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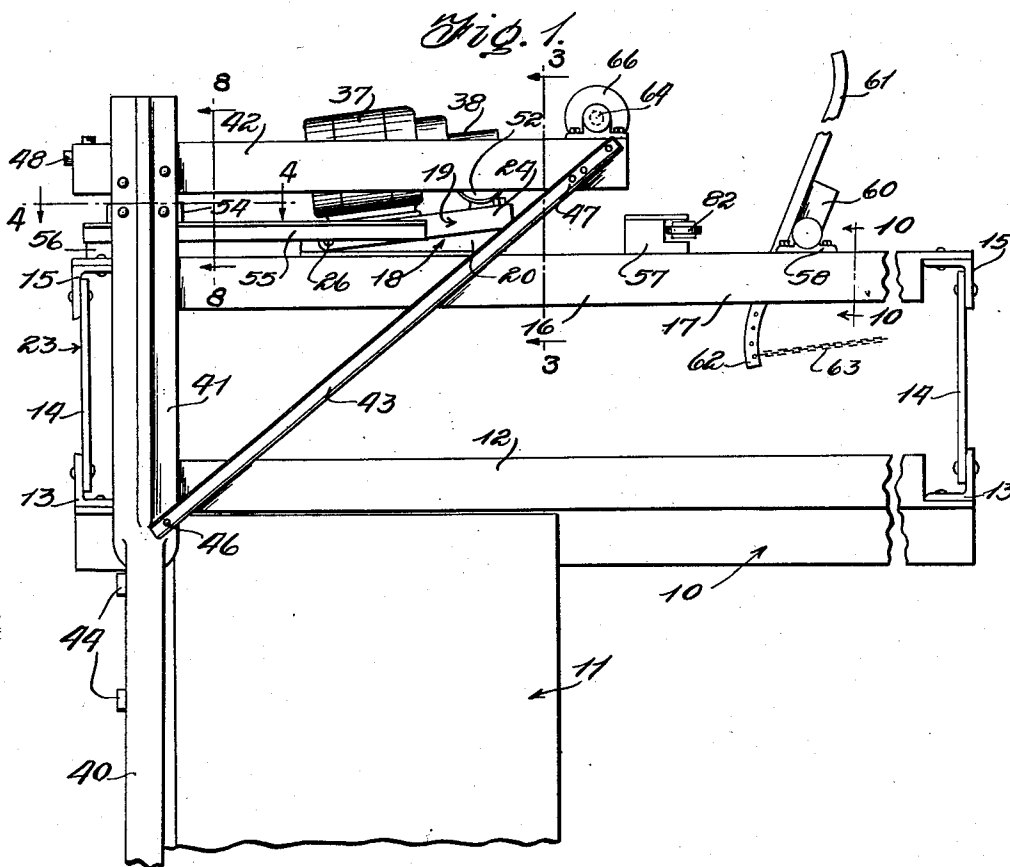
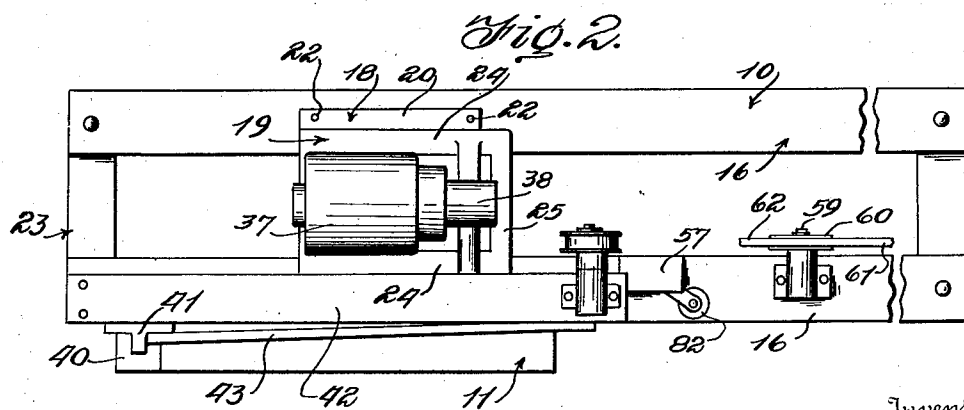
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2,166,527

OPERATING MEANS FOR ELEVATOR DOORS

Filed March 24, 1938

3 Sheets-Sheet 1



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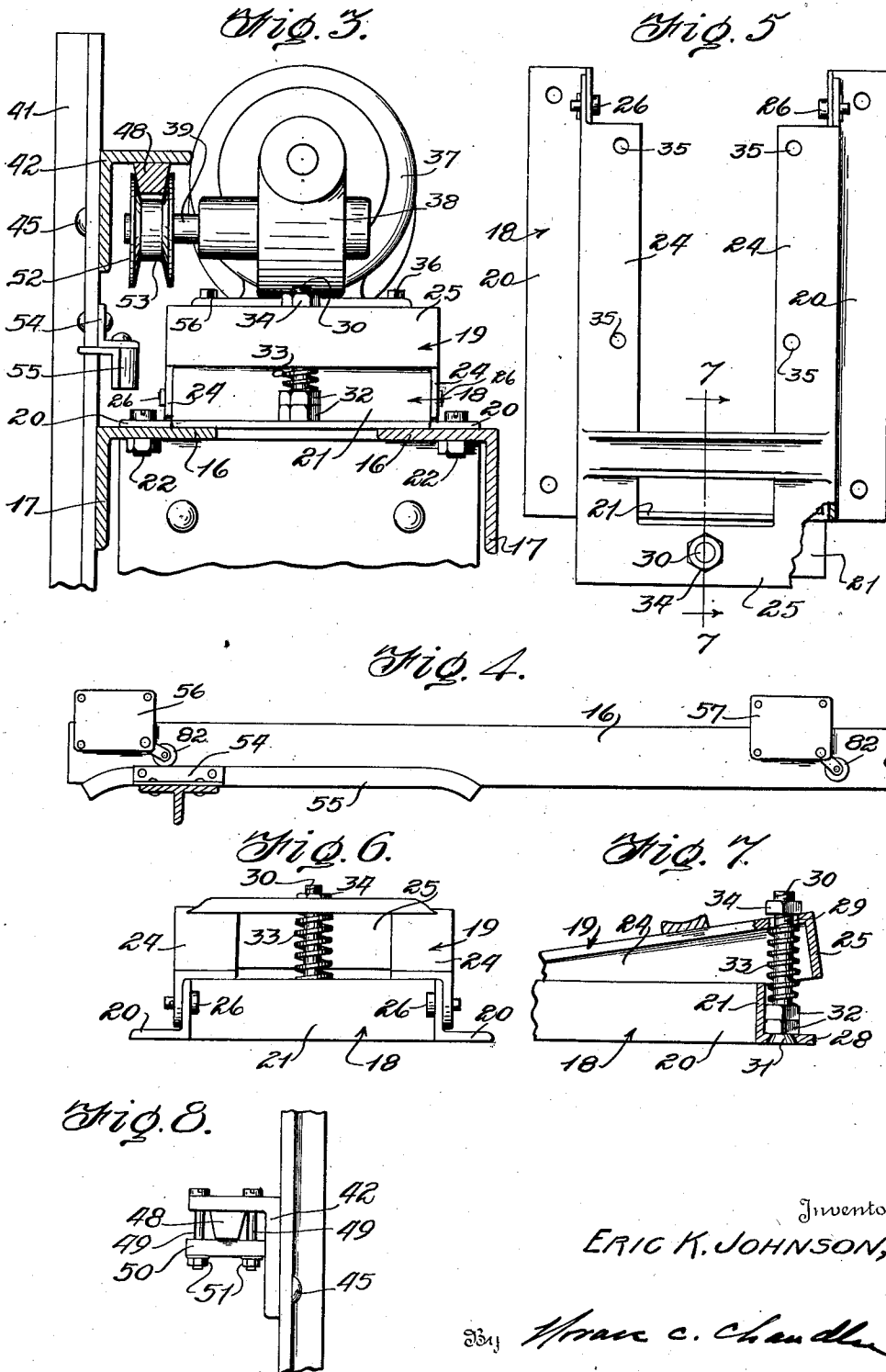
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3 Sheets-Sheet 2



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Fig. 9.

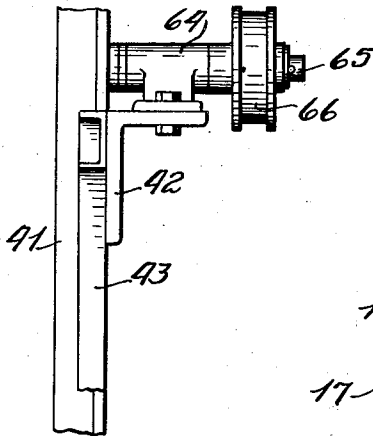


Fig. 10.

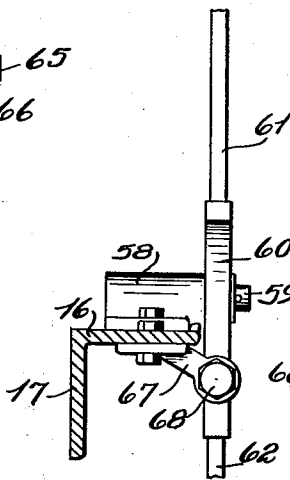


Fig. 11.

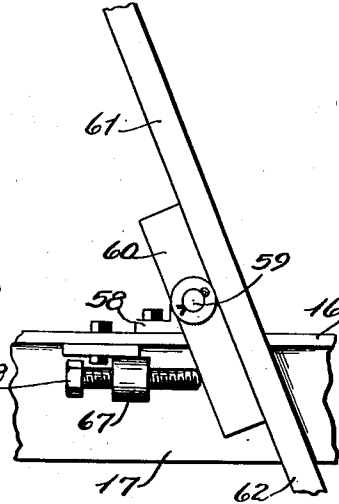


Fig. 12

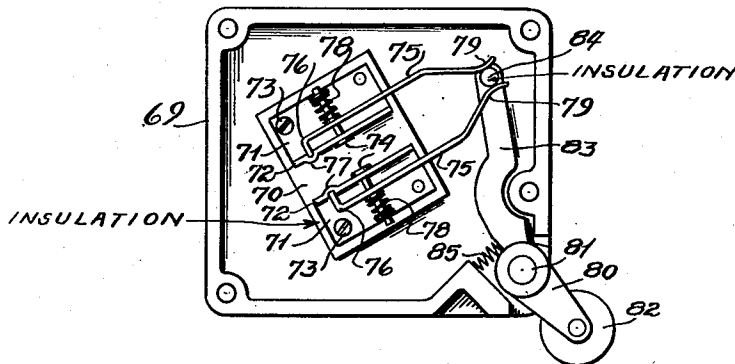
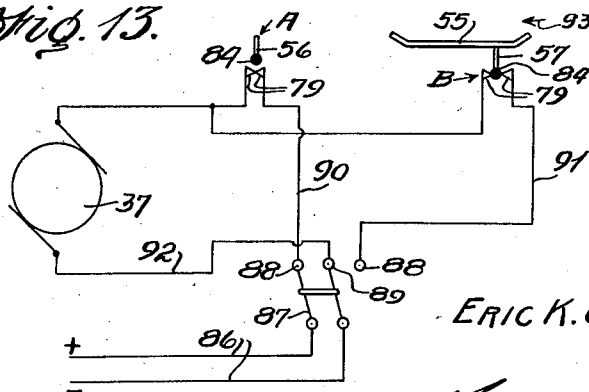


Fig. 13.



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OPERATING MEANS FOR ELEVATOR DOORS

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2 Claims. (Cl. 268—53)

This invention relates to means for imparting rectilinear motion and has special reference to elevator door opening and closing means.

More particularly the invention relates to means for automatically opening and closing the doors of that type of elevators wherein the operation of the elevator is controlled by push button closed electromagnetic means.

One important object of the invention is to provide a novel and improved device for the purpose wherein the mechanism is arranged to provide slipping between the motor means for moving the door and the door itself upon occurrence of any accidental stoppage of the door movement such, for instance, as a person having their hand or clothing caught by the door.

A second important object of the invention is to provide an improved arrangement of operating mechanism whereby the degree of traction force between the motive power and the door moved thereby may be regulated as desired by the user.

A third important object of the invention is to provide a mechanism for the purpose of great simplicity and which will be highly effective in operation, consist of few parts and those not liable to become deranged in use.

A fourth important object of the invention is to provide a novel device for this purpose wherein friction driving means is employed for effecting reciprocation of an object between limits, the driving means acting as a brake as the object approaches each limit of its movement.

A fifth important object of the invention is to provide a novel device for this purpose wherein the reciprocable object will complete its movement even if forceably brought to rest, either purposely or accidentally, and then released.

A sixth important object of the invention is to provide a novel device for this purpose which will effectively move a reciprocable object between its limits and smoothly and quietly bring such an object to rest at its movement limits without requiring the use of checks or bumpers for engaging the object at such limits.

With the above and other objects in view as will be presently explained, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and particularly pointed out in the appended claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:

Figure 1 is a side elevation of a portion of an elevator structure showing part of a door frame and the door and showing the operating mechanism forming this invention,

Figure 2 is a plan view of the parts shown in Figure 1,

Figure 3 is a section on the line 3—3 of Figure 1,

Figure 4 is a fragmentary detail section on the line 4—4 of Figure 1,

Figure 5 is a plan view of a motor base used herein, the motor being omitted,

Figure 6 is an end view thereof,

Figure 7 is an enlarged fragmentary section on the line 7—7 of Figure 5,

Figure 8 is an enlarged section on the line 8—8 of Figure 1,

Figure 9 is a detail end view of a certain bracket used herein and showing a trip lever actuating roller,

Figure 10 is a detail section on the line 10—10 of Figure 1,

Figure 11 is a side elevation of the parts shown in Figure 10 but looking in the opposite direction to Figure 1,

Figure 12 is a plan view of a certain limit switch used herein, the cover of the switch being omitted, and

Figure 13 is a wiring diagram showing the wiring connections for an elevator door operated in accordance with this invention.

While the device has been here illustrated in connection with an elevator door it is to be understood that the invention is adapted for use in actuating any device which it may be desired to move to and fro in a rectilinear path between limiting positions. The invention is not, therefore, to be considered as restricted in its use to the particular construction here shown and described, this being but one embodiment of this device.

As here shown there is illustrated a portion of a door frame indicated in general at 10 and a portion of a door 11, the latter being supported in the usual anti-friction manner not here shown but which permits ready movement of the door from closed position here shown to the open position which is to the right in the present disclosure.

As here shown only the upper part of the frame is illustrated and this part includes a lower horizontal frame member 12 extending transversely of the door opening. At each end of the member 12 an angle member 13 extends transversely of the member 12. Plates 14 are fixed to the angles

13 and extend vertically upward therefrom. Upper angles 15 are riveted to the upper edge portions of the plates 14 and these angles 15 support a plate 16 which has its end portions riveted to said angles 15. The plate 16 has downwardly extending flanges 17 at its longitudinal edges. This plate 16 functions as a platform for the support of the motor base and motor and for the support of certain other elements of the invention to be described.

The motor base comprises a bottom member indicated in general at 18 and a swinging motor support indicated in general at 19. The bottom member consists of a pair of parallel angle member sides 20 and a transverse angle member 21 extending between like extremities of the sides. The sides and ends each have a horizontally disposed leg and a vertically disposed leg extending upwardly from the inner edges of said horizontal legs. The horizontal legs of the side members are secured to the plate 16 by suitable means, such as the bolts 22, on the plate 16 to extend longitudinally thereof in spaced relation to the forward edge 23 of the door frame. The upper member 19 comprises a pair of parallel side members 24 and a transverse member 25 which connects corresponding ends of the members 24, each member 24 is of angle shape and has a transversely horizontal leg and a vertical leg depending from the outer longitudinal edge of the horizontal leg. The vertical legs of the members 24 are so spaced as to lie against the outer faces of the vertical legs of the members 20 and the open ends of the two U-shaped frames thus formed are connected by pivot bolts 26 passing through the vertical legs of the frame sides 20 and 24. The cross member has its horizontal leg provided with a centrally disposed vertical opening 28. The transverse member 25 is provided with an elongated opening 29 aligned vertically above the opening 28. A bolt 30 extends through the openings 28 and 29 and is provided with a head 31 which rests in the opening 28, the opening 28 being countersunk at its lower end to accommodate this head 31. On the lower part of this bolt is secured a pair of nuts 32 the lower one of which constitutes a jam nut. Between the upper nut 32 and the under side of the member 25 there is provided a coiled spring 33 which surrounds the bolt 30 and urges the free end of the swinging frame 19 upwardly, the extent of upward movement being limited by a nut 34 screwed upon the upper end of the bolt 30 which projects above the member 25. By adjusting the nuts 32 the tension of the spring 33 may be adjusted to suit the specific conditions desired in the particular installation. The swinging frame 19 is provided with suitable bolt holes 35 for the reception of the holding down bolts 36 of the motor 37 used herein as the motive power of the device. This motor 37 is provided with a speed reduction mechanism of any preferred construction the casing of which is shown at 38 and the speed reduction mechanism has the usual output shaft 39. This motor is positioned in such manner that the shaft 39 extends transversely of the base and is located adjacent the free ends of the swinging frame 19.

The door includes a vertically disposed front edge member 40 whereon is secured a bracket consisting of a vertical member 41, a horizontal member 42 extending parallel to the upper edge of the door 11 and a diagonal brace member 43. The member 41 has its lower part secured to the vertical door edge by bolts 44 and projects

at its upper end above the level of the plate 16. This upper portion of the member 41 is of T-shape in cross-section and the head of the T faces the door frame. The member 42 is of angle shape and has a vertical flange which is secured adjacent one of its ends to the upper part of the member 41 by rivets 45 or other suitable means. This member 42 has a horizontal flange projecting over the plate 16 in spaced parallel relation thereto. The brace 43 is secured to the member 41 adjacent the top edge of the door 11 by rivet means 46 and to the free end of the member 42 by rivets 47 or other suitable means. Extending longitudinally of the horizontal flange of the member 42 is a rail 48 of trapezium form in cross-section. This rail is positioned with its major base in contact with the under face of said horizontal flange and its sides extending downwardly from the base to form an elongated bluntly wedge-shaped structure. This rail is secured to the member 42 at each end and in order to effect such securing there is provided at each end a pair of bolts 49 which extend down through the horizontal flange to lie on opposite sides of the rail 48. A plate 50 is mounted on the lower ends of the bolts 49 and is forced up against the under face of the rail 48 by nuts 51 screwed on the lower ends of the bolts. Fixed upon the shaft 39 to rotate therewith is a drive wheel 52 having a peripheral groove 53 of a cross-section corresponding to that of the rail 48. This groove engages the rail 48 frictionally so that revolution of the wheel 52 causes movement of the rail longitudinally over the door frame and consequent movement of the door 11 to open and close in accordance with the direction of rotation of the motor, it being understood that the motor 37 is a reversing motor. It will be noted that the greater the tension on the spring 33 the greater will be the friction between the wheel 52 and the rail 48.

Fixed to the member 41 just below the member 42 is a bracket 54 to the under side of which is secured a cam rail 55. In the path of this cam rail there is provided a pair of spaced limit switches 56 and 57, the switch 56 being engaged by the cam rail upon the door being in closed position and the switch 57 being engaged by said rail upon the door being opened to its full extent. By this means the motor circuit is broken at the proper positions of the door so that the wheel 52 ceases to rotate upon the door reaching such positions. The reduction gear is preferably of the worm and worm-wheel type so that it is irreversible and the wheel 52 cannot revolve to actuate the motor. Consequently stoppage of the motor causes the wheel 52 to act as a brake on the rail 48 and this eliminates the necessity of bumper springs or other check devices for bringing the door to rest. Also this brake action of the wheel prevents slamming of the door in the opening and closing movements. Furthermore, if the motion of the door be arrested between its limits of movement the wheel 52 will slip on the rail 48 so long as the arresting action continues, but upon release of the door the wheel will again act to complete the movement of the door to open or close as the case may be.

At 58 is a bracket which is fixed on the plate 16 and this bracket carries a pivot 59 whereon is pivoted a saddle 60. Fixed intermediate its ends to the saddle 60 is a lever having an upper arm 61 extending upwardly from the saddle and having a lower arm 62 extending downwardly from said saddle. Connected to the lower end of the

arm 62 is a flexible strand here shown as a chain 63 which is connected to the door switch locks (not shown) so that pulling upon the chain releases said locks. Mounted on the free end of the member 42 is a bearing 64 which supports a shaft 65 carrying a roller 66. The lever arm 61 lies in the path of this roller so that opening of the door causes engagement of the roller with said arm. This contact takes place prior to the door being moved to fully opened position so that the final position of the door opening movement effects tilting of the lever 61 and consequent traction on the chain 63. In order to limit the forward movement of the arm 61 and rearward movement of the arm 62 an adjustable stop is provided. This stop consists of an angle bracket 67 mounted beneath the plate 16. Through the bracket 67 is screwed a stop screw 68 the point of which normally contacts with the lower end of the saddle 60. This screw may be positioned to project through the bracket to any desired extent so that the saddle is normally in the desired position. Each limit switch preferably consists of a casing 69 wherein is mounted a plate 70 of insulating material. This plate carries a pair of spaced angle members of conductive material each having a leg 71 fixed to the plate 70 and each having a vertical leg 72, the legs 72 rising from the proximal edges of the legs 71 and being parallel. Each leg 71 is provided with a binding post 73 for connection of a circuit wire. Extending through the legs 72 about the centers thereof are pins 74 which also pass through the contact strips or blades 75. The blades 75 have curved ends 76 which rest in seats 77 formed on the legs 72. Springs 78 surround the pins 74 and urge the free ends 79 of the blades toward each other. One corner of the casing is provided with an opening wherethrough projects one arm of a lever 80 carried by a pivot 81 and carrying a cam roller 82 which normally lies in the path of the cam bar 36. The other arm 83 of the lever extends inwardly of the casing and carries an insulating pin movable into and out of position between the contact ends 79. A spring 85 normally biases the arm 83 to bring the pin 84 between said ends but movement of the cam bar into engagement with the roller 82 moves the pin 84 from between the ends 79 so that these ends contact.

In Figure 13 is shown a diagram of the circuit connections for the motor 37 and the limit switches. In this figure line wires 86 lead to a reversing switch 87 forming part of the usual elevator controller. The outer contacts 88 of this switch are connected in multiple through wires 90 and 91, and limit switches here shown at A and

B to one terminal of the motor 37. The center contact 89 is connected to the other terminal of the motor through the wire 92. In the position shown current will flow from the positive lead 86, contact 88, wire 90 and switch A to the motor and thence back through wire 92 and contact 89 to the negative lead 86. This causes the motor to move the door and bar 36 in the direction of the arrow 93. As the bar 36 disengages from the limit switch B the switch closes. When the bar 36 engages switch A the latter opens and the circuit to the motor is broken. The circuit will remain open until the controller is shifted to engage the contact 88 of the wire 91 whereupon circuit is again closed through the motor. Under these conditions current will flow in a reverse direction through the motor which will thus operate in the opposite direction and effect movement of the door and bar in a direction opposite the arrow 93 until switch B is engaged by bar 36 and opened.

What is claimed is:

1. An elevator door actuating mechanism including a platform extending in the direction of movement of said door, a bracket fixed to said door to move therewith and having a member extending longitudinally above said platform in spaced relation thereto, a friction rail fixed to said member on the under side thereof, a motor base fixed on said platform and having a swingingly mounted motor supporting element, spring means urging one end of said motor supporting element upwardly from said platform, a motor mounted on said supporting element, a worm driven reduction gear actuated by said motor and having an output shaft, and a friction wheel fixed on said shaft and frictionally engaging said rail.
2. An elevator door actuating mechanism including a platform extending in the direction of movement of said door, a bracket fixed to said door to move therewith and having a member extending longitudinally above said platform in spaced relation thereto, a friction rail fixed to said member on the under side thereof, a motor base fixed on said platform and having a swingingly mounted motor supporting element, spring means urging one end of said motor supporting element upwardly from said platform, a motor mounted on said supporting element, a worm driven reduction gear actuated by said motor and having an output shaft, a friction wheel fixed on said shaft and frictionally engaging said rail, and means to adjust the tension of said spring means and thereby regulate the frictional engagement of the wheel and rail.

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