Dec. 19, 1967 E. S. MINARD 3,358,719

DRIP COLLECTOR FOR RECEPTACLE FILLING MACHINES

Original Filed Feb. 27, 1961 3 Sheets-Sheet 1

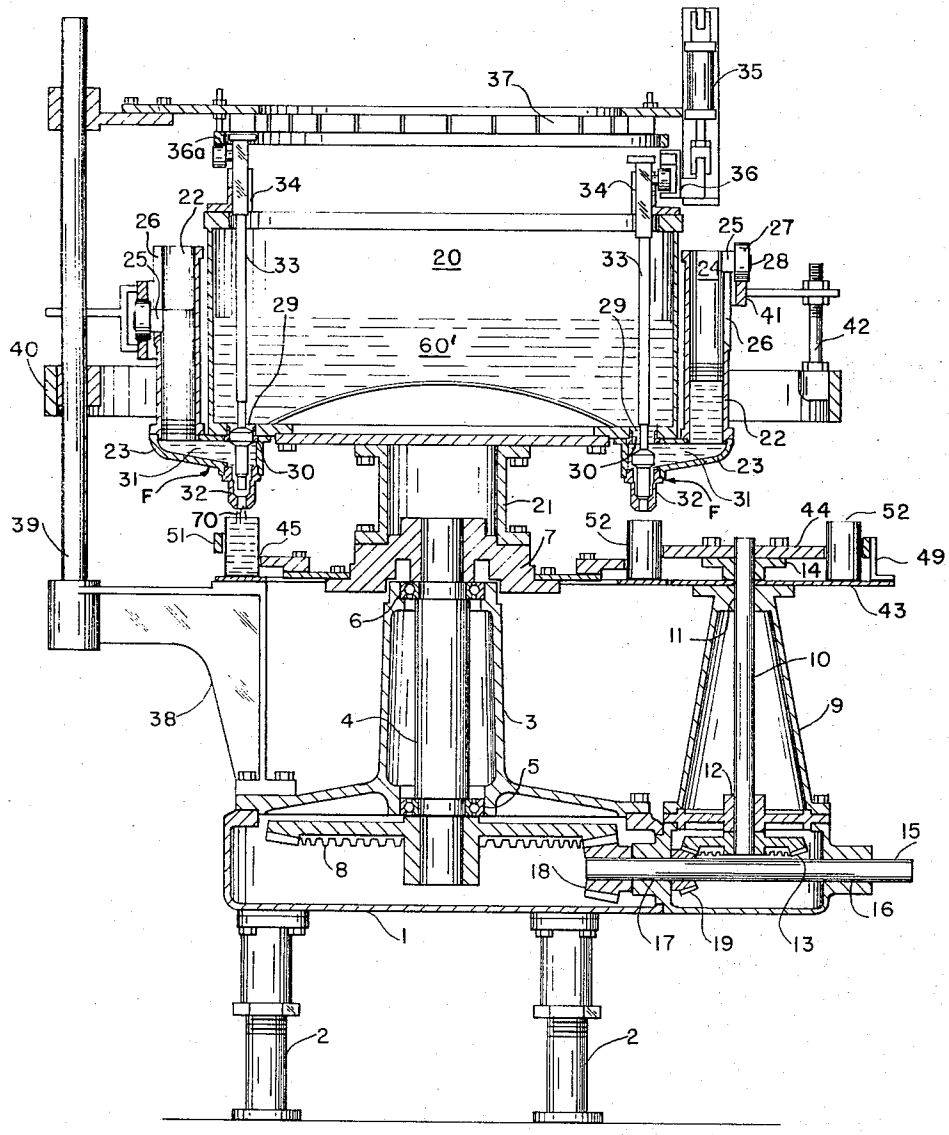



FIG. 1

INVENTOR
EVERETT S. MINARD
BY
ATTORNEY

Dec. 19, 1967 E. S. MINARD 3,358,719

DRIP COLLECTOR FOR RECEPTACLE FILLING MACHINES

Original Filed Feb. 27, 1961 3 Sheets-Sheet 2

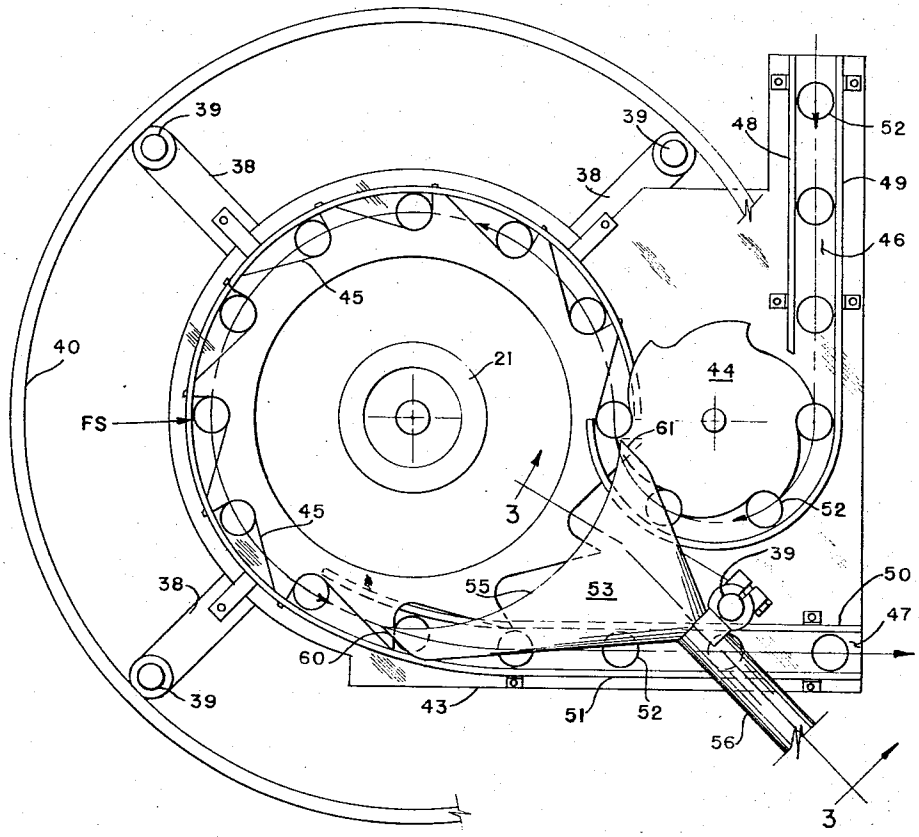



FIG. 2

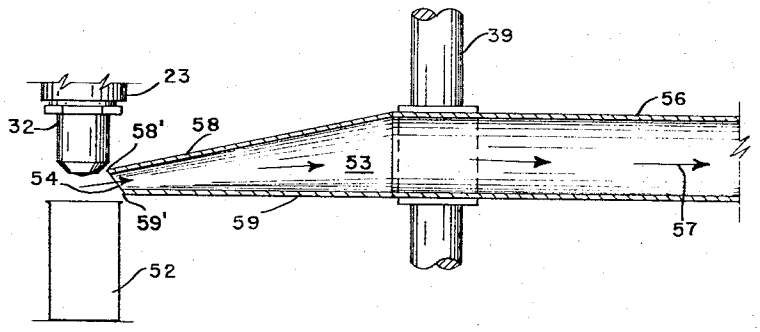



FIG. 3

INVENTOR
EVERETT S. MINARD
BY
ATTORNEY

Dec. 19, 1967 E. S. MINARD 3,358,719

DRIP COLLECTOR FOR RECEPTACLE FILLING MACHINES

Original Filed Feb. 27, 1961 3 Sheets-Sheet 3

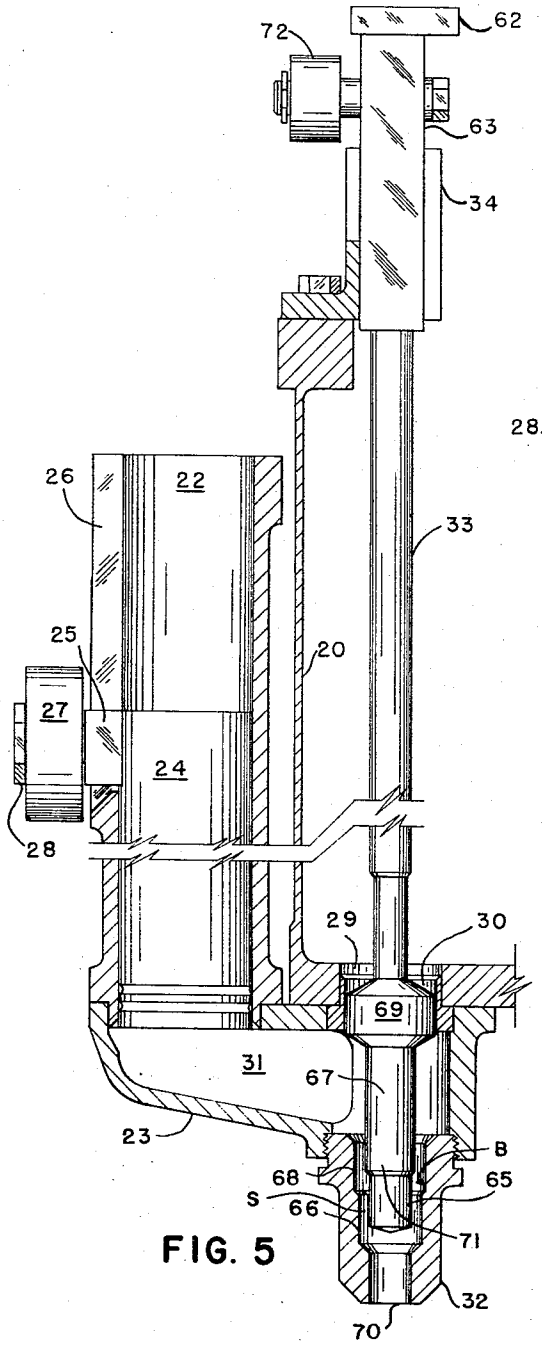



FIG. 5

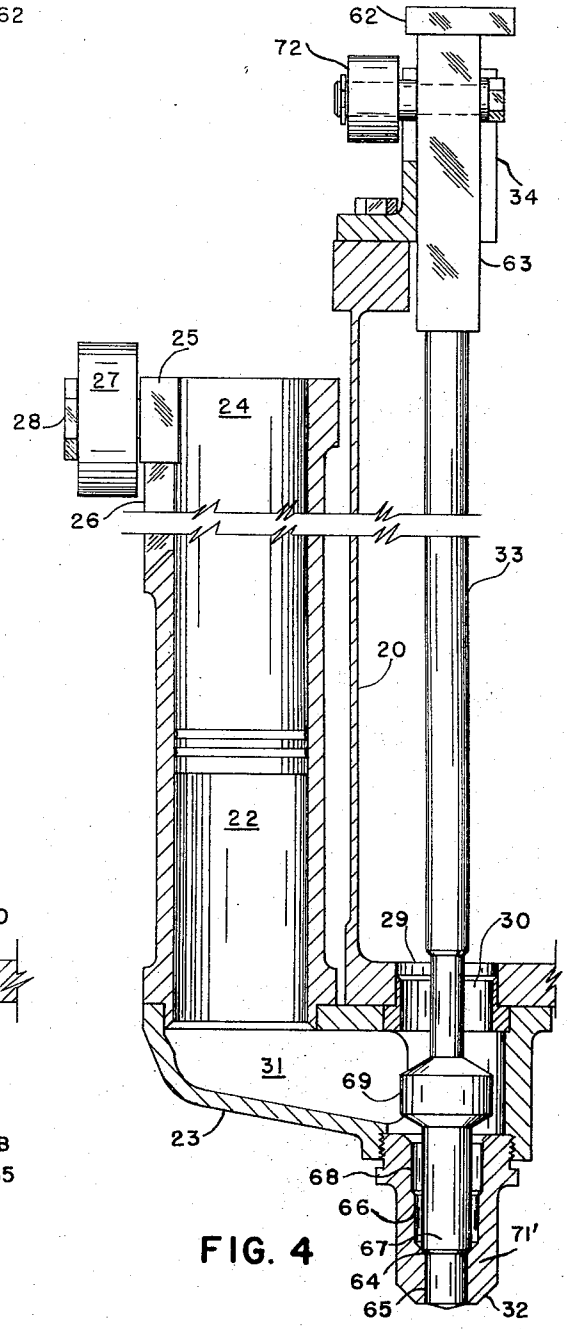



FIG. 4

INVENTOR
EVERETT S. MINARD
BY
ATTORNEY

United States Patent Office 3,358,719
Patented Dec. 19, 1967



3,358,719

# DRIP COLLECTOR FOR RECEPTACLE FILLING MACHINES

Everett S. Minard, Laguna Hills, Calif., assignor to Chemetron Corporation, Chicago, Ill., a corporation of Delaware

Continuation of application Ser. No. 91,955, Feb. 27, 1961. This application Jan. 22, 1965, Ser. No. 434,163
2 Claims. (Cl. 141—86)

## ABSTRACT OF THE DISCLOSURE

A receptacle filling machine having a plurality of filling assemblies with an annular restricted passage to restrict flow therealong in the absence of substantial fluid pressure and with a vacuum duct to control dripping of product from the filling assemblies.

This is a continuation of co-pending patent application Ser. No. 91,955, filed Feb. 27, 1961, now abandoned.

This invention relates generally to receptacle filling machines and more particularly to means for eliminating excess product clinging to discharge nozzles after discharge of product.

This invention provides a novel arrangement for filling assemblies which are attached to a receptacle filling machine. An annular restricted passageway prevents the flow of viscous fluid from the filling assembly in the absence of a substantial fluid pressure on the fluid. The restricted annular passage is defined by the cooperative dimensioning of an outlet of the filling assembly and a valve movably positioned within the outlet. The valve is movable into the opening to close the opening and prevent the flow of fluid therefrom. A plug portion of the valve is movable to a position where it is withdrawn from the opening to define the annular restricted passage through which the liquid flows under pressure. The configuration of the valve portion is such that the cross-sectional area of the annular passageway is closely approximate to the cross-sectional area of the opening itself. By cooperatively contouring the valve and opening, product flow therefrom is substantially cut off in the absence of pressure. If some slight dripping of product should occur from the filling assemblies, this invention further provides an arcuate vacuum duct which tends to remove any product clinging to the filling assemblies in a portion of the filling machine wherein no receptacles are positioned below the filling assemblies.

Present day filling requirements in the canning industry are such that receptacles must be filled with a predetermined maximum amount of product and control to prevent excess is critical. With newly developed and improved cap or cover designs for receptacles it is an absolute requirement that the amount of product discharged into each receptacle be kept somewhat below the top face of the receptacle. This provides what is normally called "head space" in the canning industry. It is equally important also that no product is deposited on surfaces of the receptacles where such material may become imbedded in the cap, cover seal or other attaching surfaces.

Furthermore, if in the case of a product to be frozen after filling and capping of the receptacle, the receptacle is allowed to be overfilled and so reduce the head space, expansion of the product in the freezing operation may distort the receptacle or force open the cap or cover. On the other hand, in the case of product to be cooked in a sealed receptacle the same results may be expected from the expansion of the product due to heating.

Under present day sanitary requirements, any product



or material that is retained in the cap or cover between the sealing surfaces is considered unsanitary and susceptible to bacteria growth which spoil the whole.

It has therefore become a major problem of all filler manufacturers to assure a more accurate fill, eliminate all run-off from valves when the machine is stopped during the filling cycle, and to prevent any drippings of product from deposition on receptacle top faces after closing the discharge valves. Such products as frozen fruit juice concentrates, baby foods in both cans and jars, apple sauce and catsup lead the demand for better filling machines with improved sanitary provisions.

While this invention may be used with many of the established filling machines, it has advantageous application to machines of the type described in U.S. Letters Patent No. 2,896,676 issued July 28, 1959 and applications for U.S. Letters Patent Ser. No. 795,711, filed Feb. 26, 1959, now Patent No. 3,073,359 and Ser. No. 39,887, filed June 30, 1960, now Patent No. 3,097,672.

It is therefore a primary object of this invention to provide filling nozzles for receptacle filling machines that will not drop product except during the discharge on a filling cycle.

Another object of this invention is to provide means for removing any product collecting or clinging to the end of filling nozzles after completion of the filling cycle and so preventing "drippings" from possibly falling on the top edges of the receptacles or on the filling machine itself.

Another object of this invention is to arrange product measuring means devoid of pockets in which air can accumulate and thus abort the accuracy of measure.

Other objects, and advantages of this invention will become more readily apparent as the following description proceeds taken in conjunction with the accompanying drawings, in which;

FIG. 1 is a sectional view of a receptacle filling machine of the rotary piston type;

FIG. 2 is a plan view of the filling machine with upper parts omitted to illustrate the receptacle path and a vacuum duct arrangement;

FIG. 3 is an enlarged sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view through a cylinder and valve assembly in which a piston is shown in an upper position and its associated valve is shown in its lowered position;

FIG. 5 is an enlarged sectional view through a cylinder and valve assembly showing a piston in its downward position and its associated valve in its upper or raised position.

The main housing **1**, shown in FIG. 1 is supported on legs **2**, and the housing includes on its upper side an extended tube-like casing **3** encasing the main filler shaft **4** which is rotatably mounted on bearings **5** and **6**. Secured on the upper end of the shaft **4** is a hub **7** and a gear **8** is secured to the lower end of the shaft **4**.

Adjacent to and in fixed relation to the tubular casing **3**, another tubular casing **9** supports another shaft **10** rotatably mounted in bearings **11** and **12**. Secured to the lower end of the shaft **10** is a gear **13** and secured on the upper end of the shaft **10** is a hub **14**. A drive shaft **15** located in the casing **1** rotates in bearings **16** and **17** by means of a prime mover (not shown). Pinions **18** and **19** are secured to the shaft **15** in mesh with gears **8** and **13** for rotation within the tubular casings **3** and **9** all described in Minard Patent 2,896,676 and in which, a more detailed description of the gear arrangements may be found.

Secured to the hub **7** and furnishing a connecting means for the reservoir **20** containing the fluid product **60'** to be

dispensed, is a spool-shaped spacer 21. This spacer 21 provides a driving connection with the reservoir 20 assuring that the reservoir and all connected parts will rotate above the shaft 4.

A plurality of cylinders 22 preferably equally spaced are concentrically positioned about the wall of the reservoir 20. These cylinders 22 are held in fixed positions in relation to the wall of the reservoir 20 by a plurality of valve port housings 23 which are secured to the bottom of the reservoir and extend outward from the reservoir, thus providing a continuous flange assembly to which the cylinders are attached. This flange assembly is more clearly shown in FIGS. 4 and 5.

A piston 24 having a guide block 25 secured near its upper end, and slidable in a slot 26 provided in the cylinder is mounted to reciprocate in each cylinder 22. Secured to each guide block 25 is a pin 28 for rotatably mounting a roller 27, adapted to turn on the pin when rotated on a guide track 41 in a manner described in the Minard Patent 2,896,676.

In the base of the reservoir 20, preferably equally spaced and concentric with the reservoir center are a plurality of inlet port openings 29 forming a part of filling assemblies generally indicated at F, one for and within each valve port housing 23. Each valve port housing 23 forms the casing for a manifold or passageway 31 communicating between the reservoir 20 and cylinder 22. In each valve port housing 23 forming communication between the reservoir 20 and manifold 31, and vertically aligned with an inlet port 30 is a discharge port or outlet 70 extending downward from the housing 23 and in communication with the manifold 31. The discharge port 70 is formed in a casing 71' of a nozzle 32 (see FIGS. 4 and 5) which is threadedly received in an opening in the valve port housing 23. The casing 71' has in addition to the port 70 an intermediate bore 66 of slightly larger diameter than port 70, and another bore 68 of slightly larger diameter than bore 66.

A movable member or stem 33, slidably aligned with the inlet port 30 and the discharge port 70 and guided by a valve guide 34 secured to an upper flange of the reservoir 20, is positioned through each set of inlet and discharge ports. The valve stems 33 are actuated and in particular reciprocated by roller 72 controlled by lift shoe 36 and a semi-circular ring of holding magnets 37 (see FIG. 1) in a manner described in Patent No. 3,097,672, in which the operation and timing may be found. However, briefly a magnetically attractable plate 62 is attached to the top surface of the upper stem guide 63 for attraction by the magnetic ring 37. A roller 72 secured to the upper stem guide 63 lifts the valves, and ring 37 maintains the valves at a predetermined level during a portion of the rotational movement around tracks 36*a*.

The valve 33, having a lower end 71, is shown in its lowermost position in FIG. 4, wherein a seat contact is made between a valve stem or valve stem portion 67 of valve stem 33 and a tapered shoulder 64 representing the lowermost part of bore portion 66. An enlarged bore B is shown to be comprised of enlarged bore portions 66 and 68. The valve stem portion 67 being larger in diameter than the plug end 65 of the valve 33 allows for the valve seating surface. An annular restricted space portion formed between valve stem portion 67 and the bore portion 66 extends preferably from the shoulder 64 upward by a distance equal to the length of the plug end 65. The total cross section area of bore portion 66, preferably should not be less than two times the area of the cross section of plug 65. Thus, when the plug is positioned within the bore 66, the cross-sectional area of the annular restricted space within the bore 66 is not less than the cross-sectional area of the plug 65. A second larger annular restricted space portion is formed around valve stem 67 by the bore portion 68 and extends upwardly to the inside end of the discharge nozzle 32. The length of this annular space portion is preferably at least as long as the plug end 65, and the area of this annular space, that is, between the bore 68 and the stem portion 67 preferably has a cross section at least as great as the cross section area of plug 65. The first and second restricted space portions combined form a restricted space S.

A cylindrical valve member or plug 69 above the portion of the valve stem 67 is concentric with plug end 65 and has a diameter to form a slidable fit with the bore of the inlet port 30 as seen in FIG. 5. This plug 69 is positioned so that its lower face never comes in contact with the top face of the discharge nozzle 32, and the length is such that the upper end enters the inlet port 30 only a slight distance (approximately ⅛ inch) before plug 65 fully leaves the port 70 when the valve 33 is raised from one position to another as shown in FIG. 4 to that shown in FIG. 5. Thus, when the valve 33 is raised to the upper position, the plug 69 closes off inlet port 30 and prevents product 60' from passing through port 30 from reservoir 20 and into the manifold 31.

Therefore, when the valve 33 is moved to the downward position shown in FIG. 4, the product 60' passes from the reservoir 20 through inlet port 30, and into the manifold 31 where the product seeks a level in cylinder 22 below the raised piston 24, while the plug 65 maintains closed the lowermost portion of the discharge port 70. When the valve is reciprocated to the uppermost position shown in FIG. 5 the plug 69 closes port 30 before the plug 65 is completely withdrawn from the lowermost portion of discharge port 70, and consequently only that amount of product 60' filling the cylinder 22 and manifold 31 will be discharged through the discharge port 70 as displaced by the downward stroke of piston 24.

The piston 24 which is synchronized to travel upward within cylinder 22 as shown in FIG. 4, at the time the product 60 is passing through inlet port 30 and filling the cylinder 22, is also synchronized to begin its downward stroke immediately after the valve 65 is withdrawn from the discharge port 70. Likewise, the piston 24 is synchronized to start its upward stroke at the time the plug 69 is lowered out of engagement with the inlet port 30.

A series of brackets 38 (FIGS. 1 and 2) extending from the main housing 1 support vertically disposed rods 39 which extend to a point above the top surface of the reservoir 20. An annular ring 40 is secured to rods 39 at locations near the bottom flange of the reservoir 20. Secured on the ring 40 by means of a series of studs 42, are an upper and lower cam track 41 between which the piston rollers 27 are guided. The guidance of the rollers 27 secured to the pistons 24 for providing the necessary reciprocation is fully described in the referenced Patent No. 3,073,359.

A stationary filler table 43 (FIGS. 1 and 2) extends throughout the path over which the receptacles to be filled will be moved, and is mounted on the casing 9 and brackets 38. This table thus provides a surface over which the receptacles may be moved in a horizontal plane. An infeed conveyor 46 provides the means for feeding the receptacles to the filling machine over the table 43, and a discharge conveyor 47 provides the means for transporting the receptacles from the filling machine after the filling operation. A feed star 44 is secured to a hub 14 attached to the rotatable shaft 10, and is adapted to receive in pockets the receptacles 52 fed by the infeed conveyor 46, and in turn, feed the receptacles to pockets of another rotating feed star 45. Feed star 45 is mounted on the hub 7 which is secured to the rotatable shaft 4. Guide bars 48, 49, 50 and 51 guide the receptacle 52 in proper position during movement through the filler machine. The receptacle feeding arrangement is also more fully described in Patent No. 3,073,359 to which reference may be had.

A vacuum duct 53 (FIGS. 2 and 3) is utilized to withdraw any product tending to cling to the receptacle dis-

charge nozzle 32 after the receptacles are filled. The vacuum duct 53, as viewed from FIG. 2 has an arcuate edge 55 extending from end 60 to 61 covering an arcuate area adjacent the feed star 45 between the discharge conveyor 47 and feed star 44. Along this arcuate edge 55 extends a slit-like intake opening 54 in a plane between the discharge nozzles 32 and the top of the receptacles 52, as seen in FIG. 3. The slit-like opening 54 is connected to a suitable vacuum supply line via the duct members 56 and 59, maintaining a continuous flow of air along a path designated by arrows 57. The slit-like opening 54 is formed between two plates 58 and 59 of the duct members. The plate 58 overhangs the plate 59 in the direction of the nozzles 32 as they approach the discharge conveyor 47 whereby the lower end of the approaching nozzles 32 are horizontally aligned with the plate 58 and the arcuate edge 55 is slightly removed from the path of the nozzles 32.

The end 60 (FIG. 2) of the edge 55 is positioned at a point where the receptacles 52 are moving out from under the discharge nozzles 32, and the other end 61 is positioned where the receptacles pass from the feed star 44 to a position under the nozzles 32. Thus, any product clinging to the nozzles 32 after having discharged product into the receptacles will be drawn into the duct 53 during rotation between ends 60 and 61.

Operation of this mechanism is as follows:

The reservoir 20 is filled approximately half full with the fluid material to be measured and discharged into the receptacle. When the power is applied to shaft 15, the receptacles are moved in the direction of the arrows extending through the receptacles shown in FIG. 2. By the operation of a no-can no-fill mechanism, not shown, but described in Patent 3,073,359, to which reference may be had the valves 33 remain in a position where the discharge ports 70 are closed and the inlet ports 30 remain open. In this manner material is drawn into the cylinder 22 by the movement of the piston 24. On the downward stroke of the piston 24 the material in the cylinder 22 is forced back into the reservoir 20. Any air that is trapped in the cylinder is allowed to flow out of the measuring area since the lower face of the piston 24 reaches a plane in alignment with the bottom opening of the inlet hole 30 on the bottom of the piston stroke.

When the machine is placed in operation, the feed star 44 is rotated through the mesh of gear 13 and pinion 19, and the reservoir 20 is rotated through the mesh of gear 8 and pinion 18. The gears and pinions are preferably of a pre-established 1 to 1 ratio between pockets of feed stars 44 and 45.

For the first three or four revolutions of the machine, receptacles are withheld from the machine so that the cylinders 22 become fully charged with product. After this pre-charging operation, the receptacles 52 are fed to star wheel 44 from conveyor 46, and star wheel 44 transfers the receptacles to the pockets of star wheel 45 which aligns the receptacles to beneath the discharge nozzles 32 at a filling station generally indicated at FS. As a receptacle reaches this position, the no-can no-fill mechanism as described in Patent No. 3,073,359 is made operative, permitting the valve 33 to raise as the piston 24 starts its downward stroke, so that the inlet port 30 is closed and the discharge port 70 is opened. During the downward stroke of the piston 24, the product in the cylinder 22 is forced downward through the openings leading to port 70.

The stroke of the piston 24 is adjusted so that an exactly pre-determined amount of product will be discharged to the receptacle 52 underlying the nozzle 32. The downward stroke of the piston continues for approximately 180 degrees of its rotational movement with the reservoir 20. When the piston reaches the bottom of its downward stroke, the valve 33 and more particularly its metallic plate 62 is released from its attraction to the magnetic ring 37 to again close the discharge port 70 and open the inlet port 30 in a manner described in Patent No. 3,097,672.

As the discharge port 70 is closed, the piston 24 starts on the upward stroke to recharge the cylinder 22 for the next cycle of operation. During this period, the filled receptacle is moved away from the filler onto the discharge conveyor 47. Should any product cling to the end of the valve plug 65 or the lower end of the nozzle 32, such product will be drawn into the vacuum duct 53. The forward upper edge 58' of plate 58 overhanging plate 59 insures that there is no possibility of product being deposited on the lower forward edge 59' of plate 59 and falling below the duct onto a receptacle or other parts of the filling machine. Such product will first be deposited on the edge 55 and be drawn into the duct.

Should the filling machine be stopped while receptacles are in position beneath the open discharge ports 70, the product will not drain into and overfill the receptacles, because the bore portions 66 and 68 are of such size that the cohesive forces within the product prevent the air from passing through into manifold 31, and in turn prevent product from falling out.

For a proper filling operation it has been found that the downward force of the piston 24 should develop preferably a pressure on the product between ½ p.s.i. and 1½ p.s.i. The diameters of bore portions 66 and 68 are established so that the cross sectional area of the annular space around the plug 65 and stem 67 equals the cross sectional area of the discharge port 70. In most cases this is satisfactory as many products being filled are at an elevated temperature and thus are very fluid. Should the product be of relatively high viscosity such as that of tomato paste, dog food, or meat spread, it is necessary to make the bore portions 66 and 68 of greater diameter so that the pressure does not exceed the stated desired maximum. These alterations in diameter can be established empirically as to particular products to be filled. Once this data is obtained it can be tabulated for future use, and therefore a suitable nozzle 32 having the proper diameter bore portions 66, and 68 and discharge port 70 will be available.

While specific size requirements for nozzle bores cannot be given as a certain amount of experimentation is necessary for each different product due to differences in viscosity, temperature, adhesive and cohesive characteristics, the basic plan for accomplishment has been established. For example, if a receptacle such as a catsup bottle is filled with water and a thin plate having a 3/16 inch diameter hole through the center is placed over the open end of the bottle it will be found that the bottle can be turned bottom side up and that the water will not drain out. As in the case of a more viscous product the diameter of the hole can be increased above that of 3/16 inch and the product still retained in the bottle without drip or run-off. It is the combination of a clinging product created through adhesive and cohesive forces within the product working in conjunction with atmospheric pressure, that is utilized in this invention.

While one specific and preferred form of the present invention has been illustrated and described, it will be understood that other forms will be suggested to those skilled in the art, and all such that do not depart from the spirit of this invention are intended to fall within its scope as best defined in the appended claims wherein there is claimed:

1. In combination in a receptacle filling machine, a first rotating feed star having a plurality of receptacle receiving pockets movable along a first path, a second feed star for feeding empty receptacles to the first feed star, means for transporting filled receptacles from the first feed star, a plurality of filling assemblies overlying said first path and movable along on a path in synchronism with the plurality of receptacle receiving pockets, a common reservoir for material to be filled, means asso-

ciated with each of said filling assemblies comprising an outlet through a nozzle having a discharge end, measuring means for discharging a measured quantity of material through said outlet into a receptacle beneath its associated filling assembly outlet, and vacuum means positioned along said first path after said means transports filled receptacles from said first star and before said second star feeds empty receptacles to the first star for withdrawing any material tending to cling to said nozzles after said measured material has been discharged into receptacles, said vacuum means having an arcuate edge and a slit-like intake opening disposed substantially at the level of said discharge ends so that material clinging to the discharge ends of the nozzles is withdrawn as said nozzles moves along said path between the transporting means and the second feed star, said intake opening of said vacuum means having an upper forward end and a lower forward end, said upper forward end overhanging said lower forward end to obviate the possibility of fluid clinging to said discharge ends being deposited on said lower forward end and then falling out of reach of the vacuum.

2. A receptacle filling machine as claimed in claim 1, wherein the nozzle of each filling assembly includes a bore terminating at the discharge end and a movable valve member, said bore having a first enlarged portion and having a second smaller portion adjacent said discharge end, said movable valve member having a lower end, said lower end terminating at a plug for selectively plugging and unplugging said discharge end, said lower end being larger in diameter than said plug and smaller in diameter than said second smaller portion, said second



smaller portion being as long as the plug and having a larger cross-sectional area than the area of the plug, said first enlarged portion being approximately as long as the lower end of the movable valve member and being larger in cross-sectional area than said smaller portion, said plug being movable into said smaller portion to unplug the discharge end and said lower end being simultaneously movable into said first enlarged portion, said lower end and plug of the movable valve member and said first and second portions of the bore defining an annular restricted passage when said lower end is within said first enlarged portion and said discharge end is unplugged, means for actuating said movable valve member to selectively move said plug from within said discharge port into said second smaller portion to establish a flow path through said annular restricted passage and then through said discharge end and to thereafter move said plug into said discharge end, said annular restricted passage being sufficiently small in relation to the viscosity of the fluid to prevent flow through the annular restricted passage in the absence of substantial fluid pressure from said measuring means.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 961,408 | 6/1910 | Hebrank | 141—90 |
| 2,896,676 | 7/1959 | Minard | 141—146 |
| 3,055,403 | 9/1962 | Barresi | 141—93 |


LAVERNE D. GEIGER, *Primary Examiner.*

E. J. EARLS, *Assistant Examiner.*