Jan. 23, 1934. R. B. HUNTER 1,944,432

CONTROL APPARATUS FOR ELECTRIC ELEVATORS

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Fig. 1

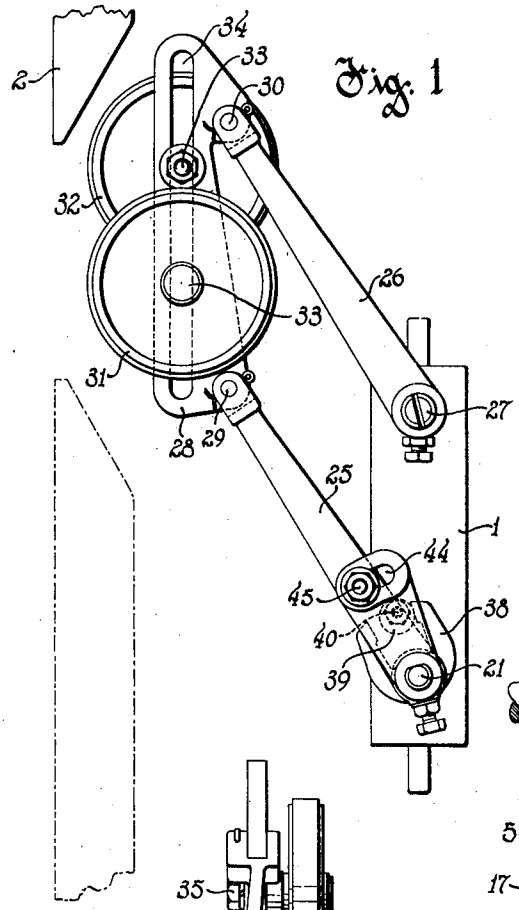



Fig. 2

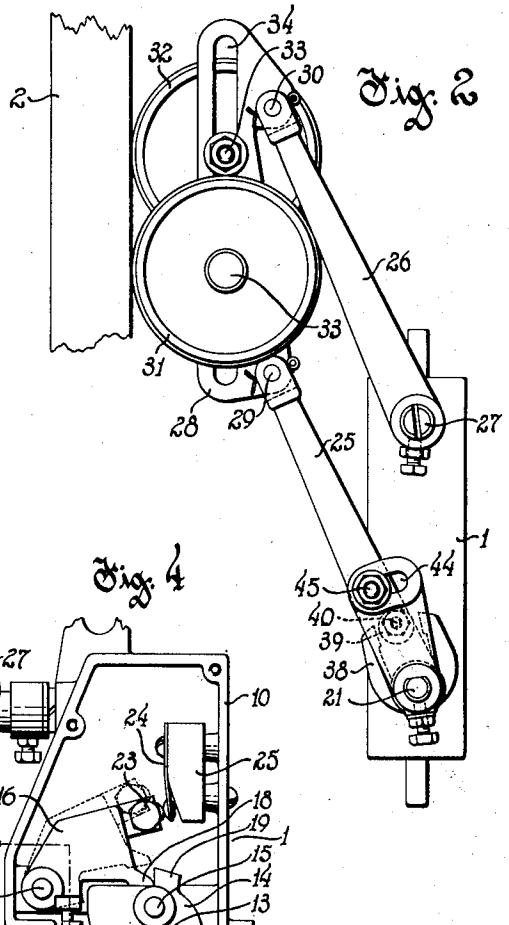



Fig. 3

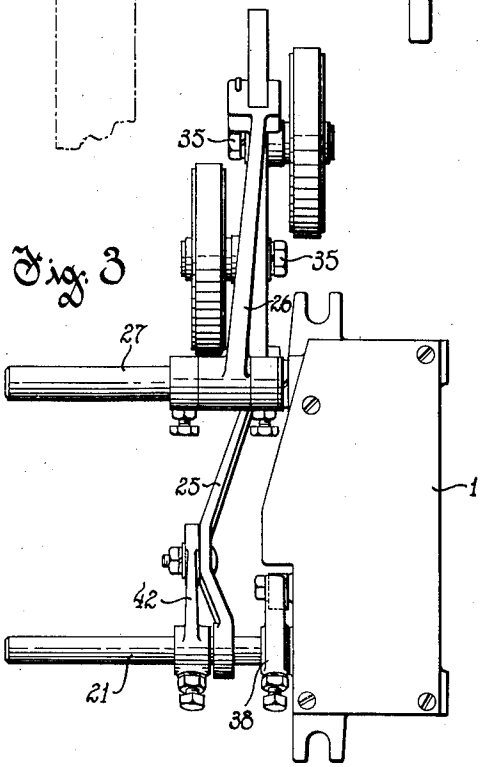



Fig. 4

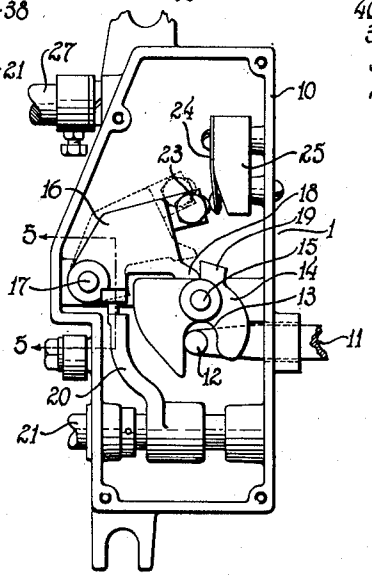
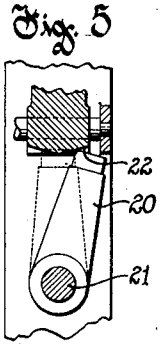



Fig. 5




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Fig. 6

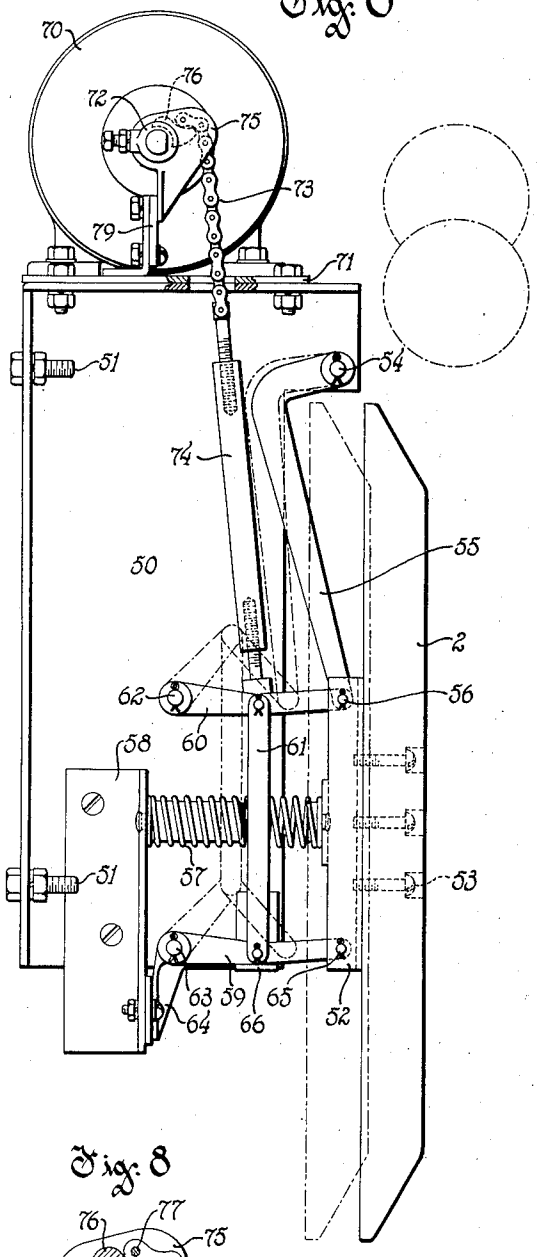



Fig. 7

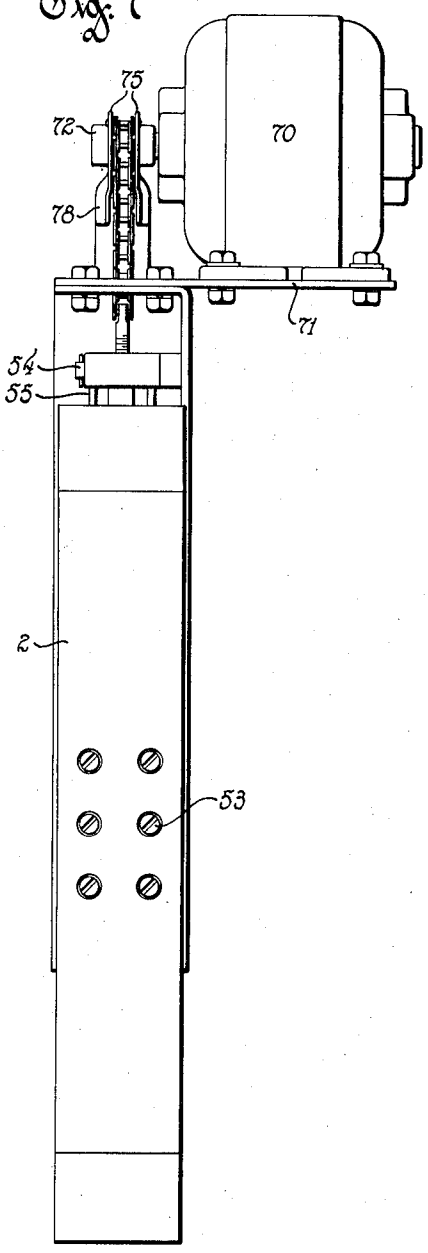
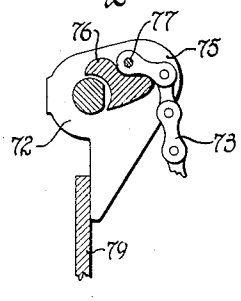



Fig. 8




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# UNITED STATES PATENT OFFICE

1,944,432

## CONTROL APPARATUS FOR ELECTRIC ELEVATORS

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Application July 17, 1930. Serial No. 468,585

12 Claims. (Cl. 187—29)

This invention relates to control apparatus for electric elevators.

While apparatus embodying the invention is capable of use in elevator control systems of various types, the same is particularly applicable to control systems of the character disclosed in the co-pending application of Edwin W. Seeger, Serial No. 460,951, filed June 13, 1930.

In the control system disclosed in said application the landing doors are provided with locking devices, each of which has a control switch associated therewith. Said control switches prevent starting of the driving motor unless all of the landing doors are locked in closed position by their respective locking devices, and each of said control switches is also adapted to effect stopping of the driving motor upon release of its associated locking device. The several locking devices are controlled by a cam mounted upon the elevator car and during movement of the car to a selected landing said cam is held in a retracted position until the elevator car approaches the selected landing, whereupon the driving motor is slowed down and the cam is permitted to move to a projected position. The cam then acts during final movement of the elevator car into a position opposite the selected landing to operate the locking device at such landing and thereby stop the driving motor and unlock the associated landing door.

In order to effect accurate stopping of the elevator car in positions level with the various landings it is necessary to adjust the points at which the retiring cam operates the locking devices to suit the degree of coasting which occurs upon opening of the control switches associated with said devices.

The present invention has among its objects to provide an improved mechanism for operating the locking devices in systems of the aforesaid character which is adjustable to insure stopping of the elevator car in positions level with the various landings.

Another object is to provide improved means for operating the retiring cam in elevator systems of the aforesaid character.

The objects and advantages of the invention will be more specifically explained in connection with the accompanying drawings which illustrate one embodiment thereof.

In the drawings,

Figure 1 is a side elevational view of an elevator control device having a cam operated mechanism associated therewith which embodies certain features of the invention.

Fig. 2 is a view similar to Fig. 1, illustrating the operating mechanism in another position.

Fig. 3 is a front elevational view of the operating mechanism shown in Fig. 1.

Fig. 4 is a front elevational view of one form of control device with which the operating mechanism shown in Fig. 1 may be used.

Fig. 5 is a detail sectional view taken on lines 5—5 of Fig. 4.

Fig. 6 is a side elevational view of the operating mechanism for the cam shown in Fig. 1.

Fig. 7 is a front elevational view of the operating mechanism shown in Fig. 6, and

Fig. 8 is a detail sectional view of one of the operating parts of the cam operating mechanism.

Referring to Fig. 1, the same illustrates a door locking device 1 to be operated by cam 2 associated with the elevator car. The locking device 1 may be of any desired type, as for example that shown in Fig. 4, and it is assumed that one of such devices is associated with each of the landing doors. It is also assumed that during movement of the elevator car to a selected landing the cam 2 is held in a retracted position until the elevator car approaches such landing, whereupon the cam is moved to a projected position wherein the same is adapted to release the associated locking device during final movement of the elevator car into a position opposite the selected landing.

The locking device illustrated in Fig. 4 includes a casing 10 adapted to be secured to the jamb of a landing door, and a horizontal bar 11 movable within an opening in said casing and adapted to be fixed to the landing door. Bar 11 has a hook projection 12 on the end thereof, and as the landing door closes said projection moves into a recess 13 formed in a tumbler 14 rotatably mounted upon a pin 15 fixed to casing 10. A locking member 16 is rotatably mounted upon a pin 17 fixed to casing 10 and said locking member is provided with a projection 18 which cooperates with a projection 19 on the upper side of tumbler 14. Locking member 16 is biased by gravity towards tumbler 14, and as is apparent when said locking member is in the position illustrated by full lines tumbler 14 is locked against counterclockwise movement to thereby lock the landing door by preventing withdrawal of bar 11. Upon upward movement of locking member 16 to its dotted line position the tumbler 14 is released and the same is then rotatable in a counterclockwise direction to permit opening of the landing door. Upon open-

ing of the landing door the projection 19 on tumbler 14 moves under projection 13 on locking member 16 and said locking member is thus held in its dotted line position pending reclosure of the landing door. Locking member 16 is adapted to be moved upwardly from its full line position to its dotted line position by a lever 20 fixed to a shaft 21 which is rotatably mounted in bearings provided in opposite walls of enclosing casing 10. As shown in Fig. 5 locking member 16 has a cam surface 22 on the under side thereof to be engaged by the free end of lever 20, and upon movement of said lever in a counterclockwise direction from the full line position illustrated in Fig. 5 locking member 16 is moved upwardly into its released position.

Locking member 16 has an insulated bridging contact 23 fixed thereto which cooperates with a pair of stationary contacts 24, one of which is illustrated in Fig. 4. Contacts 24 are mounted upon an insulating block 25 fixed to casing 10, and the bridging contact 23 engages said stationary contacts when locking member 16 occupies its locking position, and upon movement of said locking member to its released position said bridging contact disengages said stationary contacts.

In systems employing a locking device of the character above described it is desirable to provide for adjustment of the points at which the retiring cam 2 is adapted to operate the shaft 21 without variation in the angular movement of said shaft by said cam. The operating mechanism employed for this purpose includes a pair of parallel levers 25 and 26 of equal length, the former being fixed to shaft 21 and the latter being rotatably mounted upon a shaft 27 fixed to casing 10. Shaft 27 is arranged so that the axis thereof is parallel to the axis of shaft 21 and vertically alined therewith, and the free ends of levers 25 and 26 are pivotally secured to a link 28 at points 29 and 30. Link 28 carries a pair of rollers 31 and 32 which are arranged on opposite sides thereof and the former roller is arranged to be engaged by cam 2 during upward movement of the elevator car, while the latter roller is arranged to be engaged by said cam during downward movement of the elevator car. Each of the rollers 31 and 32 is rotatably mounted upon a pin 33, and said pins are adjustable within a vertical slot 34 in link 28 and are secured to said link by nuts 35.

As is apparent from Fig. 1, the weight of arms 25 and 26 and the parts carried thereby tends to rotate shaft 21 in a counterclockwise direction, and rotation of said shaft in opposite directions is limited by a forked member 38 which cooperates with an eccentric stop 39 fixed to casing 10 by a bolt 40. As is apparent from Fig. 1, variation of the angular position of stop 40 varies the angular position at which shaft 21 is normally held by its associated operating mechanism, and in practice the stop 40 is so adjusted that arm 20 engages cam surface 22 on locking member 16 immediately upon movement of shaft 21 out of normal position.

Arm 25 is secured to shaft 21 through the medium of a lever 42 which is fixed against rotation on said shaft and is adjustable axially thereon. Lever 42 is provided with a slotted opening 44 adjacent the end thereof for receiving a bolt 45 fixed to arm 25 and by loosening said bolt the normal angular position of said arm can be varied to suit the position of cam 2. In this connection it should be noted that vertical adjustment of rollers 31 and 32 on link 28 does not vary the range of movement of shaft 21 by cam 2.

Referring now to Figs. 6, 7 and 8, the same illustrate the means employed for effecting operation of cam 2. Cam 2 is supported by a plate 50 having bolts 51 associated therewith for securing the same to the elevator car. Cam 2 has a bracket 52 secured to the rear face thereof by screws 53 and the same is supported from a pivot pin 54 fixed to plate 50 through the medium of a lever 55, the upper end of said lever being rotatable upon said pin and the lower end thereof being pivotally secured to the upper end of bracket 52 by a pin 56. Cam 2 is biased to move towards the right by a coil spring 57 which is held under compression between bracket 52 and an angle bracket 58 fixed to plate 50. A pair of toggles 59 and 60 are provided for moving cam 2 towards the left against the action of spring 57, said toggles being of the same dimensions and being connected intermediate their ends by a link 61. The left hand end of toggle 60 is pivotally secured to a pin 62 fixed to plate 50 while the right hand end thereof is pivotally secured to the pin 56. The left hand end of toggle 59 is pivotally secured to a pin 63 carried by a bracket 64 fixed to bracket 58 while the right hand end thereof is pivotally secured to a pin 65 mounted upon the lower end of bracket 52. The toggles 59 and 60 tend to move downwardly by gravity and such movement is limited by a cooperating stop 66 fixed to plate 50. As shown by full lines in Fig. 1 stop 66 is arranged to permit movement of the links of said toggles slightly below their horizontal positions.

The toggles 59 and 60 are thus normally held in positions wherein the same are adapted to lock cam 2 against movement towards the left from the projected position illustrated by full lines, and as is apparent lever 55 serves to hold said cam against longitudinal movement. However, upon upward movement of the toggles 59 and 60 lever 55 swings towards the left and cam 2 is moved to a retracted position indicated by dotted lines against the action of spring 57.

Toggles 59 and 60 are adapted to be moved upwardly to effect retraction of cam 2 by a motor 70 which is mounted upon a plate 71 fixed to the upper end of plate 50. Motor 70 has a crank 72 fixed to the shaft thereof and said crank is connected to the toggles 59 and 60 through the medium of a chain 73 and a turn buckle device 74. As shown in Figs. 7 and 8, crank 72 is provided with spaced side plates 75—75 which are connected by a lug 76 and the chain 73 is arranged between said side plates and is connected thereto by a pin 77. The side plates 75 are provided with projections 78, and as shown in Fig. 6 said projections are adapted to engage a stop 79 fixed to plate 71 to limit rotation of motor 70 in a clockwise direction when the same is deenergized.

The crank 72 normally occupies the position shown in Fig. 6 and upon energization of motor 70 the same rotates in a counterclockwise direction. Upon rotation of crank 72 in this direction the chain 73 is wound upon lug 76 to move the toggles 59 and 60 upwardly for retraction of cam 2. As is apparent from Fig. 6 the power required to effect upward movement of the toggles 59 and 60 increases as the cam 2 moves from its projected position towards its retracted position. In practice it is desirable to maintain

the load upon motor 70 substantially constant during cam retracting operations, and for this purpose the lug 76 of crank 72 is shaped as shown in Fig. 8 to increase the effective pull of said motor upon the toggles 59 and 60 as the latter move upwardly.

In connection with the foregoing it should be noted that the aforedescribed operating mechanism is not limited to use in systems of the character hereinbefore mentioned but is capable of being used in elevator systems of various other types.

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

1. In a control mechanism for electric elevators, the combination with a cam element for mounting upon an elevator car, of means for supporting said element against vertical movement with respect to the elevator car, and operating means for said element including a toggle mechanism operable to move said element laterally to effect projection and retraction thereof with respect to the elevator car.

2. In a control mechanism for electric elevators, the combination with a cam element for mounting upon an elevator car, of means for supporting said element against vertical movement with respect to the elevator car, and operating means for said element including a pair of toggles arranged to maintain said element in a vertical position and operable to move the same laterally to effect projection and retraction thereof with respect to the elevator car.

3. In a control mechanism for electric elevators, the combination with a cam element for mounting upon an elevator car, of a pivoted lever for supporting said element and for holding the same against vertical movement with respect to the elevator car, and operating means for said element including a pair of toggles arranged to maintain said element in a vertical position and operable to move the same laterally to effect projection and retraction thereof with respect to the elevator car, said toggles being normally positioned to lock said cam element in a projected position.

4. In a control mechanism for electric elevators, the combination with a cam element to be mounted upon the elevator car, of a pivoted member adapted to swing in a vertical plane and supporting said cam element, a toggle mechanism operable to swing said cam element laterally to effect projection and retraction thereof, said toggle mechanism being adapted to normally lock said cam element in a projected position, an electro-responsive device for operating said toggle mechanism to effect retraction of said cam element and an operating connection between said operating device and said toggle mechanism.

5. In a control mechanism for electric elevators, the combination with a cam element to be mounted upon the elevator car, of a lever adapted to swing in a vertical plane and supporting said cam element, a pair of toggles associated with said cam element and adapted to normally lock said cam element in a projected position, a spring tending to move said element towards its projected position, and electromagnetic means for operating said toggles to effect movement of said cam element into a retracted position against the action of said spring.

6. In a control mechanism for electric elevators, the combination with a cam element to be mounted upon the elevator car, said element being biased to a projected position, of a toggle mechanism associated with said element and adapted to normally lock the same in its projected position, said mechanism being operable to effect movement of said cam element to a retracted position, an operating motor associated with said toggle mechanism and adapted when energized to move said cam element to its retracted position, a crank fixed to the shaft of said motor and a flexible connection between said crank and said toggle mechanism.

7. In a control mechanism for electric elevators, the combination with a cam element to be mounted upon the elevator car, said cam element being biased to a projected position, of a toggle mechanism associated with said element and adapted to normally lock the same in its projected position, a motor for operating said toggle mechanism to move said cam element into a retracted position, a crank fixed to the shaft of said motor, and an operating connection between said crank and said toggle mechanism, said crank being adapted to maintain the load on said motor substantially constant during movement of said cam element into its retracted position.

8. In a control mechanism for electric elevators, the combination with a cam element to be mounted upon the elevator car, said cam element being biased to a projected position, a toggle mechanism associated with said element and adapted to normally lock the same in a projected position, a motor adapted to operate said toggle mechanism to move said cam element to a retracted position, a crank member fixed to the shaft of said motor, a flexible connection between said crank and said toggle mechanism and adapted to be wound upon said crank to effect operation of said toggle mechanism, said crank member including means to maintain the load on said motor substantially constant during movement of said cam element to its retracted position.

9. In a control mechanism for electric elevators, in combination, a cam associated with the elevator car and a landing door locking device having a pair of operating parts associated therewith each engageable by said cam to effect release of said locking device, said operating parts being vertically spaced to provide for engagement of said cam with one of said operating parts in advance of the other during operation of the elevator car in one direction, and for engagement of said cam with said latter operating part in advance of said former operating part during operation of the elevator car in an opposite direction.

10. In a control mechanism for electric elevators, the combination with a control device, including a rotatable operating shaft, of an operating mechanism for said device to be actuated by a cam element mounted upon the elevator car, said mechanism including a pair of rotatable arms associated with said device, said arms being of equal length, and being arranged in a parallel relation, and one of the same being fixed to the operating shaft of said device, a vertically arranged link pivotally connected to the free ends of said arms and a roller mounted upon said link to be engaged by the cam mounted upon the elevator car, said roller being adjustable longitudinally with respect to said link.

11. In a control mechanism for electric elevators, the combination with a control device having a rotatable operating shaft, of an operating mechanism for said device to be actuated by a cam element mounted upon the elevator car, said operating mechanism including a pair of rotatable arms associated with said device, said arms being

of equal length and being arranged in a parallel relation, and one of the same being fixed to the operating shaft of said device, a vertically arranged link pivotally connected to the free ends of said arms, and a pair of rollers adjustable longitudinally with respect to said link, one of said rollers to be engaged by the cam element mounted upon the elevator car during upward movement of the elevator car, and the other to be engaged by the cam element during downward movement of the elevator car.

12. In a control mechanism for electric elevators, in combination, a cam associated with the elevator car and a landing door locking device having a pair of operating parts associated therewith each engageable by said cam to effect release of said locking device, said operating parts being vertically spaced to provide for engagement of said cam with one of said operating parts in advance of the other during operation of the elevator car in one direction and for engagement of said cam with said latter operating part in advance of said former operating part during operation of the elevator car in an opposite direction, each of said operating parts being adjustable vertically with respect to said locking device to vary the points at which said device is actuated by said cam.

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