March 3, 1953 R. W. HEPT 2,630,502

COMBINED STARTER AND IGNITION SWITCH

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Fig. 2

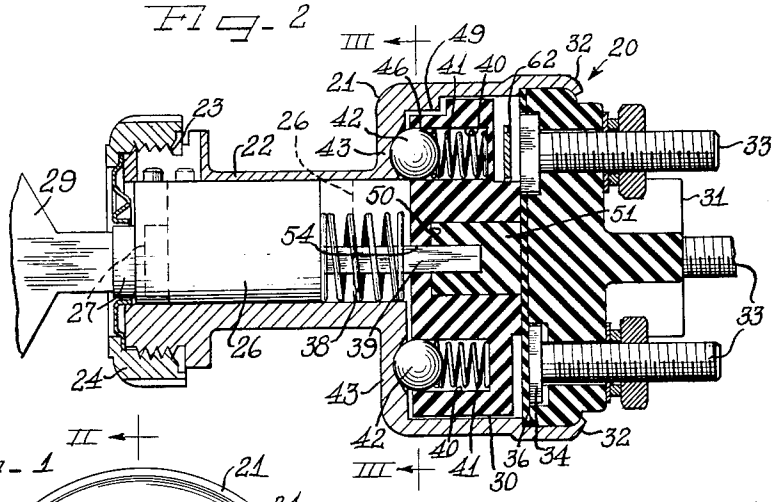


Fig. 1

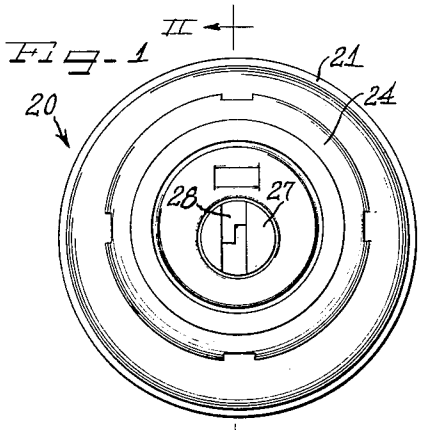


Fig. 3

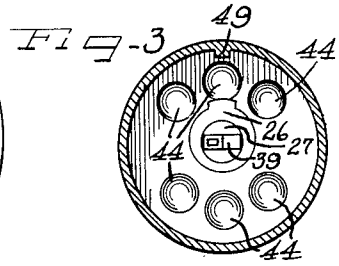


Fig. 5

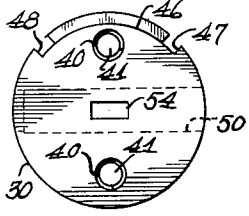


Fig. 6

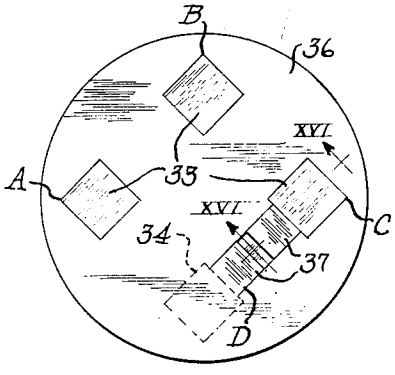
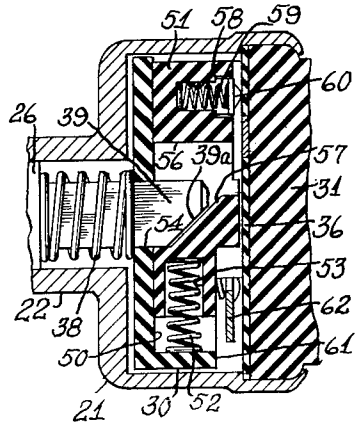


Fig. 4



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COMBINED STARTER AND IGNITION SWITCH

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Fig. 7

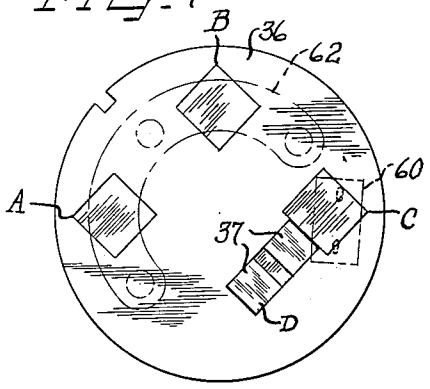


Fig. 8

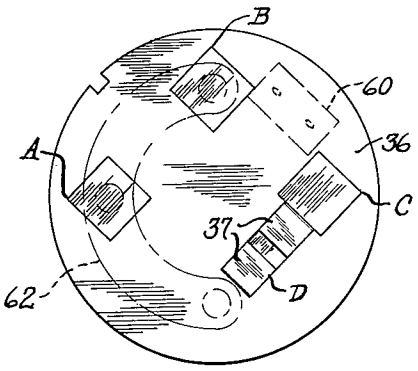


Fig. 9

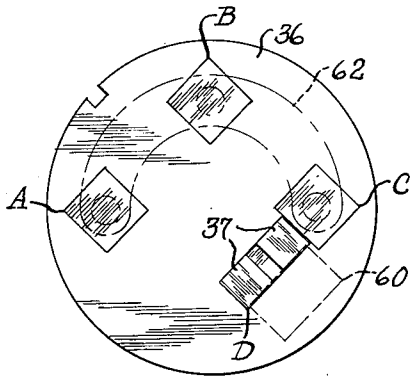


Fig. 10

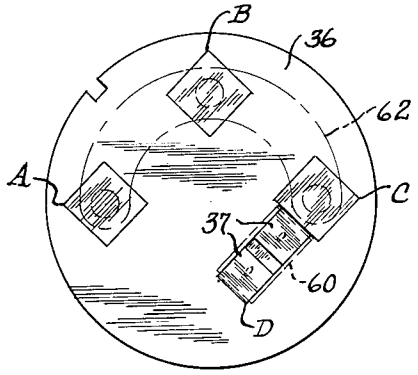


Fig. 16

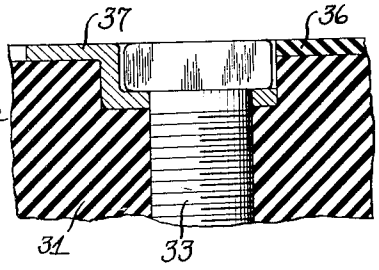


Fig. 14

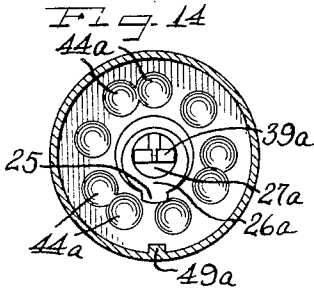
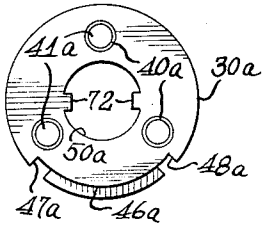


Fig. 15



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Fig. 11

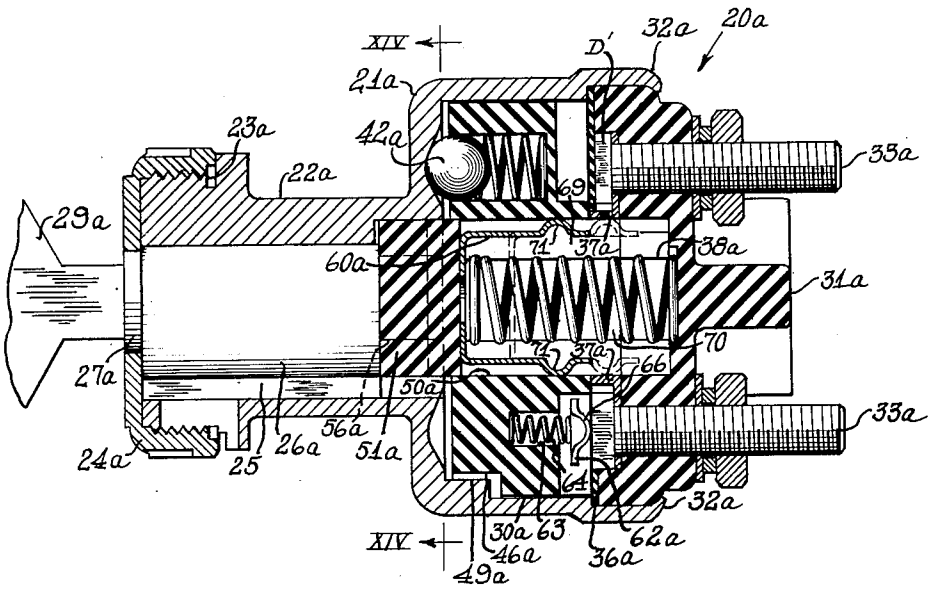


Fig. 12

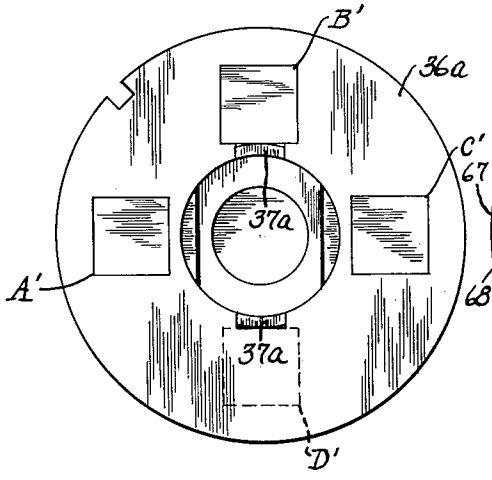
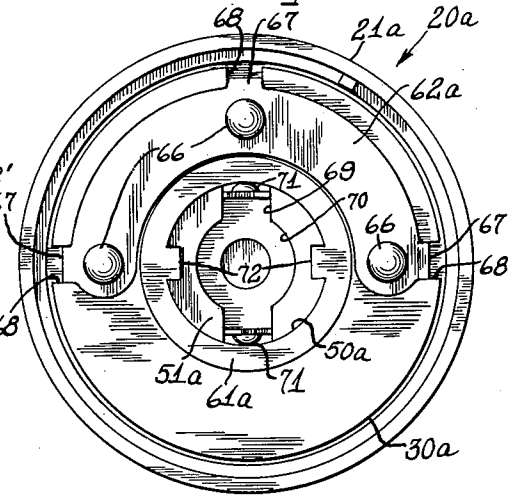


Fig. 13



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2,630,502

UNITED STATES PATENT OFFICE

2,630,502

COMBINED STARTER AND IGNITION SWITCH

Ralph W. Hept, Dayton, Ohio, assignor to Kingston Products Corporation, Kokomo, Ind., a corporation of Indiana

Application February 15, 1951, Serial No. 211,065

7 Claims. (Cl. 200—44)

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This invention relates generally to composite switch mechanisms and more particularly to a combined starter-ignition-accessory switch for the electrical system of an automotive vehicle.

According to the principles of the present invention, a composite ignition-starter-accessory switch is provided including a rotatable carrier having means to complete an ignition circuit or an accessory circuit upon selected predetermined rotation thereof, and a second carrier is slidably mounted in the first carrier with means thereon adapted to complete a starter circuit upon predetermined translation thereof. The switch components are drivingly connected to a key-actuated lock which includes rotatable and translatable elements to selectively rotate the first carrier and displace the second carrier.

It is an object of the present invention to provide an improved switching structure which is composite in character so as to efficiently and selectively control the ignition, accessory and starter electrical circuits of an automotive vehicle.

Another object of the present invention is to provide a composite ignition-starter switch having a key-actuated lock rotatably and reciprocably actuatable in a turn-push sequence to sequentially close an ignition circuit and thereafter selectively control a starter motor circuit.

A further object of the present invention is to provide a novel and improved composite switch structure which is made from a reduced number of simplified elements and which is easy to operate and economical to produce.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheets of drawings upon which preferred forms and structural embodiments of composite switch structures incorporating the principles of my invention are set forth.

On the drawings:

Figure 1 is a cross-sectional view with parts shown in elevation and with parts broken away taken substantially on line II—II of Figure 1;

Figure 2 is a cross-sectional view with parts shown in elevation and with parts broken away taken substantially on line II—II of Figure 2;

Figure 3 is a fragmentary cross-sectional view with parts shown in elevation and with parts removed taken substantially on line III—III of Figure 2;

Figure 4 is a fragmentary cross-sectional view

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showing additional details of construction of the structure provided in Figure 2 and taken on a plane substantially at right angles to the cross-sectional plane of Figure 2;

Figure 5 is a reduced end elevational view of a carrier member employed in the apparatus;

Figure 6 is an elevational view of the base member showing the disposition of the contact terminals thereon;

Figures 7, 8, 9 and 10 are similar to Figure 6 but show in phantom the bridging contact elements mounted on the first and second carriers of the switch structure positioned as such contacts would be located in various operational positions of the switching mechanism components;

Figure 11 is a cross-sectional view with parts shown in elevation and with parts broken away showing an alternative form of switching structure provided in accordance with the present invention;

Figure 12 is an elevational view of the base member provided for the switching structure shown in Figure 11;

Figure 13 is an end elevational view looking into the open end of the switch structure housing of Figure 11 before assembly of the base member therewith and showing the carrier components positioned in the housing;

Figure 14 is a reduced cross-sectional view with parts removed for the sake of clarity and with parts shown in elevation taken substantially on line XIV—XIV of Figure 11;

Figure 15 is an end elevational view of the carrier member employed in the switching structure of Figure 11; and

Figure 16 is an enlarged fragmentary cross-sectional view taken substantially on line XVI—XVI of Figure 6.

As shown on the drawings:

A composite switching structure is indicated generally by the reference numeral **20** and includes a housing **21** of generally cylindrical configuration terminating at one end in a reduced diameter neck **22** threaded as at **23** to receive a cap **24**.

In the neck **22** is situated a barrel **26** reciprocatorily slidable in the neck **22** and rotatably carrying a cylinder **27** having a keyhole opening **28** to receive a key **29** operably conforming to the tumbler pattern of the tumblers (not shown) contained within the cylinder **27**.

A first carrier indicated generally by the reference numeral **30** is positioned within the housing **21** and a base member closes the open end of the housing **21**, the edges of the housing **21** be-

ing peened over as at 32 to retain the switching components in assembly with one another.

The base member 31 comprises an electrically non-conductive material shaped to conform to the configuration of the housing 21 and suitably apertured to seat a plurality of terminal posts 33. In the embodiment of Figure 2, there are four terminal posts 33, one of the terminal posts having a head portion of reduced thickness such as at 34 (Figure 2). An insulating washer 36 is provided with three spaced apertures, two of which receive the heads of two of the corresponding terminal posts 33 and the other being enlarged to receive one of the heads of the terminal posts 33 as well as to receive and expose the ends of a pair of jumpers 37 connected to two of the terminal posts 33.

Referring particularly to Figures 6 and 16, it will be noted that each of the jumpers 37 includes a bent clip member suitably apertured to receive a terminal post 33 and having a contact portion offset to lie flush with the surface of the insulating washer 36.

The barrel 26 is normally retained in the position shown in Figure 2 by a resilient biasing means such as a coil spring 38 interposed between the barrel 26 and the first carrier member 30. Through the center of this coil spring 38 extends a stem 39 which is connected to the cylinder 27 so as to be co-rotatable therewith and co-reciprocable with the barrel 26. The end of the stem 39 is provided with a camming surface 39*a*, the purpose of which will become manifest presently.

Referring particularly to Figures 2, 3, 4 and 5, it will be noted that the first carrier 30 comprises a generally cylindrical block of electrically non-conductive material. On one face of the block, a pair of recesses 40 are provided each of which seating a coil spring 41 arranged to resiliently urge a ball 42 toward a radially extending wall 43 located between the enlarged section of the housing 21 and the neck 22.

The wall 43 is provided with a plurality of radially spaced apart detent recesses 44 arranged to receive the balls 42 and together with the springs 41 comprising a spring biased detent means to retain the first carrier 30 in selected angular position relative to the housing 21.

An arcuate clearance 46 is provided along one edge of the first carrier 30 to provide a pair of radially spaced-apart shoulders 47 and 48 effectively cooperable with a lug 49 formed as an integral part of the housing 21 to provide limiting means controlling the amount of angular adjustment of the carrier 30 in the housing 21.

A generally rectangular slot 50 is cut out of the opposite face of the carrier 30 and slidingly receives a second carrier 51 therein, the second carrier 51 being laterally translatable along a reciprocatory path relative to the turning axis of the carrier 30 against the bias of a coil spring 52 having one end received in a recess 53 formed in the second carrier 51 and the other end abuttingly engageable with the carrier 30 at the end of the slot 50.

An opening 54 is provided in the carrier 30 to receive the stem 39 and an opening 56 is formed in the second carrier 51 to lie in registry with the opening 54. As will be noted on Figure 4, the opening 56 is of irregular configuration, thereby to provide a camming surface 57 cooperable with the camming surface 39*a* formed on the end of the stem 39. Thus, as the stem 39 is plunged inwardly by movement of the barrel 26 inwardly against the bias of the spring 38, the second carrier 51 will be laterally displaced along its path of reciprocation in the slot 50 against the bias of the spring 52.

A recess 58 is provided in the second carrier 51 to seat a coil spring 59, the free end of the spring 59 engaging a U-shaped bridging contact member 60.

The carrier 30 is also recessed as at 61 to accommodate a spring-biased bridging contact member 62, the structural details of which being similar to a bridging contact member to be described in connection with the embodiments of Figures 11 and 13. In Figures 7, 8, 9 and 10, the bridging contact member 60 and the bridging contact member 62 are shown in phantom in relation to their respective positions when cooperating with the heads of the binding posts 33.

The operational characteristics of the composite switching structure 20 can best be understood by referring to Figures 6–10. For the sake of clarity, the head portions of the terminal posts 33 which form spaced-apart contact members adapted to be selectively bridged by the bridging contact members 60 and 62 carried on the carriers 30 and 51 are each indicated by one of the reference characters A, B, C and D. Since the head portion 34 of one of the binding posts 33 is insulated by the insulating washer 36, the reference character D is applied to the jumper 37 associated therewith.

In Figure 7, the switching components are shown in "off" position. It may be noted that the bridging contact member 62 is provided with a plurality of depressed toe portions to promote intimate electrical engagement with the contacts A, B and C and also to sufficiently space the body portion of the bridging contact member 62 away from the contacts A, B and C so as to avoid possible short circuiting. Thus, in the Figure 7 "off" position, the toe portions of the bridging contact member 62 are each situated in an inactive location and the bridging contact member 60 merely engages the contact C and therefore effects no bridging function.

It will be understood that although the principles of the present invention are as general application, the composite switching structure 20 finds a particularly useful application when employed to control various circuits of an automotive electrical system. In an automotive electrical system, it is frequently desirable to separately energize an accessory circuit without concurrently energizing other electrical circuits, for example, the ignition circuit.

To facilitate such procedure, the key 29 may be turned to the left, thereby angularly displacing the barrel 26 which, in turn, through the stem 39 rotatably drives the first carrier 30, whereupon the bridging contact member 62 will complete an electric circuit between the contacts A and B to which may be connected the leads of the accessory circuit. In this position, the bridging contact member 60 moves to an inactive position.

In order to concurrently energize both the accessory circuit and the ignition circuit of an automotive electrical system, the key 29 may be turned to the right whereupon the barrel 26 will be angularly displaced and, together with the stem 39, will drive the first carrier 30 through a predetermined angular distance whereupon the bridging contact member 62 will complete a closed circuit between the contacts A, B and C to which the ignition and accessory circuit leads may be connected. It will be noted that in this position the bridging contact member 60 is in an inactive po-

sition but is positioned opposite the jumper elements 37.

In order to complete the electric circuit to the starter motor, the key 29 is plunged inwardly, whereupon the barrel 26 will be slidably displaced in the neck 22 against the compression of the coil spring 38. This movement is shown in Figure 1 where the initial position of the barrel 26 is shown in full lines and the innermost position is shown in dotted lines. The cylinder 27 and the stem 39 will be carried along therewith so that the cam surface 39a on the end of the stem 39 will drivingly engage the cam surface 57 on the second carrier 51 to laterally displace same against the compression of the coil spring 52. By so doing, the bridging contact member 60 will be moved into the position shown in Figure 10 to effectively complete the electric circuit between the contact D and the contact C by bridging the jumper elements 37. It will be understood that the starter motor will be connected in circuit with the contacts C and D.

Upon release of the key 29, the spring 38 will drive the barrel 26 to its initial position and the coil spring 52 will again return the second carrier 51 to its initial position whereupon the components of the switching mechanism will be restored to the position shown in Figure 9.

In Figure 11 is shown an alternative structural embodiment of the composite switching structure 20 which is provided in accordance with the principles of the present invention. Where possible, similar reference numerals distinguished by the suffix "a" will be used to identify the components of this alternative embodiment.

The switch structure is indicated generally by the reference numeral 20a and includes a housing 21a having an enlarged portion and a reduced diameter neck 22a terminating in a threaded portion 23a and closed by a cap 24a engageable with the threaded portion 23a.

A lock is provided having a barrel 26a slidable in the bore of the neck 22a and including a polarizing rib 25 received by a suitable groove formed in the bore of the neck 22a to prevent relative rotation between the barrel 26a and the neck 22a.

A cylinder 27a is rotatably carried in the barrel 26a and contains the usual tumblers (not shown) to cooperate with the key 29a.

Positioned within the housing 21a is a first carrier 30a and the end of the housing 21a is closed by a base member 31a tightly gripped by the turned-over portions 32a formed on the housing 21a after the switching apparatus components are in assembled relationship.

Four terminal posts 33a are provided in the base member 31a in spaced-apart relationship to one another, each of the terminal posts 33a having an enlarged head portion forming a contact member indicated on Figure 12 by the reference characters A', B', C' and D', respectively.

An insulating washer 36a suitably apertured to expose the contacts A', B' and C' engagingly abuts the base member 31a and covers the contact D'.

The first carrier 30a comprises a ring of electrically non-conductive material and is provided with a central aperture 50a extending therethrough to slidably receive a second carrier 51a.

As shown in Figure 15, one face of the carrier 30a is provided with a plurality of equally spaced-apart recesses 40a in each of which a coil spring 41a is seated. One edge of the carrier 30a is also recessed as at 46a to provide a pair of radially spaced-apart shoulders 47a and 48a, the recess 46a being adapted to cooperate with a lug 49a provided in the housing 21a for the purpose of limiting the relative angular displacement between the carrier 30a and the housing 21a.

The opposite face of the carrier 30a is characterized by an annular rib 61a as well as a plurality of spaced-apart recesses 63 each seating a small coil spring 64, the coil spring 64, in turn, resiliently mounting a bridging contact member 62a. The bridging contact member 62a is of general arcuate configuration and comprises a generally U-shaped segment having a plurality of depressed toe portions 66 which not only promote good electrical engagement with the contacts A', B' and C' but also furnish seating recesses for the coil springs 64. A plurality of clip portions 67 are turned over along one edge of the bridging contact member 62a to be received by correspondingly spaced slots 68 formed in the carrier 30a, the inside edge of the contact members 62a being adjacent the annular rib 61a.

The second carrier 51a comprises a generally cylindrical member having a slot 69 cut thereinto to receive a U-shaped bridging contact member 60a, the slot 69 being enlarged by a central bore 70 to receive a coil spring 38a which operates between the base member 31a and the second carrier 51a. It will be noted that two of the terminal posts 33a are provided with jumpers 37a arranged to electrically engage bent-out toe portions 71 formed in opposite legs of the U-shaped contact member 60a.

The sides of the second carrier 51a and the aperture 50a of the first carrier 30a are provided with mating polarizing means as at 72 to prevent relative rotation therebetween and to guide the second carrier 51a as it slides along its reciprocatory path through the first carrier 30a.

Referring to Figure 11 in connection with Figure 14, it will be noted that the end of the second carrier 51a is provided with a recess 56a adapted to receive a stem 39a connected to the cylinder 27a. Thus, when the stem 39a is rotated, the second carrier 51a will be turned thereby and will, in turn, also rotate the first carrier 30a. The coil spring 38a will normally drive the second carrier 5 a into engagement with the barrel 26.

It will also be noted that a wall 43a is provided between the enlarged portion of the housing 21a and the neck 22a, the wall being provided with a plurality of detents 44a to receive balls 42a, one ball 42a being seated on each of the springs 41a in the recesses 40a.

It will be understood that the operation of the composite switching mechanism 20a will be generally similar to that previously described in connection with the composite switching structure 20, with the possible exception that in plunging the key 29a inwardly, for example, to complete a starting motor circuit, the barrel 26 will be slidably displaced against the compression of the spring 38a and the U-shaped contact member 60a will be moved from the full line position shown in Figure 11 to the dotted line position, at which time the contacts B' and D' will be effectively bridged through the jumpers 37a to complete the circuit leads connected to such contact members.

Although I have resorted to detail in the description of the preferred embodiment structurally incorporating the principles of my invention, it should be understood that I wish to embody within the scope of this patent all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A switching mechanism comprising a housing, a lock reciprocably mounted in said housing and having a rotatable key-actuated cylinder in said lock, a stem connected to said cylinder and extending inwardly into said housing, a rotatable carrier supported in said housing and adapted to be rotatably driven by said stem, means between said rotatable carrier and said housing to limit the angular movement thereof, spring biased detent means between one face of said rotatable carrier and said housing arranged to yieldingly retain said rotatable carrier in selected indexed angular positions, a slidable carrier, said rotatable carrier having a trackway to receive said slidable carrier, said slidable carrier being engaged by said stem for reciprocation in said trackway, means resiliently biasing said slidable carrier in one direction in said trackway, a base member in said housing, a plurality of contact terminals carried by said base member in spaced-apart relationship to one another, and bridging contact members carried by said rotatable carrier and said slidable carrier, said lock operably actuatable to rotate said bridging contact members together with said rotatable carrier and to displace said bridging contact members together with said slidable carrier in and out of contact engagement with said contact terminals.

2. A composite ignition - starter - accessory switch arrangement for the electrical system of an automotive vehicle, comprising, a key-actuated lock, said lock having cylinder means adapted to be rotatably displaceable in opposite directions from an off-reference position, a first angularly displaceable carrier driven by said cylinder means and having a trackway therein, bridging contact means on said first carrier, accessory circuit means having contact terminals arranged to be bridged upon predetermined angular movement of said cylinder means in one direction, ignition circuit means having contact terminals arranged to be bridged upon predetermined movement of said cylinder means in an opposite direction, and a slidable second carrier mounted in said trackway of said first carrier for reciprocable movement therein, said cylinder means being movable reciprocatorily on an axis normal to the plane of rotation thereof and being drivingly engageable with said second carrier to displace same, bridging contact means on said second carrier, and starter circuit means having contact terminals arranged to be bridged upon a predetermined sliding movement of said second carrier.

3. A switching mechanism comprising a housing, a lock reciprocably mounted in said housing and having a rotatable key-actuated cylinder in said lock, a stem extending inwardly into said housing and carried by said cylinder, a rotatable carrier in said housing and adapted to receive said stem for relative angular displacement with respect to said housing, said carrier having a lateral trackway therein, means between said carrier and said housing limiting relative angular displacement, spring-biased detent means between

said rotatable carrier and said housing to yieldingly retain said rotatable carrier in selected angular positions in said housing, a slidable carrier laterally reciprocable in said lateral trackway of said rotatable carrier, means resiliently biasing said slidable carrier in one direction in said trackway, a base member closing the end of said housing, a plurality of contact terminals on said base member and spring-biased bridging members cooperable therewith on each of said carriers, resilient means normally biasing said cylinder away from said carriers, and mating cam surfaces between the end of said stem and said slidable carrier to move said slidable carrier laterally upon translation of said stem, whereby said cylinder may be actuated to rotate said bridging contact members on said rotatable carrier and to displace said bridging contact members on said slidable carrier laterally in and out of contact engagement with said contact terminals in response to translatory motion thereof.

4. A composite ignition - starter - accessory switch arrangement as defined in claim 2, wherein said trackway is laterally disposed in said first carrier and said cylinder means and said second carrier are provided with complementary camming surfaces to drive said second carrier in said trackway upon reciprocation of said cylinder means.

5. A composite ignition - starter - accessory switch arrangement as defined in claim 2, wherein said trackway is provided by a slot formed in said first carrier and said second carrier and the bridging contact means thereon comprise a member conforming in shape to said slot and having a U-shaped bridging contact member thereon and being connected to said cylinder means.

6. A composite ignition - starter - accessory switch arrangement as defined in claim 2, wherein said first carrier comprises a ring and said trackway is provided by a central aperture extending through said ring, said second carrier comprising a member conforming in shape to said central aperture and being connected to said cylinder means.

7. A composite ignition - starter - accessory switch arrangement as defined in claim 2, wherein said first carrier comprises a generally cylindrical block and said trackway is formed by a slot provided in one face of the block disposed laterally with respect to the longitudinal axis of the block, said second carrier and said cylinder means having a right angle driving connection to reciprocate said second carrier laterally in said slot upon reciprocating said cylinder means longitudinally relative to said first carrier.

RALPH W. HEPT.

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