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Shawcross et al.

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[54] **IMPACT FIRE PROTECTIVE SWITCH FOR MOTOR VEHICLES**

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[51] **Int. Cl.** **H01h 35/02**

[58] **Field of Search** ..... 200/61.45 R, 61.48, 200/61.5

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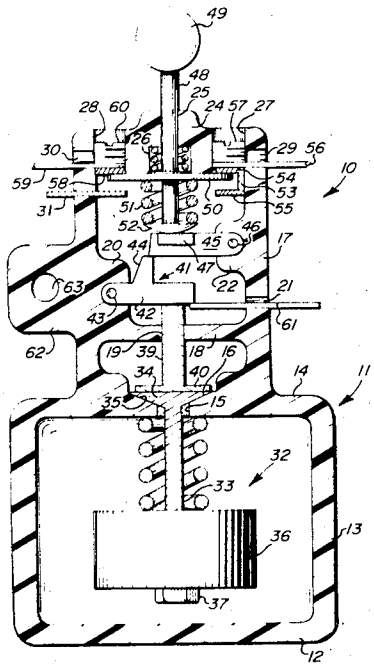
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[57] **ABSTRACT**

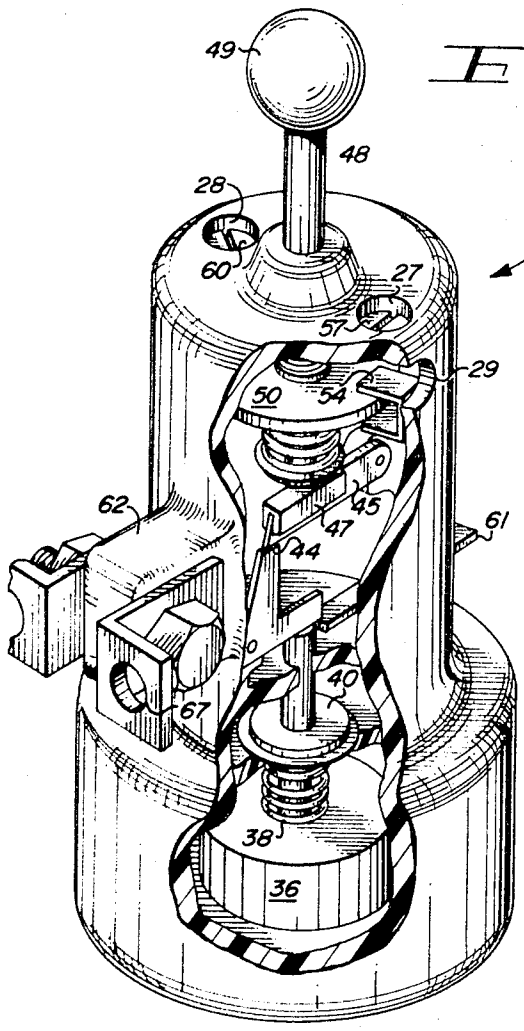
This invention relates to an impact switch which is designed for installation in a motor vehicle for interrupting all of the electrical circuits in the vehicle when the latter is involved in a collision. A tiltable weight member trips a latch assembly thereby causing a movable contact to engage a predetermined fixed contact assembly. The impact switch also includes a manually operable trip for cutting out the circuits under other conditions.

10 Claims, 6 Drawing Figures



2 Sheets-Sheet 1

Fig-1



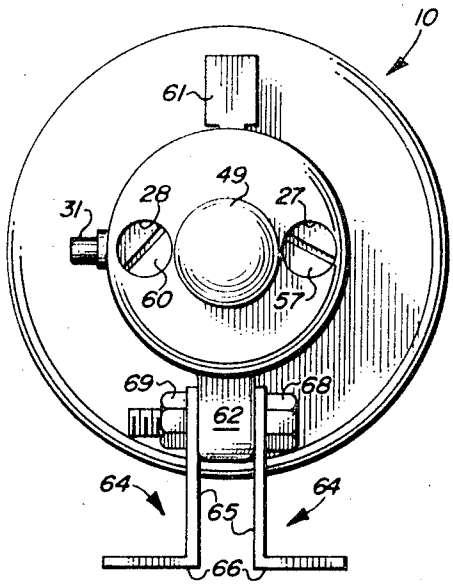


Fig-2

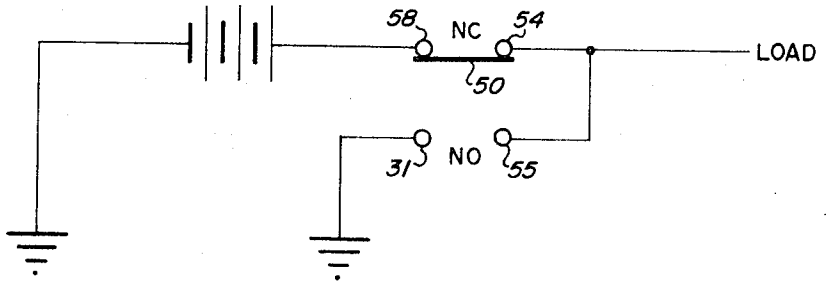


Fig-3

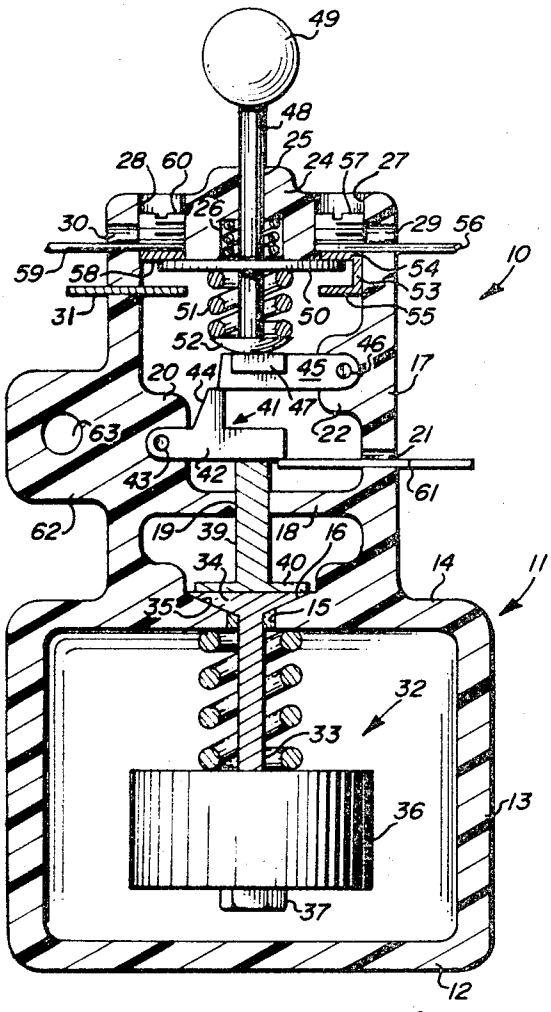


Fig. 4

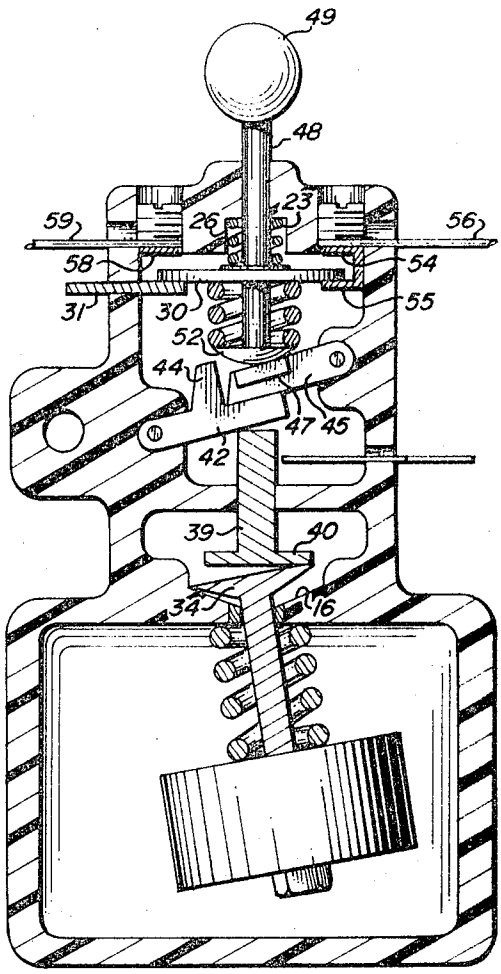


Fig. 5

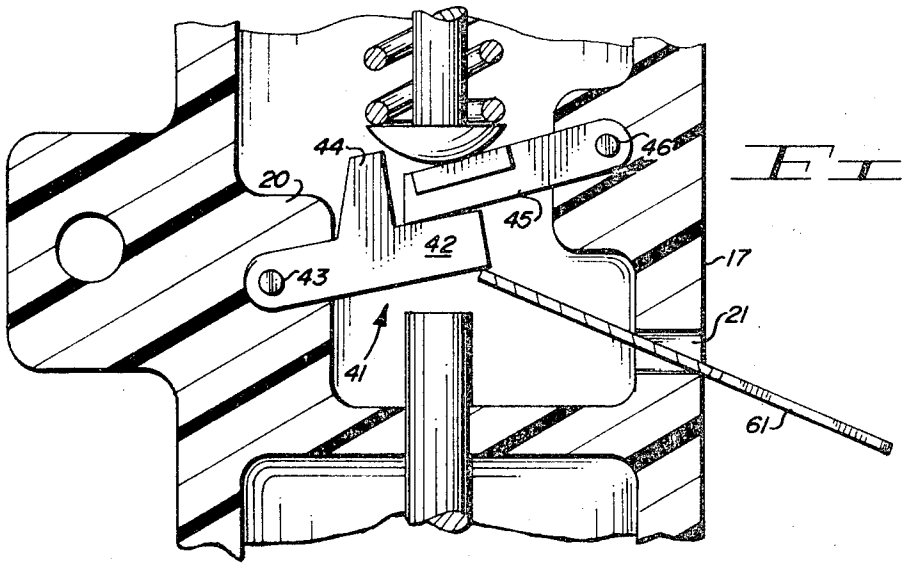


Fig. 6

IMPACT FIRE PROTECTIVE SWITCH FOR MOTOR VEHICLES

The present invention relates to fire protective switches for motor vehicles of the impact type and is concerned primarily with certain novel improvements in such a switch which not only enhance its effectiveness for its primary purpose, but also incorporate additional utility into the switch.

BACKGROUND OF THE INVENTION

It has long been recognized that when an automobile or other motor vehicle is involved in a collision, a fire hazard is presented. This danger arises from the possibility that the electric circuit from the battery or the vehicle generator will short circuit and creates sparks which ignite the fuel of the car. Impact switches have been proposed which interrupt the circuit from the battery of the car and therefore partially solve the problem. That is, they will prevent fires under many but not all conditions.

Each of the now known impact switches includes as its triggering mechanism a pendulum comprising a vertical arm with a weight fixedly secured at its lower end. Such a pendulum is effective when the motor vehicle is involved in a collision, but presents a serious liability in the possibility of the switch being triggered when the vehicle travels over rough road surfaces. Thus, when a pronounced bump is encountered, a lateral component of force is imparted to the weight which possibly might trigger the switch and, thus, render the vehicle inoperative. So far as this phase of the known art is concerned, there is no known impact switch of the pendulum type which is designed to accommodate rough road surfaces.

While a fire protective impact switch is intended primarily for fire protection purposes, it is possible and entirely practical for it to have other phases of utility. Thus, should a car owner or mechanic desire to work under the hood, it is now necessary for him to disconnect the battery cables if a condition of maximum safety is to be achieved.

At the present time, it is possible to discourage theft of a motor vehicle by either disconnecting a battery cable or including an anti-theft switch at some other point.

The now known impact fire protective switches for motor vehicles do not include a manual trip which may be operated as occasion demands by simple operation to interrupt all circuits from the battery and which may be easily reset.

As above pointed out, the impact switches of the type with which the present invention is concerned interrupt the circuit from the battery, but do not accommodate a condition in which the generator is still operable immediately after a collision and thus presents a fire hazard.

The now known impact fire protective switches also present other undesirable features which might be considered as of a minor nature as compared to those set forth above. Thus, the practice has been to connect the cables to the switch mechanism externally of the casing which houses the switch mechanism. Also, the brackets which are used to mount the switch on the interior of a car hood are not designed to accommodate curvatures or irregularities in the hood structures so that the switch may be accurately mounted in a vertical position.

OBJECTS OF THE INVENTION

With the foregoing conditions in mind, the present invention has in view the following objectives:

1. To provide an impact fire protective switch for motor vehicles which is particularly adapted to accommodate rough road surfaces without triggering the switch.

2. To provide, in an impact switch of the type noted, a pendulum comprising a vertical arm, and a weight which is movable on the arm and spring biased towards the lower end thereof.

3. To provide, in an impact switch of the character aforesaid, mechanism for interrupting the circuit to the battery upon triggering of the switch and at the same time grounding the circuit to the generator.

4. To provide, in an impact switch of the kind described, a manually operable trip which may be used to interrupt the circuit to the battery on occasions other than collisions when it is desired to do so.

5. To provide an impact fire protective switch for motor vehicles which is housed in a plastic casing with the cables which are connected to the switch being secured to terminals located on the interior of the casing.

6. To provide an impact switch of the type noted with a pair of mounting brackets which particularly adapt the switch to be mounted at any convenient place on the interior of the car hood with the pendulum arm of the switch in a vertical position.

Various other more detailed objects and advantages of the invention such as arise in connection with carrying out the above ideas in a practical embodiment will, in part, become apparent and, in part, be hereafter stated as the description of the invention proceeds.

SUMMARY OF THE INVENTION

The foregoing objects are achieved by providing an impact fire protective switch comprising a plastic casing having a lug extending laterally therefrom and to which are secured a pair of angle brackets which are individually adjustable. The casing includes a lower horizontal partition formed with a central opening from which is suspended a pendulum comprising an arm having a head, the underside of which is formed as a conical surface which engages a conical surface on the partition contiguous to the opening. A weight is longitudinally movable on the arm and is urged against an abutment at the lower end thereof by a spring. The casing is also formed with an intermediate partition having a central aperture in alignment with the opening in the lower partition and slidably mounted in this aperture is an actuating member having a foot at its lower end which engages the head of the pendulum arm.

The casing is formed with an inwardly extending tab on which is pivotally mounted a trigger comprising a horizontal arm and an upstanding detent. The outer end portion of this arm normally rests on the upper end of the actuating member, while the detent engages the underside of an end portion of a lever that is pivotally mounted on another tab extending inwardly from the casing in diametrically opposed relation to the first mentioned tab.

The casing has a top wall formed with a central opening in alignment with the opening in the aperture aforesaid and in which is slidably mounted a plunger having an operating knob at its outer free end and a foot at its other end which engages the outer end portion of said

lever. This plunger slidably carries a bridging member in the form of a copper disc which is located on the interior of the casing just beneath the top wall and which is biased upwardly by a spring interposed between said foot and disc.

The cylindrical wall of the casing just below the plunger is formed with a pair of diametrically opposed openings into which extend terminal cables. The top wall is formed with a pair of diametrically opposed threaded sockets into which plugs are screwed to clamp the terminals in position and into engagement with a pair of contacts mounted on the inner casing wall. One of these terminals is on the end of a battery cable and the other on the end of a cable which goes to the operating circuit of the vehicle including the generator. The contact to which the latter cable is connected is also connected to a contact which is normally spaced from the copper disc, while another contact in diametrically opposed relation to the first mentioned contact is connected to ground. The underside of the top wall is formed with a counterbore about the central opening and received therein is a light expansion coil spring which engages the copper disc to hold the latter in engagement with the contacts after the switch is triggered.

The cylindrical wall of the casing is formed with an opening substantially in alignment with the trigger and in which is pivotally mounted a manually operable trip, the inner end of which engages the underside of the trigger arm.

Upon impact generated by collision, the weight of the pendulum swings laterally to upset its head from its seat on the lower partition. This moves the actuating member upwardly to impart upward movement to the trigger to move the detent away from its engagement from the end of the lever and thus permit the latter to fall downwardly under the influence of gravity action and the light spring about the plunger. Thus, the copper disc is moved away from the metallic elements to which the terminals are connected and into engagement with the contacts which ground the operative circuit of the vehicle. When the switch is to be reset, the plunger is pulled upwardly and the foot thereon which is ferrous cooperates with a magnet mounted on the upper edge of the lever to pull the latter upwardly into a horizontal position. The trigger then falls under gravity action to bring the detent thereon into engagement with the outer end of the lever and the actuating member and pendulum reassume their normal positions under gravity action.

For a full and more complete understanding of the invention, reference may be had to the following description and the accompanying drawings wherein:

FIG. 1 is a perspective of the impact fire protective switch of the present invention with a portion of the casing broken away to permit illustration of the mechanism on the interior thereof;

FIG. 2 is a top plan view of the switch;

FIG. 3 is a wiring diagram illustrating the relation of certain elements of the subject switch to the electrical circuits of a motor vehicle;

FIG. 4 is a vertical section through the casing depicting the various elements of the switch mechanism in the positions which they assume when the circuit from the battery is maintained;

FIG. 5 is a sectional view similar to FIG. 4 illustrating the condition of the switch after impact and with the circuit from the battery interrupted and that to the generator grounded, and

FIG. 6 is a detail section taken on an enlarged scale through the casing immediately contiguous to the trigger and illustrating the operation of the manual trip.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters denote corresponding elements throughout the several views, and first more particularly to FIG. 1, the switch of this invention is shown as including a casing which is identified in its entirety at **10.** It will be noted that this casing **10** is of plastic for its insulating properties, and is susceptible of being molded in the construction illustrated. While it is not a material part of the present invention, it is noted that the casing is first molded in two halves and after certain parts are assembled therewith, the halves are joined together by fusion.

Casing **10** includes a bottom section designated generally **11** which, as shown in FIGS. **4** and **5,** comprises a bottom wall **12,** a cylindrical wall **13** and a top wall **14,** which, in effect, is a lower partition of the casing. This partition is formed with a central opening **15** which terminates on its upper side in a conical surface or seat **16.**

Integral with lower partition **14** and upstanding therefrom is a cylindrical wall **17** which carries an intermediate partition **18** having an aperture **19** in alignment with opening **15.** Immediately above partition **18,** wall **17** is formed with an inwardly extending tab **20** and substantially diametrically opposite thereto is an opening **21.** Above opening **21** is another inwardly extending tab **22.**

Casing **10** is formed with a top wall **24** having a central opening **25** which is substantially in alignment with aperture **19** and which terminates in a counterbore **26** on its lower side. Top wall **24** is also formed with a pair of diametrically opposed sockets **27** and **28.** Immediately below top wall **24,** cylindrical wall **17** is formed with an opening **29** which opens into socket **27,** and another opening **30** which opens into socket **28.** A contact **31** is embedded in cylindrical wall **17** below opening **30.**

A pendulum identified generally at **32** comprises an arm **33** having a head **34** at its upper end and the lower surface of which is conical as indicated at **35** and which normally engages the conical seat **16.** The upper surface of head **34** is flat. A weight **36** is mounted on arm **33** for vertical movement thereon and after it is positioned on arm **33,** a nut **37** is screwed onto the lower end of arm **33** and constitutes an abutment limiting downward movement of weight **36.** An expansion coil spring **38** is disposed about arm **33** and interposed between weight **36** and partition **14** to urge weight **36** against abutment nut **37.**

An actuating member **39** is received in aperture **19** with a fairly snug fit and has a foot **40** at its lower end, the underface of which is flat and in engagement with the flat upper face of head **34.** The upper end of actuating member **39** projects above intermediate partition **18.**

A trigger identified generally as **41** comprises an arm **42** which is pivotally mounted at **43** on tab **20** and the underside of which rests on the upper end of actuating member **39.** Trigger **41** also includes an upwardly ex-

tending detent 44. A lever 45 is pivotally mounted at 46 on tab 22 and a magnet 47 is mounted on the upper edge of lever 45 adjacent to its free end. This free end of lever 45 normally rests on detent 44 of trigger 41.

A plunger 48 is slidably received in opening 25 and carries an operating member in the form of a knob 49 at its upper free end and a foot 52 at its lower end. An electrical bridging element in the form of a copper disc 50 is slidably mounted on plunger 48. A heavy expansion coil spring 51 is interposed between foot 52 and disc 50. Foot 52 is of ferrous metal and engages magnet 47 on lever 45.

Immediately below socket 27, a U-shaped conducting member 53 is mounted on the innerface of wall 17 and presents an upper contact 54 and a lower contact 55. A terminal 56 which is connected at the end of a cable that goes to the operating system of the car passes through opening 29 and is clamped against contact 54 by a plug 57 which is screwed into the socket 27. An electrical contact 58 is mounted on wall 17 below socket 28 and a terminal 59 is passed through opening 30 and clamped into engagement with contact 58 by plug 60 which is screwed into socket 28.

A manual trip 61 is pivotally mounted in opening 21 and has an inner end engaging the underside of trigger arm 42 at the free end thereof. The outer end portion of trip 61 may be depressed to raise its inner end and thus raise trigger arm 42. Cylindrical wall 17 in casing 10 is formed with an outwardly extending lug 62 having an opening 63.

Referring now to FIG. 2, a pair of L-shaped brackets identified generally at 64 include arms 65 and end ears 66. Each of ears 66 is formed with an opening 67 as shown in FIG. 1. The inner ends of arms 65 are formed with openings (not illustrated) which align with opening 63 in lug 62. A bolt 68 passes through these aligned openings and a nut 69 is screwed onto the threaded end of the bolt to clamp the arms against lug 62. It is evident that the angular position of each bracket 64 may be adjusted individually relative to the lug 62, thus permitting ears 66 to be properly located relative to the inner surface of a hood, so that some appropriate fastening means, such as bolts, may be passed through opening 67 to secure the casing 10 in a truly vertical position.

OPERATION

While the manner in which the subject impact switch operates is believed to be obvious from the illustrations of the drawings and description of parts set forth above, it is briefly described as follows:

It will be understood that the casing 10 is mounted on the underside of the hood of a motor vehicle, preferably in close proximity to the battery and with the casing in a vertical position. The position of the various elements of the mechanism, when the vehicle is operating under normal conditions, is illustrated in FIG. 4. In this position, when a bump is encountered on a rough road surface, weight 36 is merely moved upwardly against the influence of spring 38 and little or no significant lateral component of force is imparted thereto. Thus, the car can travel along the road without the switch being triggered.

When a collision occurs, the impact thereof causes the weight 36 to be swung horizontally. The conical surfaces 16 and 35 extend throughout a full 360°, and hence, regardless of the direction of the impact, head 34 will be disturbed from its horizontal position into the canted position depicted in FIG. 5 in which an edge portion is swung upwardly and away from seat 16. This raises foot 40 to move actuating member 39 upwardly to cause trigger arm 42 to be swung upwardly and move detent 44 out of the path of lever 45. This lever 45 will now drop down under gravity action, and this same action permits plunger 48 with bridging disc 50 to fall. Thus, disc 50 is moved from the position in which it bridges contacts 54 and 58 into the position in which it bridges contact 31 and contact 55. Thus, the circuit from a battery of the vehicle as illustrated in FIG. 3 to the operating circuit of the car which is represented by the designation "Load" in FIG. 3 is interrupted, and the load is grounded. The generator of the car is included in the load and hence it is grounded. A light expansion coil spring 23 is disposed in counterbore 26 about plunger 48 and serves to maintain disc 50 into engagement with contact 31 and contact 55 immediately after impact which, of course, prevents the copper disc from returning to the position in which it bridges contacts 54 and 58.

When the switch is to be reset, an upward pull is exerted on knob 49. This pulls plunger 48 upwardly to cause disc 50 to again bridge contacts 54 and 58. As head 52 is of a ferrous metal and is in engagement with magnet 47, lever 45 is swung upwardly to cause its free end to clear detent 44. When this occurs, pendulum 32, actuating member 39 and trigger 41 will fall downwardly under gravity action and reassume the position illustrated in FIG. 4.

In the event it is desired to interrupt the circuit to the battery for some reason other than a collision, such as to discourage theft of the car or permit a mechanic to work thereon, trip 61 is manually depressed as shown in FIG. 6 to cause the same series of operations discribed above which begin with the raising of trigger arm 42.

It is notable that the connection of terminal 56 to contact 54 and terminal 59 to contact 58 is effected completely within casing 10 where the connections are fully protected.

It will be understood that while the primary intended use of the subject switch is for automobiles, it may be used with other types of motor vehicles, such as trucks and also with powered boats, in which many of the conditions and operations of use are the same as those encountered with automobiles.

While a preferred specific embodiment is herein disclosed, it is to be clearly understood that the invention is not to be limited to the exact construction, mechanisms and devices illustrated and described because various modifications of these details may be provided in putting the invention into practice.

What is claimed is:

1. For use in a motor vehicle including a battery and a generator, an impact switch for fire protective purposes comprising:

a. a casing of electrical insulating material intended to be mounted in a vehicle in a vertical position and including a side wall, a lower horizontal partition having a central opening, an intermediate horizontal partition having an aperture in alignment with said opening, and a top wall having an opening in alignment with said opening and aperture;

b. a conical seat on the upper face of said lower horizontal partition about said central opening;

c. a pendulum comprising a vertical arm passing through said central opening in said lower horizontal partition and having a head with a conical underface engaging said seat and a flat top face, a weight movable on said arm and an abutment at the lower end of said arm;

d. an actuating member slidable in said aperture and having a foot with a flat underface engaging said flat top face of said head and an upper end;

e. a trigger comprising a trigger arm pivotally mounted at one end on said side wall and engaging said upper end of said actuating member and an upstanding detent on said arm;

f. a lever pivoted at one end to said side wall with a portion adjacent to its other end engaging said detent;

g. a plunger slidable in said opening in said top wall and having an operating member at its upper end and a foot at its lower end;

h. an electrical bridging member movable on said plunger;

i. an expansion coil spring about said plunger between the foot thereon and said bridging member;

j. a first pair of spaced contacts on said side wall and extending into said casing, said contacts being connectible by said bridging member, one of said contacts being connected to said battery of said vehicle;

k. a second pair of spaced contacts mounted on said casing below said first pair of contacts and connectible by said bridging member, one of said second pair of contacts being connected to the generator of said vehicle and the other contact of said second pair being grounded;

l. means on said top wall for clamping a terminal to each of said first pair of contacts, and

m. means for connecting said foot on said plunger to said lever.

2. The impact switch of claim **1** in which said foot of said plunger is of ferrous metal and the means for connecting said foot on said plunger to said lever comprises a magnet on said lever.

3. The impact switch of claim **1** together with a movably operable trip pivotally mounted on said side wall and engaging said trigger arm.

4. The impact switch of claim **1** together with an expansion coil spring on the arm of said pendulum between said lower horizontal partition and said weight.

5. The impact switch of claim **1** in which said side wall is cylindrical and said contacts of each of said pairs are diametrically opposed.

6. The impact switch of claim **1** in which said electrical bridging member takes the form of a copper disc.

7. The impact switch of claim **6** in which said underface of said top wall is counterbored at the end of said opening therein, together with a light expansion coil spring in said counterbore, about the plunger and engaging said copper disc.

8. The impact switch of claim **1** in which a mounting lug outstands from said side wall together with a pair of L-shaped sockets with means for individually clamping said brackets to said lug and means in said brackets for connecting said brackets to a vehicle hood.

9. The impact switch of claim **5** in which said cylindrical side wall includes a lower section of a diameter greater than that of said remaining cylindrical wall.

10. The impact switch of claim **9** in which said cylindrical section of larger diameter has a bottom wall.

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