

[54] **CONTROLLER FOR A BACK SEATED VALVE**

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[22] Filed: **Nov. 25, 1970**

[21] Appl. No.: **92,733**

[52] U.S. Cl. **251/47, 251/63.6, 92/85, 92/143**

[51] Int. Cl. **F16k 31/143, F16k 41/14, F01b 11/02**

[58] Field of Search **251/63.4, 63.6, 47, 330, 60; 92/85, 143, 134**

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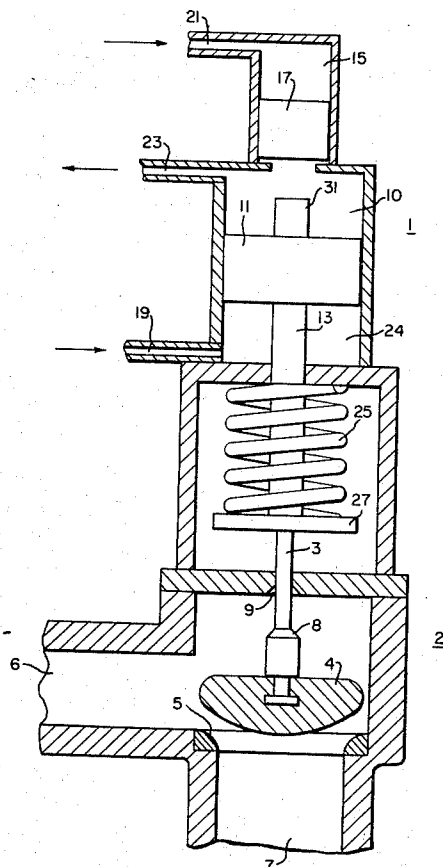
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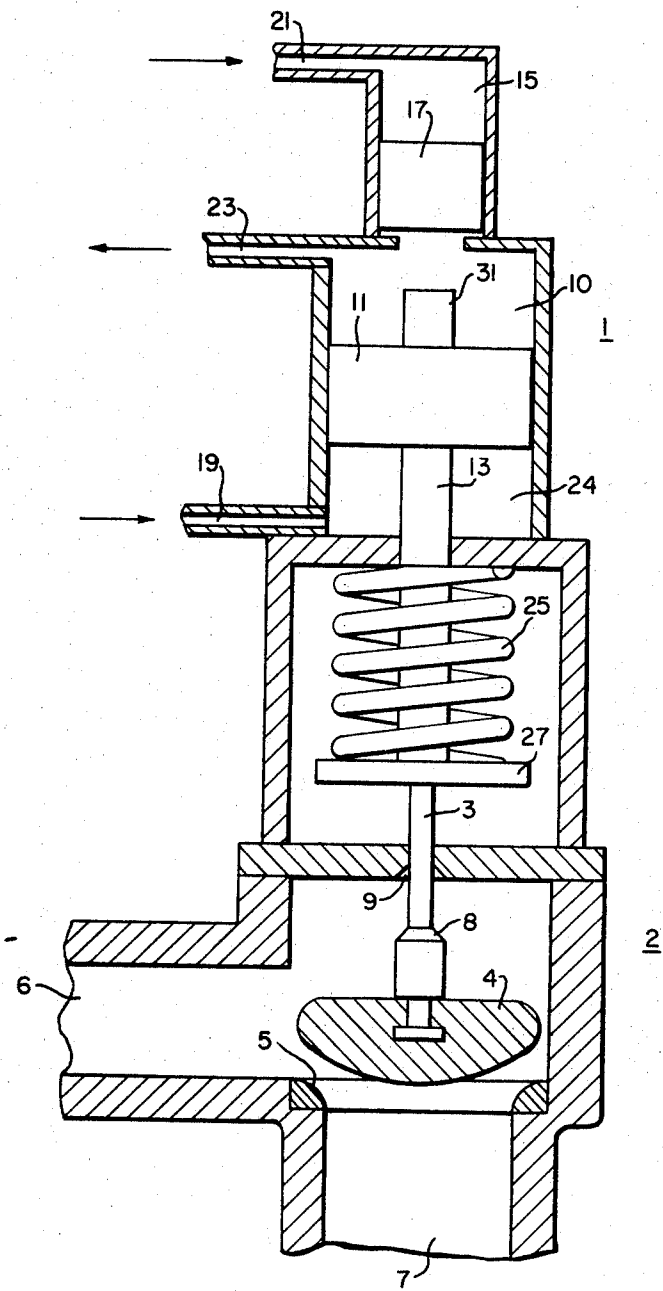
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[57] **ABSTRACT**

A hydraulic controller for a back seated steam valve wherein the controller comprises a pair of axially aligned hydraulic cylinders disposed to operate in opposite directions, one of the cylinders having a drive piston and piston rod connected to the valve stem, and the other cylinder having a free piston disposed therein, which opposes the force the drive piston applies to the valve stem as the drive piston approaches the end of its stroke in valve opening direction, thus reducing the back seating force applied to the valve stem by the drive piston. The free piston also increases the initial acceleration of the valves moving parts in closing direction, thus reducing the valve's closing time.

5 Claims, 1 Drawing Figure





CONTROLLER FOR A BACK SEATED VALVE

BACKGROUND OF THE INVENTION

This invention relates to steam valves and more particularly to back seated steam valves having a device which reduces the force applied to the stem of the valve as the valve approaches its fully open position. The stem of back seated valves heretofore made are subject to the full force developed by the motive fluid acting on the drive piston minus the spring closing force when the valve back seats. This requires large diameter stems to maintain the stem stress levels within the allowable limits based on creep and rupture considerations at elevated temperatures. Larger stems increase the stem leakage before back seating and may require larger and more expensive gland condensers.

SUMMARY OF THE INVENTION

In general, a controller made in accordance with this invention is incorporated in a valve having a movable stem and a back seat on the stem for sealing the stem when the valve is fully open. The controller comprises a cylinder having a movable abutment therein, a rod connecting the abutment to the valve stem, and a device associated with the movable abutment for reducing the force the movable abutment delivers to the rod as the abutment approaches the end of its stroke in valve opening direction, thus reducing the back seating force applied to the valve stem.

BRIEF DESCRIPTION OF THE DRAWING

The objects and advantages of this invention will become more apparent from reading the following detailed description in connection with the accompanying drawing in which:

The sole FIGURE is a vertical axial sectional view of a back seated steam valve having a controller made in accordance with this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now, in detail to the drawing, generally indicated at 1 is a controller for a steam valve 2 having a movable stem 3, which positions a plug 4 relative to a seat ring 5 to control the flow of steam through the inlet and outlet ports 6 and 7 thereof, and a back seat 8 on the stem, which registers with a seating surface 9 disposed in the valve's bonnet to seal the stem when the valve 2 is fully open.

The controller comprises a first cylinder 10 having a drive piston or movable abutment 11 disposed therein, and having a piston rod 13 connecting the drive piston to the valve stem 3. A second cylinder 15 is disposed above the first cylinder 10, and the bores of the two cylinders are generally in axial alignment and are in communication with each other. The diameter of the bore of the second cylinder 15 is smaller than the diameter of the first cylinder 10. A free piston 17 is disposed within the bore of the second cylinder 15.

Fluid inlet ports 19 and 21 are disposed adjacent the ends of the cylinders 10 and 15 opposite the ends in communication and are supplied with pressurized fluid, such as hydraulic fluid from a suitable supply of pressurized fluid. A fluid drain port 23 is disposed adjacent the area in which the bores are in communication, the drain port 23 is in communication with the bores of the cylinders 10 and 15 and with a fluid reservoir (not shown) to drain the fluid which bypasses the pistons as the drive piston moves to open the valve 2. Thus, the cylinders are single acting and are disposed to operate in opposite directions and to oppose each other. Pressurized fluid is supplied to a chamber 24, formed by the first cylinder 10 and the drive piston 11, via the inlet port 19 to drive the piston 11 in valve opening direction. A compression spring 25 acting against a disc 27 fastened to the stem 3 biases the drive piston

11 in valve closing direction to close the valve when the fluid is allowed to flow from the chamber 24 via port 19.

A bar 31 extends upwardly from the drive piston 11 in a direction opposite the piston rod 13. Pressurized fluid is supplied to the chamber 24 via the inlet port 19, causing the drive piston 11 to move upwardly or toward the second cylinder 15. As the drive piston approaches the end of its stroke in valve opening direction, the bar contacts the free piston 17. Since the free piston is being acted upon by the pressurized fluid to bias it downwardly in a direction toward the drive piston 11, when the bar 31 contacts the free piston 17 the free piston resists upward movement with a force equal to the cross sectional area of the second cylinder 15 times the pressure of the pressurized fluid.

The free piston 17 and the bar 31 extending from the drive piston 11 are cooperatively associated with the drive piston and the second cylinder to reduce the force the drive piston delivers to the piston rod 13, as the drive piston 11 approaches the end of its stroke in valve opening direction, or upwardly as shown in the drawing. Thus, the back seating force applied to the valve stem 3 by the drive piston 11 is reduced by this amount. Therefore, in a control system which has a number of different control valves operating at different pressures and proportioned to handle various flows, a constant pressure motive fluid can be supplied to each valve and the second cylinder can be sized to limit the force the controller exerts on the stem and super structure of the valve when it is back seated. The free piston will also exert added closing force when the valve is fully open, accelerating the stem and its associated parts in closing direction so that closing time of the valve is reduced.

What is claimed is:

1. A hydraulic controller for a valve having a stem and a back seat on said stem for sealing the stem when the valve is fully opened, the controller comprising
 - a first cylinder having a movable abutment therein,
 - a rod connecting the abutment to the valve stem,
 - a supply of pressurized fluid,
 - a fluid inlet port disposed adjacent one end of the first cylinder,
 - a second cylinder having a bore, one end of which is in communication with the bore of the first cylinder, the bores of the cylinders being generally in axial alignment, the diameter of the bore of the second cylinder being smaller than the diameter of the bore of the first cylinder,
 - a fluid inlet for said second cylinder,
 - the fluid inlets of said cylinders being disposed adjacent the end of said cylinders opposite the ends in communication,
 - a port in communication with said cylinder bores adjacent the area in which said bores are in communication, said port acting as a fluid drain as the abutment moves to open the valve, and
 - means associated with said movable abutment for reducing the force said movable abutment delivers to said rod and said valve stem as said abutment approaches the end of its stroke in valve opening direction, thus reducing the back seating force applied to the valve stem.
2. A controller as set forth in claim 1 and further comprising means for biasing the valve in closing direction.
3. A controller as set forth in claim 1 and further comprising a compression spring acting against a disc fastened to the valve stem for closing the valve when pressurized fluid is allowed to flow from the supply inlet of the first cylinder.
4. A controller as set forth in claim 1, wherein the cylinders are hydraulic cylinders and the pressurized fluid is hydraulic fluid.
5. A controller as set forth in claim 1, wherein the cylinders are single acting hydraulic cylinders disposed to operate in opposite directions and oppose each other.

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