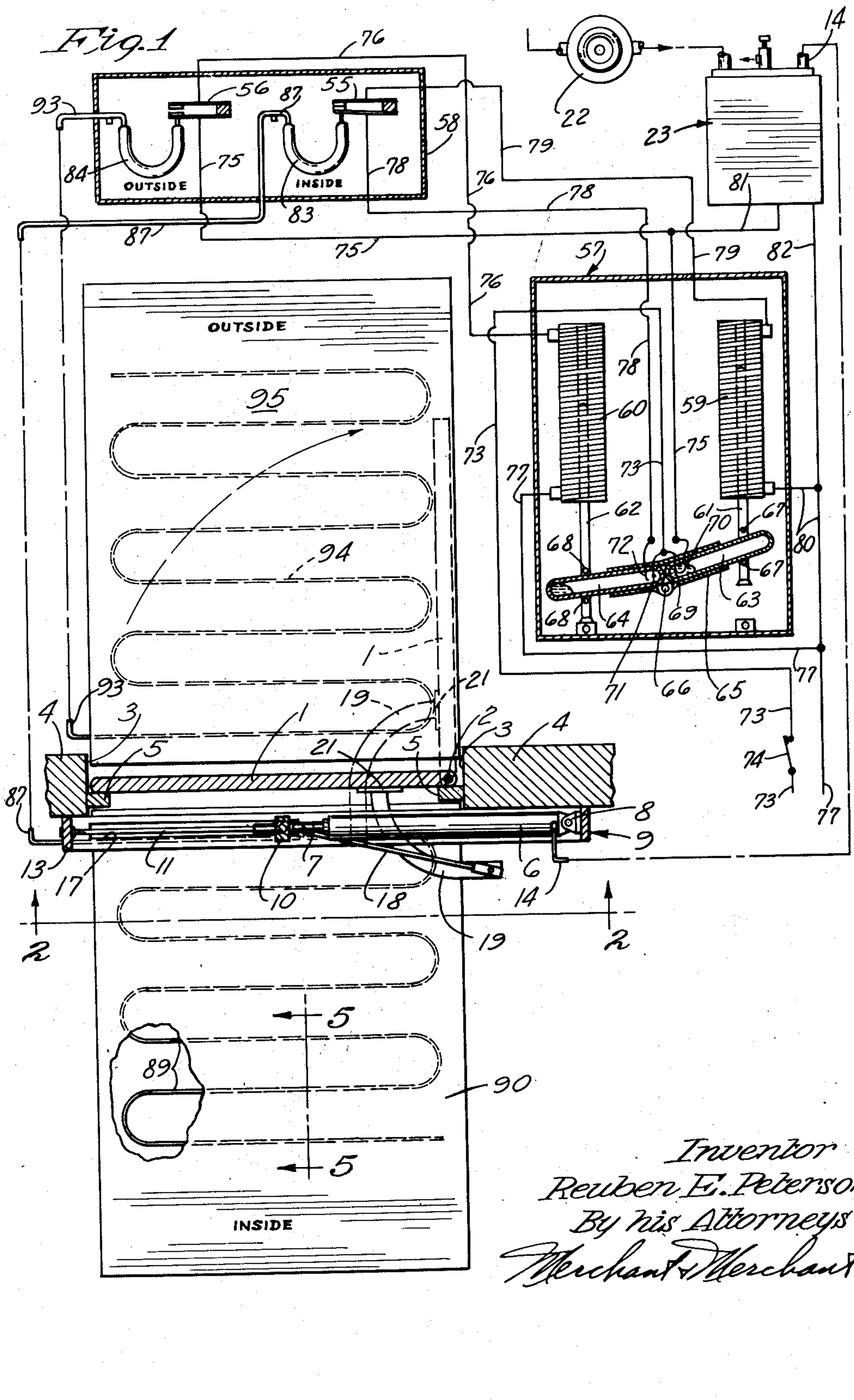
Jan. 6, 1953 R. E. PETERSON 2,624,569

DOOR OPENING AND CLOSING MECHANISM

Filed March 24, 1950 3 Sheets-Sheet 1

Fig. 1



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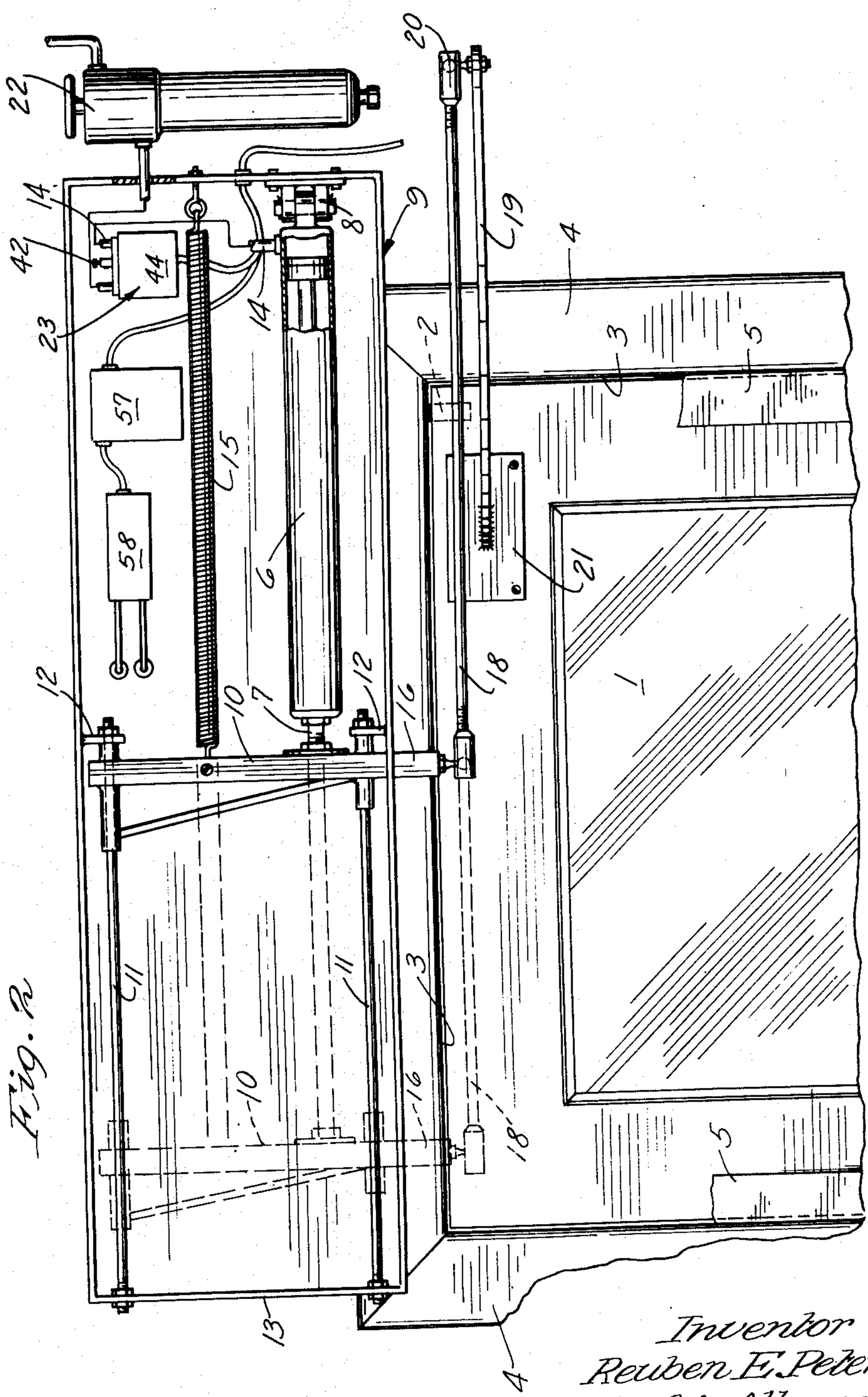

Fig. 2

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DOOR OPENING AND CLOSING MECHANISM

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Fig. 3

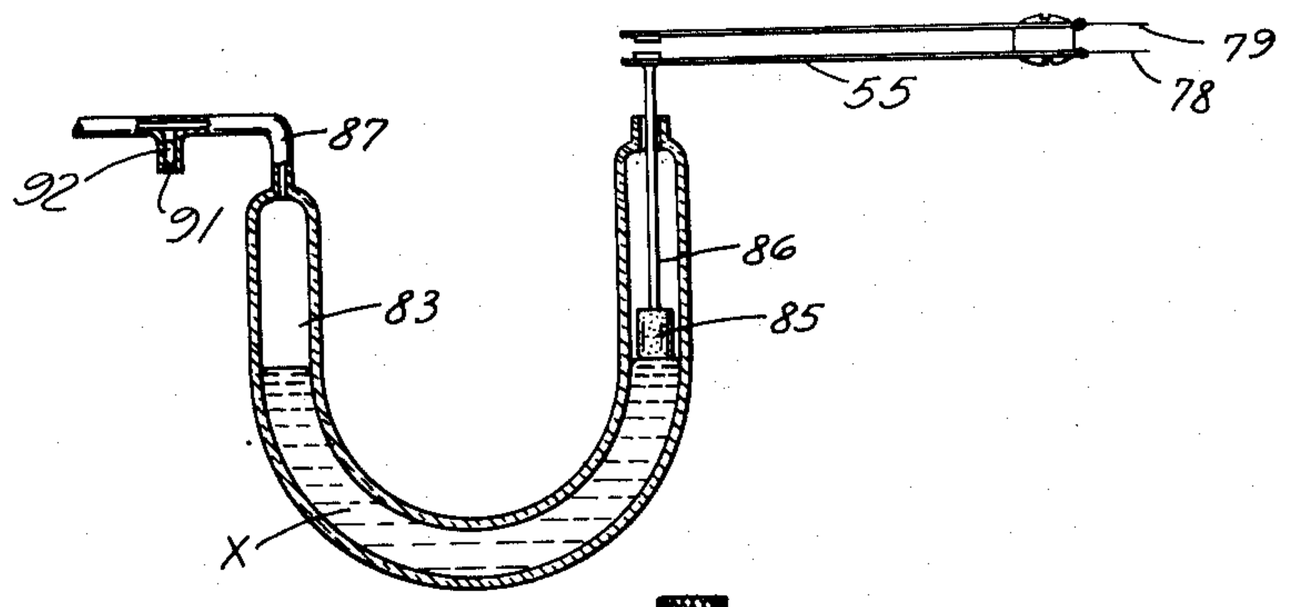


Fig. 4

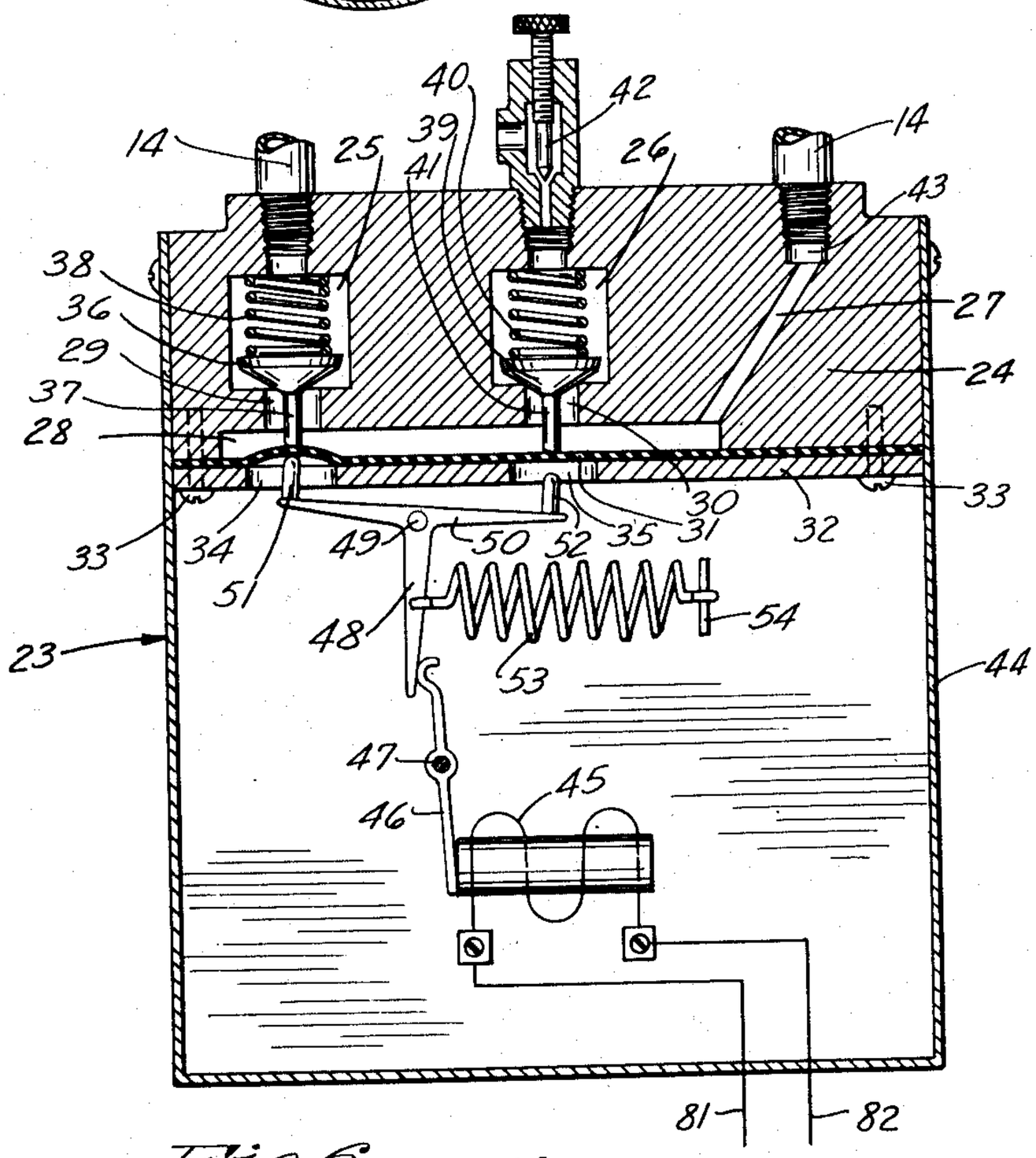


Fig. 5

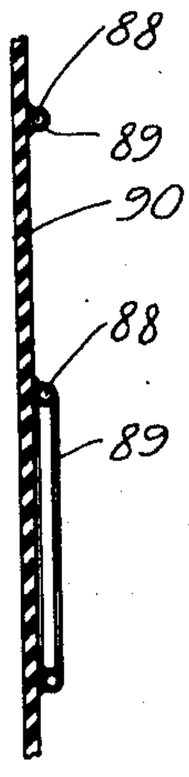
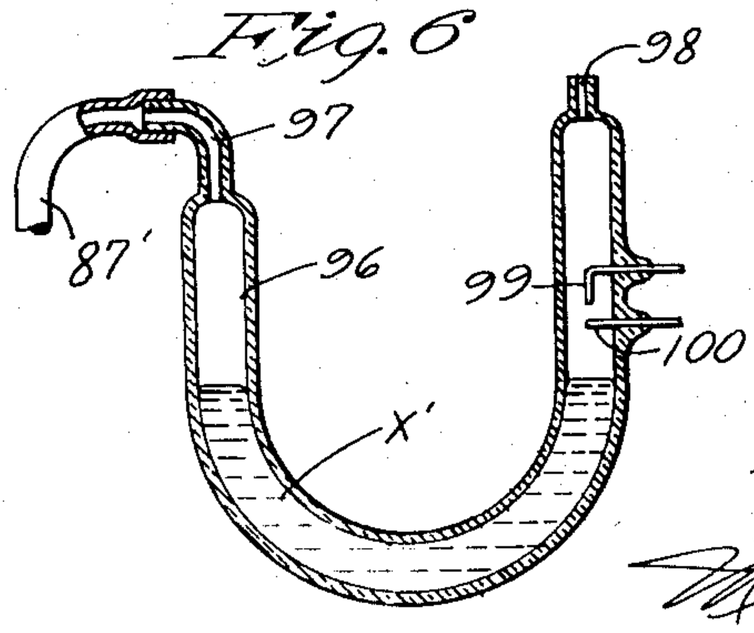


Fig. 6



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UNITED STATES PATENT OFFICE

2,624,569

DOOR OPENING AND CLOSING MECHANISM

Reuben E. Peterson, Fergus Falls, Minn.

Application March 24, 1950, Serial No. 151,716

7 Claims. (Cl. 268—34)

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My invention relates generally to automatic door-opening and closing mechanism and, more specifically, to mechanism for opening a door responsive to the presence of traffic on one side thereof and for closing the door responsive to the presence of traffic on the other side thereof.

I am aware that automatic door-opening and closing mechanisms, which include electronic apparatus and motors for opening a door, are in use at present. However, my invention contemplates the use of relatively inexpensive fluid-pressure means and novel switch mechanism operated thereby to control operation of a door.

An important object of my invention is the provision of door-operating mechanism including fluid pressure-operated switches and means on opposite sides of a door, whereby said switches may be operated to control door-operating mechanism.

Another object of my invention is the provision of a pair of control circuits including the above-mentioned switches, whereby energization of one of said circuits will render the other of said circuits operative upon closing the control switch thereof.

Another object of my invention is the provision of a novel fluid pressure-operated switch.

Still another object of my invention is the provision of a switch, wherein a body of mercury is contained normally in equilibrium and movable by fluid pressure applied thereto to close or open an electric circuit.

Still another object of my invention is the provision of means for operating a fluid pressure-operated switch, said means being in the nature of a mat adapted to lie in the path of traffic moving toward or from said door, said mat containing a resilient tube extending thereabout in serpentine fashion and having connections therewith to said switch.

Other highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims, and attached drawings.

Referring to the drawings, wherein like characters indicate like parts throughout the several views:

Fig. 1 is a view partly in plan and partly in diagram of my novel door-operating mechanism, some parts being broken away and some parts shown in section;

Fig. 2 is an enlarged fragmentary view in elevation as seen from the line 2—2 of Fig. 1, some parts being broken away and some parts shown in section;

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Fig. 3 is an enlarged view in side elevation of a fluid pressure-operated switch made in accordance with my invention, some parts thereof being broken away and some parts being shown in section;

Fig. 4 is a view partly in vertical section and partly in diagram of an electrically-operated control valve of my invention;

Fig. 5 is an enlarged fragmentary section taken on the line 5—5 of Fig. 1; and

Fig. 6 is a view corresponding to Fig. 3, but showing a modified form of switch.

My novel door-opening and closing mechanism is adapted for use with swinging or sliding doors or gates for the admittance of any type of traffic, but, preferably and as shown, is applied to a swinging door for the passage of pedestrian traffic through the opening therefor. In the drawings, a door is indicated by the numeral 1 and is hingedly mounted, as at 2, in a door-opening 3 of a door casing or wall 4, from a normally closed position, as indicated by full lines in Fig. 1, to an outwardly-open position indicated by dotted lines in Fig. 1. In its closed position, the door 1 normally rests against the conventional stop strips 5.

For imparting opening and closing movements to the door 1, I provide a door-operating motor in the nature of a fluid pressure cylinder 6 and a cooperating piston-equipped plunger 7. The cylinder 6 is pivotally mounted to a bracket 8 rigidly secured to a generally rectangular frame 9, which is secured to the upper end portion of the door casing or wall 4 by any suitable means. The outer end of the piston plunger 7 is rigidly secured to a cross head 10, which is mounted for sliding movements laterally of the door opening 3 on a pair of spaced parallel slide rods 11 that are rigidly secured at one end to a pair of brackets 12 welded or otherwise secured to the frame 9 intermediate its ends and at their opposite ends to an end wall 13 of the frame 9. Door-opening movements are imparted to the cross head 10 by fluid under pressure being introduced to one end of the cylinder 6 through a conduit 14, whereas door-closing movements are imparted thereto by a coil tension spring 15 anchored at its opposite ends to the cross head 10 and the end of the frame 9 opposite the end wall 13 thereof. A depending portion 16 of the cross head 10 extends downwardly through a slot 17 in the bottom wall of the frame 9 and has ball and socket engagement with one end of a rigid link 18, the other end of which has ball and socket engagement with one end of a rigid arm 19, as indicated at 20. The arm 19 is curved in the direction of

the door 1 about the axis of the hinge 2, and is provided at its inner end with a mounting plate 21, which is screwed or otherwise rigidly secured to the door 1. As indicated by full and dotted lines in Figs. 1 and 2, movements of the crosshead 10 from the right to the left with respect to these figures causes the door 1 to open to an extent approximating ninety degrees of circular movement; whereas movement of the crosshead 10 in the opposite direction causes the door 1 to close against the stop strips 5.

Fluid under pressure for motivating the door-operating mechanism which, in this instance, may be assumed to be air, is conducted through the conduit 14 from a pressure tank or other source not shown and is controlled by a conventional air transformer or pressure regulator valve 22 and an electrically-operated directional control 23. With reference particularly to Fig. 4, it will be seen that the control 23 comprises a valve body 24 having inlet and outlet valve chambers 25 and 26 respectively, a passage 27, and a chamber 28. The chamber 28 communicates with the passage 27 and with the valve chambers 25 and 26 through short passages 29 and 30 respectively. A flexible rubber-like diaphragm 31 defines one wall of the chamber 28 and is held in place by a retainer plate 32 and mounting screws or the like 33. The plate 32 is provided with a pair of apertures 34 and 35 that are axially aligned with the passages 29 and 30 respectively. A valve element 36 is seated in the valve chamber 25 and is provided with a stem 37 which projects downwardly through the passage 29 in the direction of the diaphragm 31. Valve element 36 is yieldingly biased toward a valve-closed position by a coil compression spring 38. Valve element 39, similar to the valve element 36, is biased toward a valve-closed position in the valve chamber 26 by a coil compression spring 40 and is provided with a stem 41 extending downwardly through the passage 30 and the chamber 28. The valve chamber 26 is open to atmosphere through a metering valve 42, whereas the valve chamber 25 communicates with the pressure regulator valve 22 through a portion of the conduit 14. The passage 27 terminates in a port 43 which is threaded to receive the portion of the conduit 14 leading to the fluid pressure cylinder 6.

A casing 44 for the control 23 houses relay-operated mechanism for manipulating the valve elements 36 and 39, which mechanism comprises a relay coil 45, an armature 46 therefor pivoted intermediate its ends as indicated at 47, and a T-shaped lever 48. The lever 48 is pivoted in the casing 44 as at 49, the cross bar portion 50 thereof being provided at its opposite ends with thrust pins or the like 51 and 52, which extend upwardly into the openings 34 and 35 respectively, whereby to engage the diaphragm 31 for valve-operating movements against the valve stems 37 and 41. The armature 46 is adapted to move the lever 48 when the relay winding 45 is energized against bias of a tension spring 53 secured at its opposite ends to the lever 48 and an anchoring pin or the like 54 in the casing 44. As shown in Fig. 4, energization of the relay winding 45 causes the armature 46 to move the lever 48 against bias of the spring 53 to a position where the thrust pin 51 moves the diaphragm 31 and the overlying valve element 36 upwardly against bias of the spring 48 sufficiently to permit air to enter the chamber 28 and flow from thence through the passage 27 and conduit 14 to the cylinder 6. When the relay winding 45 is de-energized, the lever 48 will be moved by the spring 53 in a direction to permit closing of the valve 36 and to move the valve element 39 to a valve-open position, which will permit flow of air from the cylinder 6 through the conduit 14 and the passage 27 to atmosphere through the passage 30, the valve chamber 26, and the metering valve 42 under return movements of the piston plunger 7 and crosshead 10 under bias of the spring 15.

The electro-magnetic winding 45 is energized to cause air under pressure to flow to the cylinder 6, and de-energized to permit air to escape from the cylinder 6 to atmosphere, by a pair of switches 55 and 56, an electro-magnetic switch actuator 57, and electrical circuits therefor. The switches 55 and 56 are in a normally open position and are mounted in a casing 58 which, together with the switch actuator 57, the control 23, and parts of the door-operating mechanism, are contained within the frame 9 (see particularly Fig. 2). It may be assumed that a cover plate not shown extends over the area of the frame 9 to conceal the parts contained therein. The switch actuator 57 comprises a pair of electro-magnetic or solenoid windings 59 and 60 for respective armatures 61 and 62 and a pair of mercury switches 63 and 64 mounted for common movements in a bracket 65 pivotally mounted, as indicated at 66, between the depending portions of the armatures 61 and 62. As shown in Fig. 1, the outer end portion of the mercury switch 63 extends between a pair of fingers 67 projecting outwardly from the lower end portion of the armature 61, and the outer end portion of the mercury switch 64 similarly extends between a pair of fingers 68 projecting outwardly from the lower end portion of the armature 62. Energization of the winding 59 causes upward movement of the armature 61 and rocking movement of the bracket 65 and the mercury switches 63 and 64 secured thereto to the position indicated in Fig. 1, the armature 62 being moved downwardly with respect to the winding 60 by reason of its engagement with the mercury switch 64. Conversely, energization of the winding 60 causes upward movement of the armature 62 and rocking movement of the bracket 65 and switches 63 and 64 in the opposite direction with consequent downward movement of the armature 61 with respect to the winding 59.

The switch 63 is provided with a pair of contact elements 69 and 70, and the switch 64 is likewise provided with a pair of contact elements 71 and 72. The contacts 69 and 71 are adapted to be connected to a source of potential not shown by a common lead 73 in which is interposed a switch 74. The contacts 69 and 70 are interposed in a normally open control circuit comprising the lead 73 and switch 74, a lead 75 extending from the contact 70 to one side of the switch 56, a lead 76 extending from the opposite side of the switch 56 to the solenoid winding 60, and a lead 77 extending from the opposite end of the winding 60 to the source of potential not shown. The contacts 71 and 72 of the switch 74 are interposed in a second normally open control circuit comprising the common lead 73 and switch 74, a lead 78 extending from the contacts 72 to one side of the switch 55, a lead 79 connecting the other side of the switch 55 with one end of the solenoid winding 59, and a lead 80 connecting the opposite end of the winding 59 with the lead 77. The electro-magnetic winding 45 of the control 23 is interposed in a circuit comprising the lead 75, a lead 81 extending from the lead 75 to one end of the

winding 45, and a lead 82 connecting the other end of the winding 45 and the lead 80, and a portion of the lead 77.

From the above, it will be seen that closing of the switch 55 will cause energization of the solenoid winding 59, thereby moving the mercury switches 63 and 64 to a switch-closed position of the switch 63. Closing of this switch completes the circuit through the relay winding 45 to energize the same, whereby to open the valve 36 and permit air under pressure to be fed to the cylinder 6. The switches 55 and 56, being of the momentary contact type, remain closed only as long as closing pressure is exerted thereon. Assuming that the switch 55 is open, closing of the switch 56 causes the solenoid winding 60 to be energized, whereby to close the switch 64 and open the switch 63. Opening of the switch 63 causes the relay winding 45 of the control 23 to be de-energized whereupon the spring 53 will be permitted to close the valve 36 and open the valve 39, thus allowing air to escape from the cylinder 6 through the metering valve 42 to atmosphere.

I provide novel means for selectively closing the separate switches 55 and 56 when it is desired to open or close the door 1. Mounted within the casing 58 are a pair of generally U-shaped tubular elements 83 and 84, the former having one end underlying the switch 55 and the latter having one end underlying the switch 56. The tubular elements 83 and 84, and parts contained therein, are identical, and, for the sake of brevity, but one of them is shown and described in detail. Referring to Fig. 3, it will be seen that the tubular element 83 has contained, in the lower portion thereof, a body of mercury X which extends upwardly into the opposite legs thereof and is normally in equilibrium therein. In the leg of the tubular element 83 underlying the switch 55, is a float 85 which may be of any suitable material having a specific gravity less than that of the mercury X. A plunger rod 86 is secured to the float 85 and projects upwardly through the open end of the tubular element 83 in the direction of the switch 55. The other end of the tubular element 83 is connected with a fluid pressure conduit 87, which extends downwardly to the floor adjacent the inside of the door 1 and communicates with one end of a resiliently-walled chamber 88 which, preferably and as shown, is defined by a length of rubber-like tubing 89 secured to the bottom surface of a rubber mat or the like 90. By reference to Fig. 1, it will be seen that the tube 89 extends over the greater part of the mat area in serpentine fashion, the free end of the tube 89 being closed. Weight of a person stepping on to the mat 90 is sufficient to compress a portion of the resilient tube 89, whereby to displace a portion of the fluid in the chamber 88, the fluid in this instance being air. This displacement is transmitted through the conduit 87 to the tubular element 83, causing the mercury X to raise the float 85 and plunger rod 86 sufficiently to close the switch 55. A moisture trap for the conduit 87 comprises an opening 91, which is packed with cotton or the like 92. The cotton packing 92 is sufficiently dense to prevent undue escape of air therethrough, and any moisture contained within the conduit 87 will be absorbed thereby.

A conduit 93 extends from the tubular element 84 downwardly to the floor or ground outside of the door 1 and terminates in a pressure chamber defined by a resilient tube or the like 94 on the bottom side of a mat 95. The tube 94 and mat 95 are identical to the tube 89 and mat 90 on the inside of the door, and it is felt that further detailed description thereof is unnecessary.

It should be understood that the arrangement herein shown and described provides for traffic passing through the door opening 3 in a single direction, that is, from the inside to the outside of the door. When it is desired for a person to pass through the door opening 3, the person merely steps upon the mat 90, whereby the displacement of air in the tube 89 causes the switch 55 to be closed by the plunger 86 of the tubular element 83. Closing of the switch 55 energizes the electro-magnetic winding 59 and causes closing of the switch 63 and energization of the relay coil 45, whereupon subsequent opening of the valve 36 and closing of the valve 39 allows air under pressure to be admitted to the cylinder 6. As air under pressure enters the cylinder 6, the piston plunger 7 and crosshead 10 are moved from the right to the left with respect to Fig. 2, thereby opening the door 1. It should be noted that, when the mercury switch 63 is closed, its cooperating mercury switch 64 is opened, thus opening the circuit to the switch 55 so that, immediately upon moving the switch 63 to a closed position and the switch 64 to an open position, the electro-magnetic winding 59 is de-energized. With the door 1 thus moved to its open dotted line position of Fig. 1, the user passes outwardly through the door opening 3 and steps upon the mat 95, thus displacing air within the tube 94 and causing the mercury in the tubular element 84 to raise the float-equipped plunger rod 86 in a direction to close the switch 56. It should be noted that, after the user has stepped through the door opening 3 and away from the mat 90, the switch 55 will immediately open, due to displaced air returning to the tube 89. Closing of the switch 56 causes energization of the electro-magnetic winding 60 to simultaneously open the switch 63 and close the switch 64. Opening of the switch 63 causes the circuit to be broken to the control 23, whereupon the spring 53 will manipulate the valves 36 and 39 to permit air to escape from the cylinder 6 to atmosphere, and the spring 15 to move the crosshead 10 to close the door 1. The speed at which the door closes is determined by the power exerted by the closing spring 15 and the setting of the metering valve 42. Said metering valve 42 may be set to allow air to escape sufficiently slowly so that the person or vehicle passing through the door opening 3 has sufficient time to move out of the path of travel of the door 1 during closing movements thereof. The speed of opening movements of the door is determined by the differential in pressure of the air in the cylinder 6 and tension of the spring 15. This differential also is a determining factor, together with the metering valve 42, of the speed of closing movements of the door 1. As in the case of the resilient tube 89, when the person using the door 1 has stepped away from the mat 95, air displaced therefrom to the tubular element 84 will return, permitting the switch 56 to return to its normal open position.

In the event that a second person steps upon the mat 90, while the preceding one is treading upon the mat 95 on the outside of the door, weight of the person on the inside mat 90 will cause the coil 59 to be energized to cause the door-opening mechanism to continue to function until he also steps upon the mat 95 on the outside of

the door. Thus, the door will be held open until all persons in a group have passed therethrough.

In the modified form of switch shown in Fig. 6, I provide a generally U-shaped tubular element 96 having an opening 97 in one end thereof adapted to be connected to a conduit 87' and a relatively small opening 98 in its other end leading to atmosphere. In the lower central portion of the element 96 is a quantity of mercury X', normally in equilibrium. Between the normal level of the mercury X' and the opening 98, a pair of spaced switch contacts 99 and 100 extend through the side wall to the interior of the element 96. The switch of Fig. 6 operates in the same manner as the structure of Fig. 3 in that, air displaced from a resilient wall chamber will force the mercury X' upwardly toward and into engagement with the switch contacts 99 and 100 to close a door-opening or closing circuit thereof. Of course, when the displaced air is allowed to return to the resilient walled chamber, the mercury X' will return to a state of equilibrium within the tubular element 96, thus opening the circuit between the contacts 99 and 100.

My invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the objectives set forth; and, while I have shown and described a commercial embodiment and single modification of my improved door-operating mechanism, it should be understood that the same is capable of further modification without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. Means defining a one-way traffic passage, a normally closed door for said passage, a normally inoperative reversible motor for opening and closing the door, control mechanism for said motor, said mechanism comprising a first normally open control circuit to closing of which said motor is responsive to open the door, a second normally open control circuit to closing of which the motor is responsive to close the door, a normally open control switch in each of said control circuits, operating means for each of said switches, the operating means for the control switch of the first circuit being responsive to the presence of traffic in a zone adjacent one side of the door to close its switch, the operating means for the said control switch of the second control circuit being responsive to the presence of traffic in a zone adjacent the other side of the door to close its switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, an electro-magnetic switch actuator for said two-position switch means, said actuator comprising a pair of windings responsive to energization of one of which the said actuator moves the two-position switch to one of its two positions and responsive to energization the other of which said actuator moves said switch to the other of its two positions, each said control circuit further comprising a different one of said windings and the pair of contacts of said switch means which are closed responsive to energization of the said winding in circuit therewith.

2. Means defining a one-way traffic passage, a normally closed door for said passage, a normally inoperative reversible motor for opening and closing the door, control mechanism for said motor, said mechanism comprising a first normally open control circuit to closing of which said motor is responsive to open the door, a second normally open control circuit to closing of which the motor is responsive to close the door, a normally open control switch in each of said control circuits, operating means for each of said switches, the operating means for the control switch of the first circuit being responsive to the presence of traffic in a zone adjacent one side of the door to close its switch, the operating means for the said control switch of the second control circuit being responsive to the presence of traffic in a zone adjacent the other side of the door to close its switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, two-position electro-magnetic switch actuators for the last-mentioned switch means, each switch actuator comprising a magnetically-responsive armature and solenoid each being operable under energization to move the said switch means to a different one of its two positions, each said control circuits further comprising a different one of said solenoids and the contacts of said switch means which are closed responsive to energization of the said solenoid in circuit therewith, and means mechanically intercoupling the armatures of the pair of switch actuators to partake of simultaneous movements in opposite directions.

3. Means defining a one-way traffic passage, a normally closed door for said passage, a normally inoperative reversible motor for opening and closing the door, control mechanism for said motor, said mechanism comprising a first normally open control circuit to closing of which said motor is responsive to open the door, a second normally open control circuit to closing of which the motor is responsive to close the door, a normally open control switch in each of said control circuits, fluid pressure-operated actuator means for each of said switches, the actuator means for the control switch of the first circuit including a resilient-walled fluid chamber adapted to be engaged by traffic in a zone adjacent one side of the door to close its switch, the actuator means for said control switch of the second control circuit including a resilient-walled fluid chamber adapted to be engaged by traffic in a zone adjacent the other side of the door to close its switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, an electro-magnetic switch actuator for said two-position switch means, said actuator comprising a pair of windings responsive to energization of one of which the said actuator moves the two-position switch to one of its two positions and responsive to energization the other of which said actuator moves said switch to the other of its two positions, each said control circuit further comprising a different one of said windings and the pair of contacts of said switch means which are closed responsive to energization of the said winding in circuit therewith.

4. Means defining a one-way traffic passage, a normally closed door for said passage, a normally inoperative reversible motor for opening and closing the door, control mechanism for said motor, said mechanism comprising a first normally open control circuit to closing of which said motor is responsive to open the door, a second normally open control circuit to closing of which the motor is responsive to close the door, a normally open control switch in each of said control circuits, fluid pressure-operated actuator means for each of said switches, the

actuator means for the control switch of the first circuit including a resilient-walled fluid chamber adapted to be engaged by traffic in a zone adjacent one side of the door to close its switch, the actuator means for said control switch of the second control circuit including a resilient-walled fluid chamber adapted to be engaged by traffic in a zone adjacent the other side of the door to close its switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, a pair of two-position electro-magnetic switch actuators for the last-mentioned switch means, each switch actuator comprising a magnetically-responsive armature and solenoid each being operable under energization to move the said switch means to a different one of its two positions, each said control circuit further comprising a different one of said solenoids and the contacts of said switch means which are closed responsive to energization of the said solenoid in circuit therewith, and means mechanically intercoupling the armatures of the pair of switch actuators to partake of simultaneous movements in opposite directions.

5. Means defining a one-way traffic passage, a normally closed door for said passage, a normally inoperative reversible motor for opening and closing the door, control mechanism for said motor, said mechanism comprising a first normally open control circuit to closing of which said motor is responsive to open the door, a second normally open control circuit to closing of which the motor is responsive to close the door, a normally open control switch in each of said control circuits, fluid pressure-operated actuator means for each of said switches, said actuator means comprising a pair of mats disposed on opposite sides of the door, a resilient-walled compressible chamber underlying the top portion of each of said mats, a pair of tubular elements associated one each with each of said switches, switch-operating members movable in the tubular elements, and fluid pressure conduit means independently connecting each of said chambers with their respective tubular elements whereby fluid displaced by compression by either of said chambers when engaged by traffic will move the movable member associated therewith in a direction to operate said switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, an electro-magnetic switch actuator for said two-position switch means, said actuator comprising a pair of windings responsive to energization of one of which the said actuator moves the two-position switch to one of its two positions and responsive to energization the other of which said actuator moves said switch to the other of its two positions, each said control circuit further comprising a different one of said windings and the pair of contacts of said switch means which are closed responsive to energization of the said winding in circuit therewith.

6. The structure defined in claim 5 in which each of the resiliently-walled chambers of said mats is in the nature of a resilient tube underlying its respective mat and extending about the area thereof in serpentine fashion, one end of said tube being closed and the other end thereof communicating with its respective conduit means.

7. Means defining a one-way traffic passage, a normally closed door hingedly mounted in the passage, fluid-pressure-operated mechanism for opening and closing said door, said mechanism comprising a fluid pressure cylinder, a cooperating piston plunger, a reciprocatory slide element driven by said piston and cylinder, and linkage connecting said slide element and said door whereby swinging movements are imparted to said door by reciprocatory movements of said slide element, electrically-operated control mechanism for said fluid pressure-operated mechanism, said control mechanism comprising a first normally open circuit to closing of which said fluid pressure-operated mechanism is responsive to open the door, a second normally open control circuit to closing of which the fluid pressure-operated mechanism is responsive to close the door, a normally open control switch in each of said control circuits, operating means for each of said switches, the operating means for the control switch of the first circuit being responsive to the presence of traffic in a zone adjacent one side of the door to close its switch, the operating means for the said control switch of the second control circuit being responsive to the presence of traffic in a zone adjacent the other side of the door to close its switch, two-position switch means comprising two pairs of contacts each of which are open in one position of the switch and closed in another position of the switch, an electro-magnetic switch actuator for said two-position switch means, said actuator comprising a pair of windings responsive to energization of one of which the said actuator moves the two-position switch to one of its two positions and responsive to energization the other of which said actuator moves said switch to the other of its two positions, each said control circuit further comprising a different one of said windings and the pair of contacts of said switch means which are closed responsive to energization of the said winding in circuit therewith.

REUBEN E. PETERSON.

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