This invention relates in general to improvements in door guiding track, particularly doors of the folding type, and a reversing switch controlled thereby for the purpose of in turn controlling the motor device for operating the doors.

One of the objects of this invention is the provision of a structure of this nature which is relatively simple in construction and cheap to manufacture, and yet rugged and efficient in actual operation and use.

Another object of this invention is the provision of a door brake mechanism having movable members adapted to be moved when the door strikes an object to effect the closing of a switch to reverse the direction of movement of the door operating means.

A still further object of this invention is the provision of a suitably constructed switch in relationship with the above arrangement by means of which the said reversal may be secured.

A further object of this invention is the provision of means comprising a spring for returning a portion of the movable parts to normal position, and arranging the remainder of the movable parts for movement to normal position by the door guiding roller. These and other objects as will appear from the following disclosure are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in greater detail hereinafter.

Referring to the drawings Fig. 1 is a bottom plan view of the device of this invention;

Fig. 2 is a cross sectional view taken on the line 2-2 of Fig. 1 and showing the position of the door and its guide roller;

Fig. 3 is a cross sectional view taken on the line 3-3 of Fig. 1;

Fig. 4 is a cross sectional view taken on the line 4-4 of Fig. 1;

Fig. 5 is a cross sectional view taken on the line 5-5 of Fig. 1;

Fig. 6 is a top plan view of the switch and its container;

Fig. 7 is a cross sectional view taken on the line 7-7 of Fig. 6;

Fig. 8 is a diagrammatic circuit arrangement showing how the switch is connected with the magnet valve for controlling the door operating engine.

The purpose of this invention is to apply to folding doors the principle of reversing the direction of movement of the doors when they strike an object while closing. As is well known in this art there are devices of this nature as applied to sliding doors in which a collapsible shoe is provided on the forward edge of the door, which when it strikes an object such as a passenger in the path of the movement of the door, operates to control electrically or mechanically a suitable means by means of which the motive device for moving the doors is reversed in its direction of movement so that the door recedes to open position. Some attempts have been made to apply these principles to folding doors of the so called double-leaf type, in which the door comprises two half sections, each made up of two leaves rigidly connected together. In view of the fact that the forward edges of these doors do not move in a straight line path which is at right angles to the plane of the doors which tend to get proper operation by means of collapsible shoes. Other arrangements have been tried and its invention relates to this general field.

The invention will be better understood by direct reference to the drawings.

With particular reference to Fig. 1 it is pointed out that this is a view of the device as it would appear in actual use if one were to lie on his back in the doorway and look upwardly. The holes 9 are provided by means of which the whole structure is secured to the top of the door frame which extends across the top.

The device is shown comprising a supporting angle plate having the two wings 1 and 2 lying in planes at right angles to each other, as clearly shown in the drawings. Near one end of this member is secured on the wing 1, a short piece of angle iron 3, which is securely and rigidly fastened thereto. Secured to the upstanding portion of the angle iron 3 is a...
flat spring 4, which has its short end bearing against the upstanding portion of another length of angle iron 5, pivotally supported at 6 on the wing 1, and in alignment with angle iron 3. The pivot for angle iron 5 is shown as comprising a block 6A secured thereto, a pivot pin 6 extending there through, and engaged by the nut 6B. It is to be understood that the pivot pin is firmly secured to the wing 1, as shown clearly in Fig. 5. The flat spring 4 engages the upstanding portion of angle iron 5 and tends to rotate it in a counter clockwise direction, which movement is limited by means of the rigid arm 7 which engages the grooved end of the upstanding portion of angle iron 3. Near the other end of angle iron 5 on the upstanding wall by means of lock nuts 9 is a bolt 8 which projects at right angles thereto. Also pivotally supported on wing 1 is another short length of angle iron 10, lying parallel to angle iron 3, but spaced therefrom as clearly shown in the drawings. Angle iron 10 is pivotally supported on wing 1 by a combined pivot pin 11 which is secured to the wing 1 by a construction and in a manner similar to pivot pin 6. The upstanding wall of angle iron 10 is provided near its left hand end (Fig. 1) with a short off-set portion 19' which is at this point reduced the width of the track provided between the parallel upstanding walls of angle irons 3 and 10. The horizontal wall of angle iron 10 has secured to it near its end by the rivets 13, a bar 12.

As more clearly shown in Fig. 3 the bar 12 is provided with a slot through which projects a pin 14 which is secured to the angle iron 19. It is pointed out here that angle iron 19 is clearly riveted to wing 1 against movement with its upstanding wall in longitudinal alignment with the upstanding wall of angle iron 10. The upstanding walls of angle irons 3, 5, 10 and 19 are arranged to be parallel to each other, and to provide a guide track. Encircling pin 14 and lying between bar 12 and nut 14A is a spring 14B for offering frictional resistance to the movement of bar 12. Secured to the outer end of bar 12 is a collar 15 having a projecting lug 16 which extends through a hole in the switch box shown generally at 17. The switch box 17 is enclosed within a U-shaped metallic member 18 which is secured to the wing 2.

The association of the door with the track is shown in Fig. 2. The door is indicated at 20 and has on its upper forward edge a bracket 21 for pivotally supporting the roller 22. The roller 22 is of the proper diameter to permit easy movement thereof longitudinally along the track formed as previously described. As is well known in the art folding doors of this type are made in two sections, each section comprising two leaves rigidly connected together. The free edge of one leaf of each section is secured to a vertical door shaft to effect its rotation and the free edge of the other leaf of each section comprises the forward edges of the doors which come together and contact throughout their length when the door is closed. It is usual to provide adjacent its free forward edge of each section a roller and bracket as shown. Herefore these rollers have been moved in guide tracks which are fixed and stationary.

When the doors are closed their centerline lies in the transverse centerline of the track which would be approximately along the line A—B in Fig. 1. The guide rollers would lie approximately at the point indicated by the dotted circles C and D. As the motive device begins to open the doors the rollers would move, operating in the direction of the arrows. They would continue to move in this direction until they assume D' and C', the position shown by the dotted circles. When the doors begin to close the rollers move inwardly from each end toward the center and continue to do so until they assume the position indicated by the dotted circles C and D if the doors do not strike an obstacle. If the doors do strike an obstacle, such as a passenger, in their path, the forward edges of one or the other of the doors, or both, tend to move at an angle to the track. If the roller moving in the right hand half of the track tends to move upwardly (Fig. 1) when to the right of pivot 6, angle iron 5 will rotate in a clockwise direction about its pivot 6 against the action of spring 4, forcing bolt 8 into contact with bar 12, and causing it to move in a counterclockwise direction, so that the projection 16 on the end thereof will move downwardly (Fig. 1). It may be brought out here that as soon as this pressure is relieved spring 4 returns angle iron 5 to normal position until checked by finger 7. If the roller on the left hand of the track (Fig. 1), when to the right of pivot 11, tends to move downwardly, it will cause angle iron 10 to move in a clockwise direction about pivot pin 11, carrying with it bar 12 and again causing the projection 16 thereon to move downwardly. When the rollers are on the other sides of the pivots, the reverse movements of the parts would occur. In either case frictional resistance to the movement of bar 12 is offered by spring 14B which tends to hold it in moved position.

By an action which will be described later, the device for operating the doors will reverse in its direction of movement and cause the doors to again open to full open position. At this time the roller, moving in the left hand end of the track will come against offset portion 19 of angle iron 10 and force it to rotate in a counter clockwise direction back to normal position, carrying with it bar 12 and causing the projection 16 to move upwardly. If for any reason angle iron 5 has...
not returned completely to its normal position, the right hand end of bar 12 will contact with nut 4 and aid spring 4 in accomplishing the return to normal position. The J

doors may then again be closed, and if they strike no obstacle they will come to full closed position without operating the reversing switch. Thus this arrangement provides a guiding track for the doors and means for guiding an actuating switch.

The structure of actuating switch is shown in Figs. 6 and 7 and comprises a casing 17 of insulating material having a covering 30 of insulating material. Supported transversely of, and within the casing 17 is a rod 31. Pivotedly supported on rod 31 is a lever 32 which is held in normal position by means of spring 33. On the other end of lever 32 is a contact member 34 having the spring fingers 36. The contact member 34 is a pivotal contact with the lever 32 as shown at 35. It pivots about this point against the resistance of spring 38 which encircles the pin 37 secured to the contact member 34. This arrangement causes a flexible connection to take up any unevenness in motion. Secured to the base of casing 17 are the plate contacts 39 and 40 which lie in the path of movement of fingers 36. The projection 16 previously described passes through a hole 41 in casing 17 and contacts with one end of lever 32. When the pin moves into the casing it causes lever 32 to rotate in a clockwise direction about rod 31 against the action of spring 33 to move the spring fingers 36 against contacts 39 and 40 to complete a circuit therewith. When the pin is withdrawn spring 33 returns lever 32 to normal position and breaks the circuit.

The circuit is shown in Fig. 8 and is given for the purpose of more clearly disclosing the invention, although it comprises a circuit well known in the art. Wire 42 is connected to the positive side of the current source, and to switch 33. The contact of this switch is connected by wire 44 to one terminal of the solenoid winding used in the electro-magnetic air control valve 45. The other terminal of this winding is grounded by wire 46. It may be pointed out that this electro-magnetic valve is of a very well known type, which when de-energized exhausts fluid pressure such as air from a pneumatic engine for causing it to operate to close the doors. It being understood that the doors are operated by means of this engine in accordance with well known practice. When the magnet valve is energized by closing switch 33, it operates to supply fluid pressure to the engine to cause it to open the doors, wire 44 is connected by wire 47 to one of the contacts, for instance contact 40 of the switch 17. The other contact 39 is connected by wire 45 to the switch 49 having the contact ferrule 50 thereon. The other contact of the door switch is connected by wire 51 to wire 42. The door switch

is also of the usual and well known type employed in this art, which is arranged to be opened when the doors are closed, which is the position shown in Fig. 8. In this position ferrule 50 is out of the path of the contacts connected to wires 48 and 51. The engine operates this switch so that when the door is closed the switch is open.

To open the doors switch 33 is closed and current flows through wire 42, switch 33, wire 44, the winding of the magnet valve 45, and thence to ground at 46. The doors begin to open, and as they open the door switch 49 closes. When switch 33 is open the winding of the magnet valve is de-energized and the doors closed. If during their closing movement they strike an obstacle, operating the track mechanisms as previously described, switch 17 will be closed by the bridging of contacts 39 and 40 by spring fingers 36. Current then flows from wire 42 through wire 45, switch 49, wire 48, contact 39, contact member 34, and spring fingers 36, contact 40, wire 47, the winding of the magnet valve, and thence to ground at 46. As a result the motor is operated in the reverse direction to cause the doors to open. Switch 17 remains closed until the doors are fully open, at which time the roller, moving in the left hand portion of the track strikes the offset portion 19 of angle iron 10, and causes the switch to open. The doors will then begin to automatically close.

I am of course well aware that this invention resides in certain principles of operation and construction which have been illustrated in one form in the drawings for the purpose of this disclosure. It is of course apparent that these principles may be embodied by those skilled in the art in other physical forms, without departing therefrom, and I do not therefore desire to be strictly limited to the disclosure as it is given, but rather to the scope of the appended claims.

What I seek to secure by United States Letters Patent is

1. The combination as described comprising a door track for defining the path of movement of door guide rollers, said track having movable parts, and a switch associated therewith and adapted to be operated when any one of the movable parts of the track is displaced by the pressure of the door guide rollers thereon when the door strikes an obstruction.

2. In a combination of the type described for use in connection with folding doors having guide rollers thereon, a track member having movable portions and constructed to provide a guide track for the rollers, a switch adjacent the guide track, and adapted to be operated upon the movement of any one of the movable portions of the track by the pressure of the door guide rollers thereon when the door strikes an obstruction.

3. In a door track construction for use in
connection with folding doors having guide rollers thereon, the combination comprising a supporting member, a plurality of angle iron members secured to said support to provide a guiding track for the rollers, one or more portions of said angle iron members being pivotally secured to the support, and a switch adjacent the track adapted to be closed upon the movement of one of said movable angle iron members under the force exerted by the guide rollers when the door strikes an obstacle.

4. In an arrangement as described, the combination comprising a supporting member, two angle iron members secured to said supporting member in longitudinal alignment, one of them being pivotally supported thereon, two other angle iron members secured to said supporting member in longitudinal alignment, and spaced in parallel relation with the other angle iron supporting members, one of which is also pivotally supported on said supporting member, and a switch secured to said supporting member arranged to be closed upon the movement of either of said pivotally supported angle iron members.

5. In an arrangement as described, the combination comprising a supporting member, two angle iron members secured to said supporting member in longitudinal alignment, one of them being pivotally supported thereon, two other angle iron members secured to said supporting member in longitudinal alignment, and spaced in parallel relation with the other angle iron supporting members, one of which is also pivotally supported on said supporting member, and a switch secured to said supporting member arranged to be closed upon the movement of either of said pivotally supported angle iron members, said switch comprising two fixed contacts and a movable arm adapted to bridge said contacts when moved by either of said movable angle iron members.

6. In an arrangement as described, the combination comprising a supporting member, two angle iron members secured to said supporting member in longitudinal alignment, one of them being pivotally supported thereon, two other angle iron members secured to said supporting member in longitudinal alignment, and spaced in parallel relation with the other angle iron supporting members, one if which is also pivotally supported on said supporting member, and a switch secured to said supporting member arranged to be closed upon the movement of either of said pivotally supported angle iron members, and means for returning one of said movable angle iron members to normal position when the pressure thereon is relieved.

7. A track member of the type described adapted to be used in connection with folding doors having guide rollers thereon for movement along said track member, comprising a plurality of angle iron members supported in spaced parallel relation to provide a track, some of said members being pivotally supported, an electric switch, and means on the movable members for closing the switch when they are displaced by pressure exerted by one or both of the rollers, one of said movable members being offset along the path of movement of the roller, whereby upon engagement by the roller the movable members are returned to normal position.

8. In a combination of the type described a track member having fixed and movable parts to provide a guiding path for a door guide roller, an electric switch adjacent there to and arranged to be closed upon the movement of one of said movable members when pressure is exerted by one or more of the guide rollers thereon, and means for returning the movable members to normal position when the pressure is relieved.

9. The combination with folding door guide rollers, of a track form member having movable portions, the guide rollers being adapted to move in the track members, an electric switch, and means on the movable portions for closing the switch when the door strikes an obstacle through the pressure exerted by the guide roller on the movable portions of the track member.

10. The combination with folding door guide rollers, of a track form member having movable portions, the guide rollers being adapted to move in the track members, and electric switch, and means on the movable portions for closing the switch when the door strikes an obstacle through the pressure exerted by the guide roller on the movable portions of the track member, and means for returning the movable portions to normal position when the pressure thereon is relieved.

In testimony whereof I have hereunto set my hand on this 8th day of July, A. D., 1929.

PARIS RALPH FORMAN.