Aug. 7, 1962 C. K. HUTHSING, SR., ETAL 3,048,194

FIRE EXTINGUISHER HEAD ASSEMBLY

Filed Nov. 26, 1958 2 Sheets-Sheet 1

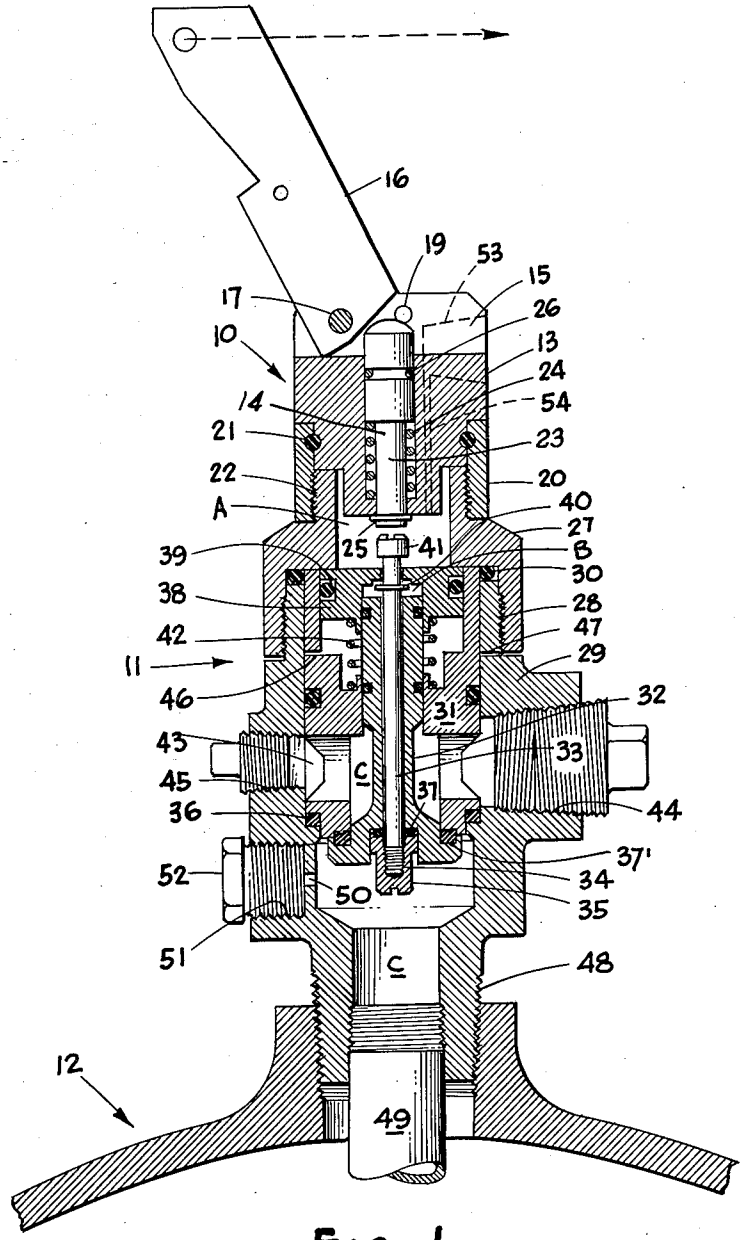


FIG. 1.

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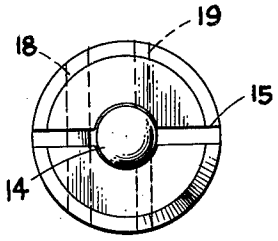


FIG. 2.

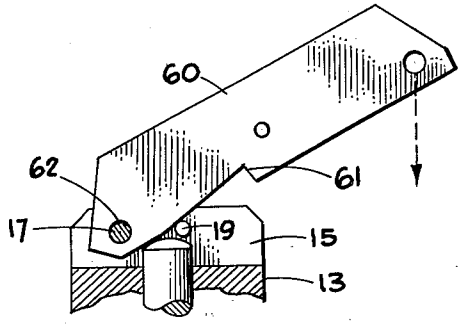


FIG. 3.

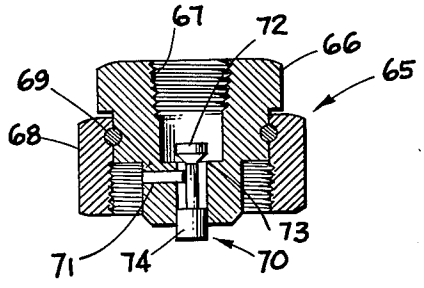


FIG. 4.

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United States Patent Office 3,048,194 Patented Aug. 7, 1962

3,048,194

FIRE EXTINGUISHER HEAD ASSEMBLY

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Filed Nov. 26, 1958, Ser. No. 776,567
1 Claim. (Cl. 137—630.15)

This invention generally relates to an improved fire extinguisher head assembly, and more particularly relates to improved discharge valve means embodied in a fire extinguisher head assembly particularly adaptable for employment in conjunction with automatic discharge fire extinguisher systems.

The improved discharge valve means of the present invention, although usable with conventional fire extinguisher apparatus, is most advantageously embodied as a component in fire extinguishing systems in which pressurized gas cylinders (for example, containing carbon dioxide) are opened by remotely controlled cables or by electrical or pressurized fluid means. Industry specifications further require that such discharge valve means be susceptible of manual operation under emergency conditions.

Although fire extinguisher discharge valve apparatus for automatic systems, as above described, is presently available on the market, the head assemblies embodying the conventional discharge valve as well as the valve itself are oftentimes difficult to maintain and repair. Furthermore, such conventional units are relatively expensive to manufacture, and difficulties have been experienced in effecting positive, leakproof operation while adhering to use a limited number of moving parts.

It is, therefore, an object of the present invention to provide a discharge valve means for embodiment in a fire extinguisher head assembly, which is characterized by a simple rugged construction.

Another object is to provide a discharge valve means for incorporation in a fire extinguisher head assembly which inherently conforms to the requirements of automatic fire extinguishing systems, and yet which is readily maintained and repaired in a minimum amount of time.

Another object of the present invention is to provide a discharge valve means for embodiment in a fire extinguisher head assembly, which after an initial triggering by suitable actuating means in the form of a control cable, pressurized fluid line, or other actuator, will inherently function to maintain itself in a discharging condition.

Another object of the present invention is to provide a discharge valve means for embodiment in a fire extinguisher head assembly which is adaptable not only for coupling to primary gas cylinders but functions equally well with limited modification in connection with secondary cylinders, which may be actuated by gas discharge from the primary cylinder.

Still another object of the present invention is to provide a valve discharge means for embodiment in a fire extinguisher head assembly which may be economically manufactured with a limited number of parts, and which embodies a positive acting leakproof construction.

These and other objects and advantages of the present invention are generally attained by providing a discharge valve means for incorporation in a portable fire extinguisher head assembly which includes primary valve means interposed in the conventional discharge passage means of the head assembly and normally urged toward a seated position in the head assembly by pressurized gas from the coupled cylinder or tank.

An actuating chamber is defined by the head assembly, and an actuating passage means communicates between the cylinder of pressurized gas and the actuating chamber through the primary valve means. Secondary valve means extend through the actuating passage in the primary valve means, and the secondary valve means has an end portion thereof urged towards a seating position sealing off the actuating passage by the pressurized gas of the cylinder.

Piston means are mounted in the head assembly and define a part of the actuating chamber with the piston means being adaptable to movement to a first position engaging and unseating the secondary valve means and thereafter to a second position engaging and unseating the primary valve means. In this regard, the piston means has a larger area subject to gas pressure than the primary valve means.

As a consequence, upon movement of the piston means to the first position, the pressurized gas from the cylinder will flow into the actuating chamber through the actuating passage means, and thereafter force the piston means to the second position to unseat the primary valve means. Towards this end, actuating means are further provided adaptable to urge the piston means towards the first position.

In one construction, the actuating means may comprise a piston actuating passage communicating between the actuating chamber and the exterior of the head assembly, the passage being adapted for connection to a source of pressurized fluid (for example, responsive to the discharge of a primary cylinder) whereby connection of the piston actuating passage to the pressurized fluid source will effect the movement of the piston means to the first position in which the secondary valve means is unseated.

It is evident that other forms of actuating means may be employed as will be clearer as the specification proceeds.

A better understanding of the present invention will be had by reference to the drawings showing merely one illustrative embodiment and in which:

FIGURE 1 is a sectional view through a fire extinguisher head assembly showing the improved discharge valve means of the present invention;

FIGURE 2 is a top view of the operating head employed in conjunction with the discharge valve means of the present invention;

FIGURE 3 is a sectional view of a modified construction for the operating head employed in conjunction with the discharge valve means of the present invention; and,

FIGURE 4 is a sectional view of a modified form of an operating head for use in conjunction with a secondary fire extinguisher unit or cylinder.

Referring now to the drawings, there is shown in FIGURE 1 a fire extinguisher head assembly embodying a discharge valve means of the present invention and generally comprising an operating head **10**, a valve assembly **11**, and a tank or cylinder **12** of pressurized gas, for example, carbon dioxide.

The operating head **10** includes a body **13** of generally cylindrical shape adapted to slidably mount therein an actuating pin **14**, and defining in its upper end portion a slotted portion **15** as is more clearly shown in the view of FIGURE 2. The slot **15** accommodates an actuating lever **16** which is pivotably coupled to the operating head body **13** as by a pin **17** extending through a suitable lateral bore **18**, the latter being shown in the view of FIGURE 2.

The operating head body **13** further includes a lateral bore **19** disposed above the actuating pin **14** and adapted to receive a safety pin member to prevent inadvertent actuation of the pin **14** by the lever **16** during periods of non-operation of the unit.

An annular nut **20** is coupled to the head body **13**, as through a retaining wire **21** enabling rotative movement of the head body **13** with respect to the nut **20** and yet securely maintaining these members in fixed axial

relationship to each other. The nut **20** defines on its lower inner sidewalls threads **22** for connection to the valve assembly **11** as hereafter described.

The actuating pin **14** is normally biased towards the position as shown in FIGURE 1, and towards this end is provided with a reduced diameter portion **23** defining a shoulder enabling spring means **24** to exert an upward force on the pin **14**. A locking ring **25** is provided on the lower end of the reduced diameter portion **23** exterior of the body **13** so as to limit upward movement of the actuating pin **14** in response to the force of the biasing spring **24**. The pin **14** is further provided with an O-ring **26** to prevent any leakage of gas between the pin **14** and the encircling head body **13**.

The discharge valve assembly **11** includes an annular valve cap **27** threadedly coupled at **22** to the nut **20** as heretofore mentioned. The valve cap **27** further includes a lower inner threaded portion **28** coupled to a discharge valve body **29** and sealed with respect thereto by an O-ring **30**.

A valve cage **31** is mounted within the valve body **29** and includes an axial bore therein accommodating a movable valve member **32**. The valve member **32** itself includes an axial bore receiving a valve stem **33**, the latter being threadedly coupled at **34** to a bleeder or secondary valve **35**.

It should be noted at this time that the valve stem **33** is of a slightly less diameter than the bore provided in the valve **32** accommodating the stem **33**.

For fluid sealing purposes, an O-ring **36** is provided between the lower end of the valve cage **31** and the valve body **29**. A molded seal **37** is provided between the secondary valve **34** and the primary valve **32**, and similarly another seal **37'** between valve **32** and cage **31**.

Radially interposed between the valve **32** (at the upper end portion thereof) and the valve cage **31** is a movable piston means **38** slidably sealed by an O-ring **39** to the valve cage **31**. The piston means **38** defines with the valve cap **27**, the pin **23**, and the operating head body **13** an actuating chamber designated by the letter A. The piston means **38** further embodies an opening accommodating the passage therethrough of the valve stem **33** and defines with the stem **33** and the valve body **32** another smaller chamber B whereby the piston means **38** is normally positioned in axially spaced relationship to the valve **32**. The valve stem **33** includes in the chamber B a rigidly coupled ring member **40** functioning for a purpose which will be clearer as the specification proceeds.

The valve stem **33** terminates at its upper end in the chamber A in an enlarged knob or end portion **41** spaced a slight distance from the lower end of the pin **14** or more particularly from the reduced diameter portion **23** thereof.

Spring means **42** are axially provided between the piston means **38** and the reduced diameter portion of the valve cage **31** such that the piston means **38** is normally biased towards the position shown in FIGURE 1.

The valve cage **31** is further provided with an annular grooved portion **43** axially aligned with diametrically opposed threaded discharge openings **44** and **45**. The discharge openings **44** and **45** are in communication with a central discharge passage C surrounding the valve **32** through radial openings extending through the sidewalls of the valve cage **31** in the area of the annular groove **43**. Thus, upon unseating of the lower end of valve **32** from the cage **31**, pressurized gas may flow upwardly from the tank **12** to the discharge passage C and thereafter out through the discharge openings **44** and **45**, assuming neither of these openings is capped off.

Fluid escape means are provided between the valve cage **31** and the valve body **29**, as by an aperture **46**, extending through the sidewalls of the cage **31**. Similarly, an aperture **47** extends through the sidewalls of the valve body **29** enabling escape of such fluid to atmosphere.

The purpose of these openings will become clearer as the specification proceeds.

The lower end of the valve body **29** terminates in a threaded reduced diameter portion **48** adapted for coupling to the conventional neck of a pressurized gas cylinder **12**. The reduced diameter portion **48** is further provided with inner threading for coupling to a gas discharge tube **49** which extends down into the tank **12**.

The valve body **29** further includes in communication with the discharge passage C an opening **50** communicating with an enlarged threaded opening **51**, the latter being adapted to receive a safety nut **52**. The safety nut **52** may appropriately include a frangible disc (not shown) which will be punctured by excessive gas pressure to allow the gas from the tank **12** to escape through the discharge passage C and thereafter out through openings in the nut **52** as shown.

In a preferred construction, the operating head further embodies in the body **13** thereof an opening **53** designed for connection to a tubular member and communicating through a passage **54** into the chamber A for a purpose that will become clearer as the specification proceeds.

The operation of the fire extinguisher head assembly and improved discharge valve means may now be described. It is to be understood that the operating head **10** and valve assembly **11**, as shown in FIGURE 1, would normally function with and as a part of a master cylinder for co-operation with a plurality of secondary cylinders adapted to be automatically actuated in response to actuation of the master cylinder of FIGURE 1. The valve means of the present invention, as shown in FIGURE 1, is so constructed that as a master cylinder it may be operated either by mechanical, fluid, or electrical means, as will be hereafter described.

Considering mechanical actuation first, a cable would normally be coupled to the lever **16** and extend through the building or structure in which the primary cylinder is located to a central emergency control station. Upon actuation of the cable in the direction of the arrow, the lever **16** would be horizontally moved about the pivot pin **17** thereof to in turn urge the actuating pin **14** downwardly in the operating head body **13**. Such operation assumes, of course, that a safety pin normally disposed in the bore **19** has been removed. As the actuating pin **14** is urged downwardly, overcoming the biasing force of the spring means **24**, the reduced diameter portion **23** thereof will contact the knob **41** coupled to the upper end of valve stem **33**. In consequence, the valve stem **33** and the secondary valve **35** (at the lower end thereof) will be actuated downwardly so as to displace the valve **35** from the valve **32**. It will be understood that under normal conditions the valve **32** and the valve **35** are subject to the pressurized gas or carbon dioxide in the tank **12** whereby they are both biased towards the closed positions as shown in FIGURE 1.

Upon displacement of the valve **35** from the valve **32** gas will be free to flow upwardly between the limited space defined by the valve stem **33** and the bore of the valve **32** as heretofore described. Thereafter, the pressurized gas will pass into the chamber B to in turn flow into the actuating chamber A. This movement of pressurized gas from the tank **12** to the actuating chamber A will, of course, occur almost simultaneously with the depression of the actuating pin **14** and the resultant opening of the valve **35**.

As soon as the gas pressure has built up in the actuating chamber A, the piston means **38** will be urged downwardly to first engage the ring **40** of the valve stem **33**. In this regard, it is to be noted, although it may not be clear from the drawings, that the ring **40** is spaced closer to the bottom stepped surface of the piston means **38** than is the upper end of the valve **32**. Thus, the piston means **38** will engage the ring **40** and urge the valve stem **33** downwardly to maintain the valve **35** in an open position before the piston means **38** contacts the upper end of the valve

32. As a consequence of this action, a flow of pressurized gas will be maintained from the tank 12 into the actuating chamber A. Thus, the pressure in the chamber A will continue to build up to thereafter force the piston means 38 further downwardly into engagement with the valve 32.

It should be noted at this time that the piston means 38, upon a slight downward movement will have a greater area subject to the pressure of gas flowing into chamber A, than the lower surface area of the valve 32. In consequence, a greater force, resulting from gas pressure, will be exerted downwardly on the piston means 38 than is exerted upwardly on the bottom of the valve 32 (including the force of spring means 42), and the valve 32 will be unseated from its normal position as shown in FIGURE 1. Upon unseating of the valve 32, gas will flow from the tank 12 through the discharge passage C, and thereafter, as heretofore described, through openings in the sidewalls of the valve cage 31 into the annular groove 43 and out through the discharge openings 44 and 45.

It will be appreciated that an important feature of the present invention resides in the provision of the ring 40 and its co-operation with the piston means 38. Thus, as soon as some form of actuating means has initially opened the valve 35 from its seated position against valve 32, no further external force need be applied or maintained. This condition results from the fact that immediately upon opening of the valve 35, gas will flow to the actuating chamber A to urge the piston means 38 down into engagement with the ring 40 and maintain the valve 35 in its open position to thereby enable further gas flow to the chamber A and subsequent opening of the valve 32 as a result of pressure built up therein.

In the event that the valve means is to be actuated by fluid pressure rather than the lever-cable arrangement shown, it is merely necessary to connect a pressurized fluid line to the opening 53. In consequence, upon subjection of the opening 53 to a given fluid pressure, the pressure will be communicated through the passage 54 to the chamber A to effect a downward force on the piston 38 and to cause its engagement with the ring 40 and the resultant opening of the valve 35. Of course, once the valve 35 has been opened as heretofore described, the unit will become self-operating and no further external force or pressurized gas will be required.

It is obvious, according to constructions well known in the art, that instead of coupling the opening 53 to a gas line, an explosive cartridge could be inserted in the opening 53 appropriately connected through electrical wiring to a master control unit. In such a case, upon detonation of the charge in the opening 53, a gas pressure would be effected downwardly through the passage 54 to in turn actuate the piston means 38 in a manner as heretofore described.

The openings 46 and 47 serve to prevent any back pressure being built up on the lower side of piston means 38 either because of gas leakage into this area or because of air compression as the piston moves downwardly.

It will be appreciated as heretofore pointed out that the lever means 16 may be actuated manually as well as by a cable connection. Furthermore, the lever means 16 may be mounted in a different orientation with respect to the operating head body 13 so that it is susceptible of operation by a vertical force as shown in the view of FIGURE 3. Thus, as shown in the view of FIGURE 3, there is shown a lever 60 (of identical construction to the lever 16 in FIGURE 1) which is turned upside down with respect to the disposition of lever 16 in FIGURE 1 such that an aperture 62 is used for pivot connection through a pin 17 to the slot 15 of the operating head body 13. The notched portion 61 functions to enable the lever to move downwardly into the slot 15 without abutting against the solid portion of the body 13.

Under circumstances in which the head assembly and discharge valve means embodied therein is to be used as a part of or in conjunction with a secondary cylinder, it is only necessary to provide an operating head sufficient to communicate gas pressure to the piston means 38. Thus, referring to FIGURE 4, there is shown a modified operating head 65 which includes a body 66 having a threaded opening 67. The opening is adapted to receive a fluid gas line or the like.

The body 66 is in turn coupled to a nut 68 (functioning in the same manner as the nut 20 of FIGURE 1) through means of a retaining wire 69.

The body 66 has disposed therein in the opening 67 a check valve 70 which is limited in its upward movement by a drive pin 71 securely mounted in the body 66.

The check valve 70 includes an upper conical shaped head 72 adapted to seat at 73. The valve member 70 further includes a lower block-like portion 74 to engage pin 71 and prevent loss of the valve 70.

In operation of the head 65, it is normally coupled to the valve cap 27 (as shown in FIGURE 1) such that the check valve 70 is forced upwardly a slight distance by the actuating knob 41 whereby gas may flow into the opening 67 and down past the check valve 70 into the chamber A. Furthermore, upon removal of the head 65 while in coupled relationship to a pressure line, gas pressure will force the conical head 72 down into seating engagement at 73 to prevent escape of gas through the line and the head 65.

In consequence of this construction, in the event a plurality of secondary cylinders are employed in the automatic fire extinguishing system, any one of the respective heads 65 may be removed for repair or maintenance of the secondary cylinder without danger of escaping gas even though the head 65 is maintained in coupled relationship to the gas line.

In view of the foregoing, it will be appreciated that applicants have invented an improved discharge valve means for embodiment in a fire extinguisher head assembly particularly adaptable for automatic discharge systems. Furthermore, the improved discharge valve means is of relatively simplified construction, is self-perpetuating, and is positive and safe in its operation without danger from failure because of escaping gas or the like. It will be additionally appreciated that the improved discharge valve means of the present invention is universal to the extent that it may be actuated by different forces without any modification to the structure thereof; also, with a simple threaded replacement, it is adaptable for use not only in conjunction with a primary cylinder but also in conjunction with secondary cylinders.

In the latter regard, it is to be noted that the discharge opening 45 as shown in FIGURE 1 is adapted for connection to secondary cylinders as a fluid pressure line, for example, for coupling to the openings 67 of the secondary head 65, as shown in FIGURE 4. In the event no secondary cylinders are employed, the discharge opening 45 would normally be closed off and the main discharge opening 44 only employed. Of course, the opening 53 is also normally closed in the event mechanical actuation is used.

It will be apparent to those skilled in the art that many modifications and changes may be made to the improved gas discharge means of the present invention without departing from the spirit and scope of the invention thereof as set forth in the following claim.

What is claimed is:

A valve assembly having inlet passage means designed for communication with a source of pressurized gas, said valve assembly comprising: primary valve means interposed in said passage means and normally urged to a seated position in said valve assembly by said pressurized gas; an actuating chamber defined by said valve assembly; actuating passage means through said primary valve means communicating between said pressurized gas and said actuating chamber; secondary valve means extending through said actuating passage means in said primary valve means, said secondary valve means having an end portion thereof urged by said pressurized gas to a seated position

sealing off said actuating passage means; piston means defining a part of said actuating chamber, said piston means being adaptable to movement to a first position engaging and unseating said secondary valve means and thereafter to a secondary position engaging and unseating said primary valve means; said piston means having a larger gas pressure acting area than said primary valve means whereby upon movement of said piston means to said first position said pressurized gas will flow into said actuating chamber through said actuating passage means and thereafter force said piston means to said second position unseating said primary valve means; actuating means for directly unseating said secondary valve means, said actuating means comprises a force transmitting means in said valve assembly spaced from said secondary valve means; and lever means coupled to said valve assembly and adapted to actuate said force transmitting means to a position engaging and unseating said secondary valve means, whereby said pressurized gas urges said piston

means to said first position to retain said secondary valve means unseated.

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