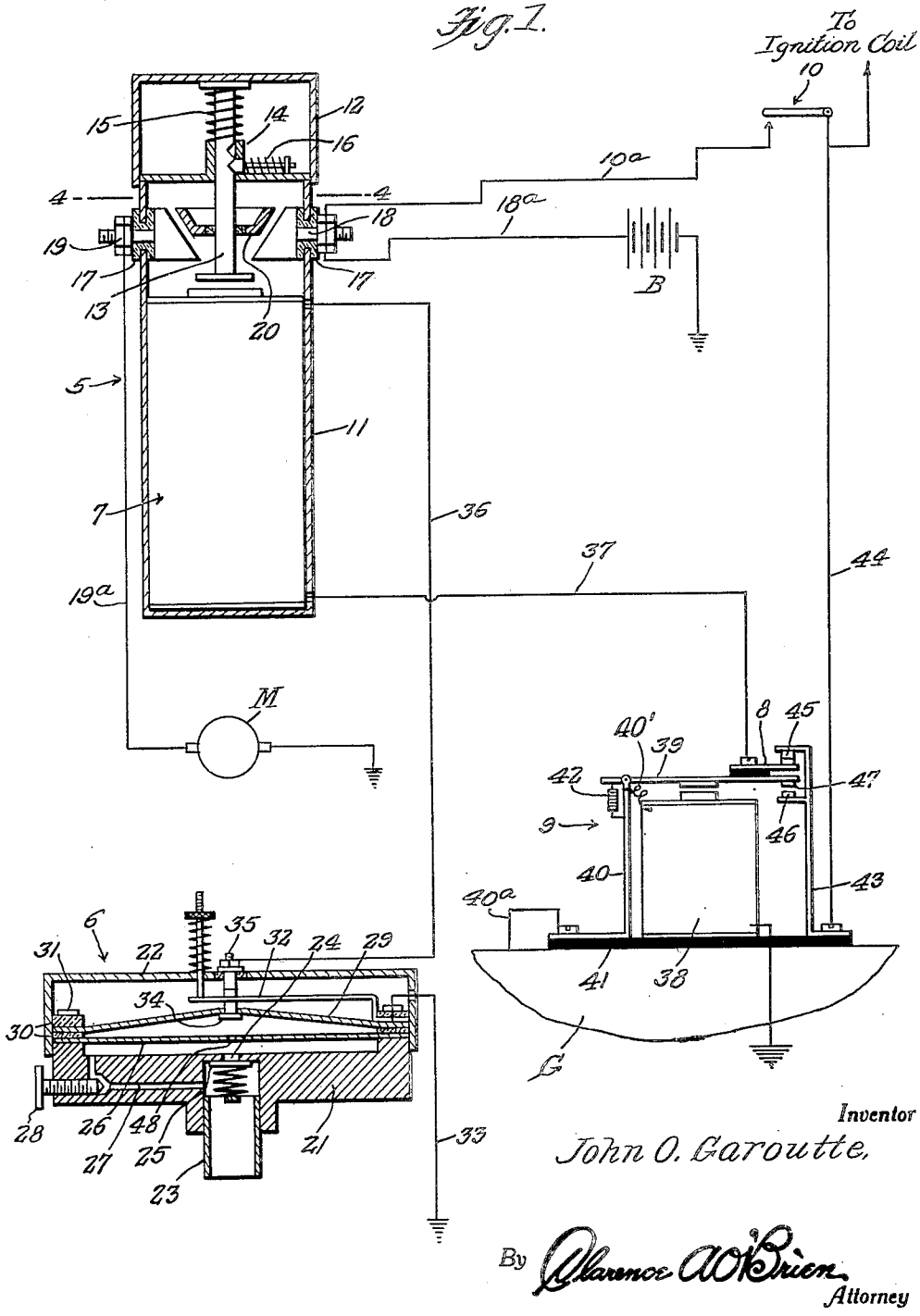
Dec. 18, 1934. J. O. GAROUTTE 1,984,736

STARTER SWITCH

Filed Nov. 16, 1932 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

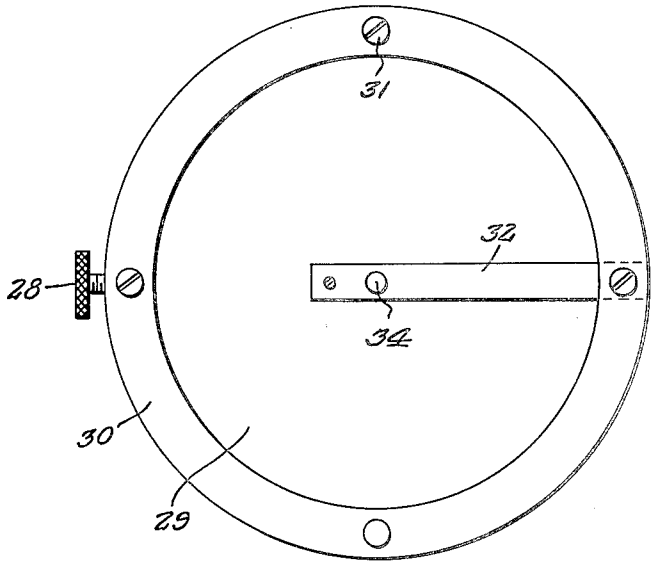
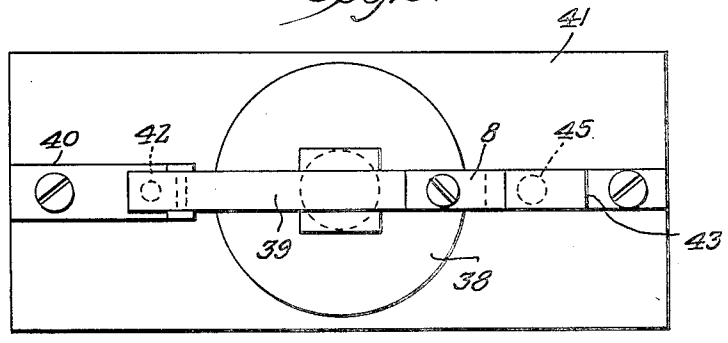


Fig. 3.



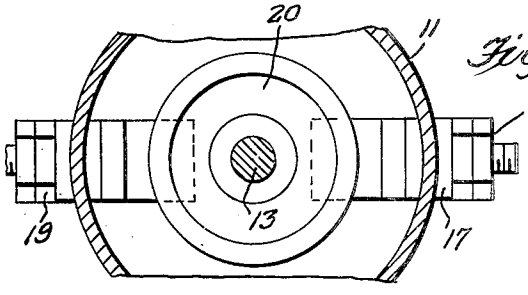


Fig. 4.

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UNITED STATES PATENT OFFICE

1,984,736

STARTER SWITCH

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Application November 16, 1932, Serial No. 642,969

1 Claim. (Cl. 290—38)

This invention relates to a starter switch for controlling the circuit to the starting motor of the type usually employed in automobiles, and the invention consists in the provision of means controlled by vacuum for opening and closing the switch.

The invention together with its numerous objects and advantages will be best understood from a study of the following description, taken in connection with the accompanying drawings wherein:

Figure 1 is a diagrammatic view showing the wiring system.

Figure 2 is a top plan view of a vacuum controlled circuit maker and breaker, the cover of the diaphragm casing being removed.

Figure 3 is a top plan view of a relay switch, and

Figure 4 is a transverse sectional view taken substantially on the line 4—4 of Figure 1.

Referring to the drawings by reference numerals it will be seen that 5 designates generally a starter switch constructed in accordance with the present invention; the reference numeral 6, a vacuum control circuit maker and breaker also constructed in accordance with the present invention; M indicates the starting motor, B a battery, G a generator, and the reference numeral 9 a conventional relay and reference numeral 10 the ignition switch. A part of the ignition circuit is shown at I.

Referring in detail to the switch 5 it will be seen that the same includes a casing 11 having arranged therein a solenoid 7. A cap 12 is slidably engaged with the upper end of the casing and is movable with an armature 13 that is constrained to shift vertically through a guide 14 provided at the top of the casing. A spring 15 is suitably associated with the armature 13 in a manner to normally urge said armature and cap 12 upwardly or to the position shown in Figure 1. A suitable spring latch device 16 is provided for securing the armature 13 in either its raised or lowered position.

Mounted on the wall of the casing 11 at diametrically opposite sides thereof are contacts 18, 19 and these contacts are suitably insulated from the casing as at 17. Carried by the armature 13 and suitably insulated therefrom is a bridge contact 20 adapted to engage the contacts 18, 19 for closing the circuit to the motor M for starting the internal combustion engine. In this connection it will be noted that the contact 18 is connected with one side of the ignition switch 10 through the medium of a wire 10*a* and that said contact 18 is also connected with one side of the battery B through the medium of a wire 18*a*; while the contact 19 is connected with one side of the starting motor M, the other side of which motor is grounded as shown, said contact 19 being connected with said one side of the motor M through the medium of a wire 19*a*.

The circuit maker and breaker 6, in accordance with the present invention comprises a casing 21 having a telescoping lid or cover 22. The casing 21 is provided with a nipple 23 that is adapted to be tapped into the intake manifold of the internal combustion engine. The bottom of the casing 21, at the inner end of the nipple 23 is provided with a port 24 normally closed by a spring pressed valve 25 as shown in Figure 1.

Suitably secured within the casing as at 31 is a partition disk 26, and below the disk 26 the casing is in communication with the intake manifold through the medium of the nipple 23 and a passage 27 controlled by a manually operable valve 28.

Disposed above the disk 26 is a diaphragm 29 that is normally flexed upwardly as shown and this disk and the diaphragm are held in place by screws 31, insulating strips 30 being disposed at the peripheral edge of the disk above and below the latter. A spring contact arm 32 is mounted within the casing 21 above the diaphragm 29 and is grounded as at 33. At its free end the arm 32 is connected by a contact button 34 with the diaphragm 29, and engages a contact 35 mounted on the lid 22 of the casing and suitably insulated therefrom. As shown contact 35 is connected with one side of the solenoid 7 through the medium of a wire 36. It will thus be seen that normally contacts 34 and 35 are engaged. However, when suction is created in the manifold the diaphragm 29 is caused to flex downwardly separating the contacts 34 and 35 for stopping the starter motor M as will be herein more clearly presented.

The generator relay 9 is of more or less conventional construction and includes among other parts an insulated base 41 which is suitably mounted on the generator G, and standards 40, 43 rising from the base and between which is located the solenoid 38. The armature of the relay is indicated by the reference numeral 39 and is pivoted in the usual manner to one of the standards, in the present instance the standard 40 and is normally urged to rotate in an anti-clockwise direction through the medium of a spring 42. The armature 39 also carries the contact 47 engageable with the contact 46 suit-

ably mounted on the standard 43, which standard 43 is of conductive material and the contact 46 is connected with the ignition switch 10 through the medium of a wire 44. However in accordance with the present invention the relay 9 is added to, to the extent of providing on the standard 43 an additional contact 45 engageable with an additional contact 8 mounted on the armature 39 and suitably insulated from said armature. The contact 8 is connected with one side of the solenoid 7 through the medium of a wire 37. As is well known, when the internal combustion engine is running the generator generates current, which when sufficient, energizes the solenoid 38 to attract the armature 39 and thereby engage the contact 46, 47 in the usual manner. The solenoid 38 can be electrically connected with the generator in any suitable manner so Fig. 1 shows the current passing from the generator through the wire 40*a*, standard 40 and wire 40' to the solenoid which is grounded to the generator as shown. In accordance with the present invention, when the contacts 46, 47 are thus engaged contacts 8 and 45 are separated thus interrupting the circuit to the solenoid 7 and thereby giving double assurance that the starter switch will not close or "cut in" when the engine is operating properly. The wire 40*a* as is well known is a part of the generator relay and carries current from the generator to the battery when the engine is running. In the construction shown, the current passes from the generator through the wire 40*a*, upright 40, armature 39, contacts 47 and 46, upright 43, wire 44, switch 10, wire 10*a*, contact 18 and wire 18*a* to battery B, though it will be understood that the current can be carried to the battery in any suitable manner.

The operation of the device may be detailed as follows:

Normally the parts are in the position shown in Figure 1. To start the internal combustion engine the ignition switch is turned on in the usual manner completing the circuit to energize the coil 7 and when the same is excited the armature 13 is attracted thereto to move the contact 20 into engagement with the contacts 18, 19 thus completing the circuit to the starting motor M for turning over the internal combustion engine. When the internal combustion motor has made several revolutions a vacuum will be created in the intake manifold sufficient to cause the diaphragm 29 to flex downwardly thereby separating the contacts 34, 35 to interrupt the circuit to the solenoid 7 and thereby permit the armature 13 to move upwardly under action of spring 15 to separate the contacts 20, 19, 18 thereby opening the circuit to the starting motor M. As will be seen, when the suction created by the engine is great enough, the valve 25 will open against the action of its spring so that the air will be drawn from under the diaphragm 29 and the diaphragm moved downwardly and thus move the contact 34 out of engagement with the contact 35. This will break the circuit to the starter motor and when the starter motor ceases to operate and if the main motor should stop, the valve 25 would close and air would pass into the casing 21 to break the vacuum therein through the passage 27 so that the diaphragm would rise and thus close the circuit to the solenoid 7 again. This operation will be repeated until the internal combustion motor continues to operate. Manifestly, with the internal combustion engine running the generator G generates current and when the generator has developed sufficient voltage armature 39 will be attracted by the coil 38 to engage the contacts 47, 46 and separate the contacts 45, 8 and the contacts 8 and 45 will remain separated as long as the coil 38 is excited sufficiently to hold the armature 39 depressed thereby insuring against a closing of the switch 5 during normal operation of the engine.

Should however the operator desire that the starter switch not be automatically opened in the manner just described but on the other hand desires to have the starter motor turn the internal combustion engine over continuously, all that is necessary is for the operator to hold the throttle pedal depressed to maintain the butterfly valve in the carbureter open and thereby prevent within the intake manifold the creation of vacuum sufficient to operate the circuit maker and breaker 6. Obviously with the throttle valve thus kept open the circuit maker and breaker 6 will not be operated for interrupting the circuit to the switch 5, and accordingly the interruption of the circuit to the switch 5 will take place only when the operator moves the butterfly valve to a closed position which he will of course do as soon as the engine begins to run properly. As is also thought apparent, after the engine starts the suction in the intake manifold causes, as before mentioned the diaphragm 29 to flex downwardly for interrupting the circuit through the coil 7 of the starter switch and as long as suction is maintained there will be no further change in the circuit described, but if the engine stalls, the lack of suction will permit the diaphragm 29 to flex upwardly to the position shown in Figure 1, the engaging contact 34 with the contact 35 resulting in repeating the starting operation hereinbefore described.

Even though I have herein shown and described the preferred embodiment of the invention, it is to be understood that the same is susceptible of further changes, modifications and improvements coming within the scope of the appended claim.

Having thus described my invention, what I claim as new is:

In a starter switch mechanism for an internal combustion engine, the combination with a battery, an electrically operable starting motor, a generator, a charging circuit between the generator and the battery, and a cut-out relay for said generator located in said charging circuit, means for electrically connecting the charging circuit to the starting motor, such means including an electro-magnetic switch, a switch arm carried by and insulated from the armature of the cut-out relay, a contact located in the battery side of the charging circuit and engaged by said arm when the relay is in inoperative position for breaking the charging circuit, a conductor leading from the switch arm to one terminal of the magnet of the electro-magnetic switch, a conductor leading from the other terminal of said magnet, circuit breaking mechanism operated by the vacuum in the engine for grounding the last mentioned conductor when said mechanism is in inoperative position and separating the conductor from ground when the engine is operated to produce a vacuum in such mechanism.

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