

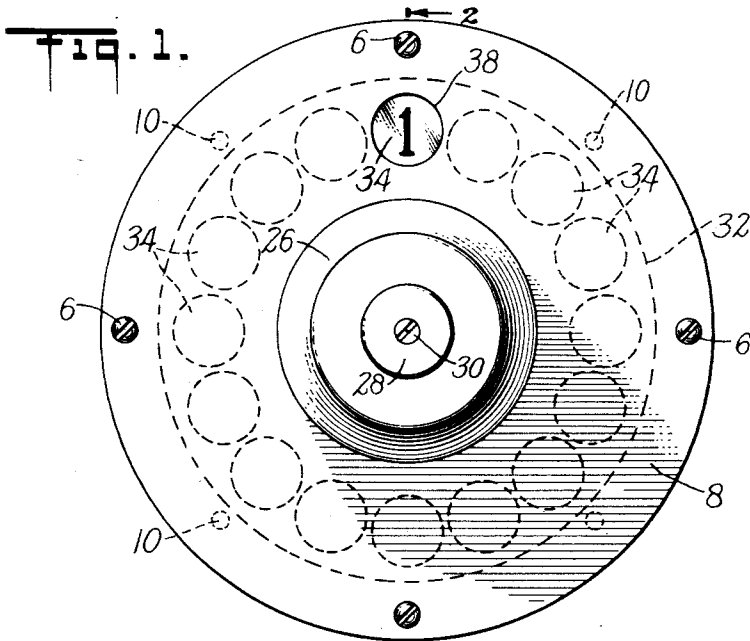
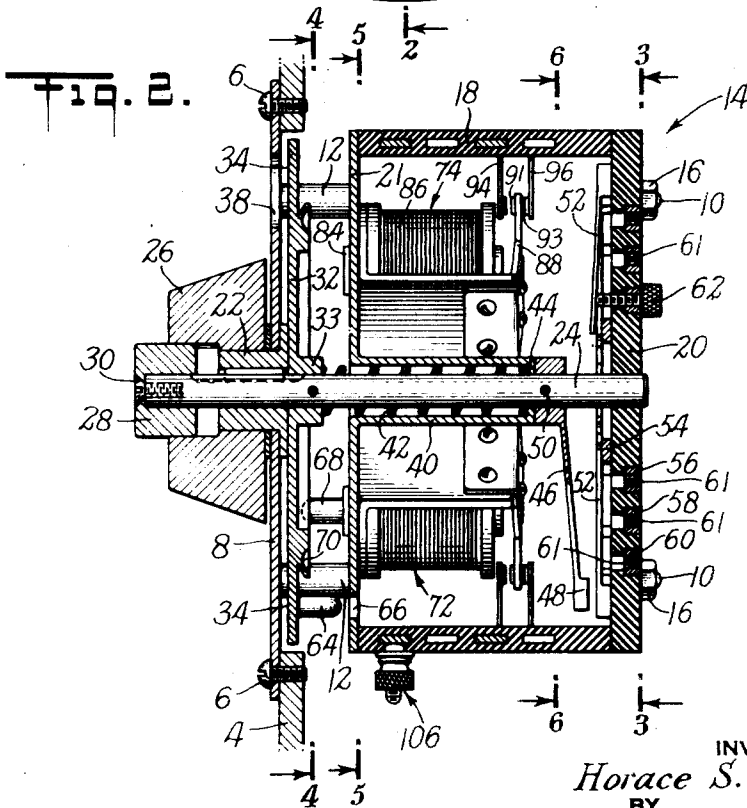
Aug. 5, 1952

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ELECTRIC CONTROL DEVICE

2,606,237

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4 Sheets-Sheet 1



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Fig. 3.

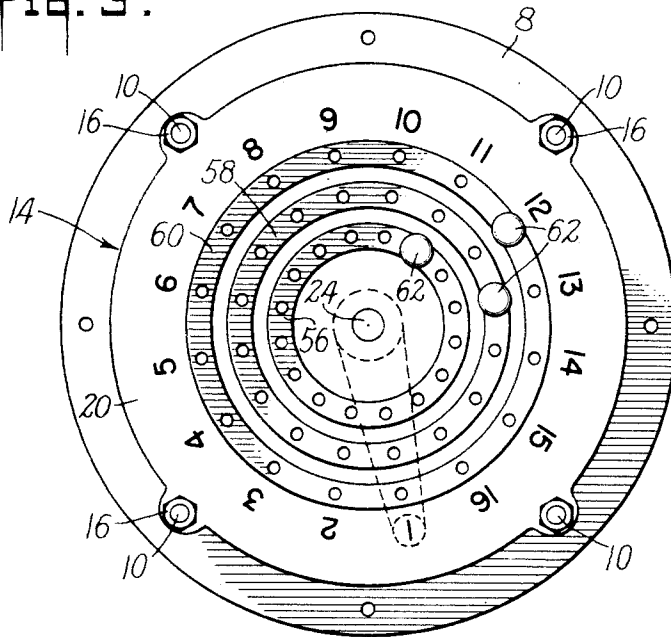
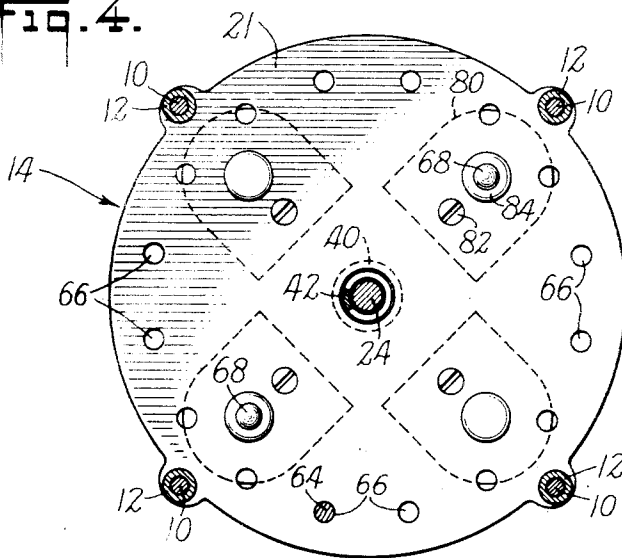


Fig. 4.



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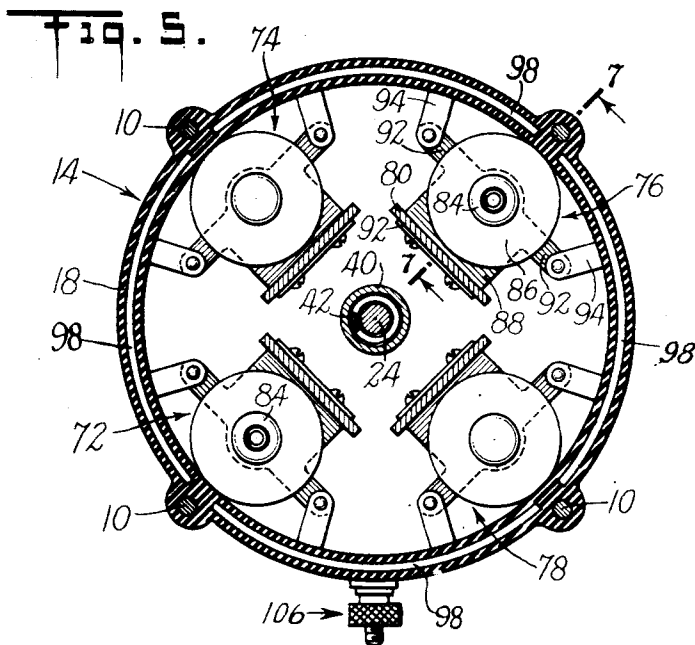
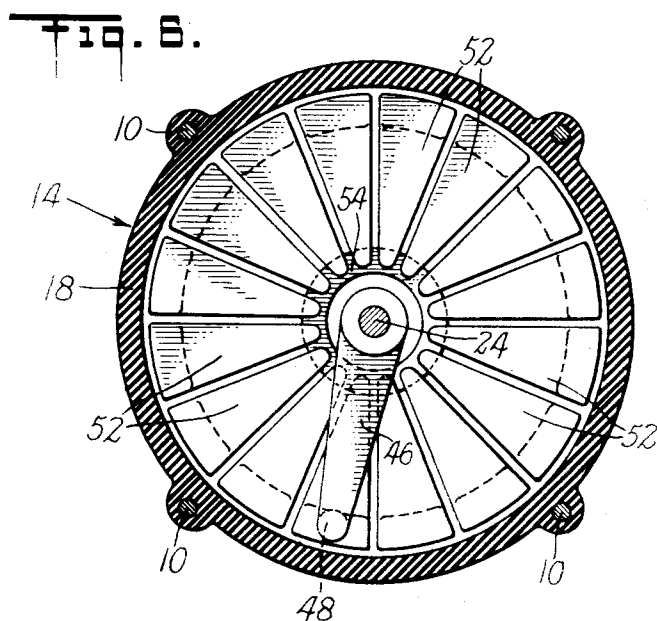
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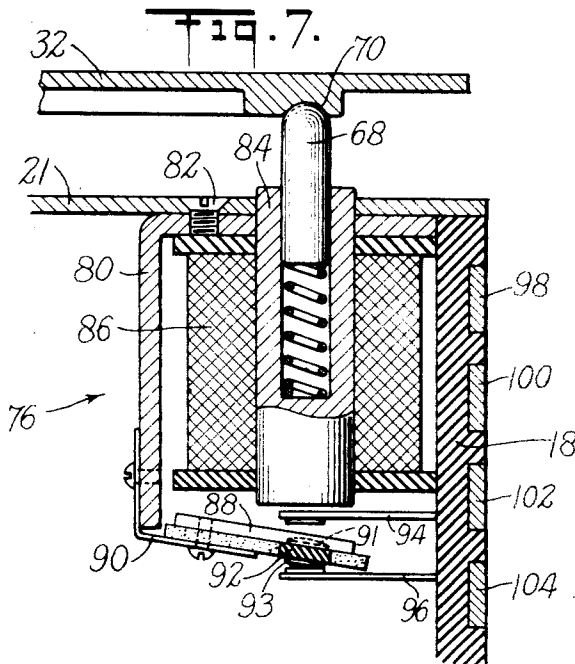
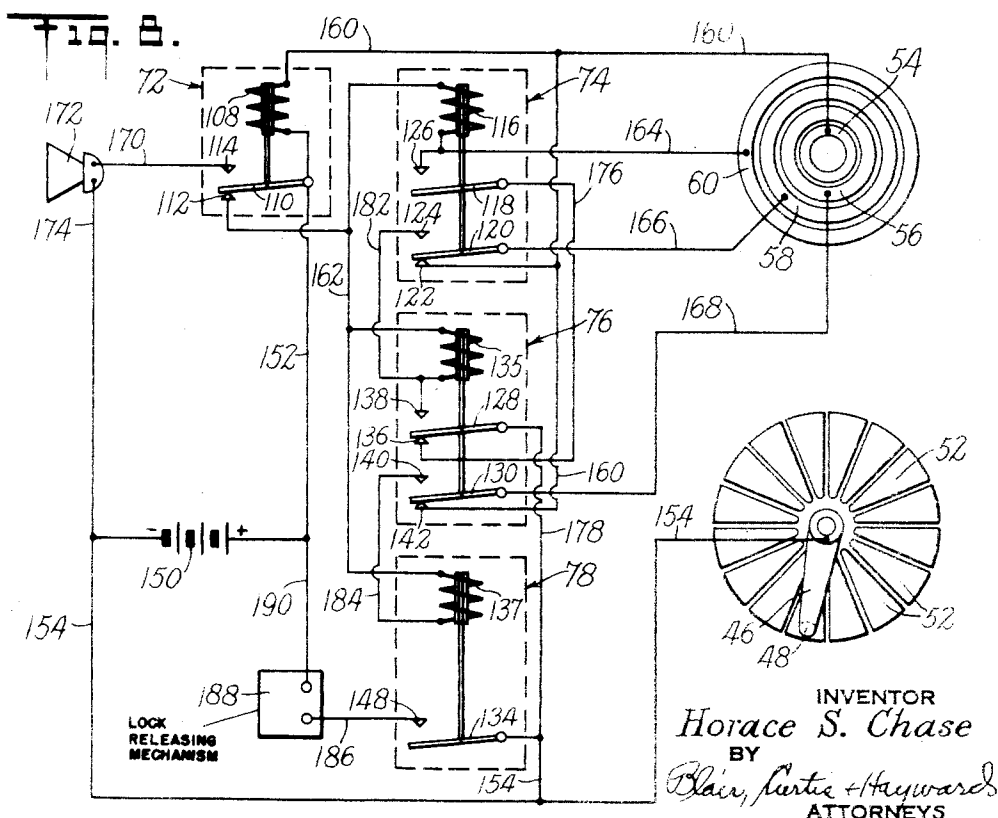
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UNITED STATES PATENT OFFICE

2,606,237

ELECTRIC CONTROL DEVICE

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6 Claims. (Cl. 175—335)

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This invention relates to control devices, and more in particular to the electrical operation of locks and latches on automobiles.

An object of this invention is to provide a control system which is simple and sturdy in construction and yet which may be operated with facility by authorized persons without permitting operation by unauthorized persons. A further object is to provide a dial control which is compact and light in weight and which is extremely dependable in use. These and other objects will be in part obvious and in part outlined below.

In the drawings in which is shown one embodiment of the invention:

Figure 1 is a front elevation of the dial control and contactor-relay unit of the system;

Figure 2 is a vertical section on the line 2—2 of Figure 1;

Figure 3 is a rear elevation taken from the right-hand side of Figure 2;

Figures 4, 5, and 6 are vertical sections taken generally along the lines 4—4, 5—5, and 6—6 respectively of Figure 2;

Figure 7 is an enlarged sectional view on the line 7—7 of Figure 5 of a modified form; and,

Figure 8 is a schematic diagram representing the electrical circuit for the system in somewhat simplified form.

In accordance with the present invention, a system is provided which includes a control dial which is manipulated to control locks and other mechanisms. The operation is in accordance with a pre-set combination and if this combination is unknown, the mechanism is not released or opened. When desirable, an alarm system is rendered operative to give an alarm in the event of manipulation other than that in accordance with the combination. When the system is used on an automobile, for example, the automobile horn or the lights may be operated to give such an alarm. In the illustrative embodiment of the invention there are sixteen dial numbers which correspond to dial positions; and the dial controls four electrical relays, three of which are sequence relays and must be energized in proper sequence in order to operate the combination and thus operate a lock. The fourth relay is a "reset" relay which operates each time that the dial is manipulated improperly, that is, in a manner other than in the proper sequence. The operation of this "reset" relay releases such of the other relays as are then energized and also may turn on the alarm for the system. Therefore, if a person starts to manipulate the dial,

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he will turn on the alarm at any time that he does not manipulate the dial in accordance with the combination. By adding additional numerals, additional dial positions may be provided; and, by adding additional relays, the sequence of numbers constituting the combination may be increased.

Figures 1 to 7, inclusive, show the dial and contactor-relay unit which is manipulated to operate the combination. Referring particularly to Figure 2, this unit is mounted in an opening in a fixed panel 4 by four screws 6 which clamp a circular dial 3 to the panel. (See also Figure 1.) Projecting rearwardly from dial 3 are four bolts 10 (the opposite ends of which are shown at the right in Figure 2) which carry spacer sleeves 12 adjacent dial 3 and upon which is rigidly mounted the relay and contactor assembly generally indicated at 14. This assembly is held in place by nuts 16 on the ends of bolts 10 and includes a cylindrical shell 18 and a rear plate 20, both of insulating material, and a front plate 21 of metal.

Dial 3 has a central recess in which is positioned a flanged sleeve 22, and within this sleeve and loosely keyed to it is a shaft 24. The right-hand of shaft 24 projects through a central bearing opening in disk 23 so that the shaft is journaled at one end in the disk and at the other end with sleeve 22 in dial 3, and the shaft may slide a limited distance with respect to sleeve 22. Fixed to sleeve 22 is a knob 26 by means of which the sleeve and the shaft may be rotated, and the knob is centrally recessed to receive a plunger knob 28 which is fixed to the end of the shaft by a screw 30. Fixed to shaft 24 adjacent sleeve 22 is a dial disk 32 which has around its periphery a row of sixteen circular numeral spaces 34 indicated in broken lines in Figure 1. Marked in luminous radium paint within the numeral spaces are the respective numbers "1" to "16," inclusive. Dial 3 has near its top a circular opening 38 which is in alignment with the row of numeral spaces 34; and, as knob 26 is turned so as to rotate shaft 24, the numerals move past opening 38 and indicate the angular position of shaft 24.

The front plate 21 of assembly 14 (Figures 2 and 4) has an integral central sleeve 40 in which is positioned a compression spring 42. Spring 42 bears at the left against a hub 33 of dial disk 32 and at the right against a flange 44 at the end of sleeve 40. As indicated above, shaft 24 is loosely keyed to sleeve 22 so that while the rotation of knob 26 is transmitted through the

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sleeve to the shaft the shaft still has limited sliding movement with respect to the sleeve. Spring 42 exerts force through hub 33 of dial disk 32 to shaft 24, urging the shaft to the left-hand position shown, but, when force is exerted on plunger knob 28 the shaft slides to the right. Near its right-hand end shaft 24 carries a spring metal contactor arm 46 which is tapered as is shown in Figure 6 and which carries at its outer end a contact 48. A screw 50 extends through the hub of the contactor arm and the shaft and, therefore, the contactor arm moves with the shaft.

Mounted on disk 20 adjacent contactor arm 46 are sixteen segments 52 which extend radially as shown in Figure 6 and are rigidly fixed at their outer ends to the disk. The inner ends of these segments are not fixed but they rest on a central contactor ring 54 fixed to disk 20 (see also Figure 2). Segments 52 are of spring brass so that their inner ends are self-urged into electrical contact with ring 54, but these inner ends of the segments may be lifted individually from the ring so as to break the electrical contact between the segments and the ring.

Referring now to Figure 3, imbedded in disk 20 are three concentric brass rings 56, 58, and 60 and the disk is of insulating material so that the rings are electrically insulated from each other. Each of these rings has sixteen threaded holes 61 which are concentric with openings in disk 20, and these holes are in radial rows and in alignment with the respective segments 52 on the inner side of the disk. Therefore, any of the rings may be electrically connected with any of the segments by threading a screw through a selected hole 61. For example, as shown in Figure 2, ring 56 is electrically connected to one of the segments 52 by a screw 62 threaded into one of the holes in this ring. The forward end of this screw not only makes electrical contact with the segment, but it also swings the end of the segment away from contactor ring 54 so as to break the contact between the segment and the contactor ring. Thus by the simple procedure of threading a screw into a hole 61 an electrical connection is made between one of the rings and one of the segments and at the same time the electrical connection between that segment and the contactor ring 54 is broken. The rows of holes 61 are numbered from 1 to 16 to correspond to the respective segments 52. The numbering is related to the numbers on dial disk 32 in such a manner that arm 46 is always adjacent the segment having the same number as that which appears through opening 38. Illustratively (see Figure 3), rings 56, 58 and 60 are connected respectively to segments numbered 11, 13 and 12.

As outlined above, the pushing of plunger knob 28 slides shaft 24 to the right and this carries contactor arm 46 to the right and moves contact 48 into engagement with the outer end of one of the segments 52. If the particular segment engaged by contact 48 lies against contactor ring 54, there is thus completed an electrical circuit from contactor arm 46 to contactor ring 54; but, if the particular segment engaged by contact 48 is connected by a screw 62 to one of rings 56, 58, or 60, then the electrical contact is from arm 46 to that ring and there is no electrical contact to contactor ring 54.

It is desirable to provide for accurate alignment of arm 46 with one of the segments 52 as the arm moves to the right, and this alignment is provided by a pin 64 which is shown in the

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lower left-hand corner of Figure 2 and is rigidly mounted near the periphery of dial disc 32. This pin is adapted to project through any one of sixteen holes 66 which are positioned around the periphery of front plate 21. (See Figure 4.) Furthermore, front plate 21 carries a pair of spring pressed pins 68 which are oppositely spaced as shown in Figure 4 and project toward dial disc 32 as shown best in Figure 2. These pins are positioned so as to align with and enter in succession sixteen detents 70 on the mating face of dial disc 32. Therefore, as shaft 24 is rotated by knob 26, it tends to stop only when the two pins 68 are seated in the bottom of a pair of the detents 70, and the relationship is such that, with the pins thus seated, contactor arm 46 is in alignment with one of segments 52 and pin 64 is in alignment with one of the holes 66.

As indicated above, the assembly includes four identical relays and these are enclosed within shell 18. These relays are best shown in Figure 5 and are indicated at 72, 74, 76, and 78. The structure of these relays is shown best in Figure 7, wherein it is seen that each relay has an angle bracket 80 which is fixed to front plate 21 by a screw 82 and which has rigidly mounted thereon an iron core 84 and a coil or solenoid 86. Bracket 80 also carries an armature 88 which is hinged to the bracket by a leaf spring 90 clamped to the bracket and the armature by screws. Each of the armatures carries at its opposite sides a pair of contactor arms 92 (see Figure 5), each of which carries a pair of contacts 91 and 93 (see also Figure 2) which are positioned on the opposite sides of the arm and which are adapted to engage respectively the contacts of two contactor arms 94 and 96. Spring 90 normally urges the armature toward contactor arm 96 but when solenoid 86 is energized the armature is drawn toward core 84 with the result that the circuit is broken to contactor arm 96 and a circuit is made to contactor arm 94.

Positioned around the periphery of shell 18 are four rows of electrical conducting segments 98, 100, 102 and 104; these segments may be embedded in the shell as in Figures 1 to 6 or they may be in grooves as in Figure 7. Each row of these segments is formed by four segments of slightly less than ninety degrees angular extent and the electrical circuit for the assembly is formed by connecting these segments in series with the other electrical elements of the assembly. Accordingly, each of the contactor arms 94 and 96, as well as each set of the contacts 91 and 93, is connected to one of the segments, and, as is shown at the bottom of Figure 2, external connections to the assembly are provided through binding posts such as 106.

Referring now to Figure 8 wherein the electrical circuit is represented schematically, the four relays are represented at the central portion of the figure as the "reset" relay 72 and the three sequence or combination relays 74, 76 and 78. "Reset" relay 72 has a solenoid 108 and armature 110 which normally engages a lower contact 112 but which engages an upper contact 114 when the solenoid is energized. Relay 74 has a solenoid 116 and a pair of armatures 118 and 120; when solenoid 116 is de-energized, armature 120 engages a contact 122 and when the solenoid is energized armature 120 engages a contact 124 and armature 118 engages a contact 126. Relays 76 and 78 may be similar, in that each may have

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two armatures; however, since only one armature of relay 78 is used, only one has been illustrated in Figure 8. Relay 76 has a solenoid 135 and armatures 128 and 130, each of which has two contacts 136 and 138, and 140 and 142 respectively. Relay 78 has a solenoid 137 and an armature 134 with a single contact 143.

As shown at the left, a battery 150 has its positive terminal connected to armature 110 and solenoid 108 of relay 72, and its negative terminal connected through a line 154 to armature 134 of relay 78 and contactor arm 46. The other side of solenoid 108 of relay 72 is connected through a line 160 to the central contactor ring 54 and also to contact 122 of relay 74 and contact 142 of relay 76. One side of each of solenoids 116, 135, and 137 is connected through a line 162 to contact 112 so that when solenoid 108 is de-energized the positive side of the battery is connected to each of these solenoids. These solenoids are also connected through lines 164, 166, and 168, respectively, to rings 60, 58, and 56 and, as explained above, contact 48 of contactor arm 46 may be connected selectively to any of these rings or to ring 54.

Contact 114 of relay 72 is connected through a line 170 to a signal horn 172, the other side of which is connected through a line 174 to the negative side of the battery. Armature 118 of relay 74 is connected through a line 176 to contact 136 of relay 76, and armature 128 of relay 76 is connected through a line 178 to line 154 and thence to the negative side of the battery. Contact 124 of relay 74 is connected through a line 182 to contact 138 and the solenoid 135 of relay 76, and contact 140 of relay 76 is connected through a line 184 to solenoid 137 of relay 78. Contact 148 of relay 78 is connected through a line 186 to a lock releasing mechanism 188, the other side of which is connected through a line 190 to the positive side of the battery. Therefore, when armature 134 of relay 78 is raised by the energization of solenoid 137, the lock releasing mechanism 188 is energized and the lock is thereby opened.

As indicated above, the sequence relays 74, 76, and 78 must be energized in the order named before a circuit is completed which will close the switch 134-148 and thereby energize the lock releasing mechanism 188. Furthermore, the energization of "reset" relay 72 releases any of the sequence relays which are then energized and it energizes the signal horn 172.

Let us assume that there are three screws 62 positioned as is shown in Figure 3 so that rings 56, 58 and 60 are connected respectively to segments 52 numbered "11," "13" and "12," and the thirteen remaining segments are connected to contactor ring 54; then, with the negative side of the battery connected to contactor arm 46, the pushing of plunger knob 28 completes a circuit through contact 48 to the selected segment and then through the ring connected to that segment to one of solenoids 108, 116, 135, or 137. This completes a circuit to energize the selected solenoid; if this is solenoid 108, armature 110 is raised so as to break the connection between the positive side of the battery and solenoids 116, 135, and 137 and at the same time a circuit is completed from the positive side of the battery through armature 110 and contact 114 and line 170 to energize signal horn 172 or any other alarm device.

The completing of a circuit through ring 60 and line 164 energizes solenoid 116 and raises

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armatures 118 and 120. The raising of armature 118 closes a circuit from solenoid 116 through contact 126, armature 118, and a line 176 to contact 136 of relay 76 and thence through armature 128 and a line 178 to line 154 and to the negative side of the battery; thus, a circuit is completed from the negative side of the battery to solenoid 116. Therefore, contact 126 cooperates with armature 118 to complete a hold-in circuit to hold the relay closed after the solenoid has once been energized through ring 60. With relay 74 thus energized and armature 120 thus held in raised position, the connecting of a circuit from contact 48 to ring 58 completes a circuit from the negative side of the battery through line 166, armature 120, contact 124 and line 182 to solenoid 135 with the result that relay 76 is energized. This raises armature 128 so that the hold-in circuit for relay 74 is de-energized. However, armature 128 engages contact 138 so as to complete a hold-in circuit for relay 76 from solenoid 135 through contact 138, armature 128 and lines 178, 154. The energization of relay 76 also raises armature 130 into engagement with contact 140 and this connects line 168 through contact 140 and line 148 to solenoid 137. Thus, with relay 76 energized the completing of a circuit from contact 48 through the proper segment 52 to ring 56 completes a circuit from the negative side of the battery to solenoid 137 so as to energize relay 78. As indicated above, this raises armature 134 so as to energize the lock releasing mechanism 188. It is thus seen that the sequential operation of these relays operates the locking device. However, during the sequential operation the energization of relay 76 breaks the hold-in circuit for relay 74. Furthermore, contact 122 of relay 74 and contact 142 of relay 76 are connected to line 160 so that if lines 166 or 168 are energized out of sequence, the "reset" relay 72 is energized. As outlined above, the energization of relay 72 energizes horn 172, and at the same time the connection between the battery and line 162 is broken by the raising of armature 110 from contact 112. Thus, the relays 74 or 76 whichever is then energized, is immediately de-energized.

After once being energized, relay 76 in the circuit shown is held energized even after the energization of relay 78 until it is de-energized by breaking its circuit, e. g., by reset relay 72.

With this circuit as shown the resetting, i. e., the releasing of both armatures 120 and 130 by means of the reset relay 72 will be accompanied by a blast on the horn 172. Obviously this can be avoided by inserting into the circuit of the relays 74 and 76, e. g., in 152, 162 or 164, a switch normally closed but adapted to be momentarily opened by the operator when he wishes to lock the car. Such a switch may be operated by the door handle or may be tied to the ignition switch so that the reset relay would be energized momentarily each time the ignition switch is turned.

The lock releasing mechanism 188 may be the spring latch engaged every time the door is closed and releasable only electrically by the circuit shown or it may be a locking bolt in addition to the ordinary spring latch, the bolt being thrown by a backward movement of the handle and released only by the electrical circuit shown.

In order to provide for operation of the lock if the battery should run down or the power source otherwise should fail, it is desirable to provide an external connection outlet by which the ordinary battery or other power source can

be disconnected from the circuit and a portable battery connected in instead.

I claim:

1. A control device including a series of sequentially operable electric relays, which comprises a plurality of spaced concentric conductor rings connected respectively to said relays, a plurality of movable radially extending segments adapted to provide electrical connection with the rings, a shaft axially mounted with respect to said rings, an arm fixed to said shaft and adapted to engage said segments selectively, and means to rotate said shaft and to project said shaft axially whereby said arm contacts a selected segment for relative actuation of said relays.

2. An electrical control device having a current source and circuit means adapted to connect said current source sequentially to relays, which comprises a plurality of concentric metal rings connected respectively to said relays, a plurality of spring arms positioned radially with respect to said rings, a plurality of screws which may be projected selectively to connect any selected ring to any selected spring arm, and a contactor arm rotatably mounted to engage said spring arm selectively whereby an electrical connection may be completed from said contactor arm through predetermined spring arms and rings to the respective relays for selective actuation thereof.

3. In a control device of the character described having a plurality of relays, a cylindrical shell, a plurality of concentric rings fixed at one end of said shell and connected respectively to said relays, a plurality of spring segments mounted within said shell and adapted to be connected with selected rings, and a rotatable contactor

arm adapted to engage any selected segment for selective actuation for said relays.

4. Apparatus as described in claim 3, wherein said segments are spring urged against the smallest of said rings and wherein screws are provided to project through the other rings and urge selected segments away from said smallest ring while providing electrical contact between the screws and the respective segments.

5. Apparatus as described in claim 3, wherein a rotatable dial is provided which bears numbers designating the respective segments through which the electrical circuit may be completed.

6. Apparatus as described in claim 3, wherein said contactor arm is mounted on a slidable and rotatable shaft, a knob to rotate said shaft, and a plunger knob which is adapted to be depressed thereby to move said shaft axially for selective engagement of said contactor arm with said spring segments.

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