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(71) Applicant and
(72) Inventor: **TERZINI, Robert** [AU/US]; 1703 Bradford Court, Corinth, TX 76210 (US).

(74) Agent: **MANNING, Guy**; Suite 102, 1407 Texas Street, Fort Worth, TX 76102 (US).

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(54) **Title**: CONTAINER DISPERSION AND FILLING SYSTEM

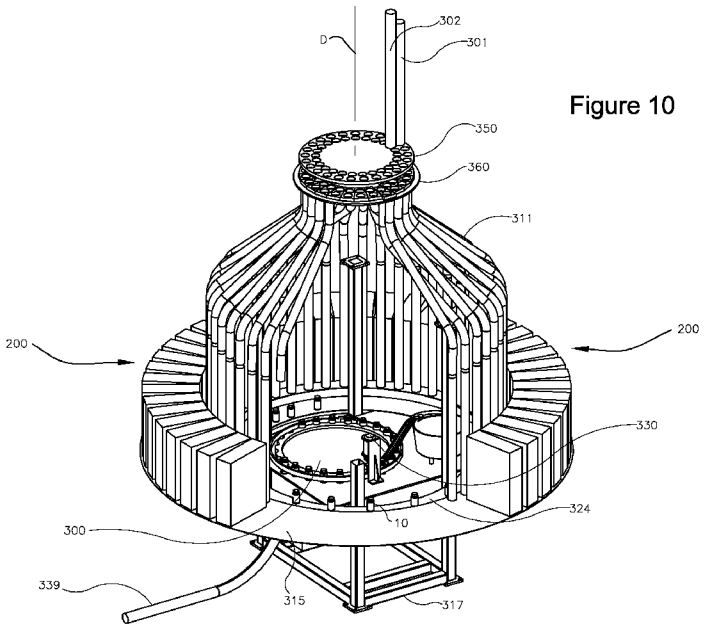

Figure 10

(57) **Abstract**: A multi-pharmaceutical dispensing station includes a circular platform around which a plurality of individual dispensers is arrayed at a convenient loading height. Each dispenser accepts a single bulk canister containing one pharmaceutical. Cylindrical, empty prescription containers carry labels bearing indicia of the patient and pharmaceutical to be dispensed into each container. Sensors detect the indicia and direct the containers to the proper dispenser which fills them with the type and quantity of a pharmaceutical according to the indicia. Incident containers first drop into a dispersion wheel which translates them around the circular station and aligns them with a vertical chute leading to the correct dispenser. After filling, the containers are urged onto a moving, circular table which conveys them to automatic closing and sealing apparatus. Once closed and sealed, the containers exit the dispenser station through pneumatic tubing which conveys them to verification, sorting and shipping stages.

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SPECIFICATION

Attorney's
Docket No. **0616M-022PCT**

TO WHOM IT MAY CONCERN:

BE IT KNOWN that I, **ROBERT TERZINI,** a citizen of Australia residing in Corinth, Texas, USA, have invented new and useful improvements in a

CONTAINER DISPERSION AND FILLING SYSTEM

of which the following is a specification. This application is a continuation-in-part of, and claims priority to, a US Provisional Application Ser. No. **61/090,901**, filed **August 22, 2008.**

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates generally to automated pharmaceutical distribution systems and particularly to the stage in such systems where prescription containers and the pharmaceuticals they are to contain are brought together. More particularly, this invention relates to apparatus for receiving, dispersing and directing empty prescription containers to pharmaceutical dispensers where the containers are filled, sealed and sent to content verification, packaging and shipping systems downstream thereof.

2. Description of Related Art:

NOTE: hereinafter, the present invention is discussed in the context of a preferred embodiment for an automated pharmaceutical prescription-filling system, but one having ordinary skill in the art will recognize that the present invention, along with the principles and practices thereof, may be utilized for filling containers of any small objects, and that all such small object container filling applications are considered to be within the spirit and scope of the present invention.

Automated pharmaceutical prescription-filling systems answer a need for high-volume pharmaceutical deliveries. Coupled with the use of mail order delivery service, automated, central filling of prescriptions has been highly successful in lowering costs of providing drugs to consumers. Benefits include increased volume, lower costs, fewer pharmacy personnel, inventory control, substance control, automated documentation, and quick turn-around times. Equally importantly, such systems assume most of the drudgery and relieve professional pharmacists from the tedium and fatigue of monitoring a multitude of high-volume orders, thereby reducing rates of medication errors.

Some recent automated systems remain relatively labor intensive. Automated dispensing machines which count out tablets or capsules often still require manual intervention, such as a pharmacist or technician positioning a container under the correct pill dispensing chute, or further manually handling the container before shipping. A system which automatically associates empty containers with their intended pharmaceuticals, dispenses the pharmaceuticals into the containers, seals the containers and forwards them to shipping would achieve the high volume throughput with the added benefits of accuracy and relief for pharmacists.

Directing empty containers to the proper location where a specified type and quantity of pharmaceuticals is dispensed into them creates its own challenges. Automated prescription filling systems necessarily must manage a large quantity and significant variety of diverse pharmaceuticals to turn a profit. The space required for such systems can be enormous when one considers the peripheral conveyors, sensors, gates, motors and the like needed to direct and convey any given prescription container to its assigned pharmaceutical dispenser, and then to extract it and forward it to shipping. A need exists for space-saving apparatus and procedures to optimize automated prescription filling services.

SUMMARY OF THE INVENTION

A multi-pharmaceutical dispensing station includes a circular platform around which a plurality of individual dispensers is arrayed at a convenient loading height. Each dispenser accepts a single bulk canister containing one pharmaceutical. Cylindrical, empty prescription containers carry labels bearing indicia of the patient and pharmaceutical to be dispensed into each container. Sensors detect the indicia and direct the containers to the proper dispenser which fills them with the type and quantity of a pharmaceutical according to the indicia. Incident containers first drop into a dispersion wheel which translates them around the circular station and aligns them with a vertical chute leading to the correct dispenser. After filling, the containers are urged onto a moving, circular table which conveys them to automatic closing and sealing apparatus. Once closed and sealed, the containers exit the dispenser station through pneumatic tubing which conveys them to verification, sorting and shipping stages.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the present invention are set forth in appended claims. The invention itself, however, as well as a preferred mode of use and further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure **1** shows in quartering perspective view an automated prescription filling system utilizing the prescription container filling system of the present invention.

Figure **2** depicts the automated prescription filling system of Figure **1** in top plan view.

Figures **3A - 3D** detail a container used in the prescription filling system of Figure **1.**

Figure **4** shows in side elevational view one channel of the automated prescription filling system of Figure **1**, with the container filling apparatus of the present invention.

Figure **5** depicts in perspective view the top portion of the container filling apparatus of the present invention.

Figure **6** depicts in perspective view the top portion of the present invention shown in Figure **5** vertically exploded to reveal its major components.

Figure **7** shows in front elevational view an incident container accumulator on the dispensing station of the present invention.

Figures **8A - 8D** show in perspective views component parts of the dispersion wheel of the present invention.

Figure **9** depicts in perspective view a close-up of container gates used in the dispersion wheel of Figures **8A - 8D.**

Figure **10** shows in quartering perspective view the lower portion of the prescription container filling stage of the of the present invention, partially opened to reveal the container transport table and automatic closure and sealing apparatus inside.

Figure **11** shows a schematic of one of the pharmaceutical dispensing machines of Figure **10**, including the process by which containers are filled.

Figures **12A - 14** detail apparatus and process by which filled prescription containers are automatically sealed for shipment.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the figures, and particularly to Figures **1, 2** and **4**, automated prescription filling system **1000** comprises prescription dispensing apparatus **300** feeding filled prescription containers **10** (see Figure **4**) through prescription verification stage **400** and sortation conveyor system **500** to bagging, packaging and shipping system **600** where filled prescriptions are conveyed through common carriers to pharmacies, hospitals and individual patients (collectively "customers"). Apparatus **300** comprises a stage where containers **10** are filled according to each individual prescription from an array of individual pharmaceutical dispensers **200** and sealed by automated closure system **160**. Bottles **10** then are transported to verification stage **400** where a pharmacist confirms that each container **10** contains the pharmaceutical required, then to conveyor **500** where container **10** is collected with other containers **10** for the same customer before being packaged at stage **600** and shipped, all without requiring human hands to handle containers **10** or their pharmaceutical contents.

Pharmaceutical dispensers **200** are the subject matter of a previously filed U. S. patent application Serial Number **12/396,417** filed March 2, 2009, (Attorney's Docket No. /0616M-

003), now pending. Pneumatic container transport system **100** also is the subject matter of a U.S. provisional patent application, Serial Number **61/090,900** filed August 22, 2008 (Attorney's Docket No. 0616M-023), now pending. Prescription verification system **400**, is the subject matter of a U.S. provisional patent application, Serial Number **61/091,346** filed August 23, 2008 (Attorney's Docket No. 0616M-024), and of U.S. provisional patent application, Serial Number **61/112,776** filed November 10, 2008 (Attorney's Docket No. 0616M-025), both now pending. All of the foregoing pending U.S. patent applications are hereby incorporated herein by reference. This application is for apparatus **300** which brings empty but labeled prescription containers together at pharmaceutical dispensers **200** for filling, closure and forwarding to the downstream stages of verification **400**, sortation **500** and autopackaging **600**.

NOTE: hereinafter, the present invention is discussed in the context of a preferred embodiment utilizing prescription bottles, but one having ordinary skill in the art will recognize that other types of containers having similar features may be substituted and still considered to be within the spirit and scope of the present invention. Further, it will be recognize that capping system **160** and **330** as described herein will be altered as needed to accommodate containers **10** which are not bottles or which utilize different closure and sealing means.

NOTE also that hereinafter, as it serves the purpose, the term "system **1000**" may be personified and discussed as carrying out operations of certain apparatus. One having ordinary skill in the art will recognize that to do so, system **1000** necessarily includes controller means (not shown) typically comprising a computer coupled to sensors, gates, actuators and the like within system **1000**. Such computer typically has a central processor, a quantum of random access memory, at least one fixed data storage device, a graphical user interface and at least one user input device (none shown). Said computer further includes at least one computer program operable to read sensor information, such as bar code indicia disposed on containers **10** and various components of dispensers **200** (discussed in more detail below), and to issue commands to devices such as gates and actuators to carry out the specified operations. For example, said controller means monitors the location and status of each container **10** as it arrives at said dispensing station **300**; operates said dispensing station **200** to direct said containers to one of said dispensers **200** for filling, sealing and discharge; stores in a database on said dynamic

storage device a record of said contents of each of said containers; and displays to a user (not shown) on said graphical user interface the status of each container **10** and dispenser **200** in response to input from said user with the user input device (not shown). All of these operations are discussed in more detail below as being carried out by system **1000**.

Prescription containers and container induction, labeling and transport

Turning first to Figures **3A - 3D**, container **10** comprises a bottle having a regular, generally cylindrical cross section composed of walls **11** surrounding and concentric about longitudinal axis **A** and defining interior **12** into which a plurality of pharmaceuticals **P** (see Figure **11**) are dispensed by dispensers **200**. Bottle **10** is closed at bottom **20** opposite shoulders **14** where it reduces to neck **17** bearing threads **18** adapted to mate with a cylindrical cap **50** (not shown; see Figures **12A - 14**) which closes and seals bottle **10**. Though larger than neck **17**, cap **50**'s diameter remains slightly smaller than that of walls **11** to remain within the profile of bottle **10**.

Disposed within annular recess **13** between shoulders **14** and bottom **20**, label **2** bears indicia **9,** comprising a bar code or other machine readable encoding, adapted to inform prescription filling system **1000** and its various sensors and software (not shown), through use of a dynamically populated database, of the contents and expected location of bottle **10** within prescription filling system **1000**. Bottle **10** is adapted to move, bottom **20** first, through pneumatic tubing **103** between the various stages of system **1000** (Figure **1**). Impellers **130** (Figure **4**) disposed at the beginning of each run of tubes **103**, provide impetus to move bottles **10** through tubes **103** between stages.

Referring now again to Figures **1, 2** and **4**, it will be understood that bottles **10** enter system **1000** uncapped, and that caps **50** must be placed on bottles **10** to seal them after they have been filled by dispensers **200** within stage **300**. The bottle capping system **160, 330** is discussed in more detail herein below.

Bottles **10** are manufactured separately and provided in bulk to system **1000**. Bottles **10** are inducted into system **1000** by first placing them into unscrambler **110** which first reorients them all with their bottoms **20** facing the same direction and then drops them single file into tube **103** to be conveyed to labeling machines **120**. Labelers **120** print labels **2**, complete with indicia **9**, and apply them to annular recesses **13** on walls **11** of bottles **10.** Labeler **120** then sends bottles **10** on to pharmaceutical dispensing system **300** for filling. Preferably, labels **2** carry indicia **9** of the patient's identity and the content and quantity of the pharmaceutical to be dispensed into bottle **10** to which it is attached. One having ordinary skill in the art will recognize that indicia **9** may comprise any unique identifying information that is capable of distinguishing each bottle **10** from the others within system **1000**, and that all such forms of indicia are considered to be within the spirit and scope of the present invention. Once bottles **10** receive label **2**, prescription filling system **1000** tracks the prescription for said customer by following the location and status of each bottle **10**.

Referring again now to Figure **4**, labelers **120** feed bottles **10** one at a time into a single tube **103**, but they arrive at dispensing station **300** in either of two entry channels **301, 302**. Which entry channel **301, 302** that bottles **10** enter is determined by system **1000** according to dispenser **200** from which bottle **10** must be filled. System **1000** selects channels **301, 302** by operating diverter **140** to route bottle **10** from tube **103** into one or the other of paired tubes **103** each of which leads to one of channels **301, 302**.

One having ordinary skill in the art will recognize that Figure **4** represents a simplified schematic of a tubular pneumatic container transport system for bottles **10** which employs labelers **120** feeding multiple dispensing stations **300**, and that diverters **140** will be employed by system **1000** as needed to optimize throughput of bottles **10** moving through system **1000**. For example, depending upon the throughput speed of stations **300**, several labelers **120** might be required to keep up with it, necessitating a plurality of diverters **140** to direct bottles **10** into the proper one of channels **301, 302**. One having ordinary skill in the art further will recognize that all combinations of unscramblers **110**, labelers **120** and diverters **140** necessary to feed bottles **10** to each station **300** to optimize throughput are considered to be within the spirit and scope of the present invention.

Dispensing station

Referring now also to Figures **5, 6** and **10**, dispensing station **300** comprises a lower level (Figure **10**) and coaxial upper level (Figure **5**), the latter stacked upon the former. Both levels are supported by lower base **317**. Structural members (not shown) couple upper base **359** to lower base **317** which supports the entire weight of station **300**. Upper base **359** in turn supports column **303** coaxial with axis **D** of station **300**.

Disposed atop column **303**, decelerator **163** receives caps **50** directed to it by cap inductor **161** (Figures **12A, 12B**). Column **303** houses duct **304** which conveys bottle caps **50** from cap decelerator **163** through dispersion wheel **350** to capping bowl **164** in the lower level substantially coplanar with platform **315**. The operation of capping system **330** inside dispensing station **300** is discussed below.

Disposed approximately three (3 ft.) feet above the floor on lower base **317**, annular platform **315** houses a plurality of pharmaceutical dispensers **200** arrayed concentrically around axis **D** and facing the interior of station **300**. Dispensers **200,** the subject matter of a separate, previously filed patent application (see above), are discussed briefly herein below (see Figure **11**) in connection with filling of bottles **10** with pharmaceuticals **P**. Bottle accumulator chutes **311** extend upward to dispersion wheel **350** (discussed in detail herein below) to receive bottles **10** one at a time as system **1000** directs them to a particular dispenser **200** for filling. Chutes **311** comprise cylindrical tubes very similar to tubes **103**, and accumulate bottles **10** awaiting filling by dispenser **200**, as discussed below. Once filled, bottles **10** move into the interior of station **300** to be capped, as discussed in more detail below, and then exit station **300** through outlet tube **339** to be urged toward verification stage **400** by pneumatic impeller **130**.

Dispersion wheel

Bottles **10** arrive at dispensing station **300** into one or the other of incoming channels **301, 302** and proceed to accumulator **340** which entrains bottles **10** for filling by dispensers **200**. Actuators **343** coupled to doors within accumulator **340** operate upon direction by system **1000**

to drop bottles **10** into dispersion wheel **350**. Accumulator **340** is supported on column **303** by brackets **342** which align accumulator **340** with cups **356** evenly disposed in radially arrayed pairs around the perimeter of dispersion wheel **350**. Accumulator **340** also includes sensors **344** adapted to read indicia **9** on labels **2** to provide system **1000** with feedback to confirm the location of each of bottles **10.**

Disposed directly below accumulator **340** and coaxial about axis **D**, dispersion wheel **350** comprises lower, circular dispersion plate **355** and upper, circular retaining ring **357.** Dispersion plate **355** and retaining ring **357** sandwich and support cups **356** in radially arrayed pairs around the perimeter of dispersion wheel **350**. Cups **356** are open through both lower plate **355** and upper ring **357** to form conduits through dispersion ring **350** for bottles **10**. Cups **356** thus admit bottles **10** from accumulator **340** and hold them upright with their bottoms **20** resting upon gates **360**. Gates **360** prevent bottles **10** from passing out of dispersion wheel **350** until directed by system **1000** to open and drop bottles **10** into chutes **311**, as discussed below.

Each of gates **360** is poised above two of chutes **311** of two dispensers **200**. Gates **360** rest upon stationary dispersion base plate **351** disposed directly beneath dispersion wheel **350**. Exit apertures **353, 354** in base plate **351** align with chutes **311** leading to dispensers **200**. Apertures **353, 354** are disposed in radially arrayed pairs with which cups **356** on dispersion wheel **350** align so that bottles **10** in cups **356** may drop into columns **311** when released.

Gates **360** comprise horizontally disposed, trapezoidal doors **361** adapted to articulate between radially opposing positions **367, 368** in response to actuators **364** operated by system **1000**. Positions **367, 368** (Figure **9**) represent open and closed states for apertures **353, 354**. Doors **361** surround and define ports **365, 366** which align with apertures **353, 354** when doors **361** are in position **368** and which are offset from apertures **353, 354** when doors **361** are in position **367**.

Thus, when bottle **10** sitting atop gate **360** is to be dropped into one of chutes **311**, gate **360** operates to shift door **361** from closed position **367** to open position **368**, thereby aligning ports **365, 366** with apertures **353, 354** respectively and allowing bottle **10** to drop through door

361 into column **311**. Once bottle **10** has cleared gate **360** and has arrived at dispenser **200**, as determined by sensors located at dispenser **200**, gate **360** closes and dispersion wheel **350** rotates to align another bottle **10** with another of columns **311**.

To position each bottle **10** above the correct dispenser **200** containing pharmaceutical **P** required for it, dispersion wheel **350** rotates about axis **D** while bottles **10** held in cups **356** slide along the upper surface of gates **360** (as best seen in Figure **14**). Motor **358** (Figure **6**) disposed beneath stationary base plate **351** rotates dispersion wheel **350** axially around column **303** and axis **D** until bottle **10** aligns with dispenser accumulation column **311** associated with dispenser **200** to which bottle **10** has been directed by system **1000**. Dispersion wheel **350** can move in both clockwise and counterclockwise directions to minimize the distance bottles **10** must move between accumulator **340** and the appropriate gate **360**. Further, both rows of cups **356** may contain one or more bottles **10** to optimize the operation of dispersion wheel **350**. Not all cups **356** will contain bottles **10** at one time, however, because that could lead to excessive wear on bottoms **20** of bottles **10**. System **1000** includes optimizing routines for deciding when to drop bottles into which cups **356** and which direction and how much to rotate dispersion wheel **350** to maximize throughput of bottles **10** with the least amount of wear.

Pharmaceutical Dispensing

Referring now to Figure **11**, dispenser **200** comprises a substantially rectangular cabinet which contains hopper **260** holding a quantum of pharmaceuticals **P** admitted thereto from canister **230**. Canister **230** couples to dispenser **200** through lock neck **240** which contains gates which will not open until system **1000** confirms that pharmaceuticals **P** contained in canister **230** are those which are intended to be dispensed by dispenser **200**. This is confirmed by scanning bar codes on canister **230**, lock neck **240** and dispenser **200**, all of which should be predetermined by system **1000** to be mated as shown. Once this is confirmed, lock neck **240** opens and admits the entire volume of pharmaceutical **P** contained in canister **230** into hopper **260** to be dispensed one at a time by dispensing disk **270** into bottles **10**.

Bottles **10** arrive in dispenser accumulation chutes **311** and stack up until they are urged one at a time by bottle pusher **313** beneath the outfall of dispenser **200**. When bottle **10** arrives in column **311** and its turn comes to be filled, four potential states can occur. First, system **1000** reads indicia on label **2** and compares it with the bar codes on dispenser **200** to verify that bottle **10** is supposed to be filled with pharmaceuticals from dispenser **200**. If not, bottle **10** is ejected, and a new bottle **10** is prepared at labeler **120** for the missing prescription.

If indicia **9** indicates bottle **10** is supposed to be filled by dispenser **200**, bottle pusher **313** moves bottle **10** beneath sensor **255** to be filled. As disk **270** rotates to drop individual pills of pharmaceutical **P** into bottle **10**, sensor **255** counts them to verify that bottle **10** receives the proper number of pills of pharmaceutical **P**, whereupon disk **270** stops and bottle pusher **313** extracts bottle **10** and urges it onto rotating table **324** (Figures **10, 13A, 13B**) while another bottle **10** drops into place in bottle pusher **313** to be filled at dispenser **200**.

Bottle Capping System

Referring now to Figures **10**, **12A, 12B, 13A, 13B** and **14**, bottle capping system **330** closes bottles **10** by automatically installing cap **50**. Caps **50** enter dispensing station **300** through decelerator chamber **163** atop column **303**. As best seen in Figures **1, 2**, caps **50** enter system **1000** at bulk hopper **161** where they are inducted into system **1000** in bulk. Hopper **161** then propels caps **50** through feed line **162** to dispensing station **300** decelerators **163**, passing through diverters **140** as necessary. In decelerator **163**, caps **50** slow and fall through duct **164** into cap bowl feeder **166** from whence they are righted and fed individually through conveyor **333** to automatic bottle capper **335** inside the lower level of dispensing station **300** (Figures **10, 12A**). A suitable capper **335** is available commercially.

As bottles **10** leave dispensers **200**, they move onto annular, moving turntable **324** which rotates around axis **D** continuously until stopped by system **1000**. As bottles **10** travel around axis **D**, they are captured by entrance conveyor **327** and urged into capping wheel **334** which incrementally rotates to place first one bottle **10** after another under capper **335** to receive cap **50**.

Figures **13A, 13B** demonstrate two alternate embodiments for entrance conveyor **327**. In Figure **13A**, entrance conveyor **327A** comprises motor driven worm gear **329** with teeth adapted to surround walls **11** of bottles **10** and urge them radially inward from table **324** to capping wheel **334**. In Figure **13B**, entrance conveyor **327B** comprises baffle **328** disposed diagonally across table **324** which slidably diverts bottles **10** radially inward toward capping wheel **334**. Entrance conveyors **327A, 327B** each have advantages. Conveyor **327B** is simple and requires few moving parts, the movement of bottles **10** being a consequence of the rotation of table **324**. Conveyor **327A**'s separately controlled worm gear **329** permits system **1000** to control bottles **10** more precisely as they enter capping wheel **334** without having to stop or regulate rotation of table **324**. One having ordinary skill in the art will recognize that all bottle conveyor systems for the purpose, including conveyors **327A, 327B**, are considered to be within the spirit and scope of the present invention.

As best seen in Figure **14**, bottles **10** are captured by capping wheel **334** in notches **336** and incrementally moved into position for capping beneath capper **335**. Caps **50** enter capper **335** from bowl feeder **166** on cap chute **333** and capper **335** threads them onto bottles **10**, thereby sealing bottles **10** with pharmaceuticals **P** inside. Capping wheel **334** continues to move capped bottles **10** around its perimeter until they fall through outlet **337** into outlet tube **339** on their way to verification stage **400**.

Dispensing station **300** of the present invention thus brings together bottles **10** labeled with indicia **9** signifying a particular patient's prescription with the pharmaceuticals that are to be dispensed into them. Station **300** makes very efficient use of pharmacy floor space, having a large array of dispensers **200** arrayed around a single capping machine. Empty bottles **10** directed by system **1000** to station **300** are dropped into dispersion wheel **350** which rotates to drop each bottle **10** to its assigned dispenser **200** without taking up any more floor space.

While the invention has been particularly shown and described with reference to preferred and alternate embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the

invention. For example, though dispensing station **300** and dispensers **200** have been presented herein in the context of prescription filling of pharmaceuticals, they easily could be adapted to dispense any inventory of small objects, such as screws, nuts or other fasteners. Container **10** has been described as a bottle having dimensions convenient to the described pharmaceutical prescription application, but it could be considerably larger or smaller as required, either in similar pharmaceutical prescription filling systems or other applications, and it could be a container **10** having other shapes and characteristics which still cooperates with container transport system tubes **100** to move between stations **300, 400, 500** and **600**.

I claim:

1. A small object dispensing station for dispensing small objects into containers, the containers having an interior surrounded by cylindrical walls, a transverse bottom closing said interior, a mouth opposite said bottom for admitting said small objects, and indicia borne on said container identifying and quantifying said small objects to be dispensed into said interior, the dispensing station comprising

a plurality of small object dispenser means for dispensing said small objects into said containers, said dispenser means arrayed around an annular platform supported by a base and having a vertical axis;

a plurality of container chutes, each chute having a lower discharge port coupled to one of said dispenser means and extending upward to terminate at an input port;

a rotatable dispersion wheel coaxial with and disposed above the annular platform and coupled to the input ports, the dispersion wheel having

coaxial annular lower and upper plates disposed a spaced distance apart, and

a plurality of cylindrical cups sandwiched between said lower and upper plates, each cup forming a conduit between a pair of lower and upper openings surrounded and defined by said lower and upper plates, each of said cups being adapted to receive one of said containers and to be rotatably aligned with one of said input ports;

a plurality of gate means disposed between said cups and said input ports and adapted articulate between an open position adapted to admit a container from one of said cups into one of said input ports and a closed position blocking said input port and retaining said container within said cup;

container entraining means for entraining said containers in sequence for entering said cups;

discharge means for discharging said containers after said small objects have been dispensed into said containers; and

controller means for operating said dispensing station.

2. The small object dispensing station according to Claim 1 wherein the small object dispenser means comprises

a cabinet surrounding a cabinet interior and having a upper cabinet door and a lower cabinet door, said lower cabinet door coupled to said container chute;

a bulk cannister containing a quantity of small objects, said bulk cannister coupled to a cabinet top of said cabinet and aligned with a cabinet door of said cabinet communicating with said cabinet interior;

a lock neck coupled between said cannister and said cabinet door, said lock neck securely attaching said bulk cannister to said cabinet and operable to admit said bulk small objects into said cabinet interior through said cabinet door;

a hopper disposed within the cabinet interior beneath said cabinet door;

an object counter disposed beneath the hopper and adapted to count a measured quantity of small objects and to dispense them one at a time through the lower cabinet door into a container.

3. The small object dispensing station according to Claim 1 wherein the gate means comprises

a trapezoidal block disposed below said lower plate of said dispersion wheel, said trapezoidal block surrounding and defining at least one window adapted to be aligned with one of said cups; and

a gate actuator coupled to said trapezoidal block and operable by said controller means to slide said trapezoidal block radially between said open position and said closed position.

4. The small object dispensing station according to Claim 1 wherein said entraining means comprises

at least one container accumulator disposed above said dispersion wheel and having

at least one entrance conduit through which a plurality of containers arrives at said dispensing station;

an exit conduit corresponding to each at least one entrance conduit and positioned above said upper dispersion wheel plate and in alignment with one of said cups;

a first actuator doors disposed within said accumulator in alignment with said at least one entrance conduits;

a second actuator door disposed within said accumulator above said first actuator door and operable to

support a plurality of containers accumulating within said at least one entrance conduit; and

drop one of said containers onto said first actuator door in response to instructions from said controller means while retaining the remainder of said plurality of containers in said at least one entrance conduit; and

indicia reading means disposed between said first and second actuator doors enabling said controller means to read reading indicia on said containers and to determine to which input chute to direct said container.

5. The small object dispensing station according to Claim 1 wherein said discharge means comprises

a turntable supported by said annular platform and adapted to receive containers from said dispenser means after said small objects have been dispensed into them and to rotate them around said vertical axis standing upright on their container bottoms;

container capture means disposed coplanar with said turntable and adapted to capture each container from said turntable and to urge it radially inward toward said vertical axis;

a container incrementing wheel coupled to said capture means and adapted to increment each container into a plurality of container exit positions one at a time;

sealing means disposed adjacent a first one of said plurality of container exit positions for sealing said mouth of said container; and

at least one outlet disposed below a second one of said plurality of container exit positions and communicating with pneumatic conduits adapted to carry said container to another container processing station outside said dispensing station.

6. The small object dispensing station according to Claim 5 wherein said sealing means comprises

a capper adapted to apply a cap to said container, said capper having

a hopper containing a plurality of caps adapted to fit over said mouth of said container;

a cap positioner adapted to position a cap above said mouth and in threaded contact therewith; and

a container turntable adapted to rotate said container to cause threads on said mouth and within said cap to close and seal said mouth with said cap.

7. The small object dispensing station according to Claim 5 wherein the container capture means comprises

a baffle disposed above said turntable and radially extending a partial distance across said turntable, said baffle adapted to intercept each of said bottles and move it radially inward, propelled by movement by said turntable..

8. The small object dispensing station according to Claim 5 wherein the container capture means comprises

a radially disposed conveyor coupled between said turntable and said incrementing wheel and having

a worm gear adapted to grasp each container and to entrain a plurality of containers one at a time into a slot in said incrementing wheel; and

a baffle disposed on said worm gear above said turntable and adapted to capture a plurality of containers and to urge them into said worm gear

wherein the worm gear is operable by said controller means to urge each container toward said incrementing wheel as said incrementing wheel turns an empty slot to said worm gear.

9. The small object dispensing station according to Claim 1 wherein the controller means comprises

a computer coupled to said small object dispensing station and having a central processor, a quantum of random access memory, at least one dynamic data storage device, a graphical user interface and at least one user input device;

a computer program operable on said computer and adapted to

read dispenser indicia disposed on each of said dispenser means to determine a type and quantity of said small objects it contains;

monitor said container indicia reading means on said entraining means to track a location and status of each container as it arrives at said dispensing station;

operate said dispersion wheel to direct each of said containers to a one of said dispensing means for dispensing the type and quantity of small objects intended to be dispensed into said container according to said container indicia;

operate said dispenser means to dispense said type and quantity of small objects into said container;

operate said discharge means to seal said container and to discharge it from said dispensing station;

store in a database on said dynamic storage device a record of said contents of each of said containers; and

display to a user on said graphical user interface a status of each container.

10. A system for matching pharmaceutical prescription bottles with bulk dispensers of pharmaceuticals to assure accuracy of prescription filling, the system comprising

a plurality of bottles bearing bottle indicia adapted to identify a type and quantity of pharmaceuticals to be dispensed into each of said bottles;

at least one pharmaceutical dispensing station having

a plurality of pharmaceutical dispensers, each positioned around an annular platform having a vertical axis;

a rotatable dispersion wheel coaxial with and disposed above the annular platform and coupled by a plurality of bottle chutes to each of said dispensers, the dispersion wheel having

a plurality of cylindrical cups adapted to receive one of said bottles and to be rotatably aligned with one of said bottle chutes;

a gate disposed above each of said bottle chutes and adapted to open to admit a bottle from one of said cups into one of said bottle chutes; and

a bottle accumulator disposed above said dispersion wheel and adapted to read said bottle indicia and to release said bottle into one of said cups;

a capper coupled to said dispensing station and adapted to cap each bottle after said pharmaceuticals have been dispensed into said bottle;

bottle inducting means for inducting said bottles into said system; and

controller means for operating said system.

11. The system according to Claim 10 wherein each of said at least one pharmaceutical dispensing stations further comprises

bulk pharmaceutical indicia disposed on each of said pharmaceutical dispensers; and

pharmaceutical dispenser location indicia disposed on each of said pharmaceutical dispenser locations

wherein said controller means is operable to determine from said bulk pharmaceutical indicia and said pharmaceutical dispenser locations which gate to operate to drop each bottle from said dispersion wheel for dispensing said type and quantity of pharmaceuticals according to said bottle indicia.

12. The system according to Claim 10 wherein the bottle inducting means comprises

a bottle unscrambler adapted to align a plurality of bulk bottles in a single direction for entering a bottle transport conduit with its bottom directed toward a next station;

a labeler adapted to receive each bottle from said bottle unscrambler and to apply a label to an exterior wall of said bottle, said label bearing said bottle indicia, said labeler coupled to said accumulator of said at least one dispensing station by pneumatic conduits adapted to receive and transmit said bottles; and

a cap inductor adapted to induct and direct a plurality of caps through pneumatic conduits to said capper.

13. An improved method of matching pharmaceutical prescription bottles with bulk dispensers of pharmaceuticals to assure accuracy of prescription filling, the method comprising

providing a plurality of bottles bearing machine-readable bottle indicia adapted to determine a type and quantity of pharmaceuticals to be dispensed into each of said bottles;

providing at least one pharmaceutical dispensing station having

a plurality of pharmaceutical dispensers, each positioned coaxially around an annular platform having a vertical axis and bearing machine-readable pharmaceutical indicia and dispenser location indica;

a rotatable dispersion wheel coaxial with and disposed above the annular platform and coupled by a plurality of bottle chutes to each of said dispensers, the dispersion wheel having

a plurality of cylindrical cups adapted to receive one of said bottles and to be rotatably aligned with one of said bottle chutes;

a gate disposed above each of said bottle chutes and adapted to open to admit a bottle from one of said cups into one of said bottle chutes;

a bottle accumulator disposed above said dispersion wheel and adapted to read said bottle indicia and to release said bottle into one of said cups; and

a capper coupled to said dispenser and adapted to cap each bottle after said pharmaceuticals have been dispensed into said bottle;

providing a bottle labeler adapted to apply unique identifying bottle indicia onto said bottles and to direct them to said at least one pharmaceutical dispensing station according to said bottle indicia; and

providing controller means for operating said dispensing station and bottle inducting means; then

operating said controller means to

(a) induct each bottle into said labeler and applying said bottle indicia to said bottle; then

(b) directing said bottle toward said accumulator on one of said at least one pharmaceutical dispensing stations; then

(c) reading said bottle indica at said accumulator to determine a select one of said plurality of dispensers said bottle is to be directed; then

(d) rotating said dispersion wheel to translate said bottle to a position above said chute leading to said select one of said plurality of dispensers; then

(e) operating said gate to drop said bottle into said select one of said plurality of dispensers; then

(f) operating said select one of said plurality of dispensers to dispense a type and quantity of pharmaceuticals into said bottle according to said bottle indicia; then

(g) operating said capper to cap and seal said bottle; then

(h) discharging said bottle; and

(i) repeating steps (a) - (h), inclusive, for each additional bottle.

14. The improved method of Claim 13 wherein

the controller means comprises

a computer coupled to said at least one pharmaceutical dispensing station and having a central processor, a quantum of random access memory, at least one dynamic data storage device, a graphical user interface and at least one user input device; and a computer program executable on said computer to control said system; and

the improved method includes the following steps to be carried out in parallel with steps (a) through (i):

(j) reading pharmaceutical and dispenser location indicia disposed on each of said dispensers to catalog a type and quantity of said pharmaceuticals available for dispensing at each dispenser location;

(k) monitoring said dispensers to track quantities of pharmaceuticals dispensed from said dispenser locations;

(l) displaying on said graphical user interface information indicating when said dispenser is nearing empty and halting further directing of bottles to said dispenser until said pharmaceuticals are replenished;

(m) storing in a database on said dynamic storage device a record of said contents of each of said bottles after said discharging step (h).

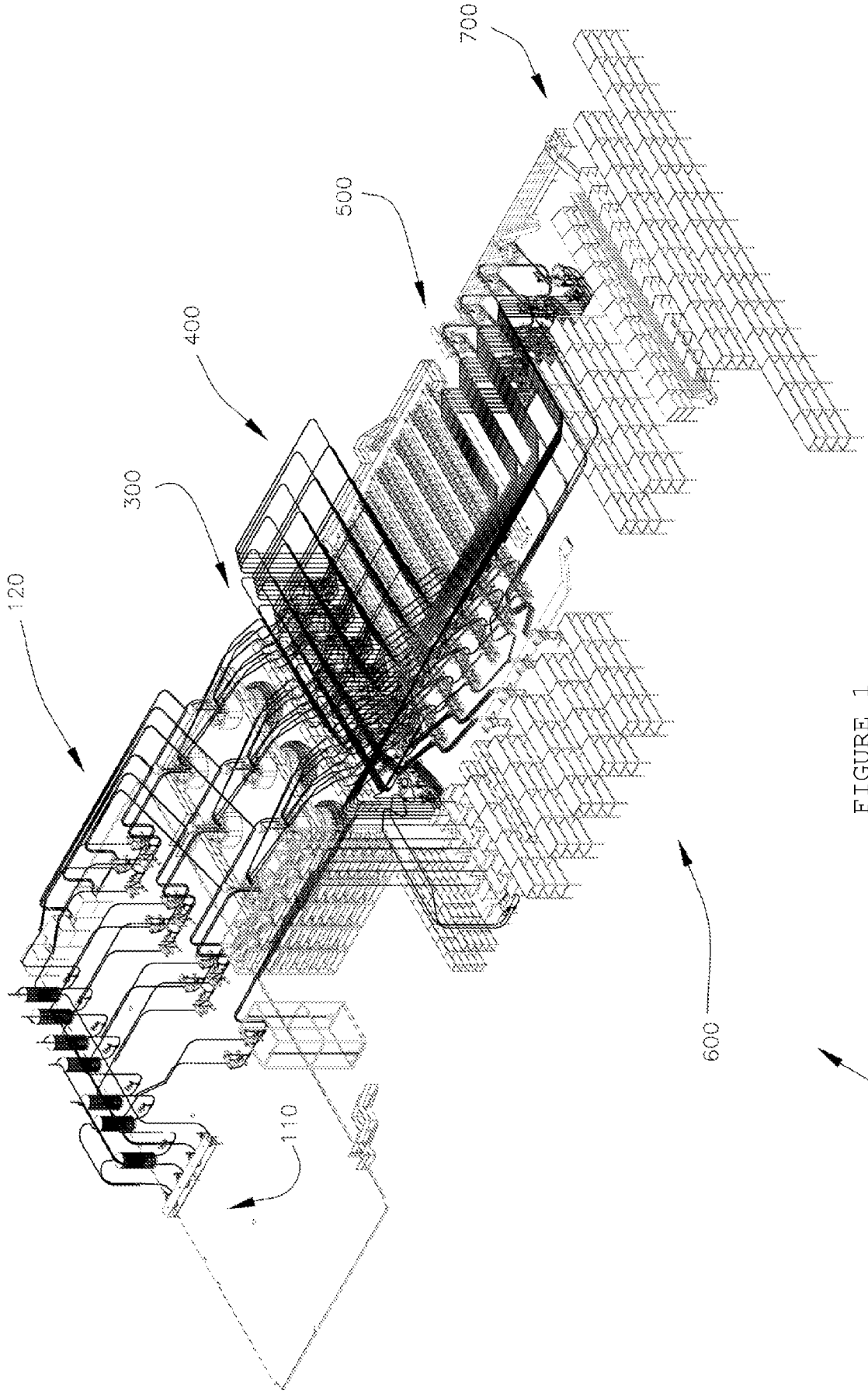


FIGURE 1

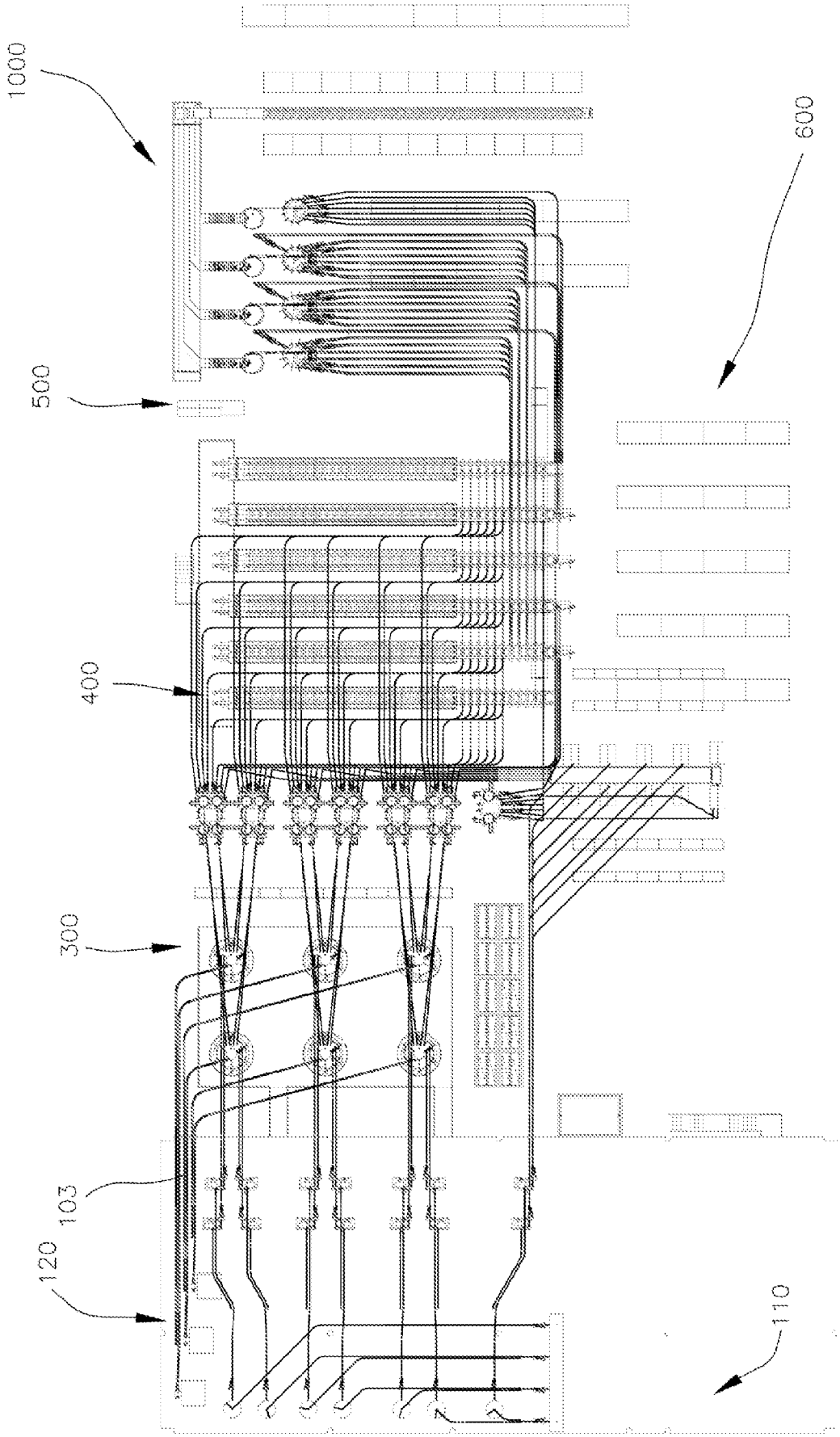


FIGURE 2

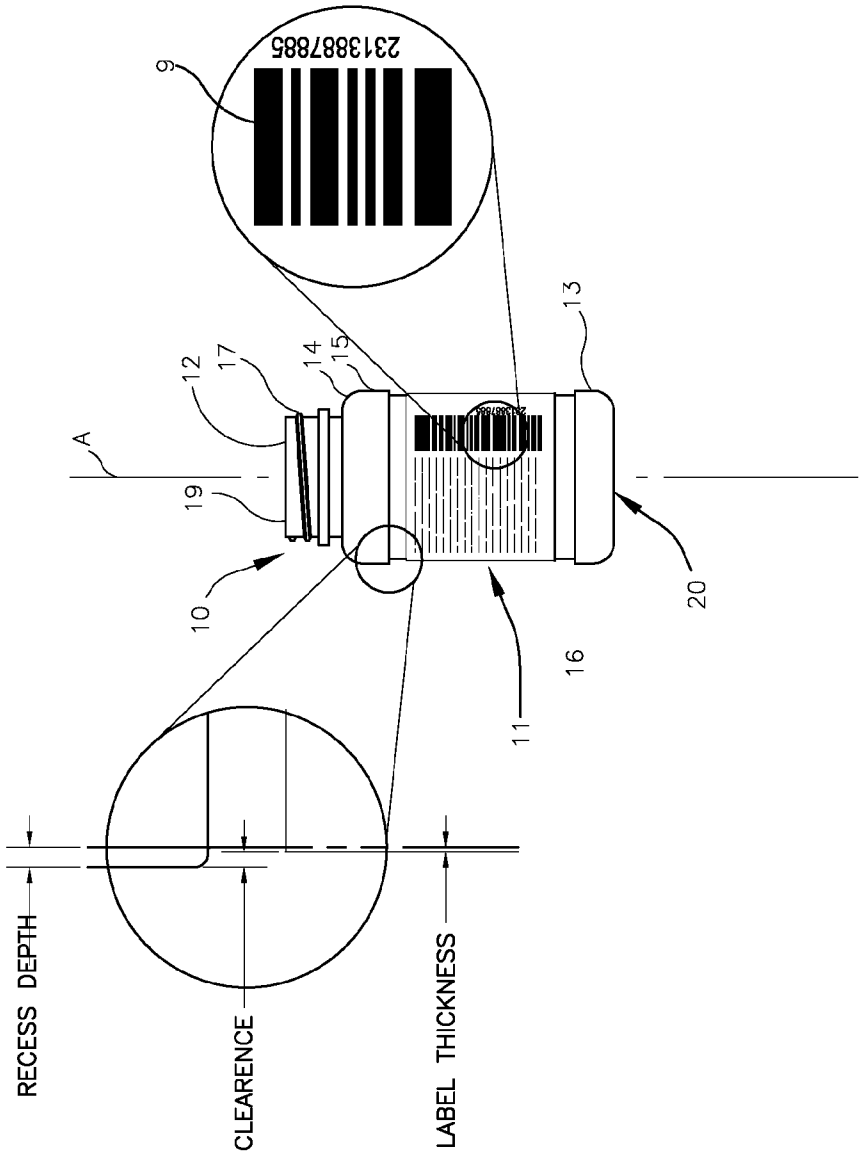

2313887885
9
13
12
17
14
15
A
19
10
11
16
20
RECESS DEPTH
CLEARENCE
LABEL THICKNESS

Figure 3A

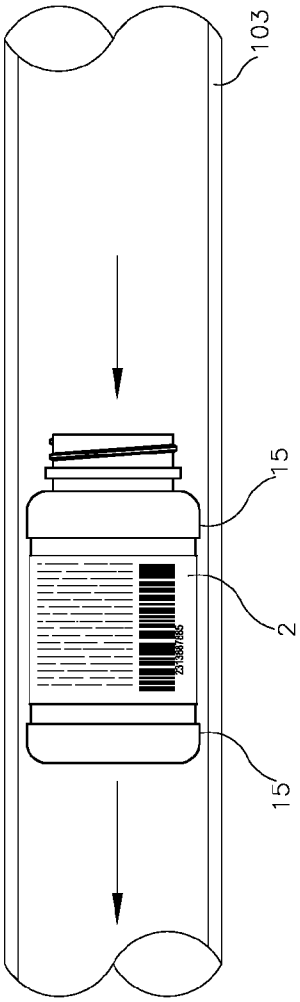


Figure 3D

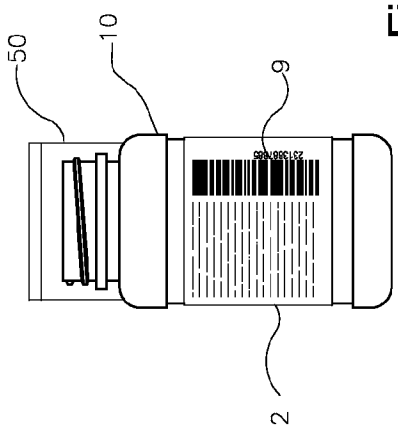


Figure 3C

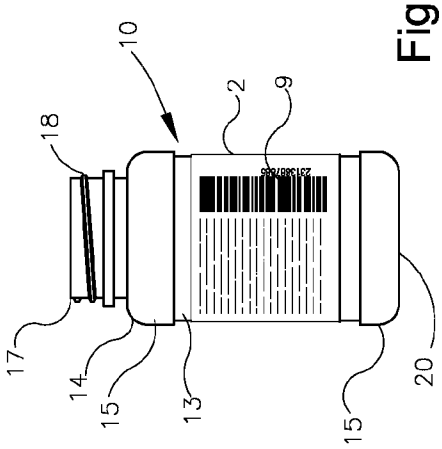


Figure 3B

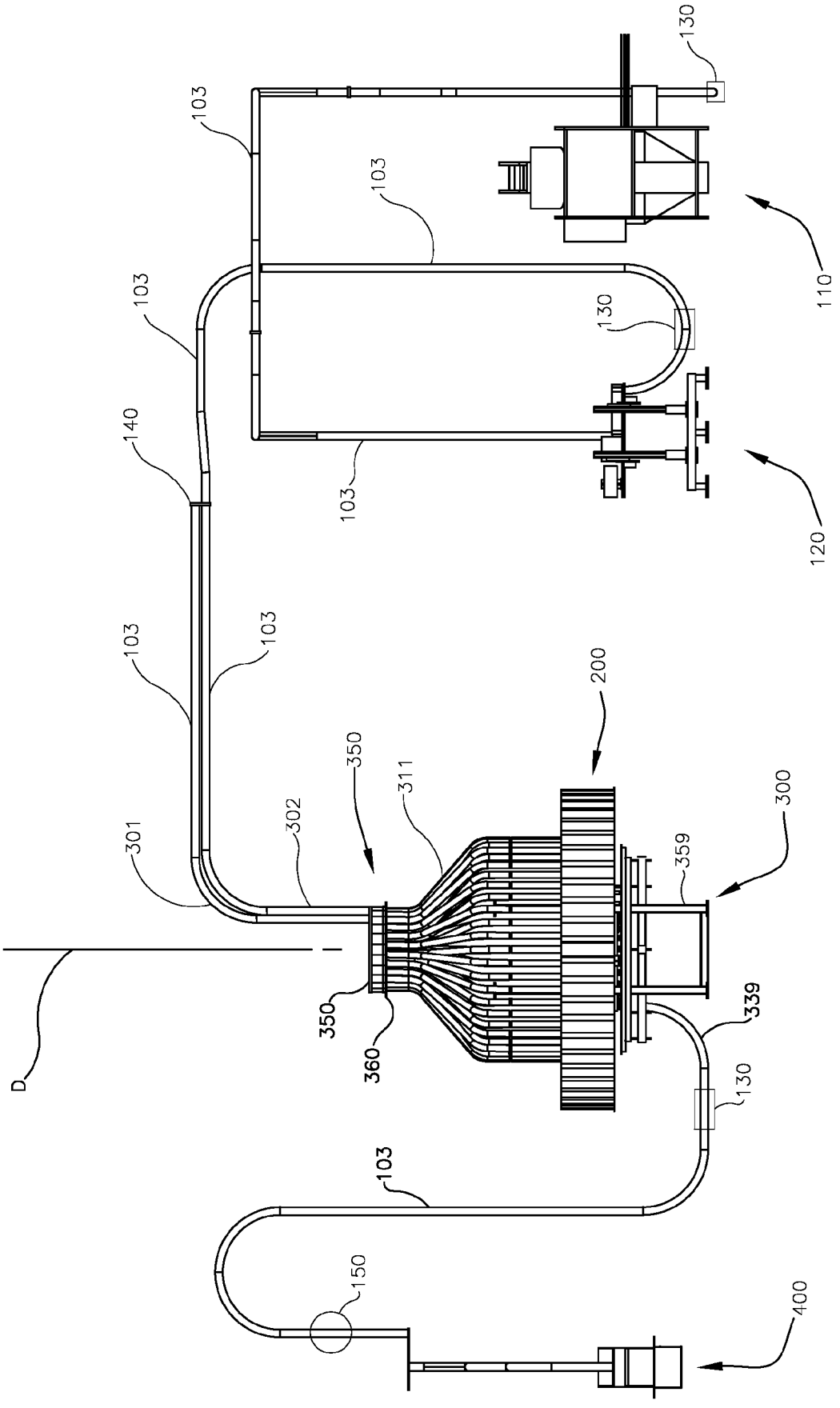

130
103
103
110
103
130
140
103
120
103
103
200
350
311
300
301
302
359
350
339
360
130
103
150
400
D

Figure 4

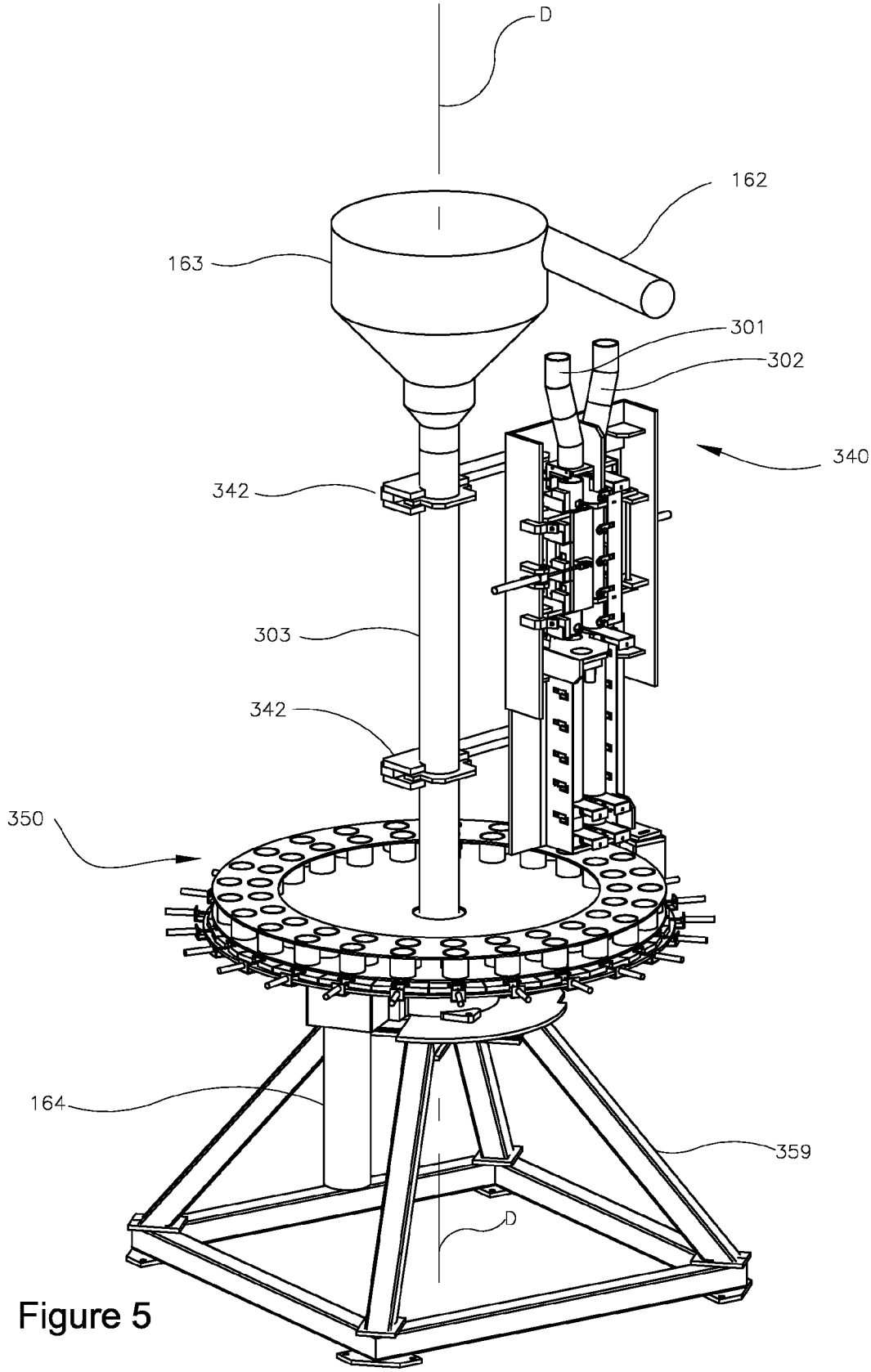


Figure 5

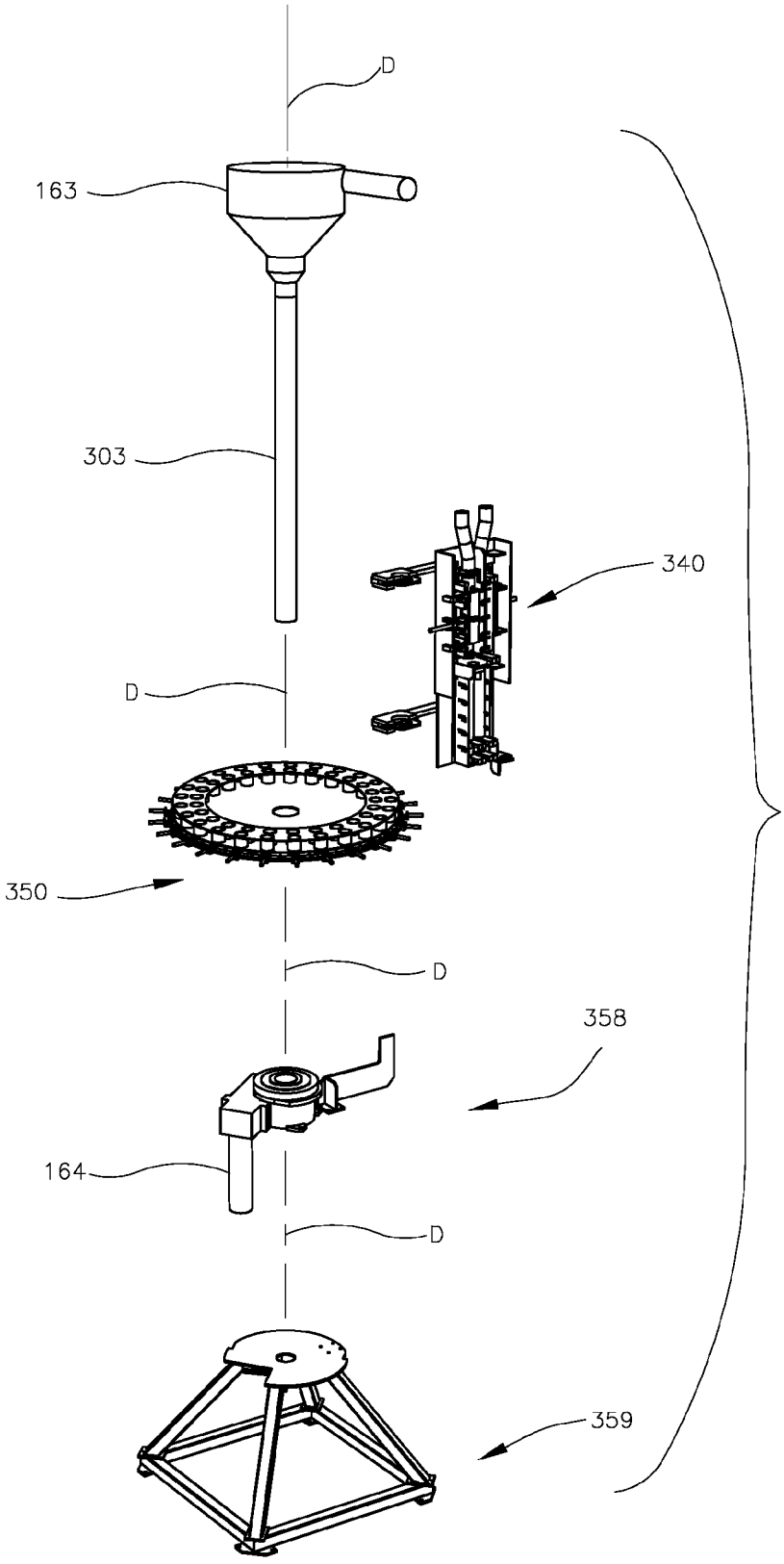


Figure 6

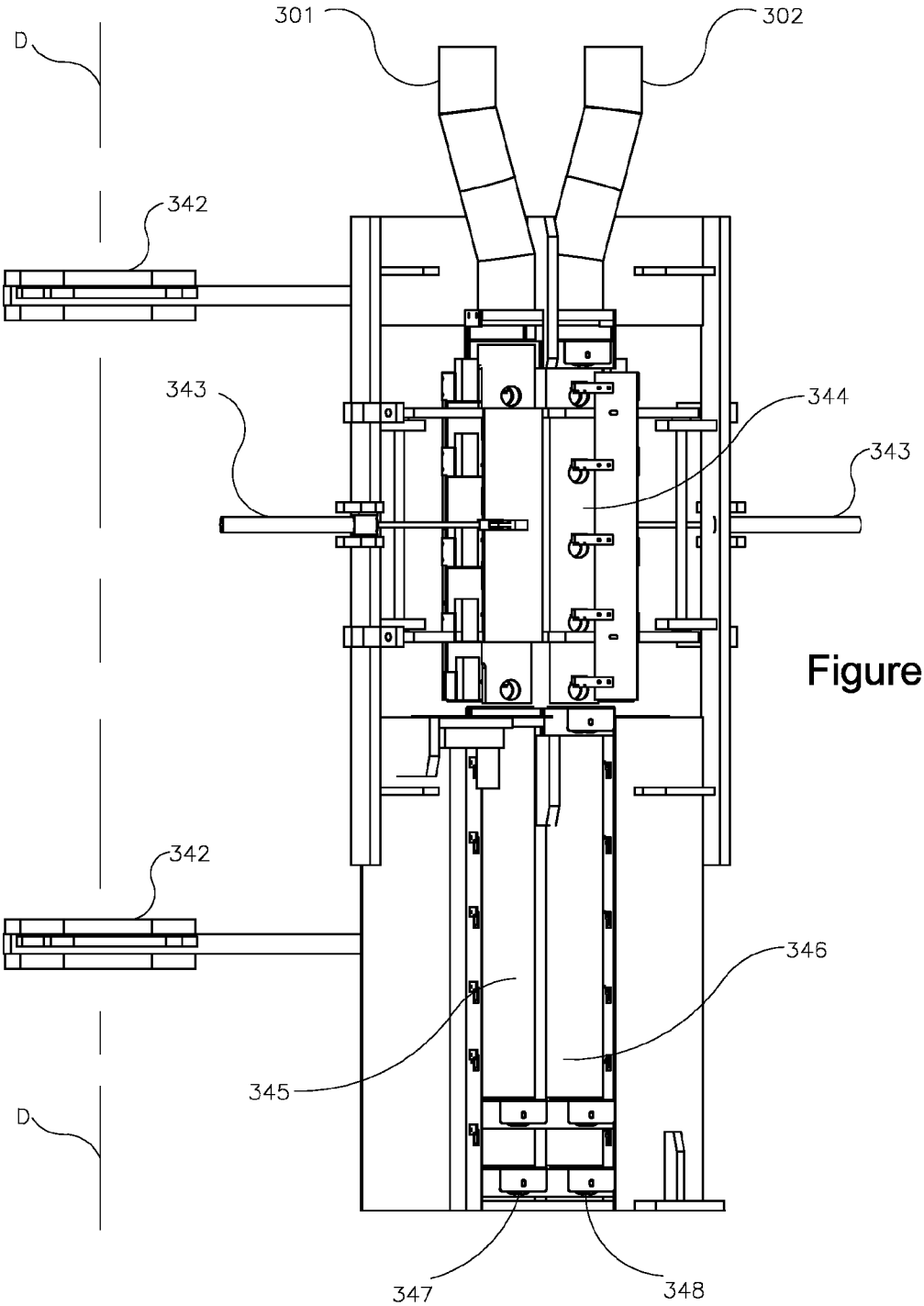


Figure 7

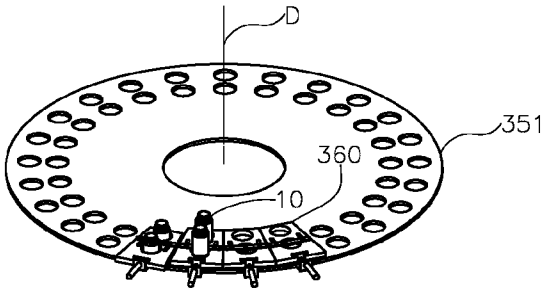


Figure 8A

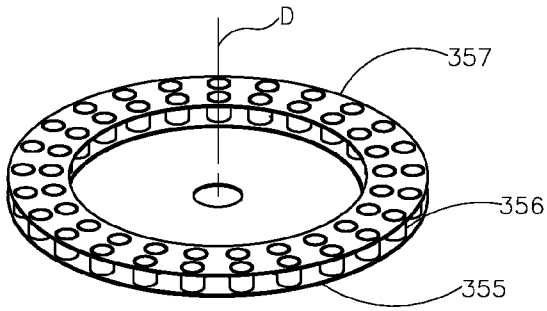


Figure 8B

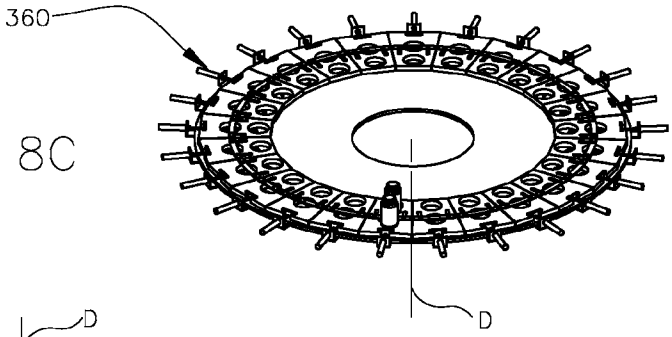


Figure 8C

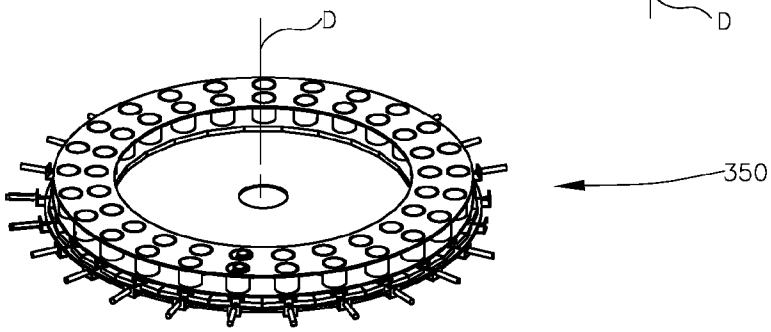


Figure 8D

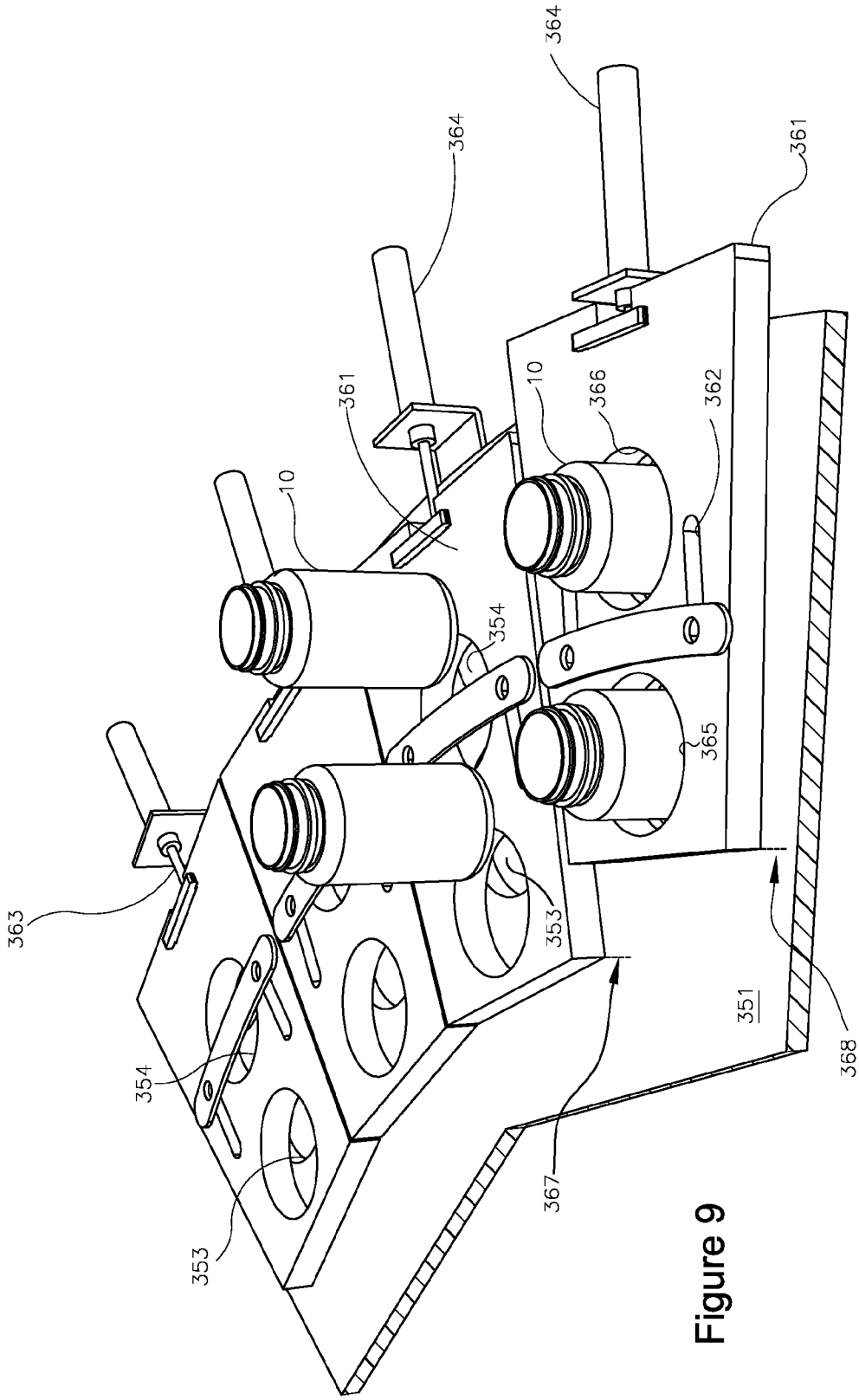
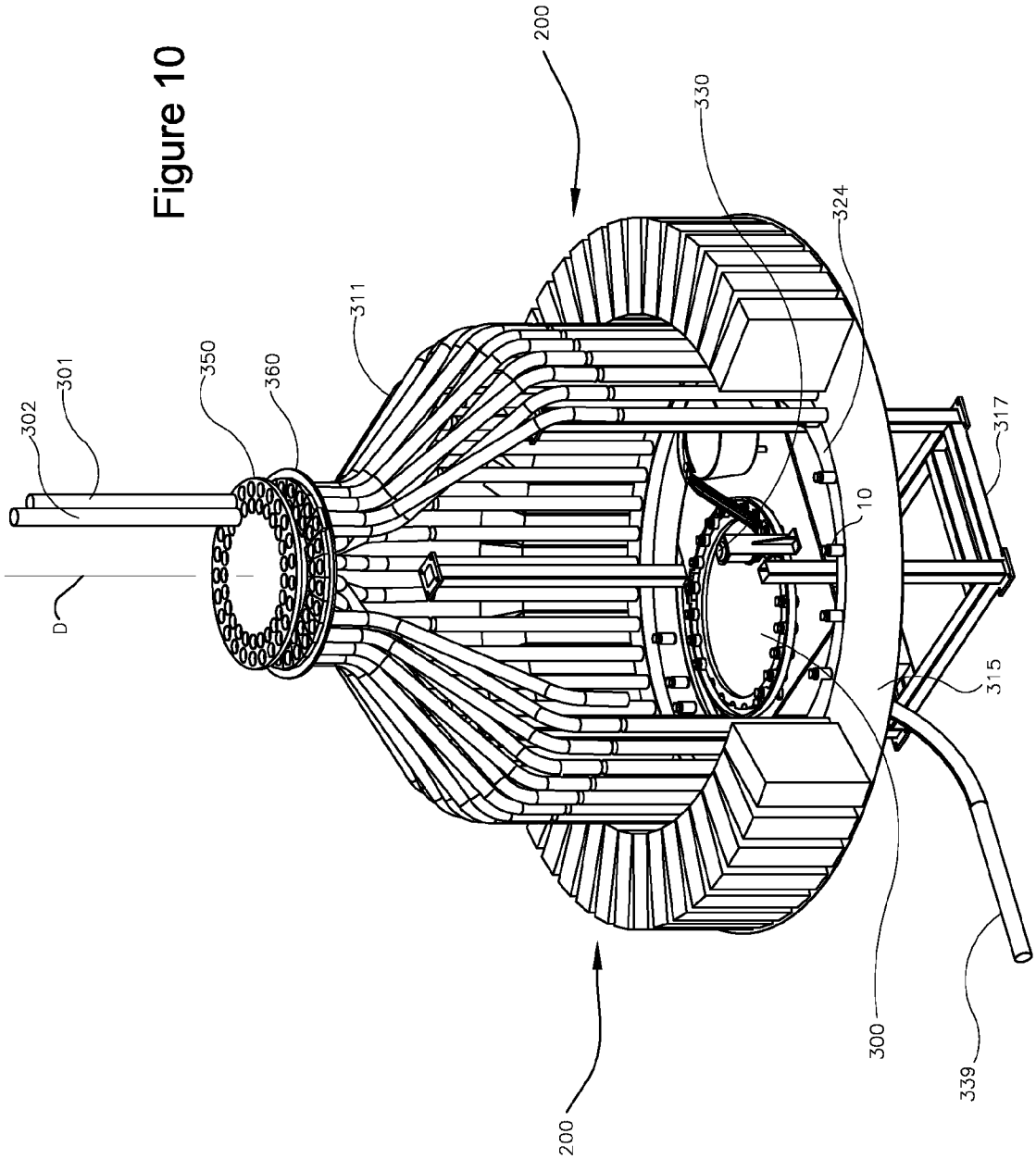


Figure 9

Figure 10



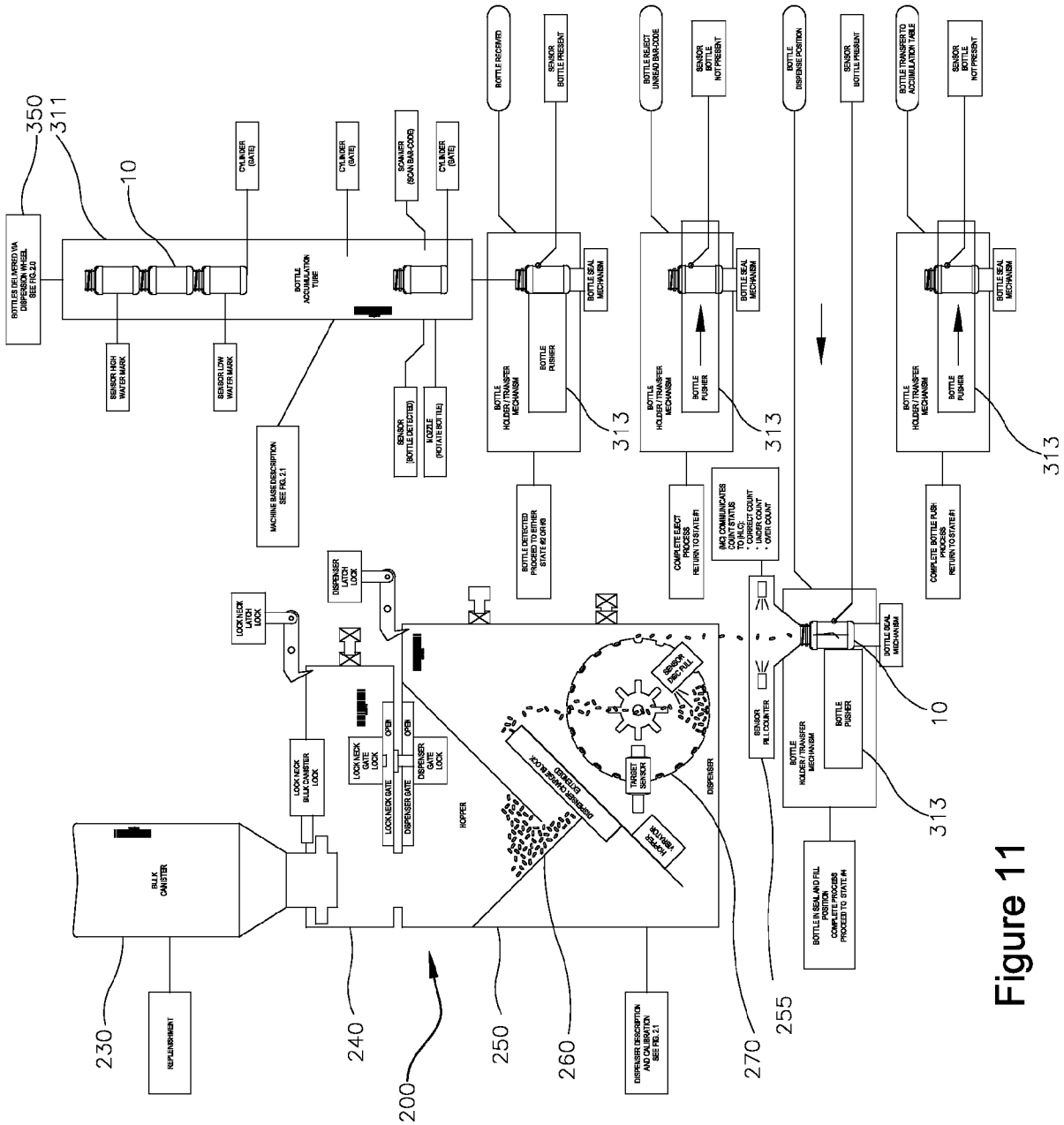

350
311
10
BOTTLES DELIVERED VIA DISPENSION WHEEL SEE FIG.2.0
BOTTLE ACCUMULATION TUBE
CYLINDER (GATE)
CYLINDER (GATE)
SCANNER (BOOK BAR-CODE)
CYLINDER (GATE)
SENSOR HIGH WATER MARK
SENSOR LOW WATER MARK
MACHINE BASE DESCRIPTION SEE FIG. 2.1
SENSOR (BOTTLE DETECTED)
NOZZLE (ROTATE BOTTLE)
BOTTLE RECEIVED
SENSOR BOTTLE PRESENT
BOTTLE SEAL MECHANISM
BOTTLE HOLDER / TRANSFER MECHANISM
BOTTLE PUSHER
313
BOTTLE DETECTED PROCEED TO EITHER STATE #2 OR #3
BOTTLE REJECT UNREAD BAR-CODE
SENSOR BOTTLE NOT PRESENT
COMPLETE EJECT PROCESS RETURN TO STATE #1
IM3 COMMUNICATES COUNT STATUS TO PLC: • CORRECT COUNT • UNDER COUNT • OVER COUNT
BOTTLE DISPENSE POSITION
SENSOR BOTTLE PRESENT
BOTTLE TRANSFER TO ACCUMULATION TABLE
SENSOR BOTTLE NOT PRESENT
COMPLETE BOTTLE PUSH PROCESS RETURN TO STATE #1
DISPENSER LATCH LOCK
LOCK NECK LATCH LOCK
LOCK NECK BULK CANISTER LOCK
LOCK NECK GATE LOCK
OPEN
OPEN
DISPENSER GATE LOCK
LOCK NECK GATE
DISPENSER GATE
HOPPER
BULK CANISTER
DISPENSER
SENSOR DISC FULL
TARGET SENSOR
VOLUMETRIC SENSOR
SENSOR PILL COUNTER
BOTTLE IN SEAL AND FILL POSITION COMPLETE PROCESS PROCEED TO STATE #4
REPLENISHMENT
DISPENSED DESCRIPTION AND CALIBRATION SEE FIG. 2.1
230
240
200
250
260
270
255

Figure 11

Figure 12B

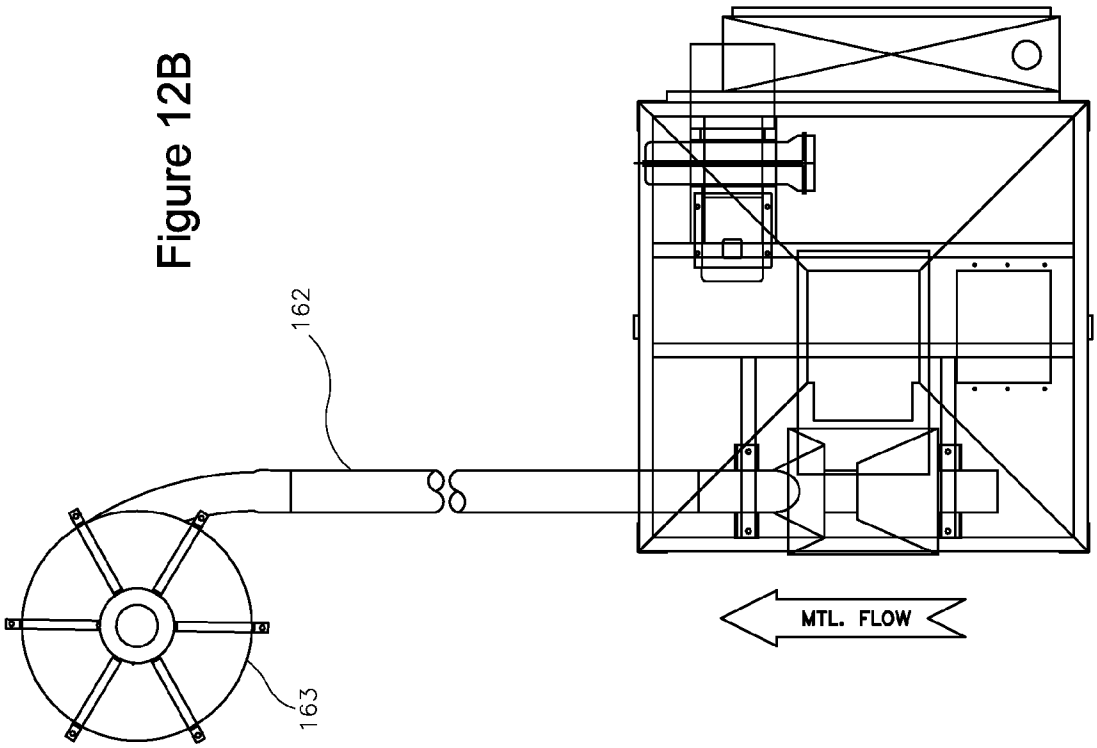


Figure 12A

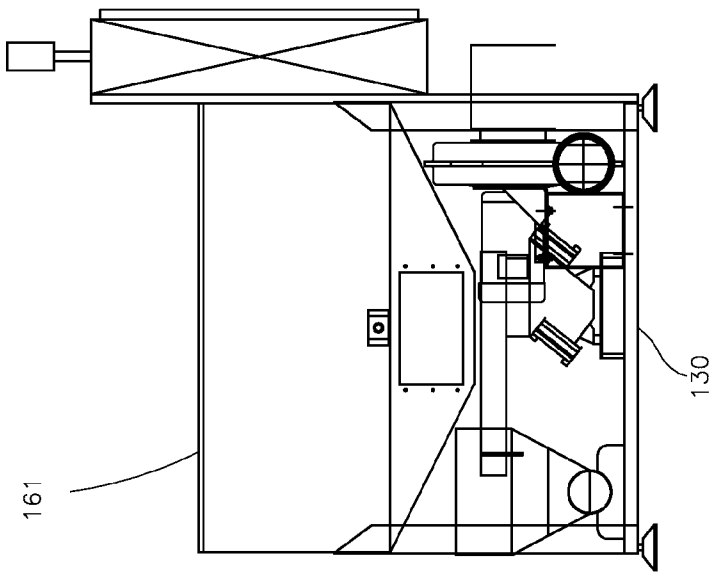
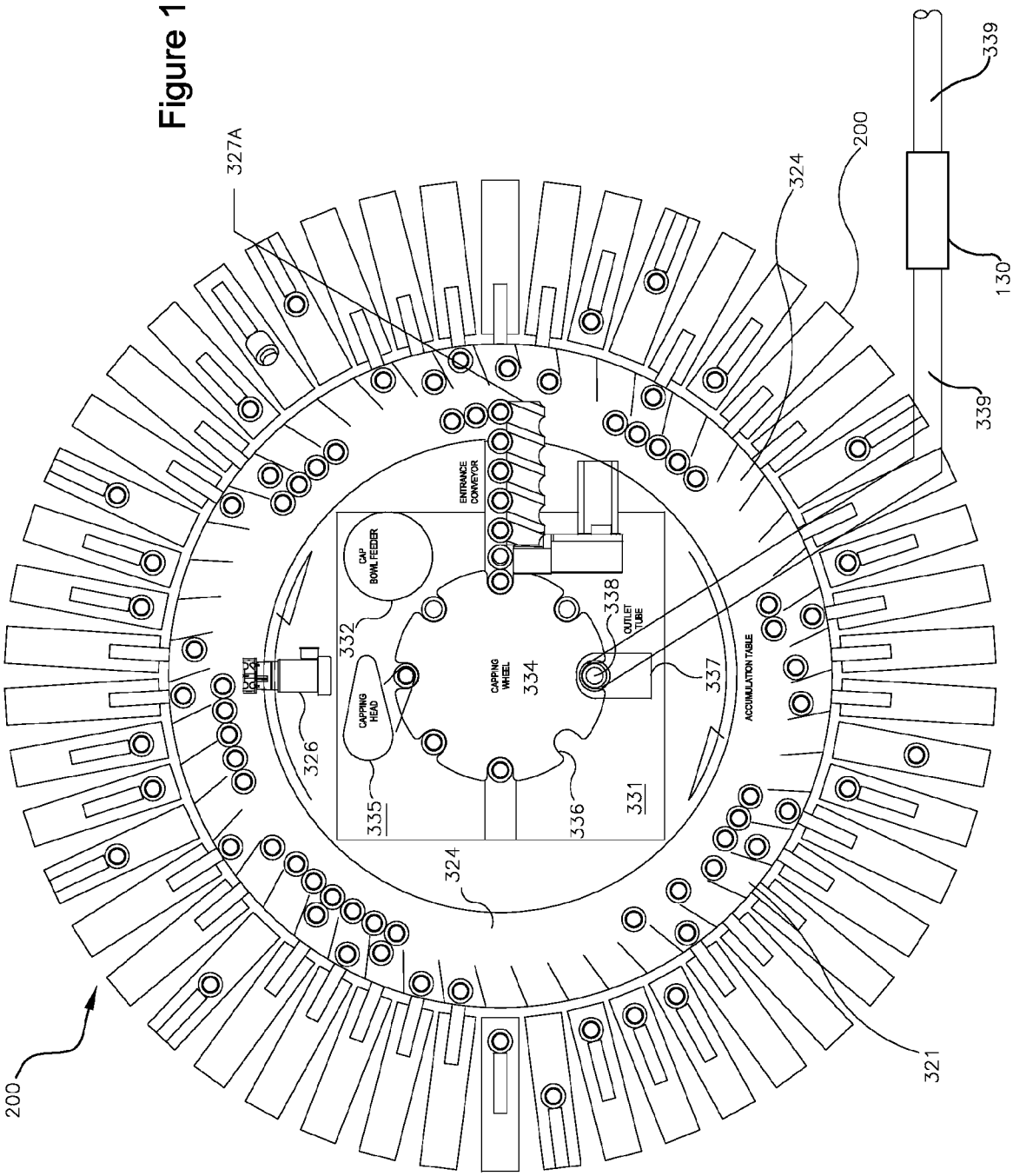


Figure 13A


200
327A
324
200
339
130
339
321
ENTRANCE CONVEYOR
CAP BOWL/FEEDER
332
CAPPING HEAD
326
335
CAPPING WHEEL
334
336
331
324
338
OUTLET TUBE
337
ACCUMULATION TABLE

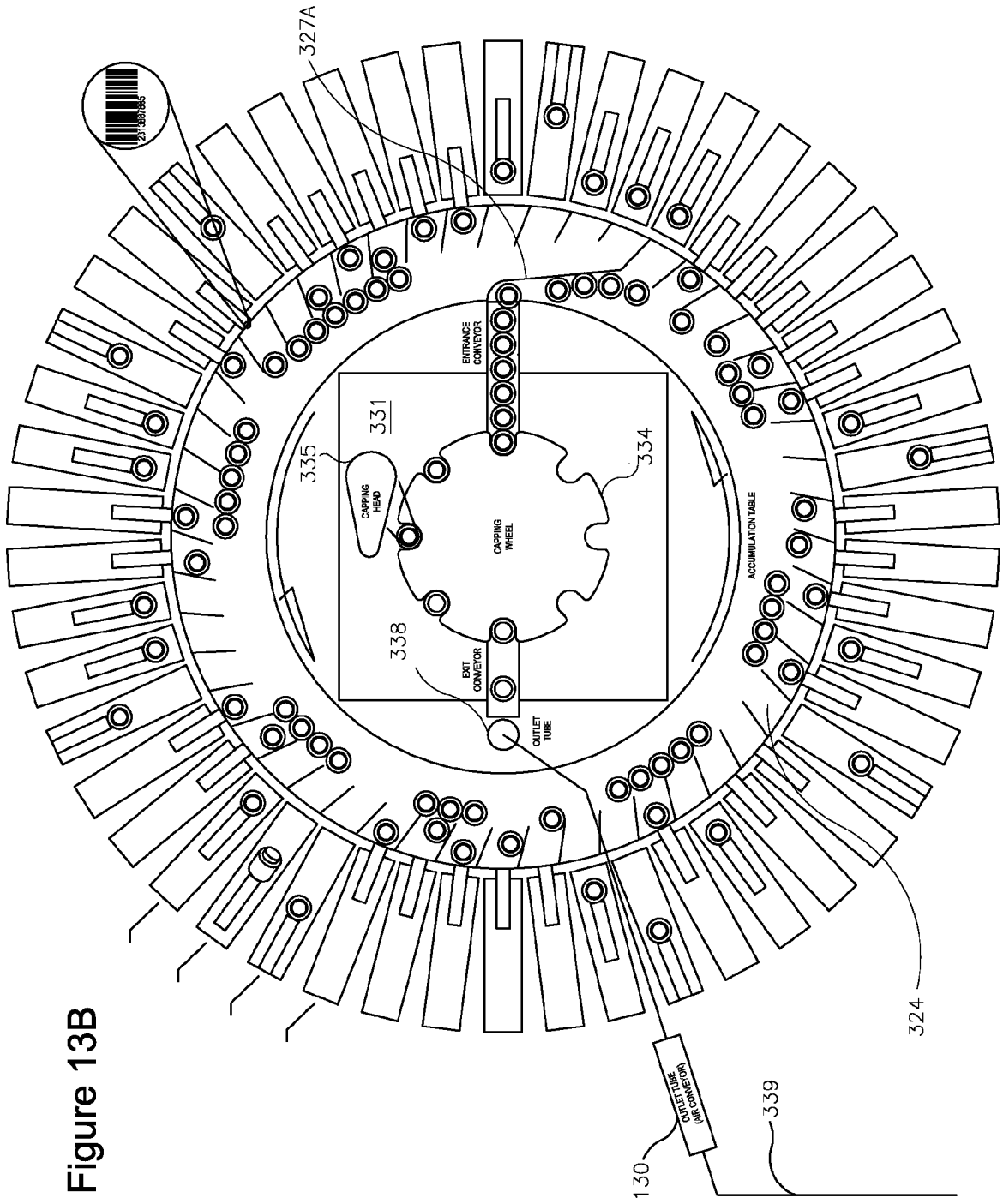

327A
ENTRANCE CONVEYOR
331
335
CAPPING HEAD
CAPPING WHEEL
334
338
EXIT CONVEYOR
OUTLET TUBE
ACCUMULATION TABLE
324
339
130
OUTLET TUBE (AIR CONNECTION)

Figure 13B

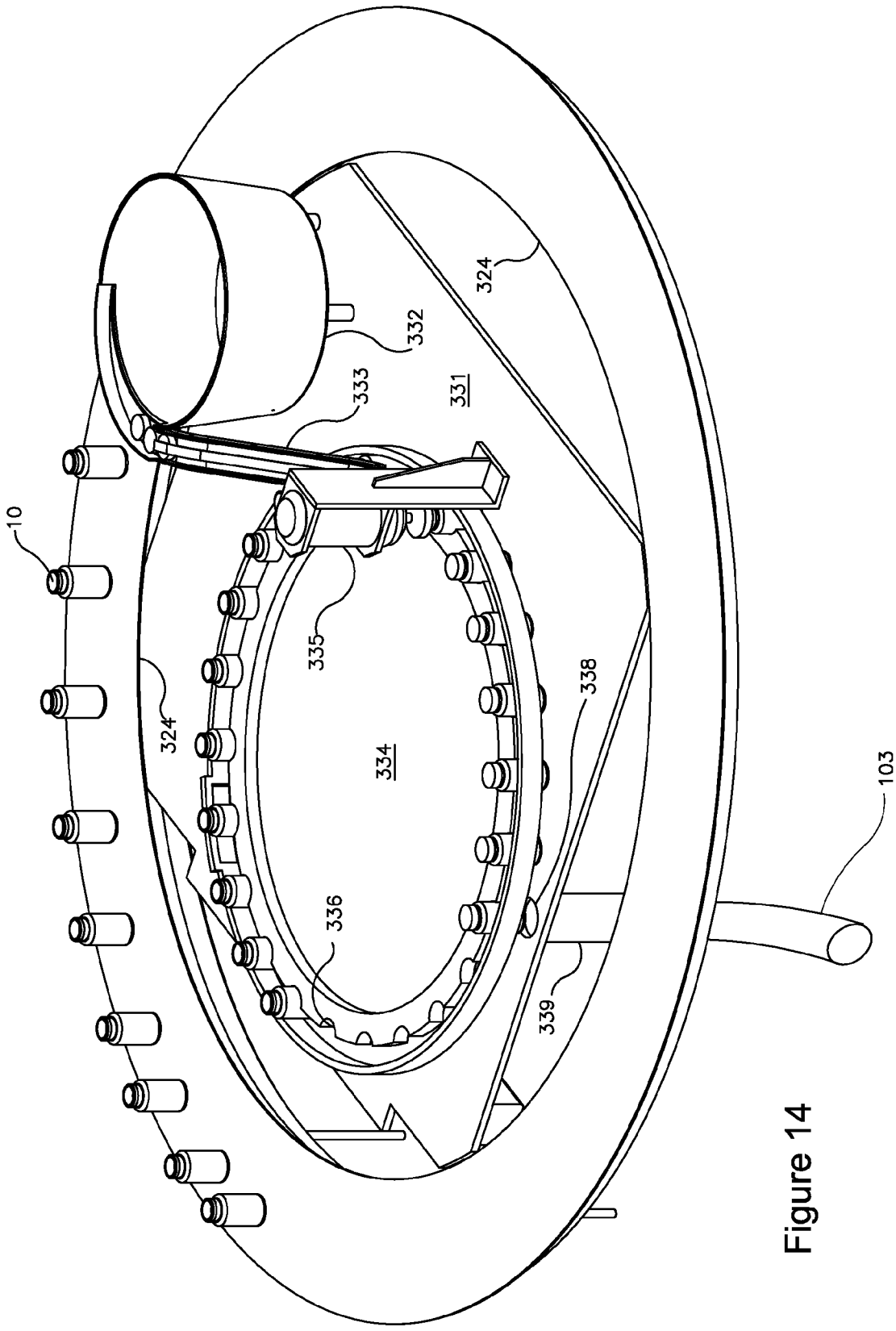


Figure 14