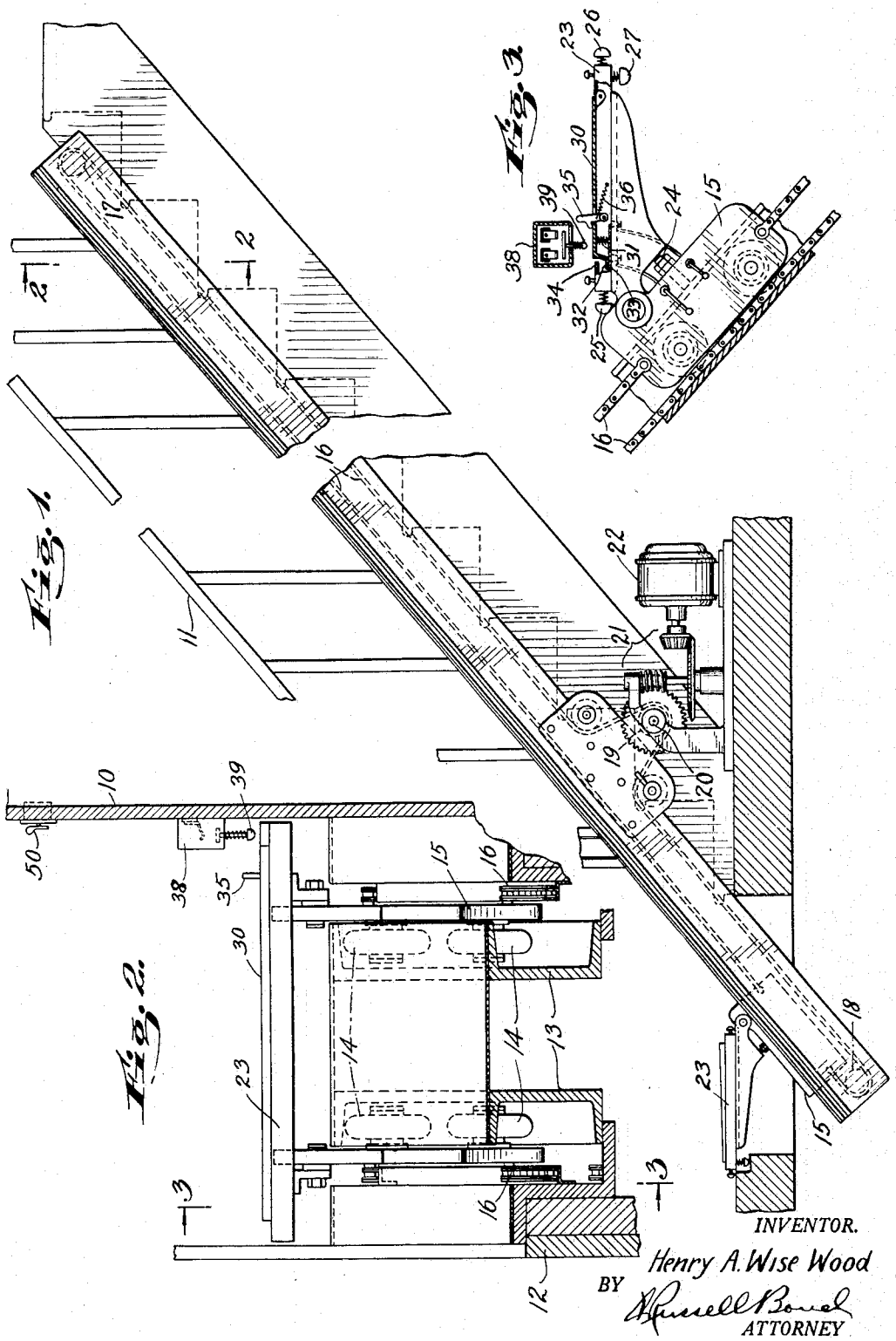
Oct. 31, 1933. H. A. W. WOOD 1,933,131

CONTROL APPARATUS FOR ELEVATORS

Filed Oct. 30, 1930 2 Sheets-Sheet 1



Oct. 31, 1933. H. A. W. WOOD 1,933,131

CONTROL APPARATUS FOR ELEVATORS

Filed Oct. 30, 1930 2 Sheets-Sheet 2

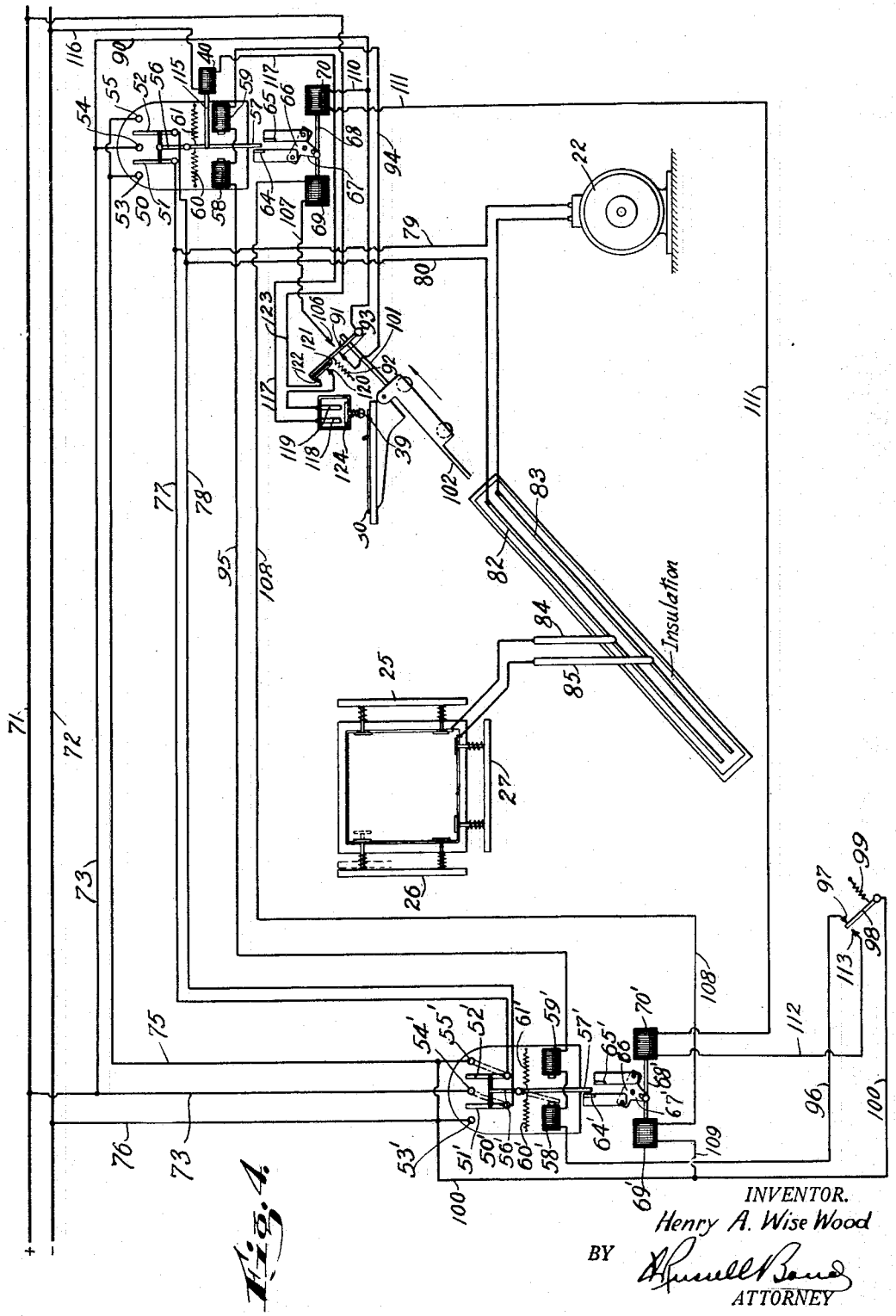


Fig. 4.

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CONTROL APPARATUS FOR ELEVATORS

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Application October 30, 1930. Serial No. 492,142

10 Claims. (Cl. 187—12)

My invention relates to control apparatus for elevators and conveyor and is particularly adapted for stairway lifts.

A stairway lift is a form of inclined elevator installed as an adjunct to a stairway in a dwelling house or building and comprises a platform or car which runs up and down an inclined track parallel to the stairs to carry passengers or loads from one floor to another.

In my Patent No. 1,768,650, issued July 1, 1930, I describe a stairway lift driven by an electric motor and a control switch is provided at the top and another at the bottom of the stairway for operating the motor either in the "up" or "down" direction. Automatic means are also provided for stopping the motor when the car reaches either the top or the bottom platform of the stairway. With this arrangement, a passenger at either floor level, finding that the car is at the other floor level, may operate the adjacent control switch to bring the car to him, and then after mounting the car or placing a load thereon, he may operate the switch in the opposite direction to return the car to said other level. When the car reaches either floor level it stops automatically.

However, a stairway lift is more often used to carry passengers or loads from a lower floor to an upper floor rather than in the opposite direction, and it is an object of the present invention to provide means for automatically returning the lift to the lower level, after it has carried the load to the upper level.

Another object of the invention is to provide means for preventing the automatic return of the car while it is bearing a load. Hence it will remain at the upper level until the load is removed and as soon as it is relieved of its load it will automatically start downward.

Another object of the invention is to provide means for preventing operation of the automatic return mechanism when so desired, so that the car may be held at the upper level whether loaded or not.

Another object of the invention is to provide means for preventing a careless or malicious person from turning the motor control switches in wrong direction. For instance, when the car is at the upper level, if either of the switches were thrown to "up" position the motor would turn in the wrong direction, with the result that the motor would burn out or the lift would be wrecked. Similarly when the car is at the lower level, the switches must not be turned to "down" position. In the present invention I provide automatic means for preventing either of the switches from being thrown to "up" position, while the car is at the top of the incline and also to prevent either of the switches from being thrown to "down" position when the car is at the lower level.

With these and other objects in view which will appear hereinafter, I shall describe a preferred embodiment of my invention and will thereafter point out the novelty and scope of the invention in the claims.

In the drawings;

Figure 1 is a view in side elevation of a stairway lift;

Fig. 2 is a view in section, but on an enlarged scale, taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmental sectional view taken on the line 3—3 of Fig. 2; and

Fig. 4 is a diagram of electrical connections.

The particular embodiment of my invention chosen for illustration is what is known as the "double-chainway" type which occupies half the width of a stairway. The stairway is bordered on one side by a wall 10 and on the other by a balustrade 11. The stair treads and risers extend from an outer stringer, not shown, to a central stringer 12.

In the space between the stringer 12 and the wall 10 are two inclined channel beams 13 set with their flanges extending outward, and the lower flanges provide tracks for the wheels 14 of a pair of trucks 15. Chain belts 16 are connected at their opposite ends to the trucks and pass over sprocket wheels 17 and 18 mounted respectively at the top and bottom of the lift. The lower runs of the chain belts are led about the sprocket wheels 19 which are fixed on a shaft 20. The latter is driven through suitable gearing 21 by reversible motor 22. Hinged upon the trucks is a platform 23 and the trucks and platform constitute a car or carriage for supporting passengers or loads.

The platform 23 normally bears against stops 24 which are adjustable to maintain the platform in horizontal position. However, the platform is free to swing upward if it encounters an obstacle when the carriage is moving down the incline. The carriage may also be provided with safety strips 25 and 26 at its forward and rear ends and also with a safety trip 27 under the forward edge, which, upon encountering an obstacle, will interrupt the circuit of the motor and arrest the carriage. These features, however, have already been described in the patent above referred to and form no part of the present invention.

As shown in Fig. 3, the platform is provided with a floor or panel 30 which is hinged at its forward end and is normally pressed upward by a light spring 31. The rear or free edge of the panel is formed with a flange 32 which plays between lower and upper stops 33 and 34 respectively. Normally the spring 31 holds the flange 32 against the upper stop but a light load on the panel will depress the same. A latch 35 is provided for holding the panel in depressed position. This latch may be readily kicked forward into latching position when the panel is depressed, but a light spring 36 holds the latch normally in unlatched position.

Mounted on the wall 10 at the top of the lift is a switch box 38, depending from which is a push button 39. This button normally lies in such position as to clear the panel 30 when the carriage reaches the upper end of its travel, if the panel is in depressed position. When, however, the panel is released it will strike the push button 39, lifting the same and closing a circuit to a solenoid 40 which operates to start the motor in reverse direction and cause the carriage to move downward, as will be explained hereinafter.

The various control circuits are shown diametrically in Fig. 4. A reversing hand switch 50 is provided at the top of the lift and a similar switch 50' at the lower end of the lift for controlling the motor. These switches may be conveniently located on the wall 10. The switch 50 includes two blades 51 and 52 which when moved to the left from normal position, as viewed in the drawings, will engage two contact points 53 and 54 respectively and when moved to the right from normal position will engage the contact point 54 and another contact point 55 respectively. The switch blades are carried by an arm of a lever 56. The other arm of which constitutes an armature 57 movable between two opposed retaining electro-magnets 58 and 59. Opposed springs 60 and 61 are connected to the switch lever 56 in such manner as to maintain the switch blades normally in neutral position (that is, out of engagement with any of the contacts 53, 54 and 55).

A pair of stops 64 and 65 are mounted on a pivoted cross-head 66 which is connected by a crank arm 67 to a plunger 68 of a pair of opposed solenoids 69 and 70. The stops are adapted to engage opposite sides respectively of the switch lever but they move alternately into arresting position. When the plunger 68 is pulled toward the left as viewed in the drawing the left hand stop will be raised to arresting position and the right hand stop will be lowered. The switch blades 51 and 52 will then be movable to engage switch points 53 and 54, but not switch points 54 and 55. When the plunger 68 is pulled in the opposite direction, relative positions of the two stops will be reversed preventing the switch blades from moving in the opposite direction from neutral.

The switch 50' includes blades 51' and 52' which normally occupy a neutral position between three contact points 53', 54' and 55'. The blades are carried by a switch lever 56' which carries an armature 57' movable between two retaining electromagnets 58' and 59'. Opposed springs 60' and 61' hold the switch blades normally in neutral position. The switch 50' also includes a pair of stops 64' and 65' which are connected to the plunger 68' of a pair of opposed solenoids 69' and 70' in such manner that when the plunger 68' is moved to the left, as viewed in the drawings, the stop 64' will be raised to arresting position, and when the plunger 68' is moved to the right the stop 65' will be raised to arresting position.

Electric current for operating the motor 22 is supplied from a suitable power source through a pair of mains 71 and 72. In the particular embodiment illustrated, direct current is employed, the main 71 being a positive line and main 72 a negative line. To reverse the motor either the field circuit or the armature circuit must be reversible but not both. For the sake of simplicity and to prevent complication of the diagram, I show only the reversible circuit, since it will be obvious to anyone skilled in the art how the non-reversible circuit may be controlled by the switches 50 and 50'.

From the positive main a pair of leads 73 run to the central switch points 54 and 54'. The switch points 53, 53', 55 and 55' are connected together by a lead 75 and to the negative main by a lead 76. The switch blade 51 is connected by a line 77 to the switch blade 52' and the switch blade 52 is connected by a line 78 to the switch blade 51'. Lines 79 and 80 run from the lines 77 and 78 respectively, to the motor 22. However, the line 80 is interrupted to include a pair of contact bars 82 and 83 respectively, running adjacent the incline and engaged by brushes 84 and 85 respectively. These brushes are carried by the car and lead current through the trip mechanism on the car above referred to. This trip mechanism is normally held closed, but whenever a trip is depressed, as indicated by broken lines in Fig. 4, the circuit through the line 80 is broken.

It will be obvious from the description so far given that when the switch blades are moved toward the right, as shown in Fig. 4, and make contact with the switch points 54 and 55 respectively, current will be supplied to the motor in one direction and when the switch is turned in the opposite direction to make contact with the points 53 and 54 respectively, the direction of rotation of the motor will be reversed. Whenever the switch 50 is thrown into engaging position it will be held in such position either by the retaining magnet 53 or 59, as the case may be, and the same will be true of the switch 50' which will be retained in set position either by the retaining magnet 58' or the magnet 59'. The retaining magnets 58, 58', 59 and 59' are normally energized, being connected in series across the mains 71 and 72. The circuit of these magnets may be traced as follows: From the line 73 which is connected to the main 71 there is a lead 90 which runs to a switch arm 91. This switch arm is normally held by a spring 92 in engagement with a switch point 93 which in turn is connected by a line 94 to the electro-magnets 59 and 58. Thence the circuit is continued by way of a line 95 through the magnets 59' and 58'. From here current is led by a line 96 which runs to a contact point 97 normally engaged by a switch arm 98, such engagement being maintained by a tension spring 99. A line 100 leads from the switch arm to the lead 76 which, as stated above, is connected to the main 72. Thus, as long as the switches 91 and 98 are closed, the retaining magnets will be energized.

It is necessary, however, to deenergize the magnets when the car reaches either the upper or the lower level so that the hand switch that is in contacting position may be returned to neutral position. To this end, the carriage is provided with a forwardly projecting arm 101 and a rearwardly projecting arm 102. When the carriage

nearly reaches its upper limit of travel the arm 101 strikes the switch arm 91 breaking the circuit through the retaining magnets, and the hand switch which has been retained in set position by one of said magnets will swing to neutral position, thereby cutting off current to the motor and bringing the latter to a stop. However, it is necessary immediately to reestablish the circuit through the retaining magnets so that they will be ready to hold the switch which is next operated, and for this reason, the arm 101 is arranged to snap past the switch arm 91 so as to interrupt the circuits to the magnets only momentarily. The same is true of the switch arm 98 which is struck by the arm 102 when the carriage is about to reach the lower level. This momentarily breaks the circuit through the retaining magnets, but immediately thereafter the switch is closed. It will be understood, of course, that the play of the armatures between the retaining magnets is so great that they cannot pull the armature from neutral position, but will merely act to retain the armature when it has been manually moved into engagement with one or another of the retaining magnets.

The stop operating solenoids 69 and 69' are connected in series in a circuit controlled by the switch arm 91 while the solenoids 70 and 70' are connected in series in a separate circuit controlled by the switch arm 98. The switch arm 91 when pushed by the arm 101 engages a switch point 106 which is connected by a line 107 to one terminal of the solenoid 69. The other terminal of this solenoid is connected by a line 108 to one terminal of the solenoid 69', the other terminal of which is connected by a line 109 to the line 100. Since (as explained above) the switch arm 91 is connected to the main 71 and line 100 to the main 72, current passes through solenoids 69 and 69', whenever the arm 91 engages the switch point 106.

The circuit through the solenoids 70 and 70' may be traced as follows: From the line 90 there is a lead 110 to one terminal of the solenoid 70. The other terminal of this solenoid is connected by a line 111 to one terminal of the solenoid 70', and the other terminal of the latter solenoid is connected by a line 112 to a switch point 113 adapted to be engaged by the switch arm 98 when the latter is pushed by the arm 102.

The solenoid 40 above referred to operates a plunger 115 connected to the armature 57. The circuit of the solenoid 40 is as follows: One terminal of the solenoid is connected by a line 116 to the main 72 and the other terminal is connected by a line 117 to a switch blade 118 in the switch box 38. Another switch blade 119 in said box is connected to a contact point 120 adapted to bear against a conductor 121 carried by but insulated from the switch arm 91. Another switch point 122 also bearing against said conductor is connected by a line 123 to the main 71. The push button 39 bears a contact member 124 which bridges the blades 118 and 119 when the push button is raised, thereby closing the circuit through the solenoid 40 and causing the main switch to be operated in such direction that the blades 51 and 52 will engage switch points 53 and 54 respectively, and start the motor 22 running in the down direction. It will be understood, of course, that when the switch arm 91 is in normal position the conductor 121 bridges the contact points 120 and 122.

The operation of the apparatus is as follows: It will be assumed that the car is at the lower floor level and that a load has been placed thereon depressing the panel 30. The operator then moves the switch 50' to the position indicated by broken lines in the drawings. This will start the motor running in such direction as to draw the carriage up the incline. At the same time the retaining magnet 58' will hold the switch in this position. When the car reaches the top of the incline, the arm 101 will push the arm 91 forward breaking the circuit through the retaining magnets and the switch 50' will then return to normal position under impulse of the springs 60' and 61'. The break in the circuit of the retaining magnets, however, is momentary because the arm 101 snaps past the switch 91 and the latter is then returned to normal position by the spring 92. When the arm 91 was pushed forward by the arm 101 the circuit through the solenoids 69 and 69' was momentarily completed, causing the stops 64 and 64' to rise and the stops 65 and 65' to drop. This prevents operation of either of the main switches to the "up" position. When the load is removed from the carriage, the panel 30 rises lifting the push button 39 and closing the circuit through the solenoid 40. This causes the main switch 50 to be thrown to the "down" position in which position it is held by the retaining magnet 59. The car then moves down the incline and when it reaches the lower level it momentarily throws the switch arm 98 to deenergize the retaining magnets and by engaging the switch point 113 energizes the solenoids 70 and 70' to reverse the position of the stops, so that the switches can now be operated only in the "up" position. Of course, as soon as the carriage starts downward, the push button 39 is released and the circuit through the solenoid 40 is broken. If it is desired to retain the carriage at the upper level, this can be done by throwing forward the latch 35, so as to hold the panel 30 in depressed position and prevent it from operating the push button. The carriage will then remain at the upper level, but it may be drawn down to the lower level even though the panel is latched in depressed position, by operating either of the hand switches to the "down" position.

While I have described my invention as applied to a particular form of lift, it is obvious that it is applicable to vertical lifts as well as other forms of inclined lifts. I wish it to be understood therefore that this embodiment is to be taken as illustrative and not limitative of my invention and that I am free to make such changes in form, construction and arrangement of parts as fall within the spirit and scope of the following claims.

I claim:

1. An elevator comprising a car adapted to carry a load from one level to another, driving mechanism for propelling the car, means for arresting the propelling mechanism when the car reaches the latter level, and automatic means including a spring-pressed controller normally depressed by the load for restarting the propelling mechanism in the opposite direction when the load is removed from the car.

2. An elevator comprising a car adapted to carry a load from one level to another, driving mechanism for propelling the car, means for arresting the propelling mechanism when the car reaches the latter level, means automatically actuated upon relieving the car of its load for restarting the propelling mechanism in the opposite direction, and means on the car for

preventing operation of said automatic means.

3. An elevator comprising a car adapted to travel back and forth between two levels, driving mechanism for propelling the car, means controlled by the car for stopping the propelling means when the car reaches either of said levels, manually operable means at each level for restarting the propelling means, and stop means at each level controlled by the car on reaching said level for preventing restarting of the propelling means except in reverse direction.

4. An elevator comprising a car adapted to travel back and forth between two levels, driving mechanism for propelling the car, means controlled by the car for stopping the propelling means when the car reaches either of the levels, a controller at each level for starting the propelling means, each controller being manually operable in one direction from neutral position to cause the car to move upward and in the other direction to cause the car to move downward, and stop means controlled by the car on reaching either level for preventing operation of either of the controllers except in such direction as to cause the car to move toward the other level.

5. An elevator comprising a car adapted to travel back and forth between two levels, driving mechanism for propelling the car, means controlled by the car for stopping the propelling means when the car reaches either of the levels, a controller at each level for starting the propelling means, each controller being manually operable in one direction from neutral position to cause the car to move upward and in the other direction to cause the car to move downward, stop means controlled by the car on reaching either level for preventing operation of either of the controllers except in such direction as to cause the car to move toward the other level, and automatic means controlled by the car at one of the levels for moving the adjacent controller in such direction as to cause the car to travel toward the other level.

6. An elevator comprising a car adapted to carry a load from one level to another, mechanism for propelling the car, means for arresting the propelling mechanism when the car reaches the latter level, a movable support on the car and adapted to be depressed by the load, a spring for raising the support when the load is removed, a controller at said latter level for restarting the propelling mechanism in reverse direction, and means controlled by the raising of the support for operating said controller.

7. An elevator comprising a car adapted to carry a load from one level to another, mechanism for propelling the car, means for arresting the propelling mechanism when the car reaches the latter level, a movable panel on the car and adapted to be depressed by the load, a spring for raising the panel when the load is removed, and automatic means at said latter level operable by engagement with the panel when relieved of load to restart the propelling mechanism in reverse direction.

8. An elevator comprising a car adapted to carry a load from one level to another, mechanism for propelling the car, means for arresting the propelling mechanism when the car reaches the latter level, a movable panel on the car and adapted to be depressed by the load, a spring for raising the panel when the load is removed, automatic means at said latter level operable by engagement with the panel when relieved of load to restart the propelling mechanism in reverse direction, and a latch for holding the panel in depressed position to prevent operation of said automatic means.

9. An elevator comprising an inclined guideway, a car, an electric motor for propelling the car along the guideway, a reversing switch for starting the motor, said switch being movable in opposite directions from neutral to control movement of the car up and down respectively, resilient means urging the switch to neutral position, electro-magnetic means for holding the switch in either active position, means operable by engagement with the car at one end of the guideway for momentarily deenergizing the electro-magnetic means to release the switch, a solenoid for throwing the switch in reverse position, a load carrying panel on the car, means for raising the panel when relieved of load, and means controlled by engagement with the panel when raised for energizing said solenoid.

10. An elevator comprising an inclined guideway, a car, an electric motor for propelling the car along the guideway, a reversing switch for starting the motor, said switch being movable in opposite directions from neutral to control movement of the car up and down respectively, resilient means urging the switch to neutral position, electro-magnetic means for holding the switch in either active position, means operable by engagement with the car at one end of the guideway for momentarily deenergizing the electro-magnetic means to release the switch, a solenoid for throwing the switch in reverse position, a load carrying panel on the car, means for raising the panel when relieved of load, means controlled by engagement with the panel when raised for energizing said solenoid and a latch for holding the panel in depressed position to prevent operation of said automatic means.

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