Feb. 16, 1965 J. LUND ETAL 3,169,674

PUMP WITH DELIVERY ADJUSTMENT

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Fig. 1

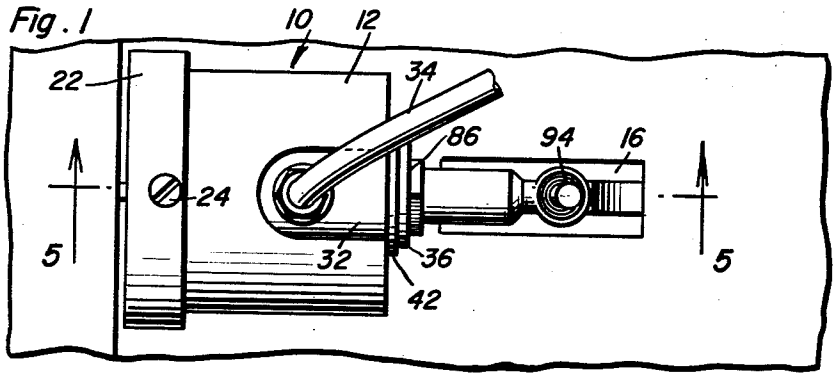


Fig. 2

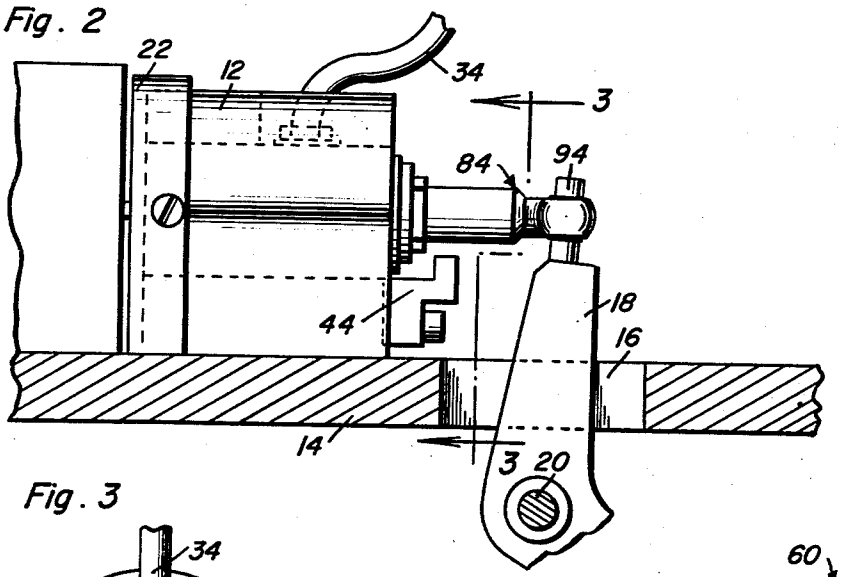


Fig. 3

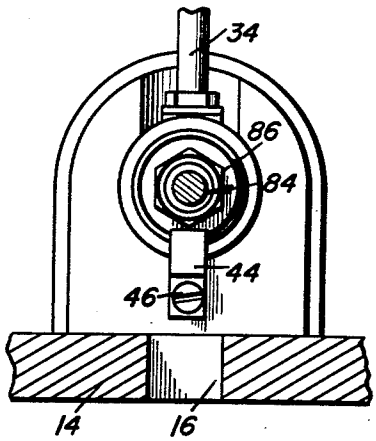
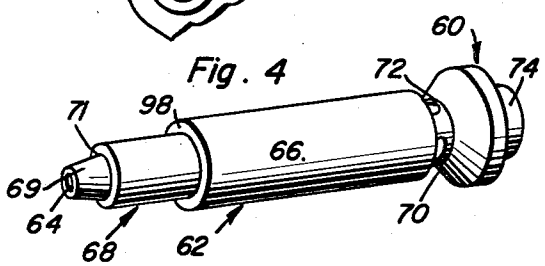


Fig. 4



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Fig. 5

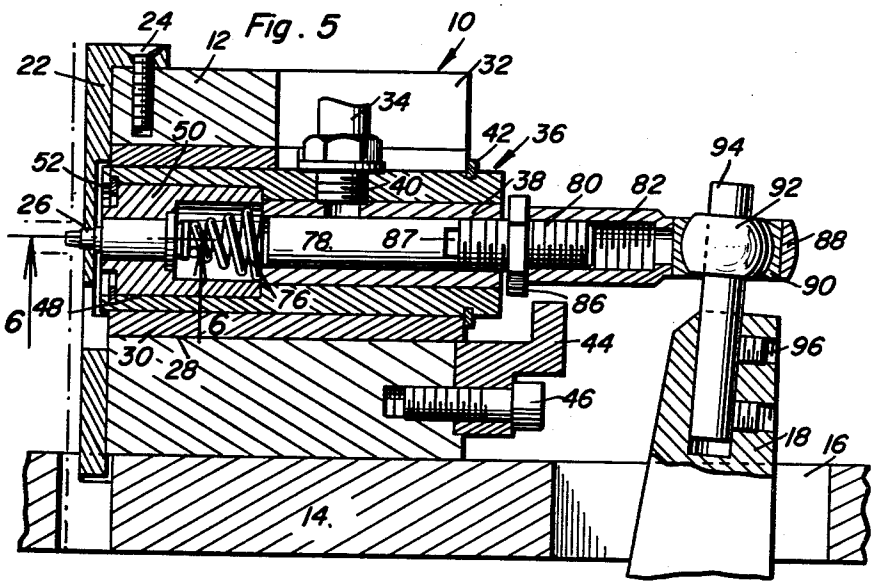


Fig. 6

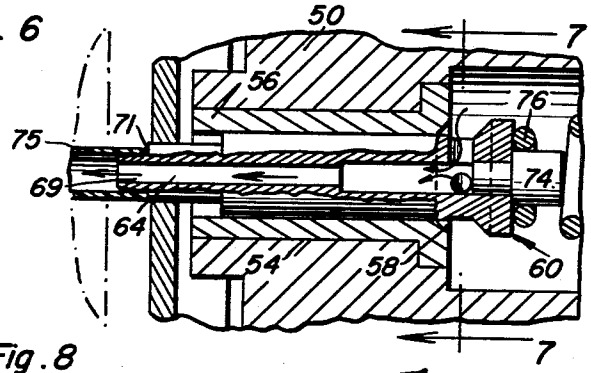


Fig. 7

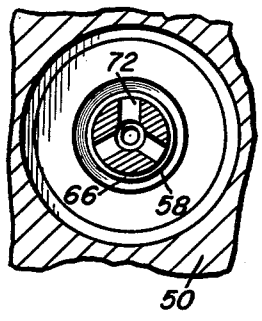


Fig. 8

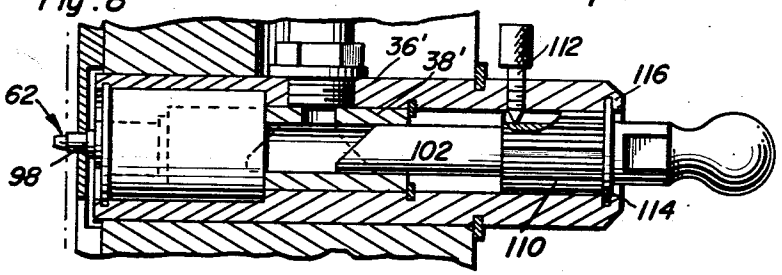
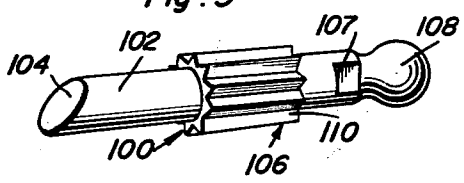


Fig. 9



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PUMP WITH DELIVERY ADJUSTMENT

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7 Claims. (Cl. 222—309)

The present invention generally relates to pumps, and more particularly to a pump which discharges a predetermined quantity of fluid or viscous materials, preferably in the filling of ball point ink cartridges, but also suitable for other applications requiring the consistently accurate discharge of a predetermined amount of material.

One of the primary objects of the present invention is the provision of a pump which will consistently discharge a predetermined amount of fluid.

Another object of the present invention is the provision of easily accessible means for varying the amount of fluid discharged.

Another object of the present invention is the provision of a discharge pump wherein the amount of discharge can be varied without varying the piston stroke.

Additionally, an object of the present invention is the provision of a shut-off nozzle providing an immediate cut-off of the fluid discharge effected by a suction effect created by a rearward movement of the piston.

Also, an object of the present invention is the provision of a filling pump which is extremely durable, inexpensive to construct, easy to operate and extremely reliable in its operation due to the relative simplicity of its construction.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a top plan view of the pump of the present invention;

FIGURE 2 is a side elevational view of the pump of the present invention;

FIGURE 3 is an elevational view taken substantially on a plane passing along line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged perspective view of the discharge nozzle of the present invention;

FIGURE 5 is a cross-sectional view taken substantially on a plane passing along line 5—5 in FIGURE 1;

FIGURE 6 is an enlarged cross-sectional view taken substantially on a plane passing along a line 6—6 of FIGURE 5;

FIGURE 7 is a partial cross-sectional view taken substantially on a plane passing along line 7—7 of FIGURE 6;

FIGURE 8 is a view similar to FIGURE 5 but illustrating a modified type of adjustable piston rod; and

FIGURE 9 is a perspective view of the modified piston shown in FIGURE 8.

Referring now more particularly to the drawings, reference numeral 10 generally designates the pump of the present invention. The pump 10 consists of a housing 12 mounted on a base 14 provided with an elongated slot 16 through which an actuating arm 18 extends. The actuating arm 18 is pivotally mounted at 20 and is generally provided at its lower end, not illustrated, with means for inducing a constant forward and rearward pivotal movement of the arm 18.

The pump housing 12 has, at its forward end, a face plate 22 removably secured thereto by screw means 24. A central aperture 26 is provided through the face plate 22 and is concentrically aligned with a bore 28 extending

through the housing 12 and having a hardened liner or sleeve 30 thereabout. The housing 12 further includes an elongated slot 32 extending through both the housing and liner 30 into the bore 28 so as to enable the attaching of a fluid or material conduit 34 to the cylinder 36 for reciprocating movement therewith in a manner which shall be pointed out presently.

A cylinder 36 is slidably mounted within the liner 30 and includes a hardened lining 38 and an intake port 40 to which the conduit 34 is secured so as to introduce fluid into the interior of the cylinder 36. A retaining ring 42 limits the forward movement of the cylinder 36, and, a stop 44, secured to the lower portion of the pump housing 12 by a screw means 46, limits the rearward movement of the cylinder 36. The forward end of the cylinder 36 is provided with a recess 48 for closely accommodating a valve seat 50, in a manner so as to prevent leakage of fluid under pressure, secured therein by a retaining ring 52. This valve seat 50 is, however, removable for serving of the nozzle 62 and spring 76.

The valve seat 50 includes a centrally located bore 54 axially aligned with the face plate aperture 26. A hardened liner 56 is provided within the bore 54 and has a valve seat recess 58 at its rearward end for the accommodation of the valve head 60 provided on the nozzle 62.

The nozzle 62 comprises a body portion 66, a reduced forward end 68, a stepped tip 69 on the forward end 68 forming a shoulder or stop 71, an undercut portion 70 located adjacent the valve head 60, a plurality of apertures 72 located within the undercut portion 70 and a central blind bore 64 extending from the reduced forward end into communication with the apertures 72. The rear end of the nozzle 62 is provided with a projecting portion 74 about which is engaged a spring means 76 which has its other end in abutment with the forward end of the hardened cylinder liner 38 thereby urging the nozzle 62 forwardly so as to engage the valve head 60 within the recess 58 thus preventing any flow of material through the apertures 72.

The piston 78, slidably mounted within the cylinder 36, has a threaded rear end 80 adjustably secured within the threaded end 82 of a rod 84, and is locked therto by a lock nut 86. Further, wrench flats 87 are provided on the piston 78 for adjustment thereof relative to the rod 84. The rod 84 is provided with an aperture 88 having a seat means 90 located therein with the seat means 90 pivotally receiving a bushing 92 which in turn slidably receives a dowel 94 which is fixedly secured to the upper end of the actuating arm 18 by a plurality of set screws 96 for inducing forward and rearward movement of the piston. The threaded connection between the piston 78 and the rod 84 enables the positioning of the piston rod in a variety of adjusted positions so as to quickly regulate the amount of material discharged by the pump 10.

The piston 78, in its retracted position within the cylinder 36, allows for the entrance of fluid through the feed conduit 34 and intake port 40. Such a fluid feed can be either by gravity or under pressure, however, in the instant case, gravity feeding has been found to be adequate because of the suction action created by the rearward movement of the piston 78. When the piston 78 is in its rearwardmost position the coil spring means 76 biases the valve head to its closed or sealed position relative to the cylinder 36 which in addition causes a rearward biasing of the cylinder 36 within the pump housing 12 when the forward end of the nozzle is engaged. Such a rearward biasing is limited by the stop means 44. Upon a forward movement of the piston 78 induced by a pivotal movement of the actuating arm 18, the fluid within the cylinder is compressed forwardly. This compression of the fluid by the piston 78 builds up a sufficient pressure

so as to overcome the friction between the cylinder 36 and the liner 30, causing both the piston and the cylinder to move forward as a unit until the shoulder 71 of the nozzle 62 contacts and seals the item 75 to be filled, with the tip 69 being engaged therein, as shown in FIG. 6, at which time, the forward motion of the nozzle 62 is prevented thereby causing the opening of the apertures 72 and a retarding of the cylinder while the forward movement of the piston 78 continues so as to discharge the fluid. The ingress end of the item 75 to be filled is positioned adjacent the aperture 26 in the face plate 22, so as to contact the open end of the nozzle upon its extension therethrough thereby enabling the fluid to flow through the nozzle 62 and into the item 75. In the event that non-rigid items, such as plastic cartridges, are being filled, an additional stop means can be provided for causing a rearward movement of the nozzle 62 relative to the valve seat 50. If so desired, such a stopping action can be provided by the abutment of the shoulder 98 between the nozzle body portion 66 and nozzle forward end 68, against the rear surface of the face plate 22.

Upon a rearward movement of the piston 78, the cylinder 36 will be biased rearwardly by the spring means 76 relative to the nozzle 62, thus resulting in a sealing off of the apertures 72. It will be noted that the rearward movement of the piston 78 will create a slight suction at the nozzle end thus immediately cutting off the flow of fluid so as to prevent any undesirable leakage. The continuous rearward movement of the piston creates a further suction effect within the cylinder 36 and when the intake port 40 is cleared, a new supply of fluid is quickly drawn in for a subsequent forward movement of the piston 78. From the foregoing, the manner in which the present device provides for the consistently accurate and rapid filling of various items such as ink cartridges is considered to be readily apparent. Of particular significance is the fact that the stroke of the piston remains constant regardless of the amount of fluid being dispensed. The adjustment of the length of the piston rod is the only adjustment necessary for increasing or decreasing the amount of fluid dispensed.

Attention is now directed toward FIGURES 8 and 9 wherein a modified form of adjustable piston is illustrated. This piston is generally referred to by reference numeral 100 and comprises an elongated body 102 having a beveled forward surface 104, a sleeve 106 integral therewith, wrench flats 107, and a spherical rear end 108 capable of being secured to an actuating means in any conventional manner. The sleeve 106 is provided with a plurality of elongated slots 110 which provide a means for orientating the bevelled forward end 104 within the liner 38' of the cylinder 36' for regulating the amount of fluid dispensed. One or more locating pins 112, threaded through the cylinder 36' maintain the piston 100 in its adjusted position in a manner so as to allow reciprocable sliding movement of the piston 100 relative to the cylinder 36'. The piston 100 is retained within the cylinder 36' by means of a lock ring 114 received within an upwardly opening groove 116. As set forth supra in regard to piston 78 forward movement of the piston 100 will compress the fluid which in turn will build up a pressure sufficient enough so as to overcome the frictional engagement between the cylinder 36' and the pump housing, at which time, both the piston 100 and the cylinder 36' will move forward as a unit so as to engage the nozzle 62' with either an item to be filled or a stop means which causes the rearward movement of the nozzle 62 along with a subsequent opening of the apertures 72 so as to allow for an outward flowing of the compressed fluid. It will be noted that the locating pins 112 are engaged with the slots 110 sufficiently so as to prevent rotation of the piston 100 while allowing forward and rearward sliding of the piston 100. Further, attention is directed to the fact that the piston 78 can, if so desired, be provided with a beveled end similar to 104 of piston 100.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A filling pump comprising a pump housing, a hollow cylinder located therein, a reciprocating piston slidably mounted in the cylinder and extending outwardly from the rear end thereof, a discharge nozzle mounted at the forward end of the cylinder and extending forwardly therebeyond, spring means biasing the nozzle forwardly to a closed position relative to the cylinder, an intake port to the interior of the cylinder positioned forward of the piston when said piston is in its retracted position, and rearward of the nozzle, a valve seat mounted in the forward end of the cylinder, said valve seat having a recess formed in its inner end, the nozzle being slidably received within the valve seat and having an enlarged valve head engageable within the recess and biased thereto by said spring means, a longitudinally extending bore extending inwardly from the forward end of said nozzle, a plurality of apertures located forward of the enlarged valve head and in communication with the bore so as to provide a fluid passage between the cylinder and the nozzle bore upon a rearward movement of the nozzle against the bias of the spring, and means for effecting a periodic forward and rearward movement of the piston, said cylinder being slidably mounted for limited movement in response to movement of the piston so as to engage the forward end of the nozzle with a stationary item to be filled, with a continuing forward movement of the cylinder causing the rearward movement of the nozzle relative to the valve seat resulting in the opening of the apertures and the flowing of fluid therethrough.

2. The structure of claim 1 including stop means for limiting the forward and rearward movement of only the cylinder.

3. The structure of claim 2 wherein the cylinder forward movement is in response to a pressure build-up within the cylinder brought about by a compression of the fluid by the piston upon its forward movement.

4. The structure of claim 3 wherein the rear end of the piston is threadedly engaged within a rod for longitudinal adjustment of the piston so as to vary the amount of fluid dispensed by increasing or decreasing the volume of the cylinder forward of the piston.

5. The structure of claim 3 wherein the piston is provided with a beveled forward end and includes means for rotatably positioning the beveled end relative to the intake port so as to vary the amount of fluid dispensed.

6. The structure of claim 5 wherein the means for rotatably positioning the beveled end consist of a plurality of longitudinally extending elongated slots on the piston engageable by at least one locating pin adjustably extending through the cylinder, said pin allowing longitudinal movement of the piston while preventing rotational movement thereof.

7. The structure of claim 4 wherein the piston is provided with a beveled forward end and includes means for rotatably positioning the beveled end relative to the intake port so as to vary the amount of fluid dispensed.

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