June 10, 1930. R. P. HIGBEE 1,763,151

SIGNALING SYSTEM

Filed June 24, 1927

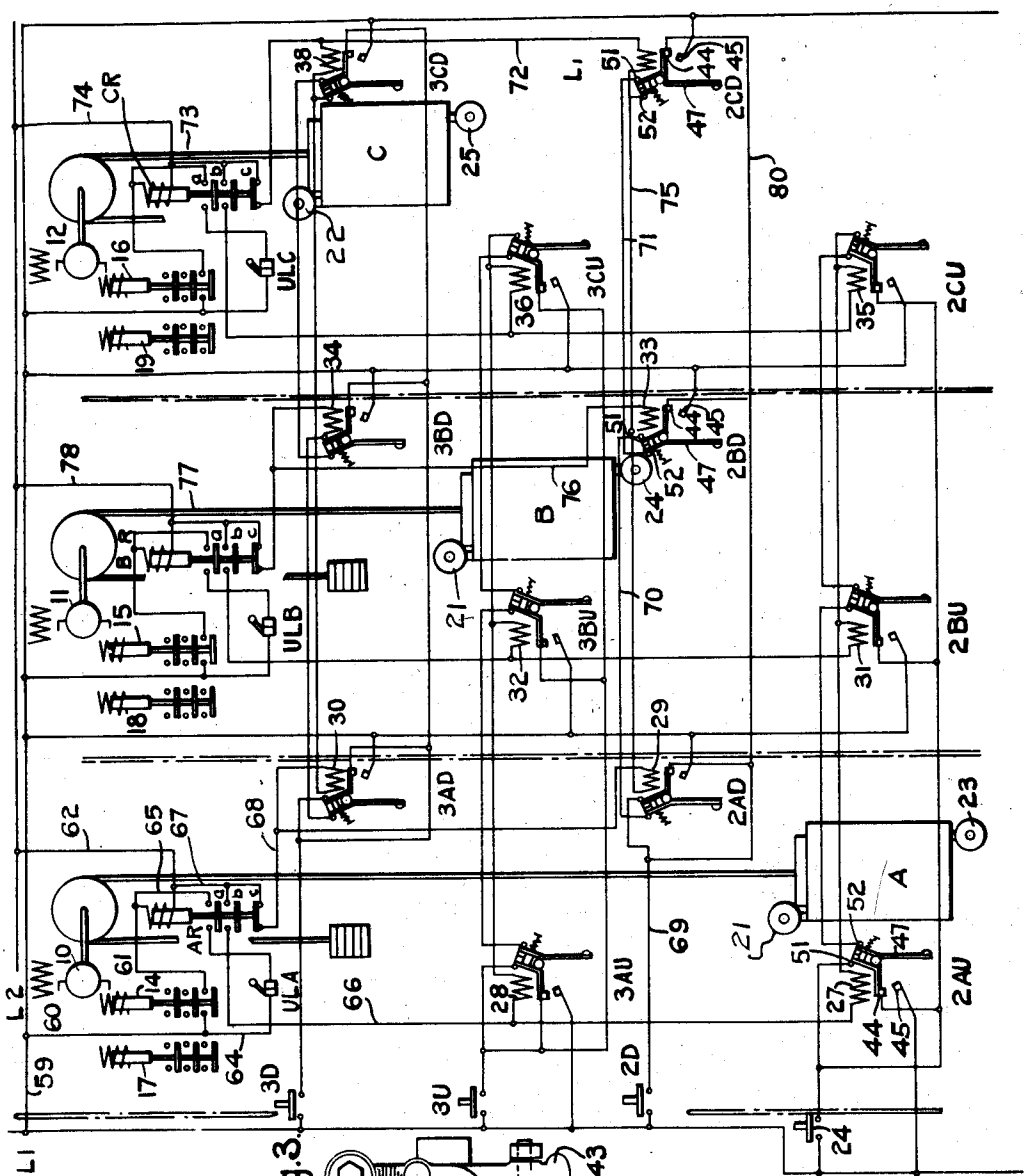

Fig. 1.

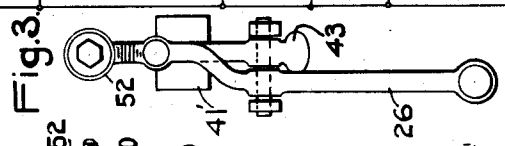

Fig. 3.

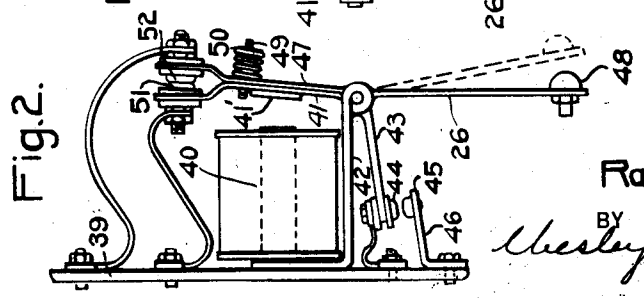

Fig. 2.

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UNITED STATES PATENT OFFICE

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SIGNALING SYSTEM

Application filed June 24, 1927. Serial No. 201,157.

This application is a continuation in part of my application Serial No. 657,675, filed December 23, 1924.

My invention relates to signaling systems and it has particular relation to systems employed in connection with the control of elevators.

One object of my invention is to provide a signal system for elevators employing an annunciator device of such character that the car operator is able to devote his entire attention to the control of the elevator and the manipulation of the doors.

Another object of my invention is to provide an electric signal system for elevators wherein all of the necessary wiring is located in the hatchway and the disadvantages of wiring on the elevator are avoided.

Another object of my invention is to provide an audible signal system for elevators wherein call signals for the several floors for either direction may be initiated for a plurality of elevators in a bank and wherein the first car to approach the corresponding floor in the corresponding direction will receive the signal and prevent any subsequently approaching car from receiving such signal.

Another object of my invention is to provide a signaling system for elevators of the so-called "automatic landing" type shown in the application of E. M. Bouton Serial No. 731,921, filed Aug. 14, 1924, and assigned to Westinghouse Electric & Manufacturing Company, wherein a signal will be given to the attendant on the car when the car is at a sufficient distance from a floor for the attendant to return the car-controlling switch to "off" position in time to permit the automatic landing devices to stop the car accurately level with the corresponding floor.

Other objects of the invention will, in part, be obvious, and will, in part, appear hereinafter.

Flash-light signaling systems commonly employ a lamp in the car that is illuminated, after the waiting passenger has operated a push-button switch, in such manner that the operator receives the flash-light signal when the car is a predetermined distance from a floor, sufficient to effect a proper landing. Such a system, however, requires attentiveness on the part of the operator and imposes a tax on his vision and attention which should be devoted entirely to the control of the car.

I propose to employ a system embodying an annunciator or bell on each car that is actuated by means of tripping devices or electromagnetic devices corresponding to the landings. The system is arranged to transmit signals to any car, in a bank of elevator cars, but only the first car to approach the selected landing in the corresponding direction receives the signal, whereupon it restores or resets the signaling devices corresponding to that landing with respect to all other cars travelling in the same direction.

My invention will be best understood by reference to the accompanying drawing, in which Figure 1 is a diagrammatic view of main circuits and apparatus embodying my invention, as applied to a plurality of elevators;

Fig. 2 is a view, in side elevation, of the striker relay forming a part of the system illustrated in Fig. 1; and

Fig. 3 is a view, in front elevation, of the striker relay illustrated in Fig. 2.

Referring to Fig. 1, elevator cars A, B, and C are operated in a well-known manner by means of hoisting motors 10, 11 and 12, which are governed by means of suitable controllers comprising "up" direction switches 14, 15 and 16 and "down" direction switches 17, 18 and 19.

It is assumed that the elevators will always travel to the top and the bottom landings and that signals will not be needed for these terminal landings. I have, therefore, illustrated the invention as applied to a bank of

elevators operating between four floors, including a second floor landing and a third floor landing intermediate the terminal floors. While I have illustrated a system embodying three elevators, it is obvious that any number of elevators may be controlled in the manner to be described.

Bells or gongs 20, 21 and 22 for "up" signals and similar bells or gongs 23, 24 and 25 for "down" signals are illustrated as mounted on the cars. If desired, the apparatus may be so arranged that one bell on each car will serve both "up" and "down" signal devices. A plurality of "up" striker relays 2AU, 3AU, 2BU, 3BU, 2CU and 3CU and a plurality of "down" striker relays 2AD, 3AD, 2BD, 3BD, 2CD, and 3CD are disposed at suitable points in the hatchways to cooperate with the bells or gongs in giving signals, as will be more fully explained hereinafter.

The striker relays are respectively provided with strikers 47 which are counterweighted so that they will normally occupy a position out of line with the bells or gongs and, therefore, will not strike the bells when the cars pass them, unless they are set in a striking position.

It will be noted that the strikers are respectively operated by a plurality of coils 27 to 38, inclusive, on the striker relays. For example, the coils 28, 32 and 36, when energized, set the "up" strikers, and coils 30, 34 and 38, when energized, set the "down" strikers for signals for the third floor.

The construction of the striker relay forming a part of the elevator system illustrated in Fig. 1 is more clearly set forth in Figs. 2 and 3. As shown, the relay comprises a base 39 of insulating material, a stationary magnetizable core member 40 secured thereto, a coil 40′ mounted on the core member, and a movable armature 41 that is pivotally mounted upon the outer end of a support 42, which is secured to the base 39. The armature 41 is provided with a magnetizable plate 41′ and has an extended portion 43 upon which a contact member 44 is disposed to cooperate with a contact member 45 when the coil 40′ is energized. The contact member 45 is attached to a support 46, which is secured to the base 39.

The striker embodied in the relay comprises a lever 47 and a hammer 48 mounted on one end thereof. The lever 47 is pivotally mounted upon the support 42 in hinged relation to the armature 41 and in such position that its hammer end hangs downwardly, while its upper end, or body portion, is in contact with, or is close to, the armature 41. A bolt 49, that extends through the lever 47, is secured to the armature 41 and is employed to provide a lost-motion connection between the free ends of the armature and the lever. In order to keep the upper body of the lever biased toward the armature, a spring 50 is so mounted upon the bolt 49 as to normally press against the lever 47 and yieldingly hold it in contact with the armature 41.

A pair of cooperating normally-closed contact members 51 and 52 are mounted on the upper ends of the armature 41 and the striker lever 47, respectively. These contact members and the contact members 44 and 45 are connected in circuit with the coil of the striker relay, in a manner to be more fully described hereinafter.

In the operation of high-speed elevators, it is essential that the operator receive a signal for any landing in sufficient time to permit the stopping of the car at that landing without overtravelling. Therefore, the striker relays are suitably located in the hatchways at the proper distances above and below the corresponding landings. Such distances will, of course, vary in accordance with the speed of the elevators and the time required for decelerating the elevators to make accurate landings.

It will be observed that each floor landing is provided with a passenger-operated "up" push-button and a similar "down" push-button. All of the "up" striker relays for all of the cars for each landing are connected in circuit with the "up" push-button located at that landing. Similarly, all of the "down" striker relays for each landing are connected in circuit with the "down" push-button located at such landing. For example, the "up" push-button 2U at the second floor landing controls a circuit that extends from supply conductor L1 through the normally closed actuating-circuit contact members on each of the "up" striker relays 2AU, 2BU and 2CU for the second floor landing, and thence, in parallel paths, through the coils 27, 31 and 35 of the striker relays 2AU, 2BU and 2CU to the contact members *b* on signal relays AR, BR and CR, respectively, whence circuits are extended to supply conductor L2.

In order that all of the "up" striker relays or all of the "down" striker relays for any one landing may be held in operative condition after a corresponding push-button has been operated, each set of relays is provided with a holding circuit. For instance, all of the "up" striker relays 2AU, 2BU and 2CU for the second floor landing are connected in a holding circuit that extends in parallel paths from supply conductor L1 to the normally-open holding contact members 44 and 45 on the striker relays, thence, in series, through the normally closed actuating-circuit contact members 51 and 52 on each of the striker relays, and thence, in parallel paths, through the coils 27, 31 and 35 of the striker relays 2AU, 2BU and 2CU to the contact members *b* on each of the signal relays AR, BR and CR, and thence to supply conductor L2.

If the motor of one of the cars A, B and C

is energized to drive the car upwardly, the corresponding "up" direction switch 14, 15 or 16 closes its associated signal relay AR, BR or CR. Each of the signal relays AR, BR and CR is provided with a holding circuit that is completed when the relay is closed.

For example, if the motor for car A is energized to drive it upwardly, the "up" direction switch 14 closes and completes a circuit from supply conductor L1, through conductors 60 and 61, the coil of relay AR and conductor 65, to supply conductor L2. The energizing of signal relay AR closes its contact members AR*a*, which completes a holding circuit extending from supply conductor L1, through conductors 60 and 64, a switch ULA of the limit switch type, conductor 65, the coil of relay AR and conductor 62, to supply conductor L2. The "up" limit switch ULA will remain in circuit until it is actuated by the approach of the car A to its upper limit of travel to break the holding circuit through the signal relay AR.

The energizing of the signal relay AR also closes contact members AR*b* and thus completes a circuit from the "up" striker relays 3AU and 2AU, through conductors 66, 67 and 62 to the supply conductor L2, thus permitting the energization of "up" striker relays 3AU and 2AU.

The movement of the signal relay AR to close contact members AR*a* and AR*b* also opens its contact members AR*c* and opens the circuit through conductors 68, 67, 62 and L2, thus preventing the energization of the down striker relays 2AD and 3AD during the upward travel of the car A.

In considering the operation of the system illustrated in Fig. 1, assume that car A is going up and that cars B and C are going down. If a waiting passenger on the second floor presses the "down" push-button 2D, the striker relays 2CD and 2BD are energized to throw their strikers 47 in the paths of the bells 24 and 25 on the descending cars B and C, by the completion of a circuit from supply conductor L1, through conductor 69, the actuating-circuit contact members 44 and 45 on the striker relay 2AD, and conductor 70, to a junction-point at the actuating-circuit contact members of striker relay 2BD. One branch of the circuit will continue through conductor 71, actuating-circuit contact members of striker relay 2CD, the coil of relay 2CD, conductor 72, contact members CR*c*, conductor 73, and conductor 74 to supply conductor L2. The other branch of the circuit will be completed from the actuating-circuit contact members on the striker relay 2CD through conductor 75, coil 33 of the striker relay 2BD, conductor 76, contact members BR*c*, conductor 77, and conductor 78 to supply conductor L2.

The energizing of the striker relays 2CD and 2BD will close their holding-circuit contact members 44 and 45 and complete a holding circuit from supply conductor L1, through conductors 79, 80 and 69, actuating-circuit contact members 51 and 52 on striker relay 2AD, conductor 70, actuating-circuit contact members 51 and 52 on striker relay 2BD, conductor 71, actuating-circuit contact members 51 and 52 and coil 37 on striker relay 2CD, conductor 72, contact members *c* on signal relay CR and conductors 73 and 74 to the other supply conductor L2. At the same time, another part of the circuit will be completed from the actuating-circuit contact members 51 and 52 on the striker relay 2CD, through conductor 75, coil 33 of striker relay 2BD, conductor 76, contact members *c* on signal relay BR and conductors 77 and 78, to the supply conductor L2.

The holding circuit, thus established, will keep the coils of the striker relays 2CD and 2BD energized and the strikers in operative position until the circuit is broken by the first descending car to approach the landing.

For example, assume that car B is the first descending car to approach the landing. Its "down" bell will engage and be sounded by the striker on the striker relay 2BD and will move the striker to the left. The movement of the striker in sounding the bell causes the lever 47 to be moved away from the armature 41 by reason of the fact that the armature is held against the core member 40 by the energized coil. The separation of the lever 47 and the armature 41 will separate the contact members 51 and 52 and thus release the striker relays 2CD and 2BD. In view of this operation, it will be seen that the first car to approach the selected landing receives the given signal and, at the same time, restores or resets the signaling devices for the same landing with respect to all other cars travelling in the same direction.

It will also be noted that, inasmuch as car A is going up, it does not receive the "down" signal, because the "down" signal circuit cannot be completed through the coil of striker relay 2AD, by reason of the fact that the "up" direction switch 14 has operated to complete a circuit through the coil of signal relay AR and has opened contact members AR*c*.

In a manner similar to that described, all the intermediate floors between the top and the bottom floors may be provided with push-button switches for effecting proper signaling, in accordance with the direction of travel of the several elevators, and the first car to arrive at any landing in answer to a call restores the other striker relays and cancels the concurrent calls for a stop at that landing with respect to the other elevators travelling in the same direction. In the system described there can be no interference between calls for "up" and "down" directions of travel, and only one "up" and one "down"

push-button switch is required for each landing.

I have described and illustrated my invention in preferred form; however, modifications thereof may occur to those skilled in the art, and I desire, therefore, that my invention shall be limited only in accordance with the scope of the appended claims.

I claim as my invention:

1. In a signaling system for an elevator, the combination with an elevator car operable in a hatchway past a floor landing, of a bell on the car, a striker mounted in the hatchway for actuating said bell, passenger-operated means located at the landing for moving said striker from a non-operative position to an operative position to actuate the bell, means to maintain said striker in said operative position, and means for restoring the striker to its non-operative position upon the striking of said bell.

2. In a signaling system for an elevator, the combination with an elevator car operable past a floor, of a bell mounted on the car, a striker adjacent the floor for operating the bell to produce a signal, and a passenger-operated means located at the floor for moving the striker from a non-operative position to an operative position to operate the bell when the car approaches the floor, said means to maintain said striker in said operative position, bell and striker constituting a tripping mechanism for restoring the striker to its non-operative position upon operation of the bell.

3. In a signaling system for elevators, the combination with a plurality of elevator cars operable past a floor, of a bell mounted on each car, a striker adjacent to the floor for each car for actuating said bells to produce a signal, a passenger-operated means located at the floor for moving the strikers from non-operative positions to operative positions to actuate the bell, means to maintain said strikers in said operative positions when moved thereto and means responsive to the actuation of the bell for any of said cars for restoring all of the moved strikers at the floor to their non-operative positions.

4. In a signal system for elevators, the combination with a plurality of elevator cars operable past a plurality of floors. of a bell mounted on each of said cars, an "up" striker and a "down" striker adjacent to each of the floors intermediate the terminal floors for each car for actuating the bells on the respective cars to produce a signal, a passenger-operated means at each of the floors intermediate the terminal floors for moving the "up" strikers adjacent that floor from non-operative positions to operative positions to actuate the signal-giving means on the cars, means to maintain said "up" strikers in said operative positions when moved thereto, a passenger-operated means at each intermediate floor for moving the "down" strikers adjacent that floor from non-operative positions to operative positions to actuate the bells on the cars, means to maintain said "down" strikers in said operative positions when moved thereto, means responsive to actuation of the bell on the first car to approach the corresponding floor in an "up" direction for restoring all of the "up" strikers for that floor to their non-operative positions, and means responsive to the actuation of the bell on the first car to approach the corresponding floor in a "down" direction for restoring all of the "down" strikers for that floor to their non-operative positions.

5. In a signal system for an elevator, a plurality of cars operable past a floor, a bell on each of said cars, an "up" striker and a "down" striker for each car adjacent to said floor, passenger-operated means for moving said strikers from a normal position out of possible engagement with said bells to an abnormal position of possible engagement with said bells and means responsive to the direction of travel of each of said cars for preventing movement of the striker associated with that car for the opposite direction.

6. In an electro-responsive device, in combination with a base and an electromagnet mounted thereon, of an armature having a main body portion for cooperating with said magnet and provided with a projecting portion, a lever, means for mounting said armature and said lever for pivotal movement relative to said magnet and to each other, means for biasing the armature and the lever toward each other for unitary movement relative to the magnet, a pair of cooperating contact members mounted on the armature and the lever, an energizing circuit for the magnet including the said pair of contact members, a second pair of cooperating contact members mounted respectively on the projecting portion of the armature and the base, and a holding circuit for the magnet including the first pair of contact members and the second pair of contact members.

7. In an electro-responsive device, the combination with a base and an electromagnet mounted thereon, of an armature, a lever, means for mounting said armature and said lever for pivotal movement relative to said magnet and to each other, means for biasing the armature and the lever toward each other for unitary movement relative to the magnet, and a pair of normally engaged cooperating contact members mounted, respectively, on the armature and the lever, whereby relative movement of said armature and said lever will cause disengagement of said contact members.

8. In an electro-responsive device, the combination with a base, and an electromagnet mounted thereon, of an armature, a lever, means for mounting said armature and said lever for pivotal movement relative to said

magnet and to each other, means for biasing the armature and the lever toward each other for unitary movement relative to the magnet, a pair of normally engaged cooperating contact members mounted respectively on the armature and the lever, and a circuit for said magnet including said contact members whereby relative movement of said armature and said lever will cause disengagement of said contact members to deenergize said magnet.

In testimony whereof, I have hereunto subscribed my name this 14th day of June, 1927.

RAY P. HIGBEE.