My improved invention relates to automatic door operating and locking devices and particularly in the present instance to cooperating safety means whereby in case any obstacle comes in contact with moving doors or other contrivances operated thereby the motor is immediately automatically stopped without injury to it or to the obstructing object.

My improved invention is not only intended for swinging doors but for gates, curtains, etc., as well. An important object is to provide, in conjunction with the foregoing, a simple and efficient automatic door operating device having a safety cut-out switch, not likely to get out of order, fool proof and one which can be manufactured at a price within the reach of customers of modest means.

These and other obvious objects broadly set forth the invention in its entirety, a desirable embodiment being illustrated by the following figures:

Fig. 1 is a plan view of a preferred arrangement illustrating the use of my improved invention when applied to operate a pair of doors, and Fig. 1a is a sectional detail on line 1a—1a of Fig. 1.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a vertical cross section taken on line 3—3 of Fig. 2.

Fig. 4 is a back view of Fig. 2.

Fig. 5 is a face view of one of the centrifugal control elements.

Fig. 6 is an edge elevation of the control elements and,

Fig. 7 is a general wiring diagram.

Referring now in detail to the drawings and more particularly to Fig. 1, to the framework 8 is hingedly attached a pair of doors 9. To said framework 8 is also attached the automatic operating and locking mechanism, comprising a motor 10, a motor shaft 11, a motor operated shaft 13, a coupling 12 uniting said shafts, a worm shaft 15, a friction clutch 14 operatively relating worm shaft 15 to shaft 13, a worm 16 mounted upon the extremity of shaft 15 and meshing with a pinion 17, and a bearing 18 in which shaft 15 is journaled.

Said pinion 17 meshes with said worm 16 and is mounted upon the end of a transverse driven shaft 19. Said driven shaft 19 is journaled in brackets 20 wherein are mounted worms 21 and 22 meshing with pinions 23 and 24. To the shafts 23a and 24a of said pinions are secured for angular displacement, a pair of jointed levers 25 and 26 operatively related to the aforesaid pair of doors 9.

The actuation of the motor 10 through the transmission line just described, opens and closes the doors. To stop the doors when they are properly opened and closed and to provide for a safety feature when the path of movement of either door becomes accidentally obstructed by reason of an automobile or other object being inadvertently placed or allowed to remain in such a position that ample clearance is not provided for the operation of the doors, requires additional cooperating features. There must be means to start the motor (a switch 27), means to stop the motor (a switch 28), manual means (not shown) to operate the first switch, and automatic means, a governor device 31, to operate said switch 28. Any number of manually operated switches at different locations may be stationed in the line as at 27 in the wiring diagram, only one, however, being shown. The stationary part 28b of the second switch 28 is placed in juxtaposition with its centrifugally and centripetally operated member 28a.

Said switch member 28a and the governor device 31 which operates it are clearly illustrated in Figs. 2 to 6 inclusive. Said governing device which operates the switch member 28a need not be described in full detail with respect to its revolving parts which may be patterned after a number of well known governing devices on the market. It may be briefly stated, however, that said device 31 may comprise three pivotally mounted arms 35, illustrated in detail in Figs. 5 and 6, which are identical in construction and which are provided with pivots 36 near one end so that, when the device is rapidly rotated, centrifugal force tends to cause said arms to swing outwardly in oppo-
sition to their retracting springs 37. Said centrifugally operated arms or members 35 travel between the flanges 39 and 40 of a vertically slideable member 45 the lower end of which carries the aforesaid switch member 28a.

As soon as switch 27 has been momentarily closed the motor driven shaft 13 speeds up sufficiently to cause the rotary portion of the governor device 31 to expand, thereby causing its crescent shaped arms 35 to press outwardly upon lip 40 thus moving switch member 28a into the closed position indicated in dotted lines in Fig. 4. Upon the completion of the opening or closing movement of the doors, or in case they encounter an obstruction, the increased load on the motor retards the speed of shaft 13 thus causing a reverse action of the governor device under the urge of its springs 37. The result is that the crescent arms 35 bear against the lip 39, as shown in section in Fig. 3, thus retracting the movable switch member 28a, opening switch 28.

In order to prevent a too sudden strain upon the motor, friction clutch 14 is interposed between axially aligned shafts 13 and 15. A two pole double throw reversing switch 50 (see Figs. 1a and 7), is reversely operated prior to each stoppage of the motor, by means of a radial trip arm 51 secured to shaft 19 and positioned to operate in reverse directions the arm 50a of said switch 50. Said switch 50 is desirably mounted upon a base 33 which also supports the operating parts shown in the right hand portion of Fig. 1.

Assuming the doors to be opened, the operator first momentarily closes the starting switch 27, thus completing the starting circuit through the starting winding of the motor. As soon as the motor starts, the centrifugal action of the governor device 31 causes said device to close switch 28, thus completing the circuit through the main winding of the motor. Then the motor continues to run until the doors are completely opened or else encounter an obstruction. As soon as that happens the slowing down of the motor permits the springs 37 of the governor device, acting against the lessened centrifugal force, to open the switch 28 controlled thereby, thus opening the main winding circuit and causing the motor to stop.

The reverse movement is accomplished by the reversing switch 50 placed adjacent shaft 19 and connected in the starting circuit, and which is operated by a radial arm 51 fixed on shaft 19. This reversing takes place subsequently to each operation of the motor or as soon as the shaft 19 starts rotating. Hence, the next time the switch 27 is momentarily closed the motor turns in the opposite direction and moves the doors accordingly.

When switch 27 is closed, the circuit for starting the motor is completed through line wire 70, conductor 71, switch 27, conductors 72, 73, 74 and 76, through the starting winding 77 of the split phase motor 10, thence through conductors 78, 79 and the other line wire 80 to the source of current supply (not shown). After the motor has run a moment it generates sufficient speed to cause the governor device 31 to close the switch 28 thereby, after the switch 27 is permitted to open, the current is furnished to the motor through the line wires 70, 71a, switch 28, wires 72a, 73 and 85 through the main winding 77a of the motor, thence through wire 86 to the other line wire 80. The current is reversed by means of the reversing switch 50, indicated in the diagram, by means of the arm 51 carried by shaft 19 as already described.

Said reversing switch 50 is an ordinary two pole, double throw reversing switch and is diagrammatically shown in the wiring diagram.

In this specification, and the accompanying drawings, I have described and shown a preferred form of my invention and specifically mentioned certain of its more important objects. I do not limit myself to the forms disclosed, since various changes and adaptations may be made therein, without departing from the essence of my invention as hereinafter claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

Claims:

1. In an automatic door control, a door, means to impart opening and closing movements to said door; said means comprising an electric motor, a rotary governor centrifugally and centripetally operated, means to impart motion from said motor to said governor, and an electric circuit in which said motor is included, said governor maintaining said circuit closed during free movements of said door, and automatically opening said circuit to stop said motor when the movement of said door is arrested.

2. In an automatic door control, a door, means to impart opening and closing movements to said door; said means comprising an electric motor, a rotary governor centrifugally and centripetally operated, means to impart motion from said motor to said governor, an electric circuit in which said motor is included, said governor maintaining said circuit closed during free movements of said door, and automatically opening said circuit to stop said motor when the movement of said door is arrested, and a friction clutch whereby to relieve said motor of temporary strain when the movement of said door is arrested.

3. In an automatic door control, a door; and means to open and close said door; said means comprising an electric motor operatively connected with said door, a rotary governor operated by said motor, an electric cir-
circuit including said motor and controlled by said governor, said governor maintaining said circuit closed during free movements of said door, and automatically opening said circuit to stop said motor when the movement of said door is arrested, a reversing switch in said circuit to reverse the rotation of said motor, and means operated by each starting movement of said motor to operate said switch to cause said motor when again started to run in the reverse direction.

4. In combination, a pair of doors, a shaft, a pair of oppositely related worms secured to said shaft, means operatively relating each of said worms to its respective door whereby to cause a simultaneous clockwise movement of one of said doors and an anti-clockwise movement of the other of said doors, a motor, means operatively connecting said motor with said worm shaft, a centrifugal governor actuated by said motor, and a switch operated by said governor, whereby upon an obstruction in the path of movement of said doors diminishing the orbit described by said governor, the latter is to open said switch.

5. In combination, a motor, a door, means operated by said motor to open and close said door, an electric circuit in which said motor is included, a rotary expanding governor operatively related to said motor, a switch in said circuit and operatively related to said governor, said governor upon expanding increasing its orbit whereby to close said switch and circuit and upon contracting diminishing its orbit whereby to open said switch and circuit, a second switch to cause a reverse operation of said motor subsequently to each starting thereof, and means driven by said motor to operate said second switch.

6. In combination, a motor, a door, means operated by said motor to open and close said door, an electric circuit in which said motor is included, a rotary expanding governor operatively related to said motor, a switch in said circuit and operatively related to said governor, said governor upon expanding increasing its orbit whereby to close said switch and upon contracting diminishing its orbit whereby to open said switch and circuit, a second switch to cause a reverse operation of said motor subsequently to each starting thereof, and means driven by said motor to operate said second switch, said last mentioned means comprising a rotary shaft and a radial arm carried thereby and positioned to operate said second switch in reverse directions.

7. In combination, a motor, a door, means operated by said motor to open and close said door, an electric circuit in which said motor is included, a rotary expanding governor operatively related to said motor, a switch in said circuit and operatively related to said governor, said governor upon expanding increasing its orbit whereby to close said switch and circuit and upon contracting diminishing its orbit whereby to open said switch and circuit, a two pole double throw reversing switch to cause a reverse operation of said motor subsequently to each starting thereof and rotary means operated by said motor to operate said double throw switch in reverse directions.

8. In combination, a split phase motor having a starting winding and a main winding, an electric circuit for said motor and its said windings, a source of electric current supply for said circuit, a door, operating means for said door driven by said motor, a rotary expanding governor driven by said door operating means, a switch to open and close said circuit, said rotary expanding governor being operatively related to said switch to close said switch when its orbit is expanded and to open said switch when its orbit is contracted, a two pole double throw reversing switch to reverse the current through said motor, to cause it to rotate in a reverse direction at each starting thereof, said door operating means comprising a rotatable part to operate said double throw switch in reverse directions after each starting of said motor, and a manually operable switch to close the circuit through said motor.

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