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R. W. FUCHS

3,446,154

HAND PRIMER

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FIG. 1.

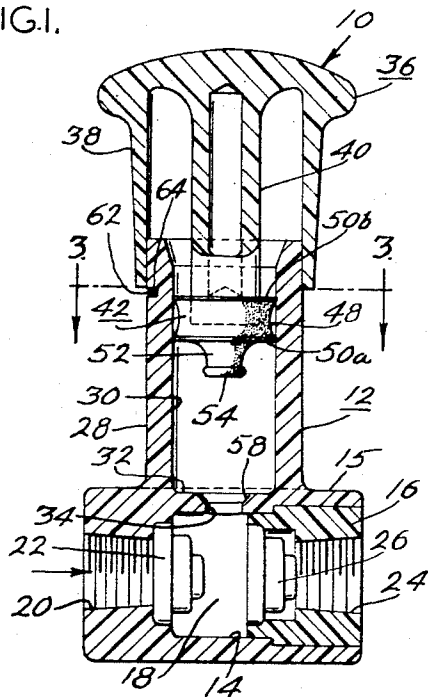


FIG. 2.

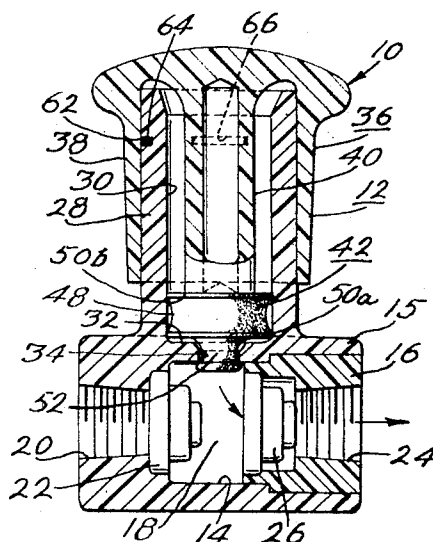


FIG. 3.

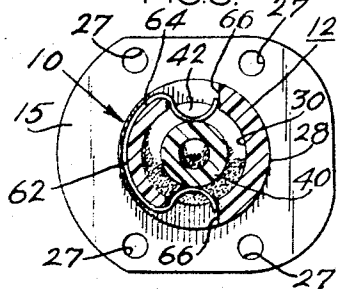


FIG. 5.

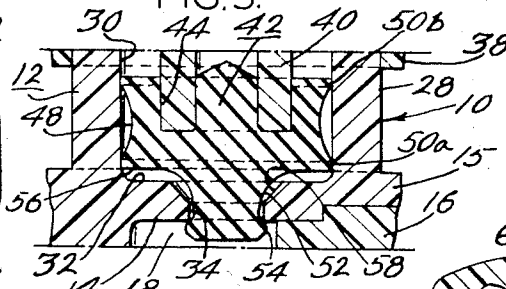


FIG. 4.

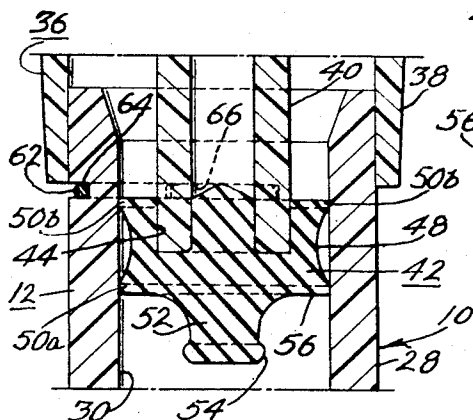


FIG. 6.

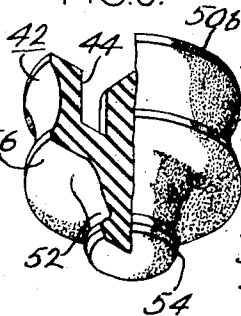
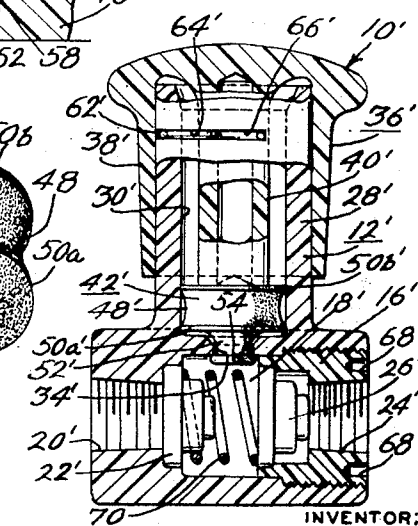


FIG. 7.



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1

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HAND PRIMER

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7 Claims

ABSTRACT OF THE DISCLOSURE

A hand primer for engine fuel systems and similar applications including means for locking the primer plunger in the retracted position, said means including a resilient flanged nub extending from the plunger piston adapted for forcible entry through the fluid opening at the cylinder end, the resilient nub in conjunction with the vacuum formed between the piston and cylinder end wall holding the plunger in the retracted position against fluid pressure.

The present invention relates generally to manually operable piston-cylinder devices and relates more particularly to an arrangement for securing the plunger of a hand primer in the closed position following termination of the priming operation.

Manually operated priming devices are utilized in many situations in which a liquid is to be transferred from a supply tank to a receiver such as a supply pump or the like. The hand primer is generally employed only to initially deliver fuel to the pumping system whereupon the fuel delivery is accomplished automatically by suitable pumping means. An example of such a hand primer application is in a fuel injection pump system wherein it is desirable to have a manually controlled primer connected with the fuel supply tank to provide positive priming of the fuel injection pump.

It is conventional and necessary to provide means for securing the primer plunger in the fully retracted position following use. Without such means, the fluid supply pressure would move the plunger to its extended position in which it would be subject to damage and would take up unnecessary space. Many arrangements have been proposed heretofore to lock the plunger in the retracted position including latching mechanisms, threaded devices and the like. Almost without exception, all of the prior arrangements have involved rather complex, expensive devices and have required certain manipulative steps on the part of the operator both to free the plunger for use and to lock the plunger in position after use.

In the present invention, the plunger locking arrangement is of an extremely simple, effective design which may be economically manufactured. The present locking arrangement for operation requires only the application of an axial depressing force at the end of a pumping stroke somewhat greater than that employed in the pumping stroke. Release of the plunger from the locked position requires only the outward withdrawal of the plunger, this again requiring somewhat more force than that required for the pumping operation.

The invention in brief involves the provision of a resilient flanged nub extending axially inwardly from the plunger piston and adapted to coact with the fluid opening in the cylinder end wall in the retracted plunger position to prevent outward movement of the plunger under fluid pressure. The resilient nub extends through the opening with a flanged tip portion expanding interiorly around the opening to provide a locking effect. In addition, the disposition of the piston proximate the cylinder end wall in the retracted plunger position provides

2

a suction force which must be overcome to withdraw the plunger, the resilient nub blocking flow through the aperture and preventing release of the suction until a substantial withdrawing movement of the plunger has been effected.

In view of the foregoing, it can be understood to be a primary object of the present invention to provide an improved hand primer plunger locking arrangement for securing the primer plunger in the retracted position.

A further object of the invention is to provide a plunger locking arrangement as described which is engaged and released simply by the application of an axial force to the plunger.

Another object of the invention is to provide a plunger locking arrangement of the type described of a simple construction which may be economically manufactured.

Additional objects and advantages of the invention will be more readily apparent from the following detailed description of embodiments thereof when taken together with the accompanying drawings in which:

FIG. 1 is a sectional view of a hand primer embodying the present plunger locking arrangement showing the plunger in the extended position;

FIG. 2 is a view as in FIG. 1 showing the plunger in the retracted locked position;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is an enlarged partial sectional view of the hand primer shown in FIGS. 1—3 showing in particular detail the plunger piston with resilient locking nub;

FIG. 5 is an enlarged partial sectional view showing the manner in which the resilient nub of the plunger piston coacts with the cylinder end wall aperture in the retracted plunger position to lock the plunger;

FIG. 6 is a perspective view partly broken away of the plunger piston; and

FIG. 7 is a sectional view showing a hand primer of a modified type employing the present invention.

Referring to the drawings, a hand primer generally designated 10 embodying the present invention includes a housing 12 of an inverted T shape which is preferably formed of an oil and heat resistant plastic or a metal die casting. A bore 14 extends partway into the portion 15 of the housing and includes a plug 16 secured in the bore to form a fluid chamber 18 therein. The chamber 18 is connected to a source of liquid by means of inlet port 20 extending coaxially through the housing wall in which a check valve 22 is mounted to permit flow only into the chamber. An outlet port 24 in the plug 16 similarly communicates with the chamber 18 through a check valve 26 mounted therein which only permits flow outwardly from the chamber. The plug 16, preferably of a plastic or die casting as used for the housing, and the check valves may be secured to the housing by means of a press fit and suitable adhesive. Holes 27 are provided in housing portion 15 for mounting screws.

Extending transversely to the chamber and aligned inlet and outlet ports is a cylindrical portion 28 of the housing having a coaxial bore 30 therein defining a pumping cylinder. The end wall 32 of the cylinder includes a coaxial aperture 34 of a diameter smaller than that of the bore 30 providing fluid communication between the cylinder and the chamber 18. A hand plunger 36 includes a cylindrical skirt portion 38 adapted to slidably engage the outer cylindrical surface of the cylindrical portion 28 of the housing. A hollow shaft portion 40 of the plunger extends coaxially into the cylinder and supports on its inner end a resilient piston 42. As shown most clearly in FIG. 4, the piston 42 includes an annular groove 44 within which the end of the shaft portion 40 of the plunger is secured. The piston 42 has a concave peripheral surface

48 producing inner and outer annular sealing edges 50a and 50b respectively which provide an effective sealing of the cylinder.

Depending coaxially inwardly from the piston 42 is an integral resilient nub 52 having an annular radial flange 54 at the tip thereof. As shown in FIG. 5, the nub 52 is adapted to extend through the aperture 34 in the cylinder end wall 32 in the retracted locked plunger position, the nub being slightly smaller in diameter than the aperture while the tip flange 54 is slightly larger in diameter than the aperture. As illustrated, the nub is of a sufficient axial length so that the flange will extend beyond the aperture into the chamber 18 and expand to block flow through the aperture. The lower face 56 of the piston 42 in this plunger position is proximate the cylinder end wall 32, permitting only a small amount of fluid to remain in the cylinder. As a result, a substantial suction is created upon initial outward movement of the plunger, the suction force augmenting the resistance of the nub flange to effectively lock the plunger in the retracted position against fluid pressure in the chamber 18.

The aperture 34 is beveled at 58 on the cylinder side to guide the flanged nub into the proper position. As illustrated, the nub 52 preferably extends integrally from the lower piston face 56 in the curved tapering configuration illustrated to provide an increased transverse rigidity and prolonged life of the resilient nub.

The outward movement of the plunger is limited by the spring clip 62 inserted in the circumferential groove 64 and opposed slots 66 in the cylindrical portion 28 of the housing. The spring clip 62 contacts the upper surface of the piston 42 to establish the outer limit of the plunger stroke.

In the operation of the hand primer, the inlet port 20 is connected with a source of liquid, for example, a fuel tank, and the outlet port 24 is connected to an appropriate receiver, such as a fuel pump. To provide a priming flow of the liquid, the plunger 36 is manually reciprocated to draw the liquid through the check valve 22 into the chamber 18 and cylinder 30 on the outward plunger stroke, and to pump the liquid through the check valve 26 from the cylinder 30 and chamber 18 on the inward plunger stroke, this operation being well known and conventionally employed in hand priming devices. At the completion of the priming operation, to lock the plunger in the retracted position, the plunger is depressed at the end of the inward pumping stroke with somewhat more force than normally applied in the pumping operation to force the flanged resilient nub 52 through the aperture 34 with the nub flange 54 extending into the chamber 18 to seal the aperture as shown in FIGS. 2 and 5. In this position, nearly all of the liquid has been forced out of the cylinder by the piston, the nub 52 with the exception of the flanged tip providing sufficient clearance within the aperture 34 to permit a practically complete evacuation of the cylinder. On release of the plunger, the fluid pressure within the chamber 18 acting against the end face of the nub urges the flange into sealing relation against the edge of the aperture. As indicated above, the combination of the frictional resistance of the nub flange to passage through the aperture and the suction condition created between the piston lower face 56 and the cylinder end wall 32 combine to lock the plunger in the retracted position when its use is not required.

A forceful outward pull on the plunger coupled preferably with a twisting of the plunger is sufficient to release the resilient nub from the opening and overcome the suction beneath the piston. It is not necessary to screw or unscrew any latching devices to operate or lock the plunger and the time saving advantages are obvious. The resilient nub which is integral with the piston may be inexpensively molded therewith and since no assembly operations are involved, the manufacture of the plunger locking arrangement is extremely economical.

By limiting the diameter of the aperture 34 to a fraction of the diameter of the cylinder, the force of fluid pressure in the chamber 18 acting outwardly against the plunger in the locked plunger position is minimized. In a properly designed primer, the present plunger locking arrangement can resist up to 70 p.s.i. of fluid pressure in chamber 18.

The primer housing 12, plug 16 and plunger 36 may be made of an oil and heat resistant plastic material or of a metal die casting. The resilient piston and hub may be of Buna-n or similar material bonded to the plunger.

In the preferred embodiment shown in FIGS. 1-6, the check valves 22 and 26 as well as the plug 16 are permanently secured in position. Serviceability of such an arrangement, however, is difficult in the event of a check valve failure. A modified embodiment of the invention is shown in FIG. 7 wherein the construction of the primer is practically identical with that of the preferred embodiment with certain exceptions to be noted below. Corresponding parts are accordingly identified with primes of the numbers utilized above with respect to the preferred embodiment. In FIG. 7, the plug 16' is threadedly seated in the housing 12' and is provided with wrench sockets 68 to permit ready removal thereof. The check valves 22' and 26' are held in their respective positions by means of a compression coil spring 70 extending therebetween. On removal of the plug 16', the check valves 22' and 26' may be quickly removed and replaced. Operation of the embodiment shown in FIG. 7 is, of course, the same as that of the preferred embodiment described above in all respects.

Manifestly, changes in details of construction can be effected by those skilled in the art without departing from the spirit and the scope of the invention as defined in and limited solely by the appended claims.

I claim:

1. In a hand primer including a fluid chamber, a cylinder having an aperture in one end thereof communicating with the chamber, and a plunger operative for manual movement of a piston within the cylinder, the improvement comprising means for securing the plunger in the retracted position, said means including a resilient nub on the piston and means comprising a resilient radially extending portion of said nub adapted for engagement with said aperture when said piston is positioned proximate the apertured end of said cylinder, said piston in the retracted position being maintained in said position by the resilient engagement of said nub with said aperture and by the suction effect created by the proximity of said piston to said apertured cylinder end.

2. The invention as claimed in claim 1 wherein said resilient nub includes a flanged tip of a diameter greater than the diameter of said aperture.

3. In a hand primer including a fluid chamber, a cylinder having an aperture communicating with the chamber, and a plunger operative for manual movement of a piston within the cylinder, the improvement comprising a resilient nub on the piston axially aligned with and adapted for engagement within the aperture connecting the cylinder and fluid chamber, an annular radial flange on the tip of said nub, said flange having a diameter greater than the diameter of said aperture, said nub flange in the retracted plunger position extending through said aperture into the fluid chamber to resiliently hold the plunger against fluid pressure in the chamber.

4. The invention as claimed in claim 3 wherein the diameter of the aperture is substantially smaller than the diameter of the plunger piston.

5. A hand primer comprising a housing, a bore in said housing, a plug in the end of said bore forming a fluid chamber therein, inlet and outlet ports communicating with said chamber, check valves in each of said inlet and outlet ports, a cylinder in said housing having an aperture communicating with said chamber, a plunger

5

associated with said cylinder having a piston connected thereto for movement within the cylinder, and a flanged nub on said piston adapted for engagement within the aperture connecting the cylinder and chamber to hold the plunger in a retracted position against fluid pressure in the chamber.

6. The invention as claimed in claim 5 wherein said inlet and outlet ports are axially aligned, and a compression spring extending between said check valves to secure said valves in position.

7. Thre invention as claimed in claim 6 wherein said ports are axially aligned with said bore, one of said ports passing through said plug, and wherein said plug is threadedly mounted in said bore to permit access to said chamber.

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References Cited

UNITED STATES PATENTS

1,039,933	10/1912	Hamberger	-----	222—384
2,155,850	4/1939	Vogel	-----	230—172
2,194,340	3/1940	Vogel	-----	230—172
3,006,282	10/1961	Sisson	-----	103—153
2,889,089	6/1959	Herrick et al.	-----	222—543

FOREIGN PATENTS

314,908	2/1934	Italy.
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U.S. Cl. X.R.

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