, the documents are transported past the media and currency detectors (in any order), and then the document processing device determines whether the document is a valid medium or authentic currency bill. Note that in the embodiments in which the document processing device has only a single output receptacle, steps 1206 and 1212 are identical because both valid media and authentic currency are transported to the same output receptacle.

At step 1214, the document processing device determines whether it is instructed to halt on detecting an unacceptable document, i.e., a document that is neither valid media nor authentic currency, such as a blank piece of paper. These instructions may be operator-specified or preprogrammed. In some embodiments, the document processing device is adapted to determine whether an unacceptable document is an invalid medium or a non-genuine currency bill, and can receive separate instructions on handling each. If the device is instructed to halt on detecting an unacceptable document, the operation of the device is halted or suspended at step 1216 to permit inspection and/or removal of the unacceptable document. At step 1218, operation of the device is restarted once the unacceptable document has been inspected and/or removed from the document processing device, and operation continues at either steps 1200 or 1222 depending on preprogrammed or operator-specified instructions. In some embodiments, the operator may, upon inspection, determine a bill's denomination. In such embodiments, the operator may manually enter the denomination of a currency bill, such as via a denomination key, deposit the bill into an output receptacle, and resume operation. In another embodiment, the operator may, upon inspection, determine information about the unacceptable substitute currency medium, such as the information described above.

Returning to step 1214, if the document processing device is instructed to offsort unacceptable documents, the unacceptable document is transported to the offsort receptacle at step 1220. The particular offsort receptacle which is to receive unacceptable documents may be operator-specified or preprogrammed. In embodiments in which the device is adapted to discriminate between invalid media and non-genuine currency bills, the unacceptable document may be routed to one of two offsort receptacles depending on what kind of unacceptable document was detected. This routing decision may be made under the control of operator-specified or preprogrammed instructions.

If there are no further documents to be processed at step 1222, the device may optionally display information associated with the processed documents at step 1224. This information may include any combination of the following according to one or more different embodiments: the total amount of authentic currency bills processed (e.g., \$15,567); a breakdown of the denominations of currency bills processed (e.g., 140 \$1 bills, 147 \$5 bills, 268 \$10 bills, and so on); the total number of valid media detected (e.g., 156 pieces of valid media processed); barcode information detected from barcoded media (e.g., barcode number 12345678); the total number of flagged currency bills processed (e.g., 5 flagged bills, where 3 bills are no call bills, 1 bill is a suspect bill, and 1 bill is both suspect and no call); the total number of invalid media detected (e.g., 16 pieces of invalid media processed); the total amount of media detected (e.g., \$10,000 in media processed); the total number of unidentified documents—i.e., documents which were neither determined to be a currency bill nor a valid substitute currency medium, such as a blank piece of paper for example—detected (e.g., 27 pieces of unidentified

documents processed); why a particular currency bill was not authenticated (e.g., 4 bills failed magnetic strip test, 2 bills failed ultraviolet test); the total number of documents processed (e.g., 11,253 documents processed); the number of batch identification cards processed (e.g., 4 batch identification cards processed); identification information of the gaming machine from which a batch of currency bills and substitute currency media originated based on information encoded on a batch identification card (e.g., batch identification card number 12345 which identifies gaming machine number 42); and other suitable information.

At step 1226, the device may optionally generate a report based on some or all of the information displayed at step 1224. This report may be formatted and displayed to the operator, and/or it may be printed, and/or it may be transmitted to a network computer for storage or further manipulation.

Note that in the embodiments described in connection with FIG. 12, the device may further include a coin sorting device in which coins are also processed. The information associated with the processed coins may be combined with the information associated with the processed documents. A single or separate reports may be generated based on the processed coins and processed documents.

Turning now to FIG. 13, there is shown a flowchart further describing the operation of a document processing device according to any embodiment described in connection with FIG. 12. At step 1300, documents are deposited into an input receptacle of a document processing device. The documents may include a combination of mixed currency bills and substitute currency media, or they may include currency bills only or substitute currency media only. At steps 1302 and 1304, the device determines whether a first document is a valid barcoded ticket or whether a first document is an authentic currency bill. Note that steps 1302 and 1304 can be performed in any order. If a document is determined to be a valid barcoded ticket, the barcode number associated with the bar-coded ticket is stored in a memory location at step 1306. At step 1308, if a document is determined to be an authentic currency bill, the value of the currency bill is added to the value of all authentic currency bills scanned since step 1300. This value may be initialized to zero or may be initialized to some other number, such as a number representing the total amount of another batch of currency bills which was processed by the document processing device. If the first document is determined to be neither a valid barcoded ticket nor an authentic currency bill, it may be processed at step 1310 in accordance with steps 1214, 1216, 1218, and 1220 described in connection with FIG. 12 hereinabove.

At step 1312, the device determines whether any more documents remain to be processed. If there are, operation continues at step 1302 until there are no further documents to be processed. If no further documents are to be processed, the device retrieves the values associated with the stored barcode numbers from a computer network at step 1314. Alternatively, after each instance in which the device detects a barcode number, the device may retrieve the value associated with the barcode number from the computer network. The computer network may be a casino gaming machine network or a retailer network, for example. In a casino gaming environment, the barcode numbers may be associated with bar-coded cashout tickets. In the retailer environment, the barcode numbers may be associated with store coupons, gift certificates, or other barcoded promotional media. In the casino gaming environment, one or more databases may be linked to provide information about the player who redeemed the ticket, when the ticket was dispensed, when the ticket was redeemed, and so forth, based on the barcode number from a

cashout ticket. In the retailer environment, one or more databases may be linked to provide information about the product associated with the promotion, manufacturer data, and customer information based on data associated with customer loyalty cards, for example. This information and the other information described in connection with FIG. 12 may be included in a report generated by the device at step 1316. All or a portion of this generated report may be displayed and/or printed and/or stored or transmitted for later retrieval or further manipulation.

Additional details concerning the operation of a document processing device according to the present invention may be found in connection with the description of FIGS. 1a-11 above.

FIG. 13a illustrates a method of processing documents including currency bills and substitute currency media bearing more than one barcoded pattern in a document processing device according to any embodiment described in connection with FIG. 12. A plurality of documents are deposited into an input receptacle of a document processing device at step 1320. The document processing device determines whether the documents under consideration is an authentic currency bill at step 1322. If the document is an authentic currency bill, the bill's denomination is determined and, at step 1326, the value of the bill is added to a running total of the value of currency bills processed. If the document is determined not to be an authentic currency bill, the document processing device checks whether the document is a valid substitute currency medium at step 1324. Note that the sequence of steps shown in FIG. 13a are not necessarily presented in the order in which they are performed. For example, step 1324 could be performed before or concurrently with step 1322.

In the specific case where the substitute currency media are barcoded tickets, a valid substitute currency medium is detected when a media detector successfully decodes the barcoded patterns imprinted on the barcoded ticket into sets of meaningful characters. In a specific embodiment, one set of meaningful characters is a ticket number, and another set of meaningful characters is a value or amount of currency. Thus, a value of \$12BB, for example, would not be a meaningful set of characters and the document would be flagged as an invalid substitute currency medium and processed as such at step 1334. Similarly, the ticket numbers may have to conform to a set of predetermined rules, such as being a six-digit number followed by an alphabet letter. Thus, a ticket number of 1234567 would not be a meaningful set of characters, and a document bearing that ticket number would be flagged and processed as an invalid substitute currency medium.

At step 1334, operation of the document processing device may be halted or suspended, or the invalid substitute currency medium may be directed to a reject output pocket, for example. If a valid substitute currency medium is detected, the first barcoded pattern is decoded into a ticket number at step 1328. The second barcoded pattern is decoded into a value at step 1330, and the ticket number and the value are stored to a file at step 1332.

At step 1336, the document processing device determines whether there are any more documents to be processed. If so, processing continues at step 1322. If there are no further documents to be processed, the document processing device transmits the ticket numbers and values generated at either or both of steps 1326 and 1332 to an accounting system for reconciliation at step 1338. Alternately, the document processing device can copy the file to a storage medium such as a floppy disk. The machine operator may then present the floppy disk to the accounting system for reconciliation. At

step 1340, an optional report may be generated containing a summary of the processed documents.

Control Unit

Referring back to FIG. 1a, there is shown a control unit 116 which may be employed in any embodiment shown or described herein. As previously explained, the control unit 116 may comprise a desktop computer comprising a monitor and keyboard; a touch screen; or a panel including a display and keys, switches, or buttons. In addition, the control unit 116 may comprise a touch/video display, which is described below.

FIG. 14 illustrates a functional block diagram of a touch/video display 1400 according to one embodiment of the present invention. The touch/video display 1400 is a display that comprises a touch portion 1402 and a video portion 1404. The touch portion 1402 of the display 1400 operates as a touch screen, accepting input from the operator through actuation of specific areas 1406, 1408 on the touch portion 1402. The touch portion 1402 may also display information to the operator. The video portion 1404 of the display operates as a video display. For example, an operator of a document processing device in accordance with any embodiment shown or described herein may need assistance in operating the device. In a training mode, for example, the touch/video display 1400 would receive input from the operator indicating a desired area of training (such as clearing document jams, for example) via the touch portion 1402 of the touch/video display 1400, and would display a video presentation, for example, of the desired area of training on the video portion 1404. The video presentation could direct the operator to perform various tasks as part of the training mode, pausing to permit the operator to complete a task, and then resuming when the operator so indicates by touching a specific area on the touch portion 1402 of the touch/video display 1400, such as specific area 1406. In alternate embodiments, the touch/video display 1400 may be employed to provide interactive help or instructional presentations regarding various operations of the document processing device, or to communicate messages such as advertisements or other information to an operator.

As described above, an operator may select via the control unit 116 any one of a multitude of preprogrammed or user-defined modes, such as those disclosed in U.S. Pat. No. 6,278,795, entitled "Multi-Pocket Currency Discriminator," in U.S. Pat. No. 6,460,705, entitled "Method of Creating Identifiable Smaller Stacks of Currency Bills Within a Larger Stack of Currency Bills," and in co-pending U.S. patent application Ser. No. 09/688,538, entitled "Currency Handling System Having Multiple Output Receptacles," which was filed on Oct. 16, 2000, previously incorporated by reference. The operator may select these and other modes via an interface such as the control unit 116 shown in FIG. 1a and described above.

System of Networked Document Processing Devices

FIG. 15 is a diagram of a system 1500 for processing currency bills and substitute currency media which generally includes gaming machines 1502, 1504, 1506, document processing devices 1508, 1510, and a network 1512. While FIG. 15 describes embodiments in a casino environment, other environments such as a retailer or an amusement park, for example, are contemplated. In a retailer environment, the gaming machines 1502, 1504, 1506 are replaced with document accepting devices, such as self-checkout stations. In an amusement park environment, the gaming machines 1502, 1504, 1506 may be replaced with vending machines or other document accepting devices suitable for use in amusement park environments. In short, the gaming machines 1502,

1504, 1506 may be any document accepting device suitable for use in a particular environment. A document accepting device includes a document acceptor for accepting a document, such as a currency bill or a substitute currency medium.

5 A casino environment includes a first gaming machine 1502, a second gaming machine 1504, and an nth gaming machine 1506 arranged about a casino floor. Casino patrons play games of chance on the gaming machines 1502, 1504, 1506 during which currency bills and substitute currency media are received and dispensed. At certain predetermined times, such as daily, hourly, every six hours, and so forth, or upon the occurrence of certain events, such as a full condition reported by a bill validator box, a casino operator empties the bill validator boxes which contain stacks of documents 1518, 1520, 1522 from the gaming machines 1502, 1504, 1506, respectively. The stacks of documents 1518, 1520, 1522 are brought into a soft-count room in a secure area of the casino for processing. One or more of the stacks of documents retrieved from the gaming machines are deposited into an 10 input receptacle of a document processing device within the soft-count room. In FIG. 15, the stacks of documents 1518, 1520 retrieved from the first gaming machine 1502 and the second gaming machine 1504 are deposited into the input receptacle of a first document processing device 1508. The stack of documents 1522 retrieved from the nth gaming machine 1506 is deposited into the input receptacle of a mth document processing device 1510.

The document processing devices 1508, 1510 may be any document processing device shown and described above such as those described in connection with FIGS. 1a-11. They are communicatively linked via a host 1536 to the network 1512 such as described in connection with FIG. 11. The first document processing device 1508 processes the stack of documents deposited in its input receptacle and identifies authentic currency bills and their denominations, no call bills, suspect bills, valid substitute currency media, or invalid substitute currency media. Depending on the number of output receptacles present in the document processing device 1508, authentic, no call, and suspect bills and valid and invalid 15 substitute currency media will be directed to one or more of the output receptacles of the machine 1508. Likewise, the mth document processing device 1510 processes authentic currency bills whose denominations can be determined, valid substitute currency media, no call and suspect bills, and invalid substitute currency media.

In some embodiments where the substitute currency media include a barcoded pattern encoding a ticket number, the ticket numbers of the valid substitute currency media processed in the document processing devices 1508, 1510 are stored in a file in a storage medium such as the storage medium 119 shown in FIG. 1c. The file containing the ticket numbers is presented to a ticket tracking system 1516 which, according to one embodiment, is coupled to the network 1512. In other embodiments, the ticket numbers are stored in a floppy disk which is presented to the ticket tracking system 1516. The ticket tracking system 1516 compares the ticket numbers in the file with the ticket numbers stored in a ticket database 1538 and retrieves the values associated with each ticket number from the ticket database 1538. The ticket numbers and values are presented to an accounting system 1514 for reconciliation.

60 The gaming machines 1502, 1504, 1506 are communicatively coupled to the network 1512. In one embodiment, the information encoded on the batch identification cards placed in the gaming machines is maintained in the accounting system 1514, which information includes the identity of the 65 gaming machine in which the batch identification card is

placed. The batch identification cards may be generated by a portable device carried by casino operators who empty the bill validator boxes from the gaming machines. When a bill validator box is emptied, the portable device dispenses a batch identification card bearing a barcoded pattern representative of the name or number of the gaming machine into which the card is placed. After the bill validator box fills up with currency bills and substitute currency media, the batch identification card, the currency bills, and the substitute currency media are placed into a document processing device for processing. The barcode on the batch identification card is decoded and stored in a file along with information about the currency bills and substitute currency media processed by the document processing device.

FIG. 16 is a diagram of a system 1600 for processing currency bills and substitute currency media which generally includes a gaming machine 1602 coupled to a network 1604. The network 1604 is coupled to an accounting system 1606 and a ticket-tracking system 1608. The casino operator optionally places a batch identification card at the bottom of the bill validator box in the gaming machine 1602. The batch identification card includes a barcoded pattern that encodes the identity of the gaming machine and/or is otherwise associated with the gaming machine such as by the accounting system associating the barcoded information on the card with the particular gaming machine. During operation, casino patrons will insert currency bills and substitute currency media into the bill acceptor slot of the gaming machine 1602. At predetermined intervals (hourly, daily, etc.) or upon the occurrence of a certain condition (e.g., the bill validator box is full), the casino operator will remove the bill validator box and bring it into the casino's soft-count room. The bill validator box contains a stack of documents 1616 that includes a batch identification card 1610, a plurality of currency bills 1612, and a plurality of barcoded tickets 1614.

The casino operator removes the stack of documents 1616 and places them into the input receptacle of a document processing device 1650. The document processing device 1650 may be any document processing device shown and described in connection with FIG. 1a, 1b, or 1c. In the illustrated embodiment, the documents are transported, one at a time, past one or more currency detectors 1618 and one or more barcode readers 1620, though not necessarily in that order. The currency detector 1618 is adapted to detect characteristic information associated with the authenticity and denomination of currency bills, and communicates information indicative of the denomination of an authentic currency bill to a controller in the document processing device. The denomination information is stored as processed document data 1630.

If the document under consideration includes one or more barcoded patterns, the barcoded patterns on the ticket are scanned by the barcode reader(s) 1620 and decoded into characters. For example, the barcoded pattern on a batch identification card would be decoded into a batch identification number 1622, which is a number associated with the gaming machine 1602. A first barcoded pattern of a multi-barcoded ticket would be decoded into a ticket number 1624. A second barcoded pattern would be decoded into a value 1626 representing the currency amount for which the barcoded ticket was redeemed. The values of the authentic currency bills processed, the batch identification number 1622, the ticket numbers 1624, and the values 1626 form the processed document data 1630. The processed document data 1630 is stored in a file on a floppy disk, a hard drive, a network drive, or any other suitable storage medium.

After the documents are processed, they are directed to one or more output receptacles at step 1628. The processed document data 1630 is provided to the network 1604. In an alternate embodiment, the processed document data 1630 may be provided to the accounting system 1606 or the ticket tracking system 1608. When the processed document data 1630 includes ticket numbers and values, the processed document data 1630 can be provided either via the network 1604 or directly to the accounting system 1606 for reconciliation.

10 The gaming machine 1602 is also coupled to the network 1604. The gaming machine 1602 produces preprocessed document data 1632 during operation. The preprocessed document data 1632 includes information about the currency bills inserted into the bill validator or acceptor in the gaming machine 1602 and information about the barcoded tickets redeemed at the gaming machine 1602. The preprocessed document data 1632 is provided via the network 1604 to the accounting system 1606 or the ticket tracking system 1608. After the processed document data 1630 is received in the 15 accounting system 1606, the two sets of data are compared for discrepancies.

20 The ticket tracking system 1608 keeps track of the tickets dispensed and the tickets redeemed, and prevents redemption of the same ticket number more than once. For example, when a casino patron redeems a barcoded ticket at the gaming machine 1602, the ticket number may be flagged by the ticket tracking system 1608 as redeemed. Thus, for example, if the casino patron attempted to redeem a photocopy of the barcoded ticket he just redeemed, the ticket tracking system 1608 would inform the gaming machine 1602 not to award any credits or dispense any currency bills for that ticket.

25 In some embodiments, the bill validator in the gaming machine 1602 is adapted to detect only the ticket number from a barcoded ticket, even if the value is also encoded on the ticket. In such embodiments, when the barcoded ticket is redeemed in the bill validator of the gaming machine 1602, the gaming machine 1602 transmits the ticket number to the ticket tracking system 1608. The ticket tracking system 1608 looks up the ticket number in a database 1634, and the database 1634 returns the value associated with that ticket number. The ticket tracking system 1608 then credits the gaming machine 1602 with the value retrieved from the ticket database unless the ticket database 1608 indicates that the ticket has already been redeemed.

30 45 In other embodiments, the casino patron redeems a ticket at a redemption machine (not shown) by inserting the ticket into the device which validates the ticket and dispenses currency bills and/or coins commensurate with the value of the ticket. In such embodiments, the redemption machine is coupled to the ticket tracking system which keeps track of the tickets in the same manner as described above.

50 55 As explained in connection with FIG. 15, the system described in FIG. 16 is not limited to the casino environment, but other environments such as a retailer and amusement park environments, for example, are contemplated. In addition, in some embodiments, the ticket tracking system 1516 of FIG. 15 may be incorporated into or a part of the accounting system 1514, or vice versa. In other embodiments, the ticket tracking system 1608 of FIG. 16 may be incorporated into or a part of the accounting system 1606, or vice versa.

55 60 As indicated above, there are occasions where a bank or a casino have a large number of small batches. In other words, each batch, or sub-batch, might consist of as few as 0 notes (e.g., some casinos will process empty batches for completeness purposes) to maybe 100, 200, 300, or more notes. But the capacity of a typical input receptacle, also referred to as a hopper or feeder area, is much larger. FIGS. 17-22 illustrates

methods that focus on running a sequence of batches in a near continuous manner, i.e., multiple-batch processing. The continuous flow of multiple small batches enables the operator to perform other tasks or functions while the machine is mirroring these various batches. And although a hopper might be able to hold 3, 4, 10 or even 20 batches, it is generally desirable to be able to identify each batch within the hopper with a source from which the batch came, or with other information associated with the batch. With reference to FIG. 17, at step 1702 a source identification information (Source ID) is associated with a batch. The Source ID can be disposed on a barcode card (also referred to as a source identification card) placed in, for example, a gaming machine after the previous batch from that machine is emptied, or associated with the batch after the batch is emptied from that gaming machine. The Source ID represents a set of characters that indicate the device with which the batch is associated, e.g., the gaming machine from which the batch was retrieved. For example, ten slot machines at a casino are emptied, each slot machine has a barcoded header card, to, for example, designate slot 1 for the first batch of documents, slot 2 for the second batch of documents, and so on. At step 1704 the batches of documents are delivered, individually or collectively, to a processing location. At step 1706, the Source ID for batch 1 is entered in memory of the processing machine. The memory can be external to the processing machine, such as in a PC, or internal to the processing machine. The Source ID can be entered by barcode scanning with, for example, a barcode gun, or it can be keyed in via a keyboard, OCR-scanned, MICR-scanned, or detected via infrared, for example. At step 1708, the Source ID for the i^{th} batch is entered in memory. The identification information for each batch is entered until at step 1710, the Source ID for batch n is entered in memory. At step 1712, batch 1 is loaded into the processing device with a separator card. The separator card may be the barcode card comprising the Source ID, or a blank card, or some other appropriate separation structure. Alternatively, the separator may be part of the processing device.

In one embodiment, the Source ID, which is captured from the source identification card, can be compared to a database (or any information library). The comparison can be used, for example, to validate the Source ID. The database can reside on the processing device or can be remotely accessible.

At step 1714, batch i is loaded into the processing device with a corresponding separator card. At step 1716, batch n is loaded into the processing device with a separator card. Batches 1 through n may be loaded at one time, if the input receptacle has enough capacity, or in groups of batches. At step 1718 multiple-batch processing is begun. If all of the batches could not be loaded, the remaining batches can be loaded as device capacity permits.

Continuing with the above example concerning ten gaming machines, assume ten batches can be loaded into the feeding area, or hopper, of the processing device. A barcode gun can be used to capture the Source ID from the header card for the first batch of currency at any time during document processing, including prior to feeding or loading the batches, as the batches are being fed into the machine, after some of the batches have been processed, or after all of the batches have been processed. The barcode gun can be used to capture the Source ID from the header card for the second batch, and then the second batch is placed in the feeding area. The header card for the third batch can be barcode gunned (scanned), and the third batch placed in the input receptacle. This process continues until all ten batches are placed in the feeding area. The start key of the processing device is pressed and the processing device begins to run to process the currency.

At step 1720, documents are transported, in seriatim, through the processing device. The device determines, at step 1722, whether or not a document is a separator card. If the document is a separator card, which in some embodiments is a barcode card, the card does not have to be read by the processing device as the card passes through the processing device. The card does not have to be read because the data on the card has already been captured by, for example, barcode gunning (scanning) the header card before loading the corresponding batch.

At step 1724, after determining the document is a separator card, the card is sent to a reject receptacle, such as the upper output receptacle 208a of FIG. 2. At step 1726, if the separator card is being used as a header card (positioned in front of the batch) the controller associates information based on processing subsequent documents, until the next separator card is detected, with a corresponding Source ID already stored in memory. Alternatively, if the separator card is used as a trailer card, information based on processing documents between the previous separator card, e.g., the card for batch i-1, and the present separator card, e.g., the card for batch i, is associated with the Source ID for batch i. Since the batches of documents are processed in a sequence consistent with the sequence in which source identification information was entered, the entries in memory of source identification information can be stepped through to match up information based on processing a batch of documents.

At step 1728, where the document is not a separator card, the document is processed for characteristic information to, for example, determine a denomination. At step 1730, the memory is updated with information based on processing the document. And at step 1732, the loop is continued until there is not another document, and then multiple-batch processing ends, at step 1734.

FIG. 18 illustrates a variation of the method illustrated in FIG. 17. At step 1810, the barcode card for batch 1 is scanned to enter the Source ID corresponding to batch 1 into memory. At step 1812, batch 1 is loaded in the processing device, along with the barcode card associated with batch 1. This scanning and loading continues for each batch; at step 1814, the barcode card for batch i is scanned. At step 1816, batch i is loaded in the processing device along with the barcode card for batch i. This process continues until, at step 1818, the barcode for batch n is scanned to enter the information for batch n into memory. At step 1820, batch n is loaded in the processing device along with the barcode card for batch n.

At step 1830, multiple-batch processing is begun. And as discussed in relation to FIG. 17, the barcode card may be scanned prior, during, or after processing of the documents. At step 1832, documents are transported, one at a time, through the processing device. At step 1834, the processing device determines if the document is a barcode card. If the document is a barcode card the device sends the card, at step 1836, to reject. If the document is not a barcode card, the processing device, at step 1838, determines if the document is a reject, e.g., an unreadable document. If the document is a reject then, at step 1840, the processing device sends the document to reject.

If the document is not a reject, then at step 1842, the processing machine processes the document to obtain characteristic information. At step 1844, memory is updated based on the information obtained from processing the document at step 1842. For example, the count of documents processed for the batch, or the current multiple-batch run, is incremented. Similarly, the total value for the batch may be adjusted based on the document.

If, at step 1846, there is another document to process, then the processing device determines, at step 1834, if the document is a barcode card. If there is not another document, then at step 1848, the processing device queries the operator as to whether or not there are any rejects, e.g., non-machine-readable documents to key in manually. If there are rejects to key in, then at step 1850, the operator can manually key in the rejects associated with the then current batch. If there are no rejects to key in, then at step 1852 the document information in memory for the batch is matched with the batch barcode information for that batch on a sequential basis due to the batches being processed in a sequence consistent with that in which the barcode information was entered.

At step 1854, the processing device determines if there are any more active batches. If there are more active batches then the device, at step 1848, cues the operator as to whether or not there are any rejects to key in. The rejects for the batches are keyed into the processing device in a sequence consistent with the sequence in which the batches were processed. If there are no more active batches, then at step 1856, multiple-batch processing is ended.

Rather than feeding the stacks of documents directly into the input receptacle of the machine, a stack of currency can be removed from a slot machine and placed into a cartridge or cassette with a retractable front gate and a unique number. The header card from the slot machine is electronically scanned or inputted manually and placed either in the front or in back of the stack of currency. The cartridge includes a pressure assembly to keep forward pressure on the documents as they are fed into the feeding mechanism of a document processing machine. This process is repeated for other slot machines until the cartridge is full. The cartridge is placed into the feeding mechanism and its unique number is entered manually or automatically into the machine. During processing, when a header card is present, the machine does not interpret the information encoded on the card. The header cards of each batch are sent to a reject pocket along with any rejected currency identified in the respective batch. The cartridge loading station terminal could be networked to the customer's host computer system whereby the transaction numbers could be downloaded to cross-check the validity of the entered number and provide the currency processing employees with a list of missing or duplicate entries.

FIG. 19 illustrates an alternate method of multiple-batch processing. At step 1910, the barcode card for the batch 1 is gun scanned. The barcode card for batch 1 is replaced, at step 1912, with a separator card. At step 1914, batch 1 is loaded into the processing device along with the separator card. This routine is repeated for each subsequent batch. For example, at step 1916 batch is loaded into the processing device along with a separator card. After all the batches are loaded into the processing device, into the feed hopper, for example, then at step 1918 multiple-batch processing is started. If the total quantity of documents of the batches exceeds the capacity of the feed hopper, the batches can be processed in groups, where each group includes multiple batches.

Each document is then transported one at a time through the document processing device. If, at step 1920, a document is determined to be a separator card, then the device, at step 1922, sends the card to reject. In methods in which the separator card is used as a header card, the processing device then, at step 1924, sets a flag indicating a separator card has been reached so that information from processing documents between this separator card and the next separator card will be associated with bar code information corresponding to this separator card. The barcode information in memory is associated with the information from document processing on a

sequential basis. For example, the barcode information entered from the i^{th} barcode will be associated with the information obtained for processing documents of the i^{th} batch of documents. The barcode information entries in memory can, for example, be stepped through on a first-entered-first-batch basis or a last-entered-first-batch basis. In methods in which the separator card is used as a header card, the documents following the i^{th} header card belong to the i^{th} batch of documents. In methods in which the separator card is used as a trailer card, then the information from processing documents between the previous separator card and the current separator card are associated with the current separator card. Then the current separator card, the i^{th} separator card, is associated with the i^{th} barcode information in memory, on a sequential basis.

If at step 1920 the document is not a separator card, then at step 1930, if the document is a reject, e.g., not readable or not genuine, then the document is, at step 1932 sent to reject. If the document is not a reject, then, at step 1940, the document is processed to, for example, determine its denomination. Memory is updated at step 1942. For example, the number of documents processed and the total denomination for a particular batch may be determined and stored in memory. That information is matched to, for example, the proper source ID in memory by stepping through source IDs in memory, by, for example, taking one step for each batch processed.

If, at step 1950, there is another document to be processed, then the process continues again, at step 1920. Multiple-batch processing ends at step 1960, if there is not another document to process.

FIG. 20 illustrates a method of processing documents similar to that of FIG. 19, except that the barcode card is not replaced with a separator card. At step 2010 the barcode card for batch 1 is gun scanned. At step 2012, batch 1 is loaded into the device without the barcode card. In a variation, batch 1 is loaded into the device, without a barcode card, before the information from the barcode card is gun scanned.

At step 2014, the barcode card for batch 2 is scanned. Batch 2 is then, at step 2016, loaded into the device without corresponding barcode such that a paddle separates batch 1 and batch 2. This general routine continues until at step 2018, multiple-batch processing is begun.

With reference to the i^{th} batch, at step 2020, the document processing device transports documents from batch i , one at a time, through the device. Each document of batch i is, at step 2022, processed to assess document characteristics. And then, at step 2024, the processing device automatically advances the paddle separating batch i from batch $i+1$. At step 2026, a separator is sent from a printer to reject to separate rejects of batch i from rejects of batch $i+1$. Then at step 2028 documents from batch $i+1$ are transported, one at a time, through the processing device. And at step 2030, batch $i+1$ documents are processed.

The separator is not required to be ejected from the printer to the reject receptacle, e.g., output receptacle 208c or 208a, prior to beginning to transport documents from batch $i+1$ through the device. The controller controls sequencing such that documents from $i+1$ that are rejected do not enter the reject until after the separator ejected from the printer enters the reject. This general process continues until, at step 2032, multiple-batch processing is complete.

As an alternative to the paddle method, another embodiment uses a sequence of input receptacles, each of which contains one batch to be sorted. The batches include header cards with either barcodes to be scanned or data to be entered manually using a keyboard. The receptacles are configured in-line, or in a "lazy susan" configuration. The receptacles

approach the feeder sequentially, and when the first receptacle is empty, the second receptacle move to the feeder. This process continues until all input receptacles are empty. To differentiate the source of the bills in the reject receptacle, in an embodiment, a printer is coupled to the device and prints a card that is placed in the reject receptacle at the start of each batch processed. The information printed on the card informs the user as to which bills in the reject receptacle correspond to which batch sorted.

FIG. 21 illustrates yet another method of multiple-batch processing. At step 2110, batch 1 is loaded with a header card in the processing device. And each batch is loaded with its header card in succession into the processing device with its header card. For example, at step 2112 batch i is loaded with its header card in the processing device. And then at step 2114 multiple-batch processing is begun.

If, at step 2116, a document is determined to be a header card, then at step 2118, the card is sent to reject. At step 2120 a flag is set or pointer is moved in memory to indicate a separation between batches has been reached. If at step 2116 the document card is not a header card, then at step 2130, the document is processed to assess characteristic information. At step 2140 the memory is updated to reflect information from processing that document.

If at step 2150 there is another document to process, then processing continues again at step 2116. After all the documents have been processed, then at step 2160 information from each of the header cards, which have been collected in reject, e.g. output receptacle 208a or 205c, are entered into memory on a sequential basis. Then, at step 2170 document information in memory for each batch is matched with header information that has been entered for each batch on a sequential basis. To simplify the matching process, the information from the header cards, e.g. source ID, should be entered into memory in an order consistent with the order in which the batches were processed. As an alternative to matching document information in memory after all of the header card information has been entered, document information for each batch can be matched with information as the information from each card is entered from a header card that has been collected in reject.

FIG. 22 illustrates a method of multiple-batch processing in which rejected currency is keyed in for each batch. Similar to what has been described with respect to some methods above, at step 2210 batch 1 is loaded into the processing device with a header card. Loading continues until the feed hopper is full or all the batches have been loaded. And then at step 2220 multiple-batch processing is started. If at step 2230 there is not another document to process, then at step 2232 the processing device prompts the operator to key in rejected currency for batch n. In step 2234 document information in memory batch n is updated. At step 2236 the processing device queries the operator as to whether there is more rejected currency for batch n. If there is more rejected currency for batch n, then the operator returns to step 2232 to key in more rejected currency.

In one method the operator enters all the rejected currency for a given batch, without the processing device prompting the operator each time for additional rejected currency from that batch. After the rejected currency for the given batch is entered, the operator notifies the processing device that all rejected currency for the given batch has been entered.

If there is no additional rejected currency for batch n, then at step 2238 the operator enters header card information for batch n from header card n collected in reject. At step 2240, document information in memory for batch n is matched to information from header card n.

This general process of entering rejected currency and header card information continues for each batch. For example at step 2242 rejected currency for batch i is keyed in. At step 2244 document information in memory corresponding to batch i is updated with the keyed in information. At step 2246, header card information for batch i is entered. And then at step 2248 document information for batch i is matched to header card information from header card i. This process continues until the header card information for batch 1 is entered, at step 2250. At step 2260, document information for batch 1 is then matched with information obtained from header card 1 that was collected in reject.

FIG. 23 illustrates a document processing device 2300 that is suited for multiple-batch processing. Document processing device 2300 is similar to the processing device 200 illustrated in FIGS. 2 and 3 above. Accordingly, previously-described components are not discussed here. Processing device 2300 includes a barcode gun 2302, connected to memory, for entering source identification information from a barcode card into memory. After scanning the barcode for batch 1, batch 1 is loaded into the input receptacle 202 at a first location 2304 in the input receptacle 202. After scanning the barcode card for batch 2, batch 2 is loaded into the input receptacle 202 at a second position 2306 of the input receptacle 202 such that a paddle 2308 separates batch 1 from batch 2.

After the nth batch is placed in the input receptacle 202, multiple-batch processing is started. Transport mechanism 206 guides each document, one at a time, through the valuation region 204. Paddle 2308 automatically advances as documents are transported through the processing device 2300. After the last document from batch 1 is processed, printer 2310 ejects a separator to reject output receptacle 208a. Where output receptacle 208c is also used as a reject receptacle, printer 2312 can send a separator to escrow portion 205a through slot 2314. A controller controls the sequencing of the transport mechanism and printers 2310 and 2312 to provide a separator in reject 208a and escrow portion 205a in order to separate rejected documents from sequential batches.

In one embodiment, when paddle 2308 gets to the front of input receptacle 202, where the documents are being stripped into the transport mechanism 206, the paddle 2308 remains idle until the entire batch has been cleared through the machine, or the machine is timed out, for example. The paddle then automatically removes itself from the transport path by, for example, folding flush with the feed mechanism and allowing the feed mechanism to continue to advance.

Where Source ID information has already been entered into memory via, for example, barcode gun 2302, printers 2310 and 2312 can print the source identification information on the separator card by, for example, known ink jet, thermal, laser, dot matrix, or stamping methods.

In some embodiments it is desirable to separate two or more categories of reject documents into two or more reject receptacles. In a method in which a separator card is processed with the documents of the batch, the separator card can be sent to one reject, such as 208a, and printer 2312 can eject a separator card into another reject, such as 205a.

In other embodiments, a document processing device, such as shown in FIGS. 1a and 23, includes a printing or marking device which can print or mark documents with a variety of information, including a date, time, operator, text, and so forth. In other embodiments, the document processing device, such as shown in FIG. 1a, may not include the media detector 112, and includes the printing or marking device described above. The printing or marking can be done using known ink jet, thermal, laser, dot matrix, or stamping methods. Referring to FIG. 1a, for example, the printing or mark-

ing can be done at any time along the transport mechanism 106, and the printing or marking is controlled by the controller 114. The controller 114 instructs the printing or marking device not to mark certain documents, such as currency or a document that needs to be reprocessed. Control may be obtained in other ways, such as by placing the printing or marking device at a location where no currency or documents to be reprocessed will appear. In an embodiment, the printing or marking device is placed proximate the output receptacle 108 to mark all documents routed to that particular output receptacle.

Some casino gaming commissions may begin requiring that casino tickets be marked with the word VOID after they are collected in the back room. By incorporating a printing or marking device in the document processing device, the word VOID can be printed or marked on a casino ticket that has been processed.

The printing or marking device may also be used in connection with any of the methods described in connection with FIGS. 17-22b. A printing or marking device is disposed near an input receptacle or along a transport mechanism path. A blank card is inserted into the input receptacle and is printed or marked in-line before being sent to an output receptacle. Rejected documents can be routed to the same output receptacle such that all of them appear behind the blank card which has been printed or marked. Account numbers or other information is imported into the document processing device via a network, for example, or is entered into the document processing device manually via a keyboard or keypad, for example, and the account number or other information is printed or marked on the blank card.

Any of the embodiments described in connection with FIGS. 17-22b may be adapted to include two cards, a first card that is a barcode card as described above and a second card that is a separator card. Multiple batches are deposited into the input receptacle of the document processing device. Each batch includes the first card which includes a Source ID, the separator card, and a stack of currency bills and/or substitute currency media. The first card is routed to a first output receptacle of the document processing device, such as a first upper output receptacle. The separator card is routed to a second output receptacle, such as a second upper output receptacle, along with any rejected currency bills and/or rejected substitute currency media. In this manner, rejected documents from separate batches will be separated by the separator cards in the document processing device.

In an embodiment, the separator cards described immediately above may be sequentially numbered, such as, 1, 2, 3, 4, etc., using a printing or marking device, and the sequence number is matched using software with a corresponding Source ID.

Finding a Document in a Stack of Documents

Referring now to FIG. 24, a method of processing documents will be described for finding a document located in a stack of documents. Generally, the documents in the stack of documents are first processed in a document processing device, and then the documents are physically stored in a storage location or electronically imaged and stored on a media such as a DVD-ROM, a hard drive, for example. The processing of the documents may be performed according to any method as described above in connection with FIGS. 1a-23, and the document processing device may be any document processing device as described above in connection with FIGS. 1a-23. However, sometimes it is necessary to retrieve a specific document for verification purposes. For example, if an amount redeemed for a casino ticket is larger than the expected amount for that particular ticket, then the

physical ticket may need to be visually inspected. Clearly, the process of finding the desired ticket can be extremely time-consuming particularly if the ticket is stored among thousands or hundreds of thousands of tickets.

At step 2700, a stack of documents is deposited into an input receptacle of a document processing device. The stack of documents may include a combination of currency bills and substitute currency media, or it may include currency bills only or substitute currency media only. Sources of the stack of documents include a storage facility, a gaming machine, or a coupon machine, for example.

At step 2710, an operator inputs document information for verifying a specific document. The document information includes a document-identifier that is characteristic of the specific document which is sought. For example, a document-identifier can be a barcode, a serial number, a color or black-and-white pattern, a magnetic strip, or any other identifying characteristic that could distinguish one document from another document. In other embodiments, the document-identifier can be a combination of characteristics, such as, for example, a barcode and a color pattern. In a specific embodiment, the document-identifier is a ticket number. The operator inputs one or more document-identifiers by using an input device such as a control unit, which in alternate embodiments can be a control unit as described above in connection with FIGS. 1a-23, e.g., a touch screen, and/or a keyboard.

At step 2720, the document processing device searches the deposited stack of documents for the document bearing the document information which was inputted at step 2710. The documents are transported, one document at a time, past a detector, from the input receptacle to one or more of a plurality of output receptacles. The documents are transported via a transport mechanism along a transport path, and the transport mechanism can be any transport mechanism, such as any of the transport mechanisms described above in connection with FIGS. 1a-23. The documents may be transported along the transport path at a rate in the range of at least about 500 documents per minute to at least about 1,600 documents per minute. The detector scans the document-identifier of each document to determine whether a scanned document-identifier matches the specific document-identifier, which was inputted by the operator at step 2710. The instructions for determining whether a document-identifier matches the specific-document identifier can be stored in the memory, such as, for example, in the form of a computer program.

In one embodiment of the present invention, the control unit includes a visual indicator for indicating when a specific document has been found. For example, the visual indicator can be a plurality of lights, such as light-emitting diodes or display elements on a video display, which change from one color to a different color when a corresponding specific document has been found, e.g., the light changes from gray to green. The visual indicator may include a light or a display element on a video display that changes colors for each of the inputted document-identifiers. In an alternate embodiment, there is a single light or display element for all of the inputted document-identifiers. In still another embodiment, the light does not change colors, rather, it only turns on or off when a specific document has been found. It should be understood that the visual indicator may be any other indicator that provides the operator with a visual notification that a specific document has been found.

The present invention contemplates that the operator may input one document-identifier at a time or more than one, such as up to ten, document-identifiers at a time. Each time a document corresponding to the document-identifier under

consideration is located, that document can be routed to any operator-specified or pre-programmed output receptacle.

In another embodiment of the present invention, the control unit includes an audio indicator for audibly indicating when a specific document has been found. For example, the audio indicator can be a single beep sound, a series of beep sounds, a continuous sound, a pre-recorded message (e.g., "Your document has been found"), or any other sound patterns. Alternatively, the audio indicator may be used in connection with the visual indicator for providing both a visual and an audio indication that a specific document has been found.

At step 2730, after making a determination that a document-identifier matches the specific document-identifier inputted by the operator, the document processing device directs the specific document to a designated output receptacle. In one embodiment, the document processing device stops after the specific document is directed to the output receptacle. The operator may remove the specific document and then instruct the document processing device to proceed in making additional identifications. Alternatively, the document processing device automatically restarts after the specific document has been removed from the output receptacle. As described above in connection with FIGS. 1a-23, the document processing device may, in alternate embodiments, have one or more output receptacles, e.g., one output receptacle, two output receptacles, or eight output receptacles, and, consequently, the directing of the found documents will vary according to how many output receptacles are included in the document processing device. For example, if the document processing device has a single output receptacle, the document processing device can halt after directing a specific document to the output receptacle and restart after the specific document has been removed. If the document processing device has a plurality of output receptacles, then at least one of the output receptacles is designated for receiving a specific document. Thus, the specific document or specific documents can be directed to a first output receptacle, such as an off-sort receptacle, and all the other documents can be directed to the other output receptacles. If the limit of an output receptacle is reached before all the documents in a stack of documents have been processed, then the document processing device stops to allow the removal of the document from the full output receptacle, or, in another embodiment, the document processing device directs the remaining documents to be processed to a next output receptacle.

In one embodiment, the limit of an output receptacle is 2,000 documents. If all the output receptacles are full, then the operator should clear at least one document from at least one output receptacle before the document processing device can continue processing the documents from the stack of documents. Alternatively, the operator can clear output receptacles on-the-fly without stopping of the document processing device. If a feed error (e.g., no calls, chains, doubles, skew errors, and suspects) or a jam occurs, it should be handled as described above in connection with FIGS. 1a-23.

In another embodiment, the document processing device includes storage cassettes as described above in connection with FIGS. 1a-23. The storage cassettes can be used by the operator for transporting the documents to be searched to the input receptacle and for storing the documents after the documents have been processed. An advantage of the storage cassettes is that they provide a more convenient means for transferring documents to and from the document processing device.

The searching stops when all the specific tickets have been found or when all of the documents in the input receptacle have been processed. In one embodiment, the searching stops

after all the specific tickets have been found. The operator must remove the unprocessed documents from the input receptacle and combine them with the processed documents from the output receptacle(s). This embodiment can be used with a document processing device having a single output receptacle. The output receptacle receives the processed documents, and when a specific ticket is found, operation stops to permit removal of the ticket for inspection. The ticket can then be returned to the output receptacle, and the processing may continue or the two stacks from the input and output receptacles can be combined.

In another embodiment, all the tickets from the stack of documents received in the input receptacle are processed even if all the specific tickets are found before the last ticket from the stack of documents is processed. An advantage of this approach is that the operator does not have to combine the tickets from the input receptacle and the tickets from the output receptacle in order to recreate the original stack of documents.

In still another embodiment, when the last specific ticket is found, the operation pauses to give the operator an option of continuing to process the remaining documents or to halt operation and manually recreate the original stack of documents. For example, if the last ticket to be searched is found within the first few documents in the stack of documents, it may be faster to halt operation and manually recreate the original stack of documents, rather than allowing processing to continue through all of the remaining documents in the stack. On the other hand, if the last ticket to be searched is found towards the end of the stack of documents, the operator may wish to continue processing the remaining documents rather than manually combining the remaining documents with the processed documents.

As described above, a visual and/or audio indicator notifies the operator that a ticket has been found, and the operator can easily remove the ticket from the designated output receptacle for inspection. In another embodiment, the visual and/or audio indicator may notify the operator that a duplicate ticket having the same ticket number as a previously found ticket (e.g., a potentially counterfeit ticket), has been found. Duplicate tickets can be sent to the same output receptacle as the previously found ticket, or they can be sent to a different output receptacle. For example, if the previously found ticket is sent to a first off-sort pocket, then the duplicate tickets can be sent to a second off-sort pocket.

Referring now to FIG. 25, an example of a ticket verification method will be described in more detail. In one embodiment, the document processing device includes eight output receptacles, two of the eight output receptacles being off-sort pockets used for receiving either rejected tickets or found tickets. An operator selects a "ticket verify" mode from a menu of options and then is prompted to clear any storage cassettes located in the document processing device. The menu of options may be presented to the operator on a video display overlaid by a touchscreen, for example. Other or additional input devices include a mouse, a keyboard, or switches. In a specific embodiment, the "Ticket Verify" screen displays a number of buttons and options, including a numeric keypad, ten ticket number fields with indicators, a start or continue button, a stop button, an end-verify button, and an exit button.

At step 2810, a cassette having a stack of casino tickets, which can be retrieved, for example, from a storage facility, is deposited into an input receptacle of the document processing device. Each of the casino tickets bears an encoded and/or unencoded ticket number for identification purposes. The operator, at step 2820, uses the numeric keypad or other

suitable input device to enter up to ten ticket numbers that require verification. The entered ticket numbers are stored in the memory of the document processing device.

After all the ticket number have been entered, the operator presses the start button or otherwise initiates operation of the document processing device. At step 2830, a first ticket from the stack of tickets is processed by the document processing device. A detector in the document processing device scans the ticket number of the first ticket and, at step 2840, a determination is made whether there is a match between the scanned ticket number and any one of the entered ticket numbers. If a determination is made that a match does not exist between any one of the entered ticket numbers and the first ticket number, then, at step 2850, the first ticket is directed to a first output receptacle. If a determination is made that a match exists between any one of the entered ticket numbers and the first ticket number, then, at step 2860, the first ticket is sent to a first off-sort output receptacle and the indicator associated with the found ticket number notifies the operator that the specific ticket has been found. At step 2870 a determination is made whether all the tickets corresponding to the entered ticket numbers have been found. If tickets remain to be found, then the document processing device, at step 2880, processes the next ticket in the input receptacle. The next ticket undergoes a similar process as the first ticket, repeating steps 2840 through 2870, and the process ends when all the specific tickets have been found.

Finding a Stack of Documents in a Plurality of Stacks of Documents

Referring now to FIG. 26, a method of processing documents will be described for finding a particular stack of documents located in a plurality of stacks of documents. This mode of operation will be referred to as Reference Mode. Places of business such as casinos and retailers deal with large numbers of documents, e.g., currency bills, casino tickets, and store coupons, which are, in general, processed and then stored as stacks of documents. On any given day, there could be thousands or tens of thousands of documents that are processed by a document processing device. To verify whether specific document was processed on a particular day, an operator might have to search every stack of documents that was processed on that day. For example, if a document processing device processes 50,000 documents in one day, and the documents are stored in stacks of 2,000 each, the operator might have to search through each one of the 25 stacks of documents before the specific document is found. Therefore, although the verification method described above in connection with FIGS. 24 and 25 can decrease the time and effort required to find a specific document, a method of processing documents that actually identifies the specific stack of documents which contains the specific document requiring verification would further decrease the time and effort required for verifying a specific document.

At step 2910, a first stack of documents is processed, one document at a time, by a document processing device. The document processing device can be any document processing device, such as any of the document processing devices described in connection with FIGS. 1a-23, and the processing method can be any processing method, such as any of the document processing methods described in connection with FIGS. 1a-23. The first stack of documents is complete when the predetermined number of documents for the first stack of documents is reached, e.g., 2,000 documents.

At step 2920, the document processing device assigns a stack-identifier to the first stack of documents. Like a document-identifier, which identifies a particular document, a stack-identifier identifies a particular stack of documents.

More specifically, a stack-identifier may be anything that identifies a particular stack of documents, e.g., any combination of one or more numbers, a date, or a barcoded pattern. The number may be a reference number uniquely identifying a stack of documents or it may refer to the number of documents in the cassette containing the stack of documents.

In one embodiment, the stack-identifier is printed on a card, such as a batch identification card or header card as described above. In another embodiment, the stack-identifier is printed on a receipt after processing a stack of documents, which is placed at the head or at the back of a stack of documents. Alternately, the stack-identifier is printed on a sticker that may be affixed to the container or bag containing the stack of documents.

At step 2930, the document processing device correlates each document-identifier in the first stack of documents with the stack-identifier assigned to the first stack of documents. In one embodiment, the correlation is carried out by generating a list or table that associates each document-identifier with the corresponding stack-identifier. This list is stored in a memory of the document processing device.

At step 2940, a determination is made whether additional stacks of documents require processing. If so, then at step 2950, a next stack of documents is processed as described above in connection with steps 2920-2940. If additional stacks of documents do not require processing, then at step 2960, the operator inputs a specific document-identifier for verifying a specific document, wherein the specific document is the document corresponding to the specific document-identifier. The inputting of the specific document-identifier may be carried out in the manner described above in connection with FIGS. 24 and 25.

At step 2970, the document processing device determines the specific stack-identifier which corresponds to the inputted document-identifier. In one embodiment, the determination is made by software that executes instructions stored in memory for searching and retrieving the specific stack-identifier from a memory of the document processing device. The stack-identifier is displayed to the operator on a video display or may be printed on a receipt so that the operator can bring the receipt to the storage facility to retrieve the stack of documents corresponding to the stack-identifier.

At step 2980, a determination is made whether there are additional document-identifiers for which stack-identifiers need to be identified. If there are additional document-identifiers that need to be referenced, steps 2960 through 2980 are repeated. If there are no additional document-identifiers that require verification, then the process ends. Note that the operator may enter several document-identifiers at a time before the document processing device searches for the correlating stack-identifiers.

The document processing device displays to the operator which stack of documents corresponds to each inputted document-identifier. Alternately, the document processing device prints a receipt that shows the inputted document-identifier(s) along with the corresponding stack-identifier(s). The operator may bring this receipt to the storage facility to retrieve the proper stack(s) of documents to be searched.

Referring now to FIG. 27, another example of the method for finding a specific stack of documents described above in connection with FIG. 26 will be described. At step 3010, a stack of casino tickets are deposited into the input receptacle of the document processing device. At step 3020, the tickets are processed using any processing method described above in connection with FIGS. 1a-26.

At step 3030, as the document processing device processes the tickets, they are separated into stacks of up to 2,000

tickets. When a storage cassette is full, i.e., contains 2,000 tickets, subsequent tickets are automatically redirected to another non-full storage cassette. At step 3040, a stack-identifier, is assigned to each stack of tickets. A receipt may be optionally printed that shows the date on which the stack was created, the number of documents in the cassette, and the reference number corresponding to the cassette or stack of tickets. Then, at step 3050, a reference table is made that correlates each ticket to its corresponding stack of tickets, and the reference table is saved in a memory of the document processing device.

At step 3060, an operator uses a touchscreen or other suitable input device to enter a ticket number, which corresponds to a ticket that requires verification. For example, the document processing device may present to the operator a "Ticket Search" command and a data field for entering the specific ticket number for which the corresponding stack needs to be located. At step 3070, the document processing device determines which stack of tickets corresponds to the inputted ticket number and notifies the operator. At step 3080, the document processing device determines whether all the ticket number have been verified. In the current example, there was only one ticket number inputted and, therefore, the process is finished. If there are more ticket numbers to be processed, then the document processing device repeats steps 3060-3080. After locating the specific stack corresponding to the specific ticket number, the operator either manually searches the specific stack or uses the method described above in connection with FIGS. 24 and 25.

Processing Batches of Documents and Separator Cards

Referring now to FIG. 28, a document processing device 4000 for processing batches of documents 4010 uses separator cards 4020 that identify each batch of documents 4010a, b, c, d to a particular source. The device 4000 can be modified in accordance with any one or more of the embodiments described above in reference to FIGS. 1a-27, and the processing of the documents may be performed according to any method as described above in reference to FIGS. 1a-27. As explained in more detail below, the device 4000 includes an input receptacle 4110 having a feeder assembly 4030, an evaluation unit 4040, a transport mechanism 4050, a first offsort receptacle 4060a, a second offsort receptacle 4060b, and a plurality of output receptacles 4070a-4070f. The first and second offsort receptacles 4060a, b are particular types of output receptacles. In another embodiment of the invention, shown in FIG. 29, the device 4000 includes other components such as a strapping unit 4075, a compartment 4076 which can house a computer, and a plurality of storage cassettes 4100a-4100f.

Each batch of documents 4010a, b, c, d includes one or more documents and corresponds to a respective separator card 4020a, b, c, d. For ease of understanding, currency bills will sometimes be used herein as an example of documents included in a batch of documents. However, as described above, the current invention can be used for processing a wide variety of documents, such as currency bills, checks, and casino tickets. Furthermore, each batch of documents can include documents of more than one type, e.g., currency bills and checks.

Referring now to FIGS. 30a and 30b, a specific embodiment of the separator card 4020 will be described in more detail. On the back side, shown in FIG. 30a, the separator card 4020 includes a conductive material 4120 and a rectangular bar 4130. The material 4120 is made of an electrically conductive, non-magnetic material, such as aluminum-based polyester film, adhesive-backed copper foil, and conductive ink, has a generally square shape, and it is located in a central

location. In some embodiments, the conductive material 4120 is a foil. For example, the foil known by the trade designation KoldFoil Metallic, commercially available from Amagic Holographics, Inc., may be used as the material 4120. In this specific embodiment, the foil has a thickness of approximately 16 microns (0.00063") and can range in area and shape depending on the sensor and user requirements.

In other embodiments, the material 4120 can have any other shape or pattern (e.g., rectangular, circular, trapezoidal, triangular, snowflake pattern, etc.) and can be located anywhere on the separator card 4020 and on either or both sides of the separator card 4020. Furthermore, it is not necessary for the material 4120 to be in a single location. As can be seen in FIG. 41a, the separator card 4020 can include a plurality of foils 4120 which can be arranged anywhere on the separator card 4020.

On the front side of the specific separator card 4020 shown in FIG. 30a, the separator card 4020 includes a barcode 4140 and a set of characters 4150 as shown in FIG. 30b. The barcode 4140 is positioned generally in a central location of the separator card 4020 and the set of characters 4150 is positioned adjacent to the barcode 4140. As can be seen in FIG. 41b, in other embodiments, the barcode 4140 can be positioned in any position on the separator card 4020, and on either or both sides of the separator card 4020. Those skilled in the art will appreciate that the position and location(s) of the barcode 4140 depends on the position and number of barcode reader(s) in the document processing device 4000. Further, in other embodiments, the set of characters 4150 can be positioned in any position on the separator card 4020 relative to the barcode 4140. The barcode 4140 and the set of characters 4150 correspond to identification information that identifies the source of the batch of documents, i.e., the source ID, described above.

For example, the characters "LC" shown on the separator card 4020 shown in FIG. 30b can be used as an abbreviation for "Label Card," to distinguish the separator card 4020 from other types of documents such as casino tickets. The characters "1234" can be used to identify the particular document source, e.g., a particular slot machine, from which the associated batch of documents 4010 has been retrieved. Thus, by using a barcode 4140 and a set of characters 4150 both a human operator and the device 4000 can identify the source from which the batches of documents 4010 have been retrieved.

The rectangular bar 4130 is an optional mark that corresponds to a printer registration mark used by a printer device to imprint the barcode 4140 and the set of characters 4150 in a consistent location on the separator card 4020.

Referring now to FIGS. 31a and 31b, the batch of documents 4010 includes currency bills of varying denominations, such as \$5, \$10, and \$20 bills, and a separator card 4020, which is placed behind the last bill or document to be processed in the batch of documents 4010. As shown in FIG. 31b, the material 4120 faces away from the remaining documents in the batch of documents 4010 so that it is visible to the operator. Note that for ease of illustration, the separator card 4020 is highlighted by thicker lines to distinguish it from documents in the batch. This highlighting does not necessarily mean that the separator card 4020 is thicker than the documents in the batch 4010. For example, in some embodiments, the separator card 4020 has substantially the same thickness as a currency bill, and in other embodiments, the separator card 4020 has a thickness different from that of currency bills. The separator card 4020 also has the same dimensions as a currency bill, but in other embodiments, the separator card 4020 may have different dimensions to further

distinguish it from currency bills. For example, in such other embodiments, in addition to sensing the foil 4210 on the separator card 4020, the document processing device may also detect the size of the foil.

In some embodiments, the batch 4010 may be collected in a cartridge or similar containing device and such device can be inserted or attached to a feeder assembly appropriately modified to accept such device. In such embodiments, the operator inserts into the cartridge a separator card 4020 behind the last document to be processed in the batch 4010, and inserts or attaches the cartridge to the feeder assembly.

Referring now to FIG. 32, the feeder assembly 4030 is adapted to feed batches of documents 4010a,b and their corresponding separator cards into the device 4000. Each batch of documents 4010a,b is placed in the feeder assembly 4030 and is separated from an adjacent batch by a corresponding separator card 4020a,b. Each separator card 4020a,b is placed behind the last document to be processed in each respective batch of documents 4010a,b.

Referring now to FIG. 33, one embodiment of the feeder assembly 4030 is shown containing three batches of documents 4010a,b,c and corresponding separator cards 4020a,b,c with their foils facing the operator. The feeder assembly 4030 includes two slideable paddles 4065 which can be used for separating certain batches from other batches. The feeder assembly 4030 includes a sensor assembly 4071 that detects whether a foil is present on any passing document in the feeder assembly 4030.

Referring now to FIG. 34, the sensor assembly 4071 is shown in an enlarged view of part of the feeder assembly 4030. In the illustrated embodiment, the sensor assembly 4071 is positioned on one side of the transport path such that the material 4120 faces the sensor assembly 4071 as the separator card 4020 is moved past the sensor assembly 4071. The sensor assembly 4071 senses anything conductive, such as the material 4120, and therefore senses each separator card 4020a,b,c,d as it is being transported past the sensor assembly 4071. The sensor assembly 4071 can identify the separator card 4020 even if the separator card 4020 is masked by one or more adjacent documents. Such masking might occur, for example, if one or more currency bills behind the separator card 4020 are fed through the feeder assembly 4030 concurrent with the separator card 4020. Another masking might occur if the separator card itself is faced in the batch with its foil facing the other documents in the batch.

Referring now to FIG. 35, in one embodiment of the present invention the sensor assembly 4071 includes a continuous processing sensor 4073 such as a TouchSensor, commercially available from TouchSensor Technologies, LLC, headquartered in Wheaton, Ill. It is emphasized that any field-effect sensor that can sense conductive materials may be used instead. The TouchSensor is a low impedance field-effect switch that is used in combination with specific pad geometry to form a TouchCell. Each TouchCell includes a sensor integrated circuit, two resistors for sensitivity setting, and an electrode structure. A voltage is applied across the TouchCell, creating an electric field that emanates through any dielectric substrate such as glass or plastic. When a conductive mass (such as a foil on a separator card) enters the electric field, the sensor 4073 detects the change and indicates an event has occurred.

Referring now to FIGS. 36-38, the transport mechanism 4050 includes a forward stacker 4080 and a reverse stacker 4090. The forward stacker 4080 is associated with the first offsort receptacle 4060a, and the reverse stacker 4090 is associated with the second offsort receptacle 4060b. Documents that are sent to the first offsort receptacle 4060a are

transported via the forward stacker 4080, and documents that are sent to the second offsort receptacle 4060b are transported via the reverse stacker 4090. The reverse stacker 4090 outputs documents such that the documents are facing the same direction they faced when they were placed in the feeder assembly 4030, and in the same order. For example, if a \$5 bill, a \$10 bill and a separator card are sent to the second offsort receptacle 4060b via the reverse stacker 4090 in that order, the second offsort receptacle 4060b would contain the \$5 bill, the \$10 bill, and the separator card in that same order and facing the same direction as originally fed into the feeder assembly 4030. An advantage to reverse stacking the documents is that the original order and facing positions of the documents are preserved, reducing operator confusion about the order in which the documents were processed.

Referring now to FIG. 39, a method of processing a batch of documents according to one embodiment of the present invention will be described. At step 4200, an operator retrieves a first batch of documents from a first machine. For example, a casino employee retrieves a batch of documents containing currency bills and casino tickets from a gaming machine. The operator, at step 4210, optionally generates a first separator card bearing a source identification that identifies the source (e.g., the gaming machine) from which the first batch of documents was retrieved. For example, the operator can have a plurality of blank separator cards, one of which is imprinted, using a thermal printer, with the barcode number 4140 and the set of characters 4150, to form the first separator card. The first separator card and its blank counterpart have a conductive material pre-disposed thereon as described above. The operator places the first separator card behind the last document to be processed in the batch. In other embodiments, the operator can have a set of pre-printed separator cards having a sequence of barcode numbers and characters identifying the various sources of documents in the environment. In such embodiments, the operator simply locates a separator card bearing the source identification corresponding to the gaming machine from which the operator has emptied a set of documents, and places the separator card behind the last document to be processed in the batch.

In embodiments where both steps 4200 and 4210 are performed, it should be noted that such steps can be performed in any order. In other embodiments, in lieu of step 4210, the first separator card can be recycled from a previously generated separator card and reused to identify a newly collected batch of documents 4010. Unless the set of characters identifying a source of documents is altered, a separator card identifying such source can be reused as often as desired.

As described above, the operator arranges the first batch of documents such that the first separator card is the last document to be processed and such that the foil on the first separator card faces outward so as to be visible by the operator. The other face of the separator card is concealed from view by the preceding documents in the batch. If the operator faces the separator card the wrong way in the document processing device, the separator card will still be sensed thanks to the field-effect sensing capabilities of the sensor assembly 4071.

At step 4220, the operator retrieves a next batch of documents from a source, if there is a next batch, and optionally generates, at step 4230, a next separator card that identifies the source of the next batch of documents. The same embodiments described in connection with steps 4200, 4210 also apply to steps 4220, 4230.

As with the first batch of documents, the operator places the next separator card behind the last document in the next batch of documents. The first and next batches of documents and corresponding separator cards can be arranged sequen-

tially or maintained separately until depositing into the feeder assembly **4030**. The documents must be arranged such that the separator card corresponding to a particular batch of documents is placed so as to be the last document to be processed after all the documents in the particular batch has been processed.

At step **4240**, if there are additional batches of documents to be retrieved, step **4220** and optional step **4230** are repeated. If there are no additional batches of documents to be retrieved (step **4240**), the retrieved batches of documents and corresponding separator cards are properly ordered and loaded into the feeder assembly **4030** of the document processing device **4000**. The proper order of the documents, from the first document to the last document to be processed, is as follows: the documents in the first batch of documents followed by the first separator card followed by the documents in the next batch of documents followed by the next separator card.

At step **4250**, the first batch of documents and corresponding first separator card are processed in a document processing device, such as the device **4000**. The device **4000** maintains batch integrity, which refers to ensuring that no documents associated with other batches are co-mingled with the batch being processed, by pausing operation of the feeder assembly **4030** after a separator card has been sensed. Thus, the device **4000** will not resume feeding the next batch of documents until the first batch of documents has been successfully processed, for example, when all jams and rejects in the first batch have been reconciled.

The device **4000** processes the first batch of documents and, if there are no rejects, jams, or other processing anomalies, the first batch of documents is closed at step **4300** following detection of the source identification information on the first separator card. A closed batch refers to a batch that has been successfully processed such that the source identification information and batch totals can be transmitted to an accounting system. The accounting system reconciles the batch totals using the source identification information with associated account information to verify whether the batch totals equal the totals associated with a particular account or accounts in the accounting system.

A reject refers to documents such as a no call bill, a suspect bill, a document causing a feed error, or a separator card. In some embodiments, all rejects are routed to a common output receptacle, such as the second offsort receptacle **4060b** shown and described above. Such embodiments promote batch integrity by arranging all rejects in one receptacle, providing confidence to the operator that all other documents not located in that receptacle processed successfully. Furthermore, the rejects are intuitively arranged in the same order in which they were arranged in the input receptacle, reducing operator confusion.

Referring again to step **4260**, if the device **4000** rejects one or more documents associated with the first batch of documents, all the rejected document(s) including the first separator card are sent to a designated receptacle, such as the second offsort receptacle **4060b** (step **4270**). In other embodiments, the rejected documents are sent to any one or more pre-programmed or operator-specified output receptacle, such as the first offsort receptacle **4060a**. For example, the rejects can be offsorted according to their type, e.g., no call, suspect, or separator card.

At step **4280**, the operator reprocesses the rejects including the first separator card by replacing the rejects in the feeder assembly **4030** and directing the device **4000** to reprocess the rejects. The rejects including the separator card are removed from the offsort receptacle and replaced in the feeder assembly **4030** without having to reorient them. Maintaining the

original order and facing orientation of the rejects preserves batch integrity by eliminating operator discretion in replacing the rejects for reprocessing. No reorientation is necessary, nor is there any doubt as to which batch the rejects belong.

Alternatively, instead of performing step **4280** the operator may choose to manually process the rejected documents and/or the first separator card by manually entering the characteristic information associated with each of the rejected documents, e.g., the amount of a currency bill, and the source identification information. For example, this option may be desirable when a relatively small number of documents are rejected or when the device **4000** rejects the same documents more than once.

Referring now to step **4300**, the first batch of documents is closed after all the documents from the first batch have been successfully processed, meaning that any and all jams, rejects, and other processing anomalies have been reconciled, and all other documents processed normally have been evaluated. When the batch is closed, all documents in that batch are correlated to the source identification information associated with the separator card. After the first batch is closed, the first separator card may be discarded or may be reused for a different batch of documents that will be retrieved in the future from the same machine from which the first batch of documents was retrieved.

At step **4310**, all the documents from the first batch of documents have been sent to one or more of the output receptacles **4070a-4070f**, and the first separator card has been sent to the first offsort receptacle. Note that in this embodiment it is irrelevant which orientation the first separator card is facing when placed in the first offsort receptacle because the first separator card has no further use in relation to the closed first batch of documents. In other embodiments, the first separator card can be sent to any one receptacle of the second offsort receptacle and the output receptacles **4070a-4070f** and the documents from the batch can be sent to one or more of the output receptacles **4070a-4070f** and the first and second offsort receptacles.

At step **4320**, after the first batch and the first separator card have been processed and sent to the appropriate output receptacles, the device **4000** determines whether any batches remain in the feeder assembly **4030**. If the device **4000** determines that no additional batches remain in the feeder assembly **4030**, the processing run is ended and the device **4000** is readied to receive another set of batches of documents into the feeder assembly **4030**.

Referring again to step **4320**, if the device **4000** determines that additional batches of documents require processing, operation of the feeder assembly is resumed, and the next batch of documents is processed at step **4330**. Just like the processing of the first batch of documents, the device **4000** will not begin feeding another batch of documents until this next batch of documents has been successfully processed. Note that if there are no rejects or jams in the previous batch, the device **4000** will process the next batch of documents and, if there are no rejects or jams, this batch of documents will be closed at step **4380**.

The procedure at step **4330** through step **4390** is similar to the procedure described above at steps **4250** through **4310**. At step **4390**, all the documents from the next batch of documents are sent to one or more of the output receptacles **4070a-4070f** where they are stacked either by themselves or along with the documents from the first batch. As mentioned above, the processed separator cards may be collected and reused to identify future batches of documents.

Step **4330** through step **4390** can repeat until, at step **4400**, the device **4000** determines that all the batches of documents

4010 from the feeder assembly **4030** have been successfully processed. At this point, device **4000** is ready for further loading of another retrieved batch of documents **4010** into the feeder assembly **4030**.

Referring now to FIG. 40, a method for reconciling a document jam will be described. At step **4500**, after a document jam, the processed separator cards **4020** that have been sent to the first offsort receptacle are cleared. For example, in some embodiments, the device **4000** instructs the operator that a "JAM HAS OCCURRED" and to "PLEASE CLEAR UPPER REJECT POCKET," as shown in FIG. 40b. An optional sensor in the first offsort receptacle **4060a** can detect whether any documents have in fact been cleared from that receptacle before guiding the operator to the next step.

At step **4510**, the feeder assembly **4030** is cleared of all documents to prevent any new batches of documents from being processed until the jam reconciliation process has been completed. For example, in one embodiment of the invention, the device **4000** instructs the operator to "PLEASE CLEAR FEEDER AREA," as shown in FIG. 40c. To clear the feeder assembly **4030**, the documents can be physically removed from the feeder assembly **4030**, or the remaining documents can be pushed sufficiently away from the input area of the feeder assembly **4030** by using one or more of the paddles **4065a,b**. An optional sensor in the feeder assembly **4030** can detect whether remaining documents have been moved away from the input area before permitting the operator to advance the next step.

At step **4520**, the device **4000** is flushed to remove all the documents remaining in the transport path of the device **4000**. This flush will ensure that all of the documents are transferred to designated or pre-programmed escrow receptacle. In alternate embodiments, an escrow receptacle can be any one of the lower output receptacles **4070a-4070f** or the offsort receptacle **4060a**, and it is a receptacle used for the temporary storage of flushed documents. In some embodiments, before flushing, the operator clears all processed documents from the escrow receptacle to prevent the co-mingling of processed documents and unprocessed documents.

At step **4530**, the operator collects the flushed documents from the escrow receptacle and any reject documents and the separator card from the offsort receptacle **4060b**, and reloads these documents into the feeder assembly **4030** to be re-fed into the device **4000**. For example, in a specific embodiment of the invention the device **4000** instructs the operator to "PLEASE PLACE MONEY FROM ESCROWS AT FRONT OF FEEDER AND RERUN," as shown in FIG. 40d. All the documents to be re-fed are documents from the same batch of documents, which batch corresponds to the separator card found in the offsort receptacle **4060b**. In this respect, the operator is assured that no documents in the escrow receptacle or offsort receptacle **4060b** belong to a different batch of documents other than the batch being processed before the jam condition.

At step **4540**, the documents are reprocessed in the device **4000** to verify the original count prior to the jam condition. At step **4550**, the device **4000** determines whether all the documents can be successfully processed. An optional manual entry screen such as shown in FIG. 40e is provided for the operator to enter via a conventional input device any documents that cannot be properly processed by the device **4000**. The input device may be a touchscreen or a keyboard, for example. Thus, at step **4560**, the operator manually enters problematic documents that cannot be re-processed, such as a document that continues to causes a document jam or a suspect bill.

Referring again to step **4550**, if all the documents can be properly processed, at step **4570**, the device **4000** finishes processing any remaining documents in the batch of documents before the jam condition. For example, in some embodiments, the device **4000** returns to a default screen such as the one shown in FIG. 40f. After the document jam has been reconciled, the operator can return to the feeder assembly **4030** all the batches of documents that were previously removed from the feeder assembly **4030**.

In other embodiments, after each batch of documents **4010** is successfully processed, the device **4000** transmits the source identification information and batch total to a host accounting system. This transmission can be carried out while the device **4000** is processing a next batch of documents **4010**. In still other embodiments, the transmission is carried out after the device **4000** has finished processing all the batches of documents **4010**. The accounting system associates an account with the batch total and source identification information.

While the present invention has been described with reference to one or more particular embodiments, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present invention. Each of these embodiments and obvious variations thereof is contemplated as falling within the spirit and scope of the claimed invention, which is set forth in the following claims.

What is claimed is:

1. A method of processing casino tickets on a document processing device, the method comprising:
receiving a stack of casino tickets, each casino ticket having a barcoded pattern;
transporting the casino tickets via a transport mechanism, one casino ticket at a time, along a transport path in a wide-edge leading manner at a rate of at least 350 casino tickets per minute;
imaging, during the transporting in the wide-edge leading manner, each of the casino tickets transported along the transport path with an image scanner to generate image data that is reproducible as a visually readable image of each of the casino tickets; and
using a controller, decoding the barcoded pattern of each casino ticket from the image data associated with each casino ticket transported along the transport path in the wide-edge leading manner.
2. The method of claim 1, wherein the barcoded pattern of each casino ticket encodes a respective ticket number on each casino ticket, and further comprising the act of:
scanning with a barcode scanner the barcoded pattern on each casino ticket transported along the transport path to obtain the ticket number on each casino ticket.
3. The method of claim 1, wherein the acts of transporting and imaging occur at a rate of at least 1000 casino tickets per minute.
4. The method of claim 1, wherein the acts of transporting and imaging occurs at a rate of at least 1500 casino tickets per minute.
5. The method of claim 1, further comprising the act of storing in a storage device one or more image files including at least a portion of the generated image data.
6. The method of claim 5, wherein the one or more stored image files include at least a portion of the generated image data being tagged with information of interest from a casino ticket.
7. The method of claim 5, wherein the one or more stored image files include at least a portion of the generated image

67

data tagged with an operator identifier and characteristic information for a casino ticket.

8. The method of claim **5**, wherein each of the stored image files has an image resolution of approximately 100 DPI by approximately 100 DPI. 5

9. The method of claim **5**, wherein each of the stored image files has an image resolution of approximately 200 DPI by approximately 200 DPI.

10. The method of claim **5**, wherein the one or more image files stored on the storage device include generated image data tagged with text-searchable information from a casino ticket. 10

11. The method of claim **5**, wherein the storage device is remote from the document processing device.

12. The method of claim **5**, wherein the storage device includes a network drive, a RAM, CD-ROM, or a DVD. 15

13. The method of claim **1**, wherein each barcoded pattern uniquely identifies a casino ticket.

14. The method of claim **1**, wherein each barcoded pattern encodes a ticket number uniquely identifying a casino ticket. 20

15. The method of claim **1**, further comprising performing an image quality check of the image data for each casino ticket.

16. The method of claim **1**, wherein each casino ticket includes additional ticket data, the method further comprising extracting the additional ticket data using optical character recognition. 25

17. The method of claim **1**, wherein the casino ticket is a cashout voucher.

18. The method of claim **1**, wherein at least a portion of the image data is reproducible as partial images of at least one side of each received casino tickets. 30

19. The method of claim **1**, wherein at least a portion of the image data is reproducible as full images of at least one side of each received casino tickets. 35

20. The method of claim **1**, wherein a transaction identifier is generated for each batch of received casino tickets.

21. The method of claim **1**, wherein each casino ticket is associated with a monetary value, the method further comprising, totaling the monetary values of the received stack of casino tickets to obtain a total value of received casino tickets. 40

22. The method of claim **21**, further comprising, communicating the total value to an accounting system.

23. A barcoded casino ticket scanning device, comprising:
a receptacle configured to receive barcoded casino tickets,
each barcoded casino ticket having a barcoded pattern;
a transport mechanism configured to transport the bar-coded casino tickets from the receptacle to an output in 45

68

a wide-edge leading manner at a rate of at least 350 barcoded casino tickets per minute;

an image scanner configured to generate image data, during the transporting in the wide-edge leading manner, reproducible as an image of at least one side of each received barcoded casino ticket; and

a controller configured to (1) receive a transaction identifier associated with the received barcoded casino tickets, (2) decode the barcoded pattern of each casino ticket from the image data associated with each barcoded casino ticket transported to the output in the wide-edge leading manner, thereby obtaining a respective unique identifier from the generated image data for each bar-coded casino ticket, and (3) create an image file for each of the barcoded casino tickets, each created image file including at least a portion of the image data, wherein the image file for each received barcoded casino ticket is tagged with the respective unique identifier and the received transaction identifier such that one or more of the barcoded casino tickets are traceable by the unique identifier or the transaction identifier.

24. The barcoded casino ticket scanning device of claim **23**, wherein the controller is further configured to perform an image quality check of the image data for each casino ticket.

25. A casino ticket processing device, comprising:
an input receptacle configured to receive a stack of casino tickets, each casino ticket having a barcoded pattern;
a transport mechanism for transporting the casino tickets, in a serial fashion, from the input receptacle, at a rate of at least about 350 casino tickets per minute, along a transport path in a wide-edge leading manner;
an image scanner positioned to image, during the transporting in the wide-edge leading manner, each of the casino tickets transported along the transport path to produce an image file associated with each casino ticket;
a controller configured to decode the barcoded pattern of each casino ticket from the image file associated with each casino ticket transported along the transport path in the wide-edge leading manner; and
a barcode scanner positioned to scan a barcode on each casino ticket transported along the transport path.

26. The casino ticket processing device of claim **25**, wherein the controller is further configured to perform an image quality check of the image file for each casino ticket.

27. The casino ticket processing device of claim **26**, wherein the controller is further configured to receive a transaction identifier associated with the received casino tickets.

* * * * *