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PUMP MECHANISMS OF WATER PISTOLS

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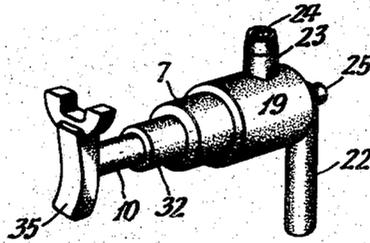


FIG. 1.

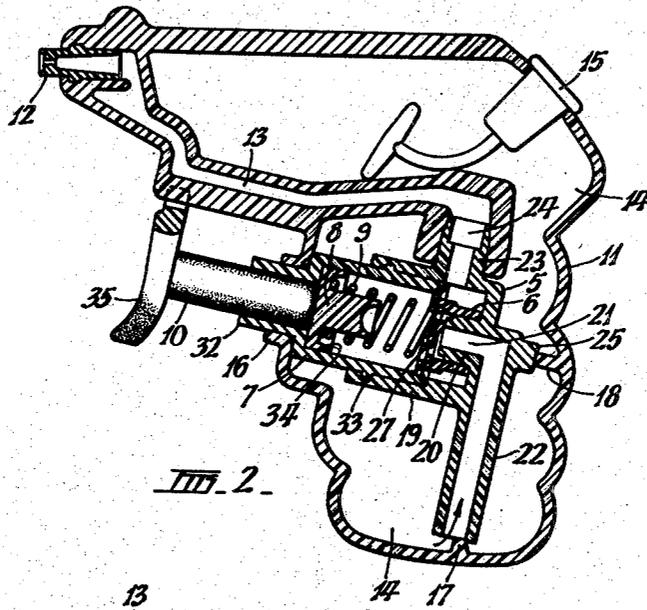


FIG. 2.

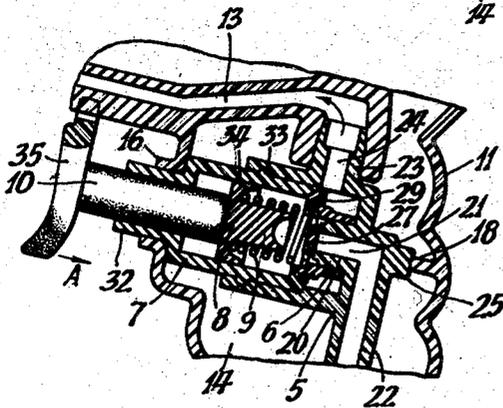


FIG. 3.



FIG. 4.

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## PUMP MECHANISMS OF WATER PISTOLS

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6 Claims. (Cl. 103—153)

This invention relates to pump mechanisms of water pistols and other apparatus incorporating valve-controlled reciprocatory pump means (hereinafter referred to by the term "water pistols") and it has been devised particularly with the object of providing a relatively simple and compact construction of pump mechanism, for a water pistol, which will be efficient in operation and economical to manufacture.

It is known to provide water pistols in which the major portion of the interior of the pistol constitutes a water reservoir from which water may be drawn by a pump mechanism and expelled through an outlet nozzle of the pistol. In such constructions of water pistol it is necessary to provide a plunger or reciprocatory type of pump mechanism by means of which water may be drawn from the reservoir on one stroke of the pump mechanism and then expelled through the outlet nozzle on the next stroke of the pump. It is customary in such water pistols to provide a piston movable in a cylinder, and inlet and outlet passageways connected to the cylinder, there being provided spring-loaded ball valves in each of the inlet and outlet passageways so as to ensure that there is a uni-directional flow of water from the reservoir through the inlet passageway to the cylinder and thence through the outlet passageway to the outlet nozzle of the pistol. The spring-loaded non-return valves as hitherto provided in such pump mechanisms are relatively expensive to manufacture and are somewhat difficult to assemble.

A further object of the invention therefore is to provide a relatively simple construction of valve means for incorporation in the pump mechanism of a water pistol. Another object is to devise a construction of valve means for the pump mechanism of a water pistol which will lead to a simplification of the construction of the pump and also facilitate the assembly of the parts of the pump.

The invention provides a double-acting valve member—that is to say, a valve member adapted to operate to permit flow of liquid in one direction in certain circumstances whilst preventing or restricting the flow in the opposite direction, and to prevent or restrict the flow of liquid in said one direction in other circumstances whilst permitting flow in said opposite direction—for incorporation in the pump mechanism of a water pistol, the valve member being made in one piece.

The invention also provides a pump mechanism, for a water pistol, in which the pump cylinder is connected through an inlet pipe to the water reservoir of the pistol and through an outlet pipe to the outlet nozzle of the pistol, and wherein there is a valve member controlling the flow of liquid into and from the pump cylinder. The valve member, in the preferred form of the invention, is made in one piece and it is operative to prevent the flow of liquid into the cylinder through the inlet when the piston is moved in one direction—whilst permitting the flow of liquid from the cylinder—and to prevent the flow of liquid into the cylinder through the outlet when the piston is moved in the opposite direction, whilst permitting the flow of liquid into the cylinder through the inlet.

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It is also a feature of the invention to provide a valve member of tubular shape formed with an internal valve adapted to co-operate with an inlet pipe or member so as to constitute an inlet valve, and having an external flange adapted to co-operate with a valve seating so as to constitute an outlet valve.

In order that the invention may be readily understood and conveniently put into practical form I shall now describe, with reference to the accompanying illustrative drawings, a preferred construction of pump, for a water pistol, incorporating the invention. In these drawings:

Fig. 1 is a perspective view of the complete pump unit assembled ready for installation in a water pistol;

Fig. 2 shows a longitudinal cross-section through a water pistol having incorporated therewith the pump unit illustrated in Fig. 1;

Fig. 3 is a broken-away view of portion of the water pistol incorporating the pump, showing the plunger and piston of the pump pushed inwardly; and

Fig. 4 illustrates the construction of the valve member of the pump unit.

The pump mechanism illustrated in the drawings consists in all of six parts—the valve housing 5, valve member 6, cylinder 7, piston 8, spring 9 and plunger 10—and it is so made that it may be conveniently mounted within the body portion of a water pistol of any suitable design such as that depicted in Figs. 2 and 3 of the drawings. That water pistol has a casing 11 which is made in two parts, an outlet nozzle 12, a passageway 13 leading to the nozzle 12, a water reservoir 14, a plug 15 for a filler opening in the casing 11, a boss 16 in which is fitted a neck part of the cylinder 6, and locating ribs 17 and 18 projecting inwardly of the casing, the pump mechanism being located between the inner end of the passageway 13, the inner end of the boss 16 and the ribs 17 and 18.

The construction of the water pistol does not form a part of the invention.

The valve housing 5 has a hollow, substantially cylindrical portion 19 which is open at one end, and at the other end there is formed a co-axial inlet member 20 having an opening 21 communicating with the passageway through an integrally-formed inlet tube 22. An outlet tube 23 is formed integrally with the cylindrical portion 19 and through it is an outlet opening 24 leading from the interior of said portion 19.

The outlet tube 23 is adapted to fit tightly in the inner end portion of the passageway 13, whilst the outer end of the inlet tube 22 bears upon the locating rib 17 and a projection 25 on the end of the housing 5 bears on the locating rib 18 when the pump mechanism is correctly located in the casing of the water pistol. It is apparent from a consideration of the drawings that the passageway through the inlet tube 22 is in communication with the water reservoir 14 within the water pistol casing 11.

The valve member 6—the construction of which is illustrated in Fig. 4—has a tubular portion 26 of which the bore is substantially the same diameter as the external diameter of the inlet member 20, an inlet valve 27 within the tubular portion 26, a shoulder or seating 28 for one end of the spring 9 and an external flange which constitutes the outlet valve 29. As the bore of the tubular portion 26 is substantially the same size as the external diameter of the inlet member 20 the valve member 6 is adapted to fit relatively neatly on the inlet member 20, and when fitted thereon the inlet valve 27 bears upon the end of said inlet member. The inlet valve is supported by two arm 30 which are formed integrally with the valve 27 and with the tubular portion 26, and cross-ribs 31 are formed on the inoperative surface of the valve 27 (the surface which does not make contact with the inlet member) so as to provide for a desired rigidity in the valve 27.

The outlet valve 29 is so shaped that the operative surface of the valve is at an angle to the plane normal to the central axis of the tubular portion 26.

The cylinder 7 has a neck portion 32 of reduced diameter at one end—the opening through the neck portion being of such size as to slidably accommodate the plunger 10—and the internal bore of, or the chamber in, the major part of the cylinder is of such size that the piston 8 is neatly but slidably accommodated therein. The external diameter of the major, larger portion of the cylinder is such that said cylinder may be fitted tightly into the valve housing 5. The end of the cylinder 7 remote from the neck portion 32 is chamfered at an angle corresponding to the angle of the outlet valve 29. That chamfered end of the cylinder constitutes the outlet end of the cylinder, and the chamfered portion constitutes the seating for the outlet valve.

At an intermediate position in the length of the cylinder there is a circumferential rib 33 which is adapted to engage in a recess formed in the interior of the valve housing 5 near the open end thereof, and when the cylinder 7 is pressed into the valve housing 5 to the position whereat the rib 33 is engaged in that recess (the valve member 6 having been first fitted on the inlet member 20) then the chamfered end of the cylinder will engage with the outlet valve 29.

The piston 8 has a central portion and a skirt 34 and when the parts are assembled portion of the spring 9 fits about the central portion so that one end of the spring presses upon the piston 8, the other end of the spring bearing upon the seating 28 provided in the valve member 6. It is apparent that as the spring 9 is operative to press the piston 8 outwardly so also is it operative to press the valve member 6 firmly on to the inlet member 20 of the valve housing 5.

The plunger 10 is formed integrally with a trigger 35, in known manner, so that when the trigger 35 is moved in the direction of the arrow A in Fig. 3 the plunger 10 is forced inwardly of the cylinder 7, and as the inner end of the plunger 10 is in contact with the piston 8 said piston will also be moved inwardly against the pressure of the spring 9, as shown in Fig. 3.

The parts of the pump mechanism are so arranged and proportioned that when the valve member 6 is pressed firmly on to the inlet member 20 the inlet valve 27 will normally press upon the inner end of the inlet member 20 so as to close the passageway or opening 21 against the flow of water. Then, too, the outlet valve 29 will be in firm contact with the seating at the inner end of the cylinder 7.

If the trigger 35 be pressed inwardly the inward movement of the piston 8 will cause fluid to be forced past the outlet valve 29, and the fluid pressure within the cylinder 7 will operate to press the inlet valve 27 firmly on its seating to restrict flow of fluid through the inlet opening 21. When pressure upon the trigger 35 is released the piston 8 will be moved outwardly under bias of the spring 9 and in that action the outlet valve 29 will be held on its seating by reason of the reduced pressure within the cylinder 7 and the inlet valve 27 will be lifted from its seating to permit flow of liquid from the reservoir 14 through the inlet tube 22 and inlet member 20 to the interior of the cylinder 7. If the trigger 35 be again pressed inwardly liquid will be forced from the cylinder 7 through the outlet opening 29 into the passageway 13.

The valve member 6 constitutes both the inlet valve and the outlet valve—acting in association with the end of the inlet member 20 and the end of the cylinder 7.

By reason of the simplicity of construction of the valve mechanism the construction of the pump mechanism as a whole is greatly simplified and the cost of production reduced. Furthermore, the pump mechanism incorporating the valve member is of relatively compact design and easy to assemble.

I therefore particularly point out and distinctly claim as my invention:

1. In a pump for a water pistol, a valve member having a tubular body portion, an inlet valve within the tubular body portion, the inlet valve consisting of a closure member, an arm formed integrally with said closure member and being integral with the tubular body portion, and an external flange integral with and formed about the outer surface of the tubular body portion, said external flange being flexible and constituting an outlet valve.

2. In a pump for a water pistol, a valve housing, an inlet opening at one end of the valve housing, an outlet opening in the valve housing at the same end as the inlet opening about the same, a valve seating in the valve housing at said outlet opening, and a valve member having integral inlet and outlet valves, the valve member having a tubular body portion within which is formed the inlet valve and on the outside of which is formed an external flange constituting the outlet valve, the valve member being disposed in said housing with the inlet valve against the inlet opening and the outlet valve against the valve seating, and the valve member being operable to permit flow of liquid through the inlet opening into the housing and out through the outlet opening.

3. In a pump for a water pistol the combination as set out in claim 2 wherein two flexible arms are provided integral with the body portion of the valve member and with the inlet valve to support the latter movably within such body portion.

4. In a pump for a water pistol the combination as set out in claim 2 wherein there is an inlet member formed integrally with the valve housing, said inlet member extending inwardly from one end of said valve housing and being co-axial with said housing, and the inlet opening is in said inlet member.

5. In a pump for a water pistol, a pump cylinder open at one end, a valve housing about such open end of said cylinder and having inlet and outlet openings therein, a valve member having integral inlet and outlet valves, said valve member having a tubular body portion within which is formed the inlet valve and on the outside of which is formed an external flange constituting the outlet valve, the valve member being disposed in said housing with the inlet valve against the inlet opening of the same and the outlet valve against the inner end of the pump cylinder, such inner end forming a seating for the outlet valve, and the valve member being operable to permit flow of liquid through the inlet opening into the pump cylinder and out through the outlet opening.

6. In a pump for a water pistol the combination as set out in claim 5 wherein a piston is mounted in the pump cylinder for linear movement toward and away from the inlet opening, and a compression spring is mounted in said cylinder with one end pressing against and thereby holding the valve member in correct position in said valve housing.

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