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FLUID DELIVERY DEVICE

Filed Aug. 5, 1960

FIG. 4.

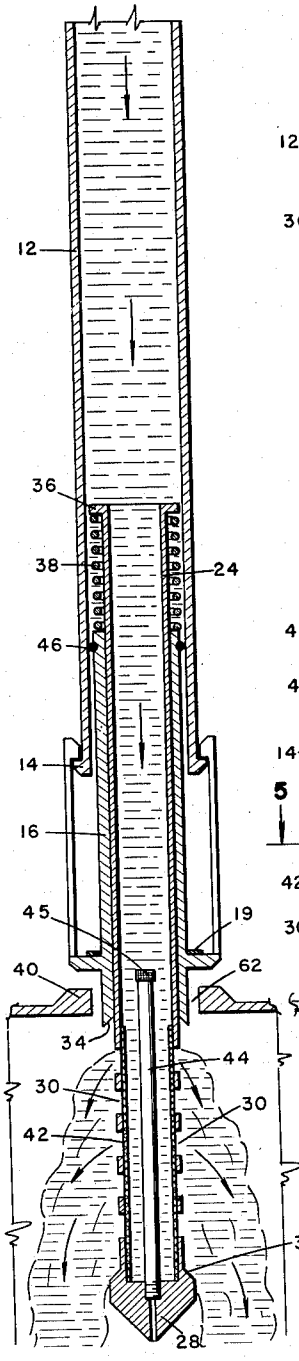
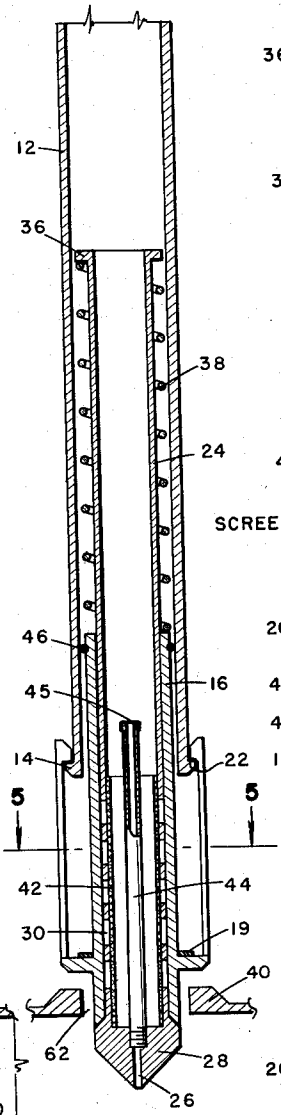


FIG. 3.



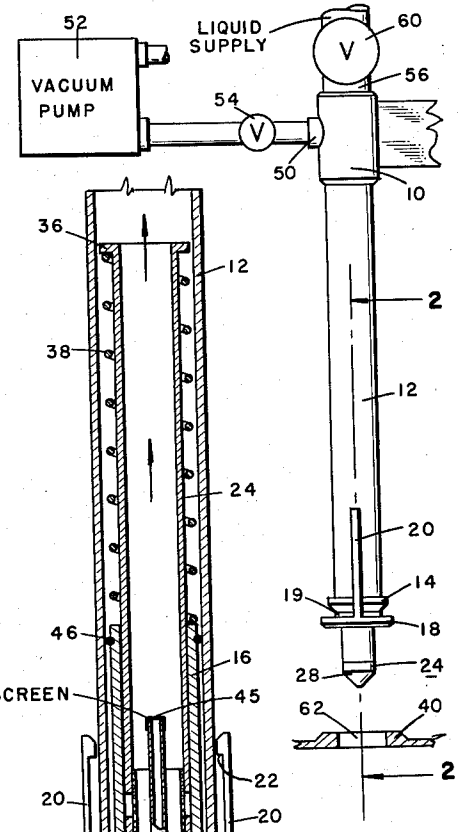


FIG. 1.

FIG. 2.

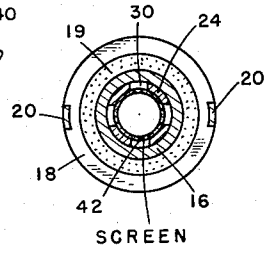


FIG. 5.

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FLUID DELIVERY DEVICE

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This invention relates to devices for supplying fluids to containers. More particularly, this invention is a new fluid filling device which is quick-acting, is dripless, and requires minimum physical effort.

When containers are being filled with certain types of fluids, various problems arise. For example, in filling oil drums with oil, it often occurs that after a predetermined amount of oil has been placed in the drum and the feeding of oil is terminated, the afterdrip causes an inaccurate measurement. This afterdrip also amounts to a waste and the top of the oil drums must be cleaned for good housekeeping. The same problem is present when the fluid is a syrup or other viscous substance which tends to stick to the sides of the fluid nozzle.

Another problem with currently used fluid delivery devices is that most or all of the fluid is directed vertically into the container. This vertically directed force causes a dynamic vertical force to effect the barrel which leads to erroneous weight readings. This is a particular disadvantage in automatic weighing operations.

The fluid delivery device to be described herein includes structure for eliminating the afterdrip and for reducing the dynamic vertical force on the barrel. In addition, this device eliminates to a large degree the tendency for many fluids to foam. In some cases this foaming tendency limits the filling rate on conventional nozzles.

Briefly described, this invention includes a support in which are slidably mounted inner and outer telescoping members. The telescoping members are adapted to fall as a single unit in response to gravity. Thus, after the device has been positioned above the hole in the container, the release of suction which is holding the telescoping members upwardly within the support causes the single unit to fall by gravity to extend below the support. The inner member is provided with at least one fluid outlet and is normally held retracted within the outer member by a spring bias. After the telescoping members have been lowered into the container by gravity, the fluid is flowed through the inner member. The flow of fluid against the inner member causes the inner member to extend beyond the outer member. Means are provided for limiting the downward movement of the telescoping members. After the container has been filled with fluid, suction is again applied to the inside of the inner member. This suction retracts the telescoping members upwardly into the support and also draws into the inside of the inner member the fluid droplets which are adhering to the outside of the inner member.

The invention as well as its many advantages may be further understood by reference to the following detailed description and drawings in which:

FIG. 1 is an elevational view, showing the fluid delivery device arranged above the container into which fluid is to be flowed;

FIG. 2 is an enlarged view taken along lines 2—2 of FIG. 1;

FIG. 3 is a view similar to FIG. 2 showing the telescoping members after they have been lowered by gravity into the top of the container;

FIG. 4 is a view similar to FIGS. 2 and 3 showing the filling of the container with a fluid, such as oil, with the inner telescoping member in its fully extended position; and

FIG. 5 is a sectional view taken along the lines 5—5 of FIG. 3.

Referring to the drawings, the support 10 is shown to which is connected a stationary barrel 12. A collar 14 is provided on the lower extremity of the barrel 12.

A retractable barrel 16 is mounted for slidable movement with the stationary barrel 12. Retractable barrel collar 18 extends outwardly from the retractable barrel 16 at a point below the collar 14 of the stationary barrel 12. The collar 18 is of a greater diameter than the diameter of the stationary barrel 12. A rubber ring 19 is provided between the collar 18 and lower extremity of stationary barrel 12 to prevent metal to metal impact.

A pair of diametrically spaced limiters 20 are integrally connected to the collar 18. Limiters 20 extend upwardly and parallel to the outside of the stationary barrel 12. Each of the limiters 20 is provided with a downwardly facing shoulder 22. The shoulders 22 are adapted to engage the top of the collar 14 on stationary barrel 12 to limit the downward movement of the retractable barrel 16.

Mounted for slidable movement within the retractable barrel 16 is a nozzle 24. The lower end of nozzle 24 tapers inwardly and downwardly. A hole 26 is provided through the plug 28 which is mounted in the lower part of the nozzle 24. Also, a plurality of radial ports 30 are formed through the nozzle 24. The ports 30 extend upwardly from the bottom of the nozzle 24 for a particular desired distance.

Adjacent the lower end of the nozzle 24 a bevel 32 is provided. The bevel 32 is shaped to mate with a mating bevel 34 provided on the lower extremity of the retractable barrel 16. This provides for seal-tight engagement of the nozzle 24 and retractable barrel 16 when they are in the position shown in FIG. 2.

The nozzle 24 is of greater length than the retractable barrel 16. A spring retaining ring 36 is connected to the upper part of the nozzle 24. Spring retaining ring 36 extends outwardly from nozzle 36 and is in sliding contact with the inside of the stationary barrel 12. A coil spring 38 is mounted about the nozzle 24. The upper part of coil spring 38 is in contact with spring retaining ring 36 and the lower part of the coil spring 38 is in contact with the top of the retractable barrel 16. Thus, spring 38 normally biases the beveled portions of the nozzle 24 and retractable barrel 16 into sealing contact.

If fluids such as oil are being fed into the container 40, a cylindrical strainer 42 may be provided around the inside of the nozzle 24. The strainer 42 which may consist of wire cloth extends upwardly from the bottom of the nozzle 24 a distance sufficient to cover all of the ports 30.

Extending upwardly from the bottom of the nozzle 24 and in fluid contact with the hole 26 is vacuum tube

44. A wire cloth 45 may also be soldered across the top of the vacuum tube 44.

An O-ring 46 is provided between the retractable barrel 16 and the stationary barrel 12 to provide a fluid tight seal therebetween.

Extending outwardly from the support 10 is a vacuum connection 50 leading to a vacuum pump 52. The application of suction from the vacuum pump 52 through connection 50 to the nozzle 24 is controlled by means of valve 54.

Extending upwardly from the support 10 is a fluid supply connection 56 leading to a source of fluid not shown. The supply of fluid from the supply source is controlled by means of a valve 60.

In operation, when it is desired to fill a container 40, the container 40 is positioned such that the entrance 62 of the container 40 is directly below the nozzle 24. The nozzle 24 and retractable barrel 16 are at this time held upwardly within the stationary barrel 12 by means of a vacuum applied into the inside of the nozzle 24 from the vacuum pump 52. The size of the hole 26 and the size of the tube 44 are such that when the vacuum pump is operated, the atmospheric pressure against the outside of plug 28 is greater than the pressure inside nozzle 24. Hence, the nozzle 24 and barrel 16 are kept retracted in stationary barrel 12. At this time, valve 60 is closed to shut-off the fluid supply.

After the container 40 has been properly positioned and it is desired to fill said container with a predetermined amount of fluid, the valve 54 is closed, thereby cutting off the suction. The cut off of the suction causes the nozzle 24 and the retractable barrel 16 to fall by force of gravity downwardly into the opening 62 of the container 40. The downward movement of the nozzle 24-barrel 16 unit is limited by the contact of the downwardly facing shoulders 22 of the limiters 20 with the collar 14 on the lower extremity of the stationary barrel 12, as shown in FIG. 3.

Thereafter, the valve 60 is opened. Upon the opening of valve 60, fluid flows from the fluid supply through connection 56 and support 10, barrel 12, and into the nozzle 24. The dynamic force of the flowing fluid overcomes the bias of the spring 38. Thus, the nozzle 24 extends downwardly into the container 40, as shown in FIG. 4. This downward movement of nozzle 24 exposes the radial ports 30.

Most of the fluid flows through the radial ports 30. This radial flow reduces the dynamic vertical force on the barrel leading to more correct weight readings.

After the proper amount of fluid has been placed in the container 40, the valve 60 is closed to shut off the supply of fluid. Suction is again applied to the nozzle 24 by the opening of the valve 54 in vacuum connection 50. With the application of suction, any fluid droplets which remain on the conical tip of the nozzle 24 are sucked upwardly through hole 26 and vacuum tube 44 into the interior of the nozzle 24. This eliminates any afterdrip.

The applied suction also retracts the nozzle 24 and retractable barrel 16 into the stationary barrel 12 to the position shown in FIG. 2. The fluid delivery device is then ready to fill another container.

We claim:

1. A fluid delivery device for supplying fluid to a container comprising: a support; inner and outer telescoping members slidably mounted in said support and adapted to fall as a single unit in response to gravity to extend below the support, the inner member extending upwardly within the support a greater distance than the outer member and being provided with at least one fluid outlet and normally held retracted within the outer member by a spring bias, the flow of fluid against the inner member causing the inner member to extend beyond the outer member; and means for limiting the downward movement of the fall by gravity of the unit.

2. A fluid delivery device for supplying fluid to a container comprising: a stationary barrel; inner and outer telescoping members slidably mounted in said barrel and adapted to fall as a single unit in response to gravity to extend below the barrel, the inner member extending upwardly within the barrel a greater distance than the outer member and being provided with at least one fluid outlet and normally held retracted within the outer member by a spring bias, the flow of fluid through the inner member causing the inner member to extend beyond the outer member; and engaging means on the barrel and the outer telescoping member adapted to interengage to limit the downward movement of the fall by gravity of the unit.

3. A fluid delivery device for supplying fluid to a container comprising: a stationary barrel; inner and outer telescoping members slidably mounted in said barrel and adapted to fall as a single unit in response to gravity to extend below the barrel, the inner member being provided with a fluid outlet at its lower extremity and a plurality of fluid outlets extending upwardly for a particular desired distance and normally held retracted within the outer member by a spring bias, the flow of fluid through the inner member causing the inner member to extend beyond the outer member; engaging means on the support and the outer telescoping member adapted to interengage to limit the downward movement of the fall by gravity of the unit; and a tubular member mounted within the inner member and in fluid contact with the fluid outlet at the lower extremity of the inner member whereby suction applied within the inner member retracts the telescoping members and draws into the inner member any fluid droplets sticking on the outside of the inner member.

4. A fluid delivery device for supplying fluid to a container comprising: a stationary barrel; inner and outer telescoping members slidably mounted in said barrel and adapted to fall as a single unit in response to gravity to extend below the barrel, the inner member extending upwardly within the barrel a greater distance than the outer member and having a fluid outlet at its lower extremity and a plurality of fluid outlets extending upwardly for a particular desired distance; a spring retaining member mounted on the inner member and above the outer member; a spring in contact with the retaining member and the outer member whereby the flow of fluid through the inner member causes the inner member to extend beyond the outer member; engaging means on the barrel and the outer telescoping member adapted to interengage to limit the downward movement of the fall by gravity of the unit; and a tubular member mounted within the inner member and in fluid contact with the fluid outlet at the lower extremity of the inner member whereby suction applied within the inner member retracts the telescoping members and draws into the inner member any fluid droplets sticking on the outside of the inner member.

5. A fluid delivery device for supplying fluid to a container comprising: a stationary barrel having an integral collar on its extremity; a retractable barrel having a beveled extremity mounted for slidable movement within the stationary barrel; a collar having a greater diameter than the diameter of the stationary barrel extending outwardly from the retractable barrel; a pair of diametrically spaced retractable barrel movement limiting members integrally connected to the retractable barrel collar and extending longitudinally along the outside of the stationary barrel, each of said limiting members being provided with inwardly extending shoulders adapted to engage the stationary barrel collar to limit the extent of movement of the retractable barrel; a nozzle of greater length and lesser inside diameter than the retractable barrel and having ports formed therein, said nozzle being mounted for slidable movement within the stationary barrel and having a beveled portion adapted to mate with the beveled extremity of the retractable barrel when the nozzle and retractable barrel are in retracted position and

also having a spring retaining ring extending outwardly from the outer periphery of the nozzle to slidingly engage the inside of the stationary barrel; a coil spring mounted about the nozzle with one end in contact with the spring retaining ring and the other end in contact with the retractable barrel to bias the beveled portions of the nozzle and retractable barrel into sealing engagement; a cylindrical strainer around the inside of the nozzle and covering the ports; and a tube connected to the end of the nozzle and extending along the axis of the nozzle and inside the nozzle whereby suction may be applied to the inside of the nozzle to hold the retractable barrel and nozzle in retracted position, the container positioned

under the nozzle, the suction stopped to permit the ends of the nozzle and retractable barrel to fall by gravity into the container, fluid flowed into the nozzle to extend the nozzle beyond the retractable barrel against the bias of the coil spring and fill the container with fluid, and then suction applied to retract the retractable barrel and nozzle.

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