May 16, 1933. E. N. JACOBI 1,909,585

SWITCH

Filed July 10, 1930 4 Sheets-Sheet 1

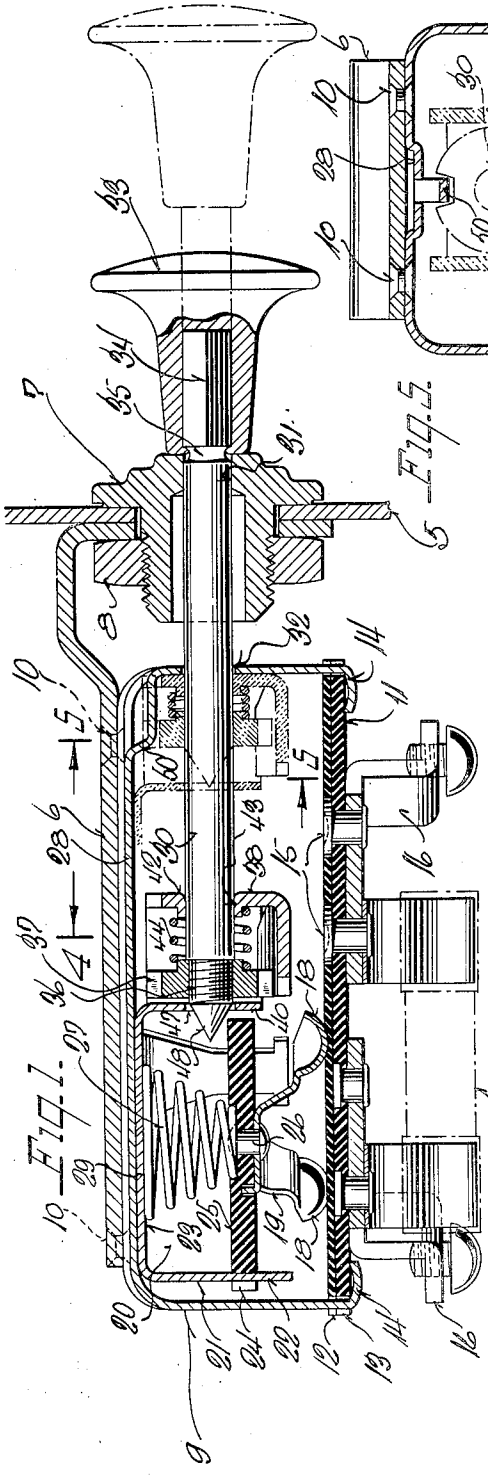


Fig. 1.

Fig. 5.

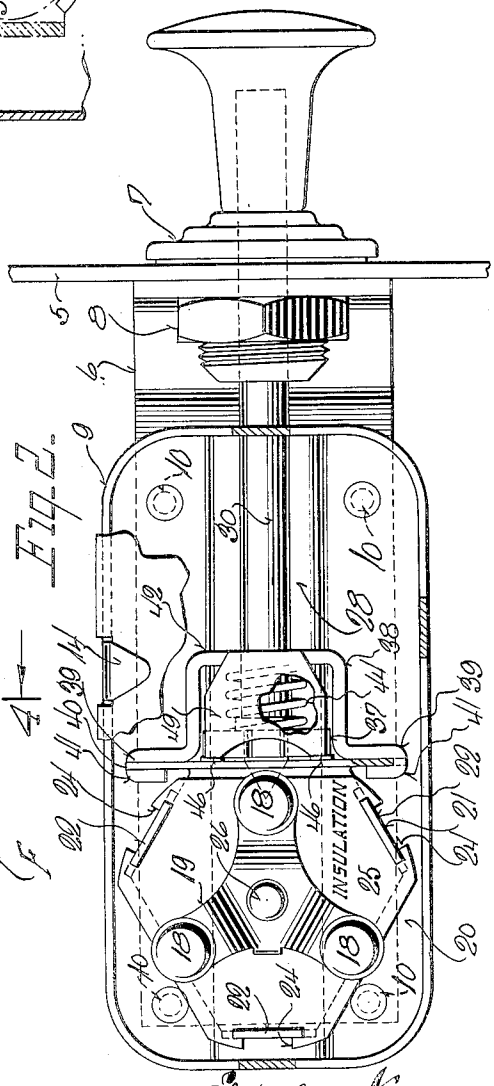


Fig. 2.

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SWITCH

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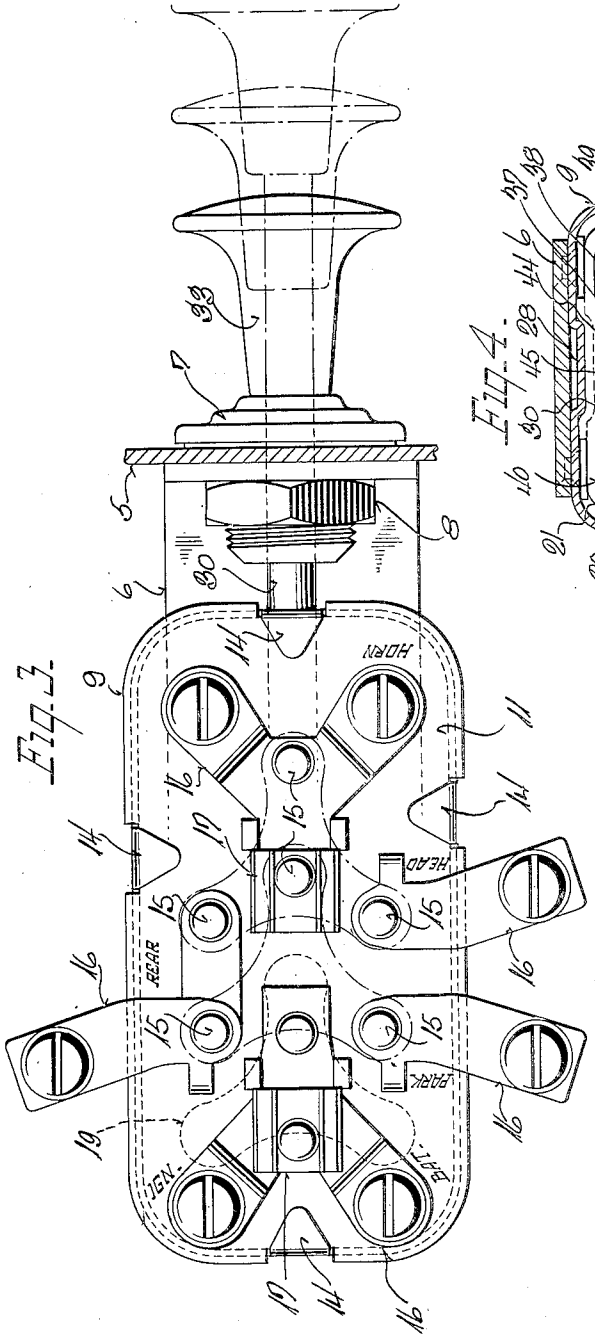


Fig. 3.

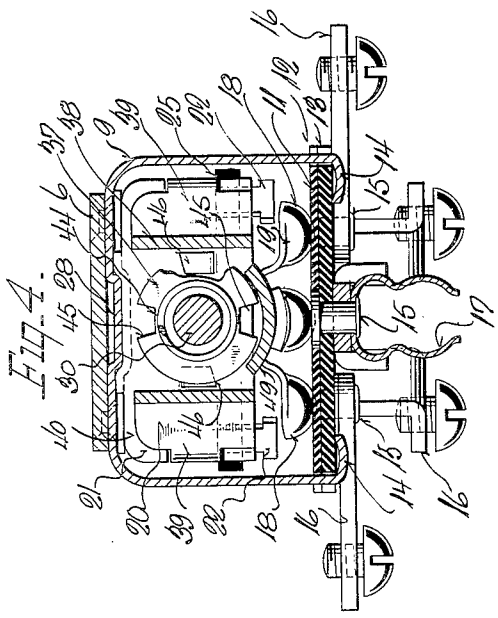


Fig. 4.

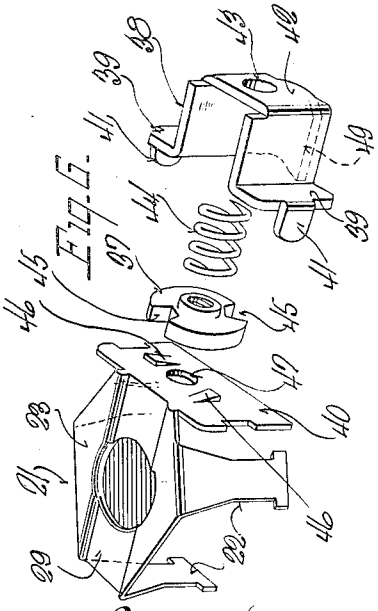


Fig. 5.

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SWITCH

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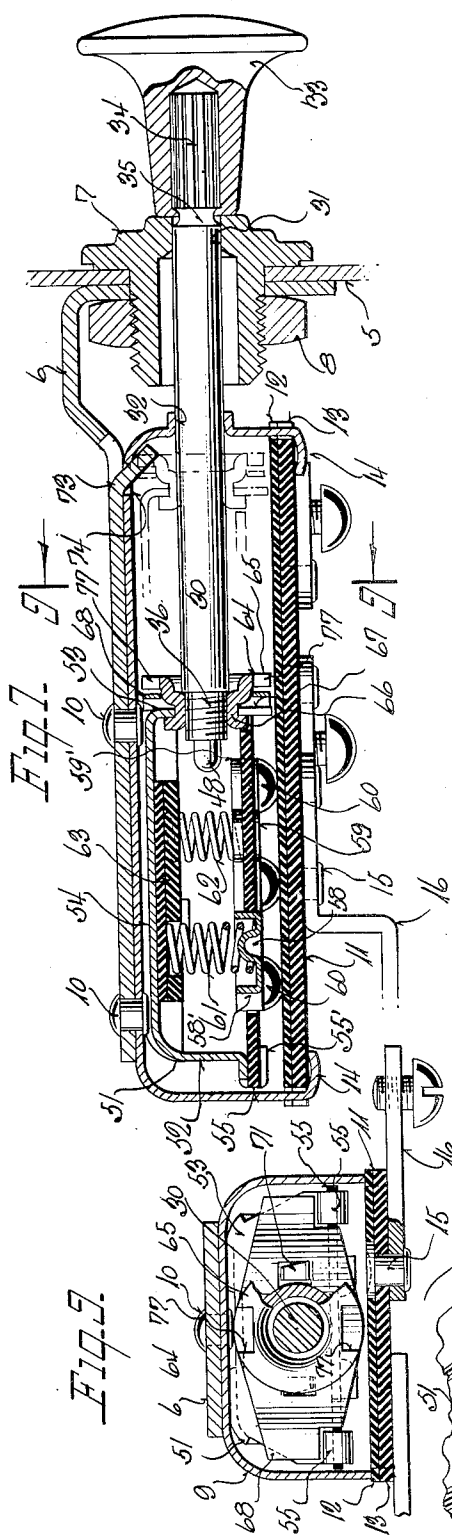


Fig. 7.

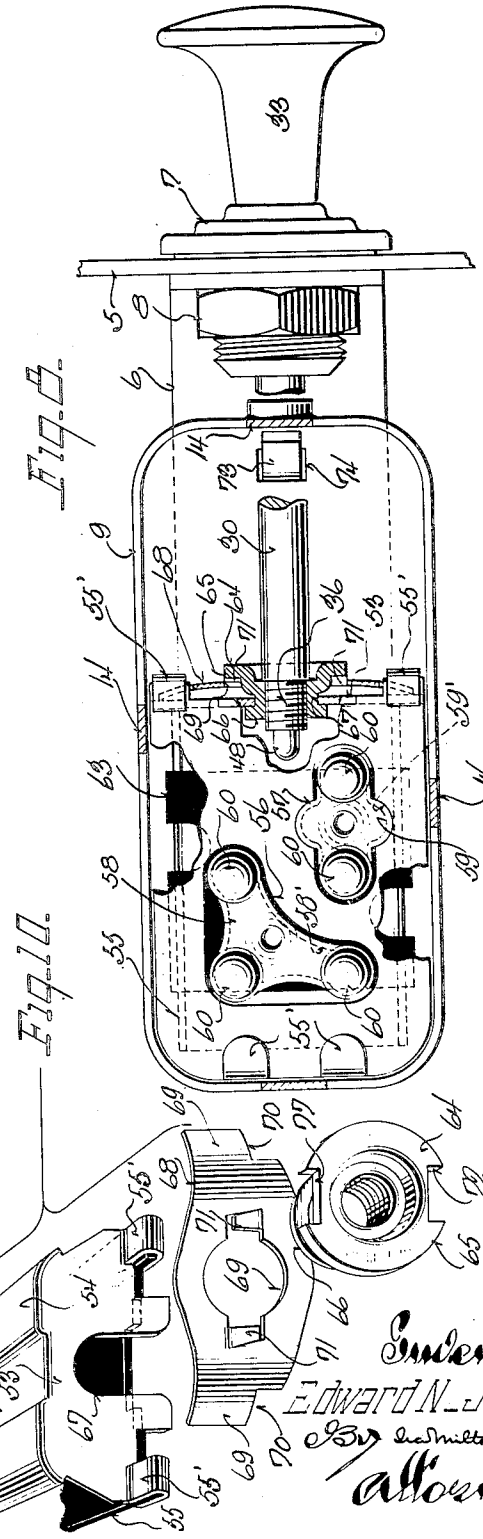


Fig. 8.

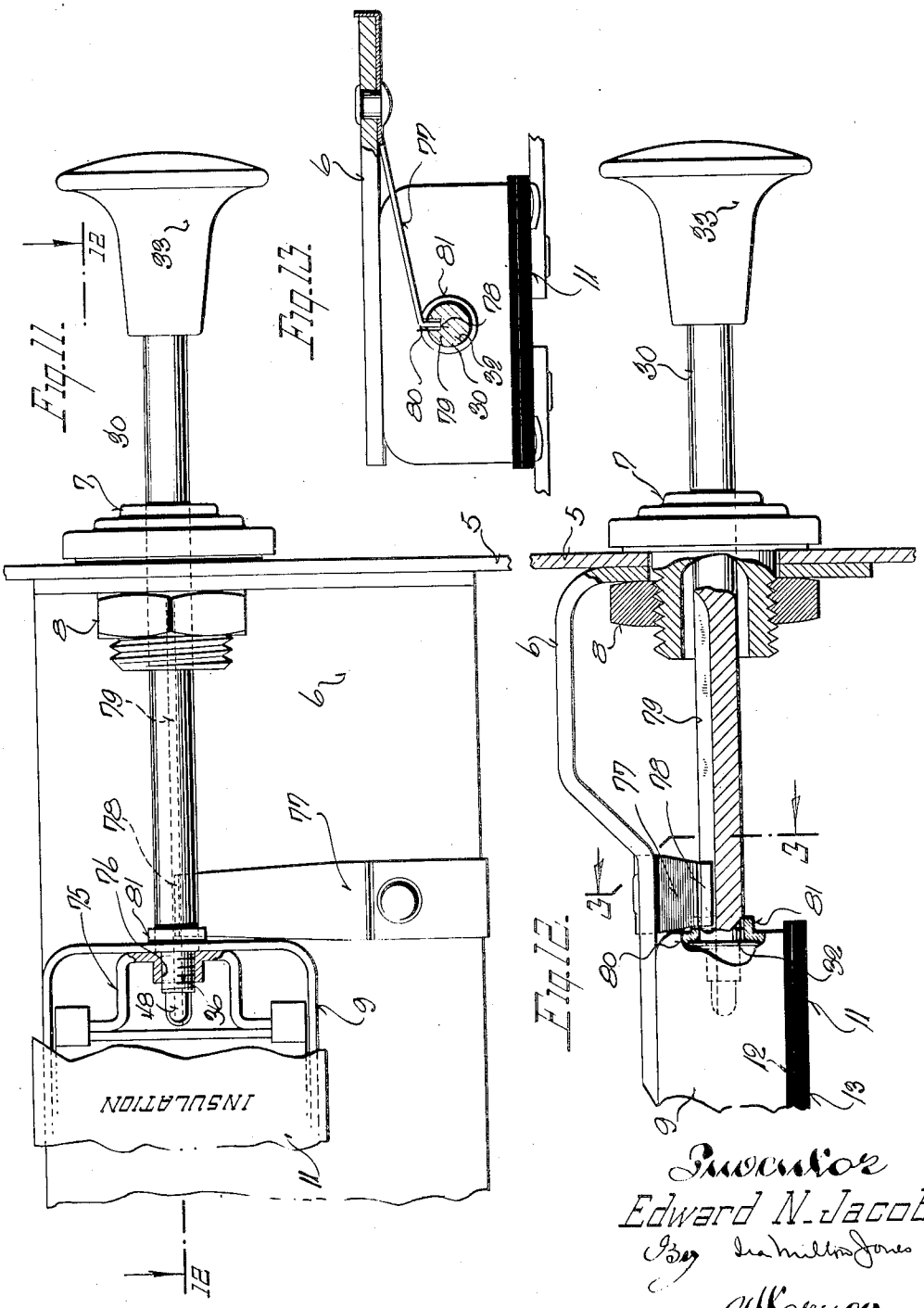
Fig. 10.

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SWITCH

Filed July 10, 1930 4 Sheets-Sheet 4



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Patented May 16, 1933 1,909,585

UNITED STATES PATENT OFFICE

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SWITCH

Application filed July 10, 1930. Serial No. 467,030.

This invention relates to certain new and useful improvements in switches, and refers more particularly to a switch adapted for use as a lighting switch for automotive vehicles, and has as one of its objects to provide smoother action for switches of this type and to facilitate action of the movable unit to any of its several positions.

Heretofore lighting switches for automotive vehicles usually have been of the rotary type, the construction of which involves difficulties of manufacture and requires a relatively complicated design. The present invention entirely overcomes these objectionable features by providing a switch wherein the movable unit is lonigtudinally movable, as contrasted to the rotary motion of existing switches.

Another object of this invention, therefore, resides in the provision of a switch of the character described, the movable unit of which is actuated by a member mounted for longitudinal movement and wherein said member is connected with the movable switch unit in a manner facilitating installation of the switches.

A more specific object of this invention resides in the provision of novel means for connecting the actuating stem or rod with the movable switch unit whereby accidental disengagement is prevented and intentional removal is facilitated.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated several complete examples of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a transverse sectional view through a switch structure embodying my invention;

Figure 2 is a bottom view of the switch with portions broken away and in section to illustrate structural details;

Figure 3 is a view similar to Figure 2 illustrating a typical arrangement of switch terminals;

Figure 4 is a cross sectional view taken through Figure 1 on the plane of the line 4—4;

Figure 5 is a cross sectional view taken through Figure 1 on the plane of the line 5—5;

Figure 6 is a perspective detail view of the movable switch unit driver and the elements for connecting the same with the actuating rod, said elements being shown separated and arranged in their proper order of assembly;

Figure 7 is a transverse sectional view similar to Figure 1 illustrating a slightly modified form of my invention;

Figure 8 is a bottom view with parts broken away, of the structure shown in Figure 7;

Figure 9 is a cross sectional view taken through Figure 7 on the plane of the line 9—9;

Figure 10 is a perspective view similar to Figure 6 and illustrating the movable switch unit driver of the structure shown in Figure 7 and its associated mechanism for connecting the same with the actuating rod;

Figure 11 is a bottom view of another modification of this invention;

Figure 12 is a transverse sectional view taken on the plane of the line 12—12 of Figure 11; and

Figure 13 is a cross sectional view taken through Figure 12 on the plane of the line 13—13.

Referring now more particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, the numeral 5 represents the dash board or other portion of an automotive vehicle to which a bracket 6 is adapted to be secured by a bushing 7 passed through aligned openings in the dash board and the head of the bracket and having a nut 8 threaded on its inner end to clamp the head of the bracket

securely to the inner face of the dash board.

The bracket extends rearwardly from the dash board 5 and has a switch casing 9 secured thereto by rivets 10 or the like. The switch casing 9 is preferably stamped from bendable metal and is rectangular in shape with its open lower side closed by a terminal head 11 formed of inner and outer layers of insulating material 12 and 13 respectively. The terminal head 11 is secured in position closing the casing by a plurality of tangs 14 extended from the marginal edges of the casing and clinched over the outersurface of the terminal head.

Mounted on the terminal head is a plurality of contacts 15 which may be arranged in any desired relationship, and in the present instance are formed by the heads of rivets which pass through openings in the terminal head and secure terminals 16 thereto. A typical arrangement of the terminals and their respective switch contacts is illustrated in Figure 3 and it is noted that the endmost terminals are provided with fuse clips 17 adapted to receive a conventional fuse "F", which as is customary, is included in the lighting circuit of the vehicle. The specific construction and arrangement of the terminals of the terminal head does not form part of the present invention and further description thereof is therefore unnecessary.

However, it will be noted that the stationary contacts 15 are arranged in two sets of three to be selectively engaged by the contacts 18 of a spider-like contactor 19 forming part of the movable switch unit indicated generally by the numeral 20, and which is longitudinally slidably mounted in the casing.

The two sets of stationary contacts are so located on the terminal head, that when the movable switch unit is in its innermost position as illustrated in Figures 1 and 2, the movable contactor 19 will be in its "off" position disengaged from the stationary contacts, and when moved to an intermediate position the contactor will electrically connect the three stationary contacts comprising the intermediate position of the switch to arrange the circuits to connect the "parking" and "tail" light of the vehicle with the battery terminal, (see Figure 3) and when in its outermost position will connect the "tail" light and "head" lights with the battery terminal through the fuse "F". The two "on" positions of the movable switch unit are indicated by forming the heads of the contacts 15 with cup-shaped depressions so that as the contacts of the movable contactor align therewith they snap into position and the "off" position is indicated by similar depressions formed in the inner layer 12 of the terminal head.

Hence it is seen that none of the three positions are favored and that the movable unit may be actuated to all positions with equal facility.

The movable switch unit comprises beside the contactor 19, a driver 21 of skeletonized construction, preferably stamped from bendable metal and having a plurality of arms 22 directed laterally from its central base 23. The arms 22 are substantially T shaped at their outer ends to be received in notches or recesses 24 formed in edge portions of an insulating panel 25 to which the contactor 19 is secured by a rivet 26.

The connection between the arms of the driver 21 and the insulating panel 25 permits movement of the panel and consequently the contactor carried thereby, toward and away from the terminal head, and an expansive spring 27 confined between the base 23 of the driver and the panel 25 at all times yieldably urges the panel and the contactor toward the terminal head, the T shaped portion of the outer ends of the arms 22 preventing disassembly of the contactor and its carrying panel from the driver when the terminal head is removed from the switch casing. As there are three arms 22, engagement of the contactor carrying panel with the driver may be effected by merely springing one of the arms outwardly sufficiently far to permit its engagement in its respective notch 24 as will be readily apparent.

The longitudinal movement of the movable switch unit driver 21 in the casing to carry the contactor 19 to and from its several positions is guided by an inwardly pressed rib 28 formed in the top of the casing which is received in a complementary depression 29 formed in the base 23 of the driver, and movement may be imparted to the driver by means of a longitudinally movable actuating rod 30.

The actuating rod or stem 30 extends from the outside of the dashboard 5 through aligned openings 31 formed in the bushing 7 and an opening 32 formed on the adjacent end of the casing, and has its inner end connected with the movable switch unit driver in a manner to be later described. The opening 32 in the bushing thus assists in guiding the movement of the actuating rod, and the outer end of the rod has an actuating knob or handle 33 non-rotatably secured thereto in any desired manner, as by having the outer irregularly shaped end 34 of the rod received in a correspondingly shaped opening in the knob and its inner end swedged over to lie in a channel 35 formed at the juncture of the irregularly shaped end 34 and the major portion of the rod.

The manner of attaching the inner end of the actuating rod or stem with the driver greatly facilitates the installation of the switch in an automotive vehicle, as it requires merely the insertion of the rod or stem into the switch casing and the engagement of its threaded inner end 36 in a nut member 37 carried by the driver.

The nut member is maintained assembled

with the driver 21 by a substantially U shaped retaining member 38 secured at its ends 39 to the opposite sides of a wall 40 formed on the driver 21, by means of tangs 41 clinched over the edges of the wall 40. The closed end 42 of the U shaped retaining member 38 has an opening 43 to freely rotatably receive the rod or stem 30, and the nut member 37 is positioned between the wall 40 of the driver and the closed end 42 of the retaining member, being held against displacement and yieldably urged toward the wall 40, by an expansive spring 44 confined between it and the closed end of the retaining member.

Diametrically opposite notches 45 formed in the nut member 37 cooperate with detents 46 formed on the wall 40 to hold the nut member against turning in one direction during application of the rod or stem with the nut member while permitting rotation in an opposite direction to prevent accidental detachment. The detents may be formed by striking outwardly in opposite directions portions of the wall, so that the abrupt ends of the detents enter the recesses 45 and restrain the nut member against rotation upon threaded engagement of the actuating rod or stem with the nut member, the wall 40 preferably having an opening 47 to receive the extreme inner end 48 of the actuating rod or stem which is preferably pointed to form a guide to facilitate the engagement of its threaded portion with the nut member 37.

The U shaped retaining member 38 also has an arcuate lower wall 49 struck from the lower edge of its closed end 42 of the retaining member, to cooperate with the wall 40, the closed end 42, and the top of the casing, to form a substantially closed box to prevent the possibility of the nut member being displaced.

From the preceding description it will be obvious that attachment of the actuating rod or stem with the movable switch unit is a simple matter and requires merely the threading of the end of the rod in the nut member. This may be accomplished with the movable switch unit in any of its normal positions, as the ratchet action afforded by the detents 46 and the notches or recesses 45 of the nut member hold the nut member against rotation and permit the threaded engagement of the actuating stem therewith.

Accidental unscrewing of the actuating member from the nut member is precluded by the fact that the relatively flat inclination of the detents 46 provides insufficient friction to hold the nut member stationary upon retrograde movement of the actuating rod or stem.

If however, it is desired to remove the actuating rod or stem, this may be accomplished by drawing the rod outwardly beyond its outermost normal position as indicated in dotted lines in Figure 1. With the rod thus drawn outwardly a projection 50 in the form of an inwardly pressed portion of the casing enters one of the notches or recesses 45 of the nut member, providing it has been turned to alignment therewith, and thus secures the same against rotation facilitating disengagement of the stem or actuating rod therefrom.

It will be noted that to engage one of the notches or recesses 45 with the projection 50 it is necessary to apply tension to the rod or stem sufficient to compress the spring 44, hence it is obvious that under normal conditions, that is, during normal operation of the switch, the nut member will not be moved outwardly sufficiently far to permit the engagement of its notches with the projection 50.

In Figures 7 to 10 inclusive, a slightly modified form of this invention is illustrated, and in this structure, the switch casing is mounted as in the embodiment shown in Figures 1 to 6 inclusive, but the movable switch unit is of varied construction to accommodate two independent circuits. In this instance, the driver 51 of the movable switch unit is substantially of rectangular shape having its ends 52 and 53 directed laterally from its closed base 54 and having a mounting panel of insulating material 55 secured to the end walls 52 and 53 by struck over tangs or lugs 56.

The driver 52 together with its panel of insulating material thus forms substantially a closed box-like structure, and the panel 52 is provided with two irregularly shaped openings 56 and 57 in which contactors 58 and 59 are respectively mounted. The contactors conform to the shape of their respective openings and have downwardly extending cup-shaped depressions forming contacts 60 which cooperate with the stationary contacts of the terminal head to perform the desired functions of the switch as the movable switch unit is moved in the casing.

Expansive springs 61 and 62 are confined between the contactors 58 and 59 respectively and a strip of insulating material 63 mounted in the base of the movable switch unit driver 51 to provide contact pressure, and the springs are maintained in proper relation by upwardly extending tits formed on the contactors and by engaging their upper ends in suitable recesses formed in the insulating material 63.

It is noted that this manner of mounting the contactors leaves them free to accommodate any misalignment of the terminal head and to adjust themselves so as to obtain intimate contact with the stationary contacts, and to assure a positive driving connection between the driver panel 55 and the contactors, the contactors 58 and 59 are provided with upwardly extending peripheral flanges 58′ and 59′ respectively.

In this modification, the rib for guiding

the longitudinal movement of the movable switch unit driver is eliminated by extending the panel 55 to substantially the inner sides of the casing; and the manner of readily removably connecting the actuating rod or stem 30 with the driver comprises a nut member 64 preferably stamped of bendable metal and best illustrated in Figure 10, having an outer flange 65 and an inner substantially spool shaped portion 66. The spool shaped portion 66 of the nut member is engageable in a recess 67 formed in the forward wall 53 of the driver 51 where it is held against detachment by a leaf spring member 68.

The leaf spring member 68 has a central opening 69 of a size to permit the passage of the spool shaped inner end of the nut member therethrough, and the outer ends of its oppositely directed arms 69 cut away as at 70 to engage over the adjacent tangs 56 of the driver and prevent detachment of the spring member and the nut member from the forward wall 53 of the driver.

The spring member 68 is also bowed to project its inner portion outwardly of the wall 53 and has detents 71 projected outwardly therefrom adjacent its opening 69 which, due to the inherent resiliency of the spring member, are normally yieldably urged toward the enlarged flange 65 of the nut member. The flange 65 of the nut member has transverse recesses 72 formed therein, which like the recesses or notches 45 of the embodiment illustrated in Figures 1 to 6 inclusive, are adapted to receive the detents 71 and restrain rotation of the nut member in a clockwise direction to accommodate attachment of the rod or stem with the nut member while permitting counter-clockwise rotation thereof to prevent accidental disengagement of the rod.

The nut member 64 ordinarily will be left in an angular position at right angles to that shown in Figure 9, with the two notches 77 engaged with the detents 71; since the detents will fall into the notches and come to rest there when the knob and stem are installed. This places the notches 77 out of registry with a tang or lug 73 projecting from the bracket 6 through an opening 74 in the casing 9 and projecting into the path of the flange of the nut 65. Furthermore, when the movable switch unit is in its farthest normal switching position toward the dash board 5, the detent action of the ball shaped contact points of the contactors 58 and 59 in the stationary contact depressions, brings the movable switch unit to rest with the flange of the nut 65, in a plane spaced from the lug 73.

To remove the knob and stem it is necessary to pull the knob so that the movable switch unit overcomes its detent action and passes beyond its extreme normal contact making position toward the dash board, and to turn the knob until either notch 77 embraces the lug 73. The knob and stem may then be unscrewed from the nut 65 as the latter is held from turning by the lug 73.

Figures 11, 12, and 13 illustrate another slightly modified manner of preventing accidental detachment of the actuating rod or stem from the movable switch unit, and in this construction a U-shaped strap member 75 is secured to the forward wall of the movable switch unit driver, the closed end of the strap member being provided with an internally threaded opening 76 in which the threaded portion of the actuating rod or stem is engageable.

The bracket 6 in this construction is wider than that of the preceding structures and has a spring member 77 secured thereto to yieldably engage its free end, which is directed laterally as at 78, in a longitudinal channel 79 formed in the actuating rod and also in a recess 80 formed in a bushing 81 struck up from the casing front wall.

The actuating rod or stem is thus normally restrained against rotation in either direction and when it is desired to disengage the stem from the movable switch unit it is merely necessary to hold the free end of the spring 77 out of engagement with the actuating rod whereupon rotation thereof will be permitted.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that I provide a novel construction for lighting switches of automotive vehicles and the like, which is of simplified construction requiring no complicated manufacturing methods and in which novel means are provided for connecting the actuating rod or stem with the movable switch unit to facilitate installation of the switch and prevent accidental detachment of the actuating rod.

What I claim as my invention is:

1. In a device of the character described, the combination with an enclosing casing, of a movable switch unit within the enclosing casing, an actuating member for moving the switch unit from the exterior of the casing, and means for connecting the actuating member with the switch unit comprising a nut member carried by the switch unit and with which the actuating member is threadedly engaged, ratchet means for holding the nut member against rotation in one direction to facilitate threaded engagement of the actuating member with the nut member while permitting movement of the nut member in the opposite direction to prevent accidental detachment of the actuating member from the nut member, yieldable means for maintaining the nut member in active engagement with the ratchet means, and means for holding the nut member against movement in said

last mentioned direction to enable intentional detachment of the actuating member therefrom, said means requiring movement of the actuating member and the switch unit to a predetermined position.

2. In a switch of the character described, an elongated casing, switch instrumentalities movable within the casing in a direction longitudinal to the casing, an actuating stem slidable in an opening in one end wall of the casing, and means to removably connect the inner end of the stem with the switch instrumentalities comprising a nut member rotatably carried by the switch instrumentalities to be at all times within the casing, means to restrain rotation of the nut member in one direction to enable threading of the inner end of the stem into said nut member, said restraining means permitting rotation of the nut member in the opposite direction whereby detachment of the stem from the nut member by retrograd rotation of the stem is normally precluded, and means within the casing and beyond the normal limits of movement of the nut member with the switch instrumentalities to engage the nut member and restrain the same against rotation in said opposite direction so as to enable the stem to be detached from the nut member.

3. In a switch of the character described, an enclosing casing, switch instrumentalities within the casing, and having a predetermined normal rectilinear movement therein for the performance of definite switching functions, an actuating stem slidable in an opening in one wall of the enclosing casing to be movable longitudinally in the direction of the rectilinear movement of the switch instrumentalities, means on said switch instrumentalities and the inner end of the actuating stem providing a threaded connection for attaching the stem to the switch instrumentalities, said means being so arranged as to enable the making of said threaded connection with the switch instrumentalities within their normal limits of movement, and means within the enclosing casing and operable upon movement of the switch instrumentalities beyond one of their normal limits of movement to cooperate with one of the means affording the threaded connection to enable detachment of the stem from the switch instrumentalities.

4. In a switch device of the character described, an elongated casing, switch instrumentalities having rectilinear motion along the longitudinal axis of the casing between predetermined limits in the performance of definite switching functions, an actuating stem slidable in an end wall of the casing, means to detachably connect the inner end of the actuating stem with the switch instrumentalities comprising, a nut member rotatably carried by the switch instrumentalities and adapted to have the inner end of the stem threaded therein, ratchet means between the switch instrumentalities and the nut to restrain rotation of the nut in a direction permitting the engagement of the stem therewith but permitting rotation of the nut in the opposite direction so as to preclude accidental detachment of the stem therefrom, and means within the casing and engageable with the nut upon movement of the switch instrumentalities and the nut beyond one of said normal limits of movement to hold the nut against rotation in said opposite direction and enable unthreading of the stem therefrom.

5. In a switch of the character described, a flat terminal head having a plurality of stationary contacts mounted in a predetermined relationship, a movable contactor of a shape bearing a definite relationship to the arrangement of the stationary contacts, a guiding and propelling member with which the movable contactor is connected to be moved thereby with a rectilinear motion across the terminal head into selective engagement with the contacts, an actuating stem for the guiding and propelling member mounted for longitudinal motion in line with the rectilinear movement of the movable contactor, and means to connect the actuating stem with the guiding and propelling member comprising a nut member rotatably carried by the guiding and propelling member and with which the inner end of the actuating stem is adapted to be threadedly engaged, and ratchet means to hold the nut member against rotation in one direction only, whereby threaded engagement of the stem with the nut member is permitted but accidental detachment therefrom is precluded.

6. In a switch of the character described, including movable switch instrumentalities, and an actuating stem slidable along the axis of movement of the movable switch instrumentalities, means to detachably connect the actuating stem with the switch instrumentalities comprising a nut retaining member connected with the switch instrumentalities and forming therewith a pocket in which the nut member is rotatably confined, ratchet means to restrain rotation of the nut member in one direction, spring means cooperating with one wall of said pocket to maintain the nut member in operative relationship to the ratchet means, and a threaded portion on the actuating stem adapted to be threaded into the nut member, said ratchet means holding the nut member against rotation during engagement of the threaded actuating stem portion therewith but permitting rotation of the nut member in an opposite direction to preclude accidental detachment of the actuating stem therefrom.

7. In a switch of the character described, movable switch instrumentalities, a propelling and guiding member for the movable

switch instrumentalities, an actuating stem for the propelling and guiding member, and means to connect the actuating stem with the propelling and guiding member, comprising a nut member engaged with one wall of said propelling and guiding member in line with the actuating stem and adapted to threadedly receive the inner end of the stem, ratchet means to hold the nut member against rotation in one direction to enable the threaded engagement of the actuating stem therewith but permitting rotation of the nut member in the opposite direction so as to preclude accidental detachment of the stem, and common spring means for maintaining the nut member engaged with said wall of the propelling and guiding member and for maintaining said ratchet means in operative association with the nut member.

8. In a switch of the character described, a flat terminal head having a plurality of stationary contacts mounted thereon in a predetermined definite relationship, a movable contactor of a shape bearing a definite relationship to the arrangement of the stationary contacts on the terminal head, a propelling and guiding member for said movable contactor including a flat insulated plate lying adjacent to and parallel with the inner face of the terminal head and having an opening therein to receive the movable contactor with portions thereof fitting closely and with other portions fitted loosely therein whereby the contactor is firmly guided but is free to tilt in following the inner face of the terminal head, and spring means to urge the movable contactor toward the terminal head.

9. In an electric switch including an enclosing casing, reciprocable switch instrumentalities within the casing and an actuating stem for reciprocating the switch instrumentalities, means within the casing to attach the actuating stem to the switch instrumentalities comprising, a nut member adapted to have the inner end of the actuating stem threaded therein, means to rotatably mount said nut member from the switch instrumentalities in a position to be engaged by the inner end of the stem, ratchet means to restrain rotation of said nut member in a direction enabling the threading of the stem therein, and a spring interposed between the apertured member and a part carried by the switch instrumentalities, said spring maintaining the ratchet means operative and applying the normal impelling force of the stem in one direction to the switch instrumentalities.

10. In an electric switch including an enclosing casing, reciprocable switch instrumentalities within the casing and an actuating stem for reciprocating the switch instrumentalities, means within the casing to attach the actuating stem to the switch instrumentalities comprising, a nut member adapted to have the inner end of the actuating stem threaded therein, means to rotatably mount said nut member from the switch instrumentalities in a position to be engaged by the inner end of the stem, ratchet means to restrain rotation of said nut member in a direction enabling the threading of the stem therein, a spring interposed between the apertured member and a part carried by the switch instrumentalities, said spring maintaining the ratchet means operative and applying the normal impelling force of the stem in one direction to the switch instrumentalities, said part of the switch instrumentalities engaging the casing wall to limit the normal movement of the switch instrumentalities in said direction, and means projected from a casing wall to have an interlocking engagement with the nut member upon extended movement of said nut member with the actuating stem in said direction against the force of said spring to enable intentional detachment of the stem from the nut member.

In testimony whereof I have hereunto affixed my signature.

EDWARD N. JACOBI.