United States Patent	12384588
Kind Code	B2
Date of Patent	August 12, 2025
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Plural-mode automatic medicament packaging system

Abstract

A plural-mode automatic medicament packaging system. In embodiments, the system may include an automatic dispensing machine including an automatic medicament dispensing unit and may further include pouch packaging and blister package packaging units. The medicament dispensing unit may include one or more storage and dispensing units which store and dispense medicaments. Medicaments output from the medicament dispensing unit may be packaged in a pouch package by the pouch packaging unit. Alternatively, a diverter may direct medicaments output from the medicament dispensing unit to the pouch package packaging unit for packaging in a blister package. A single automatic medicament packaging system can package medicaments in different types of packaging providing a pharmacy with the opportunity to package medicaments in the form of packaging most appropriate to meet patient needs.

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Appl. No.: **18/631309**

Filed: **April 10, 2024**

Prior Publication Data

Document Identifier	Publication Date
US 20240278951 A1	Aug. 22, 2024

Related U.S. Application Data

continuation parent-doc US 18147294 20221228 US 11981472 child-doc US 18631309
continuation parent-doc US 17338790 20210604 US 11542054 20230103 child-doc US 18147294
continuation parent-doc US 16571368 20190916 US 11027872 20210608 child-doc US 17338790
continuation parent-doc US 15243613 20160822 US 10427819 20191001 child-doc US 16571368
us-provisional-application US 62209659 20150825

Publication Classification

Int. Cl.: **B65B65/00** (20060101); **A61J1/03** (20230101); **B65B1/04** (20060101); **B65B5/06** (20060101); **B65B5/10** (20060101); **B65B7/16** (20060101); **B65B11/52** (20060101); **B65B35/10** (20060101); **B65B35/34** (20060101); **B65B43/42** (20060101); **B65D75/32** (20060101)

U.S. Cl.:

CPC **B65B65/006** (20130101); **A61J1/035** (20130101); **B65B1/04** (20130101); **B65B5/067** (20130101); **B65B5/103** (20130101); **B65B7/16** (20130101); **B65B11/52** (20130101); **B65B35/10** (20130101); **B65B35/34** (20130101); **B65B43/42** (20130101); **B65D75/327** (20130101); B65B2210/02 (20130101); B65B2220/14 (20130101)

Field of Classification Search

CPC: B65B (1/04); B65B (1/06); B65B (1/10); B65B (1/30); B65B (5/04); B65B (5/045); B65B (5/067); B65B (5/103); B65B (35/10); B65B (35/34); B65B (2210/02); B65B (2220/14); B65B (11/52); B65B (65/006); B65B (5/10); B65B (5/101); B65B (7/16); B65B (9/06); B65B (43/123); B65B (43/42); B65B (51/10); B65B (57/04); B65B (57/10); B65B (57/14); B65B (57/20); B65B (39/007); B65B (2039/009); B65B (61/26); B65D (75/327); A61J (1/035)

USPC: 53/128.1; 53/167; 53/500; 53/52; 53/53; 53/54; 53/494; 53/501; 53/64; 53/65; 53/131.2

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Background/Summary

RELATED APPLICATIONS (1) The present application is a continuation of and claims priority to U.S. patent application Ser. No. 18/147,294, filed Dec. 28, 2022, now U.S. Pat. No. 11,981,472, which is a continuation of and claims priority to U.S. patent application Ser. No. 17/338,790, filed Jun. 4, 2021, now U.S. Pat. No. 11,542,054, which is a continuation of and claims priority to U.S. patent application Ser. No. 16/571,368, filed Sep. 16, 2019, now U.S. Pat. No. 11,027,872, which is a continuation of and claims priority to U.S. patent application Ser. No. 15/243,613, filed Aug. 22, 2016, now U.S. Pat. No. 10,427,819, and claims priority from and the benefit of U.S. Provisional Patent Application No. 62/209,659, filed Aug. 25, 2015, the disclosure of each of which is hereby incorporated herein by reference in its entirety.

FIELD OF THE INVENTION
(1) The invention relates to packaging systems and, more particularly, to packaging systems capable of dispensing and packaging medicaments in selected different types of packages.
BACKGROUND OF THE INVENTION
(2) Automatic dispensing machines are utilized by retail and mail order pharmacies and by pharmacies of hospitals, nursing homes and other long-term care facilities to automatically provide medicaments and nutriceuticals required to fulfill patient prescription orders. Such automatic dispensing machines are computer controlled and can automatically dispense loose, bulk form medicaments from on-board storage units, such as cassettes. The dispensed medicaments can subsequently be packaged in pouch packages by means of an on-board form, fill and seal packaging unit.
(3) The automatic dispensing machines are efficient and have a high rate of dispensing and packaging throughput. However, the automatic dispensing machines are also relatively expensive and can cost hundreds of thousands of dollars because of the sophisticated automation necessary to program and operate the machines.
(4) Increasingly, medicaments are required to be delivered to the patient packaged in what is known as a “compliance” or “multi-dose” package. A compliance package is a type of packaging in which the medicaments are arranged in a package or packages by medicament type and quantity and in a sequence in which each medicament is to be taken by the patient. Each medicament represents a separate dosage unit. For example, a plurality of compliance packages could be serially organized by patient and by time of day at which the medicaments are to be taken by the patient (e.g., breakfast, lunch, dinner, bed time). The medicaments in the compliance package are taken by the patient in the sequence, first-to-last, in which medicaments are provided in the compliance package.

(5) The compliance package represents an important improvement over conventional containers such as vials and bottles which include a 30, 60, or 90 day count of medicaments. With conventional medicament containers, the responsibility for following the physician's prescription order lies with the patient who must select and access the required medicament from the containers at the correct time of day. This may be difficult for some patients because the containers may look alike and because the patient must remember the sequence in which the medicaments are to be taken. In contrast, compliance packaging shifts responsibility for following the physician's prescription order to the pharmacy by enabling the pharmacy to place the medicaments in the proper sequence for the patient. In short, compliance packaging which can be provided by the pharmacy encourages the patient to comply with the doctor's prescription order, potentially resulting in improved health outcomes.
(6) Pouch packages of the type output from the aforementioned automatic dispensing machines can represent a type of compliance packaging. This is because the individual pouch packages can be grouped and loaded by the patient and arranged serially in a pouch package web (also referred to as a “strip” or “vine”). Each individual pouch package can contain each required medicament to be taken at a particular time and the pouch packages collectively can be arranged in the web in the sequence one-after-the-other in which the medicaments are to be taken by the patient. Pouch packages are not limited to multi dose compliance packaging and can also be utilized for “unit dose” packaging in which all or a certain number of packaged medicaments are alike.
(7) Pouch packages are excellent packages in which to deliver medicaments for reasons such as those just described. However, pouch packages may not be an optimal packaging solution for all applications and patients. Pouch packages in the form of a long pouch package web can be unwieldy to handle and can require winding on a spool. Pouch package segments require careful management to avoid loss or co-mingling with pouch packages for another patient. Other types of medicament packaging, such as blister packaging, may be more optimally suitable for use in certain applications.
(8) A limitation of automatic medicament dispensing machines, including machines that package medicaments in pouch packages, is that such machines can package medicaments in just a single type of package. This limitation prevents a pharmacy from utilizing the automatic dispensing machine with a type of package other than that for which the machine was designed. Many pharmacies are unable to afford more than one of the sophisticated and costly automatic dispensing machines and are thereby limited to providing medicaments in just a single type of package which may not be optimal for all applications.
(9) There is a need for an improved automatic medicament packaging system which would improve the medicament dispensing process, which would make the medicament dispensing process more responsive to the needs of the pharmacy and the patients served by the pharmacy, which would reduce cost, and which would generally improve the quality of patient care.

SUMMARY OF THE INVENTION

(10) The present invention is an improvement in medicament packaging systems. In one embodiment, a plural-mode automatic medicament packaging system is provided. A packaging system may include an automatic medicament dispensing unit, a pouch packaging unit, a blister package packaging unit and a plural-position medicament diverter.
(11) The automatic medicament dispensing unit may include a plurality of medicament storage and dispensing units. The medicament storage and dispensing units may dispense medicaments stored therein in any sequence required for packaging.
(12) In one packaging mode, the pouch packaging unit may be paired or positioned for operation with the automatic dispensing machine. The pouch packaging unit may package medicaments from a storage and dispensing unit in one or more pouch package.
(13) In a further packaging mode, the blister package packaging unit is used in place of the pouch packaging unit. The blister package packaging unit receives medicaments from the automatic dispensing machine and packages the medicaments in blister packages. In embodiments, a blister packaging unit may include a robotic pick-and-place device which loads medicament into a cell of the blister package and a sealer unit which seals the blister package after loading.
(14) In a first-mode position, medicaments may be delivered from the medication and storage units of the automatic medicament dispensing unit without interference by the diverter. As a result, medicaments may be received by the pouch packaging unit and packaged in pouch packages by the pouch packaging unit. In a second-mode position, the diverter redirects medicaments from the medication and storage units of the automatic medicament dispensing unit to the blister package packaging unit. Medicaments received by the blister package packaging unit may be packaged in blister packages by the blister package packaging unit.
(15) Further aspects of the plural-mode automatic medicament packaging system are described in the drawings and detailed description which follow.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Exemplary systems and apparatus for a plural-mode automatic medicament packaging system may be understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements throughout the different views. The drawings are not necessarily to scale, emphasis

instead being placed upon illustrating the principles of the invention. The drawings depict only embodiments of the invention and are not therefore to be considered to be limiting of the scope of the invention. In the accompanying drawings:

(2) FIG. **1** is a perspective view of an embodiment of a plural-mode automatic medicament packaging system according to the invention illustrated in a first packaging mode enabling medicament packaging in pouch packages;

(3) FIG. **2** is a front elevation view of the packaging system of FIG. **1**;

(4) FIG. **3** is a top plan view of the packaging system of FIG. **1**;

(5) FIG. **4** is a perspective view of the packaging system of FIG. **1**, but with certain components removed to facilitate understanding;

(6) FIG. **5** is a section view of the packaging system taken along section **5**-**5** of FIG. **3**;

(7) FIG. **6** is a view of medicament storage and dispensing units of the packaging system of FIG. **1** with certain surfaces cut away to facilitate understanding;

(8) FIG. **7** is a perspective view of the pouch packaging unit of the packaging system of FIG. **1**;

(9) FIG. **8** is a section view of the packaging system taken along section **8**-**8** of FIG. **3**;

(10) FIG. **9** is a section view of the packaging system taken along section **9**-**9** of FIG. **2** showing removal of a pouch packaging unit;

(11) FIG. **10** is a section view of the packaging system taken along section **9**-**9** of FIG. **2** showing transfer of the pouch packaging unit to a cart;

(12) FIG. **11** is a perspective view of the packaging system of FIG. **1** but in a second mode enabling medicament packaging in blister packages;

(13) FIG. **12** is a perspective view of the packaging system of FIG. **11**, but with certain components removed to facilitate understanding;

(14) FIG. **13** is a front elevation view of the packaging system of FIG. **11**;

(15) FIG. **14** is a section view of the packaging system taken along section **14**-**14** of FIG. **13** with certain components removed to facilitate understanding;

(16) FIGS. **14**A-**14**G are perspective views illustrating manipulation of a blister package with certain components removed to facilitate understanding;

(17) FIG. **15**A is a section view in perspective of the packaging system taken along section **15**-**15** of FIG. **14**;

(18) FIG. **15**B is a perspective view of an embodiment of a robotic pick-and-place unit;

(19) FIG. **15**C is an alternative perspective of a robotic pick-and-place unit;

(20) FIG. **16** is a section view in perspective of the packaging system taken along section **16**-**16** of FIG. **14**;

(21) FIG. **17** is a block diagram illustrating components of a control system for the packaging system of FIG. **1**;

(22) FIGS. **18**-**19** illustrate an exemplary pouch package web including discrete pouch packages formed therein;

(23) FIGS. **20**-**22** illustrate an exemplary blister package; and

(24) FIG. **23** illustrates an exemplary user interface with packaging system **10**.

DETAILED DESCRIPTION OF THE INVENTION

(25) Referring first to FIGS. **1**-**17**, there is shown an embodiment of a plural-mode automatic medicament packaging system **10** according to the invention. In the embodiment, packaging system **10** may include an automatic dispensing machine **11** having an automatic medicament dispensing unit **13**. Packaging system **10** may further include a pouch packaging unit **15** and a blister package packaging unit **17** which cooperate with dispensing machine **11** to package medicaments, such as medicaments **19**, **21**, **23**, **25**, **27**, **29**, **31**, in different types of packages. For convenience and brevity, medicaments **19**-**31** will generally be referred to by the single reference number **19**.

(26) Packaging system **10** may operate in one of a plurality of packaging modes to package medicaments **19** in different package types. In a first packaging mode, medicaments dispensed from medicament dispensing unit **13** may be packaged by pouch packaging unit **15** into pouch packages such as pouch packages **33**, **35**, **37**, **39**, **41**, **43** illustrated in FIGS. **18**-**19**. For convenience and brevity, all pouch packages will be referred to by reference number **33**, it being understood that the other pouch packages **35**-**43** may be identical. In a second packaging mode, medicaments **19** dispensed from dispensing machine **11** may be packaged by blister package packaging unit **17** into blister packages, such as blister package **45** illustrated in FIGS. **20**-**22**.

(27) Pouch packages **33**-**43** and blister packages **45** may be of a compliance or multi-dose type in which such packages contain medicaments **19** in a sequence in which the medicaments **19** are to be taken by a patient in accordance with a physician's instructions. Alternatively, such packages could be of a unit dose type, for example, containing the same type of medicament **19** which may then be provided to any patient.

(28) Packaging system **10**, therefore, enables a pharmacy to automate medicament **19** dispensing and packaging utilizing different types of packages by means of a single packaging system **10**. Costs are significantly reduced because one packaging system **10** can do the work of many packaging systems, enabling delivery of health care at a lower price and generally improving the quality of patient care.

(29) Referring again to FIGS. **1**-**17**, packaging system **10** may be controlled by a controller **12** (FIG. **17**) which may be one or more programmable computer with one or more central processing unit (“CPU”) and associated memory. Controller **12** may be programmed with a set of instructions, which may be in the memory of controller **12**, for execution by packaging system **10**.

(30) Controller **12** may, for example, consist of a main frame computer, a computer server, a personal computer ("PC"), or plural operably-connected servers or PCs. Controller **12** may include a computer **14** illustrated as being within automatic dispensing machine **11**. Controller **12** through computer **14** may control all aspects of operation of packaging system **10** including automatic dispensing machine **11**, medicament dispensing unit **13** of automatic dispensing machine **11**, pouch packaging unit **15**, blister package packaging unit **17** as well as a diverter **163**.
(31) One of ordinary skill in the art will appreciate that controller **12** can be dedicated to packaging system **10** or can be a computer which is shared by multiple modules, including a pharmacy information system which controls the overall operation of a pharmacy in addition to operating packaging system **10**. Controller **12** may be in data-transmission relationship with automatic dispensing machine **11**, medicament dispensing unit **13** of automatic dispensing machine **11**, pouch packaging unit **15**, blister package packaging unit **17** as well as a diverter **163**.
(32) Referring to FIGS. **1**-**10**, automatic dispensing machine **11** and dispensing unit may include a housing **47** which may enclose medicament dispensing unit **13** and pouch packaging unit **15** when pouch packaging unit **15** is mounted in dispensing machine **11**. Housing **47** may include top and bottom walls **49**, **51**, left and right side walls **53**, **55**, and front and rear walls **57**, **59**. In one embodiment, side wall **53** may include a removable access panel **61** which may enable dispensing machine **11** to operate with blister package packaging unit **17** as described herein. Access panel **61** may be removably secured to housing **47** by any suitable means including by fasteners, clips, latches or the like which enable easy removal of access panel **61** from housing **47**.
(33) Housing **47** may further include a pair of access doors **63**, **65** in front wall **57**. Doors **63**, **65** close and open to allow a technician to access components internal to housing **47**, such as pouch packaging unit **15**. Doors **63**, **65** may also be opened to mount and remove pouch packaging unit **15** from dispensing machine **11** as described herein. In certain embodiments, packaging system **10** may be configured so that pouch packaging unit **15** could simply be moved aside while remaining in automatic dispensing machine **11** or so that pouch packaging unit **15** could remain in place with diverter **163** redirecting medicaments **19** to pouch package packaging unit **17**.
(34) In the example, medicament dispensing unit **13** of automatic dispensing machine **11** may be located at least partially within housing **47** above the position of pouch packaging unit **15**. Medicament dispensing unit **13** may include a plurality of pull-out drawers indicated by reference number **67**. For convenience and brevity, reference number **67** designates each such drawer, it being understood that the drawers are identical in the example. In the example, the drawers **67** are organized into five rows and four columns of drawers for twenty total drawers **67**. Any number of drawers may be provided. Structure other than drawers may also be provided.
(35) As illustrated in FIGS. **6** and **8**, each drawer **67** may support a plurality of removable medicament storage and dispensing units indicated by reference number **69**. For convenience and brevity, reference number **69** designates each storage and dispensing unit, it being understood that the storage and dispensing units are identical in the example. Any number of storage and dispensing unit **69** may be provided. Storage and dispensing units **69** may be of a cassette type as illustrated or may be of another type capable of storing and dispensing medicaments **19** or other items therefrom.
(36) Each storage and dispensing unit **69** is provided to store a bulk quantity of loose, free flowing medicaments such as the solid tablet-form medicaments **19**-**31** described previously and illustrated in FIG. **20**. Each storage and dispensing unit **69** can also dispense, or output, such medicaments **19** for subsequent packaging.
(37) One type of medicament **19** is typically stored in each storage and dispensing unit **69**. The type of medicament **19** in each storage and dispensing unit **69** may be stored in a database associated with controller **12**, enabling packaging system **10** to activate only the storage and dispensing unit(s) **69** containing the necessary medicament **19**.
(38) Typically, medicaments **19** stored in such storage and dispensing units **69** are of types which are prescribed and used more frequently to fulfill patient prescription orders. Such frequently-used medicaments **19** may be referred to as "fast movers." Medicament **19** (and medicaments **21**-**31**) is merely an example because any flowable item could be stored in a storage and dispensing unit **69**.
(39) In one embodiment, storage and dispensing units **69** may each include a cassette **71** removably mounted on a motor base **73**. Motor base **73** may be controlled by controller **12**. Motor base **73** may be supported on a drawer such as a drawer **67**. Cassette **71** may include a hopper **75** which receives and stores medicaments **19**. Cassette **71** and hopper **75** may be covered by a removable lid **77**. Cassette **71** may be initially loaded or replenished with medicaments **19** by removing lid **77** and pouring medicaments **19** into hopper **75** with the quantity loaded being updated in the database associated with controller **12**. Such loading may occur with cassette **71** mounted on motor base **73** or at a workstation spaced from packaging system **10** after first removing cassette **71** from motor base **73**.
(40) Each storage and dispensing unit **69** may further include a rotor **79** toward a bottom of hopper **75** in medicament-flow relationship with the hopper bottom opening **80**. A motor **81** associated with motor base **73** controlled directly or indirectly by controller **12** may be in power-transmission relationship with rotor **79** when hopper **75** is mounted on motor base **73** to power rotation of rotor **79**. As rotor **79** rotates under power of motor **81**, medicaments **19** flow by means of gravity downward in hopper **75** toward rotor **79** and are dispensed, or output, from a port **82** in the storage and dispensing unit **69** as illustrated in FIG. **6** in a singulated manner one-after-the-other.
(41) A counter **84** registers a count each time a medicament **19** passes counter **81** and is dispensed or output from a storage and dispensing unit **69**. For example, a medicament passing counter **84** could break an infra-red energy source (not shown) across port **82** to register a count. The count information may be used directly or indirectly by packaging system **10** controller **12** to track the quantity of medicaments **19** dispensed or output in each operation of the storage and

dispensing unit **69** and may be a first control to ensure that the correct quantity of medicaments **19** have been dispensed. Motor **81** is deactivated to stop further medicament **19** dispensing when the required count has been reached.
(42) Each storage and dispensing unit **69** may be replenished as medicaments **19** stored therein are dispensed during repeated medicament **19** packaging operations. Replenishment may be accomplished merely by manually pulling or sliding out the drawer **67** on which the storage and dispensing unit **69** to be replenished is mounted followed by refilling the storage and dispensing unit **69** with a bulk quantity of medicaments **19** as described previously. As previously stated, any number or type of storage and dispensing units may be provided as components of medicament dispensing unit **13** of automatic dispensing machine **11**, and storage and dispensing units **69** are merely examples.
(43) After being dispensed, or output, from a storage and dispensing unit **69**, medicaments such as medicament **19** may fall down by means of gravity through one or more vertical chutes **83**, **85**, **87**, **89** and into a funnel-shaped hoppers **91**, **92** beneath medicament dispensing unit **13** chutes **83**, **85**, **87**, **89**. Movable valve-like shutters **93**, **94** control flow of medicaments **19** from hoppers **91**, **93** into guide **95** so as to permit simultaneous staging of two different types of medicaments **19** in hoppers **91**, **92**. Guide **95** has a wide top opening **97** which receives the medicaments **19**, downwardly-sloped angled walls **99** and a narrow bottom opening **101** which directs medicaments **19** toward a packaging unit, which may be pouch packaging unit **15** or blister package packaging unit **17** depending on the mode in which packaging system **10** is configured as explained in more detail below.
(44) Any number and size of automatic dispensing machines **11** may be utilized as the packaging system **10** may be scaled to meet the needs of the pharmacy. Automatic dispensing machine **11** is intended to be an example.
(45) As stated, packaging system **10**, automatic dispensing machine **11** and medicament dispensing unit **13** may operate under control of instructions from controller **12** to operate storage and dispensing units **69** to dispense, or output, all medicaments **19** required to fulfill any pending prescription order (i.e., a prescription order that has been approved for fulfillment). Instructions for dispensing each medicament **19** may reside in a separate file residing in a database in memory of such controller **12**. Each file may contain all information necessary for dispensing and packaging of each medicament **19** including patient name, physician name, medicament type and strength, medicament lot number, time of day on which medicament **19** is to be taken and any other pertinent information.
(46) Each file may also be updated to create a record of each count from counter **81** as each medicament **19** is dispensed from a storage and dispensing unit **69** to confirm that the actual medicament count matches the required medicament count for each pouch package **33** or blister package **45**.
(47) It will be understood that “file” is intended to be a broad term which means or refers to one or more elements of data stored in memory which may be recalled by packaging system **10**. It will be further understood that multiple memory locations may be utilized for storing the data elements relating to each file. Therefore, the term “file” as used herein refers to the data elements for any given pouch package **33** or blister package **45**.
(48) Storage and dispensing units **69** may dispense such medicaments **19** in any sequence to fulfill the pending prescription orders. Thus, all medicaments **19** for a patient may be dispensed from a storage and dispensing unit **69** in the sequence in which the medicaments **19** are to be taken by the patient according to the physician's instructions embodied in the physician's prescription order.
(49) Referring now to FIGS. **1-13** there is shown an embodiment of a pouch packaging unit **15** which may be utilized when packaging system **10** is in the first packaging mode. Pouch packaging unit **15** may be controlled directly or indirectly by controller **12**. As described in detail below, pouch packaging unit **15** may package medicaments **19** dispensed from medicament dispensing unit **13** into pouch packages **33-43** formed in a pouch package web **103** (FIGS. **18-19**).
(50) In the example, pouch packaging unit **15** may be a modular, self-contained and integrated packaging unit. Pouch packaging unit **15** may be mounted within housing **47** of automatic dispensing machine **11** on platform **105**. Doors **63**, **65** may be opened to access pouch packaging unit **15** for service or for removal or mounting of pouch packaging unit **15** within dispensing machine **11** to accommodate a change in packaging modes of packaging system **10**.
(51) In the example, platform **105** is mounted for back-and-forth sliding movement on telescoping rails **107**, **109** between the operating position of pouch packaging unit **15** illustrated in FIGS. **1-5** and **8** and the position in which pouch packaging unit **15** is removed from automatic dispensing machine **11**. The operating position of pouch packaging unit **15** refers to the state in which packaging system **10** is ready to function in the mode for pouch packaging. Pouch packaging unit **15** may be secured to platform **105** in any manner, including by quick-release latches or the like. This structure enables pouch packaging unit **15** to be slid into or out of (i.e., to translate) automatic dispensing machine **11** housing **47**. When slid on platform **105** out of housing **47**, pouch packaging unit **15** may be detached from platform **105** and transferred to cart **111** as illustrated in FIGS. **10-13**. Cart **111** may include caster wheels (one wheel indicated as **113**) to enable cart **111** and pouch packaging unit **15** loaded thereon to be easily moved away from packaging system **10** (FIGS. **11-13**) when packaging system **10** is in a packaging mode for use with blister package packaging unit **17** or a further packaging module.
(52) Referring again to FIGS. **1-8** and **18-19**, when pouch packaging unit **15** is in the operating position, pouch packaging unit **15** packages medicaments **19** dispensed from storage and dispensing units **69** into separate pouch packages **33** to generate, or create, a pouch package web **103**. The material comprising web **103** may be supplied before use as a thin flexible film material wound into a supply roll **114** mounted for rotation on a motor-driven spindle (not shown) of frame **115** of pouch packaging unit **15**. The material which may be used for web **103** may be a lightweight low

density polyethylene (“LDPE”) film.
(53) Exemplary pouch packaging unit **15** may further comprise a printer **117**, and a sealer and perforation unit **119** supported by frame **115**. The operation of pouch packaging unit **15** is carefully synchronized directly or indirectly by controller **12** with operation of dispensing unit **13** and each motor base **73** to dispense and package medicaments **19** in accordance with file information as described herein so that the automatic dispensing machine **11** can preferably produce any desired arrangement of pouch packages **33**.
(54) Referring to FIGS. **4**-**8**, each medicament **19** falls from guide **95** and into tube **121** of pouch packaging unit **15**. When pouch packaging unit **15** is mounted for operation in automatic dispensing machine **11**, tube **121** is aligned with guide **95** bottom opening **101** (FIGS. **4**-**5** and **8**). A valve-like shutter **123** across tube **121** may open and close to limit or allow movement of a medicament **19** through tube **121**. When shutter **123** opens, a medicament **19** falls through tube **121** and exits tube **121** through nozzle **125** toward a lower end of tube **121**.
(55) After exiting nozzle **125**, medicaments **19** are packaged as represented schematically in FIG. **7**. Pouch packaging unit **15** forms by folding a pocket **127** in pouch package web **103** as web **103** is unwound from supply roll **114**. The pouch package web **103** may be folded in half by rollers (not shown) while web **103** is under tension to form pocket **127**.
(56) As illustrated in the example of FIGS. **7** and **18**, pouch package web **103** may include an opaque or semi-opaque portion **129** which receives printed information **131** thereon and a transparent portion **133**. Once a pouch package **33** is formed in pouch package web **103** as described above, opaque portion **129** becomes a first side of the pouch package **33** and the transparent portion **133** becomes a second side of the pouch package **33**. Opaque portion **129** preferably contrasts with printed information **131** applied thereto and facilitates reading or machine detection (e.g., barcode recognition or optical character recognition) of the printed information **131**. The transparent portion **133** permits each medicament **19** to be easily viewed within each pouch package **33** so that the contents of each pouch package **33** can be compared with the printed information **131** on the pouch package **33** for accuracy.
(57) In the example, the folded web **103** is delivered to printer **117** shown schematically in FIG. **7**. Printer **117** prints information on the folded web **103** opaque portion **129** adjacent the location where each pouch package **33** will be formed. In the example, the printing occurs before each medicament **19** for the pouch package **33** is loaded into pocket **127** from nozzle **125**. Any suitable type of information-application device could be used in place of a printer **117**. Advancement of web **103** is stopped momentarily by controller **112** so that printer **117** can apply printed information **131** to web **103** adjacent where each pouch package **33** will be formed.
(58) Information **131** applied to pouch package web **103** adjacent the location of pouch package **33** may include any information deemed appropriate. Information **131** may include, for example: the patient name, instructions for taking the medicament **19** (e.g., date and time of day the medicament is to be taken), medicament information (e.g., medicament strength and type, medicament appearance information, quantity, lot number, and expiration date), and a machine-readable code, such as a barcode.
(59) Referring further to FIG. **7**, pouch packaging unit **15** fills, or loads, each required medicament **19** into pocket **127** formed in web **103** adjacent the corresponding printed information **131** for the pouch package **33**. Nozzle **125** guides each medicament **19** into pocket **127**. Dispensing of each medicament **19** from a storage and dispensing unit **69**, or other storage and dispensing apparatus, for each pouch package **33** and loading of each medicament **19** into pocket **127** is carefully synchronized with application of information **131** by printer **117**. At the same time that web **103** is momentarily stopped for printing, one or more medicament **19** is loaded into pocket **127** downstream from printer **117** adjacent the corresponding printed information **131** for the pouch package **33** into which each such medicament **19** is loaded.
(60) A sealer and perforator unit **119** shown schematically in FIG. **7**, is used to seal each medicament **19** into a discrete, separate pouch package **33** formed in the pouch package web **103**. Sealer and perforator unit **119** may seal web **103** into separate pouch packages **33** by advancing web **103** between heated sealing rollers such as illustrated in FIGS. **7** and **9**-**10** or by other means, such as sonic welding. The sealer and perforator unit **119** may also perforate web **103**, making a perforation line **135** between each adjacent pouch package **33** to permit each formed pouch package **33** to be easily separated from the pouch package web **103** by tearing. In embodiments, packaging system **10** and automatic dispensing machine **11** may be capable of generating a separate pouch package **33** approximately every one second.
(61) Web **103** and the pouch packages **33** formed therein are advanced from sealer and perforator unit **119** to outlet port **137** in front wall **57** of housing **47**. Therefore, web **103** and pouch packages **33** formed therein exit port **137** even as further pouch packages **33** are being formed in web **103** by pouch packaging unit **15**. After exiting port **137**, web **103** including pouch packages **33** may fall into a collection bin, or may be wound onto a spool, or may simply fall onto a floor surface adjacent automatic dispensing machine **11** and outlet port **137**. Exiting port **137** completes the packaging process for each pouch package **33** provided by the pouch packaging unit **15**.
(62) Packaging system **10** continues to operate in the first mode for packaging of medicaments **19** in pouch packages **33** until such time as the pharmacy desires to package medicaments **19** in a different type of package and packaging mode. When it is desired to configure packaging system **10** for operation in a further packaging mode, operation of packaging system **10** is temporarily stopped. In the example, pouch packaging unit **15** may be removed from dispensing machine **11** as described above. With pouch packaging unit **15** removed, packaging system **10** may be configured for operation in a further packaging mode such as for use with blister package packaging unit **17**, as will now be described.
(63) Referring now to FIGS. **1**-**5**, **8**-**17** and **20**-**22**, there is shown an embodiment of a blister package packaging unit **17** which may be utilized when packaging system **10** is in the second packaging mode. Blister package packaging unit **17**

may be adapted to function with medicament dispensing unit **13** once pouch package packaging unit **15** is removed from automatic dispensing machine **11** as described above. Blister package packaging unit **17** may be provided to package medicaments **19** dispensed from medicament dispensing unit **13** into a blister package **45**. Efficiencies are provided to the pharmacy because the same automatic dispensing machine **11** can be used with different packaging units **15**, **17**, or other packaging units, freeing the pharmacy from purchasing separate packaging systems for each different package type and increasing the utility of automatic dispensing machine **11** to the pharmacy.

(64) A representative blister package **45** embodiment which could be utilized with packaging system **10** is illustrated in FIGS. **20**-**22**. Blister package **45** may include a top and a bottom side **139**, **141** and cells, of which cell **143** is representative. Blister package **45** cells **143** are referred to by some in industry as "wells." Each cell **143** is defined by a cell wall, of which cell wall **145** is representative. Blister package **45** derives its name from the outwardly protruding appearance of the walls defining cells **143**. For purposes of simplicity and brevity, each cell **143** of blister package **29** is indicated by reference number **143** and each cell wall **145** is indicated by reference number **145**.

(65) Referring again to FIGS. **20**-**22**, each wall **145** defines a cell **143** upper opening, or inlet, **147** and a cell bottom **149**. As shown in the example, the cell inlets **147** extend through, and are included in and along, top side **139**. In the embodiment, medicaments **19** are loaded into each cell **143** through inlet **147** by means of blister package packaging unit **17** as described herein.

(66) In the blister package **45** embodiment illustrated, each cell **143** is identical. However, it is possible that cells **143** and cell walls **145** of blister package **45** may have a structure which is not identical and which may differ depending on the needs of the user. For example, certain cells **143** of blister package **45** could have a depth or a cross-sectional shape which differs from the depth and cross-sectional shape of other cells of blister package **45**.

(67) Referring yet again to FIGS. **20**-**22**, the blister package **45** example includes thirty two total cells **143** organized into four rows and eight columns of cells **143**. The organization of cells **143** is merely exemplary. Cells **143** can be of any number and need not be arranged in rows and columns as illustrated. For example, cells **143** could be arranged in any number of rows and columns, in a circular pattern, or any other suitable arrangement. Blister package **45** may, by way of example only, be of a thin sheet of thermoformed or vacuum-formed transparent plastic of a polyvinyl chloride ("PVC") material. A transparent blister package **45** would permit packaged medicaments **19** to be viewable therein.

(68) A closure **151** of paperboard, or of aluminum foil, or plastic may be placed over all of the cells **143** of a loaded blister package top side **139** to close blister package **45**. The closed blister package **45** is then ready for delivery to the patient.

(69) Certain blister package containers **45** are referred to as "push-through-packs." In a push-through-pack, the cell wall **145** material in which the cells **143** are formed is collapsible by pushing with a human finger. The seal provided by closure **151** is breakable so that the medicament **19** within the selected cell **143** can be pushed through the closure and out of blister package **45** for use.

(70) Blister package **45** may be used as a compliance or multi-dose container by, for example, printing the days of the week above each cell **143** and arranging the medicaments **19** in cells **143** according to the order in which the medicaments **19** are to be taken by the patient. Such an arrangement ensures that the medicaments **19** can be taken by the patient one-after-another at the correct date and time. Blister package **45** could also be used as a unit-dose package with identical medicaments packaged therein.

(71) Referring to FIGS. **1**-**5** and **8**-**16**, a blister package packaging unit **17** may generally comprise a blister package delivery unit **153**, an information application unit **155**, a blister package conveyor **157**, a robotic pick-and-place unit **159** and a sealer unit **161**. The operating position of blister package packaging unit **17** refers to the state in which packaging system **10** is ready to function in the mode for packaging medicaments **19** in blister packages **45**. In the example, blister package delivery unit **153** delivers an empty blister package **45** with information provided by information application unit **155** to blister package conveyor **157**. Blister package conveyor **157** delivers the empty blister package **45** to robotic pick-and-place unit **159** for filling with medicaments **19**. The cells **143** of the filled blister package **45** are closed and the blister package **45** sealed by attachment of a sheet of closure material **151** across the cells **143** by sealer unit **161**.

(72) A plural-position medicament diverter **163** may be provided to move medicaments **19** from automatic dispensing machine **11** to pouch packaging unit **17**. In the example, diverter **163** may be extended into housing **47** to divert or change the direction of movement of medicaments **19** from a path which would be toward the pouch packaging unit **15** were it mounted in dispensing machine **11** and to a different path toward blister pack packaging unit **17**. Diverter **163** may include a medicament conveyor **165** which delivers medicaments **19** to the blister pack packaging unit **17**.

(73) The diverter **163** embodiment will now be described in more detail in connection with FIGS. **1**-**5** and **8**-**16**. In the example, diverter **163** may be located adjacent dispensing machine **11** housing **47** side wall **53**. When not in an operational position or state, diverter **163** front end **167** may be adjacent and spaced from side wall **53**. Removal of access panel **61** permits extension of diverter **163** front end **167** into and within housing **47** so as to position diverter **163** in the path of medicaments **19** falling from guide **95**, thereby enabling the medicament **19** diversion.

(74) In one embodiment, diverter **163** may include a frame **169** which supports diverter **163** on a floor surface and which enables movement of diverter **163** into the path of medicaments **19** falling from and exiting guide **95**. Frame **169** may include a pair of fixed-position parallel elongate frame rails **171**, **173** which lie in a horizontal plane and may further include pairs of vertical legs **175**, **177**, **179**, **181** at opposite ends of frame rails **171**, **173** to support frame rails **171**, **173** and diverter **163** on a floor surface adjacent dispensing machine **11**.

(75) Riding on frame rails **171**, **173** are a pair of sliding parallel elongate slide rails **183**, **185** which slide (i.e., translate) in a horizontal plane alternatively in the directions of dual-headed arrow **187**. Slide rails **183**, **185** easily ride back-and-forth on a respective frame rail **171**, **173** by means of rollers (not shown). Slide rails **183**, **185** slide between a retracted position illustrated in FIGS. **1**-**5** and **8**-**10** and an extended position illustrated in FIGS. **12**-**16**. A first latch **189** may secure and lock slide rails **183**, **185** in either the extended position or the retracted position. Handle **191** may be grasped and turned to release or engage first latch **189**.
(76) Medicament conveyor **165** may ride on slide rails **183**, **185** which may be components of diverter **163** frame **169**. Medicament conveyor **165** may be supported within a pair of parallel elongate side walls **195**, **197** which slide (i.e., translate) in a horizontal plane alternatively in the directions of dual-headed arrow **187**. Side walls **195**, **197** easily ride back-and-forth on a respective slide rail **183**, **185** by means of rollers (not shown). Side walls **195**, **197** and slide rails **183**, **185** slide between the retracted position illustrated in FIGS. **1**-**5** and **8**-**10** and the extended position illustrated in FIGS. **12**-**16**. A second latch **199** may secure side walls **195**, **197** in either the extended position or the retracted position. Handle **201** may be grasped and turned to release second latch **199**. Medicament conveyor **165** may be moved laterally in a telescoping manner to position medicament conveyor **165** under guide **95** to receive medicaments **19** falling from guide **95** bottom opening **101**. In the example, sliding of slide rails **183**, **185** and side walls **195**, **197** may be accomplished by manual pushing or pulling after release of latches **189**, **199**.
(77) Side walls **195**, **197** of medicament conveyor **165** may also support a front idler roller **203**, a rear driven roller **205** and an endless belt **207** supported on rollers **203**, **205** between side walls **195**, **197**. An electric motor **209** may be in power-transmission relationship with rear driven roller **205** to power movement of belt **207** in the rearward direction of arrow **275**. Motor **209** and stepwise movement of belt **207** may be controlled by controller **12** (FIG. **17**) which controls overall operation of packaging system **10**. A sensor or any appropriate control may be used to stop and start motor **209** for each step.
(78) Referring next to FIGS. **12**, **14**-**16**, belt **207** may support a plurality of carriers **211**, **212**, **213**, **214**, **215**, **216**, **217**, **218**, **219**, **221**. Each carrier **211**-**221** is provided to hold medicaments **19** dispensed from medicament dispensing unit **13** while diverter **163** transports such medicaments **19** to blister package packaging unit **17**. To accomplish this, each carrier **211**-**222** may be attached to belt **207** in a manner permitting carrier **211**-**222** to be upside down on belt **207** without falling off belt **207**. Indexed or stepwise movement of belt **207** driven by motor **209** in the direction of arrow **275** positions one carrier **211**-**222** under bottom opening **101** of guide **95** during each step. Carriers **211**-**222** may each include a bowl **224**. Bowl **224** may include a rim for holding medicaments **19** which fall from guide **95** into a carrier **211**-**222** when the carrier **211**-**222** is positioned under guide **95** bottom opening **101**. A carrier **211**-**222** loaded with one or more medicament **19** may then be moved by belt **207** to blister package packaging unit **17** for transfer and packaging of medicaments **19** into a cell or cells **143** of blister package **45**. Therefore, diverter **163** redirects movement of medicaments **19** toward blister package packaging unit **17**.
(79) Any quantity of medicaments **19** required for loading a blister package **45** may be loaded into a carrier **211**-**222** by medicament dispensing unit **13**. For example, if blister package **45** were to have 32 cells **143** and each cell **143** were to require one identical medicament **19** to fulfil the prescription order, then 32 identical medicaments **19** could be output from the storage and dispensing unit(s) **69** holding such medicament **19** and loaded into a single carrier **211**-**222** for delivery to the robotic pick-and-place unit **159**. Further, if different types of medicaments **19** are to be loaded into a single blister package **45**, then the required quantity of each type of medicament **19** may be loaded into separate carriers **211**-**222** and each carrier may be delivered to the robotic pick-and-place unit **159** so that each medicament **19** can be loaded into a blister package **45**.
(80) Referring next to FIGS. **4**-**5** and **15**A-**16**, an imager **223** may be provided to capture an image record of the medicament contents of each carrier **211**-**222** before packaging of the medicaments **19** into a blister package **45** by robotic pick-and-place unit **159**. Imager **223** may capture an image of the quantity, color, size, shape and other physical characteristics of medicaments **19** in carrier (e.g., carrier **211**). The video image may be stored in the file associated with computer **12** for the blister package **45**. Computer **12** may inspect the video image for a match (i.e., pass/fail) with the medicament count and type expected to be in the carrier (e.g., carrier **211**) as stored in the file. If there is a match, then a record may be kept in the file for the blister package **45**. If there is no match, then an alarm may be generated so that the technician can correct the mismatch error. System **10** may be momentarily stopped by controller **12** for this error correction. The image record may be used to keep an archive in a database associated with controller **12**, indicative that the correct medicament **19** for the blister package **45** was supplied in accordance with the file information for the blister package **45**. Imager **223** may be a second control to ensure that the correct quantity and type of medicaments **19** have been dispensed.
(81) Imager **223** may include a housing **225** and an imaging device **227**. Housing **225** may be an enclosure which may be positioned over one carrier (e.g., carrier **211**) to cover carrier **211** while belt **207** is momentarily stopped by controller **12**. Imager **223** may be supported above belt **207** and carriers **211**-**222** by a cover **230**. In addition to supporting imager **223**, cover **230** can prevent medicaments **19** from bouncing out of a carrier **211**-**222** during transport on medicament conveyor **165**. And, cover **230** can protect medicaments **19** from contact by contaminants. Cover **230** may be raised or lowered to space imager **223** above a carrier **211**-**222** as desired to produce the required image of medicaments **19** in a carrier **211**-**222**.
(82) Imaging device **227** may be supported on housing **225** to capture an image of medicaments **19** in bowl **224** of carrier

211. Imaging device **227** may be a charged coupled device ("CCD"). A preferred CCD captures light and converts it to digital data that is stored through processing in each file for each blister package **45** by controller **12**. It is preferred that imaging device **227** has a resolution of about 8 megapixels or greater. A dome-like lamp **229** may be provided within housing **225** to illuminate medicaments **19** for image capture by imaging device **227**.
(83) Controller **12** may power motor **209** to momentarily power belt **207** back-and-forth alternatively in the directions of arrow **187**. Back-and-forth movement of belt **207** may serve to shake medicaments **19** within a carrier **211**-**222** so as to avoid stacking of medicaments **19** and to ensure medicaments are uniformly spread out within a carrier **211**-**222** so as to provide for more accurate imaging of such medicaments **19**.
(84) Referring next to FIGS. **1**-**5** and **8**-**16**, components of one embodiment of a blister package packaging unit **17** will now be described. Components of blister package packaging unit **17** may include blister package delivery unit **153**, information application unit **155**, blister package conveyor **157**, robotic pick and place unit **159** and sealer unit **161**. All of these components may be controlled by controller **12**.
(85) In the example, bin **231** may be provided as a storage location for a source of empty blister packages **45**. Bin **231** may hold a stack of empty blister packages **45** nested one on top of the other in bin **231**.
(86) Referring to FIGS. **14**A-**14**C, information application unit **155** may include a label printer **233** and a transport mechanism **235**. Information application unit **155** may be provided to apply information **237** to each empty blister package **45** describing the medicaments **19** which will be packaged in each such blister package **45**. It is not required that information application unit **155** apply information **237** to each empty blister package. For example, a unit dose blister package **45** not intended for a specific patient may not need application of information **237**. If applied, information **237** may include patient-specific information **237** from the file associated with controller **12** for the blister package **45**. The information **237** may include all information necessary for dispensing of each medicament **19** packaged in the blister package **45** including patient name, physician name, medicament type and strength, medicament lot number and any other pertinent information.
(87) In the example, label printer **233** may include any suitable printer which affixes the information **237** to an adhesive-backed label **239**. In the example, label printer **233** may output the adhesive-backed label **239** for a blister package **45** onto platform **241**.
(88) Transport mechanism **235** may include an arm **241** which may be moved in an x-y coordinate system. Transport mechanism **235** may include a vacuum source (not shown) which utilizes a negative pressure to momentarily adhere arm **241** to label **239** on platform **243** and may press and affix the label **239** to the topmost empty blister package **45** from the blister package **45** stack in bin **231** as illustrated in FIG. **14**C.
(89) Referring next to FIGS. **14**D-**14**G, blister package delivery unit **153** may be a robot controlled by controller **12** provided to move the empty and labeled blister package **45** from the stack of blister packages **45** in bin **231** adjacent information application unit **155** and to and onto blister package conveyor **157**. Such robot may include an articulated arm **245** which may be moved in an x-y-z coordinate system. A gripper **246** may be carried at an end of arm **245**. Blister package delivery unit **153** may include a vacuum source (not shown) which utilizes a negative pressure to momentarily adhere gripper **246** to the topmost labeled empty blister package **45** from the blister package **45** stack in bin **231**. As illustrated in FIGS. **14**D and **14**E, arm **238** may be moved from a start position (FIG. **14**D) to a further position in which to gripper **246** contacts and grips the blister package **45** (FIG. **14**E). Gripping may occur by generation of the vacuum.
(90) As illustrated in the sequence of FIGS. **14**F-**14**G, arm **245** may then lift the gripped blister package **45** as illustrated in FIG. **14**E, flip the gripped blister package **45** as illustrated in FIG. **14**F, and place the blister package **45** onto one blister package holder **247**, **249**, **250**, **251**, **252**, **253**, **254**, **255** on blister package conveyor **157** as illustrated in FIG. **14**G. Arm **245** may then gently push blister package **45** down onto a holder (e.g., holder **247**) so that blister package **45** nests onto such holder with cells **143** in positions known to controller **12** as described next. Arm **245** may then return to the position of FIG. **14**A to begin another cycle.
(91) Blister package conveyor **157** may include a frame **257** including a pair of parallel elongate side walls **259**, **261**. Frame **257** may be supported on a floor surface by attachment of sidewall **259** to frame rail **173** of diverter **163** frame **169** and by vertical legs **263**, **265**. In the embodiment, blister package conveyor **157** and medicament conveyor **165** may be parallel to each other.
(92) Frame **257** of blister package conveyor **157** may also support a front idler roller **267**, a rear driven roller **269** and an endless (i.e., continuous) flexible belt **271** supported on rollers **267**, **269**. An electric motor **273** may be in power-transmission relationship with rear driven roller **269** to power rearward movement of belt **271** in an indexed or stepwise manner in the direction of arrow **275**. Motor **273** may be controlled by computer **12** which controls overall operation of packaging system **10**. A sensor or any appropriate control may be used to stop and start motor **273** for each step.
(93) Referring next to FIGS. **1**, **3**-**4**, **9**-**12** and **14**-**16**, belt **271** may support a plurality of blister package holders **247**-**255** which may have a structure each identical to the other. Each holder **247**-**255** may be attached to belt **271** in a manner permitting holder **247**-**255** to be upside down on belt **271** without falling off belt **271** allowing belt **271** to be driven entirely around rollers **267**, **269** in the direction of arrow **275**. Each holder **247**-**255** may be provided to receive an empty labeled blister package **45** from transport mechanism **235**, to hold the labeled blister package **45** during loading of medicaments **19** into cells **143** by robotic pick-and-place unit **159**, to hold the loaded and labeled blister package **45** during sealing by sealer unit **161** and to tip so that the sealed blister package **45** can be ejected from the holder **247**-**255**.
(94) Each holder **247**-**255** may define a top surface **277** and a plurality of concave pockets **279** which may be arranged in

a shape and pattern identical to the arrangement of cells **143** of blister package **45** so that a blister package **45** can be nested on any holder **247-255**. For example, if blister package **45** includes thirty two total cells **143** organized into four rows and eight columns of cells **143**, then each holder **247-255** may have a pattern of pockets **279** identical to the pattern of the blister package cells **143** and cell walls **145** defining cells **143**. The location of each pocket **279** may be known to controller **12**.

(95) Blister package **45** may be set on a holder **247-255** by arm **238** with each cell **143** nested in a corresponding pocket **279**. This arrangement enables each cell **143** location to be identified by computer **12** which controls operation of packaging system **10** for purposes of precisely loading any medicament **19** into any desired cell **143** of a labeled blister package **45** by robotic pick-and-place unit **159**.

(96) Rearward indexed or stepwise movement of belt **271** in the direction of arrow **275** delivers a holder **247-255** and an empty labeled blister package **45** nested thereon to robotic pick-and-place unit **159** for filling with medicaments **19** as described next.

(97) In one embodiment, a robotic pick-and-place unit **159** may be a floor mounted unit supported on a floor stand **281**. Stand **281** may support robotic pick-and-place unit **159** above and straddling both the parallel blister package conveyor **157** and medicament conveyor **165** with robotic pick-and-place unit above conveyor belt **207** of blister package conveyor **157** and conveyor belt **271** of medicament conveyor **165**. Robotic pick-and-place unit **159** may be under control of computer **12** which controls operation of packaging system **10**. In the example, robotic pick-and-place unit **159** may be capable of picking a medicament **19** from a carrier **211-222** and placing the medicament **19** into any cell **143** as specified by instructions associated with controller **12** for the blister package **45**.

(98) A supply of medicaments **19** and an empty labeled blister package **45** may be delivered to robotic pick-and-place unit **159** for loading of each medicament **19** into the required cell **143** of blister package **45**. Imaging of medicaments **19** in carrier **211-222** may occur before delivery of carrier **211-222** to robotic pick-and-place unit **159** as described above.

(99) In the exemplary embodiment, the blister package loading process may be as follows. A carrier **211-222** on belt **271** with one or more medicament **19** in bowl **224** may be delivered by medicament conveyor **165** to a loading station **283** adjacent to and preferably beneath robotic pick-and-place unit **159**. A carrier **211-222** at loading station **283** is referred to herein as being at a “delivery position” at which medicaments can be transferred to a blister package **45**. Belt **271** may be stopped with one carrier **211-222** at loading station **283**. Because of the indexed stepwise movement of belt **271** and carriers **211-222** thereon, each carrier **211-222** is identified to packaging system **10**. A sensor or any appropriate control may be used to stop and start motor **273** for each step.

(100) Simultaneously, a holder **247-255** holding an empty labeled blister package **45** may be delivered in an indexed manner by blister package conveyor **157** to loading station **283** whereupon belt **271** may be stopped with one holder **247-255** at loading station **283**. The indexed stepwise movement of belt **271** and holder **247-255** thereon permits each cell **143** position to be identified to packaging system **10**. By identification, it is meant that packaging system **10** may have a record of both each cell **143** location (e.g., row **1**, column **1** of blister package **45**) and of each medicament **19** that is required to be loaded in each cell **143** location. Consequently, a carrier **211-222** containing medicaments **19** and a blister package **45** to be loaded with the medicaments **19** are both at loading station **283** for transfer of medicaments to blister package **45** by robotic pick-and-place unit **159**.

(101) Robotic pick-and-place unit **159** may be any device capable of loading medicaments **19** into the labeled blister package **45** at loading station **283**. One example of a device which may be utilized as robotic pick-and-place unit **159** is a Fanuc robot M-1iA/1HL available from Fanuc America Corporation of Hoffman Estates, Ill. Such Fanuc robot may include three computer-controlled **12** articulated **285**, **287**, **289** arms. Arms **285**, **287**, **289** of robotic pick-and-place unit **159**, may be interconnected to hold a single control head **317** toward the ends of such arms **285-289**. Control head **317** may have a probe end **319** connected to a vacuum source (not shown). The vacuum source permits probe end **319** to pick and hold a medicament **19** from carrier (e.g., **211**) for transport to blister package **45**.

(102) Under control of computer **12**, each arm **285-289** can be coordinated to move control head **317** toward carrier **211-222** at loading station **283** to allow probe end **319** to grip or “pick” one medicament **19** in bowl **224**. Negative pressure from the vacuum mechanism at probe end **319** momentarily grips a medicament **19**. Arms **285-289** are then moved to move control head **317** to the appropriate cell **143** of labeled blister package **45** also at loading station **283**. A momentary cessation of the vacuum at probe end **319** causes control head **317** to drop or “place” a medicament **19** into a specified cell **143**.

(103) The combination of all three arms **285-289** and their individual motion, control the location of control head **317** and probe end **319** in a controlled range of motion. The combination of the arms **285-289**, control head **317**, and a video camera **321** give the robotic pick-and-place unit **159** the ability to locate the desired medicament **19** to be picked and the location and orientation of the cell **143** into which the medicament **19** will be placed. This video image may be taken for each picking cycle of the robotic pick-and-place unit **159** to insure target medicaments **19** and cells **143** have not been moved during the last cycle of arms **285-289**. The control head **317** may have a 360 degree rotary control axis that allows the robotic pick-and-place unit **159** to control the orientation of the medicament **19** should it have a larger profile (e.g., an elongate oval tablet) which needs manipulation to fit through cell inlet **147**.

(104) Video camera **321** may capture an image of the quantity, color, size, shape and other physical characteristics of medicaments **19** in carrier (e.g., carrier **211**). The video image may be stored in the file associated with computer **12** for the blister package **45**. Computer **12** may inspect the video image for a match (i.e., pass/fail) with the medicament count

and type expected to be in the carrier (e.g., carrier **211**) as stored in the file. If there is a match, then a record may be kept in the file for the blister package **45**. If there is no match, then an alarm may be generated so that the technician can correct the mismatch error. System **10** may be momentarily stopped by controller **12** for this error correction.
(105) In the example, packaging system **10** may provide three checks of medicaments **19** before loading in a blister package **45**. A first check may occur when a count is generated by counter **84**. A second check may occur based on analysis of the image captured by imager **223**. A third check may occur based on analysis of the image captured by video camera **321** of robotic pick-and-place unit **159**.
(106) Robotic pick-and-place unit **159** may have the capability to place any medicament **19** in any cell **143** of blister package **45** as required for fulfillment of the prescription order associated with the blister package **45**. For example, if different types of medicaments, such as medicaments **19** and **21** (FIG. **19**), are to be loaded in a single blister package **45**, then first single-type medicaments **19** from a first carrier **211** could be loaded in the required cells **143** in any required sequence, including by potentially skipping cells **143** in which a different type medicament **21** is to be loaded.
(107) Next, a second carrier **213** with a second and different type of medicament **21** could be delivered by medicament conveyor **165** to loading station **283** while the partially-loaded blister package **45** remains stopped at loading station **283**. The second type of medicament **21** could then be loaded in the required cells **143** for that medicament **21**, once again in any required sequence potentially skipping cells **143** in which a further different type medicament **23** is to be loaded. The process is continued until all cells **143** of a single blister package **45** are loaded with a medicament (e.g., medicament **19**, **21**, **23**) as required by the patient's prescription order.
(108) The foregoing process enables a single blister package **45** to be loaded with an identical type of medicament **19** or with different types of medicaments **19**, **21**, **23** in, for example, the order in which the medicaments **19**, **21**, **23** are to be taken by the patient. As an example, three different medicaments **19**, **21**, **23** to be taken serially at different times of the day (e.g., breakfast, lunch and dinner) could be loaded in three consecutive cells **143** to be taken one after the other by the patient.
(109) Following loading of blister package **45**, belt **271** of blister package conveyor **157** may be restarted permitting further rearward indexed movement of belt **271** in the direction of arrow **275**. Such movement delivers the next empty blister package **45** to be loaded and holder **247-255** in which the blister package **45** is nested to loading station **283**. Such movement further delivers the loaded blister package **45** and holder **247-255** in which blister package **45** is nested to the sealer unit **161** for sealing of blister package **45** as described next.
(110) Any number or size of robotic pick-and-place units **159** may be utilized as the packaging system **10** may be scaled to meet the needs of the pharmacy. Robotic pick-and-place unit **159** is intended to be an example.
(111) Referring now to FIGS. **1-5** and **9-15**C, sealer unit **161** may be provided to seal blister package **45** and the medicaments **19** loaded therein. Sealer unit **161** may be controlled directly or indirectly by controller **12**. Sealer unit **161** may be provided to close and seal each filled and loaded blister package **45** by attachment of a closure **151** across the cells **143**. In the example, sealer unit **161** may also print information on closure **151** to assist the patient in taking medicaments **19** packaged in blister package **45**.
(112) Sealer unit **161** may include a supply roll **293** including a web **295** of a carrier or backing material and a plurality of die-cut closures **151** supported on the carrier web **295**. Each closure **151** may, for example, be a of a thin sheet of paperboard, aluminum foil or plastic material and may include a thin layer of adhesive (not shown) on a side which will face top side **139** of blister package **45**. Closure **151** may be of a material type which can be easily broken by a patient pushing on cell bottom **149** so as to provide a “push-through-pack” as previously described.
(113) Web carrier **295** carrying closures **151** may be unwound from roll **293** through a series of idler rollers **297**, **299**, **301** and onto a take-up roller **303** driven by take-up roller motor **305**. Web carrier **295** wound onto take-up roller **303** may subsequently be discarded.
(114) As illustrated in FIGS. **5** and **13**, after unwinding from supply roll **293** carrier web **295** may pass through an information-application device such as printer unit **307**. Printer unit **307** may print information (not shown) on closure **151** at a position visible to a patient. The data and instructions used by printer unit **307** to print the information on closure **151** may be from the file for the blister package **45** stored directly or indirectly by controller **12**. The printed information may include any information relevant to blister package **45** and medicaments **19** therein. The printed information may be patient specific and may include the patient name, identification of each cell **133** or the cell **133** contents, instructions for taking each medicament **19** (e.g., date and time of day the medicament is to be taken), medicament information (e.g., medicament strength and type, medicament appearance information, quantity, lot number, and expiration date), and a machine-readable code, such as a barcode. The information may include instructions for the sequence in which each cell **133** is to be accessed for purposes of taking the medicaments in blister package **45** in the correct sequence. The printed information need not be patient specific information and may include information, for example, relevant to a unit dose package not intended for any specific patient at the point of packaging by packaging system **10**. Such information applied by printer unit **307** may be used in place of or in addition to information **237** that could be applied by information-application unit **155**.
(115) Closure **151** separates from carrier web **295** after traveling over idler roller **297** and between pressure roller **309** and top side **139** of blister package **45**. Pressure roller **309** applies a force pushing closure **151** onto top side **139** of blister package **45**. Adhesive on closure **151** side facing top side **139** of blister package **45** joins closure **151** to blister package **45**, thereby sealing blister package **45**. After sealing, each blister package **45** is considered to be complete and the

finished package **45** is ready for delivery to the patient or for any other purpose such as providing an inventory of medicaments **19**.
(116) Further movement of belt **271** in the direction of arrow **275** causes holder (e.g., holder **247**) in which blister package **45** is nested to tip as such holder passes over roller **269**. Tipping of the holder (e.g., holder **247**) causes the sealed blister package **45** to fall off of blister package conveyor **157**. The sealed blister package **45** may fall into a tote or other container (not shown) completing the packaging process provided by the example of the blister package packaging unit **17**.
(117) Referring now to FIGS. **1-23**, overall operation of the example of packaging system **10** will now be described. In operation, the mode in which packaging system **10** is to operate may first be determined. Controller **12** may be set to the desired packaging mode through an appropriate user interface such as a keyboard **311**, touch screen video display **313**, mouse **315** or the like in data-transmission relationship with controller **12** (FIG. **23**). In the example, controller **12** may be set to either a first mode for pouch **33** packaging or to a second mode for blister package **45** packaging. Further or different modes of packaging may be provided with other embodiments of packaging system **10**. For example, packaging system **10** could be configured to function with packaging units other than pouch packaging unit **15** or blister package packaging unit **17** to thereby package medicaments **19** in other types of packages.
(118) A record of medicament **19** type and quantity within each storage and dispensing unit **69** of medicament dispensing unit **13** may reside in memory of controller **12**. Instructions and data for packaging of medicaments **19** in the selected packaging mode may be stored in a separate file residing in a database in memory of controller **12**. Each file may contain all information necessary for dispensing and packaging of each medicament **19** as previously described. Thus, a separate file may exist for each pouch package **33** and a separate file may exist for each blister package **45**. The files may be arranged by a technician or controller **12** in a “batch” of files containing all files for a given packaging run by packaging system **10**. Controller **12** may cause packaging system **10** to process the files of the batch so as to serially dispense and package medicaments **19** in the sequence in which the medicaments **19** are to be taken by the patient. Such an arrangement can provide for compliance or multi-dose packaging in which the packaging itself orders the medicaments **19** in a manner which encourages patient compliance with the physician's prescription order.
(119) Packaging other than in compliance packaging is contemplated. For example, all pouch packages **33** or blister packages **45** in a particular batch of files could include an identical medicament **19**. Such an arrangement may be desirable when a pharmacy seeks to build an inventory of like medicaments **19** or to provide unit dose packages for patients. Other packaging arrangements and combinations of packaging arrangements are contemplated for processing by packaging system **10**.
(120) When packaging system **10** is in a first mode for pouch packaging of medicaments **19**, pouch packaging unit **15** may be mounted on platform **105**. Pouch packaging unit **15** may be loaded with a supply roll **114** and web material **103** from supply roll **114** may be pulled from supply roll **114** and guided by rollers or other structure to printer **117** and sealer and perforation unit **119**. Platform **105** with pouch packaging unit **15** thereon is slid into automatic dispensing machine **11** housing **47**. Tube **121** of pouch packaging unit **15** may be aligned with guide **93** bottom opening **101** to receive medicaments **19** falling or otherwise output from medicament dispensing unit **13**. Doors **63**, **65** may be closed after pouch packaging unit **15** on platform **105** is slid into housing **47** to enclose and protect pouch packaging unit **15** for operation.
(121) Access panel **61** is preferably in place on housing **47** to further enclose pouch packaging unit **15** within housing **47**. Diverter **163** may be in a non-operational state with medicament conveyor **165** in a retracted position and with diverter front end **167** outside of housing **47** proximate access panel **61**. Packaging system **10** is ready for operation in a first mode for the pouch packaging process.
(122) The pouch packaging operation begins with activation of the storage and dispensing unit(s) holding medicaments **19** required to be packaged in each pouch package **33**. For example, if one unit of a medicament **19** is required for a first pouch package **33**, then motor **81** of storage and dispensing unit **69** holding that medicament **19** is activated to rotate rotor **79** until a single count is made by counter **84** and recorded by controller **12**. Control of the storage and dispensing unit **69** activated and the count from counter **84** of that unit **69** may be a first control over the correct type and quantity of medicaments **19** dispensed for a given pouch package **33** or blister package **45**. Controller **12** may adjust motor **81** speed to rotate at a slower or faster speed depending on whether one or a greater quantity of medicaments **19** are to be dispensed or output from the storage and dispensing unit **69**.
(123) Medicament **19** may fall in a path through port **82** and chute **83** and into guide **95**. Medicament **19** further falls in a path from guide lower opening **101**, through tube **121** and nozzle **125** and into pocket **127** formed in web material **103** by pouch packaging unit **15**. Printer **117** may provide printed information **131** for the pouch package **33** adjacent pocket **127** containing medicament **19**. Sealer and perforation unit **119** subsequently forms a discrete pouch package **33** in pouch package web **103**.
(124) The foregoing pouch packaging process is repeated by pouch packaging unit **15** for each pouch package **33**. The lengthening pouch package web **103** with discrete pouch packages **33-43** formed therein produced by pouch packaging unit **15** may be output through port **137**. The pouch packages **33** may then be collected and provided to each patient or for other purposes as required. The files associated with controller **12** are updated accordingly to indicate that each required medicament **19** has been packaged as required by the instructions associated with each file. This concludes the pouch packaging process of the first packaging mode.

(125) When it is desired to package medicaments in a blister package **45**, controller **12** may be set to the second mode through any of the user interfaces discussed above. In the example, pouch packaging unit **15** on platform **105** may be slid out and away from housing **47** of automatic dispensing machine **11**. Pouch packaging unit **15** may then be transferred to cart **111**. Platform **105** may then be slid back into housing **47** and doors **61**, **63** closed. As stated previously, packaging system **10** may be configured so that pouch packaging unit **15** could remain in place or moved while packaging system **10** operates in a different packaging mode.
(126) With access panel **61** first removed, diverter **163** may be moved into its extended operational position and state. Medicament conveyor **165** of diverter may be partially extended into housing by releasing latches **189**, **199** and by pushing frame rails **171**, **173** and slide rails **183**, **185** toward guide **93** such that a carrier **211**-**217** on conveyor belt **271** may be located under guide **93** bottom opening **101**. Such position of a carrier **211**-**217** under guide **93** lower opening **101** in position to receive medicaments **19** therein may be referred to as a "receiving position." Closing of latches **189**, **199** locks medicament conveyor **165** in the extended position. Packaging system **10** is ready for operation in a second mode for the blister package packaging process.
(127) In the example of packaging system **10**, diverter **163** and blister package packaging unit **17** may comprise parallel lines of conveyors. Medicament conveyor **165** serves to deliver medicaments **19** from medicament dispensing unit **13** to loading station **283** and the delivery position. Blister package conveyor **157** parallel to medicament conveyor **165** receives medicaments **19** transferred to blister package **45** for packaging.
(128) Like the pouch packaging operation, the blister package packaging operation begins with activation of the storage and dispensing unit(s) **69** holding medicaments **19** required to be packaged in each blister package **45**. For example, if three different types of medicaments **19**, **21**, **23** are required to fill all the cells **143** of a single blister package **45**, then the required quantity of the first type medicaments **19** are first output from the storage and dispensing unit **69** holding the such medicaments **19**. This is accomplished once again by activating motor **81** until the required quantity of medicaments **19** are counted by counter **84** and the file associated with controller **12** is updated.
(129) The first type of medicaments **19** may fall in the path through port **82** and chute **83** and into guide **95**. Medicaments **19** further fall in a path from guide lower opening **101**.
(130) The second mode of packaging differs from the first mode of packaging because diverter **163** diverts, changes and re-directs the path of movement of the medicaments **19** so that the medicaments **19** fall into a carrier **211**-**222** in the receiving position under guide **93** lower opening **101** rather than fall toward pouch packaging unit **15** which had been previously removed from automatic dispensing machine **11** in the example. A record of the quantity of medicaments **19** counted by counter **84** and the carrier (e.g., carrier **211**) in which the medicaments **19** were collected is made by controller **12**.
(131) Diverter motor **209** powering medicament conveyor **165** may next be activated directly or indirectly by controller **12** to advance belt **207** with carrier **211** one step in the rearward direction of arrow **275** so that the next carrier **213** is under guide bottom opening **101** in the receiving position. The second type of medicaments **21** required for blister package **45** may then be dispensed into carrier **213** in the same manner as previously described. The process is repeated for the third type of medicament **23** which may fall into further carrier **215** advanced stepwise to the receiving position under lower guide opening **101**.
(132) Imager **223** may capture an image of the medicaments **19** in carrier **211**, and subsequently in the other carriers (e.g., carriers **213**, **215**). The image can be utilized by controller **12** to confirm that the correct quantity and type of medicaments **19** were dispensed into carrier **211**, providing a second level of control over the quantity and type of medicaments **19** dispensed. Computer imagery of the physical characteristics of the medicaments **19** (i.e., shape, color, size, markings, etc.) can be utilized for the recognition. An alarm may be provided and the packaging process stopped if an error is detected as a result of the imaging.
(133) Through repeated cycles of loading of carriers **211**-**222**, belt **207** is advanced stepwise so that carrier **211** with the first type of medicament **19** arrives at loading station **283** in the delivery position for transfer of medicaments **19** to a blister package **45** by robotic pick-and-place unit **159**. A sensor or any appropriate control may be used to stop and start motor **209** for each step.
(134) Packaging unit **17** operation may be synchronized with diverter **163** operation by controller **12**. Transport mechanism **235** arm **241** may affix a label **239** output by label printer **233** to the topmost empty blister package **45** in bin **231**. Label **239** may include patient-specific information **237** (or any other type of information) to empty blister package **45**. Arm **245** of blister package delivery unit **153** may next lift and deliver the labeled blister package **45** into one holder **247**-**255** so that cells **143** are nested into corresponding pockets **279**. Since controller **12** tracks the position of each pocket **279**, controller necessarily can track the position of each cell **143** in the corresponding pocket **279**.
(135) Blister package conveyor motor **273** may next be activated directly or indirectly by controller **12** to advance belt **271** with holder **247** one step in the rearward direction of arrow **275** so that holder **247** is at loading station **283** and the next holder **249** is in position to receive an empty labeled blister package **45** from transport mechanism **235** of blister package delivery unit **153**. A sensor or any appropriate control may be used to stop and start motor **273** for each step.
(136) Operation of blister package packaging unit **17** may be synchronized with medicament dispensing unit **13** and diverter **153** so that the blister package **45** in holder **247** may be the patient-specific blister package **45** for which the first through third types of medicaments **19**-**23** are required in this example. With both carrier **211** containing the first type of medicaments **19** and holder **247** with the blister package **45** into which the first type of medicaments **19** are to be loaded

at loading station **283**, transfer of such medicaments **19** can occur by means of robotic pick-and-place unit **159** in the example.
(137) Arms **285**-**289** of robotic pick-and-place unit **159** may each position control head **317** and probe end **319** to grip or pick a medicament **19** by means of vacuum and move the medicament **19** into the specific cell **143** of blister package **45** into which the medicament **19** is to be loaded or placed as determined by controller **12**. The medicament **19** is then dropped into the specific cell **143** by momentary stoppage of the vacuum. Video camera **321** may capture an image of medicaments in the carrier **211**-**222** and such image maybe be used by controller **12** to determine that the correct quantity and type of medicaments **19** are in the carrier **211**-**222** providing a further level of control.
(138) When all of the first type of medicaments **19** have been transferred from carrier **211** to blister package **45**, motor **209** powering medicament conveyor **165** belt **207** advances the next carrier **213** one step to loading station **283**. The aforementioned loading process is repeated for the second type of medicaments **21** with the second type of medicaments **21** being loaded by robotic pick-and-place unit **159** into the specific cells **143** of blister package **45** into which such medicaments **21** are to be loaded as determined by controller **12**. The foregoing process is repeated for the third type of medicaments **23** until all required medicaments **19**, **21**, **23** have been transferred from carriers **211**, **213**, **215** to blister package **45** in this example.
(139) Once blister package **45** has been loaded, motor **273** powering blister package conveyor **157** belt **271** advances holder **211** one step to sealer unit **161**. At sealer unit **161**, a closure **151** which may include printed information applied to closure **151** by printer, is attached to blister package **45** creating a sealed, finished-form blister package **45**. Further advancement of belt **271** causes the sealed blister package **45** to be ejected from holder **247** as previously described. This concludes the pouch packaging process of the second packaging mode according to the example.
(140) While the principles of this invention have been described in connection with specific embodiments, it should be understood clearly that these descriptions are made only by way of example and are not intended to limit the scope of the invention.

Claims

1. A plural-mode automatic medicament packaging system comprising: an automatic medicament dispensing unit including a plurality of medicament storage and dispensing units, the plurality of medicament storage and dispensing units residing in individual storage locations in the automatic medicament dispensing unit, the medicament storage and dispensing units dispensing medicament from the storage locations; a pouch packaging unit which receives medicaments from the storage and dispensing units and packages the medicaments in pouch packages; a blister package packaging unit which receives medicaments from the storage and dispensing units and packages the medicaments in blister packages, the blister package packaging unit configured to load the medicaments into one or more specific cells of a blister package; a plural-position medicament diverter having first and second mode positions such that, in the first-mode position, individual medicaments dispensed from the storage and dispensing units are conveyed from the storage and dispensing units to the pouch packaging unit and, in the second-mode position, individual medicaments dispensed from the storage and dispensing units are conveyed from the storage and dispensing units to the blister package packaging unit; an inspection unit configured and positioned to inspect medicaments to be dispensed into one of the cells of the blister packages or one of the pouch packages; and a controller operatively associated with the automatic medicament dispensing unit, the pouch packaging unit, the blister package packaging unit, the inspection unit and the diverter.
2. The packaging system of claim 1 wherein the inspection unit includes an imaging device that captures an image of the medicaments.
3. The packaging system of claim 2, wherein the imaging device is positioned to capture an image of the medicaments after dispensing of the medicaments by the medicament storage and dispensing units.
4. The packaging system of claim 3, wherein the diverter includes a medicament conveyor.
5. The packaging system of claim 4 further including at least one medicament carrier moved by the medicament conveyor between a receiving position in which the carrier receives medicaments from the automatic medicament dispensing unit and a delivery position in which the carrier delivers the medicaments to the blister package packaging unit.
6. The packaging system of claim 1 wherein the blister package packaging unit includes a blister package conveyor which conveys a blister package for a specific patient to the blister package packing unit for loading.
7. The packaging system of claim 6 wherein the blister package conveyor transports a blister package holder into which a blister package is nested by the blister package packaging unit.
8. The packaging system of claim 1, wherein the blister package packaging unit includes a sealer unit which seals the blister package after loading.
9. A plural-mode automatic packaging system comprising: an automatic dispensing unit including a plurality of storage and dispensing units, the plurality of storage and dispensing units residing in individual storage locations in the automatic dispensing unit, the storage and dispensing units dispensing items from the storage locations; a first packaging unit which receives items from the storage and dispensing units and packages the items in first packages; a second packaging unit which receives items from the storage and dispensing units and packages the items in second packages, the second packages differing in type from the first packages; a plural-position item diverter having a conveyor, the

diverter having first and second mode positions such that, in the first-mode position, items move from the storage and dispensing units to the first packaging unit and, in the second-mode position, items move from the storage and dispensing units to the conveyor of the diverter and the conveyor delivers the items to the second packaging unit; an inspection unit configured and positioned to inspect medicaments to be dispensed into one of first packages or one of the second packages; and a controller operatively associated with the automatic dispensing unit, the first packaging unit, the second packaging unit and the diverter.

10. The packaging system of claim 9 wherein the inspection unit includes an imaging device that captures an image of the medicaments.

11. The packaging system of claim 10, wherein the imaging device is positioned to capture an image of the medicaments after dispensing of the medicaments by the medicament storage and dispensing units.

12. The packaging system of claim 9 further including at least one carrier moved by the conveyor between a receiving position in which the carrier receives items from the automatic dispensing unit and a delivery position in which the carrier delivers the items to the second packaging unit.

13. The packaging system of claim 9 wherein the second packaging unit includes a second conveyor which conveys a second package to the second packaging unit for loading.

14. The packaging system of claim 13 wherein the second conveyor transports a second package holder into which a second package is nested by the second packaging unit.

15. The packaging system of claim 9 wherein the second packaging unit includes a sealer unit which seals the second package after loading.

16. A plural-mode automatic medicament packaging system comprising: an automatic medicament dispensing unit including a plurality of medicament storage and dispensing units, the plurality of medicament storage and dispensing units residing in individual storage locations in the automatic medicament dispensing unit, the medicament storage and dispensing units dispensing medicament from the storage locations; a pouch packaging unit which receives medicaments from the storage and dispensing units and packages the medicaments in pouch packages; a blister package packaging unit which receives medicaments from the storage and dispensing units and packages the medicaments in blister packages, the blister package packaging unit configured to load the medicaments into one or more specific cells of a blister package; a plural-position medicament diverter having first and second mode positions such that, in the first-mode position, individual medicaments dispensed from the storage and dispensing units are conveyed from the storage and dispensing units to the pouch packaging unit and, in the second-mode position, individual medicaments dispensed from the storage and dispensing units are conveyed from the storage and dispensing units to the blister package packaging unit; a controller operatively associated with the automatic medicament dispensing unit, the pouch packaging unit, the blister package packaging unit, the inspection unit and the diverter; a medicament carrier movable between a receiving position in which the medicament carrier receives medicaments from the automatic medicament dispensing unit and a delivery position in which the medicament carrier delivers the medicaments to the blister package packaging unit; and an inspection unit configured and positioned to inspect medicaments to be dispensed into one of the cells of the blister packages as said medicaments are located in the medicament carrier.

17. The packaging system of claim 16 wherein the inspection unit includes an imaging device that captures an image of the medicaments.

18. The packaging system of claim 16 wherein the blister package packaging unit includes a sealer unit which seals the blister package after loading.

19. The packaging system of claim 17 wherein the imaging device is a video camera.