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PNEUMATIC DOOR-OPERATING MECHANISM

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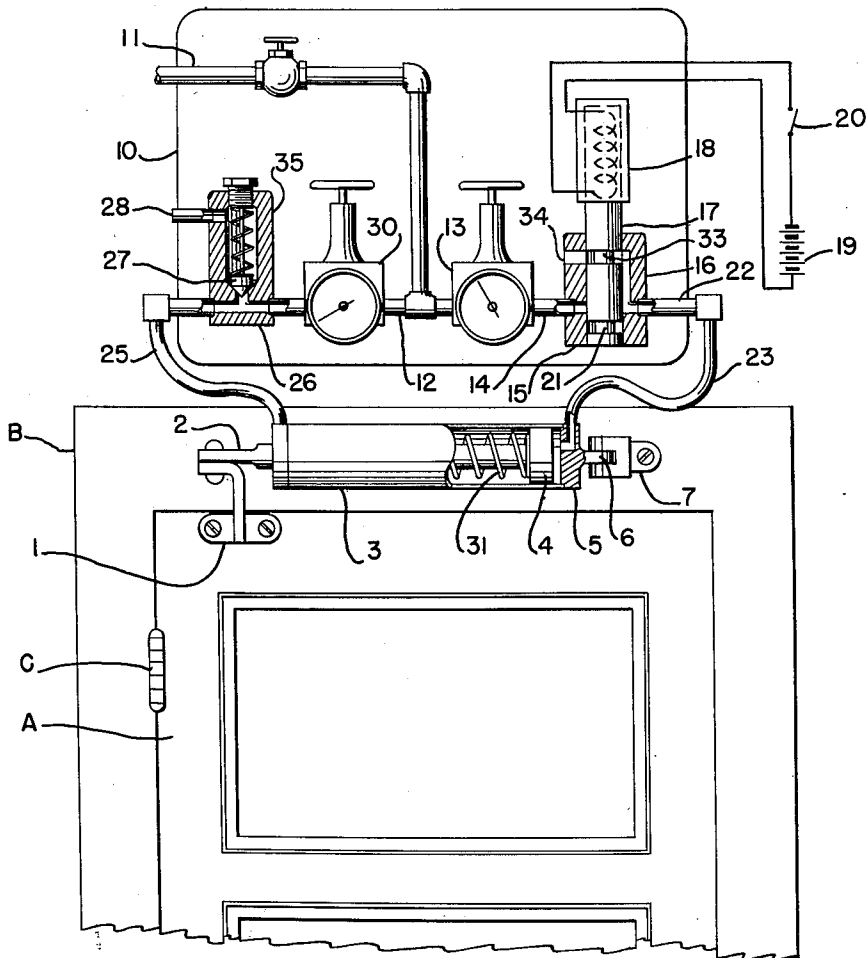


FIG. 1

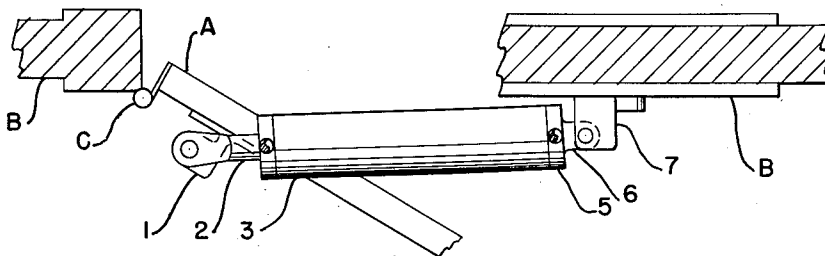


FIG. 2

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PNEUMATIC DOOR OPERATING MECHANISM

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4 Claims. (Cl. 268—66)

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This application has relation to a pneumatically operated, electrically actuated device for opening and closing a door.

It is the object of the present invention to provide a device which is pneumatically operable both to open and to close a door. It is a further object of the invention to provide a device which may be manually adjusted to control the speed of the opening and closing movements of the door. A still further object is to provide a door operating mechanism which may be maintained continuously under sufficient pressure to retain the door yieldingly in closed position until electrically actuated for opening movement. These and other objects of the invention are hereinafter fully described and reference is invited to the accompanying drawings of which:

Fig. 1 is a front elevational view of a pneumatic door operating mechanism embodying the invention; and

Fig. 2 is a plan view partly in section of a door framing and door to which the operating mechanism of the device is shown affixed.

As illustrated in the drawings, a door A is hung within a conventional framing B by means of hinges C. A bracket 1 is secured to side surface of the door at the top edge thereof in position pivotally to support the outer end of a piston rod 2 which extends into a cylinder 3 and at the inner end thereof is fitted with a piston 4. The other end of the cylinder is fitted with a head 5 from which projects a lug 6 and the latter is pivotally secured to a bracket 7 of the door frame B.

Within a casing 10, which is shown mounted on the wall to which the door framing is secured, is placed the pneumatic operating mechanism of the invention. Air under pressure is carried through a conduit 11 to a horizontal conduit 12 near the bottom center of the casing. One end of the conduit 12 communicates with a pressure regulator 13 and from this regulator through a pipe 14 to a valve 15 which, as indicated in Fig. 1, is set to check the flow of the pressure medium into the valve. The stem 17 of this valve rises through the casing thereof and it terminates at the top in the core of a solenoid magnet 18. This magnet is cut into a circuit extending from a suitable source of energy 19 and the circuit is controlled by a switch 20. When this switch is closed, it is found that the magnet is energized to elevate the stem 17 of the valve thereby to bring a passage 21 of the stem into registration with the conduit 14 and a conduit 22 extending from the valve casing in axial alignment therewith.

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A flexible tube 23 extends from the conduit 22 to a passage through the cylinder head 5, through which the pressure fluid now is free to flow and so to advance the piston 4 through the cylinder, thereby to open the door. The air within the cylinder in the front of the piston is free to pass through a flexible tube 25 into an exhaust valve casing 26, causing the air pressure to raise the valve 27 from its seat and so to open the passage for the air through an exhaust tube 28. When the door is fully opened, the switch 20 may be thrown open to break the circuit and to cause the valve stem to drop back into the position indicated in Fig. 1, thereby to cut off the flow of the pressure medium to the valve.

A second pressure regulator 30 is connected with the horizontal conduit 12 at the opposite end thereof and it is adjusted to cut down the pressure to a degree merely sufficient to return the door to a closed position but insufficient to raise the valve 27 from its seat. From this it is seen that the pressure fluid will flow through this second regulator and the flexible tube 25 to the opposite end of the cylinder to return the piston 4 to its initial position and so to close the door. It may be found advantageous to place a compression spring 31 within the cylinder to assist the pressure fluid in moving the piston to close the door. The pressure fluid in advance of the piston is, during closing operation of the door, free to return through the flexible tube 23 and the valve 16 to flow through a passage 33 of the stem which, at this time, is in registration with an exhaust passage 34 of the valve.

It is seen from the foregoing description that I have provided a pneumatic door operating mechanism adapted both to open and to close a door. It is furthermore important to note that the door at all times remains under pressure control normally to maintain the door closed until the circuit is again energized to induce opening movement thereof. As above stated, the door operating mechanism of the invention is primarily intended for use in places such as factories or restaurants where workers carrying perambulatory loads are required recurrently to pass through a normally closed door. In such cases it is common practice either to place the circuit closing switch within a pad on the floor which is actuated by the foot of the approaching worker to close the circuit and so to open the door, or a conventional photo-electric cell combination may be installed for the same purpose. This does not mean that the door cannot by a person be moved into open position, but rather that a

certain amount of force is required to move the door into open position against the pressure passing through the low pressure regulator 30. It does mean that the mechanism can be so adjusted that light pressure such as may be induced by a draft through the rooms controlled by the door will be ineffective to initiate door opening movement. It is to be understood, of course, that the pressure of the spring 35 within the exhaust valve 26 must be adjusted to overbalance the pressure of the fluid flowing out of the low pressure regulator 30.

It is seen from the foregoing description that I have provided a mechanism for positively opening and closing a door. Furthermore, that the various elements of the door operating mechanism may be adjusted to determine the speed of opening and closing movement. Also, that the door may be manually operated by applying sufficient force against the door to overcome the pressure of the low pressure regulator. Should the pressure supply fail, it would be found expedient to ease the tension of the spring 35 within the exhaust valve so as to relieve all resistance, except that due to friction and to the tension of the closing spring 31, where such spring is included.

I claim:

1. A fluid pressure opening and closing device for a door pivotally hung on a wall, said device including a cylinder, a piston therein, the rod of the piston extending through one end of the cylinder, means pivotally securing the end of the piston rod and the other end of the piston to the door and the wall respectively, a conduit having extensions for carrying pressure fluid to both ends of the cylinder, a high pressure regulator in the extension leading to the space in front of the piston, a low pressure regulator in the extension to the space behind the piston, means controlling the flow of fluid through said high pressure extension, an exhaust valve in the low pressure extension beyond the low pressure regulator, and means for adjusting the tension of exhaust valve to yield to the high pressure flow and to check the low pressure flow.

2. A fluid pressure opening and closing device for a door pivotally hung on a wall, said device including a cylinder, a piston therein, the rod of the piston extending through one end of the cylinder, means pivotally securing the end of the piston rod and the other end of the piston to the door and the wall respectively, a conduit having extensions for carrying pressure fluid to both ends of the cylinder, a high pressure regulator in the extension leading to the space in front of the piston, a low pressure regulator in the extension to the space behind the piston, means controlling the flow of fluid through said high pressure extension, a spring held exhaust valve in the extension between the low pressure regulator and

the cylinder, and means for adjusting the spring of said valve to yield to the high pressure flow and to check the low pressure flow.

3. A fluid pressure opening and closing device for a door pivotally hung on a wall, said device including a cylinder, a piston therein, the rod of the piston extending through one end of the cylinder, means pivotally securing the end of the piston rod and the other end of the piston to the door and the wall respectively, a conduit having extensions for carrying pressure fluid to both ends of the cylinder, a high pressure regulator in the extension leading to the space in front of the piston, a valve between the regulator and the cylinder, an electric circuit, a magnet in said circuit operatively connected to open said valve for flow from the regulator to the cylinder, a low pressure regulator in the extension to the space behind the cylinder, and a valve between the low pressure regulator and the cylinder set to yield to the flow of fluid under high pressure and to check the flow of fluid from the low pressure regulator.

4. A fluid pressure opening and closing device for a door pivotally hung on a wall, said device including a cylinder, a piston therein, the rod of the piston extending through one end of the cylinder, means pivotally securing the end of the piston rod and the other end of the piston to the door and the wall respectively, a conduit having extensions for carrying pressure fluid to both ends of the cylinder, a high pressure regulator in the extension leading to the space in front of the piston, a low pressure regulator in the extension to the space behind the piston, a valve in the extension from the high pressure regulator to the cylinder normally checking flow to the cylinder and having an exhaust port for flow from the cylinder, an exhaust valve between the low pressure regulator and the cylinder, said exhaust valve being adjustable to pass the flow of fluid under high pressure but to check passage of low pressure fluid.

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