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**Hansen**

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## [54] SAFETY VALVE FOR USE IN FILLING OF FIRE EXTINGUISHERS


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[51] **Int. Cl.** ..... **A62c 13/00**

[58] **Field of Search** ... 169/19, 20, 21, 30, 31 R, 31 P; 141/18, 20



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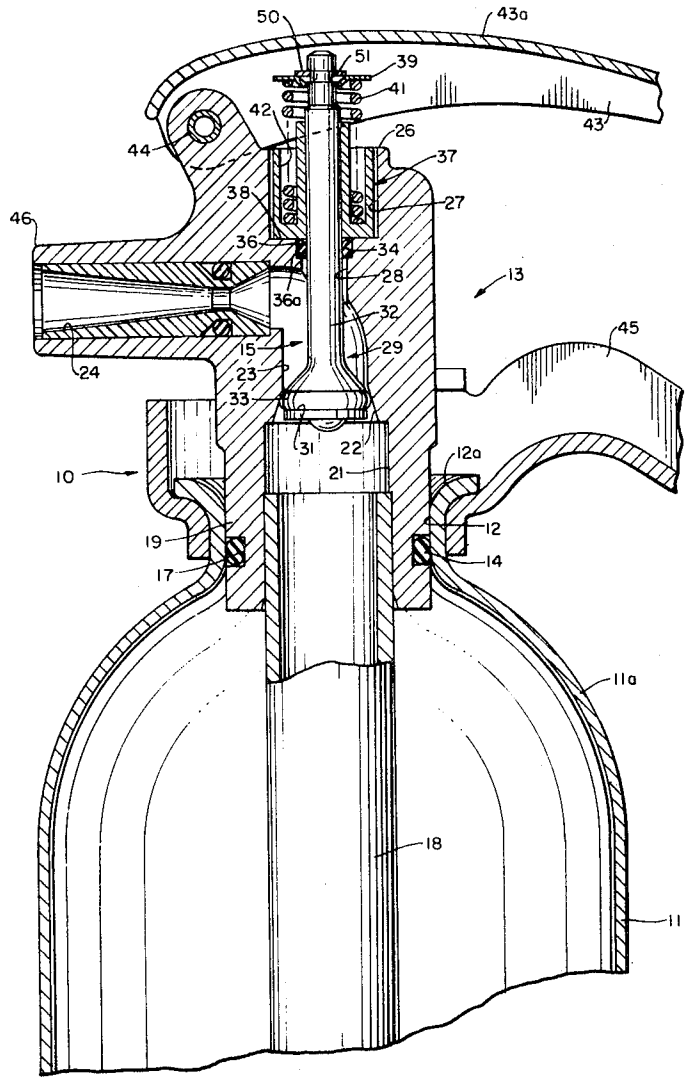
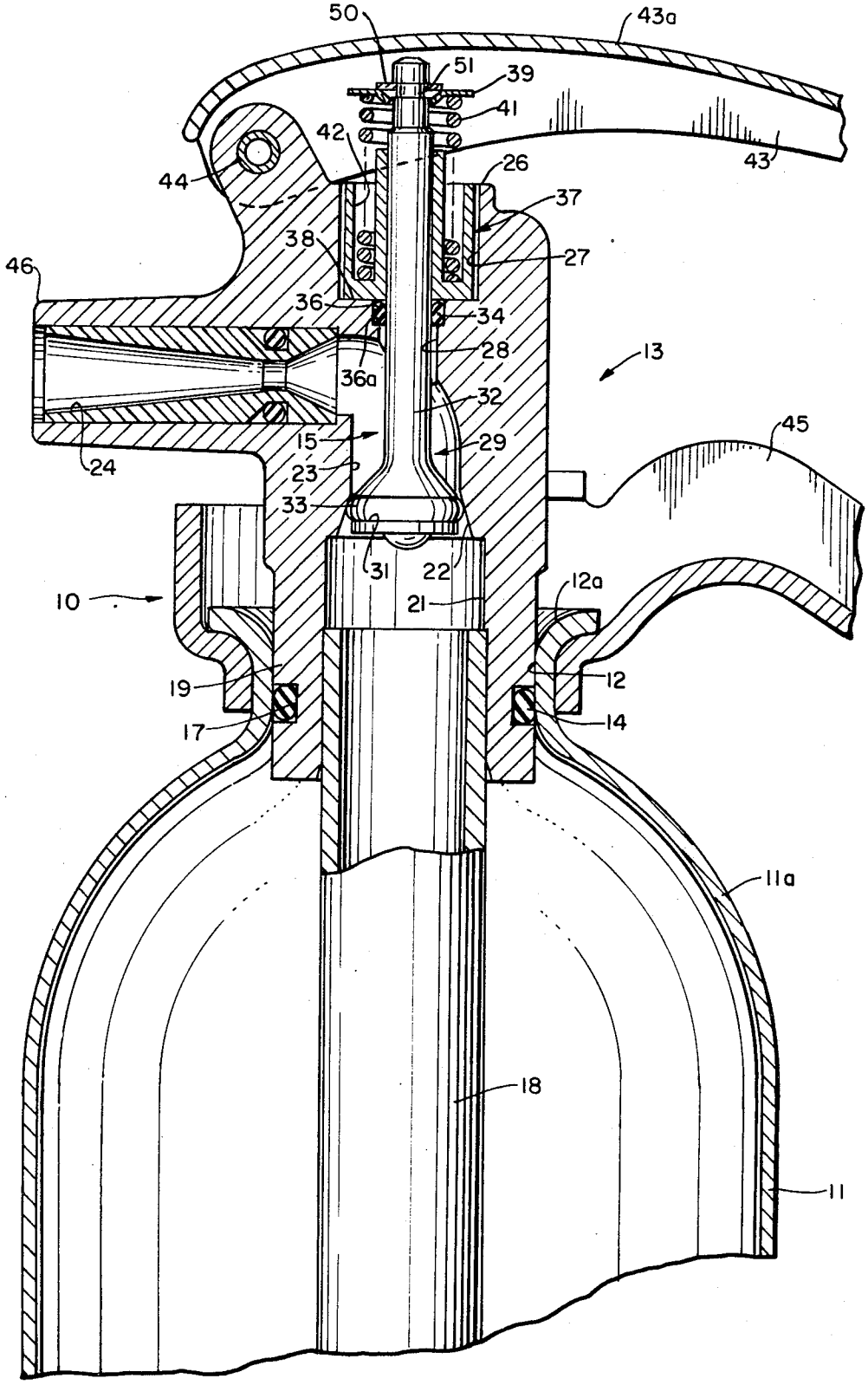
[57] **ABSTRACT**

A safety valve for use in filling of fire extinguishers and the like is disclosed. There is provided the usual storage container for containing fire extinguishing chemicals under pressure and having a control head attached thereto at one end. The control head is provided with a pair of discharge passages in fluid flow communication with the interior of the container. A main valve seals one of the passages and a safety valve is provided to seal the other passage. Preferably, the two passages are continuous so that a stem of the main valve extends from the one passage into the other. The safety valve is acted upon by the fluid when the main valve is open. A compression spring is connected between the stem and the safety valve tending to close the latter when the former is open. When fluid pressure on the safety valve is greater than the pressure from the spring, the safety valve moves to vent fluid from the container to the atmosphere.


**12 Claims, 1 Drawing Figure**

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# SAFETY VALVE FOR USE IN FILLING OF FIRE EXTINGUISHERS

## BACKGROUND OF THE INVENTION

The present invention relates to apparatus for confining and dispensing a fluid medium under pressure, such as portable fire extinguishers and the like, and more particularly to chemical-type fire extinguishers having a relief valve or safety valve communicating with the pressurized fluid and adapted to release such fluid when the pressure reaches a predetermined value.

Portable fire extinguishers of the type referred to herein, are normally charged or filled by inserting a special tool or jig into the outlet nozzle of the apparatus. The dry fire extinguishing chemicals are then forced under pressure through the outlet and into the container of the fire extinguisher. By way of example only, the normal fill pressure is about **195** pounds per square inch.

Control over the pressurizing operation is normally exercised by a pressure regulator on the filling apparatus. Such regulators may act in two ways. The regulator may control the pressure entering the container. Under these conditions, fluid will flow into the container so long as the pressure therein is less than the incoming pressure as determined by the regulator. When the pressures equalize, as when the container is full, there is no longer a net flow of fluid into the container. Other types of regulators may sense the pressure which is building within the fluid container of the fire extinguisher, and when a predetermined pressure is reached, the incoming or pressurizing flow from the filling apparatus is interrupted. In the absence of automatic filling apparatus, the operator will normally observe a pressure gauge which registers the internal pressure of the fire extinguisher. When the observed pressure reaches a predetermined value, the operator disconnects the filling apparatus.

It may happen, however, that the pressure regulator on the filling apparatus will malfunction, or, alternatively, the operator may not pay proper attention to the gauges. Under such circumstances, there is a likelihood that the container of the fire extinguisher will be overfilled, or overpressurized, since the storage pressure of the filling apparatus is normally extremely high relative to the operating pressure within the fluid reservoir of the fire extinguisher. Such overpressurization may cause the container of the fire extinguisher to burst, resulting in serious, if not fatal, injury.

Accordingly, the present invention provides a relief valve for sensing the pressure which builds up in the fire extinguisher during the filling operation. When the fluid within the container reaches a predetermined value, the valve will raise and provide a release to vent such fluid to the atmosphere. In a preferred form of the invention, the relief valve is of the poppet type slidably engaging an extension or elongated stem of the main valve which controls access to the fluid reservoir of the fire extinguisher. The poppet valve is adapted to be acted upon by the pressurized fluid in the container when the main valve is open. The main valve and the safety valve are operatively connected by a compression spring connected between the stem and the poppet and which exerts a force on the poppet tending to close the same when the main valve is open. When the force exerted on the poppet valve by the pressurized fluid is greater than the force exerted on the poppet valve by the compression spring, the poppet valve moves to vent fluid from the container to the atmosphere.



It is therefore an object of the present invention to provide apparatus for dispensing a fluid medium under pressure having a safety valve for rapidly discharging fluid from the container when the pressure exceeds a predetermined value.

Another object is to provide a safety valve for use in filling of fire extinguishers, which includes a pressure sensitive poppet-type relief valve which will move to discharge fluid from the fire extinguisher when it is overpressurized.

Still another object is to provide a safety valve for use in filling of fire extinguishers, which will reset itself automatically when the internal pressure of fluid being exhausted from the container is reduced to a predetermined value.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the present invention, reference may be had to the accompanying drawing, in which there is illustrated a longitudinal view taken partly in cross-section of a preferred embodiment of a fire extinguisher equipped with a safety valve in accordance with the present invention.

## BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, there is shown, by way of example, a fire extinguisher, generally indicated by reference numeral **10**, having a container or receptacle **11** for storing a fluid medium under pressure. The container **11** may be formed of a suitable metal such as stainless steel and is preferably provided with a domed end **11a** having an outwardly flared neck portion **12**. An opening **12a** is formed in the neck **12**.

A control head **13** is inserted into the opening **12***a* in such a way as to form a fluid-tight seal with an inner surface **16** on the neck. The sealing arrangement between the neck **12** and the control head may be accomplished in several ways, however, it has been found convenient to provide on the head **13** a sealing member, such as an O-ring **14**, to engage the neck's inner surface **16**. For this purpose, the control head **13** is provided adjacent its lower end with an annular recess **17** to contain the O-ring.

The body of the control head **13** is preferably made of a plastic material such as polymerized formaldehyde, and is provided part way therethrough with a first axial bore **15** having an enlarged diameter lower end portion **21** for receiving a siphon tube **18**. Tube **18** extends downwardly from the control head **13** into the container **11** where the chemical, for example an extinguishing agent in powder form, is stored. The upper end of the enlarged diameter portion **21** is formed with an inwardly tapered wall portion **22** to serve as a valve seat for a valve member **29** movable to control the charging and discharging of fluid from the container **11**. A reduced diameter portion **23** of the bore **15** extends above the valve seat **22** and has an angled bend of substantially 90° to be in fluid flow communication with a substantially laterally extending discharge passageway **24**. The discharge passageway is formed within a protruding nose portion **46** of the control head

which may be pointed at the fire to be extinguished to direct the flow of exhausting pressurized fluid.

The control head **13** is further provided with a stepped axial bore **26** which is coaxial with the bore **21** and extends from the upper end toward the interior of the control head. The upper portion **27** of bore **26** is of the largest diameter, and a reduced diameter portion **28** is in fluid flow communication with the curved portion **23** of bore **21**.

The valve **29** has a head **31** and a stem **32** and is mounted within the control head **13** so that the head **31** is positioned and can travel within the bore **21**. The stem **32** extends upwardly from the head **31** through the stepped bore **26** above the upper surface of the control head. The valve stem **32**, therefore, extends along an axis common to the bores **21** and **26** and the siphon tube **18**. An O-ring **33** is preferably mounted on the valve head **31** for engagement with the valve seat **22** to provide a fluid tight seal between the bore **21** and the discharge passageway **24**.

A valve operating lever **43** is pivotally mounted at the top of the control head **13**. Preferably, the lever **43** is mounted at pivot **44** on one side of the top portion of the control head and extends laterally across over the top or upper end of the control head and the protruding valve stem **32**. In the embodiment illustrated, the lever **43** extends laterally outwardly from the control head substantially coextensively with a handle **45** which is swaged or otherwise rigidly secured to the flared neck portion **12**. The lever **43** may be provided with an outwardly protruding flange **43a** which extends directly over the upper end of the valve stem **32** to engage the valve stem when the lever is pivoted in a clockwise direction, as viewed in the drawing. The valve **29**, accordingly, may be operated when the lever **43** and the handle **45** are grasped in one hand and squeezed together.

In the preferred embodiment, the reduced diameter portion **28** of the bore **26** is provided with an annular recess **36** which supports an O-ring **34** in sealing relationship with the valve stem **32**. The recess **36** is formed with a shoulder portion **36a** upon which the O-ring **34** rests. The O-ring **34**, therefore, may be moved to slide along the valve stem **32** upwardly within the stepped bore **26** toward the large diameter portion **27**, as will be more fully explained below.

A valve member **37**, which is preferably annular in shape, is slidably mounted on the valve stem **32** in the large diameter portion **27** of bore **26**. The diameter of the valve member **37** is less than that of the enlarged diameter portion **27** of the bore **26** so that a substantially annular passageway is formed between the valve and the wall of bore portion **27**. The shoulder **38** between stepped bore portions **27** and **28** serves as a seat for the valve member **37**.

A collar **39**, which is shown as a washer having a downwardly extending flange, is positioned near the upper end of the valve stem above the body of the control head **13**. A helical coil spring **41** is positioned between the collar **39** and valve member **37**. Valve member **37** is provided with a recessed portion **42** to receive the lowered end of spring **41**. The collar **39** against which the upper end of the spring pushes, is held onto the stem **32** by a C-washer **50** snapped into a retaining groove **51**.

Spring **41** serves simultaneously to bias the valve **29** upwardly to effect the seal between the valve head **31** and the valve seat **22**, and to bias the valve **37** downwardly to effect the seal between the lower face of valve **37** and the O-ring **34**.

It should be noted that since the valve members **29** and **37** act respectively in opposite directions, the force produced by the coil spring **41** serves to seat each of the valve members simultaneously. As explained previously, the fire extinguisher is of the type adapted to be partially filled with a fluid medium, such as water or dry chemical powder, and then pressurized with a gas. Fluid may thereby be forced up through the siphon tube **18** and out through the valve **29** and discharge passage **24** when the valve **29** is opened. The extinguisher is charged by injecting the liquid or dry powder chemical fire-extinguishing agent under pressure into the container **11** through the outlet **48** and discharge passageway **24**. Preferably, the valve **29** is opened by depressing the valve operating lever **43**. The valve is thereby moved downwardly away from the valve seat **22**, and the charging fluid is permitted to enter the container **11**. Alternatively, pressure applied through the incoming fluid may force the valve member **29** downwardly against the pressure of the spring **41** to open the passage to the siphon tube **18** and the container **11**.

The safety feature of the invention operates as follows. As the container **11** is pressurized, the valve **29** is moved downward, thereby compressing the spring between the collar **39** and the valve **37** and causing energy to be stored in the spring. A predetermined force is exerted by the spring against the valve **37** effecting the seal of the reduced diameter bore portion **28** by the bottom wall seat **38** of valve **37**. If the pressure within the fire extinguisher reaches a value grater than this predetermined force, the resultant of the forces acting on the O-ring **34** is directed upwardly to lift the O-ring **34** off of the shoulder **36*a***. The O-ring **34** is therefore caused to slide upwardly along the valve stem **32**, and carries the valve member **37** upwardly against the pressure of the spring **41**. Once the O-ring is moved past the upper surface of the valve seat **38**, the fluid medium may escape through the annular passageway formed between the inner surface of the bore **27** and the outer surface of the valve member **37**, thereby discharging the container and reducing the pressure therein. In the preferred embodiment, once the pressure within the container has declined sufficiently, downward pressure on the valve member **37** from spring **41** causes the valve to reset itself against the shelf **38** and the O-ring to reset itself within the annular recess **36**.

It should be noted that the safety valve **37** may be unseated independently of the position of the main valve **29**; however, the safety feature is usually significant only when the O-ring **34** is exposed to and senses the force exerted by the pressurized chemical fluid within the container **11**. This occurs when the main valve **29** is open, as during the charging or filling operation.

It should also be noted that in the normal operation of the present fire extinguisher, downward pressure from the valve operating lever **43** causes the valve member **29** to move downwardly and unseat to open the discharge passage to the pressurized fluid medium.

The movement of stem 32 with the downward movement of the valve 29 serves to compress the spring 41, thereby increasing the pressure on the valve member 37, which pressure tends further to effect the seal. This arrangement provides additional protection against inadvertent escape through the safety valve 37 of fluid medium which is being discharged in the normal operation of the apparatus.

What is claimed is:

1. Apparatus for dispensing a fluid medium under pressure comprising:

a container for storing the fluid medium and having an opening at one end;

a control member closing said opening and having first and second discharge passages in fluid flow communication with said opening;

a first valve mounted within said first passage and movable to seal said opening;

a second valve mounted within said second passage and movable to seal said second passage, said second valve having a pressure surface communicating with the fluid medium when said first valve is open, for producing a first force in response to the pressure of the fluid tending to open said second valve; and

means operatively connecting said first and second valves for exerting a second force tending to close said second valve when said first valve is open, said second valve being adapted to open said second passage to vent fluid from said container when said first force is greater than said second force.

2. Apparatus as in claim 1, wherein said first and second passages are continuous.

3. Apparatus as in claim 2, wherein at least a portion of each of said first and second passages is substantially coaxial with the other and with said opening.

4. Apparatus as in claim 3, wherein said first valve includes an operating arm extending into said second passage.

5. Apparatus as in claim 4, wherein said second passage comprises a stepped cross-sectional configuration having a large diameter portion and a reduced diameter portion.

6. Apparatus as in claim 5, wherein said second valve comprises first and second valve members, each of said members surrounding a portion of said operating arm, said first member being disposed within said large diameter portion of said second passage and said second member being disposed within said reduced diameter portion.

7. Apparatus as in claim 6, wherein said second member comprises an O-ring to cooperate with said operating arm and the sidewalls of said reduced diameter portion of said second passage to form a seal to close said second passage.

8. Apparatus as in claim 7, wherein the diameter of said second valve member is less than the diameter of said large diameter portion of said second passage.

9. Apparatus as in claim 8, wherein said pressure surface is formed as part of the external surface of said O-ring.

10. Apparatus as in claim 9, wherein said arm extends completely through said second passage to protrude beyond the perimeter of said control member and includes an annular flange adjacent its outer end and projecting radially therefrom.

11. Apparatus as in claim 10, wherein said means operatively connecting said first and second valves comprises a compression spring disposed between the undersurface of said flange and the upper surface of said second valve.

12. Apparatus as in claim 1, further comprising means for manually opening said first valve to discharge the fluid through said first passage.

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