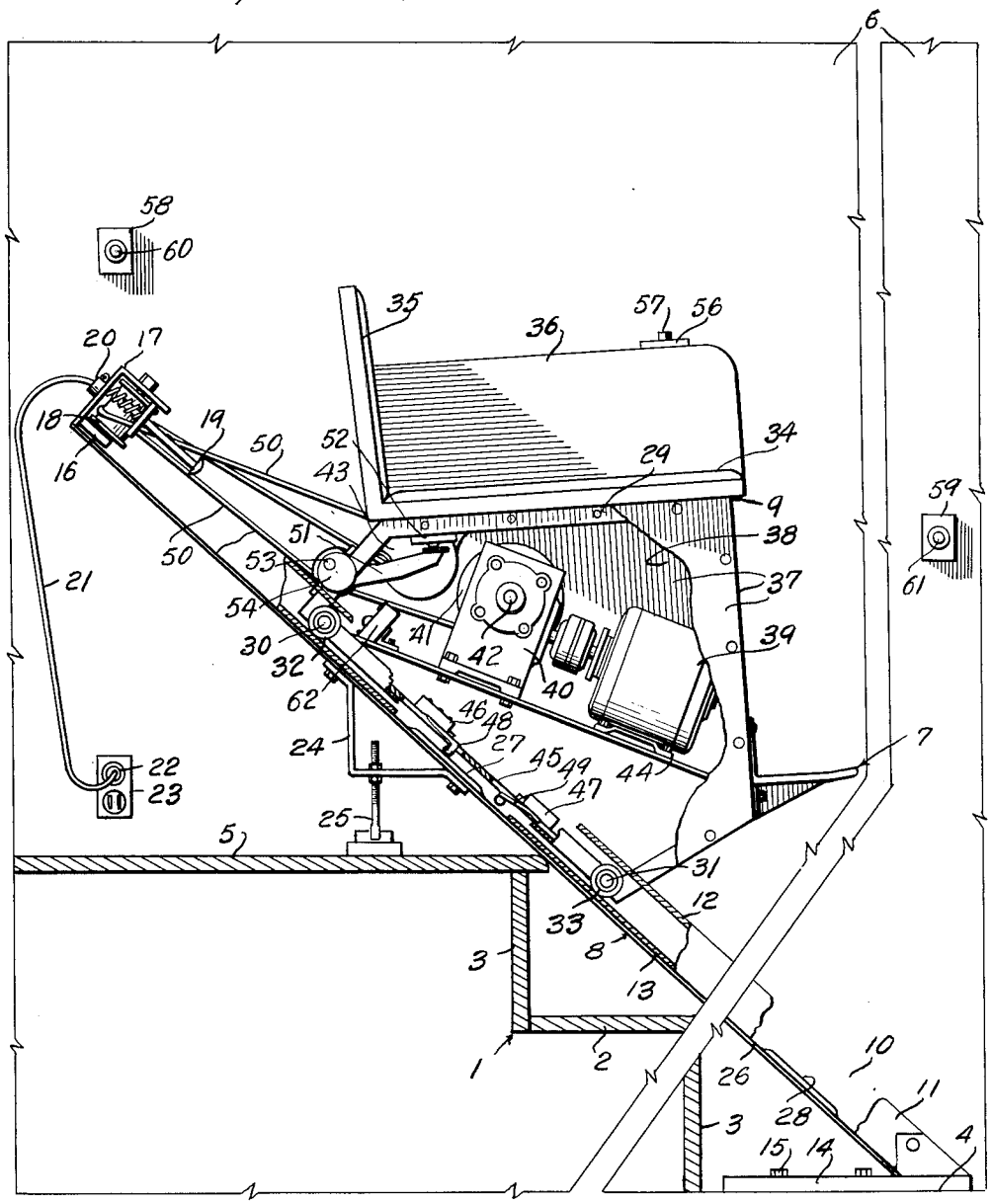
May 23, 1961 F. H. JACKSON 2,985,257

ELEVATOR FOR STAIRWAYS

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Fig. 1.



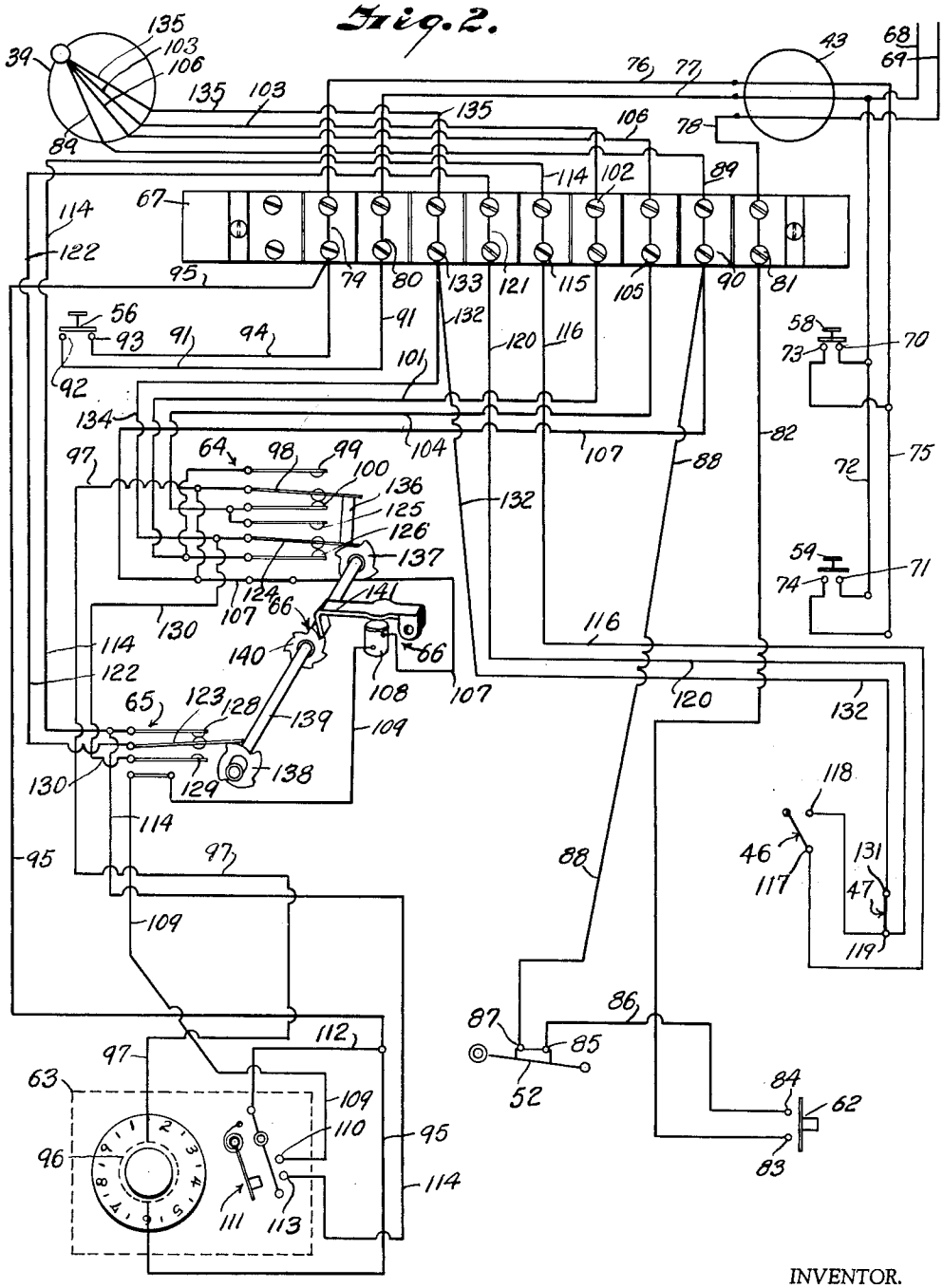
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Fig. 2.



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2,985,257

ELEVATOR FOR STAIRWAYS

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6 Claims. (Cl. 187—12)

This invention relates to a chair elevator of the type including a track adapted for support on the treads of a stairway and a chair which travels up and down the track, as disclosed in Patents Nos. 2,619,195 and 2,619,196, both dated November 25, 1952.

In the stair elevators disclosed in these patents, the chair is operable only by a person riding the chair or by a person going to the chair and setting a switch on the chair in a position to cause movement thereof to the opposite end of the stairs. Consequently, it is desirable to place the chair into motion in the desired direction from either the top or bottom of the stairs.

It is, therefore, the principal object of the present invention to accomplish the above result by an electrical apparatus for effecting and controlling operation of the chair at the top and bottom of the stairs, as well as from the chair itself.

Other objects of the invention are to provide a control of this character that is safe and dependable; to provide for control by means of pushbuttons requiring constant pressure by the operator to keep the chair in motion and which will instantly result in stopping all motion when the pressure is released; to provide delayed action after pressing a button to prevent accidental unexpected starts and before the rider is comfortably and safely seated on the chair; to provide a safety feature whereby when a chair is at the bottom of the track it can only be put in motion to travel up the track, and when the chair is at the top of the track it can only start in a downward direction; to provide a control apparatus that makes it impossible through carelessness or ignorance to push the control buttons in such a way that when the chair is in motion the motor does not have time to come to a full stop before reversing and going in the opposite direction; and to provide means which assures that movement of the chair is under control responsive to one pushbutton as long as the pressure is applied to that button.

It is also a prime object of the invention to provide a control system that safely adapts operation of the chair by a simple and inexpensive type of reversible motor.

In accomplishing these and other objects of the invention as hereinafter pointed out, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a stairway equipped with an elevator having controls embodying the features of the present invention, parts being broken away to better illustrate other parts.

Fig. 2 is a wiring diagram of the circuits composing the control apparatus.

Referring more in detail to the drawings:

1 designates a stairway comprising a series of steps composed of conventional treads and risers 2 and 3, whereupon a person may climb from a lower floor 4 to an upper floor or landing 5. Mounted on the stairway at one side thereof, preferably adjacent a wall 6, is a chair elevator 7 of the type to which the present invention pertains. The elevator 7 is preferably a self-contained unit, including an inclined track 8, a chair 9, and an operating mechanism including electrical circuits and control apparatus embodying the features of the present invention.

The track 8 comprises rails 10 and 11 adapted for support on the forward edges of the stair treads 2. The rails 10 and 11 are preferably channel shaped to provide inwardly directed upper and lower flanges 12 and 13. The rails are of a length to extend from the lower floor 4 to a point above a landing 5 to permit movement of the elevator chair 9 onto the landing 5. The lower ends of the rails are fixed to a transverse plate 14 that lies flatly against the floor and is adapted to be secured by fastening devices such as screws 15. The upper ends of the rails are connected by a cross bar 16 and by a housing 17 which forms an enclosure for shielding certain mechanisms later to be described, such as a guide roller 18 and a top emergency cutoff plunger 19. The housing also carries a clamp 20 for an electrical cord 21. The cord 21 has a plug 22 adapted to be plugged into an electrical socket 23 for supplying an electric current to operate the chair 9, as later to be described. The upper end of the track 8 is suitably supported by brackets 24 having foot portions 25 adapted to bear on the landing 5. The rails 10 and 11 are interconnected by a bottom panel 26 which carries cams 27 and 28 at the upper and lower ends of the track for actuating switches on the chair, later to be described.

The chair 9 as shown in the above mentioned patents includes spaced apart side frames 29, each carrying front and rear spindles 30 and 31 at upper and lower ends thereof for mounting wheels 32 and 33 at the forward and rear ends thereof. The wheels 32 and 33 travel between the upper and lower flanges 12 and 13 of the channel shaped rails 10 and 11 and retain the chair for up and down movement along the track. The chair includes a seat 34 supported on the side frames 29, a back 35, and an arm rest 36. The side frames 29 are enclosed at the sides and front of the chair by panels 37, so as to form a compartment 38 under the seat for containing a reversible motor 39, a speed reduction unit 40 connected to the motor 39, a cable winding reel 41 fixed to the output shaft 42 of the unit 40, and an automatic reel 43 for winding up and paying out the end of the electrical cord 21, whereby an electric current is supplied to operate the motor 39. The motor 39 and speed reduction unit 40 are mounted within the compartment on a transverse plate 44.

Mounted on the under side of a floor 45 extending transversely between the frames 29 are switches 46 and 47 having levers 48 and 49, respectively adapted to engage the cams 27 and 28 previously referred to, and which are connected in the control circuit as later to be described. Attached to the cable winding reel 41 and wound thereon is a cable 50 that extends upwardly of the track around the roller 18 and thence downwardly of the track to connect with the frame of the chair and to engage a safety arm 51 for operating a microswitch 52 in case the cable should become slack or break. The safety arm 51 is mounted on a transverse shaft 53 that extends across the rear portions of the side frames 29 at a point just above the upper flanges 12 of the track rails 10 and 11, and fixed to the outer ends of the shaft 53 are eccentric wheels 54 having their peripheries suitably knurled for frictionally engaging the upper faces of the flanges 12 in the case of failure of the cable or any part that may result in slacking tension of the cable. The eccentric wheels are kept in retracted position and out of contact with the flanges 12 of the rails 10 and 11 as long as tension of the cable remains on the cable, but should the cable break or a part fail, a spring (not shown) is released to effect rotation of the eccentric wheels 54

into clamping engagement with the flanges 12 of the rails 10 and 11, substantially as described in the above mentioned patents. Carried by the arm 26 of the chair is a switch 56 having a pushbutton 57 whereby an operator seated on the chair 9 may start and stop movement of the chair, as later to be described.

Also, in accordance with the present invention, the movement of the chair is controlled at the top and bottom of the stairs by means of switches 58 and 59 that are operated by pushbuttons 60 and 61. The switches 58 and 59 may be attached to the upper and lower ends of the track or, as shown in the drawings, on the wall 6. In addition to the microswitch 52 and the pushbutton control switch 56, the chair carries a switch 62 adapted to be actuated by the cutoff plunger 19 at the upper end of the track, to open the supply circuit to the motor and prevent the possibility of the chair 9 coasting beyond the stopping points controlled by the cam 27 and switch 46.

Suitably mounted in the compartment under the seat of the chair is a time delay mechanism 63, relay switches 64 and 65, an electromagnetic actuator 66 for operating the relay switches 64 and 65, and a terminal block 67 for providing an easy interconnection of the wires for the various circuits employed to operate the chair either from the top or bottom of the stairs or on the chair. (Fig. 2.)

The circuitry is as follows:

The cord 21 leading to the clamp 20 has two main conductors 68 and 69 for supplying the electric current. The conductor 68 is connected with contact terminals 70 and 71 of each of the wall switches 58 and 59 by a conductor 72, and the other contact terminals 73 and 74 of the switches 58 and 59 are connected by a conductor 75 which is contained with the portion of the cord that winds and unwinds from the reel 43. Carried by the chair are conductors 76, 77 and 78 that respectively connect with terminals 79, 80 and 81 of the terminal block 67 which is also carried by the chair. The terminal 81 for the conductor 78 also connects a conductor 82 that leads to one contact terminal 83 of the normally closed switch 62. The other terminal 84 of the switch 62 connects with one contact 85 of the microswitch 52 by a conductor 86. Another terminal 87 of the microswitch connects by a conductor 88 with a conductor 89 through terminals 90 on the terminal block 67. The conductor 89 connects with one of the terminals of the reversible motor 39. The plunger switch 62 and microswitch 52 are thus connected in series with one side of the current supply, so that if either one is opened, circuit to the motor is opened and the chair cannot be placed in motion until repairs or adjustments have been made.

Secured to the terminal 80 is a conductor 91 leading to one of the terminals 92 of the pushbutton switch 56 located on the arm of the chair. The other terminal 93 of the pushbutton switch 56 is connected by a conductor 94 with the terminal 79, consequently, when either one of the pushbutton switches 56, 58 and 59 is closed, a circuit is established to a conductor 95 leading to the timing device 96 of the time delay relay 63. Circuit is completed through the timing device by a conductor 97 leading to a movable contact arm 98 of the impulse relay 64. The contact arm 98 is adapted to engage one or the other of a pair of contacts 99 and 100, the contact 99 being connected with a conductor 101 leading to a terminal 102 of the terminal block 67 which also connects with one of the reversing leads 103 of the motor 39. The other contact 100 connects through a conductor 104 with a terminal 105 of the terminal block 67, which in turn is connected with another reversing lead 106 of the motor 39. Also connected with the current supply conductor 97 is a conductor 107 that supplies current to the winding 108 of the solenoid actuator 66 for the impulse switches, later to be described. The other terminal of the winding 108 is connected by a conductor 109 with one contact 110 of a switch 111 that forms a part of the time delay mechanism 63. The movable contact of the switch 111 connects through a conductor 112 with the conductor 95 previously described. The switch 111 has another contact 113 that connects through a conductor 114 with a terminal 115 of the terminal block, which also connects a conductor 116 leading to one terminal 117 of the switch 46. The other terminal 118 and terminal 119 of the switch 47 connect with a conductor 120 leading to a terminal 121 of the terminal block, which also connects a conductor 122 leading to the movable contact arm 123 of the relay 65. Another movable contact arm 124 of the relay 64 is adapted to make contact with one or another contacts 125 and 126. The contact 125 is connected with the conductor 104 and the contact 126 is connected with the conductor 101. The movable contact arm 123 of the relay switch 65 is adapted to engage one or another contact 128 or 129. The contact 128 is connected with the conductor 114 previously referred to and the contact 129 is connected by a conductor 130 with the movable arm 124 of the relay 64, also previously referred to.

The other contact 131 of the switch 47 connects with a conductor 132 leading to a terminal 133 of the terminal block 167, whereby it is connected with a conductor 134 which connects with the conductor 130. The terminal 133 also connects a lead 135 of the motor 39. The movable contact arms 98 and 124 are interconnected by an insulator 136 and both contact arms 98 and 124 are shifted alternately with the contact arm 123 by means of cam wheels 137 and 138 on opposite ends of a shaft 139. The shaft 139 carries a ratchet wheel 140 that is rotated by a pawl 141 that is operated upon energization of the winding 108 of the electromagnet 66.

Assuming that the stairway elevator is constructed and installed in a stairway with the circuits connected as described, and assuming that the chair is at the top of the stairway and that a person is at the bottom of the stairway and desires to ride the chair up the stairs:

The button 61 of the switch 59 is pressed with the finger and the pressure is retained, which closes a circuit to and from the main line conductors 68 and 69 through the conductor 72, switch contacts 71 and 74, conductors 75, 76 and 95, to the time delay unit 96. The opposite side of the time delay unit is connected with the other main line conductor 69 by way of the conductors 97, 107, 88, safety switches 52 and 62, conductors 82 and 78. It will thus be apparent that when the pushbutton is depressed, current flows through both safety switches 52 and 62 and the time delay unit 96 is placed in operation. As soon as the time delay unit 96 has closed the time delay switch 111, a current also flows by way of the conductor 95, conductor 112, contact 110, conductor 109, solenoid winding 108 of the magnetic actuator 66, and conductor 107 to actuate the reversing relays 65 and 64, which relays, together with the limit or stop switches 46 and 47, control flow of current to the reversible motor 39. Thus there is a delay from the time the pushbutton 61 is operated and the motor 39 is set into operation to rotate the winding drum 41 in a direction for lowering the chair along the track to the bottom of the stairway.

The circuit to the motor for lowering the chair on the track is as follows:

The limit switch 46 at the top of the track is, of course, open, since it was previously opened by upward movement of the chair. Upon closing of the switch 111 with the contact 113, current flows in the conductor 114, contact 128, and switch arm 123 of the impulse relay 65, conductors 122 and 120, contacts 119 and 131 of the limit switch 47, conductor 132, and to the lead 135 of the reversible motor 39, even though the switch 46 is open. The motor lead 106 is connected with the main line conductor 69 through the conductors 78, 82, safety switches 62 and 52, conductors 88 and 107, switch arm 98 of the impulse relay 64, contact 100 and conductor 104. The

motor lead **89** is also connected with the main line conductor **69** by way of the safety switches **52** and **62**. The motor lead **103** is connected into the circuit on the same side of the main line **68** as the motor lead **135**. This is effected by conductors **101**, contact **126**, and arm **124** of the relay **64** and conductor **134**.

The motor **39** is now in operation to lower the chair on the track. The operator continues to push the button **61** of the switch **59** until the chair has reached the bottom of the stairs, because if the pressure is released circuit is interrupted to the timing unit **96** and a spring thereof returns it to normal position, thereby opening the switch **111**. If the chair is stopped on the track before it reaches the bottom and the button is again pushed, the magnetic actuator for the reversing relays will be energized to change the connection of the circuits, however, a release of the button and a second operation thereof will again actuate the reversing relays to return them to their previous positions, so that the chair may continue its movement to the bottom of the track. When the chair reaches the bottom of the track, the switch **47** is opened by the cam **28** to break the circuit to the motor lead **135** and thereby stop the chair.

The chair is now in position to be boarded by the rider. The limit switch **47** is now open, but the switch **46** had previously closed as soon as the arm of that switch left the upper cam **27**. The rider seats himself on the chair and pushes the button **57** of the switch **56** that is mounted on the arm **36**. Circuit is then closed between the main conductors **68** and **69** by way of the conductors **77**, **91**, contacts **92** and **93** of the switch **56**, conductor **94**, conductor **95**, timing unit **96**, conductor **97**, conductor **107**, conductor **88**, switches **52** and **62**, conductor **82** and conductor **78**. The motor **39** will not start immediately because of the time delay unit, however, as soon as the time delay unit effects closure of the switch **111**, a current is established through the winding **108** of the impulse relay actuator. The delay effected by the timing unit gives time for the rider to adjust himself on the chair and to avoid sudden reversal of the motor.

Upon actuation of the magnetic actuator **66**, the positions of the movable arms **98**, **124** and **123** of the impulse relays will be changed to reverse connection of the leads **103**, **106** and **35** of the motor. The movable arm **123** of the relay **65** now engages the contact **129**. Circuit is now closed through the conductor **114**, conductor **116**, ocntacts **117**, **118** ofthe switch **46**, conductor **120**, conductor **122**, contact arm **123** of the relay **65**, contact **129**, conductor **130** and conductor **134** to the motor lead **135**. The contact arm **124** is now engaging the contact **125** of the relay **64** to connect the motor lead **106** through the conductor **104**. The contact arm **98** is now engaging the contact **99** to connect the motor lead **103** with the conductor **97**. Itis thus obvious that the connections of the leads **103** and **106** are changed with respect to the main current supply conductors **68** and **69** to reverse the motor **39** and cause the chair to move up the track to the top of the stairway. As soon as the switch **47** has left the cam **28**, that switch closes preparatory to another change in directional movement of the chair, however, the chair will continue up the track until the arm of the switch **46** engages the cam **27**, whereupon the circuit is broken through the switch **46** to stop the chair at the top of the track.

It is to be understood that the rider will retain finger pressure on the button of the switch **56** to keep the chair in motion until it reaches the top of the track, however, the chair will instantly stop should the rider remove finger pressure from the button of the switch **56**, in which case the time delay mechanism will again come into action and it will be necessary to press the button twice to restore the circuits established by the reversing relays for continuing movement of the chair up the track. This is an important feature of the invention, because it avoids possible injury or accident, or damage to the equipment.

If the chair is at the bottom of the stairs and a person at the top of the stairway desires the chair to ride down the stairs, the button **60** at the top of the stairs is operated to close the switch **58**, which effects closure of the circuits in the manner as described when the chair is operated by pushing the button **57** of the switch **56** that is mounted on the chair. Likewise, when the person boards the chair, he pushes the button **57** of the switch **56**, and the circuits will be connected with the motor leads in the same manner as described when the button **61** of the switch **59** at the bottom of the stairs is actuated.

If the cable should become slack for any reason when the chair is in operation, the eccentric wheels **54** will automatically engage the upper flanges **12** of the track to lock the chair in position so that it will not slide down the track. Also, the microswitch **52** will be actuated to open circuit between the conductors **88** and **86** to stop operation of the motor until the cable or other failure causing slacking of the cable has been repaired.

Should the chair, in traveling up the track, coast beyond the cutoff point of the switch **46**, the plunger **19** will engage the micrswitch **62** to open circuit between the conductors **86** and **82**, which also effects opening of the motor circuit.

One of the great advantages of the time delay which is built into the electrical circuitry (in addition to the importance of making it impossible to set the automatic controls wrongly before the motor can reverse itself) is the safety feature offered when children, the curious, pranksters, and guests who are not familiar with the operation of the stair elevator, attempt to play or tamper with it. For example, whenever someone not completely familiar with the action of the time delay mechanism presses one of the buttons and there is not an expected immediate movement of the chair, he will invariably remove his finger from the pushbutton before the relatively long delay interval has elapsed, at the end of which time the chair would have started in motion had the pressure been maintained on the pushbutton. Then, when the experimenter pushes the button the second time, and this time decides to hold it down for a long interval, there can be no movement or action of any kind, because by letting up pressure on the button in the first instance before action started, the experimenter reversed the starting controls, consequently, no matter how long he holds his finger on the button the second time, the chair cannot move, because the cutoff switch at that end of the track is engaging its operating cam. Usually, after a number of experimental pushes of one of the buttons, with no movement or action of any kind, the inexperienced person will let the buttons alone, assuming that the current has been cut off or that the mechanism will simply not operate.

The fact that the moving chair stops instantly when pressure is removed from the controlling pushbutton is a major safety feature, and is one that is required for the unit to pass the National Safety Code for private residence elevators. If a person subject to fainting spells or heart attacks should lose consciousness while riding the chair, the instant that the finger pressure is released, the chair will stop, and it is impossible for the rider to fall from the chair and be dragged up and down the steps.

It is obvious that successive operation of any one of the push button switches will start and reverse the chair on the track, but the actual movement of the chair is delayed by means of the timing mechanism for the time delay switch. In this way, the reversing relays are not immediately operated, since the circuit to the relay actuator has been delayed during actuation of the timing mechanism. It is also obvious that alternate actuation of the relays connects the motor leads in circuit with the push buttons to move the chair in the proper direction on the track.

From the foregoing, it is obvious that I have provided an elevator for stairways wherein the chair may be moved

up and down the track responsive to actuation of pushbuttons at the top and bottom of the stairs, so that the chair may be caused to travel to a person waiting on either floor. It is also obvious that the delay mechanism and reversing relays provide a delayed action to avoid sudden jerks and jars upon reversal of the motor. They also allow for ample time for a person to seat himself on the chair before the chair starts in motion. Another feature is the safety afforded by the pushbutton control of the chair by the operator when seated thereon.

What I claim and desire to secure by Letters Patent is:

1. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairway, a chair movable on the track, means for moving the chair along the track including a reversible motor having reversing leads, electrical conductors adapted for connection with a current supply for the motor, the combination of means for controlling operation of the chair including manual switches at the top and bottom of the stairs, a manual switch on the chair, alternately operable limit switches at upper and lower end portions of the track, circuits connecting the leads of the reversible motor with the limit switches and the electrical conductors, alternately operable relays in said circuits and cooperating with the limit switches to control flow of current to the reversing leads and the motor in accordance with the alternating action of the limit switches, an electromagnetic actuator for the relays for actuating the relays in alternate relation, a time delay action switch for controlling flow of current to the relays and to the electromagnetic actuator, and a timing mechanism for operating the time delay switch and having electrical connections with said manually actuated switches whereby any one of the manually actuated switches effects delayed action of the electromagnetic actuator upon actuation of any one of the manually actuated switches for delayed actuation of the motor.

2. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairway, a chair movable on the track, a reversible motor on the chair for operating the chair up and down the track, an electrical cord containing conductors for supplying current from a source of supply to the motor, and a reel on the chair for the electrical cord, the combination of means for controlling operation of the reversible motor in which said means includes pressure actuated switches at the top and bottom of the stairs, an electrical conductor connecting one of the current supply conductors with said pressure actuated switches, a conductor connecting the switches and contained in said electrical cord with said first-named conductors, a pressure actuated switch on the chair and having connection with one of the current supply conductors and the last-named conductor, alternately operable limit switches at upper and lower end portions of the track, control circuits connecting current supply conductors with the motor and the alternately operable limit switches, alternately operable relays in the control circuits and cooperating with the limit switches for controlling flow of current to the reversible motor in accordance with alternating action of the limit switches, an electromagnetic actuator for the relays, a time delay action switch for controlling flow of current to the relays and to the electromagnetic actuator, and a timing mechanism for operating the time delay switch and having electrical connections with said pressure actuated switches whereby operation of any one of the pressure actuated switches effects delayed action of the relays.

3. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairway, a chair movable on the track, a winding drum on the chair, a cable wound on the winding drum and having connection with the upper end of the track, a reversible motor on the chair for operating the winding drum to effect movement of the chair up and down the track, an electrical cord containing conductors for supplying current from a source of supply to the motor, and a reel on the chair for the electrical cord, the combination of means for controlling operation of the reversible motor in which said means includes pressure actuated switches at the top and bottom of the stairs, an electrical conductor connecting one of the current supply conductors with said pressure actuated switches, a conductor connecting the switches and contained in said electrical cord with said first-named conductors, a pressure actuated switch on the chair and having connection with one of the current supply conductors and the last-named conductor, alternately operable limit switches at upper and lower end portions of the track, control circuits connecting current supply conductors with the motor and the alternately operable limit switches, alternately operable relays in the control circuits and cooperating with the limit switches for controlling flow of current to the reversible motor in accordance with alternating action of the limit switches, an electromagnetic actuator for the relays, a time delay action switch for controlling flow of current to the relays and to the electromagnetic actuator, a timing mechanism for operating the time delay switch and having electrical connections with said pressure actuated switches whereby operation of any one of the pressure actuated switches effects delayed action of the relays, and a normally closed switch in the current supply and having an operating connection with said cable on the winding drum for opening the circuits to the motor on slackening of the cable.

4. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairway, a chair movable on the track, a reversible motor on the chair for operating the winding drum to effect movement of the chair up and down the track, an electrical cord containing conductors for supplying current from a source of supply to the motor, and a reel on the chair for the electrical cord, the combination of means for controlling operation of the reversible motor in which said means includes pressure actuated switches at the top and bottom of the stairs, an electrical conductor connecting one of the current supply conductors with said pressure actuated switches, a conductor connecting the switches and contained in said electrical cord with said first-named conductors, a pressure actuated switch on the chair and having connection with one of the current supply conductors and the last-named conductor, alternately operable limit switches at upper and lower end portions of the track, control circuits connecting current supply conductors with the motor and the alternately operable limit switches, alternately operable relays in the control circuits and cooperating with the limit switches for controlling flow of current to the reversible motor in accordance with alternating action of the limit switches, an electromagnetic actuator for the relays, a time delay action switch for controlling flow of current to the relays and to the electromagnetic actuator, a timing mechanism for operating the time delay switch and having electrical connections with said pressure actuated switches whereby operation of any one of the pressure actuated switches effects delayed action of the relays, and a normally closed switch on the chair and connected in the current supply to be engaged by a part at the upper end of the track to open the current supply circuit upon failure of the upper of said limit switches in stopping movement of the chair.

5. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairway, a chair movable on the track, a winding drum on the chair, a cable wound on the winding drum and having connection with the upper end of the track, a reversible motor on the chair for operating the winding drum to effect movement of the chair up and down the track, an electrical cord containing conductors for supplying current from a source of supply to the motor, and a reel on the chair for the electrical cord, the combination of means for controlling operation of the reversible motor in which said means includes pressure actuated switches at the top and bottom of the stairs, an electrical conductor connecting one of the current supply conductors with said pres-

sure actuated switches, a conductor connecting the switches and contained in said electrical cord with said first-named conductors, a pressure actuated switch on the chair and having connection with one of the current supply conductors and the last-named conductor, alternately operable limit switches at upper and lower end portions of the track, control circuits connecting current supply conductors with the motor and the alternately operable limit switches, alternately operable relays in the control circuits and cooperating with the limit switches for controlling flow of current to the reversible motor in accordance with alternating action of the limit switches, an electromagnetic actuator for the relays, a time delay action switch for controlling flow of current to the relays and to the electromagnetic actuator, a timing mechanism for operating the time delay switch and having electrical connections with said pressure actuated switches whereby operation of any one of the pressure actuated switches effects delayed action of the relays, a normally closed switch in the current supply and having an operating connection with said cable on the winding drum for opening the circuits to the motor on slackening of the cable, and a second normally closed switch connected in series with the first normally closed switch and adapted to be opened by a part at the upper end of the track to open the current supply circuit upon failure of the limit switch at the upper end of the track in stopping movement of the chair.

6. In an elevator for stairways, in which said elevator includes a track adapted for support on steps of the stairways, a chair movable on the track, means for moving the chair along the track including a reversible motor and means for supplying an electric current, the combination of means for controlling operation of the reversible motor in which said means includes pressure actuated switches at the top and bottom of the stairs, means connecting said pressure actuated switches with the current supply, a pressure actuated switch on the chair and having connection with the current supply, alternately operable limit switches at upper and lower end portions of the track, control circuits connecting current supply with the motor and the alternately operable limit switches, alternately operable relays in the control circuits and cooperating with the limit switches for controlling flow of current to the reversible motor in accordance with alternating action of the limit switches, an electromagnetic actuator for the relays, and means actuated by the pressure operated switches for operating the relays alternately.

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