US012383105B2

(12) **United States Patent**
Osborne, Jr.

(10) **Patent No.: US 12,383,105 B2**
(45) **Date of Patent: Aug. 12, 2025**

(54) **DISPENSER FOR ROLLED SHEET MATERIALS**

(71) Applicant: **Charles Agnew Osborne, Jr.**, Cumming, GA (US)

(72) Inventor: **Charles Agnew Osborne, Jr.**, Cumming, GA (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.: **18/392,863**

(22) Filed: **Dec. 21, 2023**

(65) **Prior Publication Data**

US 2024/0122417 A1 Apr. 18, 2024

Related U.S. Application Data

(63) Continuation of application No. 17/507,857, filed on Oct. 22, 2021, now Pat. No. 11,889,955, which is a continuation of application No. 16/593,004, filed on Oct. 4, 2019, now Pat. No. 11,154,166, and a continuation-in-part of application No. 15/988,579, filed on May 24, 2018, now Pat. No. 11,109,722.

(60) Provisional application No. 62/741,350, filed on Oct. 4, 2018.

(51) **Int. Cl.**

A47K 10/38	(2006.01)
A47K 10/34	(2006.01)
A47K 10/36	(2006.01)

(52) **U.S. Cl.**

CPC ***A47K 10/38*** (2013.01); ***A47K 10/34*** (2013.01); ***A47K 10/36*** (2013.01)

(58) **Field of Classification Search**

CPC A47K 10/38; A47K 10/36; A47K 10/34
USPC 221/277
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,738,934	A	3/1956	Dobkin
3,317,150	A	5/1967	Summersby
3,554,456	A	1/1971	Moore
3,892,368	A	7/1975	Ricards
3,893,636	A	7/1975	Wise et al.
4,003,525	A	1/1977	Podvin et al.
4,071,200	A	1/1978	Stone

(Continued)

FOREIGN PATENT DOCUMENTS

CN	104703521	A	6/2015
EP	0378550	B1	9/1994

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion for PCT/US2016/038135, mail date of Sep. 15, 2016.

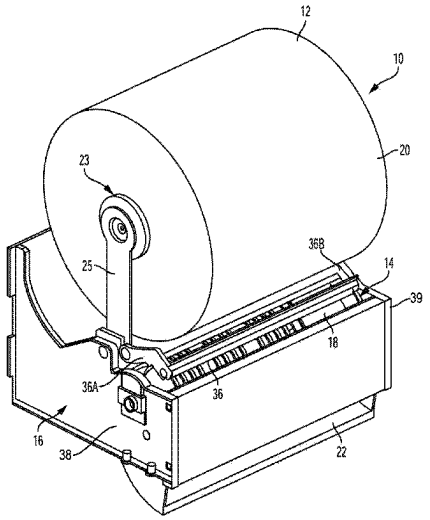
(Continued)

Primary Examiner — Omar Flores Sanchez
(74) *Attorney, Agent, or Firm* — Womble Bond Dickinson (US) LLP

(57) **ABSTRACT**

In one aspect, the present disclosure is directed to a sheet material dispenser that includes a feed roller that is rotatable to facilitate dispensing of the sheet material from a discharge in a housing of the dispenser. The dispenser can have a cutting assembly that includes a cutting blade and at least one movable support coupled to cutting blade and that is actuated with rotation of the feed roller to cause movement of the cutting blade to at least partially cut, score, or perforate the sheet material during dispensing thereof. The dispenser also can have a biasing assembly coupled to the feed roller body to assist rotation of the feed roller body and/or movement of the cutting blade. Other aspects also are described.

19 Claims, 17 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

4,192,442	A	3/1980	Bastian et al.
4,635,837	A	1/1987	Granger
4,690,344	A	9/1987	Yokota
4,712,461	A	12/1987	Rasmussen
4,738,176	A	4/1988	Cassia
4,790,490	A	12/1988	Chakravorty
4,846,035	A	7/1989	Granger
5,048,386	A	9/1991	DeLuca et al.
5,060,877	A	10/1991	Bullivant
5,441,210	A	8/1995	Hinton
5,452,832	A	9/1995	Niada
5,672,206	A	9/1997	Gorman
5,772,291	A	6/1998	Bryd et al.
5,848,609	A	12/1998	Marchesseault et al.
6,079,305	A	6/2000	Bloch et al.
6,098,917	A	8/2000	Cruz
6,179,243	B1	1/2001	Granger
6,196,102	B1	3/2001	Granger
6,199,792	B1	3/2001	Mivelaz
6,283,139	B1	9/2001	Symonds
6,314,850	B1	11/2001	Morand
6,378,725	B1	4/2002	Granger
6,408,727	B1	6/2002	Harris et al.
6,411,920	B1	6/2002	McConnell
6,532,979	B1	3/2003	Richter
6,553,879	B2	4/2003	Morand
6,691,945	B2	2/2004	Slezak
6,695,246	B1	2/2004	Elliott et al.
6,715,730	B2	4/2004	Ehr
6,820,785	B2	11/2004	Kapiloff
6,826,985	B2	12/2004	Broehl
6,834,825	B2	12/2004	Pollastrelli et al.
6,892,620	B2	5/2005	Kapiloff
6,892,746	B2	5/2005	Ford
6,895,848	B1	5/2005	Svensson
6,903,654	B2	6/2005	Hansen et al.
6,977,588	B2	12/2005	Schotz et al.
6,988,689	B2	1/2006	Thomas et al.
7,147,204	B2	12/2006	Hollingsworth
7,213,782	B2	5/2007	Osborne et al.
7,296,765	B2	11/2007	Rodrian
7,357,348	B2	4/2008	Kananen
7,370,824	B1	5/2008	Osborne
7,373,864	B2	5/2008	Granger
7,460,013	B1	12/2008	Osborne et al.
7,527,215	B1	5/2009	Siddiqui
7,571,670	B2	8/2009	Formon
7,637,452	B2	12/2009	Kanbar et al.
7,946,522	B2	5/2011	Lewis et al.
7,987,756	B2	8/2011	Lewis et al.
8,082,827	B2	12/2011	Friesen et al.
8,146,471	B2	4/2012	Hansen et al.
8,167,228	B2	5/2012	Kobayashi et al.
8,297,160	B2	10/2012	Friesen et al.
8,353,475	B2	1/2013	Kobayashi et al.
8,382,026	B2	2/2013	Keily et al.
8,402,872	B2	3/2013	Friesen et al.
8,424,431	B1	4/2013	Jackman et al.
8,468,920	B2	6/2013	Hagleitner
8,528,851	B2	9/2013	Friesen et al.
8,555,761	B2	10/2013	Keily et al.
8,578,826	B2	11/2013	Hansen et al.
8,651,003	B1	2/2014	Vercellone
8,733,218	B2	5/2014	Hansen et al.
8,800,415	B2	8/2014	Osborne
8,919,233	B2	12/2014	Lewis et al.
8,943,938	B2	2/2015	Sahlberg
9,010,602	B2	4/2015	Budz et al.
9,032,850	B2	5/2015	Chiba et al.
9,701,508	B2	7/2017	Diamond
9,756,992	B2	9/2017	Osborne
9,907,441	B2	3/2018	Osborne et al.
9,918,598	B2	3/2018	Osborne
10,441,117	B2	10/2019	Osborne, Jr.
10,660,486	B2	5/2020	Osborne, Jr.
10,835,086	B2	11/2020	Osborne, Jr.
11,071,415	B2	7/2021	Osborne, Jr.
11,109,722	B2	9/2021	Osborne, Jr.
11,142,419	B2	10/2021	Osborne, Jr.
11,154,166	B2	10/2021	Osborne, Jr.
11,344,165	B2	5/2022	Osborne, Jr.
11,889,955	B2	2/2024	Osborne, Jr.
2001/0045149	A1	11/2001	Granger
2002/0073819	A1	6/2002	Phelps et al.
2003/0019899	A1	1/2003	Chen
2004/0188486	A1	9/2004	Granger
2005/0051008	A1	3/2005	Granger
2005/0145745	A1	7/2005	Lewis et al.
2005/0167541	A1	8/2005	Osborne
2006/0037449	A1	2/2006	Lavallee
2006/0236832	A1	10/2006	Cvjetkovic et al.
2007/0079684	A1	4/2007	Friesen et al.
2007/0176041	A1	8/2007	Friesen et al.
2007/0194166	A1	8/2007	Reinsel et al.
2007/0215743	A1	9/2007	Granger
2008/0128448	A1	6/2008	Cittadino
2008/0217350	A1	9/2008	Hansen et al.
2009/0057478	A1	3/2009	Connor
2009/0140001	A1	6/2009	Lewis et al.
2009/0256022	A1	10/2009	Maurer
2010/0102101	A1	4/2010	Keily et al.
2010/0243696	A1	9/2010	Friesen et al.
2010/0286817	A1	11/2010	Goeking
2010/0319508	A1	12/2010	Hagleitner
2011/0068129	A1	3/2011	Maurer
2011/0133019	A1	6/2011	Keily et al.
2011/0233318	A1	9/2011	Anderson
2012/0085857	A1	4/2012	Vienneau et al.
2012/0167739	A1	7/2012	Lewis et al.
2012/0182366	A1	7/2012	Kobayashi et al.
2012/0312853	A1	12/2012	Osborne et al.
2013/0192437	A1	8/2013	Sahlberg
2013/0320130	A1	12/2013	Osborne
2014/0054410	A1	2/2014	Achton
2014/0263812	A1	9/2014	Osborne
2014/0312158	A1	10/2014	Hluschenko et al.
2015/0083846	A1	3/2015	Budz et al.
2015/0297043	A1	10/2015	Osborne et al.
2016/0353945	A1	12/2016	Osborne
2016/0353946	A1	12/2016	Osborne
2016/0353947	A1	12/2016	Osborne
2017/0188760	A1	7/2017	Henson et al.
2017/0367547	A1	12/2017	Osborne
2017/0369262	A1	12/2017	Green
2018/0146829	A1	5/2018	Osborne
2018/0153360	A1	6/2018	Osborne, Jr. et al.
2018/0170703	A1	6/2018	Osborne, Jr.
2018/0263433	A1	9/2018	Osborne, Jr.
2019/0174972	A1	6/2019	Osborne, Jr. et al.
2020/0054177	A1	2/2020	Osborne, Jr.
2020/0163498	A1	5/2020	Osborne, Jr.
2020/0187727	A1	6/2020	Osborne, Jr
2020/0205620	A1	7/2020	Osborne, Jr.
2020/0205621	A1	7/2020	Osborne, Jr.
2020/0229659	A1	7/2020	Osborne, Jr.
2020/0390295	A1	12/2020	Osborne, Jr.
2021/0113033	A1	4/2021	Osborne, Jr.
2021/0330142	A1	10/2021	Osborne, Jr.
2022/0039614	A1	2/2022	Osborne, Jr.

FOREIGN PATENT DOCUMENTS

WO	WO89/00968	A1	2/1989
WO	WO2018/126236	A1	7/2018

OTHER PUBLICATIONS

International Search Report and the Written Opinion of the International Searching Authority for PCT/US2019/033341; mailed Sep. 25, 2019.

International Search Report and the Written Opinion of the International Searching Authority for PCT/US2019/054641; mailed Jan. 23, 2020.

(56) **References Cited**

OTHER PUBLICATIONS

Extended European Search Report of European Application No. 19869468.9 dated Jun. 2, 2022.
European Examination Report of European Application No. 19869468.9 dated May 6, 2024.

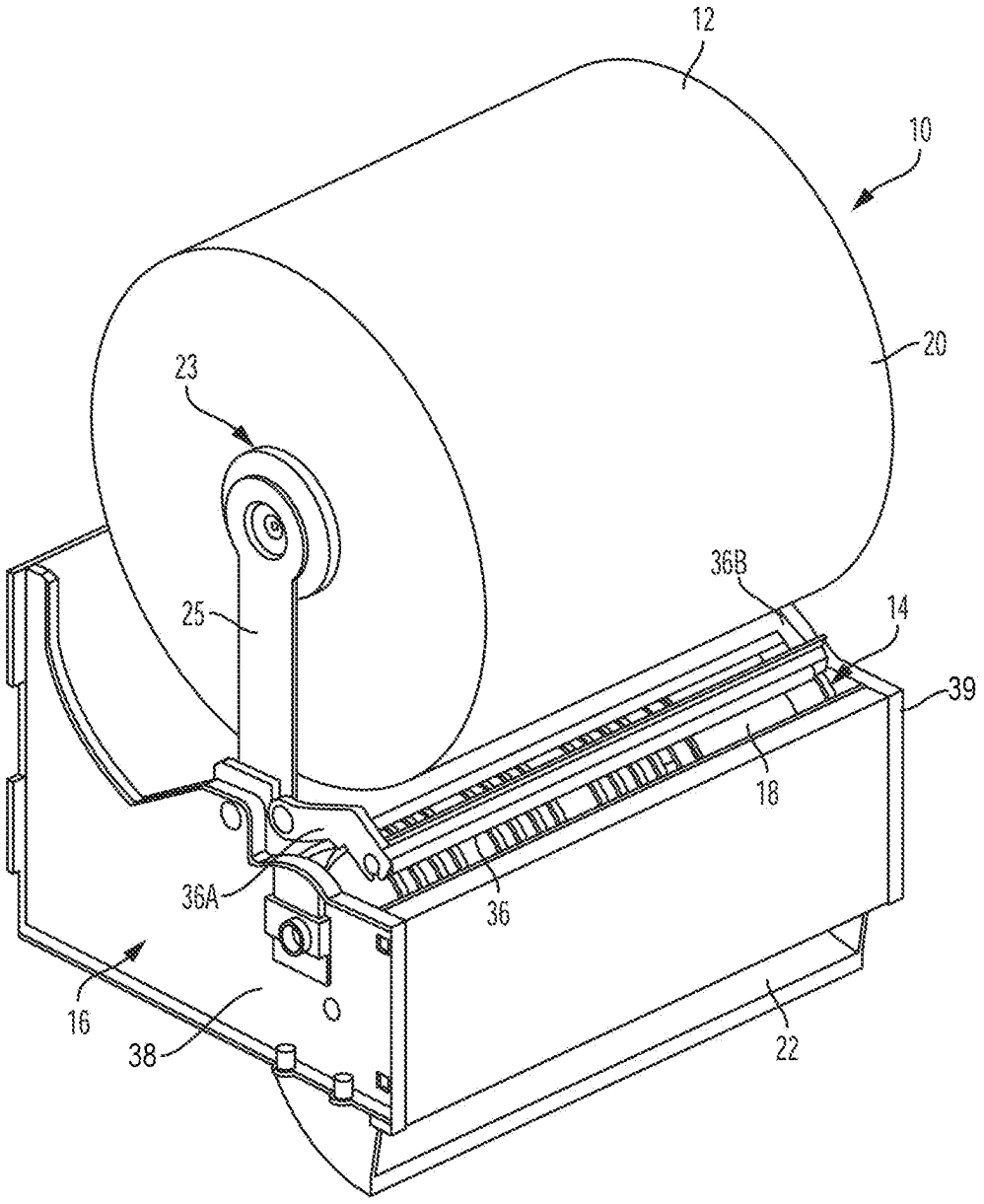


FIG. 1

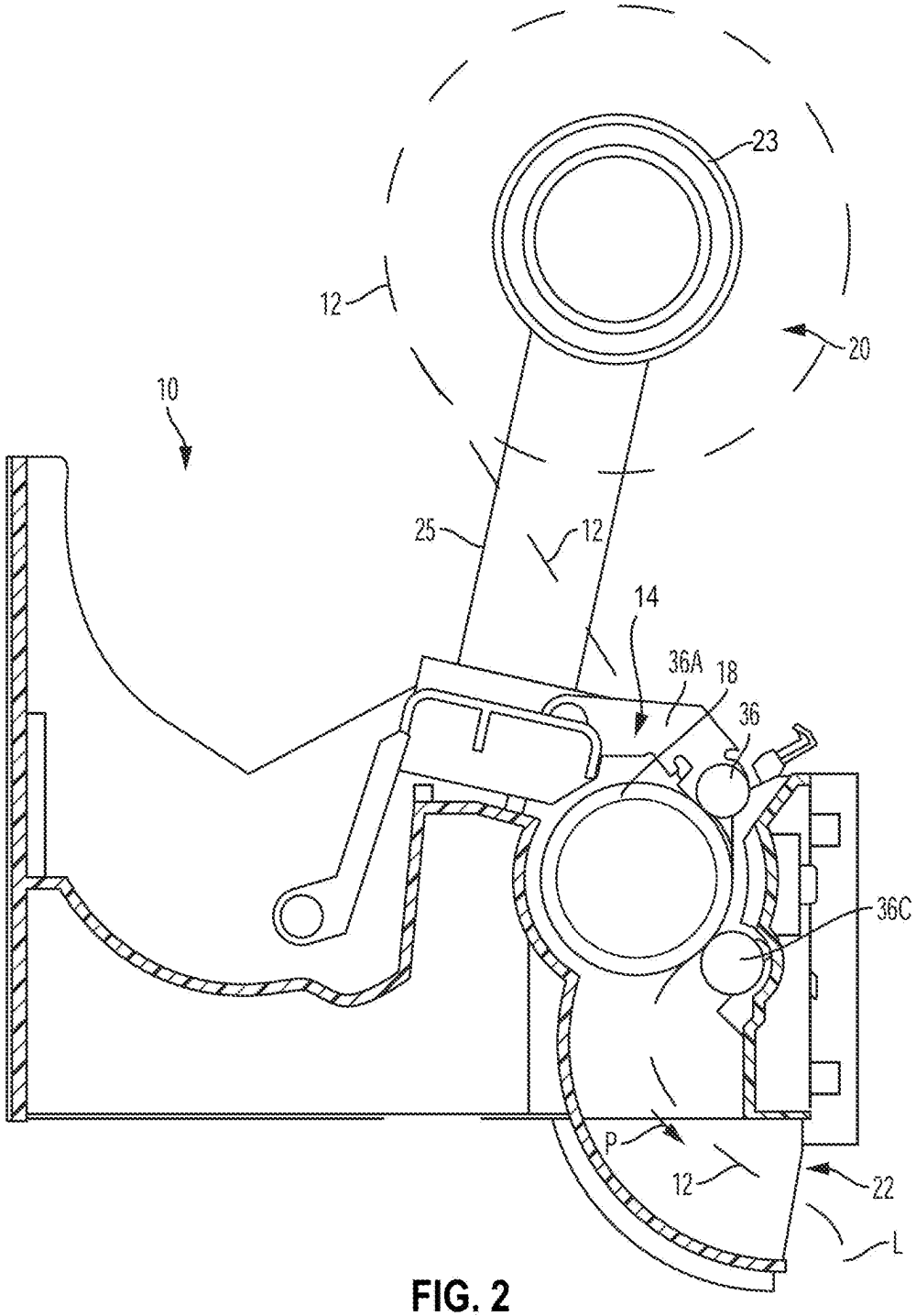


FIG. 2

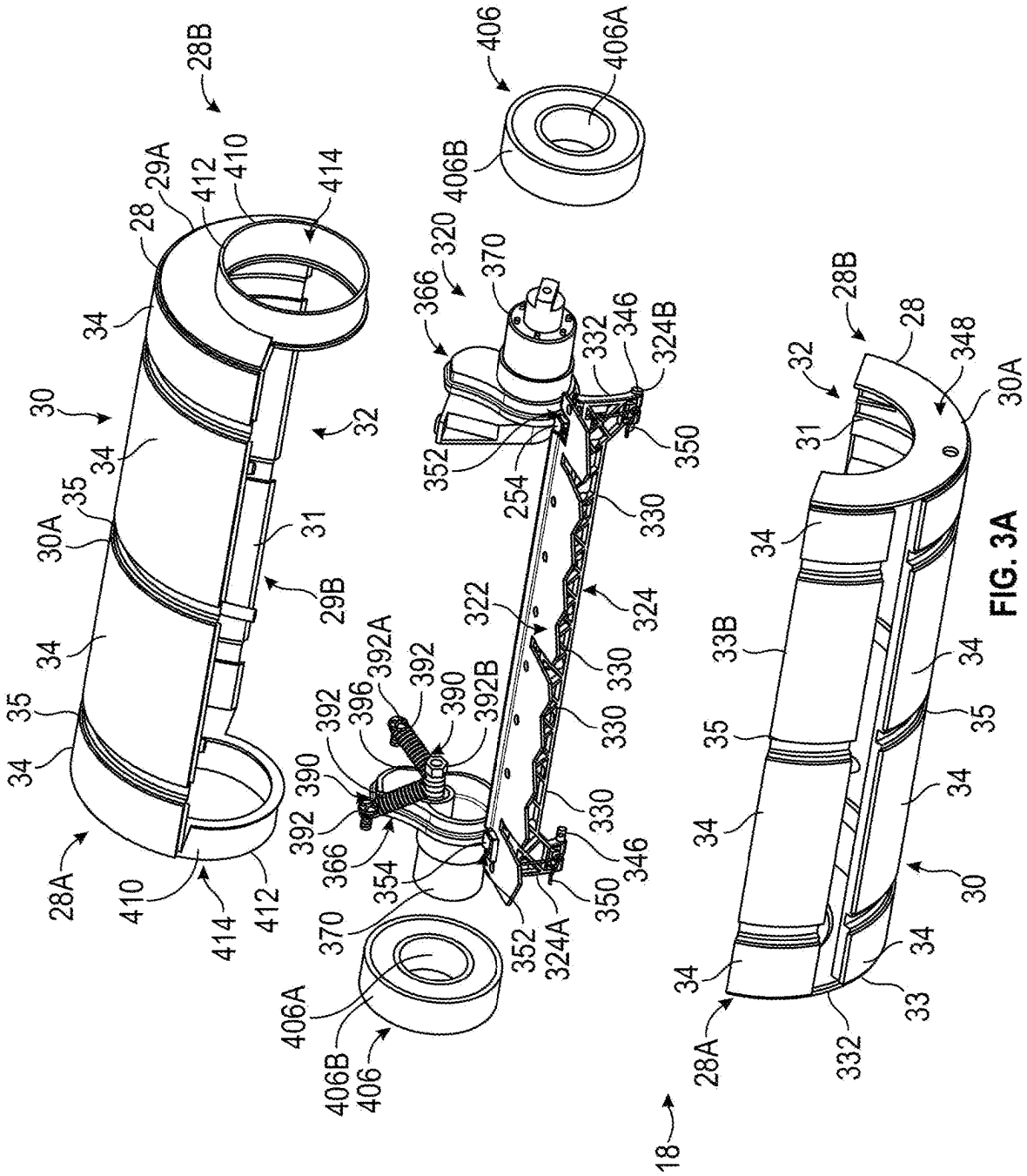

28B
29A
28
412
410
414
34
30
32
30A
35
31
29B
28A
406
406A
406B
320
366
370
332
346
324B
350
352
254
330
322
324
392A
392
396
390
392B
354
324A
18
33B
33

FIG. 3A

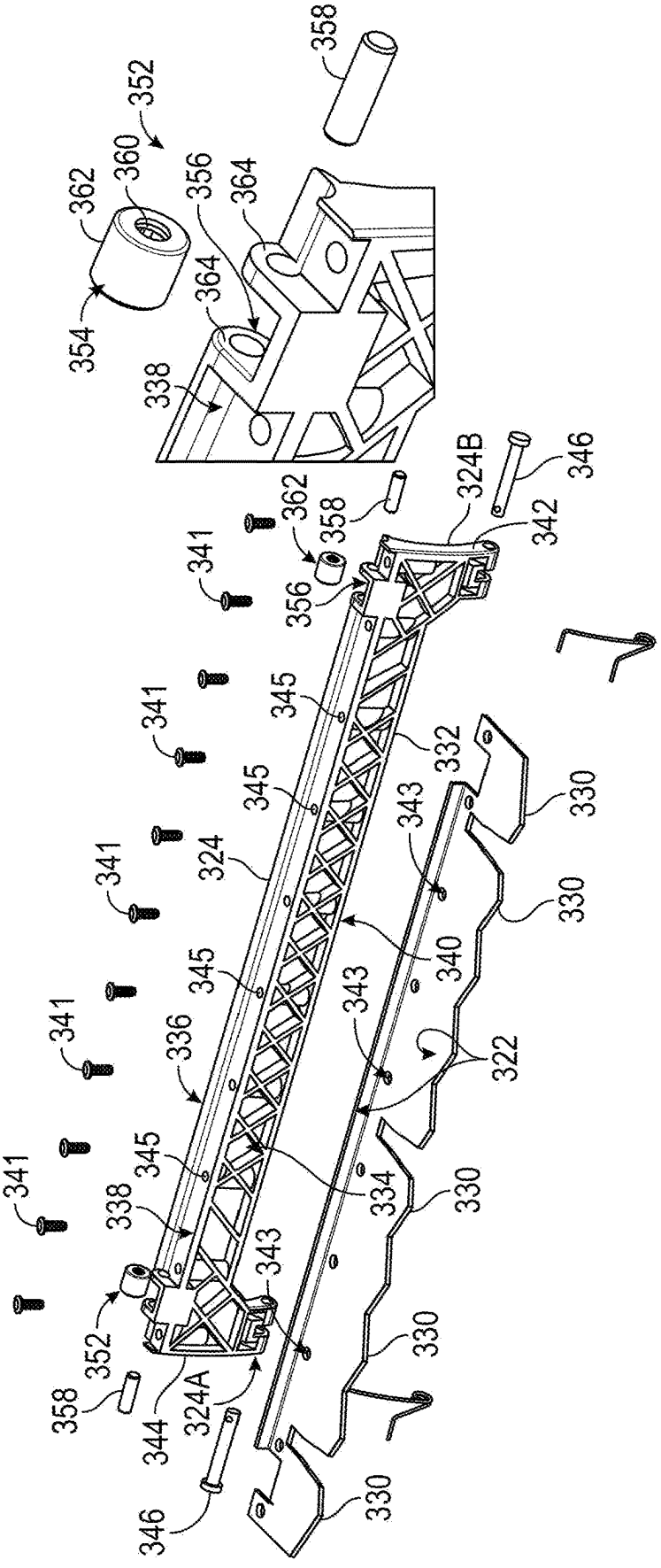

358
352
360
362
356
364
364
354
338
362
358
324B
346
342
341
356
341
345
332
345
343
330
324
341
330
345
340
343
336
322
341
345
338
334
330
343
352
358
324A
344
346
330
330

FIG. 3B

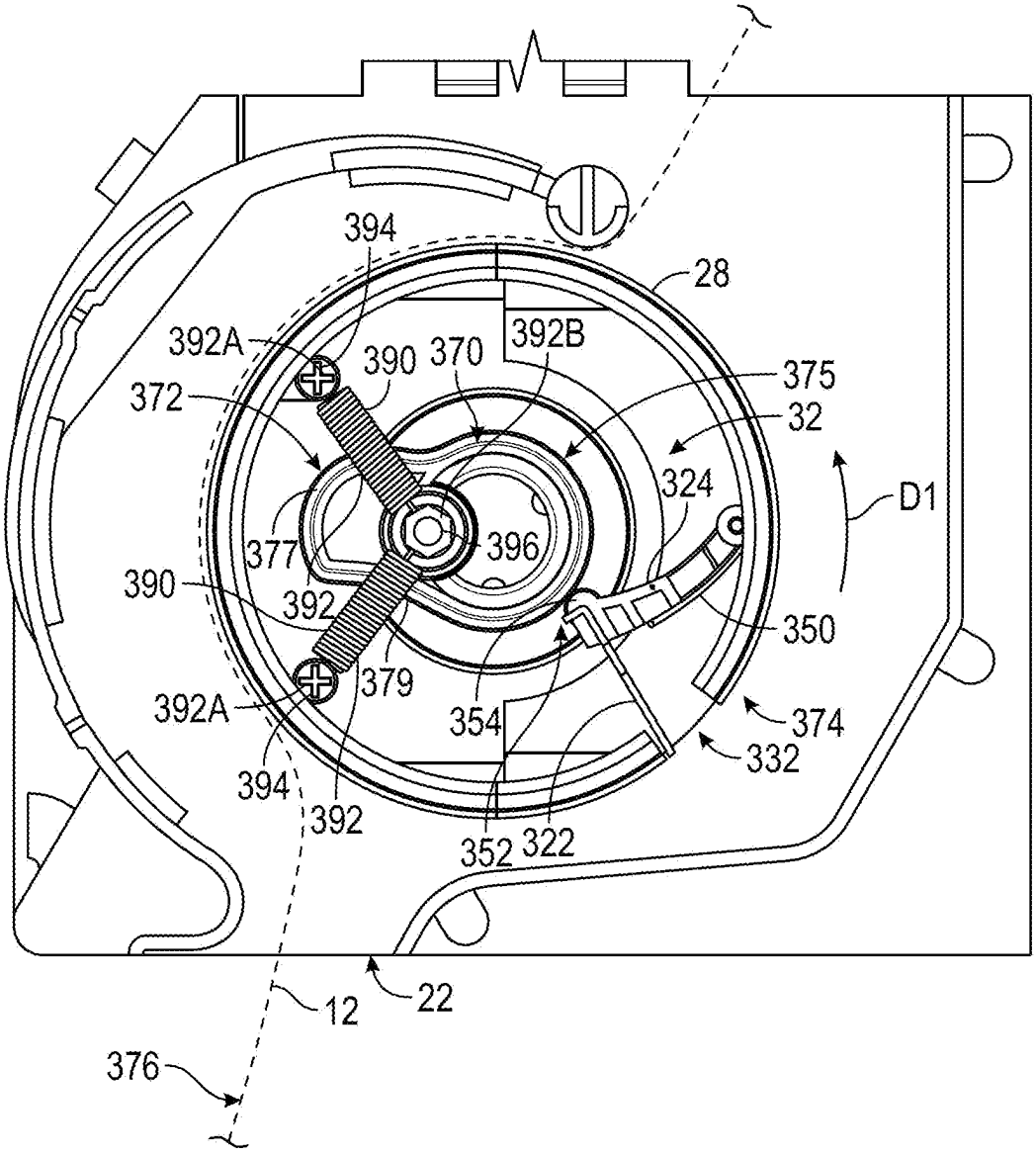

394
28
392A
390
370
392B
372
375
32
324
D1
377
396
390
392
350
379
392A
354
374
332
394
392
352
322
12
22
376

FIG. 4A

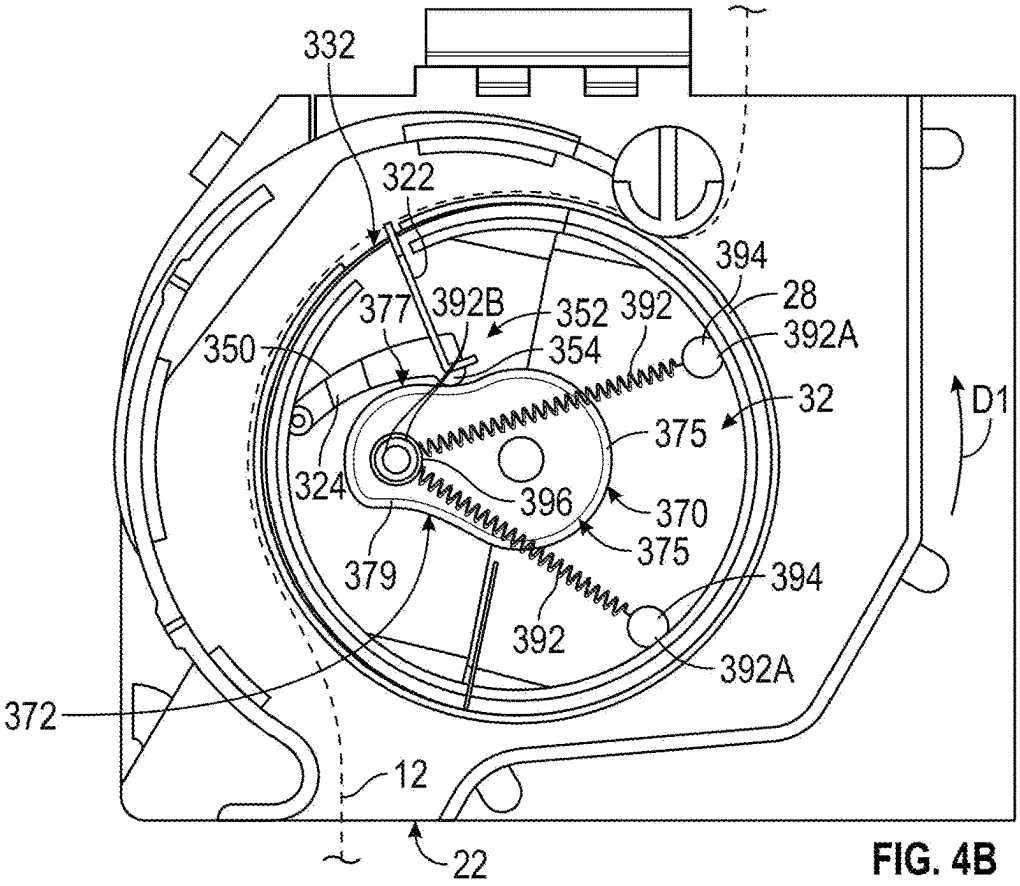

332
322
394
28
392B
377
352
392
392A
350
354
32
D1
375
324
396
370
375
379
394
392
392A
372
12
22

FIG. 4B

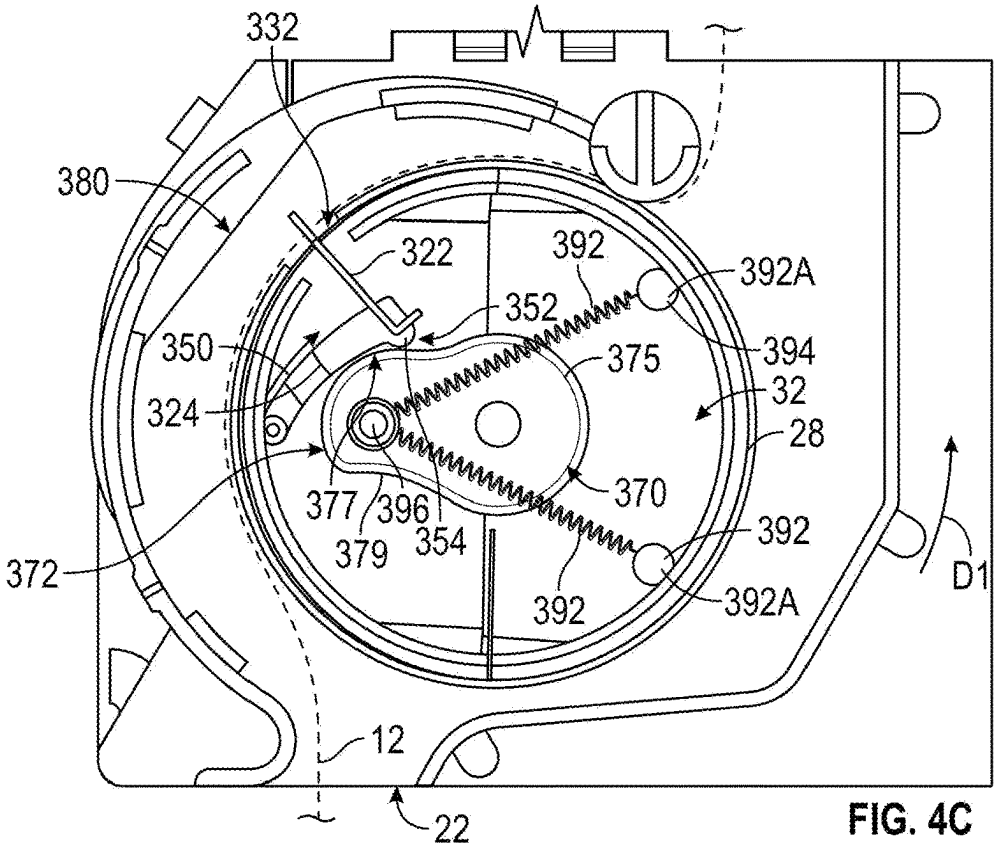

332
380
322
392
392A
352
350
375
394
32
324
28
370
377
396
379
354
392
372
392
392A
D1
12
22

FIG. 4C

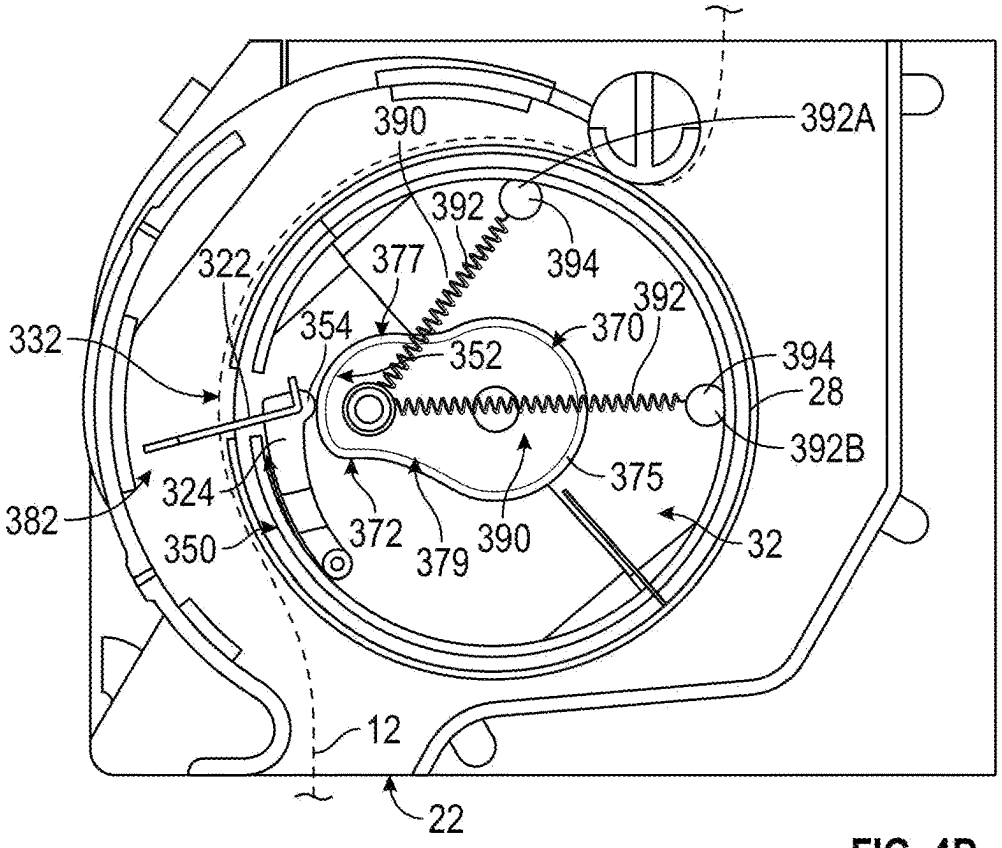

390
392A
392
394
322
377
354
370
392
332
352
394
28
392B
375
324
382
372
379
390
350
32
12
22

FIG. 4D

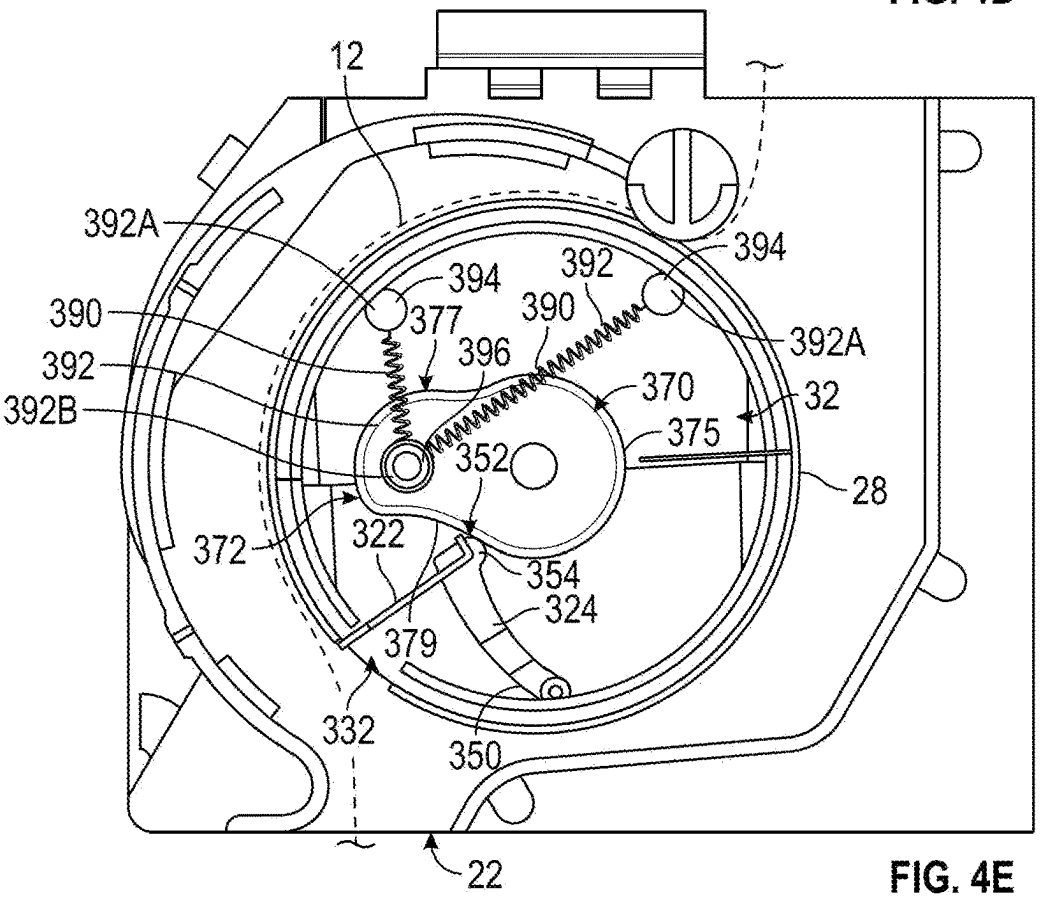

12
392A
394
394
392
390
377
390
392A
392
396
370
32
392B
375
352
28
372
322
354
324
379
332
350
22

FIG. 4E

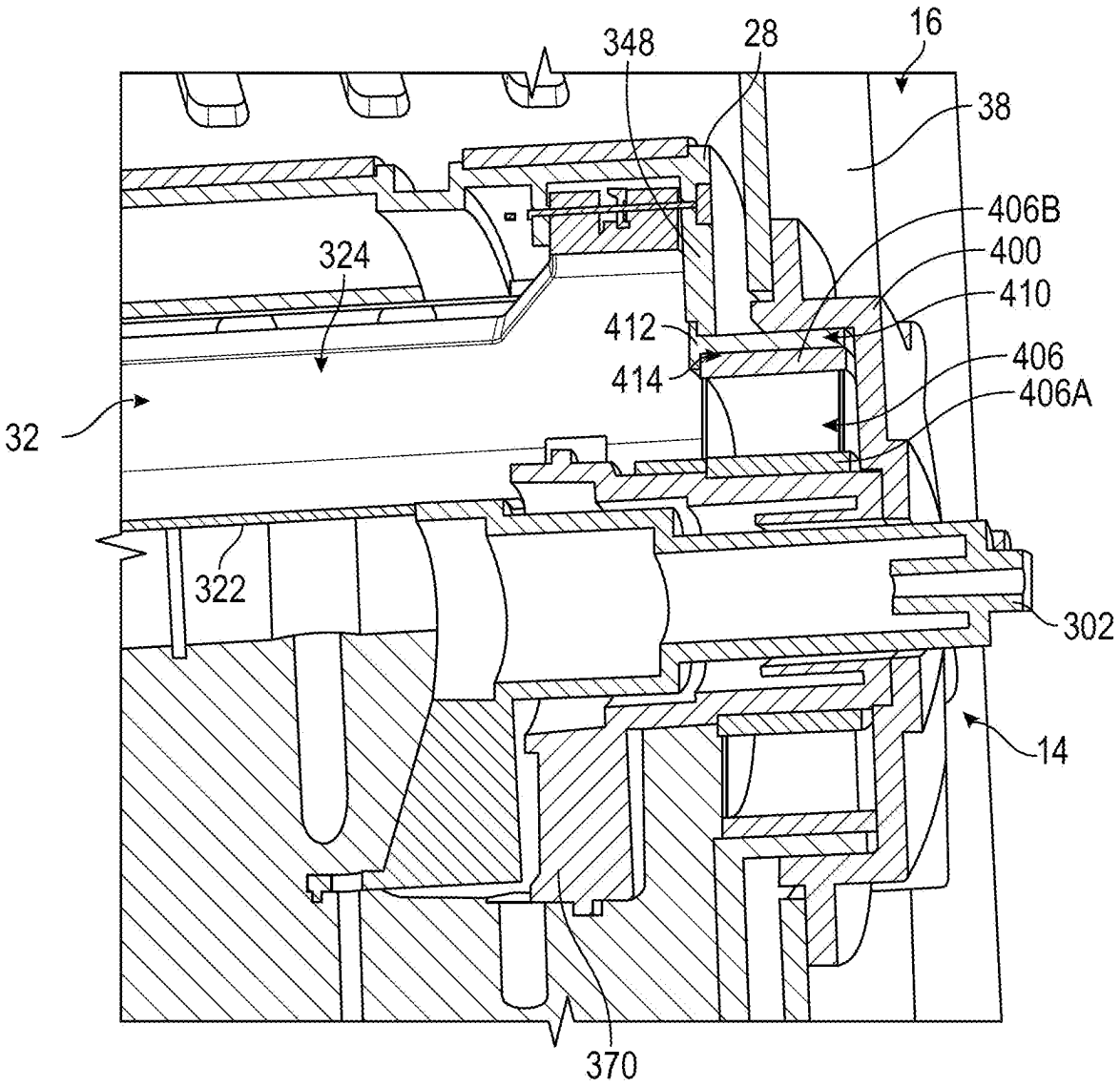


FIG. 5

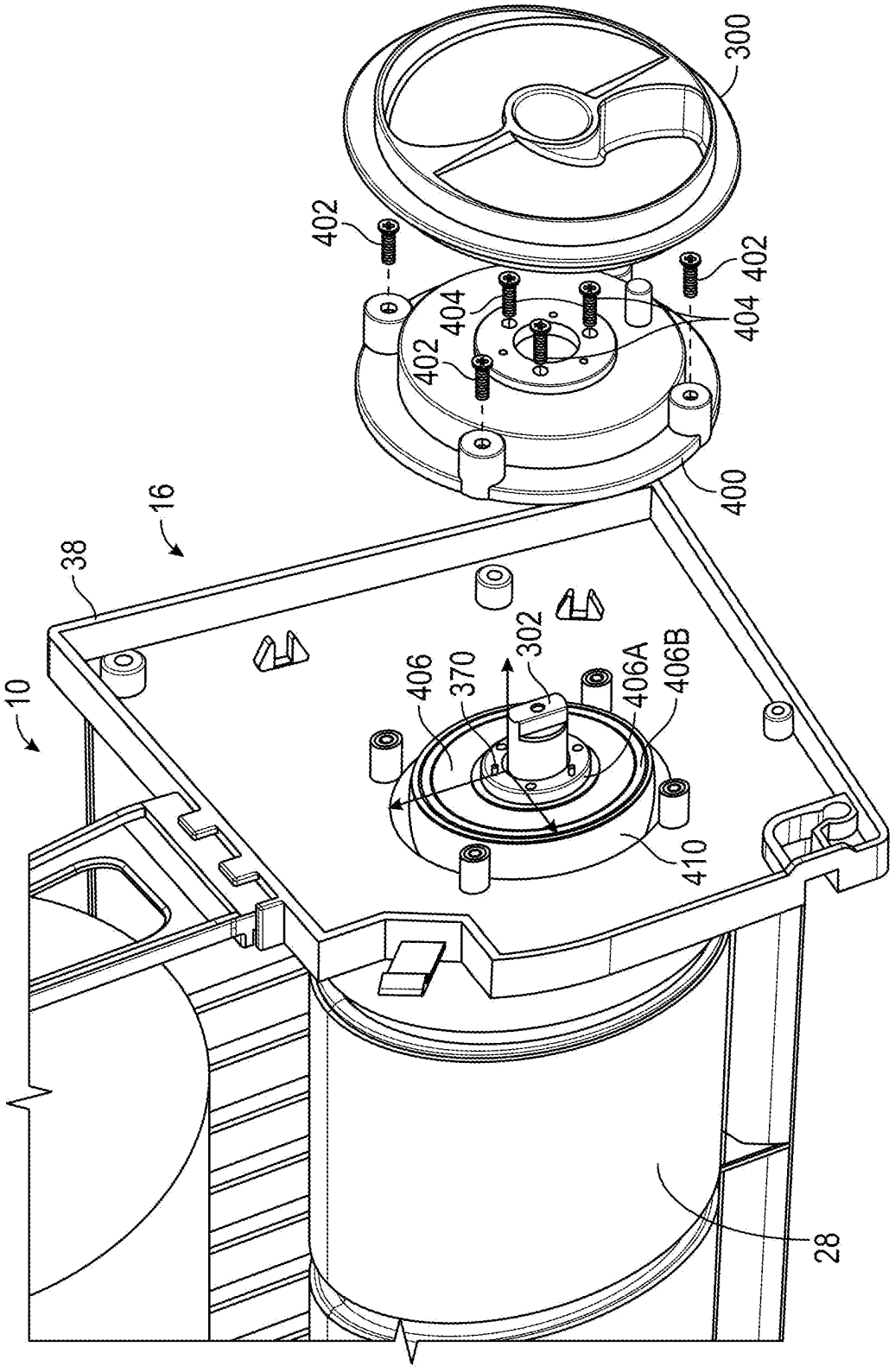


FIG. 6

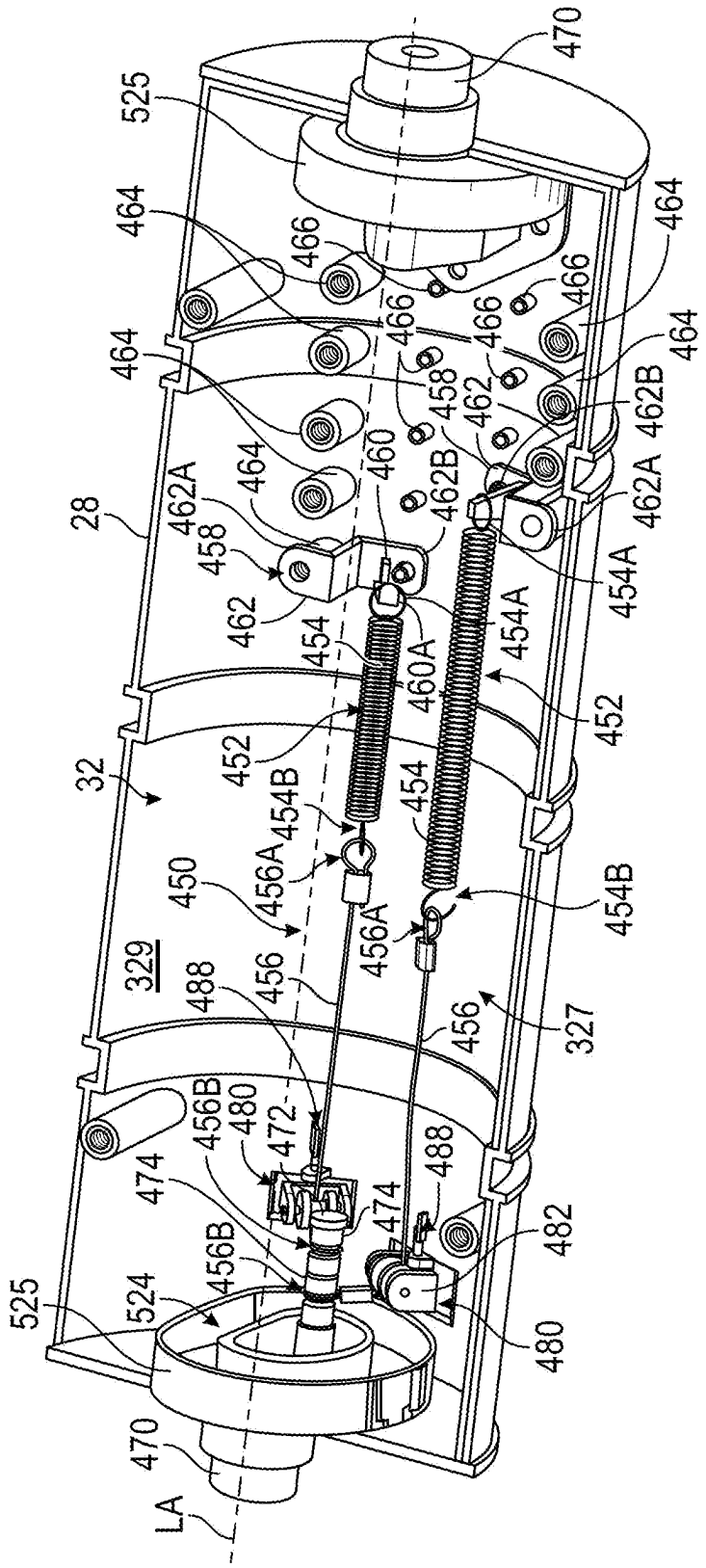

470
525
464
466
458
462
462B
462A
460
454A
454
460A
452
454B
456A
450
329
488
456
327
480
472
474
482
524
LA
28
32

FIG. 7A

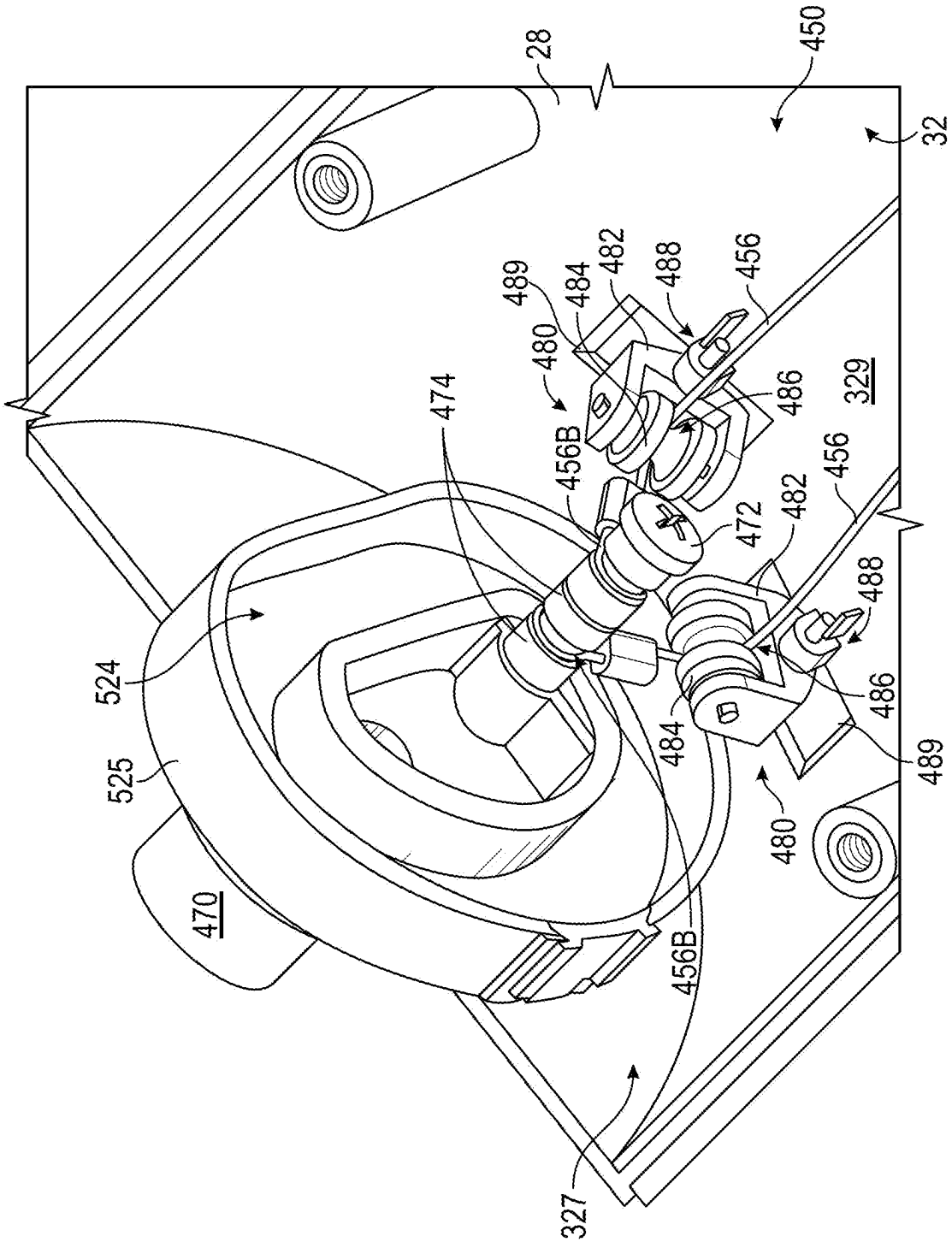

28
450
32
489
484
482
488
456
480
474
486
329
456B
456
472
482
488
524
486
525
484
489
480
470
456B
327

FIG. 7B

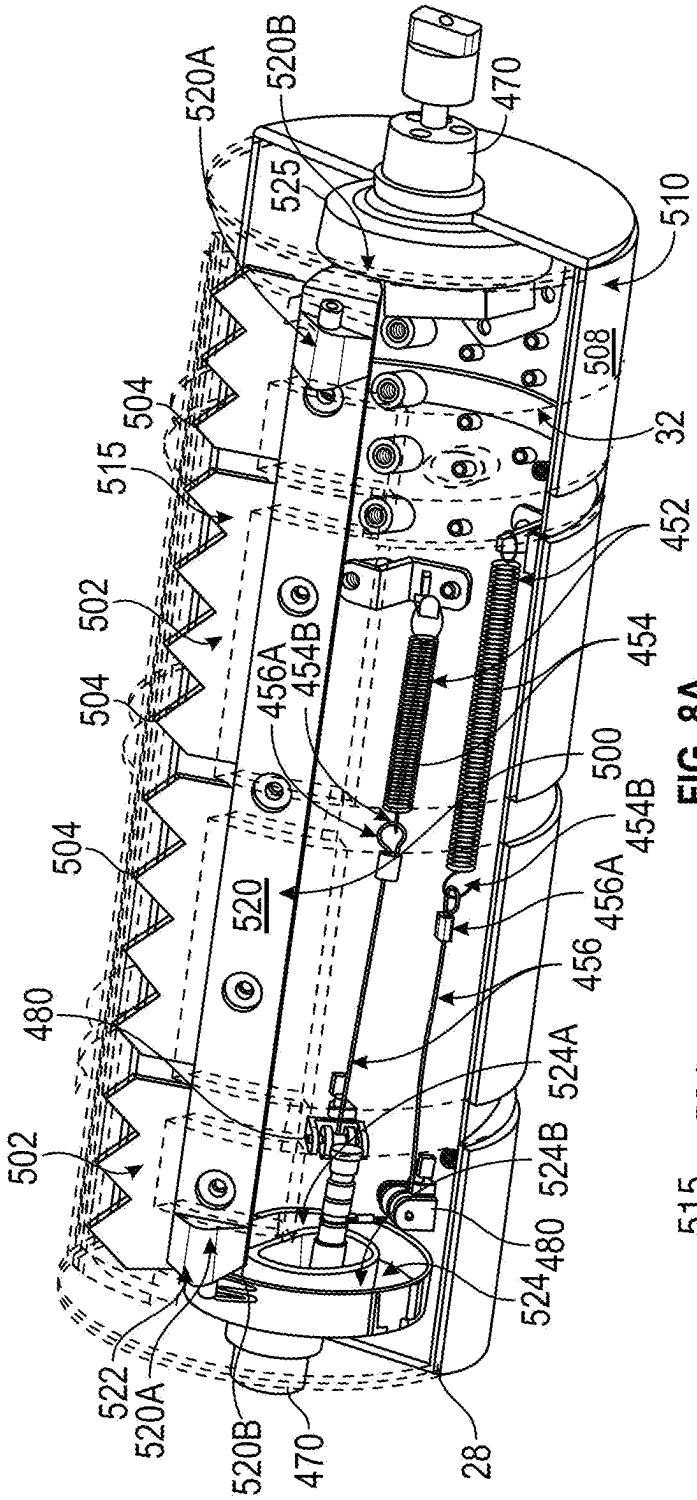

520A
520B
470
525
510
508
32
452
454
454B
456A
500
456
524A
524B
480
524
522
28
504
515
502
520

FIG. 8A

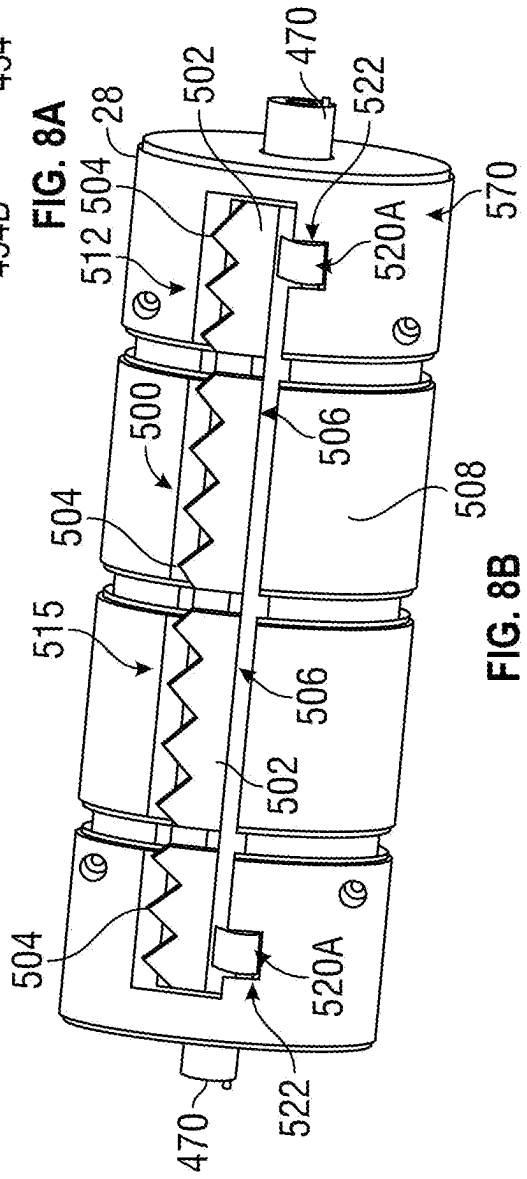

470
522
28
502
504
512
520A
570
500
506
508
515
504
502
520A
522
470

FIG. 8B

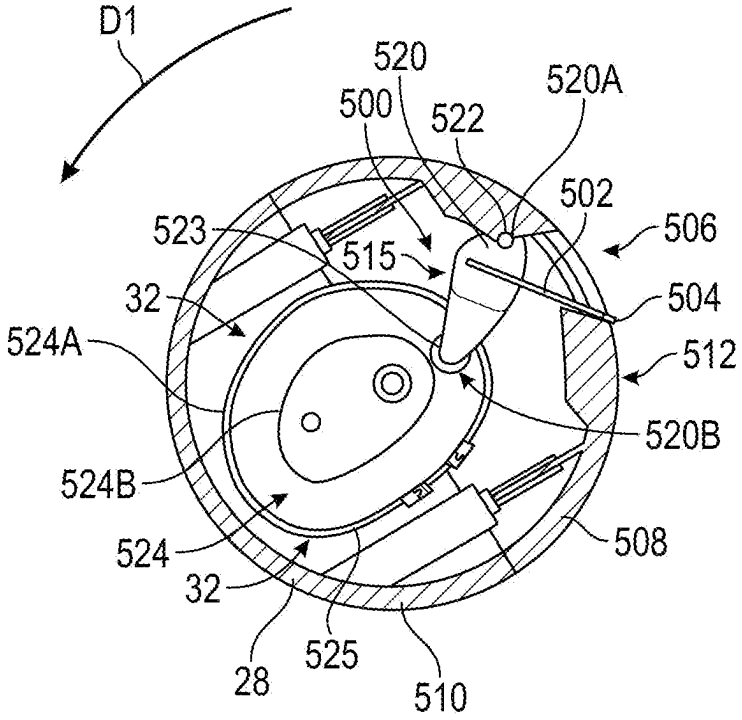

D1
520
520A
500
522
502
506
523
515
504
32
524A
512
520B
524B
524
508
32
28
525
510

FIG. 9A

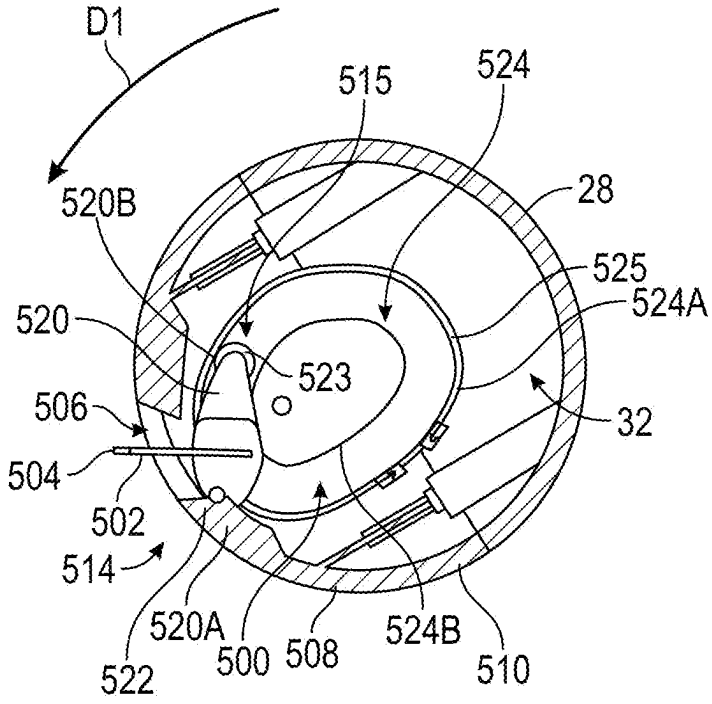

D1
515
524
28
520B
525
524A
520
523
506
32
504
502
514
520A
500
508
524B
522
510

FIG. 9B

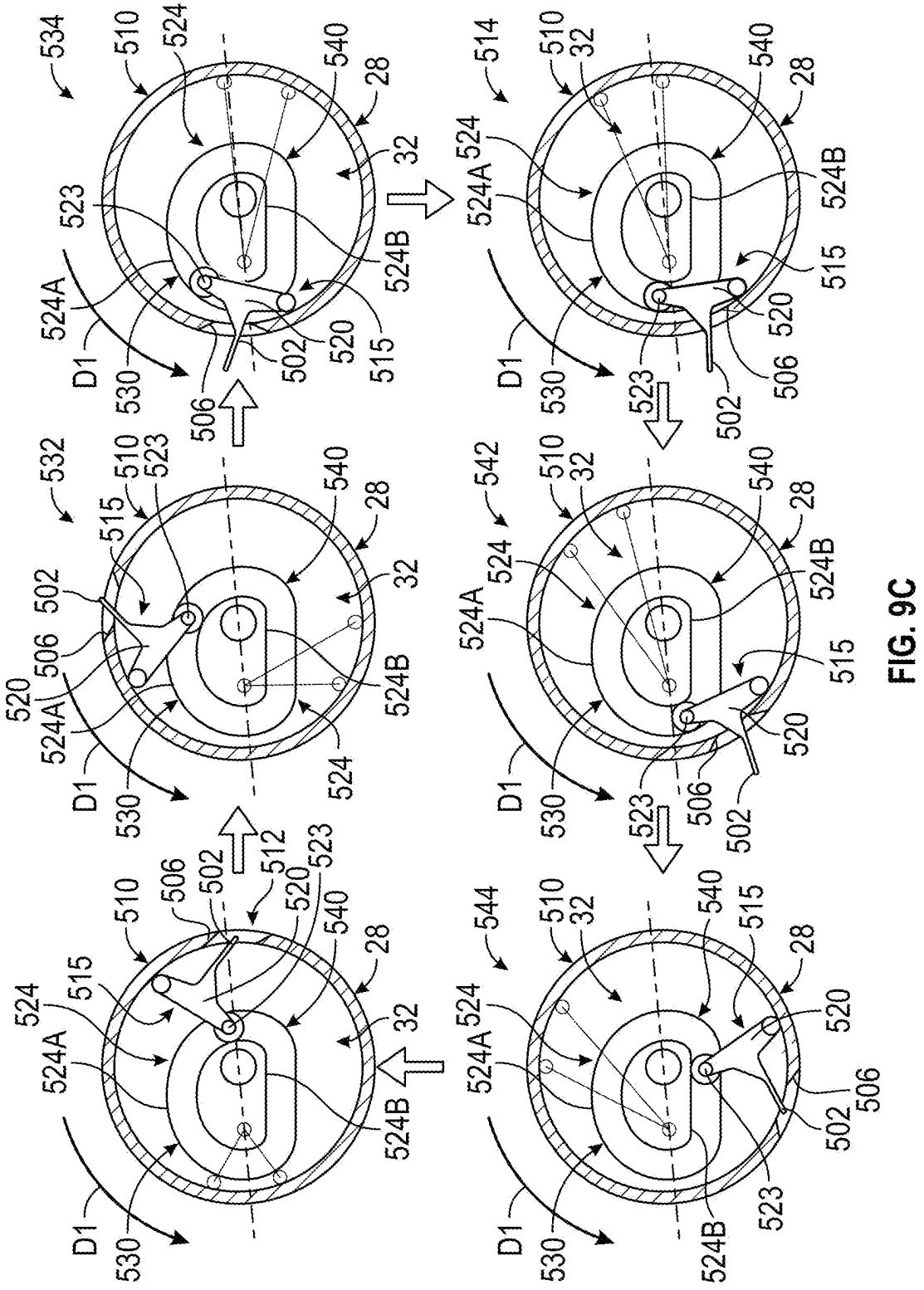

534
510
524
540
28
32
523
524A
524B
D1
530
506
502
520
515
532
512
514
542
544

FIG. 9C

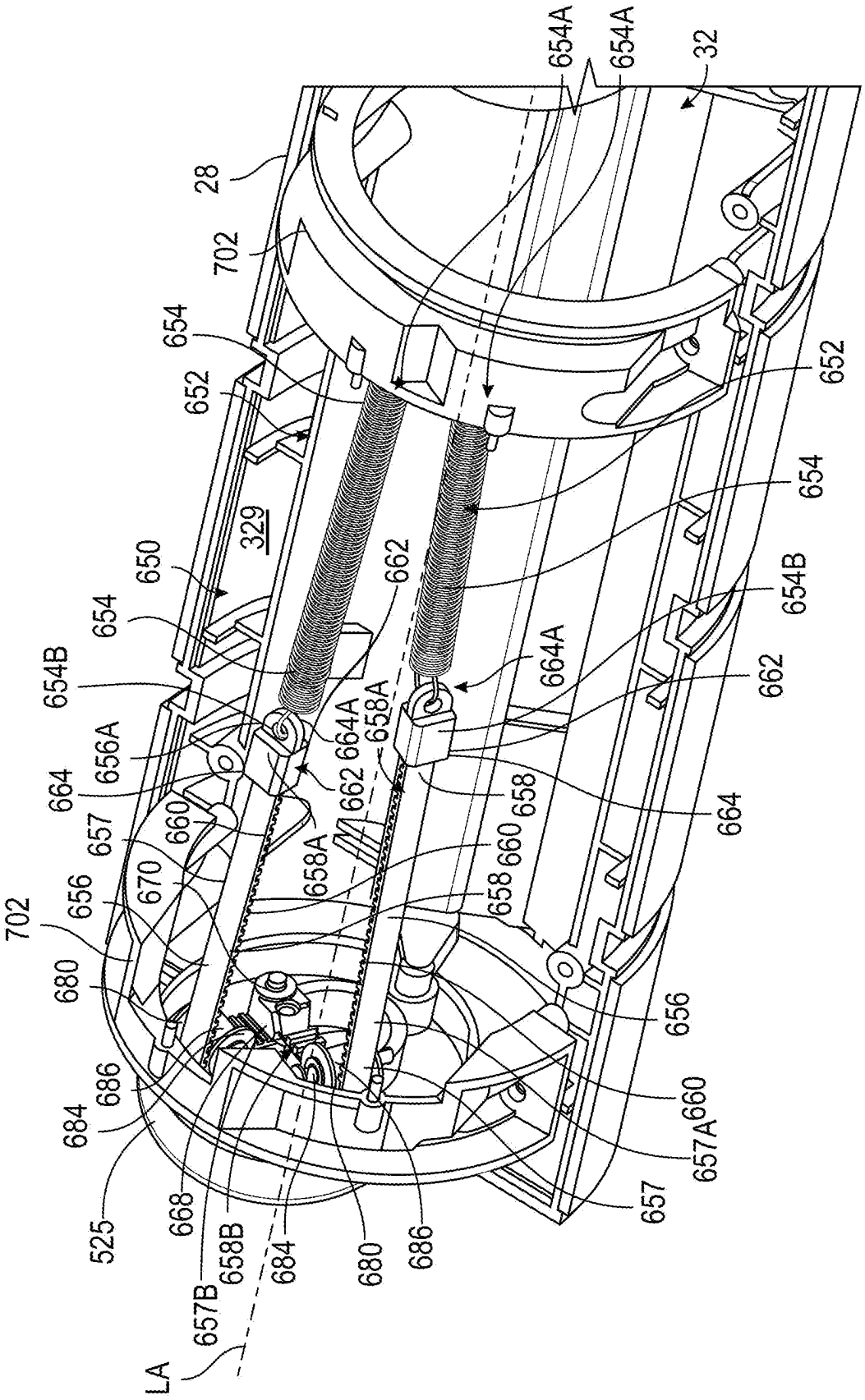

654A
654A
32
28
702
654
652
652
654
329
650
662
654
654B
664A
658A
662
656A
664
660
657
658
664
658A
660
658
670
656
702
680
656
686
684
657A
660
657
525
668
658B
684
680
686
657B
LA

FIG. 10A

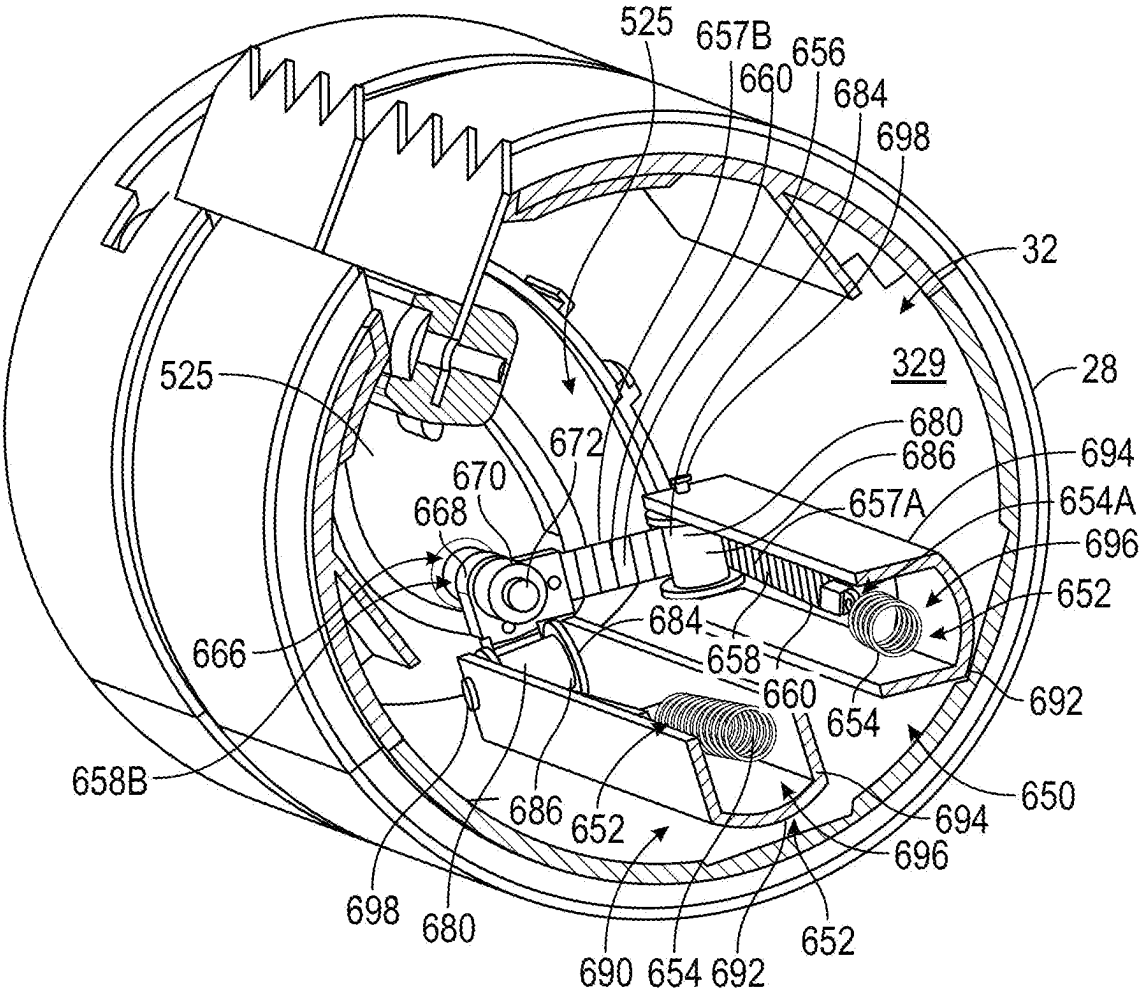

525
657B
656
660
684
698
32
525
329
28
680
672
686
694
670
668
657A
654A
696
652
684
666
658
660
692
654
658B
650
686
652
694
696
698
680
652
690
654
692

FIG. 10B

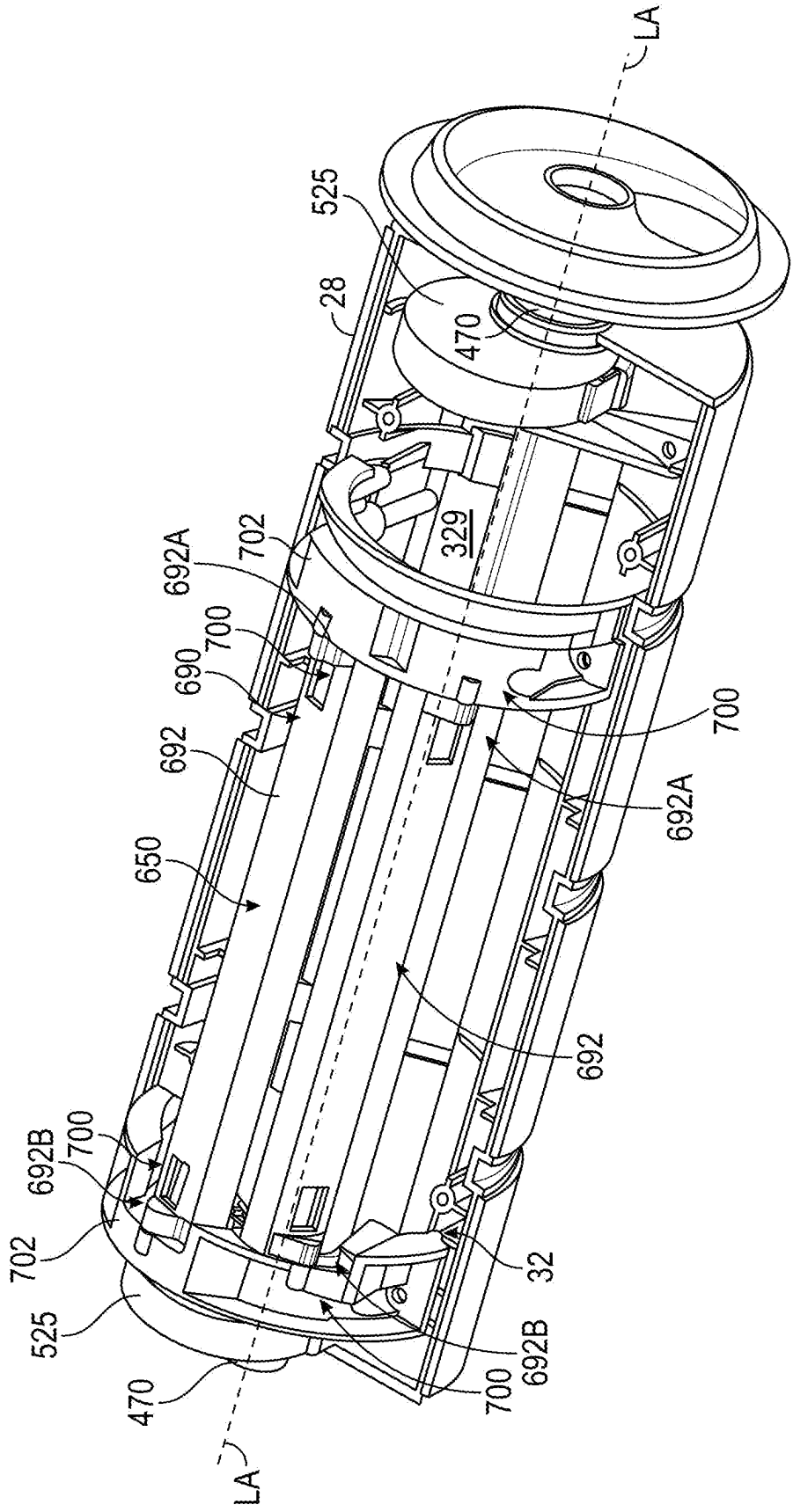

LA
525
28
470
329
692A
702
700
690
692
650
700
692A
692
692B
700
702
525
470
LA
32
692B
700

FIG. 10C

DISPENSER FOR ROLLED SHEET MATERIALS

CROSS REFERENCE TO RELATED APPLICATIONS

The present utility patent application is a continuation of U.S. patent application Ser. No. 17/507,857, filed Oct. 22, 2021, which is a continuation of U.S. patent application Ser. No. 16/593,004, filed Oct. 4, 2019, now U.S. Pat. No. 11,154,166, issued on Oct. 26, 2021, which claims the benefit of U.S. Provisional Patent Application No. 62/741,350, filed on Oct. 4, 2018. The present utility patent application also is a continuation-in-part of U.S. patent application Ser. No. 15/988,579, filed on May 24, 2018.

INCORPORATION BY REFERENCE

U.S. patent application Ser. No. 17/507,857, filed Oct. 22, 2021, U.S. patent application Ser. No. 16/593,004, filed Oct. 4, 2019, now U.S. Pat. No. 11,154,166, issued on Oct. 26, 2021, U.S. Provisional Patent Application No. 62/741,350, filed Oct. 4, 2018, and U.S. patent application Ser. No. 15/988,579, filed on May 24, 2018, are incorporated by reference herein as if set forth in their entireties.

TECHNICAL FIELD

This disclosure generally relates to dispensers and, more particularly, to dispensers for flexible sheet material, such as paper products.

BACKGROUND

Different types of devices for dispensing selected quantities of paper and other flexible sheet products, such as for use in restrooms, hospitals and/or other environments, have been developed in recent years. Some of these dispensers have incorporated mechanical cutting mechanisms that cut or perforate a portion of the paper as it is dispensed, without requiring a user to pull and tear the paper against a tearing mechanism. A drawback with some of these mechanical cutting mechanisms is that their blades or other devices can cause bunching, ripping, or inconsistent cutting of the paper while it is being dispensed, particularly when different grades of paper (i.e., heavier towel type or thinner, tissue type paper). Additionally, such dispensers and cutting systems may produce a significant amount of noise during operation, which noise may be undesirable or disruptive in hospitals, offices, or other environments. Furthermore, a user's pull force may not be sufficient to reset the dispensers and/or the cutting mechanisms. Accordingly, it can be seen that a need exists for a dispenser with a cutting mechanism that provides for reliable cutting or perforation of the sheet material/paper product without bunching or tearing, reduces noise generated as the sheet material is dispensed, provides a biasing force to facilitate resetting of the cutting mechanism, and which addresses the foregoing and other related and unrelated problems in the art.

SUMMARY

Briefly described, in one aspect, the present disclosure includes a dispenser for dispensing a flexible, rolled sheet material. The dispenser typically includes a dispenser housing with a supply of the sheet material supported therewithin, and a drive or feed mechanism. During a dispensing operation, a length or portion of the sheet material will be along a dispensing or feed path/path of travel defined through the housing and to a discharge.

The feed mechanism of the dispenser can include a manual drive or, alternatively, can include a motor driven drive.

In one aspect, the feed roll assembly can include a feed roller rotatably mounted within the housing and arranged along the path of travel of the sheet material. The feed roller can comprise a body having a chamber defined therein, and an exterior surface that at least partially engages the sheet material for feeding or dispensing thereof.

The feed roller can include a biasing assembly with one or more biasing members coupled thereto (e.g., springs or other suitable biasing mechanism) that assist in rotation of the feed roller (e.g., facilitate return of the feed roller to an initial position after manual dispensing of the sheet material).

One or more pressing rollers further can be positioned adjacent the feed roller. The pressing rollers also can be biased toward the body of the feed roller sufficient to engage the sheet material between the one or more pressing rollers and the feed roller so that the sheet material is pulled therebetween and from the supply for feeding along the dispensing path upon rotation of the feed roller during a dispensing operation.

Additionally, the dispenser can include a cutting mechanism or assembly at least partially disposed within the chamber defined by the body of the feed roller. The cutting assembly can include a cutting blade coupled to at least one movable support.

The at least one moveable support further can be operatively connected to the body of the feed roller so as to be actuated with rotation thereof to cause the cutting blade to be moved into and out of one or more openings or a notch or recess defined along the body of the feed roller and at least partially cut, score, or perforate the sheet materials after or during a dispensing operation with the feeding of a selected portion of the sheet material.

The cutting assembly further can include a cam follower (e.g., including a roller or bearing) that is connected to the at least one moveable support, and which engages and rides along a cam surface or track positioned within the chamber of the body of the feed roller as the feed roller is rotated to cause movement of the cutting blade into and out from the one or more openings in the body of the feed roller.

The cutting assembly can include a substantially fixed cam member or track mounted within the chamber of the feed roller body such that the feed roller and the cutting mechanism are rotatable thereabout.

The cam member can have at least one protrusion, or alternatively the track can have an area or portion, shaped, positioned, sized, and/or configured to be engaged by the cam follower to cause rotation or pivoting of the at least one support sufficient to move the cutting blade out of the feed roller body for at least partially cutting, scoring, or perforating the sheet material. The protrusion of the cam member (or area of the track) can have various configurations, including having one or more curved or arcuate surfaces configured to engage the cam follower, in response to which, the cutting blade is moved out of the feed roller body for at least partially cutting, scoring, or perforating the sheet material without scrapping, tearing, and/or ripping thereof.

In one aspect, the at least one moveable support also may be biased, e.g., by one or more biasing members, to urge the cam follower into engagement with the portion or track. In one aspect,

In one additional aspect, the cutting assembly can include a linkage driven cutting mechanism (e.g., without biasing members) having at least one support that supports the cutting blade and is connected to an interior surface of the feed roller body at a first portion/end and to a cam follower, such as a roller or bearing that is received within the track, at a second portion/end. As the body of the feed roller rotates the roller connected to the first portion of the support can move about and engage the track, such that the support is pivoted or otherwise moved about the first end thereof connected to the body of the feed roller to move the cutting mechanism into engagement with the sheet material.

The biasing assembly connected to the feed roller to assist rotation thereof and can also facilitate/assist movement of the cutting blade into and out from the one or more openings for at least partially cutting or perforating the selected portion of the sheet material.

The one or more biasing members of the biasing assembly further can extend generally along a longitudinal or rotational axis of the feed roller body.

The biasing assembly also can include one or more linkages and one or more pulleys. The linkage(s) can include one end that is connected to a corresponding biasing member, and an opposing end that is connected to a component of the dispenser that is substantially fixed in relation to the feed roller body. The pulley(s) can be configured to engage the linkage(s) to facilitate a change of direction thereof, such that an axial pull force or tension along the biasing member (s) is converted into a radial pull force or tension to maintain or assist in rotation of the feed roller body and/or facilitate movement of the cutting blade into and out from the one or more openings for at least partially cutting or perforating the selected portion of the sheet material.

Still further, the biasing assembly can include a support assembly configured to support the biasing member(s), linkage(s), and pulley(s) along the feed roller body, e.g., to help facilitate alignment of, or to help to substantially reduce, prevent, or inhibit misalignment of, the biasing member(s), linkage(s), and/or pulley(s) when the biasing assembly is rotated or otherwise moved with the feed roller body.

These and other advantages and aspects of the embodiments of the disclosure will become apparent and more readily appreciated from the following detailed description of the embodiments and the claims, taken in conjunction with the accompanying drawings. Moreover, it is to be understood that both the foregoing summary of the disclosure and the following detailed description are exemplary and intended to provide further explanation without limiting the scope of the disclosure as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the embodiments of the present disclosure, are incorporated in and constitute a part of this specification, illustrate embodiments of this disclosure, and together with the detailed description, serve to explain the principles of the embodiments discussed herein. No attempt is made to show structural details of this disclosure in more detail than may be necessary for a fundamental understanding of the exemplary embodiments discussed herein and the various ways in which they may be practiced.

FIG. **1** shows a perspective view of an example sheet material dispenser according to principles of the present disclosure.

FIG. **2** shows a cross-sectional view of an example dispenser according to principles of this disclosure.

FIGS. **3**A and **3**B illustrate exploded views of a feed roller and cutting assembly/system according to one aspect of the present disclosure.

FIGS. **4**A, **4**B, **4**C, **4**D, and **4**E show cross-sectional views of a feed roller with the cutting system/assembly of FIGS. **3**A and **3**B.

FIG. **5** shows a further cross-sectional view of a feed roller with the cutting system/assembly of FIGS. **5**A and B.

FIG. **6** shows a partial perspective view of an example manually drive mechanism according to principles of the present disclosure.

FIGS. **7**A and **7**B show a side elevational view and a partial side elevational view of a biasing assembly for controlling movement of a feed roller and/or cutting mechanism according to one aspect of the present disclosure.

FIGS. **8**A and **8**B show side elevational views of the feed roller with a cutting system according to an additional aspect of the disclosure.

FIGS. **9**A, **9**B, and **9**C show cross-sectional views illustrating the various positions of the cutting mechanism of FIGS. **8**A and **8**B.

FIGS. **10**A, **10**B, and **10**C show partial cutaway, perspectives view of a biasing assembly for controlling movement of a feed roller and/or cutting mechanism according to an additional aspect of the present disclosure.

DETAILED DESCRIPTION

The following description is provided as an enabling teaching of embodiments of this disclosure. Those skilled in the relevant art will recognize that many changes can be made to the embodiments described, while still obtaining the beneficial results. It will also be apparent that some of the desired benefits of the embodiments described can be obtained by selecting some of the features of the embodiments without utilizing other features. Accordingly, those who work in the art will recognize that many modifications and adaptations to the embodiments described are possible and may even be desirable in certain circumstances. Thus, the following description is provided as illustrative of the principles of the embodiments of the invention and not in limitation thereof, since the scope of the invention is defined by the claims.

As generally illustrated in FIGS. **1**-**10**C, the present disclosure is directed to a sheet material dispenser **10** for feeding or dispensing a flexible sheet material **12** (FIGS. **1**-**2**). The dispenser **10** generally includes a feed roller drive assembly **14** mounted/disposed within a dispenser housing **16**. The drive assembly **14** generally will be manually operated (as shown in FIGS. **5** and **6**); though in some constructions the dispenser can include a motorized/driven feed roller. Upon use or activation of the dispenser **10**, the feed roller drive assembly **14** for dispensing sheet material will be engaged, causing rotation of a feed roller or drive spindle **18**, thereby resulting in conveyance of a measured or selected amount or length L of sheet material **12** along a conveying or feed path P (FIG. **2**) from a roll or supply **20** of the sheet material **12** and out of a dispensing throat or discharge chute **22** or other suitable aperture or opening provided/defined in the housing **16**, as generally indicated in FIGS. **1** and **2**. It further should be appreciated that the sheet material dispenser **10** described herein should not be considered to be limited to any particular style, configuration, or intended type of sheet material. For example, the dispenser **10** may be operable to dispense paper towels, toilet tissue, or

other similar paper or sheet materials, including dispensing or feeding non-perforated and/or perforated sheet materials.

As indicated in FIGS. **1** and **2**, the dispenser housing **16** generally includes a roll support mechanism **21**, for holding at least one roll **23** of the supply **20** of sheet material **12**. For example, the roll **23** can be supported by a pair of arms **25** coupled to the dispenser housing **16**. These arms **25** may be fixedly arranged to hold the supply **20** of sheet material in a spaced relationship with the feed roller **18** or, in the alternative, the arms **25** may be biased or urged, such as by a spring, other pre-stressed member or suitable biasing mechanisms, toward the feed roller **18** to urge or direct the supply **20** of sheet material downwardly toward or against the roller **18**. In an alternative construction (not shown), the roll support mechanism can include slots or grooves defined in or along the dispenser housing **16** that are configured to receive the first and/or second ends of the roll **23** of the sheet material **12**, such that at least a portion of the supply **20** of sheet material **12** is supported by, and/or rests on or engages the feed roller **18**. The slots or grooves of the roll support mechanism further can include one or more angled or sloped portions having a variable slope to increase/decrease the amount of force the supply **20** of sheet material exerts on the roller **18**. For example, a slope can be selected such that as the supply **20** of sheet material is fed (e.g., the amount of sheet material **12** left on the roll decreases), the slope or position of the supply roll can change so as to keep a downward force exerted on the feed roller **18** by the supply roll substantially constant as the supply of sheet material, and likewise the weight thereof, is diminished as selected portions of the sheet material **12** are dispensed.

FIGS. **1** and **2** further show that the dispenser **10** also can include one or more pressing rollers **36** that can be biased toward engagement with the feed roller **18**, so as to engage and force or press the sheet material **12** against the feed roller **18**. The pressing roller(s) **36** can be movably mounted within the dispenser housing **16**, such as with the ends thereof held within holders or brackets **36**A/**36**B that can be biased toward engagement with the driven feed roller **18** such as by springs, biased cylinders or other suitable biasing mechanisms. The pressing rollers or a single roller, when used, also can be biased independently forward the feed roller. The pressing roller(s) **36** further can include bands of a gripping material, such as a rubber or synthetic material, to assist in pulling the sheet material therebetween without causing damage to the sheet material as it passes between the feed roller and pressing roller(s). Additional pressing or guide rollers **36**C also can be arranged along the feed roller **18** to assist in guiding the sheet material, which additional rollers **36**C (FIG. **2**) may be fixed or biased against the feed roller body **30**, such as by springs, biased cylinders or other suitable biasing mechanisms.

FIG. **3**A provides an exploded view of the feed roller **18** according to one embodiment. As illustrated in FIG. **3**A, the feed roller body **28** may include first and second ends **28**A/**28**B and a generally cylindrical outer side wall **30** and an inner side wall **31** defining an open ended passage, recess, or at least partially hollow cavity **32** defined within/along the feed roller body **28**, and the feed roller body **28** may also include one or more driving bands **34** disposed on, or adhered to, an outer surface **30**A of the side wall **30**, such as a series of driving bands or sections **34** disposed on the outer surface **30**A in a spaced arrangement or configuration. The driving bands **34** may at least partially include or be comprised of rubber, plastic, resin or other similar materials suitable to increase grip of the feed roller **18** and/or friction between the feed roller **18** and the sheet material **12** to thereby assist in the feeding or driving of the sheet material **12**. In addition, the outer surface **30**A of the feed roller body **28** also may include a series of recessed or gap sections **35** defined therein.

As additionally illustrated in FIG. **3**A, the feed roller body **28** can be made up of various sections or portions including a first section or portion **29** having, for example, a cylindrical sidewall **29**A defining an open ended passage or at least a partially hollow cavity **29**B therealong, and a second, or other additional, section or portion **33** connected to and/or adjacent the first section **29** also having, for example, a cylindrical sidewall **33**A defining an open ended passage or at least a partially hollow cavity **33**B therealong. The feed roller body **28** can be movably or rotatably mounted/attached to one or more walls or other portions of the dispenser housing **16**, such as side walls **38**/**39** (FIGS. **1** and **5**-**6**). The first **28**A and/or second **28**B ends of the feed roller body **28** can be connected, mounted or otherwise coupled to the side walls **38**/**39** by one or more bearing assemblies **406** (FIGS. **3**A and **5**-**6**), and/or other suitable support mechanisms that support and allow for rotation of the feed roller body **28** in relation to the dispenser housing **16**. The bearings **406** may include roller or ball bearings, though embodiments of this disclosure are not so limited and may include plain, fluid, or magnetic bearings or any other suitable mechanisms for rotatably fixing the feed roller body **28** to or within the dispenser housing **16**. The first **28**A and/or second **28**B ends of the feed roller body **28** can be receive and engage the bearing assemblies **406** to enable the feed roller body **28** to rotate with respect to the dispenser housing **16** (FIGS. **3**A and **5**-**6**).

FIGS. **3**A-B and **4**A-E show a dispenser cutting assembly or system **320** according to one embodiment of the present disclosure, wherein the cutting assembly **320** can include a cutting blade **322** and a base or support **324** connected to and at least partially supporting the cutting blade **322**. The base **324** can be pivotally or otherwise movably mounted within the cavity or chamber **32** defined within the feed roller body **28**, such that teeth or sharpened portions **330** of the cutting blade **322** are extensible between extended and retracted positions out of and back through an opening or slot **332** defined along the feed roller body **28** by movement of the base.

The base **324** can have a body **332** with front **334**, back **336**, top **338**, bottom **340**, and side **342**/**344** portions or sections (FIG. **3**B). In one embodiment, the body **332** of the base **324** further can be formed from a plastic material or other polymeric material, though other suitable materials, such as rubber, wood, composites, etc., also can be used without departing from the scope of the present disclosure. The base **324** further generally will be coupled or connected to the cutting blade **322** along the top portion **338** of the base **324**, for example, by a series of fasteners **341**, such as screws, bolts, rivets, etc., that can be received and/or threaded through a series of holes **343** defined in/through the cutting blade **322** as well as corresponding holes **345** defined in the top portion of the base **324**. However, the cutting blade **322** can be otherwise fixed to or integrally formed with the support/base **324**, without departing from the scope of the present disclosure.

As generally shown in FIGS. **4**A-E, the base **324** further is rotatably or pivotally coupled to at least a portion of the feed roller body **28**. For example, the cutting assembly **320** can include pins **346**, or other suitable connection means or connecting members, e.g., rods, bearings, etc., allowing for pivoting or rotation thereabout, to couple to ends **324**A/B of the base **324** to side walls **348** of the feed roller body **28** such

that the base/support **324** is rotatable/pivotable about the pins **346** and further moves/rotates with the feed roller body **28** during dispensing of the sheet material. Additionally, the cutting assembly **320** can include one or more biasing members **350**, such as torsion springs, or other suitable biasing members, that are coupled to pins **346** and provide a biasing force against the support/base **324**, e.g., sufficient to urge or bias the support/base **324**, and thus the cutting blade **322**, toward a retracted position.

FIGS. **3**A-**3**B and **4**A-**4**E also show that the base **324** also has a cam follower assembly **352** arranged along the top portion **338** thereof. The cam follower assembly **352** generally has one or more cam followers **354**, which can include bearings, rollers, or other rotating members or portions. In one embodiment, the cam followers **354** can be at least partially received within notches or grooves **356** defined in the top portion **338** of the base **324**, and can be rotatably coupled thereto by rods or pins **358**, or other suitable connection mechanisms, as generally shown in FIG. **3**B. The rods or pins **358** each further can be received/engaged within a hole or passage **360** defined through a body **362** of each cam followers **354** and corresponding holes/passages **364** defined along the top portion **338** of the base **224**, to rotatably couple the cam followers **354** to the base **324**, as generally shown in FIG. **3**B.

The cam followers **354** engage and move along one or more corresponding cam surfaces or tracks **366** located within the cavity **32** of the feed roller body **28**, as the feed roller body **28** is rotated, and correspondingly pivot/rotate the base **324** and move the cutting blade **322** out from and back into the opening/slot **332**. For example, in one embodiment, the cutting assembly **320** can include cam members **370** that can be mounted in a substantially fixed or stationary position within the cavity **32** of the feed roller body **28**, such that the feed roller body **28** and the base **324** are rotated about such cam members **370**, such as indicated in FIGS. **4**A-E.

The biasing member **350** further can bias or urge the cam followers **354** against and into engagement with at least a portion of the cam members **370**. The cam members **370** further can have one or more protrusions, protuberances, or extending portions **372** provided therealong, such that when the protrusion(s) **372** are engaged by the cam followers **350** the biasing force of the biasing member **350** is overcome to cause the base/support **324** to pivot, rotate, or otherwise move and thereby extend the cutting blade **322** out from the opening/slot **332** in the feed roller body **28** for at least partial perforation or cutting of the sheet material. Accordingly, as shown in FIGS. **4**A-E, as the feed roller body **28** is rotated to dispense sheet material **12** (and the base **324** is rotated therewith) the cam followers **354** will be pressed against/into engagement with and moved along the cam members **370** such that the support/base **324** pivots or moves the cutting blade **322** between a plurality of extended and retracted positions **374**, **380**, **382**.

As shown in FIG. **4**A, the cutting blade **322** initially can be in a rest or initial position **374**, with the cam followers **354** engaging a surface or portion **375** of the cam members **370** such that the cutting blade **322** is retracted from the opening **332** in the feed roller body **28**. In this rest/initial position **374**, a tail or portion **376** of the sheet material **12** may hang or otherwise extend from the discharge chute **22** of the dispenser. It will, however, be understood that the present disclosure is not limited to this arrangement, and the sheet material **12** may be concealed within the dispenser or in any other suitable arrangement, without departing from the scope of the present disclosure.

FIGS. **4**B-C also indicate that when the feed roller body **28** is rotated to dispense a selected amount of sheet material, for example, upon a manual activation of the dispenser, e.g., when a user turns a knob or lever **300** operatively connected to the feed roller body **28** by a post or support **302** (FIGS. **5** and **6**) or pulls on the tail **276** of a hanging sheet or portion of sheet material extending from the discharge, the cam follower **354** will move along surface **375** until the cam follower **354** engages a cam surface or portion **377** of a protrusion **372** of the cam member **370** and is moved to an extent sufficient to overcome the biasing force of the biasing member **350**. In response, the support/base **324** will be pivoted so as to move the cutting blade **322** to exit the opening **332** defined in the feed roller body **28** to cut, score, or perforate the sheet material **12**.

In addition, FIG. **4**B shows that when the feed roller body **28** is rotated an initial amount, e.g., rotated approximately 150° to approximately 180°, such as approximately 170°, from the rest position **374** in a counterclockwise direction D**1**, the cam follower **354** generally will begin to engage the surface or portion **377** of the protrusion **372** and the cutting blade **322** will begin to exit the opening **332**. Thereafter, as shown in FIG. **4**C, as the feed roller body **28** is rotated a further amount, e.g., rotated approximately 170° to approximately 200°, such as approximately 180°, from the rest position **374** in the counterclockwise direction D**1**, to the cam follower **354** is moved further along the surface/portion **377**, causing the cutting blade **322** to extend further toward a cutting position **380** with the cutting blade **322** contacting or otherwise engaging the sheet material for cutting or perforation thereof. In one embodiment, the cam surface or portion **377** of the protrusion **372** further generally can be sloped, curved, or otherwise shaped or configured to help control the engagement of the cutting blade with the sheet material so as to substantially prevent ripping or tearing during cutting, scoring, or perforation thereof.

Subsequently, as illustrated in FIG. **4**D, when the feed roller body **28** rotates an even further amount, e.g., approximately 220° to approximately 240° or more, such as approximately 230°, from the rest position **374** in the counterclockwise direction D**1**, the cam follower **354** is moved further along the cam surface or portion **377** such that the cutting blade **322** is moved to its fully extended position **382**, with the cutting blade **322** substantially projecting or extending out of the opening **332** in the feed roller body **28**.

Thereafter, as the feed roller body **28** continues to rotate and as the cam follower **354** engages and moves along cam surface or portion **379** of the protrusion **372**, the cutting blade **322** is retracted back through the opening **332** in the feed roller body **28** (FIG. **4**E). Additionally, when the feed roller body **28** has made a full rotation, e.g., rotated approximately 360° from its initial or rest position **374**, the cam follower **354** will again engage the cam surface or portion **375** of the cam members **370** such that the cutting blade **322** is in its retracted or initial position (FIG. **4**A)

FIGS. **4**A and **4**A-E additionally show that the feed roller body **28**, in some embodiments, can include a biasing assembly **390** disposed within the body and operable or configured to assist rotation of the feed roller body **28** and/or movement of the cutting assembly **320**, for example, upon manual activation of the feed roller body **28**. The biasing assembly **390** can include tension springs **392**, e.g., one or two tension springs, though any suitable number of springs, such as 3 or more, also can be employed without departing from the scope of the present disclosure. The springs **392** generally will be fixably connected to the feed roller body **28** and rotatably coupled to at least a portion of one of the cam

members **370**, or other suitable fixed portion positioned within the cavity **326** of the feed roller body **28**. For example, one end **392**A of the springs **390** can be fixably connected, such as by fasteners **394**, e.g., screws, bolts, rivets, etc., to the feed roller body **28**, and an opposite/opposing end **392**B of the springs **392** can be rotatably connected, such as by a bearing assembly **396**, or other moveable/pivotably assembly, to one of the cam members **370**. The springs **392** also can be arranged such that they are transverse or oblique to one another, for example, the springs **392** can be disposed to have an angle of approximately 30°-45° therebetween, though lessor angles and/or angles up to 90° or more can be used without departing from the scope of the present disclosure.

As shown in FIG. **4**A, with the cutting blade **322** at its initial or rest position **374**, the springs **392** can have an initial or equilibrium length. Then, as the feed roller body **28** is rotated, the springs **392** will be elongated and can provide biased assistance for rotation of the feed roller body **28**, with the spring tension further assisting movement of the cutting blade **322** for cutting, scoring, or perforating the sheet material. The springs **392** further can cause the feed roller body **28** to fully rotate, e.g., rotate approximately 360°, while also helping to return the cutting blade **322** to its initial or rest position **374**, retracted into the body **28** of the feed roller.

FIGS. **5** and **6** also indicate that the cam members **370** can be attached to at least a portion, e.g., side walls **38**/**39**, of the dispenser housing **16**, for example, by support caps **400**. The support caps **400** can be connected to the side walls **38**/**39** of the dispenser housing **16** by fasteners **402**, e.g., screws, bolts, rivets, etc., and further can be connected to the cam members **370** using fasteners **404**, such as screws, bolts, rivets, etc., to mount and support the cam members **370** within the cavity **326** of the feed roller body **28**. As a result, the feed roller body **28** and the base **324**, with the cutting blade **322** attached thereto, are supported in a manner so as to be generally rotatable about the cam member **370**. Other connectors also can be used to connect the support caps **400** to the dispenser housing **16** and the cam members **370**, however, such as, for example, snap-fit or press-fit connections, adhesives, etc., without departing from the scope of the present disclosure.

As further shown in FIGS. **3**A, **5**, and **6**, the feed roller body **28** can be rotatably coupled to the cam member(s) **370** by bearings **406**. For example, at least a portion of the cam members **370** will be received within a passage **408** defined through the bearings **406**, and can engage an inner race **406**A of the bearings **406**. The bearings **406** further will be connected to the feed roller body **28** by one or more support portions **410**, each of which can include a body **412** having a ring-like or circular shape and connected to or integrally formed with the sidewalls **348** of the feed roller body **28**, as generally indicated in FIGS. **3**A and **5**. The bearings **406** further generally can be received within, e.g., fitted into, a passage **414** defined through the body **412** of each of the supports **410** to operatively connect the feed roller body **28** to an outer race **406**B of the bearings **406**.

FIGS. **7**A and **7**B show a biasing assembly **450** for assisting in the operation/movement of the feed roller (such as for use in a manually driven or similar operation of the feed roller) for assisting movement of the feed roller for an operative cycle and to a rest or home position, wherein the cutting blade can be retracted to a non-operative position (e.g., within a recess, notch, opening, etc. in the feed roller body), according to an additional embodiment of the present disclosure.

As also shown in FIGS. **7**A and **7**B, the biasing assembly **450** can include one or more biasing members **452**, e.g. in the embodiment illustrated, a pair of biasing members **452** are shown extending along the interior surface **329** of the feed roller body **28**. It will be understood that fewer or more biasing elements can be used without departing from the scope of the present disclosure. Each biasing member **452** can comprise a tension spring or other suitable tensioning or biasing member having an elongated spring body **454** with first and second ends **454**A/B. The biasing members **452** also generally extend in a direction along, e.g., generally parallel, to the longitudinal (or rotational) axis (axis LA shown in FIG. **7**A) of the feed roller body **28**, and can be fixably attached to the interior surface **329** of the feed roller body **28**.

The first or distal end **454**A of each biasing member **452** can engage and couple to a connection mechanism **458**, such as flange, arm, or other connecting member attached to the feed roller body **28** by one or more fasteners, (e.g., a screw, rivet, or other fastener). For example, in one embodiment, as illustrated in FIGS. **7**A-**7**B, the first end **454**A of the spring body **454** of each biasing member **452** can include a hoop, ring, hook or other suitable feature or mechanism that connects to a protruding portion **460** formed with, or connected to the connection mechanism **458**, which portion **460** has a notch or opening **460**A for receiving the hoop, ring, or hook of the spring. The second end **454**B of each biasing member **452** can be similarly attached to a connecting linkage **456** that is connected to a bearing assembly **470** for the feed roller as indicated in FIGS. **7**A-**7**B.

In one example, the connection mechanism **458** can include a body **462** that is connected to, or engages, portions or protrusions **464** and **466** fixed to, or integrally formed with, the feed roller body **28**, e.g., at first and second ends **462**A and **462**B of the body **462**. The protrusions **464** and **466** can be received within openings or apertures defined along the ends **462**A and **462**B of the body **462**, and/or can include threaded openings defined therein to receive fasteners passed through the openings in the ends **462**A/**462**B of the body **462** to secure the body **462** to the feed roller body **28**. The body **462** can have a generally Z-shaped cross-section to facilitate connection of the body **462** to the portions **464**/**466**, though the body can have other suitable shapes and configurations, without departing from the scope of the present disclosure.

In one variation or alternative constructions, the feed roller body **28** can have a plurality of attachment points **464**/**466** about the interior surface **329** thereof. For example, the feed roller body **28** can have multiple portions **464**/**466** formed/connected to the feed roller body **28** in spaced series to allow for adjustment (e.g., tightening or loosening) of the biasing members **452**, e.g., to accommodate different sheet material sizes and/or to correct for time dependent displacement or movements of the spring due to the repeated loading. In one embodiment, up to five attachment points can be provided, though any suitable number of attachment points, e.g., 2, 3, 4, or more than 5, can be employed without departing from the scope of the present disclosure.

FIGS. **7**A and **7**B further show that each linkage **456** can include a wire, band, or rod **468**, or other flexible coupling, with first and second ends **456**A/**456**B. The first end **456**A of each linkage **456** can be formed as a looped end, and can be connected to the second end **454**B of its corresponding biasing member **454** such as by a hook, hoop, or split-ring type of connection forming the second end **454**B of the biasing member **454**. The second end **456**B of each linkage **456** can be formed with a similar looped end and generally

will be rotatably connected to the bearing assembly **470**, such as by attachment to a fastener **472** (e.g., screw, bolt, etc.) or other suitable connection mechanism. The fastener **472** also can have one or more spacers **474** received therealong to engage and facilitate alignment of the second looped ends **456**B of the linkages **456** (FIGS. **7**A and **7**B).

Additionally, the biasing assembly **450** can include one or more pulley assemblies **480** (as shown in FIGS. **7**A and **7**B) that engage and facilitate a change in the direction of the linkages **456** operatively connecting the biasing members **452** to the bearing assembly **470** (e.g., such that an axial pull force or tension along the biasing members **452** can be converted into a radial pull force or tension to maintain or assist in rotation of the feed roller body **28** and/or movement of the cutting mechanism). Each of the pulley assemblies **480** can include a bracket **482** that is connected to the interior surface **329** of the feed roller body **28** and that at least partially supports a pulley **484** having a track or race **486** against which at least a portion of the linkage **456** is engaged and/or moves.

As shown in FIG. **7**B, the pulley brackets **482** can be pivotably or rotatably mounted (e.g., by a pinned or hinged connection **488**) to the interior surface **329** of the feed roller body **28**. The pinned or hinged connection **488** can help to maintain engagement between, or substantially prevent disalignment of, the linkage **456** and the race **486** of the pulleys **484**, e.g., as/when the feed roller body **28** is rotated and the biasing assembly **450** is rotated therewith. The interior surface **329** of the feed roller body **28** further can have a notch or recessed portion **489** formed/defined therein to accommodate movement/pivoting of the brackets **482**.

In operation, upon activation of the feed roller **28** (e.g., when a user pulls a hanging tab or portion of sheet material or turns a knob or lever connected to the feed roller), the feed roller body **28** rotates and carries the biasing assembly **450** therewith. As a result, the linkages **456** are caused to be pulled or otherwise engaged about the pulleys **484**, tensioning and stretching the spring bodies of the biasing members **452**, thus creating tension in or along the biasing members **452**. This tension assists in the rotation of the feed roller and helps urge the feed roller body **28** to facilitate return of the feed roller body **28** to its rest or home position. In one example, the rotation of the feed roller can be sufficient to generate a tab or portion for pulling or engagement by subsequent users for dispensing a selected portion of sheet material. Also, this tension helps facilitate rotation of the feed roller body **28** sufficient to cause activation or movement of the cutting blade of the dispenser to cut, perforate, or otherwise cause or assist in separation of a sheet of the paper material. The return movement of the feed roller body **28** also can cause retraction of the cutting blade (e.g., into a notch, recess, opening, etc. in the feed roller body).

FIGS. **8**A-**8**B and **9**A-**9**C illustrate a cutting assembly **500** according to an additional embodiment of the present disclosure, which cutting assembly **500** includes a cutting blade or portion **502** (e.g., having a plurality of spaced serrated or sharpened portions **504**) that includes a linkage or similar structure that controls movement of the cutting blade **502**. As shown in FIGS. **8**A and **8**B, the cutting blade **502** is received within a notch or recess **506** defined along an outer surface **508** of a cylindrical side wall **510** of the feed roller body **28**, when the cutting blade **502** is in a retracted position **512** (as shown in FIGS. **8**A, **8**B, and **9**A). The cutting blade **502** is moveable to an extended position **514** whereupon it at least partially projects from the notch/recess **506** of the feed roller body **28** to an extent sufficient to enable the blade **502** to engage the sheet material as it is dispensed to at least partially cut, score, or perforate a portion thereof.

The cutting assembly **500** also includes a linkage assembly **515** with a moveable support or body **520** that is connected to (or integrally formed with) and supports the cutting blade **502**. A first end or portion **520**A of the support **520** is rotatably, pivotably, or otherwise moveably connected to the feed roller body **28**. In one example, the first end or portion **520**A of the support **520** can include a pivotable or rotatable connection mechanism, such as a pinned or hinged connection **522**, or other suitable connector for pivoting, rotation, or other movement thereabout. A second, free end **520**B of the support **520** is attached to a cam follower **523**, such as a roller, bearing, etc., that is received within and rides along a cam track **524** as the feed roller body **28** is rotated to dispense selected portions of the sheet material.

The cam track **524** is positioned/formed within selected positions of feed roller body **28**, (e.g., within the interior cavity or chamber **32** thereof), and in one variation, the cam track **524** can be integrally formed with, or otherwise connected to, the bearings **470** supporting the feed roller body **28** and allowing rotation thereabout. In one embodiment, the cam track **524** can be defined in a track body or component **525** that is integrally formed with, or otherwise attached to, the bearing **470**. In alternative constructions, the cam track **524** can be integrally formed with or otherwise defined in or along the feed roller body **28** or other portions attached thereto. As a result, as the feed roller is rotated to dispense the sheet material, the feed roller body **28** rotates about the cam track **524** moving the cam follower **523** therealong. As components of the cutting assembly **500** (e.g., the cam track **524**) and the biasing assembly integrated with the feed roller body, e.g., housed within the feed roller body, tampering, damaging, unwanted access to, etc. of these components can be substantially minimized, inhibited, or prevented.

As additionally shown in FIGS. **8**A-**8**B and **9**A-**9**C, the cam track **524** is shaped, positioned, or otherwise configured such that the support **520** is rotated or pivots, moving the cutting blade between the retracted and extended positions **512** and **514**, with rotation of the feed roller. For example, the cam track **524** has an outer surface **524**A and an opposing inner surface **524**B that contact or otherwise engage the cam member **523**, and the cam track **524** controls/engages the cam follower **523** to engage and move the second end **520**B of the support **520** towards and away from the wall **510** of the feed roller body **28** to pivot or otherwise move the support **520** about the rotatable connection mechanism **522** at its first end or portion **520**A.

FIGS. **9**A-**9**C illustrate cross-sectional views of the cutting assembly **500** and the feed roller body **28** showing movement of the cutting mechanism **500** between its initial, retracted or rest position **512** and its extended, cutting position **514** with rotation of the feed roller. FIG. **9**A shows the cutting mechanism **500** in the initial, retracted position **512**, FIG. **9**B shows the cutting mechanism **500** in the extended, cutting position **514**, while FIG. **9**C illustrates movement of the cutting mechanism **500** across approximately 360 degree rotation of the feed roller body **28**.

As shown in FIGS. **9**A and **9**C, in its retracted position **512**, the cutting blade **502** is received within the notch or recess **506** and does not extend from the side wall **510** of the feed roller body **28** (e.g., such that sheet material can be received about the notch/recess without interference from the cutting blade). Then, as the feed roller body **28** is rotated (e.g., in the counterclockwise direction D**1** shown in FIGS. **9**A-**9**C) to dispense a selected amount of sheet material, the

cam follower **523** will enter/engage a first portion **530** of the cam track **524**, causing the cutting blade **502** to extend out from the notch **506** (at position **532**). As the feed roller further rotates in the counterclockwise direction, the cam follower **523** further moves along/engages the first portion **530** of the cam track **524** to further extend the cutting blade **502** from the notch **506**. The cam follower **523** will move along the first portion **530** of the cam track **524** with rotation of the feed roller body **28** until the cutting mechanism **502** is moved to its extended position **514** to substantially cut or perforate the sheet material as it is being dispensed, as generally shown in FIGS. **9**B and **9**C.

After the cutting blade **502** has reached its extended position (e.g., as shown at **514**) and as the feed roller body **28** is continued to be rotated (e.g., under tension of the biasing assembly), the cam member **523** will begin to enter/engage a second portion **540** of the cam track **524** that facilitates return of the cutting blade **502** to its initial, retracted position **512** (e.g., as shown at **542**). As the feed roller body **28** continues to rotate (e.g., under tension of the biasing assembly **450**), the cutting blade **502** will return to its initial rest position **512** with the cutting mechanism **502** retracted within the notch **506**.

FIGS. **9**A-**9**C further show that the cam track **524** is shaped, positioned, and/or configured to move the second end **520**B of support **520** to be in relatively closer proximity to the side wall **510** of the feed roller body **28** as the cutting blade **502** is moved toward its extended position (e.g., position **514**). The track **524** further is shaped to move the second end **520**B of the support **520** relatively further away from the side wall **510** of the feed roller body **28** to return the blade **502** to its retracted position **512**. As a result, the cutting blade **502** is moved or driven by the linkage assembly **515**, which movement can be controlled without requiring springs or other biasing members to return the blade **502** to the retracted position **512** (or to move the blade **502** to the extended position **514**), e.g., enabling enhanced control and improved reliability, and/or cleaner cutting of the sheet material.

The cam track **524** further can be shaped, positioned, and/or configured such that the cutting blade **502** is in its extended position **514** (or other positions) at a selected or desired positions within the housing of the dispenser. For example, the cam track **524** may be shaped, positioned, and/or configured such that the cutting blade **502** only extends within the chamber of the housing, or does not extend at a position in which the cutting blade **502** would be exposed to users or maintenance personnel, e.g., to substantially prevent injury thereto or damage to the cutting blade.

FIGS. **10**A-**10**C illustrate a biasing assembly **650** according to yet another embodiment of the present disclosure. As shown in FIGS. **10**A-**10**C, the biasing assembly **650** includes a plurality of biasing members **652**, such as two or more biasing members **652**, extending along the interior surface **329** of the feed roller body **28**, e.g., in a direction that extends generally along the longitudinal (or rotational) axis (axis LA shown in FIGS. **10**A and **10**C) of the feed roller body **28**. In one embodiment, the biasing members **652** can be generally parallel to the longitudinal axis LA; however, in other embodiments, the biasing members **652** can be set at an angle in relation to the longitudinal axis LA. The biasing members **652** can include tension springs with an elongated spring body **654** having first and second ends **654**A/B, though other suitable tensioning or biasing members can be used without departing from the scope of the present disclosure. In one embodiment, one of the spring bodies **654** can have a length that is longer than another one of the spring bodies **654**, though the spring bodies **654** can have generally the same length, without departing from the scope of the present disclosure.

As further illustrated in FIGS. **10**A and **10**B, the first end **654**A of the biasing members **652** is connected to the feed roller body **28**, and the second end **654**B of the biasing members **652** is connected to a linkage **656**. The linkage **656** is operatively connected to the bearing assembly **470**, e.g., connected to the track body **525** formed therewith, or other suitable, fixed component that does not rotate with the feed roller body **28**. The linkage **656** further generally includes a belt **657** having a belt body **658** with a plurality of cogs or teeth **660** or other suitable gripping projections extending along the belt body **658**. The belt body **658** generally is formed from an elastomeric material, such as rubber, though the belt body **658** can be formed from other suitable materials, e.g., plastics or other polymeric materials, or combinations of materials, without departing from the scope of the present disclosure.

FIGS. **10**A and **10**B additionally show that the first end **656**A of each linkage **656** can include a connector **662** having a connector body **664** that includes a looped or hooked end **664**A that is connected to the second end **654**B of a corresponding biasing member **454** (e.g., by a hook, hoop, or split-ring type of connection forming the second end **654**B of the biasing member **654**). The connector body **664** can be formed from a plastic or other suitable polymeric material, and further can be attached to the belt body **658** at a first end **658**A thereof (e.g., by a fastener, adhesive, or other suitable fixing mechanism, such as, snap-fitting, frictional connection, etc.). The second end **656**B of each linkage **656** can include a rotatable connection assembly **666** that is movably connected to the bearing assembly **470**, e.g., to the track body **525** formed therewith. The rotatable connection assembly **666** can include a rotatable body **668** that is connected to the track body **525** by a pinned connection or other suitable connection that allows for rotational movement between the rotatable body **668** and the bearing assembly **470**. In the illustrated embodiment, the rotatable body **668** includes a passage **670** defined therethrough that is sized and configured to receive a pin or axle **670** that is connected to the track body **525** and facilitates rotation of the rotatable body **668** relative thereto. The pin **670** can support the rotatable bodies **668** of the linkages **656** for each of the plurality of biasing members **652** in an adjacent series, e.g., the rotatable bodes **668** can be positioned next to or adjacent to each other along the pin **670**, so as to be supported thereby. The rotatable body **668** further can be formed from a plastic or other suitable polymeric material, and can be fixed to a second end **658**B of the belt body **658** (e.g., by a fastener, adhesive, or other suitable fixing mechanism, such as snap-fitting, frictional connection, etc.).

Additionally, the biasing assembly **650** can include one or more pulley assemblies **680** (as shown in FIGS. **10**A and **10**B) that engage and facilitate a change in the direction of the linkages **656** operatively connecting the biasing members **652** to the bearing assembly **470** or track body **525** (e.g., such that an axial pull force or tension along the biasing members **652** can be converted into a radial pull force or tension to maintain or assist in rotation of the feed roller body **28** and/or movement of the cutting mechanism). Each of the pulley assemblies **680** can include a pulley **684** having a track or race **686** against which at least a portion of the belt body **658** is engaged and/or moves. The pulley **684** can include a plurality of teeth or cogs (not shown) that correspond to an engage the cogs **660**, such as to substantially

reduce, inhibit, or prevent slippage or other disengagement between the pulley **684** and the belt body **658**. Each pulley **687** further generally engages a corresponding belt **657** such that a first portion **657**A of the belt **657** is generally aligned with its corresponding biasing member **652**, e.g., extends in a direction along the longitudinal axis LA, and a second portion **657**B of the belt **657** is generally arranged to be transverse to the biasing member **657**, e.g., extends radially in relation to the feed roller body **28** or in a direction that otherwise transverse to the longitudinal axis LA of the feed roller body **28**.

Accordingly, upon activation of the feed roller **28** (e.g., when a user pulls a hanging tab or portion of sheet material or turns a knob or lever connected to the feed roller), the feed roller body **28** rotates and carries the biasing assembly **650** therewith. As a result, the linkages **656** are caused to be pulled or otherwise engaged about the pulleys **684**, tensioning and stretching the spring bodies of the biasing members **652**, thus creating tension or force in or along the biasing members **652**. This substantially linear force or tension can be translated into a rotational or radial tension force by the biasing assembly **650** to assist in the rotation of the feed roller and help urge the feed roller body **28** to return to its rest or home position. In one example, the rotation of the feed roller can be sufficient to generate a tab or portion for pulling or engagement by subsequent users for dispensing a selected portion of sheet material. Also, this tension helps facilitate rotation of the feed roller body **28** sufficient to cause activation or movement of the cutting blade of the dispenser to cut, perforate, or otherwise cause or assist in separation of a sheet of the paper material. The return movement of the feed roller body **28** also can cause retraction of the cutting blade (e.g., into the notch, recess, opening, etc. in the feed roller body).

FIGS. **10**B and **10**C further indicate that the biasing assembly **650** can include a support assembly **690** that is configured to support the biasing members **652**, linkages **656**, and pulleys **684** along the feed roller body **28**, e.g., to help facilitate alignment of, or to help to substantially reduce, prevent, or inhibit misalignment of, the biasing members **652**, linkages **656**, and/or pulleys **684** when the biasing assembly **650** is rotated or otherwise moved with the feed roller body **28**. As shown in FIGS. **10**B and **10**C, the support assembly **690** can include brackets or other suitable supports **692** corresponding to each of the biasing members **652**. The brackets **692** can include an elongated bracket body **694** with a passage or channel **696** defined therealong that receives corresponding biasing members **652**, linkages **656**, and pulleys **684**. The brackets **692** can support and/or engage the biasing members **652**, linkages **656**, and pulleys **684** such that the biasing members **652**, linkages **656**, and pulleys **684** move substantially in unison with each other, e.g., as a unit, to reduce, inhibit, or prevent dislocation or misalignment thereof during rotation or other movements of the feed roller body **28**.

The bracket body **694** can be formed from a plastic or other polymeric material, though other suitable materials, such as materials sufficient rigidity to help to facilitate alignment of the biasing members **652**, linkages **656**, and/or pulleys **684** can be used without departing from the scope of the present disclosure. The biasing members **652** can be connected to a first end **692**A of the bracket body **692** (e.g., a hooked or looped end of the springs **654** can be connected to a rod, pin, or other fastener, such as a screw, bolt, etc., that is attached to the bracket body **625**). The pulleys **684** can be connected to a second end **692**A of the bracket body **692**. In the illustrated embodiment shown in FIG. **10**B, the pulleys **684** are connected to the bracket body **692** by a pin or rod **698** that allows for rotation or pivoting of the pulleys **684** thereabout.

As additionally indicated in FIG. **10**C, the brackets **692** can be pivotably or rotatably mounted (e.g., by a pinned or hinged connection **700**) to the interior surface **329** of the feed roller body **28**. The pinned or hinged connection **700** can help to maintain engagement between, or substantially prevent misalignment of, the biasing members **652**, linkages **656**, and/or pulleys **684** as/when the feed roller body **28** is rotated. FIG. **10**C shows that the brackets **692** are connected to the feed roller body **28** at the first and second ends **692**A and **692**B thereof by corresponding pinned connections **700**. For example, the pinned connections **700** can allow for some give or movement of the brackets **692** and the supported biasing members **652**, linkages **656**, and/or pulleys **684** in relation to the feed roller body during rotation thereof for dampening of accelerations, vibrations, etc. and substantially reducing, inhibiting, or preventing dislocation or misalignment thereof.

In the embodiment illustrated in FIGS. **10**A and **10**C, the support assembly **690** also includes bearing supports **702** that support and connect the brackets **692** to the feed roller body **28**. That is, the brackets **692** can be connected to the bearing supports **702** by the pinned connection **700**, and the bearing supports **702** can be connected to the feed roller body **28** (e.g., the bearing supports **702** can be connection to the feed roller body **28** by fasteners, such as screws, bolts, etc. though the bearing supports **702** can be otherwise connected to the feed roller body **28**, such as by an adhesive, snap-fitting, or other suitable attachment mechanism, without departing from the scope of the present disclosure). The bearing supports **702** generally can include a bearing support body **704** that includes a generally arcuate, curved, or cylindrical shape and is sized and/or otherwise configured to generally conform to or be complementary to the interior surface **329** of the feed roller body **28**. The bearing support body **704** further can be formed from a plastic or polymeric material, though other suitable materials, e.g., other synthetic or composite materials, can be used without departing from the scope of the present disclosure. The interior surface **329** of the feed roller body **28** further can have a notches or recessed portions **706** formed/defined therein to accommodate movement/pivoting of the brackets **692** about the pinned connection **700**. Furthermore, it will be understood that the bearing supports **702** can be omitted and the brackets **692** can be directly or otherwise connected to the feed roller body **28**, without departing from the scope of the present disclosure.

The foregoing description generally illustrates and describes various embodiments of the present invention. It will, however, be understood by those skilled in the art that various changes and modifications can be made to the above-discussed construction of the present invention without departing from the spirit and scope of the invention as disclosed herein, and that it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as being illustrative, and not to be taken in a limiting sense. Furthermore, the scope of the present disclosure shall be construed to cover various modifications, combinations, additions, alterations, etc., above and to the above-described embodiments, which shall be considered to be within the scope of the present invention. Accordingly, various features and characteristics of the present invention as discussed herein may be selectively interchanged and applied to other illustrated and non-illustrated embodiments of the invention, and numerous

variations, modifications, and additions further can be made thereto without departing from the spirit and scope of the present invention as set forth in the appended claims.

What is claimed is:

1. A dispenser for dispensing a sheet material, the dispenser comprising:

a feed roller configured to feed the sheet material from a supply of sheet material along a path of travel to a discharge, the feed roller comprising a feed roller body having a chamber defined therein,

a cutting assembly comprising:

a cutting blade at least partially disposed within the chamber, and

at least one moveable support coupled to the cutting blade;

wherein the at least one moveable support comprises a first portion positioned along an interior surface of the feed roller body, and a second portion configured to move along a cam track located within the chamber;

wherein the cutting blade is at least partially positioned within the chamber and is moved with rotation of the feed roller from a retracted position to an extended position extending at least partially through one or more openings defined in the feed roller body to at least partially cut, score, or perforate the sheet material during dispensing of a selected portion thereof; and

a biasing assembly including:

at least one biasing member coupled to the feed roller body;

at least one linkage having one end connected to the at least one biasing member and an opposing end that is substantially fixed against rotation; and

at least one pulley adapted to engage the at least one linkage and facilitate a change of direction of the at least one linkage to convert a tension force applied by the at least one biasing member to a radial pulling force to assist in one or more of:

rotation of the feed roller body; or

facilitate movement of the cutting blade through the one or more openings of the feed roller body.

2. The dispenser of claim 1, wherein the at least one moveable support comprises a cam follower connected to the second portion thereof, and wherein the cam follower engages and rides along a cam surface of the cam track located within the chamber of the feed roller body as the feed roller is rotated.

3. The dispenser of claim 2, wherein the at least one moveable support comprises a hinged connection at the first portion of the at least one moveable support configured to pivotably couple the first portion of the at least one moveable support to the interior surface of the feed roller body, and a cam follower located at the second portion of the at least one moveable support; and wherein as the feed roller is rotated, the cam follower moves about the cam track as the first portion of the at least one moveable support pivots about the hinged connection to move the cutting blade toward engagement with the sheet material.

4. The dispenser of claim 1, further comprising at least one pressing roller biased toward the feed roller so as to engage the sheet material against the feed roller so that the sheet material is pulled from the supply and fed along the path of travel toward the discharge upon rotation of the feed roller.

5. The dispenser of claim 4, wherein the at least one pressing roller comprises a pair of pressing rollers positioned at spaced locations and configured to engage and press the sheet material against the feed roller at two locations.

6. The dispenser of claim 1, wherein linkage comprises a wire, band, belt, rod, or a combination thereof.

7. A sheet material dispenser, comprising:

a dispenser housing having a discharge;

a supply of sheet material received within the dispenser housing;

a feed roller rotatably mounted within the dispenser housing, the feed roller comprises a feed roller body having a chamber defined therein, and an exterior surface along which the sheet material is engaged;

wherein, the sheet material is fed from the supply of sheet material along a path of travel toward the discharge by rotation of the feed roller;

a cutting assembly comprising:

a cutting blade at least partially received within the chamber of the feed roller body and moveable into and out of the feed roller body through at least one opening defined therein,

at least one moveable support coupled to the cutting blade and having a first end pivotally connected to the feed roller body and a second end;

wherein as the feed roller rotates to pivot the at least one moveable support about the first end thereof and move the cutting blade at least partially through the at least one opening defined in the feed roller body and toward engagement with the sheet material; and

a biasing assembly coupled to the feed roller and configured to one or more of:

assist rotation of the feed roller; or

facilitate movement of the cutting blade

wherein the biasing assembly comprises one or more biasing members positioned within the chamber and extending at least partially along a rotational axis of the feed roller body.

8. The sheet material dispenser of claim 7, further comprising one or more pressing rollers positioned adjacent the feed roller body and biased toward the feed roller body so as to engage the sheet material between the one or more pressing rollers and the feed roller body so that the sheet material is pulled therebetween upon rotation of the feed roller.

9. The sheet material dispenser of claim 7, further comprising a knob located along an external surface of the dispenser housing and connected to the feed roller body such that the feed roller is caused to rotate upon rotation of the knob by a user.

10. The sheet material dispenser of claim 7, wherein the biasing assembly further comprises one or more linkages connected to a corresponding biasing member; and one or more pulleys engaged by at least one linkage of the one or more linkages; and wherein an axial pulling force or tension generated by the one or more biasing members is converted into a radial pulling force adapted to assist in rotation of the feed roller, to facilitate movement of the cutting blade, or a combination thereof.

11. The sheet material dispenser of claim 10, wherein the biasing assembly further comprises at least one bracket supporting each of the one or more pulleys and pivotally connected to an interior surface of the feed roller body, wherein the at least one bracket is configured inhibit misalignment of one or more of:

the one or more biasing members;

the one or more linkages; or

the one or more pulleys.

12. The sheet material dispenser of claim 10, wherein each linkage comprises a wire, band, belt, or rod; and wherein a first portion of at least one linkage of the one or more linkages extends along a rotational axis of the feed roller body, and a second portion of the at least one linkage of the one or more linkages extends transverse to the rotational axis of the feed roller body.

13. The sheet material dispenser of claim 7, further comprising a bearing assembly having a pair of bearings coupled to the dispenser housing and rotationally supporting the feed roller body; and a cam track defined along or attached to the at least one of the bearings wherein the second end of the at least one moveable support is moved along the cam track as the feed roller is rotated to cause the cutting blade to move between a retracted position and an extended positions.

14. A dispenser for dispensing a sheet material, comprising:

a feed roller configured to engage and feed the sheet material from a supply of sheet material;

a cutting assembly at least partially disposed within the feed roller, the cutting assembly comprising a cutting blade and a moveable support;

wherein the moveable support comprises a first end pivotally connected to an interior surface of the feed roller and a second end adapted to move about a cam track defined along the feed roller such that the moveable support is pivoted about the first end thereof to move the cutting blade toward engagement with the sheet material; and

a biasing assembly comprising at least one biasing member positioned within the feed roller and extending at least partially along a rotational axis of the feed roller, the at least one biasing member configured to assist rotation of the feed roller, to facilitate movement of the cutting blade through one or more openings formed through the feed roller for at least partially cutting or perforating a selected portion of the sheet material, or a combination thereof.

15. The dispenser of claim 14, further comprising one or more pressing rollers biased toward the feed roller so as to engage the sheet material between the one or more pressing rollers and the feed roller so that the sheet material is pulled from the supply and fed along a path of travel upon as the feed roller is rotated.

16. The dispenser of claim 14, wherein the biasing assembly further comprises:

a linkage connected to the at least one biasing member and to a portion of a housing of the dispenser that is substantially fixed in relation to the feed roller; and

a pulley engaging the linkage, wherein an axial pulling force or tension directed along the at least one biasing member is converted into a radial pulling force.

17. The dispenser of claim 16, wherein the linkage includes a wire, band, belt, or rod; and wherein a first portion of the linkage extends along the rotational axis of the feed roller, and a second portion of the linkage extends transverse to the rotational axis of the feed roller.

18. The dispenser of claim 14, further comprising a bearing assembly having one or more bearings coupled to the dispenser housing and rotationally supporting the feed roller, wherein the cam track is defined along at least one of the one or more bearings.

19. The dispenser of claim 14, further comprising a knob located along an external surface of the dispenser and connected to the feed roller such that the feed roller is caused to rotate upon manual engagement of the knob by a user.

* * * * *