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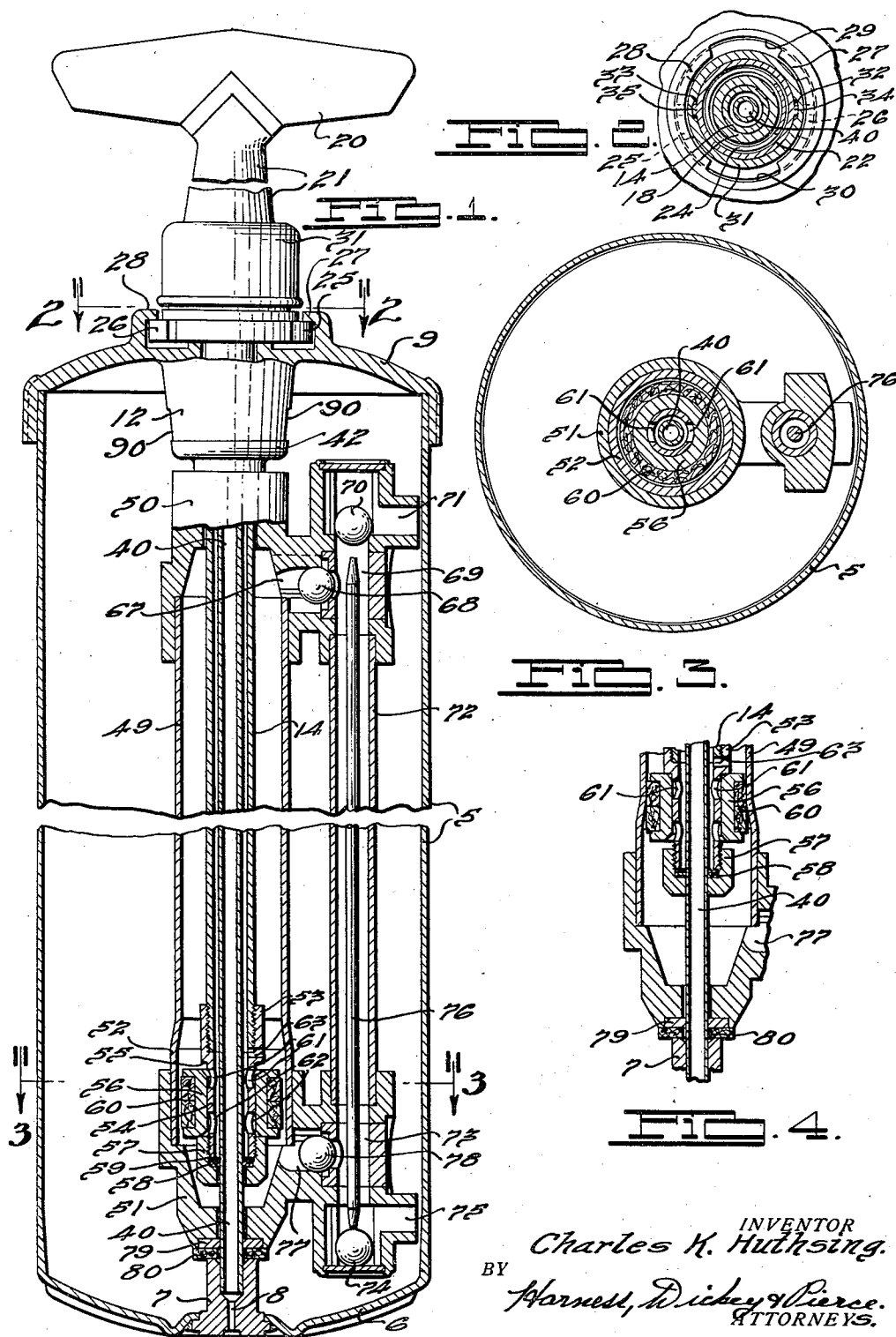
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FIRE EXTINGUISHER CONSTRUCTION

Filed Nov. 17, 1938

2 Sheets-Sheet 1



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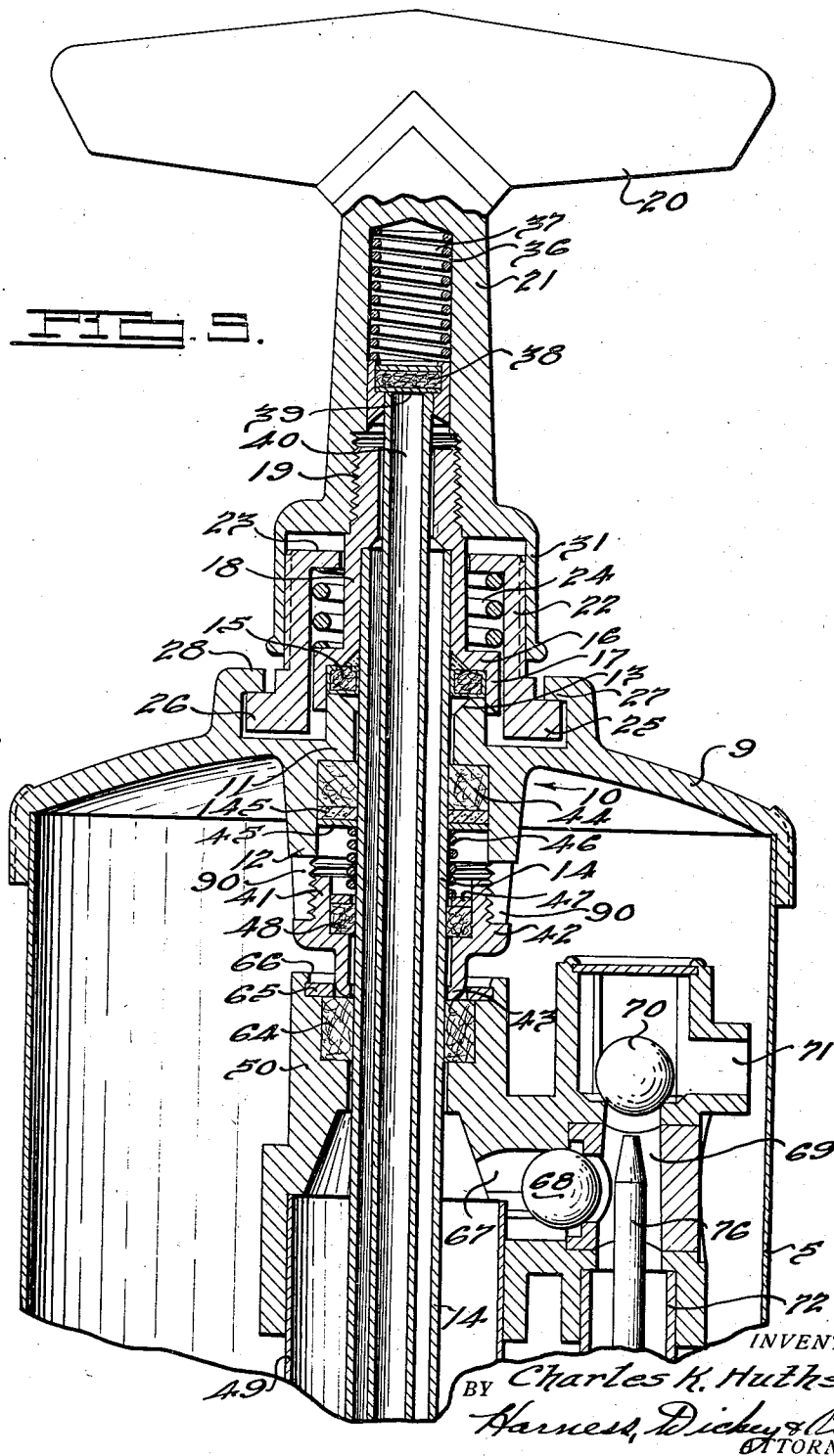
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UNITED STATES PATENT OFFICE

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FIRE EXTINGUISHER CONSTRUCTION

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2 Claims. (Cl. 103—153)

This invention relates to a fire extinguisher of the hand type.

The main objects of this invention are to provide a fire extinguisher which is assured of being in operable condition regardless of the length of time of non-use and which therefore can be depended upon at all times in the event of emergency; to provide a construction in which the piston packing will have a close working fit so as to prevent slippage of fluid past the piston and still not be frozen in position by corrosion regardless of the length of time of non-use of the extinguisher; to provide a construction in which one end of the cylinder is enlarged whereby the piston packing is not compressed and caused to take a permanent set when the extinguisher is not used for long periods of time; to provide a construction in which the piston may be provided with resilient felt packing rings which will retain their original size regardless of the length of time of non-use; to provide a construction in which the felt packing rings provided around the piston serve as a centering means for the piston and thereby prevent metal to metal contact of the piston and cylinder in which it reciprocates; and to provide improved means for stripping the fluid from the piston rod so as to prevent slight leakage or dripping when the rod is reciprocated through its packing gaskets and which means is resilient and yielding so as to not become frozen on the rod by corrosion during long periods of non-use.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Fig. 1 is a longitudinal medial sectional view, with the middle broken out, of a fire extinguisher embodying the new improvements.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional view of the lower end of the pumping cylinder showing the sliding piston in a position on the piston rod opposite to that shown in Fig. 1.

Fig. 5 is an enlarged, fragmentary, medial sectional view of the improved fire extinguisher showing the details of construction of the piston rod packing glands and sealing means.

As is well known in the fire extinguisher art, it is both desirable and necessary to have the piston, which reciprocates in the pumping cylinder for expelling the fluid from the extinguisher, fit snugly with very close limits so that there shall

be either a total absence or a minimum of slippage of fluid past the piston when reciprocated in its cylinder. It is also well known that due to the inherent character of fire extinguishing fluids there is a great tendency for corrosion to take place within the fire extinguisher on those parts which are contacted by the fire extinguishing fluid. This corrosion will oftentimes freeze the piston to the cylinder wall when the fire extinguisher has not been in use for a long period of time with the result that when the emergency of fire arises it is often impossible to operate the fire extinguisher and disastrous results follow.

The important problem of the fire extinguisher manufacturer is to make an apparatus which is leak-proof when the extinguisher is not in use and at the same time have an extinguisher which unquestionably will operate immediately when the emergency of fire arises. It is of course self-evident that a fire extinguisher from which the fire extinguishing fluid has leaked or evaporated out or a fire extinguisher which is frozen and will not operate in case of an emergency are both worse than having no fire extinguisher at all.

The use of felt packing rings on the working face of the piston for making a fluid tight seal with the cylinder walls has not heretofore been satisfactory for the reason that during long periods for non-use the packing is held compressed by reason of its tight fit in the cylinder and will thereby lose its expanding resiliency with the result that much slippage of fluid occurs past the piston during the pumping strokes.

In the present invention the well recognized difficulties have been entirely overcome by providing a piston which has substantial clearance with the cylinder walls; providing the working face of the piston with felt packing rings, and then having the lower end of the pumping cylinder, in which the piston normally rests when the extinguisher is closed and not in use, of larger diameter than the remainder of the pumping cylinder with the result that the packing rings are not subjected to any compression whatever when the extinguisher is not being used. Furthermore, the entire piston, when in the enlarged portion of the cylinder, will have sufficient clearance with respect to the cylinder wall to prevent the corroding together of the metal parts during periods of non-use. When the extinguisher is used the piston will be held centered in the cylinder by the packing rings and not have any metal to metal contact with the cylinder walls with the result that freezing or sticking of the piston in the cylinder is impossible.

With respect to sealing the reservoir against evaporation during non-use, this improved extinguisher is provided with a spring pressed seal in which the complementary contacting sealing faces are rotated while being axially compressed with the result that any dirt or foreign matter on the contacting face of the sealing parts is ground into the faces or displaced so that a very effective seal is secured which is maintained under spring tension during non-use of the extinguisher with the result that it is impossible for the fluid to leak or evaporate out of the reservoir.

Another problem encountered in the use of fire extinguishers having felt packing glands for the piston rod has been that of the fluid adhering to the piston rod as it is drawn through the gaskets and then dripping off in the hands of the user during the pumping strokes.

In the present invention this objection has been overcome by having the helical compression spring, which compresses the rod gaskets, fit tightly around the rod, so that it acts as a resiliently gripping fluid stripper. Due to the yieldability of the spring, it may have a snug fit around the rod, but will not freeze thereto by corrosion.

In the construction shown in the drawings, a cylindrical reservoir 5 has an integrally formed lower end 6 in the center of which is brazed or otherwise rigidly secured a nozzle fitting 7, having an axially disposed discharge opening 8 formed therethrough.

The upper end of the reservoir is closed by a cap 9 brazed or otherwise sealed thereto in which is a filler opening with screw closure plug, not shown, in the usual manner of fire extinguishers of this character. The cap 9 has an annular collar or sleeve portion 11, extending axially outwardly and having an axial opening therethrough, and a cylindrical skirt portion 12 which extends axially inwardly from the cap. The opening through the sleeve 11 has an easy working fit with a piston rod 14 which is slidable therethrough. The outer axial face of the sleeve 11 forms a sealing face 13 which coacts with an annular ring gasket 15 carried by an annular sealing member 16 which is rigidly brazed or otherwise secured to the piston rod 14. The member 16 comprises an axially extending cylindrical skirt portion 17 which embraces and carries the gasket 15, and an oppositely extending cylindrical sleeve portion 18, the axial end of which terminates in an exteriorly threaded end 19. A handle 20, having an axially extending hollow shank 21, is threaded on the end 19 in abutting relationship against a shoulder of the sleeve 18, to limit and position the parts.

An axially slidable sleeve 22 surrounds the annular sealing member 16 and piston rod 14 in spaced relation thereto and the upper end is provided with a radially disposed, inwardly extending flange 23 which is freely slidable on the sleeve portion 18 of the annular sealing member 16. A helical compression spring 24 is provided in the space between the fixed sleeve 18 and the slidable sleeve 22 and bears between the sealing member 16 and the flange 23 of the sleeve 22. The lower end of the slidable sleeve 22 is provided with diametrically opposed radially extending lugs 25 and 26 which have cam surfaces on their upper axial faces for interengaging with flange portions 27 and 28 integrally formed on the cap 9, openings 29 and 30 being provided in the flange through which the lugs may enter in the usual manner of bayonet connections,

The lower end of the hollow shank 21 is flared out to provide a cylindrical sleeve 31 which surrounds the axially slidable sleeve 22 and which is provided with diametrically opposed axially extending inwardly presenting slots 32 and 33 which receive similarly disposed ribs 34 and 35 respectively which are integrally formed on the slidable sleeve 22 whereby the sleeve and handle are non-rotatably secured while permitting relative axial movement therebetween.

The hollow shank 21 of the handle 20 is provided with an axially extending bore 36 in which is housed a helical compression spring 37, one end of which abuts the blind end of the bore 36 and the other end of which contacts an axially slidable floating seal 38, the inner face 39 of which fits upon and closes one end of a discharge tube 40 when the handle is in closed position, as shown in Fig. 5.

The opposite end of the discharge tube 40 is rigidly mounted in the inwardly projecting end of the nozzle fitting 7 with the opening therethrough communicating with the discharge opening 8, the tube 40 being concentrically disposed within the piston rod 14 and in spaced relation thereto.

The inner end of the sleeve 12 is interiorly threaded to receive the exteriorly threaded axially extending sleeve portion 41 of a fitting 42 which is provided with an oppositely extending cylindrical sleeve portion 43 which has a free sliding fit on the piston rod 14. The space between the piston rod 14 and the sleeves 12 and 41 is provided at its upper end with a felt gasket 44, a cork washer 45, and a brass washer 45 bearing thereagainst. The gasket 44 is constantly urged in compression around the piston rod 14 by a helical compression spring 46, which snugly surrounds and yieldingly grips the rod 14, so as to strip the fire extinguishing fluid from the rod during reciprocation thereof. One end of the compression spring 46 bears against the washer 45 and the other end thereof bears against a similar but smaller washer 47 which fits against a felt gasket ring 48 disposed at the other end of the space, thus providing a double yielding seal around the piston rod which is automatically tensioned at all times and which prevents substantial leakage of fluid around the piston rod during its reciprocation when subjected to pumping action.

The piston rod 14 is surrounded by a pumping cylinder 49, one end of which is fixed to a rotatable head 50 and the other end of which is similarly fixed in a rotatable head 51. A portion of the lower end of the pumping cylinder 49 adjacent to the head 51 is of enlarged diameter, as indicated at 52, and constitutes one of the main features of the present application. The lower end of the piston rod 14 is exteriorly threaded and has screwed thereon the interiorly threaded end 53 of a tubular nipple 54. The nipple 54, adjacent the end 53, has an annular shoulder 55 which serves as one limit stop for an axially slidable piston 56 which is carried on the nipple 54. The piston 56 is loosely retained on the nipple 54 by an interiorly threaded cap 57 which is screwed on to the exteriorly threaded lower end of the nipple 54 and which carries a packing 58 therein retained by a thin washer 59.

The circumferential working face of the piston 56 is provided with an outwardly presenting peripheral groove which carries a pair of yielding or resilient felt packing rings 60. The sizes of the piston 56, packing rings 60, enlarged cylin-

der end 52 and cylinder 49 are such that the packing rings 60 are compressed and have a snug working fit in the smaller diameter of the pumping cylinder 49 and are free from radial compression and have clearance from the walls of the enlarged portion 52 of the pumping cylinder.

Means are provided for admitting fluid from the pumping cylinder 49 into the hollow piston rod 14 from whence it can pass into the upper end of the discharge tube 40 and thence out through the discharge nozzle opening 8 and comprise apertures 61 and 62 in that part of the nipple 54 which is surrounded by the piston 56. The apertures are so positioned that on the upstroke of the piston rod the piston, when resting against the axial end face of the nipple 51, will uncover the openings 61 so that fluid may pass thereinto, and upon the downstroke, when the piston is abutting against the shoulder 55, as shown in Fig. 4, the fluid will enter through the apertures 62. A by-pass port 63 is provided for permitting part of the fluid within the hollow piston rod to pass back into the pumping cylinder 49 to help fill the same on the downstroke of the pump when the suction from the reservoir may not quite fill the pumping cylinder 49.

The head 50 which supports the upper end of the pumping cylinder 49 is provided with a felt packing ring or gasket 64 which is retained by a relatively thin brass washer 65 secured on an annular radially extending seat by rolling over the metal at the edge of the opening which receives the washer, as shown at 66. The inner edge of the washer 65 rides upon the outer surface of the axially extending sleeve portion 43 which serves as a bearing for supporting the upper end of the suction mechanism and which bearing, having relatively small metal to metal contact, will have a minimum of tendency to stick and present very little friction to rotation of the head, thus providing a structure which will have freedom from freezing by reason of corrosion or the like.

The head 50 is provided with a laterally extending weighted arm having passageways there-through with ball check valves which serve as suction ports for the pumping cylinder. The upper end of the cylinder 49 communicates with a radially extending port 67 controlled by ball valve 68 which leads to an axially extending passageway 69, one end of which is controlled by a ball check valve 70 and which in turn communicates with a second radially extending port 71, the outer open end of which lies closely adjacent to the inner peripheral wall of the reservoir 5. The end of the passageway 69 opposite to the ball check valve 70 communicates with an axially extending tube 72, the upper end of which is rigidly secured in axial alignment therewith, and the opposite end of which is similarly secured to and communicates with an axially extending passageway 73 formed in the laterally extending weight arm of the head member 51. The lower end of the passageway 73 is likewise provided with a ball check valve 74 which controls communication between the passageway 73 and a radially extending port 75, the outer open end of which lies closely adjacent to the interior wall of the cylindrical reservoir 5.

A metal rod 76 is housed within the tube 72 and functions to tap the ball check valves 70 or 74 off of their respective seats when the fire extinguisher is inclined either upwardly or downwardly, as the case may be, thus insuring free communication for the passage of fluid from the

reservoir into the tube 72 and heads 50 and 51. The laterally extending weight arm of the head 51 is also provided with a radially extending port 77 controlled by a ball check valve 78 which provides communication between the passageway 73 and the lower end of the pumping cylinder 49.

The head 51 at its lower end is in slightly spaced relation to the discharge tube 40 and is provided with a relatively thin brass washer 79, the inner edge of which rides upon the tube 40 and serves as a bearing for the head 51 which has relatively little friction and thus permits free rotation of the head with respect to the tube 40. A felt packing gasket 80 is interposed between the axial face of the washer 79 and the opposed axial face of the discharge nozzle fitting 7 for preventing substantial leakage of fluid thereof, it being understood that when the piston rod is pushed downwardly, as viewed in Fig. 1 of the drawings, the friction between the piston packing 60 and interior wall of the pumping cylinder 49 will tend to slide the entire suction unit, comprising the heads 50 and 51 and pumping cylinder 49 and suction tube 72, downwardly against the packing 80 and tightly compress it so as to prevent leakage of fluid. Likewise during the upstroke, the entire suction assembly will move axially upwardly and thereby cause the axial end face of the sleeve 43 to compress the packing ring 64 and prevent leakage at this point of the fluid entrapped within the pumping cylinder 49.

In the operation of this fire extinguisher, the reservoir 5 is filled with fire extinguishing fluid through an opening in the head 9 (not shown) in the usual manner. During non-use of the fire extinguisher the cam lugs 25 and 26 are engaged under the inturned flanges 27 and 28, thus compressing the helical spring 24 between the radially extending inturned flange 23 and the annular sealing member 16 which is brazed to the piston rod 14, thus compressing the gasket 15 between the sealing member 16 and the outer axial face 13 of the sleeve 11. Thus a fluid tight effective seal is maintained at all times which will prevent leakage or evaporation of the fluid within the reservoir past or through the opening in the sleeve 11 around the piston rod 14.

When the handle is in the foregoing described closed and sealed position, the lower face 39 of the floating seal 38 is tightly pressed against the upper end of discharge tube 40 by the helical compression spring 37, thus preventing any leakage or evaporation of fluid through the discharge tube 40 and nozzle opening 8 of the apparatus.

When it is desired to operate the fire extinguisher, the reservoir portion 5 is grasped in one hand and the handle 20 in the other, and the handle rotated relatively to the reservoir until the cam lugs 25 and 26 are in registry with the openings 29 and 30 between flanges 27 and 28, at which time the handle carrying the piston rod 14 may be withdrawn or pulled out axially from the head end of the fire extinguisher.

Inasmuch as the felt piston packing rings 60 have been in the enlarged end 52 of the pumping cylinder 49 during non-use of the fire extinguisher these packing rings will have remained their original size, and when drawn up into that part of the pumping cylinder 49 having the smaller diameter, will make a tight fit therein which will prevent slippage of fluid past the piston. The piston 56 is made of smaller diameter than the interior diameter of the pumping cylinder 49 so as to not make metal to metal contact therewith and the piston will be held centered within

the pumping cylinder by the packing rings 60.

During the upstroke of the piston rod, the piston 56 will ride upon the axial end face of the nipple 57 thus uncovering the openings 61 and permitting fluid from the pumping cylinder 49 to pass through said openings into the hollow piston rod 14, thence upwardly toward the handle and into the open upper end of discharge tube 40 which has been uncovered and unsealed by withdrawal of the handle 20. During this upward stroke of the piston the fluid which is in the pumping cylinder 49 is prevented from passing out around the piston rod 14 through the head 50 by reason of the stripping action of the spring 46 and the resilient felt packing rings 44, 48 and 64. During such upward stroke fluid is drawn into the lower end of the pumping cylinder 49 through the port 77 around the ball check valve 78, it being understood of course that fluid is drawn in and fills the passageways 69, tube 72, and passageways 73 either through the radially extending ports 71 or 75 depending upon the position of the fire extinguisher. If the discharge end of the extinguisher is pointed down, then the ball check valve 70 will rest upon its seat, as shown in Fig. 1 of the drawings, and the rod 76 will tap the ball check valve 74 off of its seat and thus open communication through the intake port 75. Conversely, if the discharge end of the extinguisher is pointed upwardly, the ball valve 74 will rest upon its seat and the rod 76 will tap the ball check valve 70 off of its seat and thus provide suction opening through the port 71.

When the piston has reached the upper limit of its stroke it is then forced downwardly by pushing in of the handle 20 at which time the axially slidable piston 56 abuts against the shoulder 55 of the nipple threaded on to the end of the piston rod 14 and thus opens communication to the interior of the piston rod 14 through the radial ports 62. As the fluid is forced into the hollow piston rod 14 and thence out through the discharge tube 40 a portion of it is by-passed through the port 63 and into the pumping cylinder 49 back of the piston so as to help fill the pumping cylinder on the downstroke, as it has been found that during this downstroke, it is at times desirable to supplement the fluid being brought in through the port 67 around the check valve 68.

During the downstroke of the piston, the friction between the packing rings 60 and interior wall of the pumping cylinder 49 carries the entire suction assembly axially downward, as viewed in Fig. 1, so as to compress the gasket 80 and thus prevent leakage of fluid from the lower end of the pumping cylinder around the discharge tube 40 which would otherwise occur by reason of the substantial clearance between the outside of the discharge tube and the head 51 through which it passes.

From the foregoing, it will be clearly evident that it will be impossible for the piston 56 to become frozen to the interior wall of the pumping cylinder 49 during long periods of non-use of the fire extinguisher, and furthermore that the pack-

ing rings 60, being free from compression during such periods of non-use, will make a tight sealing fit with the interior wall of the pumping cylinder 49 when drawn up into the smaller diameter portion thereof which is the substantial pumping length of the cylinder.

It will also be equally evident that when the handle 20 is forced downwardly so as to compress the spring 37, the floating seal 38 will effectively close the upper end of the discharge tube 40 and prevent evaporation or leakage of the fluid thereinto. When the cam lugs 25 and 26 are rotated underneath the flanges 27 and 28, the sliding sleeve 22 will move axially downwardly toward the head 9, as shown in Fig. 1 of the drawings, thus compressing the spring 24 which yieldingly holds the annular sealing member 16 and gasket 15 tightly upon the sealing face 13 of the sleeve member 11.

It is to be particularly noted that during this latter closure, the sealing member 16 carrying the packing gasket 15 is not only axially compressed on its cooperating sealing seat, but by reason of the member 16 being secured to the piston rod 14 and hence rigid with the handle 20, the contacting surfaces of the sealing members are rotated with respect to each other, thus grinding out any dust or foreign matter which may be on their contacting faces and effecting a superior seal at this point somewhat analogous to a rotated grinding fit of the contacting faces.

The cylindrical sleeve portion 12 is provided with a plurality of axially extending slots or notches 90 through which the fluid that is stripped from the piston rod 14 may return to the interior of the reservoir.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In a fire extinguisher, a pumping cylinder, a piston reciprocable in said cylinder for expelling fluid from said extinguisher, said piston having a groove in its circumferential face and felt packing rings in said groove, said cylinder having a portion of enlarged diameter and the relative sizes of said cylinder, piston, and packing rings being such that said packing rings are under compression when said piston is in the smaller diameter of said cylinder and are relieved of compression when said piston is in the larger diameter of said cylinder.

2. In a fire extinguisher, a pumping cylinder, a piston reciprocable in said cylinder for expelling fluid from said extinguisher, said piston having a relatively close working fit within said cylinder, said cylinder having a portion thereof of larger diameter than the remainder thereof, said piston being normally positioned in said enlarged portion during non-use of said extinguisher and having sufficient clearance with respect thereto to prevent the corroding together of said piston and cylinder during periods of non-use.

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