June 7, 1955 R. F. ANDERSON 2,710,128

CONFECTION MOLD FILLING MACHINE

Filed June 10, 1950 3 Sheets-Sheet 1

Fig. 1.

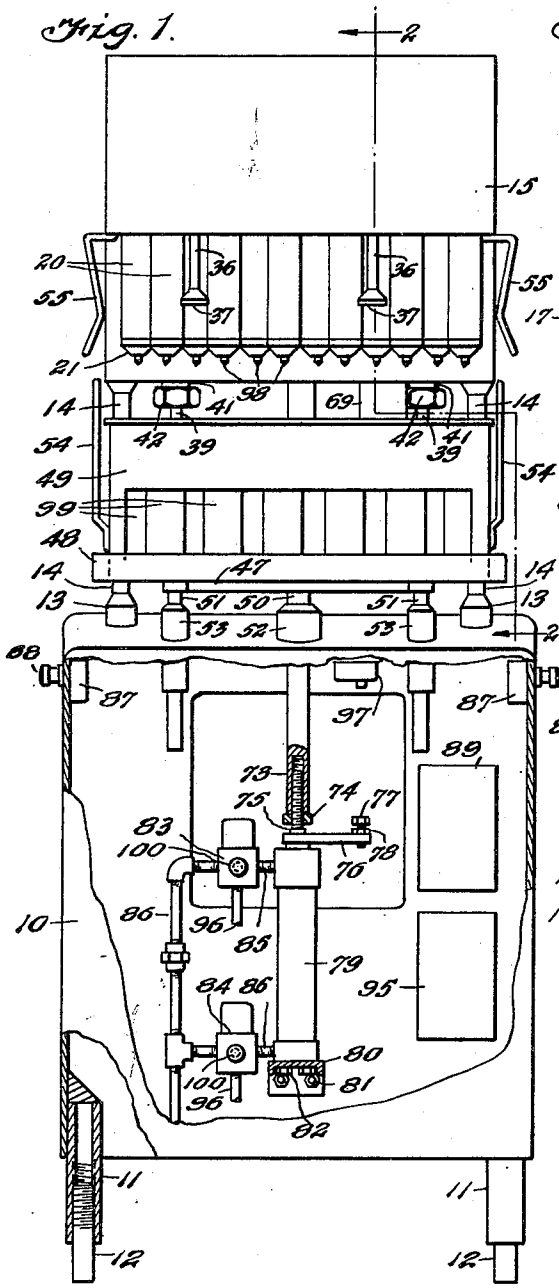
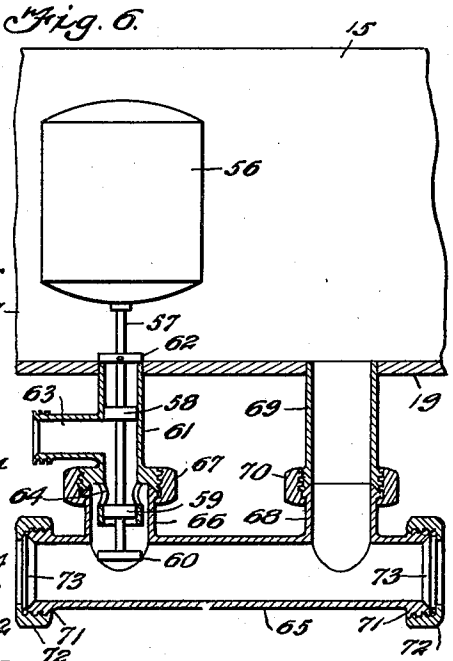


Fig. 6.



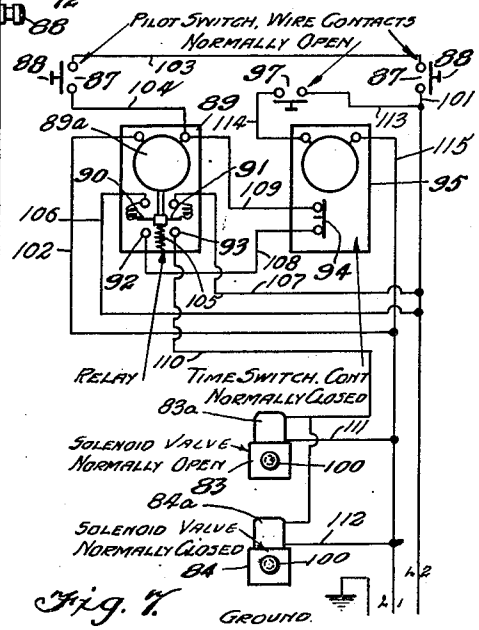


Fig. 7.

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CONFECTION MOLD FILLING MACHINE

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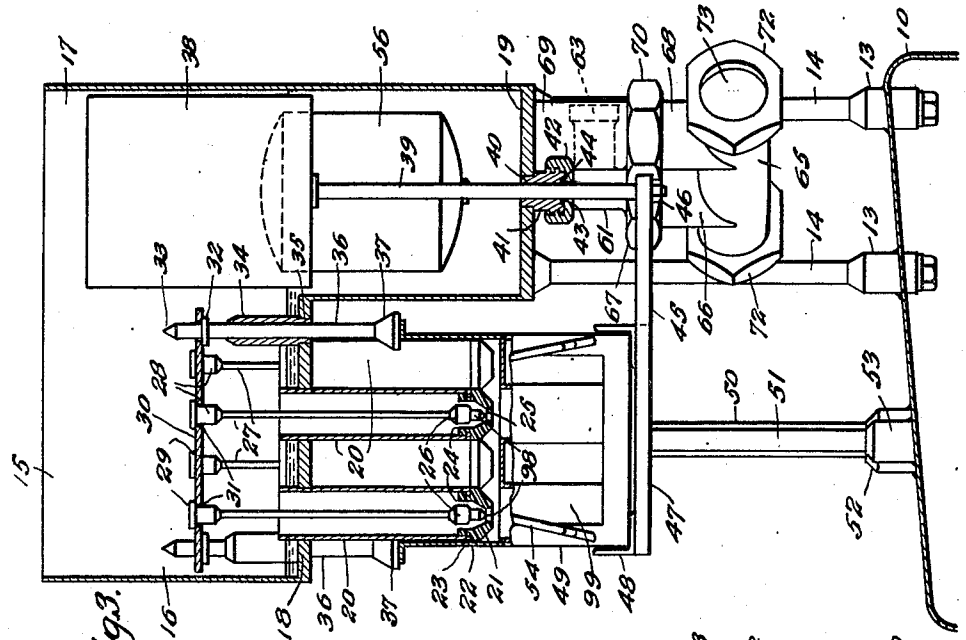

Fig. 3.

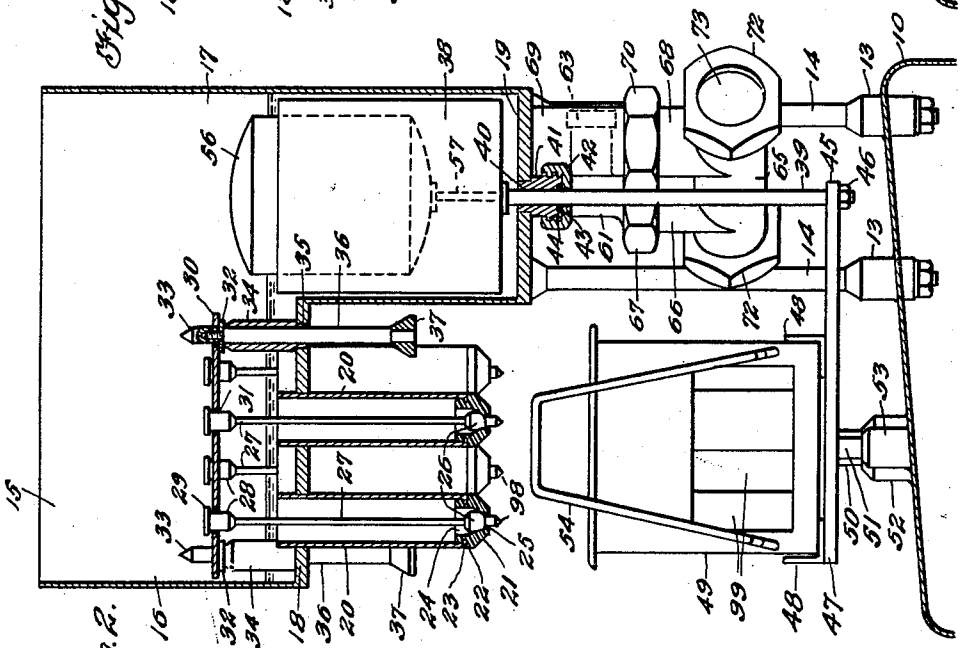

Fig. 2.

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Fig. 4.

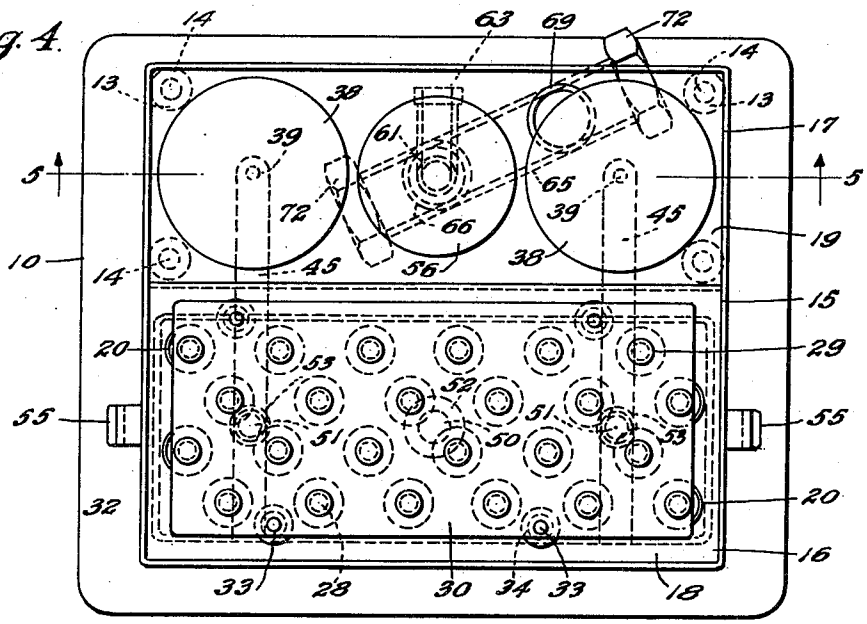
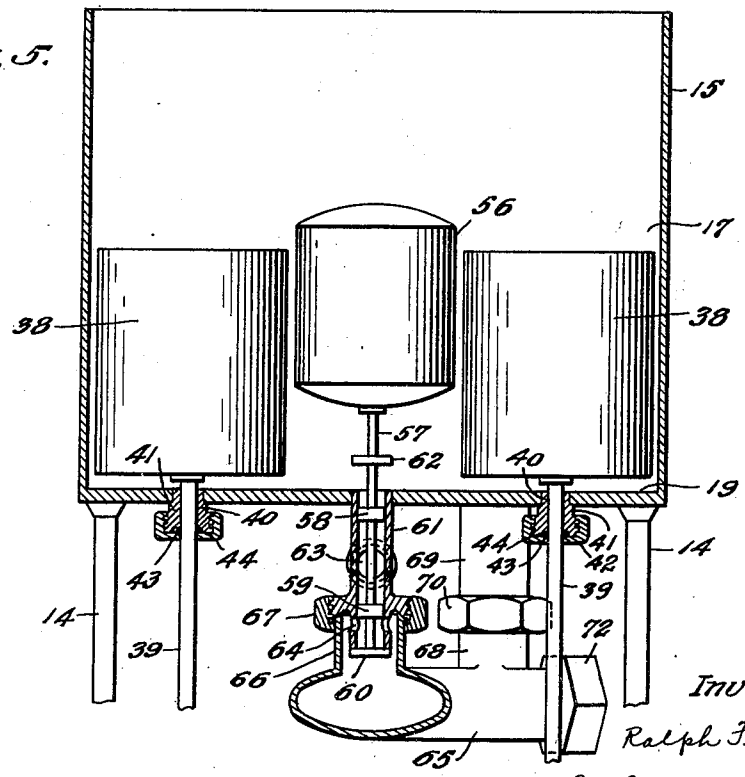


Fig. 5.



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2,710,128

CONFECTION MOLD FILLING MACHINE

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Application June 10, 1950, Serial No. 167,303

9 Claims. (Cl. 226—106)

This invention relates to filling machines for molds and more particularly to machines for feeding a predetermined quantity of liquid to each of a plurality of identical mold cavities.

It has for an object to provide a mechanism comprising a plurality of measuring chambers mounted in the bottom of a reservoir chamber so that in the filling operation, these measuring chambers are submerged, and before these chambers are to be emptied into molds, the liquid level recedes below the upper edge of each chamber so that a predetermined amount of liquid is contained in each chamber.

A further object of this invention is the provision of a semi-automatic mechanism with manual control to start the cycle of operation, and a timing cycle established to assure the proper measuring and filling operations for a plurality of identical mold cavities.

A still further object of this invention is the provision of a reservoir having a displacement chamber formed therein with displacement plungers movable therein, and a float movably mounted in said chamber to actuate a valve mechanism to control the flow of make-up liquid to said chamber, said displacement plungers serving to vary the liquid level in said tank, measuring chambers carried by the bottom of said reservoir to be filled with the liquid when the displacement plungers are in their lowest positions, and said measuring chambers having their upper ends exposed when the liquid level has receded when the displacement plungers are in their raised positions.

A still further object of this invention is the provision of a movable head for supporting a mold having a plurality of mold cavities therein in juxtaposition to the filling chambers, together with a semi-automatic cycling mechanism so that when an operator starts the cycle of operation, the mold is raised so that the mold cavities may receive the liquid from the measuring chambers, and in its raised position, the mold supplements the cycling mechanism in causing operations of valves to discharge the measured volumes of liquid into the mold cavities, and for refilling the reservoir.

Further objects will be apparent from the following specification, appended claims and drawings thereof, in which:

Figure 1 shows a front elevation of a machine constructed in accordance with this invention, with parts broken away to show parts in the base;

Fig. 2 is a transverse section as on line 2—2 of Figure 1;

Fig. 3 is a similar view showing parts in moved positions;

Fig. 4 is a plan view of the machine;

Fig. 5 is a longitudinal sectional view as on line 5—5 of Fig. 4;

Fig. 6 is a diagonal sectional view through the float mechanism, and

Fig. 7 is a diagrammatic view of the electrical circuits and parts.

Referring more specifically to the drawings forming a

part of this application, there is a base member 10 which is provided with tubular sockets 11 which may be welded in place in the corners of the lower end of this base, and these tubular sockets will preferably have extension legs 12 threaded into these tubular sockets so that the machine may be leveled to an upright position by adjusting one or more of the extension legs to suit.

This base member is preferably made of stainless steel or the like to withstand frequent and thorough cleaning, and the top of this base is provided with bosses 13 which may be welded in place to receive the standards 14. These standards 14 rigidly support a reservoir 15 above the base member in spaced relation thereto.

The reservoir 15, as shown in Fig. 4, comprises two compartments as shown at 16 for the filling area, and 17 for the displacement area. These compartments, also shown in Figs. 2 and 3, show the bottom 18 of the filling compartment 16 at a higher elevation than the bottom 19 of the displacement compartment 17.

A plurality of filling and measuring tubes 20 is secured in spaced and staggered relation in the bottom 18 as shown in Fig. 4 and each tube has its upper end extending a slight distance above the upper face of this bottom 18. This provides for flooding or submerging these tubes when the liquid level in the reservoir is raised, and for draining off excess liquid above these tubes when the liquid level is below the upper rim of each tube. This may also be accomplished by having the upper edges of these tubes flush with the top face of the bottom supporting them.

Each filling tube has the major portion thereof depend below the bottom 18, and the volume of each filling tube is predetermined to provide the correct amount of liquid to be discharged into the mold cavities intended to receive this liquid as will be hereinafter described. A rubber or synthetic rubber plug 21 is detachably secured in the lower end of each tube as by having a molded plug provided with an annular groove 22 which receives an inwardly directed flange 23 formed at the lower end of each tube. This provides for quick removal and replacement for cleaning and sterilization of these parts, and could serve as a means for varying the contents of a tube by substituting longer or shorter plugs in the tube. This plug is provided with a recessed center as at 24 of which the side wall tapers downwardly to present a valve seat 25.

Each filling tube 20 is provided with a valve 26 which fits into the plug 21 to engage the valve seat 25, and this valve 26 is carried by a stem 27 which extends above the upper end of the filling tube. The upper end of each valve stem 27 is provided with a head 28 which has a flange 29 formed thereon. This flange normally reposes a slight distance above a valve actuating plate 30 which is mounted in the compartment 16, and in this plate, there is a clearance opening 31 for each head 28 of the several valve stems. This loose fit allows the valve to properly seat on the valve seat 25 without imposing any additional weight on the valve when the plate 30 is at rest. Each valve 26 has a pilot 98 formed on the lower end thereof.

When at rest, this actuating plate 30 is supported by the flanges 32 formed on heads 33 and these flanges rest upon the upper ends of spacing sleeves 34 secured in the bottom 18 as by having reduced shanks 35 sweated or pressed into holes formed in the bottom 18. Push rods 36 which have the heads 33 screwed or otherwise formed thereon, pass downwardly through these spacing sleeves and extend down to positions to engage the rim of a mold to be hereinafter described, and the lower end of each push rod is provided with an enlarged foot member 37 to assure engagement with the mold.

Displacement plungers 38 are mounted to move vertically in the displacement compartment 17, and each

plunger is attached to a push rod 39 which passes downwardly through a guide bearing 40 formed in the plug 41 which is secured in place in the bottom 19 of the displacement compartment. This plug 41 is secured in place with a liquid tight seal in the bottom and is provided with a cap 42 which is threaded on the plug to engage an O ring or other packing 43 placed in the stuffing box 44 to make a liquid tight seal where the push rod 39 passes out into the open. The bottom of each push rod 39 is attached to a bracket 45 as by having a reduced shank pass through this bracket and then secured in place by a nut 46, or otherwise if desired.

A work table 47 includes these brackets 45 and the angle iron rails 48 upon which the mold 49 is placed. This work table is provided with a plunger rod 50 and guide rods 51 so that it may be moved vertically with respect to the filling tubes and in true alignment therewith. The plunger rod 50 passes through a guide boss 52 welded in place on the base member top, and the guide rods 51 pass through the bosses 53 also welded in place on the top of the base member.

A mold 49 comprising a body and a plurality of mold cavities 99 is placed on the work table 47 and slid into position for an operation. There is a mold cavity 99 for each filling tube 20 and these mold cavities are separate and in spaced relation to each other so that in subsequent processing, free circulation and contact of a coolant may be had with the wall of each cavity. After this mold has been placed on the angle iron rails of the work table 47 and slid to approximate position under the filling tubes, the upper edge of this mold has a predetermined height with respect to the work table so that in the upward movement of the work table, the mold 49 engages the heads 37 on the push rods 36 to impart the desired movement in lifting the valve actuating plate 30 when it is time to dump the filling tubes. This mold is further provided with handles 54 on the ends thereof to facilitate in handling the mold to or from the work table, and in the upward movement of the mold, these handles engage the arms 55 carried by the reservoir to guide the mold in vertical juxtaposition to the filling tubes.

There is a certain amount of vertical travel of the work table before the mold 49 contacts the feet 37 of the push rods 36, during which, the displacement plungers 38 are lifted to drain the excess liquid below the top edges of the filling tubes 20.

For a relatively constant volume of liquid in the reservoir, a float valve is provided for make-up liquid. This comprises a float 56 which is carried by a float valve stem 57 and this float is placed in the displacement compartment 17 between the displacement plungers 38. The valve stem 57 is provided with the valves 58 and 59 and the lower end of this stem terminates in a head 60 to restrict the upward movement of the valve mechanism. The valves 58 and 59 are slidable in a valve body 61 which is secured in place in the bottom 19. This valve body has its upper end machined true and may be flush with, or it may extend a trifle above the bottom 19 so that a further valve 62 may seat on the upper end of the valve body in the lower-most position of the float 56. The valve body is provided with a branch 63 which will be connected to a source of supply and the bore for the valves 58 and 59 is machined true so that these valves will have free sliding movement therein. Valve 58 is positioned on the valve stem so that in the lower-most position of the valve stem, this valve 58 will have its bottom face coincident with the top face of the branch passage and the valve 62 will seat on the end of the valve body. In this position of the valve stem, the valve 59 will be moved down so that the top face of this valve will be coincident with the bottom face of the ports 64. In this position, make-up liquid from a source of supply will enter the branch 63 and flow down through the valve body 61 and through the ports 64 past the valve mechanism.

A manifold 65 is connected to the valve body 61 through a branch fitting 66 and the union fitting 67. The manifold also has a second branch fitting 68 which is detachably connected to a feed pipe fitting 69 through another union fitting 70. This feed pipe is secured in the bottom 19 and provides communication from the valve mechanism into the displacement compartment. The manifold has its ends provided with externally threaded enlargements 71 to receive the nuts 72 thereon to clamp removable disks 73 against the ends of the manifold to seal the ends against leakage of the liquid therefrom. The purpose of these union fittings is to provide easy dismantling of these parts when desired as for draining, cleaning and for reassembly.

The plunger rod 50 is adjustably connected to the threaded end of an air cylinder plunger as at 73 and after the desired adjustment has been made, a lock nut 74 is tightened to maintain that adjustment. This air cylinder plunger rod 75 is provided with an offset bracket 76 which has an adjusting screw 77 threaded into a tapped hole in the end thereof and a lock nut 78 on this screw serves to lock the screw in its desired adjusted position.

An air or other fluid operated cylinder 79 is mounted upon a cross member 80 which has its ends bolted to the front and rear walls of the base member as at 81 and the capscrews 82 serve to hold the air cylinder in place on this cross member. This cylinder is of the conventional type so that sectional details are not required, but the capacity and stroke are predetermined for the purposes of this machine.

A solenoid valve 83 is connected to the upper end of this air cylinder and a second solenoid valve 84 is connected to the lower end of this air cylinder. These valves are normally mounted directly on the cylinder but for clarity I have shown short nipples 85 connecting these solenoid valves to the air cylinder and the air supply under pressure may be fed to these valves through the piping and fittings 86. The difference between the solenoid valves 83 and 84 is that valve 83 at the upper end of the air cylinder is normally open, while solenoid valve 84 at the lower end is normally closed.

Referring to Fig. 7, the control circuit for effecting semi-automatic lifting and downward return of the work table 47 includes the series circuit of two normally open pilot switches 87 and the coil 89*a* of relay 89, this series circuit being connected through lines 101 and 102 across the power lines L_1 and L_2 leading from a suitable electrical power source. The two switches 87 are connected by a line 103, while the second of the switches 87 is connected through line 104 to one side of the relay coil 89*a*. The pilot switches 87 are secured inside the base member and have push buttons 88 extending beyond the outer side faces of this base member, as best seen in Fig. 1. The push buttons 88 must be depressed simultaneously to initiate the operation of the lifting mechanism and are so located (Fig. 1) that the operator's hands are out of the way of any moving parts of the apparatus when the pilot switches are closed. Closing of both these pilot switches simultaneously completes an energization circuit for relay coil 89*a* from L_2, line 101, the first pilot switch 87, line 103, the second pilot switch 87, line 104, relay coil 89*a*, and line 102 back to power line L_1.

Associated with the relay coil 89*a* are a pair of mobile contacts 90 and 91 which are normally biased by spring 105 away from engagement with fixed contacts 92 and 93, respectively. When relay coil 89*a* is energized it moves relay contacts 90 and 91 into engagement with the fixed contacts 92 and 93. Mobile relay contact 90 is connected to the line 106 leading from power line L_2, while mobile relay contact 91 is connected to the line 107 leading from power line L_2. When the relay contact 90 engages fixed contact 92, in response to initial energization of relay coil 89*a* by closing of pilot switches 87 as described, a holding circuit for maintaining relay

coil 89*a* energized is completed from power line L_2 through line 106, contacts 90 and 92, line 108, normally closed timer switch 94, line 109, and thence through relay coil 89*a* and line 102 to the other power line L_1. This holding circuit maintains relay coil 89*a* energized independent of the pilot switches 87 as long as timer switch 94 remains closed, so that push buttons 88 may then be released, after which the operation of the control circuit is fully automatic.

The operating coils 83*a* and 84*a* for the respective solenoid valves 83 and 84 are connected in parallel with each other to the fixed contact 93 through line 110. Therefore, when mobile relay contact 91 closes against fixed contact 93, in response to the initial energization of relay coil 89*a* as described, both of the solenoid valve coils 83*a* and 84*a* are energized from power line L_2 through line 107, contacts 91 and 93, and line 110 and thence back through the respective return conductors 111 and 112 to the other power line L_1. Energization of solenoid coil 83*a* causes normally open solenoid valve 83 to close, and at the same time energization of solenoid coil 84*a* causes normally closed solenoid valve 84 to open. From Fig. 1 it will be apparent that closing of valve 83 in this manner enables the air in the top of cylinder 79 to be exhausted to atmosphere through the associated pipe 96 and cuts off the supply of air under pressure to the top of the cylinder, while opening of valve 84 admits an under pressure to the bottom of cylinder 79 for lifting the piston therein to elevate the work table 47.

The timer switch 94 is controlled by a conventional timer mechanism 95, illustrated schematically in Fig. 7. A normally open switch 97 controls the operation of the timer mechanism, switch 97 being connected in series with timer 95 across power lines L_2, L_1 through line 113 extending between power line L_2 and switch 97, line 114 extending from switch 97 to timer 95, and line 115 extending from timer 95 to power line L_1. Switch 97 is positioned to be engaged and closed by the screw 77 (Fig. 1) which moves in unison with the air cylinder plunger rod 75, so that when the work table 47 is fully elevated the switch 97 is closed. Closing of switch 97 initiates the operation of timer 95, which after a predetermined time interval, opens switch 94 to break the holding circuit for relay coil 89*a* and de-energize solenoid valves 83*a* and 84*a*, so that the solenoid valves 83 and 84 return to their normally open and normally closed positions, respectively. In turn, this causes air pressure to be supplied to the top of air cylinder 79 and to be relieved from the bottom of air cylinder 79, to lower the work table 47.

In operation, with the branch 63 connected to a source of supply, with the piping 86 connected to a source of fluid under pressure, and with the electrical parts connected to their sources of electrical energy, a mold with its cavities to receive the liquid for further processing is placed upon the work table. The liquid being measured and filled is allowed to enter the reservoir through the valve body 61 and valve mechanisms until the float 56 rises to cut off the supply. This will establish a level of liquid in the reservoir so that liquid will spill into the measuring tubes and fill them. In this position, the displacement plungers 38 are in their lowermost positions.

When the push buttons 88 are pressed in, the pilot switches 87 close the circuit through the actuating coil 89*a* of relay 89. This establishes through the circuit breaker 94 of the timer mechanism 95 a holding circuit for the relay coil 89*a* and an energization circuit for the windings of the solenoid switches 83 and 84. The regulated flow of fluid under pressure into the cylinder 79 causes the plunger 75 to raise the work table 47 with its superimposed mold up to filling position. The rate of travel of this plunger is regulated by the needle valves 100 so that a cushioned movement is had rather than an instantaneous stroke.

When the work table starts to rise, the brackets 45 lift the displacement plungers 38 and cause the level of the liquid in the reservoir 15 to fall so that excess liquid flows into the displacement compartment. This allows excess liquid to spill over and drain away from the tops of the filling tubes 20. Continued upward movement of the work table 47 causes the mold 49 to raise the push rods 36 and lift the actuating plate 30 to open the valves 26 and dump the contents of the filling tubes into the mold cavities 99. When the work table has about reached the limit of its upward travel, the adjusting screw 77 presses against the push button of the switch 97 and energizes the winding of the timer 95. This timer is adjustable so that the cycle of operation may be set for from three seconds, up to three minutes or for any duration therebetween best suited for the nature of the liquid being handled.

While this timer is going through its cycle of operation, the circuit breaker 94 remains closed, but as soon as the timer has completed its predetermined cycle, the circuit breaker 94 opens to deenergize the coil of the relay 89, at which time the contacts 90 and 92, and 91 and 93 open, and the solenoid valves 83 and 84 become deenergized and the several parts return to a normal position. The mold with its filled mold cavities is removed from the work table to be passed along for further processing and another mold is placed upon the work table ready for a subsequent operation.

Meanwhile, when the displacement plungers 38 are in raised position, the liquid level in the reservoir 15 falls and when this liquid level is below a normal fluctuating low, the float 56 actuates the valves 58 and 59 and admits a quantity of make-up liquid to the reservoir to maintain a normal working volume for continued operation.

It is apparent from the foregoing that modifications may be made in the mechanical and electrical portions of this invention without departing from the scope thereof and that the use of this mechanism is not restricted to a free flowing liquid as variations may be made in the cycles of operation to provide for more sluggish liquids of higher viscosities.

I claim:

1. In a filling machine of the class described, in combination, a base member to support and house parts of the mechanism, a liquid reservoir carried by said base member, said reservoir having bottom sections thereof set at different elevations, a plurality of measuring and filling tubes depending from the higher bottom section, said filling tubes communicating with the interior of said reservoir, each of said filling tubes having a valve seat formed in the bottom end thereof, a valve member to seat on each of said valve seats in said filling tubes, an actuating plate in said reservoir operably connected to said valve members for controlling the position thereof, push rods connected to said actuating plate for controlling the position thereof, a work table having a mold thereon carried by said base member, said work table and mold having vertical movement with respect to said filling tubes, and means operative in response to the movement of said work table to fill said tubes with liquid and thereafter to lower the liquid level in said reservoir below the tops of said tubes, said mold when raised by the work table engaging said push rods to lift the plate and open said valves.

2. In a filling machine of the class described, in combination, a base member to support and house parts of the mechanism, a liquid reservoir carried by said base member, said reservoir having sections of the bottom set at different elevations, a plurality of filling and measuring tubes depending below the higher bottom section, each filling tube communicating with the interior of said reservoir, each filling tube having a valve seat formed in the lower end thereof, a valve to seat in each of said valve

seats, a valve stem connected to each valve and rising through and above each filling tube, an actuating plate in said reservoir operatively engaging said valve stems for controlling the movement of each valve, spacing sleeves mounted on the reservoir bottom to locate said actuating plate in its lower position, push rods slidable through said spacing sleeves, heads carried by said push rods operable to engage the under side of said actuating plate, said push rods extending below the supporting bottom section, a work table movably supported by said base having uniformly directed vertical movement with respect to said filling tubes, and means operative in response to the movement of said work table to fill said filling tubes with liquid and thereafter to lower the liquid level in said reservoir below the tops of said tubes, said work table supporting a mold containing a plurality of molds to receive the contents of said filling tubes, said mold being operative when raised by the work table to contact said push rods for lifting said actuating plate to open the valves in the upward movement of said work table.

3. In a machine of the class described, in combination, a base member to support and house parts of the mechanism, a reservoir carried by said base member, a plurality of filling and measuring tubes carried by and communicating with said reservoir, a work table carried by said base beneath said tubes and movable vertically with respect to said filling tubes, brackets formed on said work table, displacement plungers movable vertically in said reservoir, push rods connecting said displacement plungers with said brackets, a float and float valve mechanism to control the make-up liquid for said reservoir, comprising a float movable vertically in said reservoir, a float rod having a plurality of valves formed thereon, a valve body carried by the bottom of said reservoir and communicating therewith, some of said valves being slidable in said valve body to guide the travel of said float rod, said float rod having an enlarged head on the lower end to limit upward travel of said float rod, a disk positioned on said float rod to limit downward travel of said float rod, a branch connection to said valve body to admit make-up liquid for said reservoir, said valve body having a plurality of ports formed therein which are controlled by one of said valves on said valve stem, and a manifold communicating with said ports and the interior of said reservoir to direct the flow of the make-up liquid to said reservoir, said manifold having easily removed plugs at the ends thereof for cleaning.

4. In a machine of the class described, in combination, a base member, a reservoir carried by said base member, said reservoir having bottom sections thereof set at different elevations to form filling and displacement compartments within said reservoir, a plurality of filling and measuring tubes carried by the bottom section of the filling compartment and communicating with the interior of said reservoir, a work table carried by said base and movable vertically therewith under said filling tubes, brackets formed on said work table, displacement plungers movable vertically in said reservoir in the displacement compartment, said displacement plungers having sufficient volume displacement to vary the liquid levels within the reservoir upon movement of said plungers, push rods connecting said displacement plungers to said work table, and a float and float valve mechanism to control the flow of make-up liquid to said reservoir comprising a float movable vertically in said reservoir, a float rod having a plurality of valves thereon carried by said float, a valve body carried by and communicating with said reservoir, some of said valves on said float rod being slidable within said valve body, a head on the bottom of said valve stem seating against said valve body when said valve stem is in its uppermost position, and a disk on said stem to seat against the top of said valve body in the lowermost position of said valve stem, a branch pipe connected to said valve body to admit make-up liquid for said reservoir, a manifold connecting said valve body to said reservoir, and said manifold having easily removable closures for cleaning.

5. In a machine of the class described, in combination, a work table movable vertically in its limits of travel, a fluid actuated plunger for said work table, solenoid valves for controlling the movement of said fluid actuated plunger, a source of fluid under pressure, and a semi-automatic control for said plunger to provide uniform cycles of operation, comprising a pilot switch for manual operation, a relay switch to actuate contacts having its operating coil energized upon closing of said pilot switch, said relay actuating contacts to close a holding circuit through a circuit breaker and the operating coil of said relay, and for energizing the actuating coils of said solenoid valves, a time switch for determining the duration of the operating cycle, a pilot switch for the circuit of said time switch actuated by said plunger, and a circuit breaker in said time switch to open the circuit through said relay and restore the parts to a normal position upon the termination of the cycle of operation of said time switch.

6. In a liquid dispensing apparatus, the combination of a downwardly-extending measuring tube formed with an inturned transverse flange at its lower end, a resilient deformable plug member formed with an annular groove about its periphery and snugly received in said lower end of the tube, said inturned flange at the lower end of the tube extending into said annular peripheral groove in the plug member to detachably retain said plug in the lower end of said tube, said plug being inwardly deformable to permit disengagement of said plug from the flange on said tube whereby the plug may be easily removed for cleaning the apparatus, said plug being formed with a passage communicating with the interior of said tube for emptying the liquid contents therefrom and defining a valve seat, and a movable valve member operable to seat on said valve seat in the plug member for controlling the emptying of the liquid contents from said tube.

7. In a liquid dispensing apparatus, the combination of a liquid reservoir, a tube extending downward from said reservoir for discharging liquid therefrom and formed with an inturned transverse flange at its lower end, a resilient deformable plug member closing the lower end of said tube and formed with an annular groove about its periphery, said plug member being snugly received in the lower end of the tube, said inturned flange on the tube extending into said annular peripheral groove in the plug member to detachably retain said plug in the lower end of said tube, said plug being inwardly deformable to permit disengagement of the plug from the flange on the tube whereby the plug may be easily removed for cleaning the apparatus, said plug being formed with a downwardly-extending passage communicating with the interior of said tube for emptying the liquid contents therefrom and defining a valve seat intermediate said passage, a reciprocable valve stem extending downward through said tube, and a valve carried on the lower end of said valve stem and operable in one position of the valve stem to seat on said valve seat in the plug member to block the flow of liquid through said passage in the plug member.

8. In a liquid dispensing apparatus, the combination of a liquid reservoir, a plurality of discharge tubes extending downward from said reservoir for discharging liquid therefrom and having valve seats at their lower ends, a plurality of valve stems extending downward respectively into said tubes and carrying at their lower ends valves operable to seat on said valve seats to block the flow of liquid from the tubes, said stems at their upper ends being formed with enlarged transversely extending portions, a plate disposed in said reservoir and formed with a plurality of holes through which the valve stems extend, said enlarged portions of the valve

stems being located above said plate and positioned to be engaged thereby for simultaneous lifting of the valves from said valve seats when the plate is lifted, a plurality of upstanding spacing sleeves within said reservoir presenting at their upper faces seating surfaces limiting downward movement of said plate, push rods engaging said plate and extending downward through said sleeves below the reservoir, and a work table reciprocable vertically below said reservoir and operable to lift a mold to be filled from said reservoir, said push rods being displaced upward in response to the elevation of the mold to lift said plate to raise the valves away from said valve seats to empty the liquid from said tubes.

9. In a liquid dispensing apparatus, the combination of a liquid reservoir, a plurality of discharge tubes extending downward from said reservoir for discharging liquid therefrom and having valve seats at their lower ends, valves in said discharge tubes at the lower ends thereof operable to seat on said valve seats to block the flow of liquid from the tubes, connection members attached to said valves and extending upward through said tubes, a plate disposed in said reservoir and having connections to said connection members, a plurality of upstanding spacing sleeves within said reservoir presenting at their upper faces seating surfaces limiting downward movement of said plate, push rods engaging said plate and extending downward through said sleeves below the reservoir, and a work table reciprocable vertically below said reservoir and operable to lift a receptacle to be filled from said reservoir, said push rods being displaced upward in response to the elevation of the receptacle to lift said plate to raise the valves simultaneously away from said valve seats at the lower ends of the discharge tubes to empty the liquid from the tubes.

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