June 18, 1940. G. E. FERGUSON 2,204,798

FIRE EXTINGUISHER

Filed May 10, 1939

Fig. 1.

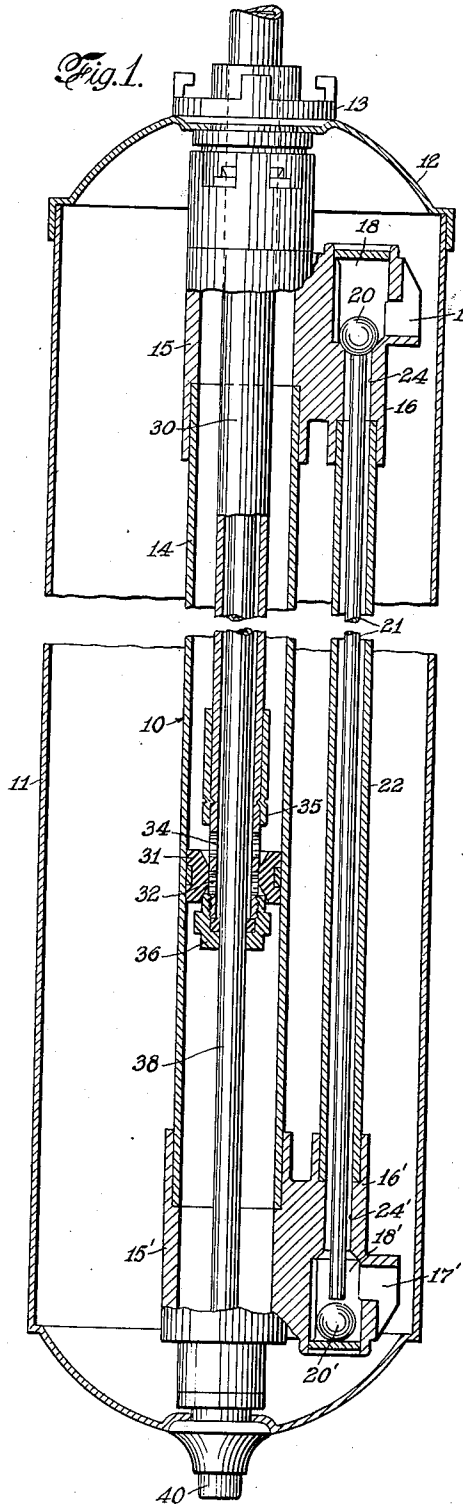


Fig. 2.

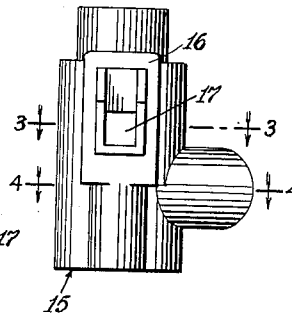


Fig. 3.

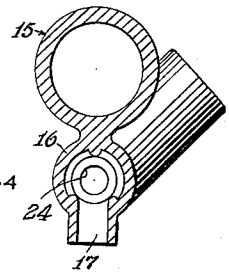


Fig. 4.

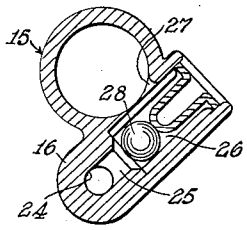


Fig. 5.

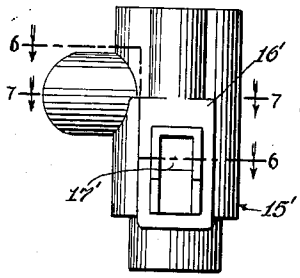


Fig. 6.

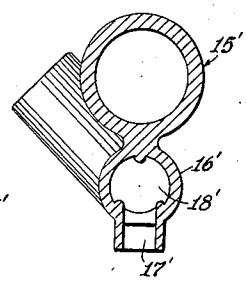
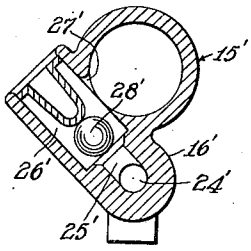


Fig. 7.



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FIRE EXTINGUISHER

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Application May 10, 1939, Serial No. 272,823

1 Claim. (Cl. 299—98)

This application is a continuation in part of applicant's earlier and once copending application Serial No. 132,483, filed March 23, 1937, and subsequently abandoned, the present application being directed to an invention relating to improvements in combined double-acting liquid pumps and pick-up devices used in fire extinguishers of the type containing, as the fire extinguishing liquid, carbon tetrachloride which must be forcibly expelled from the liquid chamber regardless of the position in which the extinguisher is held when operated.

The general object of the invention is to increase the reliability and prolong the life of such double-acting pumps and pick-up devices when the fire extinguisher containing them is subjected to long continued and severe vibrations (for example, on a policeman's motorcycle) tending to injure and ultimately destroy the valve mechanism upon which the reliability of the fire extinguisher depends.

To the above end, the present invention comprises, in a combined double-acting pump and pick-up device for use in a fire extinguisher of the carbon tetrachloride type, the improved means hereinafter described for controlling the delivery of the fire extinguishing liquid to opposite ends of the double-acting pump.

In the drawing, Fig. 1 is a central, longitudinal, sectional view of a fire extinguisher embodying the present invention, certain parts being broken away and other parts being shown in elevation; Fig. 2 is a view in elevation of the upper pump head; Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; Fig. 4 is a sectional view taken on line 4—4 of Fig. 2; Fig. 5 is a view in elevation of the lower pump head; Fig. 6 is a sectional view taken on line 6—6 of Fig. 3; Fig. 7 is a sectional view taken on line 7—7 of Fig. 3. Like parts are referred to by similar reference characters.

Referring to the drawing, the numeral 10 indicates a double-acting pump, arranged within a liquid receptacle 11, having a head 12, provided with a retaining plate 13 to which a pump-operating handle (not shown) is adapted to be locked when the extinguisher is not in use.

The pump 10 comprises a metallic pump tube 14, to opposite ends of which are secured metallic pump heads 15, 15' formed respectively with offset portions 16, 16' and provided with inlet ports 17, 17', respectively. Within the pump heads 16, 16' are inlet valve chambers 18, 18' containing valve balls 20, 20', with which is adapted to cooperate a longitudinally movable ball-spacing and actuating rod 21 carried within a metallic tube 22 of considerably larger diameter suitably connected with the offset portions 16, 16' of the pump heads and communicating with pump head passages 24, 24'. These passages 24, 24' communicate with the inlet valve chambers 18, 18' and also communicate through ports 25, 25' with check-valve chambers 26, 26' which communicate respectively with opposite ends of the pump tube 14 through openings 27, 27' provided in the pump heads. That is, the valve balls 28, 28' are arranged within the check-valve chambers 26, 26', and cooperate with their respective seats to close communication between the pump tube 14 and the passages 24, 24'; whereas the valve balls 20, 20' cooperate with their seats to close the inlet ports 17, 17'.

Within the pump tube 14 is arranged a metallic piston-operating member, herein shown as a piston tube 30, which projects through the fire extinguisher head 12 and carries at its inner end a piston 31. The piston 31 has a limited movement on the piston tube 30 and is adapted to so move, when the piston tube is being moved outwardly (that is, upwardly as shown in Fig. 1) as to close inlet ports 32 and open inlet ports 34 formed in the piston tube. Upon reverse (downward) movement of the piston tube 30, the piston 31 moves on the piston tube 30 and closes the ports 34 and opens the ports 32; the piston being limited in its movement in one direction by a collar 35 carried by the piston tube, and being limited in its movement in an opposite direction by a gland nut 36 which is carried at the end of the piston tube 30. A nozzle tube 38 is arranged centrally of the piston tube 30, and is held stationary by reason of its connection with a nozzle 40 which is secured to the outlet end of the receptacle 11.

The pump 10 is journalled for rotation within the receptacle 14, at one end on the piston tube 30, and at its other end on the nozzle tube 38; and the offset portions 16, 16' of the pump heads 15, 15' are of sufficient weight to insure pendulum-like turning of the pump about the piston tube and the nozzle tube when the extinguisher receptacle 11 is rotated while held in other than a vertical or substantially vertical position. Thus the picking up of the fire-extinguishing liquid from the lowest spot in the receptacle 11 is assured.

When it is desired to operate the extinguisher, the operating handle, not shown, is unlocked from the retaining plate 13 by imparting to the handle a part turn as is customary. If the piston tube 30 is then drawn outwardly (upwardly), such tube

at first moves with respect to the piston 31, thereby closing the ports 32 and opening the ports 34. If the extinguisher is being operated with its nozzle 40 pointing generally downwardly, the fire extinguishing liquid will enter the port 17', pass over the unseated valve ball 20' and into the passage 24', thence around the valve ball 28' and into the lower part of the pump through the port 27'. Upon reverse (downward) movement of the piston tube 30, such tube will move with respect to the piston 31, thereby closing the ports 34 and opening the ports 32, whereupon liquid previously drawn into the pump tube 14 passes through the ports 32 and into the piston tube 30 from which it enters the inlet end (not shown) of the nozzle tube 38 from which it is ejected by way of the nozzle 40. As the piston tube 30 moves inwardly, the valve ball 28' becomes seated and closes the communication previously afforded, through the port 25', between the receptacle 11 and the lower part of the pump. While the piston 31 is being moved inwardly (downwardly), liquid is drawn through the port 17' and passes up through the passage 24' and the tube 22, from which it enters the passage 24 and passes around the then-unseated valve ball 28 into the pump through the port 27. On the next outward (upward) stroke of the piston tube 30, liquid enters the lower end of the pump tube 14, as previously explained; and the liquid which has been drawn into the pump through the port 27 passes from the pump tube through the ports 34 and into the piston tube from which it passes into the nozzle tube 37 and is expelled.

With the nozzle end of the extinguisher pointed generally upwardly, liquid, on the inward (downward) stroke of the piston tube, enters the head 15 through the port 17 thereof and passes through the port 27 into the pump tube 14, as previously described, the liquid in front of the piston tube 31 being then expelled from the pump through the ports 32, the piston tube 30 and the nozzle tube 38, as also previously described. On the outward (upward) stroke of the piston tube 30, liquid enters the head 15 through the port 17 and passes into the tube 22 and on into the pump tube 14 through the port 27', the liquid at the rear of the piston 31 being then forced through the ports 34 into the piston tube 30 from which it is directed into and through the nozzle tube 37, as previously described.

While the extinguisher is held in a horizontal position and operated, liquid may be admitted to the pump tube 14 on the inward and outward strokes of the piston, through either of the ports 17 and 17', or both of these ports, depending upon the position of the valve balls 20 and 20'. On the inward (downward) stroke of the piston tube 30, liquid will pass around the valve ball 28 and enter the pump tube 14 through the port 27. During the outward (upward) stroke of the piston tube 30, liquid passes around the valve ball 28' and enters the pump tube 14 through the port 27'. The liquid thus entering the pump tube 14 at opposite ends thereof is expelled, as previously described.

From the foregoing it will become apparent that the pick-up device, which is adapted to rotate with the pump 10 about the longitudinal axis of the pump tube 14, includes the pump heads 15, 15', the valve balls 20, 20', 28, 28', the ball-spacing and actuating rod 21 and the tube 22 within which the ball-spacing and actuating rod is carried.

The object sought to be attained by the present invention is realized by so constructing the valve balls 20, 20', 28, 28' that they have a specific gravity slightly less than the specific gravity of the fire extinguishing liquid and by so constructing the ball-spacing and actuating rod 21 that it has a specific gravity substantially equal to that of the fire-extinguishing liquid. Satisfactory relations between the specific gravity of the valve balls, the fire-extinguishing liquid and the ball-spacing and actuating rod have been found to exist, for example, when using valve balls made of Bakelite and having a specific gravity of 1.35 and when using carbon tetrachloride (having a specific gravity of 1.591) as the fire extinguishing liquid and when using a ball-spacing and actuating rod made of a composition of paper and Bakelite and having a specific gravity of 1.588, the respective specific gravities just mentioned having been observed at a temperature of 60° F. Even though the difference between the specific gravity of the fire extinguishing liquid and the specific gravity of the valve balls 20, 20', 28, 28' is such that the valve balls would normally float in the fire extinguishing liquid, the function of the valve balls is not impaired in the present embodiment of the invention, because the valve balls 28, 28' are forcibly moved by the internal pump pressure into sealing engagement with their respective seats and because neither of the valve balls 20, 20' need be in sealing engagement with its seat so long as the quantity of fire extinguishing liquid within the receptacle 11 is sufficient to cover the valve seat of whichever valve ball 20, 20' that may be uppermost during operation of the extinguisher. It is to be observed that as the fire extinguishing liquid recedes from its uppermost level during operation of the extinguisher, the uppermost valve ball moves into sealing engagement with its companion valve seat well before the fire extinguishing liquid assumes such a level as would otherwise permit air to pass into the tube 22 by way of the uppermost valve seat. As the uppermost valve ball approaches its seated position incident to recession of the level of the fire extinguishing liquid, the weight of such ball becomes sufficient to overcome the slight buoyant effort exerted by the fire extinguishing liquid on the spacing rod 21 and the relatively greater buoyant effort which is exerted by that liquid on the lowermost of the valve balls, so as to insure unseating of the lowermost valve ball and establishing communication between the liquid receptacle 11 and the tube 22 by way of the lower end thereof well before the uppermost valve ball assumes its seated position.

Ordinarily, under such severe conditions of vibrations as are encountered when an extinguisher of the general type to which the present invention relates is used as an accessory to or as part of the equipment of a policeman's motorcycle, pronounced vibration of the valve balls on their cooperative seats and against their surrounding chamber walls has resulted in such deformation of the valve seats as to render the valves incapable of sealing the various ports or passages with which they are associated, and in some cases the pounding has taken place as between the valve balls and their surrounding chamber walls to such an extent as to break through the walls with deleterious results. It has been found that the life of an extinguisher constructed according to the present invention is greatly prolonged in cases where the extinguisher is subjected to severe vibrations, the extended life of the extinguisher being due to the above-men-

tioned specific-gravity relationship which obviates the detrimental pounding of the valve balls on the valve seats and the valve chamber walls and at the same time obviates any undue pounding of the ball-spacing and actuating rod on whichever of its associated valve balls that may be in contact therewith at any given instant.

It will be understood that various structural changes may be made in the fire extinguisher herein shown and described and that allowable tolerances in the particular specific-gravity relationships herein set forth may be resorted to without departing from the spirit of the invention.

What is claimed is:

In a portable hand operated type fire extinguisher, a closed container for a liquid fire extinguishing medium, a combined pick-up device and double-acting liquid pump in said container, inter-communicating valve means at opposite ends of the container controlling the delivery of liquid to said pump, each said valve means including a valve ball adapted to operate in said liquid and having a specific gravity slightly less than the specific gravity of said liquid, and a spacing rod extending between said balls and adapted to operate in said liquid and having a specific gravity approximately the same as that of said liquid.

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