

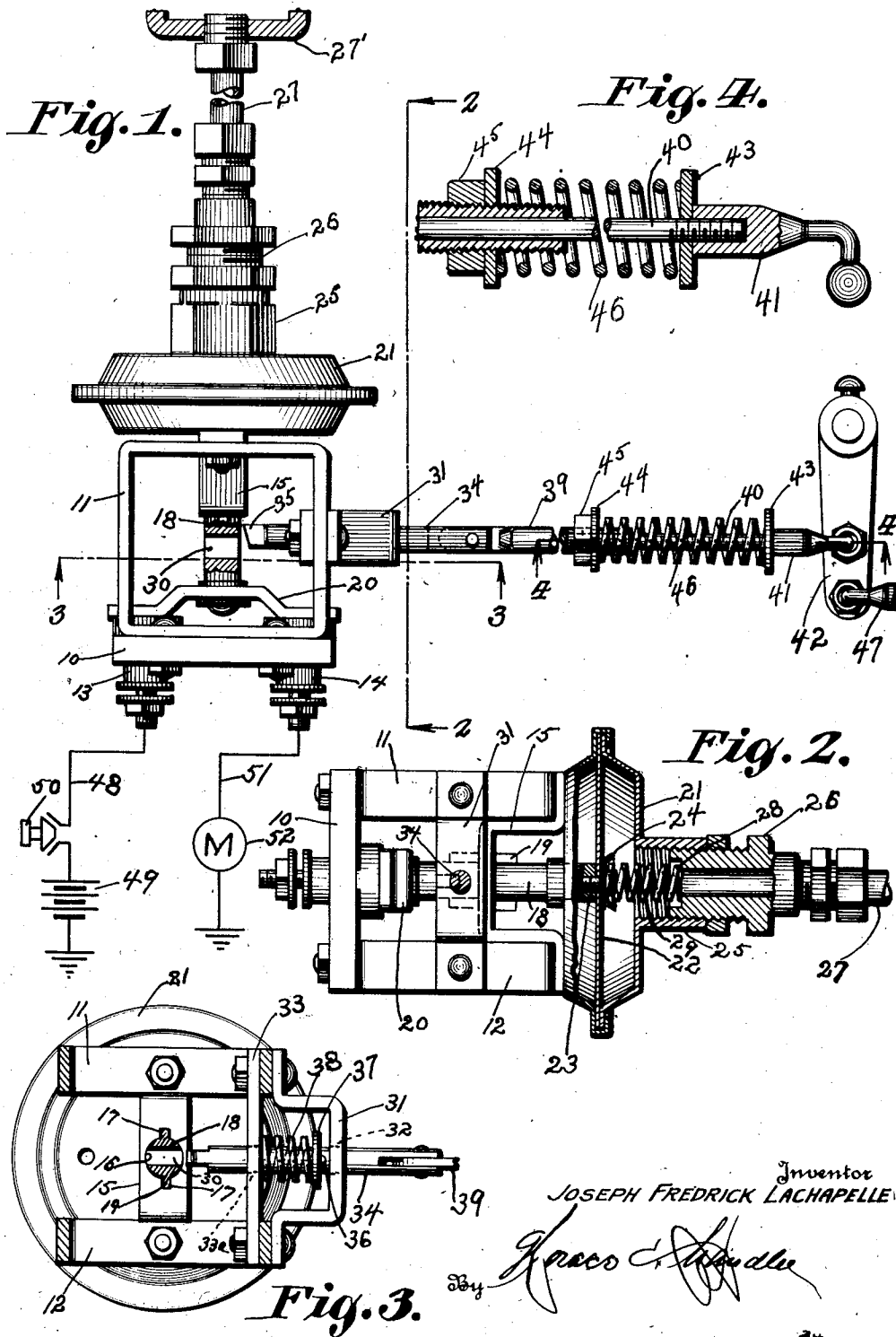
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AUTOMATIC STARTER SWITCH

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AUTOMATIC STARTER SWITCH

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This invention relates to new and useful improvements in electric switches, and particularly to such switches as are used in connection with the starting motors of automobile engines.

The principal object of the invention is to provide a switch of the type mentioned, which shall be so constructed and arranged as to automatically close the circuit to the starting motor, and cause it to function should the engine become stalled.

Another object is to provide a switch of this character which will automatically open after the starting motor has performed its function.

Other objects and advantages will be apparent from the following description when taken in connection with the accompanying drawing.

In the drawing:

Figure 1 is a view of the switch with its means of connection to the throttle arm of the engine, to the electrical circuit and to the intake manifold.

Figure 2 is a view, partly in section, showing a suction operated diaphragm forming a part thereof.

Figure 3 is a sectional detail view on the line 3-3 of Figure 1.

Figure 4 is a detail sectional view of parts connecting the switch with the throttle arm.

Referring particularly to the accompanying drawing, the present invention includes a base 10 to which are connected the rectangular frames 11 and 12 and through which are disposed, and secured, electric terminals 13 and 14, insulated from the base and having their inner ends exposed above the face thereof as shown in Figure 1. Secured to the opposite sides of the frames 11 and 12, and extending forwardly therebetween, is a guide yoke 15, having an opening 16. In opposite sides of this opening are recesses 17. Slidable through the opening 16 is a stem 18 having opposite longitudinal ribs 19 positioned within the said recesses, the latter being for the purpose of preventing rotation of the stem 18. Mounted on an end of the stem 18 is a transverse metal contact bar 20 which, when the engine is idle, bridges the inner ends of the terminals 13 and 14. The other end of the stem 18 extends beyond the frame members 11 and 12 for a purpose which will be described later.

Mounted on the ends of the guide yoke 15, exteriorly of the frame members 11 and 12, is a casing 21, within which is secured a diaphragm 22, and secured to one face of this diaphragm, by means of a screw 23, is the said extended end of

the stem 18, a small cup washer 24 being held between the head of the screw and the opposite face of the diaphragm, as shown in Figure 2. The outer side of the casing 21 is provided with an internally threaded nipple 25, in which is screwed a longitudinally bored plug 26, said plug having its outer end provided with means of attachment to one end of a suction pipe 27 which has its other end with the intake manifold of the engine, a portion of this manifold being illustrated in Figure 1 and marked 27'. In the inner end of the plug 26 is a recess 28 in which is seated one end of a coil spring 29, the other end of this spring being seated in the cup washer 24. This spring serves to urge the stem 18 through the opening in the guide yoke 15, whereby to engage the contact bar 20 with the terminals 13 and 14. Its tension may be adjusted by means of the plug 26, as will be readily understood. Formed in the stem 18, intermediate its length, is an opening 30.

Secured to other sides of the frame members 11 and 12, and extending outwardly thereof, is a yoke 31, having a guide opening 32 in its right portion, which is in alignment with a similar opening 33a in a strap 33, connecting the frame members. Slidably disposed through these openings 32 and 33a is a latch rod 34, having a nose 35 for engagement in the opening 30 of the stem 18, under conditions to be described later. Held in position on the latch rod 34, within the yoke 31, by means of a pin 36, is a disk 37, and encircling the latch rod, between the disk and the adjacent side of the strap 33, is a coil spring 38, the normal action of which is to yieldably hold the latch rod out of the opening 30 in the stem 18. Pivotally connected to the outer end of the latch rod 34 is one end of a hollow rod 39, and telescoped into the other end of this hollow rod is one end of a rod section 40, the other end of said rod section being provided with means, shown at 41, for attachment to the arm 42 of the throttle of the automobile engine. Carried by the rod section 40, and bearing against the throttle connecting means 41, is a disk 43. Threaded on the adjacent end of the hollow rod 39 is a disk 44 and a jamb nut 45, for holding the disk in adjusted position. Encircling the rod section 40, and the adjacent end portion of the hollow rod 39, is a coil spring 46, the ends of which bear against the disks 43 and 44. By means of the disk 44 and nut 45, the tension of the spring 46 may be adjusted.

The arm 42 is connected to a member 47, which

leads to means, not shown, for operating the throttle.

Connected to the terminal 13 is a wire 48, which leads to the usual battery 49, through a switch 50, which switch also controls the ignition circuit. A wire 51 is connected to the terminal 14 and leads to the starting motor 52. It will be noted that the battery and starting motor are grounded, on one side, in the usual manner.

To start the engine, the operator closes the switch 50 which simultaneously completes the circuit through the starting motor and closes the ignition circuit. After the engine has been started, the suction from the intake manifold, operating through the pipe 27, will draw the diaphragm 22 against the tension of the spring 21, so that the said diaphragm will pull the stem 18 and thereby disengage the contact bar 20 from the terminals 13 and 14, breaking the starting motor circuit. The engine now functions in the usual manner but, should it become stalled, the suction in the intake manifold will be discontinued, with the result that the diaphragm 22 will no longer be influenced by such suction, but will be forced into its normal position by the spring 29 to re-engage the bar 20 with the terminals 13 and 14, thus closing the circuit through the starting motor and again starting the engine.

When the engine is running at a high rate of speed, the suction at the intake is materially reduced and this would ordinarily permit the diaphragm to relieve the stem 18 and prematurely close the circuit through the starting motor, resulting in serious consequences. To prevent this, the nose 35 of the latch rod 34 will be forced into the opening 30 of the stem 18, when the throttle has been opened to a sufficient degree to cause the arm 42 to be moved to a sufficient extent to compress the spring 46 to overcome the spring 38. When, however, the speed of the engine has been reduced, by moving the throttle and permitting the arm 42 to move to a sufficient degree to relieve the spring 46, the spring 38 will withdraw the nose of the latch rod 34 from the opening in the stem. The latter, together with its bar 20, will be then held in proper position by the normal suction at the intake manifold of the engine, thus keeping open the circuit through the starting motor, until the engine has again ceased to operate.

It will be understood that the switch 50 which controls the ignition circuit, as well as the starting motor circuit, will be located within convenient reach of the driver's seat, as usual. It will also be understood that the throwing of this switch will simultaneously close these two circuits, thus causing the engine to start without the manipulation of any other switch, such as the starter button, or switch, now in general use.

It will also be understood that the construction illustrated and described is only for the purpose of enabling the various features of the invention to be understood, and that various changes may be made in the mechanical details of the invention without departing from the spirit of the invention as set forth in the appended claims.

What is claimed is:

1. The combination with an electric switch and vacuum controlled means for opening said switch; of a spring urging said switch to closed position, said switch including a stem having an opening therein, a plunger adapted to engage in said opening upon the switch being moved to fully open position, a spring urging said plunger toward said stem, and pedal controlled means for retracting

said plunger against the action of the last mentioned spring.

2. In a vacuum controlled switch, a base, a pair of laterally spaced frames carried by said base, a pair of spaced contacts fixed to the base between the sides of the frames, a guide yoke bridging the upper parts of the said frames and having a central opening provided with opposed recesses, a stem slidable through said opening and having ribs engaged in said recesses to prevent rotation of the stem, a transverse contact bar carried by the lower end of the stem to move into and out of bridging engagement with the contacts, and a vacuum cell mounted on said guide yoke for operating said stem.

3. In a vacuum controlled switch, a base, a pair of laterally spaced frames carried by said base, a pair of spaced contacts fixed to the case between the sides of the frames, a guide yoke bridging the upper parts of the said frames and having a central opening provided with opposed recesses, a stem slidable through said opening and having ribs engaged in said recesses to prevent rotation of the stem, a transverse contact bar carried by the lower end of the stem to move into and out of bridging engagement with the contacts, a vacuum cell mounted on said guide yoke for operating said stem, said stem having a transverse latch opening, a pair of spaced guide members connecting the frames at one side thereof, a latch bar slidable through said guide members into and out of engagement in the opening in the stem, and spring means urging said latch bar out of said engagement.

4. Starting apparatus for internal combustion engines comprising a current source, a starting motor adapted to be operated by current from said source, a control switch for controlling the operation of said starting motor, means operated by fluid pressure derived from the engine for operating the switch and effective to open the switch when the engine starts to run, an accelerator pedal, means operatively connected with the accelerator pedal for controlling the operation of the switch operating means and movable by the accelerator pedal, when said pedal is operated, to hold the switch operating means in such a position that the switch is maintained in open condition.

5. In a starting apparatus for internal combustion engines, a current source, a starting motor operable by current from said source, a circuit between said current source and starting motor adapted to be closed in order to cause operation of the starting motor, a control switch in said circuit, means for controlling the quantity of mixture supplied to the engine, and means operated by the mixture controlling means for holding said control switch open under certain operating conditions in order to prevent closing of the circuit between the starting motor and current source.

6. In a starting apparatus for internal combustion engines, a current source, a starting motor operable by current from said source, a circuit between said current source and starting motor adapted to be closed in order to cause operation of the starting motor, a control switch in said circuit, means for controlling the quantity of mixture supplied to the engine and means operated by the mixture controlling means when it is moved to a position to supply a relatively large quantity of fuel mixture to the engine to hold the switch open in order to prevent closing of the circuit between the starting motor and current source.

7. In a starting apparatus for internal combustion

tion engines, a current source, a starting motor operable by current from said source, a circuit between said current source and starting motor adapted to be closed in order to cause operation of the starting motor, means for controlling said circuit including a control switch which must be closed in order to close the circuit and cause the starting motor to become operative, means for controlling the quantity of fuel mixture supplied to the engine, means operated by the engine, when it becomes self-operative, for opening said control switch and means operated by the mixture controlling means for holding said switch open during self-operation of the engine, in order to prevent any possible closing of the starting motor circuit while the engine is operating under its own power.

8. In a starting apparatus for internal combustion engines, a current source, a starting motor operable by current from said source, a circuit between said current source and starting motor adapted to be closed in order to cause operation of the starting motor, means for controlling said circuit including a control switch which must be closed in order to close the circuit and cause the starting motor to become operative, means for controlling the quantity of fuel mixture supplied to the engine, means operated by engine suction, when the engine starts to run under its own power, to open the control switch, and means operated by the mixture controlling means for holding said switch open during self-operation of the engine in order to prevent any possible closing of the starting motor circuit while the engine is operating under its own power.

9. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a normally closed control switch in said circuit, a second normally open switch in series with said control switch, means for closing said second switch to effect closing of the circuit to cause the starting motor to become operative, means for opening said normally closed control switch when the engine starts to run to break said circuit, means for controlling the supply of fuel mixture to the engine, and means operated thereby to prevent closing of said control switch during operation of the engine under its own power.

10. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a pair of control switches in series in said circuit, manually operable means to close one of said switches to effect closing of said circuit in order to cause the starting motor to become operative, engine operated means for opening the other of said control switches to break said circuit when the engine begins to run, means for controlling the supply of fuel mixture to the engine and means operated thereby to prevent closing of the engine operated control switch during operation of the engine under its own power.

11. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a pair of control switches in series in said circuit, manually operable means to close one of said switches to effect closing of said circuit in order to cause the starting motor to become operative, means operable by engine suction for opening the other of said control switches to break said circuit when the engine starts to run, means for controlling the supply of fuel mixture to the engine and means operated thereby to

prevent closing of the suction operated control switch during operation of the engine under its own power.

12. In a starting apparatus for internal combustion engines, a current source, a starting motor adapted to be operated by current from said source, a circuit between the starting motor and current source, means for controlling the opening and closing of said circuit including an ignition switch and a second control switch in series therewith and adapted when closed to close the starting motor circuit, in order to cause said starting motor to become operative, means to control the quantity of mixture supplied to the engine and means operated thereby to control the operation of the second control switch.

13. In a starting apparatus for internal combustion engines, a current source, a starting motor adapted to be operated by current from said source, a circuit between the starting motor and current source, means for controlling the opening and closing of said circuit including an ignition switch and a second control switch in series therewith and adapted when closed to close the starting motor circuit, in order to cause said starting motor to become operative, means to control the quantity of mixture supplied to the engine and means operable thereby during operation of the engine under its own power, to hold the second control switch open in order to prevent closing of the starting motor circuit while the engine is self-operative.

14. In a starting apparatus for internal combustion engines, a current source, a starting motor adapted to be operated by current from said source, a circuit between the starting motor and current source, means for controlling the opening and closing of said circuit including an ignition switch and a second control switch in series therewith and adapted when closed to close the starting motor circuit, in order to cause said starting motor to become operative, means operable by engine suction to open the second control switch and break the starting motor circuit when the engine starts to run under its own power, in order to cause the starting motor to become inoperative, means for controlling the quantity of fuel mixture supplied to the engine, and means operated by said mixture controlling means to hold the second control switch open during self-operation of the engine to prevent closing of the starting motor circuit while the engine is running.

15. In a starting apparatus for internal combustion engines, a current source, a starting motor adapted to be operated by current from said source, a circuit between the starting motor and current source, means for controlling the opening and closing of said circuit including a normally open ignition switch adapted to be closed in order to close said circuit and a second normally closed control switch in series with the ignition switch and also controlling the starting motor circuit, means for controlling the quantity of fuel mixture supplied to the engine and means operated by the mixture controlling means for also controlling the operation of said second control switch.

16. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a normally open ignition switch operable when closed to close the ignition circuit and also said starting motor circuit, a normally closed switch in series with said ignition switch and also controlling the starting motor circuit, means operable by engine suction for

opening said normally closed switch when the engine starts to run in order to break the starting motor circuit, means for controlling the supply of fuel mixture to the engine and means operated thereby to prevent closing of said suction operated switch during operation of the engine under its own power.

17. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a main starting motor switch in the circuit between the current source and starting motor, a normally open ignition switch in series with said starting motor switch and adapted when closed to close both the starting motor circuit and ignition circuit, means operable when the engine begins to run under its own power to open the main starting motor switch to break said circuit entirely independently of the ignition switch and means for preventing closing of said main starting motor switch while the engine continues to operate under its own power.

18. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, means for moving said movable contact to a position to open the switch when the engine starts to run, means for controlling the supply of fuel mixture to the engine, and a member operated thereby and movable to a position to engage said movable contact to prevent closing of said control switch during operation of the engine.

19. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, means for moving said movable contact to a position to open the switch when the engine starts to run, a foot operated accelerator pedal for controlling the supply of fuel mixture to the engine and a member operable thereby and movable to a position to engage said movable contact to prevent closing of said control switch during operation of the engine.

20. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, means for moving said movable contact to a position to open the switch when the engine starts to run, a foot operated accelerator pedal for controlling the supply of fuel mixture to the engine, a member operable thereby and movable to a position to engage said movable contact to prevent closing of the control switch during engine operation, and a resilient operating connection between said pedal and said member, so as to permit movement of the pedal without corresponding movement of said member.

21. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, means for moving said movable contact to a position to open the switch when

the engine starts to run, means for controlling the supply of fuel mixture to the engine, a member movable to a position to engage said movable contact to prevent closing of said control switch during operation of the engine, and operating connections between said member and the mixture controlling means, said operating connections being so constructed as to permit movement of the mixture controlling means independently of the said member.

22. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, means for moving said movable contact to a position to open the switch when the engine starts to run, means for controlling the supply of fuel mixture to the engine, a member movable by said mixture controlling means to a position to engage said movable contact and prevent closing of the control switch as said mixture controlling means is moved to increase the quantity of mixture supplied, operating connections between said mixture controlling means and said member so constructed that said mixture controlling means can be moved to a position to supply a maximum quantity of mixture to the engine after engagement of said member with the movable contact without further movement of said member.

23. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, the latter of which is movable to a position to open the control switch and break the starting motor circuit, an element secured to said movable contact and having a recess formed therein, means for controlling the supply of fuel mixture to the engine, and a rod connected to said means and movable thereby to engage said recess after the movable contact is moved to switch open position, so as to prevent closing of the switch during operation of the engine under its own power.

24. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said circuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, the latter of which is movable to a position to open the control switch and break the starting motor circuit, an element secured to said movable contact and having a recess formed therein, means for controlling the supply of fuel mixture to the engine, and a rod connected to said means and movable thereby to engage said recess after the movable contact is moved to switch open position, so as to prevent closing of the switch during operation of the engine under its own power, said rod being connected to the mixture controlling means through the medium of a resilient operating connection so that the mixture controlling means may move after the rod engages said recess without further movement of the rod.

25. In a starting apparatus for internal combustion engines, a starting motor, a current source, a circuit between said starting motor and the current source, a control switch for closing said cir-

cuit in order to cause the starting motor to become operative and comprising fixed and movable contacts, the latter of which is movable to a position to open the control switch and break the starting motor circuit, an element secured to said movable contact and having a recess formed therein, a member movable to different positions to variably control the supply of fuel mixture to the engine, a rod one end of which is connected to said member for operation thereby and the other end of which is movable into engagement with said recess when the movable contact is in

position to break the starting motor circuit, said rod being moved to such position as said member is moved in a direction to increase the supply of fuel mixture to the engine, and a resilient connecting element between said rod and its operating member effective to permit movement of said member to a position to supply a maximum quantity of fuel mixture to the engine after engagement of the rod with said recess and without additional movement of the rod.

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