

July 28, 1959

W. RIECKMAN

2,897,376

CODE SET KEYLESS STARTER FOR AUTOMOBILES

Filed Sept. 4, 1958

2 Sheets-Sheet 1

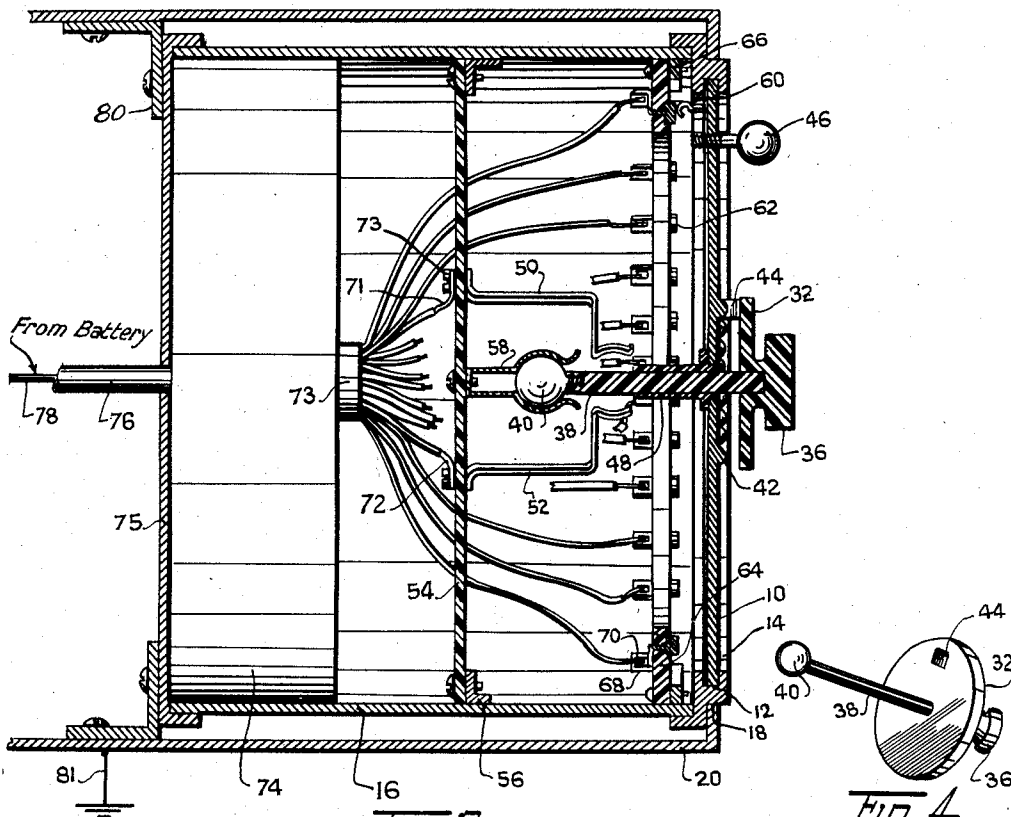


Fig. 2.

→ 2

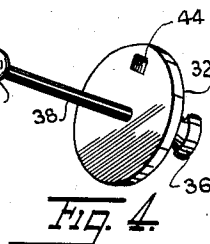


Fig. 4.

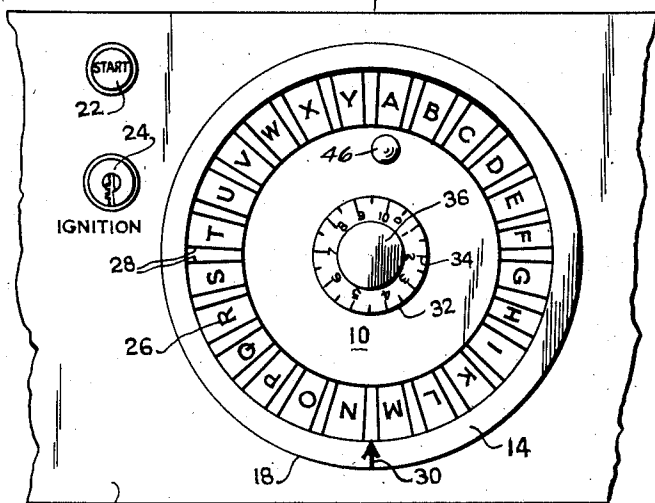


Fig. 1.

→ 2

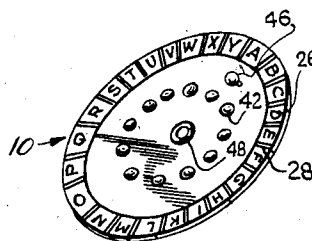


Fig. 3.

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2 Sheets-Sheet 2

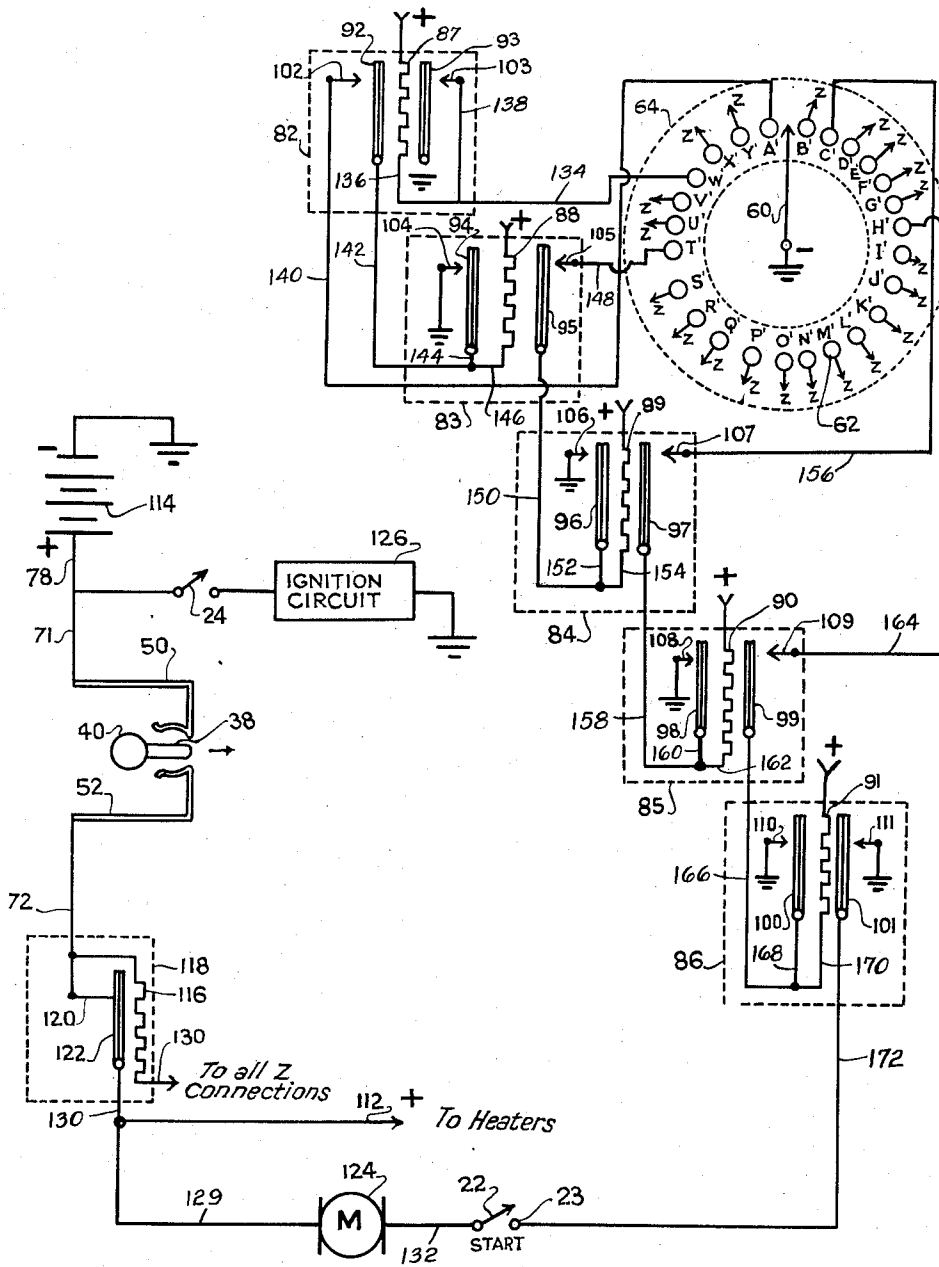


Fig. 5.

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CODE SET KEYLESS STARTER FOR
AUTOMOBILES

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5 Claims. (Cl. 307—10)

This invention relates to control devices and more particularly to the electrical operation of a starter circuit in a motor vehicle.

A principal object of the invention is to provide a control system which is simple in construction and yet which may be operated by authorized persons without permitting operation by unauthorized persons.

A further object is to provide a dial operated control system for a starter circuit.

A still further object is to provide a control system including a plurality of safeguards against operation by unauthorized persons.

Another object is to provide a control system including sequentially operated thermal delay relays operated in conjunction with coded wiring.

In accordance with the present invention a dial is provided for closing a plurality of relay circuits in a prescribed or coded sequence. Each relay circuit must remain closed a certain minimum time before the next relay circuit in the sequence is closed. If an unauthorized person attempts to operate the system and turns the dial to an incorrect position which is not in the prescribed code the system becomes reset by a thermal delay relay after the dial remains in the incorrect position for a prescribed time. The system will become reset by the thermal delay relay even if the unauthorized person takes an unduly long time to position the dial in the correct sequence, should this person accidentally learn the code of the system. According to the invention there is further provided another dial which appears to require manipulation in order to work the code of the system, but actually the second dial serves as a safety and interlock switch and is not employed in the coding of the system.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is an elevational view of the device as installed on the dashboard of a motor vehicle.

Fig. 2 is an enlarged sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a perspective view of the main coding dial of the device.

Fig. 4 is a perspective view of the safety dial.

Fig. 5 is a diagram of the electrical circuit of the device.

Referring to Figs. 1, 2 and 3, there is shown a circular dial 10 made of metal. The dial is mounted for rotation in a groove 12 of a circular detachable rim 14 of a cylindrical case 16, best shown in Fig. 2. The rim 14 is engaged in an opening 18 of a dashboard 20 of a motor vehicle. This dashboard also carried a starter switch 22 and an ignition lock-switch 24.

Dial 10 is marked with a series of code symbols 26 preferably letters of the alphabet, in this instance there

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being twenty-five letters A—Y. Pairs of index lines 28 separate the letter spaces and indicate neutral positions of the dial with respect to index mark 30 on the rim 14. A second dial 32 made of insulation material is rotatably carried by dial 10. This dial has various index marks or symbols 34 at its peripheral edge. The dial 32 has a knob 36. This dial, as best shown in Figs. 2 and 4 carries a shaft 38 made of insulation material. Attached to the free end of the shaft is a metallic, movable ball switch contact element 40.

Dial 10, as most clearly shown in Figs. 2 and 3, has a series of bumps or projections 42 arranged concentrically with the center of the dial and extending outwardly so that they may be engaged by a finger 44 extending from the underside of dial 32. An insulating knob is threadedly mounted on dial 10 for turning the dial. An insulated sleeve 48 is secured at the center of dial 10 in which shaft 38 is rotatably journaled. Both dial 32 and shaft 38 can be pulled outwardly axially from the innermost position shown in Fig. 2, until the movement is stopped by the inner free end of sleeve 48 being met by ball 40 at which point the ball will be engaged by curved fingers of two stationary leaf spring switch contacts 50, 52. These contacts are disposed in an electric circuit to be described which is normally open circuited by the separation of the contacts. When contacts 52 and 54 are engaged by the ball contact this circuit is closed. The ball and springs act as a safety and interlock switch in the circuit. Spring contacts 50, 52 are carried on an insulated bar 54 extending diametrically across the case 16 and is held by brackets 56. A metal spring catch member 58 is also secured centrally to bar 54. This catch member is not connected in the electrical circuit and only serves to hold the ball 40 in its innermost position. The catch has curved fingers which hold ball 40 loosely so that the shaft, ball and dial 32 can rotate freely. Rotation of the dial 32 in this innermost position of the ball is only limited by engagement of finger 44 between the projections 42 so that the dial 32 rotates with a clicking sound and detent action with respect to dial 10 if dial 10 is manually held against rotation by grasping knob 46. If the knob is not held, dial 10 will rotate with dial 32 when this dial is in its innermost position.

When the dial 32 is in its outermost position, finger 44 is clear of projections 42 so that dial 10 rotates freely, being limited only by the contact of a spring metal switch contact element 60 with fixed metal switch contacts 62. Contact element 60 is mounted on the inner side of dial 10 and extends inwardly to make contact with a circular array of contact elements 62 mounted in an insulated ring 64 secured to the inner wall of the case. Arcuate brackets 66 retain the ring on the case. Each element 62 has a metal lug 68 to which is connected a wire 70 in the circuit of the device. Other circuit wires 71 and 72 are connected to screws 73 which hold spring contacts 50, 52 on bar 54. All the wires are insulated and are brought together at a tubular nipple 73 at the center of a relay housing 74. This housing is preferably a closed cylindrical container secured to the bottom cover 75 of the case, so that the relays therein cannot be tampered with by unauthorized persons. A cable 76 carrying a wire 78 enters housing 74 through the cover 75 at the rear of the device. Brackets 80 secure the device to top and bottom walls of the dashboard 20. The dashboard as well as the metal cover 75, casing 16, rim 14 and dial 10 are electrically grounded as indicated at 81 in Fig. 2.

The circuit shown in Fig. 5, includes five thermal delay relays 82—86 enclosed in housing 74. These relays have heater coils 87—91, respectively. Each relay has two bimetallic movable contact elements designated 92—93, 94—95, 96—97, 98—99 and 100—101. The bimetallic elements are normally out of contact with associated

fixed contact elements 102-111, respectively. All heaters have one terminal connected to a positive or high voltage terminal 112 in the circuit.

Battery 114 provides power to the circuit. The positive or high voltage end is connected via wire 78 to wire 71 which terminates at spring contact 50. Contact ball 40 is arranged as explained in connection with Figs. 2 and 4 to close the normally open circuit between spring contacts 50 and 52. Wire 72 is connected from spring contact 52 to heater 116 of another and slower acting thermal delay relay 118. Wire 72 is also connected to fixed contact 120. This contact is normally connected with the contact element 122 in relay 118. Element 122 is connected to terminal 112. Thus, when movable ball contact 40 closes the circuit through contacts 50 and 52, the high voltage side of the battery is connected to all relay heaters 87-91 through closed contacts 120, 122.

The starter motor 124 of the motor vehicle is connected to contact element 122 by wires 129 and 130 and is in series with the starter switch 22 by wire 132. The negative side of the battery is grounded. Contact 60 of the dial 10 is also grounded through the case of the device and the dashboard of the vehicle as above mentioned. An independent ignition circuit 126 is connected to the battery via the ignition switch 24.

The circuit shown in Fig. 5 is arranged for a predetermined code based upon any arbitrary selection of five different letters. If a code of more or less than five letters is required then the number of thermal delay relays will be correspondingly increased or decreased. The code arbitrarily selected for convenience in illustrating the circuit is the common word W-A-T-C-H. The fixed contacts 62 on ring 64 are arbitrarily assigned letter symbols A'-Y' corresponding to the letter symbols A-Y indicated at 26 on dial 10. Thus, when contact 60 on dial 10 contacts the W' contact on ring 64, the letter W on dial 10 is located at the index mark 30 on rim 14. The same applies to all the other letter symbols on dial 10. The first contact 62 of the pre-selected code, in this case the contact symbol W' assigned to letter W, is connected to heater coil 87 by wires 134 and 136 and to contact 103 by wires 134 and 138. The second contact, in this case symbol A', is connected to relay contact 102 by wire 140. Element 93 is grounded and element 92 is connected to contact 94 by wires 142 and 144 and to heater 88 by wires 142 and 146. Contact 104 is grounded and contact 105 is connected to the third or symbol T' contact by wire 148. Element 95 is connected to element 96 by wires 150 and 152 and to heater 89 by wires 150 and 154. Contact 106 is grounded and contact 107 is connected to the fourth code contact C' by wire 156. Element 97 is connected to element 98 by wires 158 and 160 and to heater 90 by wires 158 and 162. Element 108 is grounded and element 109 is connected to the fifth code contact H' by wire 164. Element 99 is connected to element 100 by wires 166 and 168 and to heater 91 by wires 166 and 170. Contacts 110 and 111 are grounded. Element 101 is connected to fixed terminal 23 at the start switch by wire 172. All the other twenty contacts 62 carried on ring 64 are connected to Z terminal 130 of the heater 116 in relay 118.

In operation of the device, an authorized person will first pull dial 32 outwardly so that ball contact 40 closes the circuit through contacts 50 and 52. This enables the coded circuit for operation. The dialing of the code word should now begin promptly. If a delay is to occur in beginning the dialing the dial 10 should be set at a neutral position between two lines 28 so that the circuit can remain alert for beginning of dialing. Dialing will begin in the system illustrated by setting dial 10 at letter W. The dial should remain in this position a sufficient time for the heater to warm up in order to close contacts 92, 102 and 93, 103. It is preferred that the relays 82-86 be relatively quick acting

and have operating times of one to five seconds. After a pause at this first letter position, the dial is set at each of the other letter positions in turn with a similar pause at each letter position. The dial may be left at the last letter position but is preferably set at a neutral position to ready the dial for the next coding operation.

When the first relay 82 has heated its contacts close in the conventional manner of thermal delay relays employing bi-metallic contact elements. The closing of contacts 93 and 103 effects completion of a power supply holding circuit which permits the heater coil 87 to remain continuously energized even though the operator turns dial 10 away from the first letter position W. The closure of contacts 92, 102 completes a circuit from the second code contact A', so that when the dial is set at the second position heater 88 is energized. After the required delay period of one or more seconds the contacts in relay 83 close. Again a holding circuit is completed for this relay through closed contacts 94, 104 while closed contacts 95, 105 complete a circuit from the third code contact T' to the heater 89 in the third relay. Thus, it will be noted that actuation of each preceding relay must occur before the next relay in the sequence can be operated. A similar action takes place for the fourth relay in which contacts 98, 108 provide the holding circuit for heater 90. Contacts 100, 110 provide the holding circuit for heater 91. Contacts 97, 107 complete the circuit for the fourth code contact C' and contacts 99, 109 complete the circuit for the fifth code contact H'. Contacts 101, 111 are closed upon actuation of relay 86 at the end of the dialing of the code and close the circuit to the start switch 22. The start circuit is then in a position for operating the start motor 124 upon manual closing of the start switch 22. If the operator delays in starting the motor, the circuit will remain active and alert awaiting this action. The ignition circuit will be closed independently through its lock switch 24 while the start circuit switch is closed to operate motor 124.

After the motor is started or the operator discontinues the starting effort, he must push dial 32 inwardly to disengage ball contact 40, whereupon the power supply to all heaters will be cut off and the closed contacts in the five relays 82-86 will open.

The thermal delay relay 118 remains inactive if dialing proceeds properly with the prescribed pause at each of the code positions. If an unauthorized person should try to operate the device he would have to know that safety dial 32 must be pulled to its outer position. If he did not do so the circuit would remain inactive while he turned dial 32 with respect to dial 10, either or both of the dials independently or separately. Turning dial 32 when the dial is pushed in indicates to an authorized person that the circuit has been deactivated, if dial 10 turns with dial 32 or if dial 32 turns with respect to dial 10 with the clicking sound produced by passage of finger 44 past projections 42.

If the unauthorized person should attempt to operate the device with the dial pulled outwardly to close contacts 50, 52 electrically, he would have to know the code word. If he did not know the code and turned the dial 10 repeatedly with or without pausing at the uncoded contacts connected to heater 116, this heater would gradually warm up to open contacts 120, 122 and the circuit would become deactivated. If he paused at any uncoded contact for a length of time necessary to actuate relay 118, the relay would open contacts 120, 122 at this time. It will be noted that an integrating effect is obtained in the heating of the relay 118 since each time contact 60 crosses over one of the uncoded contacts 62 a pulse is delivered to heater 116 which raises its temperature.

In the normal dialing operation, it will take less than one second to turn from one of the prescribed code contact positions to the next. Since dial 10 is turned no more than five times, not more than five seconds of heating will

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be applied to relay 118. Relay 118 should be a slower acting relay having a delay time of three or four times the total normal transition times between dial code positions. This longer delay time provides a sufficient safety factor so that if the authorized operator is slow in dialing the code sequence relay 118 will not be activated, but if the operator is unduly slow so that twenty or more seconds are required to turn between the various prescribed code positions, then relay 118 will be actuated and the dialing circuit will open. Then it will be necessary to turn dial 10 to a neutral position or to the first code position and wait until heater 122 cools down sufficiently to close contacts 120, 122 when dialing can begin again.

There has thus been incorporated in the system, a means for insuring that unauthorized persons cannot operate the system without first operating the safety dial to close the interlock switch 50, 52, and then dialing the code with sufficient speed between code positions and with proper pauses at each code position.

If it is desired to change the code of the system, the device must be removed from the dashboard and rim 14 taken off so that dial 10 can be pulled off of casing 16 to expose the wires 70. Those wires 70 which are connected to the existing code contact terminals 68 must be removed and attached to the newly selected terminals and all the remaining terminals 68 should be connected to the Z terminal 130. The wires can be detached and reconnected to terminals 68 without removing ring 64 from the casing but the ring can be removed if desired.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. A control device for activating a starting circuit in a motor vehicle including a series connected starter motor and a starter switch, comprising a rotatable dial positionable in a plurality of positions, certain of said positions constituting a predetermined coded sequence, means operatively connecting said dial and circuit whereby said circuit is closed upon rotation of said dial to each of said certain positions in said predetermined coded sequence, said means comprising a second dial having a safety switch disposed in said circuit for normally deactivating the circuit, said safety switch being operable to close said circuit for rotating the first-named dial to said certain positions in turn, said means further comprising a series of electric time delay relays, each of said relays including a relay circuit, a plurality of contact elements arranged circularly, certain of said elements being connected respectively to the relay circuits, the first-named dial being positioned to close said relay circuits in said predetermined coded sequence, and a power supply source connected to said starting circuit in circuit with the last relay in said series of relays, said power supply source being directly connected to said starter motor and starter switch when said last relay is actuated.

2. A control device for activating a starting circuit in a motor vehicle including a series connected starter motor and a starter switch, comprising a rotatable dial positionable in a plurality of positions, certain of said positions constituting a predetermined coded sequence, means operatively connecting said dial and circuit whereby said circuit is closed upon rotation of said dial to each of said certain positions in said predetermined coded sequence, said means comprising a second dial having a safety switch disposed in said circuit for normally deactivating the circuit, said safety switch being operable to close said circuit for rotating the first-named dial to said certain positions in turn, said means further com-

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prising a series of electric time delay relays, each of said relays including a relay circuit, a plurality of contact elements arranged circularly, certain of said elements being connected respectively to the relay circuits, the first-named dial being positioned to close said relay circuits in said predetermined coded sequence, a power supply source connected to said starting circuit in circuit with the last relay in said series of relays, said power supply source being directly connected to said starter motor and starter switch when said last relay is actuated, and another time delay relay connected in said starting circuit, said other time delay relay being connected to others of said contact elements and operative to open said starting circuit when the first-named dial is in other positions than said certain positions.

3. A control device for activating a starting circuit in a motor vehicle including a series connected starter motor and a starter switch, comprising a rotatable dial positionable in a plurality of positions, certain of said positions constituting a predetermined coded sequence, means operatively connecting said dial and circuit whereby said circuit is closed upon rotation of said dial to each of said certain positions in said predetermined coded sequence, said means comprising a second dial having a safety switch disposed in said circuit for normally deactivating the circuit, said safety switch being operable to close said circuit for rotating the first-named dial to said certain positions in turn, said means further comprising a series of electric time delay relays, each of said relays including a relay circuit, a plurality of contact elements arranged circularly, certain of said elements being connected respectively to the relay circuits, the first-named dial being positioned to close said relay circuits in said predetermined coded sequence, a power supply source connected to said starting circuit in circuit with the last relay in said series of relays, said power supply source being directly connected to said starter motor and starter switch when said last relay is actuated, and another time delay relay connected in said starting circuit, said other time delay relay being connected to others of said contact elements and operative to open said starting circuit when the first-named dial is in other positions than said certain positions, said other time delay relay and said series of relays each including a heater element, at least one bimetallic element and at least one fixed element adapted to contact said bimetallic element.

4. A control device for activating a starting circuit in a motor vehicle including a series connected starter motor and a starter switch, comprising a rotatable dial positionable in a plurality of positions, certain of said positions constituting a predetermined coded sequence, means operatively connecting said dial and circuit whereby said circuit is closed upon rotation of said dial to each of said certain positions in said predetermined coded sequence, said means comprising a second dial having a safety switch disposed in said circuit for normally deactivating the circuit, said safety switch being operable to close said circuit for rotating the first-named dial to said certain positions in turn, said means further comprising a series of electric time delay relays, each of said relays including a relay circuit, a plurality of contact elements arranged circularly, certain of said elements being connected respectively to the relay circuits, the first-named dial being positioned to close said relay circuits in said predetermined coded sequence, a power supply source connected to said starting circuit in circuit with the last relay in said series of relays, said power supply source being directly connected to said starter motor and starter switch when said last relay is actuated, and another time delay relay connected in said starting circuit, said other time delay relay being connected to others of said contact elements and operative to open said starting circuit when the first-named dial is in other positions than said certain positions, said series of relays each including a heater element, two bimetallic

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elements, and two fixed contact elements normally open and out of contact respectively with the bimetallic elements, one of the bimetallic elements and one of the fixed contact elements constituting a holding circuit for said heater element in each relay in said series of relays.

5. A control device for activating a starting circuit in a motor vehicle including a series connected starter motor and a starter switch, comprising a rotatable dial positionable in a plurality of positions, certain of said positions constituting a predetermined coded sequence, means operatively connecting said dial and circuit whereby said circuit is closed upon rotation of said dial to each of said certain positions in said predetermined coded sequence, said means comprising a second dial having a safety switch disposed in said circuit for normally deactivating the circuit, said safety switch being operable to close said circuit for rotating the first-named dial to said certain positions in turn, said means further comprising a series of electric time delay relays, each of said relays including a relay circuit, a plurality of contact elements arranged circularly, certain of said elements being connected respectively to the relay circuits, the first-named dial being positioned to close said relay circuits in said predetermined coded sequence, a power supply

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source connected to said starting circuit in circuit with the last relay in said series of relays, said power supply source being directly connected to said starter motor and starter switch when said last relay is actuated, and another time delay relay connected in said starting circuit, said other time delay relay being connected to others of said contact elements and operative to open said starting circuit when the first-named dial is in other positions than said certain positions, said series of relays each including a heater element, two bimetallic elements, and two fixed contact elements normally open and out of contact respectively with the bimetallic elements, one of the bimetallic elements and one of the fixed contact elements constituting a holding circuit for said heater element in each relay in said series of relays, the other bimetallic element and the other fixed contact element providing means for completing a power supply circuit to the heater element in each succeeding relay in said series of relays.

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