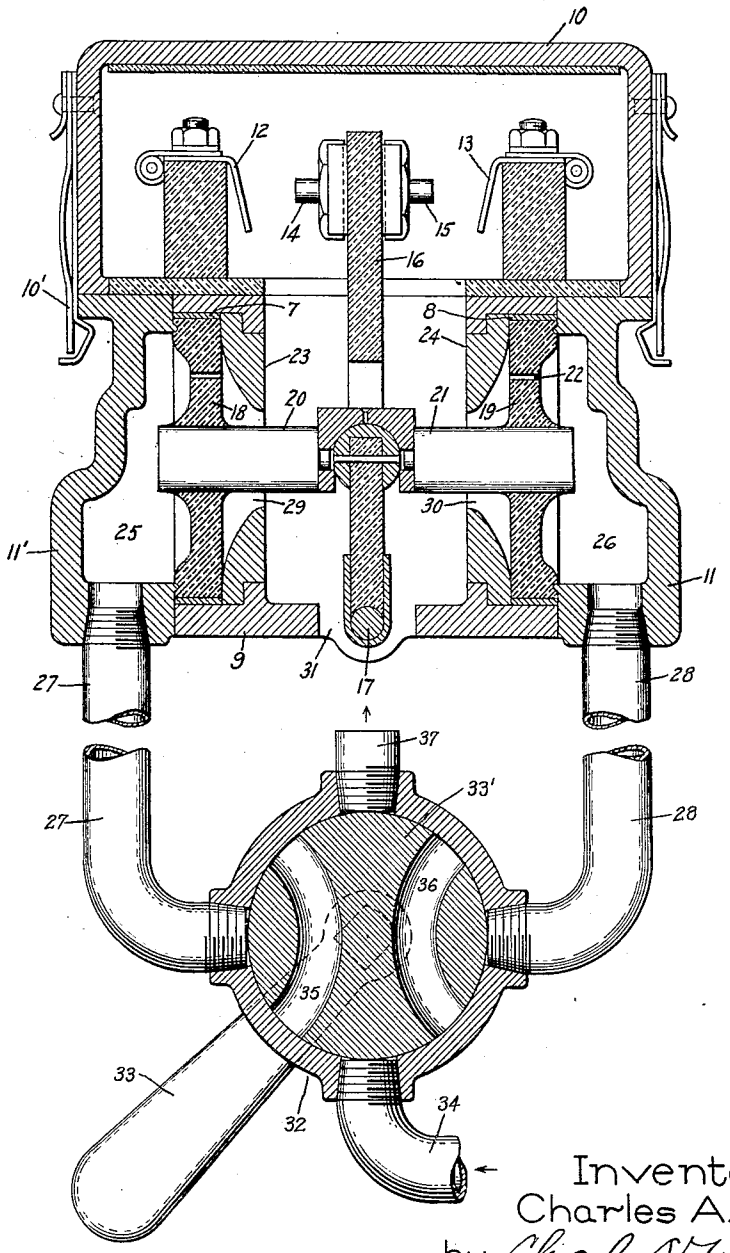
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PNEUMATIC CONTROL DEVICE

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PNEUMATIC CONTROL DEVICE

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My invention relates to control apparatus, more particularly to pneumatic control apparatus.

In some forms of contactor mechanism for controlling electric circuits, pneumatic means are used to operate the contactor mechanism. In this type of control mechanism, fluid under pressure is admitted against one side of a diaphragm which actuates a moving contact-carrying element of the contactor. Due to slow or partial opening of the valves for controlling the fluid under pressure a slow making and breaking of the contacts of the contactor may result thereby causing arcing at the contacts, particularly in interrupting the circuit. This, of course, results in a rapid deterioration of the contacts which requires frequent replacements and may also produce improper operation of the apparatus controlled by the contactor. Further, it is difficult to design a contactor of the above type which can be readily placed at the point of control and which is inexpensive and simple and which can handle high voltages.

Hence it is the principal object of my invention to provide a quick-acting pneumatic-operating device for a contactor thereby preventing arcing and insuring longer life of the contactor as well as better operation of the apparatus controlled thereby.

It is a further object of my invention to simplify the pneumatic-control apparatus and to provide an inexpensive contactor which can easily be attached where desired.

These and other objects will appear hereinafter.

Briefly, the preferred embodiment of my invention consists of a casing in which is mounted a pair of contacts between which a movable element carrying a contact is actuated. Oppositely disposed and connected to this movable contact-carrying element by means of pins are a pair of resilient rubber diaphragms, each bonded to a portion of the casing under tension. The pins connecting the movable element to the diaphragms are mounted centrally of the diaphragms and when the diaphragms become flexed by the application of a fluid under pressure to one side thereof, this flexing movement causes a movement of the movable contact-carrying member so that the contact mounted thereon will come into engagement with one or the other of the two stationary contacts mounted within the casing. The other side of the diaphragms are open to the atmosphere. A port in said diaphragm cooperating with a retaining plate permits a quick return of the diaphragm to an unflexed position when the fluid under pressure is no longer furnished to flex the same by permitting a rapid equalization of the pressures on the two sides of the diaphragm. This construction produces a quick break contactor which is highly desirable in for example a magnetic valve control for a pneumatic brake. Further it can be readily attached to the brake valve.

A better understanding of my invention will be had by referring to the following description and the accompanying drawing.

The single figure in the drawing represents a cross section of my invention.

A casing comprising four parts 9, 10, 11 and 11′ houses the contactor mechanism. In the upper portion 10 of the casing, which is maintained in engagement with the lower portions 9—11 and 11′ by means of the snap spring members 10′, are mounted the stationary contact elements 12 and 13 and cooperating therewith are the contacts 14 and 15 carried by the pivoted contactor-carrying elment 16 which is pivoted at 17. Mounted on opposite sides of the pivoted member 16 and in the lower part 9 of the casing are the rubber diaphragms 18 and 19 which are bonded to metal rims 7 and 8 in a manner such that these diaphragms are under tension.

Centrally mounted in these diaphragms are the pins or connecting members 20 and 21 which operatively connect the movable member 16 with the diaphragms to cause movement of the movable member when the diaphragms are flexed due to the application of fluid pressure on one side thereof. A port such as 22 is provided in the diaphragms which cooperate with the retaining plates 23 and 24 during operation as will be described below.

On one side of the diaphragms are pro-

vided the chambers 25 and 26 into which a fluid under pressure is furnished through the conduits 27 and 28. It will be noted that the other sides of the diaphragms open into the atmosphere through the openings 29 and 30 in the retaining plates and the opening 31 in the lower part of the casing 9.

A valve 32 for controlling the fluid under pressure is provided with an operating handle 33 which operates the portion of the valve 33′ provided with the passageways 35 and 36. A conduit 34 is provided for leading fluid under pressure to the valve and a conduit 37 provides a passage to the atmosphere. When the handle is positioned to admit fluid under pressure to chamber 25 from conduit 34 through passageway 35 and conduit 27, chamber 26 is opened to atmosphere through conduit 28, passageway 36 and conduit 37. Likewise, when the handle is positioned to admit fluid under pressure to chamber 26 through conduit 34, passageway 36 and conduit 28, chamber 25 is opened to atmosphere through conduit 27, passageway 35 and conduit 37.

The operation of the device is as follows: When no pressure is being exerted by the diaphragms, they assume the position shown in the drawing and hold the contact-carrying element 16 in a central position out of contact with either of the contacts 12 or 13. When the valve 32 is operated to admit fluid under pressure to one side or the other, for example, through the conduit 28 to the chamber 26, although there will be a slight leakage of the fluid under pressure through the port 22, sufficient pressure will be exerted upon the diaphragm to cause a flexing outwardly so that the rubber diaphragm 19 contacts with the retaining plate 24 and thereby closes the port 22 preventing any further escape of fluid from the chamber 26. This flexing movement causes a movement of the pin 21 to the left moving the contact-carrying element 16 to cause the contacts 14 and 12 to engage each other thus forming the electrical connection desired.

When the valve 32 is operated to open the conduit 28 to atmosphere through conduit 37, the pressure on the diaphragm begins to fall permitting the diaphragm, due to its elasticity and stressed condition, to begin to return to its unflexed position. As soon as the port 22 is uncovered the fluid under pressure is given an auxiliary passage to the atmosphere and the pressures on the two sides of the diaphragm rapidly equalize permitting the diaphragm to return with a quick snap action to its unflexed position with the result that the contacts 12 and 14 have their engagement quickly broken. This of course reduces the arcing which would result from a slow opening movement.

The contactor here described is small and simple in construction, is light in weight and can be readily connected to the control valve with little difficulty. Its small size, simple structure and ease of application to a brake valve permit it to be readily replaced in case of trouble which could not be done with the old type of contactor. Arcing is reduced to a minimum, increasing the life of the contactor mechanism and insuring proper operation of the valves controlling the pneumatic brake apparatus.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use and I, therefore, aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A control device including a resilient diaphragm, a retaining plate adjacent to one side of said diaphragm, said diaphragm being provided with a port for quickly equalizing pressures on both sides thereof and which is closed by said retaining plate when fluid under pressure is admitted to the opposite side of said diaphragm to cause said diaphragm to move against said retaining plate.

2. In a pneumatic contactor, a resilient diaphragm, a conduit for directing fluid under pressure against one side of said diaphragm to flex the same, the other side of said diaphragm being open to the atmosphere, a port extending through said diaphragm, means for closing said port when said diaphragm is flexed under pressure, said port permitting said diaphragm to return quickly to unflexed position when said pressure is released.

3. A control device including a resilient diaphragm fixed at its periphery and having a port formed in an intermediate flexible portion thereof, a fixed member for controlling said port disposed adjacent said flexible portion of the diaphragm, and fluid pressure means for flexing the diaphragm to close and open the port therein.

4. A pneumatic contactor comprising a movable contact-carrying member, a pair of resilient diaphragms operatively connected to said member to cause movement thereof in opposite directions, means for directing fluid under pressure against one side of said diaphragms to cause flexing thereof to move said member, said diaphragms having means for permitting said diaphragms to quickly return to unflexed position when said fluid pressure is released.

5. A pneumatic contactor comprising a casing, a movable contactor element, oppositely-disposed resilient-rubber diaphragms, said diaphragms being mounted in said casing and being provided on one side with means for

directing fluid under pressure against said diaphragms to flex the same, and connecting pins mounted at the center of said diaphragms and operatively engaging said movable element to move the same when said diaphragms are flexed, said diaphragm having means to quickly break said contact and return to unflexed position when said pressure is released.

6. A pneumatic contactor comprising a plurality of stationary contacts, a member carrying a cooperating contact and movable between said contacts, oppositely-disposed resilient diaphragms operatively connected to said member to move it into contact with one or another of said stationary contacts, means for directing fluid under pressure against said diaphragms to cause flexing thereof to move said contact-carrying member to a contacting position, said diaphragm being provided with means to quickly break said contact and return to unflexed position when said fluid pressure is released.

7. A pneumatic contactor comprising a plurality of rubber diaphragms, a retaining plate adjacent each of said diaphragms, said diaphragms being provided with a port for quickly equalizing pressures on opposite sides thereof and which is closed by said retaining plate when fluid under pressure is admitted to said diaphragm to cause said diaphragm to move against said retaining plate, and fluid conduits for directing fluid under pressure against one side of said diaphragms to cause flexing thereof to operate said contactor.

8. A contactor comprising a movable contact carrying member, a pair of oppositely-disposed resilient-rubber diaphragms operatively connected to said member to cause movement of the same, a conduit for directing fluid under pressure against one side of each diaphragm for flexing the same to move said contact-carrying member, the other side of said diaphragms being under atmospheric pressure, and said diaphragm being provided with means for permitting the same to quickly return to unflexed position when said fluid pressure is released.

9. A contactor comprising a movable contact carrying member, oppositely-disposed resilient, rubber diaphragms operatively connected to said member to cause movement of the same, conduits for directing fluid under pressure against one side of said diaphragms to flex the same to move said member, the other side of said diaphragm being open to the atmosphere, a port extending through said diaphragm, means for closing said port when said diaphragm is under pressure, said port permitting said diaphragm to return quickly to unflexed position when said pressure is released.

10. A contactor provided with oppositely-disposed resilient-rubber diaphragms having one side open to the atmosphere and the other side adapted to be exposed to fluid under pressure to flex said diaphragms, a port extending through each of said diaphragms, a retaining plate adjacent the atmospheric side of each of said diaphragms, said plate closing the port when a diaphragm is subjected to fluid under pressure, said port upon release of pressure permitting rapid equalization of the pressure on opposite sides of the diaphragms to cause said diaphragms to quickly resume an unflexed position.

11. A pneumatic contactor comprising a casing, a plurality of stationary contacts mounted within said casing, a member carrying a cooperating contact movable between said stationary contacts, a plurality of resilient diaphragms within said casing, each bonded to a metal rim under tension, said diaphragms being open on one side to the atmosphere and provided on the other with a chamber into which fluid under pressure is admitted to flex said diaphragms, operative connections between said contact-carrying member and said diaphragms whereby flexing of the same will cause movement of said contact-carrying member to contact with one or another of said stationary contacts, and said diaphragms being provided with means for permitting quick return to unflexed position when pressure is released therefrom.

12. A pneumatic contactor comprising a casing, a movable contactor element therein, a pair of oppositely-disposed resilient-rubber diaphragms mounted in said casing, said casing being provided with chambers for directing fluid under pressure against one side of said diaphragms to flex the same, connecting pins mounted centrally of said diaphragms for operatively connecting said diaphragms and said movable element to cause movement of the same when either of said diaphragms is placed under pressure, and a port extending through said diaphragms, said port on release of pressure permitting quick return of said diaphragms to unflexed position.

13. A pneumatic contactor comprising a casing, a movable contactor element therein, a pair of oppositely-disposed resilient-rubber diaphragms in said casing, each bonded to a metal rim under tension, said casing provided with means for directing fluid under pressure against one side only of said diaphragms to flex the same, connecting pins mounted centrally of said diaphragms for operatively connecting said diaphragms and said movable element to cause movement of said movable element when either of said diaphragms is subjected to fluid pressure, and a port extending through said diaphragms to permit a quick return of the same to unflexed position.

In witness whereof, I have hereunto set my hand this 12 day of August, 1930.

CHARLES A. IVES.