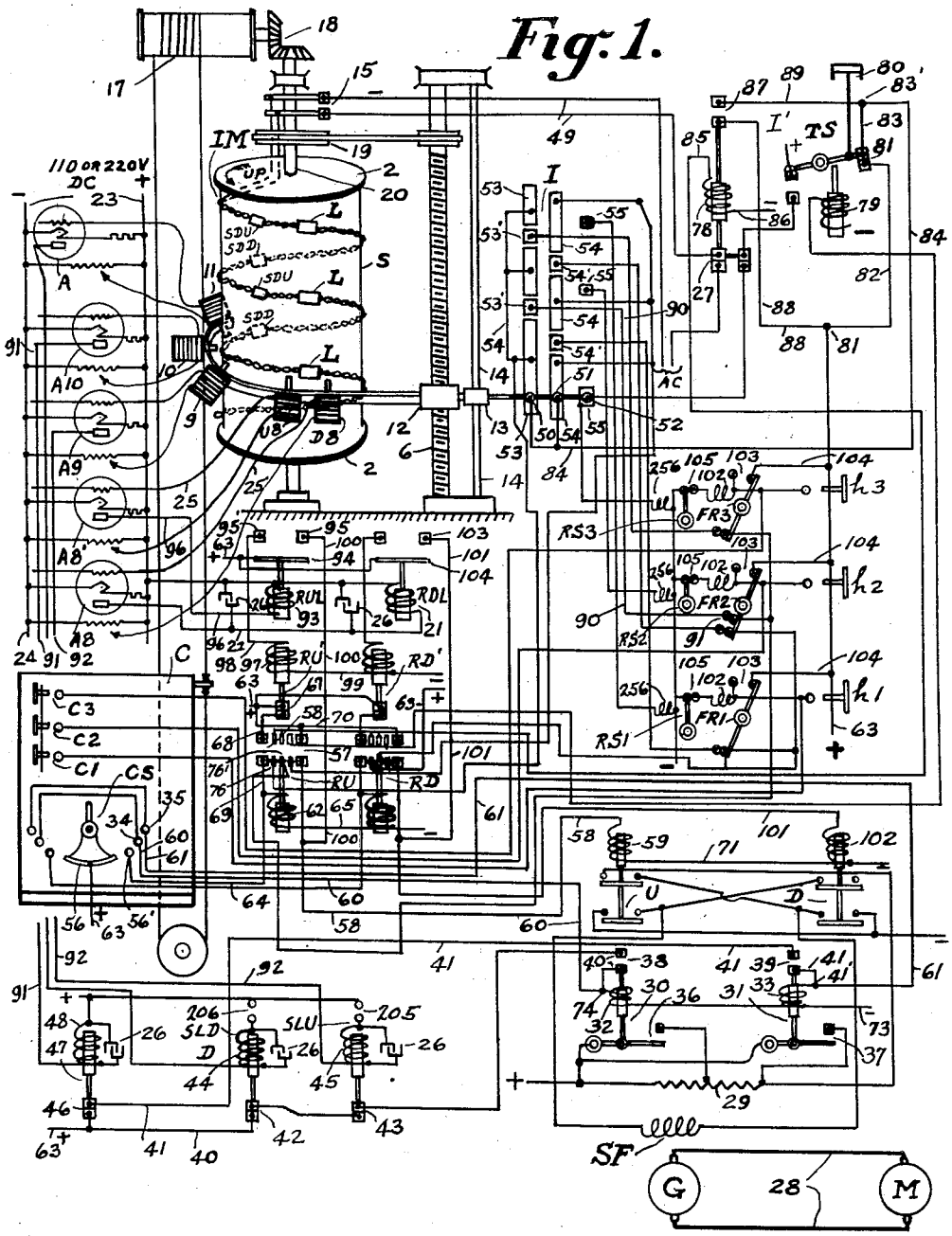
May 28, 1935. S. N. RUBIN 2,002,986

SYSTEM OF CONTROL FOR ELEVATORS

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Fig. 1.



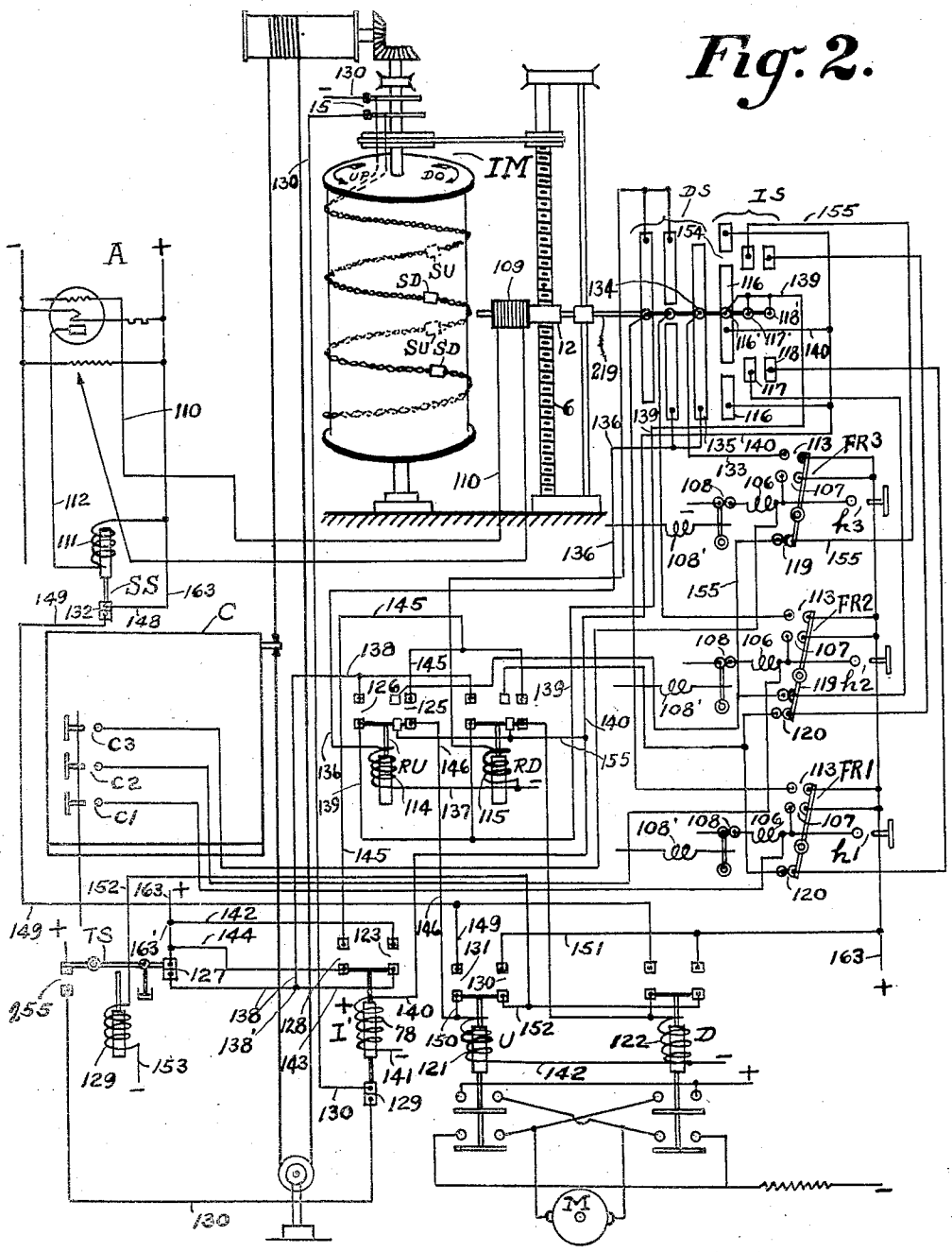
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SYSTEM OF CONTROL FOR ELEVATORS

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Fig. 2.



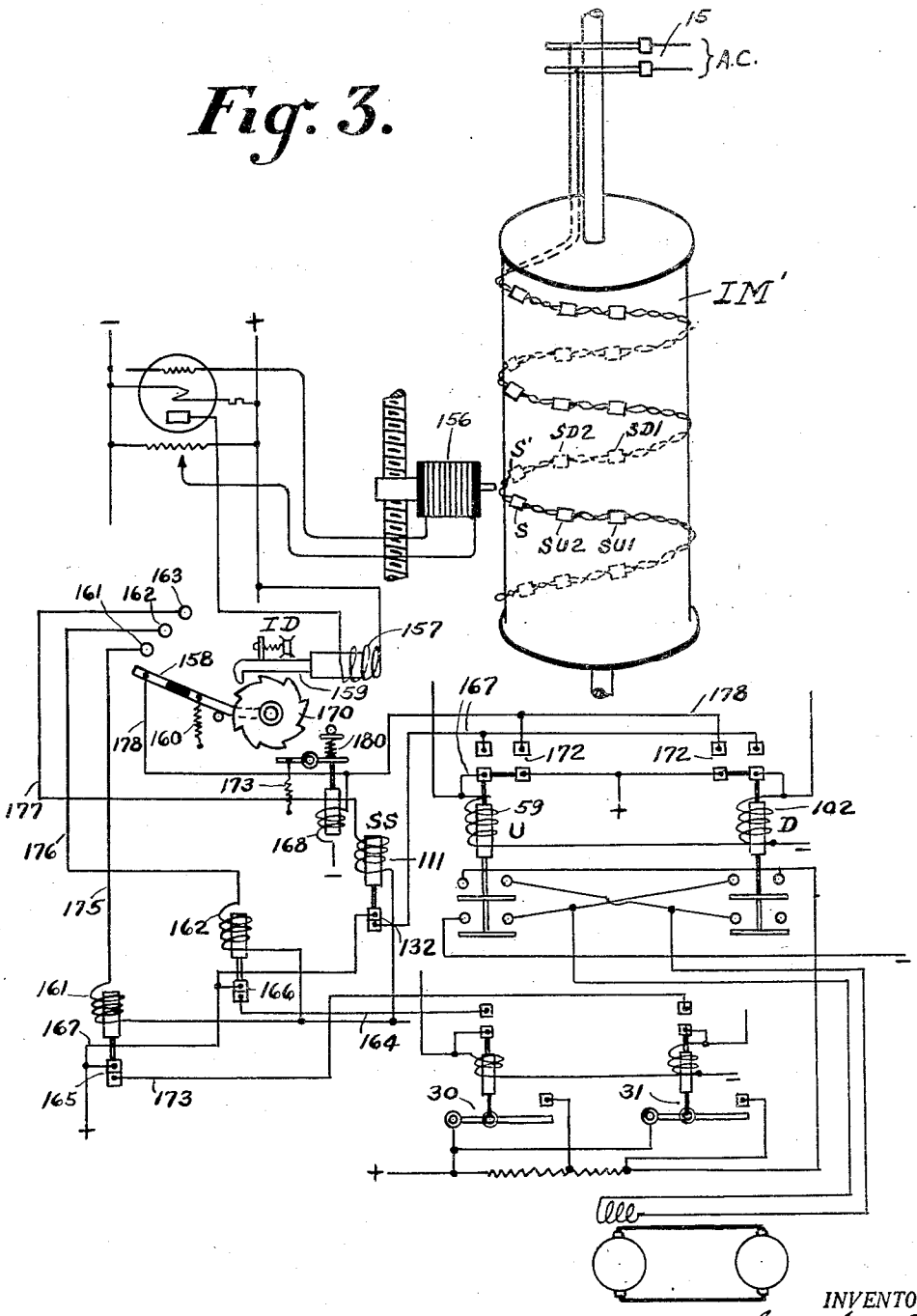
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SYSTEM OF CONTROL FOR ELEVATORS

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Fig. 3.



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SYSTEM OF CONTROL FOR ELEVATORS

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Fig. 5.

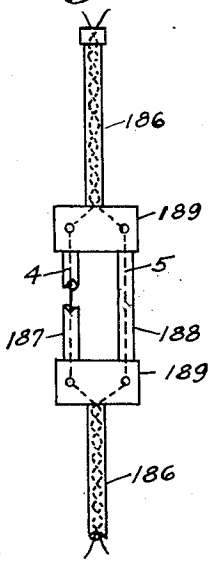
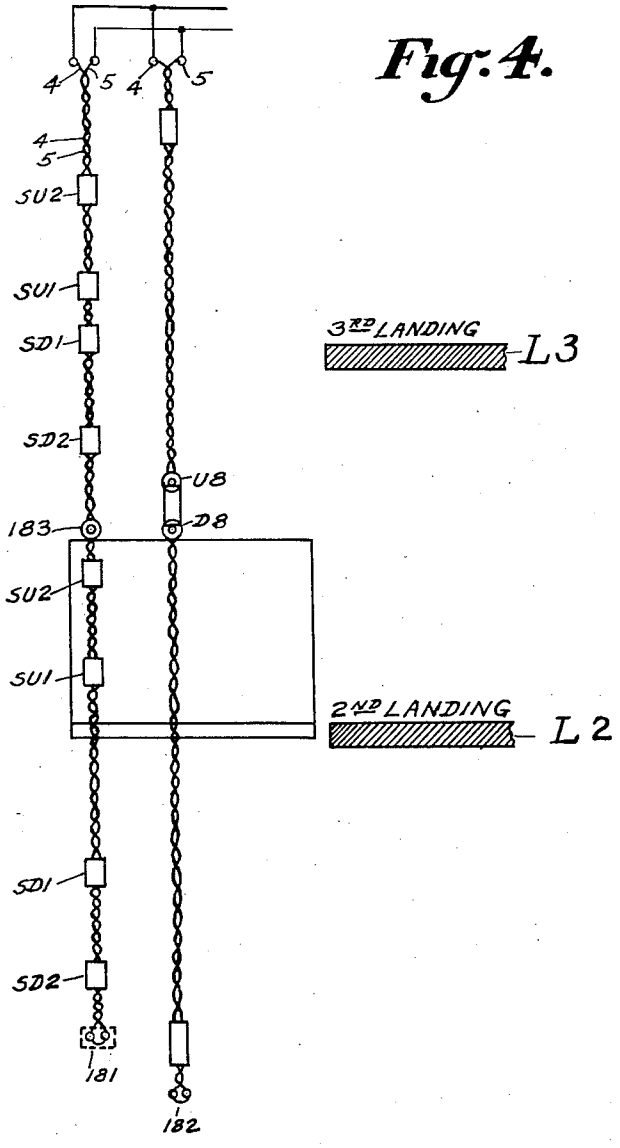


Fig. 4.



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Fig. 6.

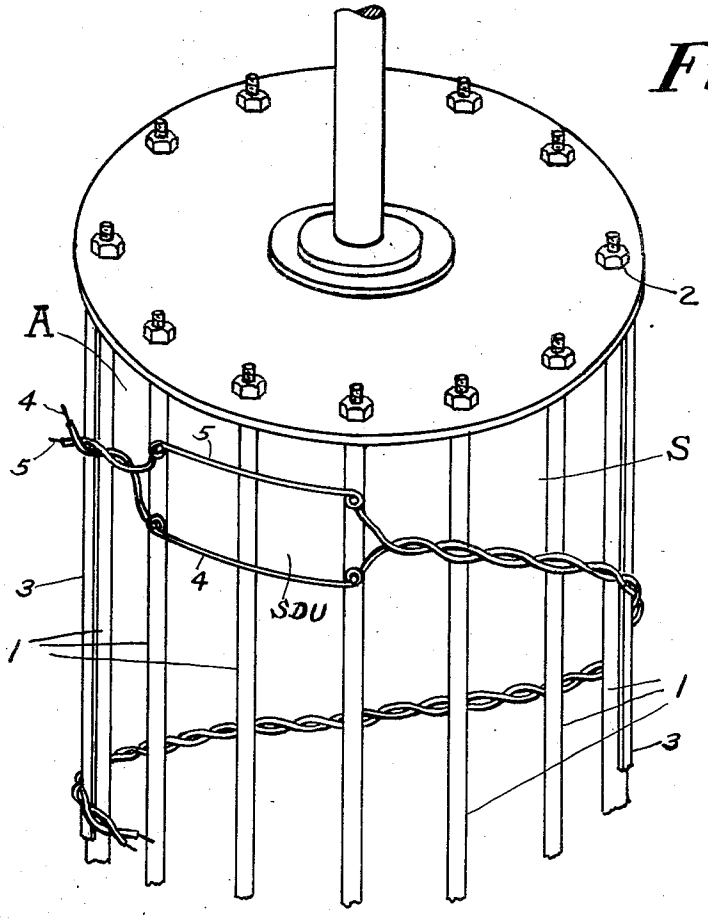
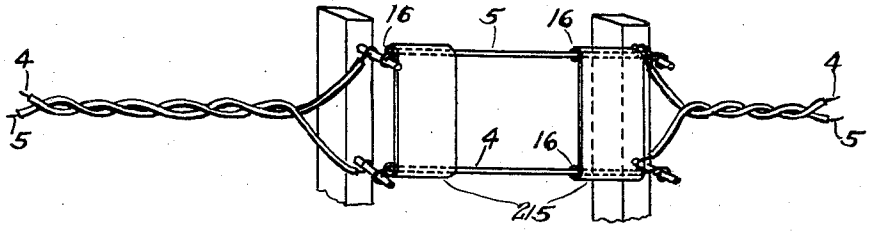


Fig. 7.



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Patented May 28, 1935

2,002,986

UNITED STATES PATENT OFFICE

2,002,986

SYSTEM OF CONTROL FOR ELEVATORS

Samuel N. Rubin, Astoria, N. Y., assignor, by mesne assignments, to The Gurney Elevator Co., Honesdale, Pa., a corporation of Pennsylvania

Application November 8, 1930, Serial No. 494,280

46 Claims. (Cl. 187—29)

My invention relates to electrical control mechanism and has particular application to electrical control systems for a body movable in a guided path such as, for example, an elevator car.

The invention resides in features summarized as follows:—

First:—Electro-magnetic induction mechanism comprising electrical conductor means constructed and arranged so that certain portions of its length are rendered non-inductive and certain other portions or zones thereof are rendered inductive and said electrical conductor, by co-operation with a pick-up or search coil, functions in a manner so that for pre-determined positions of the movable body the inductive zone and search coil are brought into co-operative magnetic relation which results in inducing, in said search coil, a very feeble current which, through amplification and rectification by a tube amplifier, results in energization of a control relay.

Second:—Electro-magnetic induction mechanism effective to cause slow-down of the car in successive steps in accordance with the position of the car.

Third:—Electro-magnetic induction mechanism effective to cause automatic leveling of the car platform with the landing.

Fourth:—Electro-magnetic induction mechanism effective to control a non-directional stop switch.

Fifth:—Electro-magnetic induction mechanism having functions as above set forth, and which for elevator use may be of a remote type, that is, located either overhead or in a basement and being driven preferably from the car itself, or it may be of a type in which certain of the elements are located on a guided movable body for co-operation inductively with elements fixed in the path of travel of the body as for example in an elevator hoistway.

Sixth:—The embodiment of said electro-magnetic induction mechanism with the functions set forth, into systems of car control circuits for different classes of elevator service one of which is identified as an operatorless intercepting type of elevator in which push-buttons located at the landings and within the car have a function both to dispatch and to intercept the car, and another class having an operator within the car who alone and only from within the car controls car starts, and push-buttons within the car and at the several landings have a function only to intercept the car at their respective landings.

Referring now to the accompanying drawings, Fig. 1 is a diagrammatic illustration of electro-magnetic induction mechanism of a remote type in accordance with the present invention, embodied in a system of car control circuits wherein start of the car is controllable by an operator only from within the car, and stops are controlled from within the car and from landings, and constructed and arranged to cause automatic slow-down in successive steps in accordance with the position of the car and to effect level stops at landings; Fig. 2 is a diagrammatic illustration of the electro-magnetic induction mechanism in accordance with the present invention, embodied in a system of car control circuits wherein passenger controlled buttons at the landings and within the car have functions both to dispatch and to intercept the car, constructed and arranged to control a non-directional stop switch; Fig. 3 is a diagrammatic illustration of the electro-magnetic induction mechanism of a modified form to cause automatic slow-down of the car in successive steps in accordance with the position of the car; Fig. 4 is a diagrammatic illustration of the electro-magnetic induction mechanism having the co-operating elements located on the car and in the hoistway; Fig. 5 is an enlarged view of a portion of Fig. 4 in modified form, and Figs. 6 and 7 are enlarged views somewhat in detail of certain parts of the induction mechanism.

The Fig. 1 arrangement will now be described and at this point reference will be made also to Figs. 6 and 7 for a more detailed description of the induction mechanism itself since in Fig. 1, such mechanism is illustrated in a more or less diagrammatic manner.

The induction mechanism designated as a whole, IM, consists of a rotatable spider S made up of spacing bars 1 which connect with a pair of end plates 2, the bars on their outer faces being lined with insulating members 3. A pair of insulated electrical conductor wires 4 and 5 are wrapped in the form of a helix around the periphery of the spider and may be secured thereto in any well known manner (not shown). The angular pitch line of the helical conductors co-incides with the angular pitch of the threads of a worm drive 6 for one or any desired number of search coils such, for example, as U8, D8, 10, 9 and 11 which are adapted to be attached to and movable with a nut 12 having axial movement on the worm 6 when the latter is rotated. A collar 13 slidably engages a guide post 14 to prevent rotation of the traveling nut 12.

The pair of conductor wires when assembled form a rotatable helix which throughout its en-

tire length forms a complete electrical circuit for carrying a very small or feeble current at a pressure of say for example 1 volt, from any suitable source of alternating current supply so designated, the current supply being transmitted to the helix by way of collector rings and brushes designated as a whole 15. Certain pre-determined portions of the helix are formed by twisting the two wires together and such portions of the helix when energized are non-inductive and at pre-determined points on the helix inductive or magnetic zones are formed by spacing the two wires in parallel lanes for a pre-determined distance. One of these inductive zones is designated SDU in Fig. 6.

In order to adjust or vary the effective area of an inductive zone, metallic plates or shields such as 215 of suitable dimensions (see Fig. 7) are provided, in which case the shielded area is non-inductive. Each shield is bent to embrace the parallel wires as at 16 and the face of the shield at the point where it embraces the wires may be provided with suitable insulation (not shown).

The spider with the helical winding assembled thereon is rotatable in accordance with the movement of the car by connecting it in any well known manner as for example to a moving part of hoistway apparatus (not shown); or it may be directly connected to the car through the intermediary of a tape and reel, chain and sprocket, or cable and drum connection such as 17 for example through suitable gearing 18. With this arrangement it will be noted that by suitable gearing or by suitable spider diameter, or by both methods, the speed of the spider at its periphery can be made to correspond to the linear speed of the car, or it can be made greater or less as may be desired. For example, if level stops are desired it is preferable that the peripheral speed of the spider be greater than the linear speed of the car. The worm 6 is rotatable in accordance with movement of the guided movable body or car C by connecting it by a sprocket and chain connection 19 with the spider shaft 20. The search coils such as U8, D8, 9, 10 and 11 of Fig. 1 for example are adapted to be supported by and movable with the traveling nut 12 so that as the latter advances axially on the worm 6 in accordance with movement of the car but at a much reduced rate, the search coils will, by linear movement, always be in step with or in other words move co-ordinately with the pitch line of the induction helix so that at pre-determined points of car position the search coils are traversed by pre-determined inductive zones and at other points of car position said coils are traversed by the non-inductive portions of the helix.

When by rotation of the induction helix, and linear movement of a search coil, say D8 for example, the search coil is brought into co-operative relation with a magnetic or inductive zone of the energized helix, a very small or feeble current is induced in said search coil and amplification of this current by the action of a tube amplifier A8 causes the actuating winding 21 of a relay RDL (Fig. 1) to become energized to actuate its associated contacts to control a car control circuit hereinafter described. In carrying out this arrangement, the actuating winding 21 is placed in the plate circuit 22 connecting with the positive wire of a 110 or 220 volt direct current supply line designated 23. The grid circuit 25 is biased to zero and the search coil is connected to the grid circuit and said coil may be tuned to be responsive within a range of from 40 to 500 cycles. The actuating winding 21 in the plate circuit is preferably shunted by a condenser 26 which smooths out the pulsations of the plate current. With this arrangement of the search coil and actuating winding or relay in association with the tube amplifier and in combination with the induction mechanism hereinbefore described, no current flows in the plate circuit and consequently the actuating winding 21 remains de-energized whenever the non-inductive or twisted wire portions or shielded portions of the induction helix when energized are traversing the search coil; however, when the search coil is transversed by or is in co-operative relation with the inductive zone of the helix when energized, a feeble or small current induced in the search coil energizes the grid thus bringing the plate circuit into action in a well known manner to cause energization of the actuating winding 21.

The linear movable search coils such as D8, U8, 9, 10 and 11 serve as a tell-tale for car position and they move upwardly when the car is ascending and downwardly when the car is descending. Looking down on the spider it rotates in a counter-clockwise direction when the car is ascending and in a clockwise direction when the car is descending.

The induction mechanism as arranged in Fig. 1, is for a three floor run of the car, and the induction helix is provided with up and down slow-down inductive zones designated SDU and SDD, and also a leveling inductive zone L for the second or intermediate landing, and for the top and bottom landings there is one slow-down inductive zone for each, designated respectively SDU and SDD, and also one leveling inductive zone for each, designated L.

The search coils D8 and U8 in effect control the automatic leveling of the car at landings in case of over-run and under-run and maintain the car level during loading and unloading in which case twist or untwist of the hoisting cables may result in movement of the car from a level with the landing. The search coils 10 and 9 control first and second steps of slow-down for the car when ascending and the search coils 10 and 11 control said first and second step of slow-down for the car when descending.

In the Fig. 1 embodiment of the induction control mechanism into an elevator control system, the induction mechanism is rendered effective to carry out its intended functions only for predetermined points or landings for which push-buttons both within the car and at the landings are actuated. The car push-buttons are designated C1, C2 and C3 there being one for each landing, and the hall push-buttons are designated *h*1, *h*2 and *h*3, there being one for each landing. Said push-buttons, in conjunction with any suitable type of intercepting selector such as I for example, render said induction mechanism effective to cause automatic slow-down of the car and to effect a level stop at any landing or landings for which push-buttons are actuated or in other words for which calls are registered, by their control of an intercepting contactor I' which by closing its back-contacts 27 completes an energizing circuit for the helical conductor wires 4 and 5 by way of the collector rings and brushes 15.

The particular type of intercepting selector as illustrated and described herein and associated intercepting circuits as controlled by said selector and the push-buttons is the invention of Ernest L. Gale, covered by patent application Serial Number 472,003, filed July 31st, 1930, entitled, "System of

control for elevators", and assigned to the Gurney Elevator Company. However, it will be understood that the induction mechanism is capable of general application in conjunction with both intercepting and non-intercepting types of selector of any desired and well known type.

Other elements which make up the system comprise an electrical hoisting motor M which may be of the type having multi-speed regulation through control by rheostat, multi-voltage, variable voltage otherwise known as the Ward-Leonard system or by any other suitable method, the Ward-Leonard system being illustrated herein simply for illustrative purposes in which case the armature of the hoisting motor and that of the motor generator G are electrically connected by a loop circuit designated 28. According to the method of the Ward-Leonard system, speed variation of the hoisting motor is obtained by variation of a resistor 29 in the circuit of a shunt field winding SF of the generator G, and this resistor may be in sections to be short-circuited in successive steps by fast and slow speed contactors 30 and 31 having operating windings 32 and 33 respectively controlled from contacts 34 and 35 respectively of the car switch CS, to operate in the order as named to close circuit their respective contacts 36 and 37. These fast and slow-speed contactors 30 and 31 are made self-holding by the provision of self-holding contacts 38 and 39 for holding circuits 40 and 41 respectively. The self-holding circuit 40 includes two sets of normally closed contacts 42 and 43 of slow-down contactors SLD' and SLU' respectively said slow-down contactors having operating windings 44 and 45. The self-holding circuit 41 includes the normally closed contacts 46 of a slow-down contactor 47 having an operating winding 48.

When the car is ascending and approaches within a pre-determined distance of a landing for which a button is actuated, the intercepting selector I functions in a manner to render the induction mechanism IM effective, by closing at contacts 27 of contactor I', an energizing circuit 49 for the helical winding so that as rotation of the latter causes an inductive zone SDU corresponding to said landing to traverse the search coils 10 and 9 in successive order, the induction action thus effected combined with the action of an amplifier tube such as A for example fully described hereinbefore, (one of which is provided for each of the search coils, D8, U8, 9, 10 and 11), causes energization successively of windings 48 and 45 of slow-down contactors 47 and SLU which open the self holding circuits 41 and 42 at contacts 46 and 43 respectively causing the slow-down contactors 31 and 30 to open-circuit their contacts 37 and 36 successively in the order named, thus to cause automatic slow-down of the car by reinserting in successive steps the resistor 29 in the field-circuit of the generator.

When the car is descending, inductive zones SDD corresponding to landings for which car or hall push-buttons are actuated function in conjunction with contactors 47 and SLD to control said slow-down contactors 31 and 30 to cause automatic slow-down of the car in the same manner as above described. Contacts 205 and 206 controllable by the contactors RU and RD respectively but shown disassociated therefrom for convenience, are included in the circuits of the operating windings 45 and 44 respectively so that said winding 45 becomes effective only when the car is ascending and said winding 44 becomes effective only when the car is descending.

Other elements of the control system comprise floor-relays FR1, FR2, FR3, having windings 102 each responsive to actuation of its associated car or hall push-button to register a call at any time regardless of direction of car movement or position of the car at the time the buttons are actuated and each relay winding 102 is made self-holding by the provision of self-holding contacts 103 and circuit 104, so that a call once registered is maintained until response of the car thereto at which time each floor-relay is automatically re-set by operation of associated re-set relays RS1, RS2, RS3 to open-circuit their contacts 105 in the holding circuit of said floor-relay windings; electro-responsive reversing switches U and D which reverse direction of current flow in the generator field winding thereby to reverse direction of current flow in the armature of the hoisting motor; up and down relays RU and RD responsive directly to operation of the car switch to control the reversing switches U and D; leveling relays, RUL and RDL controllable by the induction mechanism, etc. to control the automatic-leveling operation of the car directly through control of the reversing switches U and D; auxiliary relays RU' and RD', and a time switch TS.

The intercepting selector I in general consists of brushes 50, 51 and 52 adapted to move in accordance with the position of the car by connecting them for example with the traveling guide 13. The brushes 50 and 51 may be termed up and down and each co-operates with its associated row of fixed segments designated 53 and 54. Each row of segments comprises the two sets one set designated 53 and the other 53', and the other row comprises the two sets one set designated 54 and the other 54' the two sets of each row are arranged in alternate order for successive engagement by their associated brushes.

The brush 52 co-operates with a row of fixed segments 55 to control circuits for the windings 256 of the re-set relays RS1, RS2 and RS3.

Operation of the parts through a complete cycle of operation will now be described.

With the parts as illustrated, the car is at the first landing at rest. The car may be started upwardly by moving the car switch segment 56 to engage contact 56' to cause operation of relay RU which closes its contacts 57 and 58. The contacts 57 complete an energizing circuit for a winding 59 of the up reversing switch U which operates in a well known manner to cause start of the car by closing an energizing circuit for the generator shunt field winding SF and which circuit at this time includes the two sections of the resistor 29, which results in slow-speed movement of the car upwardly. Movement of the car switch segment 56 to engage contacts 34 and 35 results in successive energization of circuits 60 and 61 for windings 32 and 33 of the fast and slow speed contactors which results in operation of said switches to close-circuit their contacts 36 and 37 to short-circuit said resistor 29 in successive steps to cause the car to accelerate to full speed operation.

The relay RU is made self-holding by providing the self-holding contacts 58 for the winding 62, and the fast and slow speed contactors 30 and 31 are made self-holding by the provision of the self-holding contacts 38 and 39, so that in effect, when the car switch has functioned to start and cause acceleration of the car, it may be immediately returned to its normal position as shown, and the car will continue its travel at full

speed rate until intercepted in response to calls registered by the car or hall push-buttons.

A completed circuit for the winding 62 may be traced as follows;—from a plus wire 63 to wire 64 by way of segment 56 and contact 56', through winding 62 to wire 65 which connects with minus line.

A self-holding circuit for winding 62 may be traced as follows;—from a plus wire 63, through normally closed contacts 67 of auxiliary relay RU', wire 68, contacts 58, wire 69 which forms a junction with wire 64 and so on through winding 62 to the minus line by way of wire 65.

A circuit for the reversing switch winding 59 may be traced as follows;—from the plus wire 63, wire 70, contacts 57, wire 58, through winding 59, and thence to the minus line of wire 71.

A completed circuit for the winding 32 may be traced as follows;—from the plus wire 63, wire 60 by way of segment 56, and contact 34, through winding 32 and thence to minus line by wire 73.

A completed holding circuit for the winding 32 may be traced as follows;—from a plus wire 63, wire 40 including contacts 42 and 43 in series, contacts 38 to a junction 74 with wire 69 and so on through winding 32 to the minus line by wire 73.

A completed circuit for the winding 33 of the fast and slow speed contactor 31 may be traced as follows;—from the plus wire 63, wire 61 by way of segment 56 and contact 35, through winding 33 and thence to minus line by wire 73.

A completed holding circuit for the winding 33 may be traced as follows;—from the plus wire 63, contacts 46, wire 41, contacts 39, wire 41 to junction 41' with wire 61, through winding 33 and thence to the minus line by wire 73.

Operation of the relay RU causes closure of its two additional pair of contacts 76 and 77. Closure of contacts 76 and 77 causes energization of windings 78 and 79 of the contactors I' and TS respectively which results in operation of the contactor I' to open-circuit its back-contacts 27 which renders the helical winding of the induction mechanism and likewise its associated search coils, etc. ineffective by opening the energizing circuit 49 for said helical winding at the contacts 27. Operation of contactor TS against the action of a dashpot 80, causes a delayed opening of contacts 81 to insure closure first of self-holding contacts 87 for the winding 78.

The contacts 76 and 81 in series complete an initial energizing circuit for the winding 78 of the intercepting contactor I', which circuit may be traced as follows;—from a plus wire 63, to junction 81, wire 82, contacts 81, wire 83, to junction 83', wire 84, traveling brush 50, a segment 53, to wire 54, contacts 76, wire 85, through winding 78 and thence to the minus line by way of wire 86. Operation of contactor I' closes top contacts 87 to complete a holding-circuit for said winding 78, said holding-circuit being the same as just traced for said winding, excepting that it by-passes the time opening contacts 81, said by-pass circuit being traced as follows;—from junction 81, wire 88, holding contacts 87, wire 89 to the junction 83 with wire 84 and so on to the minus line by way of the intercepting selector I as above traced.

We now have the car ascending at full rate of speed with the induction mechanism rendered ineffective or in other words de-energized by the starting operation of the car by opening the energizing circuit 49 therefore at contacts 27 of the intercepting contactor I'. With the car now ascending the helical winding is rotating in a counter-clockwise direction as viewed from the top; the nut 12 is traveling upwardly carrying with it the search coils U8, D8, 9, 10 and 11 in proper relation with the helical winding so as to be traversed by the latter. The brushes 50, 51 and 52 being operably connected with the traveling nut will now move upwardly in accordance with movement of the car.

Assume now that a passenger at the second landing actuates the push-button *h*2 thereat to register a call on the floor-relay FR2 say for example prior to the start of the car from the first landing. Actuation of the floor-relay conditions a circuit 90 for winding 78 by opening it at contacts 91 so that when the car is at a pre-determined distance from the second landing to disengage brush 50 from segment 53 and engage it with segment 53', the self-holding circuit for the winding 78 is de-energized because of said open-circuit at contacts 91. The winding 78 being de-energized results in rendering the induction mechanism IM, etc. effective as by closure of the contacts 27 to complete an energizing circuit 49 for the helical induction winding to function to cause automatic slow-down of the car in successive steps and bring the car to a stop substantially level with the second landing.

When the car is at said pre-determined distance from the second landing, the leveling inductor L on the helix, which corresponds to the second landing, has already traversed the search coils 11, 10 and 9 in the order named, but without effect because the operation of the intercepting selector I is timed to control the contactor I' so that it will not close its back-contacts 27 to energize the helical winding until after the said inductive zone L on the helix has traversed and cleared said search coils. However, energization of the helical winding is effective in time so that the inductive zone SDU on the helix which corresponds to the second landing, as it traverses the search coils 10 and 9 in the order named, will momentarily induce a current in each coil which results in causing automatic slow-down of the car in successive steps in a manner described in some detail hereinbefore and which needs no further description at this point.

It will be mentioned here, that the very feeble current induced in each of the search coils 10 and 9, is amplified by its associated tube amplifier A10 and A9 respectively to cause energization of the windings 48 and 45 by way of their plate circuits 91 and 92 respectively.

When the car platform enters the leveling zone which we will say for example extends 18 inches above and 18 inches below the landing, the leveling search coil U8 is traversed by the inductive zone L of the helix which results through amplification of a feeble current induced in search coil U8 in causing energization of the actuating winding 93 of the up leveling contactor RUL, said winding 93 being connected in the plate circuit of its associated tube amplifier A3', by way of wire 96.

The contactor RUL operates to cause a contact disk 94 to engage a pair of contacts 95 and 95'. The contacts 95 and 95' and disk 94 complete parallel circuits, one to energize a winding 97 to cause it to operate to open contacts 87, to open at such point the self-holding circuit for the winding of the contactor RU which now opens its contacts 57 to open at that point the energizing circuit heretofore traced for the winding 59 of the reversing switch U; and contact 95 and disk

94 complete another energizing circuit for said winding 59 which circuit by-passes contacts 57 and since said by-pass circuit is closed before said contacts 57 are opened, the continuity of the energizing circuit for the reversing switch winding 59 is maintained without interruption, during its transfer from the contactor RU to the leveling contactor RUL.

The circuit completed by contact 95' and disk 94 may be traced as follows;—from a plus wire 63, disk 94, contact 95', wire 98, through winding 97, and to the minus line by wire 99.

The by-pass circuit around contacts 57 may be traced as follows;—plus wire 63, disk 94, contact 95, wire 100 to a junction 101 with wire 58, thence through reversing switch winding 59 and by wire 71 to the minus line.

The search coil U8 and inductive zone L by such co-operation in effect continue movement of the car upwardly until the platform is substantially level with the landing, at which time the inductive zone L of the helix has passed out of inductive range with respect to the search coil U8 and assumes a neutral position with respect to both the up and down search coils U8 and D8. The instant that the search coil U8 and the inductive zone L are out of inductive relation, current flow in the search coil U8 ceases and thereby causes de-energization of the winding 93 and the contactor RUL will now operate and open-circuit at the contacts 95 and disk 94 the energizing circuit for the reversing switch winding 59 and the reversing switch will now open to effect stop of the car.

If the car in coming to a stop at the second landing should over-run said landing, the inductive zone L and the search coil D8 are thereby brought into co-operative relation, which results through induction of a feeble current in said search coil, in causing energization of the winding 21 of the contactor RDL which operates to complete at contact 103 and disk 104 an energizing circuit 101 for a winding 102 of the down reversing switch which will now close to cause movement of the car downwardly. When the car is substantially level with the landing, the search coil D8 and the inductive zone L are out of co-operative relation which results in de-energization of the winding 21 which opens its contacts 104 and 103 thus to de-energize the winding 102 of the reversing switch D to cause stop of the car.

If it may be desired to render the leveling operation of the car ineffective while a hoistway door is open, this result may be accomplished in one way as for example by including the well known door controlled contacts (not shown) in series with each other in the circuit 49 of the helical winding so that with the car stopped at a landing said helical winding is de-energized by opening the hoistway door at said landing and will be energized again by closing the door and will remain energized until start of the car in which case said winding is again de-energized by opening of contacts 27 of the selector I'.

However, if it may be desired to have the leveling operation effective with the hoistway door open at the landing stopped at, the circuit remains as illustrated with the door contacts omitted and in such case the helical winding remains energized because of the contacts 27 being closed, throughout the stopping period of the car and until the car is re-started by operation of the car switch and by so maintaining the helical winding energized the leveling operation remains effective which in effect means that the car will be maintained level with the landing during loading and unloading which may cause lengthening or shortening of the hoistway cables with consequent tendency of the car platform to move in one direction or the other away from a level position with the landing.

For example if the car platform should tend to move away from the landing in either direction by reason of lengthening or shortening of the hoisting cables due to loading or unloading, the inductive zone L is thus brought into co-operative relation with either of the search coils U8 or D8 depending on such direction of movement of the car away from the landing, with the result that the contactor RUL or RDL will be caused to operate to return the car to a level with the landing and stop it thereat.

Having thus described the manner in which the induction mechanism through the co-operation of the search coils 10 and 9 with the induction zone SDU of the helical winding causes automatic slow down of the car in successive steps when ascending, it is thought obvious without any further detailed description, that the same result is accomplished when the car is descending but takes place when the car is at a different point relatively to the landing by the co-operation of the search coils 10 and 11 with the induction zone SDD.

In the Fig. 2 arrangement of the induction mechanism IM, it has a function to cause automatic stop of the car through control of a non-directional stop switch SS, at pre-selected landings in response to actuated car and hall push-buttons C1, C2, C3, and *h1*, *h2* and *h3* which control associated floor-relays FR1, FR2 and FR3 by energization of their associated windings 106 to register calls at any time regardless of direction of movement of the car or the position of the car at the time the push-buttons are actuated. Each floor-relay is provided with holding contacts 107 for its winding 105 to maintain a call registered after its push-button is released and until response of the car thereto at which time the floor-relay corresponding to the landing stopped at is automatically re-set by its associated re-set contactor 108 having a re-set winding 108'.

The induction mechanism when used to control automatic stop of the non-directional stop switch is made up by providing on the helical winding at suitable points thereon corresponding to stopping distances from the landings, up and down stop control inductive zones such for example as SU and SD respectively for each intermediate landing, and for each end landing there is only one inductive zone each, an SU inductive zone for the top landing and an SD inductive zone for the bottom landing. Only a single search coil 109 is used, operatively connected to the traveling nut 12 for axial movement therewith in accordance with movement of the car. The driving connections from the car to the rotatable spider having the helical winding assembled thereon, and to the worm 6 may be the same as in the Fig. 1 arrangement, so that the helical winding as it rotates traverses the linear moving search coil 109.

The search coil circuit connection 110 with the tube amplifier A is the same as a search coil connection in Fig. 1 and an actuating winding 111 of the stop switch is connected in the plate circuit 112.

Each floor-relay is provided with top contacts 113 which in conjunction with a directional selec-

tor which may be of any well known type but which herein is in the form of a commutating machine designated DS, and controls start of the car toward a landing for which a push-button is actuated, through control of direction contactors RU and RD having actuating windings 114 and 115 and said direction switches maintain direction for car travel until a farthest point of dispatch is reached.

The car C is controlled automatically to be intercepted at any landings toward which it is moving and for which calls are registered either from within the car or from the landings, by a system of intercepting circuits in conjunction with an intercepting selector which may be of any desired type and which as illustrated herein is in the form of a commutating machine designated IS. The intercepting selector consists of the three rows of fixed segments 116, 117 and 118, and co-operative brushes 116', 117' and 118' movable in accordance with car position by means of a mechanical connection 219 with the guide member 13, successively to engage their associated segments.

The floor-relay such as FR2 for an intermediate landing is provided with two sets of intercepting or stop control contacts 119 and 120 for up and down directions respectively. The floor-relay FR3 for the top landing is provided with one up set 119 and the floor-relay for the bottom landing is provided with one down set 120.

The intercepting selector IS in conjunction with said stop contacts on the floor-relays and associated intercepting circuits, control an intercepting contactor I' having an actuating winding 78, to de-energize the latter winding to cause opening of one of two energized circuits for either the up or down reversing switch windings 121 or 122 which is effected by opening contacts 123 of the intercepting contactor I', and this operation is effected at a point substantially mid-way between landings as the car is approaching the landing for which a call is registered. Such opening of one of the parallel circuits for a reversing switch winding transfers control of the reversing switch winding to the other parallel circuit for said winding and this circuit is controlled by the non-directional stop switch SS which in turn is controlled by the induction mechanism IM, and search coil 109, etc. to effect the final stop of the car at the landing. Hence when car reaches a pre-determined distance from the landing or in other words the stopping distance, the search coil 109 is at such time traversed by an induction zone corresponding to the landing to be stopped at and a current is momentarily induced in the search coil which through amplification by the tube amplifier A brings the plate circuit into action to cause energization of the winding 111 of the stop switch to cause it to open its contacts 124 and thus open said parallel circuit for the reversing switch winding and the latter being de-energized permits opening of the reversing switch to cause stop of the car at the landing.

The intercepting selector IS, the directional selector DS and associated circuits for starting, and intercepting the car in response to car and hall push-buttons are elements which of themselves and in combination form the subject matter of the patent application by Ernest L. Gale, hereinbefore referred to.

The present invention which as to one of its features resides in the control of a non-directional stop switch by induction mechanism, and in the embodiment thereof into a push-button or selective control system in which the push-buttons within the car and at a landing have a dual function both to start the car as well as intercept it, is not limited in its use to any particular type or arrangement of selectors, etc.

Other elements of the system comprise the electro-magnetically operable up and down reversing switches U and D having the operating windings 121 and 122 respectively, a hoisting motor M which merely for illustration is of the rheostat controlled type, and a time-controlled contactor TS which controls duration of car stop and effects restart of the car.

Operation of the elements through a complete cycle of operation will now be given.

With the elements in the position as illustrated, the car is at rest at the second landing with no calls registered. Assume now that a passenger at the third landing presses the third landing button *h*3 which causes the floor-relay FR3 to close its two sets of top contacts and open its stop contacts 119 and in this manner register the call. The relay remains self-holding because of the holding circuit being closed at the contacts 107 all of which is well known and therefore requires no detailed tracing of circuits.

The starting contacts 113 are now closed and complete an energizing circuit for the winding 114 of the up directional contactor RU which closes its two sets of contacts 125 and 126. The contacts 126 and contacts 127 in series now complete an energizing circuit for the winding 78 of the intercepting contactor I' which closes its two sets of contacts 123 and 128 and opens its back-contacts 129 which forms an open-circuit in the wire 130 which forms a circuit for the helical winding. The contacts 123 by-pass the contacts 127 which are opened by energization of a winding 129 controlled by closure of reversing switch contacts 130, and in such manner the winding 78 is rendered self-holding and the holding circuit is controlled by the intercepting selector IS.

Operation of contactor I' in effect causes start of the car by closing its contacts 128 to complete an energizing circuit for the winding 121 of the reversing switch U. When the reversing switch operates it closes contacts 131 which in conjunction with normally closed contacts 132 of the stop switch SS completes a second energizing circuit for the winding 121.

A completed circuit for the winding 114 may be traced as follows:—from a plus wire 163 contacts 113, wire 133, to traveling brush 134, an up segment 135 corresponding to the third landing, a common wire 136, through winding 114 and wire 137 to the minus line.

A completed circuit for the winding 78 may be traced as follows;—from a plus wire 163, contacts 127 of time-switch TS, wire 138, contacts 126, wire 139, brush 116', segment 116, wire 140, through winding 78, and wire 141 to the minus line. The by-pass circuit for the winding 78, around contacts 127 starts from a junction 163' with wires 163, wire 142, self-holding contacts 123, wire 143, junction 138' with wire 139, and so on as heretofore traced. This self-holding circuit it will be noticed is subject to control by the intercepting selector IS.

One completed circuit for the winding 121 of the reversing switch U may be traced as follows;—from the plus wire 163, wire 144, contacts 128, wire 145, contacts 125, wire 146, through the winding 121, and wire 147 to the minus line.

A second completed circuit for the winding 121 may be traced as follows;—from a plus wire 163,

wire 148, contacts 132 of stop switch SS, wire 149, contacts 131, wire 150 which forms a junction with wire 146 and so on through the winding 121 to the minus line.

From the above tracing of circuits it will be observed that there are now two completed parallel circuits for the winding 121 of the up reversing switch U, one of which is controlled by the intercepting selector IS and the other controlled by the automatic stop switch SS subject to the control of the induction mechanism IM.

A completed circuit for the winding 129 of the time switch may be traced as follows;—from a plus wire 153, wire 151, reversing switch contacts 130, wire 152, through winding 129, and to the minus line by wire 153.

We now have the car moving upwardly and when it has reached a point substantially midway between the second and third landing, the brush 116' engages a dead zone 154 and the brush 117' and segment 117 and the back-contacts 119 of the third landing floor-relay FR3 control a by-pass feed around said dead zone for the winding 73, and since this by-pass is open-circuited at the contacts 119, because of the registered call, this results in de-energization of the winding 73, which by opening its contacts 128 opens one of the feeds for the reversing switch winding 121 but the latter winding remains energized because of the other energizing circuit therefor controlled by the contacts 132 of the stop switch SS.

The contactor I' closes its contacts 129 to complete an energizing circuit designated 130 for the helical winding said circuit preferably being controlled also by contacts 155 of the time switch TS, said contacts being closed at this time and their opening being delayed so that the helical winding may not remain energized indefinitely after having performed its function of causing stop of the car at the landing. The circuit for the helical winding may be connected with any suitable A. C. source of supply of relatively low voltage say one volt for example at cycles ranging anywhere from 40 to 550.

We now have the reversing switch winding 121 under the control of the stop switch and as the car continues its travel toward the third landing and reaches a point corresponding to the stopping point, the search coil 109 is traversed by the induction zone SU for a relatively short period so that the induction period is only of momentary duration, resulting in momentary energization of the stop switch winding 111 to cause it to open its contacts 132 to open at such point the sole energizing circuit for the reversing switch winding 121 thereby to cause opening of the reversing switch U and in this manner cut off the power to the hoisting motor to cause the car to stop at the third landing.

When the reversing switch opens, it opens contacts 130 thus to de-energize the winding 129 of the time switch and at a predetermined time thereafter contacts 255 open to deenergize the helical winding, and contacts 127 re-close to automatically re-start the car only if a call remains registered.

In the Fig. 3 arrangement the induction mechanism IM' comprises the helical winding and only a single search coil 156 adapted to be driven from the car in exactly the same manner as in Fig. 2.

The helical winding is provided with three "up" inductive zones and three "down" inductive zones for each intermediate landing and for each end landing there is provided only one set of inductive zones for each.

The inductive zones SD1, SD2 and S', control the first and second steps of slow-down and final stop (non-leveling) for their associated landings for down direction of car travel, and inductive zones SU1, SU2 and S control the first and second steps of slowing down and final stop (non-leveling) for up direction of car travel. This arrangement of three inductive zones, say SU1, SU2 and S for the third landing for example as they traverse the single search coil 156 in succession, will by induction in the search coil cause it to energize an actuating winding 157 to cause it to impart successive impulses, (three in number according to the present arrangement of inductive zones) to a movable brush 158 through the intermediary of a dog and ratchet-wheel connection 159, against the action of a brush return spring 160. With the brush in normal position as illustrated said three successive impulses will cause it successively to engage the three fixed contacts to segments 161, 162 and 163 thereby to complete energizing circuits 175, 176 and 177 for the operating windings 161, 162 and 111, all of said circuits being fed from a common wire 178 connected to the brush 156 and controlled by reversing switch contacts 172.

The circuit-control mechanism of the impulse device as a whole designated ID in effect causes successive opening of slow-down contactors 31 and 30 by energizing the windings 161 and 162 successively in the order named and by so doing momentarily opening the self-holding circuits 173 and 164 at the contacts 165 and 166 respectively, and in addition the final impulse causes stop of the car by energizing the winding 111 of the stop switch SS and by so doing momentarily opening the stop switch contacts 132 thereby to open a self-holding circuit 167 for a winding 59 or 152 of whichever reversing switch may be closed at the time.

Of course it will be obvious that slow-down inductive zones may be increased or reduced in number to suit the particular needs and the number of contacts or segments, etc. will be changed accordingly, it being understood that the arrangement for effecting slow-down in only two steps is merely for illustration.

While the impulse device is in operation a winding 168 is energized by the circuit 178 controlled by the reversing switch, to actuate a stop member 169 through the intermediary of a resilient member 180 to retain it in engagement with the ratchet wheel 170 to prevent return movement thereof to normal position by the action of the spring 160 until the complete cycle of operation is completed and at such time whichever reversing switch opens to stop the car, will by opening its contacts 172, thereby deenergize said winding 168 to permit a spring 173 to disengage said stop member from the ratchet wheel and the latter will then be returned to its normal position as illustrated by the action of the spring 169.

In the Fig. 4 arrangement the induction mechanism is of the type which may be termed the hoistway type as contra-distinguished from the type illustrated in Figs. 1 and 2 which may be termed the remote type. The induction mechanism as to function is arranged to control successive slow-down and level stop the same as in Fig. 1 and for this purpose there may be two independent vertical lanes 181 and 182 in the elevator hoistway the lane 181 consisting of a pair of conductors 4 and 5, twisted together to

form non-inductive zones and having up and down inductive zones formed as in Fig. 1, said zones cooperating with a single search coil 183 on the car, to cause automatic slow-down in two successive steps through control of an impulse device (not shown) but such as is illustrated in Fig. 3 for example. The lane 182 consists of a pair of conductors 4 and 5 having twisted portions to form non-inductive zones and the wires are separated at predetermined points in the run of the wires to form inductive zones to be traversed by search coils U8 and D8 on the car to control the leveling operation of the car at the various landings designated L1, L2 and L3.

When located in the hoistway and in order to meet the requirements of regulations in certain localities as to fire hazard, the two lanes of wires may be contained within suitable separate conduits, a section of which for one lane is illustrated in Fig. 5, in which case a conduit containing the twisted portion of the conductors is designated 186 and at points where the inductive zones are formed the two conductor wires 4 and 5 extend through parallel conduits 187 and 188 which terminate in junction boxes 189.

It will be mentioned here that the induction mechanism, etc. according to the present invention, insofar as the flux producing element i. e.; the helical winding is concerned, is lacking in the use of a magnetic core which feature distinguishes it from other known induction controlled systems used both for elevator and railway train control. The helical conductor may be made up of relatively small gauge conductor wires and the inducing current may be very feeble but the pick-up current in the search coil through amplification causes a relatively snappy or undelayed operation of the relay.

Although I have illustrated and described herein the induction mechanism and various embodiments thereof for different functions relating to the control circuits for elevators, it may however in principle have a general application to the control of elevator accessories such for example as floor-lanterns, car signals, dispatcher signals, car position indicators, etc. each of which as a class employs as a basis for its control, a mechanism operable in accordance with car position and anyone skilled in the art by obvious substitutions and proper arrangement of the induction mechanism may readily adapt the latter to the purposes mentioned.

Without limiting myself to precise details and arrangements of parts, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. The method of controlling a circuit controller in accordance with position of a car movable in a pre-determined path which consists in energizing an electrical inductor when the car is at pre-selected points, traversing said inductor by a search coil movable in accordance with the car, and utilizing current induced in said search coil by said inductor to close a car running circuit to reverse movement of the car and return it to a landing when, if during loading and unloading it should move in either direction away from a level therewith.

2. The method of controlling a circuit-controller in accordance with position of a body movable in a pre-determined path which consists in traversing electrical conductors by a search coil movable in accordance with movement of the body, rendering said conductors when energized non-inductive by twisting them together for a portion of their length, rendering said conductors capable of inducing current in said search coil when the latter traverses certain other portions thereof, and utilizing current so induced in said search coil to actuate said circuit-controller.

3. The method of controlling a circuit-controller in accordance with position of a body movable in a pre-determined path which consists in traversing electrical conductors by a search coil movable in accordance with movement of the body, twisting said conductors together to render them ineffective though energized to induce current in said search coil as it traverses pre-determined portions of the energized conductor, forming said conductors in parallel lines to render them capable of inducing current in said search coil when the latter traverses certain other portions thereof, and utilizing current so induced in said search coil to actuate said circuit-controller.

4. The method of controlling a circuit controller in accordance with position of an elevator car which consists in energizing inductive means when the car is at pre-determined points in its travel, in response to actuated control means for each of a plurality of landings, said control means located both within the car and at each of said landings, traversing said inductive means by a search coil movable in accordance with the car, and utilizing current induced in said search coil by said inductive means to control said circuit-controller.

5. In combination, an elevator car, a control circuit including a circuit controller, a plurality of control means one for each of a plurality of landings, induction mechanism to control said circuit-controller comprising an inductor, and a selector operable jointly with said control means to render said inductor effective by energizing same at pre-determined points in the travel of the car in response to actuated control means.

6. In combination, an elevator car, a plurality of control means, one for each of a plurality of landings, induction controlled slow-down circuit-controlling mechanism, and a selector operable jointly with said control means to render said induction mechanism effective to cause slow-down of the car at any landings for which control means are actuated.

7. In combination, an elevator car, a plurality of control means, one for each of a plurality of landings, induction controlled slow-down and levelling circuit-controlling mechanism, and a selector operable jointly with said control means to render said induction mechanism effective to cause slow-down and stop of the car level with any landings for which control means are actuated.

8. In combination, an elevator car, a plurality of control means, one for each of a plurality of landings, induction controlled stop control means, and a selector operable jointly with said control means to render said induction mechanism effective to cause stop of the car at any landings for which control means are actuated.

9. In combination, a body movable in a predetermined path, power mechanism to move said body, multiple electrical control devices operable successively, to control said power mechanism to reduce the speed thereof, induction mechanism to control said multiple devices to cause reduction in speed of said movable body, and selective means comprising selectively operable manual switches and a switch controllable by said body, operating jointly to render said in-

duction mechanism effective at pre-determined points in its path of travel.

10. In combination, a body movable in a predetermined path, power mechanism to move said body, multiple electrical devices operable successively to control said power mechanism to regulate the speed thereof, induction mechanism operable in accordance with position of said movable body to control said multiple devices to cause reduction in speed of said movable body, and selective means comprising a manual control at pre-determined points in the path of travel of said body and a selector actuated in accordance with position of said body, operable jointly with said selective means, to render said induction mechanism effective at points for which said manual controls are actuated.

11. In combination, an elevator car, a plurality of control means, one for each of a plurality of landings, having combined starting and intercepting functions, a car running circuit responsive to actuated control means to cause the car to start, a car stopping circuit, induction mechanism to control said stopping circuit, and a car controlled selector operable jointly with said control means to render said induction mechanism effective to control said stopping circuit to cause stop of the car at landings for which control means are actuated.

12. In combination, an elevator car, a plurality of control means one for each of a plurality of landings, a car start circuit, means only within the car to control same to cause start of the car, a stop circuit, induction mechanism to control said stop circuit, and a selector operable jointly with said control means to render said induction mechanism effective to control said stop circuit to cause stops at landings for which said controls are actuated.

13. In combination, an elevator car, a plurality of control means one for each of a plurality of landings, start control means controllable only from within the car to start the car, slow-down and stop circuits, induction mechanism to control said circuits, and a car controlled selector operable jointly with said control means to render said induction mechanism effective to control said slow-down and stop circuits at pre-determined points in the travel of the car to cause slow-down and stop at landings for which control means are actuated.

14. In combination, an elevator car, a plurality of control means one for each of a plurality of landings, start control means controllable only from within the car, slow-down and leveling circuits, induction mechanism to control said circuits, and a car actuated selector operable jointly with said control means to render said induction mechanism effective to control said slow-down and leveling circuits at pre-determined points in the travel of the car to cause slow-down of the car and effect stop thereof substantially level with the landing in the event of it over-running or under-running same.

15. In combination, an elevator car, and induction mechanism actuated in accordance with positions thereof, said mechanism located remotely from the car, and comprising a rotatable supporting structure for an electrical conductor wound in helical form.

16. In combination, an elevator car, and induction mechanism comprising an inductor in the form of a helix and being rotatable bodily, and a coil having current induced therein by said inductor, said inductor and coil being located remotely from the car and arranged so that one is traversed by the other in accordance with position of the car and current inducing means movable in synchronism with the car and in cooperative relation to said conductor.

17. In combination, an elevator car, and induction mechanism comprising a plurality of inductors and a coil having current induced therein by said inductors, said inductors arranged in a helical path and one of said elements traversing the other in accordance with position of the car.

18. In combination, an elevator car, induction control mechanism remote from the car comprising an inductor arranged in the form of a helix to be traversed by current inducing means operatively connected with the motive means for the car.

19. In combination, an elevator car, induction control mechanism remote from the car, comprising inductor means arranged in a helical path and rotatable as a unit in accordance with movement of the car, and a current pick-up coil having linear movement in accordance with movement of the car, said coil by its linear movement being traversed by said inductor means.

20. In combination, an elevator car, induction control mechanism having a portion thereof arranged in the form of a helix and rotatable in accordance with movement of the car, said helix having peripheral speed at a rate corresponding at least to the linear speed of the car and means movable in synchronism with the car and in cooperative relation to said helix to receive an induced current charge from the latter.

21. In combination, an elevator car, induction control mechanism having an inductor arranged in a helical path and rotatable in accordance with movement of the car, said inductor having peripheral speed at a rate corresponding at least to the linear speed of the car, and current inducing means having linear movement in accordance with movement of the car, said movement being at a reduced rate from that of the car, said inductor and inducing means co-operating in a manner so that one traverses the other.

22. An electrical circuit comprising an energized electrical conductor rendered non-inductive for a portion of its length, and having another portion thereof rendered inductive by forming separated parallel lanes for the flow of current, and a pick-up coil adapted to traverse said inductor, said coil being energized by induction only while it traverses said parallel lanes and becoming de-energized by traversing said non-inductive portion.

23. An electrical circuit comprising a pair of energized electrical conductors twisted together for a portion of their length to render such portion non-inductive, and having another portion constructed to form an inductive zone by separating said pair of conductors to form parallel lanes for the flow of current, and a pick-up coil adapted to traverse said pair of conductors, said coil being energized by induction only while it traverses said conductors at the point of separation and being deenergized by moving out of the area of separation and while traversing said twisted portion of the conductors.

24. An electrical circuit comprising an inductive zone formed by a pair of energized conductors separated to form parallel lanes for a predetermined portion of their length the inductive zone terminated at both ends by twisting said wires together, means to render any portion

of said zone ineffective and a search coil adapted to traverse said zone and by so doing become energized by traversing the effective area thereof and become de-energized when traversing the area rendered ineffective by said means.

25. In combination, an elevator car, a car control circuit including a circuit controller, a control means at a landing, induction mechanism to control said circuit controller comprising an inductor, and a selector operable jointly with said control means to render said inductor effective by energizing same at a pre-determined point in the travel of the car in response to actuation of said control means and a current inducing coil cooperating with said inductor to effect actuation of the circuit controller.

26. In combination, an elevator car, induction control mechanism comprising an energized conductor arranged in a substantially vertical lane in the hoistway and a pick-up coil on the car to traverse said conductor, said conductor having portions of its length rendered non-inductive and other portions rendered inductive, said coil by coming into said inductive area, effective to energize a car running circuit, and by going out of said inductive area effective to de-energize said car running circuit.

27. In combination, an elevator car, induction control mechanism comprising energized conductors arranged in a substantially vertical lane in the hoistway and a pick-up coil on the car to traverse said conductors, portions of said conductors being rendered non-inductive by twisting said conductors together, and other portions thereof arranged to form inductive zones by separating said conductors to form substantially parallel lanes.

28. In combination an elevator car, induction mechanism comprising electrical conductors extending in a substantially vertically lane in the hoistway, said conductors being rendered non-inductive for a pre-determined portion of their length by twisting them together, and being rendered inductive at pre-determined portions of their length by separating them to form parallel paths for the flow of current, and a current pick-up coil on the car to traverse said conductors throughout the entire travel of the car.

29. In combination, an elevator car, and induction control mechanism comprising an electrical conductor in the form of a helix and having rotary motion so that its peripheral speed corresponds at least to the linear speed of the car and a pick-up coil mounted in cooperative relation to said conductor and having linear movement at a rate proportionate to the linear speed of the car.

30. Leveling mechanism for elevators comprising in combination, an elevator car operating means therefor including a circuit controller, an electrical conductor, a source of current supply for said conductor, a pick-up coil, said conductor and pick-up coil brought into inductive relation when the car reaches a pre-determined distance from a landing thereby to induce current in said pick-up coil and control operation of said circuit controller to cause movement of the car toward said landing, said conductor and pick-up coil going out of inductive relation when the car is level with the landing thereby to cause de-energization of said pick-up coil to cause automatic stop of the car.

31. Leveling mechanism for elevators comprising in combination, an elevator car operating means therefor including a circuit controller, an electrical conductor, a source of current supply for said conductor, two pick-up coils one being brought into inductive relation with said conductor as the car approaches a landing from one direction and the other brought into inductive relation with said conductor as the car approaches said landing from the other direction, each coil by being so brought into inductive relation with said conductor having current induced therein to control operation of said circuit controller and cause movement of the car toward said landing and whichever coil is effective, when the car is substantially level with said landing, being brought out of inductive relation with said conductor thereby to de-energize such coil to control and cause stop of the car, both of said coils being in non-inductive relation with said conductor when the car is substantially level with the landing.

32. The method of controlling the leveling of an elevator car with a landing which consists in bringing a pick-up coil into inductive relation with an energized electrical conductor when the car reaches a pre-determined distance from a landing, utilizing current induced in said coil to control a car running circuit and cause continuation of car movement toward said landing, bringing said pick-up coil out of inductive relation with said electrical conductor when the car is substantially level with said landing to cause de-energization of said pick-up coil, thereby opening the car running circuit to stop the car at said landing.

33. In combination, an elevator car, induction mechanism comprising conductors arranged in the form of a helix and having a portion thereof rendered non-inductive by twisting the conductors together, and means to rotate said helix bodily in accordance with movement of the car and means cooperatively associated with said conductors inductively charged thereby and controlling effective operation of motive means for moving the car in each direction.

34. In combination, an elevator car, induction mechanism comprising conductors arranged in the form of a helix, having a portion thereof rendered inductive by separating said conductors to form parallel lanes, having another portion thereof rendered non-inductive by twisting said conductors together, and means to rotate said helix bodily in accordance with movement of the car and means cooperatively associated with said conductors inductively charged thereby and controlling effective operation of motive means for moving the car in each direction.

35. In combination, an elevator car, induction mechanism comprising an electrical conductor in the form of a helix, means to rotate said helix bodily in accordance with position of the car, and collector rings and brushes to connect said helix with a source of current supply and means cooperatively associated with said conductor inductively charged thereby and controlling effective operation of motive means for moving the car in each direction.

36. In combination, an elevator car, a rotatable conductor in the form of a helix, a worm shaft, a driving connection between said car, helix and worm shaft, a current pick-up coil movable by said worm, in working relation with said helix at all times throughout entire car travel, and collector rings and brushes to connect said helix with a source of current supply, said conductor effective to induce current in said coil at pre-

determined points of car position and ineffective during certain portions of car position.

37. The method of operating circuit control means for an elevator car, which consists in energizing an electrical conductor at selected positions of the car in its travel path by one of a plurality of selectively actuable means, relatively moving said conductor into and out of inductive relation with respect to pick-up, and means adapted to receive an induced current charge from said conductor in accordance with car movement, and utilizing the current induced in said means to govern the effective operation of said car circuit control means.

38. In combination, a body movable in a predetermined path, power mechanism to move the body, control means to set said body in motion, multiple control devices operable successively to reduce the speed of and to stop said body, induction mechanism to energize said multiple control devices to cause stop of said body, and selective means operable at any time to render said induction mechanism effective to cause successive operation of said multiple control devices at predetermined points in the path of movement of said body.

39. In combination, an elevator car, power mechanism for operating the same, control means for the car including plural speed modifying devices, an inductor, plural pick-up coils movable inductively with respect to said inductor, and circuit connections between the respective pick-up coils and said speed modifying devices for operating said devices in response to electrical energy induced in said coils from said inductor.

40. In combination, an elevator car, power mechanism for operating the same, control means for the car including plural devices for successively reducing the speed of the car and leveling the car at a landing, an inductor, plural pick-up coils successively movable into inductive relation with said inductor in response to car movement, and circuit connections between the respective pick-up coils and said devices for reducing the speed of and leveling the car for operating said devices in response to electrical energy induced in said coils from said inductor.

41. In an induction control system for elevator cars, a single inductor circuit and a plurality of pick-up coils movable successively into inductive relation with respect to said inductor circuit in response to car movement to effect slow-down and stop of the car.

42. In an induction control system for elevator cars, a single inductor circuit having plural inductive portions separated by non-inductive portions, plural pick-up coils movable successively into inductive relation with each of said inductive portions of the inductor circuit in response to car movement, and means for selectively controlling car movement in response to electrical energy induced in said pick-up coils.

43. In combination, an elevator car and control means therefor including induction mechanism comprising an inductor circuit arranged in the form of a helix and including inductive and non-inductive areas, means for rotating said helix in response to car movement, a pick-up coil movable rectilinearly in response to car movement, and means for timing the movements of the helix and said coil whereby the inductive and non-inductive areas of the helix are successively presented in operative relation to said coil.

44. In combination, an elevator car and control means therefor including induction mechanism comprising an inductor circuit arranged in the form of a helix and including inductive and non-inductive areas, means for rotating said helix in response to car movement, a pick-up coil movable in response to car movement, and means for correlating the movements of the helix and coil in response to car movement whereby the inductive and non-inductive areas of the helix are successively presented in operative relation with respect to said coil.

45. A control system adapted to be operated in conjunction with a traveling conveyance comprising a conveyance, operating means therefor, means for creating a magnetic field along the path of travel of the conveyance, means for neutralizing the magnetic field at predetermined points, magnetically sensitive means carried by the conveyance in operative relation to the magnetic field along the path of the conveyance, and control means connected to said magnetically sensitive means and adapted to be actuated by changes produced therein.

46. A control system for a traveling conveyance moving along a predetermined path comprising a conveyance, means for operating the conveyance, an electrical conductor disposed along the path of the conveyance, a source of current connected to said conductor for creating a magnetic field about the conductor, a second conductor adjacent said first mentioned conductor and carrying a current equal and opposite to the current in said first mentioned conductor to neutralize the magnetic effect of the current flowing in said first mentioned conductor, said conductors being separated at predetermined points along the path of the conveyance, inductive means carried by the conveyance in inductive relation to said conductors and adapted to have a current induced therein at the points of separation of the conductors, and control means for the conveyance operating means operatively connected to said inductive means.

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