United States Patent

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[54] **COMBINED PRESSURIZING AND RELIEF VALVE FOR FIRE EXTINGUISHERS**
3 Claims, 1 Drawing Fig.

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[50] **Field of Search** 137/493, 493.7, 102, 226, 596, 469, 509

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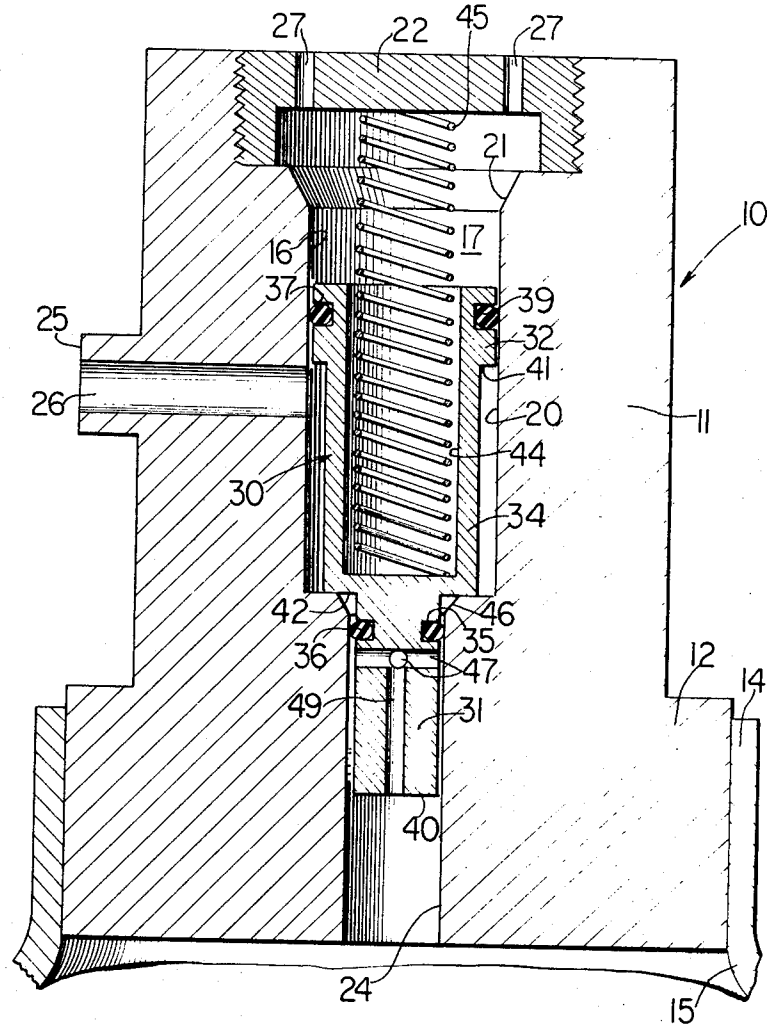
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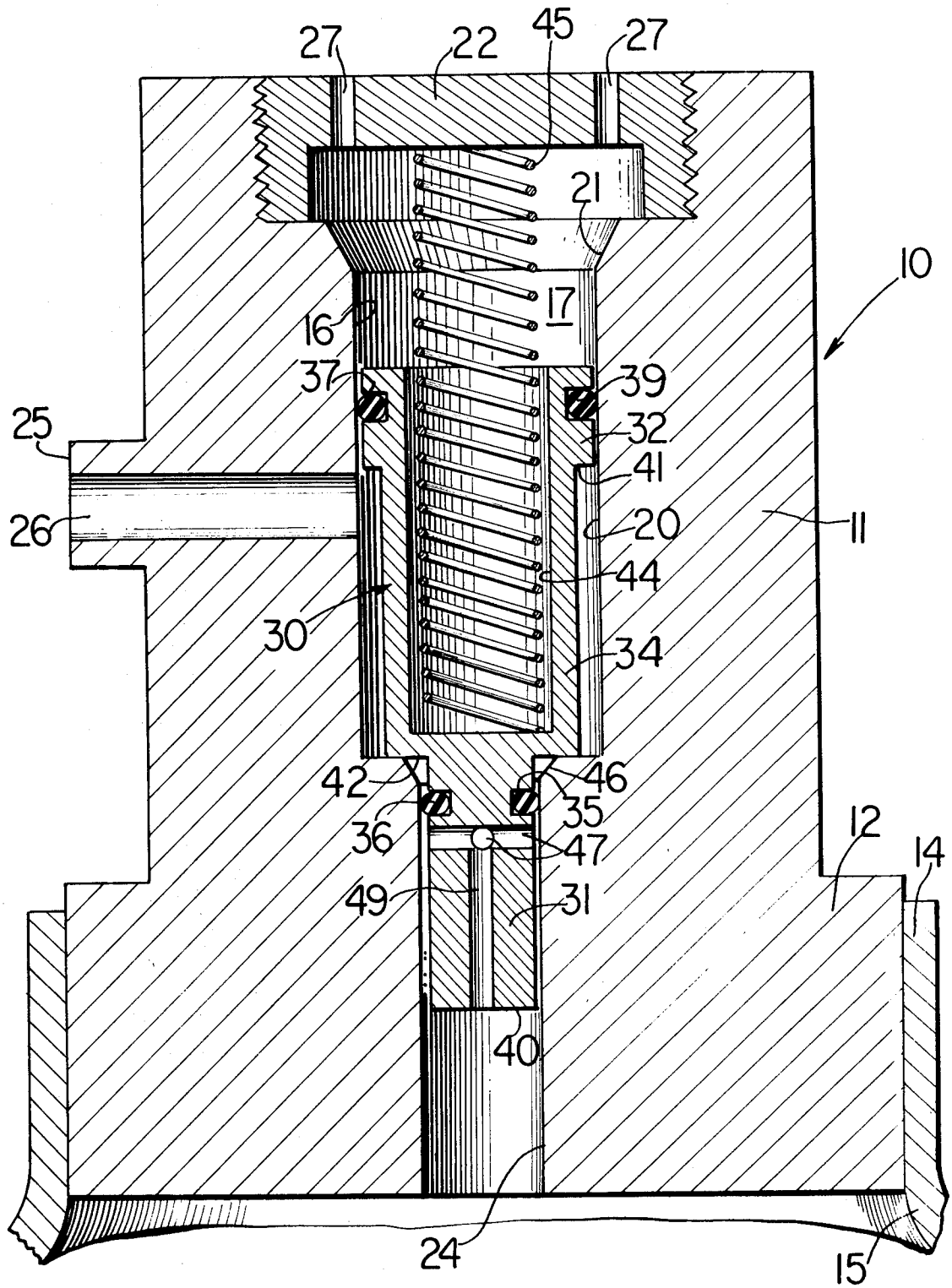
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ABSTRACT: A combined pressurizing and relief valve in the control head of a fire extinguisher including a spring-biased valve member controlling flow between the external fill port and the pressure vessel of the extinguisher and between the fill port and venting openings. The valve member is provided with a small piston area in communication with the pressure vessel for operating the valve to allow excessive pressure within the vessel to flow out through the fill port. The valve member is also provided with a large piston area in communication with the fill port for operating the valve first to allow charging fluid entering the fill port to flow to the pressure vessel and, when the vessel is properly pressurized, to further operate the valve to allow the charging fluid to flow out through the venting openings.





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COMBINED PRESSURIZING AND RELIEF VALVE FOR FIRE EXTINGUISHERS

BACKGROUND OF THE INVENTION

The present invention relates to valves, and more particularly to pressurizing valves and pressure relief valves for apparatus for confining and dispensing fluid medium under pressure such as fire extinguishers, insecticide sprayers and the like.

In apparatus of the class described, it has been common practice to provide separate pressurizing and relief valves in the control head of the apparatus. Each valve and other sealing point represents a potential leakage point and therefore it is desirable to eliminate as many of these sealing points as possible.

Apparatus of this type is conventionally pressurized from a fluid source which is at a much higher pressure than that desired within the pressure vessel of the apparatus. The conventional pressurizing valve is either mechanically operated (e.g. of the type used in automobile tires) or is of the simple check type valve type. Therefore, it has been necessary in the past to exercise care to prevent over pressurization.

SUMMARY

Accordingly, an object of the present invention is to provide in apparatus of the class described, a single valve which functions both as a pressurizing valve and as a relief valve.

Another object is to provide such a valve which prevents the apparatus from being over pressurized.

In accordance with the present invention the foregoing objects are generally accomplished by providing a combined pressurizing and relief valve in a body adapted to be mounted on a pressure vessel comprising in combination means providing a chamber within the body, means providing a first fluid passageway extending from one end of the chamber to be in communication with the pressure vessel, means providing a second fluid passageway extending from the chamber to fill port in the body, means providing a venting passageway from the other end of the chamber to the atmosphere, a spring-biased valve member in the chamber moveable between a lower position wherein the other passageways are sealed from each other, an intermediate position wherein the first and second passageways are in communication, and an upper position wherein the second passageway is also in communication with the venting passageway, the valve member having a first piston surface in communication with the first passageway and a second piston surface in communication with the second passageway for moving the valve member from its first position into its second or third position in response to the pressure within the pressure vessel and the pressure in the second passageway.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

The single FIGURE of the drawing is a fragmentary longitudinal sectional view of a fire extinguisher control head embodying a valve according to the present invention.

Referring now to the drawing in detail, there is shown a section of a fire extinguisher control head **10** incorporating a valve according to the present invention. The control head **10** has an upper section **11** and a cylindrical base section **12** positioned in the neck **14** of a pressure vessel **15** in which the extinguishing agent is stored under pressure.

In accordance with standard practice, the control head contains a discharge control valve disposed within a flow path interconnecting a discharge outlet and a syphon tube extending into the pressure vessel. The discharge control valve and the flow path which it controls are positioned in the part of the control head which has been cut away and since they do not form a part of the present invention they are not shown or described herein.

Referring again to the drawing, the upper section **11** of the control head is provided with a vertically extending stepped bore **16** forming a valve chamber **17**. The bore **16** includes an upper large diameter threaded portion **19**, a lower cylindrical portion **20** of smaller diameter, and an intermediate conical portion **21** joining the portions **19** and **20**. A threaded cap **22** is threaded into the bore portion **19**. A bore **24** extends from the lower end of the chamber **17** downwardly through the base section **12** to form a passageway between the interior of the pressure vessel **15** and the chamber **17**. A pressurizing fitting **25** is provided on the exterior surface of the upper control head section **11**, and a horizontal bore **26** provides a passageway between the port **25** and the chamber **17**. A plurality of apertures **27** are provided in the cap **22** to place the upper end of the chamber **17** in communication with the atmosphere.

A valve member **30** is positioned in the chamber **17** and includes a small diameter lower end section **31** dimensioned to fit within the bore **24**, an upper section **32** dimensioned to fit within the bore portion **20**, and a central section **34** having an intermediate diameter. The lower end section **31** is provided with an annular groove **35** in which an O-ring sealing member **36** is positioned to provide a fluid seal between the section **31** and the bore **24**. Likewise, the upper section **32** is provided with an annular groove **37** in which an O-ring seal **39** is positioned to seal the section **32** to the bore **20**.

The end of the section **31** presents a piston surface **40** to the pressure within the pressure vessel **14**, and the sections **32** and **34** present piston surfaces **41** and **42** to the pressure within the lower end of the chamber **17**. The section **31** is of sufficient length to maintain the surface **40** within the bore **24** throughout all stages of operation of the valve. A vertical bore **44** extends downwardly into the valve member **30**, and a spring **45** is seated in the bore and bears against the cap **22** to bias the valve member downwardly. A conical surface **46** is provided at the junction of the bores **24** and **20**, to guide the sealing member **36** into the bore **24**. The section **31** is further provided with a pair of intersecting diametrical bores **47** and a longitudinal bore **49** extending upwardly from the surface **40** to intersect the bores **47**.

In operation, the pressure vessel is pressurized by connecting the fitting **25** to a source of gas under pressure. The gas flows through the bore **26** into the lower portion of the chamber **17** and acts upon the surfaces **41** and **42** to lift the valve member **30** against the force of the spring **45**. The pressure of the gas source is sufficient to force the valve member **30** upwardly to a position where the seal **36** has moved out of the bore **24** and and the bores **47** are adjacent the conical surface **46**. The pressurizing gas then flows into the pressure vessel through the bores **47**, **49**, and **24**.

As the pressure builds up within the vessel **15** it acts upon the surface **40** of the section **31** to cause further upward motion of the valve member **30**. The spring **45** is designed so that when the pressure vessel **15** approaches the desired pressure, the upper seal **39** is adjacent to the lower edge of the conical surface **21**. Further pressurization moves the seal **39** out of contact with the bore **20**, and flow through the bore **26** then vents to the atmosphere through the apertures **27** preventing over pressurization of the vessel **15**.

The source of gas is then disconnected from the fitting **27**, and the pressure within the chamber **17** vents to the atmosphere through the bore as the spring **45** forces the valve member **30** back into the position shown in the drawing.

Should the pressure within the vessel **15** subsequently increase substantially, for example, as a result of being exposed to abnormal temperatures, the increased pressure acting against the surface **40** forces the valve member **30** upwardly placing the bore **24** in communication with the lower end of the chamber **17** to permit the excess pressure to vent through the bore **26** to the atmosphere.

It will be seen from the foregoing, that the present invention provides in apparatus of the type described a single valve which functions both as a pressurizing valve which prevents

the apparatus from being over pressurized and as a relief valve.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. A combined pressurizing and relief valve for a pressurized container, said valve including a body mounted to said pressurized container, said body formed with a chamber, means forming an inlet passage to said body in fluid flow communication with said chamber through which said container is to be pressurized from a source of pressurized fluid, said body also being formed with a first passage in fluid flow communication between the interior of said container and said chamber, and a vent passage in fluid flow communication between said chamber and the atmosphere surrounding said body, a valve member located in said chamber movable between a closed position blocking fluid flow communication between said inlet passage and said first passage and an open position for permitting fluid flow between said inlet and said first passages, spring means biasing said valve member into said closed position, said valve member having a first piston area in fluid flow communication with said inlet passage to move said valve member against the biasing force of said spring to said open position upon application of the pressurizing fluid from the source to said inlet passage, said valve member also having a second piston area in fluid flow communication with the interior of said container to move said valve member to said open position in response to excessive pressure within said container in the absence of the pressurizing fluid being applied to the inlet passage, said first and second piston areas also moving said valve to a position to provide fluid flow communication between the inlet passage and the vent passage in response to a combined excess pressure in the container on said second piston area and the pressure on said first piston area from the pressurizing fluid.

2. A valve as in claim 1 wherein said valve member is of stepped construction having a large diameter shoulder at an intermediate portion thereof forming said first piston area and having a small diameter end section located in a portion of said first passage which comprises said second piston area.

3. A valve as in claim 2 wherein said chamber of said body includes a bore having a stepped construction, the portion of said valve member defining said first piston area located in the larger diameter portion of the bore and the portion of the valve defining said second piston area located in the smaller diameter portion of the bore.