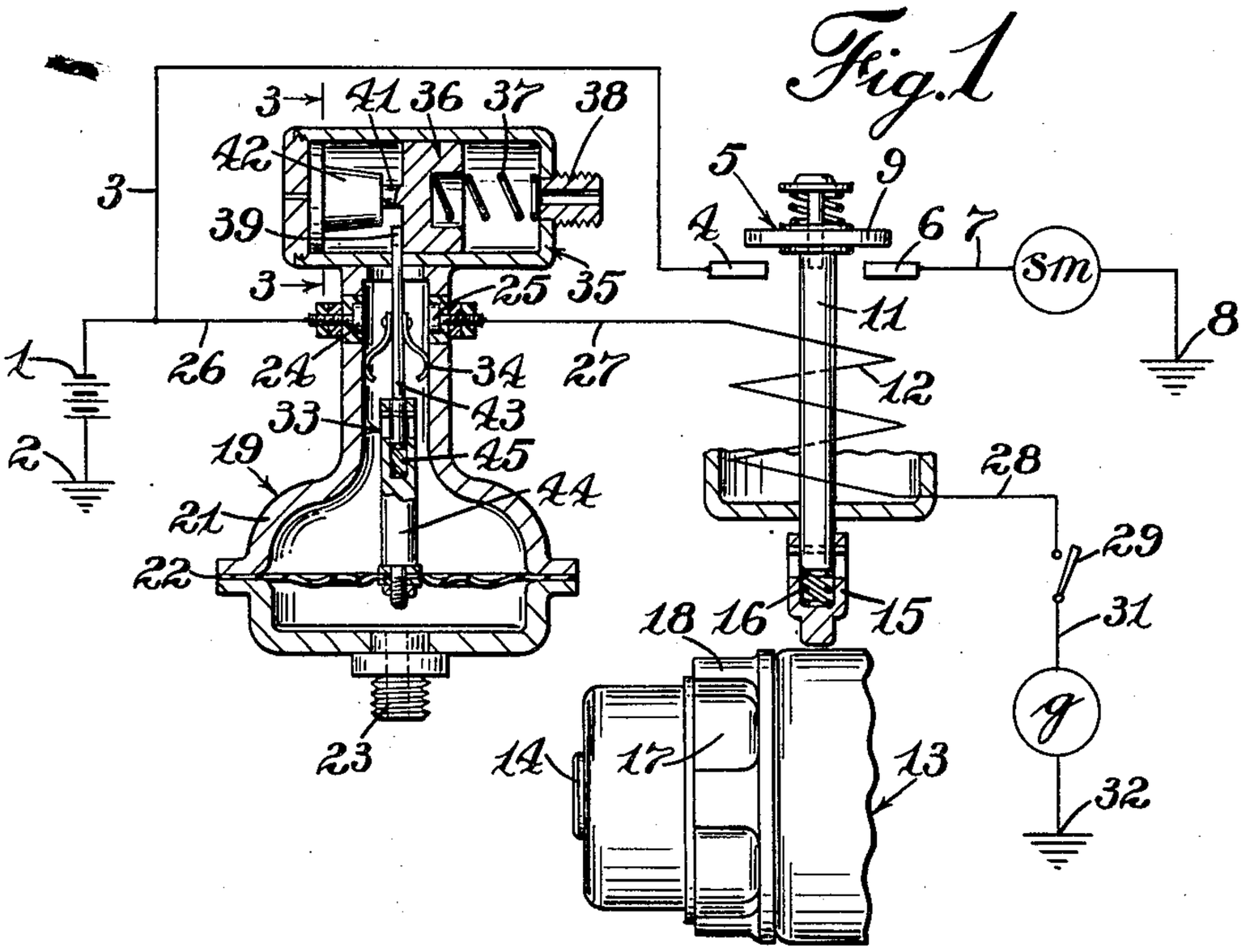
Oct. 31, 1950 J. E. BUXTON 2,528,112

SEMIAUTOMATIC ENGINE STARTER CONTROL

Filed Oct. 29, 1948

Fig. 1



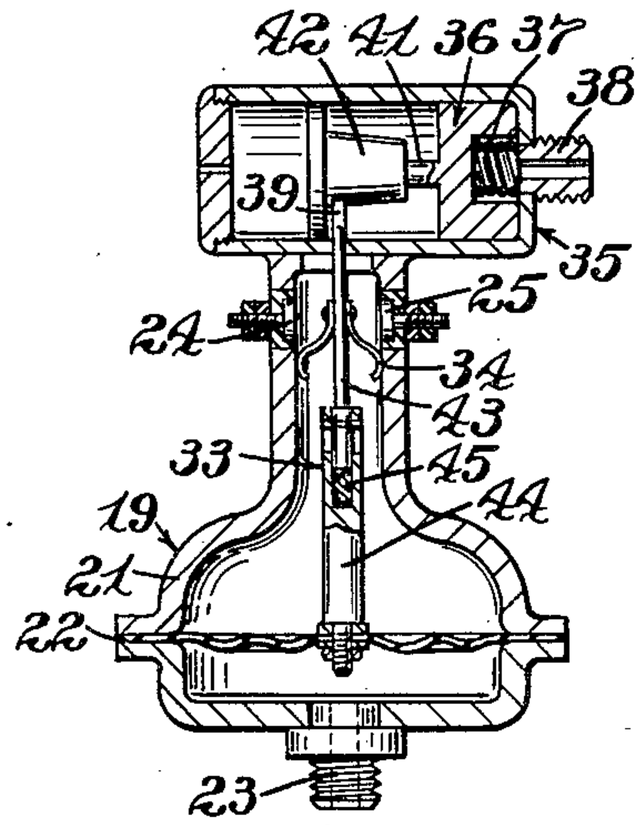


Fig. 2

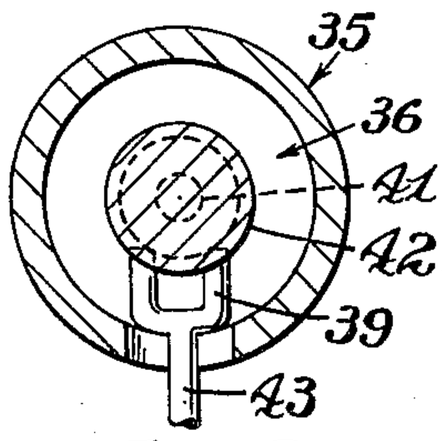


Fig. 3

WITNESS:

Esther M. Stockton.

INVENTOR.
James E. Buxton
BY
Clinton L. James
ATTORNEY

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SEMIAUTOMATIC ENGINE STARTER CONTROL

James E. Buxton, Elmira, N. Y., assignor to Bendix Aviation Corporation, Elmira Heights, N. Y., a corporation of Delaware

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The present invention relates to a semi-automatic starter control for internal combustion engines, and more particularly to means for causing actuation of the starter for the engine of an automotive vehicle when the vehicle brakes are applied.

In the operation of certain types of motor vehicles, especially those in which the control of the load clutch is automatic, it is desirable to accomplish the starting of the engine in a semi-automatic manner so that if the engine stalls while idling it will be restarted without thought or effort on the part of the operator, who may not immediately notice that the engine has stopped. It is more particularly advantageous that the restarting operation be accomplished incidentally to the actuation of the braking system of the vehicle, especially in those instances where a vehicle such as an automobile has been stopped on an incline which requires the operator to keep the brakes applied until the engine assumes the driving load.

It is an object of the present invention to provide a novel starter control for the power plants of motor vehicles which operates as an auxiliary function of the braking system for the vehicle.

It is another object to provide such a device in which the act of applying the vehicle brakes causes actuation of the starting system if the engine is stopped while the ignition system is operative.

It is another object to provide such a device including novel means for preventing actuation of the starting system when the engine is running.

It is a further object to provide such a device incorporating means for preventing the premature interruption of the cranking operation.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a semi-diagrammatic illustration of a starting system forming a preferred embodiment of the invention.

Fig. 2 is a detail of the starter control switch with the parts in lockout or running position; and

Fig. 3 is an enlarged sectional detail of the lockout device for the starter control switch.

In Fig. 1 of the drawing there is illustrated a starting system of an internal combustion engine including a battery 1 grounded at 2 and connected by a lead 3 to a contact 4 of a starting switch indicated generally by numeral 5. A corresponding contact 6 of the starting switch is

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connected by a lead 7 to the starting motor SM which is grounded at 8 to complete the starting circuit.

The starting switch 5 also includes a bridging contact 9 mounted on a magnetic plunger 11 which is movable by a solenoid 12 toward an engine starter drive indicated generally by numeral 13 which is slidably mounted on the armature shaft 14 of the starting motor in the manner more fully shown and illustrated in the patent to Oliver 2,444,429 issued June 29, 1948.

The switch plunger 11 has slidably mounted on its lower end a detent member 15 normally held in extended relation by a spring 16 and adapted to be brought into frictional engagement with the periphery of the drive 13 by downward movement of the switch plunger. When the drive 13 is moved to the right on the armature shaft 14 into cranking position, the detent 15 enters one of the pockets 17 in a fiber ring 18 swiveled on the starter drive 13, so as to latch the drive in operative position as long as the starting switch remains closed.

Means for automatically energizing the solenoid 12 when the engine is stopped, as an incident to the actuation of the braking mechanism of the vehicle is provided comprising a hydraulically-operated control switch indicated generally by numeral 19 which is arranged to be closed whenever the vehicle brakes are applied while the engine is inoperative. Switch 19 comprises a casing 21 having a flexible diaphragm 22 suitably mounted therein, and a nipple 23 adapted to be connected to the hydraulic braking system of the vehicle so as to transmit hydraulic pressure to the diaphragm 22 whenever the braking system is actuated.

A pair of fixed contact members 24 and 25 are mounted in the upper portion of the casing 21, insulated therefrom; contact 24 being connected by lead 26 to the battery 1, while contact 25 is connected by lead 27 to one terminal of the solenoid 12. The opposite terminal of solenoid 12 is connected by a lead 28 to a manual switch 29, and the latter is connected by a lead 31 to the engine driven generator (*g*), which is grounded as indicted at 32. It will be understood that the polarities of the battery 1 and generator (*g*) are so arranged that when the generator is driven by the engine it will oppose the flow of current from the battery through the solenoid 12.

A telescopic plunger 33 is fixed at its lower end in any suitable manner to the center of the diaphragm 22 and protrudes from the upper end of the casing 21, in which it has a sliding bearing.

A bridging contact member 34 is suitably mounted on the plunger 33 in such position that it will engage and connect the contacts so as to complete the control circuit for the solenoid 12 when the diaphragm 22 is flexed upwardly by hydraulic pressure from the braking system.

Means for preventing such closure of the control circuit when the engine is self operative is provided comprising a cylinder 35 suitably fixed on the top of switch case 21 and having a piston member 36 slidably mounted therein. Piston 36 is normally maintained in the position shown in Fig. 1 by a spring 37 but is arranged to be drawn to the right into the position shown in Fig. 2 when the right hand end of the cylinder 35 is evacuated. A nipple 38 mounted on the cylinder 35 serves to connect the cylinder to the intake manifold of the engine so as to cause reduced pressure in the cylinder during self operation of the engine.

The contact carrying plunger 33 extends into the cylinder 35 and terminates in a fork 39 (Fig. 3). The position 36 is provided with a reduced portion 41 of such diameter as to allow the fork 39 to slide freely thereon, and a portion 42 of intermediate diameter which is too large to receive said fork, so that when the piston is moved to the right as shown in Fig. 2, the portion 42 thereof prevents the plunger 33 from moving upward. On the other hand, if the fork is moved upwardly when the piston 36 is in idle position so that the fork embraces the reduced portion 41, the fork thereby locks the piston in idle position.

The plunger 33 is preferably formed of two sections 43, 44 which are connected for limited telescopic movement as indicated, and are normally held extended by a spring 45 which thus determines the maximum pressure applied to the piston 36 by the fork 39 of the plunger. The relative strength of the springs 37 and 45 is such that the spring 37 will return the piston 36 to its idle position upon failure of vacuum in the cylinder 35, in spite of any lateral pressure applied by the fork 39 to the piston due to the application of the vehicle brakes at that time. In order to facilitate this action the portion 42 of intermediate diameter of the piston 36 may be tapered slightly as illustrated.

In operation, after closure of the manual switch 29, actuation of the vehicle brake causes closure of the control switch 19, thus energizing the solenoid 12 and thereby closing the starting switch 5 and causing the starting motor to crank the engine. When the engine starts, the generator (g) develops sufficient voltage to prevent the battery 1 from discharging through the solenoid 12 so that the starting switch 5 opens and the starting motor is deenergized. When the vehicle brakes are released, the diaphragm 22 returns to its normal position, thus opening the control switch 19, whereupon the fork 39 is withdrawn from the piston 36, allowing the vacuum from the intake manifold of the engine to draw the piston 36 to the right so as to bring the portion 42 thereof into registry with the fork 39. Thereafter, as long as the engine remains operative, application of the vehicle brakes cannot close the control switch 19 since the portion 42 of the piston 36 prevents the fork 39 from moving upwardly.

Should the engine stop for any reason, the spring 37 returns the piston 36 to its idle position

so that subsequent application of the vehicle brakes causes the starting operation to be repeated. If the engine stops while the brakes are applied, the same action takes place since the lateral pressure of the fork 39 on the piston 36 is insufficient to prevent the spring 37 from returning it to idle position so that the starting system is immediately actuated as soon as the engine stops.

Although certain structure has been shown and described in detail, it will be understood that other embodiments are possible and that various changes may be made in the precise form and arrangement of parts without departing from the spirit of the invention.

I claim:

1. In a motor vehicle comprising an internal combustion engine, a starting system therefor, and a braking system, the combination of a starting switch, means for closing said switch, a connection from the braking system to the switch-closing means for actuating said switch-closing means when the brakes are applied, lockout means preventing closure of the starting switch, means responsive to a running function of the engine for actuating the lockout means, and means preventing the lockout means from opening and starting switch after it has been closed.

2. In a motor vehicle comprising an internal combustion engine, a starting system therefor and a hydraulic braking system, the combination of a starting switch, pressure responsive means for closing said switch, a connection from the hydraulic braking system to the pressure responsive switch-closing means for actuating said switch-closing means when the brakes are applied, lockout means preventing closure of the starting switch, means responsive to the intake vacuum of the engine for actuating the lockout means, and means preventing the lockout means from opening the starting switch after it has been closed.

3. In a motor vehicle of the type which includes an internal combustion engine having an intake manifold, an electrical starting system therefor, and a hydraulic braking system; the combination of an electromagnetic starting switch, a control circuit therefor including a control switch, pressure responsive means for closing the control switch, a connection from the pressure responsive means to said braking system for actuating the pressure responsive means when the brakes are applied, an abutment movable into and out of position to prevent closure of the control switch, fluid pressure means for moving the abutment into operative position, and a conduit for connecting the fluid pressure means to said intake manifold; including further, yielding means urging the said abutment away from operative position, and means actuated by closure of the control switch for preventing movement of the abutment to operative position.

JAMES E. BUXTON.

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The following references are of record in the file of this patent:

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