Nov. 24, 1931. W. H. COLLIER 1,832,857

MANUALLY CONTROLLED SWITCH FOR AUTOMOBILES

Filed Sept. 26, 1930 3 Sheets-Sheet 1

Fig. 1.

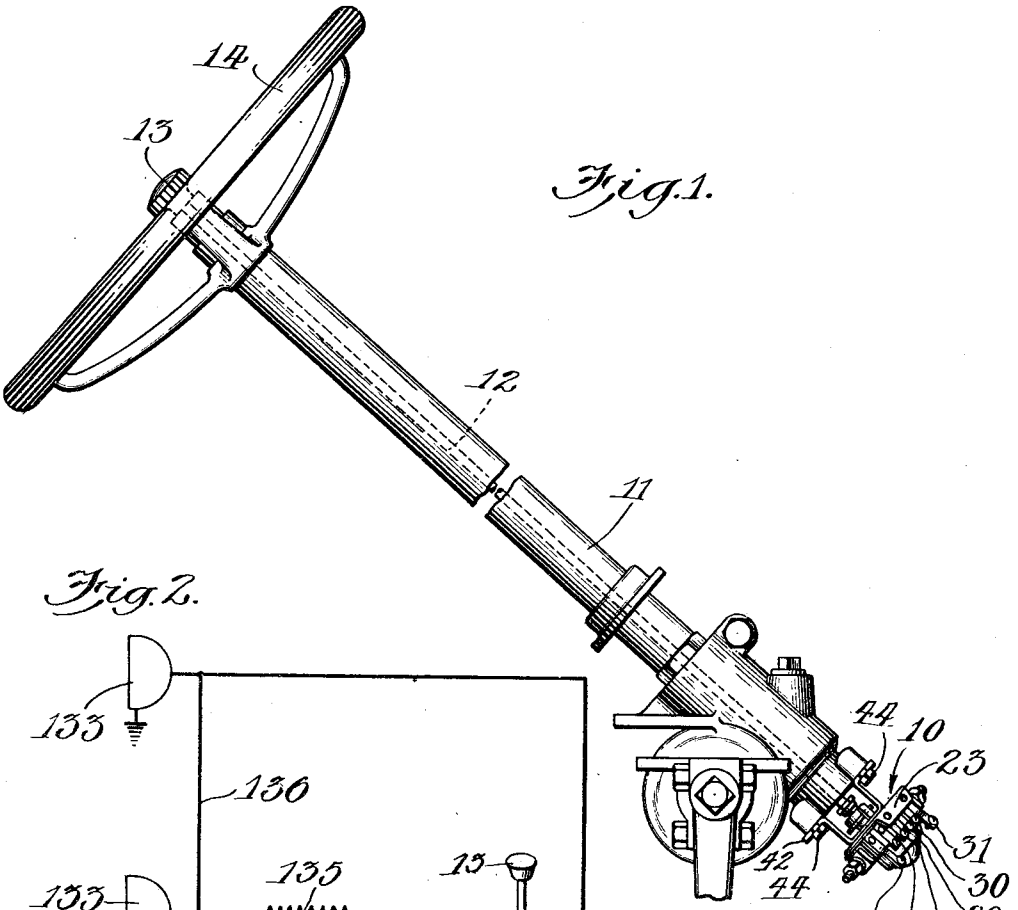
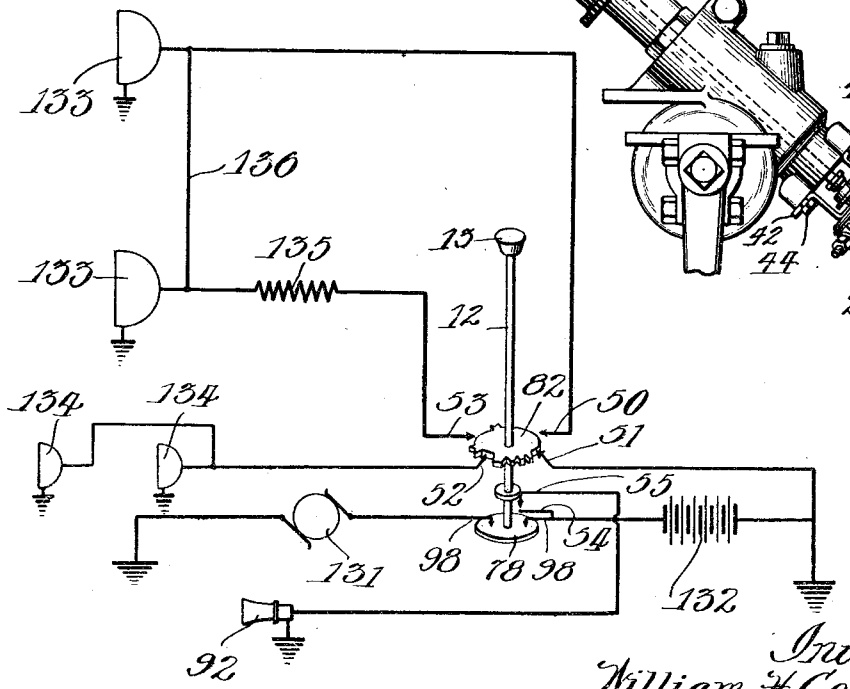


Fig. 2.



Inventor:
William H. Collier
By Williams, Bradbury
McCaleb & Hinkle.
Attys

Nov. 24, 1931. W. H. COLLIER 1,832,857

MANUALLY CONTROLLED SWITCH FOR AUTOMOBILES

Filed Sept. 26, 1930 3 Sheets-Sheet 2

Fig. 3.

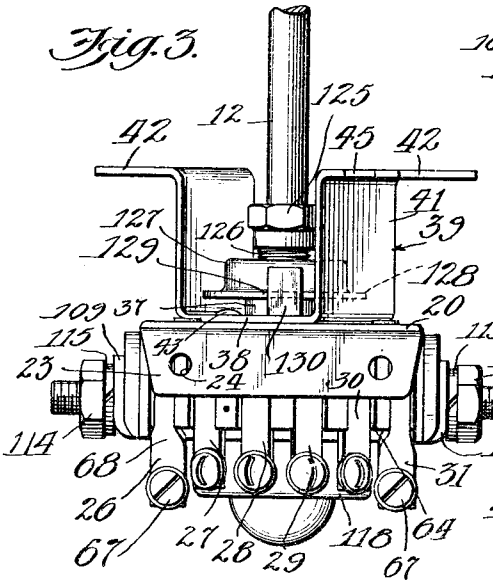


Fig. 11.

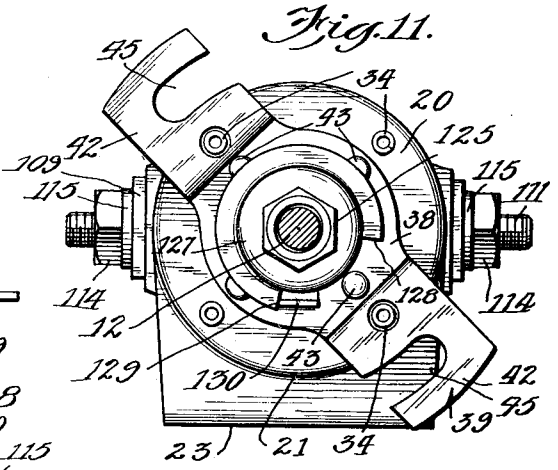


Fig. 4.

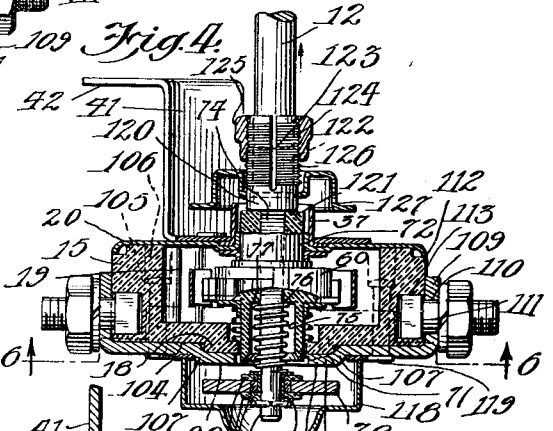
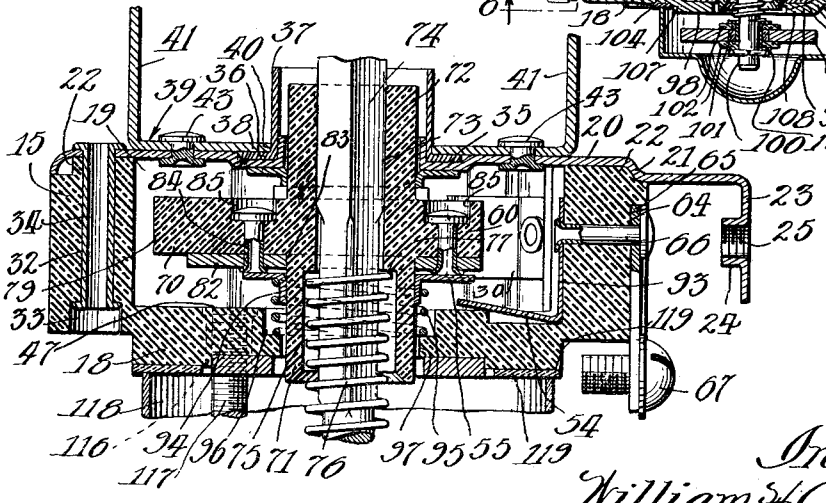


Fig. 5.



Inventor:
William H. Collier
By Williams, Bradbury
McCaleb & Hinkle.
Attys.

Nov. 24, 1931. W. H. COLLIER 1,832,857

MANUALLY CONTROLLED SWITCH FOR AUTOMOBILES

Filed Sept. 26, 1930 3 Sheets-Sheet 3

Fig. 6.

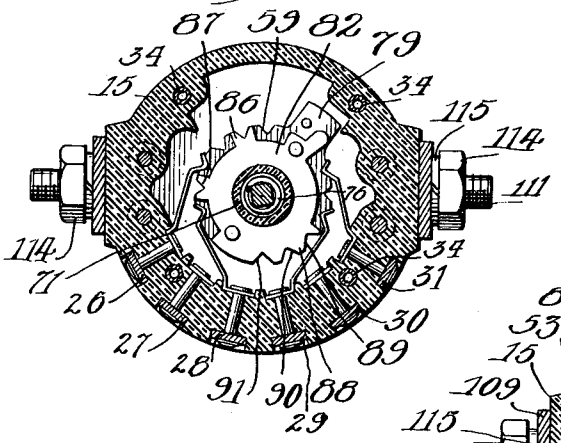


Fig. 7.

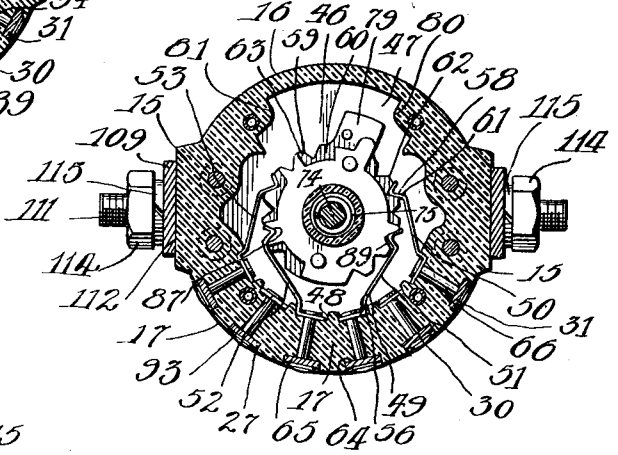


Fig. 8.

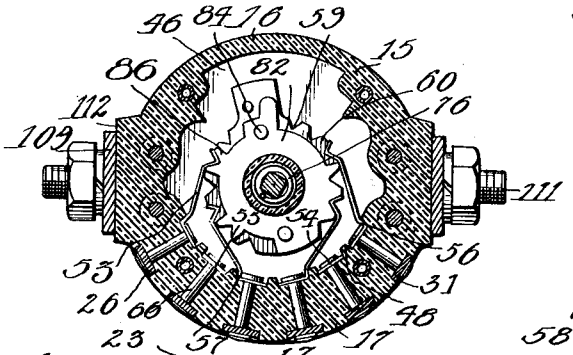


Fig. 9.

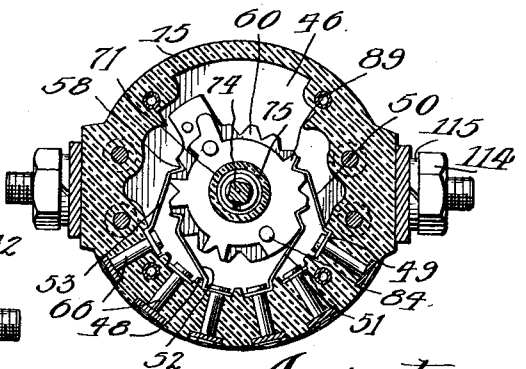
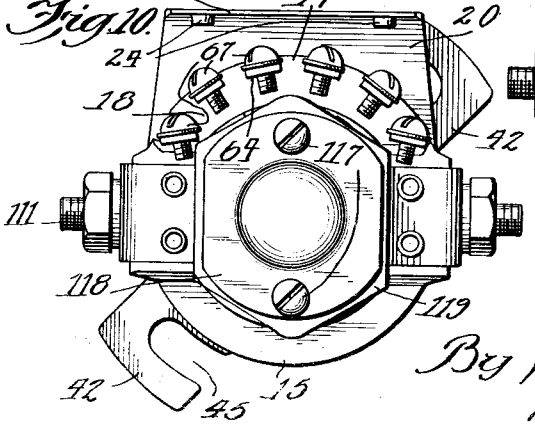


Fig. 10.



Inventor:
William H. Collier
By Williams, Bradbury
McCaleb & Hinkle Attys

Patented Nov. 24, 1931 1,832,857

UNITED STATES PATENT OFFICE

WILLIAM H. COLLIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO PINES WINTERFRONT CO., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

MANUALLY CONTROLLED SWITCH FOR AUTOMOBILES

Application filed September 26, 1930. Serial No. 484,629.

The present invention relates to manually controlled switches for automobiles or other vehicles and is particularly concerned with combined switches for controlling the starting, lighting and signal circuits of the automobile, although the switch may be employed for various different kinds of circuits.

One of the objects of the invention is the provision of an improved control switch for performing functions similar to those of the device of my prior Patent No. 1,549,524, in a more efficient manner, and which is capable of more economical manufacture.

Another object is the provision of a switch of the class described, in which the various types of switch parts are more perfectly adapted to the control of the particular types of circuits and in which the contacts and circuits are better insulated and protected against corrosion, wear, or the possibility of mechanical disorder.

Another object is the provision of an improved switch of the class described, the parts of which lend themselves readily to manufacture by mass production operations such as stamping or molding, and assembly by riveting operations so as to reduce the expensive machining operations and decrease the cost of manufacture.

Another object is the provision of an improved switch of the class described which is readily applicable to modern automotive vehicles with a minimum amount of labor and which is adaptable to a large number of different types of cars.

Another object is the provision of an improved switch having a minimum number of different parts, thereby reducing the cost of manufacture, and the provision of an improved switch having all of the contacts suitably enclosed to maintain the contacts in the best condition.

Another object is the provision of an improved switch of the class described having lighting circuit control contacts which are positively held in a controlling position and adapted to be moved in the next controlling position without possibility of stop at an intermediate point, to avoid mistakes in control and assure the full movement of the switch to the next position.

Another object is the provision of a contact switch of the class described having connector terminals most conveniently arranged for inspection of the connections, and for access in making connections.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are three sheets;

Fig. 1 is an elevational view of an exemplary installation of the invention upon a steering wheel;

Fig. 2 is a diagrammatic view of circuits which may be used in one of the preferred forms of installation;

Fig. 3 is an elevational view of the manually controlled switch;

Fig. 4 is a transverse sectional view taken on a vertical plane passing through the axis of the shaft;

Fig. 5 is a similar view on a larger scale, of the interior mechanism;

Fig. 6 is a sectional view taken on the plane of the line 6—6 of Fig. 4 with the rotary switch in the off position;

Fig. 7 is a similar view with the parking light switch contacts closed;

Fig. 8 is a similar view with the dim headlight contacts closed;

Fig. 9 is a similar view with the bright headlight contacts closed;

Fig. 10 is a bottom plan view of the controlling switch; and

Fig. 11 is a top plan view of the controlling switch.

Referring to Figs. 1 and 2, the present manually controlled switch, which is indicated in its entirety by the numeral 10, is preferably installed upon the lower end of a hollow steering column 11, and provided with an actuating rod or shaft 12, extending through the steering column and having an insulating actuating knob 13 secured at its upper end.

The present switch may be installed in any

type of steering apparatus provided the actuating shaft 12 is adapted to be rotated and reciprocated within the steering column 11, but the details of the steering column and other mechanism of the automobile may be varied considerably within the scope of the present invention. The control knob 13 being located near the steering wheel 14, the switch 10 is practically at the finger tips of the operator, and the present switch is adapted to control the signaling circuit for a horn or other devices, the starting circuit for the starting motor and the lighting circuits for dim or bright headlights and for parking lights.

It should be understood, however, that many of the features of the present invention are capable of separate application, and every embodiment of the invention need not include all of the advantageous features described herein.

Referring to Figs. 3 to 5, the present switch is preferably provided with a molded casing 15 of insulating material, such as a phenolic condensation compound, and the casing 15 may be provided with rounded outer walls 16, 17 and with a flat bottom 18. The end of casing 15 opposite bottom 18, may be left open as at 19, to be closed by a sheet metal cover plate 20, which is preferably permanently secured to the casing 15 after the mechanism is assembled in the casing 15, so as to make the switch substantially tamper proof and prevent unauthorized persons from access to the interior of the casing.

The cover plate 20 may consist of a sheet metal member which is preferably formed with a stamped circular depression 21, adapted to fit on a complementary circular formation 22 carried by the adjacent end of the molded casing 15. At one side, the cover plate 20 may be provided with an outwardly extending and downwardly turned attaching flange 23 having pressed tubular formations 24 which may be threaded as at 25 for the reception of attaching screws. The flange 23 may be used for securing a casing above the lighting circuit connectors 26, 27, 28, 29, 30, 31.

The insulating casing 15 is preferably provided with a plurality of bores 32 which are countersunk as at 33, so that the cover plate 20 may be secured to the casing 15 by a plurality of tubular rivets 34, the heads of which are protected against short circuit by being received in the counterbores 33. Any number of securing devices may be used. The cover plate 20 is preferably formed with an annular stamped depression 35 located substantially at the center of the circular depression 21 and adapted to receive the annular attaching flange 36 of a bearing member 37.

The bearing member may be secured in place by the body 38 of a supporting bracket 39, comprising a substantially flat metal plate having a centrally located bore 40 for receiving the bearing 37 and having a pair of outwardly projecting supporting flanges 41 which are provided with laterally extending attaching flanges 42.

The body 38 of the supporting bracket 39 is preferably secured to the cover plate 20 by a plurality of rivets 43 passing through both the body 38 and cover plate 20, before the cover plate is attached to the casing 15. The flange 36 of bearing 37 is confined between the stamped depression 35 in cover plate 20 and the body 38 of the supporting bracket 39.

Referring to Fig. 1, it will be noted that the switch may be attached to the lower end of the steering column 11 by a plurality of screw bolts 44 passing through the attaching flanges 42 of the supporting bracket 39 and threaded into the lower end of the steering column casing. Since many of the modern automotive vehicles have spark and throttle controlling rods extending parallel to the steering column 11, the flanges 42 may be provided with arcuate slots 45 which are adapted to accommodate the spark and throttle control rods.

The casing 15 is preferably formed with a movable contact chamber 46 during the molding operation and the contact chamber 46 may be provided with a flat bottom 47, but preferably has its lateral walls shaped as illustrated in Figs. 6 to 9. Thus the interior of the wall 17 is provided with a plurality of axially extending grooves 48 which are adapted to receive complementary attaching flanges 49 carried by the resilient fixed contacts 50, 51, 52, 53, 54 and 55.

The fixed contacts 50 to 53, inclusive, may all be of substantially the same shape and are preferably employed for the lighting circuit contacts. Each of the fixed contacts 50—53, is preferably provided with a body consisting of an elongated resilient sheet metal strip of spring brass or similar resilient and non-corrodible material, curved outward at 56 and curved at right angles at 57, to provide an attaching flange 49 capable of being received in the complementary grooves 48.

The opposite end of each of the contacts 50—53 is provided with an oppositely extending substantially V-shaped contact formation 58 which is adapted to be received in the complementary V-shaped notches or grooves 59 in the rotatable insulating body 60. The sides 61 and 62 of the V-shaped contact formations are capable of being cammed out of the notches or grooves 59 in the rotatable insulating body 60 upon rotative movement of that body, but the resilient contacts 50—53 present a certain amount of resistance to such rotative movement, and after the peak 63 between any of the notches 59 has been passed by any of the resilient contacts 50—53, the contact tends to snap into the next notch,

causing the movable switch member 60 to reach one of the predetermined switch positions.

The resilience of the fixed contacts and depth of the groove, may be made such that a predetermined amount of force is required at the knob 13 to actuate the rotatable switch member 60 and so that it is practically impossible to cause the switch member 60 to stop at any intermediate point between the predetermined switching positions. Thus, the possibility of the driver mistakenly turning his switch to some intermediate point, where none of the lights are on, is precluded and the rotatable switch member 60 is adapted to snap from place to place and to be actuated only by the use of a predetermined amount of torque.

The insulating casing 15 is also preferably provided with a plurality of axially extending groove 64 located on the outer surface of the wall 17 opposite the grooves 48. The grooves 64 are complementary to the attaching flanges 65 of a plurality of connectors 26—31, and the contacts 50—53 and connectors 26—31 may be secured in place by a plurality of rivets 66, each rivet passing through its connector flange 65 and the attaching flange 49 of the resilient contact inside the casing.

The walls of the grooves 48 and 64 engage the sides of the attaching flanges 49 and 65 and enable the firm securement of the connectors and contacts with a minimum amount of labor, since only a single rivet need be employed. Rotation of the contacts or connectors on the rivets 56, is prevented by lateral engagement of the contact and connectors with the walls of the grooves.

The connectors 26 to 31 comprise elongated strips of metal, one end of which serves as an attaching flange 65 which is secured in an attaching flange 65 which is secured in a groove 64 by rivet 66, but the opposite ends of the connectors 26—31 are preferably provided with threaded bores for receiving a plurality of screw bolts 67. Since the exterior surface of the wall 17 is substantially cylindrical, the connectors 26—31 will be arranged in an arc and when the switch is installed on the lower end of the steering column casing as shown in Fig. 1, the connectors are very conveniently located for access. The connectors 26—31 may be made of different lengths, if desired, thereby spacing the securing bolts 67 from each other so that there is less danger of short circuit by the loose ends of the wires secured thereto.

Thus, in Fig. 3 it will be noted that the end connectors 26 and 31 are each made longer and slightly twisted at 68 to bring the heads of the screw bolts into a horizontal plane.

The movable switch body 60 also preferably consists of an insulating member molded of phenolic condensation compound, having a substantially circular body portion 70 and hubs 71 and 72 extending axially from each side of the body 70. The hub 72 and body are provided with a non-circular aperture 73 adapted to receive the squared or non-circular shaft 74 of the switch shaft, and the hub 71 is provided with a counter-bore 75 adapted to receive the starter switch coil spring 76, which is tensioned between the bottom of the movable contact member 60, that is, the annular shoulder 77 and the movable starter contact 78 described in detail hereinafter.

The insulating body 60 is preferably formed with a radially extending lug 79 which is adapted to move in the arcuate space between two shoulders 80 and 81 formed on the interior wall of the casing 15 adjacent the lugs 79, to determine the range of motion of the rotary switch member 60. The rotary switch body 60 is preferably provided with a plurality of substantially V-shaped grooves 59, so located as to engage with contacts 50—53 in each of the different predetermined switching positions.

In order to provide a switch requiring the same amount of energy or force for actuation to each position, the body 60 is provided with grooves 59 for the off positions of the contacts 50—53, as well as the on positions. Thus, in Fig. 6 it will be observed that there are six grooves 59 on each side of the insulating body 60 for engaging the contacts 50—53 in the various positions of the switch member 60.

The contacts 50—53 are preferably employed for lighting circuits which do not require a large amount of current, and consequently the insulating body 60 may be provided with a bridging contact which consists of a sheet metal plate 82 preferably of brass or copper, having a centrally located aperture 83 for receiving the hub 71. The plate 82 may be secured to the insulating body 60 by a plurality of rivets 84, preferably having their heads countersunk in counter-bores 85 and the plate 82 is provided with a plurality of radially projecting lugs for engagement with the resilient contacts 50—53.

Referring to Fig. 6, and beginning at the stop 79, it will be observed that the plate 82 is provided with a radial contact lug 86 coinciding with the second notch 59. The fifth notch 59 is likewise covered by a radial contact lug 87, while the first, third, fourth and sixth notches on the left side in Fig. 6 are located out beyond the plate 82.

Referring to the right side of the plate 82 in Fig. 6, it will be noted that the first, second and third notches from the stop lug 79 are notches in the insulating material, spaced from the bridging plate 82, but the fourth, fifth and sixth notches are covered by a radially extending formation 88 on the bridging

plate 82, which is formed with notches 89, 90 and 91.

The lugs 86 and 87 are likewise formed with substantially V-shaped notches, but it should be noted that the notches in the metal plate 82 are not of the same depth as the notches in the insulating material of the body 60, so that the plate overhangs the border of the insulating body 60 at the notches 86, 87, 89, 90 and 91, and the bridging plate 82 is thus adapted to contact with the fixed contacts 50—53 when the switch body is in an appropriate position; that is to say, when the contacts 50—53 are in registry with notches in the metal plate 82.

The resilient contact which connects with the connector 27 (Fig. 7) and the resilient contact which connects with the connector 30, are adapted to be utilized for controlling a signalling circuit, such as the circuit for the horn 92, and these contacts are preferably adapted to be actuated by an axial movement of the body 60. Thus, the fixed contact member 93 (Fig. 5) extends downward in the wall 17 and is bent over at substantially right angles toward the hub 71, its end lying beneath the contact member 55. The fixed contact member 55 likewise extends down the inside of the wall 17 and is provided with an annular movable contact formation seen in section in Fig. 5, and provided with a tubular bearing 94 surrounding the hub 71.

The movable contact 55 is preferably also provided with a helical spring 95 coiled about the bearing 94 and hub 71, and seated in an annular enlargement 96 formed in the bottom 47 of casing 15. The spring 95 and the natural resiliency of contact spring 55, urge the contact spring 55 into the position of Fig. 5, but it may be brought into contact with contact 54 by an axial force on the knob 13 transmitted through rod 12 to the insulating body 60, which reciprocates in the chamber 46 until contact 55 engages contact 54, closing the horn circuit.

The body 70 is slidably supported for reciprocation by the bearing 37 surrounding hub 72 and by the bore 97 in the bottom wall 18 of casing 15. On release of the knob 13, the spring 95 again moves the contact 55 and body 60 to the position of Fig. 5, opening the contacts 54, 55.

The present switch is also preferably adapted to be used for controlling the circuit of the starting motor and for this purpose is provided with fixed switch contacts 98, 99 and a movable contact 78 capable of carrying relatively high current, such as that required by a starting motor. The lower cylindrical end 100 of switch shaft 74 preferably supports a rotatable contact 78 which may take the form of a thick metal disc.

The disc 78 is preferably constructed of copper and provided with a centrally located aperture which is lined with an insulating tube 101. Insulating washers 102 are located on each side of disc 78 and the washers 102 and tube 101 may be fixedly secured to disc 78 by a tubular rivet 103 adapted to serve as an electrically insulated bearing for the contact member 78 on the shaft 74. A coil spring 76 is tensioned between the upper washer 102 and the annular shoulder 77 in counter-bore 75, thereby urging the movable contact 78 to open position.

The bottom wall 18 of casing 15 is preferably formed with grooves 104 complementary to the shape of the fixed contacts 98 and 99, and the fixed contacts may be secured in place by a plurality of rivets 105 passing through the contacts and insulating body 15 and preferably having their heads countersunk in counter-bores 106.

The fixed contacts 98 and 99 preferably consist of relatively heavy copper strips which are provided with arcuate formations surrounding the hub 71 above the disc 78, the contacts 98 and 99 being spaced from each other but being adapted to be bridged by the disc 78.

It should be noted that on pulling the shaft 74 upward by means of the rod 12 and knob 13, against the tension of spring 76, the disc 78 will be brought into contact with fixed contacts 98 and 99, but on release of the knob 13, the spring 76 will again move the contact disc 78 to the position of Fig. 4. The contact disc 78 is adapted to rotate freely and to constantly present a new and clean contact surface for engagement with the fixed contacts 98, 99.

The fixed contacts 98, 99 are preferably provided with offsets at 107, thereby bringing the arcuate formations 108 into prominence on the bottom of the insulating body 15, for engagement with the disc 78, but retaining the bodies of the contact strips 98 and 99 in the grooves 104 for better securement and insulation.

Each of the contact strips 98, 99 is preferably provided with an upwardly turned connector flange 109 having an aperture 110 for receiving the connector screw bolt 111. The flanges 109 bear flatly against the flat ends 112 of casing 15, and the casing is preferably provided with non-circular sockets 113 beneath the bores 110 for receiving the heads of connector bolts 111, which are provided with the usual nuts 114 and spring washers 115. The sockets 113 prevent the rotation of the bolt in the connector during the application of a wrench to the nut 114, and greatly facilitate the convenient application of heavy current conductors to the contact strips 98 and 99, since it is desirable that heavy current connections be made very secure to reduce the contact resistance.

The casing 15 is preferably provided with metallic threaded members 116 which are located in the body of the casing during the

molding operation, for receiving securing screw bolts 117 which extend through the metal cap 118 and are threaded into the threaded sockets 116. An insulating washer 119 is interposed between the metal cap and the heavy current contacts 98, 99, to prevent short circuiting of these contacts by the metal cap 118 and the cap 118 thus encloses and protects the starter motor switch.

The switch shaft 74 is preferably provided with an enlargement 120 forming an annular shoulder 121 for engaging the end of hub 72 to actuate the insulating body 60 in a downward direction in Fig. 4. The enlargement 120 is formed with a bore 122 adapted to receive the connecting rod 12 and the walls of the bore 122 are preferably split at 123. A threaded ferrule 124 having a non-circular outer surface 125 is applied to the outer threaded surface 126 of the enlargement 120, the enlargement 120 being tapered so that the ferrule 122 gradually forces the split ends of the shaft together to clamp the shaft to the connecting or actuating rod 12.

The present switch is thus adapted to be very conveniently applied to the switch rods in existing steering wheel installations, and the actuating rod may be inserted from the top of the steering column and connected to the switch at the botom of the steering column.

The enlargement 120 on shaft 74 also preferably carries a stop plate 127 which is formed with a pair of radially extending stop shoulders 128, 129 for engaging the upwardly extending lug 130, which is struck up out of the body 38 of supporting bracket 39.

The circuit connections for an exemplary installation will be evident from the diagram of Fig. 2, in which the grounded system is employed, and one side of the starter motor 131, battery 132, headlights 133, parking lights 134 and horn 92, is connected in each case to the frame of the vehicle. The starter motor contacts 98, 99 are connected in a direct circuit from the other side of the battery to the starter motor and adapted to be bridged by the movable contact 78.

The signal contacts 54 and 55 are connected in a direct circuit from the battery 132 to the horn 92 and are adapted to be closed by a downward axial movement on the knob 13.

The parking light contacts are the contacts 51 and 52 which are interposed in a circuit leading from one side of the battery to the parking lamps 134, the latter being connected in parallel.

When the rotary switch member 60 is in the position of Fig. 6, it will be observed that all of the fixed contacts 50—53 are out of engagement with the bridging plate 82, the resilient contacts being seated in notches in the insulating body 60. When the rotary switch member 60 is moved by a clockwise movement of the knob 13, which will be one step to the left counter-clockwise as viewed from the bottom in Fig. 7, the contacts 51 and 52 come into engagement with notches 87, 89 in the metal plate 82, thereby closing the parking light circuit, but it will be observed from Fig. 7 that the remainder of the fixed contacts 50 and 53 are seated in notches in the insulating body 60 out of engagement with the metal plate 82.

The contact 51 serves as a common battery contact for the lighting circuit, and consequently is adapted to come into successive engagement with the notches 89, 90, 91 in the metal plate 82. Contact 53 is preferably connected through a dimming resistance 135 to the headlights 133, which are connected in parallel by a conductor 136. When the rotary switch body 60 is moved one more step counter-clockwise from the position of Fig. 7 to that of Fig. 8, contact 53 comes into engagement with notch 86 in metal plate 82, closing the dimming circuit for the headlights, and when the switch is moved one more step counter-clockwise from the position of Fig. 8 to Fig. 9 contact 50 comes into engagement with the notch 89, closing the direct circuit from the battery to headlights 133.

It should be understood that if desired, the overhanging notched formations on the metal plate 82 may be so located that side lights and headlights may be lighted simultaneously, or additional contacts may be provided for controlling other lighting circuits by the same switch. The operation of the exemplary installation will be evident from the foregoing explanation of the circuits. The operation of the switch is briefly outlined as follows:

When the knob 13 is pulled upward by the operator, the starting switch is closed and the starter motor operated to start the internal combustion engine. When the knob 13 is pressed downward, the signalling circuit through the horn or other device, is closed, and when the knob 13 is rotated in a clockwise direction, the parking lights or side lights, the dim headlights and the bright headlights are successively energized.

It will thus be observed that the control of starting, signalling and lighting, is substantially at the fingertips of the operator, and the present manually controlled switch is peculiarly adapted to accomplish all of the foregoing functions with a minimum of effort on the part of the operator, since the hands of the operator are always in close proximity to the knob 13 at the head of the steering column.

The present switch is adaptable to be installed in many different types of automotive vehicles and is peculiarly adapted to give long and efficient service without possibility of short circuit or other derangement. The various parts of the switch lend themselves readily to manufacture by molding and stamping operations, so that the switch may

be manufactured at a very low cost, thereby bringing the invention within the means of a greater number of purchasers.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

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

1. In a switch, the combination of a molded insulating body, having a chamber formed therein and having a bore extending through said chamber, with a plurality of resilient contacts, said body having a plurality of axially extending grooves, and said contacts having attaching flanges fitting in said grooves, connectors carried by the outside of said body, said connectors being received in external grooves in said body and securing means for fastening said contacts and connectors in said grooves.

2. In a switch, the combination of a molded insulating body, having a chamber formed therein and having a bore extending through said chamber, with a plurality of resilient contacts, said body having a plurality of axially extending grooves, and said contacts having attaching flanges fitting in said grooves, connectors carried by the outside of said body, said connectors being received in external grooves in said body and securing means for fastening said contacts and connectors in said grooves, said connectors comprising strips of metal and clamping screws, and said strips extending axially from said insulating body.

3. In a switch, the combination of a molded insulating body, having a chamber formed therein and having a bore extending through said chamber, with a plurality of resilient contacts, said body having a plurality of axially extending grooves, and said contacts having attaching flanges fitting in said grooves, connectors carried by the outside of said body, said connectors being received in external grooves in said body, securing means for fastening said contacts and connectors in said grooves, a metal cover for one end of said body, said cover being formed with a central bearing, and a movable contact member having a hub rotatably mounted in said bearing.

4. In a switch, the combination of a molded insulating body, having a chamber formed therein and having a bore extending through said chamber, with a plurality of resilient contacts, said body having a plurality of axially extending grooves, and said contacts having attaching flanges fitting in said grooves, connectors carried by the outside of said body, said connectors being received in external grooves in said body, securing means for fastening said contacts and connectors in said grooves, a metal cover for one end of said body, said cover being formed with a central bearing, and a movable contact member having a hub rotatably mounted in said bearing comprising a molded insulating body and a metal plate carried by one side of said latter body for engaging said fixed contacts.

5. In a combined lighting and starting switch, the combination of a rotatable and reciprocable insulating body, with an insulating casing, said body being formed with a plurality of peripheral notches, a metal plate carried by said body and provided with similar notches but projecting beyond said body, and a plurality of resilient fixed contacts carried by said casing and adapted to engage in said notches.

6. In a combined lighting and starting switch, the combination of a rotatable and reciprocable insulating body, with an insulating casing, said body being formed with a plurality of peripheral notches, a metal plate carried by said body and provided with similar notches but projecting beyond said body, and a plurality of resilient fixed contacts carried by said casing and adapted to engage in said notches, said notches being substantially V-shaped in cross section and said fixed contacts having complementary formations whereby said contacts are cammed out of said notches by rotation of said body.

7. In a combined lighting and starting switch, the combination of a rotatable and reciprocable insulating body, with an insulating casing, said body being formed with a plurality of peripheral notches, a metal plate carried by said body and provided with similar notches but projecting beyond said body, a plurality of resilient fixed contacts carried by said casing and adapted to engage in said notches, and a pair of resilient contacts located between the end of said body and said casing and adapted to be brought into mutual engagement by axial movement of said body toward said latter contacts.

8. In a combined lighting and starting switch, the combination of a rotatable and reciprocable insulating body, with an insulating casing, said body being formed with a plurality of peripheral notches, a metal plate carried by said body and provided with similar notches but projecting beyond said body, a plurality of resilient fixed contacts carried by said casing and adapted to engage in said notches, a pair of resilient contacts located between the end of said body and said casing and adapted to be brought into mutual engagement by axial movement of said body toward said latter contacts, a shaft keyed to said body and adapted to slide therein, motor starter circuit contacts located on both sides

of said shaft on the outside of said casing, and a bridging contact carried by said shaft.

9. In a combined lighting and starting switch, the combination of a rotatable and reciprocable insulating body, with an insulating casing, said body being formed with a plurality of peripheral notches, a metal plate carried by said body and provided with similar notches but projecting beyond said body, a plurality of resilient fixed contacts carried by said casing and adapted to engage in said notches, a pair of resilient contacts located between the end of said body and said casing and adapted to be brought into mutual engagement by axial movement of said body toward said latter contacts, a shaft keyed to said body and adapted to slide therein, motor starter circuit contacts located on both sides of said shaft on the outside of said casing, a bridging contact carried by said shaft, and a coil spring for urging said bridging contact away from said starter contacts.

10. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing, on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, and a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts.

11. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, a tubular bearing member interposed between said shaft and circular contact, and insulation interposed between said tubular member and said circular contact.

12. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, an insulating body rotatably mounted in said casing and slidably mounted on said shaft, and contacts adapted to be controlled by rotation of said insulating body.

13. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, an insulating body rotatably mounted in said casing and slidably mounted on said shaft, contacts adapted to be controlled by rotation of said insulating body, and a coil spring about said shaft and compressed between said circular contact and said insulating body.

14. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, an insulating body rotatably mounted in said casing and slidably mounted on said shaft, contacts adapted to be controlled by rotation of said insulating body and a pair of resilient contacts located in the casing below said insulating body, and adapted to be closed by axial movement of said body.

15. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, connector flanges carried by said fixed contacts and engaging the sides of said casing and terminal bolts carried by said flanges.

16. In a starter switch, the combination of an insulating casing, with a shaft slidably mounted therein, a pair of fixed contacts located on the external wall of said casing on opposite sides of said shaft, said casing having grooves complementary to said fixed contacts, and having arcuate portions adjacent said shaft, a circular bridging contact rotatably mounted on said shaft to engage said fixed contacts, connector flanges carried by said fixed contacts and engaging the sides of said casing, and terminal bolts carried by said flanges, said bolts having heads received in complementary sockets in said casing.

17. In a combined lighting and starting switch, the combination of an insulating casing, with a shaft and an insulating body slidably mounted on said shaft in said casing, resilient contacts, interposed between said body and casing to be actuated by axial movement of said shaft in one direction, contacts carried by said casing and shafts to be actuated by axial movement of the shaft in the other direction, and contacts carried by said casing and body to be actuated by rotation of said body by said shaft.

18. In a combined lighting and starting switch, the combination of an insulating casing, with a shaft and an insulating body slidably mounted on said shaft in said casing, resilient contacts interposed between said body and casing to be actuated by axial movement of said shaft in one direction, contacts carried by said casing and shafts to be actuated by axial movement of the shaft in the other direction, and contacts carried by said casing and body to be actuated by rotation of said body by said shaft, said shaft having a bore with split walls at one end and a compressing sleeve thread over said walls to clamp said shaft to an extension.

19. In a combined lighting and starting switch, the combination of an insulating casing, with a shaft and an insulating body slidably mounted on said shaft in said casing, resilient contacts interposed between said body and casing to be actuated by axial movement of said shaft in one direction, contacts carried by said casing and shafts to be actuated by axial movement of the shaft in the other direction, contacts carried by said casing and body to be actuated by rotation of said body by said shaft, a metal cover plate for said casing, stop lugs carried by said plate, and a stop plate carried by said shaft for limiting rotation of said body.

In witness whereof, I hereunto subscribe my name this 24th day of September, 1930.

WILLIAM H. COLLIER.