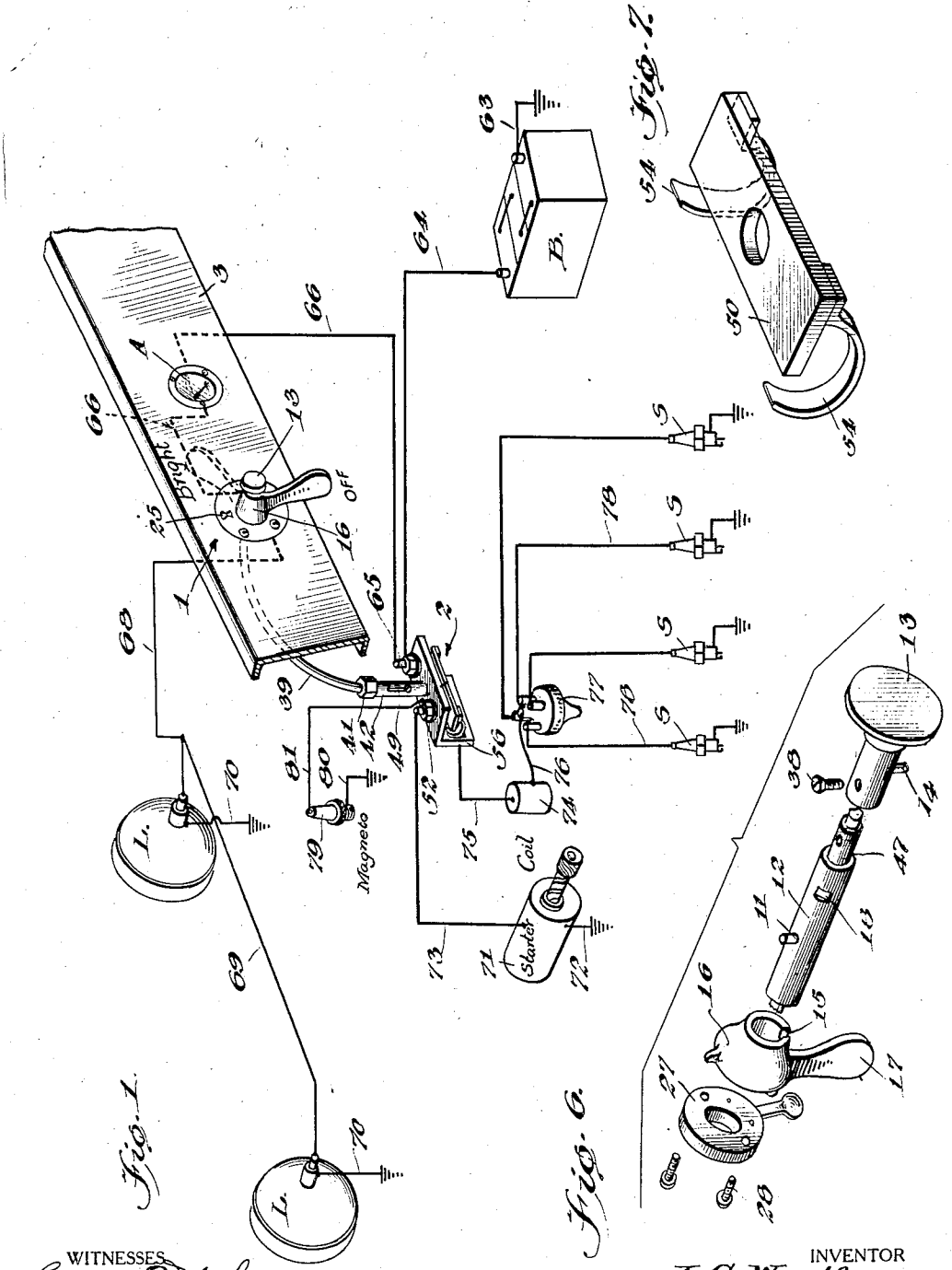
Jan. 14, 1930. J. G. WORTHAM 1,743,949

STARTING AND LIGHT SWITCH

Filed July 15, 1926 2 Sheets-Sheet 1



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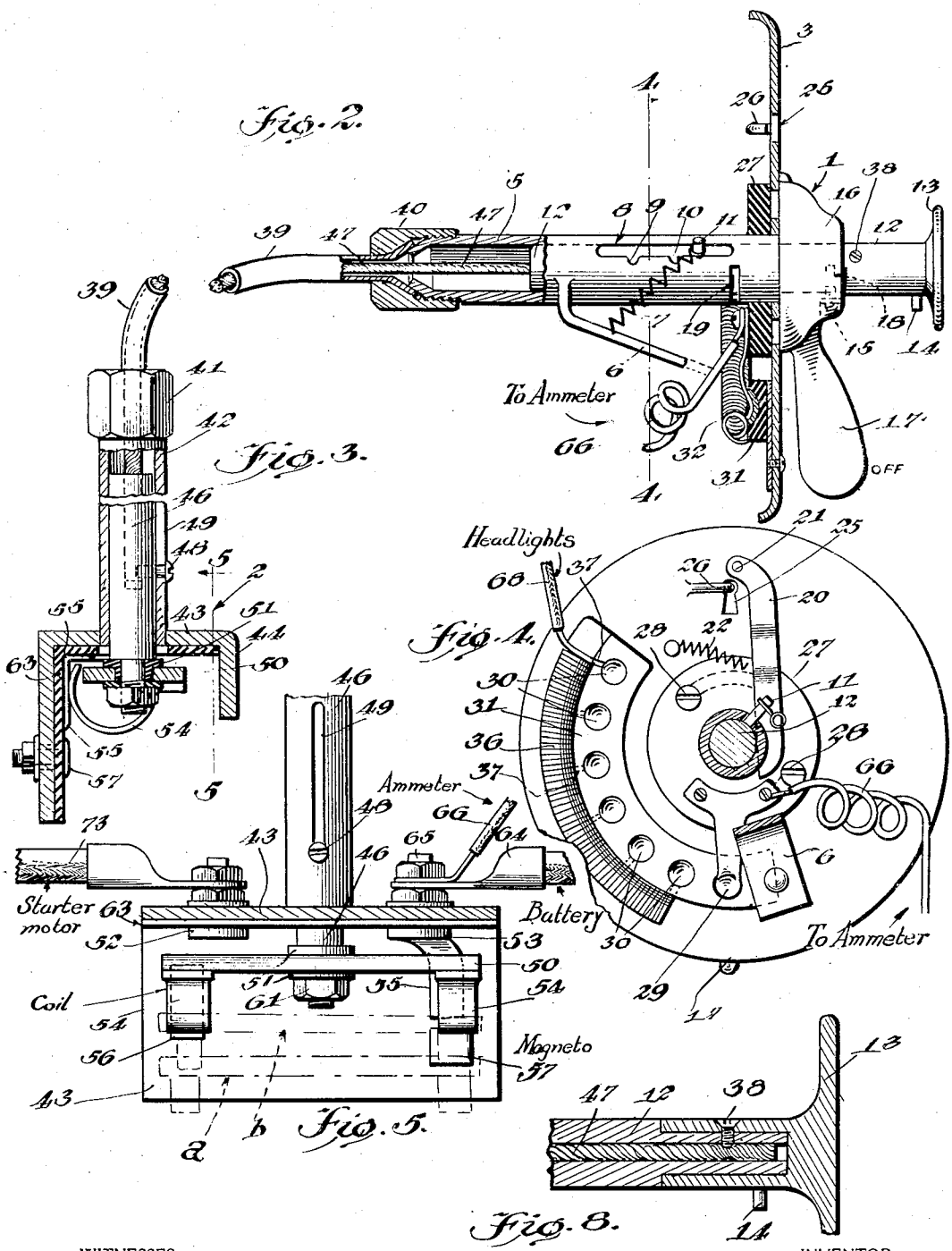
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UNITED STATES PATENT OFFICE

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STARTING AND LIGHT SWITCH

Application filed July 15, 1926. Serial No. 122,683.

This invention relates to improvements in switches, and it consists in the constructions, combinations and arrangements herein described and claimed.

An object of the invention is to provide a relative simple and inexpensive switch arranged for controlling starter motor, ignition and headlight circuits from the instrument or dash board of the motor vehicle and in a convenient manner.

Other objects and advantages appear in the following specification, reference being had to the accompanying drawings, in which:

Figure 1 is a diagrammatic perspective view illustrating both the elements of the improved switch and also the various circuits with which it is concerned.

Figure 2 is a sectional view of that portion of the switch carried by the instrument board.

Figure 3 is a sectional view of an associated part of the switch,

Figure 4 is a section taken on the line 4—4 of Figure 2, showing the appearance of the instrument board section of the switch from the rear.

Figure 5 is a sectional view of said associated part of the switch taken on the line 5—5 of Figure 3.

Figure 6 is a detail perspective view of separated parts of the instrument board section of the switch.

Figure 7 is a detail perspective view of separated parts of said associated part of the switch.

Figure 8 is a sectional view of a portion of the switch carried by the instrument board.

As briefly indicated in the foregoing statement, it is one of the objects of the invention to assemble all of the necessary switch elements for the control of the starter motor, the ignition system and the headlights or other lights of a motor vehicle upon the instrument board within convenient reach of the operator for manual operation. In other words, the starter motor, ignition and headlight switches are assembled in one place on the instrument board, the arrangements being such that they can be easily operated by hand, there being a further arrangement which insures that the ignition circuit and the starter motor circuits are closed so that there may be no danger of exhausting the battery through forgetfulness on the part of the operator to close the ignition circuit. These and various other objects of the invention will be fully understood later on.

Reference is had to Figure 1 for the general arrangement of the improved switch. Although the parts 1 and 2 are herein referred to as the instrument board and associated parts respectively of the switch, they are in fact, elements of one structure between which there is mutual cooperation. The former is appropriately mounted upon the instrument board 3 from which it derives its name, the associated part being mounted at any convenient place on the car.

The switch part 1 (describing the elements in order) comprises a sleeve or guide 5 (Figs. 2 and 4) which is rigidly mounted on back of the instrument board 3. The terms "back" and "front" distinguish the sides of the instrument board in relation to the operator, that part facing him being regarded as the front, the concealed part being regarded as the back. The sleeve 5 is on back of the instrument board, as stated, and is concealed from the operator.

A bracket 6 secured both to the sleeve and to the back of the instrument board (Fig. 2) assists in holding the former rigid. It also serves as the mounting for one end of a spring 7. The sleeve has a slot 8 extending in the axial direction, this slot having a pair of lateral recesses 9 and 10 respectively representing magneto and battery circuit closing positions. These recesses are intended to be occupied by a stud 11 on a plunger 12 which is manually shifted in the sleeve 5. The remaining end of the spring 7 is attached to the stud 11 and the act of engaging the stud with one or the other of the recesses occurs automatically when the plunger is pulled out far enough to permit.

A button 13 on the exposed extremity of the plunger 12 facilitates pulling and push-

ing of the plunger. The plunger has a pin 14 on the underside near the button, this pin being intended to enter a slot 15 in the head 16 of the headlight switch lever 17 when the plunger is pushed to the inner extremity, thereby locking the switch lever 17 from turning. The plunger 12 controls the magneto and battery components of the ignition circuit and the circuit of the starter motor, and it is therefore an additional object of the invention to lock the lighting switch lever 17 in an open position when the plunger 12 assumes an open position in respect to the foregoing circuit. Locking of the lever 17 from turning is accomplished by engagement of the pin 14 with the slot 15 and the engagement of the stud 11 with the slot 8. But in order that the locking of the switch may be complete it is necessary to prevent pulling out of the plunger 12.

For this purpose the plunger has a groove 18 at one side (Figs. 2, 4 and 6). This groove is registrable with a slot 19 in the sleeve 5 when the plunger 12 is in the circuit opening position. At such time a locking lever 20 will be swung upon its pivot 21 on back of the instrument board 3 by virtue of a spring 22 (Fig. 4) to engage both the slot and groove and prevent pulling out of the plunger as the reader can readily understand. The operator must have an appropriate key to swing the lever 20 out of locking position and permit pulling out of the plunger 12. For the purpose of the present illustration, the instrument board is shown provided with a key hole 25.

Immediately behind the key hole there is a rest 26 to receive the barrel of the key for turning of the latter. The ward of the key will engage the lever 20 and swing it out of locking position as stated. In practice the arrangement will not be so simple, it being preferred to substitute one of the well-known locks for the keyhole 25 and rest 26 so that the switch may not be unlocked so readily. As already stated, the present showing is merely for illustration, and the reader must understand that a lock may be substituted for the elements 25, 26. An insulating collar 27 on the back of the instrument board 3 has suitable connection with the head 16, as by means of screws 28 passing through arcuate slots in the instrument board to provide a revoluble mounting for the lever 17. The head 16 and collar 27 are thus fixedly connected together, movement of the lever 17 therefor moving the collar 27 and causing the contactor 29 carried by the collar to traverse a series of contacts 30 (Fig. 4) that are carried by a segment of insulation 31. The contactor may comprise a familiar style of spring-pressed carbon brush or spring brass or any other means may be employed to make contact.

The contacts 30 are suitably mounted upon the insulating segment 31. A resistance coil 36 is connected at places 27 with the various contacts thus controlling the brilliancy of the headlights.

A bent tube 39 extends from the element 1 to the element 2 of the switch. This tube is coupled at one end with the stationary means 5 as at 40, and is coupled at the other end as at 41 with the stationary sleeve 42 of the element 2. The latter sleeve is firmly fixed upon the switch base 43 which has a suitably arranged flange 44 by means of which the element or part 2 may be mounted in any desired position upon the vehicle.

A plunger 46 in the sleeve 42 has connection with the plunger 12 by means of a suitable flexible element 47. An outward pull on the plunger 12 produces upward motion of the plunger 46 in the sleeve 42 and vice versa. The plunger 46 is kept from turning in the sleeve 42 by the engagement of the stud 48 on the plunger with the slot 49 of the sleeve.

The plunger 46 carries a conductive contact bar 50, insulating therefrom by a bushing 51 (Fig. 3) and adapted to bridge the contacts 52 and 53 respectively relating to the starter motor and to the battery when the plunger 12 is pulled all the way out. Spring contacts 54 carried by the bar 50 are engageable with contacts 55, 56 and 57 upon the base 43.

The bar 50 and contacts 54 bridge the contacts to complete certain circuits. When the plunger 12 on the instrument board is pushed all the way in, the stud 11 rests in the back end of the slot 8, the bar 50 approximately assumes the position *a* (Fig. 5). When the plunger 12 is pulled out so as to bring the stud 11 within the range of the first recess 9 the bar 54 assumes the bridging position *b* to close the magneto-coil circuit represented by the contacts 56 and 57. When the plunger 12 is pulled out so that the stud 11 is within range of the second recess 10 the bar 50 assumes the full line position in Figure 5 closing the battery-coil circuit represented by the contacts 55 and 56. When the plunger 12 is pulled all the way out the contact bar 50 engages the contacts 52 and 53 of the battery-starter circuit. The spring contacts 54 will then still be in engagement with the contacts 55 and 56.

A sheet of fiber 63 inside of the base 43 serves to insulate the various contacts from each other, or these contacts may be made on and carried with bar 50, these also being insulated from the base where they pass through and carry appropriate binding nuts.

Attention is directed to Figure 1 for the electrical system. One of the terminals of the battery B is grounded as at 63, the other terminal being connected by means of a wire 64 with the terminal 65 of the contact 53 then with one side of the ammeter A by

means of a wire 66. The other side of the ammeter is connected with the contactor arm 29 by a wire 66 (Figs. 2 and 4).

A wire 68 connects the uppermost one of the contacts 30 (Fig. 4) with the headlights L, the lamps of these headlights being connected in parallel at 69 and grounded at 70. One side of the starter motor 71 is grounded at 72, the other side being connected with the contact 52 (Fig. 5) by means of a wire 73. 74 designates a suitable coil. One terminal of the coil is connected with the contact 56 by means of a wire 75, a wire 76 connecting the other terminal of the coil with the distributor 77 whence high tension current is distributed to a plurality of spark plugs S by way of the wires 78. 79 designates a magneto which is grounded at one side as at 80 and at the other side is connected by means of the wire 81 with the contact 57.

The operation may be readily understood. Assume the plunger 12 on the instrument board to be pushed all the way in, the button 13 being nearest to the instrument board. The stud 11 (Fig. 2) will rest at the back end of the slot 8. The pin 14 on the plunger will occupy the slot 15 in the switch lever head 16, assuming the switch lever 17 to be in the down or off position, such occupancy preventing turning of the switch lever to throw on the headlights. The plunger 46 of the switch element 2 will be in the down position, the contact bar 50 and contacts 54 then assuming the position *a* (Fig. 5) at which time they are inoperative to close any circuit.

The plunger 12 is held in the foregoing position by the engagement of the locking lever 20 with the slot 18 in the plunger and the groove 19 in the sleeve 5. Inasmuch as the plunger is prevented from being pulled out it follows that the switch lever 17 is prevented from being turned by virtue of the engagement of the pin 14 with the slot 15. It is necessary that the proper key be inserted in the hole 25 to displace the lever 20 from the locking position. As already stated, in practice the simple arrangement 25, 26 will be substituted by some prominent lock, for example, one of the Yale locks which are commonly used for purposes such as this.

Assume the plunger 12 to be unlocked. The operator should pull the button 13 all the way out to start, in other words the stud 11 (Fig. 2) should skip the recesses 9 and 10 to begin with. Motion of the plunger will pull up on the plunger 46 until the bar 50 bridges the contacts 53 and 52 and the spring contacts 54 bridge the contacts 55 and 56. The starter motor circuit being closed, current flows thus: from the battery B over wire 64 to contact 53, across contactor 50 to contact 52, over wire 73 to the starter motor 71 whence it passes to ground by way of wire 72 and to the other terminal of the battery by way of wire 63. Simultaneously with this circuit closure the battery ignition circuit is also closed, current flowing thus: from the battery B over wire 64 to contact 53, across the contactor 50 to the contact 56, wire 75 to the coil 74, wire 76 to the distributer 77 and to the various spark plugs S by wires 78, the current passing to ground, whence it returns to the other side of the battery by wire 63.

It is to be observed that the act of starting insures automatic closure of the ignition circuit, thereby precluding the possibility of continuously operating the starter without closing the ignition circuit and running the battery down before the cause of the trouble is discovered. Having started the engine, the operator pushes back on the button 13 until the stud 11 drops into the recess 10 (Fig. 2). The starter motor circuit will thus be opened by virtue of the disengagement of the contactor bar 50 from the contacts 53 and 52 as in the full line position, Fig. 5. The spring contacts 54 are still in engagement with the contacts 55 and 56, and the coil 74 may be operated by battery current until the operator sees fit to switch over to the magneto. This is done by pushing in on the button 13 again until the stud 11 drops into the recess 9.

The contactor bar 50 and contacts 54 then assume the position *b* (Fig. 5) at which time current flows as follows: from magneto 79 (Fig. 1) over wire 81 to the contact 57, across bar 50 to the contact 56, over wire 75 to the coil 74, wire 76 to the distributer 77, wires 78 to the spark plugs S whence it passes to ground, finally returning to the magneto 79 by way of the ground connection 80. Upon pushing the button 18 and plunger all the way in, the foregoing ignition circuit is opened, and the plunger 12 is automatically locked in such position by the reengagement of the lever 20 with the groove 18.

Upon desiring to light the headlights L the plunger 12 may be pulled out until the stud 11 drops into the recess 9, it being necessary to unlock the plunger first, whereupon current flows thus: from the battery B over wires 64 and 65 to the contactor arm 29, through the contacts and resistances 36 of the headlight switch (Fig. 4) to wire 68 whence it flows to the headlights returning to the battery by way of the ground connections 70 and 63. The headlights may be lighted without necessarily having the motor vehicle in operation, but it is necessary to pull the plunger 12 out sufficiently far to disengage the pin 14 from the slot 15 before the headlight switch lever 17 can be turned from the off position (Fig. 1) toward

the bright position, as indicated by the dotted arrow.

The improved switch is capable of installation on any of the known types of motor vehicles. Stopping the engine by pushing the instrument board plunger 12 in all the way not only locks the starter and ignition switches in the open positions but also locks the headlight switch lever 17 in the open position. Should it so happen that the headlights are left on, an attempt to stop the engine will be prevented by the engagement of the pin 14 with the rim of the head 16 (Fig. 2), the operator therefore finding it necessary to first open the headlight switch before he can open the ignition circuit to stop the engine. The headlight switch has six contacts 30, permitting considerable variation in the brilliancy of the light beams. The starter and ignition switches, incorporated in the element 2, may be located any desired distance from the instrument board switch, but as already fully brought out, the first switches are directly dependent upon the instrument board mechanism for control and operation.

While the construction and arrangement of the improved starting and light switch is that of a generally preferred form, obviously modifications and changes may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. A switch comprising a contactor bar and connected spring contacts, a plurality of contacts being the terminals of various eletrical circuits and arranged for a predetermined manner of engagement by said contactor bar and spring contacts, a reciprocable plunger structure carrying said bar and spring contacts, a stud on part of the plunger structure, a fixed sleeve in which the part of the plunger structure is reciprocable having a slot with lateral recesses to receive the stud, and resilient means to pull the stud into the recesses as said plunger structure is reciprocated to move the stud past thereby to indicate various engaging positions of the contactor bar and said spring contacts in respect of said plurality of contacts.

2. A switch comprising a contactor bar, associated contacts of an electrical circuit, a pair of plungers one of which carries the contactor bar the other having a stud and a groove, sleeves containing and guiding the two plungers one of the sleeves having a slot with lateral recesses to receive the stud and having a second slot, flexible means connecting the plunger and tubular means connecting the sleeves in which said flexible means is guided, resilient means causing the stud to engage the recesses when moved adjacent thereto by reciprocation of the respective plunger whereby to hold the contact bar in prearranged position, and swinging means to enter said second slot and the groove to lock said plunger when in a predetermined position in the respective sleeve.

3. A switch comprising a lever, a head from which the lever extends, said head having a slot, a contactor carried by the head, a plurality of contacts with which the contactor is engageable, means including a plunger upon which the head is revoluble to move said contactor over said contacts, said plunger being reciprocable, and a pin on the plunger engaging the slot when the lever assumes a switch-opening position to prevent rotation of the head and movement of the contactor over said contacts until the plunger is pulled out.

4. A switch comprising a concentric plunger and lever, each having a contactor and associated contacts of separate electrical circuits, common guide means in which the plunger is slidable and upon which the lever can be turned respectively to control the various circuits, and means on the plunger locking the lever against turning upon sliding the plunger in the guide means, then establishing predetermined relative positions of the contactors and contacts.

5. A switch comprising a concentric plunger and lever, each having a contactor and associated contacts of separate electrical circuits, common guide means in which the plunger is slidable and upon which the lever can be turned respectively to control the various circuits, means on the plunger locking the lever against turning upon sliding the plunger in the guide means, then establishing predetermined relative positions of the contactors and contacts, and means for then also locking the plunger against sliding.

6. A switch comprising a contactor and a contact, a plunger carrying the contactor, a stud on the plunger, a guide in which the plunger is slidable, having a slot with a lateral recess to receive the stud, and resilient means tending to move the stud either into the recess or into one end of the slot to hold the contactor in predetermined positions in respect to said contact.

7. A switch comprising a contactor and one set of contacts, a second contactor and a second set of contacts, guide means in respect to which the second contactor can turn to control the second set of contacts, said means having a slot and a recess, a plunger connected with the first contactor being slidable in said guide means to control said one set of contacts, a stud on the plunger riding in the slot engaging either with the recess or one end of the slot to hold the contactor in contact-engaging or disengaging positions, and a pin on the plunger to lock the second contactor against turning when the stud is in said one end of the slot.

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