Nov. 18, 1924. 1,515,932

F. D. CROWDER

ELECTRIC SWITCH

Filed Nov. 23, 1920

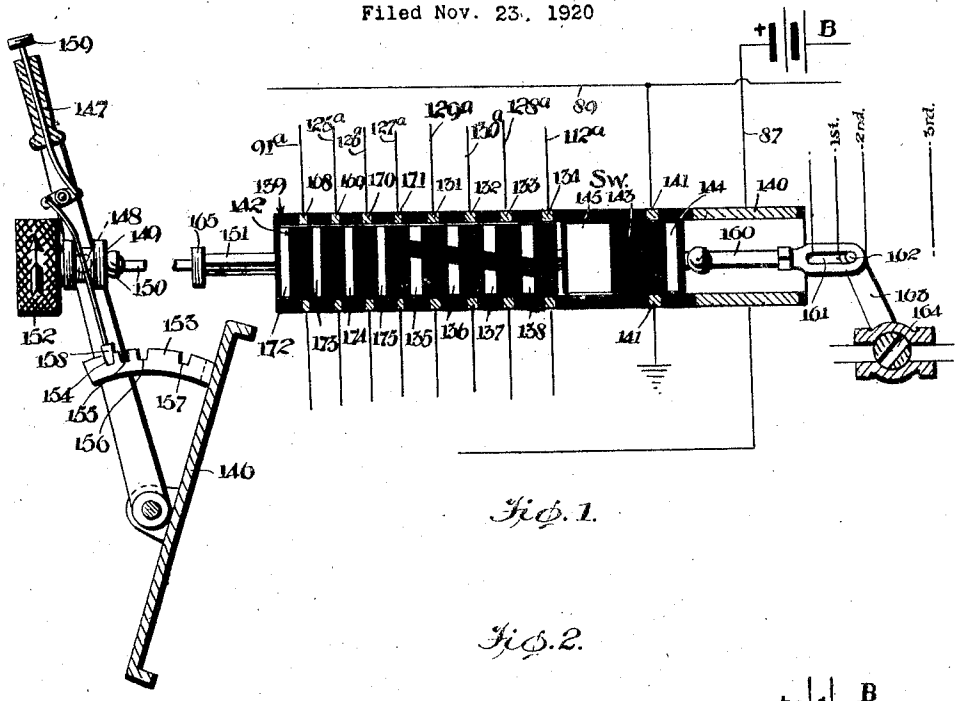
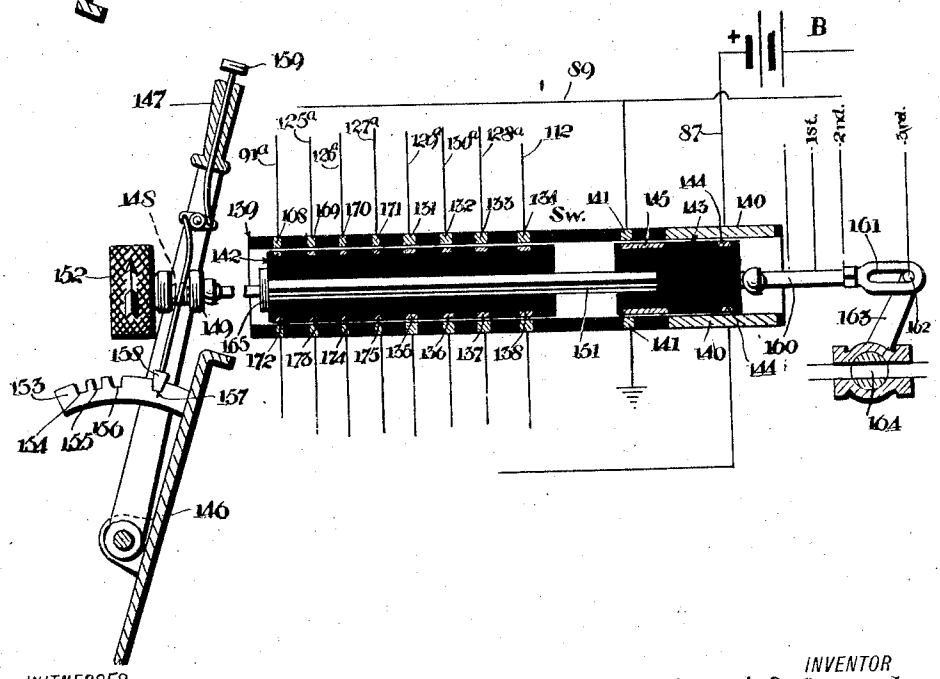


Fig. 1.

Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK D. CROWDER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-FOURTH TO LORENZO G. WARFIELD, OF WASHINGTON, DISTRICT OF COLUMBIA; ONE-FOURTH TO L. R. WILHITE, OF HOUSTON, TEXAS; AND ONE-FOURTH TO H. H. HADEN, OF HARRIS COUNTY, TEXAS.

ELECTRIC SWITCH.

Application filed November 23, 1920. Serial No. 426,063.

To all whom it may concern:

Be it known that I, FRANK D. CROWDER, a citizen of the United States, and a resident of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to improvements in electric switches, and it consists in the constructions, combinations and mode of operation herein described and claimed.

One of the foremost objects of the invention is to provide a master electric switch by means of which the function of the hydro-gas engine disclosed in my copending application for Letters Patent filed Nov. 23, 1920, Serial No. 426064 are initiated.

Another object of the invention is to provide a switch controlled by successive movements of suitable means on the instrument board of an automobile, by means of which certain functions of the engine referred to are performed in the order.

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

Figure 1 is a sectional view of the improved switch and its actuating lever, the contact plugs being shown in the initial or inoperative position and also being shown in elevation,

Figure 2 is a complete sectional view of the switch showing the plugs in the last or operative position.

The electric switch is designed to occupy a position near the engine, but the lever by which it is actuated is situated on the cowl or instrument board of the automobile. Its function is to set the electric system of the engine in operation and to open the main fluid valve of the engine, but inasmuch as the engine constitutes the subject matter of other application referred to, illustration and description thereof is omitted herein. The electric switch comprises an insulating cylinder 139 which carries sets of contacts 131, 132, 133 and 134, to be bridged by rings 135, 136, 137 and 138 to complete the current paths in the branch wires 129^a, 130^a, 128^a and 112^a joining the various contacts 131, etc. with operating parts of the engine.

There are other contacts 168, 169, 170 and 171 set in the cylinder 139, to which other branch wires 91^a, 125^a, 126^a and 127^a of other parts of the engine run. These last contacts are to be bridged by rings 172, 173, 174 and 175 to complete the current paths in the branch wires named.

The cylinder 139 has main contacts 140 at which the separated ends of a main positive wire 87 terminate. This wire receives current from the battery B. The cylinder also carries other contacts 141, one of which is connected to a common negative return wire 89, the other being grounded. Inside of the contact cylinder 139 are movable insulating plugs 142 and 143, each separate from the other, the former carrying the bridge rings 135 etc. and 172 etc. These rings are normally out of engagement with their companion contacts in the cylinder 139, that is to say, they are out of engagement as in Figure 1 when the engine is at rest, but are in permanent engagement when the engine is in operation. The latter plug carries rings 144 and 145 respectively to bridge the contacts 140 and 141.

Mounted on the instrument board 146, or at any other convenient place, is the lever 147 by means of which the contact plugs are shifted. The lever has a pin 148 working in the groove of a collar 149 on the flexible shaft 150 which extends to the non-circular shaft 151. At first this shaft slides within the contact plug 142, that plug not moving until the shoulder 165 engages it, but later this plug is turned through the medium of the non-circular shaft and the flexible shaft 150, the knurled button 152 being provided for the last purpose.

A quadrant 153 has notches 154, 155, 156 and 157 to be engaged by the latch 158. The latch is disengaged by pressing on the button 159. The forward movement of the lever 147 moves the contact plug 143 correspondingly. This plug has a stem 160 with a head having a deep slot 161 occupied by the pin 162 on the handle 163 of the main fluid valve 164. This valve is situated in the main fluid inlet conduit of the engine. Consider now the operation of the switch and how it initiates the functions of the engine. Assume the engine to be at rest. The main fluid valve 164 is

closed as in Figure 1. The main switch *Sw* is open; the lever 147 is drawn back to the last notch 154 and the whole electrical system is deenergized. Upon desiring to start the engine the lever 147 is moved to the first notch 155. This moves the plug 143 far enough to engage the ring 144 with the main contacts 140 whereupon the main positive wire 87 is closed at the main switch *Sw* in readiness for the completion of the first circuit.

This occurs when the lever 147 is moved into the second notch 156 which brings the ring 145 into engagement with the contacts 141, completing the following circuit: current flows from the positive pole of battery B over main positive wire 87 past the switch contacts 140, 144, to certain branches and working solenoids of the engine and back to the negative return wire 89, contacts 141 and 145 to ground, and so back to the negative pole of the battery.

The switch contact plug 142 is still in the original position, not having yet been engaged by the shoulder 165 of the non-circular shaft 151. The base of the slot 161 in the head of the stem 160 stands in the dot and dash line position indicated "2nd," and the main fluid valve 164 is now open but very little.

Now move the lever 147 to the last notch 157. During the passage between notches 156 and 157 the broken ring contacts 135, etc. are brought into engagement with the corresponding contacts 131 etc., before the ring 145 is entirely disengaged from the contacts 141. Certain other circuits are then completed, a detailed description of which is omitted.

Upon completing the movement of the lever 147 the main valve 164 will stand fully opened, and the ring 145 will be out of engagement with the contact 141, but the broken rings 135 etc. will be in full engagement with the contacts 131 etc., so will the rings 172 etc. and contacts 168, etc. The operator should now turn the button 152 in the direction of the arrow.

The breaks in the rings 135 etc. are arranged on a bias. A slight turn of the button 152 will convey the break of the first ring 135 beneath the contact 131 and so break a circuit of the engine. Should this function fail to occur, the operator may turn the button 152 a little farther to bring the break of ring 136 beneath the contact 132 and so break another circuit of the engine. On the same principle, all similar circuits may be broken in an effort to start the engine.

While the construction and arrangement of the improved master electric switch as herein described and claimed, 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. An electric switch, comprising a relatively fixed member with contacts, a plurality of relatively movable contactors normally in disengagement from the contacts, means in connection with one of the contactors for moving it in respect to said member and a companion contactor, means embodied in said moving means for taking up said companion contactor after a predetermined movement of the first, and means for imparting a turning movement to the contactors through said moving means at any point within the range of movement.

2. An electric switch comprising relatively fixed contacts, a plurality of separate and relatively movable contactor plugs in normal electrical disconnection, means for imparting a succession of sliding impulses to one plug to move it in respect to the companion plug and certain of said contacts, means for engaging the companion plug after said movement of the first plug to carry the former with the latter for the rest of the movement, and means enabling turning of said plugs at any position within the range of said sliding movement.

3. An electric switch comprising a series of relatively fixed contacts, a plurality of insulating plugs, each with contactors in normal electrical disengagement; means carried by one plug passing through the other, including a non-circular shaft; means for shifting the shaft and its plug by a succession of movements without affecting the other plug, and means carried by said shaft for imparting a turning movement to both plugs.

4. An electric switch comprising a series of relatively fixed contacts, a plurality of insulating plugs, each with contactors in normal electrical disengagement; means carried by one plug passing through the other, including a non-circular shaft; means for shifting the shaft and its plug by a succession of movements without affecting the other plug, means for engaging the second plug after a predetermined movement of the first, to subsequently move both together, and means carried by said shaft for subsequently turning both plugs without affecting the position then occupied, for the breaking of certain circuits at certain of the contacts.

5. An electric switch comprising a relatively fixed insulating mounting with a series of contacts, separate and relatively movable insulating plugs with companion contacts, means carried by one extending through the other, with a flexible connection to a point of control, means at said point for shifting the connection and ultimately said plug a predetermined distance without affecting the other plug, means included in

said shifting means for locking said plug at any of a plurality of positions, means catching up with the second plug after a predetermined movement of the first, whereupon both move together in respect to said contacts; and means for turning said flexible connection, and consequently both plugs, for the breaking of certain circuits terminating at certain of said contacts.

6. An electric switch comprising an insulating cylinder, a plurality of contacts distributed over the inner surface of the cylinder, a pair of insulating plugs situated in the cylinder, contact rings carried by one plug adapted to cooperate with certain of said contacts, interrupted contact rings carried by the same plug and adapted to cooperate with others of the contacts, contact rings carried by the other plug adapted to cooperate with others of the contacts, non-circular means passing through the first plug to a point of attachment to the second plug, a knob carried by said non-circular means and having an adjacent collar, a lever having connection with said collar permitting reciprocation of the non-circular means and corresponding reciprocation of the second plug in respect to the first plug, whereby the engagement of associated contacts is established, means carried by said non-circular means adapted to engage the first plug after a predetermined movement of the second plug whereby to move said first plug and establish the engagement of cooperating contacts, said knob permitting turning of both plugs to carry out a breaking function in respect to said interrupted rings; and means in respect to which said lever is adjusted and by which said adjustments are held.

7. An electric switch comprising a plurality of contactors, sliding means having engaging means carried by one contactor and extending through the other, means to move the sliding means and slide its contactor a predetermined distance before engaging and sliding the other, and means to turn all contactors by said sliding means independently of said sliding movement.

8. An electric switch comprising a plurality of separate contactors, movable means fixed on one contactor by which all are actuated, means on said actuating means to engage an adjacent contactor which is loose in respect to the actuating means after a predetermined distance of movement, turning means in connection with said actuating means, and means on said actuating means to turn the loose contactor with the other contactor at any point within range of said movement.

FRANK D. CROWDER.