ABSTRACT OF THE DISCLOSURE

A machine for filling liquid into a flexible bag, including a scale on which the bag is placed and carrying a holder for gripping a filling neck of the bag, with a filling nozzle moveable into engagement with the neck, and being adapted to fill liquid into the bag until the filling operation is automatically halted by the scale when the bag and contained liquid reach a predetermined weight. In moving to its filling position, the filling spout swings generally horizontally about an axis, and also moves downwardly to properly contact a filling neck of the bag.

CROSS REFERENCE TO RELATED APPLICATION


BACKGROUND OF THE INVENTION

This invention relates to improved apparatus for filling a preformed product into a container. The invention is in certain respects especially adapted for the filling of milk into flexible plastic bags, and will be described primarily as applied to that use, though it will be apparent that certain of the inventive features are equally applicable to other container filling situations.

It has recently become popular in many areas to package milk in plastic bags, rather than in bottles, cartons, or the like, especially for use in which several quarts or gallons are to be packaged in a single container. These bags are formed of fully flexible polyethylene film, and usually carry near one corner of the bag an inlet fitting which may be formed of a more rigid polyethylene or similar material. In view of the flexibility of the bag, most conventional types of filling equipment are not easily applicable to the filling of such bags.

There have been some previously devised types of filling equipment which are intended to fill flexible bags of the discussed type, but none of these prior machines with which I am familiar has proven adequate. More specifically, the previous bag-filling units have been incapable of filling bags as rapidly as would be desired, or with sufficient accuracy of measurement, and have required excessive time consuming manipulation of the bags and equipment by an operator, with a resultant low overall efficiency in the filling procedure.

SUMMARY OF THE INVENTION

A filling machine constructed in accordance with the present invention can be utilized more effectively than the above discussed prior equipment for the filling of milk or other liquids into a flexible bag, or other container, and can do so rapidly and with little manual effort, and in a manner very accurately measuring the quantity of fluid filled into each bag. The apparatus is desirably also adapted to apply closures to the bags or other containers as they are filled, so that in a very short interval a bag may be filled with a metered amount of liquid and capped to a sealed condition for removal to a delivery or storage location.

In order to facilitate filling of the desired product into a flexible bag of this type, I utilize a holder structure which is adapted to engage and hold the inlet fitting of the bag, and locate that filling at a predetermined position in spite of the inability of the fully flexible walls of the bag to themselves properly support or locate the inlet fitting. In conjunction with this holding structure, I employ a filling unit or fitting which is so located as to fill the milk or other product into the container when its inlet is located by the holder. Preferably, the filling unit is mounted for retracting movement between an active filling position and an offset retracted position. This movement may be a generally horizontal swinging motion, about a generally vertical axis, combined preferably with an axial generally vertical movement toward and away from the inlet fitting, so that the filling unit may rotate in two different directions toward the retracted position.

The filling unit or nozzle may be mounted for its horizontal swinging and vertical movements by a swinging arm, which preferably contains a passage through which the material being dispensed is fed through the nozzle. This arm may be mounted to a support shaft which is journaled to turn about the vertical axis of motion of the nozzle, and to move upwardly and downwardly along that axis, with the shaft being power actuated vertically by a piston and cylinder mechanism or the like, and being cammed rotatably upon such vertical movement to effect the swinging motion of the nozzle. In conjunction with the nozzle, the swinging arm may carry a control valve, acting to commence and terminate the flow of fluid from the nozzle in timed relation to the movement of the nozzle.

The fluid discharge nozzle may comprise or include a flexible spout, which is engageable with the filling neck of the bag in sealed filling relation, and which is adapted to flex in a manner maintaining its sealed relation with respect to the neck while avoiding the exertion of any substantial force against the neck which might tend to affect or alter the weighing operation of the scale. For this purpose, the flexible element may be of an outwardly bulging or bowing shape, presenting a generally radially extending lower edge which engages the filling neck and is flexible for limited vertical movement therewith.

A further feature of the invention resides in the provision of an improved holder for receiving and locating the filling neck of the bag during a filling operation. Specifically, this holder desirably includes a plurality of relatively movable jaws which are actuable toward and away from one another, to grip the neck and retain it in a fixed position during a filling operation.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawings, in which:

FIG. 1 is a perspective view showing a bag filling machine constructed in accordance with the invention;

FIG. 2 is a fragmentary perspective view similar to FIG. 1, but showing the apparatus in its cap applying position;

FIG. 3 is a vertical section taken primarily on line 3-3 of FIG. 1;

FIG. 4 is a fragmentary plan view, partially broken away, of the FIG. 3 apparatus;

FIG. 5 is an enlarged view taken primarily in the plane of FIG. 3, with certain portions of the apparatus broken away to illustrate their interior construction;
FIG. 6 is a transverse vertical section taken primarily on line 6—6 of FIG. 5; FIG. 6a is a view showing the two units of FIG. 6 after separation; FIG. 7 is an enlarged horizontal section taken on line 7—7 of FIG. 6; FIG. 8 is an enlarged horizontal section taken on line 8—8 of FIG. 5; FIG. 9 is a fragmentary enlarged vertical section taken on line 9—9 of FIG. 3; FIG. 10 is a greatly enlarged fragmentary vertical section taken on line 10—10 of FIG. 5; FIG. 11 is a reduced fragmentary plan view taken on line 11—11 of FIG. 10; FIG. 12 is a fragmentary view taken on line 12—12 of FIG. 1; FIG. 13 is a fragmentary vertical section taken essentially on line 13—13 of FIG. 12; FIG. 14 is an enlarged fragmentary vertical section taken primarily on line 14—14 of FIG. 12; FIG. 15 is a view showing the capping mechanism in its cap applying position; FIG. 16 is a section on line 16—16 of FIG. 15; FIG. 17 is a diagrammatic representation of the electrical and pneumatic control apparatus; FIG. 18 is a section on line 18—18 of FIG. 5; FIG. 19 is a section on line 19—19 of FIG. 10; FIG. 20 is a view on line 20—20 of FIG. 4; and FIG. 21 is a perspective view of the cap.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, I have shown at 10 a bag filling machine constructed in accordance with the invention, and having a main stationary housing 11 supported on suitable legs 12. The housing has an upstanding portion 13 at the rear of the machine, which contains certain of the pneumatic, electrical, and other parts of the apparatus. In front of this upstanding portion 13 of the housing, there is provided a platform 14 on which a bag 15 to be filled is located during the filling operation. Platform 14 is supported movably by a weighing scale 16 (see FIG. 3), which responds to the attainment of a predetermined bag weight to automatically close off the admission of milk into bag 15 through a filling valve unit 17. This unit 17 is mounted to swing between the active position of FIG. 1 and retracted position of FIG. 2, to mate with the inlet fitting or neck 18 of the bag (FIG. 3) which is held at a predetermined filling location by a holding assembly 19. After the filling operation has been completed, capping mechanism 20 may be actuated to apply a closure cap to neck 18 to complete the filling and closing operation.

As seen best in FIG. 3, the side walls 21 which define the forward lower portion of housing 11 terminate upwardly at a location 22, along the front and opposite sides of the forward portion of the housing. Scale 16 is located within this forward portion of the housing, and has a stationary body portion 23 which is suitably secured in fixed position relative to bottom wall 24 of the housing, as by fastening legs 25 of the scale to wall 24. At its upper side, weighing scale 16 has a top work supporting element 26 forming an inner platform, to which an elongated element 27 extending in a front-to-rear direction, and two or more transverse elements 28 extending from side to side, are rigidly secured, as by fastening posts 29 at 29 in FIG. 4. The top platform 14 on which bag 15 is directly positioned rests on transverse elements 28, and may have a horizontal work engaging portion 30 and depending skirts 31 and 32 extending along its front and two opposite sides of the housing. This entire platform 14 is thus supported on element 26 to move up and down therewith in weighing the bag 15 and its contents. Holding structure 19, for holding the filling neck of bag 15, is supported by the previously mentioned part 27 (FIGS. 3 and 4) for up and down movement with the weighing platform 14. For this purpose, part 27 may have an upwardly projecting portion 32 adjacent the upstanding portion 13 of housing 11. At its upper end, portion 32 carries a forwardly projecting horizontal sheet metal part 33 to which gripping structure 19 is mounted. Element 33 contains near its forward edge a circular opening 34, about which the metal of part 33 may be turned slightly upwardly, annularly, as indicated at 35 in FIG. 5. The filling neck 18 of the bag is tubular, and of an external diameter to pass upwardly through opening 34 and be confined relatively closely therein, with an upwardly projecting externally threaded portion 36 of neck 18 extending upwardly above the level of the gripping apparatus 19.

The gripping structure includes two jaws 37 and 38 (FIG. 11) which are individually pivoted at 39 and 40 to part 33 for horizontal swinging movement toward and away from one another between a first, fully gripped position of FIG. 11 and the broken line open positions of that figure. In the fully line positions, portions 41 of the jaws which are shaped non-circularly in correspondence with the lower portion 42 of filling neck 18 (FIG. 5) tightly grip that filling neck to accurately locate it in a desired filling position, and hold it against removal from that position. The jaws 37 and 38 are actuated by a manually operated lever 43 (FIG. 11), which is pivoted by a screw 145 for pivotal movement about a vertical axis 45, with parts 37 and 38 being cut away at the location of screw 145 to pass the screw upwardly from plate 33 by which it may be rigidly carried. A nut 44 is removable threaded onto screw 145, and engages the upper surface of lever 43 to hold the parts in assembled positions. Element 43 has two spaced parallel slots 46 shaped as shown in FIG. 1, and receiving camming pins 47 rigidly attached to parts 37 and 38, to cam jaws 37 and 38 toward and away from one another in response to swinging movement of lever 43.

The filling valve unit 17 includes a T-shaped body 52 having a horizontal tubular portion 48 (FIG. 5), containing a passage 49 communicating with a vertical cylindrical passage 50 formed in a vertically extending tubular forward portion 51 of body 52. Passage 49 is open at its rear end, and connected to an inlet hose 53 through which milk to be dispensed is admitted to body 52 from an appropriate supply source, typically a tank at an elevation high enough above body 52 to cause gravity flow into and through that body. Froat passage 50 may be directly vertical and open downwardly into a flexible annular seal element 54, desirably formed of rubber or other resilient material. Part 54 may be bonded to a carrier ring 55, which with part 54 is frictionally retainable on a lower reduced dimension portion 56 of body 52. Ring 55 may have an edge 57 forming a trough for receiving any materials which may fall downwardly thereon, and having a down turned portion 58 forming a gripping rear portion of part 55, to discharge those materials, if any, downwardly at that location.

Part 54 may be relatively thick at the top, and thin progressively as it curves downwardly and inwardly to form a very flexible lip 59 dimensioned to annularly engage the upper annular surface 60 of the part 18, about opening 61 within part 54 and about the fluid passage through part 18. The resilience of lip 59 is such as to avoid the exertion of any substantial downward force by that part against inlet neck 18, which force might introduce an inaccuracy on the filling.

The discharge of milk from passage 50 is controlled by a valve element 61 which may be a cylindrical rubber element fitting tightly within passage 50, but movable upwardly and downwardly therein between the full line closed position of FIG. 5, and an elevated broken line position designated 61' in that figure. In its lower position, valve element 61 engages downwardly against an
annular seat shoulder 62 formed in and by portion 51 of body 52. Element 61 is carried by a vertically extending shaft 63, typically formed of metal, and which passes through valve body 52 and is actuated by the valve housing 64. Element 61 is formed in a seal or gasket element 65 fitting closely within passage 50. Seal element 65 may be bonded to a metal disc 66 which engages downwardly against the upper end of portion 51 of body 52. As will be understood, the annular engagement of rubber seal element 65 with body 52 and shaft 63 prevents any upward flow of milk from body 52 through the valve. Element 61 preferably takes the form of a piston and cylinder mechanism whose vertically extending cylinder is represented at 68, and whose contained vertically movable piston is shown at 69. Actuating air is introduced into the cylinder at the underside of piston 69 through an inlet 70 (FIG. 5) to actuate the piston upwardly against the influence of a compression spring 71 acting upwardly against a wall 72 rigidly carried by the cylinder. The lower end of spring 71 bears downwardly against a part 73 which is rigidly attached to tubular piston rod 74. Wall 72 contains an appropriate O-ring seal element 75 held in place by spring 71 and a fibre washer 175, and forming an annular seal with the shaft or piston rod 74 to prevent leakage therepast. Air from above piston 69 may be vented to atmosphere through the interior of piston rod 74, and through a vent opening 275 leading therefrom to atmosphere.

The lower end of cylinder 68 has a terminal portion 76 which is cut away at 77 to extend only partially about the main vertical axis 78 of piston 69 and valve element 61. This portion 76 extends about the outside of the upper extremity of portion 51 of body 52, and has an arcuate inwardly extending projection or shoulder 79 disposed about axis 71 and receivable within an annular groove 79 formed in the outer surface of body 52. This groove and projection 78 lie in a horizontal plane. Preferably, portion 76 and its projection 78 extend about portion 51 of body 52 through slightly more than 180 degrees, relative to axis 78, so that portion 76 must be forced into groove 79, and must be expanded slightly during such connection of the parts together. More particularly, the cylinder body 68 is connected to body 52 by moving body 68 leftwardly from the position of FIG. 6, to the position of FIG. 6, during which movement shoulder 78', of portion 76 of body 68 slides horizontally into groove 79, transversely of axis 78, to the FIG. 6 assembled condition in which the parts are retained by virtue of the slightly more than 180 degrees encirclement of the groove by portion 76. There may subsequently be separated by forcing portion 78' out of groove 79. The metal of cylinder body 68 must of course have sufficient slight resilience to enable this frictional locking engagement between parts 68 and 52.

The same movement between the positions of FIGS. 6 and 6a acts to connect part 73 to valve stem 63 for actuation thereof. For this purpose, part 73 has a horizontally extending portion 80 having the bifurcated shape illustrated in FIG. 7, to form two fingers or arms 81 having diverging edges 82 receivable within an annular groove 83 formed in valve stem 63 above plate 66. As the cylinder housing 68 is moved to the left from the FIG. 6a position, fingers, 81, are received within the opposite sides of groove 83, and act to interfit with that groove in the FIG. 7 condition in which upward and downward movement of piston 69 is effectively transmitted to the valve 61' to open and close it. In order to maintain fingers 81 in proper orientation with respect to the proper housing, so that the same leftward movement will interconnect the piston and valve, and also the two housing parts 68 and 52, element 73 has an upper portion 84 which is connected rigidly to stem 74, and also has a tab 85 projecting into a vertical slot 86 formed in cylinder wall 68, to always key part 73 against turning movement about axis 78 relative to cylinder housing 68.

As seen best in FIG. 5 and 9, valve body 52 is rigidly mounted to a vertically extending shaft 87 for vertical movement therewith along a vertical axis 88, and for swinging movement with the shaft about axis 88. Shaft 87 may be formed of a rigid metal, and projects upwardly through a bushing element 89 which is rigidly attached to top wall 90 of the housing, and which journals and guides shaft 87 for the desired axial and rotary movement. A part 91 is rigidly brazed to body 52, and projects downwardly therefrom (FIG. 5), and contains the vertical recess 92 in body 68, that locates the end of externally cylindrical shaft 87 projects. One or more set screws 93, (FIG. 9) extend through the side wall of element 91 and are tightened against the upper end of shaft 87 to secure body 52 removably to the shaft. The part 52 is located in a fixed rotary position relative to the shaft by extension of a rigid air outlet tube 94 carried by shaft 87 through a locating notch 95 formed in the side wall of part 91. As will be apparent from FIG. 5, the tube 94 communicates with a passage 96 in shaft 87, which passage extends downwardly through the shaft and communicates at its lower end with another tube 97 rigidly connected into and upwardly through an adjustable bleed outlet 119. Similarly, current supplied to leads 121 and 123 actuates the valve 118 through a locating notch 95 formed in the side wall of part 91. As will be apparent from FIG. 5, the tube 94 communicates with a passage 96 in shaft 87, which passage extends downwardly through the shaft and communicates at its lower end with another tube 97 rigidly connected into and upwardly through an adjustable bleed outlet 119. Similarly, current supplied to leads 121 and 123 actuates the valve 118 through a locating notch 95 formed in the side wall of part 91.
reversely to admit air to the lower end of the cylinder, through line 119, to actuate its piston and shaft 87 up-
wardly, while line 125 discharges to atmosphere through an adjustable line 120. Line 120 connects with the
previously mentioned bleed valve assembly 111, and is also in communication with a line 124 leading to the
inlet side of the solenoid valve 116. When solenoid valve 116 is supplied with air through line 124, and is th
energized through leads 125 and 126 (FIG. 17), it passes air from line 124 through the valve to line 115
(FIGS. 3, 9 and 17) to shaft 87.
Current is supplied to the circuit diagram of FIG. 17 through a power line 127, connected to the primary side
of a transformer 128, under the control of a main power switch 129. The secondary of the transformer is con-
ected to ground at 130, and to a common side of micro-
switch 114. A normally closed side of this microswitch is
connected through a lead 131 to a push button start switch 132, whose opposite side is connected to lead 122
to valve 118. A normally opened contact of microswitch
114 is connected through a lead 133 to the common side
of a scale operated switch 134. The normally opened
contact of this switch is connected to lead 123, while the
normally closed contact of switch 134 is connected to
lead 126. Switch 134 is actuated magnetically from its
normal condition to the opposite condition by move-
ment of an actuating lever 135 of the switch when the
scale responds to the attainment of the predetermined
desired weight of fluid in bag 15. More particularly, arm 135 may be formed of a magnetic material, and
may be actuable downwardly when a magnet 136 carried
by conventional balance arm 236 of the scale moves
upwardly upon the attainment of a desired weight (FIG.
9). Balance arm 236 may be pivoted to body 23 of the
scale for swinging movement about an axis 237 (FIGS.
3 and 9), with the critical weight being settable by shift-
ing movement of one or more scale arm weights 238.

The cap applying mechanism 20 of FIG. 1 includes a
vertically extending tubular magazine 137 having an in-
ternal diameter corresponding approximately to the
external diameter of the circular caps 138 to be applied to bags 15. These caps are stacked within magazine 137 as shown in FIG. 1, and may be shaped as illustrated in
FIG. 18, having generally cylindrical side walls 138 closed at their upper sides by top walls 140, and containing in-
ternal threads 141 for engaging the threads of fitting 19
of the bag. The caps are positioned in magazine 137 with their inner threaded recesses facing downwardly.
The lower end of the magazine is secured rigidly to an elon-
gated mounting member 142, which extends outwardly
from one side of the rear portion 13 of housing 11, and
which is detachably secured thereto by a wing nut 143
(FIGS. 15 and 20). Element 142 takes the form of a flat
horizontal metal member received on the upper surface
of housing 11 (FIG. 13), and having a pin 144 at one of
its ends projecting horizontally through a mating aperture
in a vertical mounting portion 145 of the magazine
and coating with a screw 146 passing vertically through a horizontal second mounting portion 147 of the maga-
zine to securely but removable attach the magazine to member 142. The mounting portions 145 and 147 of the magazine may be formed integrally with the magazine or
may be separate sheet metal elements welded to or pro-
exting downwardly from two opposite sides of the maga-
zine. Along one of its sides, magazine 137 may have a
vertical slit or opening 137 of a size smaller than the
caps, to allow access to the interior of the magazine but
effectively retain the caps therein.
A second elongated arm 172 is provided for automati-
cally actuating the cap feeding plate 151, and for this
purpose, arm 172 is pivotally connected at 143 to plate 151.
A second elongated arm 172 is pivotally connected at 174 to plate 151, and slidable carries a member 175, which is received about arm 172 and slideable therealong. Member 175 carries an
upwardly projecting pin 176 which extends through an opening in the other arm 165 to pivotally connect mem-
ber 175 thereto, with the result that when member 165 is manually swung between Figs. 12 and Fig. 15 pos-
tions, the part 175 acts to simultaneously swing arm 172 in the opposite direction from its Fig. 12 position to its Fig. 15 position. Also, as will be apparent from Fig. 13, the engagement of arm 165 with member 175 allows for the discussed fulcrumming movement about pivot 168, to lower member 165 and to engage member with a cap. During this fulcrumming movement, the sliding member 175 itself may swing slightly with arm 165, and for this purpose may engage only the top and op-
posite sides of member 172, and not its underside.

To now describe the operation of the discussed appa-
ratus, assume first of all that the scale has been properly set for a particular desired bag weight, and caps have been inserted in magazine 137. Initially, cap carrier 158 is in its retracted position of Fig. 1, and the filling valve assembly 17 is in its retracted position of Fig. 2. With the parts thus retracted, lever 43 of Fig. 11 is actuated to open jaws 37 and 38, so that an empty bag 15 may have its inlets fitting 18 clamped in the jaws, with the bag being on platform 14 as shown in Fig. 1. After the filling fitting of the cap has been thus clamped by the jaws of holder 19, with the filling neck 18 extending vertically about axis 177 of Fig. 3, the operator presses start button 132 of Fig. 17 to place the apparatus in operation. Such closure of switch 132 closes an energizing circuit from the secondary of transformer 128 through lead 180 to the common contact of switch 114, then through the normally closed contact of that switch to lead 131, then through switch 132 and lead 122 to a first side of electrically operated valve 118, whose opposite side is permanently connected to the other side of the secondary of transformer 128 through ground connections 121 and 130. Such energization of valve 118 causes that valve to admit air from inlet 117 to line 120 leading to the upper side of cylinder 99. The resultant admission of air to the upper end of this cylinder causes downward movement of the contained piston 100, and the connected upwardly projecting shaft 87. As the shaft moves downwardly, it is caused to turn in a clock-
wise direction as viewed from the top of the apparatus, by virtue of the movement of cam roller 105 along the helical upper portion 104 of cam slot 102 (Fig. 9). This turning of the shaft 87 causes the body 52 (Fig. 5) for it and force from the cam 102 upwardly against the cam 87, as its lower end is uppermost of the cylinder 99 so that the piston 100 within that cylinder is actuated upwardly, to move shaft 87 and its carried parts upwardly. The first portion of this movement is directed and then, when this body 52 is inter-
posed between elements 110 and 110', as parts 109, 110, 134, the normally closed contact of that switch, and lead 126, with the second side of solenoid valve 116 being connected to ground lead 125 and the grounding connection represented at 185. The air from solenoid valve 116 and line 115 enters shaft 87 through fitting 112, 108, 106 and 97 of Fig. 5, then flows up-
wardly through passage 96 in the shaft, and outwardly through tube 94 and hose 98 to enter cylinder body 68 beneath piston 69. This actuating air forces piston 69 upwardly, to correspondingly move valve element 125 upwardly away from its seat 62 and to the broken line position 61' of Fig. 5, to allow milk to flow through horizontal passage 49 and downwardly through vertical passage 50 of part 52, and to discharge through element 54 into the bag. This filling operation continues until the weight of the filled liquid reaches a predetermined value, representing the amount of liquid which is to be metered into the bag, at which time the weight on platform 14 moves element 26 of scale 16 downwardly just sufficiently to swing balance arm 28 of the scale upwardly to a position indicating that the preset weight has been attained. This upward movement of element 26 actuates solenoid
net 136 (Figs. 9 and 17) magnetically actuates switch 134 to open the filling operation. This is effected by clos-
ing a circuit to the second side of electrically operated valve 118 as follows: from the secondary of transformer 128 through lead 180, the normally opened contact of switch 114, lead 133, the common and normally open contacts of switch 134, and lead 123 connecting into the right side of electrically operated valve 118. The second side of the valve is of course ground. At this point, it may be stated that valve 118 is of a type acting to automatically remain in whichever of its two positions it has last been actuated to. Consequently, even though the initial circuit through lead 122 is broken almost immediately after closure of the actuating switch 132, the valve 118 will nevertheless be actuated to its filling position when switch 132 is closed, and will remain in that position until the just discussed circuit through scale operated switch 134 is closed to lead 123. When this circuit is closed, the valve 118 is returned to its initial condition, to admit air to the lower end of the cylinder 99 through line 119, and relieve the pressure from the upper end of cylinder 99 so that the piston 100 within that cylinder is actuated upwardly, to move shaft 87 and its carried parts upwardly. The first portion of this movement is directed and then, when this body 52 is inter-
posed between elements 110 and 110', as parts 109, 110, 134, the normally closed contact of that switch to break the circuit to valve 116, and thereby close off that valve, and the flow of milk from valve 17.

When valve 118 is actuated to the above discussed condition for admitting air to the lower end of cylinder 99 through line 119, such actuation of the valve also serves to simultaneously connect line 120 from the upper end of the cylinder to outlet 120', to release the pressure at the upper end of the cylinder to atmosphere. However, outlet 120' is adjusted to a restricted condition in which it releases the pressure only very slowly, and thus allows very slow upward movement of piston 100, shaft 87 and dispensing unit 17. After these parts have moved up-
wardly a predetermined distance, preferably to the point at which cam slot 102 commences the lateral swinging movement of unit 17, the bleed valve 111 suddenly opens automatically to allow discharge of air from line 120 much more rapidly than had theretofore been possible, so that the unit 17 completes its upward and lateral travel at a greatly increased speed. Valve 111 is inserted, as shown in Figs. 5 and 18 condition of the apparatus, held down-
wardly against its seat 212 by a compression spring 312 interposed between elements 110 and 110'. As parts 109
and 110 commence their upward movement, the spring 312 continues to hold element 110' closed, but with reduced force, until ultimately, as unit 17 commences its lateral swinging motion, valve element 110 suddenly pops open to release air to atmosphere through passages 212' and 412, which in the open position of element 110' are much less restricted to air discharge than is outlet 120'. The purpose of the initial period of slow upward movement of shaft 87 is to allow ample time for any excess milk in unit 17 to drip from that unit into the bag, during such slow direct vertical movement of unit 17, and prior to the more rapid lateral retraction of that unit. The downward movement of unit 17, on the other hand, may be rapid, and about that downward travel, and for this purpose outlet 119', through which air from line 119 and the lower end of cylinder 99 discharges upon downward movement, may be much less restricted than outlet 120' and typically as unrestricted as the passages 212' and 412 in their open condition. Any leakage of air through the mechanism 19, this may be separated into its component parts and detached by merely removing the nut 44, whose underside face engages part 43, so that this part 43 is free for upward movement after detachment of the nut. The slots 46 are free for removal upwardly away from their mating pins 47, following which jaws 37 and 38 may be removed upwardly by movement off of their pins 35 and 40, which are secured to and project upwardly from plate 33. After cleaning, all these parts may be replaced to the condition illustrated in FIG. 11.

Desirably, all of the metal parts of the apparatus, including especially those parts which may contact milk, such as part 52, are formed of stainless steel, to avoid any adverse effect on the milk being handled or on the parts themselves.

The various air actuated parts may be internally lubricated by introducing atomized oil into the air stream through a conventional lubricator represented diagrammatically at 300 (FIG. 9). Also the portion of this air which is discharged from valve 116 and the parts controlled thereby upon closure of valve 116 may be utilized to lubricate roller 185 and slot 102 (FIGS. 5 and 8) by directing such air from valve 116, with its contained lubricant, through a discharge line 301 onto the roller and slot.

At all times when the scale is not actually being used for a milk weighing operation, the scale platform 30 and its connected parts may be locked against unwanted shifting movement, preferably by engagement of a turned portion 313 of a swinging arm 413 (FIGS. 10 and 19) upwardly within and against a notch 513 in a part 613 rigidly carried by element 32. Arm 413 may be rigidly connected to the previously discussed switch actuating arm 113 (FIGS. 9 and 19), to swing about a horizontal axis therewith, and to be urged by spring 213 upwardly against notch 513 except when downward actuation of arm 113 to the FIG. 9 position correspondingly swings arm 413 to its broken line released position of FIG. 10, just as element 54 engages the bag in filling relation.

To allow easy adjustment of the capping structure relative to the housing, in order that a carried cap may be located precisely above the neck of a bag being filled, element 42 of the capping mechanism may be mounted adjustably to the housing. More particularly, element 42 may have a vertical flange 343 (FIGS. 15 and 20) received adjacent a side wall 11' of housing 11, with this side wall carrying a screw 143' projecting through an adjusting slot 243 in flange 343 and having the previously mentioned wing nut 143 removably connected to the screw to secure element 42 in place. Thus element 42 may be adjusted both laterally and longitudinally by shifting slot 243 relative to screw 143'.

The form of the invention shown in FIG. 1 and the other figures is designed for use in situations in which access to the machine can best be had from its side, for this reason, the filling and capping parts swing to rightwardly retracted positions. However, it is of course contemplated that opposite-handed machines may be provided in which the capping mechanism is located at the left side of the machine, and both it and the filling unit 17 retract to the left.

We claim:

1. Apparatus comprising a holder for holding a filling neck of a container with the neck facing and opening generally upwardly at a predetermined filling location, a filling nozzle for filling a fluid downwardly into said neck, power actuated means for swinging said nozzle generally horizontally about a generally vertical axis between a retracted position offset laterally from a neck retained by said holder and a filling position of vertical alignment with the neck, said last mentioned means being operable to shift the nozzle downwardly into filling relation with the neck in generally maintained relative to the horizontal swinging movement of the nozzle, and valve means for passing fluid through said nozzle and
into said neck retained by the holder in said filling position.

2. Apparatus as recited in claim 1, in which said power actuated means include a swinging arm carrying said nozzle for said generally horizontal swinging movement and containing a passage through which said fluid is delivered to the nozzle.

3. Apparatus as recited in claim 1, in which said power actuated means include a swinging arm carrying said nozzle for said generally horizontal swinging movement and also carrying said valve means for swinging movement with the nozzle.

4. Apparatus as recited in claim 1, in which said power actuated means include a swinging arm carrying said nozzle for said generally horizontal swinging movement and also carrying said valve means for swinging movement with the nozzle, said arm being essentially a tube containing a passage for delivering said fluid to said valve means and nozzle.

5. Apparatus as recited in claim 1, in which said power actuated means are operable to shift the nozzle downwardly simultaneously with its generally horizontal swinging movement.

6. Apparatus as recited in claim 1, in which said power actuated means are operable to first shift the nozzle downwardly simultaneously with its generally horizontal swinging movement and to then shift the nozzle directly downwardly into said filling relation with the neck and without further swinging movement.

7. Apparatus as recited in claim 1, in which said power actuated means include a generally vertical shaft mounted to turn about said generally vertical axis, and an arm projecting generally horizontally from said shaft to swing about said axis therewith and carrying said nozzle for said swinging movement at a location offset from said shaft.

8. Apparatus as recited in claim 1, in which said power actuated means include a power unit operable to displace said nozzle downwardly, and cam means for causing said swinging movement of the nozzle about said generally vertical axis in response to said downward movement.

9. Apparatus as recited in claim 1, in which said power actuated means include a power unit operable to displace said nozzle downwardly, and cam means for causing said swinging movement of the nozzle about said generally vertical axis in response to a first portion of said downward movement but then allowing the final portion of said downward movement without corresponding swinging movement.

10. Apparatus as recited in claim 1, in which said power actuated means include a generally vertical shaft mounted to turn about said generally vertical axis, an arm projecting generally horizontally from said shaft to swing about said axis therewith and carrying said nozzle for said swinging movement at a location offset from said shaft, a tubular structure disposed about said shaft and containing a cam slot, powered means for actuating said shaft vertically, and cam follower means connected to said shaft and received in said slot and guided thereby in a relation causing horizontal swinging of the arm and nozzle in response to said vertical movement of the shaft.

11. Apparatus as recited in claim 10, in which said power actuated means contain a passage for conducting a control fluid into a passage within said shaft, there being a conduit connected to an upper portion of said last mentioned passage within the shaft, and a unit for actuating said valve means and carried by said arm for swinging movement therewith and connected to said conduit to receive valve operating control fluid therefrom.

12. Apparatus as recited in claim 1, in which said power actuated means include a swinging arm carrying said nozzle for said generally horizontal swinging movement and also carrying said valve means for swinging movement with the nozzle, said arm being essentially a tube containing a passage for delivering said fluid to said valve means and nozzle, said power actuated means including a generally vertical shaft mounted to turn about said generally vertical axis and carrying said arm for said swinging movement, a piston and cylinder unit for actuating said shaft downwardly and upwardly, cam means about the shaft for causing horizontal swinging movement of said shaft and arm and nozzle and valve means in response to initial downward movement of the shaft, and guiding the shaft and arm and nozzle and valve means for only directly downward movement, without swinging motion, during a final portion of the downward movement of the shaft.

13. Apparatus as recited in claim 12, in which said cam means include a tube about the shaft containing a cam slot having a first helical portion terminating in a vertical portion, there being a cam follower structure connected to said shaft and extending through said slot in guided relation and containing a passage for conducting a control fluid into a passage in the shaft, there being a conduit connected to an upper end of said passage in the shaft, and a powered unit carried by said arm and actuable by control fluid from said conduit to actuate said valve means.

14. Container filling apparatus comprising a weighing scale structure having a support for receiving and supporting a container which is to be filled and weighed and which has a filling inlet, a holder for releasably holding said inlet at a predetermined location, a filling unit operable to fill a predetermined product into said container through said inlet while the latter is held by said holder and while the container is on said support, automatic control means responsive to said scale structure to halt said filling of said product into the container when the weight of the product in the container reaches a predetermined value, means for simultaneously swinging said filling unit about an axis and shifting it axially to shift the filling unit between an active position in filling relation to said inlet and an axially and rotatably retracted position, closing means for applying a closure to said inlet, means mounting said closing means for swinging movement between an active position for applying a closure to said inlet and a retracted position, a magazine for holding a plurality of said closures, and means operable in response to said swinging movement of the closing means to feed an individual closure from said magazine to a pick-up position at which said closing means can receive it.

15. Container filling apparatus comprising a weighing scale structure having a support for receiving and supporting a container which is to be filled and weighed and which has a filling inlet, a holder for releasably holding said inlet at a predetermined location, a filling unit operable to fill a predetermined product into said container through said inlet while the latter is held by said holder, and while the container is on said support, automatic control means responsive to said scale structure to halt said filling of said product into the container when the weight of the product in the container reaches a predetermined value, power actuated means for swinging said filling unit generally horizontally relative to the support between an active position for filling into said inlet while held by said holder at said predetermined location and a retracted position, said power actuated means being operable to shift said filling unit generally horizontally in timed relation to said horizontal swinging movement thereof, closing means for applying a closure to said inlet after filling, and means mounting said closing means for generally horizontal swinging movement relative to the support between an active position for applying a closure to the inlet while held by said holder at said predetermined location and a retracted position.

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