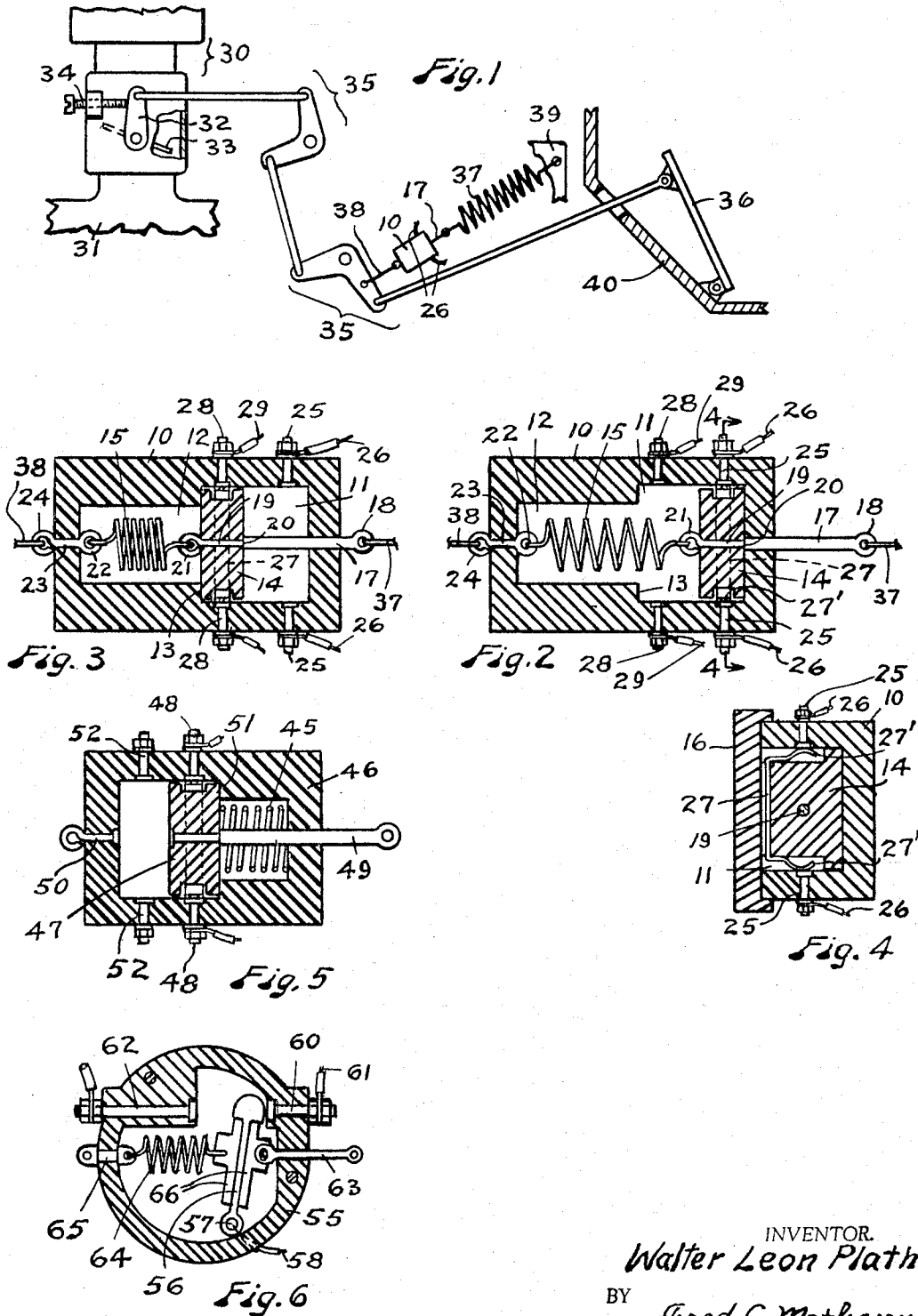


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SPRING ACTUATED SAFETY SWITCH FOR THE FUEL SUPPLY LINKAGE
OF AN INTERNAL COMBUSTION ENGINE
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SPRING ACTUATED SAFETY SWITCH FOR THE FUEL SUPPLY LINKAGE OF AN INTERNAL COMBUSTION ENGINE

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My invention relates to a spring actuated safety switch of a type particularly well adapted to be connected with the fuel control valve means and ignition system of the engine of a motor vehicle but which is capable of use in other environments wherein a valve is maintained in a predetermined position by the resilient force of a spring.

The fuel supply systems of the engines of motor vehicles ordinarily include a carburetor provided with a fuel control valve which is yieldingly urged into an idling position by a spring and is connected by linkage with a foot operated accelerator pedal by which it can be moved against the force of the spring to admit more fuel to the engine for faster operation of the same. In these conventional systems if the spring breaks or for any other reason fails to perform its function of holding the fuel control valve in an idling position said valve can, and usually will, move to a wide open position instantly and admit a maximum amount of fuel to the engine. This results in a surge of power which the operator of the vehicle is usually unable to control and which is liable to be productive of serious accidents.

It is an object of my invention to provide a simple, efficient and inexpensive safety switch which can be electrically connected in the ignition circuit of the engine of a motor vehicle and can be mechanically connected with the spring means by which the fuel control valve of the vehicle is urged into an idling position and which will function in such a manner as to instantly break the ignition circuit and render the engine inoperative in the event the spring means breaks or for any other reason fails to exert a substantial force urging the fuel control valve toward its idling position.

Other objects of my invention will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings FIGURE 1 is a somewhat schematic elevational view, with parts in section, illustrating an application of my invention to the fuel intake and carburetor control means of the engine of a motor vehicle.

FIG. 2 is a longitudinal sectional view on an enlarged scale of my safety switch showing the parts thereof in a normal operating position.

FIG. 3 is a view similar to FIG. 2 except that the switch parts are shown in the position they would occupy in an emergency.

FIG. 4 is a view in cross section taken substantially on broken line 4—4 of FIG. 2.

FIG. 5 is a longitudinal sectional view of a switch similar to the one shown in FIGS. 2 and 3 except that it uses a compression spring instead of a tension spring.

FIG. 6 is a sectional view, with parts in elevation, of a safety switch of modified form.

Like reference numerals refer to like parts throughout the several views.

The switch shown in FIGS. 1, 2 and 3 comprises a box shaped housing 10 of insulating material internally recessed to form therein two connected compartments 11 and 12, preferably of different size and which provide a shoulder 13 at the location where they come together. A contact member 14 is movably disposed in the compartment 11 and a tension spring 15 is housed within the compartment 12. A cover plate 16 completes the enclosure of both compartments 11 and 12. The cover plate

16 may be cemented to the housing 10 after the other parts of the switch are assembled.

A rod 17 extends slidably through one end wall of the housing 10 and is secured to the contact member 14. The outer end of the rod 17 is provided with an eye member 18. Said rod 17 can conveniently be secured to the contact member 14 by providing thereon an inner end portion 19 of reduced diameter which passes through the contact member 14 and forms a shoulder 20 which abuts against one side of said member 14. The terminal portion of the smaller rod part 19 protrudes from the other side of the contact member 14 and is bent to form an eye member 21 which abuts against said contact member. The rod construction just described provides for assembly by inserting the rod 17 through the end of the housing 10 and through the member 14 and then bending the eye member 21 on the inner end thereof. However this rod construction and its method of assembly with the member 14 may be varied.

The eye member 21 is connected with one end of the spring 15. The other end of the spring 15 is connected with the housing 10, preferably by connecting it with an eye member 22 on the inner end of a draw link 23. The draw link 23 extends through the end of the housing 10 shown at the left in FIGS. 2 and 3. An eye member 24 is provided on the outer end of the link 23.

The housing 10 is provided, near the end thereof shown at the right in FIGS. 2 and 3, with two spaced apart terminal posts 25, which extend through the walls of said housing from the compartment 11 outwardly and are adapted to be connected with electrical conductors 26. The conductors 26 form part of the ignition circuit of the engine to which this device is applied. The contact member 14 is provided with a metal conductor 27 which extends about half way around it and has two end portions thereof bent to form two resilient brushes 27'. The brushes 27' are suitably positioned for engagement with the respective terminal posts 25. The contact member 14 is grooved in a suitable manner to receive the conductor 27.

Preferably two emergency terminals 28 are provided in the housing 10 near the shoulder 13 and extend from the compartment 11 outwardly. The terminals 28 can be connected with conductors 29 through which a circuit to any suitable signal lamp, not shown, can be completed so that said signal lamp will indicate to the driver or to persons outside of the vehicle that the safety switch has moved to an emergency position. These terminals 28 are not essential to the operation of this safety switch in breaking an ignition circuit to an engine and they can be omitted if desired.

FIG. 1 illustrates a typical installation of my safety switch in connection with a carburetor 30 through which fuel is supplied to the intake manifold 31 of an internal combustion engine. A lever 32 on the carburetor 30 operates a fuel inlet control valve 33 which controls the supply of fuel to the engine. The valve 33 has an idling position in which the lever 32 rests against a stop member 34. Said lever 32 is connected by linkage, indicated in a general way by 35, with a foot accelerator pedal 36 on a floor board 40 of a motor vehicle. A return or pull-back spring 37 is connected with the linkage 35 in such a manner that it yieldingly urges said fuel control valve 33 toward an idling position. In the schematic showing in FIG. 1 the eye member 24 at one end of the switch housing 10 is connected by a tension member 38 with a suitable part of the linkage 35 on which the force of the spring 37 is to be exerted. The rod 17, which protrudes from the other end of the housing 10 is connected with one end of the spring 37. The other end of the spring 37 is connected in any suitable way with a fixed support 39, which may be part of the engine. This

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interposes the safety switch in line with the spring 37 so that the pull of the spring 37 is exerted through said switch by way of the link 17, spring 15, housing 10 and links 23 and 38. Obviously said safety switch will operate in the same manner if it is connected between the fixed support 39 and the spring 37.

The linkage indicated generally by 35 varies widely in motor vehicles of different models and in those made by different manufacturers but most commonly used types of this linkage provide for imparting opening movement to a fuel inlet control valve, such as valve 33, by moving it away from an idling position in response to the depression of an accelerator pedal. In substantially all instances a return spring, such as the spring 37, is connected in some manner with the linkage so it will yieldingly urge the fuel inlet control valve toward the idling position. Also in substantially all of these instances the linkage and return spring arrangement is such that, if the return spring breaks or for any other reason fails to exert its force on the linkage, the fuel inlet control valve will instantly move away from an idling position to a wide open position in which it will admit maximum fuel to the engine and cause the engine to race. When this occurs the accelerator pedal will drop to the floor board, the vehicle will accelerate swiftly, the driver will not have any control of the engine through the accelerator pedal and is liable to panic, and a serious accident is liable to result.

The use of my safety switch precludes the possibility of such an accident because said switch is electrically connected in the ignition circuit of the engine and is mechanically connected with the carburetor return spring 37 and linkage 35. The force of the return spring 37, exerted through the rod 17, switch spring 15, housing 10 and draw link 23 is greater than the maximum force which the switch spring 15 is capable of exerting. Thus the contact member 14 is drawn, by the rod 17, against the adjacent end wall of the housing 10. This maintains a closed circuit through the terminals 25 and conductors 26. Some of the pull of the return spring 37 is transmitted to the link 23 through the weaker spring 15 and the remainder of this pull is transmitted through the housing 10. Thus the housing 10 does not have to transmit the entire pull of the return spring 37. If the return spring 37 breaks or if any of the connections between the support 39 and the lever 32 give way or become loose so that said return spring 37 exerts less pull on the rod 17 than the spring 15 does then the spring 15 will instantly move the contact member 14 into the position shown in FIG. 3, in which it rests against the shoulder 13 and the ignition circuit through terminals 25 is broken.

FIG. 5 shows a modified form of my invention in which a compression spring 45 is used instead of a tension spring in a housing 46 to urge a contact member 47 toward an open circuit position relative to two terminal posts 48. The housing 46, contact member 47 and terminal posts 48 correspond to the previously described parts 10, 14 and 25 of FIGS. 1 to 4. A rod 49, similar to previously described rod 17, is secured to the contact member 47 and extends slidably through a suitable opening in one end of the housing 46. A draw link 50 is secured in the other end of the housing 46. A shoulder 51 is provided in the housing 46 for the contact member 47 to rest against when it is in a circuit closing position as respects the two terminals 48. Two other terminals 52 can be provided in the housing 45 and are capable of functioning in the same manner as previously described terminals 28. The safety switch shown in FIG. 5 is used in the same manner as the switch shown in FIGS. 1 to 4, it being understood that the force exerted by spring 45 on contact member 47 is substantially less than the force exerted by the return spring with which rod 49 is connected but sufficient to instantly break the ignition circuit if the pull of the return spring is substantially reduced.

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FIG. 6 shows another modified form of my invention comprising a recessed housing 55 of insulating material having therein a switch arm 56 of electrically conductive material. One end of the switch arm 56 is connected with the housing 55 by a pivot member 57. The pivot member 57 also serves as a terminal post and when it is in use it is connected, external to the housing 55, with a circuit wire 58. The end portion of the switch arm remote from the pivot 57 is normally held in contact with a terminal post 60 when the switch is in use. A circuit wire 61 is connected with said post 60 external to the housing 55. Another terminal post 62 can be provided in the wall of the housing 55 in opposed relation to the terminal post 60 to be used in the circuit of a signaling device, such as a lamp, if desired. A rod 63 is connected with the switch arm 56 and is slidably supported in the wall of the housing 55. A tension spring 64 in the housing 55 has one end connected with the switch arm 56 and the other end connected with a link 65 which is anchored in the wall of said housing 55. Preferably the rod 63 and spring 64 are insulated from the switch arm 56. One way to do this is to secure brackets 66 of insulating material to the respective sides of the switch arm 66 and connect the rod 63 and spring 64 with these brackets 66.

The installation and mode of operation of the safety switch shown in FIG. 6 will be apparent from the previous description relating to the switch shown in FIGS. 1 to 4. The circuit wires 58 and 61 are part of the ignition circuit of an engine and the switch is mechanically connected in line with a carburetor return spring, similar to the spring 37, of the same engine. The carburetor return spring is stronger than the spring 64 and exerts its tension through the rod 63, switch arm 56, spring 64, link 65 and housing 55. If the pull of the carburetor return spring becomes less than the pull of the spring 64 the switch arm 56 will be moved away from the terminal post 60 and the ignition circuit will be broken. When switch arm 56 is moved away from terminal post 60 it will normally be moved against the opposed terminal post 62 and if said post 62 is in circuit with a signal lamp the signal lamp will be lighted.

The foregoing description and accompanying drawings clearly disclose preferred embodiments of my invention but it will be understood that this disclosure is merely illustrative and that changes may be made within the scope of the following claims.

I claim:

1. The combination with an internal combustion engine, of a fuel intake control valve controlling the supply of fuel to said engine, said valve having an idling position in which a minimum amount of fuel is supplied to the engine; valve control means remote from said intake control valve; linkage connecting said valve control means with said valve; a return spring adapted for connection with said linkage and capable of exerting a substantial force yieldingly urging said fuel intake control valve toward its idling position, said return spring being yieldable to valve opening force exerted through said valve control means; ignition means including a conductor controlling the supply of current for ignition purposes to said engine; a safety switch adapted to be connected in line with said return spring and controlling the flow of current through said ignition conductor, said safety switch comprising a housing; two spaced apart terminals carried by said housing and controlling the flow of current in said conductor; a contact member in said housing movable between a closed circuit position and an open circuit position relative to said two terminals; a spring of less strength than said return spring disposed in said housing urging said contact member into an open circuit position; and a pull rod connected with said contact member and extending to the exterior of said housing, said pull rod and housing being adapted to be connected in line between said return spring and said linkage and said return spring

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being capable of exerting a substantially greater force in urging said contact member into a closed circuit position than is exerted by the spring within said housing in urging said contact member into an open circuit position.

2. A safety switch for use in connection with the fuel supply means and ignition system of an internal combustion engine comprising a housing of insulating material; a contact member movable in said housing between a closed circuit position and an open circuit position; stop means limiting movement of said contact member in both said open circuit and said closed circuit positions; at least one electric terminal in said housing positioned to be engaged by said contact member when said contact member is in a closed circuit position; a spring retracted pull rod passing through and connected with said contact member and extending outwardly through a wall of said housing adapted to resiliently urge said contact member into a closed circuit position; a link extending through a wall of said housing opposite to the wall through which said pull rod extends, both ends of said link and both ends of said pull rod being provided with tension member attaching means; and a tension spring connected between

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the inner end of said link and the inner end of said pull rod, said spring exerting a force tending to move said contact member into an open circuit position, whereby the circuit through said terminal will be broken if the force exerted by said spring on said contact member exceeds the tension exerted by said pull rod on said contact member.

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