APPARATUS FOR FILLING AND CAPPING BOTTLES

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The invention relates to automatic machinery for filling bottles with liquid and attaching caps thereto, and relates more particularly to the means for conveying the bottles to and from the filling and capping mechanisms in machines of the type disclosed in my co-pending application bearing Serial Number 696,456, filed March 3rd, 1924, of which this application is a division.

The principal object of the invention is to provide improved automatic conveying means for moving the bottles through the machine, which is readily adjustable to all sizes of bottles, which minimizes breakage, and which is efficient in operation.

Other objects and advantages will appear in the following description of a preferred embodiment of the invention, which I have selected for illustration in the accompanying drawings. It will be understood, however, that various changes in form, construction and arrangement may be made by those skilled in the art, without departing from the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings, Fig. 1 represents a central vertical sectional view of the machine, complete except that for clarity of disclosure only those of the identical capping heads, filler valves and bottle elevators are illustrated which are intersected by the plane of the vertical section. Fig. 2 is a plan view of the machine with the tank and upper portion of its support removed at the plane of the line 2—2 in Fig. 1. Fig. 3 is a sectional elevation taken on the plane of the line 3—3 in Fig. 1.

Stated generally, the machine as illustrated herein comprises a rotating reservoir or tank which carries depending discharge tubes with their control valves for filling the milk bottles, and which also outwardly supports a concentric series of capping heads for the placing of caps in the mouths of the bottles after they are filled. The bottles are positioned during these operations on elevating pistons located beneath the tank discharge valves and capping devices, the pistons or elevators being carried by a rotating table revolving in synchronism with the supply tank and its attached devices. The bottles are delivered to and taken away from the revolving series of elevator pistons by means of an arrangement of worm conveyors and adjustable guides which first position the successive bottles on the inner portions of the elevating pistons. The bottles are then elevated into engagement with the filling valves during a portion of the revolution of the synchronized series of pistons and filling valves. When filled, the bottles are lowered and moved by means of an adjustable guide to the outer portions of the pistons, whereupon they are again elevated into engagement with the capping heads, capped, and lowered out of engagement therewith. The bottles are then moved off from the pistons as they successively reach another guide, before the completion of the revolution of the particular pistons upon which the respective bottles rest, and are directed into engagement with the worm conveyor which moves the bottles outwardly from the filling and capping mechanism to an accumulating table or upon suitable conveying means for delivering them wherever desired. The conveying and positioning guides are readily adjustable for operation upon the several standard sizes of milk bottles.

The revolving reservoir with its bottle filling and capping devices, and the synchronously rotating mechanisms for positioning and elevating the bottles to the filling and capping devices, are fully described and illustrated in my co-pending application, Serial Number 696,456, and are identified but generally herein. The bottle conveying mechanisms are described with particularity hereinafter.

Referring to the drawings, the numeral 1 indicates a stationary base carrying at one end an upright pedestal 2 upon which is operated the mechanism for the filling and capping operations. Mounted on the lower portion of the pedestal is a stationary annular support 4 carrying a cam ring 5 for controlling the operation of the bottle lifting pistons.

The cylindrical upper portion of the pedestal operatively supports a revoluble sleeve 100...
8, on the lower end of which is secured a spur gear 11 in driven engagement with a pinion 12 mounted on the shaft 13. The shaft 13 is driven through the bevel gears 15 and 16 by a main shaft 17.

Mounted on the sleeve 8 is an annular member 19 in which are operatively supported the several bottle elevator piston rods 23 carrying the bottle supporting heads 24. The pistons 23 are supported at their lower ends upon rollers 29 bearing upon the cam ring 5. The member 19 also carries a table 38 flush with the tops of the heads 24 when the latter are in lowermost position.

Within the pedestal 2 is provided mechanism for raising and lowering the overhead supply tank with its attached filling valves and capping heads to accommodate the varying heights of bottles of different capacities.

An elevating screw 40, having a nonrotatable sliding bearing at 48 in the upper end of the pedestal 2, carries a gear sleeve 41 on its lower threaded end portion. The gear sleeve 41 is rotatably supported in the base of the pedestal, and in toothed engagement with a pinion 45 carried by the shaft 46 operable by a hand wheel 47.

A tank support 50, having a vertically slideable non-rotating bearing support in the upper portion of the sleeve 8, is positioned vertically by the elevating screw 40. The support 50 carries a supply tank 55 from which depend a series of bottle filling valves 57, and upon which are also supported a series of capping devices 59. The valves and cappers are positioned in register with the underlying series of bottle elevating heads 24.

The varying sizes of bottles are laterally centered under the valves and cappers upon the heads 24 by means of spaced arms 61 and 62 carried by a spider 60 mounted on the member 19. The spider 60 is rotatably adjusted in relation to the heads 24 by a flanged sleeve 64 connected to the spider 60 and rotatably supported on the sleeve 8. A collar 68, secured to the tank support 50, carries a key 69 engaging a spiral keyway 70 in the sleeve 64. Thus the vertical movement of the tank effects the lateral movement of the arms 61.

Milk is supplied to the tank through a pipe 73, and a level-maintaining control valve housed within the screen 84.

The base 1 is extended at one side to support a housing 86 for the transmission gears and other mechanism hereinafter described. Surrounding the housing is a flat table 87 positioned at the same level as the rotating table 38. Mounted centrally of this table are a pair of conveyor worms for moving the bottles to and from the rotary table and piston heads whereon the bottles are filled and capped.

The conveying worms are preferably constructed of spiral blades 88 and 89 mounted respectively on a pair of laterally spaced shafts 90 and 91, positioned above and parallel to the surface of the table 87. The shafts 90 and 91 have their outer bearings in a transmission case 92 mounted on the end of the table and extending downwardly into the housing 86. The transmission gears for driving the worms are positioned in the casing and comprise a pair of interengaging transmission gears, of which one is illustrated at 94, mounted respectively on the ends of the shafts 90 and 91. The shaft 91 also carries a gear 95 engaging the gear 96 mounted on a jack shaft 97 carrying also the gear 98, the latter having driven engagement with a gear 99 mounted on the drive shaft 100 extending forwardly in the transmission housing and having driving connections hereinafter described.

The inner ends of the worm shafts are operatively supported by a block 101 secured upon the inner end of the table 87, and having an extension 102 protruding over the rotary table 38 between the paths of the upper arms 61 and lower arms 63 of the revolving bottle positioning spider, the extension 102 being provided with lateral wings 103 and 104 (see Fig. 9) in which the worm shafts have their respective bearings. The wings 103 and 104 are formed with angular lateral edges serving as guides in the movement of the bottles to and from the elevating piston heads, as hereinafter more fully described. A protective cover 105 preferably is positioned over the adjacent inner portions of the revolving worms and is secured to the gear casing 92 and the block 101, the outer sides of the worms being exposed to receive bottles between the convolutions of their spiral blades and slide the bottles over the surface of the table 87 to and from the rotary series of elevating piston heads.

The bottles are moved into engagement with the blades 88 of the worm which moves the bottles toward the filling mechanism, preferably by means of a conveyor belt 106, the upper run of which is operated across and upon the upper surface of the table 87 beneath the two conveyor worms. The bottles may be dumped from cases upon a lateral extension (not shown) of the table 87 and manually pushed upon the belt 106, or they may be brought by other conveying means (not shown) and mechanically transferred to the belt 106.

The belt is operated and supported by means herein illustrated as comprising a pair of end rollers 107 and 108 (see Fig. 3) pivotally supported on brackets 109 and 110 secured to opposite sides of the table 87, and so positioned that the upper run of the thin belt lies flat on the table. The under run of the belt 106 is carried through openings in the upper portion of walls of the housing 86 and passes around a driving roller 111 mounted on an extension of the worm driving shaft 100, the latter having suitable bearings in brackets 112 depending from the
upper wall of the housing. The belt 106 may be tensioned upon the driving roller 111 by means of a pair of idler rollers 113 pivoted in bearings 114 slidably mounted on the fixed side rods 115, the latter carrying compression springs 116 tending to force the bearings 114 inwardly and causing the idlers 113 to bear resiliently upon the belt 106.

As the bottles are carried on the belt 106 toward the worm blades 88, they are preferably shifted into single file arrangement before engaging the worm. A lateral guide bar 117 (see Fig. 2), rigidly secured to the table 87, extends at its inner end angularly over and toward the center of the conveyor belt. Opposite to the bar 117 is a swinging guide 118 extending angularly over the belt 106 and having a reciprocatory motion toward the opposite portion of the bar 117, which effects the shifting of the moving bottles without jamming so that they pass singly between the two guides toward the conveyor worm. The guide 118 is supported at its pivot end upon an upright stud 119 mounted on the table 87. A bell crank 120, also pivotally mounted on the stud 119, has one arm adjustably connected to the swinging guide as by the thumb screw and nut 121 threaded through the arm of the bell crank and swivel-connected to the guide 118. The other arm of the bell crank 120 is pivotally mounted to one end of a longitudinally resilient connecting member 123, comprising a pair of telescoping elements and a coiled spring attached at its ends to the respective elements, the other end of the member 123 being connected to an eccentric 128 operating on the worm shaft 90.

As the bottles engage the spiral blades 88, they are held in such engagement by the underpassing conveyor belt 106 and are moved laterally by the blades 88 off from the belt to the surface of the table 87, where they are then retained in their engagement with the worm by an adjustable lateral guide 124 extending to the rotary table 38. The bottles are moved by the worm across the tables 57 and 38 to the elevating piston heads 24, the angular wing 103 aiding in directing the bottles into position for engagement by the arms 61 and 62 of the revolving spider. The bottles are shifted inwardly on the piston heads 24 into final position for elevation into engagement with the filling valves 57 by another adjustable lateral guide 125 supported on the table 87 and extending between the spider arms 61 and 62.

The guides 124 and 125 are supported respectively on two sliding blocks 126 and 127 which may be shifted by a single control to position the guides to accommodate either of the several standard sizes of bottles, the guide 124 being adjustable to retain either size of bottle between the worm blades 88, and the guide 125 being adjustable in cooperation with the arms 61 and 62 of the previously described adjustable spider to center either size of bottle beneath the filler valves. The block 126 is provided with ways engaging the parallel slide rails 128 fixed on the table 87 in angular relation to the axis of the worm conveyor. A bell crank 129, carried by a pivot stud 130 journaled in the table 87, has a pivoted link connection 131 between one of its arms and the block 126. A handle 132, rigidly secured to the bell crank, provides manual means for operating the block 126 on its slide rails. The block 127 also is formed with a slide way engaging a rail 133 secured to the table 87 and disposed angularly to the rails 128. The other arm of the bell crank 129 has a pivoted link connection 134 with the block 127 for movement of the latter on its slide rail. The lengths of the arms of the bell crank are so proportioned that the shifting of the guide 124 to proper position for one size of bottle automatically adjusts the guide 125 for that size. The guides may be secured in either position by means of the pins 135 movably mounted in the block 127 and positionable in selective holes in the rail 133 to secure the block against movement. A connecting guide link 136 may be pivoted on the block 126 at the inner end of the guide 124, the link having a longitudinal slot engaging a pin fixed on the adjacent end of the block 127 and automatically adjustable with the intermovement of the two sliding blocks.

A further provision against jamming of the bottles is operative as the latter first engage the worm blades 88. There being liability that a bottle occasionally may be engaged at diametrically opposite points between the outer edge of the blades 88 and the end of the guide 124 and thus damage the machine or bottle, a section 137 of the end of the guide and its support is swingable on a pivot pin 138 carried by the block 126. The swinging section 137 is resiliently maintained in normal alinement with the other section of the guide 124 by a compression spring 139 confined between a lug on the section 137 and a similar opposed lug on the block 126, the adjacent end portion of the guide 117 serving as a normal positioning stop for the swinging section.

When the bottles are filled and they reach the point where they are lowered finally out of engagement with the filler valves, they are then carried into lateral engagement with a transfer guide 140 disposed in angular relation to the circular path of the bottles and shifting the bottles radially outward on the piston heads 24 as the bottles are moved against the guide by the spider arms 61 and 62. The bottles are thus positioned in register with the outer series of capping heads 59. The transfer guide 140 is adjustable in position for the several sizes of bottles. A laterally extending supporting arm 141 carries the guide, and is centrally pivoted at 142 upon...
a lateral projection 143 formed at the inner extremity of the extension 102 of the block 101. The position of the transfer guide is controlled by an adjustable slide bar 144 having a bearing in the raised portion of the extension 102 and terminating in a head 145 positioned over the extremity of the extension 102. The head 145 is provided with a transverse slot in which is operatively positioned a pin 146 fixed in the end of the guide supporting arm 141. Longitudinal movement of the bar 144 thus effects the swinging of the transfer guide 140 to the desired position.

To secure the guide 140 in selective positions, the bar 144 is supported at its outer end in a bracket 147 rigidly secured to the bar and slidably positioned in a longitudinal slot 148 in the upper wall of the block 101, the latter being of centrally open construction. A sliding plate 149 is positioned above the wall of the block 101, overlying the slot 148 and having a guide portion extending into the slot slightly spaced from the upper end of the bracket 147. The bracket is supported on the plate 149 by means of a pair of headed screws 150 the latter being vertically movable in the plate 149 while securing the bracket and plate against relative lateral movement. The bracket 147 is provided with lateral flanges underlying the upper wall of the block 101, and, by operation of a thumb screw 151, passing freely through the plate and threaded into the bracket, the plate and bracket flanges may be clamped rigidly to the wall of the block, thus securing the bar 144 against movement. The selective positions of the plate 140 preferably are determined by a pair of lift pins 152 mounted in the plate and adapted to be dropped into selectively registering holes in the underlying wall of the block 101, each of the holes being located to properly position the guide 140 for one size of bottles.

As the bottles are being shifted outwardly over the piston heads by the transfer guide 140, they are prevented from over running their proper position by a counter guide 153 (see Fig. 2) which is pivotally mounted at one end on a vertical pin 154 carried by a bracket 155 secured to the table 87. The guide 153 is laterally swingable between the spider arms 61 and 62, and is resiliently actuated to the limit of its adjustable position by means of a compression spring 156 confined between a depending lug on the bracket 155 and a suitable abutment on the guide 153. The inward movement of the guide is adjustably limited by a screw 157 pivotally attached to the guide 153 and extending freely through a lug on the bracket 155, the outer end of the screw carrying a thumb nut 158 bearing upon the lug. Preferably the spring 156 is positioned about the screw 157 and bears against the lug supporting the screw. By adjustment of the thumb nut 158, the guide 153 may be positioned for co-operation with the guide 140 for properly positioning any size of bottle.

After the bottles have been raised into engagement with the capping heads 59, capped and again lowered, they are carried into engagement with the stationary angular guide 104 which shifts them off from the piston heads and the rotary table 33 into engagement with the spiral blades 89 of the second worm conveyor, the latter operating to slide the filled and capped bottles outwardly over the surface of the table 87.

To retain the discharged bottles in operative engagement with the blades 89, another adjustable retaining guide 159 is provided. The latter is arranged in parallel relation to the worm and has a deflected end extending over the table 88 to assist in directing the approaching bottles. The guide is supported on a sliding block 160, having slide ways formed therein in engagement with the angularly disposed slide rails 161 secured to the table 87. The guide 159 and its supporting block may be moved into the proper relation to the guide 104 and the spiral blades 89 for any size of bottles, by means of a link 162 pivotally connected at one end to the block 160 and at the other end to a crank 163 rigidly mounted on a vertical pivot stud 164 journalled in the table 87.

The lower end of the pivot stud 164 carries a crank 165 (see Fig. 1) positioned beneath the table and connected by the rod 166 to a crank 167 mounted on the extended lower end of the pivot stud 160 carrying the manual control handle 132. The machine operator is thus enabled to adjust coincidently the three guides 124, 125 and 159 at one operation to either size of bottles, the pins 136 securing the adjustment when made.

Upon passing beyond the retaining guide 159, the filled bottles accumulate on the outer end of the table 87 conveniently for the operator's inspection and their replacement in cases. Guard rails 168 and 169 prevent the bottles from being carried off the table by the belt 106, or it may be desirable to remove the guard 169 and convey the bottles away from the table for inspection and casing.

As illustrated herein, the machine is operated primarily by a motor 170 belted to a driven pulley 172 operating a conventional speed reduction train of gears housed in the case 174, and by which a main drive shaft 187 is driven, the latter being connected with the drive shaft 17 as by a coupling 193.

A rearward extension of the main drive shaft 187 carries a bevelled gear 194 meshing with another bevelled gear 195, (see Fig. 1) mounted on the upright shaft 196 having its bearings in a suitable extension of the transmission case 174 and carrying at its upper end a bevelled gear 197, operatively meshing with the bevelled gear 198, mounted on the
shaft 100 driving the worm and belt conveyors.

1. In apparatus of the class described, the

35 combination of a stationary table, a helical
blade rotatable on a horizontal axis adjacent
the surface of said table, said blade being
adapted to laterally receive bottles between
its convolutions and slide them along the sur-
facing of said table, a retaining guide positioned
laterally of a portion of said blade, and a
belt conveyor positioned on the surface of
said table beneath and transversely of said
blade, said conveyor being operable to carry
bottles into engagement with said blade and
so retain them until engaged by said retain-
ing guide.

2. In apparatus of the class described, a

table, a pair of rotatable helical blades posi-
tioned over said table adapted to receive bot-
tles of selective sizes between their convolu-
tions and move the same across said table re-
spectively to and from the adjacent ends of
said blades, a pair of retaining guides respec-
tively arranged to laterally retain the bottles
in engagement with said blades, a pair of
blocks respectively supporting said guides
and slidably supported on said table, a pair
of cranks pivoted on said table, each of said
cranks having a link connection with one of
said blocks, and operative connections be-
tween said cranks whereby said guides may
be simultaneously adjusted to a selected size
of bottle.

3. In apparatus of the class described, a

table, a rotatable helical blade adapted to
laterally receive bottles between its convolu-
tions and move them across said table, a belt
conveyor operable beneath and transversely
of said blade, a stationary lateral guide angu-
larly disposed over said conveyor, an oppo-
sitely positioned laterally swingable guide
extending angularly over said conveyor, said
two guides cooperating to shift bottles on
said conveyor into single file for engagement
with said blade, and means for reciprocally
moving said swinging guide.

In witness whereof I have hereunto set my
hand.

OLAF LARSEN.