

PATENT SPECIFICATION

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(54) PRESSURE RELIEF CONTROL DEVICE

(71) We, AMERICAN AIR FILTER COMPANY INC., a corporation organised and existing under the laws of the state of Delaware, United States of America, of 215 Central Avenue, Louisville, Kentucky, United States of America 40201, do hereby declare this invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to pressure relief devices and more particularly to a pressure control relief device which is compact and is arranged so that all of the working parts may be removed and replaced without disconnecting the device from a conduit carrying fluid to and away from the valve.

Conventional pressure relief devices generally comprise a spring loaded valve member which is seated upon a valve seat wherein the valve member is subject to movement away from the valve seat when the pressure in a fluid conduit system exceeds the pressure exerted by the counteracting spring seating force. When this occurs, the valve opens and the fluid from the fluid conduit system flows through the valve seat opening until the fluid conduit system pressure is reduced to less than the pressure exerted by the valve spring thereby seating the valve member closing off the opening in the valve seat. Most of the valves presently in use for relieving the pressure in a fluid conduit system are expensive, require a relatively large space for assembly, and, when in need of repair must be removed from the fluid conduit system.

An aim of the present invention is to provide a pressure control relief device which is straight-forward, easy to fabricate, assemble and disassemble, and is highly effective.

According to the present invention there

is provided a pressure control relief device for controlling the flow of fluid from a high pressure source to a low pressure receiving device comprising a valve body having a fluid inlet and a fluid outlet with a chamber disposed therebetween, a valve cylinder having a plurality of openings therein, at least one opening being in communication with the inlet and at least one opening being in communication with the outlet, the cylinder being disposed in the chamber and having a valve seat with an axial opening therein disposed between the inlet and the outlet openings and adaptable for receiving a slidably mounted valve thereon, said valve including a valve ball of generally the same diameter as the inner bore of the valve cylinder and adapted to be slidably mounted therein for engagement with the valve seat for closing off the axial opening, the valve ball having a flat edge thereon which is located opposite the portion of the valve ball engaging with the valve seat and is adaptable to engage a valve disc of generally the same diameter as the inner bore of the valve cylinder and is adapted to be slidably mounted therein, the valve disc being in engagement with an adjuster which is adapted to engage the valve to adjust the resisting pressure of the valve whereby flow of liquid through the valve is controlled by the pressure exerted by the adjuster on the valve.

The invention will be further described by way of example and with reference to the accompanying drawings in which:—

Figure 1 shows a perspective view of a pressure control relief valve according to the present invention with selected portions cutaway; and,

Figure 2 shows a schematic view of a valve of Figure 1 including a fluid flow conduit system.

As shown, a valve body 1 is provided

with an outlet port 2 therein passing through one wall of the valve body 1 and communicating with a valve chamber 10, and inlet ports 3a, 3b, and 3c, each of these ports passing through walls of the valve body 1 communicating with each other and the valve chamber 10.

The ports 2 and 3a, 3b, and 3c are threaded for receiving conduits 40, 41, 42 and 43 (Figure 2), respectively therein, these conduits being in communication with, for example, other conduits for fluid flow therein, pressure indicators, and the like. The valve body 1 is further provided with a bore 18 for receiving adjusting means and slidably mounted valve means therein, the slidably mounted valve means being in communication with the adjusting means and operable in response to the setting of the adjusting means. The bore 18 includes a threaded portion 25 therein for receiving the adjusting means, the adjusting means including a spring housing 16 having a threaded outer portion 17 adaptable for being received by and in threaded engagement with the threaded portion 25, a spring 14 to be received within the housing 16, and an adjusting member 22 adapted to mate with the spring 14.

The bore 18 at its inward extremity includes the valve chamber 10, the valve chamber 10 being disposed adjacent the threaded portion 25 and adaptable for receiving a valve cylinder 5 therein. The valve cylinder 5 is open at each end and has a channel portion 20 extending around the outer periphery thereof with a plurality of passageways therethrough, two being shown by numerals 6a and 6b. Fluid passing through the inlet opening identifiable by numeral 15, of the valve cylinder 5 escapes from the cylinder 5 through the passageways 6a and 6b into the channel 20 and out of the valve through the outlet port 2. The valve cylinder 5 also includes an O-ring 28 disposed around the outer periphery of the cylinder 5 for fluid tight communication with the walls of the valve chamber 10.

Disposed between the openings 6a and 6b in the valve cylinder 5 and the opening 15 is a valve seat 4 having an axial opening therein for receiving the slidably mounted valve means thereon. The slidably mounted valve means includes a valve ball 7 and a valve disc 9. The valve ball 7 is adaptable for fluid tight engagement with the axial opening of the valve seat 4 and slidable movement in the valve cylinder 5 thereby controlling the flow of fluid there-through. The valve seat 4 includes an O-ring 29 disposed around the outer periphery thereof for fluid tight communication with the walls of the valve cylinder 5.

The valve ball 7 is generally of the same diameter as the inner bore of the valve cylinder 5, and is provided with a flat edge 8, which is opposite the portion of the ball that engages with the axial opening in the seat 4 and is adaptable for co-operation with a valve disc 9. The valve disc 9 is generally the same diameter as the inner bore of the valve cylinder 5 and includes an O-ring 11 disposed around the outer periphery thereof, O-ring 11 being a sealing member for maintaining the valve disc 9 in fluid tight communication with the inner walls of the valve cylinder 5. The valve disc 9 further includes a longitudinally extending stem portion 12 and receiving ledge 13 for alignment with and receipt of one end of the spring 14, which is provided to urge the valve disc 9 and the valve ball 7 toward the valve seat 4 to close off the valve cylinder opening 15.

The spring housing 16 is provided with a threaded bore portion 21 for receiving an adjusting member 22 therein, having a threaded portion 31 for engagement with the threaded bore 21.

The adjusting member 22 includes a longitudinally extending stem portion 27 and a receiving ledge 32 for alignment with and receipt of the opposite end of the spring 14. The adjusting member 22 further includes a handle 26 for rotation of the adjusting member 22 out of or into the spring housing 16. By rotation of the adjusting member 22, the spring 14 is urged toward or released from the co-operating valve disc 9.

A lock nut 19 is provided on the threaded portion 17 of the spring housing 16 for preventing the spring housing from slacking back once it is positioned in its preselected position. Further, a lock nut 24 is provided to engage with the threaded portion 31 of adjusting member 22 to prevent the adjusting member 22 also from slacking back.

The valve can be easily disassembled by removing the adjusting member 22 together with the spring housing 16 whereby the valve cylinder 5, the valve disc 9, and the valve ball 7 may then be removed from the valve chamber 10.

In Figure 2, one example of the pressure control relief valve according to the present invention in a fluid flow conduit system is schematically illustrated. Outlet port 2 having a threaded bore therein is connected to a conduit 40. Conduit 40 is a return conduit for transporting fluid to a high pressure flow conduit 45, the conduit 45 being in communication with a high pressure fluid source. Threaded port 3c is connected to a pressure indicator 44 through a conduit 43. Threaded ports 3a and 3b, are connected to conduits 41 and 130

42 thereby allowing for the passing of fluid through the valve body 1. Conduit 42 is also in communication with conduit 45 for receiving fluid from a high pressure source and conduit 41 is in communication with a low pressure receiving device.

In operation, the adjusting member 22 is rotated inwardly urging the spring 14 against the valve disc 9 exerting pressure on the valve ball 7 pressing the valve ball 7 against the valve seat 4 thereby closing off the valve cylinder opening 15. The high pressure fluid is then allowed to pass through the port 3b at full line pressure. The adjusting member 22 is then rotated outwardly to release pressure on spring 14, in turn releasing the valve ball 7 from fluid tight engagement with opening 15. As the adjusting member 22 is continued in its outward movement, pressure upon spring 14 is released and fluid flow starts through opening 15 and out through outlet 2. The adjusting member 22 is continued in its outward rotation until the desired pressure on a pressure indicator 44 is obtained. The lock nut 24 is then adjusted downwardly until it meets with the spring housing 16 thereby preventing the slacking back of the adjusting member 22 which in turn sets the pressure necessary to initiate the flow of fluid through the valve.

WHAT WE CLAIM IS:—

1. A pressure control relief device for controlling the flow of fluid from a high pressure source to a low pressure receiving device comprising a valve body having a fluid inlet and a fluid outlet with a chamber disposed therebetween, a valve cylinder having a plurality of openings therein, at least one opening being in communication with the inlet and at least one opening

being in communication with the outlet, the cylinder being disposed in the chamber and having a valve seat with an axial opening therein disposed between the inlet and the outlet openings and adaptable for receiving a slidably mounted valve thereon, said valve including a valve ball of generally the same diameter as the inner bore of the valve cylinder and adapted to be slidably mounted therein for engagement with the valve seat for closing off the axial opening, the valve ball having a flat edge thereon which is located opposite the portion of the valve ball engaging with the valve seat and is adaptable to engage a valve disc of generally the same diameter as the inner bore of the valve cylinder and is adapted to be slidably mounted therein, the valve disc being in engagement with an adjuster which is adapted to engage the valve to adjust the resisting pressure of the valve whereby flow of fluid through the valve is controlled by the pressure exerted by the adjuster on the valve.

2. A device according to Claim 1 wherein the adjuster comprises a member which contacts one end of a spring, the other end of the spring contacting the valve disc which in turn can bear on a part of the valve so that the pressure exerted on the valve can be varied by varying the compression of the spring.

3. A pressure control relief device substantially as herein described with reference to the accompanying drawing.

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