July 3, 1951 W. J. BOEGLY ET AL 2,559,242

CONTAINER FILLING APPARATUS WITH AUTOMATICALLY TIMED FILLING AND CONVEYER MOVEMENT MEANS

Filed Oct. 19, 1946

3 Sheets-Sheet 1

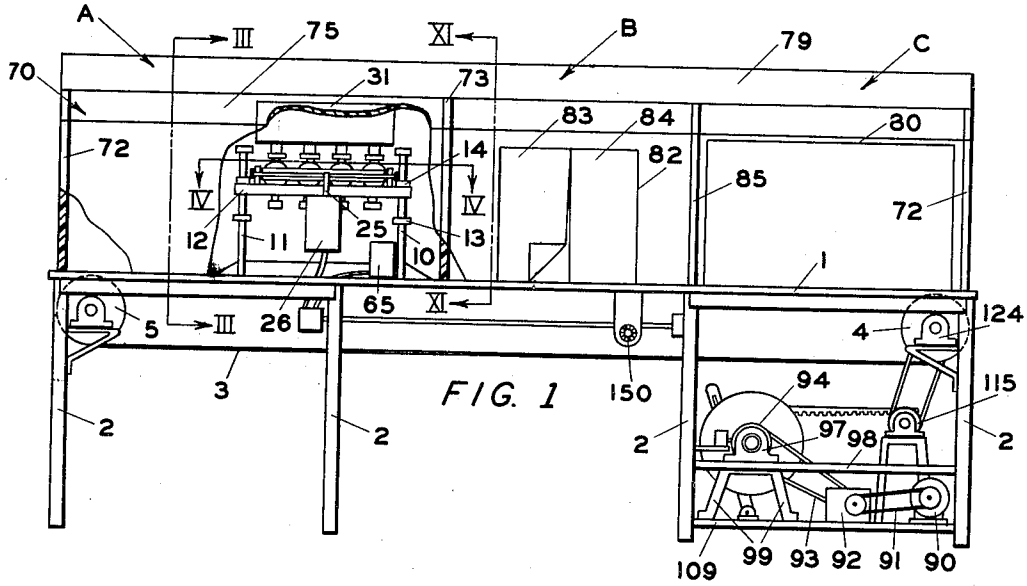


FIG. 1

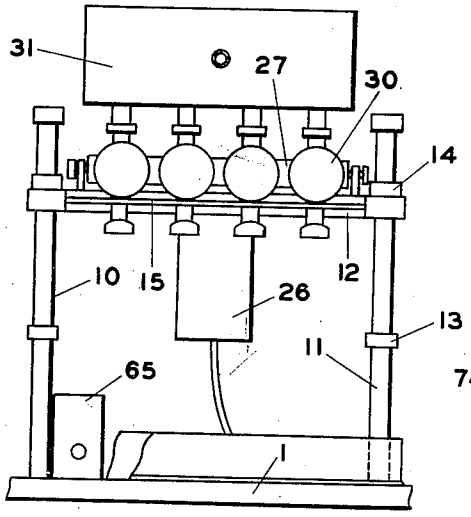


FIG. 2

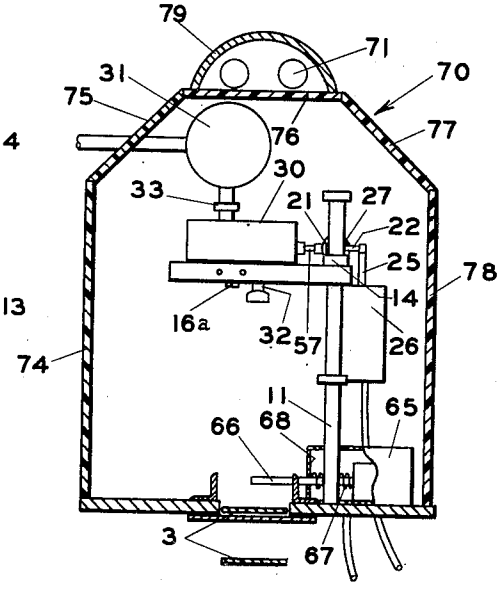


FIG. 3

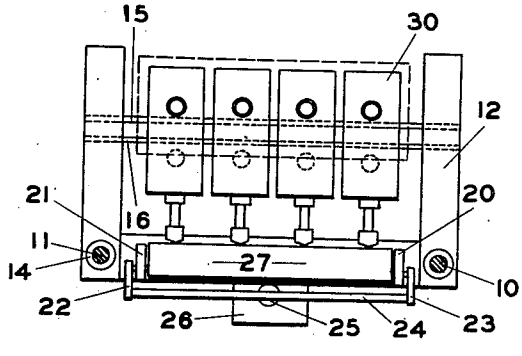


FIG. 4

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Filed Oct. 19, 1946 3 Sheets-Sheet 2

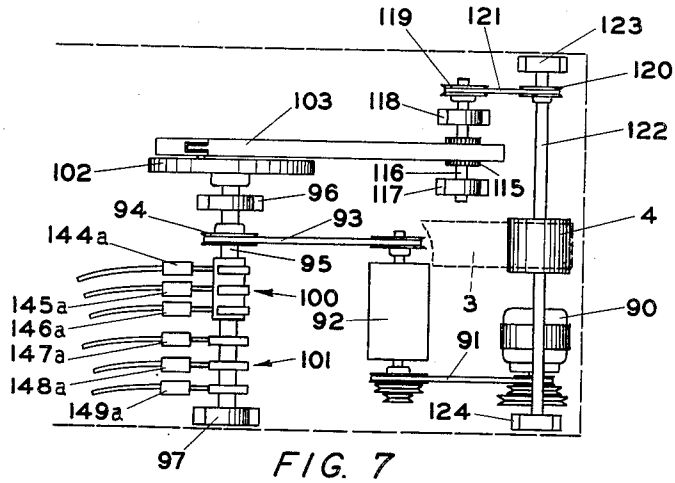


FIG. 7

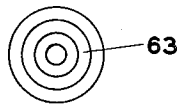


FIG. 6

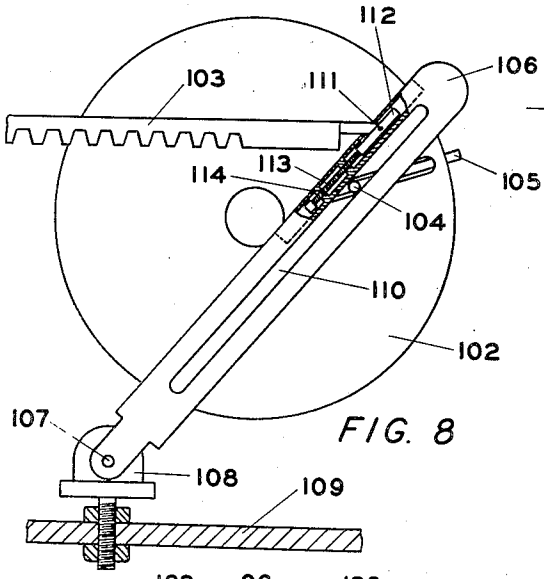


FIG. 8

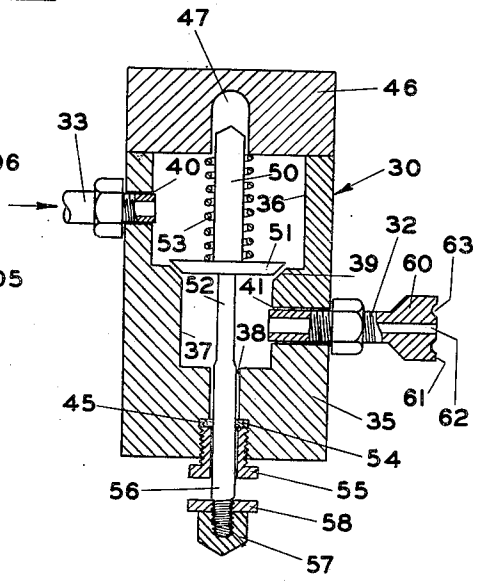


FIG. 5

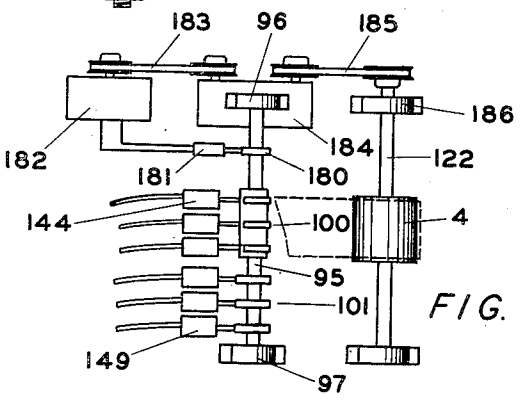


FIG. 10

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3 Sheets-Sheet 3

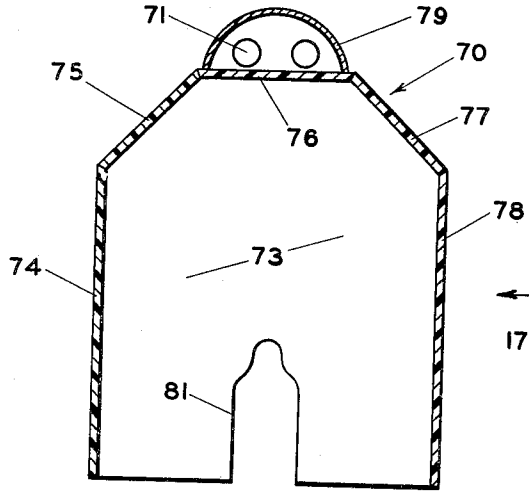


FIG. 11

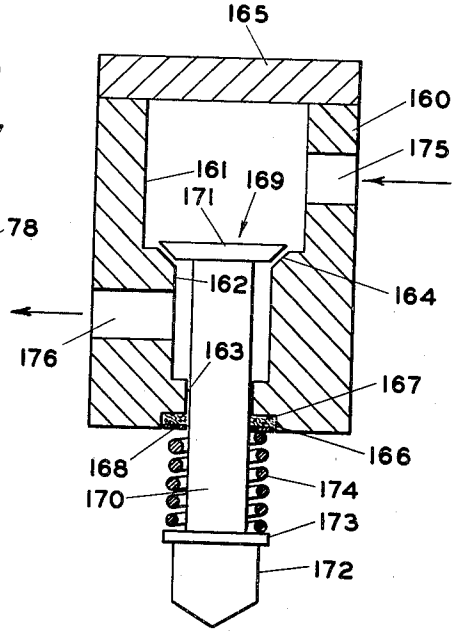


FIG. 12

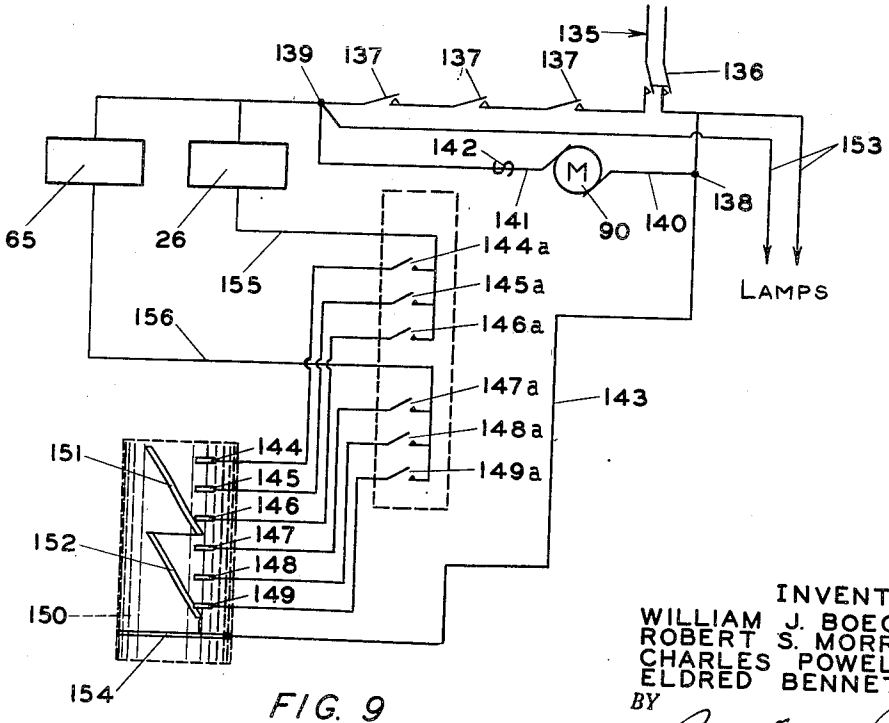


FIG. 9

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Patented July 3, 1951

2,559,242

UNITED STATES PATENT OFFICE

2,559,242

CONTAINER FILLING APPARATUS WITH AUTOMATICALLY TIMED FILLING AND CONVEYER MOVEMENT MEANS

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Application October 19, 1946, Serial No. 704,374

5 Claims. (Cl. 226—95)

1

This invention relates to an automatic machine for filling containers with a fluent material, and it relates particularly to a type thereof which will automatically measure the amount of such material which is placed into each container and which will so operate in timed relationship with a conveyor.

In providing a machine for automatically filling a plurality of containers, carried by a suitable conveyor means, with a predetermined volume of fluent material, there is presented a wide variety of problems which have been heretofore handled in a variety of ways. These ways have, however, so far as we are aware, involved extremely complicated mechanisms, which have required an intricate assemblage of levers, gears, cams or other mechanical parts, and which mechanisms were both expensive in their original construction and correspondingly expensive to maintain. It is accordingly desirable to provide a machine departing substantially from the prior constructions, which machine will carry a plurality of containers on a conveyor, successively place into said containers a controlled quantity of fluent material, do so under fully sterile conditions if desired, and then pass said bottles on to other means, such as suitable sterilizing means and/or container closure means.

It is particularly desirable to carry out these operations by means which will be rapid enough to satisfy the requirements of high production, but will also be highly accurate in order that minimum volumetric requirements may be rigidly satisfied without the necessity of using excessive overruns with the consequent undue consumption of material.

Accordingly, a primary object of our invention is to provide an automatic machine for filling a plurality of containers with a predetermined and accurately dispensed quantity of fluent material with sufficient rapidity to satisfy the requirements of production operation.

A further object of our invention is to provide a machine as aforesaid which is equipped with suitable means for maintaining fully sterile conditions in and about the filling mechanism.

A further object of our invention is to provide a machine as aforesaid which can be constructed economically and yet is strong and durable.

A further object of our invention is to provide a machine as aforesaid whose operations can be viewed completely and whose working parts are readily accessible.

Other objects and purposes will be apparent to persons acquainted with equipment of this type upon reading the following specification and inspecting the accompanying drawings.

2

General

In providing a machine to meet the objects and purposes above set forth, we have created a mechanism with an intermittently driven conveyor belt which carries one, or more rows, of containers through a filling station. Electrically driven means are provided for stopping said containers in a predetermined relationship with respect to filling nozzles. Other properly synchronized and electrically driven means open valves to permit the passage of fluid material into said containers and then close said valves when a predetermined amount of fluid material has passed into said containers, after which the conveyor may deliver the containers to other desired stations. Such stations may, for example, involve sterilization, closure, sealing or other similar operations. In the embodiment of our invention, selected for specific illustration, these stations are shown arranged together along a single conveyor, and such has proved to be by far the most convenient and economical construction. However, it should be understood that if desired for other reasons these stations may be arranged separately and may even be arranged on separate machines without departing from the scope and spirit of some aspects of our invention.

In the drawings:

Figure 1 is a side view of our improved apparatus.

Figure 2 is an enlarged side view of the bottle filling portion of our apparatus taken from the side opposite that appearing in Figure 1.

Figure 3 is a partial section taken on the line III—III of Figure 1.

Figure 4 is a section and plan view beginning at the section indicated by the line IV—IV in Figure 1.

Figure 5 is an enlarged central section of one form of the flow controlling valve and discharge nozzle.

Figure 6 is a bottom plan view of the flow discharge nozzle.

Figure 7 is a partially schematic plan view of the rightward end of our machine, as appearing in Figure 1, showing only the moving parts thereof together with the electrical switches.

Figure 8 is a detail of a part of the conveyor driving means.

Figure 9 is a diagram of the electrical system of the machine.

Figure 10 shows an alternate construction for driving the conveyor.

Figure 11 is a section taken on the line XI—XI of Figure 1.

Figure 12 shows a central section of an alternate form of the flow controlling valve.

Looking now at the drawings in more detail, wherein, for illustrative purposes, we have shown a preferred embodiment of our device, there appears a table 1 supported by suitable legs 2 which may be of any convenient construction. The table 1 is placed at a convenient working height so that containers may be placed onto and removed from said table conveniently by an operator standing alongside of it. While our invention may be applied to a machine adapted for handling any type of container, for purposes of illustration the particular machine shown in the drawings is designed for handling bottles of a conventional type. Hereinafter, bottles will be illustratively referred to as the containers concerned with the express understanding that this reference does not limit the scope or adaptability of the invention. As appearing in Figure 3, a conveyor belt 3 is supported by the upper surface of said table, or within a guiding trough provided within said table, and runs the full length thereof. Suitable means, such as the rolls 4 and 5, Figure 1 are located at each end of the said table to drive the conveyor belt 3. Suitable mechanism hereinafter described in more detail is provided for intermittently rotating said rolls by which the conveyor belt is moved in timed relationship with the action of the bottle filling mechanism.

Hereinafter, it will be assumed that the leftward end of the table, as appearing in Figure 1, is the end of the device receiving empty bottles and that the rightward end of the device, as appearing in Figure 1, is the end from which filled bottles are discharged. Hence, said leftward end may be referred to as the receiving end, and said rightward end may be referred to as the discharge end.

The general arrangement

The leftward portion A of the machine comprises a bottle receiving and filling compartment, the middle portion B comprises a sterilizing compartment and ordinarily it is here that caps are placed by hand loosely on the bottles, and the rightward portion C comprises the compartment in which caps are firmly set onto the bottles.

Covering the entire device there is a canopy 70 which is supported, and suitably compartmented, by a pair of end members 72 and by the partitions 73 and 85. These partitions are preferably made of sheets of a transparent material, such as "Lucite" which may be of the shape shown in Figure 11, or any other convenient shape. The sheets 74, 75, 76, 77 and 78 in Figure 3, comprising the sides and top of the canopy, are bonded to the partition edges in any convenient manner, such as by cementing. An arched dome 79 made of opaque material having a reflective under side, such as stainless steel, provides a chamber immediately above the top central canopy panel 76. One or more tubes 71, which may be of the fluorescent illuminating type, only, or may be of the mercury-vapor type for sterilization purposes also are mounted within said chamber in any convenient manner, of which details are not shown. Any standard type of tube having such function is suitable, and one that is particularly satisfactory is the Sperti ultra-violet lamp sold by Sperti, Inc. of Cincinnati, Ohio, under the trade-name of "Mercolito." Such lamps are energized from the power circuit of the machine through a conventional transformer and other conventional equipment for the purpose.

The sterilizing tubes should be placed at least over the filling and the capping sections of the conveyor, but may in some circumstances be desirably placed along its entire length.

There is provided at the receiving end of the table any suitable opening through the end portion or the canopy (not shown) for the passage onto the conveyor of bottles to be filled. Such passage may be accomplished by hand or by proper association of a suitable feeding conveyor.

Spaced a short distance from the receiving end of the conveyor and above the associated table is the actual bottle filling mechanism. Such spacing from said receiving end provides a working area in which bottles may be suitably placed onto the conveyor belt and, if desired, certain preliminary steps, such as cleaning with compressed air, may be performed. The amount of such space is optional and will depend entirely upon the use of the machine.

Each of the partitions has a cut-out section 81 (see Figure 11) with the approximate contour of the bottles to be filled. This cut-out section is made to fit as closely as possible to the largest size of bottle which the particular filling mechanism is intended to handle and the machine is then supplied with suitable adapters, which may be fixed to the partition in any convenient manner, as by screws, for adapting the size of the cut-out opening to smaller sized bottles when desired.

The compartment B of the machine, immediately following the filling station, may be utilized for placing caps loosely onto the bottles. Access to said bottles is gained through the opening 82 in the side of the canopy which opening is provided with curtains 83 and 84 made of any convenient transparent material such as "Pliofilm." The caps are manually placed on the bottles by an operator who reaches through the opening 82 and watches the operation through the portion of the transparent canopy immediately surrounding said opening.

From compartment B the bottles pass through the partition 85 into the bottle capping compartment C and to the capping mechanism indicated generally at 89. Here the caps may be fixed firmly to the bottles by any convenient equipment, which may be conventional. Said bottles are then discharged either for manual collection at the discharge end of the machine or for transport by another conveyor to other means such as a labeling or packaging machine.

The filling mechanism

The filling mechanism is held by a platform 12 through a pair of supports 10 and 11 as shown in Figure 2. Said platform receives the supports 10 and 11 into suitable openings within itself and is vertically and slidably adjustable thereon. The stops 13 and 14 are provided to limit the travel of said platform on said supports. Any suitable means (not shown) such as a set screw suitably associated with said platform for operation against one or both of said supports may be supplied to hold said platform in a selected position with respect to said supports. This platform is built substantially in a U-shape as illustrated in Figure 4. A pair of rods 15 and

16 extend across the opening of the U and provide support for the hereinafter mentioned valve cylinders 30. Mounted onto the forward part of said platform and between the supports 10 and 11 are a pair of bearing brackets 20 and 21. Pivotally mounted onto these brackets is a pair of levers 22 and 23 which support at their respective unpivoted ends a rod 24. Engaging this rod is a core 25 operatively connected with the solenoid 26 for reciprocating motion as said solenoid is energized and deenergized. It may conveniently be constructed so that the energizing of the solenoid coil lifts the core 25 against gravity and when said coil is deenergized the rod moves downward in response to gravity.

Between the bearing brackets 20 and 21 is eccentrically mounted a substantially cylindrical cam member 27 which is so connected through said bearing brackets to the lever members 22 and 23 that said cam member is partially rotated on its axis of mounting as said levers are arcuately moved on their respective pivot points in response to the reciprocation of the core 25. A preferred and simple way of accomplishing this is to mount the cam 27 onto a shaft supported by said bearing brackets and to extend said shaft to the levers 22 and 23 to provide the mounting means therefor.

A selected plurality, here four, of valve cylinders 30 are arranged immediately behind said cam and above the conveyor belt 3. These valve cylinders are arranged, as best shown in Figures 2, 3 and 4, so that the bottles moving along the table on said conveyor will be positioned under the discharge nozzles of the said cylinders to receive the fluent material with which such bottles are to be filled. The material being directed into the bottles, is fed through the cylinders 30 from any convenient source, such as the reservoir 31 mounted directly over said valve cylinders, which are, supported by the cross bars 15 and 16, and held against movement with respect to the cam mechanism by any suitable clamping device 16A Figure 3. Said cylinders are held against lateral movement with respect to each other in a direction parallel to said rods also by said clamping arrangement as well as by their connection to the reservoir 31. This particular means of mounting is intended for use with but one predetermined size of bottle due to the relatively sized positioning of the discharge conduits between the reservoir and the several valve cylinders with respect to each other. However, other mounting means are conceivable and if employed will not constitute any departure from the spirit and scope of the herein disclosed invention. Such spacing can be varied by replacing the reservoir 31 with another reservoir having discharge outlets appropriately spaced for reception of the conduits 33 Figures 3 and 5 connecting said discharge outlets to their respective valve cylinders at a desirable spacing for the particular size of bottle to be filled. Since the size of the reservoir will normally change with the capacity of the bottles. The change in spacing of the discharge outlets may be effected in this one changing operation and thereby avoid any unreasonable delay or inconvenience.

A more detailed illustration of the construction of one form of the said valve cylinder 30 is shown in Figure 5 as comprising a body member 35 having therein an internal opening 36 of a relatively large diameter, a coaxial opening 37 of intermediate diameter and another coaxial opening 38 of a relatively small diameter. That which would otherwise be a sharp circular edge at the junction of the central openings 36 and 37 is chamfered to form a valve seat 39. An inlet opening 40 is provided and suitably threaded for the reception of the inlet conduit 33 into the large chamber provided by the opening 36. Another opening 41 suitably threaded is provided for the reception of the outlet conduit 32 and effects its communication with the chamber provided by the intermediate central opening 37. A suitable enlargement 45 of the opening 38 is provided and threaded at least at its outward end for purposes appearing hereinafter. A cap 46 closing the end of the chamber provided by the relatively large opening 36, is affixed to the body member 35 in any convenient manner, as by suitable stud bolts, and contains a cylindrical recess 47 extending part-way therethrough and coaxial with the said relatively large opening 36.

The valve and valve support are comprised of a straight, slidable rod 50 upon which a valve 51 may be affixed either separably or integrally. The respective ends of the valve rod 50 are slidably supported by the walls of the bores 47 and 38 so that said valve 51 may be securely seated onto the valve seat 39. The mid-portion 52 of said valve rod 50 may be reduced diameter to provide for freer passage of fluid through the chamber provided by the intermediate bore.

The opening 45 constitutes a stuffing box surrounding the valve rod 50 which stuffing box contains any suitable packing material 54 and may be closed by a screw-type gland 55. The outer end of said valve rod is threaded as indicated at 56 and receives threadedly thereon a cam contact 57 and a jam nut 58. The spring 53 sleeved on the rod 50 and compressed between the valve 51 and cap 46 tends to keep said valve seated against 39.

In operation the cam contacts are adjusted on the valve rod 50 to the proper position for effective cooperation with the cam member 27 and then locked in such position by the said jam nut 58.

The discharge conduit terminates in a head 60 having a flat underside 61 and a discharge opening 62, which opening is surrounded by an annular groove 63. This groove functions to break the surface adhesion between the liquid being dispensed and the bottom surface 61 of the dispensing head 60 so that no drop will form or remain on said surface when the flow of fluid is terminated. The groove must be sufficiently close radially to the discharge opening 62 that any drop embraced wholly within the diameter of the groove will be either too small to be of concern or will by its surface tension be drawn back into the passageway terminating the said discharge opening. Thus, it is possible to utilize a substantially flat dispensing head by which the opening in the bottle may be covered, excepting for the slight clearance necessary between the upper extremity of the bottle and said bottom surface 61 in order that there may be relative movement therebetween, and yet no drops will form.

Affixed alongside the support 10 Figures 2 and 3 is a solenoid housing 65. This contains a solenoid operating a bar 66 for selectively obstructing bottles being moved on the conveyor 3. The mechanism may be constructed in any of several ways but preferably the action of the solenoid will be opposed by some convenient resilent means such as the spring 67 bearing against the end 68

of the said housing 65. In this arrangement the action of the spring retracts the bar 66 into the solenoid and away from its bottle blocking position, and energizing of the solenoid will cause the bar to extend into the bottle blocking position. This may be varied in many ways including having positive solenoid operation in each direction.

An alternative construction for a filling valve is shown in Figure 12. Here a body part 160 is provided with a large internal bore 161, an intermediate bore 162 coaxial therewith and a small bore 163 also coaxial with the two preceding named bores. The edge between the large and intermediate bores is chamfered to provide a valve seat 164. The outer end of the large bore is closed by a cap member 165 affixed to the body part 160 in any convenient manner, as by stud bolts (not shown). A small counterbore 166 is provided for the reception of packing 167 and a compression ring 168. The valve 169 comprises a valve stem 170 and a valve head 171. Said stem is received into the small bore 163 in a sliding fit for support and guidance, and said valve head 171 cooperates in the usual manner with said valve seat 164. The valve stem is threaded at its other end and receives an adjustable contact member 172 similar to, and for the same purpose as, the contact member 57 shown in Figure 5 and a jam nut 173 similar to and for the same purposes as the jam nut 58 in Figure 5. A spring 174 surrounds the valve stem and is located between the jam nut 173 and the compression ring 168. The spring thus operates both to hold the valve normally closed, and also at all times to keep a positive pressure on said compression ring 168 and by it on the packing 167. An inlet passageway is provided into the valve body at 175 and an outlet passageway corresponding to the outlet passageway 41 shown in Figure 5 is provided at 176. This form of valve is mounted and operated in exactly the same manner as above described for the form shown in Figure 5.

The timing means

Suitably located at any convenient point, but preferably near the discharge end of the conveyor is the conveyor driving and solenoid timing mechanism illustrated at the rightward end of the conveyor as appearing in Figure 1. Referring now to Figures 1 and 7 there is provided a motor 90 operating through a suitable belt or chain 91 to drive a reduction gear assembly within the gear box 92. Preferably, though not necessarily, a multi-speed belt and pulley arrangement is provided. From said gear box through a chain 93 there is driven a sprocket or pulley 94. This pulley is mounted on the shaft 95 (Figure 7) and causes said shaft to rotate in its supporting bearings 96 and 97. Said bearings are mounted in any suitable and convenient manner on the frame of the machine which includes in part the brace 98 (Figure 1) supporting the bearing 97 and the frame elements 99 supporting the bearing 96.

Mounted on one portion of said shaft is one group of switch controlling cams 100, and mounted on another portion of the shaft is another group of such cams 101 which will be described in more detail hereinafter. At one end of said shaft 95 and closely adjacent to the bearing 96 is the drive wheel 102 by which the rack 103 is caused to reciprocate.

The conveyor drive

Any of several convenient mechanisms may be provided for imparting reciprocation to the rack 103 from the wheel 102, but one mechanism which has been found particularly useful is that illustrated in Figure 8 and hereinafter described. A pin 104 is mounted for radial adjustment in the wheel 102. Such adjustment may be by any convenient means such as a screw and block mechanism indicated generally at 105. The rocker 106 is pivotally mounted at 107 to vertically adjustable means 108 which in turn is mounted in any convenient manner to the base 109 of the machine. The means by which the part 108 is caused to be vertically adjustable may be conventional and any of many types, such as the bolt and nut assembly shown. An elongated slot 110 is provided for receiving the pin 104 and permitting its reciprocation within said slot as the wheel 102 rotates. The reciprocating rack 103 is affixed to the rocker 106 by any convenient mechanism by which the point of attachment of said reciprocating rack to said rocker may be varied with respect to its distance from the pivot point 107. This may be done in any of several ways but one convenient method is by pivoting said reciprocating rack 103 at a point 111 in a slidable block 112 which is received within a suitable guiding groove in the rocker 106 and held in a determinable position therein by a pin 113 rotatably affixed thereto, which pin is threadedly held in a block 114 affixed immovably with respect to the rocker 106.

The reciprocable rack 103 engages a gear 115 (Figures 1 and 7) which gear is mounted by a uni-directional clutch mechanism to the shaft 116. Said shaft is mounted in any convenient manner as by the bearings 117 and 118 which bearings are supported on the frame of the machine. At the end of the shaft 116 is a pulley 119, or sprocket, which is operatively engaged with a pulley or sprocket 120 by a belt or chain 121. The pulley or sprocket 120 is mounted on a shaft 122 which is supported by bearings 123 and 124 mounted on the frame of the machine. The roll 4 (Figures 1 and 7) is mounted on the shaft 122 and drivingly supports the conveyor belt 3 whose position is indicated in dotted lines in Figure 7.

Thus as the main shaft 95 rotates it will rotates the wheel 102 by which the reciprocating rack 103 is caused to reciprocate. This acting through the uni-directional drive associated with the gear 115 will cause the shaft 116 intermittently to rotate and through the mechanism above described cause the shaft 122 and the roll 4 similarly to rotate intermittently. Thus the conveyor belt 3 will be given an intermittent uni-directional motion adjustable by suitable manipulation of the various adjustments described above as associated with the wheel 102 and the rocker 106. By such adjustments there may readily be secured any desired timing relationships of such uni-directional conveyor movement with respect to the rotation movement of the switch group 100 and the switch group 101.

The electrical circuit

Referring now to Figure 9 there is shown an electrical circuit by which the above described embodiment of the invention is made to operate. Other circuits, of course, are possible and certain of the electro-responsive or electro-controlling devices specifically shown for illustrative purposes in this diagram may be replaced by others effecting the same function.

From the line 135, which in our particular use is 110 v., A. C., single phase, 60 c., but which may be either direct or alternating current and of any convenient voltage and other characteristics, and

through a master switch 136 and a plurality of manually operable switches 137 in series, a potential is applied across a pair of terminals 138 and 139. The switches 137 are placed at spaced positions around the machine so that the operator can stop or start it immediately from any position. From these terminals there operate three circuits in parallel, namely, the motor circuit, the solenoid circuit and the ultra-violet light circuit. The motor circuit, for driving the conveyor, comprises the conductor 140 connecting the terminal 138 and one side of the motor 90 whose electrical characteristics are chosen according to the power required and the electrical source available. In a particular preferred embodiment, we use a motor of ½ H. P., 1725 R. P. M., single ph., 60 cycle. From the other side of the motor the conductor 141 provides connection through the motor switch 142 to the terminal 139.

The solenoid circuit comprises a conductor 143 leading from the terminal 138 to the terminal 154 of the selector switch 150. While this switch may be of any kind convenient for connecting selected pairs of circuits as hereinafter shown, one usable type is the conventional rotary switch having two spiral contacts 151 and 152 both electrically connected to the terminal 154. While any number of circuits may be used within the physical limits of a given machine, we have utilized three for illustrative purposes here. Two sets of contacts, 144, 145, 146 and 147, 148, 149 are provided in such relation to the spiral contacts 151 and 152 that selective positioning thereof will connect the terminal 154 to a selected one from each of said contact groups, as 144 and 147.

These are then connected to micro-switches 144*a*, 145*a*, 146*a*, 147*a*, 148*a* and 149*a*, respectively. One group of said micro-switches, as 144*a*, 145*a*, and 146*a*, is connected to one side of the bottle filling solenoid 26 and the other group of micro-switches 147*a*, 148*a* and 149*a* is connected to one side of the bottle stopping solenoid 65. The other sides of each of the solenoids are connected to the terminal 139. The cams 100 and 101 are arranged to open and close the micro-switches in proper timed relation to the movement of the conveyor to carry out the operations as hereinafter described. All cams may operate at all times but by reason of the selector switch only one pair of micro-switches is effective at any one time.

The conductors 153 are connected to the ultra-violet sterilizing lamps, or illuminating lamps as the case may be, in any conventional manner.

Operation

The machine is prepared for operation by filling the reservoir 31 with liquid to be bottled, bottles are arranged for feeding near the supply end of the machine and the selector switch is set to connect the pair of micro-switches appropriate to the size of bottles to be filled, for example, switches 144*a* and 147*a* for 100 cc. bottles. The master switch and all but one of the minor switches 137 are closed and the operator takes his station. The last of the minor switches 137 is then closed and the machine starts. Bottles are placed on the conveyor at its feeding end, either by hand or from automatic means, such as an automatic conveyor or the discharge mechanism of a blowing machine. The positioning of the first bottles must be in properly timed relation to the part of its cycle in which the machine is then standing, or the machine may be run until just ahead of the point at which filling commences and the bottles then placed directly under the filling nozzles. Assuming this is the procedure, at this point the stopping solenoid will be energized so that the bar 66 will extend across the conveyor, and the filling solenoid 26 will be deenergized so that the core 25 will be down and the filling valves 51 in each valve cylinder will be closed. The rack 103 will be in, or nearly in, its full rightward position. Sometimes, a small part of the driving stroke of said rack is permitted after the extension of the barrier 66 to insure the bottles' being all pushed solidly together and against said barrier. The filling nozzles are so adjusted that at this point the mouths of the bottles will be directly under and vertically close to said filling nozzles.

The motor 90, causing the wheel 102 to rotate at this point, starts the rack on its backward or leftward stroke. The uni-directional clutch within the gear 115 here functions to permit such motion by the rack without moving the conveyor belt 3.

The appropriate cam in group 100, controlling the filling solenoid 26, now closes the switch 144*a* and the filling solenoid 26 is energized. This pulls the core 25 upwardly actuating the levers 22 and 23 to rotate the cam 27 counterclockwise as viewed in Figure 3. The cam acts against the cam contact 57 (or 172) of the several valve cylinders to open the valves 51 (or 169) in each thereof. Liquid thus flows through said cylinders from the reservoir 31 and out through the discharge nozzle 60 (or 176) of each of said valve cylinders.

While this flow is taking place, the shaft 95 and the cams thereon continue to rotate, and after a precisely predetermined time further action thereof will open said micro-switch 144*a*. Since the rate of flow from said discharge nozzles is a precisely timeable matter, the period during which said valves are open will be closely related to the volume of liquid required to fill the bottles. When the switch 144*a* opens the solenoid coil 26 is substantially simultaneously deenergized. This permits the core 25 to drop by gravity and thus rotate the cam 27 clockwise to release the cam pressure against the cam contacts 57 (or 172), by which the spring 53 (or 174) closes the valve 51 (or 169) in each valve cylinder and terminates the flow of liquid. The groove 63 around the discharge outlet 62 prevents the formation of any depending drop of liquid. Substantially simultaneously the micro-switch 147*a* opens to deenergize the bottle stopping solenoid 65. The deenergizing of the solenoid 65 permits the spring 67 to draw the barrier 66 back out of its blocking position. Closely following this opening of the switches 144*a* and 147*a*, the wheel 102 comes into such position that it starts the rack 103 into a driving stroke, rightward as appearing in Figure 8. Thus immediately after the flow of liquid ceases and the barrier 66 is retracted, the conveyor again moves forward to move the bottles, now containing a measured amount of liquid, to the intermediate zone B wherein the caps may if desired be manually placed on the bottles and the bottles also exposed to sterilizing ultra-violet rays. As this takes place new bottles, placed on the conveyor during the filling of the first set, come into position within the filling zone A. Again the blocking solenoid 65 is energized and an instant later the conveyor stops, the filling valves open and the cycle repeats. This time, as the filled bottles move out of the filling zone, the previously filled

bottles, now in the sterilizing zone, move on to the cap fixing or setting zone C.

The timing of the stroke of the rack **103** must evidently be such that its backward, or non-driving, stroke fully spans in time the period of bottle filling, and the switch operating cams must be carefully timed with said rack so that the solenoids will be energized and deenergized at the proper time with respect to the intermittent movement of the conveyor.

A wide variety of adjustments may be made. For example, if the required sterilizing time is longer than the needed filling time, then the switch operating cams will be adjusted so that the filling valve **51** in the several valve cylinders is closed at the proper time to provide the correct amount of liquid within said bottles, but the conveyor does not move until the sterilizing period has expired. In all cases the barrier **66** may be retracted at any time after the conveyor has stopped at the beginning of a filling cycle, provided only it is fully retracted when the conveyor starts again.

Merely by turning the selector switch **150** the electrical system may be adjusted to operating time cycles appropriate to bottles of different capacities. Such a change will need to be accompanied by either or both of changes in the spacing longitudinally of the conveyor of the filling nozzles **60** and/or the vertical position thereof.

A constant pressure must be maintained at the discharge outlet **62** in order to insure that a predetermined volume passes said outlet in a predetermined time. This can be accomplished in any of several conventional ways, of which a convenient one is by suitable float valve mechanism (not shown) maintaining at a constant level the liquid in a tank (not shown) from which is supplied the liquid to the reservoir **31**, said constant level being vertically higher than the uppermost part of such reservoir.

By the proper placing of the switches **137** the operator can stop the restart mechanism at will and may do so practically instantly from any position which he might at any given moment occupy. This is both a decided convenience and a great safety factor.

As an alternative to an element of the construction above described but embodying certain of its same principles, the wheel **102** and its associated rack **103** and other mechanism may be replaced by electrical control as shown in Figure 10. Here the shaft **95**, supported by its bearings **96** and **97**, and carrying the cam groups **100** and **101** are all the same. The microswitches *144a* to *149a* inclusive, operating from the cam groups **100** and **101**, operate as before, and a further cam **180** operates to open and close a micro switch **181**. This switch controls a high starting torque motor **182** which connects through a belt or chain **183** to a gear box **184** for suitable speed reduction and this in turn connects through the belt or chain **185** to a pulley, or sprocket, **186** corresponding to the pulley, or sprocket, **120** in Figure 7. This pulley, or sprocket then drives the shaft **122** and the roll **4** in the same manner as above described for the pulley, or sprocket **120**, and through it the conveyor belt **3**. By proper adjustment of the cam **180** with respect to the other cam elements, intermittent movement of said conveyor belt as desired with respect to the filling action may be had.

Many other variations from the form specifically above described will be possible, without departing from the scope of the invention. Particularly, more or less than the four valve cylinders shown may be used, other means than those shown intermittently driving the conveyor and other timed means relating the operations of the solenoids with the movement of the conveyor, may be employed. Hence, the claims are to be construed broadly excepting only as they may be limited otherwise by their express language.

We claim:

1. In a device for dispensing into successive groups of containers predetermined quantities of a fluent material, the combination comprising: an intermittently movable conveyor for transporting said containers and timeable means effecting intermittent movement of said conveyor; means including a valve discharging said fluent material at a point vertically above said conveyor; electrically actuated means opening and closing said valve; means supporting a barrier and permitting movement thereof into and movement thereof out of a position in the path of containers being transported by said conveyer; electrically actuated means effecting one of said movements of said barrier and resilient means effecting the other of said movements of said barrier; a plurality of automatically operable electrical switches controlling the operation of both said electrically actuated means and timing the operation of same with respect to each other and with respect to the movement of said conveyor.

2. In a device for dispensing into successive groups of containers predetermined quantities of a fluent material, the combination comprising: an intermittently movable conveyor and timeable means effecting intermittent movement thereof; means including a plurality of valves disposed in a row above, and parallel with, said conveyor and having horizontally positioned, mutually parallel, actuating rods, each valve having an outlet opening for discharging said fluent material, and said opening being equally spaced for alignment with a said group of said containers; electrically actuated means opening and closing said valves; means supporting a barrier and permitting movement thereof into container obstructing position, thereby determining positively the stopping position of the leading one of each of said groups of containers in position for receiving fluent material from a respective one of said valves and said means also permitting movement of said barrier out of container obstructing position; electrically actuated means effecting one of said movements of said barrier and resilient means effecting the other of said movements of said barrier; a plurality of automatically operable electrical switches controlling the operation of both said electrically actuated means and timing the operation of same with respect to each other and with respect to the movement of said conveyor.

3. In a device for dispensing into successive groups of containers predetermined quantities of a fluent material, the combination comprising: an intermittently movable conveyor and timeable means effecting intermittent movement thereof; means including a plurality of valves disposed in a row above, and parallel with, said conveyor and having horizontally positioned, mutually parallel, actuating rods each valve having an outlet opening for discharging said fluent material, and said openings being equally spaced for alignment with a said group of said containers; electrically actuated means opening and clos-

ing said valves; means supporting a barrier and permitting movement thereof into container obstructing position, thereby determining positively the stopping position of the leading one of each of said groups of containers for receiving fluent material from a respective one of said valves and said means also permitting movement of said barrier out of container obstructing position; electrically actuated means effecting one of said movements of said barrier and resilient means effecting the other of said movements of said barrier; a plurality of automatically operable electrical switches controlling the operation of both said electrically actuated means and timing the operation of same with respect to each other and with respect to the movement of said conveyor, wherein the movement of said barrier into container obstructing position slightly precedes the stopping of said conveyor for each group of containers.

4. In a device for dispensing into successive groups of containers predetermined quantities of fluent material, the combination comprising: an intermittently movable conveyor carrying said containers in a single row thereon along the length of said conveyor; a guard member along each side of said conveyor spaced apart only sufficiently to permit passage therebetween of a single row of containers, and timeable means effecting said intermittent movement; a source for said fluent materials at a constant pressure; a plurality of discharge valves connected to said source and having discharge openings above and parallel with said conveyor and spaced apart a distance equal to the distance between container openings when said containers are in contacting relationship with each other on said conveyor; electrically actuated means opening and closing said valves; a barrier and means supporting same for extension across said conveyor into a container obstructing position and for retracting same out of container obstructing position; electrically actuated means effecting one of said extension and retracting movements of said barrier and other means effecting the other of said extension and retracting movements of said barrier; a plurality of automatically operable electrical switches controlling the operation of both said electrically actuated means and timing the operation of same with respect to each other and with respect to the movement of said conveyor, said means being so timed that as one group of containers moves under said valve openings the barrier extends into container obstructing position

slightly ahead of the stopping of said conveyor; whereby said containers are positively arranged in contacting relationship in precisely determined position for filling.

5. In a device for dispensing into successive groups of containers predetermined quantities of fluent material, the combination comprising: a conveyor for transporting said containers and timeable means effecting intermittent movement of said conveyor; means including a plurality of equally spaced valves disposed in a row above, and parallel with, said conveyor, each valve having a downwardly facing outlet opening for discharging fluent material; electrically actuated means opening and closing said valves; a barrier and means supporting same for movement into and movement out of a position in the path of said group of containers being transported by said conveyer, each of said containers being thereby aligned with one of said outlet openings; electrically actuated means effecting one of said movements of said barrier and resilient means effecting the other of said movements of said barrier; a plurality of automatically operable electrical switches controlling the operation of both said electrically actuated means and timing the operation of same with respect to each other and with respect to the movement of said conveyer.

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