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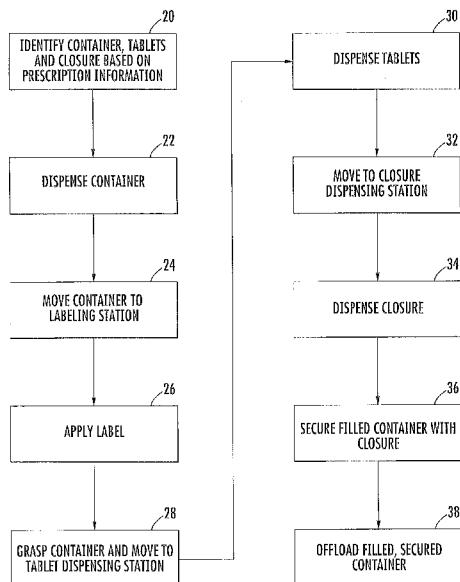


FIG. 1

(57) Abstract: An offloading unit for an automated pharmaceutical machine that dispenses filled, capped pharmaceutical vials includes at least one off-load location; at least one tote to receive the vials at each offload location, the tote assigned for distribution to a remote pharmacy location; at least one sensor to detect the presence or absence of the tote; and at least one sensor to detect a fill level of the vials in the tote.

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**DEVICE FOR OFFLOADING CAPPED VIALS USEFUL IN SYSTEM AND
METHOD FOR DISPENSING PRESCRIPTIONS**

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Related Applications

The present application claims the benefit of and priority from U.S. Provisional Patent Application Nos. 61/692,442, filed August 23, 2012, 61/813,431, filed April 18, 2013, and 61/834,198, filed June 12, 2013, the disclosure of each of which is hereby incorporated herein in its entirety.

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Field of the Invention

The present invention is directed generally to the dispensing of prescriptions of pharmaceuticals, and more specifically is directed to the automated dispensing of pharmaceuticals.

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Background of the Invention

Pharmacy generally began with the compounding of medicines which entailed the actual mixing and preparing of medications. Heretofore, pharmacy has been, to a great extent, a profession of dispensing, that is, the pouring, counting, and labeling of a prescription, and subsequently transferring the dispensed medication to the patient. Because of the repetitiveness of many of the pharmacist's tasks, automation of these tasks has been desirable.

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Some attempts have been made to automate the pharmacy environment. Different exemplary approaches are shown in U.S. Patent Nos. 5,337,919 to Spaulding et al. and U.S.

5 Patent Nos. 6,006,946; 6,036,812 and 6,176,392 to Williams et al. The Williams system conveys
a bin with tablets to a counter and a vial to the counter. The counter dispenses tablets to the vial.
Once the tablets have been dispensed, the system returns the bin to its original location and
conveys the vial to an output device. Tablets may be counted and dispensed with any number of
counting devices. Drawbacks to these systems typically include the relatively low speed at
10 which prescriptions are filled and the absence in these systems of securing a closure (i.e., a lid)
on the container after it is filled.

One additional automated system for dispensing pharmaceuticals is described in some
detail in U.S. Patent No. 6,971,541 to Williams et al. This system has the capacity to select an
appropriate vial, label the vial, fill the vial with a desired quantity of a selected pharmaceutical
15 tablet, apply a cap to the filled vial, and convey the labeled, filled, capped vial to an offloading
station for retrieval.

Although this particular system can provide automated pharmaceutical dispensing,
certain of the operations may be improved. For example, the offload station of the system
comprises a series of stationary holding compartments of conventional configuration. It may be
20 desirable to provide an offload station having a different configuration that can improve speed
and reliability of the system and allow for versatility of prescription filling options for the
pharmacy.

Summary of the Invention

As a first aspect, embodiments of the present invention are directed to an offloading unit
25 for an automated pharmaceutical machine that dispenses filled, capped pharmaceutical vials,
comprising: at least one offload location; at least one tote to receive the vials at each offload
location, the tote assigned for distribution to a remote pharmacy location; at least one sensor to
detect the presence or absence of the tote; and at least one sensor to detect a fill level of the vials
in the tote.

30 As a second aspect, embodiments of the present invention are directed to a
pharmaceutical dispensing system, comprising: a frame; a plurality of cells configured to house
pharmaceutical pills; a processor; memory coupled to the processor; and a computer program
residing in the memory that is executable by the processor for transmitting a message to one or

5 more pre-identified locations about a status or function of the system.

As a third aspect, embodiments of the present invention are directed to a pharmaceutical dispensing system, comprising: a frame; a plurality of cells configured to house pharmaceutical pills; a processor; memory coupled to the processor; at least one offload location; at least one tote to receive the vials at each offload location, the tote assigned for distribution to a remote
10 pharmacy location; at least one sensor to detect the presence or absence of the tote; at least one sensor to detect a fill level of the vials in the tote; and a GUI, wherein the GUI includes a portion specific to filling of the at least one tote.

Brief Description of the Figures

15 **Figure 1** is a flow chart of operations according to embodiments of the present invention.

Figure 2 is a top, front perspective view of a pharmaceutical dispensing system according to embodiments of the present invention.

Figure 3 is a top, rear perspective view of the system of **Figure 2** with the outer panel of the system removed to show the internal components.

20 **Figure 4** is an isometric view of an offload chute unit according to the present invention.

Figure 5 is a side view of the chute unit of **Figure 4**.

Figure 6 is a top view of the chute unit of **Figure 4**.

Figures 7-10 are sequence views of a vial traveling through the chute unit of **Figure 4**, the chute unit being shown in side section view.

25 **Figure 11** is a side section view of the chute unit of **Figure 4** illustrating that the trough thereof can hold two vials at once.

Figure 12 is a top view of the chute unit of **Figure 4** illustrating that the chutes can hold vials of different sizes.

Figure 13 is an enlarged side section view illustrating a reversible closure (RC) vial
30 entering the chute unit of **Figure 4**.

Figure 14 is a Home screen of the system graphical user interface.

Figure 15 is a Tote View screen of the tote offload portion of the system graphical user interface.

5 **Figure 16** is an In-Store screen of the system graphical user interface.

Figure 17 is a schematic diagram of a “hub-and-spoke” configuration for pharmaceutical distribution that incorporates a pharmaceutical dispensing system similar to that of **Figures 1-12** serving as the “hub”.

10 **Figure 18** is a rear perspective view of the system of **Figure 2** showing the addition of chutes and totes for offloading of vials.

Figure 19 is a front perspective view of the system of **Figure 2** showing the addition of a chute and an automatic bagging and printing unit, with a tote for offloading of vials.

Figure 20 is a partial perspective view of the system of **Figure 3** with some subsystems removed to show an exemplary imaging subsystem.

15 **Figure 21** is a flow chart illustrating exemplary operation of the system for filling of prescriptions in a “hub and spoke” arrangement.

Detailed Description of Embodiments of the Invention

20 The present invention will now be described more fully hereinafter, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like
25 numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly
30 used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

5 The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations,
10 elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein the expression "and/or" includes any and all combinations of one or more of the associated listed items.

 In addition, spatially relative terms, such as "under", "below", "lower", "over", "upper"
15 and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "under" or "beneath" other elements or
20 features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

 Well-known functions or constructions may not be described in detail for brevity and/or
25 clarity.

 As described above, the invention relates generally to a system and process for dispensing pharmaceuticals. An exemplary process is described generally with reference to **Figure 1**. The process begins with the identification of the proper container, tablets or capsules and closure to be dispensed based on a patient's prescription information (**Box 20**). A container of the proper size is
30 dispensed at a container dispensing station (**Box 22**), then grasped and moved to a labeling station (**Box 24**). The labeling station applies a label to the container (**Box 26**), after which the container is transferred to a tablet dispensing station (**Box 28**), from which the designated tablets are dispensed in the designated amount into the container (**Box 30**). The filled container is then moved to a

5 closure dispensing station (**Box 32**), where a closure of the proper size has been dispensed (**Box 34**). The filled container is secured with a closure (**Box 36**), then transported to an offload station and offloaded (**Box 38**).

A system that can carry out this process is illustrated in **Figures 2** and **3** and designated broadly therein at **40**. The system **40** includes a support frame **44** for the mounting of its various
10 components. The system **40** generally includes as operative stations a controller (represented herein by a graphics user interface monitor **42**), a container dispensing station **58**, a labeling station **60**, a tablet dispensing station **62**, a closure station **64**, and an offloading station **66**. In the illustrated embodiment, containers, tablets and closures are moved between these stations with a single carrier **68**; however, in some embodiments only a single carrier may be employed, or one or more
15 additional carriers may be employed. The operation of the container dispensing station **58**, the labeling station **60**, the tablet dispensing station **62**, and the closure station **64** are described in, for example, U.S. Patent Application Publication Nos. 2008/0110921 and 2008/0110555; and US Patent Nos. 7,596,932; and 7,344,049, the disclosures of each of which are hereby incorporated herein in its entirety. Additional components and features of the system are described in U.S. Patent
20 Application Publication Nos. 2008/0283179 and 2009/0179041, and U.S. Patent. No. 8,113,492, U.S. Patent. No. 8,224,482, and U.S. Patent. No. 8,244,398, the disclosures of each of which are hereby incorporated herein in its entirety.

During the prescription filling process, a pharmacist typically must view the contents of the vial to verify that the prescription has been filled correctly. When the vial is filled in an
25 automated system that includes a closure station **64**, such as the system **40**, the pharmacist must remove the cap on the vial to perform this verification. In some embodiments of the invention, the system **40** may include a camera **72** positioned such that it may capture an image of the contents of the vial prior to the vial being moved to the closure station **64** for capping. As shown in **Figure 20**, the camera **72** may be located, for example, above an exception assembly **70** (for
30 offloading of vials that encounter a problem in the filling process), but may be located in any other location where it will not interfere with other operations of the system **40**. Once the pills have been dispensed into the vial, the carrier **68** may move the filled vial to a position, on a shelf **74**, for example, near the camera **72** so that an image of the contents of the vial may be captured

5 prior to capping the vial. In the illustrated embodiment, the camera 72 is situated so as to view and capture an image from the top of the vial. In some embodiments, the camera 72 and associated lighting system may be situated so as to capture the image of the pills through the vial, in which case the imaging step may occur before or after the capping step. Exemplary apparatus and methods for imaging the prescription through the vial can be found in U.S. Patent No. 10 7,889,330; U.S. Patent No. 8,284,305; U.S. Patent No. 8,345,989; and U.S. Patent No. 8,477,989, the disclosures of which are hereby incorporated by reference herein in their entirety. Images may be stored in the system 40 or at another location accessible to the system 40. The pharmacist may verify that the vial contains the correct drug by viewing the image of the contents of the vial. The pharmacist may view the image of the vial contents at a location that is 15 proximate to the system 40 or in a remote location. Alternatively, automated image analysis may be employed to automatically verify the identity of the dispensed pharmaceutical and determine whether it matches the prescription that was requested. An exemplary image analysis system is described in U.S. Patent No. 6,535,637, the disclosure of which is hereby incorporated by reference herein in its entirety. The system 40 may then report whether each prescription has 20 passed the verification step; any vial that cannot be automatically verified may be flagged for manual verification by the pharmacist or for verification by some other process.

In another embodiment, a scale or other implementation of a weight sensor may be used in an additional verification process for the filling of the prescription. Exemplary systems employing a weight sensor to weigh the contents of a medication container are described in U.S. 25 Patent Nos. 8,108,068 and 5,337,919, the disclosure of each of which is hereby incorporated by reference herein in its entirety. The scale may be otherwise incorporated into the system 40, including a stand-alone scale 78 (**Figure 3**) on which the filled vial is deposited so that the weight may be determined. The scale 78 may be positioned in a location that is level and not subject to a significant amount of vibratory interference from other parts of the system 40. The 30 scale 78 may be located on the shelf 74 (**Figure 20**) upon which vials are placed for imaging; in this position, weighing and image capture can occur simultaneously, if desirable to do so. By comparing the total weight of the prescription vial and its contents with the expected weight of the filled prescription, the controller may provide another indication as to whether the

5 prescription has been filled correctly. If the total weight of the vial and its contents does not
match the expected weight of the filled prescription, the controller may direct steps to remedy the
situation. For example, the controller may direct the carrier **68** to return the vial to the
appropriate location in the tablet dispensing station **62** so that missing pills can be added, if the
controller determines that the vial may be missing one or more pills because the weight of the
10 vial and its contents is lower than expected. The controller may flag the vial with an error
message indicating that the actual weight does not match the expected weight, so that pharmacy
staff can investigate to determine if any errors had occurred in the filling process.

Turning now to **Figure 3**, the offload station **66** includes a number of chute units **100**, each
of which, in the illustrated embodiment, includes two chutes **102**, **104**, although those skilled in this
15 art will appreciate that a chute unit may include only a single chute or may include more than two
chutes. Also, the offload station **66** may include only a single chute unit or any appropriate number
of chute units.

The chutes **102**, **104** are substantially identical mirror images of each other about a vertical
plane **P** (*see Figure 4*). As such, only the chute **102** will be described in detail herein, with the
20 understanding that the description is equally applicable to the chute **104**. For the purpose of this
discussion, the terms "front," "forward" and derivatives thereof refer to the direction that a
pharmaceutical vial travels in the chute **102**, *i.e.*, from right to left from the vantage point of **Figure**
4. The terms "rear", "back" and derivatives thereof refer to the direction that is opposite of the
"forward" direction, *i.e.*, from left to right from the vantage point of **Figure 4**. One may also think
25 of the forward direction as extending "downstream" in the chutes **102**, **104** and the rearward
direction as extending "upstream" in the chutes **102**, **104**.

Referring again to **Figure 4** and also to **Figures 5** and **6**, the chute **102** has a rear lip **106** that
resides above the frame **44**. The lip **106** includes a shallow arc such that it is slightly concave. The
lip **106** merges smoothly at its front end with a concave ramp **110**. Side walls **108**, **109** rise from
30 the lateral edges of the ramp **110**, with the forward ends of the side walls **108**, **109** being higher than
the rearward ends. The effect of the configuration provided by the lip **106**, the ramp **110** and the
side walls **108**, **109** is that of a half-bowl that drains downwardly into the remainder of the chute
102. The lower portion of the ramp **110** rests on the frame **44**.

5 Still referring to **Figures 4-6**, a trough **112** having an arcuate profile extends forwardly and downwardly from the front end of the ramp **110**. The trough **112** includes a concave floor **113** that is bounded at its lateral edges by dividers **116, 117**. A rear wall **114** rises above the rear end of the trough **112**; the bottom portion **114a** of the rear wall **114** angles rearwardly and has an arcuate lower edge **114b** that, in combination with the rear end of the floor **113**, forms an inlet **115** (see **Figure**
10 **7**). At their rearward ends, the dividers **116, 117** are similar in height to the rear wall **114**. Each of the dividers **116, 117** has a leading edge **118** that slopes sharply downward in a central portion of the divider **116, 117**, such that the forward portion of the divider **116, 117** is relatively low. A front wall **120** spans the front ends of the troughs **112** and provides a landing area for vials. The front wall **120** may have a foam or other shock absorbent material attached thereto to reduce any rebound
15 effect of the vial dropping down the chute **102** and striking the front wall **120**.

The chute unit **100** is attached to the frame **44** via four latches **122**. The latches **122** are inserted into mating apertures (not shown) in the frame **44**. In the illustrated embodiment, the chute unit **100** is mounted so that the troughs **112** slope downwardly from back to front; for example, the chute unit **100** may be mounted such that the trough **112** is angled relative to a horizontal plane at an
20 angle of between about 20 and 35 degrees.

In the illustrated embodiment, the chute unit **100** is formed as a unitary member, although those skilled in this art will appreciate that the chute unit may be formed with multiple components. The chute unit **100** may be formed of any material recognized as being suitable for the conveying of objects such as pharmaceutical vials; exemplary materials include polymeric materials such as
25 polycarbonate, ABS and copolymers and blends thereof.

Referring now to **Figures 7-10**, in operation, after a vial **V** has been dispensed, labeled, filled and capped, it is transported by the carrier to the offload station **66**. The carrier **70** deposits the vial **V** "right-side up" into the half-bowl formed by the lip **106**, the side walls **108, 109**, and the ramp **110** (see **Figure 7**); the angled bottom portion **114a** of the rear wall **114** can also assist in
30 funneling the vial **V** into position. In some embodiments, the dimensions of the lip **106**, ramp **110**, side walls **108, 109** and bottom portion **114a** of the rear wall **114** are selected to ensure that a "right side up" vial **V** presented by the carrier **70** exits the "half-bowl" with the lower (*i.e.*, non-capped) end leading the upper, capped end, irrespective of which of multiple common vial sizes is presented

5 (see **Figure 8**). Typically, the length of a capped vial **V** is between about 2 and 4 inches, and the diameter is between about 1.25 and 2.0 inches. In some embodiments, the distance between the side walls **108, 109** is between about 2.5 and 2.75 inches, the ramp **110** has a depth of about 1.5 to 2.0 inches, the distance from the rear edge of the ramp **110** to the rear edge of the bottom portion **114a** of the rear wall **114** is between about 3.25 and 3.5 inches, and the ramp **110** generally forms an
10 angle of between about 20 and 30 degrees relative to an underlying horizontal surface.

Also, the smoothly merging side walls **108, 109**, lip **106** and ramp **110** are configured such that vials do not snag or hang thereon. In particular, vials known as "RC" vials (available from Owens-Corning, Owens, Illinois), have a finger on the edge thereof that might be susceptible to being caught on an unsmooth surface (see **Figure 13**).

15 Once the vial **V** enters the half-bowl formed by the ramp **110**, the side walls **108, 109** and the lip **106**, the vial **V**, oriented "non-capped end down", slides through the inlet **115** (see **Figure 9**) and down the trough **112** to the front wall **116** (see **Figure 10**), where it rests until pharmacy personnel remove it. In some embodiments, it may be desirable for at least two vials **V1, V2** to be stored at once in the trough in a stacked arrangement (see **Figure 11**). As such, the trough **112** may
20 have a length of between about 9 and 10 inches, which enables two vials 4 inches in length to be stored and accessible for pharmacy personnel. Also, vials of different sizes can be stored in chutes **102, 104** (see **Figure 12**).

Also, the dividers **116, 117** may be configured such that the chute unit **100** satisfies the provisions of UL 61010A-1, 1740 (the requirements of which are hereby incorporated herein by
25 reference), which requires that an object 2.95 in diameter be prevented from entering the inlet **115** (this test is intended to simulate a human hand entering the inlet **115** from outside of the system). In some embodiments, the leading edges **118** of the dividers **116, 117** are positioned between about 5 and 7 inches from the inlet **115** and are between about 2.5 and 2.75 inches apart.

In another embodiment, instead of being deposited into the chutes of the offload station **66**,
30 the carrier **68** may deliver a filled and capped vial to another location where a tote **61** (**Figure 18**), for example, with the capacity to hold many vials simultaneously, is positioned. Such a location may alternatively consist of a box, bin, or other container of appropriate capacity. The tote's contents may be designated for delivery to a pharmacy location different from that where the system

5 40 is located. Multiple totes 61 may be used with the system 40 simultaneously; in some
embodiments each tote 61 may be allocated to a different pharmacy such that the system 40 is
filling prescriptions for multiple pharmacies in a “hub and spoke” type of an arrangement, such as
that shown in **Figure 17**. The hub-and-spoke arrangement 300 includes a pharmacy where a system
40 is located as the “hub” 302 and a number of remote pharmacies 304. Prescription orders from
10 the remote pharmacies 304 are received by the hub 302, filled, and subsequently delivered to the
remote pharmacies 304 with the communication and delivery paths between the hub 302 and remote
pharmacies 304 considered the “spokes” 306. As prescriptions are processed through the system
40, the controller 42 may, based on the ultimate disposition of each prescription, designate the
proper location for offload of each vial from the system 40. Totes 61 may be located in any area of
15 the system 40 that is amenable to such placement. An exemplary location for a tote 61 is the shelf
area 65 shown at the end of the system 40 in **Figures 2** and **3**. This may be a desirable location for
a tote 61 due to, among other reasons, its proximity to the closure station 64; as closures are applied
to filled vials, the carrier 68 would have a shorter distance to travel to drop off the vial. The tote 61
may rest on a shelf, which may be attached to the system 40 or free standing, or the tote 61 may be
20 directly attached to the system 40; the attachment mechanism may be reversible so that the entire
tote 61 can be removed for further processing and/or delivery of the contents of the tote 61.
Additionally, multiple shelves or attachment locations for tote 61 could be installed to support
multiple totes 61 (**Figure 18**); this may be desirable to accommodate a large number of
prescriptions to be filled for a given pharmacy location and/or to accommodate prescriptions for
25 more than one remote pharmacy location 304, as discussed above.

Modifications to the system 40 may be made to facilitate this drop-off process such as the
installation of a chute 63 (**Figure 18**) or ramp to guide the movement of the vials into the tote 61
(**Figure 18**). In one embodiment, the chute(s) 63 may be illuminated. In another embodiment, the
illumination of the chute(s) 63 may be accomplished using different colored and/or blinking lights,
30 which may be used to indicate the status of the location. An example of one such arrangement is as
follows:

Chute light color/state	Indication	Description/Example
OFF	System is idle	System off or no tote in place at chute

		location
GREEN	Tote is OK	Tote is in place at that chute location and ready to receive vials
YELLOW	Caution, vial in process	The system is currently processing a vial that is destined for that chute/tote
FLASHING YELLOW	Attention needed	Exemplary reasons: Tote is full; barcode not readable
FLASHING RED	Fault/error/needs immediate attention	Exemplary reasons: Tote is removed while vial in process for that chute; tote overfilled; chute jammed

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In one embodiment, the system **40** includes one or more sensors to detect the presence or absence of a tote **61** in each location. In another embodiment, the system **40** includes one or more sensors to detect the level of the contents of each tote **61**. In still another embodiment, the tote(s) **61** may be designated to hold filled prescriptions that are intended for pick up by patients at a later time (a different day, for example) at the local pharmacy **302** and may be handled differently in the pharmacy's workflow than other prescriptions requiring earlier distribution to patients, which may be dispensed through the offload station **66**. The totes **61** and their contents can be designated for any purpose that may make it desirable to segregate a group of filled prescriptions and, thereby, facilitate the workflow of the pharmacy.

In another embodiment, exemplified in **Figure 19**, the system **40'** may include an automatic bagger **67** to bag the prescription vials once the system **40'** has completed the filling process. The bagger **67** may be positioned to facilitate receiving the filled prescription vial, such as from a chute **76**, directly from the system **40'** so that the vial may be placed in a bag prior to placement in the tote **61**. One or more filled prescription vials may be placed in a bag; a prescription order for a patient may include more than one vial of medication filled in the system **40'** or may include items that must be retrieved from outside the system **40'**, such as unit of use medications, tubes of ointment, slave, etc., oral contraceptives, prescription medications that must be retrieved from stock bottles, over the counter items, etc. The bag also may have one or more labels **69** with identifying information adhered to it; some nonlimiting examples of identifying information are patient name, patient address, patient phone number, prescription number, drug name, drug dosage, NDC number, drug image, drug description, remote pharmacy name, remote pharmacy identification number,

5 remote pharmacy address, remote pharmacy phone number, etc. The identifying information may be alpha-numeric and/or encoded (e.g., barcode, RFID, etc.). The identifying information may be printed on the labels **69** or directly on the bag by a printer that is associated with or integral to the bagger **67**, as shown in **Figure 19**. Alternatively, labels **69** may be printed by a separate printing unit and fed into the bagger **67** for application to the bags or may be otherwise applied to the bags.

10 Exemplary bagging and label printing/applying systems may be obtained from Mark-Pack, Inc. of Coopersville, MI (www.markpackinc.com). One of skill in the art will recognize that the bagger **67** could be a table-top unit. Additionally, the bagger **67** may receive vials directly from the pharmaceutical dispensing system **40'**, as shown, or may be manually fed using vials that are filled and separately offloaded from the pharmaceutical dispensing system **40'**. Items that may be

15 retrieved from outside the system **40'**, as discussed above, may be manually fed into the bagger so that they can be included in a grouped order for a customer or, if the design of the system **40'** allows, may be dispensed from inside the system **40'** as well. Paper documentation also may be included in the bags, such as drug information forms or insurance paperwork, which may be printed at a separate printer or there may be a printer and automatic folding machine included as part of the

20 bagging system and the papers may be automatically added to the bags. Papers may be inserted in the bags before they are closed or may be stapled to or otherwise attached to the outside of the bag. Bags that are released from the bagger **67** may be loaded into a container, such as a tote **61**; the container may be used as an interim collection container, may be designated for a particular storage location in the hub pharmacy **302**, or may hold bags which are designated for an off-site location,

25 such as a remote pharmacy **304**.

In a particular embodiment, the system graphical user interface (GUI) includes a portion specific to the filling of totes **61** to facilitate user interaction with and monitoring of the system **40** during tote **61** filling. Details of an exemplary GUI are set forth in U.S. Patent Application Publication No. 2009/0287350, the disclosure of which is hereby incorporated by reference herein

30 in its entirety. Referring now to **Figure 14**, in some embodiments the Home screen **200** the GUI may include an In Store Summary portion **202**, where a high level status of prescriptions entered into the system **40** for fulfillment is shown. The Home screen **200** may include a Priority button **204** which allows the user to select whether the prescriptions for the local pharmacy **302** or the

5 prescriptions entered for one or more remote pharmacies **304** are given priority in the filling process. A View button **206** allows the user to switch between the view of the GUI for tote **61** filling and a view of the GUI for the local system **40**, which includes the offload station **66**, if desired. The GUI may include an Attached Totes display **208** showing information pertaining to those totes **61** currently associated with the system **40** for filling. The GUI may include a Removed
10 Totes display **210**, showing information pertaining to totes **61** currently not associated with the system **40**. Each of the Attached Totes **208** and Removed Totes **210** displays may communicate information about the status of the totes **61** such as the number of prescriptions in the tote **212**, the designation of the store assigned to the tote **214**, and the number of prescriptions directed to that tote **216**. In one embodiment, the graphic for each tote **61** includes a dynamic fill line **218** that moves
15 higher on the representation of the tote **61** as vials are added to that tote **61** and serves as a graphic indicator of the fill status of that tote **61**. The dynamic fill level for each tote **61** may also include a color indicator. For example, the fill line for: a tote **61** that is full may be colored in red; a tote **61** that is near full (over a threshold level but not full) may be colored in yellow; and a tote **61** that under a threshold level may be colored in green.

20 Turning now to **Figure 15**, the GUI may include a Tote View screen **220** that displays information specific to that tote **61** and, therefore, a particular remote pharmacy **304**. The Tote View screen **220** displays the designation of the store assigned to the tote **214**. Such designation can be indicated in any of various ways such as by number, name, color, logo or any other unique identifier, which also can be present on the tote **61**, in the form of alphanumeric text, RFID label,
25 barcode, logo, graphics, etc. The Tote View **220** screen also comprises status tabs **222** (Pending, Incomplete, Ready and Complete, for example) which include an indication of the number of prescriptions identified by that status. The user may select a status tab to view a list of prescriptions associated with this status and the details of each prescription.

The Tote View screen **220** may also include various buttons for different functions or
30 preferences related to the selected tote **61**. Some of these functions may include editing the settings associated with the tote (button **224**), such as the store name, printing a barcode for the tote (button **225**), or deleting a tote from the application (button **226**). It may be desirable to fill the prescriptions for a given tote **61** regardless of the status of the tote **61** (i.e., even if the sensors

5 indicate that the tote **61** is full or absent); the Force Filling button **227** can be selected to perform this function. When all of the prescriptions for a given tote **61** have been filled (i.e., are in the “Ready” queue), the user can select the Pick Up All Scripts button **228** which will move all of the prescriptions for that tote **61** into Complete status in the system **40** (under local filling conditions, the bar code for each prescription would have to be scanned individually to move that prescription
10 to Complete status in the system **40**). The Tote View screen **220** may also include a Priority button **229**; in this case the selection of priority will assign preference in the filling process to the prescriptions for the particular tote **61**.

All of the locations for offload of filled prescription vials may be visualized in the In-Store GUI screen **230**, as exemplified in **Figure 16**. The offload station **66** is represented graphically at
15 **232** and **234**. The locations labeled “B”, “C”, “D”, “E”, ..., “T” **236** represent the individual locations of the graphical representation **232** of the offload station **66**. The locations of the other portion of the offload station **66** can be displayed by scrolling through the other locations of section **232** and **234**. The totes **61** are represented by the Side Tote locations **238**.

In some embodiments, it may be desirable to allow the system **40** to operate unattended. In
20 this way the system **40** still may be productive when the pharmacy is closed or otherwise slow, to maximize the volume of prescriptions filled by the system **40** and/or for strategic use of system **40** time. For example, when the pharmacy is closed or during slow periods when the pharmacy is open, the system **40** can fill prescriptions for later retrieval by the pharmacy’s own customers (i.e., refills, non-urgent prescriptions that customer indicates will be picked up at later time). In another
25 embodiment, the system **40** may operate to fill prescriptions for other pharmacy locations during these slower/overnight/closed operational periods; these prescriptions would then be delivered to the appropriate location once the orders are complete (hub and spoke arrangement).

In another embodiment, the imaging feature (discussed above) may be included in the system **40** during unattended operation. With the images available for all prescriptions filled during
30 unattended operation, the images for prescriptions contained in each tote **61** can be viewed by the pharmacist prior to releasing the tote **61** for delivery to the remote pharmacy **304**. In some embodiments, the images for all prescriptions contained in a tote **61** may be viewed by a remote pharmacist so that the remote pharmacist can provide verification that each prescription has been

5 filled correctly prior to release of the tote **61** and delivery to the appropriate pharmacy. In some
embodiments, the remote pharmacist may review the images for prescriptions filled by the system
40 to be delivered to customers at the hub pharmacy **302**; once the pharmacist has verified that the
prescription has been filled correctly, it may be released for delivery to the customer. For clarity, a
“remote pharmacist” may be located anywhere other than with the system **40** at the hub pharmacy
10 **302** and may or may not be located at one of the remote pharmacies **304**. One of skill in the art will
recognize that the functions described herein as being performed by a remote pharmacist may
alternatively be performed by a pharmacist located proximate to the system **40** (i.e., at the hub
pharmacy **302**). The system **40** may be configured to provide messages via text message, instant
message, email, voice message, or any other form of message; these messages would be delivered to
15 pre-designated phone number(s) or email address(es) upon certain situations that may arise,
particularly during unattended operation of the system **40**. Such messages may include indications
of the following:

- System error (i.e., mechanical malfunction, system inoperable, insufficient
vial/label/cap/drug/bag inventory to complete a prescription fill, etc.)
- 20 • Power failure
- Full tote(s)
- Service needed
- Low inventory in system (i.e., drugs, vials, caps, labels, bags)
- Problems with prescription filling process (i.e., capping error, labeling error, bagging
25 error, etc.)
- Prescription orders complete for delivery to specific remote location

Messages may include specific instructions related to the message, as may be programmed into the
system **40**. For example, a message indicating that the prescription orders are complete for a
specific remote location **304** may include instructions to schedule the delivery of the tote(s) **61** to
30 the appropriate remote location **304**; this message may be sent directly to the delivery organization
as notification that the prescriptions are ready for pick-up and delivery to the remote location **304**.
A message indicating that one or more totes **61** is/are full may include instructions to remove the
tote(s) **61** and replace it/them with an empty tote **61**, possibly of a specific type (i.e., a specific size

5 and/or belonging to specific remote location). A message indicating low inventory in the system **40**
may include information regarding which locations of the tablet dispensing station **62** need to be
refilled and with which drug, or that the vials or caps (of a specific size) need to be refilled, etc.
Messages indicating that the system **40** is inoperable or that service is needed may be sent directly
to a repair person with a request for service on the system **40** and may contain specific information
10 on the type of service required.

An exemplary process for filling prescriptions in a hub and spoke pharmacy arrangement, as
discussed above, is illustrated in **Figure 21**. As shown in **Figure 21**, a patient's prescription is
entered into the pharmacy management system of a remote pharmacy **304** and scheduled to be
picked up at the same location (**Block 400**). For a prescription to be entered in the system, the
15 patient may drop off a paper prescription at the remote pharmacy **304**, may request a refill (over the
phone or in person), or may place an order electronically. Additionally, the prescription may be
entered at the remote pharmacy **304** by a phone call or electronic order from the ordering physician
or by transfer from another pharmacy. Once the details of the prescription order are entered, the
system queries whether the prescription order meets criteria for filling of the prescription at the hub
20 pharmacy **302** (**Block 402**). The criteria that are evaluated may include considerations such as
pharmaceutical inventory at the hub pharmacy **302**, urgency of the prescription, scheduled pick-up
date/time, etc. If the criteria for fulfillment at the hub pharmacy **302** are not met, the prescription is
filled at the remote pharmacy **304** (**Block 404**). If the criteria for fulfillment at the hub pharmacy
302 are met, the prescription information is sent to the hub pharmacy **302** (**Block 406**). The
25 prescription may be received by a component of the hub pharmacy's pharmacy management
system, a separate server, or the system **40** itself. The prescription enters the queue of the system **40**
(**Block 408**), its location in the queue determined by criteria at the hub pharmacy **302**; these criteria
may include filling priority, the availability of the appropriate drop-off location (tote **61**), system **40**
inventory, delivery schedule for the tote **61**, etc. The prescription is filled (**Box 410**) by the steps
30 illustrated in **Figure 1**. The offloading of the filled, secured container (**Box 38** of **Figure 1**) is
accomplished by delivery of the prescription to the appropriate tote **61** for the remote pharmacy
304. The system **40** also may include a camera **72** to capture an image of the vial contents or a scale
to obtain the weight of the vial and its contents, respectively, as discussed above. The next step in

5 the process is verification by a pharmacist that the prescription has been filled as ordered (PV2)
(**Block 412**). The PV2 step may be completed by a pharmacist at the hub pharmacy **302**; this
process can be facilitated by the pharmacist's review of the images of each prescription so that the
pharmacist does not have to open each vial (this approach is a particular advantage if the
prescriptions are bagged prior to release into the tote **61**). Alternatively, automated image analysis
10 of the captured images may be performed for the PV2 step, which also is advantageous when the
vials are bagged prior to release into the tote **61**. PV2 may be performed by a pharmacist at a
remote location, whether it be that of the remote pharmacy **304** from which the prescription was
received or another pharmacy different from the hub pharmacy **302**; the images of the filled
prescriptions and the prescription information may be sent electronically to another location where a
15 pharmacist can view the available information and perform the verification of the filled prescription.
An indication of the prescription's verification status, such as verified or rejected, may be indicated
on the label or bag. When all prescriptions for a given remote pharmacy location **304** have been
filled, the tote **61** is prepared and sent to the remote pharmacy **304** (**Block 414**). Preparation of the
tote **61** may include the preparation of a manifest or other documentation, which may include order
20 identification numbers, item numbers, quantity, barcodes, etc., in addition to delivery information or
other information; information about the tote **61**, its destination, contents, etc. may be in
alphanumeric text, or may take the form of a unique code, which may be a bar code, RFID label, or
other code. The manifest or other documentation may be printed by choosing a button on the GUI
(not shown). Preparation of the tote **61** also may include bagging of the filled prescriptions, if they
25 have not already been bagged prior to release into the tote **61**, as discussed above, or packaging into
a secondary type of package. Alternatively, the prescriptions may be placed in bags at the remote
pharmacy **304**, prior to distribution to the patient or patient representative picking up the
prescription from the remote pharmacy **304**. When the tote **61** is received by the remote pharmacy
304 (**Block 416**), the prescriptions are distributed to the patient or their representative when they
30 arrive for pick-up (**Block 418**). The filled prescriptions may be temporarily stored in a will call
device or will call area of the remote pharmacy **304** to await pick up.

The foregoing is illustrative of the present invention and is not to be construed as limiting
thereof. Although exemplary embodiments of this invention have been described, those skilled in

5 the art will readily appreciate that many modifications are possible in the exemplary
embodiments without materially departing from the novel teachings and advantages of this
invention. For example, many types of error messages, specific message content, instructions and
message delivery destinations are possible and evident to one of skill in the art with the teachings
of this invention. As another example, the types of GUI screens, information displayed and
10 functional buttons may be tailored to facilitate the workflow of the pharmacy and the particular
assignment of totes (i.e., whether for delivery to a remote pharmacy, for in-store patient pick-up,
or other destination or categorization). Additionally, a variety of different light locations as well
as different color and pattern combinations can be implemented to provide information regarding
the status of the system and specific totes or chutes. While prescriptions may be entered at a
15 remote pharmacy and scheduled to be picked up at the same pharmacy, the prescription can be
scheduled to be picked up at any pharmacy, without changing the teachings and advantages of
this invention. Prescriptions may be verified (PV2) manually by a pharmacist at either the hub
pharmacy or when they are received at the remote pharmacy, prior to delivery to the patient.
Accordingly, all such modifications are intended to be included within the scope of this
20 invention as defined in the claims. The invention is defined by the following claims, with
equivalents of the claims to be included therein.

5

That Which is Claimed is:

1. An offloading unit for an automated pharmaceutical machine that dispenses filled, capped pharmaceutical vials, comprising:
 - at least one offload location;
 - at least one tote to receive the vials at each offload location, the tote assigned for
 - 10 distribution to a remote pharmacy location;
 - at least one detection sensor to detect the presence or absence of the tote; and
 - at least one fill sensor to detect a fill level of the vials in the tote.
2. The offloading unit of Claim 1, wherein a chute guides the vials into the tote.
- 15 3. The offloading unit of Claim 2 wherein the chute is illuminated with at least one light.
4. The offloading unit of Claim 3 wherein the at least one light communicates the
- 20 status of the offload location.
5. The offloading unit of Claim 4 wherein the status of the offload location is communicated by at least one of a color or an illumination pattern of the at least one light.
- 25 6. The offloading unit of Claim 1 wherein the at least one tote comprises a unique code.
7. The offloading unit of Claim 6 wherein the unique code indicates at least one of:
- 30 information about the vials loaded in the tote and information about the remote pharmacy location.
8. A pharmaceutical dispensing system, comprising:
 - a frame;

5 a plurality of cells configured to house pharmaceutical pills;
a processor;
memory coupled to the processor; and
a computer program residing in the memory that is executable by the processor
for transmitting a message to one or more pre-identified recipients about a status or function of
10 the system.

9. The pharmaceutical dispensing system of Claim 8 wherein the message is delivered by at least one of text message, email message, instant message, or voice message.

15 10. The pharmaceutical dispensing system of Claim 8 wherein the message comprises information about at least one of: a system error; a power failure; a fill level of a tote; an inventory level; a prescription order status; a service requirement of the system; a problem encountered by the system while filling orders; instructions for responding to the message; and a service request.

20 11. The pharmaceutical dispensing system of Claim 8 further comprising a camera for capturing images of filled prescriptions.

25 12. The pharmaceutical dispensing system of Claim 8 further comprising a bagger for automatically bagging the filled prescriptions.

13. The pharmaceutical dispensing system of Claim 11 further comprising a computer program residing in the memory that is executable by the processor for automatically analyzing the images captured by the camera.

30 14. The pharmaceutical dispensing system of Claim 8 further comprising a weight sensor for determining a weight of a filled vial.

15. A pharmaceutical dispensing system, comprising:

5 a frame;
a plurality of cells configured to house pharmaceutical pills;
a processor;
memory coupled to the processor;
at least one offload location;
10 at least one tote to receive the vials at each offload location, the tote assigned for
distribution to a remote pharmacy location;
at least one detection sensor to detect the presence or absence of the tote;
at least one fill sensor to detect a fill level of the vials in the tote; and
a GUI, wherein the GUI includes a portion specific to filling of the at least one tote.

15

16. The pharmaceutical dispensing system of Claim 15 wherein the GUI
communicates information about a status of the totes.

20

17. The pharmaceutical dispensing system of Claim 16 wherein the status is at least
one of: the association of the tote with the system, a number of prescriptions in the tote, a
designation of the pharmacy location assigned to the tote, a number of prescriptions directed to the
tote, and a fill level of the tote.

25

18. The pharmaceutical dispensing system of Claim 17 wherein the fill level of the tote
is indicated by at least one of a dynamic fill line or a color.

19. The pharmaceutical dispensing system of Claim 15 further comprising a camera for
capturing images of filled prescriptions.

30

20. The pharmaceutical dispensing system of Claim 15 further comprising a bagger
for automatically inserting the filled prescriptions into bags.

21. The pharmaceutical dispensing system of Claim 19 further comprising a computer

5 program residing in the memory that is executable by the processor for automatically analyzing
the images captured by the camera.

22. The pharmaceutical dispensing system of Claim 20 wherein the bagger further
comprises a printer for printing identifying information on a label or on a bag.

10 23. The pharmaceutical dispensing system of Claim 20 wherein documentation is
added to one or more of the bags.

15 24. The pharmaceutical dispensing system of Claim 15 wherein in the portion of the
GUI specific to filling of the at least one tote allows a user to create a manifest for the at least
one tote.

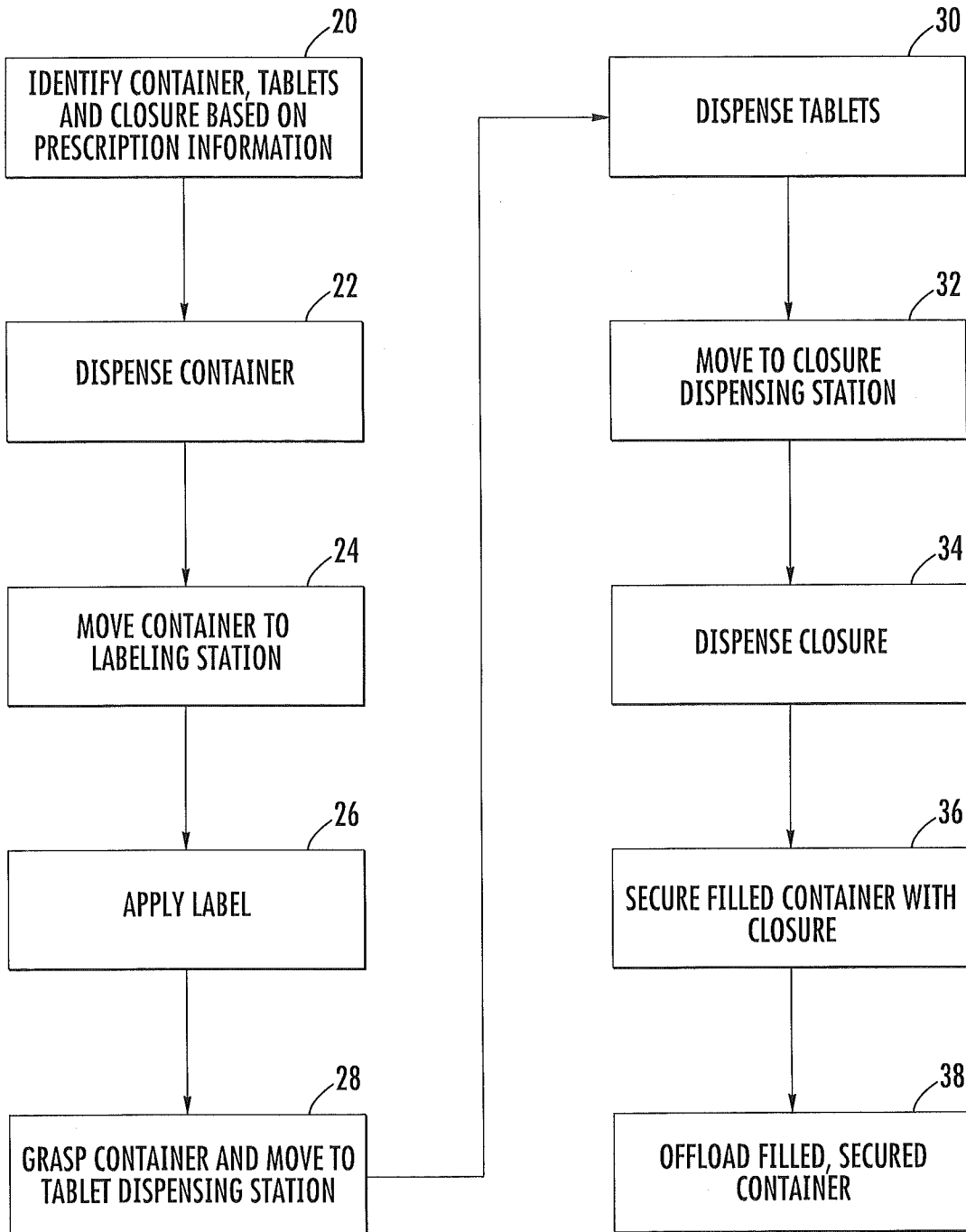


FIG. 1

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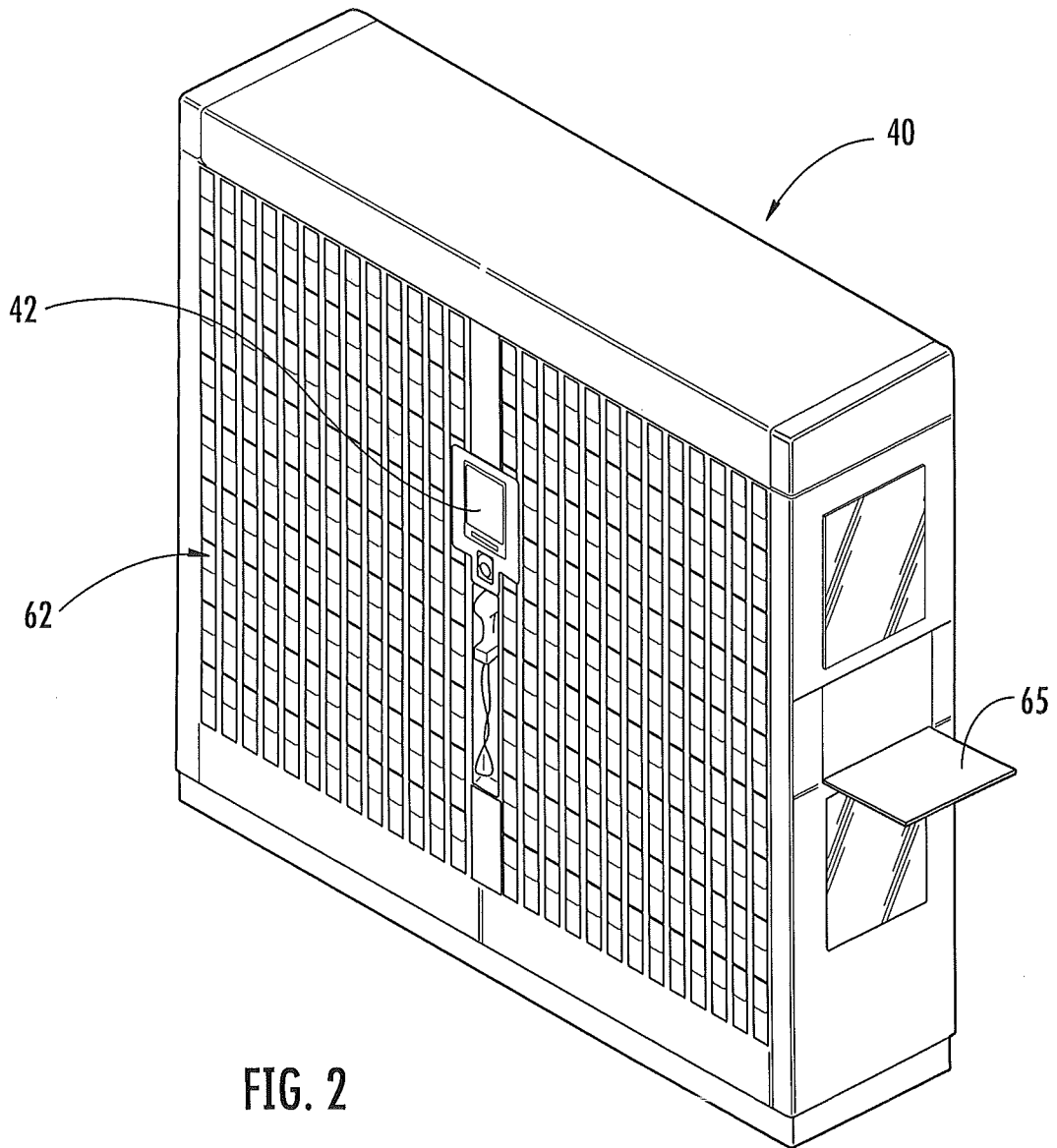


FIG. 2

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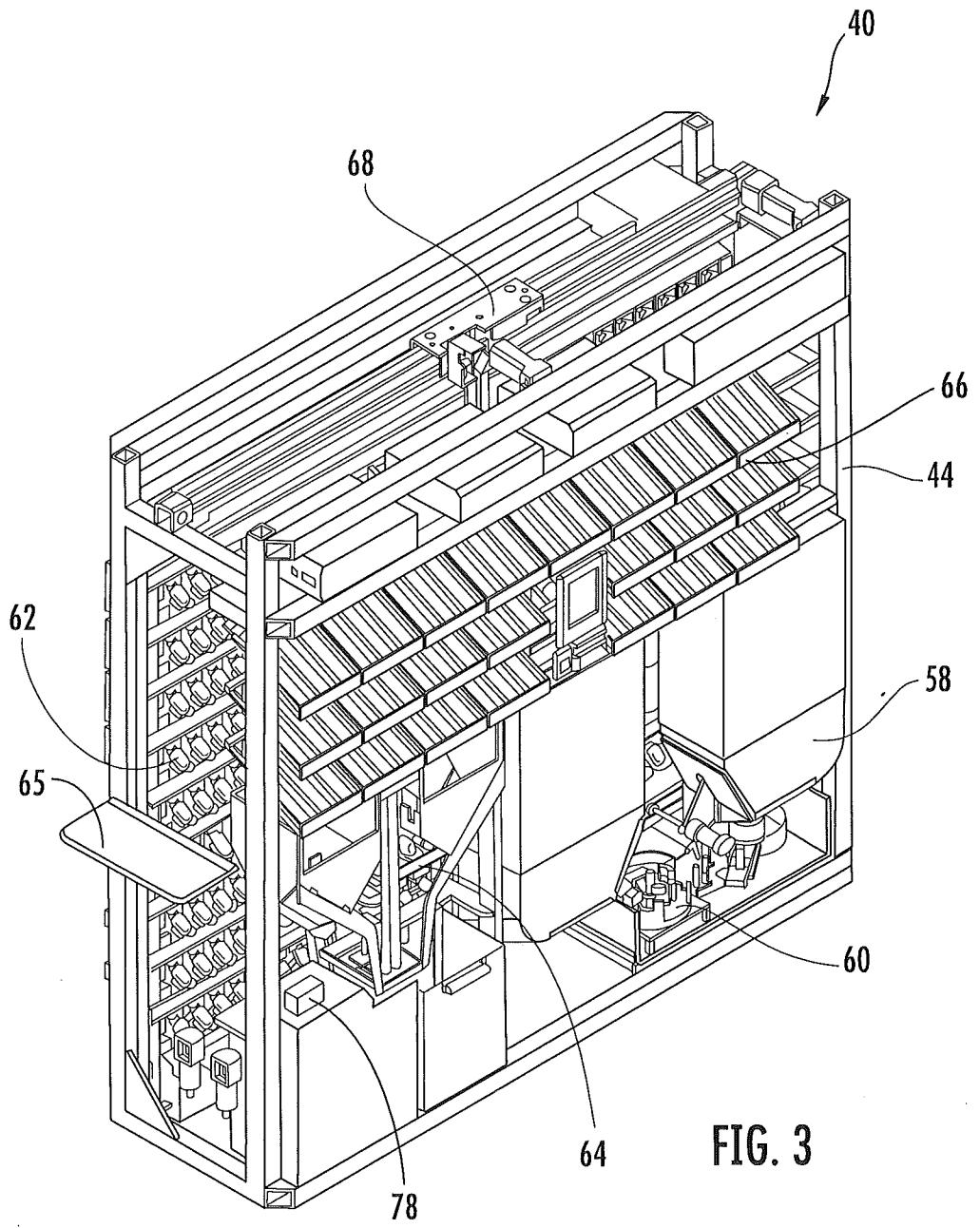
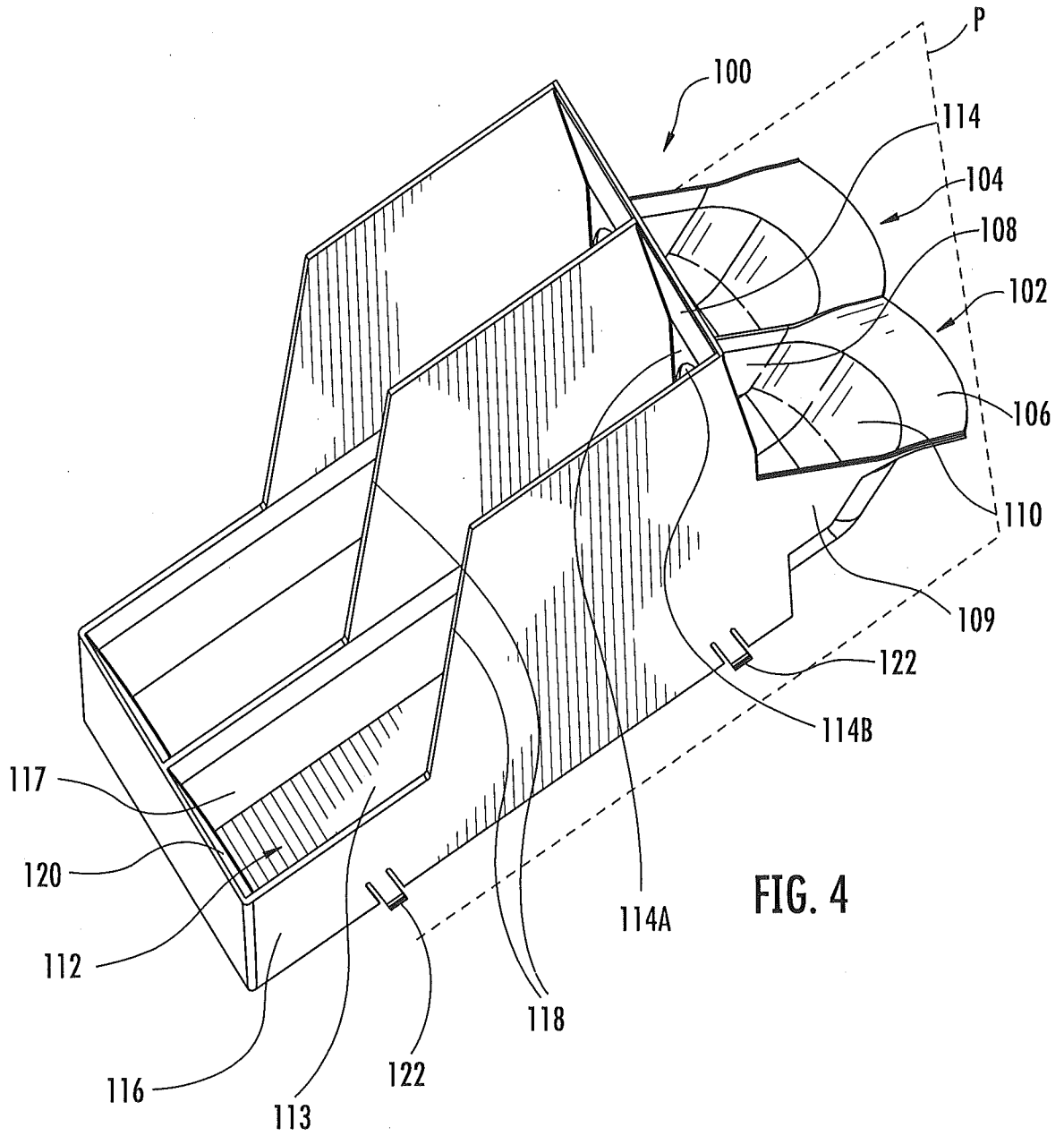


FIG. 3



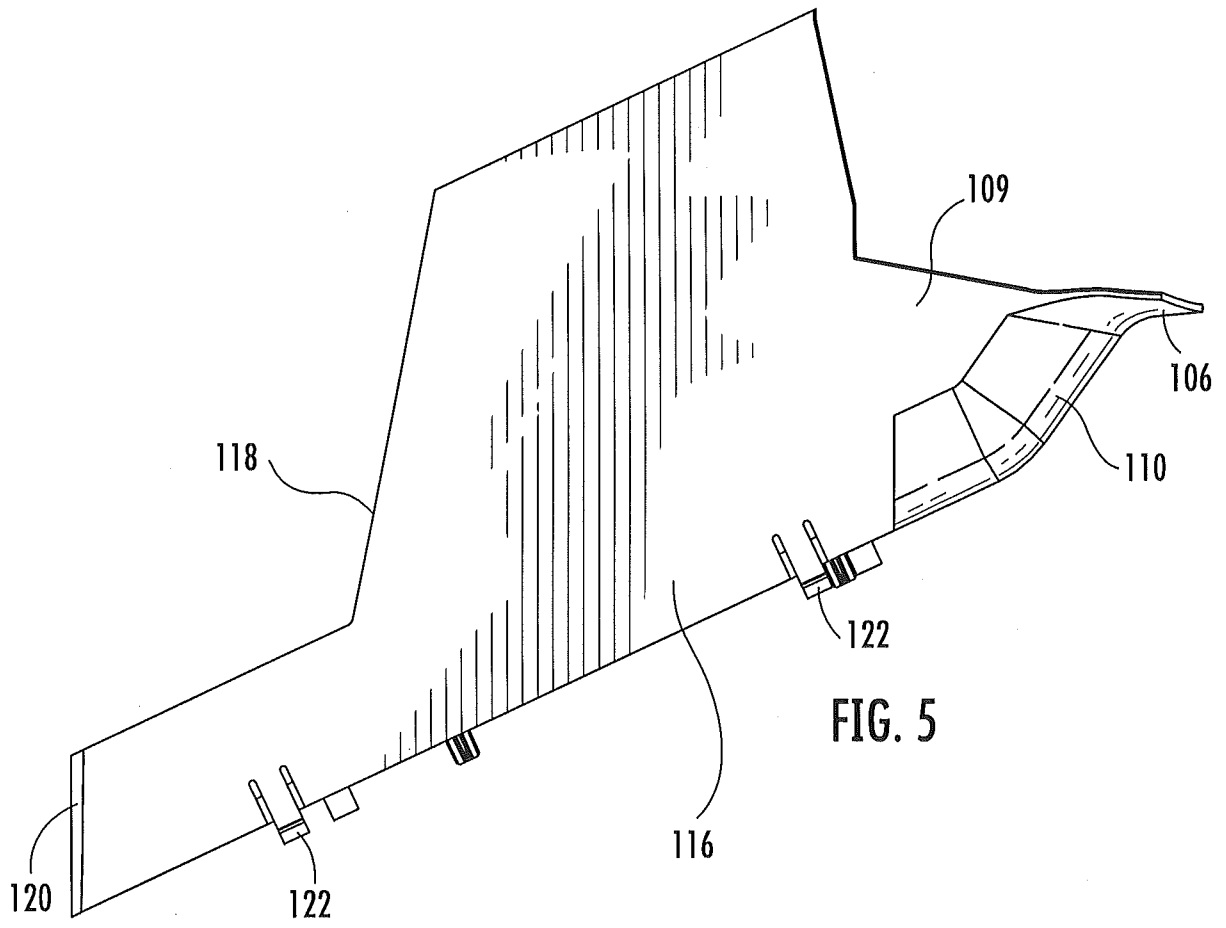
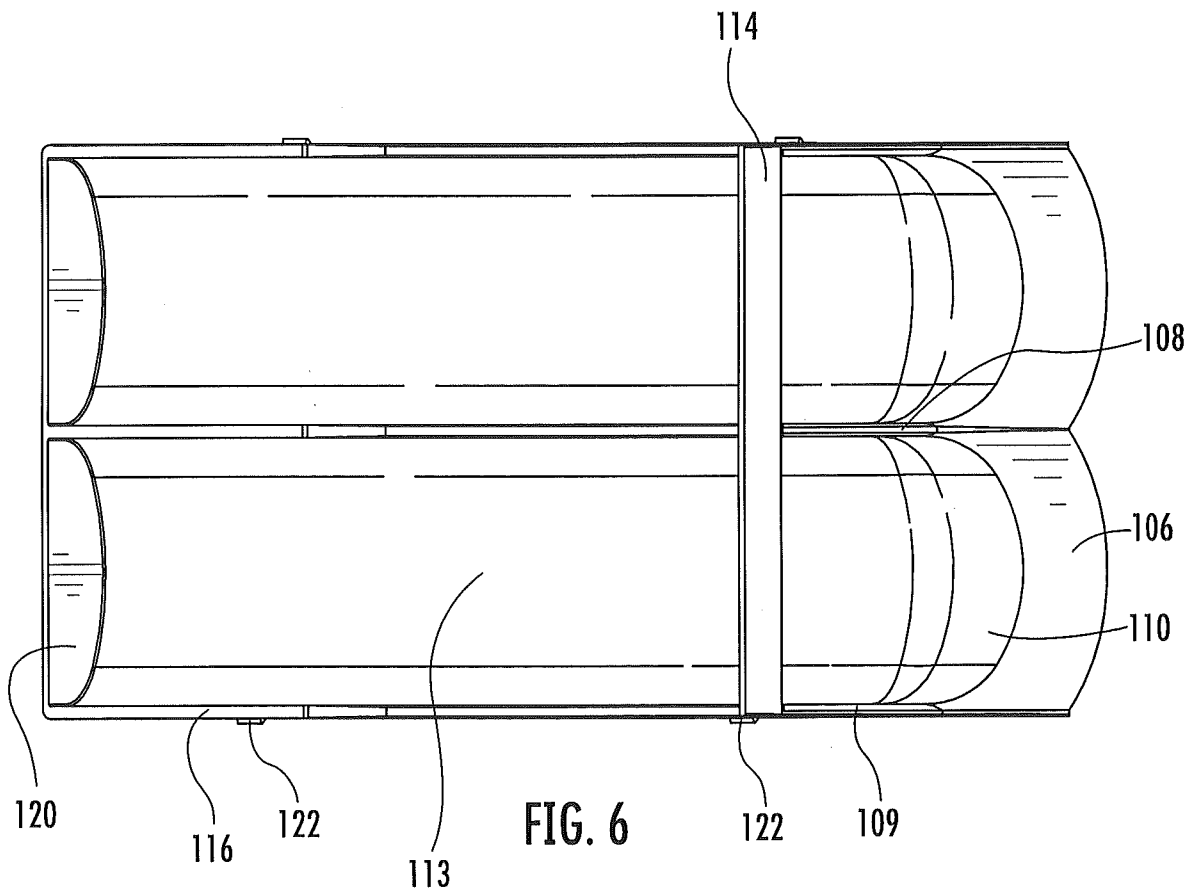
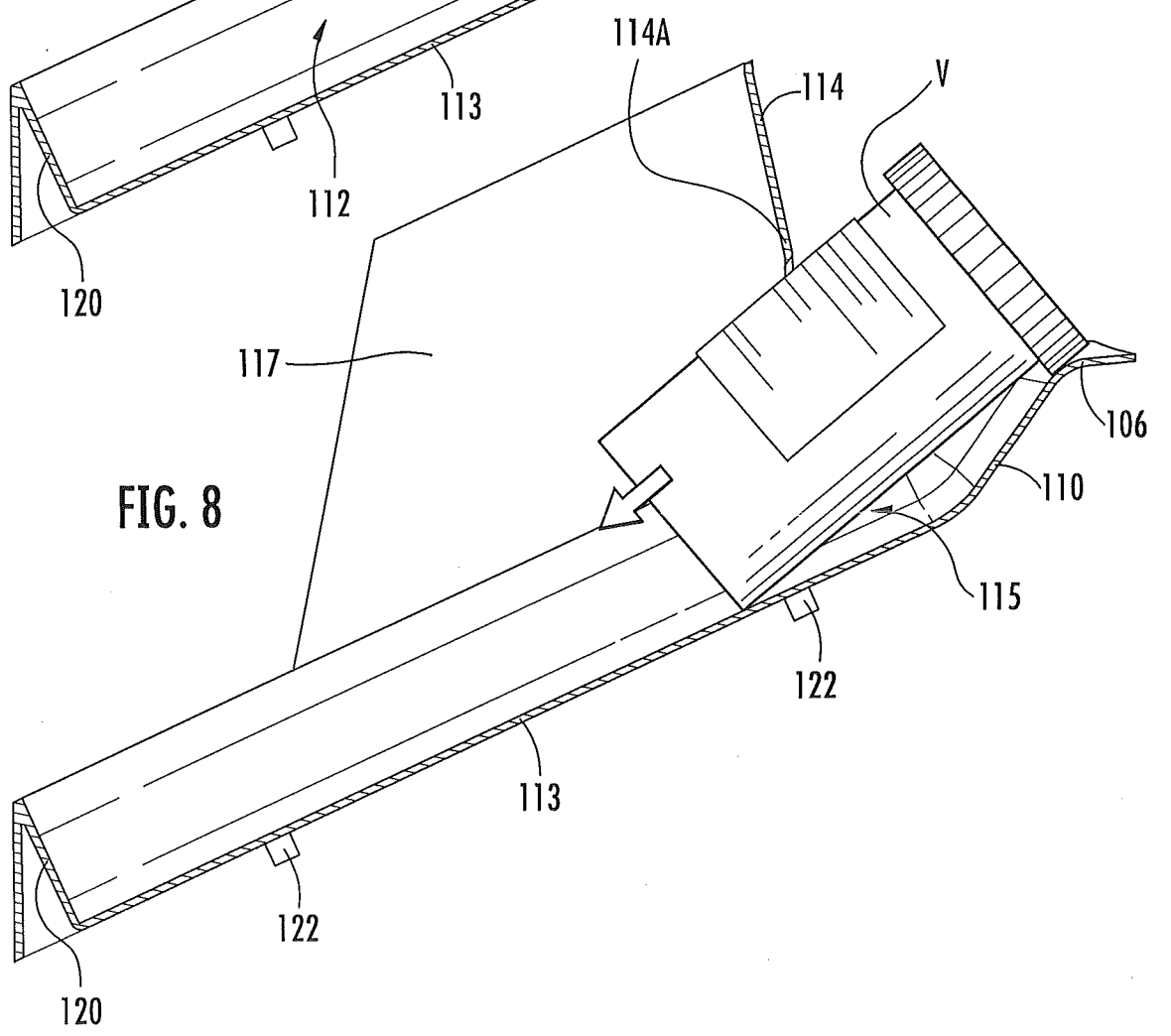
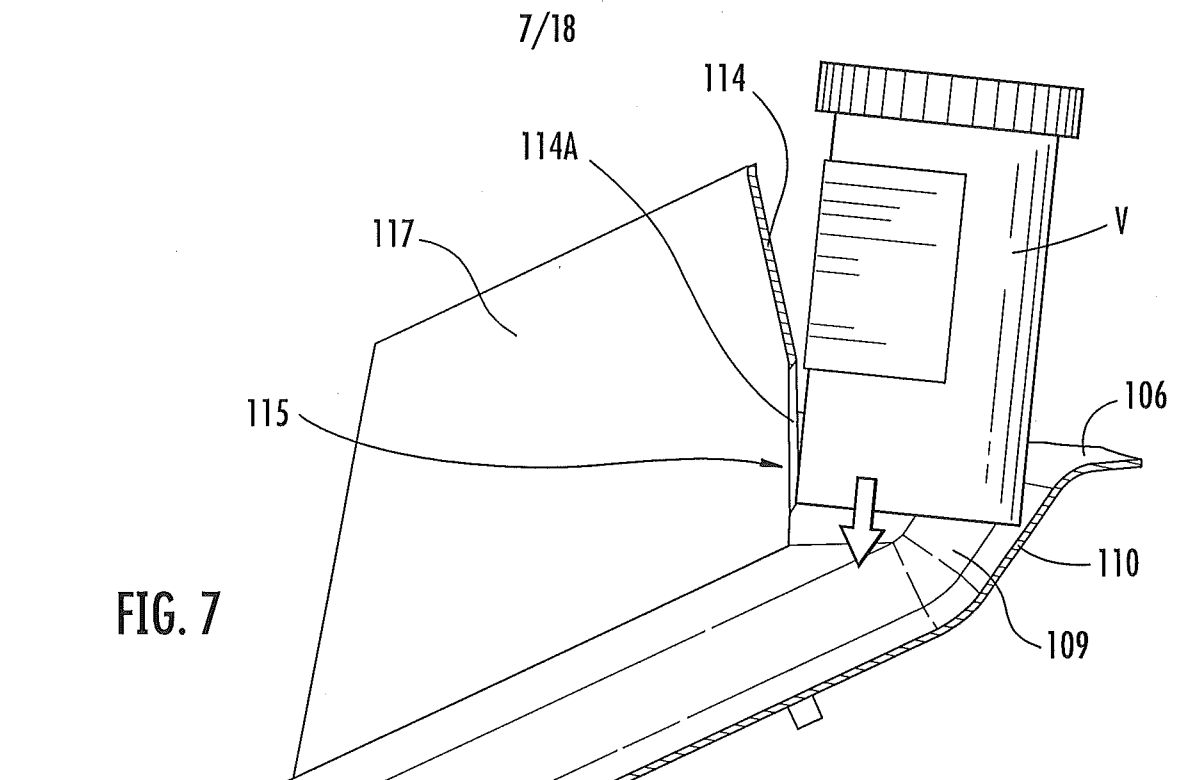
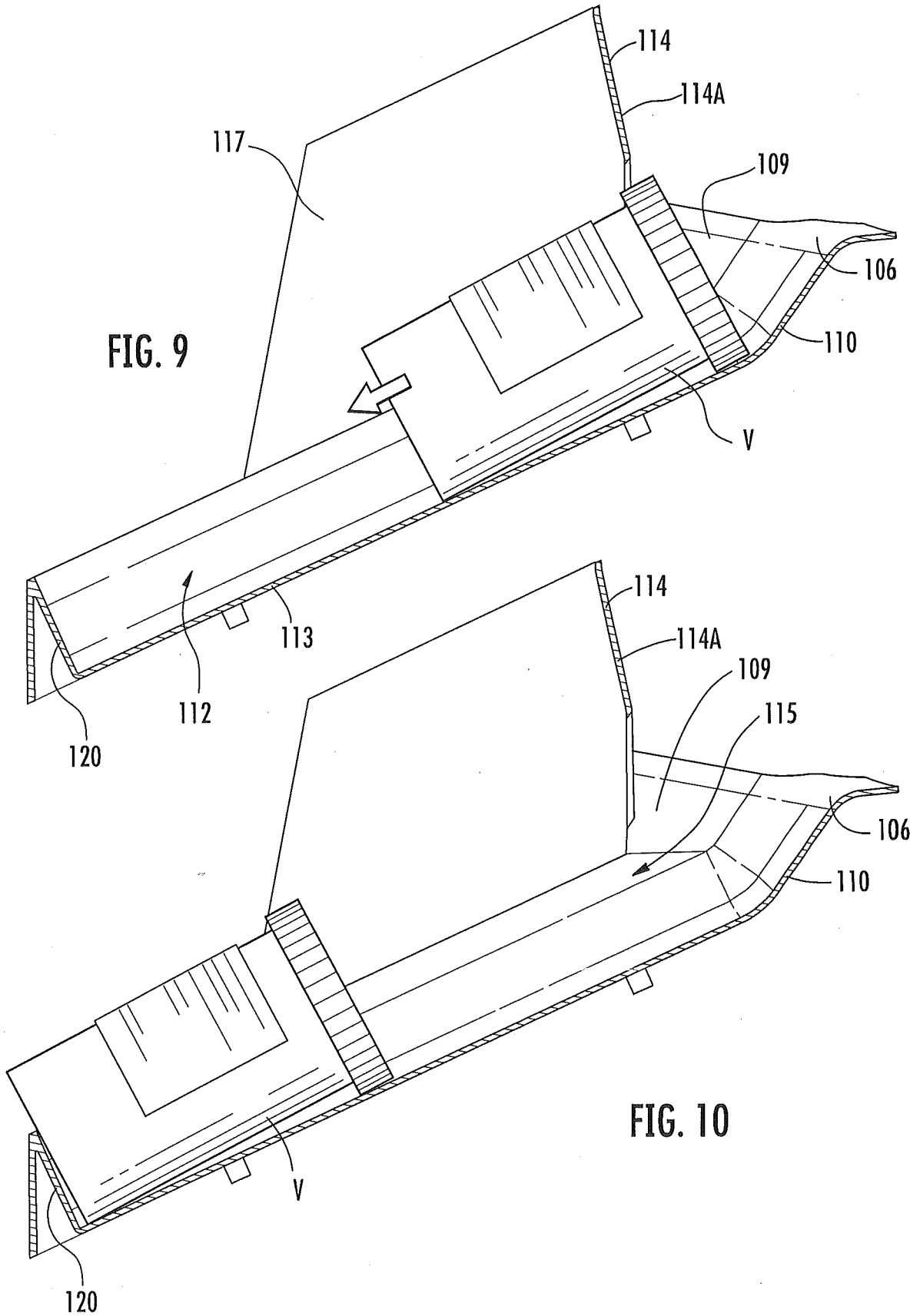
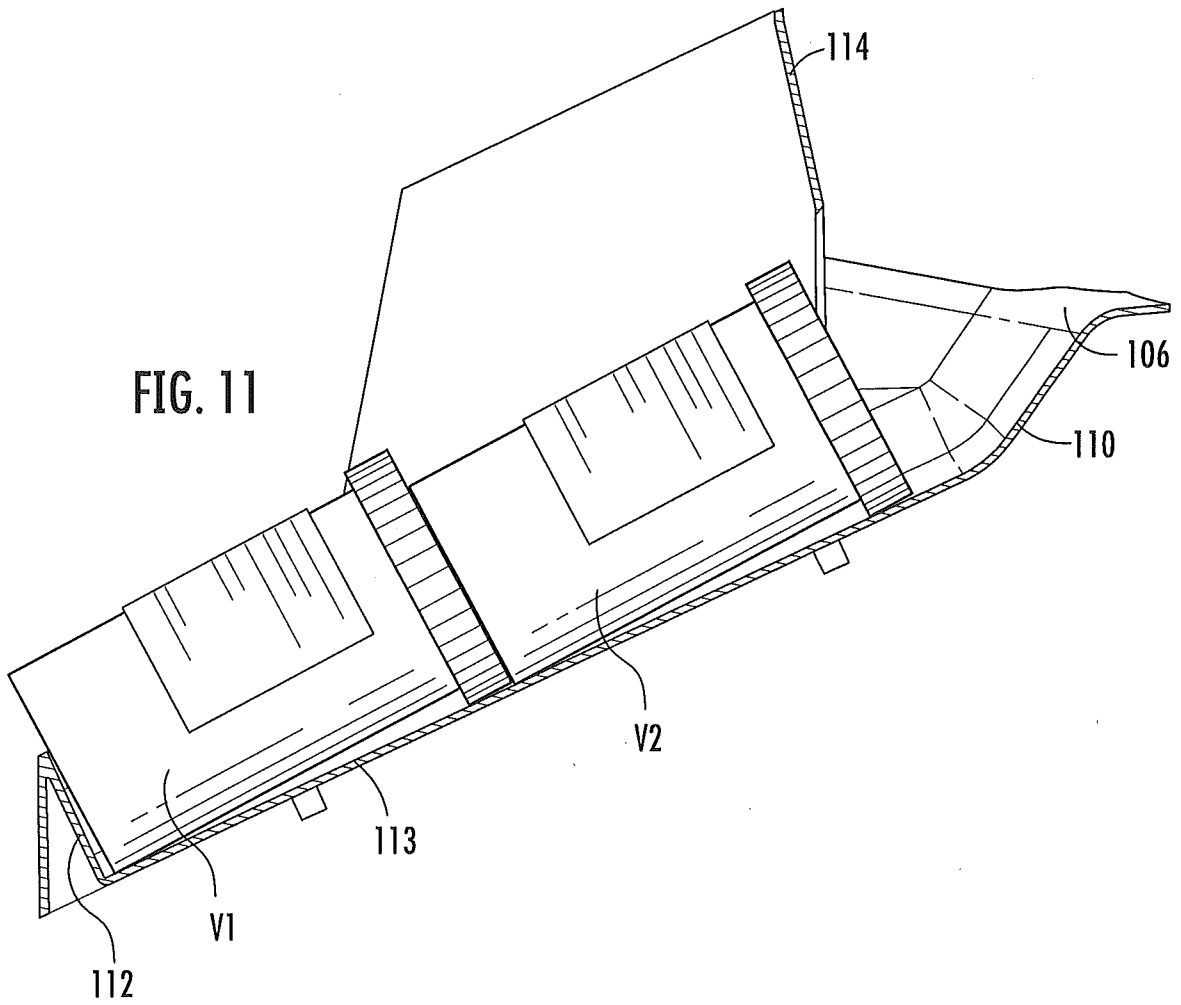


FIG. 5









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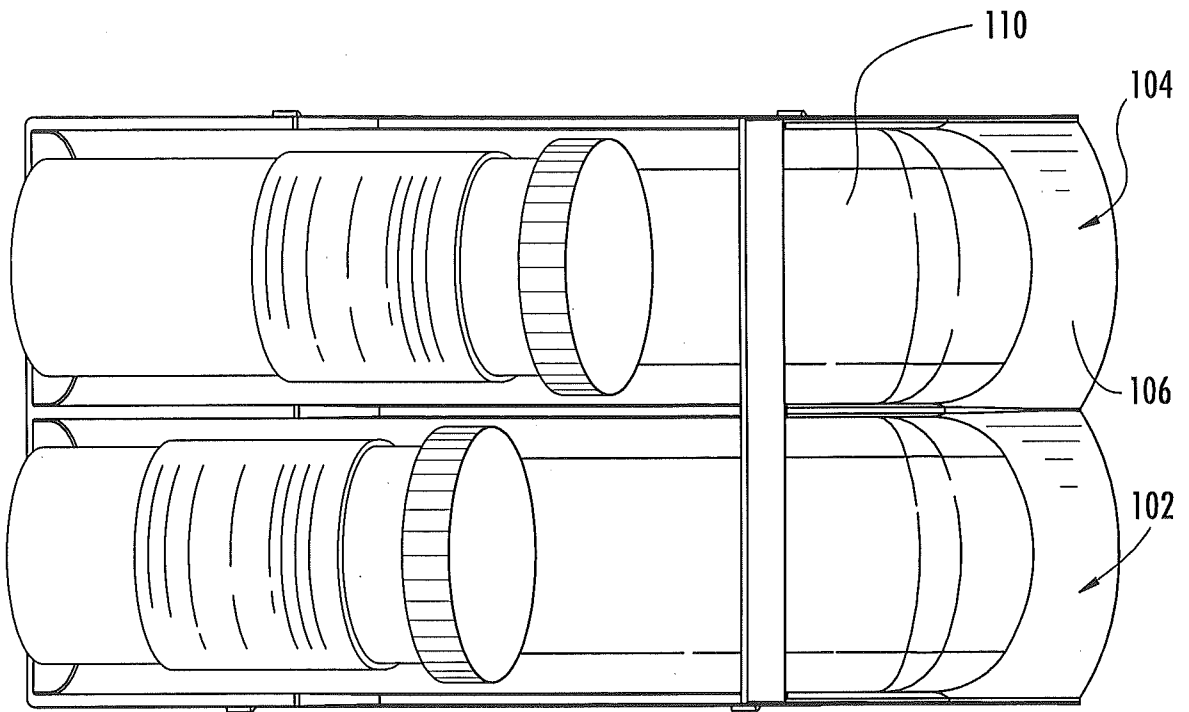


FIG. 12

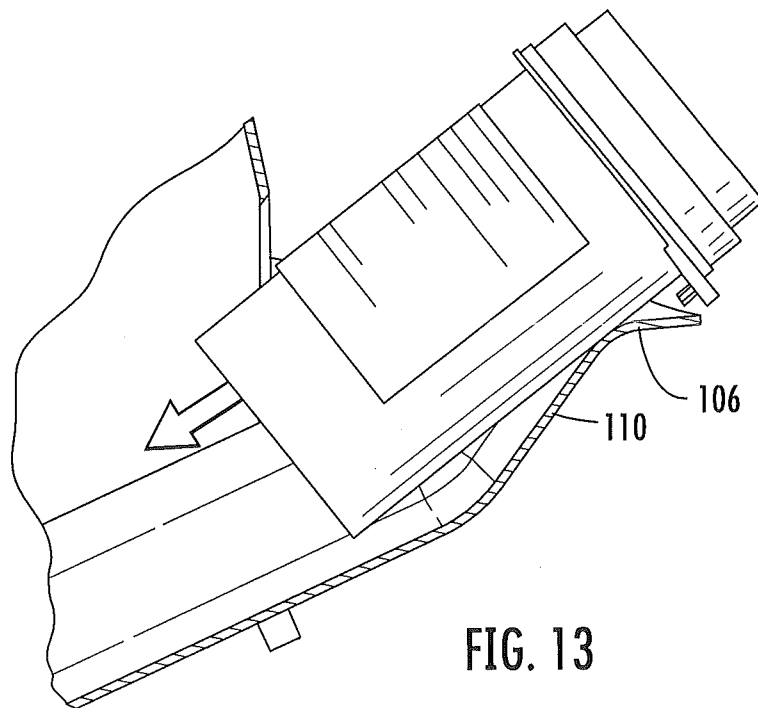
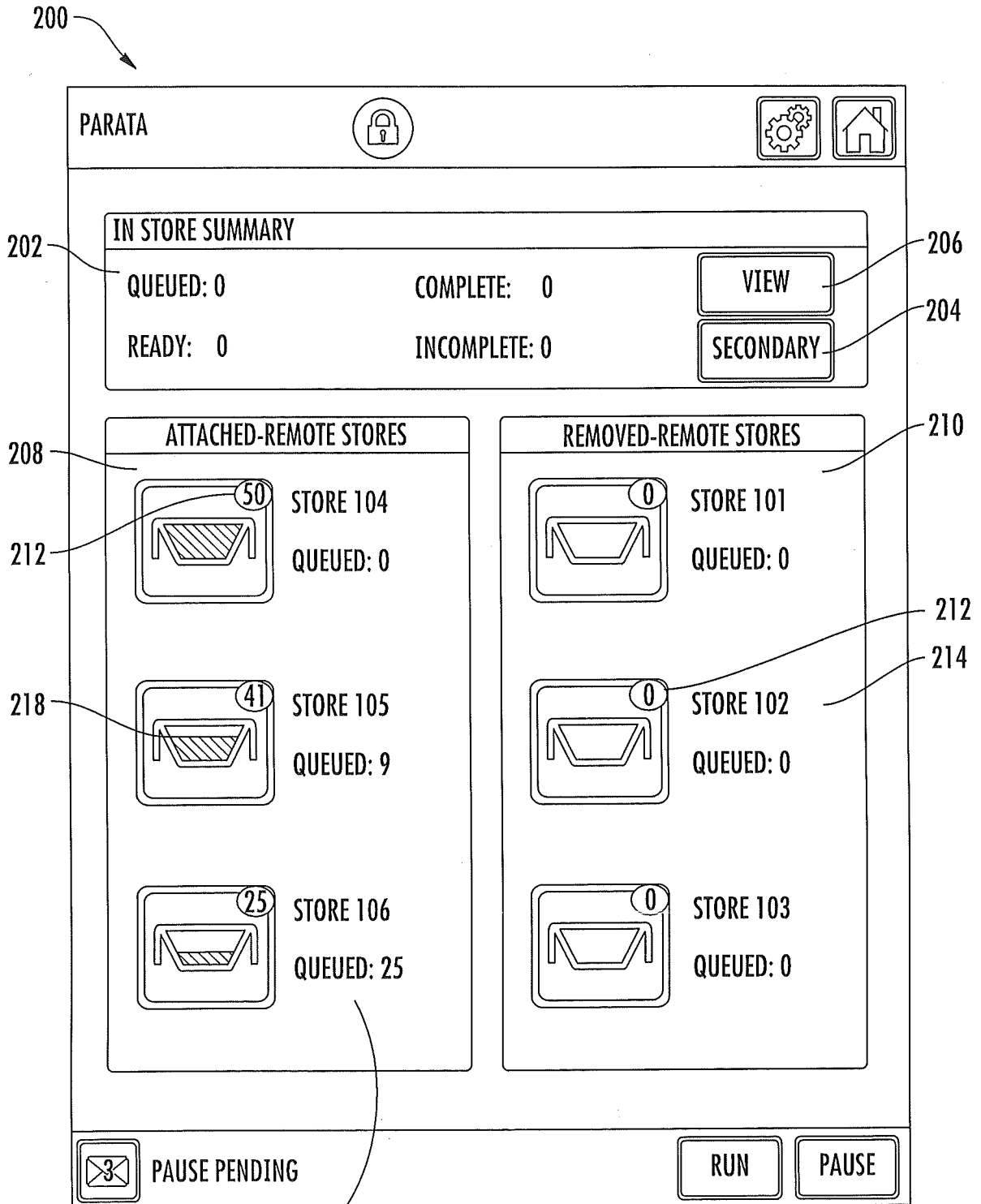


FIG. 13



216

FIG. 14

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220

PARATA

PENDING (9)		INCOMPLETE (0)	READY (41)	COMPLETE (0)
RX#	PATIENT	DRUG	QTY.	STATUS
I755388	SMITH	METFORMIN HCL ER 750 mg TABLET	10	PENDING
L891418	DOE	METFORMIN HCL ER 750 mg TABLET	10	PENDING
J181264	JONES	METFORMIN HCL ER 750 mg TABLET	10	PENDING
K523707	MILLER	METFORMIN HCL ER 750 mg TABLET	10	PENDING
L325164	BROWN	METFORMIN HCL ER 750 mg TABLET	10	PENDING
J901500	WILSON	METFORMIN HCL ER 750 mg TABLET	10	PENDING

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STORE 105

EDIT TOTE

PRINT
BARCODE

DELETE TOTE

FORCE FILLING

PICK UP ALL
SCRIPTS

SECONDARY

PAUSE PENDING

RUN

PAUSE

FIG. 15

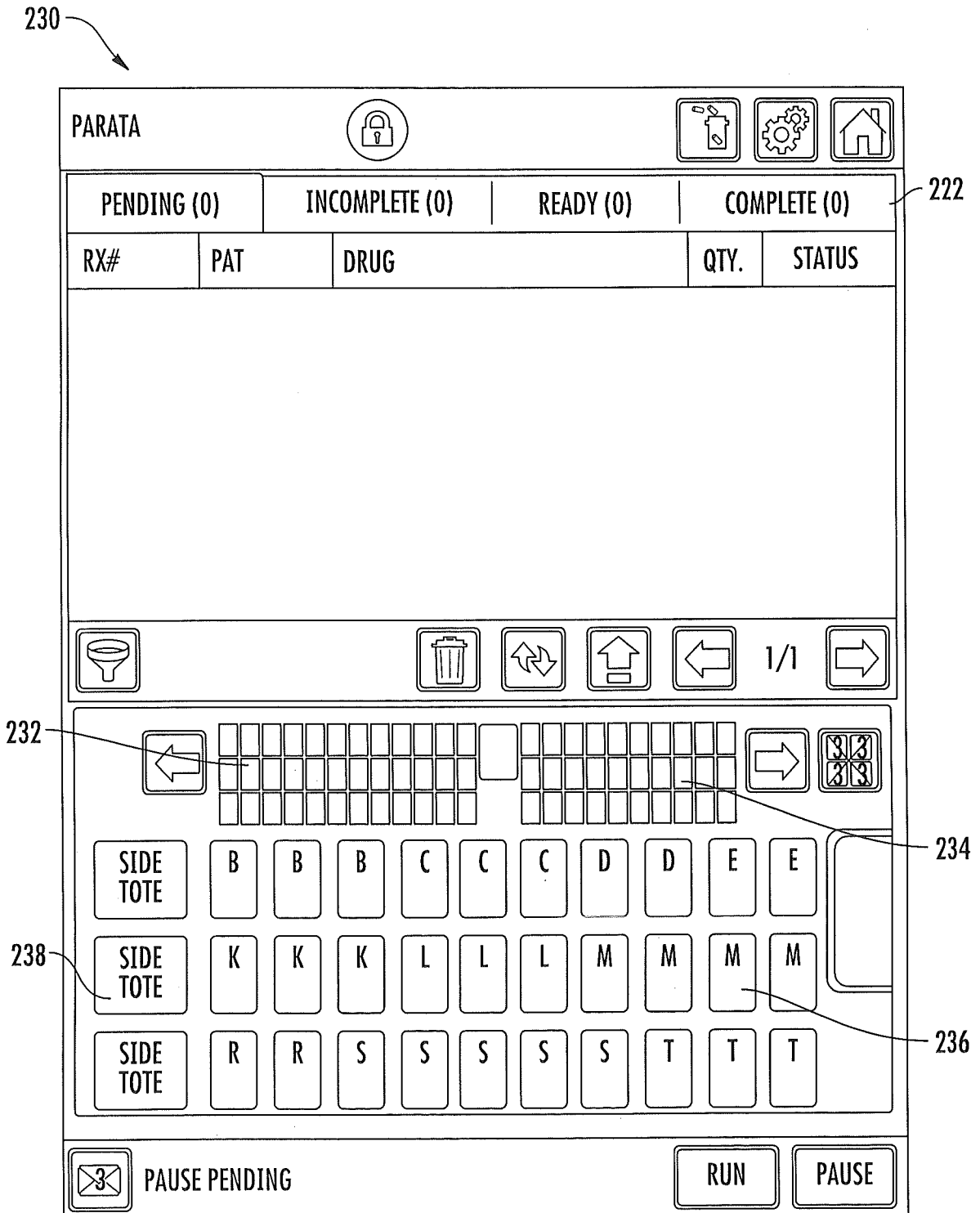


FIG. 16

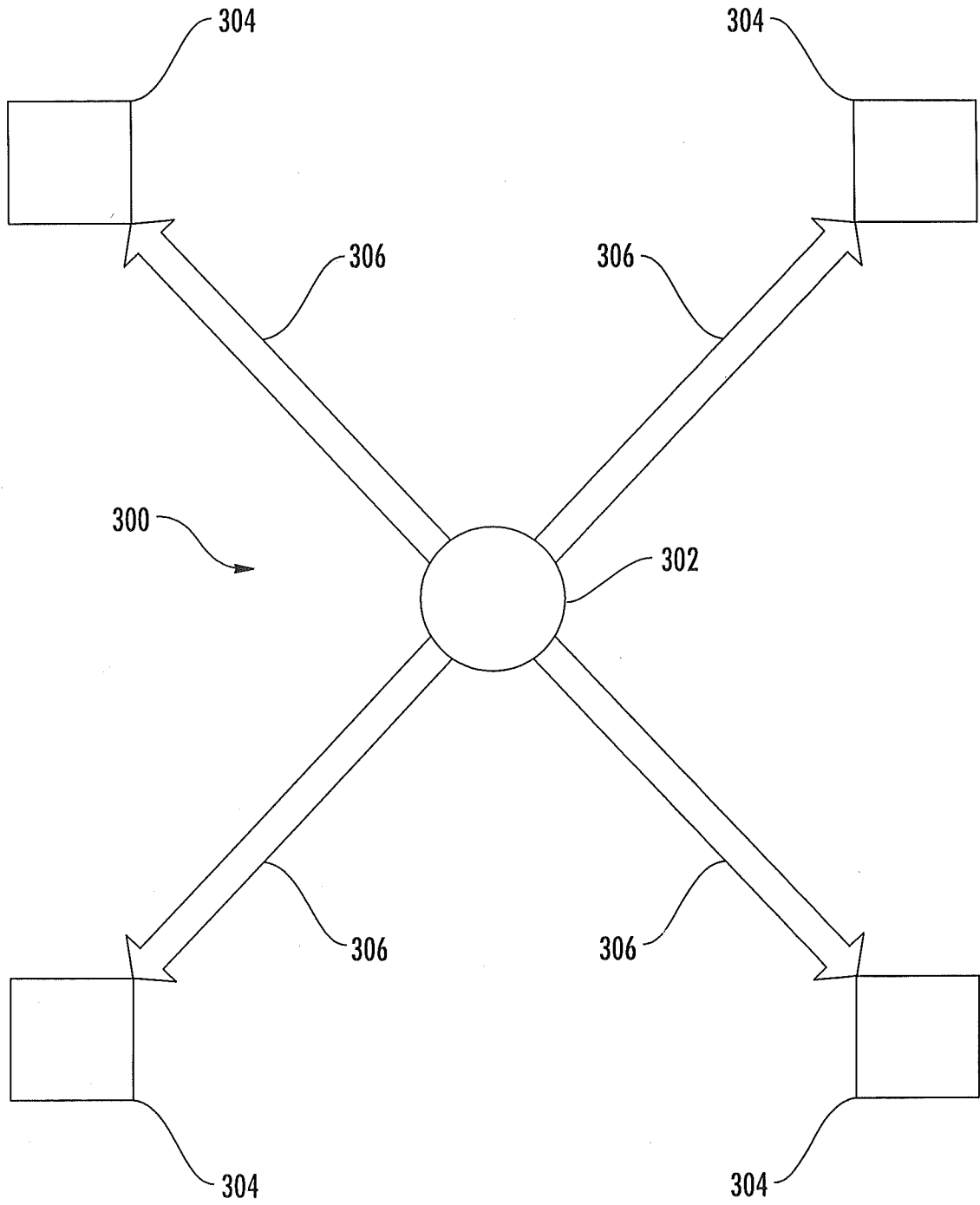


FIG. 17

15/18

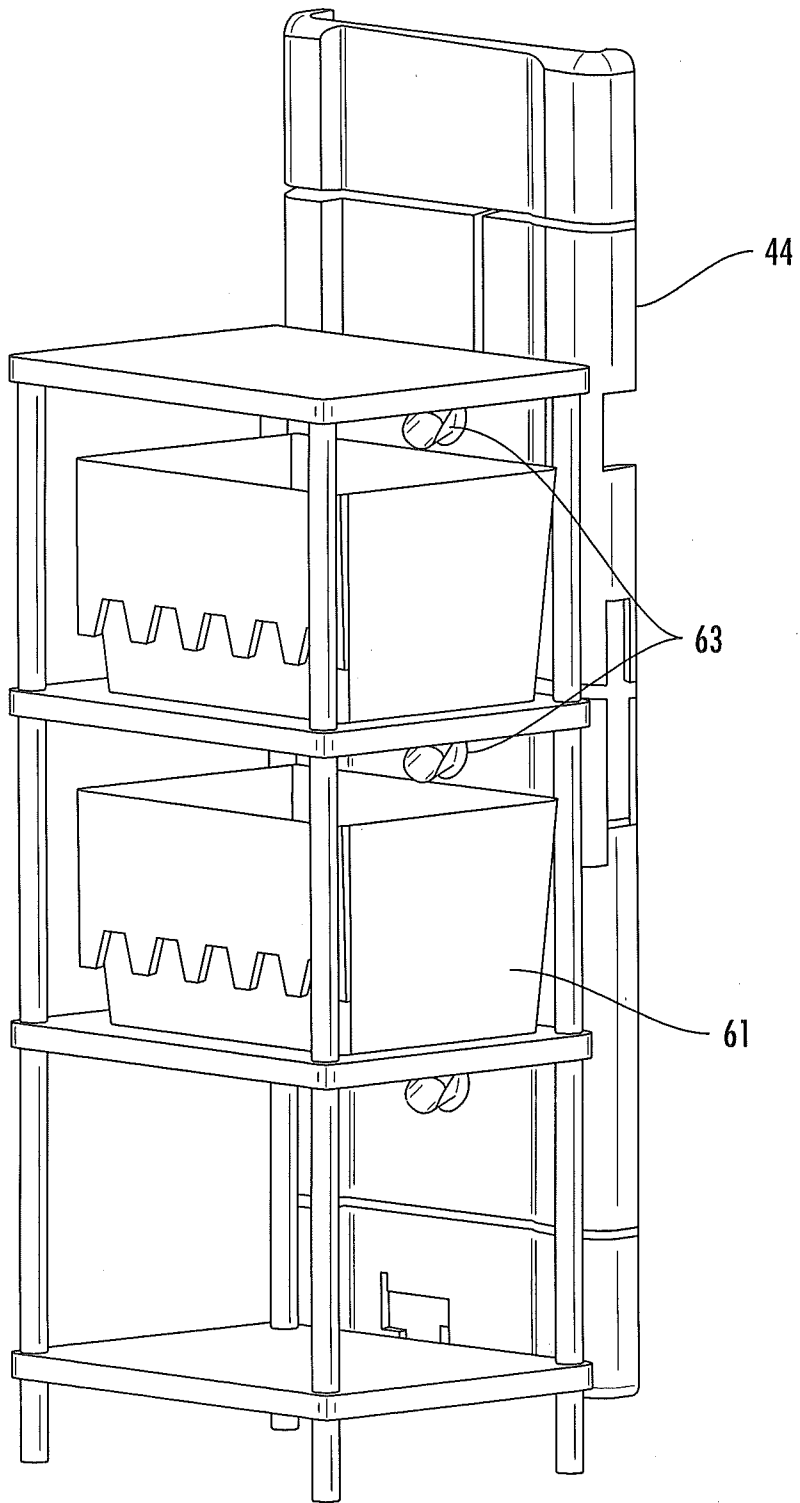


FIG. 18

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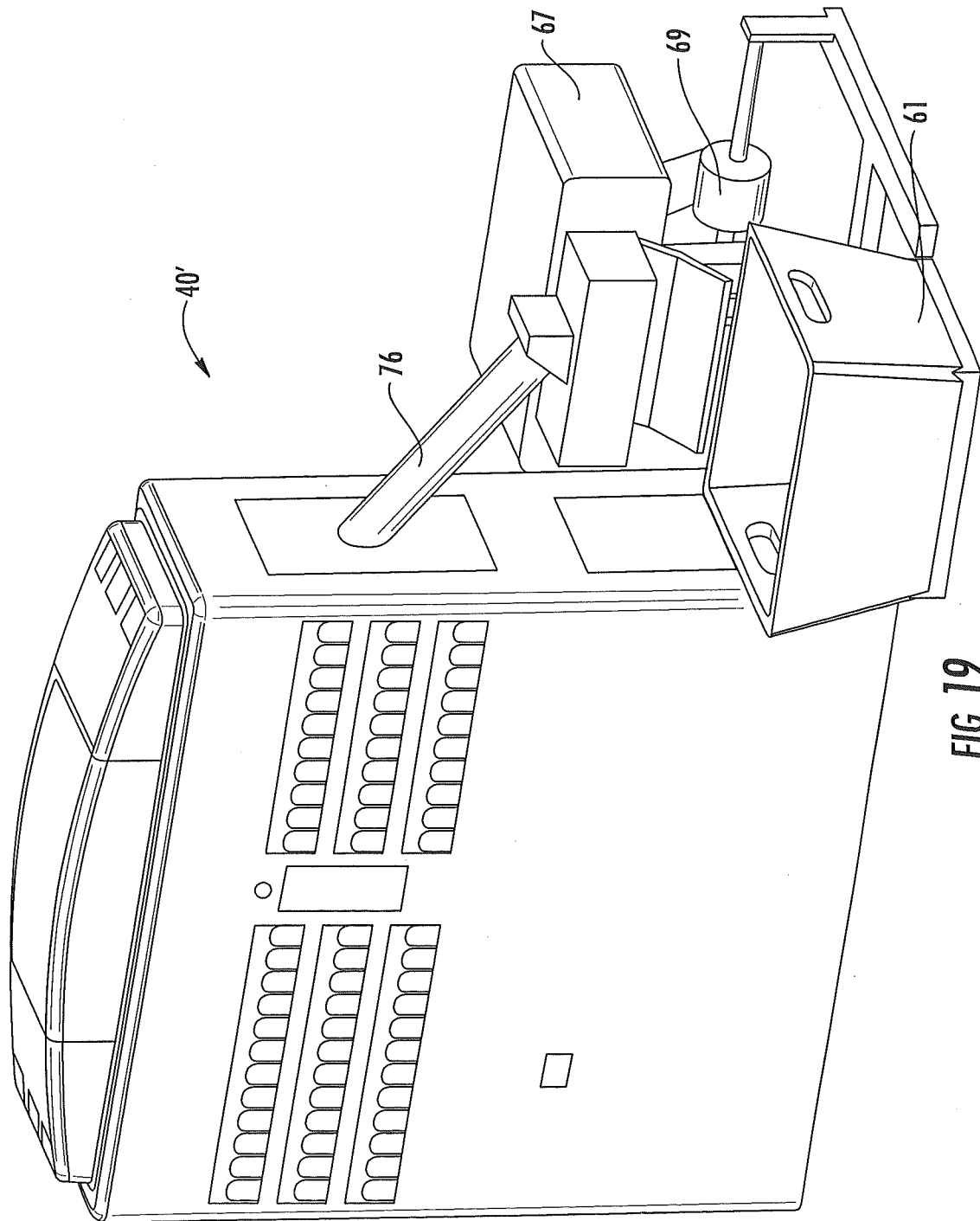


FIG. 19

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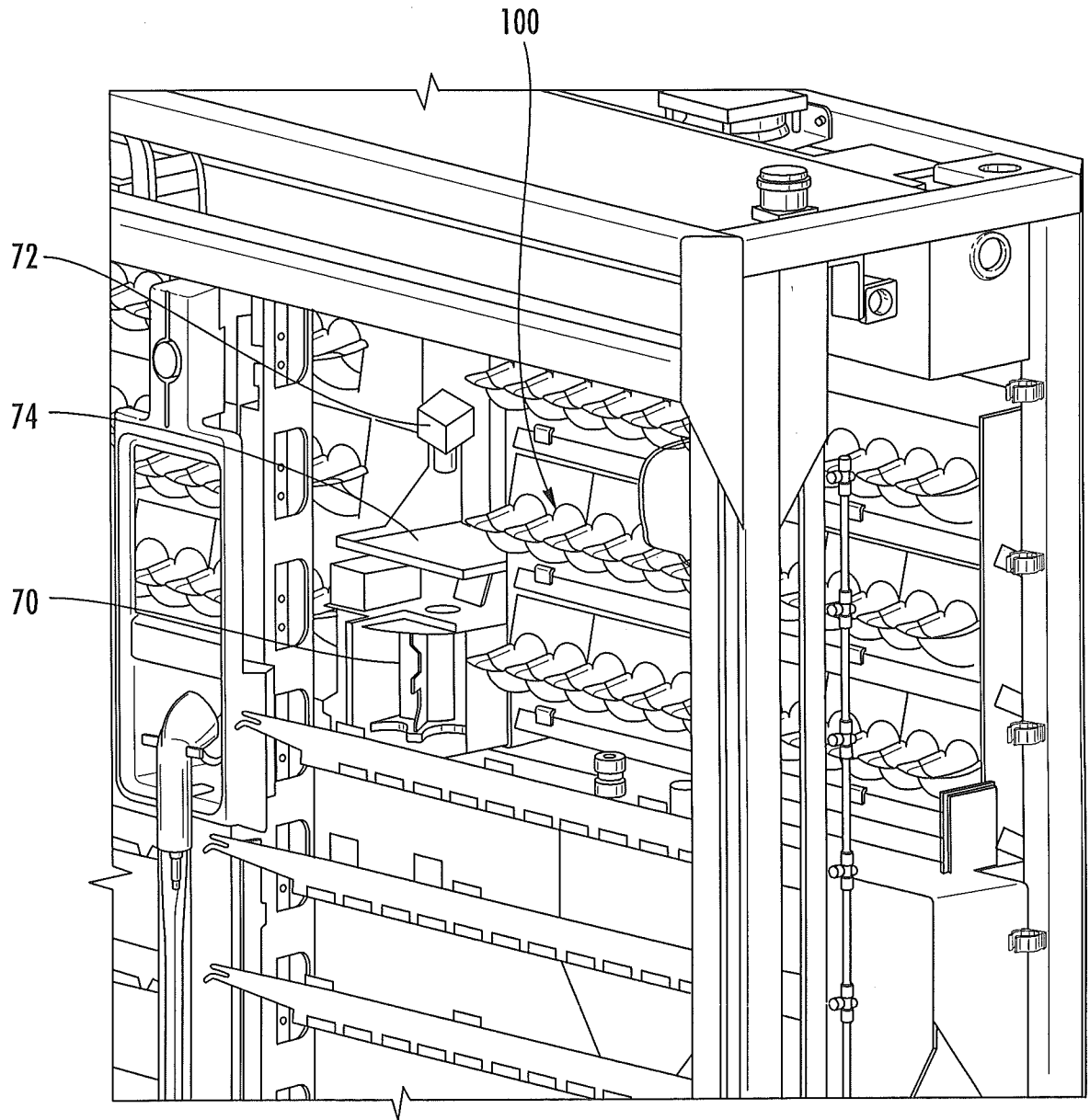


FIG. 20

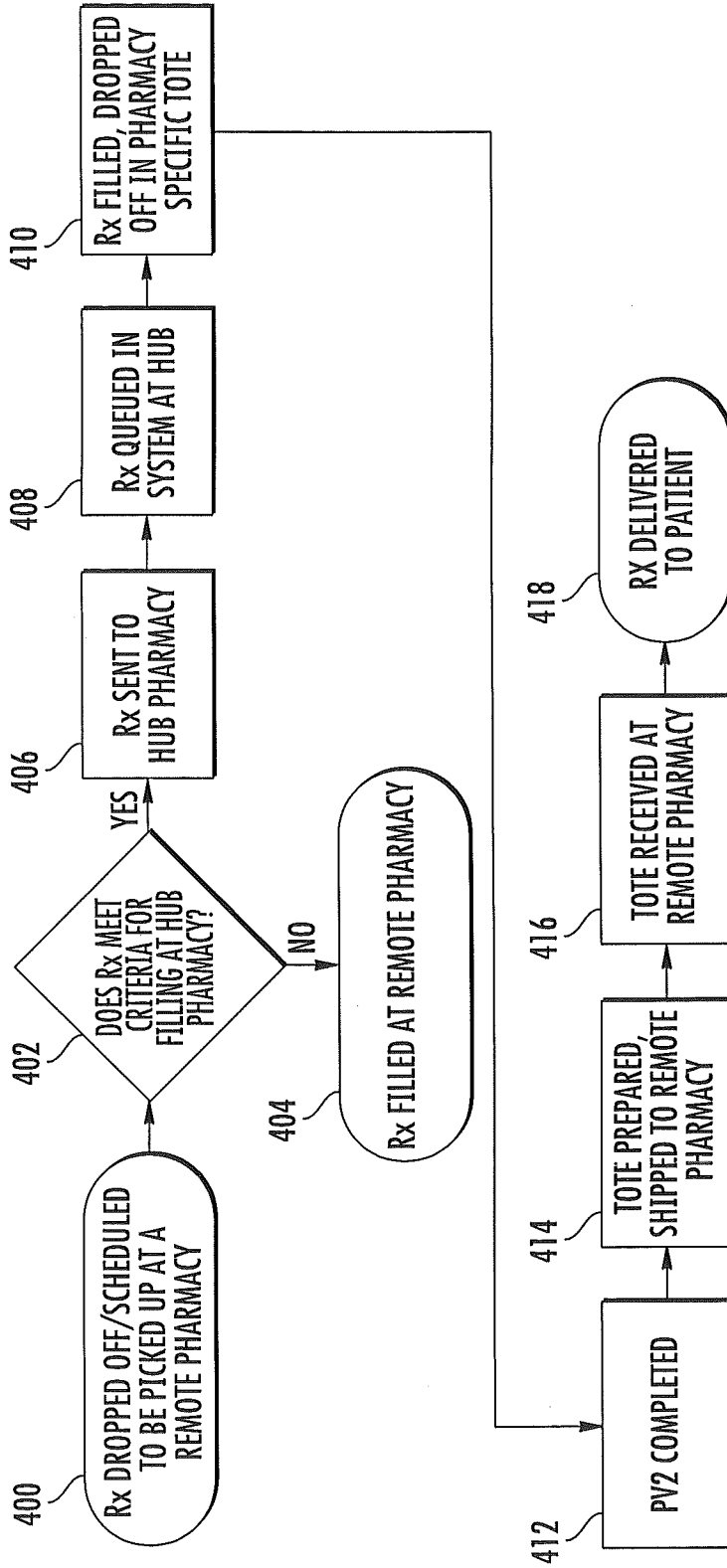


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No PCT/US2013/056325

A. CLASSIFICATION OF SUBJECT MATTER INV. B65B7/28 G07F11/54 G07F17/00 ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols) B65B G07F				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 2002/103573 A1 (FELLOWS EUGENE E [US] ET AL) 1 August 2002 (2002-08-01)	8-24		
Y	paragraphs [0025], [0025], [0043] - paragraph [0059]; figures 1-8 -----	1-7		
Y	US 5 715 660 A (BALENTINE PAUL [US]) 10 February 1998 (1998-02-10) columns 2,3,5 - column 7; figures 1-10 -----	1-3,6,7		
Y	US 2009/173745 A1 (PARRISH DAVID J [US]) 9 July 2009 (2009-07-09) paragraph [0037] -----	4,5		
A	US 5 533 606 A (YUYAMA SHOJI [JP]) 9 July 1996 (1996-07-09) abstract -----	1-24		
----- -/--				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
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