Nov. 20, 1962 P. J. O'NEILL, JR 3,064,864

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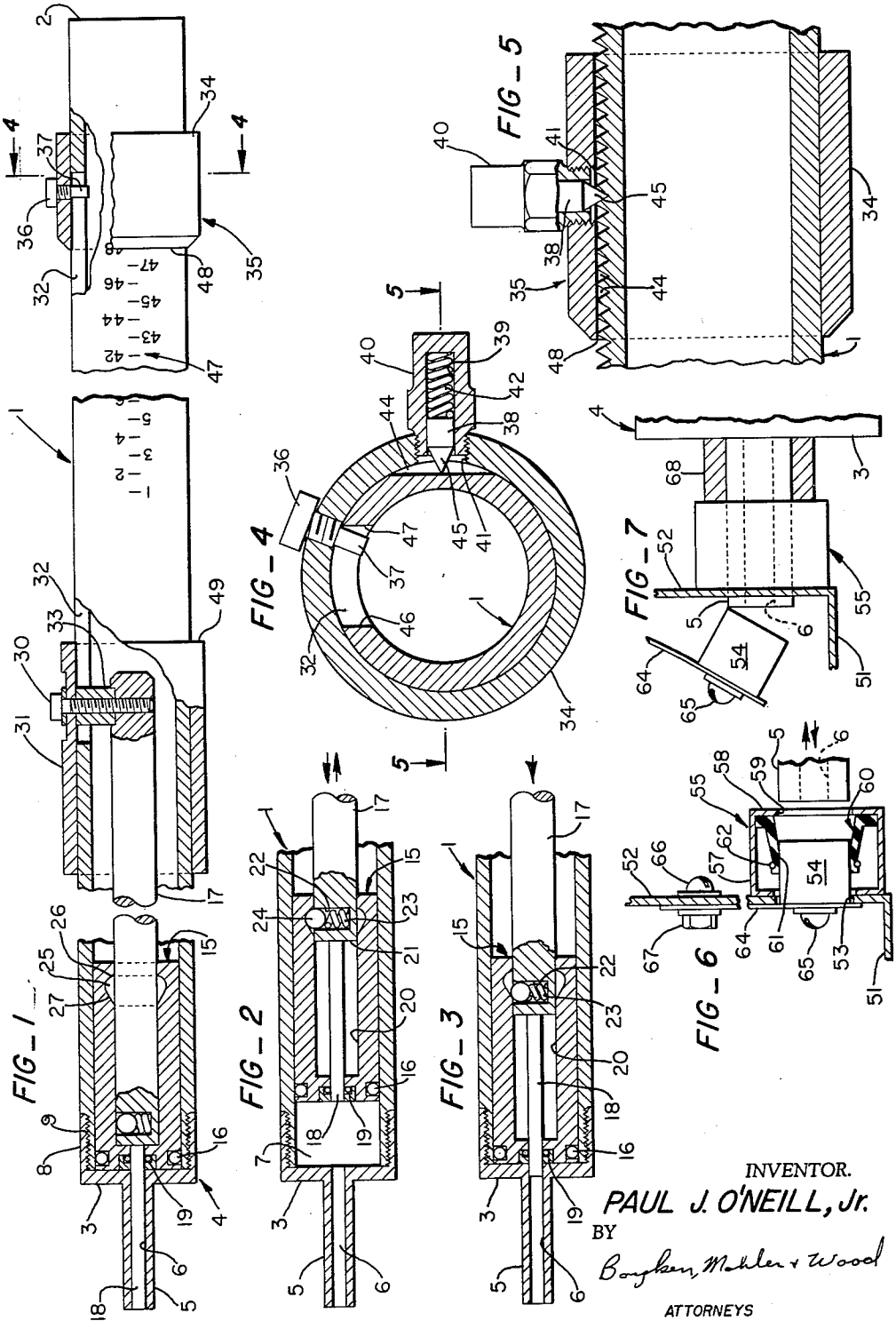
Filed Jan. 18, 1960

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United States Patent Office

3,064,864
Patented Nov. 20, 1962



3,064,864

# FLUID DISPENSER AND VALVE

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Filed Jan. 18, 1960, Ser. No. 3,118
4 Claims. (Cl. 222—255)

This invention relates to a device for dispensing predetermined accurate amounts of fluid. The invention also contemplates the provision of a valve for a liquid container which lends itself to use with the dispensing device so that the device may be readily filled with whatever exact amount of fluid is to be dispensed.

Although it will be apparent that the invention is applicable for use with any type of fluid, it will be explained herein in connection with paint pigment.

It is customary for a paint retailer to provide the customer with paint of the color desired by mixing various pigments in the proportions necessary to produce whatever blend is ordered. The main object of the present invention is to provide a simple inexpensive device for this purpose and which device is extremely accurate in operation.

Another object of the invention is the provision of a dispensing device for fluids which is self-cleaning so that it may be employed on different paint pigments successively without one pigment fouling another.

Still another object of the invention is the provision of a combination valve means and nozzle which may be employed to fill the device with fluid in a quick and efficient manner.

Other objects and advantages will be apparent from the following specification and from the drawings:

FIG. 1 is a side elevation of the dispensing device with portions broken away and in section to show internal structure.

FIG. 2 is a cross section of the discharge end of the device of FIG. 1 showing the piston partially retracted from the position of FIG. 1.

FIG. 3 is a cross section similar to FIG. 2 but with the piston rod in an intermediate position relative to the piston.

FIG. 4 is a cross section through the device as taken along lines 4—4 of FIG. 1.

FIG. 5 is a fragmentary longitudinal section through the device as taken along lines 5—5 of FIG. 4.

FIG. 6 is a fragmentary cross section of a fluid container showing the valve in closed position.

FIG. 7 is a view similar to FIG. 6 showing the valve in open position with the nozzle of the dispensing device indicated in dotted lines.

In detail the fluid dispensing device comprises an elongated cylinder 1 which is open at one end 2. The opposite end is closed by an endwall 3 which is part of a cap generally designated 4. This cap 4 includes an integral elongated tubular nozzle portion 5 which is provided with a central bore 6 communicating at its inner end with the space 7 within cylinder 1 (FIG. 2). The cap 4 includes an axially extending annular flange 8 which is internally threaded as at 9 to cooperate with complementarily formed threads on cylinder 1.

Slidably disposed within cylinder 1 is a piston generally designated 15 which may be provided with a conventional O-ring seal 16 adjacent its forward end, that is, the end nearer endwall 3.

Piston 15 is provided with central axially extending bore 20 within which is telescopically received one end of a piston rod 17. Integral with said one end is a relatively narrow elongated extension or pin 18 which is adapted to be snugly received in bore 6 of nozzle 5 (FIG. 3). To prevent fluid from entering bore 20 from the cylinder space 7 a seal 19 is provided at the forward end of piston 15 and through which seal said extension is slidable in fluid tight relation.



At this point it may be noted that if fluid is within the cylinder space 7 of FIG. 2 such fluid is completely discharged through bore 6 when piston 15 is moved to the left to the position of FIG. 1. Furthermore the bore 6 may then be completely evacuated by inserting piston rod extension into bore 6 as seen in FIG. 1. In such a case the closed end of bore 20 provides a stop for piston rod 17.

However, it will be understood that the above noted steps must be carried out in order because if the extension 18 is inserted in bore 6 before the forward end of piston 15 engages endwall 3 the device will be locked and it will be impossible to discharge the fluid from space 7. The manner in which the device is designed to achieve complete discharge of the fluid in cylinder 1 will now be described.

Piston rod 17 is provided adjacent its forward end 21 with a transversely extending bore 22 containing a compression spring 23 which is adapted to urge a locking element 24 radially outwardly of bore 22. The locking element 24 may take various forms but it is preferably a ball of a diameter slightly less than the diameter of bore 22.

Adjacent the rear end of piston 15 the same is provided with an annular radially inwardly facing groove generally designated 25 (FIG. 1). The cross section of groove 25 at its rear side 26 is formed to a radius equal to the radius of ball 24 and at its forward side is substantially frustoconical to provide a slanting cam surface 27 which is adapted to urge ball 24 radially inwardly of bore 22 as the piston rod 17 is moved to the left as shown in FIG. 3.

At this point the operation of the piston may be described. With fluid surrounding nozzle 5 movement of the piston rod 17 to the right (FIG. 1) causes the same to slide within piston 15 to withdraw extension 18 from bore 6. There is no tendency for the piston to move to the right until extension 18 is completely retracted into piston 15 as seen in FIG. 2 and by making extension 18 of sufficient length to completely occupy bore 6 (FIG. 1). It will be apparent that movement of piston 15 will not commence until said extension is completely removed from bore 6 and entirely received in piston 15. At that point fluid may enter the cylinder so that upon further movement of piston rod 17 to the right the piston 15 may move with it.

Groove 25 is positioned in piston 15 so that when the extension 18 is fully retracted into the piston the ball 24 is seated against the rear side of said groove so that further movement of piston rod 17 to the right relative to piston 15 is positively prevented.

Now assuming it is desired to discharge the fluid from cylinder 1 (FIG. 1) through nozzle 5 initial movement of piston rod 17 to the left urges the fluid out through bore 6. No movement of rod 17 relative to piston 15 occurs at this point because such movement is opposed by the force of spring 23. In other words the resistance offered by the fluid in space 7 to movement of piston 15 to the left is considerably less than the resistance of the locking ball 24 to movement out of groove 25.

However, after all of the fluid is discharged from cylinder space 7 and piston 15 engages endwall 3 the application of additional force on rod 17 toward the left forces ball 24 along cam surface 27 and into bore 22 (FIG. 3). Further movement of piston rod 17 causes extension 18 to be inserted into bore 6 (FIG. 3).

It will be noted that the above described operation results in all of the fluid within the cylinder and nozzle

being completely discharged and the manual operation is substantially the same, so far as the user is concerned, as in filling and discharging a conventional pump, or syringe.

The means for filling and discharging exact predetermined quantities of fluid will now be described.

The rear end of piston rod 17 is secured by means of a screw 30 to a cylindrical sleeve or slide member 31 which is slidably disposed on the periphery of cylinder 1. To permit said connection a longitudinally extending slot 32 is provided in cylinder 1 and in which slot is slidably received a spacer 33 which is clamped between slide 31 and piston rod 17. By this structure it will be apparent that the operator may actuate piston 15 by holding the cylinder in one hand and the slide 31 in the other hand for relatively reciprocating the two as desired.

Referring to FIG. 1 it will be apparent that the quantity of fluid received in cylinder 1 will be directly proportional to the movement of piston 15 and slide 31 to the right from the position shown. To provide an exact means for determining the quantity of fluid to be handled an adjustable stop generally designated 35 is provided on cylinder 1. With said stop 35 fixed in a position designating the exact quantity of fluid to be dispensed the slide 31 is merely moved into abutting relation with the stop to cause such exact quantity to be received in cylinder 1.

Stop 35 comprises a cylindrical sleeve or collar 34 slidably disposed on cylinder 1 and provided with a screw 36 having an end 37 adapted to be received in slot 32 in cylinder 1. Also carried by stop collar 34 is a detent 38 which is slidably received in a bore 39 formed in a housing 40. Housing 40 is screwthreadedly secured a hole 41 in collar 34 so that detent 38 is radially disposed relative to cylinder 1. A compression spring 42 is provided in bore 39 for urging said detent 38 into engagement with the outer periphery of cylinder 1 at all times.

Cylinder 1 is provided with a plurality of axially spaced tangentially extending serrations or grooves 44 which comprise segments of the circular cross section of cylinder 1. Detent 38 is provided with a pointed inner end 45 so as to be received in any selected one of the grooves 44 (FIG. 5).

Referring to FIG. 4 it is seen that upon counterclockwise rotation of collar 34 relative to cylinder 1 detent 38 is urged out of the serration in which it is received against the urgency of spring 42. It will be noted that the relationship of slot 32 and the end 37 of screw 36 is such that when end 37 engages side 46 of slot 32 detent 38 is completely removed from the groove 44 and engages the periphery of cylinder 1. In this latter position the stop collar 34 may be moved longitudinally along the length of cylinder 1 to whatever position is desired to act as a stop for slide 31.

After the collar 34 is adjusted to the desired position the same may be rotated back to the position of FIG. 4 so that the detent 38 enters the groove 44 corresponding to such desired position. In this manner a plurality of predetermined positions of stop 34 are possible, each varying from the others by increments of the pitch of grooves 44.

In order to provide visual means for setting the stop 35 the cylinder is provided, on the side opposite grooves 44, with a scale generally designated 47 (FIG. 1). When the device is employed for use with paint pigment each increment on scale 47 may represent whatever fraction of an ounce of pigment is desired since the proportions of pigments are generally given in definite fractions of an ounce. It will be noted that the slide 31 is shown in FIG. 1 in the position corresponding to zero and the space between said position and the indicium representing "one" is relatively great because during the initial movement of piston 15 to the right only the relatively narrow bore 6 is being filled.

In operation, the collar 34 is moved along cylinder 1



as described above until the end 48 thereof coincides with the indicium representing the number of ounces to be dispensed. The collar is then rotated so that detent 38 is received in the groove 44 corresponding to such indicium as shown in FIG. 4. With the nozzle 5 inserted in the fluid to be dispensed the slide 31 is moved to the right until the end 49 engages the end 48 of stop collar 35. The cylinder 1 is then removed from the fluid and transferred to the mixing pot or other container into which the fluid is dispensed by moving slide 31 to the left as described above until piston 15 engages endwall 3 and extension 18 is completely received in bore 6.

It is then merely necessary for the user to wipe off the outside of nozzle 5 and the device is ready for use with another pigment. Since no air can enter the cylinder or nozzle 5 in the position of FIG. 1 there is no danger of the parts sticking due to hardening of the pigment therein by oxidation. Furthermore the device is completely self-cleaning due to the successive operation of piston 15 and extension 18 as described above.

Instead of dipping the nozzle 5 in a container containing the pigment to be used the device shown in FIGS. 6, 7 may be employed. The use of such device also obviates the step of wiping the nozzle as will be seen later on.

The supply of a particular pigment may be contained in one of a plurality of containers each having a bottom 51 and sidewalls 52 (FIG. 6). Adjacent the bottom 51 the containers is provided with an aperture 53 through which is loosely received a cylindrical valve plug 54 which cooperates with a sealing device generally designated 55. This seal 55 comprises a cylindrical housing 57 which may be secured by soldering or other desired method to side wall 52. The outer side 58 of housing 57 is provided with a circular aperture 59 of sufficient size to permit the nozzle 5 to be received therethrough (FIG. 7).

Secured within housing 57 is an annular seal element 60 of resilient material which includes a throat portion 61 having an inner diameter just slightly less than the diameter of nozzle 5 so as to slidably receive said nozzle therethrough in sealing relation. A split ring 62 of resilient material may be used around said throat portion to maintain the desired sealing diameter in throat portion 61 and to cause said throat portion to yieldably grip the nozzle 5.

In like manner the throat portion 61 creates a fluid tight seal around plug 54 when the latter is received within the seal 60 as shown in FIG. 7.

Plug 54 is carried by one end of an elongated flat spring 64 to which it may be secured by screw 65. The other end of spring 64 is fastened to side wall 52 by screw 66 and nut 67.

Flat spring 64 is preformed in such a manner that it urges valve plug 54 into the position of FIG. 6 at all times. However, because of the length and resiliency of said spring it may be deflected inwardly as seen in FIG. 7 when the nozzle 5 is inserted through seal 55.

Since plug 54 and nozzle 5 are of substantially the same diameter it will be apparent that, in operation, it is simply necessary to urge the nozzle through seal 55 to move plug 54 inwardly to the position of FIG. 7 in which position the piston 15 (FIG. 1) may be retracted to fill the cylinder 1 with whatever quantity of pigment is desired. The nozzle 5 may then be withdrawn and the plug will automatically follow it into sealing engagement with seal 60.

In order to prevent excessive deflection of flat spring 64 an annular spacer 68 may be applied between seal device 55 and the cap portion 4 of the dispensing device. Such spacer may, if desired, be secured to seal device 55 or cap 4.

The above described valve structure not only permits the dispensing device to be filled quickly without loss of pigment from the container but provides for automatic wiping of nozzle 5 by seal element 60.

It is to be understood that the above specific description of the preferred form of the invention is not to be taken as restrictive of the invention as various modifications in design may be resorted to by those skilled in the art without departing from the scope of the following claims.

For example the method employed to obtain the proper sequence of movements of piston rod 17 and piston 15 may take other forms. The groove 25 in piston 15 need not extend around the entire inner periphery of the bore 20. Furthermore, it is not essential that locking element 24 be a ball, although this form is preferable; and it is not necessary that a rolling action take place between said ball and side 27 of the groove 25.

It is also contemplated that a compression spring could be employed in cylinder 1 to urge piston 15 to the left at all times (FIG. 1) in which case it is possible to omit spring 23 which actuates the locking element 24. However, as noted above, the essential thing is that the proper sequence of events be followed to actuate piston 15 and extension 18.

It will also be apparent that a set screw, screw-threadedly received in stop 35, may be substituted for the spring urged detent 38 if desired.

The above specific description should not be taken as restrictive of the invention as various modifications in design will occur to those skilled in the art without departing from the spirit of the invention as defined in the following claims.

I claim:

1. In a device for dispensing fluid, an elongated hollow cylinder and a piston slidably supported therein, said cylinder being provided with an endwall at one end thereof adapted to be engaged by said piston, a nozzle carried by said endwall and provided with an elongated bore extending to the discharge end of said nozzle and communicating with said cylinder and through which such fluid is fed into said cylinder and discharged therefrom, a piston rod mounted in said cylinder for longitudinal movement relative thereto and supported at one end in said piston, an extension on said one end of said rod coextensive in length with said bore and adapted to extend into and completely fill said bore with the free end of said extension extending to the discharge end of said nozzle when said piston is against said endwall for discharging all of the fluid in said cylinder.

2. In a device for dispensing fluid, an elongated hollow cylinder and a piston slidably supported therein, said cylinder being provided with an endwall at one end thereof adapted to be engaged by said piston, a nozzle carried by said endwall and provided with an elongated bore extending to the discharge end of said nozzle and communicating with said cylinder and through which such fluid is fed into said cylinder and discharged therefrom, a piston rod mounted in said cylinder for longitudinal movement relative thereto and supported at one end in said piston, an extension on said one end of said rod coextensive in length with said bore and adapted to extend into and completely fill said bore with the free end of said extension extending to the discharge end of said nozzle when said piston is against said endwall for discharging all of the fluid in said cylinder, said piston rod being slidably supported in said piston, and stop means in said piston for limiting movement of said rod relative to said piston in a direction away from said endwall to a distance equal to the length of said extension, whereby said extension is entirely received in said piston when the latter is moved away from said endwall by said rod.

3. In a device for dispensing fluid, an elongated hollow cylinder and a piston slidably supported therein, said



cylinder being provided with an endwall at one end thereof adapted to be engaged by said piston, a nozzle carried by said endwall and provided with an elongated bore communicating with said cylinder and through which such fluid is fed into said cylinder and discharged therefrom, a piston rod mounted in said cylinder for longitudinal movement relative thereto and supported at one end in said piston, an extension on said one end of said rod coextensive in length with said bore and adapted to extend into said bore to the outer end of said nozzle and completely fill said bore when said piston is against said endwall for discharging all of the fluid in said cylinder, said piston rod being slidably supported in said piston, and stop means in said piston for limiting movement of said rod relative to said piston in a direction away from said endwall to a distance equal to the length of said extension, whereby said extension is entirely received in said piston when the latter is moved away from said endwall by said rod, said stop means including a spring pressed ball adapted to connect said rod and piston together and a groove in which said ball is partially received, the side of said groove closer to said endwall having a substantially longer projected length relative to the axis of said rod than the projected length of the other side thereof to facilitate the movement of said ball out of said groove as said rod moves toward said endwall.

4. In a device for dispensing fluid, an elongated hollow cylinder and a piston slidably supported therein, said cylinder being provided with an endwall at one end thereof adapted to be engaged by said piston, a nozzle carried by said endwall and provided with an elongated bore communicating with said cylinder and through which such fluid is fed into said cylinder and discharged therefrom, a piston rod mounted in said cylinder for longitudinal movement relative thereto and supported at one end in said piston, an extension on said one end of said rod coextensive in length with said bore and adapted to extend into said bore to the outer end of said nozzle and completely fill said bore when said piston is against said endwall for discharging all of the fluid in said cylinder, said piston rod being slidably supported in said piston, and stop means in said piston for limiting movement of said rod relative to said piston in a direction away from said endwall to a distance equal to the length of said extension, whereby said extension is entirely received in said piston when the latter is moved away from said endwall by said rod, said stop means comprising a ball in said rod spring pressed radially outwardly and a groove in piston for partially receiving said ball therein, the side of said groove closer to said endwall having a substantially longer projected length relative to the axis of said rod than the projected length of the other side thereof to facilitate the movement of said ball out of said groove as said rod moves toward said endwall, said other side of said groove being formed to substantially the same contour as said ball to prevent radial movement of said ball in response to movement of said rod in a direction away from said endwall.


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