July 15, 1941. J. T. W. MOSELEY ET AL 2,249,221

STARTER SWITCH

Filed Oct. 24, 1939 2 Sheets-Sheet 1

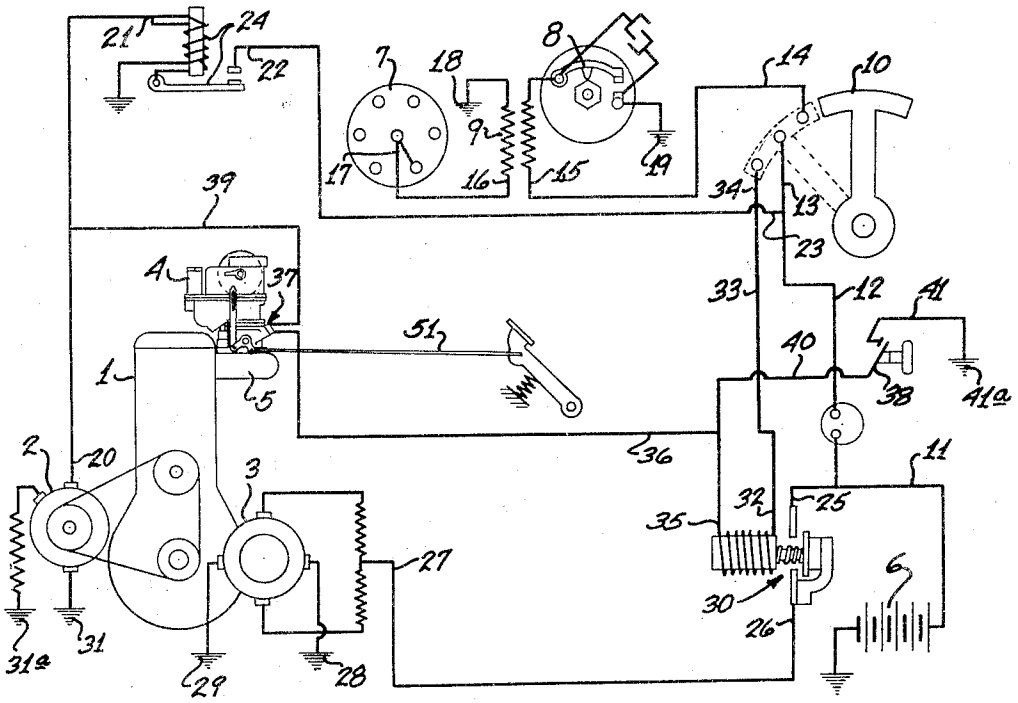

FIG. 1.

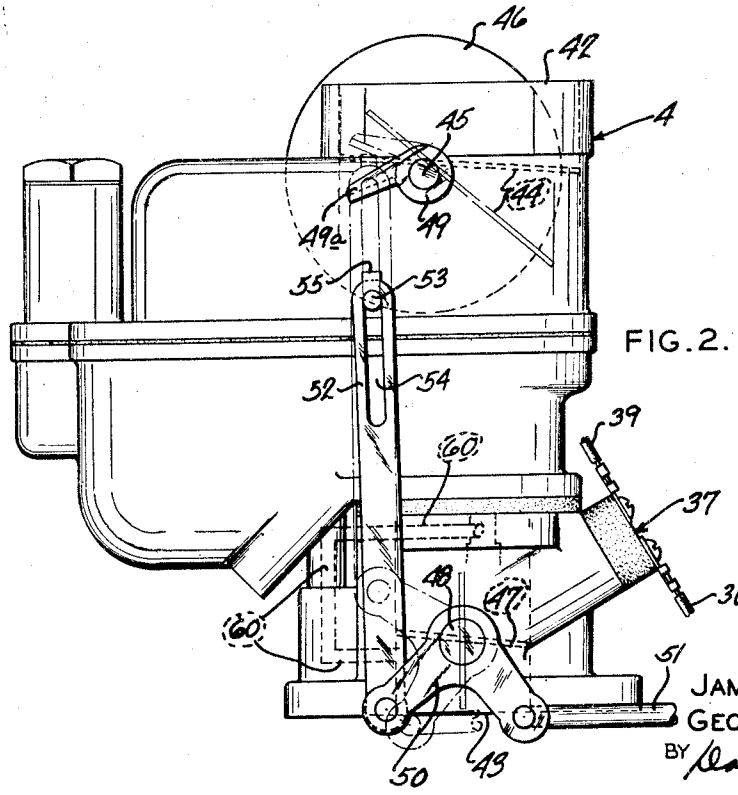

FIG. 2.

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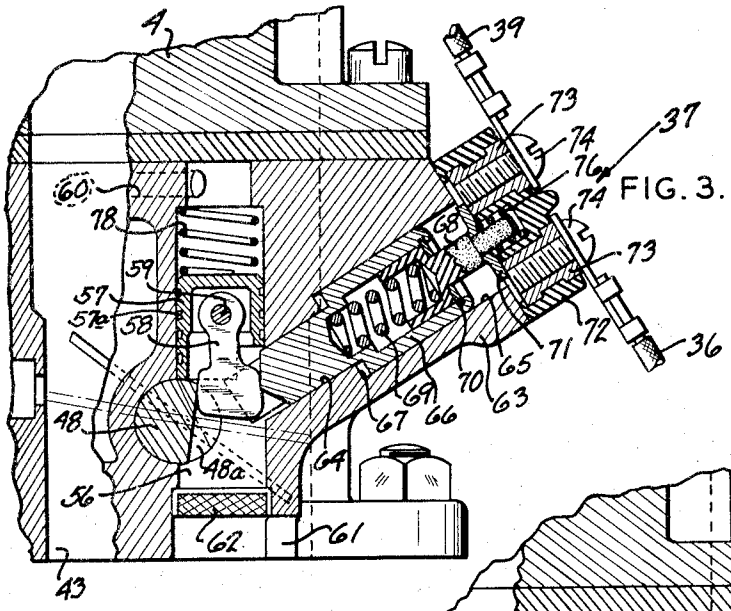

FIG. 3.

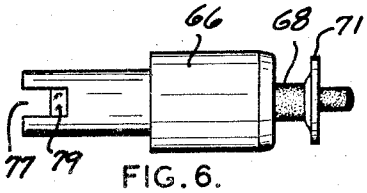

FIG. 6.

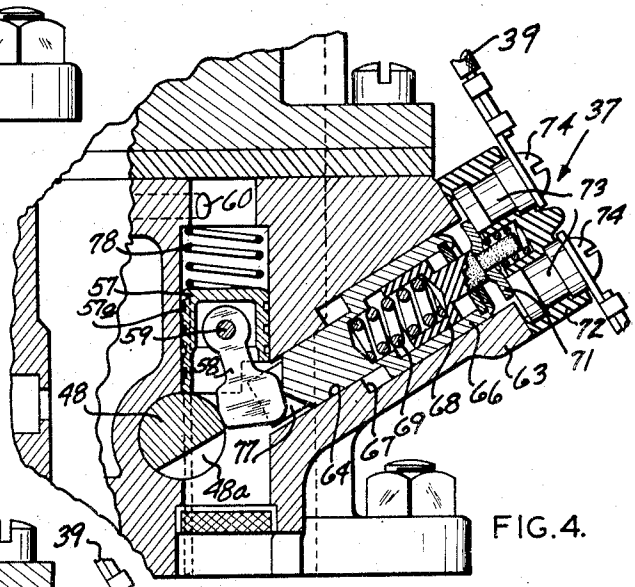

FIG. 4.

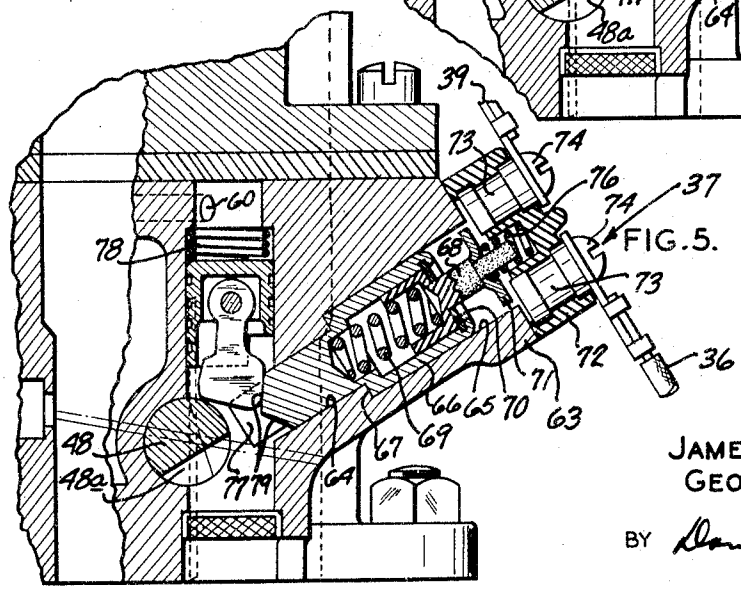

FIG. 5.

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2,249,221

STARTER SWITCH

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Application October 24, 1939, Serial No. 301,018

7 Claims. (Cl. 200—59)

This invention relates to internal combustion engine starter switches and more particularly to throttle controlled starter switches. It is an improvement of the device shown in a co-pending application, Serial No. 293,297, filed September 2, 1939, in the name of Irven E. Coffey.

In practice it has been found that the ball, as used in the switch structure of the above referred to application, has a tendency to stick on its seat thereby preventing functioning of the device. It has further been found that the tendency of the ball to stick upon its seat decreases as the diameter of the seat is decreased. It will be noted, however, that as the diameter of the seat is decreased, the vacuum required to hold the ball upon its seat must be increased, and due to the fact that under certain conditions of engine operation little vacuum is available, it will be seen that to decrease the diameter of the seat is to approach a critical condition wherein the ball may drop during engine operation and cause untimely operation of the switch.

It is an object of the present invention to provide a generally new and improved device operating on the general principle of the starter switch shown in the Coffey application referred to above and being more adaptable to economical, large scale production.

The manner in which the above object and further objects hereinafter apparent are achieved is set forth in the following description and accompanying drawings, in which like numbers refer to like parts. Referring to the drawings:

Fig. 1 is a wiring diagram of ignition, starting, and generating circuits for an internal combustion engine.

Fig. 2 is a side elevation of a carburetor embodying the present invention.

Fig. 3 is a fragmentary view of the carburetor shown in Fig. 2, disclosing the starting switch in section.

Figs. 4 and 5 are similar to Fig. 3 except that the starting switch and throttle valve are shown in different operative positions.

Fig. 6 is a starting switch detail.

The wiring diagram shown in Fig. 1 is similar to that shown in Fig. 1 of the patent to I. E. Coffey, #2,174,313 and includes an internal combustion engine 1, a generator 2 arranged to be driven by the engine, and a starting motor 3 arranged to crank the engine. A carburetor 4 attached to the engine intake manifold 5 supplies a combustible mixture thereto. The usual storage battery 6, distributor 7, breaker point mechanism 8 and high tension coil 9 are shown herewith. An ignition switch 10 is indicated and is connected to the battery 6 by means of lead 11—12—13. The switch 10 is further connected to the primary winding of coil 9 and breaker point 8 by lead 14—15. Induced current from coil 9 flows to the distributor through lead 16—17. The coil 9 is grounded at 18 and the breaker points are grounded at 19. A charging lead 20—21—22—23—12—11 connects the generator with the battery, a reverse current relay or cut-out generally indicated at 24 being interposed in this lead.

Battery 6 is connected to the starting motor 3 by means of lead 11—25—26—27, the motor being grounded at 28 and 29 to complete the circuit. Interposed in this circuit is a solenoid controlled switch 20 having its coil connected at one end to the battery through the ignition switch by means of lead 32—33—34 and connected at its other end to the generator by means of a lead 35—36—39—20. The generator is grounded at 31 and 31*a*. Interposed in the lead from coil 30 to the generator is a semi-automatic throttle operated switch device generally indicated at 37 and mounted on the carburetor. A manual push-button type switch 38 in lead 35—40—41 provides an emergency means for starting in the event of failure of switch 37. Lead 40 is grounded at 41*a*.

The carburetor 4, as shown on a larger scale in Fig. 2, is of the conventional downdraft, plain tube type having an air inlet 42 and a discharge outlet 43. For control of the air inlet an unbalanced plate-type choke valve 44 rigidly attached to a rotatable choke shaft 45 is provided. Shaft 45 extends outwardly from both sides of the carburetor and on the far side extends into the automatic choke mechanism housing 46. Automatic choke mechanism housed therein functions to yieldably position the choke valve in accordance with the temperature, suction, and other operating conditions in a manner described in the patent to I. E. Coffey #2,085,351. While the construction shown in Fig. 2 hereof is schematic, it is intended to use an automatic choke construction, together with connections to the throttle in accordance with either the said Coffey patent or the Coffey application, Serial No. 134,070. Without showing these complicated mechanisms, it is believed to be sufficient to merely show the connection 52 whereby the choke valve may be opened by the throttle or accelerator pedal by pushing it all the way to the floor against the pressure of the spring 69.

The discharge outlet 43 is controlled by a plate-type throttle valve 47 which is rigidly attached to a rotatable throttle shaft. Rigidly attached to

the near end of choke shaft 45 is a disc-like member 49 having a radial projection 49a. On the near end of throttle shaft is a throttle lever 50 rigidly attached thereto. One arm of lever 50 is perforated for attachment of a remote control rod 51. Pivotally attached to the other end of a lever 50 is a link 52. A guide pin 53 attached to the carburetor body and engaging a slot 54 guides link 52 in a vertical direction as the lever 50 is rotated clockwise. Link 52 is further provided with an abutment 55 arranged to contact the projection 49a on member 49 as the link 12 moves upward.

The carburetor body is provided with a vertical bore 56 adjacent the throttle shaft 48 as indicated in Figs. 3–4–5. Within this bore and arranged to reciprocate in the upper portion thereof is a hollow piston 57. The piston 57 carries a swinging flat key 58 which is pivotally attached thereto by means of a pin 59. Piston 57 may be provided with seal grooves 57a. Communication between the upper end of bore 56 and the carburetor discharge outlet 43 at a point below the carburetor throttle valve is accomplished by the provision of passage 60 shown in Fig. 2. Communication between the lower end of bore 56 and the atmosphere is accomplished by the provision of a slot 61. A filter 62 is provided at the lower end of bore 56.

Extending outwardly and upwardly from the axis of bore 56 is a boss 63 formed as an integral part of the carburetor. The boss 63 is provided with a longitudinal bore 64 and a counterbore 65. Fitted in bores 64 and 65 and arranged to reciprocate therein is a hollow outer plunger 66 limited in its travel inwardly by the shoulder 67. Assembled in the outer end of plunger 66 and arranged for telescoping therein is an inner plunger 68 having a reduced portion extending outwardly from the end of casing 66. The plunger 68 is constantly urged outwardly by a comparatively strong spring 69, but is retained within outer plunger 66 by a disc 70. Inner plunger 68 is constructed of non-conductive material and, therefore, electrically insulates the conductive contact plate 71, which it carries at its outer end. A cap 72 of non-conductive material, firmly secured to the outer end of boss 63 by screws (not shown) and having contact blocks 73 cast therein, is provided. The contact blocks 73 are internally threaded to receive screws 74 which are provided for the purpose of attaching starting circuit lead 36—39. The contact plate 71, being perforated, is fitted over the reduced outer end of plunger 68 and is held against a shoulder by the spring 76.

The portion of throttle shaft 48 which extends through the bore 56 is cut away, as indicated at 48a, resulting in a semi-circular section, for the purpose of providing a cam surface. The reduced inner end of plunger member 66 has been slotted, as indicated at 77, Fig. 6, to accommodate the swinging key 58. This arrangement prevents the relative rotation of piston 57 and member 66. A light spring 78 arranged to constantly urge piston 57 downwardly is provided to minimize the possibility of the piston 57 sticking at the upper end of bore 6. The purpose of beveling the inner end of outer plunger 66 as indicated at 79, is to provide a symmetrical unit which precludes the possibility of incorrect assembly.

It will be seen that the machining on the inner end of outer plunger 66 is much simpler and more economical to produce than the intricate double concavity machining required with the use of the ball.

The operation of the device is as follows:

With the engine inoperative and cold, the choke valve 44 will be yieldably held in a closed position as indicated by dotted lines in Fig. 2. At this time, there being no suction in the intake manifold, piston 57 will be in the position as shown in Fig. 3 and key 58 will be interposed between the flat on throttle shaft 48 and the inner end of plunger 66. Under these conditions, upon moving the throttle valve to the partial open position indicated in Fig. 3, the contact plate 71 will be brought into contact with contact blocks 73 thereby closing the break in lead 36—39 and grounding the solenoid control switch 30 through the generator 2. It is assumed that the ignition switch is closed at this time completing a circuit through lead 32—33—34—13—12—11 to the battery 6. Also at this time link 52 will have moved upward, but not a sufficient amount to bring abutment 55 into contact with projection 49a.

Any further opening of the throttle valve from the position as shown in Fig. 3 will require the compression of the comparatively strong spring 69 which has been designed to offer sufficient resistance to definitely warn the operator of the throttle position and to require an appreciable, additional effort on the part of the operator to further open the throttle valve. If, however, for any reason the engine fails to start and it becomes necessary to crank the engine with the choke valve partially open, the operator may further open the throttle to a position as indicated in Fig. 4, thus telescoping plunger 68 within outer plunger 66. In this position, as is indicated in dot-dash lines in Fig. 2, the link 52 has been moved upwardly and has thereby moved choke valve 44 to the position shown.

When the engine has been started and is operating under its own power and the throttle valve is permitted to close by reason of the usual throttle pull back spring, piston 57 will be pulled upward to the position shown in Fig. 5, thereby moving block 18 out of position between the throttle shaft and the inner end of plunger 66 by reason of suction below the throttle being communicated at the upper part of bore 56 by passage 60. The throttle shaft will, thereafter, be free to rotate without actuating the switch as long as a sufficient vacuum exists in the engine intake manifold to hold piston 57 in this position. It will be understood sufficient vacuum does exist in the intake manifold for this purpose during normal operation of the engine. If, however, the operator continues to hold the throttle valve open after the engine has started, switch 37 will remain closed until such time as the throttle has been closed. Upon reference to the description in Patent #2,174,313 to I. E. Coffey, it will be seen that the starting circuit will be broken as soon as the generator begins to rotate due to engine operation, sufficiently fast to reverse the current through lead 38—36 and the control switch coil 30.

Various features in the preceding disclosure are intended to be illustrative, not limiting, and exclusive use of all modifications within the scope of the appended claims is contemplated.

We claim:

1. A starting switch for use with internal combustion engines, comprising a plunger, a cam, a

key adapted to be inserted into an operative position between said plunger and said cam whereby the cam actuation of said plunger can be effected, and a pressure responsive device pivotally secured to said key for withdrawing said key from said position.

2. A starter switch for use with internal combustion engines, comprising a plunger, a cam, a key adapted to be inserted into an operative position between said plunger and said cam whereby the cam actuation of said plunger can be effected, spring means urging said key toward said position, and a pressure responsive device movably secured to said key for withdrawing said key from said position.

3. In a carburetor, means forming a mixing conduit, a throttle valve in said mixing conduit, a throttle shaft for said valve, said shaft having a cam surface formed thereon, starting switch structure comprising a plunger and a key adapted to be inserted between said plunger and said cam surface whereby the movement of said plunger can be accomplished by the rotation of said throttle shaft, means for inserting and withdrawing said key, comprising a spring loaded piston responsive to the suction in said carburetor mixing conduit posterior to said throttle valve.

4. Starter switch structure comprising a cylindrical plunger, a flat key member for controlling the operation of said plunger and a cylindrical pressure responsive piston for actuating said key, said key being pivotally attached to said piston and said plunger being provided with a slot to receive said key whereby the rotation of said piston and said plunger is prevented.

5. A starter switch device for internal combustion engines comprising a switch plate, a plunger member mounted for linear movement for operating said plate, a manual switch actuator, a key normally urged toward an operative position between said plunger member and said actuator for completing an operative connection therebetween, and a withdrawing element for said key member movable at an angle to the line of movement of said plunger responsive to operation of the associated engine, said element being movably connected to said key member.

6. A starter switch device for internal combustion engines comprising a switch plate, a plunger member mounted for linear movements for operating said plate, a manual switch actuator, a key member of non-circular section normally urged toward an operative position between said plunger member and said actuator for completing an operative connection therebetween, and an element operatively associated with said key member and movable responsive to operation of the associated engine to withdraw said key member from said position, one of said members having a guide recess slidably receiving the other member so as to maintain operative alignment between said members.

7. A starter switch device for internal combustion engines comprising a switch plate, a plunger mounted for linear movement for operating said plate, a switch actuator, a key normally urged toward an operative position between said plunger member and said actuator for completing an operative connection therebetween, a suction responsive device restrained to longitudinal movement in a direction at an angle to the direction of movement of said plunger, and a piston slidable in said cylinder and pivotally connected to said key member for withdrawing the latter from said operative position responsive to operation of the associated engine.

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