Feb. 21, 1933. W. B. LUCAS 1,898,550

POSITION INDICATOR

Filed Dec. 31, 1928

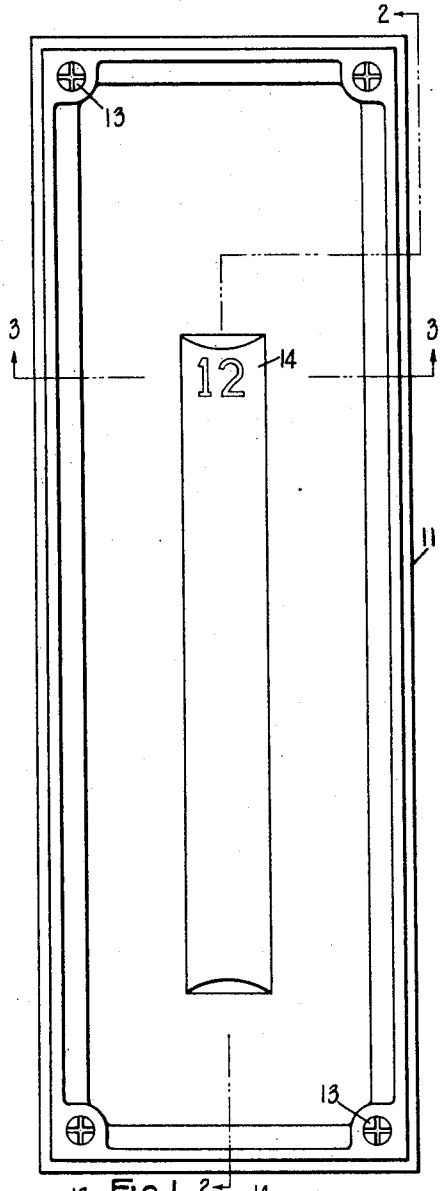


FIG. 1

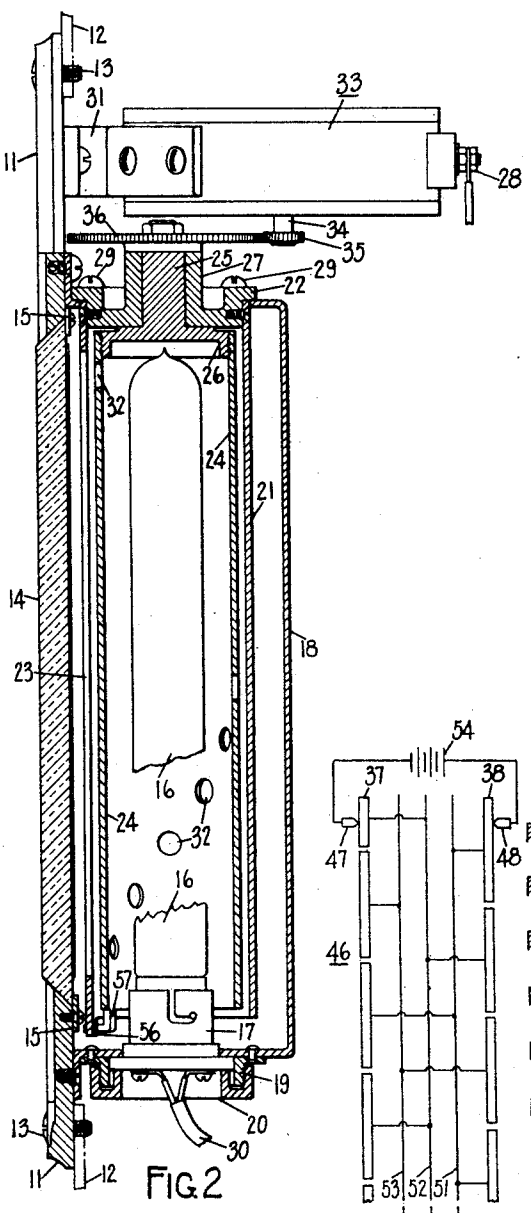


FIG. 2

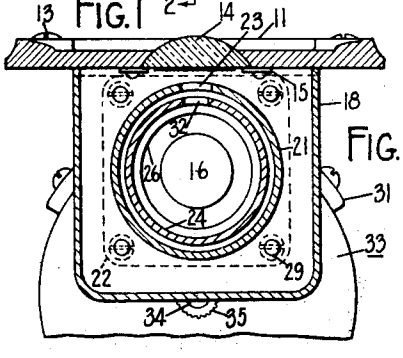


FIG. 3

FIG. 4

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UNITED STATES PATENT OFFICE

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POSITION INDICATOR

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The invention relates to indicators and particularly to position indicators for elevator cars.

The intense service demanded of some elevator installations has made it advisable in such cases to provide an indicator which is carried by the elevator car to indicate to the occupants thereof the position of the car. Such indicators are particularly useful in cars that operate at high speeds, for the landings are passed at such a rate that it is difficult, if not impossible, to read the floor numerals which are frequently positioned on the wall of the hatchway. In elevator installations using closed cabs, that is, cabs in which the car openings are closed by car doors of solid construction, it is impossible to see the hatchway wall or any numerals positioned thereon after the car doors are closed. In such an installation it is therefore apparent that position indicators carried by the cars are practically indispensable for the efficient handling of traffic.

One feature of the invention is the provision of a position indicator which is small and of compact construction, which is noiseless in operation and which may be operated for a long period of time without replacement.

Another feature of the invention lies in the provision of an elevator car position indicator which requires only a minimum of hatchway wiring.

Still another feature of the invention is to provide an elevator car position indicator of the illuminated symbol type in which only one bulb is utilized to illuminate all the symbols.

Other features and advantages will become apparent from the following description and appended claims.

Although the invention will be described, by way of illustration, as applied to an indicator carried by an elevator car, it is to be understood that the invention is applicable to an indicator which may be placed at any other point in the elevator system, as at a dispatcher's panel, or at one or more of the various landings. For convenience, the indicator of the invention is illustrated as mounted in a vertical position, but it is apparent that it may as readily be mounted in a horizontal position. This latter position may be used when the indicator is mounted on the car over the opening thereof.

In the drawing:—

Figure 1 is a front elevation of the elevator car position indicator;

Figure 2 is a vertical section thereof along the line 2—2 of Figure 1, also with parts broken away to show details thereof;

Figure 3 is a horizontal section thereof along the line 3—3 of Figure 1; and

Figure 4 is a diagrammatic illustration of a set of connections for a repeater motor to operate the elevator car position indicator.

According to the preferred arrangement shown in Figures 1 to 3 of the drawing, a front plate 11, adapted to be fastened to the interior of elevator car enclosure 12 by screws 13, is provided with an elongated slot in which is secured an elongated lens strip 14 by clips 15. Painted on or glued to or otherwise affixed adjacent the rear surface of the lens are the outlines of the floor symbols or indications which are to be successively displayed by the illumination of an elongated electric light bulb 16. This bulb is mounted in a socket 17 which is so positioned that the axis of the bulb is parallel to the elongated slot and elongated lens strip 14. The socket 17 extends through an aperture in the bottom of the casing 18, and is secured in such position by means of a cap 20, this cap being threaded to a sleeve 19 secured to the casing. With this construction, the socket and bulb may be withdrawn for inspection and replacement. The current for causing the illumination of the bulb is obtained through the cable 30 which is suitably connected to the socket 17.

Positioned about the bulb 16 there is an outer cylindrical tube 21 secured at one end to a plate 22 and provided with an elongated slot 23 opposite the lens strip 14. Within outer tube 21 there is an inner cylindrical tube 24 which is secured to a shaft 25 as by means of the threaded engagement of one end of tube 24 with an enlarged portion 26 of shaft 25. This shaft extends through a sleeve

27 formed in plate 22, and has secured to its outer end the large pinion 36. As suitable surfaces are provided on the enlarged shaft portion 26 and on the pinion 36 to engage the end surfaces of the sleeve 27, a satisfactory bearing is provided for the moving parts of the indicator while it is in either a vertical or a horizontal position. The plate 22 is suitably secured at its corners to the casing 18 by means of the screws 29.

The inner cylindrical tube 24 extends beyond the ends of the slot 23 so that normally it prevents light from the bulb 16 from reaching or passing through the slot 23 in the outer tube 21, and as a consequence, from reaching or passing through lens strip 14. The inner cylindrical tube 24 is provided with a series of holes 32, however, one for each floor, arranged helically about the tube, with the bottom hole substantially level with the first floor indication on the lens strip, with the top hole substantially level with the top floor indication on the lens strip, and with the intermediate holes substantially level with the corresponding intermediate floor indications on the lens strip. The holes, from the bottom hole to the top hole, are thus arranged progressively around the tube with equal angular spacing between the radii of the tube which pass through the centers of the various holes. This angular spacing is such that the entire series of holes does not completely encircle the tube. In this manner, when tube 24 is rotated within the outer tube 21, the holes 32 appear opposite the slot 23 individually, and progressively upward or downward, dependent upon the direction in which the tube is rotated. Thus light from bulb 16 is permitted, by the shutter-like inner cylindrical tube 24, to pass through slot 23 and through lens strip 14 to illuminate the floor indication for one floor at a time, and to consecutively illuminate all the floor indications as the inner tube is rotated.

Any suitable mechanical or electrical mechanism may be employed to rotate the inner tube 24 and shaft 25 in accordance with the movement of the elevator car in the hatchway so that as the car comes opposite the various floors the corresponding floor indications are illuminated. It is to be noted that if a mechanical mechanism is employed which operates the indicator continuously in accordance with the car movement, the holes 32 may be spaced at unequal angles about inner tube 24 in order to compensate for varying floor heights in the building.

In the embodiment illustrated, the inner tube 24 and the shaft 25 are rotated by an electrical repeater motor denoted generally by the numeral 33. This motor comprises a plurality of separate field coils distributed around a circular frame in which is positioned a soft iron armature. The energization of the field coils successively about the frame, either individually or in certain combinations of field coils, attracts and thereby rotates the armature. The motor is for simplicity illustrated in Figures 2 and 3 only generally and as enclosed within a casing which is secured to the front plate 11 by means of the bracket 31 and as provided with terminals 28. In Figure 4, the motor is diagrammatically illustrated as having three field coils, 41, 42 and 43 arranged to magnetically energize their respective arcuate pole faces. The motor armature, represented by the arrow 44, mounted upon a shaft 34, rotates within the circle outlined by the pole faces. As may be seen from the figure, there is a common connection between a terminal of each field coil, and there are separate leads 51, 52 and 53 from the other terminals of the respective field coils to a commutating device 46 which is described in more detail later.

The shaft for the rotatable armature of the repeater motor has extension 34 to which is fastened the small pinion 35. This pinion meshes with the pinion 36 fastened to shaft 25 so that there is provided a reduction of motion from the motor armature to the inner tube 24. The sequence of energization of the field coils is controlled by the commutating device 46 operating synchronously with the movements of the elevator car so that as the car moves, the fields, or combinations of fields, are successively energized in such manner to cause the armature 44 to be rotated in steps, one step for each floor. The amount of rotation of the repeater motor armature for each step, the ratio of the reduction gearing between the armature and the inner tube 24, and the angular spacing between the radii of the inner tube which pass through the center of the holes are so inter-related that each successive rotary step of the armature removes one hole 32 from opposite slot 23 and brings the next succeeding hole 32 opposite the slot. Assuming that the armature is made to rotate one step for each floor traversed by the car, as is explained later, the shutter-like tube 24 is rotated synchronously therewith and thereby permits illumination of the floor indications corresponding to the position of the car as it moves up and down the elevator hatchway.

Any suitable commutator mechanism operating synchronously with the elevator car may be used to control the sequence of energization of the field coils. In the diagram of connections illustrated in Figure 4, this mechanism, generally denoted by 46, includes two rows of stationary contacts 37 and 38 and two movable contacts 47 and 48 arranged to be moved synchronously with the elevator car. This mechanism may be arranged on a floor controller with contacts 47 and 48 positioned on the floor controller cross-head so as to successively engage the stationary contacts of rows 37 and 38 respectively. A source of

electrical energy 54 is connected across the terminals of the movable contacts. The stationary contacts are elongated, as shown, and corresponding contacts in the two rows are arranged in staggered relation. The top contact in row 37 is therefore smaller in size than the other contacts shown. The stationary contacts are connected to the leads 51, 52 and 53 in the manner illustrated in Figure 4 so that, as the movable contacts are jointly lowered over the stationary contacts from the position of the movable contacts at the top, as shown, the sequence of energization of the field coils, in combination of twos, is 41—42; 41—43; 42—43; 42—41; 43—41; 43—42; and 41—42. For simplicity, only contacts and connections thereto for seven floors have been shown, as after the sixth change the sequence repeats itself, as may be seen above.

Since the movable contacts are moved at a reduced rate but in direct proportion with the movements of the elevator car, floor numerals are placed beside the stationary contacts to indicate the positions of the movable contacts corresponding to the positions of the car when approximately level with the various floors. It is, therefore, apparent that as the car travels past the floors, the motor is rotated in successive steps, and accordingly the indications for the various floors opposite which the car travels are successively illuminated through lens strip 14 and in accordance with the actual position of the car. In the position of the parts as shown in all the figures, the car is positioned at the twelfth floor, the movable contacts are at the position corresponding thereto, and the shutter-like tube 24 is permitting, by means of the top hole 32, light from bulb 16 to pass through slot 23 and through lens strip 14 to illuminate the twelfth floor indication.

Attention is directed to the fact that bulb 14 may be a standard-rating bulb and operated directly in parallel with the cab-illuminating lights. The only separate position indicator leads from the elevator car, therefore, are the three leads 51, 52 and 53, irrespective of the number of floors for which the indicator may be operating. It is not necessary, however, that only one bulb be used as the source of illumination for the indicator. Any convenient number of suitably arranged smaller bulbs, or, if desired, a gaseous discharge tube, may be used.

It is to be noted that an indicator of the above construction is silent in operation inasmuch as there are a minimum number of moving parts and as a repeater motor, which in itself is noiseless, is employed as the motive element.

If desired, the position indicator may be given any appropriate advance, depending on the direction of motion of the car, as by actually advancing the movable contacts in the desired directions.

In order to provide an automatic reset for the indicator mechanism, if for any reason the repeater motor should get out of step with the movement of the car, mechanical stops for the inner tube 24 or the shaft 25 may be provided at the upper and lower terminal-floor indicating positions. This is illustrated in Figure 2 in which outer tube 21 has a shoulder 56 projecting downward from its lower edge and in which inner tube 24 has a lip 57 projecting downward and outward from its lower edge. The shoulder 54 and lip 57 are positioned so that the lip abuts one side of the shoulder when in one terminal-floor indicating position, as shown, and abuts the other side of the shoulder when in the other terminal-floor indicating position. To illustrate the operation of this automatic reset, assume that the car is descending and for some reason the indicator falls out of step with the car and indicates a floor or two in advance of the true car position. In such case, the indicator runs against the mechanical stop for the lower terminal floor when the car is still a floor or two above this lower terminal floor. As the indicator is unable to continue rotating in the direction corresponding to down, the car "catches up" with the indicator so that when the car is at the lower terminal floor, the position indicator indicates the true position of the car. On the other hand, if the car is descending and for some reason the indicator falls out of step with the car and indicates a floor or two in rear of the true car position, the indicator and the car are brought into step by a similar cooperation of the shoulder 56 and lip 57 at the next approach of the car to the upper terminal floor.

Attention is directed to the fact that although the source of electrical energy 54 is illustrated in Figure 4 as direct current, alternating current may be just as well used if desirable, as the armature, being made of soft iron, tends to align itself parallel to the lines of magnetic flux between two energized coils irrespective of the magnetic polarity of the field pole faces.

It is to be noted that the commutating device 46 illustrated is adapted to properly energize the repeater motor fields for each successive floor, irrespective of variations in the floor heights. This may be accomplished by extending the stationary contacts 37 and 38 for a floor with an oversize floor height and by shortening-up the stationary contacts 37 and 38 for a floor with an undersize floor height. The same result may also be attained by utilizing a standard size for stationary contacts 37 and 38 which is satisfactory for the minimum floor heights, and by increasing the spacing between adjacent sta-

tionary contacts for floors with floor heights larger than the minimum.

It is to be further noted that, if desired, the indicator and the associated mechanisms may be arranged to operate with two or more rotative steps of the repeater motor armature between each floor, instead of one as described above.

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 drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:—

1. A car position indicator for an elevator car comprising, a movable member having a plurality of indicating means corresponding to the various floors positioned thereon, means having a slot for displaying said indicating means, said indicating means being positioned on said member along a line at an angle oblique to said slot so as to be displayed individually and successively through said slot upon movement of said member, and means for causing movement of said member.

2. Position indicator mechanism for an elevator car comprising, a rotatable member with a plurality of indicating means corresponding to the various car positions to be indicated positioned helically thereon, display means having a slot cooperating with said rotatable member to display said indicating means individually and successively at different points in said slot upon rotative movement of said rotatable member, and means for causing rotative movement of said rotatable member in accordance with movement of said car to cause said display of said indicating means to correspond with the various car positions.

3. A position indicator for an elevator car comprising; a source of illumination; an opaque plate; a plurality of floor symbols, displayable by the passage of light therethrough from said source arranged in a line upon said opaque plate, a member having a plurality of apertures, corresponding respectively to said floor symbols, arranged in a line oblique to the line of said floor symbols so that each aperture controls the passage of light from said source through its corresponding floor symbol, and means actuated in accordance with movement of said car for causing relative movement between said member and the plate upon which said symbols are mounted to effect the passage of light from said source through said symbols separately and consecutively during travel of the car in accordance with the position of the car in the hatchway.

4. A position indicator for an elevator car comprising, a plurality of position symbols arranged in a line, a source of illumination for illuminating said position symbols, a rotatable tubular shutter provided with helically-arranged openings therein positioned between said source of illumination and said position symbols, the axis of said rotatable tubular shutter being parallel to said line of position symbols, and mechanism for rotating said shutter in accordance with the car movements to thereby illuminate the position symbols in accordance with the car positions.

5. In an elevator system; an elevator car; a position indicator for said car, said indicator comprising, a plurality of position symbols arranged in a line, a source of illumination adapted to illuminate said position symbols, a rotatable shutter provided with helically-arranged openings therein corresponding to said position symbols, said rotatable shutter being positioned between said source of illumination and said position symbols with the axis of said shutter parallel to said line of position symbols; and means operable in accordance with the position of the elevator car with respect to the floors served thereby for rotating said shutter to positions in accordance with the positions of the elevator car with respect to said floors to cause the illumination of said position symbols in accordance with the car positions.

6. In an elevator system; an elevator car; a source of current leading to the car; a position indicator for said car, said indicator comprising, a strip having a plurality of position symbols thereon, an electric lamp connected to said source for illuminating said position symbols, a tube surrounding said lamp and provided with helically-arranged openings to individually and progressively illuminate said position symbols as said tube is rotated, the axis of said tube being parallel to said strip having the position symbols thereon; and means operable in accordance with the position of the elevator car with respect to the floors served thereby to rotate said tube to positions in accordance with the positions of the elevator car with respect to said floors to cause the illumination of said position symbols in accordance with the car positions.

7. In an elevator system; an elevator car serving a plurality of floors with variable distances therebetween; a car position indicator, said indicator comprising a rotatable member with a plurality of equally-spaced indicating means thereon, one indicating means for each of said floors, display means cooperating with said rotatable member for displaying said indicating means individually and successively upon rotation of said member in equal amounts between the display of successive indicating means, and

means for limiting the total rotation of said rotatable member to less than one complete revolution; a repeater motor; switching mechanism for energizing the field coils of said repeater motor in a predetermined cycle, successively, to cause unlimited rotation of the armature of said repeater motor in steps each of the same fractional portion of a revolution; reduction gearing connecting said armature of said repeater motor with said rotatable member so that a given integral number of steps of rotation of said armature causes the rotation of said rotatable member one of said equal amounts thereof between the display of successive indicating means; and means responsive to the movement of said elevator car with respect to the floors for actuating said switching mechanism to effect the rotation of said repeater motor armature said given integral number of steps for each floor traversed by said car, regardless of the variations in distances between floors, so that said indicating means are displayed in accordance with the position of said car with respect to said floors.

8. A position indicating mechanism for an elevator car serving a plurality of floors with variable distances therebetween, said indicating mechanism comprising; a source of illumination; a plurality of floor symbols, one for each of said floors, displayable by the passage of light therethrough from said source, said floor symbols being arranged in a line; a rotatable member mounted with its axis of rotation parallel with said line of floor symbols, said rotatable member having a plurality of equally-spaced helically-positioned apertures therein corresponding respectively to said floor symbols for controlling the passage of light to said symbols from said source; means positioned between said member and said floor symbols having a slot parallel to said line of floor symbols for confining the passage of light from said source through said apertures to the line of floor symbols; means for limiting the total rotation of said rotatable member to less than one complete revolution; a repeater motor; switching mechanism for energizing the field coils of said repeater motor in a predetermined cycle, successively, to cause unlimited rotation of the armature of said repeater motor in steps each of the same fractional portion of a revolution; reduction gearing connecting said armature of said repeater motor with said rotatable member so that a given integral number of steps of rotation of said armature causes the rotation of said rotatable member the angular distance between adjacent apertures upon said rotatable member; and means responsive to the movement of said elevator car with respect to the floors for actuating said switching mechanism to effect the rotation of said repeater motor armature said given integral number of steps for each floor traversed by said car, regardless of the variations in distances between floors, so that said floor symbols are displayed in accordance with the position of said car with respect to said floors.

9. A position indicator for an elevator car comprising; a source of illumination; a plurality of floor symbols arranged in a line and displayable by the passage of light therethrough from said source; a member having a plurality of apertures corresponding respectively to said floor symbols and movable with respect thereto to control the passage of light to said symbols from said source, said apertures being arranged in a line oblique to the line of said floor symbols so that each aperture controls the passage of light to its corresponding floor symbol; opaque means, positioned between said member and said floor symbols and having a slot therein parallel to the line of said floor symbols, for restricting the passage of light from said source through said apertures to said line of floor symbols; and means, actuated in accordance with the position of said car in the hatchway, for moving said member and causing the passage of light from said source through said symbols separately and consecutively in accordance with the position of the car in the hatchway, thereby effecting the display of each floor symbol when the car is opposite the floor it represents.

In testimony whereof, I have signed my name to this specification.

WILLIAM BATES LUCAS.