Jan. 8, 1963 J. C. MONK 3,072,303

FILLING DEVICE

Filed May 18, 1959 2 Sheets-Sheet 1

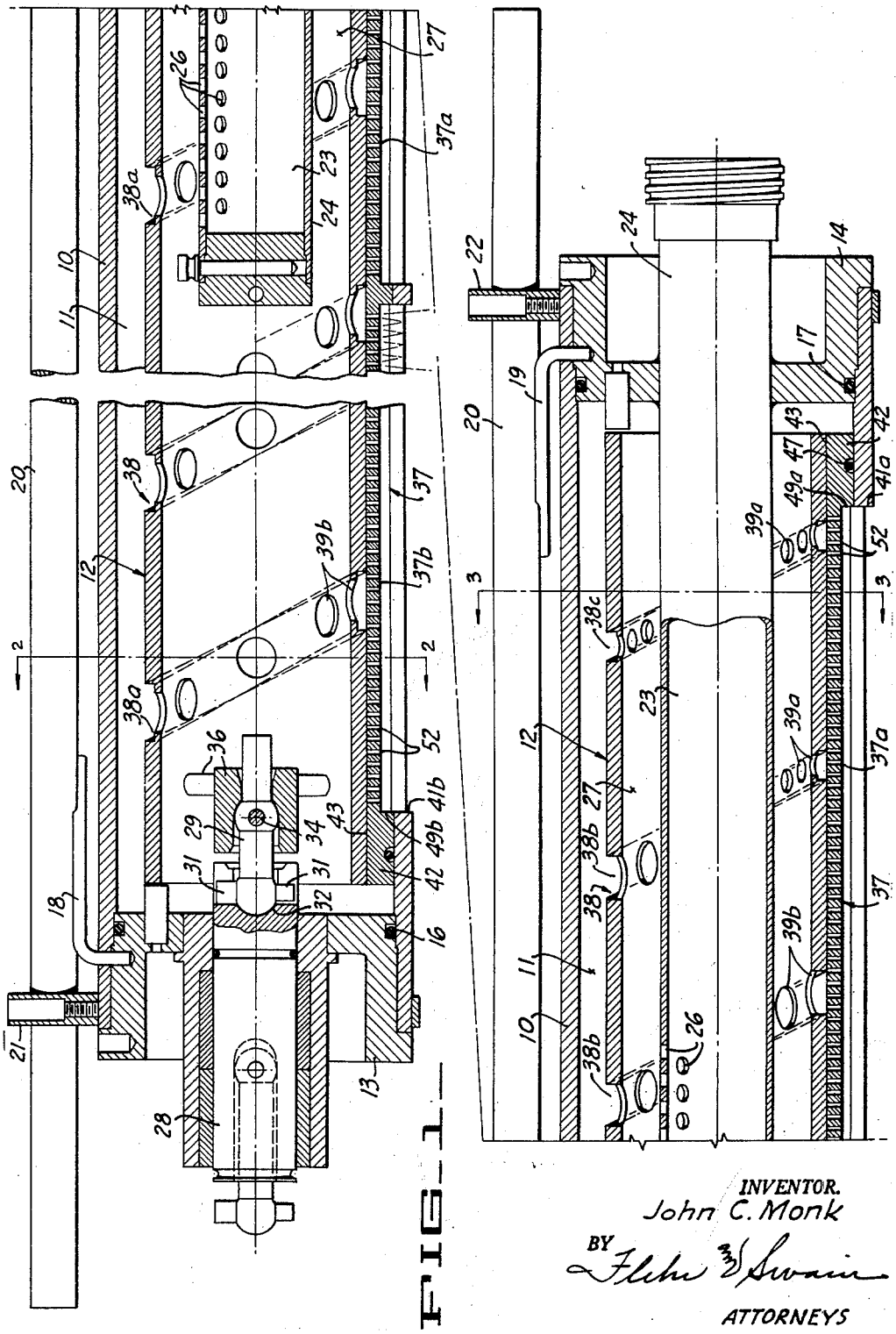


FIG. 1

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FILLING DEVICE

Filed May 18, 1959 2 Sheets-Sheet 2

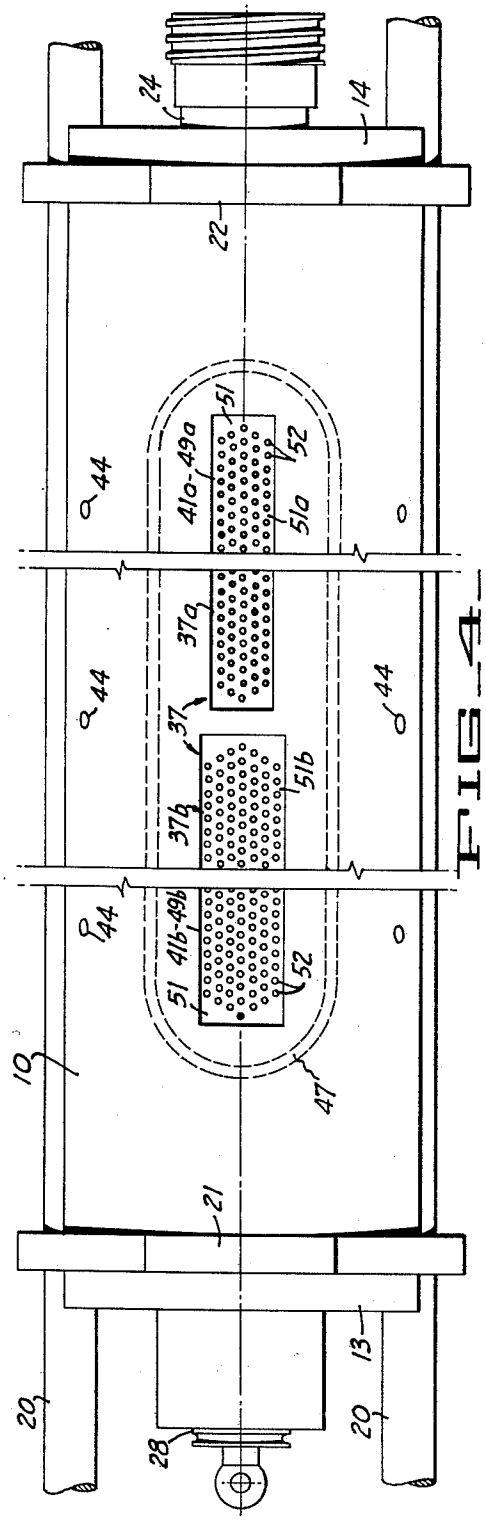


FIG. 4

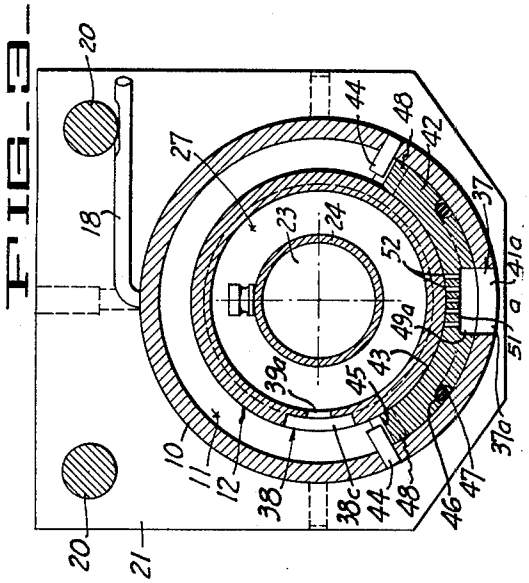


FIG. 3

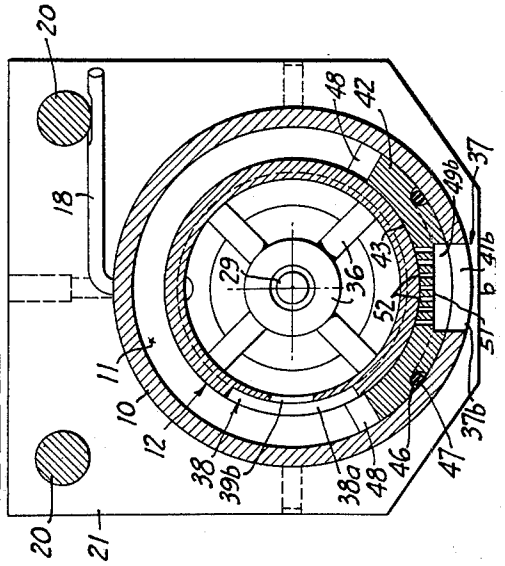


FIG. 2

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3,072,303

FILLING DEVICE

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10 Claims. (Cl. 222—485)

This invention relates generally to devices for filling containers with measured amounts of liquid material.

In the food processing and beverage industries it is common to fill cans, glass jars, or other containers with liquid foods or beverages while the containers are being conveyed to sealing or other processing operations. Accuracy of fill is important to comply with various regulations and product warranties, and to prevent uneconomical overfill. The problem of securing an accurate fill is complicated when the cans are moving continuously, and when it is desired to operate at high capacities. Assuming use of such equipment in aseptic canning methods, filling devices for this purpose should preferably be so constructed as to facilitate cleaning and sterilization (wet or dry) without substantial interruption in the continuous operation. Devices have been developed for this purpose, but have been subject to certain disadvantages. Particularly, they have not provided a fill for each container that is within the degree of accuracy desired. Their operation is such that varying amounts of liquid are frequently discharged outside of the containers, causing fouling of the equipment as well as loss of liquid. When continuous operation and sterilization are attempted, existing devices tend to seize and fail due to the operation without lubrication.

In general it is an object of the present invention to provide a continuous filling device of the above character capable of filling moving containers with a high degree of accuracy.

Another object of the invention is to provide a filling device of the above character which is capable of relatively high capacity operation.

Another object of the invention is to provide a filling device which provides clean cutoff with respect to the filling streams, thus facilitating the desired accuracy of fill, and minimizing the amount of liquid discharged outside of the cans.

Another object of the invention is to provide a filling device of this character which is particularly adapted for use with aseptic canning methods, and which can be readily cleaned and sterilized.

Another object is to provide such a filling device capable of continuous operation without lubrication, so as to facilitate wet or dry sterilization procedures.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

FIGURE 1 is a side elevational view in section illustrating a filling device in accordance with the present invention.

FIGURE 2 is a cross-sectional detail taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a cross-sectional detail taken along the line 3—3 of FIGURE 1.

FIGURE 4 is a bottom plan view of the device shown in FIGURE 1.

The filling device illustrated in the drawing consists of a body 10 which is formed to provide an inner closed chamber 11. Within this chamber there is a rotatable valve member 12 forming flow control means. Preferably the chamber is cylindrical in form, and the valve member is likewise cylindrical, being formed to a diameter that is substantially less than the diameter of the chamber. The body 10 can be in the form of a tube, which is fitted with the removable end closures 13 and 14, that may be sealed to the body by suitable sealing means, such as resilient seal rings 16 and 17 of the O-ring type. Removable pins 18 and 19 are shown fitted within registering holes in the body and the closures 13 and 14, to lock the closures in place during normal operation. These pins may be held in place by the support members 20. Also suitable attaching plates 21 and 22 can be provided for attaching the ends of the body to the support members 20. The closure 14 is provided with an inlet flow passage 23, adapted to be connected to liquid supply means (not shown). A liquid distributor pipe 24 is attached to closure 14 and extends within the flow control member 12. This pipe is provided with openings 26 whereby liquid is delivered into the space 27, within the flow control member 12.

Closure 13 provides bearing means for journaling the drive shaft 28. Preferably this bearing means is of a type requiring no lubrication (e.g. sintered graphite and bronze). A suitable universal drive coupling connects the inner end of the drive shaft with the corresponding end of the control member 12. Conventional coupling devices can be used for this purpose, such as a short coupling member 29. Pins 31 on one end of member 29 engage slots formed in a socket 32, on the end of the drive shaft 28. Pins 34 on the other end of this coupling member are disposed in slots formed in the drive spider 36. The axes of the two sets of pins are at right angles to each other. The spider in turn is fixed to the flow control member 12. Preferably the pins 31 and 34 are of different diameter so that the control member 12 will always be properly indexed upon assembly.

An elongated liquid discharge zone 37 is formed in the lower side of the body 10, and liquid is discharged from localized regions of this zone, with progression of the liquid streams from one end of the zone to the other. This zone is shown formed in two sections 37*a* and 37*b*. The flow control member 12 serves to control flow of liquid through limited regions of the zone 37. The periphery of the flow control member is provided with helicoidal porting for this purpose. Thus the helicoidal groove 38 extends from one end of the control member to the other, but terminates short of the ends. Near that end first approached by the containers, the groove is of substantial width, as indicated at 38*a* in FIGURE 1.

Approaching the other end of the control member the groove is decreased in width as indicated at 38*b*, and at its opposite end is of substantially reduced width as indicated at 38*c*. This porting is in communication with the interior of the control member through the openings 39*a* and 39*b*, the latter being larger in diameter. The purpose of this sizing of the grooves and openings is to reduce the rate of fill near the end of the filling cycle for each container, and thereby reduce turbulence of the container contents.

The preferred construction of the discharge zone 37, and the cooperation of this zone with the control member 12, is shown particularly in FIGURES 2, 3 and 4. The lower side of the body 10 is provided with longitudinally extending slots 41*a* and 41*b*, which extend to points terminating at the ends of the helicoidal porting. Within the body and overlying the slots 41*a*, 41*b*, there is a cradle-like member 42, which has its inner peripheral surface 43 curved to contact and seal with respect to the cylindrical peripheral surface of the control member. Preferably the member 42 is made from suitable plastic, such as a self-lubricating elastomer like Teflon or Kel-F, and may be fabricated as a longitudinal portion of a tubular section. Preferably it is removably attached to the body as by

the use of dowel pins 44, which engage notches 45 in the side edges of the member 42.

Suitable means is used to insure a liquid seal between the lower side of the member 42 and the adjacent walls of the body. For this purpose I have shown the lower side of member 42 provided with a continuous groove 46, which serves to accommodate the resilient seal ring 47 of the O-ring type.

The side edges of member 42 are also shown provided with separations or recesses 48, which serve to relieve stresses, for example, during heat sterilization.

The lower side of member 42 is provided with recesses 49*a* and 49*b* that are coextensive with the slots 41*a* and 41*b*, and which are formed in such a manner that when assembled in the body, the intermediate portions of the member 42 that are exposed by slots 41*a* and 41*b* present the flat horizontal surfaces 51.

The member 42 is provided with a plurality of holes 52 of capillary dimensions, which preferably are distributed in two areas 51*a* and 51*b*. By way of example, in zone 51*a*, there may be five staggered rows of holes, with each hole 0.133 inch in diameter, and with the holes disposed about 0.166 inch between centers. In zone 51*b*, there may be seven staggered rows of holes, each 0.133 inch in diameter, spaced about 0.166 inch between centers. Each hole has a length that is many times its diameter.

Holes of the size specified above are of capillary dimensions in that a column of milk or other aqueous material within the same will not flow out by gravity, but will be held within the hole by capillary attraction.

It will be evident that the number of holes in the two zones makes for a difference in the rate of liquid discharged. As will be presently explained, in normal operation the rate of liquid discharge is decreased toward the end of the filling operation.

The control member 12 is supported evenly upon the inner curved surface 43 of the cradle member 42, and when rotated, its periphery slides in sealing contact with the surface 43.

Operation of my filling device is as follows: Assuming that the device and the associated equipment have been properly sterilized and placed in operation, milk or other liquid is supplied at a constant rate to the inlet passage 23. From thence it is delivered by the distributor 24 into space 27. Liquid from space 27 flows through the openings 39*a*, 39*b* to fill the grooves 38*a*, 38*b*, and 38*c*, to discharge through those limited regions of zones 37 where the capillary holes are in communication with the grooves 38*a*, 38*b*, and 38*c*. Thus a plurality of liquid streams are discharged, with the streams near the right hand end as viewed in FIGURE 1 being smallest, and with the streams at the left hand end being largest. Because the control member 12 is rotating at a constant speed, the discharging streams move progressively from one end of the zone 37 to the other, with the streams becoming progressively smaller in size.

Suitable conveyor means is provided for moving a row of cans in synchronism with the rotation of the control member 12, whereby a traveling stream discharges into each open can, as the can and the stream move from one end of the filling device to the other. The capillary holes which are not in communication with the grooves 38*a*, 38*b*, or 38*c*, are maintained substantially filled with liquid, but this liquid does not discharge by gravity, until a liquid head is applied to the same. This makes for good cutoff of liquid flow through the holes, whereby as a stream progresses, there is no tendency towards dribbling, spraying or drippage behind the stream. Likewise, it makes for accurate sharp cutoff of the stream at the right hand end of the filling device.

The close spacing between the holes in the cradle member 42 causes the liquid discharging from these holes to merge as solid streams, as indicated in FIGURE 1. This feature likewise makes for a minimum amount of spillage,

and in general contributes with the features described above to obtain an accurate fill of each can.

In addition to the features described above, it will be noted that my construction is relatively simple and it can be readily disassembled for cleaning operations, or for repair. It also is adapted to operation without lubrication, during wet or dry sterilization, with no appreciable loss in operating efficiency.

Reference is made to applicant's copending application Serial No. 714,827, filed February 12, 1958 (now abandoned), and application Serial No. 630,235, filed December 24, 1956 (now abandoned).

I claim:

1. In apparatus for delivering measured amounts of liquid to containers being moved at a predetermined speed through a filling zone, a body extending horizontally above the filling zone and having an inner chamber adapted to receive liquid, said body having an elongated liquid discharge zone in a lower wall of the same adapted to overlie the path of movement of the containers, flow control means within the chamber for confining liquid flow to limited regions of said zone with progression of said regions from one end of the zone to the other, and means located in said zone forming a plurality of closely spaced side by side holes of capillary dimensions, the holes being distributed both laterally and longitudinally of said zone, the portion of said plurality of closely spaced side-by-side holes in each of said limited regions serving to deliver a stream of liquid to one of said containers.

2. Apparatus as in claim 1 in which each one of said holes has a length many times its diameter.

3. In apparatus for delivering measured amounts of liquid to containers being moved at a predetermined speed through a filling zone, a body extending horizontally above the filling zone and having a cylindrical inner chamber, said body having an elongated liquid discharge zone in a lower wall of the same adapted to overlie the path of movement of the container, a rotatable flow control member disposed within the body and extending beyond the extremities of said zone, means for rotating said control member, said control member having a cylindrical peripheral surface and a diameter substantially less than the diameter of the cylindrical inner chamber means for delivering liquid into the body, said control member having helicoidally disposed porting to communicate with said filling zone at a plurality of spaced regions along the length of the same, and means located in said zone forming a plurality of closely spaced side by side holes of capillary dimensions, the holes being distributed both laterally and longitudinally of said zone, liquid passing through said holes in said spaced regions forming a plurality of separate liquid streams which progress along the zone in the direction of movement of the cans.

4. Apparatus as in claim 3 in which the means for rotating the control member consists of a drive shaft, and a universal drive connection between the shaft and the control member.

5. Apparatus as in claim 4 wherein said drive shaft is journaled in a bearing requiring no lubrication, to facilitate sterilization during continuous operation.

6. Apparatus as in claim 3 in which said holes are formed in a cradle-like member formed of an elastomer.

7. Apparatus as in claim 6 in which said cradle-like member has said holes in two zones, one of said zones having a greater number of holes, per unit length, than the other.

8. Apparatus as in claim 3 in which the total cross-sectional area of those holes in communication with said control member at a spaced region near the end of the apparatus at which the containers leave the filling zone is less than the total cross-sectional area of those holes in communication with the control member at a region near the other end of the apparatus.

9. Apparatus as in claim 3 in which the helically spaced porting in said control member is of greater dimension

at that end of the apparatus at which the containers enter the filling zone than at that end of the apparatus at which the containers leave the filling zone.

10. In apparauts for delivering measured amounts of liquid to containers being moved at a predetermined speed through a filling zone, a body extending horizontally above the filling zone and having a cylindrical inner chamber, said body also having a lower slotted wall adapted to overlie the path of movement of the container and forming a discharge zone, a rotatable flow control member disposed within the body and extending beyond the extremities of said discharge zone, said member having a cylindrical peripheral surface and a diameter substantially less than the diameter of the cylindrical inner chamber, a cradle-like member removably positioned between the lower wall of the body and said rotatable control member, said cradle-like member having a plurality of closely spaced side by side holes of capillary dimensions, the

holes being distributed both laterally and longitudinally of the discharge zone, said control member having helicoidally disposed porting to communicate with said holes at a plurality of spaced regions along the length of the discharge zone, liquid passing through said holes in said spaced regions forming a plurality of separate liquid streams which progress along the zone in the direction of movement of the cans.

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