July 16, 1957 F. E. SCUTT 2,799,745

STARTING SWITCH

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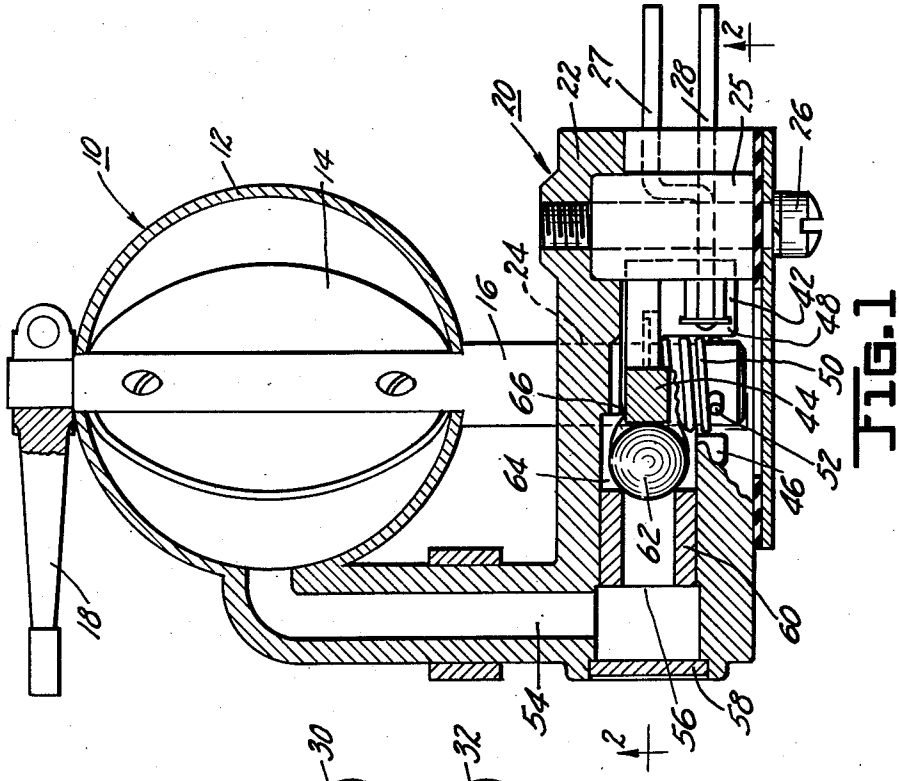


FIG. 1

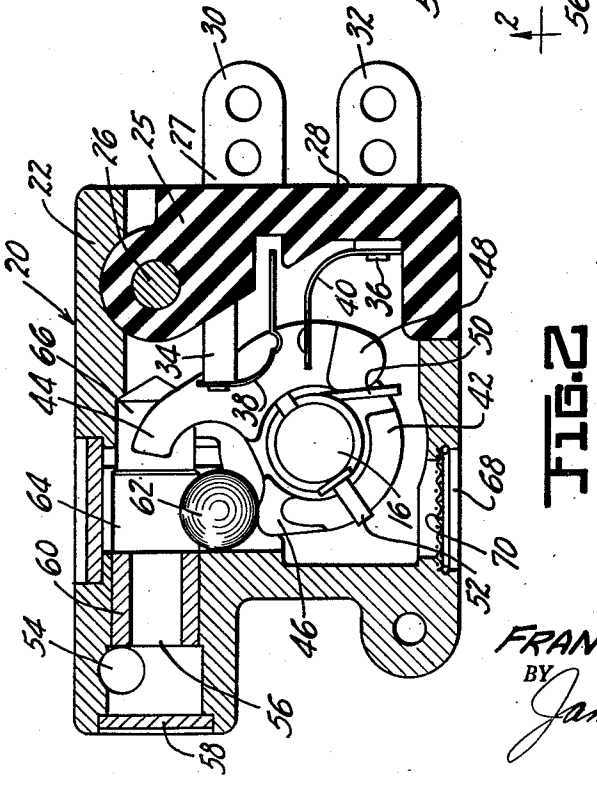


FIG. 2

INVENTOR.
FRANCIS E. SCUTT
BY James L. O'Brien
ATTORNEY

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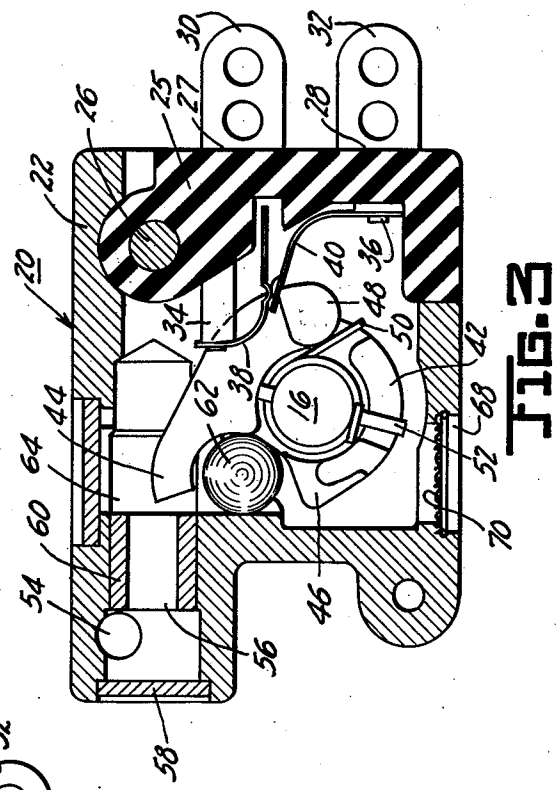


FIG. 3

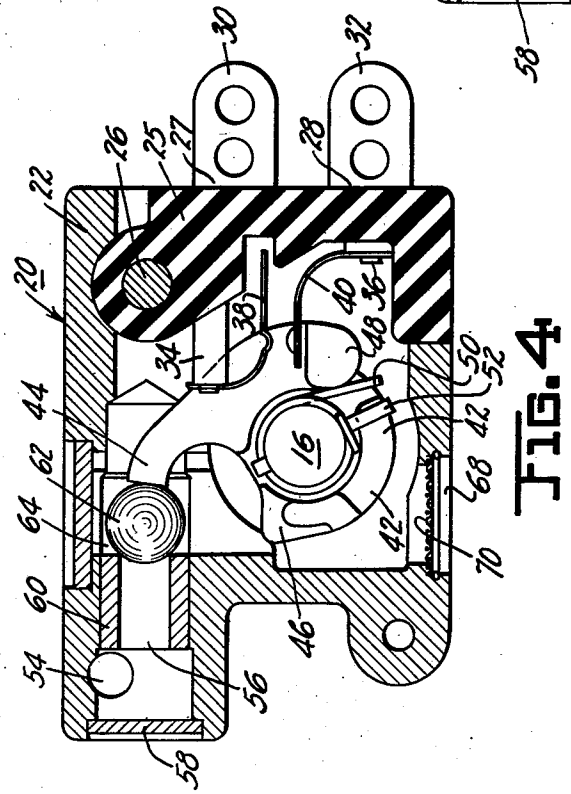


FIG. 4

INVENTOR.
FRANCIS E. SCUTT
BY
James L. O'Brien
ATTORNEY

United States Patent Office

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STARTING SWITCH

Francis E. Scutt, Elmira, N. Y., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

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9 Claims. (Cl. 200—82)

This invention relates to a starting switch device for the starting motor of a vehicle found in internal combustion engines.

The starting switch device embodying the present invention is adapted to be connected in series with the ignition switch in a starting motor electrical circuit and to be actuated by a vehicle control device, such as the accelerator pedal or clutch. After the engine is started a suction responsive means is provided to prevent the starting switch from energizing the starting motor.

In the past the reliability of switches of this type has been greatly impaired by dirt and other air-borne impurities which cause the suction responsive means to stick either rendering starting impossible or permitting damage to the starting motor.

It is a principal object of the present invention to provide a starting switch having a compact structure which is relatively unaffected by dirt and other air-borne impurities.

Another object of this invention is to provide a self-cleaning means for at least a portion of the movable parts of a starting switch.

Still another object of the invention is to provide a starting switch device which will remain energized during the cranking or starting period and which will remain de-energized under all possible operating conditions of the engine.

The starting switch device of the present invention consists of a rotor yieldably connected to the engine throttle shaft for rotation therewith to energize the switch and a suction responsive member adapted to block the rotation of said rotor during operation of the engine to prevent energization of the switch, said rotor being adapted to restrain said member during the starting period and to urge said member toward and to aid in holding said member in blocking position during operation of the engine.

Other objects and advantages of the invention will be apparent to those skilled in the art from the following description when taken in connection with the accompanying drawings, showing by way of example a preferred embodiment of the inventive idea.

Figure 1 is a top plan view of a portion of a conventional carburetor with an enlarged sectional view of a starting switch embodying the present invention connected thereto;

Figure 2 is a view taken along the line 2—2 of Figure 1 showing the position of switch parts when the throttle is closed and the engine inoperative;

Figure 3 is a view similar to Figure 2 showing the position of switch parts during engine cranking; and

Figure 4 is a view similar to Figure 2 showing the position of switch parts during engine operation with the throttle partially opened.

Referring to the drawings, numeral 10 designates a carburetor which may be of conventional construction, 12 a throttle body, 14 a throttle valve mounted on a shaft 16 therein. A throttle lever 18 is secured to one end of

shaft 16 and is adapted to be connected to an accelerator pedal (not shown).

A starting switch 20 embodying the present invention is provided with a housing 22 which may be cast integrally with the throttle body or may be secured thereto in any convenient manner. An opening 24 is located in the wall of housing 22 to receive an extension of throttle shaft 16. An insulated terminal block 25 secured in the housing by a bolt 26 carries a pair of electrical terminals 27 and 28. The terminals extend through said block and at their outer ends are provided with flanges 30 and 32 adapted to be connected to the starting motor electrical leads (not shown). At their inner ends the terminals are provided with bosses 34 and 36 which carry spring contacts 38 and 40 respectively.

Rotor 42 is rotatably mounted on an extension of throttle shaft 16 and is provided with a plurality of projections or lugs 44, 46 and 48. A torsion spring 50 encircles the throttle shaft 16 and has one end hooked about a pin 52 secured to and projecting from said shaft. The other end of spring 50 abuts against lug 48 on rotor 42 thereby forming a direct yieldable link between throttle shaft 16 and said rotor.

A conduit 54 connects a cylinder 56 formed in housing 22 with the throttle body 12 on the engine side of the throttle valve. At one end cylinder 56 is closed by a plug 58 and at the other end is provided with a sleeve 60 which forms a seating surface for a ball 62. Ball 62 is vertically displaceable in a guide 64 which is provided with a longitudinal slot 66 adapted to receive lug 44 on rotor 42. Lug 46 on rotor 42 projects under the guide 64 to form an abutment to hold ball 62 in the guide when the ball is in its lowered position. Lug 46 also imparts an initial upward force on the ball as the rotor 42 moves clockwise from the starting position shown in Figure 3. The positive actuation of ball 62 by lug 46 provides a self-cleaning feature to insure against the sticking of ball 62 in guide 64. When in its raised or seated position, ball 62 forms an abutment for lug 44 as shown in Figure 4 and prevents further rotation of rotor 42. The interior of housing 22 communicates with the atmosphere through port 68 in the lower wall of the housing below guide 64. A screen 70 is inserted in port 68 to keep dirt and other air-borne impurities from entering the housing.

The operation of the starting switch device is as follows: With the throttle closed and the engine inoperative the parts of the starting switch are in the position shown in Figure 2 wherein ball 62 rests on lug 46 and contacts 38 and 40 are open. As the throttle valve is moved toward opened position, rotor 42 is rotated in a counterclockwise direction causing lug 48 to move contact 40 into engagement with contact 38 as shown in Figure 3. Engagement of the contacts energizes the starting motor (not shown) to crank the engine. During the cranking period, the ball 62 is restrained from responding to engine suction by lug 44 which extends into the guide 64 over the ball.

After the engine starts, the throttle valve is returned toward closed position whereby lug 44 is withdrawn from the path of ball 62. At the same time, lug 46 strikes ball 62 from below imparting an initial upward motion to the ball which continues to rise under the influence of manifold vacuum until seated in sleeve 60. Thereafter, when the throttle is opened, ball 62 forms an abutment for lug 44 and prevents rotor 42 from moving contacts 38 and 40 into engagement.

Thus it can be seen that by utilizing a spherical-shaped suction responsive member and by providing for initial positive actuation of the member that my starting switch device is self-cleaning and its operation remains unaffected by dirt and other air-borne impurities. In addition the rotor is provided with a direct yieldable connection with

the throttle shaft whereby dependable operation of the switch is obtained. The relatively symmetrical arrangement of a minimum number of parts provides for an extremely compact structure much desired for use on automotive engines.

While I have herein illustrated a preferred embodiment of my invention, it readily will be understood that numerous changes, modifications and substitution of equivalents may be made therein without departing from the spirit and scope of my invention.

I claim:

1. In a starting switch device for an internal combustion engine having a throttle shaft, a housing, electrical contacts in said housing, means having a yieldable connection with said shaft and mounted in said housing for closing said contacts, a member movable in response to engine suction from an effective position to an ineffective position, said member when in said effective position being effective to prevent said means from closing said contacts, means formed on said first mentioned means for supporting said member in the ineffective position and for preventing movement of said member to the effective position.

2. A starting switch comprising a housing, electrical contacts in said housing, a rotor in said housing rotatable to close said contacts, a member movable in one direction to an effective position to block said rotor and prevent the closing of said contacts and movable in another direction to an ineffective position, and projections on said rotor effective when said rotor is in a predetermined position to limit the movement of said member in both directions.

3. A starting switch comprising a housing, electrical contacts in said housing, a shaft in said housing, a rotor rotatably mounted on said shaft, a yieldable connection between said shaft and rotor, said rotor being rotatable to close said contact, a member movable in one direction to an effective position to block said rotor and prevent the closing of said contacts and in another direction to an ineffective position, and projections on said rotor effective when said rotor is in a predetermined position to limit the movement of said member in both directions.

4. A starting switch comprising a housing, electrical contacts in said housing, a shaft in said housing, a rotor rotatably mounted on said shaft, a yieldable connection between said shaft and rotor, said rotor rotatable to close said contacts, a vertical guideway in said housing, a spherical member movable in said guideway between raised and lowered positions, and a projection on said rotor movable in a path to be obstructed by said member in its raised position whereby said rotor is prevented from closing said contacts.

5. A starting switch comprising a housing, electrical contacts in said housing, a shaft in said housing, a rotor rotatably mounted on said shaft, a yieldable connection between said shaft and rotor, said rotor rotatable to close said contacts, a vertical guideway in said housing, a spherical member movable in said guideway between raised and lowered positions, and a projection on said rotor movable in a path to be obstructed by said member in its raised position whereby said rotor is prevented from closing said contacts, said projection also movable to obstruct said member in its lowered position.

6. A starting switch comprising a housing, electrical contacts in said housing, means in said housing movable to close said contacts, a member movable to block said means and prevent the closing of said contacts, said means including a projection movable to obstruct said member when said means is in one position and a lug movable with said means to urge said member toward its blocking position when said means is in another position.

7. A starting switch comprising a housing, electrical contacts in said housing, a shaft in said housing, a rotor rotatably mounted on said shaft movable to close said contact, a spherical member in said housing movable between raised and lowered position, a portion of said rotor movable in a path to be obstructed by said member when in its raised position to prevent the closing of said contacts and a projection on said rotor movable to urge said member toward raised position.

8. In a starting switch for an engine, electrical contacts, a movable member for closing said contacts to start the engine, a vacuum responsive member having two positions for controlling the operation of said first mentioned member, and a means associated with said first mentioned member for causing initial movement of said second mentioned member toward one of said positions.

9. In a starting switch for an engine, electrical contacts, a movable member for closing said contacts, a vacuum responsive member movable between an ineffective position and a position effective to control said member, and means associated with said first mentioned member for causing initial movement of said second mentioned member from said ineffective position toward said effective position.

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