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FLUID PRESSURE CONTROL DEVICE

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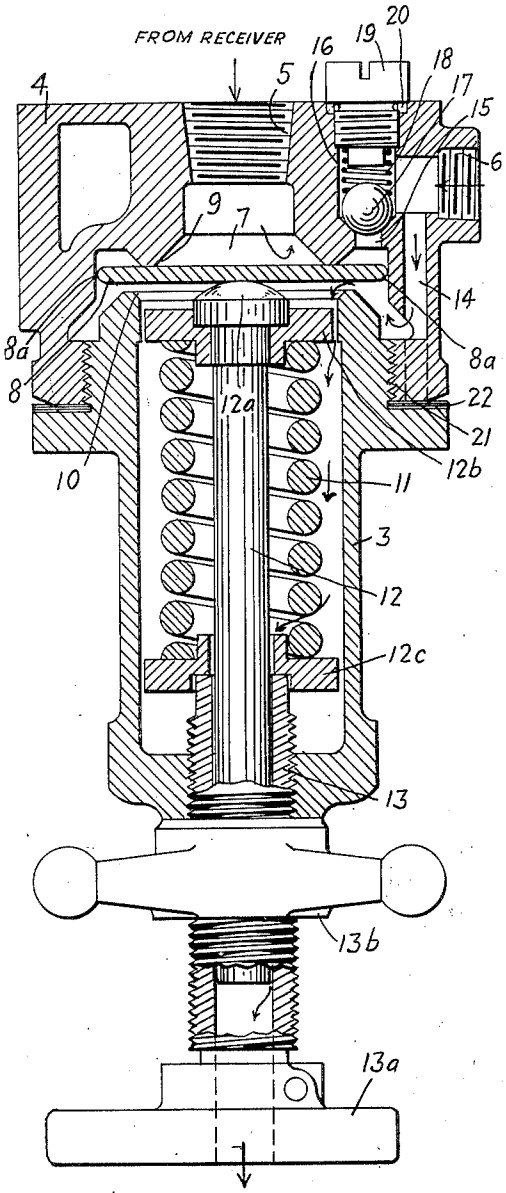

Fig. 1

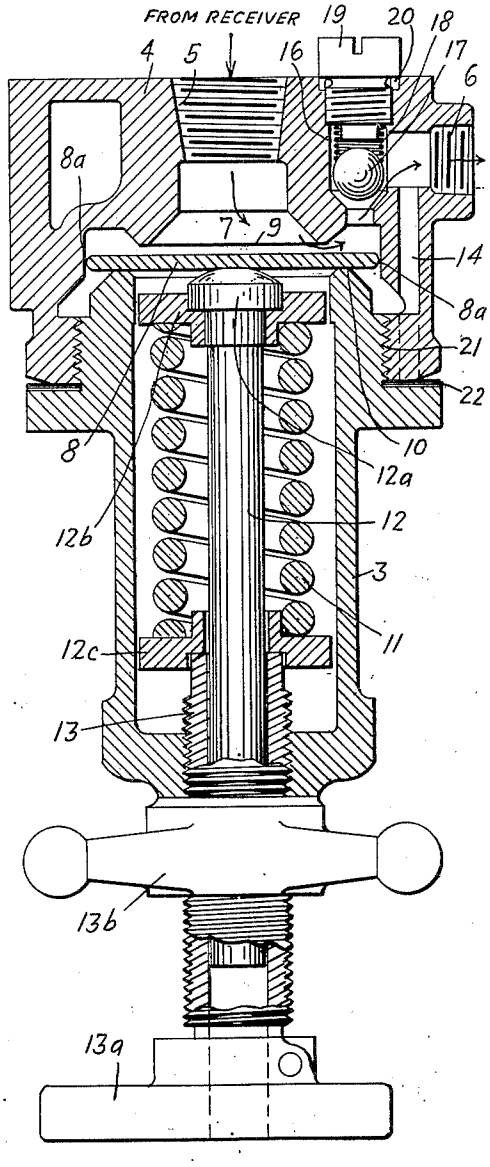

Fig. 2

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FLUID-PRESSURE-CONTROL DEVICE.

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This invention relates to fluid pressure systems and more particularly to control devices commonly referred to as actuator or pilot valves since they serve to control the admission of motive fluid to other devices. One well-known use for such devices is in the regulation of air and gas compressors in which the operation of the unloading valves is to be controlled by receiver pressure. More specifically the invention relates to differential control devices of the type shown in the patent to W. H. Callan and G. J. MacFadden No. 1,224,272, issued May 1, 1917, and may be considered as a further development of or improvement upon the same.

Among the objects of the invention are to effect a more positive action of devices of the type described, to reduce frictional resistance and sticking of the essential moving part, to permit adjustment of the range of the device without requiring the disconnecting of the pressure lines, and in general to simplify and to improve prior devices in the interest of more efficient and satisfactory service.

The invention consists in utilizing a simple plate or disc valve arranged to have minimum contact with the walls of the device. Means are provided in the outlet line to prevent immediate loss of pressure when the valve starts to move from one seat to the other so that the valve is positively seated before pressure fluid passes into the outlet line. The parts requiring repair or adjustment are arranged to be readily removable without disturbing the line connections.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawings in which:

Fig. 1 is a vertical, sectional view; and Fig. 2 is a view similar to Fig. 1 showing the parts in a different position.

The embodiment of the invention, shown for the purpose of illustration, consists of a fluid pressure control device comprising in general a body 3 and a cap 4. The cap has an opening 5 for the inlet connection, as from the pressure receiver in a compressor regulating system, and an opening 6 for an outlet connection to devices adapted to be operated by motive fluid released by the control device, as the unloading valves of a compressor. The body and the cap provide therebetween a valve chamber 7 in which is disposed a disc or plate valve 8 movable between a relatively small annular seat 9 provided by cap 4 and a somewhat larger seat 10 in body 3. Valve 8 is formed with a rounded or otherwise reduced edge 8^a in order to make a line contact with the walls of chamber 7 and thus reduce frictional resistance to its movement to a minimum. Valve 8 is normally held in engagement with seat 9 to cut off the fluid supply from inlet 5 through the action of a spring 11 disposed in body 3, the spring acting upon the valve through a plunger 12 having a head 12^a engaging the valve and provided with an abutment collar 12^b for the spring. At its opposite end spring 11 engages an adjustable stop collar 12^c, slidable on stem 12. Collar 12^c seats against the end of a tubular adjusting screw 13 threaded into the lower end of body 3 and receiving within its bore plunger 12 with a loose fit. Screw 13 is manually adjustable by means of a handle 13^a on the end thereof and a locking nut 13^b maintains the screw in adjusted position.

With the parts in the position shown in Fig. 1, the outlet line (not shown) which connects with outlet opening 6 is in free communication with atmosphere through a branch connection or passage 14 in cap 4 communicating with the chamber 7 beneath valve 8 through the loose fit of abutment collar 12^c in body 3 and of plunger 12 in the bore of tubular adjustment screw 13. Alternatively a vent port may be made in the wall of body 3 if desired. Passage 14 connects with chamber 7 outwardly of seat 10 so that when valve 8 engages the latter the vent to atmosphere is closed.

When the pressure in the inlet line (not shown) which connects with opening 5 becomes sufficient to overcome the pressure of spring 11, the valve moves from seat 9 toward seat 10. Immediately upon leaving seat 9 valve 8 releases motive fluid to pass to outward opening 6 through a branch connection or passage 15 which connects with chamber 7 outwardly of seat 9. Free escape of the pressure fluid would cause the valve 8 to vibrate or flutter. The means for preventing such undesirable action preferably takes the form

of a check valve control for passage 15. To this end cap 4 is counterbored at 16 to receive a ball valve 17 normally forced to a seat over passage 15 by a spring 18 retained in operative relation by a screw plug 19 seated upon a copper washer 20 to secure a fluid tight joint. The pressure of spring 18 upon the check valve 17 is sufficient to prevent initial escape of pressure fluid to the outlet connection so that valve 8 is moved to and positively seated against seat 10. The pressure fluid then forces ball valve 17 from its seat and passes freely through the outlet connection (as indicated by the arrows in Fig. 2) to actuate the devices in the outlet line. When the inlet or receiver pressure falls so that valve 8 is forced back against seat 9 by the pressure of spring 11, check valve 15 returns to its seat and the pressure remaining in the outlet connection is vented to atmosphere through the body of the control device as indicated by the arrows in Fig. 1.

The range of operation of valve 8 is determined by the distance between the opposed valve seats 9 and 10. To permit a convenient adjustment of the range of valve movement body 3 has threaded connection with cap 4 at 21 to permit the insertion or removal of spacing members such as shims 22. Thus the movable parts controlling the operation of valve 8 are readily accessible for repair or replacement by unscrewing body 3 without disturbing the fluid pressure lines leading to the device both of which connect with cap 4. Check valve 15 is readily accessible by removing plug 19.

From the above it will be apparent that the use of a simple plate or disc valve with rounded edges reduces to a minimum the contact of the valve with the walls of its chamber and the frictional resistance to the movement of the same, that the use of a check valve in the outlet line produces a momentary delay in the escape of pressure fluid from chamber 7 which in conjunction with the greater area exposed to pressure as the pressure control valve leaves seat 9 insures its positive movement to and engagement with seat 10, and that the particular arrangement of the cap and body parts of the device permit ready access to all moving parts without disturbing the line connections.

While a preferred form of the invention has been herein shown and described, it is to be understood that the invention is not limited to the specific details thereof but covers all changes, modifications and adaptations within the scope of the appended claims.

We claim as our invention:

1. A fluid pressure control device having spaced valve seats, a valve movable between said seats, means yieldingly maintaining said valve against one of said seats, a passage uncovered by initial movement of said valve from said last named seat, and means preventing movement of fluid through said passage until said valve engages the other seat.

2. A fluid pressure control device having spaced valve seats, a valve movable between said seats, means yieldingly maintaining said valve against one of said seats, a passage uncovered by initial movement of said valve from said last named seat, and a check valve in said passage for temporarily resisting movement of fluid therethrough.

3. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, a valve movable between said seats, an outlet from said device having branches connecting with both sides of said valve chamber under control of said valve, and means preventing movement of fluid through one of said branches in one direction.

4. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, a valve movable between said seats, an outlet from said device having branches connecting with both sides of said valve chamber under control of said valve, and means in the branch leading to the fluid pressure side of said chamber for preventing movement of fluid in one direction.

5. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, a valve movable between said seats, an outlet from said device having branches connecting with both sides of said valve chamber under control of said valve, and a check valve in one of said branches.

6. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, a valve movable between said seats, an outlet from said device having branches connecting with both sides of said valve chamber under control of said valve, and a check valve in the branch leading to the fluid pressure side of said chamber.

7. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, a disc valve movable between said seats, the edges of said valve being reduced to make line contact with the walls of said chamber, and an outlet for said device having branches connecting with both sides of said valve chamber under control of said valve.

8. A fluid pressure control device comprising a cap and a body presenting opposed valve seats and a valve chamber therebetween, said cap having inlet and outlet connections for pressure fluid extending to said chamber, the outlet connection extending to both sides of said chamber, said body connecting said chamber to atmosphere, and a disc valve movable between said seats and having restricted contact with the walls of said chamber, said valve being arranged to establish connection of said outlet either with the inlet or with atmosphere.

9. A fluid pressure control device comprising a cap and a body presenting opposed valve seats and a valve chamber therebetween, said cap having inlet and outlet connections for pressure fluid extending to said chamber, the outlet connection extending to both sides of said chamber, said body connecting said chamber to atmosphere, a valve movable between said seats, and means for adjusting the distance between said seats without disturbing the inlet and outlet line connections to the device.

10. A fluid pressure control device comprising a cap and a body presenting opposed valve seats and a valve chamber therebetween, said cap having inlet and outlet connections for pressure fluid extending to said chamber, said body connecting said chamber to atmosphere, a valve movable between said seats, and means including an interengaging connection between said cap and said body for adjusting the distance between said seats without disturbing the inlet and outlet line connections to the device.

11. A fluid pressure control device comprising a casing having two parts adjustably secured together to form a valve chamber, said parts presenting opposed valve seats within said chamber, the opposite sides of said chamber being arranged to connect respectively to a source of fluid pressure and to atmosphere, an outlet having branches extending to both sides of said valve chamber, a valve in said chamber for cooperation with said seats and to control said outlet branches, means yieldingly maintaining said valve against the seat which closes said pressure fluid inlet, and means temporarily checking the flow of pressure fluid to said outlet when the valve moves from said last named seat.

12. A fluid pressure control device comprising a casing having two parts adjustably secured together to form a valve chamber, said parts presenting opposed valve seats within said chamber, the opposite sides of said chamber being arranged to connect respectively to a source of fluid pressure and to atmosphere, an outlet having branches extending to both sides of said valve chamber, a disc valve cooperating with said seats and controlling said outlet branches, said valve having a rounded edge making a line contact with the walls of said chamber, means yieldingly maintaining said valve against the seat which closes said pressure fluid inlet, and means temporarily checking the flow of pressure fluid to said outlet when the valve moves from said last named seat.

13. A fluid pressure control device comprising a casing having two parts adjustably secured together to form a valve chamber, said parts presenting opposed valve seats within said chamber, the opposite sides of said chamber being arranged to connect respectively to a source of fluid pressure and to atmosphere, an outlet having branches extending to both sides of said valve chamber, a disc valve cooperating with said seats and controlling said outlet branches, means yieldingly maintaining said valve in contact with the seat which controls the fluid pressure inlet until a predetermined pressure is reached, said last named seat being smaller than said valve so as to subject a greater area of the valve to fluid pressure when the valve is forced to the other seat, and means temporarily checking the flow of pressure fluid to said outlet when the valve moves from the pressure fluid inlet seat.

14. A fluid pressure control device comprising a casing having two parts adjustably secured together to form a valve chamber, said parts presenting opposed valve seats within said chamber, the opposite sides of said chamber being arranged to connect respectively to a source of fluid pressure and to atmosphere, an outlet connection having branches extending to both sides of said valve chamber, a disc valve cooperating with said seats and controlling said outlet branches, said valve being arranged to present a minimum contact area to the walls of said chamber, adjustable means yieldingly maintaining said valve in contact with the seat which controls the fluid pressure inlet, and a check valve in the outlet branch leading to the inlet side of said chamber for checking the flow of pressure fluid to the outlet until said valve has engaged said other seat.

15. A fluid pressure control device having spaced valve seats, a valve movable between said seats, means yieldingly maintaining said valve against one of said seats, a passage uncovered by initial movement of said valve from said last named seat, means preventing movement of fluid through said passage during movement of the valve from one seat to the other, and means for adjusting the distance between said valve seats.

16. A fluid pressure control device having spaced valve seats, means for adjusting the distance between said seats, a valve movable between said seats, means yieldingly maintaining said valve against one of said seats, a passage uncovered by initial movement of

said valve from said last named seat, and valve means in said passage for temporarily resisting movement of fluid therethrough.

17. A fluid pressure control device having spaced valve seats, means for adjusting the distance between said seats, a disk valve movable between said seats, resilient means for normally holding said valve against one of said seats, means for adjusting said resilient means, a passage uncovered by initial movement of said valve from said last named seat, and valve means in said passage for temporarily resisting movement of fluid therethrough.

18. A fluid pressure control device having a valve chamber, one side of said chamber arranged to connect with a source of fluid pressure, the other side communicating with atmosphere, opposed valve seats in said chamber, means for adjusting the distance between said valve seats, a valve movable between said seats, an outlet from said device having branches connecting with both sides of said valve chamber under control of said valve, and a check valve in one of said branches.

19. A fluid pressure control device comprising a casing having two parts presenting opposed valve seats within said chamber, the opposite sides of said chamber being arranged to connect respectively to a source of fluid pressure and to atmosphere, one part having an outlet connection with branches extending to both sides of said valve chamber, a valve cooperating with said seats and controlling said outlet branches, adjustable means yieldingly maintaining said valve in contact with the seat which controls the fluid pressure inlet, and a check valve in the outlet branch leading to the inlet side of said chamber.

Signed by us at Franklin, Pa., this 25th day of August, 1926.

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