

[54] **RELAY**
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[73] Assignee: **Continental Oil Company**, Ponca City, Okla.
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2,844,166 7/1958 Edman..... 137/624.27
2,927,603 3/1960 Willis..... 137/463 X
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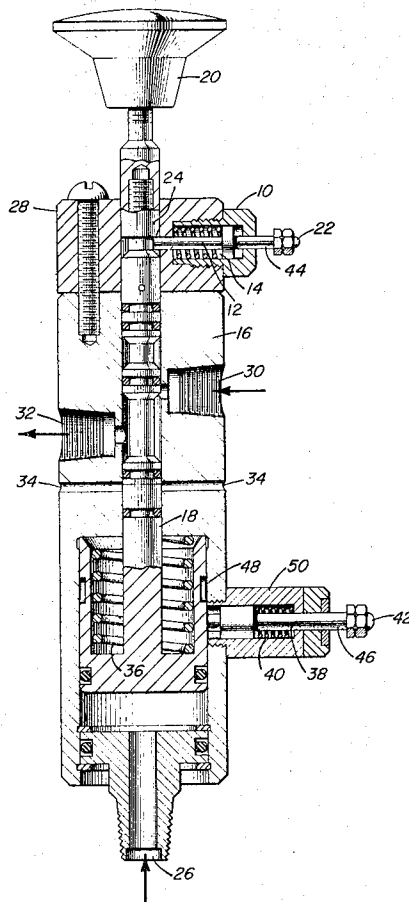
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Attorney, Agent, or Firm—Ronnie D. Wilson

[52] U.S. Cl. 137/624.27, 251/73
[51] Int. Cl. F16k 31/00
[58] Field of Search 137/625.69, 465, 463, 464,
137/624.27, 466, 625.25; 251/89, 73;
166/224, 226

[56] **References Cited**
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[57] **ABSTRACT**
A fail-safe lock-out device is disclosed which retains the piston portion of a pneumatic relay out of service until safety system pressure is returned to operating conditions at which time it releases the piston portion returning the relay to service.

5 Claims, 5 Drawing Figures



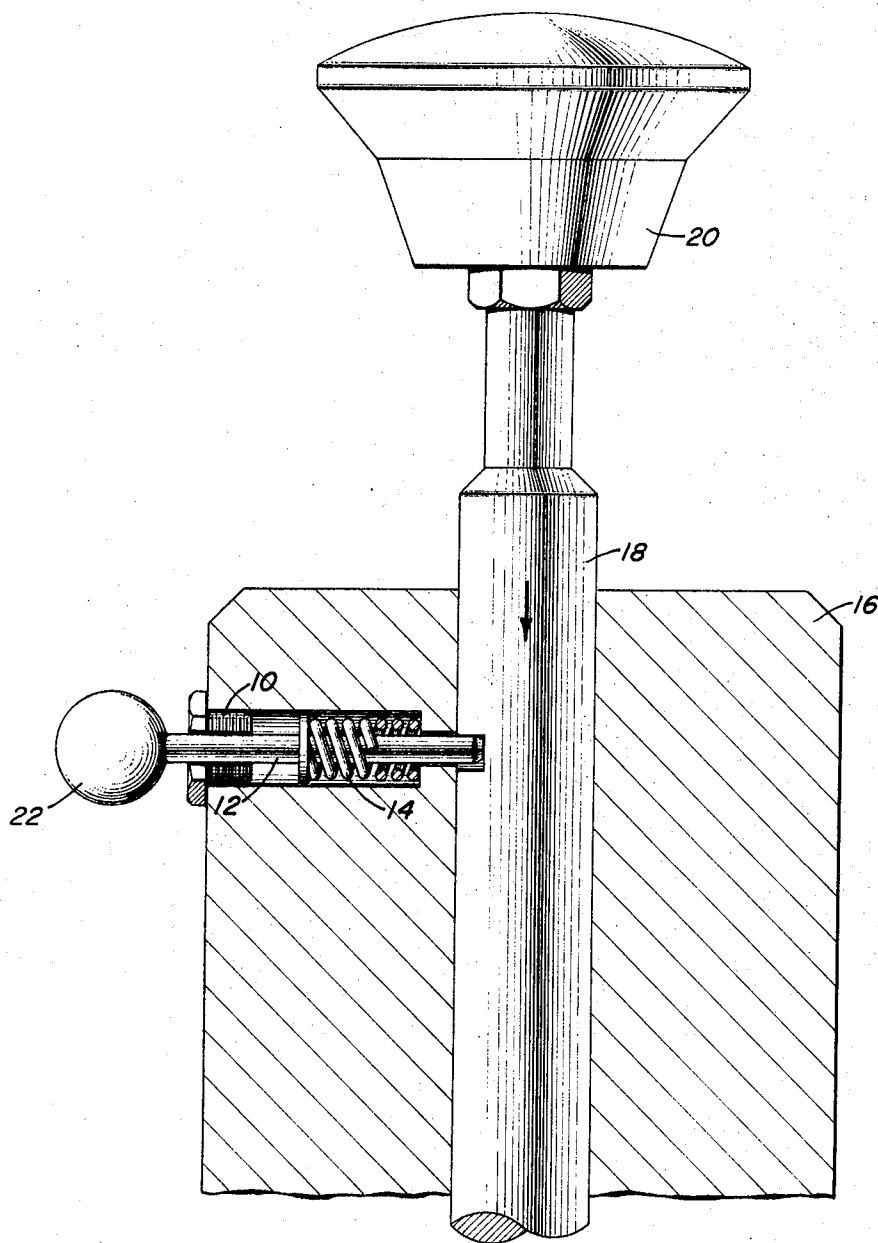


FIG. 1

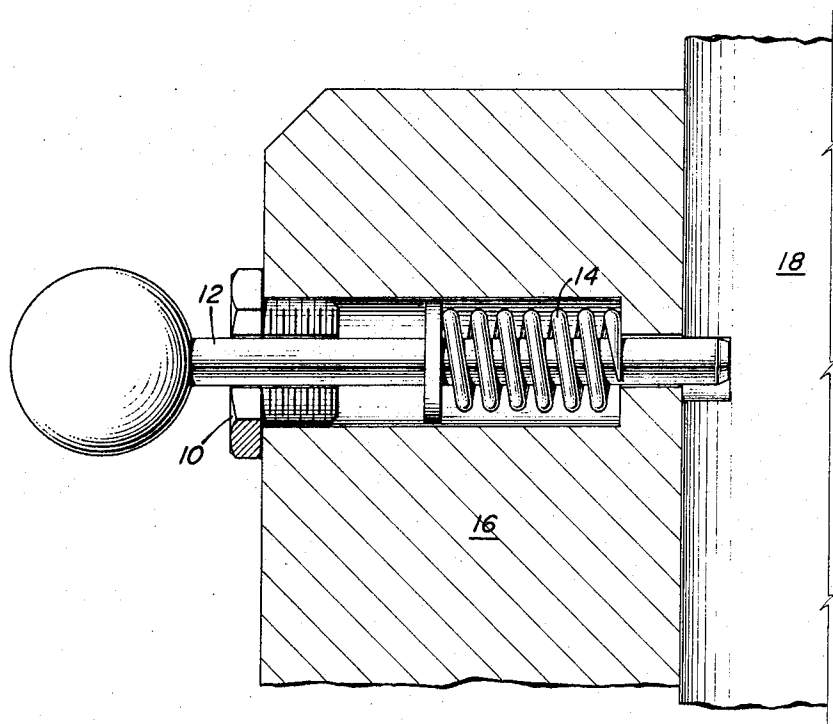


FIG. 2

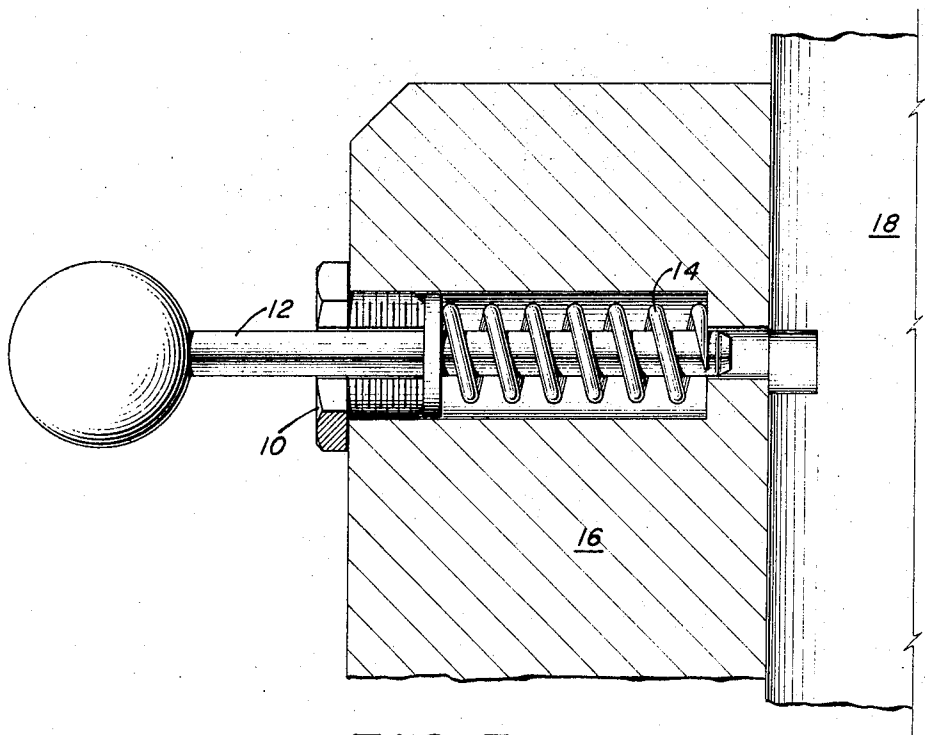


FIG. 3

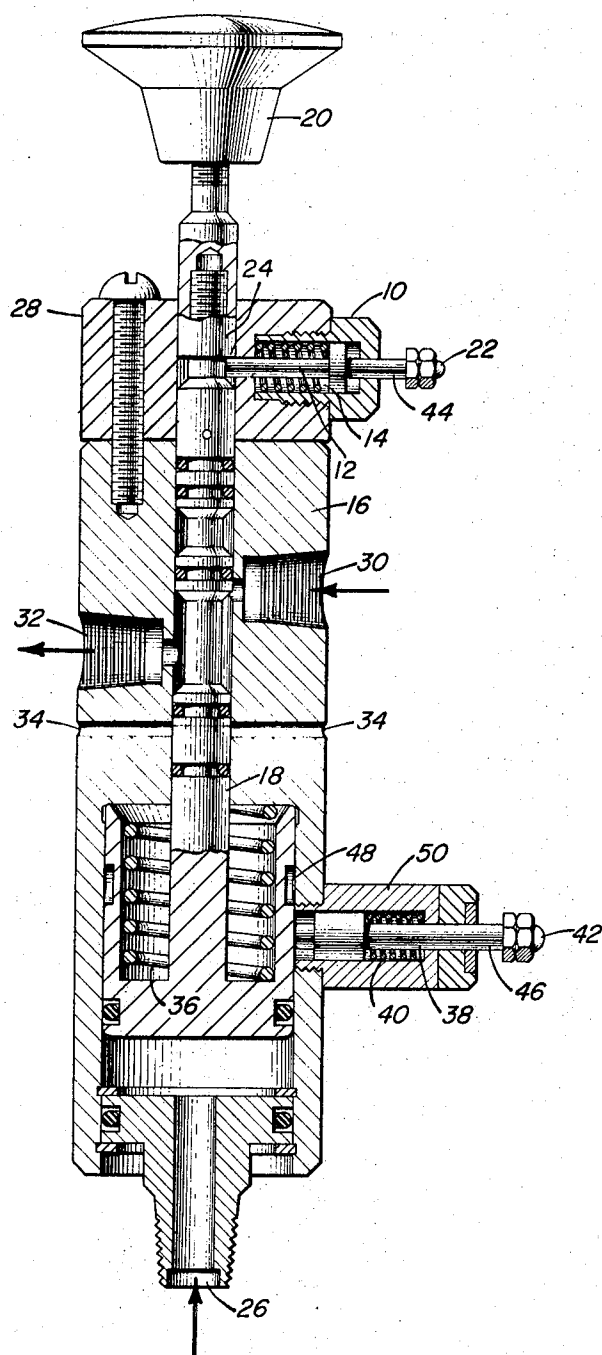


FIG. 4

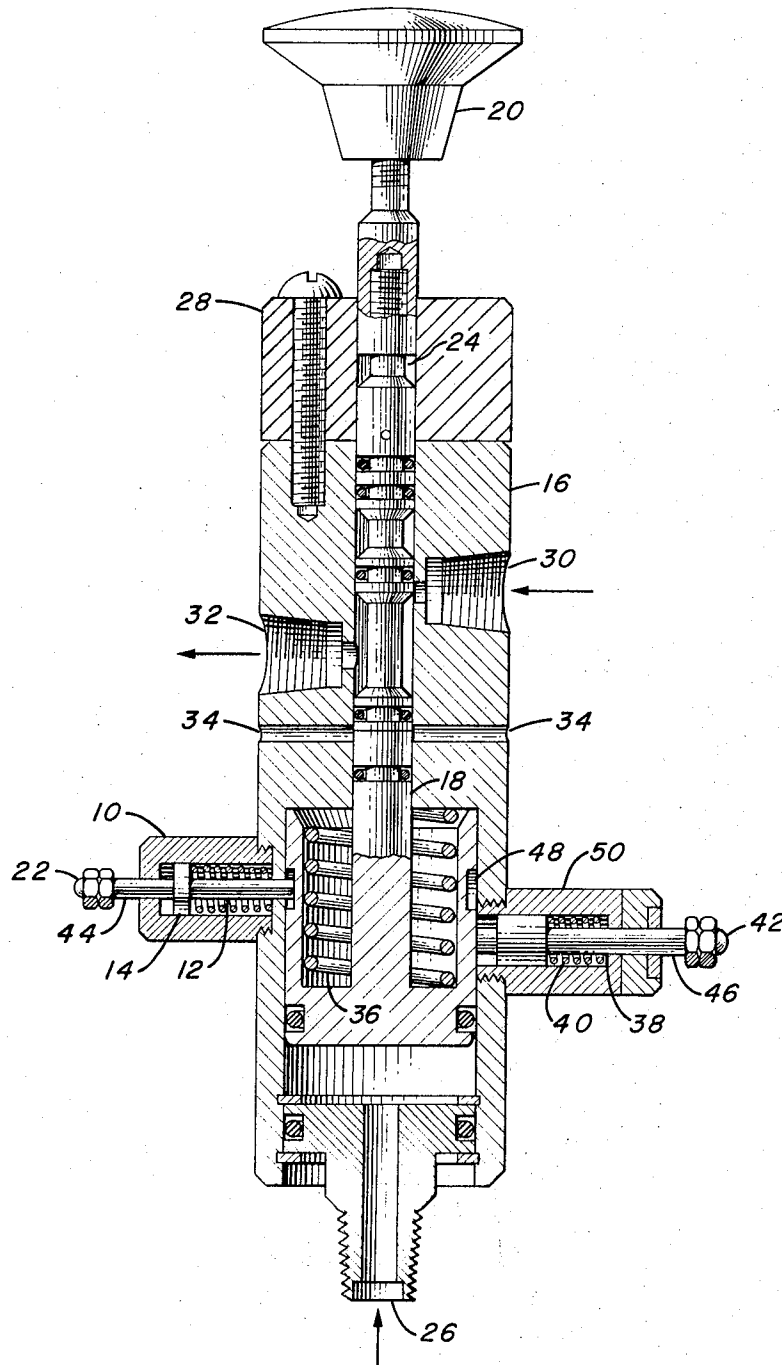


FIG. 5

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RELAY

This invention relates to a pneumatic safety relay system for use in connection with wells, wellheads, wellhead valves and associated flow lines. More particularly, the present invention relates to an improved lock-out device for a pneumatic relay system to prevent it from unintentionally being left out of service.

U.S. Pat. No. 2,927,603 to Willis, issued Mar. 8, 1960, discloses a complex shut-off valve assembly to stop the flow from a well through a flow line incident to a pressure drop taking place in the line as the result of a break or leak therein. The Willis patent discloses the use of spring-biased detent pins and hydraulic cylinders which coact with the pins.

Pneumatic relays are an integral part of various present safety systems in controlling wellhead valve operator supply pressure. Many wells presently employ pneumatic safety systems to close wellhead valves in the event of an emergency. One such relay commonly used in this capacity is provided by USI-Axelson, a division of U.S. Industries, Inc. having a model number of CR-BBM-1. A major shortcoming in the use of these types of relays is that they must be removed from service for "start-up" of the wellhead after shutting down for emergencies or any other reasons such as maintenance, etc. In the past these relays were removed from service for "start-up" by manually pinning the piston portion thereof. Therefore, after supply and safety pressure were restored at "start-up" the piston portion had to be manually unpinning to return the relay to service. If the piston portion of the relay was left pinned, the pneumatic safety system was left out of service and control of the wellhead valve was lost. The present invention provides a pneumatic relay whereby the piston portion will automatically be released when supply and safety pressure are restored at "start-up" thereby preventing the unintentional loss of control of the wellhead valve which has resulted in problems at the wellhead, such as gas or oil spills, in the past.

The invention will best be understood by reference to the drawings, in which:

FIG. 1 is a longitudinal section of the lock-out portion of the device of FIG. 4;

FIG. 2 is an enlargement partial sectional view of the device of FIG. 1 illustrating the locked out position;

FIG. 3 is an enlargement partial sectional view of the device of FIG. 1 illustrating the position of same when relay is in-service; and

FIG. 4 is a longitudinal section of a preferred embodiment of the present invention.

FIG. 5 is a longitudinal section of one embodiment of the present invention.

Referring now to the drawings and particularly to FIG. 4 in detail, the general operation of the device will be explained, followed by a more explicit consideration thereof. Safety system pressure from a source not shown is introduced into the pneumatic relay by way of orifice 26. The safety system pressure acts to move piston 18 upward to extend out of the first end 28 of housing 16. The upward movement of piston portion 18 opens inlet 30 to communicate with outlet 32 of the supply pressure orifices allowing the supply pressure to flow through housing 16. When safety system pressure is lost, piston 18 is moved by spring 36 down to close supply pressure inlet 30 and open outlet 32 to bleed ports 34. As piston 18 is moved downward by the ac-

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tion of spring 36, stem 38 in casing 50 is forced into groove 48 of piston 18 by spring 40 thereby retaining piston 18 in the down position to prevent return to service of the relay without manual reset.

To return the relay to service after safety system pressure has been lost, stem 38 is manually disengaged with knob 42, piston 18 is moved upward manually using knob 20 to a point where groove 24 aligns with stem 12 in casing 10; whereupon, stem 12 is depressed using knob 22 into groove 24 against the pressure of spring 14. Stem 12 is held in groove 24 by the pressure of spring 36 acting on piston 18. By the manual upward movement of piston 18 bleed ports 34 are closed, and supply pressure inlet 30 is opened to communicate with outlet 32. Safety system pressure is then simulated manually and the wellhead valve is opened by providing supply pressure via inlet 30 and outlet 32 of the relay. Subsequently, safety system pressure is provided via orifice 26 which acts on piston 18 overcoming the pressure of spring 36 thereby allowing spring 14 to disengage stem 12 from groove 24 returning piston 18 to its pressure-sensitive position and the safety system to service.

It should be noted that although the lock-out portion 44 of the present device as illustrated by the embodiment in FIG. 4 is located at the upper end of the device, it could be located so as to utilize the same groove in the piston as the lock device 46 shown at the lower end of the embodiment in FIG. 4 as shown in FIG. 5.

The materials of construction of the device will largely depend upon the kinds of fluids contemplated for exerting pressure for use therein. Further, the specific size and strength of the various elements included in the present invention are not critical except to the extent to which it is inherent from the above description. For example, the various springs must be of a strength to move the elements against which they are exerting their force. Various metals can be used in its construction, stainless steel being particularly satisfactory.

A device as shown in FIG. 4 was built which, in operation, was connected to a supply pressure of about 100 psi and a safety system pressure of about 30 psi and when starting up after a shut-in period the lock-out portion of the device released the piston with 100 percent accuracy upon regaining safety system pressure.

While particular embodiments of the invention have been described, it will be understood, of course, that the invention is not limited thereto since many modifications can be made, and it is, therefore, contemplated to cover by the appended claims any such modifications as fall within the true spirit and scope of the invention.

The invention having thus been described, what is claimed is:

1. A pneumatic relay which utilizes safety pressure and supply pressure, which comprises, in combination:

- a housing having a first and second end,
- orifice means for receiving safety system pressure at said second end,
- a piston portion extending from said first end,
- spring biasing means positioned between said housing and said piston portion to bias said piston portion toward said second end,

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orifice means for transmitting supply pressure through said housing between said first and second ends,

bleeding means between said first and second ends communicating with said supply pressure orifice means and the exterior of said housing,

a first casing attached to said housing having an opening therethrough perpendicularly aligned to said piston portion,

a first elongated stem slidably positioned in said opening,

spring biasing means positioned between said first casing and said first stem to bias said first stem away from said piston portion,

a second casing attached to said housing having an opening therethrough perpendicularly aligned to said piston portion,

a second elongated stem slidably positioned in said opening,

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spring biasing means positioned between said second casing and said second stem to bias said second stem toward said piston portion, and

detent means formed in said piston portion of a dimension to mate with said first and second stems.

2. The pneumatic relay of claim 1 wherein said first and second stems mate with the same detent means.

3. The pneumatic relay of claim 2 wherein said detent means is a groove.

4. The pneumatic relay of claim 1 wherein said supply pressure orifice means has an inlet and an outlet.

5. The pneumatic relay of claim 4 wherein said bleeding means is a port opened by the movement of said piston portion toward said second end by spring biasing means when safety system pressure decreases, simultaneously closing said inlet of said supply pressure orifice means.

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