

[54] **AUTOMATIC SHUT-OFF SWITCH**

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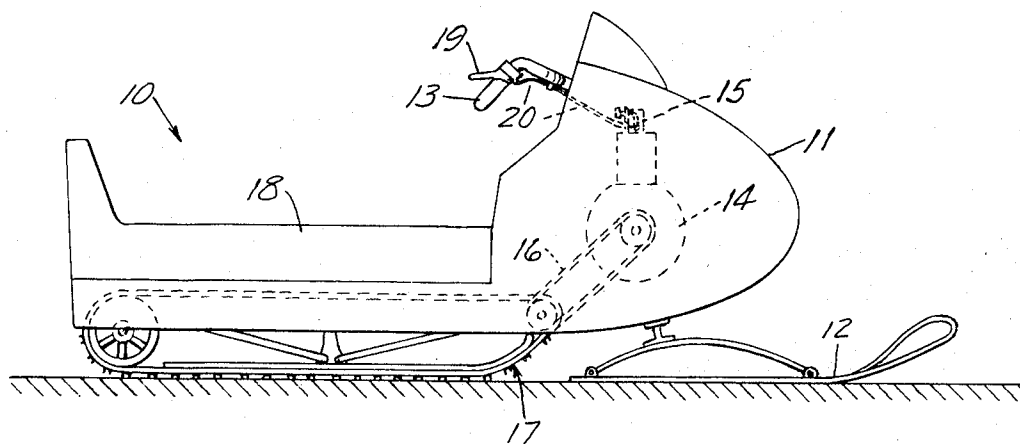
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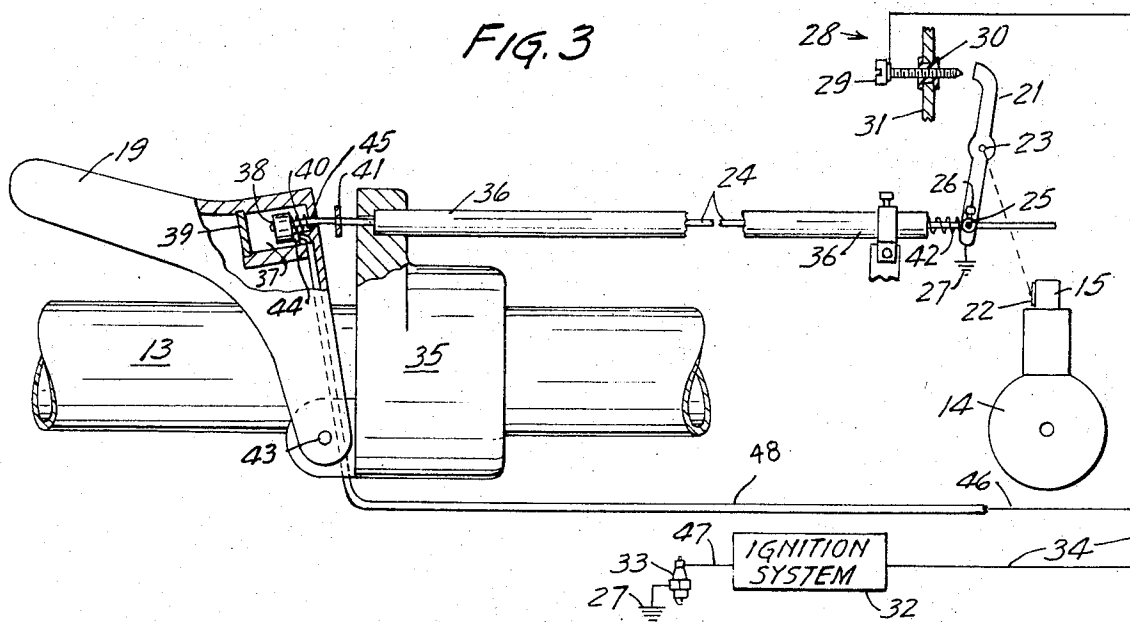
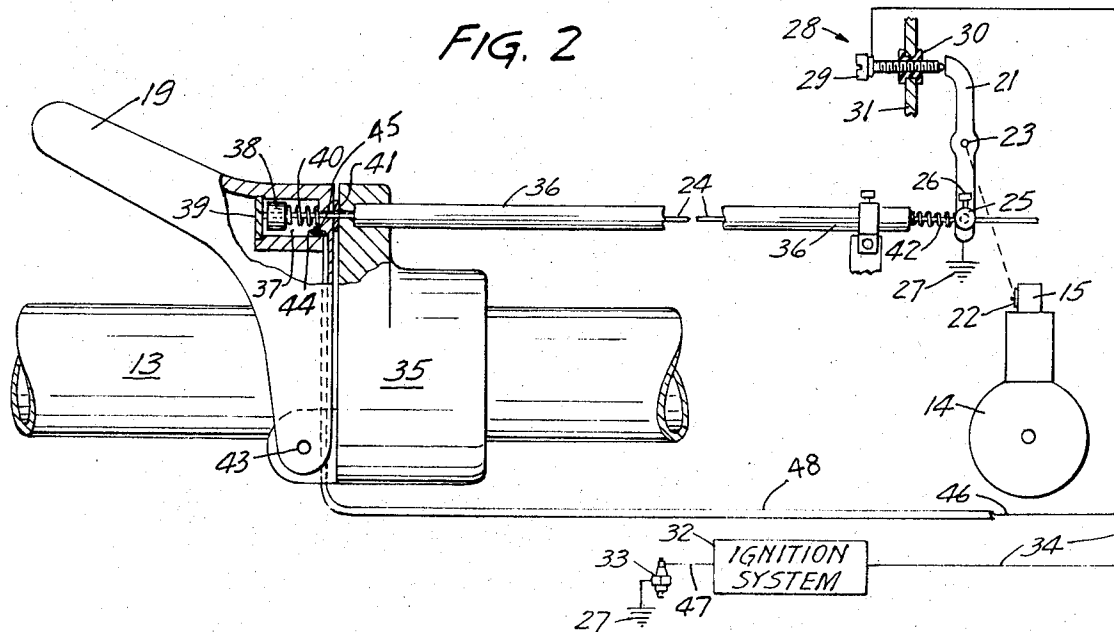
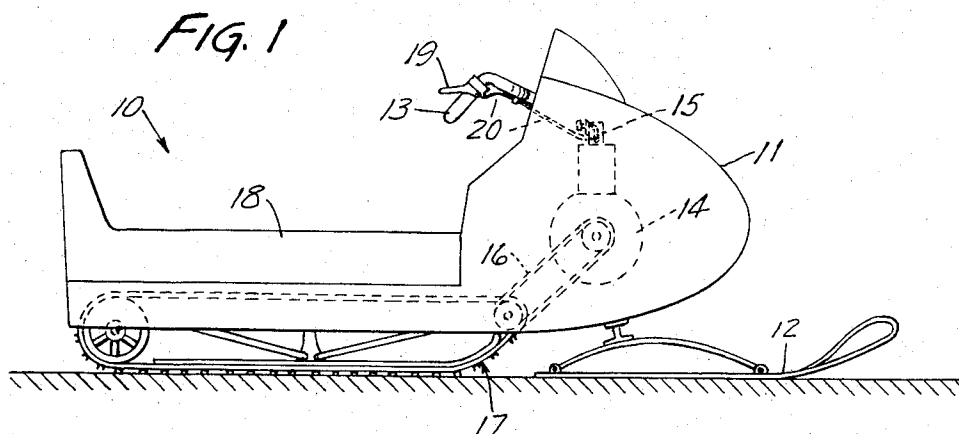
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ABSTRACT

An automatic shut-off switch system for the ignition circuit of vehicles such as snowmobiles is provided wherein the ignition circuit includes a first switch, adjacent the carburetor throttle and in operative engagement therewith, which first switch is normally closed when the engine is at idle speeds and open when the engine is at running speed and a second switch electrically parallel to said first switch and operatively joined to the manually operated throttle control means remote from said throttle. The second switch is open at engine idle speeds and closed by the manual throttle control during running speeds so that if the throttle sticks in the open position the ignition circuit will be opened upon release of the manually operated throttle control means.

10 Claims, 3 Drawing Figures





AUTOMATIC SHUT-OFF SWITCH

The present invention is directed to a safety system for vehicles and is more particularly directed to a safety system for snowmobiles. More particularly, the invention is directed to a dual switch arrangement for the electrical ignition circuit of an engine which insures that the engine will not continue to run if the throttle is stuck in the open position.

Broadly the invention incorporates two switches in the electrical circuit utilized to provide the electrical power for the spark plug of an internal combustion engine. The first switch is in operative engagement with the throttle portion of the carburetor of the engine and is normally in closed position when the engine is in the idling speed condition. The second switch is in operative engagement with a manually operated remote throttle control means and is normally in an open position when the engine is at idling speed. Upon activation of the remote throttle control means so as to accelerate the engine to a higher speed the second switch is closed while at the same time the first switch is opened. Should the throttle be stuck in an open position release by the operator of the manually controlled throttle means will cause the second switch to go to an open position and thus the ignition system will no longer function.

The need for an automatic shut off in accordance with the present invention exists in various kinds of vehicles but is particularly important in snowmobiles. Snowmobiles operate under conditions where the throttle may be locked in an open position due to formation of ice and the like in the throttle linkage. When such a condition occurs it is possible that the snowmobile will not be controllable and damage to the snowmobile and injury to the occupants or to others is a possibility. Through the invention there is provided an electrical circuit for a snowmobile incorporating two switches which prevent such an occurrence.

IN THE DRAWINGS

FIG. 1 is a side-elevational view shown partially in phantom of a snowmobile incorporating my invention;

FIG. 2 is a side elevational view of the manual control throttle means and a diagrammatic view of the throttle linkage and switches in the engine idle speed position for one form of my invention; and

FIG. 3 illustrates the unit of FIG. 2 in the engine running speed condition.

In the figures like parts will be given the same numerical designation.

Turning first to FIG. 1 there is illustrated in side-elevational view a snowmobile generally designated 10 with a conventional slide rail suspension system for the rear portion thereof of a type known in the art. The snowmobile includes a forward body portion 11 which is supported by a pair of steerable ski members 12 which are steerably controlled by means of handle bar members 13. Within housing 11 is located a motor 14 having a carburetor 15. Motor 14 by means of drive belt 16 powers the rear endless track assembly generally designated 17. The rear track assembly in turn supports rear body portion 18.

Engine 14 has fuel supplied thereto by carburetor 15 which in turn is controlled by a hand-operated remote

throttle control handle 19 which is connected by a linkage means 20 to the carburetor 15.

The snowmobile described to this point is conventional in the art. Such snowmobiles will typically have a key-operated ignition switch incorporated within the electrical circuit that provides the spark for the spark plugs of motor 14. If, during the course of operation of the snowmobile, the throttle linkage should become frozen in the open throttle condition the engine will continue to propel the snowmobile. The ignition key can be utilized in turn off the ignition system when such a key is available and assuming that the driver is able to operate the ignition switch. However, if the driver is thrown from the snowmobile or is unable to turn off the ignition switch the engine will continue to race and propel the snowmobile.

Turning to FIG. 2 there is illustrated in side elevational and fragmentary view a portion of handlebar 13 and the manually operated hand control 19. Also illustrated is the throttle linkage and a diagrammatic view of the electrical circuit, carburetor and engine. An engine 14 has positioned thereon a carburetor 15 which is controlled by a butterfly valve control arm 21 positioned adjacent carburetor 15 such as at position 22. Arm 21 is pivotally mounted upon a pin 23 and is engaged at its lower end by means of anchor 25 to a control cable 24. A clamping means such as a set screw 26 is provided so that cable 24 can be adjustably positioned within anchor 25. Arm 21 by virtue of its connection to carburetor 15 which in turn is connected to engine 14 is electrically joined to the floating ground 27.

At the upper end of arm 21 is positioned an idle adjusting mechanism generally designated 28. The idle adjusting mechanism includes a threaded screw member 29 which is in threaded engagement with an electrically insulated ring 30 which in turn is mounted within a holder 31. Holder 31 is suitably mounted by appropriate means (not shown) to the side of carburetor 15. Insulator 30 provides electrical isolation of screw 29 from the engine and carburetor assembly. The forward tip of screw 29 acts as a stop member for the upper end of arm 21 and thereby sets the idle speed of the engine. Arm 21 is spring biased by means of spring 42 to be in contacting relationship at its upper end with the tip of screw 29 when the engine is at idling speed. Increasing or reducing engine idle speed is simply accomplished by advancing or retracting screw 29.

At idle speeds ignition power system 32 provides the electrical spark and timing for a spark plug 33 by means of lead 47. Spark plug 33 is in contact with ground 27. The opposite side of the ignition system 32 is connected by means of lead 34 to idle adjusting screw 29. When the engine is at idle speed the circuit is completed via lead 34 through a closed first switch defined by screw 29 and arm 21 and thence to ground 27.

For engine running speeds the ignition circuit is completed at the remote throttle control means through a second switch arrangement which, as shown in FIGS. 2 and 3, is remotely positioned from the carburetor 15 on handlebar 13.

Fixedly mounted on handlebar 13 is a member 35 which engages the outer sheath member 36 of control cable 24. Sheath 36 may be fixedly mounted into the upper portion of member 35 by any appropriate means

such as set screws and the like. Cable 24 slidably passes through sheath 36 and through member 35.

Adjacent member 35 is a throttle control lever 19 which has a chambered portion 37 at the upper forward end thereof. Cable 24 slidably passes through an appropriately positioned opening on the forward face of handle 19 and into chamber 37 where it is fixedly mounted to a cable end 38. The rearward end of chamber 37 is desirably closed by a closure member 39 so as to prevent snow and ice from entering chamber 37. A spring member 40 is provided within chamber 37 so as to bias cable end 38 toward the rear portion of chamber 37 in the manner illustrated in FIG. 2. A cable stop member 41 is fixedly mounted on cable 24 intermediate handle 19 and member 35. The function of cable stop 41 will be described below.

Hand control member 19 is pivotally mounted to handlebar 13 by means of pin 43 so as to be movable under control of the operator into a position which will pull cable 24 rearwardly to pivot control arm 21 about pivot 23. Spring 42 is interposed between and in engagement with the end of sheath 36 and anchor 25 so as to bias arm 21, attached cable 24 and thus handle 19 into the positions illustrated in FIG. 2. Thus, under the rest or idle condition of engine speed hand control 19 will be pulled by spring 42 acting through cable 24 to the position shown in FIG. 2. The upper end of arm 21 will be in contact with idle screw 29 to form a first closed switch. Spring 40 will bias cable end 38 toward the rear of chamber 37.

Within chamber 37 there is provided a contact point 44 which is electrically isolated from the balance of hand control 19 by means of an insulator 45. Contact point 44 in turn is in electrical contact with a flexible conductor 46 which passes through an insulated lead 48. Conductor 46 is in electrical connection with lead 34.

During the idle condition of the engine illustrated in FIG. 2 contact 44 is spaced from cable end 38 and thus no electrical circuit is provided. However, when hand control 19 is activated by the operator spring 40 is compressed and cable end 38 comes into electrical contact with point 44. Further pivotal movement of hand control 19 draws control cable 24 rearwardly thus pivoting arm 21 about pivot point 23 and compressing spring 42. An electrical circuit is thus created beginning with ground 27 through arm 21 along cable 24 through cable end 38 to contact 44 and thus by wire 46 to lead 34 through the ignition power system 32 and through spark plug 33 back to ground. Cable end 38 and contact 44 form the contacts for a second switch.

When hand pressure is removed from hand control 19 spring 42 will ordinarily pull cable 24 forwardly so as to pivot arm 21 about pin 23 and back into contact with screw 29 completing the idle circuit. Hand control 19 will be pivoted into the position shown in FIG. 2. Simultaneously, spring 40 will bias cable end 38 away from contact 44 thus breaking the engine running circuit through this second switch.

In the event cable 24 or arm 21 should become locked in a position corresponding to high engine speed in spite of release by the operator of hand control lever 19 the engine will nevertheless be stopped. The switch defined by arm 21 and idle adjust screw 29 will be in the open position while the switch defined by cable end 38 and contact 44 will likewise be opened due to re-

lease of the hand control 19 and the bias provided by spring 40 will force cable end 38 and contact 44 apart. Without electrical contact at either of the two switches the ignition circuit will not be closed. The engine will no longer fire and the snowmobile will stop.

Stop 41 is fixedly mounted on cable 24 as shown so as to prevent the possibility that cable 38 will be forced into contact with contact 44 when hand control 19 is in the rest position of FIG. 2. Should an object wedged between handlebar 13 and sheath 36 dislodge cable 36 from member 35 the tension resulting on cable 24 will not result in closing of the switch defined by cable end 38 and contact 44. Stop 41 likewise prevents the tension exerted by spring 42 from overriding the bias of spring 40 when hand control 19 is in the rest position of FIG. 2.

I claim:

1. In a snowmobile having an elongated body and an underlying endless track for moving same, pivotal skis at the forward end for steering the snowmobile, an internal combustion engine for driving said track, a carburetor for controlling delivery of fuel to said engine including a throttle for controlling carburetor operation, spring means biasing said throttle in an engine idle condition, a manually operated throttle control remote from said throttle and operatively connected to said throttle by linkage means, and a closed ignition circuit for producing an electrical discharge across a spark plug in said engine, the improvement comprising including within said ignition circuit:

a. first electrical switch means mounted to said snowmobile adjacent said carburetor and in operative engagement with said carburetor throttle, said first switch being in a closed position when said carburetor throttle is in a position corresponding to an engine idling condition and in an open condition for all other engine speeds, said first switch comprising a throttle control arm, a first electrical contact on said arm and second electrical contact means, said first and second contacts being positioned and arranged so that said first and second contacts are electrically completed when said arm is in a position corresponding to engine idle speed and are electrically opened for all other engine speeds at least one of said first and second contacts being electrically insulated from its support.

b. second switch means electrically parallel to said first switch and in operative engagement with said remote throttle control means, said second switch means being in a closed position when said throttle control means is in a position which ordinarily corresponds to an engine driving speed.

2. A snowmobile in accordance with claim 1 wherein said second switch comprises a hand control lever pivotally mounted to a handlebar, an opening in said control lever, a cable sheath, a control cable attached to said throttle and slidably extending through said sheath and having an end slidably extending through said opening, a cable end being fixedly attached thereto, and defining a third electrical contact, spring means biasing said cable end away from said opening, fourth contact means insulatedly secured to said control lever adjacent the cable end side of said opening to meet said third electrical contact when said spring bias is overcome by movement of said manual control member toward said cable end.

3. In a snowmobile having an elongated body and an underlying endless track for moving same, pivotal skis at the forward end for steering the snowmobile, an internal combustion engine for driving said track, a carburetor for controlling delivering of fuel to said engine including a throttle for controlling carburetor operation, spring means biasing said throttle in an engine idle condition, a manually operated throttle control remote from said throttle and operatively connected to said throttle by linkage means, and a closed ignition circuit for producing an electrical discharge across a spark plug in said engine, the improvement comprising including within said ignition circuit:

a. first electrical switch means mounted to said snowmobile adjacent said carburetor and in operative engagement with said carburetor throttle, said first switch being in a closed position when said carburetor throttle is in a position corresponding to an engine idling condition and in an open condition for all other engine speeds, said first switch comprising a throttle control arm, a first electrical contact on said arm, an idle screw mounting means positioned adjacent said first electrical contact, an idle screw supported by said mounting means, one end of said screw forming a second electrical contact, said screw being positioned and arranged so that said first and second contacts are electrically completed when said arm is in a position corresponding to engine idle speed and are electrically opened for all other engine speeds, at least one of said first and second contacts being electrically insulated from its support,

b. second switch means electrically parallel to said first switch and in operative engagement with said remote throttle control means, said second switch means being in a closed position when said throttle control means is in a position which ordinarily corresponds to an engine driving speed.

4. A snowmobile in accordance with claim 3 wherein said remote throttle control and said second switch are mounted on a steering handlebar.

5. A snowmobile in accordance with claim 3 wherein said remote throttle control member is operatively linked to said throttle by means of a cable slidably passing through a flexible sheath fixedly mounted at the end adjacent said throttle.

6. A snowmobile in accordance with claim 5 wherein said remote throttle control member has an opening therein through which said control cable end slidably extends beyond the side of said control member remote from said throttle, said cable end having a fixedly mounted stop member thereon, a third electrical contact on said stop, spring means biasing said stop away from said opening, a fourth electrical contact operably secured to said control member adjacent the stop side of said opening to meet said third contact when said spring bias is overcome by movement of said control member toward said stop, at least one of said third and fourth contacts being electrically insulated from its support.

7. A snowmobile in accordance with claim 6 wherein a stop member is fixedly secured to said cable intermediate said lever and said cable sheath and positioned to limit cable movement toward said throttle when said lever is in a position corresponding to engine idle speed.

8. A snowmobile in accordance with claim 5 wherein said remote throttle control member has an opening therein through which said control cable end slidably extends beyond the side of said control member opening remote from said throttle, said cable end having a fixedly mounted stop member thereon, said stop member defining a third electrical contact, spring means biasing said stop away from said opening, a fourth electrical contact operably secured to and electrically insulated from said control member adjacent the stop side of said opening to meet said third contact when said spring bias is overcome by movement of said manual control member toward said stop, said third and fourth contacts defining said second switch.

9. In a snowmobile having an elongated body and an underlying endless track for moving same, pivotal skis at the forward end for steering the snowmobile, an internal combustion engine for driving said track, a carburetor for controlling delivery of fuel to said engine including a throttle for controlling carburetor operation, spring means biasing said throttle in an engine idle condition, a manually operated throttle control remote from said throttle and operatively connected to said throttle by linkage means, and a closed ignition circuit for producing an electrical discharge across a spark plug in said engine, the improvement comprising including within said ignition circuit:

a. first electrical switch means mounted to said snowmobile adjacent said carburetor and in operative engagement with said carburetor throttle, said first switch being in a closed position when said carburetor throttle is in a position corresponding to an engine idling condition and in an open condition for all other engine speeds, said first switch comprising throttle control arm a portion of which defines a first electrical contact, an insulated idle screw mounting means positioned adjacent said first electrical contact, an idle screw extending through said support member with one end of said screw defining a second electrical contact, said screw being positioned and arranged so that said first and second contacts are in electrical contact when said arm is in the position corresponding to engine idle speed and are electrically opened for all other engine speeds,

b. second switch means electrically parallel to said first switch and in operative engagement with said remote throttle control means, said second switch means being in a closed position when said throttle control means is in a position which ordinarily corresponds to an engine driving speed.

10. In a self-propelled vehicle where power to propel the vehicle is supplied by an internal combustion engine, a carburetor for controlling delivery of fuel to said engine including a throttle for controlling carburetor operation, spring means biasing said throttle in an engine idle condition, a manually operated throttle control remote from said throttle and operatively connected to said throttle by linkage means, and a closed ignition circuit for producing an electrical discharge across a spark plug in said engine, the improvement comprising including within said ignition circuit:

a. first electrical switch means mounted to said vehicle adjacent said carburetor and in operative engagement with said carburetor throttle, said first switch being in a closed position when said carburetor throttle is in a position corresponding to an

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engine idling condition and in an open condition for all other engine speeds, said first switch comprising a throttle control arm, a first electrical contact on said arm, an idle screw mounting means positioned adjacent said first electrical contact, a 5
idle screw supported by said mounting means, one end of said screw forming a second electrical contact, said screw being positioned and arranged so that said first and second contacts are electrically completed when said arm is in a position corresponding to engine idle speed and are electrically 10

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opened for all other engine speeds, at least one of said first and second contacts being electrically insulated from its support,
b. second switch means electrically parallel to said first switch and in operative engagement with said remote throttle control means, said second switch means being in a closed position when said throttle control means is in a position which ordinarily corresponds to an engine driving speed.

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