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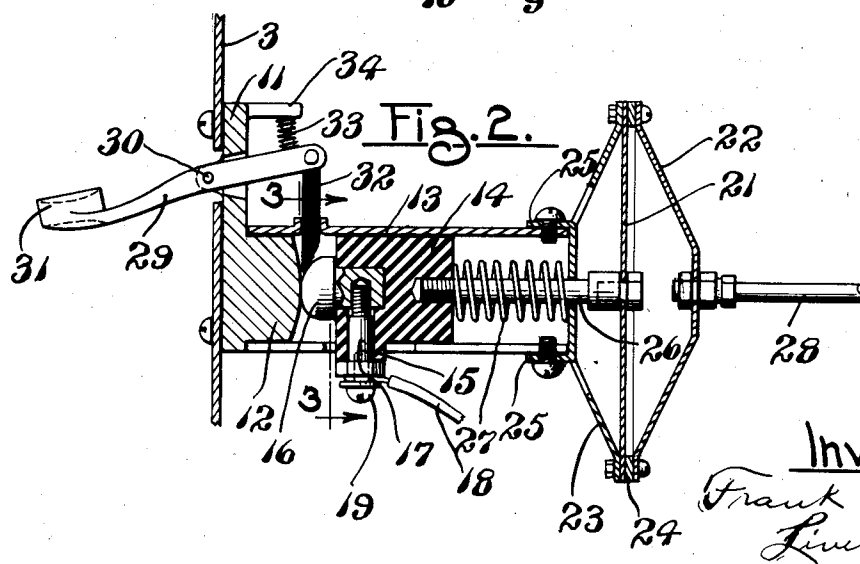
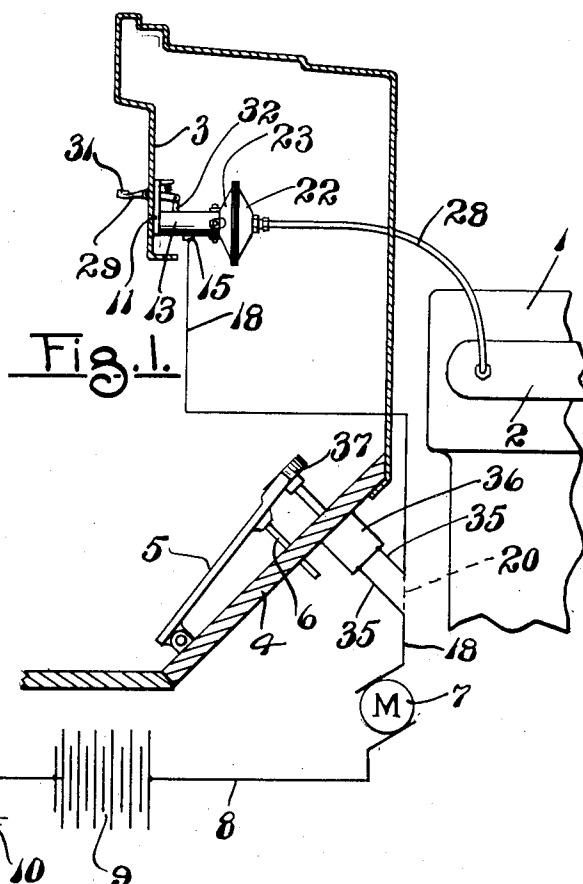
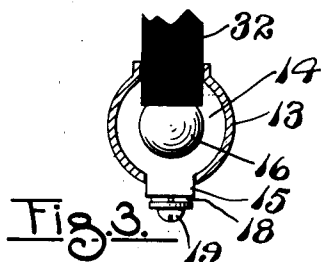
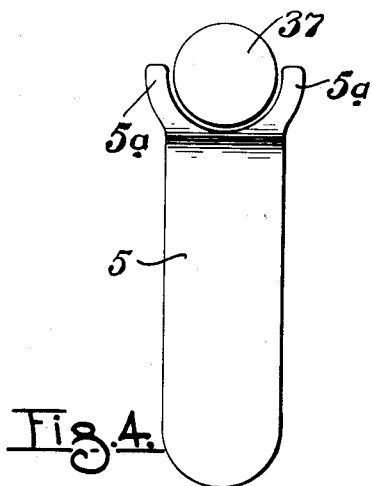
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2,117,066

ENGINE STARTING

Filed March 29, 1937

2 Sheets-Sheet 1



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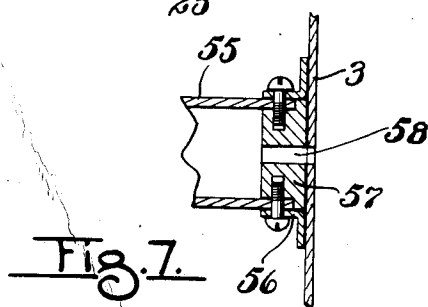
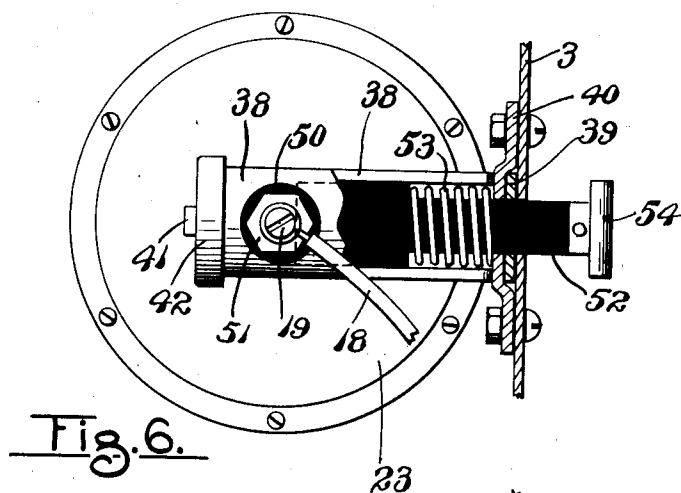
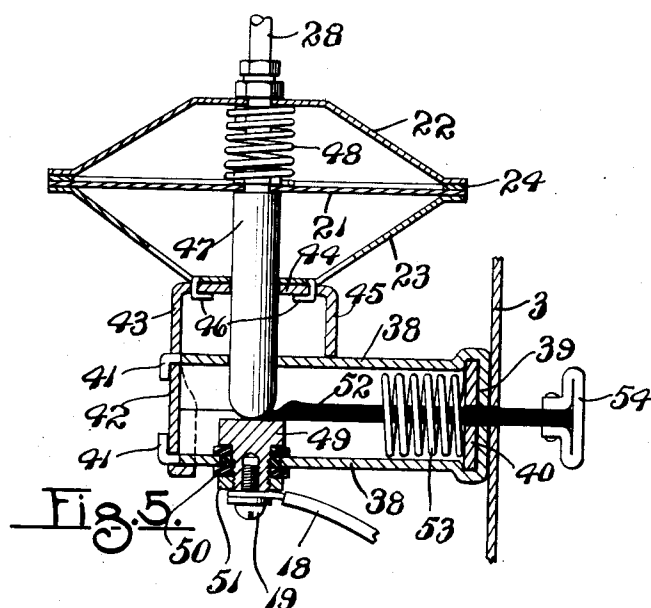
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2 Sheets-Sheet 2



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ENGINE STARTING

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11 Claims. (Cl. 290—38)

This invention relates to engine starting, particularly internal combustion engines of motor vehicles. It is an object and purpose of the present invention to provide a very economically manufactured and readily and easily operated semi-automatic starting device which, preferably, will be mounted on the dash of a motor vehicle body, said device being interposed in the electric circuit in which the starting motor which turns over the engine is located, and which may be operated to close the circuit when the engine is at rest, whereby the starting motor will be energized; and with which the starting motor circuit will be broken when the engine runs under its own power and cannot be closed again until a manual operation is performed which will move a separating member which automatically interposes itself between contacts in the starting motor circuit when the same are separated after the engine has started.

Also with this starting device and the circuit in which it is used there may be, if desired, introduced in the circuit a second switch to be closed simultaneously with a depression of the accelerator pedal which is foot operated to control the fuel mixture supplied to the engine, whereby there is an assurance that the fuel mixture to the engine will be increased upon attempted starting. There will be further assurance that accidental operation of the dash located switch will not start the engine until the second switch has been moved to closed position, and a further assurance that after the engine is started any operation of the switch which may be closed by the same foot which operates the accelerator pedal will not result in closing the starting motor circuit when the engine is running. Such second switch in the starting motor circuit may also be closed by depression of the clutch pedal to insure against accidental starting.

The invention may be understood from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a side elevation and section, illustrating the way that the starting device is installed upon the body of a motor vehicle and further diagrammatically illustrating the circuit for the starting motor associated with said starting device.

Fig. 2 is a longitudinal vertical section through the starting device.

Fig. 3 is a transverse section on the plane of line 3—3 of Fig. 2 looking in the direction indicated by the arrows, and

Fig. 4 is a plan view showing the accelerator pedal and the foot engageable member for closing the second switch.

Fig. 5 is a sectional elevation of a modification of the starting device.

Fig. 6 is a plan view, partly in section, of the device shown in Fig. 5.

Fig. 7 is a sectional elevation of a further modification of the construction shown in Fig. 5.

Like reference characters refer to like parts in the different figures of the drawings.

In Fig. 1, an internal combustion engine 1 is indicated with the intake manifold 2 associated therewith. The vertical dash 3 of the body of the motor vehicle is located at the front of the driving compartment of the car immediately before the driver. On a downwardly and rearwardly inclined floor board of the front or driving compartment the foot operated accelerator pedal 5 is pivotally mounted, depression of which moves a rod 6 which is connected with the throttle valve of the engine carburetor in the usual manner so as to control the fuel supply to the engine. The starting motor 7, which has on its shaft an automatically movable pinion to engage a ring gear on the flywheel of the engine in accordance with usual practice, is indicated as connected at one side by a wire 8 with an electric battery 9 installed in the motor vehicle, said battery being grounded at its opposite side at 10 on the frame or body of the motor vehicle. This is the environment with which my invention is associated.

In Fig. 2 the device of my invention is shown in longitudinal vertical section and includes a vertical supporting plate 11 which is adapted to be secured to the dash 3 and from which, at a lower part thereof, a boss 12 projects forwardly. Over this boss a tubular housing 13 is located and extends a distance away from the boss. It is secured to said boss in any suitable manner as by soldering, screws or the like.

Within the housing 13 and in front of the boss 12 a block 14 of insulating material is mounted for slidable movement in the housing. The lower side of the housing has a relatively wide slot therein from its forward end rearwardly substantially to the boss 12 and a downwardly projecting portion 15 of the insulating member 14 extends through said slot. A metal contact 16 is mounted at the rear portion of the block 13 and has a stem inserted into said block, with which a headed screw 17 passed upwardly through the projecting portion 15 is connected

as shown in Fig. 2. A wire 18 is connected to the screw 17 and held in place by a second screw 19 which is threaded into the outer end of the headed screw 17. The wire 18 leads to the opposite side of the starting motor 7. It may lead directly as shown by the dotted lines at 20 in Fig. 1, said dotted line indication being for a direct integral connection between the two parts of the wire 18 shown.

It is evident that in such a case when the contact 19 engages against the boss 12 an electric circuit is completed, the boss 12 serving as a ground upon the body of the car in electric communication with the ground for the battery.

A thin flexible disk diaphragm 21 is clamped between two housing members 22 and 23 at its edges there being a gasket 24 between the edges of the diaphragm and the housing member 22 to make a substantially air-tight seal therebetween. The opposite side 23 of the diaphragm housing has spaced apart ears 25 struck therefrom and turned to pass over the forward end of the housing 13. Said ears may be secured in place by the screws shown, thereby mounting the diaphragm housing upon and at the forward end of the housing 13. A rod 26 is connected at its forward end to the central part of the diaphragm 21, passes to the rear through an opening in the center of the diaphragm housing member 23 and extends to and has a threaded connection with the block 14. A coiled spring 27 under compression is located around the rod 26 between the block 14 and the member 23. A tube 28 is connected at one end to the member 22 and at the other end to the manifold 2, providing communication between the interior of the manifold and the space between the diaphragm 21 and the member 22.

A lever 29 is pivotally mounted between its ends at 30 on the supporting plate 11 above the boss 12 and the housing 13. The lever passes through the plate 11, one part extending back of the dash 3, and another part over the rear end of the housing 13. At its rear end it is equipped with a head 31, preferably having concaved recesses, as indicated in dotted lines in Fig. 2, in both its upper and lower sides. A bar 32 is pivotally mounted and extends downwardly from the forward end of the lever 29 and is guided through an opening in the upper side of the housing 13 and at its lower end is of wedge shape as shown, being adapted to pass between the boss 12 and the contact 16 when they are separated. The bar 32 is of insulating material. It is normally impelled in a downward direction by a light coiled spring 33 interposed between its upper side and a finger 34 integral with and extending forward from the upper part of the plate 11 directly over the forward end of the lever 29.

With this construction and with the wire 18 running directly from one side of the motor to connect electrically with the contact 16, with the parts in the position shown in Fig. 2, the starting motor circuit is completed and will turn the engine over. When the engine starts and is running under its own power, the vacuum developed in the manifold 2 is communicated to the space between diaphragm 21 and the member 22, whereby the diaphragm is moved to the right (Fig. 2) and with it the connected block 14 carrying in contact 16 which is moved to the right separating said contact from the boss 12. When this occurs the lever 29, impelled by the spring 33, will have a clockwise movement thereby moving the insulating bar 32 downwardly between the parts 16 and 12, so that thereafter the starting

motor circuit cannot be completed until the head 31 of the lever 29 is pushed in a downward direction to lift the bar 32 to the position shown in Fig. 2. This insures that after the engine has started there will not be a completion of the starting motor circuit while the engine is running even though the vacuum in the manifold at 2 decreases to a degree where the pressure in the manifold is substantially the same as the outside atmospheric temperature. The bar 32 stays between the parts 12 and 16 all of the time that the engine is running and after it has stopped, so that for a restarting of the engine it is necessary to manually depress the head 31 of lever 29 to lift the interposed bar 32 of insulating material from between contact 16 and ground 12 thereby permitting the spring 27 to move contact 16 to engage said ground.

It is evident that with such a construction the one starting the car will seat himself behind the steering wheel and may use his left foot to throw out the clutch. The right foot may be used to depress the accelerator pedal so that a larger volume of fuel mixture will be carried to the engine when the starting motor turns the same over. The ignition key is turned and then upon operating the lever 29 by depressing the head 31 the starting motor circuit is completed. The engine is turned over by the starting motor until it starts under its own power, whereupon the starting motor circuit is automatically broken by the movement of the contact 16 away from the boss 12 against which it is grounded because of the movement of the diaphragm 21 to the right upon development of vacuum in the manifold. Thereupon the bar 32 moves between the contact 16 and the boss 12. If, as may happen at times, the engine does not start and it is desired that the starting motor be stopped to save depletion of the battery, a lifting against the underside of the head 31 will push the bar 32 downwardly, and because of the wedged shape lower end thereof, the contact 16 may be thus manually moved away from the boss 12 on which it is grounded.

Instead of the wire 18 running directly to one side of the starting motor 17 the wire may be separated and branches 35 thereof (Fig. 1) lead to a second switch at 36 which normally has its contacts separated, but which may be bridged by a downward movement of the switch plunger 37. This plunger 37 has a head at its upper end preferably located directly at the forward end of the accelerator pedal 5 but independent thereof, the pedal 5 at its upper end going partly around the plunger 37 at each side as indicated by the arms 5a. In such case there must be a depression of the accelerator pedal to obtain greater fuel volume in order to operate the second switch to close the same thereby insuring a greater volume of fuel mixture in starting. Of course also, the second switch may be directly closed by accelerator pedal depression; or such switch may be located in the path of the clutch pedal which would then have to be depressed in order to start the engine.

While this modification is not necessary and may or may not be used, it may be of value in helping to insure that the engine may not be accidentally started by children, for example, who might depress the lever 29 and lift the bar 32. If the second switch is used for insurance against such possibility, the depression of the lever 29 alone will not serve to complete the motor circuit but one must also normally close the second switch.

In Figs. 5 and 6 the starter control device includes a tubular housing which may be stamped from a single length of sheet metal to provide two opposed semi-cylindrical housing sections 38, integrally connected at one end by a cross portion 39 which is bent around an attaching bar 40 clamped between it and the ends of the sections 38 and adapted to be secured to the dash 3 by bolts or screws. At the free ends of the members 38 are tongues 41 which pass through openings and are bent over against a closing cap 42. From the cap an arm 43 integrally projects in an upward direction for a short distance, is then bent and continued as a horizontal section 44 above and parallel to the axis of the housing, terminating in a downturned end section 45 which bears against the upper side of the housing as shown.

The member 23 of the diaphragm housing has tongues 46 bent therefrom to extend through the section 44 and clinch against the underside thereof to secure the diaphragm housing in place. A rod 47 is connected at its upper end to the central part of the diaphragm 21 and is normally impelled in a downward direction by a spring 48 between the diaphragm 21 and the other housing member 22. The rod 47 passes through the bottom of the member 23, the section 44 and the upper tubular housing member 38 and extends at its lower end into the tubular housing as shown, and is adapted to bear against the upper end of a contact 49 which is connected to the lower tubular housing member 38, passing through insulating washers 50 and carrying a binding nut 51 screwed onto a threaded downwardly extending stem of the contact 49. The circuit wire 18 is connected to the stem of the contact 49 by the screw 19, the same as it is connected to the member 17 in the structure shown in Fig. 2.

When the contact 49 is engaged by the rod 47 the circuit is completed. Normally under the action of the spring 48 the circuit will be completed if there is nothing interposed between said contact 49 and the rod 47. The rod 47 in this structure provides the ground of the electric circuit.

A flat bar 52 of suitable insulating material is narrowed in width at its rear end and passes through guide slots in the bar 40, the connecting section 39 of the tubular housing and the dash 3. A light coiled spring 53 is located around the narrowed portion of the bar 52 and between the member 40 and the shoulder which is provided at its junction with the wider portion of said bar, the tendency of which is to move the insulating bar to the left (Fig. 5). At the outer end of the bar 52 a knob 54 is permanently secured.

When the engine is running, spring 48 is compressed and the diaphragm 21 and rod 47 moved upwardly breaking the circuit and permitting the inner end portion of the bar 52 to pass between contact 49 and the lower end of the rod 47 under the influence of the spring 53. Thereafter, while the engine is running, there can be no completion of the starting motor circuit. If the vacuum produced in the engine manifold materially decreases or in fact substantially disappears the lower end of rod 47 will merely rest against the upper side so that part of the bar 52 is extended between contact 49 and the rod 47. When the engine is stopped by turning the ignition key to interrupt the ignition circuit the bar 52 remains interposed between the parts 47 and 49.

To start the engine the knob 54 is grasped and the bar 52 pulled outwardly whereupon spring 48 impels rod 47 into contact engagement with

contact 49 completing the starting motor circuit. As soon as the engine starts the vacuum produced in the manifold and transmitted to the space between the diaphragm 21 and the housing member 22 causes a break of the starting motor circuit by reason of the elevation of the rod 47; and the bar 52 automatically moves between the two parts 47 and 49. The bar 52 at its inner end is inclined as shown so that it is possible to force said bar inwardly between the parts 47 and 49 separating the two by lifting the rod 47. This form of structure and that shown in Fig. 2 operate upon the same principles. In Fig. 7 the tubular housing 55 is of straight tubular form and at one end inserts within a sleeve 56 of a member to be connected to the dash 3 and around a plug 57 inserted into the end of the tube 55, through which plug there is a guide passage 58 for the outer end portion of the bar 52. Of course, the same support for the tubular housing could be used as shown in Fig. 2, in which case the boss 12 would support the tubular housing and have a guide passage therethrough.

It is evident from the foregoing that a very simple and cheaply manufactured starter control device is provided and which for operation may be mounted on the dash at the right of the steering post, the lever 29 operated by the right hand and then such hand used for any other purposes that may be needed in getting the engine started, for example, manipulating the choke and the like. There is no need to use the hand to hold the lever 29 in the position shown in Fig. 2, as it stays in such position and cannot of itself move back to original position after the contact 16 has engaged the grounding boss 12.

Mounting this starting control device in the dash of an automobile body is not imperative, as it may be mounted at other convenient locations, such as the steering post or at other easily accessible positions.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In combination with an engine, electric starting motor therefor and electric circuit for the starting motor, of a switch in said circuit closing the circuit when free to do so, means to hold the switch in open position, said means being manually movable to release the switch to close said circuit, and engine operated means automatically moving the switch to circuit open position when the engine starts.

2. In combination with an engine, electric starting motor therefor, and a circuit for the starting motor, of a switch in said circuit including a movable member, means for normally moving said movable member to circuit closing position when free to do so, manually operable means having a part to interpose in the path of movement of said movable switch member and adapted to be manually moved out of the path of movement of said switch member through manual operation and to return to its first position when said movable switch member is withdrawn, and engine operated means for withdrawing said switch member when the engine starts.

3. In combination, an internal combustion engine, a starting motor for the engine, an electric circuit for the starting motor and a switch including a movable contact adapted to close the circuit when free to do so, a movable member of insulating material interposed in the path of movement of said contact to hold the switch in

open position, manually operable means for moving said insulating member to permit said contact to close the circuit when the engine is at rest, and engine operated means for withdrawing

5 said contact when the engine starts.

4. In combination, an engine, an electric starting motor therefor, an electric circuit for the starting motor including a ground for the circuit, a movable contact in said circuit spring actuated in the direction of said ground, a movable member of insulating material between said ground and contact to hold the switch in open position, manual means for moving said insulating member to free the movable switch member

10 whereby said contact may engage said ground and complete the circuit, engine operated means for moving said spring actuated switch member and contact away from said ground to thereby break said circuit when the engine starts, and

15 means for automatically returning said insulating member to its position between said contact and ground when said circuit is thus broken.

5. In combination with an internal combustion engine, an electric starting motor therefor, an electric circuit for the starting motor including a terminal ground at one end of the circuit, of a support connected with said ground, a block of insulating material movably mounted on said support for movement toward or away from the ground, a contact forming a part of the electric circuit mounted on said block, spring means tending to move said contact toward the ground, engine suction operated means for moving said block and attached contact away from the ground

20 when the engine starts, a member of insulating material mounted on said support in association with said contact and ground, spring means for moving said member between the contact and ground when they are separated, and manual means for moving said member from between the contact and ground when the engine is at rest to thereby complete the starting circuit.

6. A construction containing the elements in combination defined in claim 5, said member having a cam shaped inner end whereby by operation of said manually operable means in a reverse direction the contact and ground are separated and said member passes between the contact and ground.

7. In combination with an engine, an electric starting motor therefor, an electric circuit in which the starting motor is located, of a switch in said circuit having a ground comprising a supporting plate, a supporting sleeve extending from said plate, a switch block of insulating material slidably mounted in said sleeve, a contact carried by said block at the side thereof adjacent said ground plate, said contact having electric connection with said electric circuit, a spring acting on said block to move the contact into engagement with the ground when free to do so, engine suction operated means connected with said block to overcome the spring and move the contact away from the ground, a lever pivotally mounted between its ends on said plate, a bar of insulating material connected with the lever and passing through said sleeve to move between the contact and supporting plate when the engine starts, com-

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bined with means for moving said bar into such position when the contact and plate are separated, said lever being manually operable to withdraw said bar from between the contact and supporting plate when the engine is at rest.

8. In combination with an internal combustion engine, an electric starting motor therefor, an electric circuit for said motor and a switch therein for closing the circuit, of means adapted to hold the switch in open position when the engine is at rest, manually operable means for moving said switch opening means to inoperative position to permit closing said electric circuit, engine operated means for operating said switch to break the circuit after the engine has started, and means for automatically moving said first mentioned means to a position to hold the switch open when the switch has been engine operated to open position.

9. An internal combustion engine, an electric starting motor circuit therefor, a switch in said circuit including two members, one relatively movable with respect to the other and which, when in contact engagement, complete the circuit, means acting on one of said members to normally move the same into contact with the other to complete said circuit, engine operated means for moving said member to a position to break said circuit, means adapted to pass between said two switch members when the same are separated, and manual means for withdrawing said last mentioned means between said two switch members to permit the same to come into contact engagement.

10. An internal combustion engine, an electric starting motor circuit therefor, a switch in said circuit, including two members, one relatively movable with respect to the other and which when in contact engagement complete the circuit through the switch, means acting on one of said members to normally move the same into contact with the other, engine operable means for moving said member away from the other, means for holding the two switch members apart when the same are separated, and manually operated means for operating said holding means to permit the switch members to come into contact engagement.

11. In combination with an internal combustion engine, an electric starting motor therefor, an electric circuit for the starting motor, a switch in said electric starting motor circuit including two members, one relatively movable with respect to the other and which when in contact complete the circuit through the switch, means acting on one of said members to move the same into contact with the other when free to do so, means operated through suction created by the engine for moving said member to break the circuit when the engine starts, means adapted to hold said two switch members from movement toward each other when the same have been separated on engine starting, and manual means for operating said holding means which holds the switch members apart to permit the same to come into contact engagement.

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