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F. J. BAST

VALVE FOR AUTOMATIC CONTROLLERS AND THE LIKE

Original Filed June 3, 1923

Fig. 1.

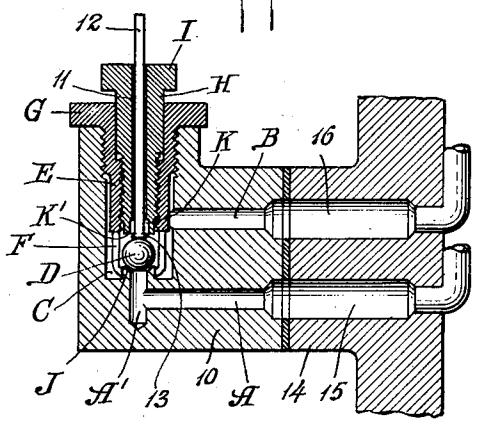


Fig. 2.

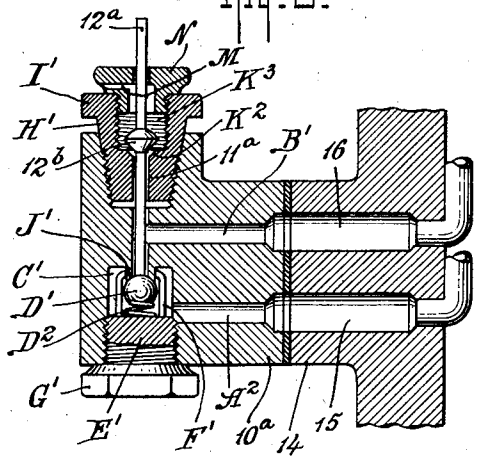
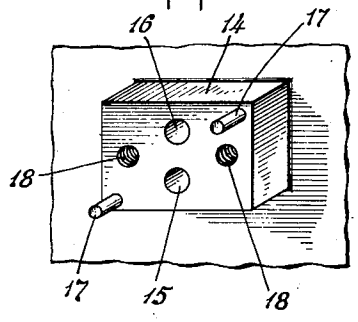


Fig. 3.



WITNESS

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UNITED STATES PATENT OFFICE.

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VALVE FOR AUTOMATIC CONTROLLERS AND THE LIKE.

Original application filed June 3, 1923, Serial No. 610,532. Divided and this application filed June 24, 1924. Serial No. 721,967.

My invention relates to valves for automatic controllers and the like and more particularly to that type commonly referred to as air valves and which constitute part of the controlling means in instruments of the above indicated class. In automatic controllers and similar apparatus such as referred to herein, the efficiency and accuracy of the instrument is dependent upon the correct adjustment of the controlling means and particularly of the air valves forming part thereof. At the same time, it is desirable to construct such air valves in a manner to permit them to be taken apart for cleaning, repairing and other purposes; this ability to dismantle the valve carries with it the necessity for readjustment of the parts subsequent to each dismantling and for very careful reassembling thereof with the existing possibility of error and incorrect setting.

The object of the present invention is to provide a valve of the indicated type constructed in a novel manner to operate with a maximum efficiency and so as to be capable of being dismantled and reassembled without in any way interfering with or disturbing the adjustment of the parts. The invention contemplates further the provision of a construction whereby differently acting air valves may be substituted for each other without affecting the efficiency of the apparatus or of the valves themselves. Other more specific objects will appear from the description hereinafter and the features of novelty will be pointed out in the claims. The present application is a division of another application filed by me in the United States Patent Office on June 3, 1923, Serial No. 610,532.

In the accompanying drawings, which illustrate examples of the invention without defining its limits, Fig. 1 is a sectional elevation of a direct-acting air valve embodying the novel features; Fig. 2 is a similar view of an indirect acting air valve and Fig. 3 is a perspective view illustrating a novel mounting for said valves.

Generally speaking air valves of the type herein referred to, which usually control diaphragm motor valves forming part of the apparatus, are made in two forms, one of which, for the purpose of distinction, is termed a direct acting valve and the other a reverse acting valve. The first mentioned valve acts in one direction when air or other fluid pressure is applied to its valve member while the second type operates in an opposite manner when its valve member is subjected to air or other fluid pressure.

A direct-acting air valve such as is shown in Fig. 1 consists of a suitable body 10 with passages A and B leading to a chamber C drilled out in said body, said passages A and B being adapted for communication with a diaphragm motor valve and with a source of fluid, such as air under pressure. A ball D is held in the removable cage fitting E which is provided with the fingers F, and external thread and a wrench head G. This cage fitting E is also provided with an internal thread which receives the valve-stem bushing H provided also with a wrench head I.

An axial passage 11 extends lengthwise of the bushing H, the latter at its inner end terminating in an escape port K having a valve seat K′ which is located in spaced registry with a second valve seat J formed in the chamber C at the end of a port A′ which is in communication with the passage A; in the operative condition of the valve the ball D is located between said valve seats and by cooperation therewith performs the controlling functions. A stem 12 extends lengthwise of the passage 11 and beyond the same at opposite ends, said stem 12 at its inner end being formed with a slight head 13, the purpose of which will appear more fully hereinafter; the diameter of the stem 12 is somewhat less than that of the passage 11 so that the latter, under certain operative conditions, acts as an exhaust or relief passage. The parts so far described are assembled as follows:

The stem 12 with its head 13 is inserted into the passage 11 in the bushing H from the lower or seat end and the ball D is entered into the cage fitting E from the wrench head end G thereof. The bushing H is then screwed into the cage fitting E and the latter is then screwed home into the body 10. By adjusting the bushing H, the ball D is brought into exactly the right relationship, a matter of only a few thousandths of an inch, with both the lower and upper seats J and K. Whenever, for any reason, it is desired to dismantle the valve, the cage fit-

ting E with the bushing H and ball D combined therewith may be removed at any time for inspection and cleaning of the valve ball, etc., and without either the ball D or stem 12 falling out of the assembly. To reassemble the parts the cage fitting E with its associated elements is simply screwed back into the body 10. Both of these operations may be performed without in any way disturbing the adjustment of the bushing H and the relationship of the two valve seats J and K to each other, it being understood that the final inward adjustment of the cage-fitting E is determined by the engagement of the wrench head G with the valve body 10.

The direct-acting air valve functions as follows: When the cooperating device of the instrument, which device, as shown in the application of which this is a division, may be a transmission lever, is not in contact with the valve stem 12, the full air pressure with which the passage A of the valve is in communication, is effective through the passage B, which as previously stated may lead to a diaphragm motor valve. The air supply reaches the air valve through the passage A which ends in the port A′ terminating at the beveled seat J above which the valve ball D is located. Because of the freedom of the valve stem 12, the air pressure is enabled to raise the ball D and enters the chamber C, from whence it cannot escape to the atmosphere because the air pressure keeps the ball D against the upper seat K which may be the beveled edge of the escape port K′, the latter being located at the end of the passage 11 through which the stem 12 passes loosely. The chamber C is then only in communication with the passages A and B, the latter of which communicates with the diaphragm motor valve so that the latter, therefore, receives the full air pressure and closes.

If the aforesaid cooperating device, such as the transmission lever of the controller, pushes against the stem 12 only to an extent sufficient to move the ball D from its upper seat K without however bringing it against its lower seat J, the air pressure entering the chamber C will be partly relieved through the leak afforded by the loose fit of stem 12 in the passage 11 of the valve stem bushing H. Thus only a part of the air pressure passes through the passage B to the aforesaid diaphragm motor valve, which as a result is only partly closed and thus performs a throttling action without cutting off entirely.

When the cooperating device as exemplified by the previously mentioned transmission lever of the controller presses against stem 12 sufficiently to hold the ball valve D tightly against the lower seat J, the air pressure supply from the passage A to the passage B will be completely cut off, while any pressure existent in said passage B is free to be relieved to the atmosphere through the channel 11 along the stem 12; the above is due to the fact that no air can enter through supply port A′ and that the escape port K is open. Under such conditions, the diaphragm motor valve controlled by the air valve will be fully opened by the action of its spring.

A reverse acting air valve such as illustrated in Fig. 2, consists of a suitable body 10^a with the passages A^2 and B′ and the chamber C′ drilled out, as shown, the passages A^2 and B′ being arranged for connection with a diaphragm motor valve or its equivalent and a source of fluid pressure as in the direct air valve of Fig. 1. The ball D′ is held in the removable cage fitting E′ which is provided with the fingers F′; the ball D′ is inserted into the cage by springing apart said fingers, after the spring D^2 which acts upon the ball D′ has been dropped into the recess provided for it. The cage fitting E′ is arranged with an external screw thread for connection with the body 10^a and is provided with a wrench head G′; the cage fitting E′ is thus removable at will, for inspection and cleaning, without having the ball drop out. The ball D′ cooperates with a valve seat J′ to control the communication between the passages A^2 and B′ as in the direct acting valve. The stem 12^a is held by the bushing H′ also provided with a wrench head I′ and arranged to screw into the body 10^a as shown in Fig. 2, said stem 12^a fitting loosely within an axial passage 11^a of the bushing H′, which passage at its one end terminates in the valve seat K^2 and connects with an escape port K^3; as shown in Fig. 2, said stem carries a valve member 12^b which, by cooperation with the seat K^2 controls the passage 11^a. By adjusting the bushing H′ the seat K^2 is raised or lowered so that the relationship of the lower and upper seats J′ and K^2, upon which the most accurate functioning of the controller is dependent, can be arranged as conditions require. This adjustment need not be disturbed, however, for inspecting and cleaning the valve stem, as the latter is held in the bushing H′ by the screw-threaded cap N having an escape passage M and provided with milled head. It will be obvious that by unscrewing cap L, the stem 12^a may be removed without disturbing the bushing H′ and without changing the relation of the two valve seats J′ and K^2; similarly, the cage-fitting E′ and ball D′ may be disconnected from the valve body 10^a without interference with the adjustment of said valve seats.

The described reverse acting air valve functions as follows: When the cooperating device, as represented, for instance, by the aforesaid transmission lever of the controller, presses against the stem 12^a, to an extent sufficient to maintain the valve member

12^b against the seat K^2 and the ball D', fully away from the seat J', the full air pressure from the passage A^2 is effective through the passage B' and thus on the diaphragm motor valve or other instrumentality which is under control of the air valve. The air supply reaches the air valve through the passage A^2 which communicates with the chamber C', the latter being provided with a supply port having the seat J' from which, in this case, the valve ball D' is pushed away against the resistance of the compression spring D^2. The full air pressure thus is communicated through outlet passage B' and no pressure escapes through the passage 11^a as the valve member 12^b, provided on the stem 12^a, is held, in this case, against the seat K^2 of the escape port K'.

In the case of a reverse-acting air valve, if the previously mentioned transmission lever of the controller or its equivalent pushes against the stem 12^a only to an extent sufficient to move the ball D' away from its seat J' without bringing the valve member 12^b against its seat K^2, the air pressure entering the chamber C' through the passage A' is partly relieved through the passage 11^a in the valve-stem bushing H'. Thus, only a part of the air pressure from supply passage A^2 is effective through the passage B' and on the diaphragm motor valve with which it is in connection, with the result that the diaphragm motor valve is partly open.

Also, in the case of a reverse-acting valve, when the transmission lever of the controller or its equivalent is not in contact with the valve stem 12^a, the latter is lifted by the action of the spring D^2 upon the ball D' to the position shown in Fig. 2; in this position of the parts, the ball D' is seated against the seat J' and the valve member is out of engagement with the seat K^2 so that the air pressure supply to the passage B' and to its connected instrumentality is cut off, while any air pressure existent in said passage B' is free to be relieved to the atmosphere through the passage 11^a.

To facilitate the interchange of the two valves, one for the other, said valves may be arranged to be mounted upon a boss 14, forming part of the apparatus with which the valves are intended to cooperate and having open ended passages 15 and 16 communicating respectively, for instance, with a source of pressure and the aforesaid diaphragm valve. Pins 17 project outwardly from the face of the boss 14 which is also provided with screw-threaded apertures 18 for the reception of screws whereby the selected valve is secured in place, with its passages A and B or A^2 and B', in communication with the passages 15 and 16 of the boss 14. Each valve, regardless of type, includes a base having openings which set over the pins 17 to properly position the valve on the boss 14 and with apertures through which the securing screws pass into the apertures 18 to fix the valve in place; a suitable gasket 19 is preferably located upon the face of the boss 14 to make the connection air tight. When it is desired to substitute one valve for another, all that is required is to remove the screws from the apertures 18 and the valve which is thus disconnected from the boss 14; the new valve may then be placed in position by setting the proper openings over the pins 17 and replacing the screws in the apertures 18.

The invention provides an air valve of maximum efficiency capable of being easily dismantled and re-assembled without interference with the adjustment thereof and adapted to be incorporated in many different types of controlling apparatus.

Various changes in the specific form shown and described may be made within the scope of the claims without departing from the spirit of my invention.

I claim:

1. An automatically operating adjustable valve comprising a casing having an inlet and outlet, a fixed valve seat in said casing, a fitting removably mounted in said casing, a bushing freely rotatable in said fitting to vary its position therein and provided with an exhaust passage arranged to communicate with either the inlet or the outlet of said casing, a valve seat at the inner end of said exhaust passage on said bushing and adjustable thereby to vary its position with respect to the fixed valve seat, said fitting and bushing being removable from said casing without disturbing the adjustment of the bushing in said fitting, and a valve member movable between said seats and cooperating therewith to control communication between the inlet and outlet and between the inlet or outlet and said exhaust passage.

2. An automatically operating adjustable valve comprising a casing having an inlet and an outlet, a fixed valve seat in said casing between said inlet and outlet, a movable valve seat adjustably mounted in said casing and comprising part of an exhaust outlet, said movable seat being arranged to occupy selected positions with respect to the fixed valve seat, a valve member cooperating with said fixed valve seat to control the communication between said inlet and outlet and freely removable means whereby said valve member may be removed from said casing and replaced therein independently of any adjustment of said valve seats.

3. An automatically operating adjustable air valve comprising a casing having an inlet and an outlet and having one valve seat fixed therein, a cage fitting removably mounted in said casing, a cage projecting therefrom, a bushing freely rotatable in said fitting to vary its position therein, a second

valve seat on said bushing adjustable thereby relatively to said first valve seat and a ball valve contained in said cage and movable independently thereof between said seats and cooperating therewith to control the passage of air through said inlet and outlet and out of said casing.

4. An automatically operating adjustable air valve comprising a casing having an inlet and an outlet and having one valve seat fixed therein, a cage fitting removably mounted in said casing, a cage projecting therefrom and extending over said fixed valve seat in the assembled condition of the valve, a removably mounted bushing, a second valve seat on said bushing and adjustable thereby relatively to said first valve seat, valve means located at least in part in said cage and cooperating with said first seat to control communication between said inlet and outlet and with said second seat to control communication between the interior of said valve casing and the atmosphere, said valve means being movable independently of said cage and cage fitting.

In testimony whereof I have hereunto set my hand.

FRANK J. BAST.