United States Patent

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[72] Inventor **John M. Barosko**
Kenosha, Wis.

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[73] Assignee **Tenneco Inc.**
Houston, Tex.
a corporation of Delaware. by mesne assignments

[54] **OVERLOAD CONTROL VALVE**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **137/505.13,** 137/470, 137/505.28
[51] **Int. Cl.** **F16k 31/143**
[50] **Field of Search** 137/505.13, 505.28, 470

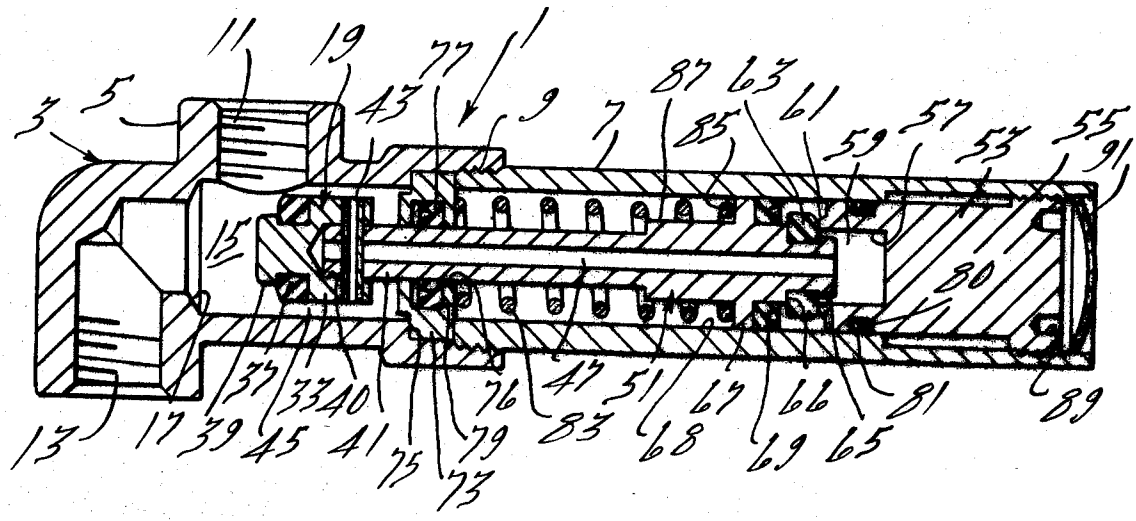
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Primary Examiner—Harold W. Weakley
Attorney—Harness, Dickey & Pierce

ABSTRACT: A valve for controlling the maximum pressure of gas in a system has a control chamber which senses pressure in the system through an aperture that extends lengthwise of a spring-pressed valve-piston which is moved to cutoff position by excess pressure.



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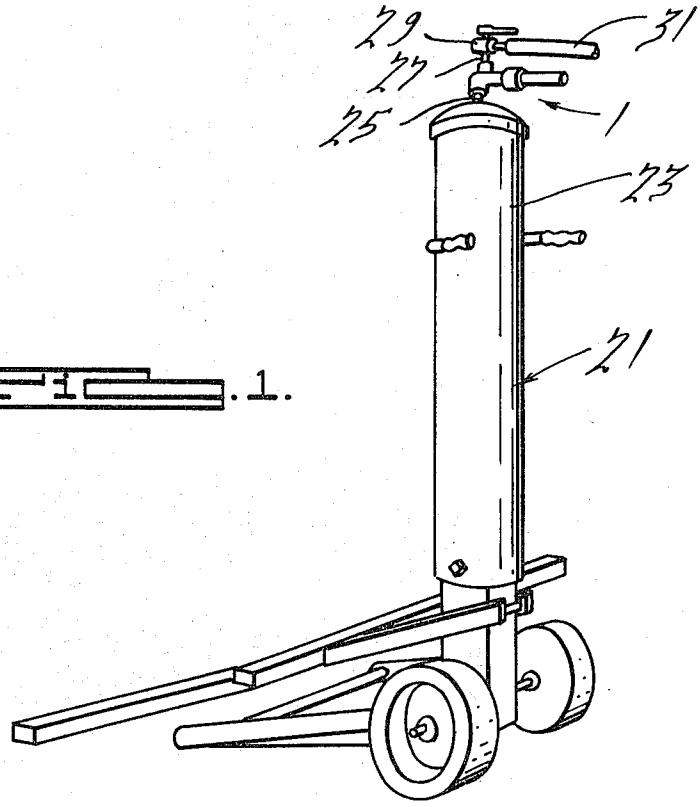
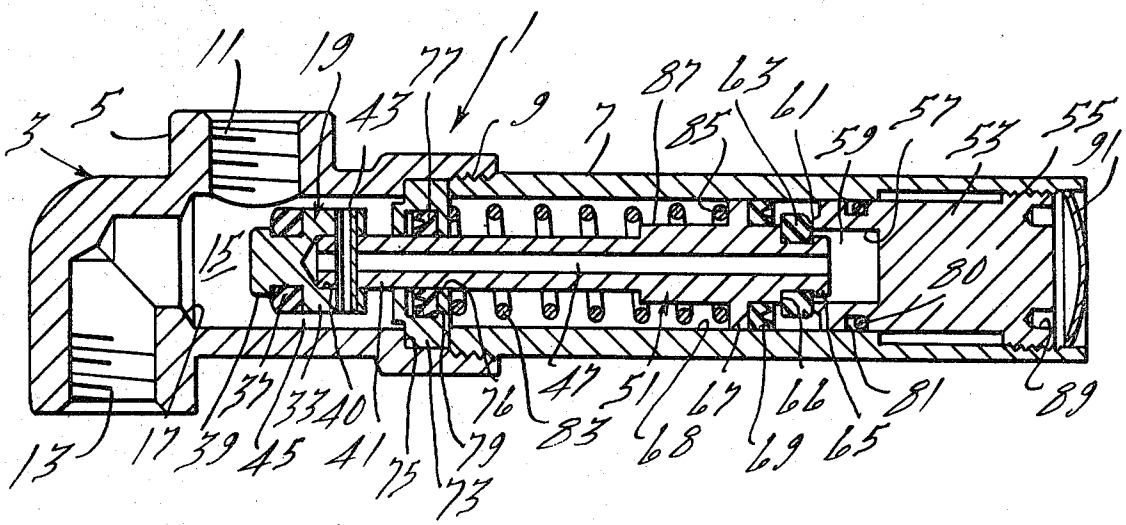


Fig. 1.

Fig. 2.



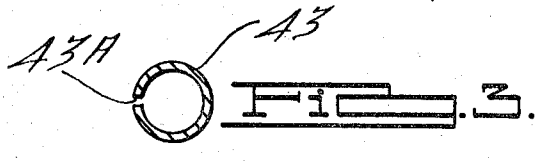


Fig. 3.

INVENTOR.
John M. Batoško
BY
Thomas, Dickey & Pierce
ATTORNEYS.

OVERLOAD CONTROL VALVE

BRIEF SUMMARY OF THE INVENTION

It is the purpose of this invention to provide a nonventing control valve adapted for use with air (or gas) operated devices to control maximum pressure.

The invention accomplishes this by means of a structure in which a housing has a through flow chamber with a shutoff valve seat at one end of a slidable valve-piston and a nonventing control chamber at the other end. A passage through the valve-piston connects the two chambers. The design features enable the control chamber pressure to closely follow that in the outlet side of the flow chamber thereby providing for accurate operation of the valve.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an air operated automobile lift device having a control valve in the air supply line which is constructed in accordance with this invention;

FIG. 2 is an enlarged longitudinal cross section through the control valve of FIG. 1; and

FIG. 3 is an enlarged cross section through the roll pin of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

The overload control valve **1** has a housing **3** which is composed of an air passage section **5** and a piston-valve cylinder section **7** which is threaded into a portion of the section **5** as indicated at **9**. The air passage section has an internally threaded inlet **11** and an internally threaded outlet **13** which are connected by a flow through chamber **15** that includes a valve seat **17**. A valve-piston structure **19** is slidable in the housing section **7** and at excessive pressures in outlet **13** engages the valve seat **17** to cutoff flow between the inlet **11** and the outlet **13**.

A typical installation and application is illustrated in FIG. **1** wherein the lift or jack **21** has a vertical housing **23** which includes air pressure operated elements (not shown) receiving air through the conduit **25** which is threaded into the outlet section **13** of the valve element **1**. The valve **1** receives air from a conduit **27** which is threaded into the inlet **11** and is itself connected to a hand-operated shutoff valve **29** that receives air under pressure from the supply line **31**.

In operation, when the hand valve **29** is opened and pressures are below the setting of the control valve **1**, air under pressure will flow from the supply line **31** through the hand valve **29** into the conduit **27** to reach the valve **1**. It flows through valve chamber **15**, by the valve seat **17** into the conduit **25** and then into the lift device **21**. In the event that excessive pressures develop, the valve-piston **19** will seat on the valve seat **17** and cut off flow from the conduit **27** to the conduit **25**. Two particular advantages of the structure of the valve **1** are first, it is closely responsive to the pressure in the device **21**; and, second, it does not blow off or vent air and therefore does not decrease pressure in the lift device **21** which could cause a lowering of the load being lifted.

The foregoing advantages are provided by the particular structure of the piston **19** and its component parts in conjunction with the arrangement of a control chamber and a sensing chamber. The piston-valve **19** includes a valve head section **33** that carries a seal **37**, held in place by an enlarged end portion **39**, which is shaped to seat and seal on the valve seat **17**. The valve section **33** has an internal aperture **40** which receives the outer diameter of a piston stem **41** and is secured to it by the transverse tubular roll pin **43** extending through aligned apertures in the two parts. The slot **43A** in the roll pin **43** forms a transverse passage connecting an annular sensing chamber **45** with a longitudinal passage **47** that extends through the entire length of the stem **41** including the piston portion **51** of the valve-piston member **19**. It will be seen that the annular pressure sensing chamber **45** communicates with the outlet **13** through the flow chamber **15** and is substantially larger than

the outer diameter of the valve head **33**. The opposite ends of the roll pin slot **43A** open into the annular chamber **45** at remote and protected positions with respect to the inlet **11** to the chamber **15** and are therefore subjected to a minimum inlet pressure effect. The slot **43A** in the roll pin **43** also provides a restriction that prevents pressure in the passage **47** from building up faster than pressure at the outlet **13**.

An adjustable nut **53** is threaded at **55** into the end of the housing cylinder section **7** and has a recess **57** formed in its inner end to provide a control chamber **59**. The inner end of the nut **53** has a valve seat **61** which is engaged by a seal **63** (which is preferably identical to seal **37**) that is held in place by an enlarged end section **65** on the piston section **51**. The inside face of the seal **63** is held against a shoulder **66** on the piston end **51** so that the seals **37** and **63** serve as valve means at opposite ends of the valve-piston member **19**. The section **51** has a land **67** which acts as a piston portion to slide in the bore **68** of housing section **7** and the side thereof facing chamber **59** supports the base of a U-shaped resilient annular packing cup **69** which opens toward the chamber **59**.

An adapter and stem support **73** fits in a recess **75** in the housing **5** and is held against the bottom thereof by the inner end of the section **7**. It has a through opening **76** the wall of which engages and supports the stem **41** of the valve member **19**. Sealing of the sliding joint is provided by a U-shaped resilient annular packing cup **77** that fits in a groove **79** in the adapter **73** and is arranged to open toward the annular chamber **45**. An O-ring **80** in groove **81** seals the nut **53**. It is noted that U-cups in the sliding joints are used instead of other seal forms, such as O-rings, as they give better sensitivity to the valve. The U-cups face outwardly of the variable size chamber containing the valve spring **83** and in opposite directions and can flex to preclude internal pressure lockup in the spring chamber.

The coil spring **83** bears at one end against the adapter **73** (that is against shoulder **75** of housing **5**) and at its other end against the face **85** of the piston land **67**, being guided by the enlarged diameter **87** on the piston portion **51**. The spring **83** holds the seal **63** on seat **61** when pressures at the outlet **13** are less than the setting of the valve as determined by the precompression of the spring. This can be adjusted by varying the longitudinal position of the nut **53** which has wrench recesses **89** in its outer face to provide for rotation and threaded movement longitudinally of the cylinder **7**. A snap plug **91** may be used for closing the outer end of the housing section **7** adjacent the nut.

The control chamber **59** is connected to sensing chamber **45** by the passage **47** and roll pin **43**. Thus, when pressure builds up in chamber **45** above a level determined by the setting of spring **83**, the valve-piston **19** will be forced to the left so that the seal **63** leaves the seat **61** whereupon pressure will reach the larger diameter provided by the land **67** of the piston head **51** and the valve member **19** will be forced rapidly to the left to seat the seal **37** on the seat **17** and shutoff flow. The higher pressure at inlet **11** will then be directly on the exterior of valve head **33** and will be passed through roll pin **43** and passage **47** to control chamber **59** and serve to hold the valve-piston **19** in shutoff position until the inlet pressure is reduced sufficiently to allow the spring **83** to reseat seal **63** on seat **61**.

As indicated, the construction is such that the pressure in the control chamber **59** is close to that at the outlet and is substantially isolated from inlet pressure effects thereby insuring proper response of the valve to the pressure conditions within the device **21**. Since there is no venting of the pressure when the valve member **19** is seated on the valve seat **17**, the pressure within the device **21** will be maintained so that there is no danger of lowering of a load that may be carried by it due to operation of the overload valve **1**.

I claim:

1. An overload control valve comprising a housing having a fluid inlet and a fluid outlet and a fluid flow chamber connecting said inlet and outlet, a first valve seat in said flow chamber

between said inlet and outlet arranged so that all fluid flows through the seat when the valve is open, said housing including a bore and first seal means defining one end of the bore, said housing including a pressure sensing chamber located between said seal means and said flow chamber and out of the path of fluid flow from said inlet to said outlet, said housing having control chamber forming means at the outer end of the bore and including a second valve seat, said first and second valve seats and said bore and chambers being longitudinally aligned, a longitudinally movable valve piston member in said bore having first and second valve portions at opposite ends arranged to seat respectively on said first and second valve seats and including a valve stem slidably extending through said seal means and an enlarged piston portion slidably engaging the wall of said bore, second seal means associated with said piston portion and engaging the wall of the bore, resilient means urging said valve member to seat on the second valve seat, said valve member including a longitudinal aperture in said stem and opening out of said second valve portion into said control chamber when said valve member is seated on said second valve seat, said valve member including transverse aperture forming means at the first valve portion end opening into said sensing chamber and connecting said sensing chamber to said longitudinal aperture when said valve member is seated on said second valve seat, said longitudinal aperture and said control chamber communicating with said piston portion when said valve member is unseated from said second valve seat and the pressure therefrom acting on the piston portion in a direction to seat said first valve portion on said first valve seat.

2. A valve as set forth in claim 1 including a coil spring in said bore based at one end on said first seal means and the other end bearing against a side of said piston portion, said coil spring forming said resilient means.

3. A valve as set forth in claim 2 wherein said control chamber forming means is longitudinally adjustable in said housing to vary the compression of said coil spring.

4. A valve as set forth in claim 1 wherein at least one of said seal means is flexible to provide for relief of pressure in the bore on the low-pressure side of the piston portion.

5. A valve as set forth in claim 4 wherein said one seal means comprises a U-cup element.

6. A valve as set forth in claim 1 wherein said first valve portion comprises a separate element mounted on said stem and said transverse aperture forming means comprises a slotted roll pin securing the element to the stem.

7. A valve as set forth in claim 6 wherein said resilient means comprises a coil spring in said bore confined between said first seal means and the low pressure side of said piston portion.

8. A valve as set forth in claim 7 wherein said one of first and second seal means comprises an annular U-cup facing outwardly from the adjacent end of the coil spring.

9. A valve as set forth in claim 8 wherein both said seal means comprise annular U-shaped cups facing outwardly from the adjacent end of the coil spring.

10. A valve as set forth in claim 9 wherein the control chamber forming means is longitudinally adjustable in said housing to vary the compression of the coil spring.