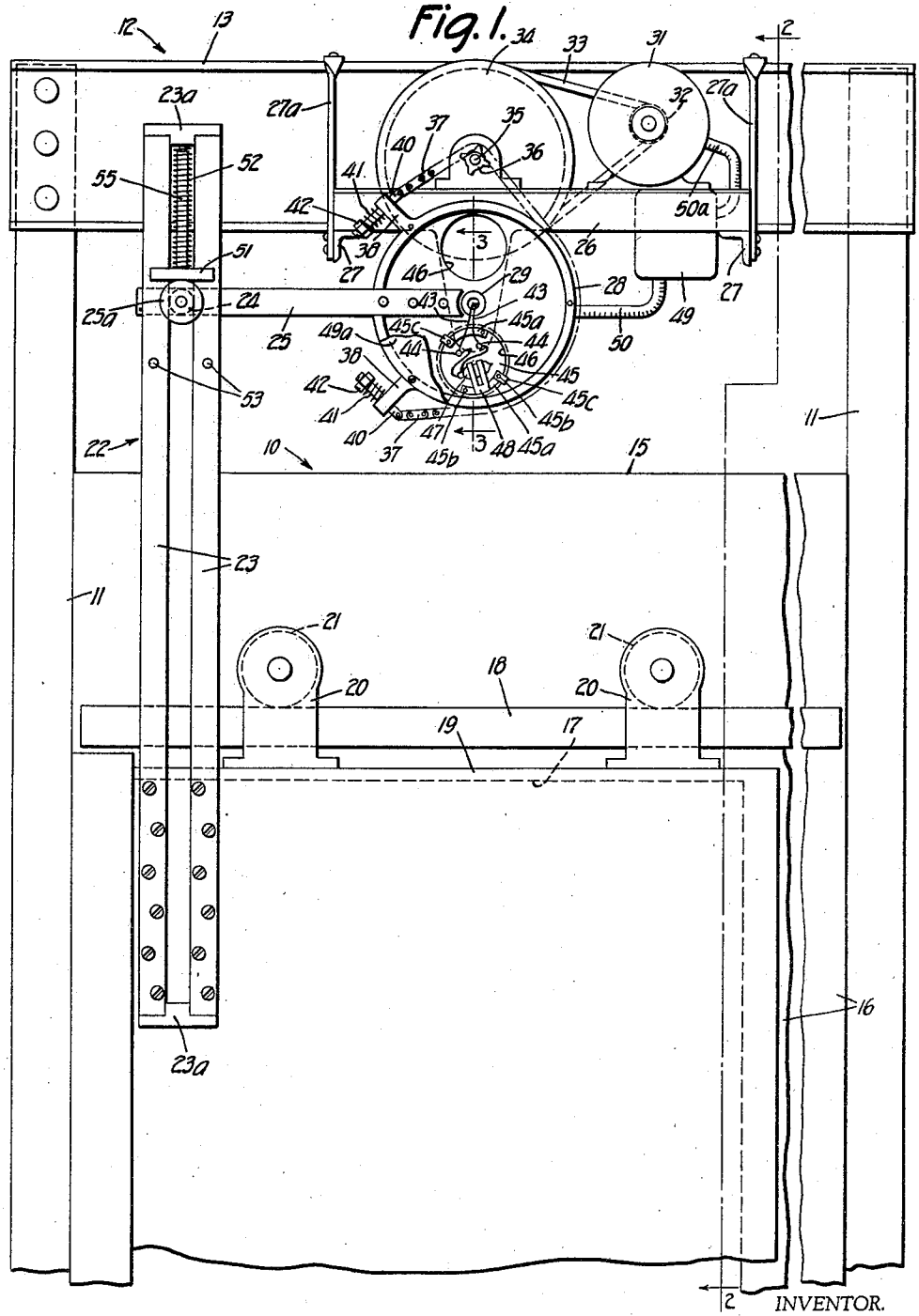
Jan. 4, 1949. M. A. MYERS 2,458,402

AUTOMATIC OPERATOR FOR ELEVATOR DOORS AND HALL DOORS

Filed Feb. 29, 1944 4 Sheets-Sheet 1

Fig. 1.



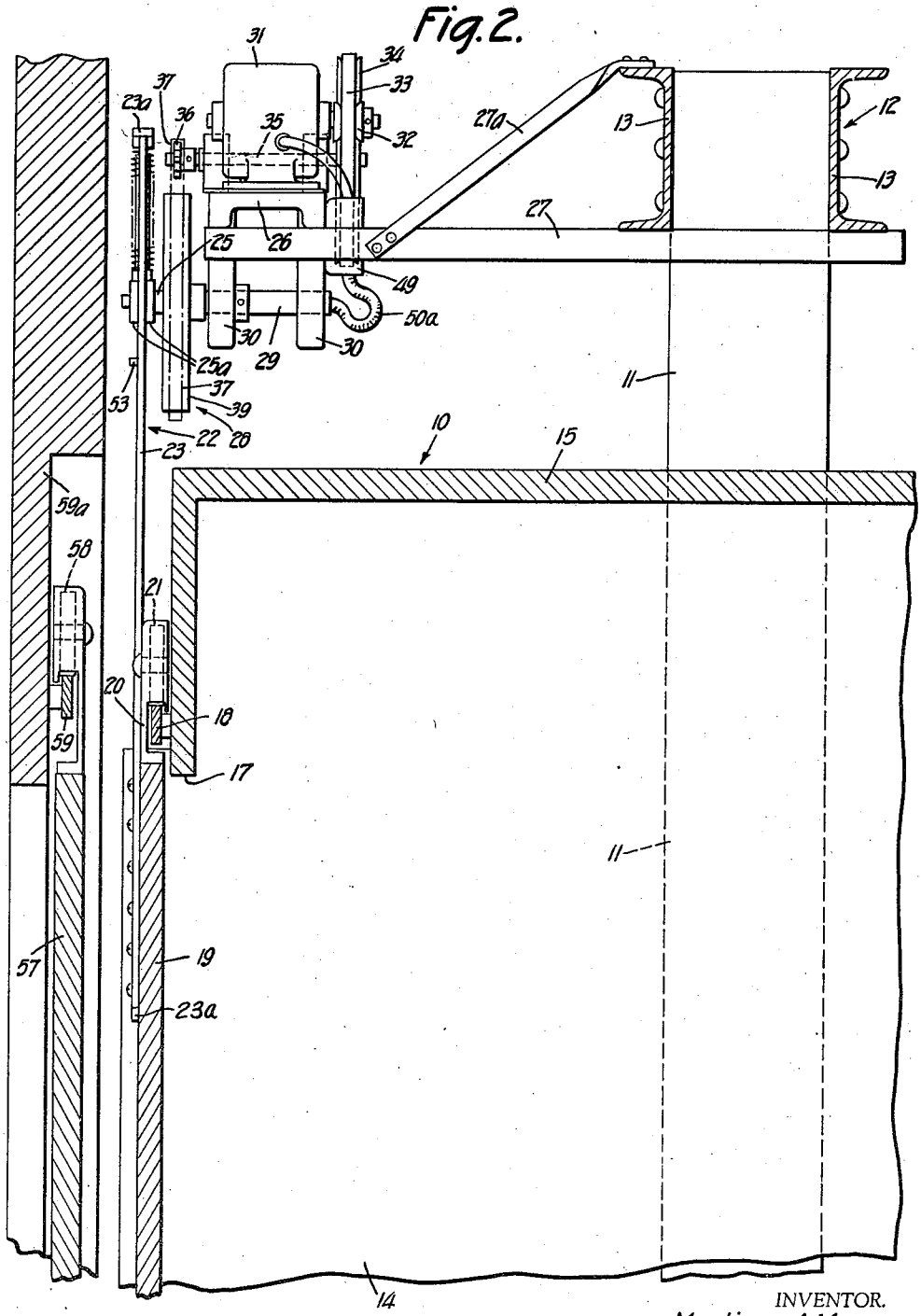
INVENTOR.
Mortimer A. Myers
BY Moses, Wolte, Crews & Berry
ATTORNEYS

Jan. 4, 1949. M. A. MYERS 2,458,402

AUTOMATIC OPERATOR FOR ELEVATOR DOORS AND HALL DOORS

Filed Feb. 29, 1944 4 Sheets-Sheet 2

Fig. 2.



INVENTOR.
Mortimer A. Myers

BY Moses, Nolte, Crews & Berry
ATTORNEYS

Jan. 4, 1949. M. A. MYERS 2,458,402

AUTOMATIC OPERATOR FOR ELEVATOR DOORS AND HALL DOORS

Filed Feb. 29, 1944 4 Sheets-Sheet 3

Fig. 4.

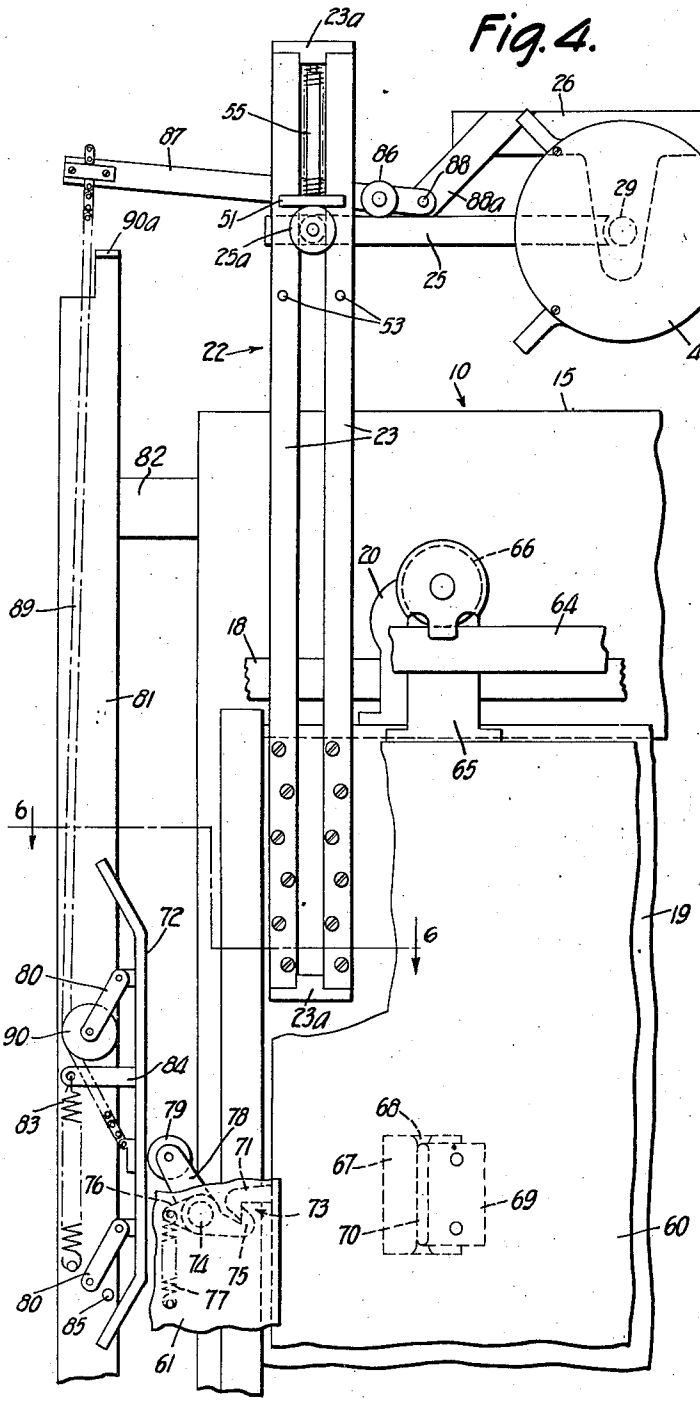
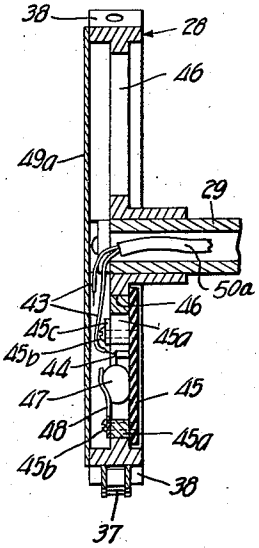


Fig. 3.



INVENTOR.
Mortimer A. Myers

BY Mosse, Notte, Crews & Berry
ATTORNEYS

Jan. 4, 1949. M. A. MYERS 2,458,402

AUTOMATIC OPERATOR FOR ELEVATOR DOORS AND HALL DOORS

Filed Feb. 29, 1944 4 Sheets-Sheet 4

Fig. 5.

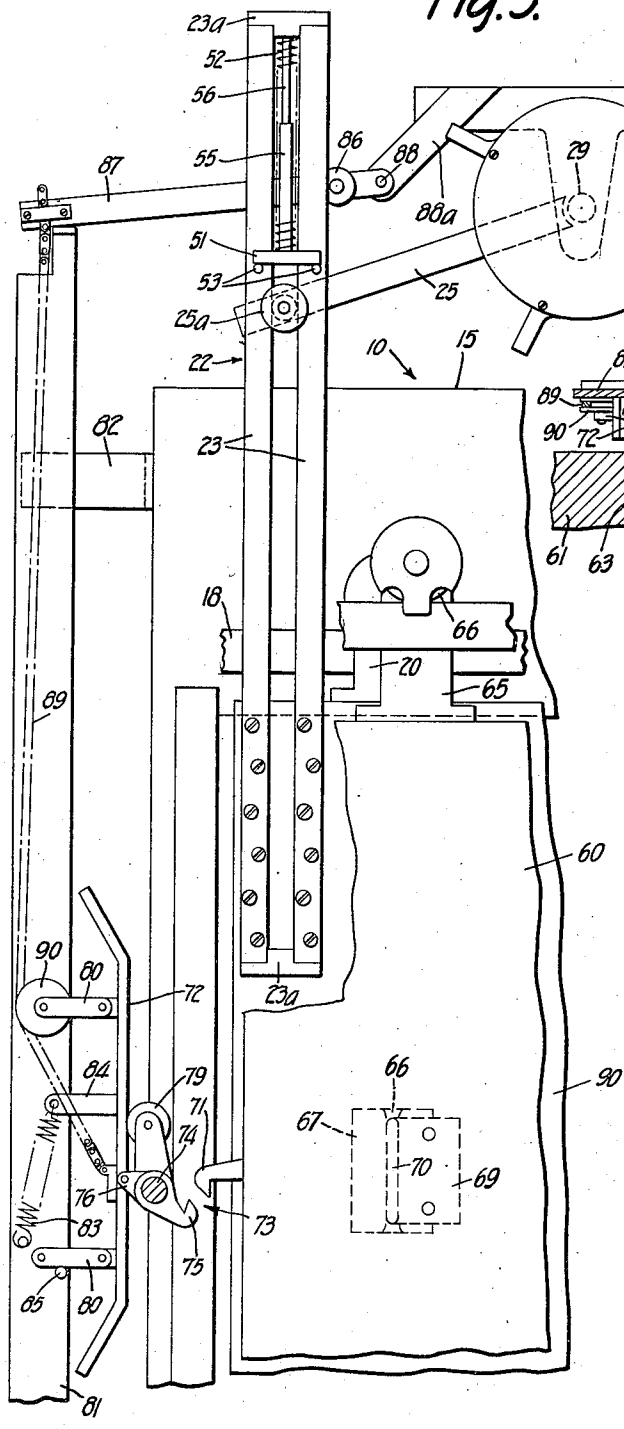


Fig. 6.

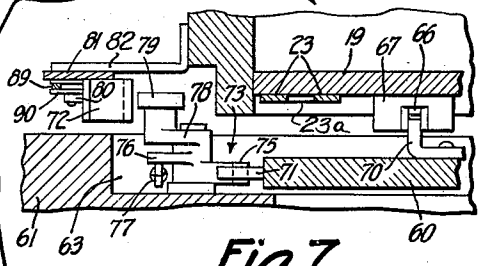


Fig. 7.

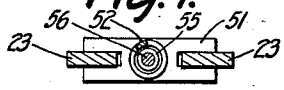
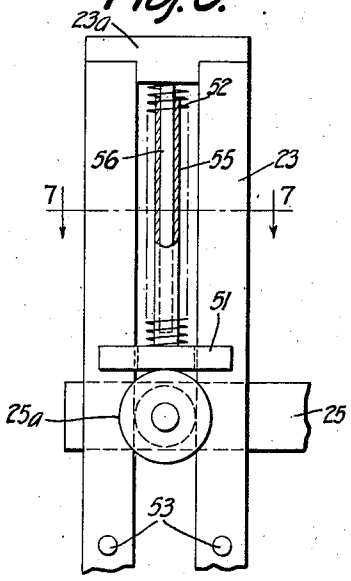


Fig. 8.



INVENTOR.
Mortimer A. Myers

BY Moses, Nolte, Crews & Berry
ATTORNEYS

Patented Jan. 4, 1949 2,458,402

UNITED STATES PATENT OFFICE

2,458,402

AUTOMATIC OPERATOR FOR ELEVATOR DOORS AND HALL DOORS

Mortimer A. Myers, Bellaire, N. Y., assignor to The Maintenance Company, Inc., New York, N. Y., a corporation of New York

Application February 29, 1944, Serial No. 524,390

13 Claims. (Cl. 268—53)

1

This invention relates to improvements in automatic elevator car door operators and in combined car door and hall door operators.

An object of the invention is to provide a novel and advantageous car door operator for elevators.

Another object is to provide novel means for operating both car doors and hall doors in elevator installations.

Another object is to provide novel door operating means whereby the door will be operated at maximum speed in the middle part of its travel and will automatically slow down in moving toward the ends of its path until zero speed is reached at the limits of travel, thus obviating the necessity of checking devices and the like and preventing slamming of the door.

Another object is to provide novel door operating means permitting the car door to be opened from within in case, for example, of interruption of the current supply for the electrically driven door operator.

Another object is to provide means, for use in connection with a door operator, according to the present invention, to unlock the hall door slightly in advance of the door opening operation.

A further object is to provide novel and advantageous door-operators which are of simple construction and are economical to manufacture, install, operate and maintain.

In carrying out the invention, use may be made of an operating arm pivoted on a structure carried by the cage or car above its roof and connected to a member slidable along a vertical guide secured to the car door at its front side. With the car at rest and the car door open the operating arm will be substantially horizontal. Upon the operation of means which may include buttons on the car and buttons at the various floors, there will be started a torque motor which swings the operating arm and closes the door. The motor is then stalled but the current is still supplied thereto. When reaching the selected floor, the action of the motor will be reversed and when the door is fully open the motor will be shut off.

To allow the door to be opened manually in case of possible interruption of the current supply with passengers in the car, provision of back pressure means is made to exert back pressure on the operating arm when it comes within a short distance, say three inches, of horizontal. The torque motor will overcome this back pressure but will be stopped by suitable means when the operating arm reaches substantially horizontal position. If, therefore, the current is cut off, the back pressure means will move the operating arm

2

downwardly and move the door back a short distance but far enough to enable anyone present to insert his fingers and open the door. The back pressure means may involve the use of springs, weights or any other suitable means.

When master door operation, that is operation of both car door and hall door together is desired, it may be attained by attaching a slotted carrier to the car door, and angle iron members to the several hall doors, all with flanges carefully aligned with the slot of the slotted carrier on the car door. Of course this connection may be reversed or other connections used. If then the car door closes or opens within a landing or floor zone, the hall door at that level will move with the car door.

With this arrangement for connecting the car and hall doors, it will be necessary to unlock each hall door before it can be opened by the car door. For this purpose a retiring cam on the car may be used to release the latches carried by the hall door frames or the adjacent walls and adapted to cooperate with suitable members or keepers on the hall doors. As each door closes, the car door operator withdraws the cam so that the hall door will be locked.

Master door operation requires unlocking of the hall door at the level reached by the car, before the doors move appreciably. This may be accomplished by causing the operating arm to operate an auxiliary arm upwardly beyond horizontal to closing position. The door movement corresponding to an upward movement of the auxiliary lever through a short distance below horizontal and a short distance above horizontal, and vice versa would be practically nil, and the door operating arm movement corresponding to this range of movement of the auxiliary arm may be used to effect the locking or unlocking of the hall door while this door and the car door connected therewith are practically stationary.

Other objects, features and advantages will appear upon consideration of the following detailed description and of the drawings, in which

Fig. 1 is a fragmentary front elevation of the upper part of the car of an automatic elevator, showing car door operating means embodying the present invention;

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

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary front elevation showing a form of the invention in which the car door operator is used to control hall door locking

means and to open and close the hall door, the hall door being ordinarily locked;

Fig. 5 is a view similar to Fig. 4 but with the hall door unlocked and both doors withdrawn slightly from closed position;

Fig. 6 is a section on line 6—6 of Fig. 4;

Fig. 7 is a section on line 7—7 of Fig. 8; and

Fig. 8 is a fragmentary detail view on a larger scale of the car door opener of Fig. 1.

Referring to Figs. 1 and 2, the supporting frame of a car 10 may comprise vertical side members 11 in the form of channels which may cooperate with vertical guides (not shown) in the elevator shaft, and a crosshead 12 comprising two horizontal channels 13 facing outwardly and having their webs secured by suitable means such as rivets to the corresponding side flanges of side members 11. The car proper may comprise a floor and a rear wall (both not shown), side walls 14, a top or roof 15, and a front wall 16 having therein a door opening 17 which may extend about half the width of the car.

Mounted on the front wall 16 of the car and somewhat above the door opening 17 is a door supporting and guiding rail 18 which is spaced from the front wall and near its top is free at both its front and rear faces. Slidably supported by this rail 18 is a door 19 slideable from closed to open position and vice versa. Such support may be attained by use of hangers 20 in the form of brackets secured to the door at its top and having pivoted to each bracket a wheel 21 adapted to rest on the rail. As illustrated each wheel 21 is to the rear of the corresponding bracket and the upper end of the bracket extends over the top of the wheel and downwardly to the rear thereof where it may assist in supporting the pivot and, as illustrated in Fig. 4, and may extend back of the rail to serve as a guard to prevent the wheel from running off the rail.

Mounted on the door 19 and extending upwardly therefrom is a guide 22 in the form of two parallel bars 23 secured together at their ends by member 23*a* which maintain said bars at such a distance apart as to provide a neat clearance fit for a roller 24 pivotally mounted, preferably with ball bearings, on one end of an arm 25 pivotally mounted at its other end, and steadied between said bars by guide washers 25*a*. The effective length of the arm is about one-half of the width of the door opening so that by movement of the arm through 180° in opposite directions about its pivotal support the door will be opened and closed.

The operating means for the arm 25 is mounted on a channel shaped bed-plate 26 supported by the forward parts of angle bars 27 attached to the flanges at the bottom of the channels 13 of the cross-head 12. For greater strength and stiffness use may be made of ties or braces 27*a* secured to the top flange of the front channel 13 and to the angle bars 27 just to the rear of the bed-plate 26.

The pivotal mounting of the end of arm 25 remote from the roller 24 is effected by securing it in radial position on a disc or head 28 secured to a hollow shaft 29 supported in two bearings 30 extending downwardly from the bed plate 26 at its front and rear edges. Actuation of the head 28 about the axis of shaft 29 may be effected by means mounted on the bed plate 26 and comprising a reversible torque motor 31, a belt drive for initial speed reduction, and a sprocket and roller chain drive for the operator head 28 actuated from the belt drive.

The torque motor 31 rotates a pulley 32 fixed on the motor shaft and connected, preferably by a V-belt 33, to a larger pulley 34 mounted on a shaft 35 carrying a small sprocket wheel 36 cooperating with a suitable roller chain 37 connected at opposite ends to brackets 38 projecting from the circumference of the head 28 at distantly spaced points between which the disc or head is provided with a wide rim 39 to carry a part or parts of the chain 37 as the head turns back and forth. The ends of the chain 37 may be connected to the brackets 38 by pins 40 slidable in the brackets 38 and carrying compression springs 41 confined between the brackets and members by nuts 42 on threaded portions of the pins. Said springs 41 may serve to hold the chain tight and to act as shock absorbers. It will be evident that in addition to the initial speed reduction from pulley 32 to pulley 34 there is a very substantial second speed reduction between sprocket wheel 36 and the disc or head 28.

It should be noted that all of the operating parts for opening and closing car door 19 are located at all times above the level of the top of said door where they will not interfere with any other part nor be interfered with by any other part.

When the car is at rest at a floor and out of use, the door 19 is open and the circuit of motor 31 is open, and arm 25 would be in a position at approximately 180° from its position shown in Fig. 1. Then if the motor circuit be closed in a known manner by pressing a suitable button in the car or a button at any other floor, the torque motor 31 would operate to swing the arm 25 through about 180° to close the door. Upon completion of the door closing, the motor which is designed so as not to be injured by such action, may be stalled due to the action on the arm of any suitable stopping means, and remains in that condition until the elevator reaches the intended floor and the motor is reversed automatically in a known manner to open the door. As brought out hereinafter a part of a device having also a different function is utilized to stop the arm and stall the motor. It is found to be distinctly advantageous to keep the motor energized in that this condition prevents tampering with the door when the car is in motion.

In connection with such opening the motor 31 must be automatically shut off or stopped as the door 19 approaches close to or reaches its final open position. To this end, as shown in Figs. 1 and 3, wires 43 of the door-opening circuit pass through the hollow shaft 29 to the front of the disc or head 28 to posts 44 on an insulating disc 45 clamped across a circular opening or hole 46 in the head, and from said posts to a mercury switch 47 held against the disc 45 by a spring clip 48. The disc 45 is guided in the hole 46 by two arcuate members 45*a* which engage, slidingly, the edge of the hole 46. These members 45*a* are held on the disc 45 by screws 45*b*, Figs. 1 and 3. The disc 45 is of slightly larger diameter than the hole 46 so as to engage the rear face of the head 28 and lips 45*c*, one on each member 45*b*, engage the front face of the head to clamp the disc 45 in adjustable position in the hole 46. As illustrated, the head 28 is provided with a second opening which might be used in installation of another mercury switch to shut off the motor 31 upon closing the car door when and if desired.

When the mercury switch 47 is in its lowermost position (Fig. 1) the circuit will be closed at that point but when the switch is moved

through 180° around the hollow shaft 29 and reaches its uppermost position as the door reaches its open position, the switch will be opened, slightly before it reaches its final position. The wires 43 extend through an armored casing 50 to a junction box 49 where they are connected to suitable binding posts (not shown). Torque motor wires or conductors (not shown) in an armored casing 50a connect the motor to suitable parts in the junction box 49. Preferably the front of the head 28 is covered by a cover plate or disc 49a, Figs. 1 and 3.

Some means should be provided to permit the door 19 to be opened manually in case of interruption of the current supply to motor 31 with passengers in the car. To this end provision may be made of a sliding member or shoe 51 on bars 23 urged downwardly by a helical spring 52, Figs. 1 and 8, interposed between the shoe 51 and member 23a. The spring will no longer be under compression when the door is open entirely or to a substantial extent, and the shoe 51 will be arrested by stop means such as pins 53 projecting from the front of bars 23 a short distance, say approximately three inches, below the position occupied by shoe 51 when the arm 25 is held in substantially horizontal door closing position by the motor. The spring 52 may be held against buckling by a telescopic guide (Fig. 8) consisting of a tube 55 projecting upwardly from shoe 51 and a rod 56 extending downwardly from member 23a and adapted to obstruct and limit the upward movement of shoe 51 so as to stop the arm 25 in substantially horizontal position with the door closed and the spring held under compression by the stalled motor. If the current supply is interrupted the spring will expand and move arm 25 downwardly to the position determined by the pins 53 thus releasing and opening the door slightly, but far enough to permit engagement of the front edge of the door to thus enable the door to be opened entirely manually.

It will be understood that there is provided at each floor a hall door 57 each door having rollers 58 by which the door is supported on a rail 59 fixed to wall 59a and upon which the door 57 may ride back and forth to open and close it. The hall doors 57 cannot be opened from the hall but only by an elevator attendant who rides in the elevator.

In Figs. 4, 5 and 6, there is illustrated an arrangement for master door operation, that is of both car door 19 and a hall door 60, at the floor where the car 10 is positioned and in which arrangement the elevator requires no attendant. The hall door 60 is slidably mounted at the shaft side of the hall wall 61, Fig. 6, so that it can move in unison with car door 19 and close and open hall door opening 62. Preferably the hall door is mounted in a recess 63 at the shaft side of the hall wall 61 and is slidably supported on a horizontal rail 64 mounted on said hall wall. The door 60 may be supported from said rail 64 by hangers or brackets 65 projecting upwardly from the door and having rollers 66 resting on the rail, the mounting being similar to that for the car door 19.

In this arrangement provision must be made of means to connect the car door 19 with the hall door 60 at the floor or landing where the car is located. One way of effecting such interlocking is to provide at the front of the car door a part 67 with a vertical slot or groove 68 and each of the hall doors 60 at their inner faces with members 69 having vertically extending tongues or flanges 70 all carefully aligned with the slot or groove 68 so as to be received thereby as the car reaches the corresponding landing zone or floor. With this arrangement, the energized torque motor action is particularly desirable in that it assures alignment during car runs, between the groove 68 in the part 67 at the outer side of the car door and the tongues or flanges 70 projecting from the inner sides of the hall doors 60.

Automatic locking of a hall door 60 at any floor before the car leaves that landing zone and unlocking of a hall door at any floor when the car reaches the landing zone, may be effected by means including a fixed locking member or hook 71 on the hall door, movable locking means on the hall door frame or the hall wall, and a retiring cam 72 carried by the car. The locking means on the hall door frame comprise a member 73 in the recess 63 and mounted on a pivot 74, said member 73 comprising a hook 75 adapted to cooperate with the hook 71, an arm 76 urged by a spring 77 to move the hook 75 into position to cooperate with hook 71, and an arm 78 having pivotally mounted thereon a roller 79 spaced inwardly from the hall wall 61 in position to be actuated by the retiring cam 72.

Said retiring cam 72 is illustrated as having a central vertical portion and end portions inclined rearwardly so that the rollers 79 will not strike the ends thereof as the car reaches different floors. The cam 72 may be supported by short parallel links 80 pivotally connected to the rear of the cam 72 and to a bar 81 carried by brackets 82, only one being shown, projecting laterally from the car at its front one at the upper end and one at the lower end of the bar 81. The cam 72 is urged to advanced position, Fig. 5, by means of a spring 83 connecting bar 81 and an arm 84 projecting from the back of cam 72, being checked in such advanced position by means of a stop 85 in the path of one of said links 80.

When the car door 19 is closed, as it is during motion of the car from one floor to another, the door operating arm 25 will be in raised position, Fig. 4, and by engagement with a roller 86 pivotally supported on a cam controlling arm 87 mounted at one end on a pivot 88 on a bracket 88a secured to the bed plate 26, will hold the other end in raised position. A flexible member such as a chain 89 is connected to the outer end of arm 87, passes around a pulley 90 pivoted on bar 81 and is connected to cam 72 to hold the cam in retiring or retracted position. Downward movement of arm 87 may be limited by a stop 90a on the bar 81. As indicated, there is very little clearance between the cam 72 and the roller 79 but the inclined ends of the cam prevent trouble even if the roller strikes the cam.

When the arm 25 is swung from its Fig. 4 position to open the door, the arm 87 will move downwardly and the cam 72 will be moved downwardly and laterally to its advanced position, Fig. 5, by gravity aided by the spring 83, thus causing withdrawal to ineffective position of the locking member or hook 75 against the action of spring 77.

When the hall door 57 of Fig. 1 is to be opened manually, the unlocking of this door may take effect after the car door 19 has opened to some extent and under these conditions the upward movement of the door operating arm to close the door may stopped with the arm in horizontal position, Fig. 1, which it will maintain during movement of the car. The locked condition of

the outer or hall door would not interfere in any way with opening of the car door. In the case of a self-service elevator the hall door, which may be of the swing type, can be opened from the hall or the landing at which the car is at rest because the retiring cam has unlocked that particular door.

However, with master door operation, Figs. 4, 5 and 6 the car door cannot open unless the hall door is unlocked before the doors move appreciably. This condition may be helped, for example, by changing the length of stop rod or pin **56** so as to permit roller arm or door-operating arm **25** to move upwardly beyond the horizontal in closing. Obviously, the horizontal movement of door-operating roller **24** during movement of arm **25** from a position slightly above horizontal will be substantially nil. Consequently the door movement would be substantially nil during the unlocking of the hall door and there would be no interference. Similarly the final return of the locking hook **75** to effective position would take place in the corresponding interval. In other words, the movement of the arm **25** during this interval may be utilized to operate the cam in locking or unlocking the hall door, while the car door and the hall door are practically stationary.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. Operating means for a sliding door of a car of an automatic elevator, comprising a guide with a vertical slot fixed to said door, a roller movable in said slot, a door-operating arm on one end of which said roller is pivoted and which is pivoted at the other end to the car, said arm having an effective length of about one-half of the door width, electrical means for swinging said arm in one direction to close the door and to substantially horizontal position in the opposite direction to open the door, a member slidable on said guide above said roller, a stop device to limit upward movement of the slidable member, spring means urging said slidable member downwardly but stressed by movement of the arm to door-closing position, said spring means acting upon interruption of power to force said arm downwardly to release and slightly open the door and means for limiting the downward movement of said slidable member.

2. Operating means for a sliding door of a car of an automatic elevator, comprising a vertical guide fixed to said door, a device movable along said guide, a door-operating arm connected at one end to said device and pivoted at the other end on said car, said arm having an effective length of about one-half the door width, means including a torque motor for operating said arm in opposite directions in one direction to close the door and in the opposite direction to open the door, a device to stop said arm in substantially door-closing position and stall said motor, and means cooperating with said device movable along the guide overcome by said arm in the latter part of its door-closing movement but rendered effective by interruption of current in the motor circuit to move the door in the opposite direction and open the door enough to permit manual opening thereof.

3. In an elevator, a sliding door therefor, means

for operating said door comprising a member having a substantially cylindrical peripheral portion mounted for rotation, a door-operating arm carried on the member and connected to the door, a chain connected between spaced fastening means associated with the peripheral portion of the member and in engageable and disengageable relationship with arcuate segments of the peripheral portion of the member, electric motor means for operating the member to rotate the same including a pinion operatively cooperating with said chain to drive the chain and gravity actuated switch control means on the rotatable member and responsive to the rotation of the member to a predetermined position and disposed to control the operation of the electric motor.

4. In an operating device for a slidably mounted door, a guide member secured to the door disposed to provide rectilinear guiding action in a direction substantially perpendicular to the direction of sliding motion of the door, a pivotally mounted operating member movably and pivotally engaging the guide member, the first-named pivot being substantially fixedly positioned with respect to the door, power actuated operating means adapted to cause closure of the door by rotation of the operating member to a position where a radius drawn from the center of the first-named pivot through the center of pivotal sliding engagement will be substantially parallel to the direction of sliding motion of the door and adapted to remain energized maintaining the operating member in this parallel position to lock the door, and unlocking means adapted yieldingly to oppose rotation of the operating member as it nears the position of parallel radius and further adapted upon deenergization of the power actuated means to rotate the operating member to a position sufficiently removed from the position of parallel radius to permit manual opening of the door.

5. A device as in claim 4 in which the unlocking means comprises spring means operatively associated with the guide member.

6. A device as in claim 4 in which the power actuated operating means comprises an electric motor capable of repeated intermittent energization in the stalled condition without being damaged thereby.

7. A device as in claim 4 in which the power actuated means comprises an electric motor capable of continuous energization in the stalled condition without being damaged thereby.

8. A device as in claim 4 in which the unlocking means comprises spring means operatively associated with the guide member and in which the power actuated operating means comprises an electric motor capable of repeated intermittent energization in the stalled condition without being damaged thereby.

9. In an operating device for a slidably mounted door, a transverse guide member secured to the door, a pivotally mounted operating member movably and pivotally engaging the guide member, the first-named pivot being substantially fixedly positioned with respect to the door, electrically actuated operating means adapted to cause opening of the door by rotation of the operating member, and gravity operated switching means operatively associated with the electrically actuated means and disposed to control the actuation thereof, the switching means being effectively fixedly positioned with respect to the operating member and being further dis-

posed to control the actuating means to stop further rotation of the operating member upon being rotated therewith into an angular position corresponding substantially to the open position of the slidably mounted door.

10. A device as in claim 9 in which the position of the switching means is angularly adjustable with respect to the operating member and including means for locking the switching means in any such position within the range of adjustment.

11. In an operating device for a slidably mounted door, a pivotally mounted operating member disposed to cause sliding action of the door upon rotation of the operating member through a predetermined arc, a substantially cylindrically shaped chain carrier concentric with the axis of rotation of the operating member and adapted to rotate therewith, spaced terminations associated with the chain carrier, a chain joining the terminations and secured thereto, an electrically controlled power operated pinion cooperating with the chain and disposed to drive the chain, and gravity actuated electrical switching means disposed to rotate with the operating member and further disposed to control the pinion to stop further operation thereof after the operating member has rotated to a predetermined angular position substantially in accordance with a limit of sliding travel of the door.

12. A device as in claim 11 in which the terminations comprise resilient spring members adapted to maintain the chain under tension.

13. A device as in claim 11 in which the terminations comprise resilient spring members adapted to maintain the chain under tension and limiting means disposed to permit a limited amount of movement of the chain with respect to the terminations accompanied by deformation of the resilient spring members.

MORTIMER A. MYERS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,174,403	Fassett	Mar. 7, 1916
1,440,605	Hynes	Jan. 2, 1923
1,529,434	Hynes	Mar. 10, 1925
1,630,127	Martindale	May 24, 1927
1,643,064	Elliott	Sept. 20, 1927
1,643,454	Hynes	Sept. 27, 1927
1,716,568	Shonnard	June 11, 1929
1,738,686	Brady	Dec. 10, 1929
1,744,823	Brubaker	Jan. 28, 1930
1,777,526	Morse	Oct. 7, 1930
1,863,417	Shonnard	June 14, 1932
1,961,938	Norton	June 5, 1934
2,009,342	Nielsen	July 23, 1935
2,121,906	Dunn	June 28, 1938
2,166,527	Johnson	July 18, 1939
2,368,722	Newkirk	Feb. 6, 1945

FOREIGN PATENTS

Number	Country	Date
197,063	Switzerland	July 1, 1938