Dec. 23, 1941. E. L. DUNN 2,267,642

ELEVATOR CAR POSITION INDICATOR DRIVING MECHANISM

Filed Dec. 18, 1940 3 Sheets-Sheet 1

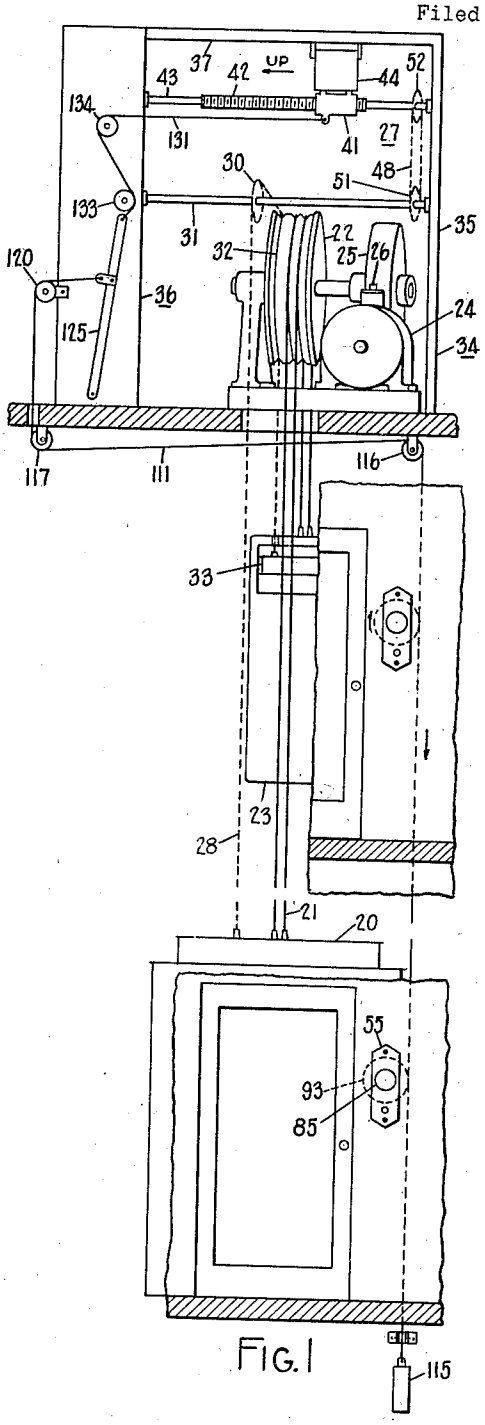

FIG. 1

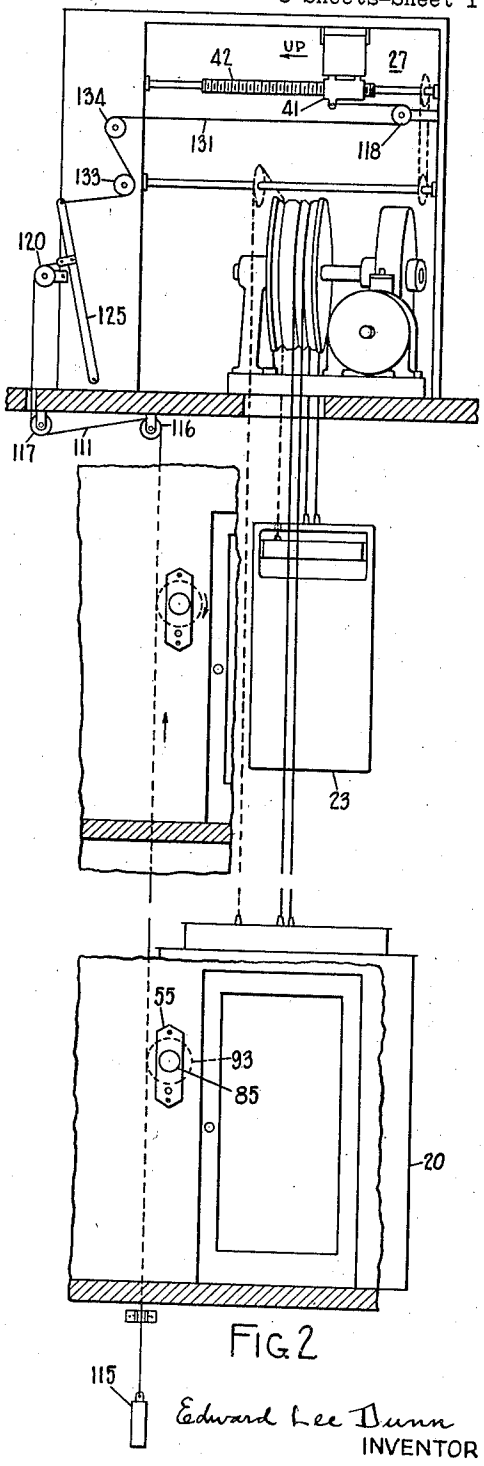

FIG. 2

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Dec. 23, 1941. E. L. DUNN 2,267,642

ELEVATOR CAR POSITION INDICATOR DRIVING MECHANISM

Filed Dec. 18, 1940 3 Sheets-Sheet 2

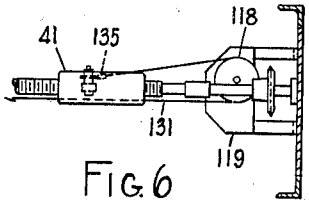

FIG. 6

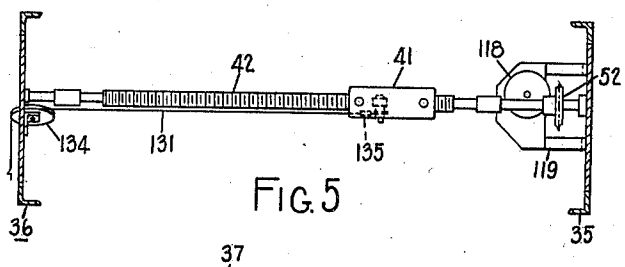

FIG. 5

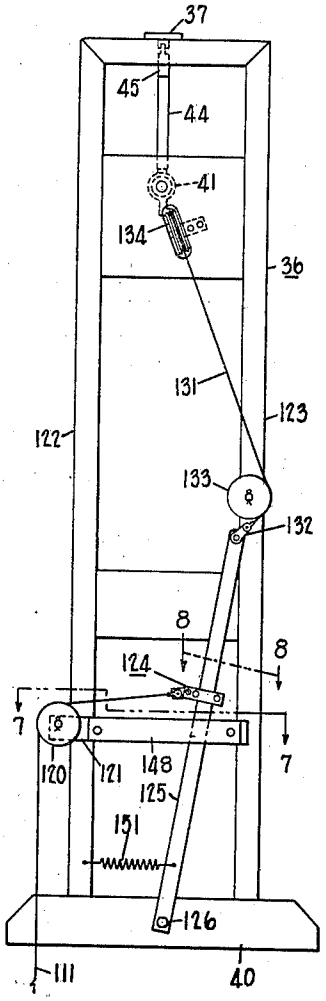

FIG. 3

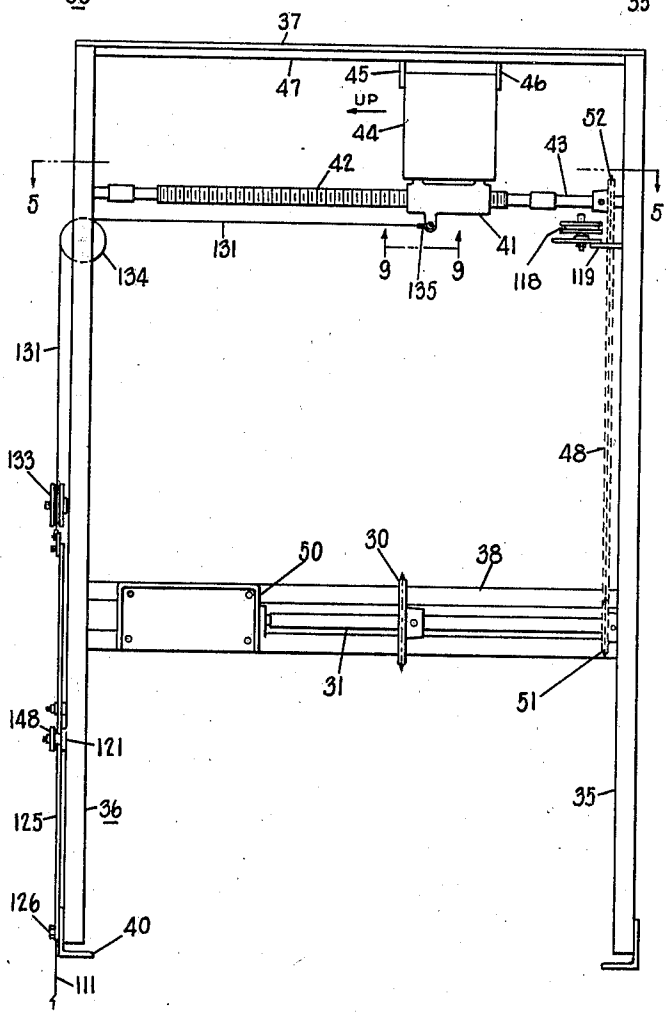

FIG. 4

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Dec. 23, 1941. E. L. DUNN 2,267,642

ELEVATOR CAR POSITION INDICATOR DRIVING MECHANISM

Filed Dec. 18, 1940 3 Sheets-Sheet 3

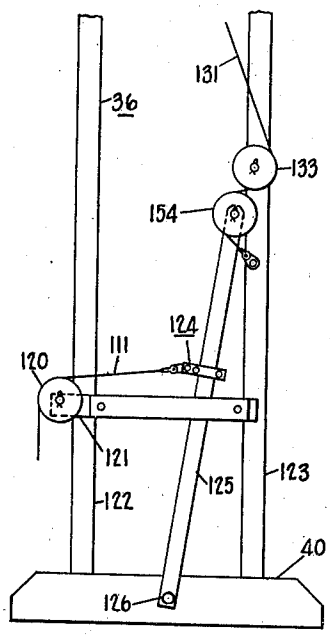

FIG. 10

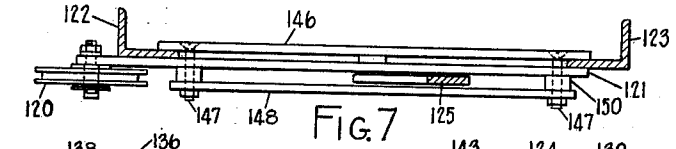

FIG. 7

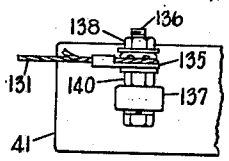

FIG. 9

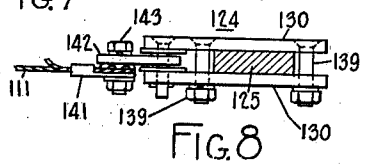

FIG. 8

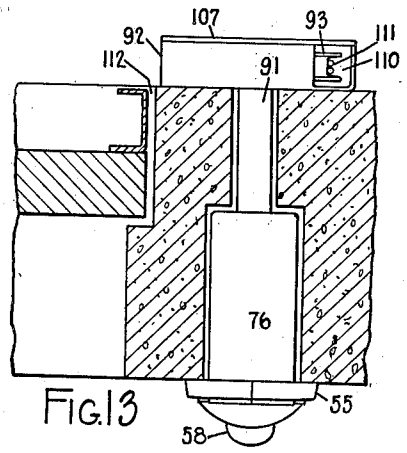

FIG. 13

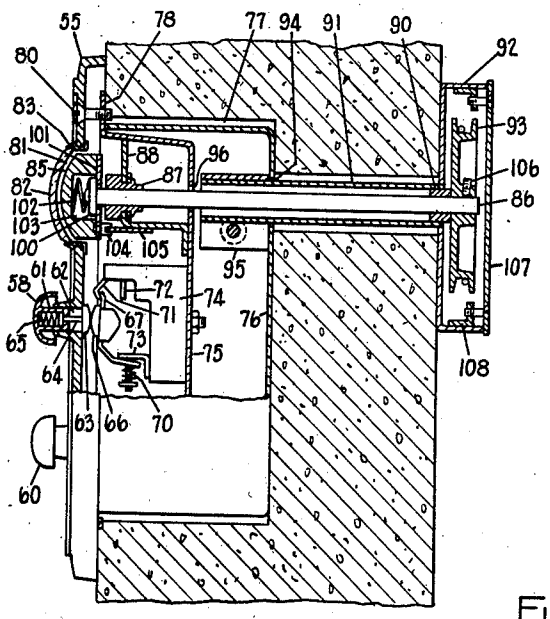

FIG. 12

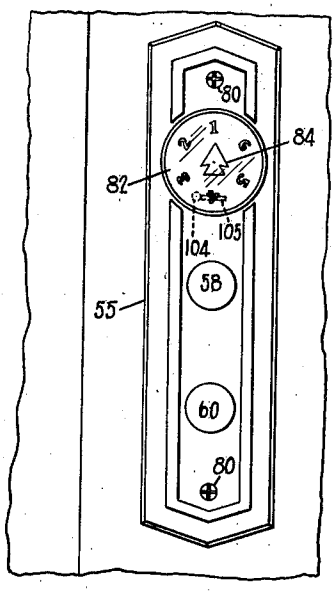

FIG. 11

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Patented Dec. 23, 1941

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UNITED STATES PATENT OFFICE

2,267,642

ELEVATOR CAR POSITION INDICATOR DRIVING MECHANISM

Edward Lee Dunn, Livingston, N. J., assignor to Otis Elevator Company, New York, N. Y., a corporation of New Jersey

Application December 18, 1940, Serial No. 370,673

3 Claims. (Cl. 116—122)

The invention relates to driving mechanism for elevator car position indicators, especially indicators of the type which are arranged at the floors and mechanically rotated in accordance with movement of the car to indicate the position of the car in the hatchway.

One form of mechanically rotated position indicator is the small dial type which, in installations having hall push buttons at the floors, may be arranged in the push button fixture. The invention is especially applicable to position indicators of this character and will be described as applied thereto although it is to be understood that the invention is not limited in its application to this form of indicator.

It is highly desirable in installations having mechanically rotated position indicators at the floors to provide each of the indicators with reset mechanism operable at the terminal floors. This minimizes the possibility of any of the indicators getting considerably out of step with the car.

The object of the invention is to provide driving mechanism for mechanically rotated position indicators which is of simple construction, reliable in operation and which may be readily adjusted for installations of different distances between terminal floors.

In the arrangement which will be described, the indicators are actuated by movement of the crosshead of mechanism such as a floor controller actuated by car movement. In such mechanism, the movement of the crosshead corresponds with the movement of the elevator car but the speed of the crosshead is considerably less than the car speed. Thus a considerable speed reduction is obtained for actuating the indicators. The indicator dials are driven by a wire connected for actuation by movement of the crosshead and extending down the hatchway. This wire is wrapped around driving sheaves for the indicators one after the other from the top floor to the bottom floor, and on the lower end is provided with a tensioning weight. Each dial is provided with a plurality of characters such as numerals corresponding to the floors of the installation. In order to render the reset mechanism of each indicator effective at the terminal floors for installations of different numbers of floors, the dial is always rotated through the same angle for a terminal to terminal run regardless of the number of floors, the characters indicating the terminal floors are arranged on the dial at the limiting points of movement and the characters for the intervening floors are positioned so that there is equal spacing between characters over the portion of the dial corresponding to the car travel. In certain instances, as where there are more than a certain number of floors, the characters for certain floors may be omitted.

The invention involves connecting the driving wire for the indicators for actuation by the crosshead through mechanism which is readily adjustable to impart the same amount of vertical movement to the wire on terminal to terminal runs for installations of varying numbers of floors.

In carrying out the invention according to the preferred arrangement, an upwardly extending lever is pivotally mounted at its lower end on the framework of mechanism actuated in accordance with car movement at one end thereof. The upper end of this lever is connected by wire to the crosshead so as to be swung about its pivot by crosshead movement and in a direction dependent on the direction of crosshead movement. The driving wire for the indicator sheaves is adjustably connected to the lever intermediate the ends thereof, the exact position being determined by the distance from the bottom floor to the top floor of the installation. Inasmuch as the same amount of rotative movement of the indicator dials is to be effected, regardless of the number of floors, the connection of the driving wire to the lever is made at a point which effects this amount of movement with the swing of the lever obtained by the crosshead movement in making a terminal to terminal run. Thus, in an installation of a few floors for example, this connection would be effected nearer the top of the lever than in an installation of a larger number of floors. To maintain the swing of the lever commensurate with the distance between the sides of the framework of the mechanism actuated in accordance with car movement in case of a considerable number of floors, the relative swing of the lever with respect to crosshead movement may be reduced as by connecting the wire from the crosshead to a fixed point and passing it around a pulley carried by the upper end of the lever.

A general idea of the invention and of the mode of carrying it out which is at present preferred and various features and advantages of the invention will be gained from the above statements. Other features and advantages of the invention will be apparent from the following description and appended claims.

In the drawings:

Figure 1 is a schematic representation of an elevator installation embodying the invention, the position indicators being shown on the right hand side of the hatchway doors;

Figure 2 is a view similar to Figure 1 with the position indicators shown on the left hand side of the hatchway doors;

Figure 3 is an end view of the floor controller illustrated in Figure 1;

Figure 4 is a side view of the same;

Figure 5 is a view in section taken along the line 5—5 of Figure 4;

Figure 6 is a fragmentary detail similar to Figure 5 but illustrating the connection to the floor controller crosshead for the arrangement shown in Figure 2;

Figure 7 is an enlarged view in section taken along the line 7—7 of Figure 3;

Figure 8 is a detail in section taken along the line 8—8 of Figure 3;

Figure 9 is an enlarged detail along the line 9—9 of Figure 4;

Figure 10 is a fragmentary end view of the floor controller illustrating a 1:2 drive for the actuating lever;

Figure 11 is a front view of a push button fixture embodying a position indicator;

Figure 12 is a side view of the same with parts in section; and

Figure 13 is a top view of the same.

Referring first to Figure 1, the elevator car 20 is suspended by hoisting ropes 21 which extend upwardly from the car around the hoisting sheave 22 and downwardly to the counterweight 23. A geared machine is illustrated in which the hoisting sheave is driven by the hoisting motor 24 through a worm and worm gear reduction 25. 26 is the electromagnetic brake for holding the car at rest.

An installation is illustrated in which push buttons are provided at the various floors and which act through a floor controller 27 to control the operation of the car. The floor controller is illustrated as driven from the car by sprocket chain 28 which passes from the car upwardly to and over a sprocket wheel 30 secured to the floor controller drive shaft 31 and from there over the hoisting sheave in a special groove 32 provided thereon and down to a tensioning weight 33 in the counterweight frame. The floor controller framework 34 is illustrated as straddling the hoisting motor. This framework comprises a pair of side frames 35 and 36 joined at the top by top plate 37. Feet 40 are secured to the bottoms of the side frames for mounting on the floor controller, as shown in Figures 3 and 4.

Referring now also to Figures 3 and 4, the floor controller crosshead 41 is in the form of a nut and is driven by a screw 42 on a horizontal shaft 43. This shaft is supported at its ends in bearings arranged in the side frames 35 and 36. A frame 44 is carried by the crosshead to support brushes (not shown) for engaging stationary contacts (also not shown) in the control system. The crosshead frame is provided with guides 45 and 46 which extend into a trough 47 secured to top plate 37 to prevent rotation of the crosshead upon rotative movement of shaft 43. Shaft 43 is driven from the floor controller drive shaft 31 by a sprocket chain 48. The drive shaft is supported in bearings, one in side frame 35 and the other in a frame 50 which is supported by cross members 38 for the purpose of mounting mechanism (not shown) utilized in the control system. Another sprocket wheel 51 is secured to shaft 31 for driving chain 49. This chain extends upwardly around a sprocket 52 secured to shaft 43. Thus, upon movement of the elevator car, shaft 43 is rotated to move the crosshead in accordance with car movement and at a reduced ratio with respect thereto.

Details of one of the position indicators actuated by movement of the crosshead are illustrated in Figures 11, 12 and 13. The indicator is shown as arranged within a push button fixture. This fixture comprises a face plate 55 for both an up push button 58 and a down push button 60. These push buttons are illustrated as of the mushroom type, each being provided with a stem 61 which extends through an aperture 62 in the face plate. The push button operates a knob 63 on the end of a shank 64 through a spring 65 arranged within the stem. This knob engages a contacting knob 66 on movable contact 67 of the push button contacts. The movable contact is biased by a spring 70 into engagement with a stop 71. Upon pressure of the push button the movable contact is pushed to the right to engage the stationary contact 72. The stop 71, stationary contact 72 and the supporting bracket 73 for the movable contact are mounted on an insulating base 74 within and secured to a casing 75. The fixture has two casings 75 and 76, the outer casing 76 being secured as by welding to the inner casing 75. A pocket 77 is formed in the hatchway wall into which the outer casing extends. A flange 78 is formed on the inner casing which is secured as by screws (not shown) to the hatchway wall in the manner of an electric outlet box. The face plate 55 is secured to the flange as by screws 80.

Above the push buttons the face plate is provided with an aperture 81 to receive a crystal 82. This crystal is mounted in a bezel 83 which is clamped to the face plate around the aperture. The crystal is provided with an arrow 84 preferably formed centrally thereof on the inner surface as by vitreous enamel fused to the glass. This arrow points upwardly to indicate on a dial 85 the number or character for the floor at which the car is positioned. The dial is immediately behind the crystal and is driven by an elongated shaft 86. This shaft is supported near the dial by a bearing 87 in an angle member 88 secured as by welding to inner casing 75. At its other end the shaft is supported by a bearing 90 in a sleeve 91 extending from the casing 92 for the driving sheave 93. The sleeve 91 extends through an aperture 94 in the outer casing 76. The end of the sleeve extends well into the casing and is supported there by a clamp 95 secured to the casing. An aperture 96 is provided in inner casing 75 through which the shaft extends.

The driving of dial 85 by shaft 86 is effected through a clutch device. A leather disc 100 is secured to the dial end of the shaft and engages plate 101 secured to the back of the dial. A spring 102 within a pocket 103 formed in the dial maintains the leather disc in frictional engagement with the plate. A stop 104 is secured to plate 101 and a stop plate 105 is secured to bracket 88. The stop 104 engages one edge of plate 105 upon full movement of the dial in one direction and the opposite edge of the plate upon full movement of the dial in the other direction. The width of the plate is such as to limit the movement of the dial to an arc of substantially 300°.

Assuming for convenience that all floors are represented by numerals, the numeral for the lower terminal floor is positioned on the dial to be immediately above the pointer when the stop is engaging the left hand edge of plate 105 as viewed in Figure 11, while the numeral for the

upper terminal floor is positioned on the dial to be immediately above the pointer when the stop is engaging the right hand edge of plate **105**, thus placing these numbers 300° apart. The numerals for the other floors are so positioned on the dial that considering the 300° space the spacing between numerals is equal for any given number of floors, regardless of the number of floors, assuming substantially equal floor heights. It is preferred to space the numerals so that the angle between adjacent ones is not less than a certain minimum amount. For example, on a 1¾" dial, it is found that for the preferred size numerals an angle between numerals of less than 37½° is undesirable. An angle of 37½° permits nine numerals to be placed on the dial. In case of an installation of less than nine floors, the angle would be increased accordingly, whereas for installations of more than nine floors some of the numerals, as for example every other one, might be omitted, although if desired more numerals might be placed on the dial by using smaller numerals, in which event the angle between numerals would be decreased. Also, the dials might be made larger to accommodate more numerals of the desired size.

The drive sheave **93** for the dial is secured to the inner end of drive shaft **86** by a set screw **106**. A cover **107** is provided for the drive sheave casing, this cover being secured by screws extending into threaded apertures in brackets **108** welded to the casing. The casing is formed with openings **110** to provide an entrance and exit for the driving wire **111**, these openings being on the side of the casing away from the hatchway door opening **112**, thereby minimizing the possibility of tampering with the indicator. This is indicated schematically in Figure 1 for an arrangement in which the indicators are arranged on the right hand side of the hatchway doors and in Figure 2 in which the indicators are arranged on the left hand side of the hatchway doors. The drive wire extends down the hatchway and is wrapped around the indicator driving sheaves in series relation, one after the other. A full wrap is taken around each sheave. This driving wire may be of cotton center galvanized aircraft cord and to maintain the desired traction for actuating the indicators, a weight **115**, such as a sash weight, is connected to the lower end of the wire.

Referring now to Figures 1, 3, 4 and 5, the drive wire extends upwardly from the position indicator driving sheave for the uppermost floor to an idler pulley **116**. From this pulley the wire extends to a second idler pulley **117**, these pulleys being utilized to provide the proper lead to the floor controller. From pulley **117** the wire extends upwardly to a sheave **120** mounted on an adjustable cross bar **121** extending between uprights **122** and **123** of the side frame **36** of the floor controller. The end of the wire is connected as by an adjustable clamp **124** to a lever **125** pivotally mounted at its lower end **126** on the foot **40** for side frame **36**. A wire **131** is connected to the upper end of lever **126** through a link **132**. This wire also may be cotton center galvanized aircraft cord. This wire extends over an idler sheave **133** mounted on upright **123** from where it extends upwardly to another idler sheave **134** arranged at right angles to sheave **133** and in alignment with the direction of the wire from sheave **133** to sheave **134**. From sheave **134** the wire extends over to the crosshead to which it is connected by an eyelet **135**. Thus, during downward car travel, movement of the crosshead to the right as viewed in Figure 4 takes up on wire **131** to pull lever **125** clockwise about its pivot as viewed in Figure 3. This takes up on the wire **111** to move the position indicator dials counterclockwise. Conversely, during up car travel, movement of the crosshead to the left as viewed in Figure 4 pays out wire **131**. As this takes place, lever **125** is pulled counterclockwise about its pivot as viewed in Figure 3 by the tensioning weight at the end of wire **111** to move the position indicator dials clockwise.

Where the drive wire **111** for the indicators is on the left hand side of the doors as illustrated in Figure 2, wire **131** is passed first around an idler sheave **118** before being connected to the crosshead, this sheave being mounted on a bracket **119** secured to the side frame **35** for the floor controller, as shown in Figures 4, 5 and 6. With this arrangement, movement of the crosshead imparts movement to lever **25** which is opposite to that obtained with the arrangement of Figure 1. Thus with the wrap extending counterclockwise around the drive sheave for the dials as viewed in Figure 2, the dials are operated in the same direction as in the arrangement of Figure 1. With this arrangement, the extent of movement of lever **125** about its pivot depends upon the amount of movement of the crosshead, which in turn depends upon the amount of travel of the car in making a terminal to terminal run. Thus in an installation of a few floors, for example, the amount of swing of the lever on a terminal to terminal run would be small, whereas in a larger number of floors the lever might be swung to its full extent, as indicated in Figure 3.

To determine the proper length for wire **131**, the car is positioned at about the midpoint of its terminal to terminal run, lever **125** is positioned vertically, and the wire is fastened to the crosshead. This connection, as shown in Figure 9, is effected by pulling the wire taut in the eyelet **135** and clamping the eyelet to the crosshead. This connection is effected by a bolt **136** extending through lug **137** on the crosshead, the eyelet being clamped between nuts **138** and **140** on the bolt. Inasmuch as the position indicator dials have a fixed amount of rotative movement, the amount of movement of wire **111** is fixed and is the same for a terminal to terminal run regardless of the extent of crosshead movement in making such a run. To obtain this fixed amount of movement of wire **111**, it is connected to lever **125** at a point determined by the amount of swing of the lever for a terminal to terminal operation. For an installation of a small number of floors in which the arc of movement of the lever for a terminal to terminal run is small, the connection of wire **111** to lever **125** would be near the upper end of the lever, the connection being effected at increasingly lower points on the lever for installations of increasing numbers of floors.

As shown in Figure 8, the clamp **124**, by means of which wire **111** is adjustably connected to lever **125**, comprises a pair of plates **130**, one on each side of the lever. Bolts **139** are provided for clamping the plates onto the lever. The wire **111** is connected to the clamping plates by an eyelet **141** and link **142**. In making the connection of wire **111** to the lever, the positions of the lever for the terminal positions of the car are marked and a point on the lever is determined by measurement such that the distance between that point on the lever in the extreme positions of the

lever is equal to the amount of vertical movement of the wire desired. The clamp 124 is then clamped to the lever at this point. When setting the position of the clamp, the cross bar 121 is moved along with the clamp so as to position the top of sheave 120 just below the clamp. In this way, the chord for the arc of movement of the point of connection for a terminal to terminal run is made substantially equal to the vertical movement of wire 111. As shown in Figure 7, cross bar 121 is clamped in adjusted position to uprights 122 and 123 by an additional cross bar 146 and bolts 147. An additional cross bar 148, which is spaced from across bar 121 by collars 150 arranged on bolts 147, acts in conjunction with cross bar 121 as a guide for lever 125. When the setting of clamp 124 and cross bar 121 has been effected, wire 111 is connected to the clamp, pulled taut and upwardly enough so that the tensioning weight is suspended when the car is at the upper terminal and the eyelet clamped to the link 142 by bolt 143. A full round trip of the car is then made which automatically sets the position indicator dials in their proper positions.

Where the amount of movement of the crosshead is such as would result in greater swing of the top end of lever 125 than is permitted by the position of sheave 133, it is preferred to reduce the amount of the swing of lever 125 by a 2:1 connection rather than to obtain this swing by setting lever 125 to the left of vertical for the mid-position of the car, thus causing the top end of the lever to swing well beyond upright 122. This may be effected as shown in Figure 10 by providing a sheave 154 on the upper end of the lever and connecting the end of wire 131 to upright 123 and passing it around sheave 154 before passing the wire around sheave 133. Such condition might exist in an installation of a large number of floors.

It is preferred to bias lever 125 for counterclockwise movement as viewed in Figure 3, as by a spring 151, to obviate any slack in wire 131 as it is being paid out as where movement of wire 111 is stopped, thereby preventing wire 131 making undesirable electrical connections in the circuits.

Although the invention has been described with reference to small dial indicators arranged within a double push button fixture, it is to be understood that it is equally applicable to arrangements in which the indicator is arranged in a single button fixture, as in the push button fixtures for the terminal floors in Figures 1 and 2, and arrangements in which the indicator is arranged within a special fixture without any push button. Also, the invention is applicable to other types of mechanically rotated position indicators, although especially applicable to the small dial type, inasmuch as the construction of such indicator facilitates the employment of a reset device on the indicator itself.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In an elevator system in which at each of a plurality of floors served by the elevator car there is a rotatable car position indicator, said indicator being limited to a certain amount of rotative movement and having an actuating sheave, said indicators being actuated by flexible means which is wrapped around said indicator actuating sheaves one after the other from top to bottom, and in which mechanism is provided having a travelling member which is actuated in accordance with car movement and at a reduced ratio with respect thereto, an upwardly extending lever, the lower end of which is mounted on a stationary pivot, flexible means connecting the upper end of said lever to said travelling member to swing said lever in accordance with car movement, and means for adjustably connecting the upper end of said first named flexible means to said lever at a point on said lever to cause an amount of movement of said first named flexible means to move each indicator from one limit to the other upon a terminal to terminal run of the car.

2. In an elevator system in which at each of a plurality of floors served by the elevator car there is a car position indicator having a rotatable indicating dial, said dial being limited to a certain amount of rotative movement and being provided with means for automatically resetting the dial at its limits of movement, each indicator having an actuating sheave, said indicators being actuated by flexible means which is wrapped around said indicator actuating sheaves one after the other from top to bottom, means being provided on the lower end of said flexible means for maintaining it taut, and in which mechanism is provided having a travelling member which is actuated in accordance with car movement and at a reduced ratio with respect thereto, an upwardly extending lever mounted at its lower end on a stationary pivot secured to said mechanism, flexible means connecting the upper end of said lever to said travelling member to swing said lever in accordance with car movement, and means for adjustably connecting the upper end of said first named flexible means to said lever at a point on said lever to cause an amount of movement of said first named flexible means to move each dial from one limit to the other upon a terminal to terminal run of the car, said last named means comprising adjustable means for causing the chord of the arc of movement of the point of connection of said first named flexible means to said lever on a terminal to terminal run substantially to equal said amount of movement of said first named flexible means.

3. In an elevator system in which at each of a plurality of floors served by the elevator car there is a position indicator having a rotatable dial with characters indicative of said floors thereon in spaced relationship and means for indicating said characters to indicate the position of the car in the hatchway, said indicator being provided with stopping means to limit the amount of rotative movement of said dial in each direction and said dial being actuated from a sheave through a clutch device to provide means in conjunction with said stopping means for automatically resetting the dial, said indicators being actuated by a wire which extends vertically down the hatchway and which is wrapped around said indicator actuating sheaves one after the other from top to bottom, the lower end of said wire being provided with a tensioning weight, and in which mechanism is provided having framework and a travelling crosshead which is actuated in accordance with car movement and at a reduced ratio with respect thereto, an upwardly extending lever, the lower end of which is pivotally

mounted on said framework, a wire connecting the upper end of said lever to said crosshead to swing said lever in accordance with car movement, and means for connecting the upper end of said first named wire to said lever at a point intermediate the ends of said lever to cause an amount of movement of said first named wire to move each dial from one limit to the other upon a terminal to terminal run of the car, regardless of the length of such run, said last named means including a clamp for adjustably connecting said upper end of said first named wire to said lever and a sheave adjustably mounted on said framework over which said first named wire extends in reaching said lever, said sheave being adjusted along with said clamp to cause the chord of the arc of movement of the point of connection of said first named wire to said lever on a terminal to terminal run substantially to equal said amount of movement of the wire.

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