

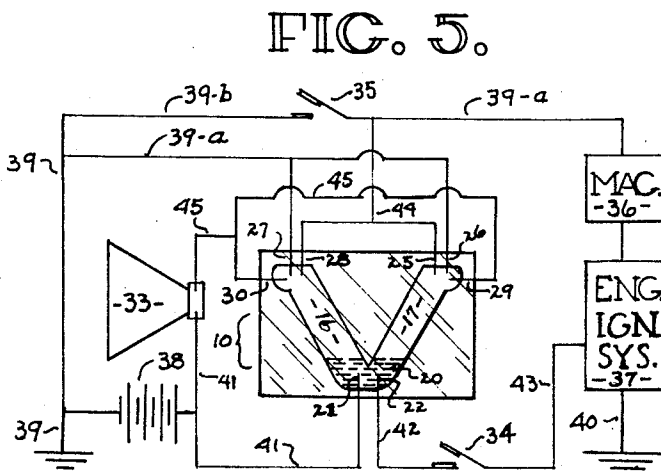
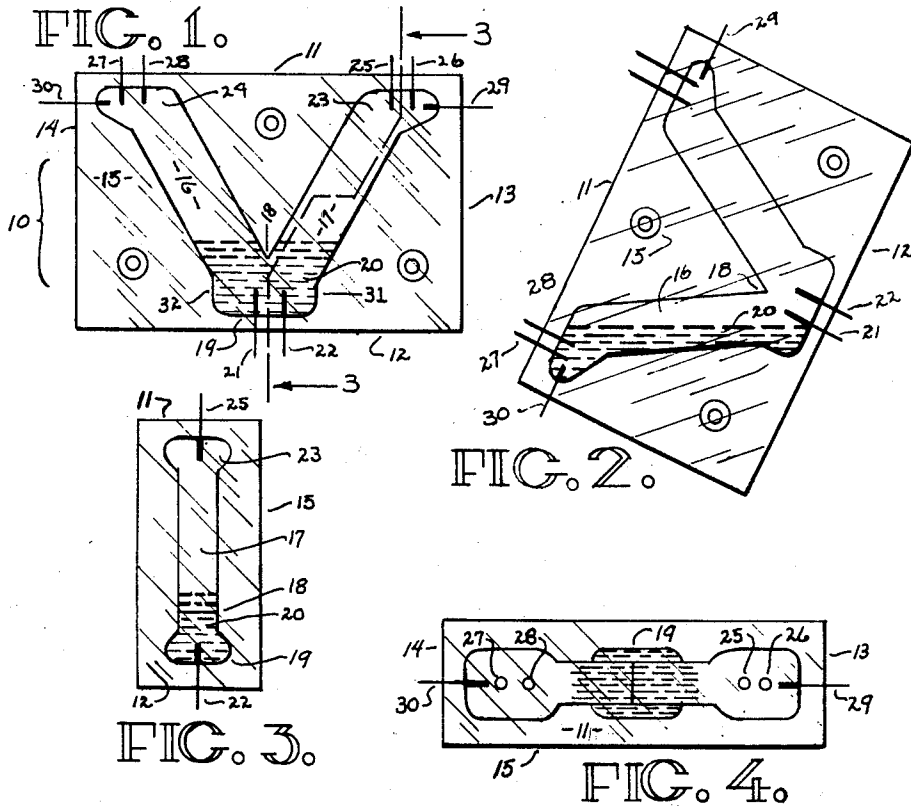
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GRAVITY-SENSITIVE MULTIPLE CONTACT SWITCHES

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GRAVITY-SENSITIVE MULTIPLE CONTACT SWITCHES

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This invention relates to automotive electrical circuits and the switches used therein, and more particularly to a gravity operated switch utilizing a liquid conductor and being adapted to de-energize the battery and magneto ignition systems of an automobile and sound an alarm signal in case the vehicle in which the apparatus is installed is upset or tilted laterally beyond a certain point relative to its normally upright position.

Highway patrol and insurance company records indicate that in a high percentage of cases the upsetting of a vehicle in an accident is followed by fire; and that fire is quite often the major cause of damage and loss of life in serious highway accidents.

Most often the fires following upsets occur because the engine remains running or the starter and ignition circuits are not de-energized and serve to ignite the fumes of displaced fuel.

Furthermore, in accidents in which fire is not an important factor, scores of motorists each year fail to negotiate turns on mountainous roads and drive unseen over the tops of embankments, coming to rest down the hill side far below the line of vision of other motorists where they remain injured or entrapped for hours or days before being seen and rescued.

My invention has been made with the foregoing considerations in mind and can be said to have a plurality of important objectives.

One important object of my invention is the provision of a device and an electrical circuit therewith being adapted to de-energize the conventional ignition circuit of a vehicle when tipped beyond a predetermined point relative to its normally upright position.

Another important object of my present invention is the provision of a device of the character described which is further adapted to de-energize the supplementary magneto ignition circuit in vehicles having both battery and magneto systems in cases of upsets or extreme displacement from the normal upright positioning of a vehicle.

A further important object of my invention is the provision of a device and the electrical circuitry associated therewith which is adapted to de-energize the ignition systems, as mentioned, and furthermore to energize an alarm circuit to attract the attention of passersby.

An additional important object of my invention is the provision of a device of the character described being adapted for fully automatic operation, and being dust and moisture proof and requiring no adjustment or service when properly installed.

And a still further important object of my invention is the provision of a switching device as previously described which is conformed of transparent body material to facilitate checking and inspection.

In brief, my invention includes a rectangular block of transparent non-conductive material having parallel front and back faces normally vertically disposed and having therebetween longitudinally extended top and bottom sur-

faces, and shorter opposite vertical ends. A generally V-shaped cavity having serif-like enlargements of its two upwardly disposed ends and its central bottom portion is centered within the solid block of the main body intermediate of the front and back faces thereof, and a pair of electrodes is disposed through the body material into each of the upper enlargements from the top and from each end, and into the central enlargement from the bottom. A quantity of mercury sufficient to fill the central bottom portion of the cavity to a point slightly above the inner convergence of its two diagonally disposed sides is sealed therein after the air is exhausted and replaced by an inert gas.

The switch is installed on any solid transverse structural member of the vehicle, such as the engine compartment firewall, with the bottom of the switch substantially parallel to the road surface.

The electrodes are wired into the electrical system so that the operation of the vehicle is normal as long as it remains in an upright position, but if it is tilted laterally in either direction sufficiently to cause the mercury to run down either of the diagonal sides of the cavity, the bottom electrodes break the conventional ignition circuit, and the contacts disposed within the upper end portion filled with mercury serve to ground out the magneto ignition system and energize an alarm device.

Other important objects of this invention will become apparent in the following detailed description of one embodiment thereof when read with reference to the accompanying drawings, of which:

Figure 1 is a diagrammatic front elevational view of a mercury switch constructed according to my invention, the switch being disposed in the normally upright position;

Figure 2 is a view similar to that of Figure 1 showing the disposition of the mercury within the switch cavity when tilted laterally;

Figure 3 is a cross sectional view taken along the line and in the direction indicated by the arrows 3—3 in Figure 1;

Figure 4 is a plan view of the device as it would appear in the normal upright position seen in Figure 1; and,

Figure 5 is a schematic wiring diagram indicating the manner in which the device cooperates with various elements and circuits in a conventional automotive electrical system.

Reference is again made to Figure 1 in which the switch constructed according to my invention is designated by the numeral 10 which will be used hereinafter to indicate the solid rectangular body portion of the device including its top 11, bottom 12, ends 13 and 14, and the flat rectangular frontal face 15.

As has been previously indicated, the solid body portion 10 is conformed of transparent material, and for the sake of illustrative clarity the V-shaped cavity therein is shown in solid rather than dotted lines.

Again in Figure 1, the cavity is seen to be comprised of two upwardly extended diagonal channels 16 and 17, the inner edges of which converge at the central point 18 below which the channels merge into an enlarged basal portion 19 which is indicated in the figure as being filled with a quantity of mercury 20 which surrounds a pair of electrodes 21 and 22 which are extended through the bottom 12 into the basal area 19 of the cavity.

Each of the channels 16 and 17 is enlarged at its upper termination as shown at 23 and 24 and pairs of electrodes designated as 25—26 and 27—28 are entered therein through the top 11 with single electrodes 29 and 30 disposed through the sides 13 and 14 respectively into the enlarged terminal areas 23 and 24.

Particular attention is directed to Figures 3 and 4

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which show the particular conformation of the enlarged terminal areas 23 and 24 of the channels 17 and 16 and the sectional contour of the basal terminal area 19 which are seen to be extended laterally substantially beyond the straight sides of the channels. Also significant is the manner in which the basal area 19 is conformed with vertical sides as seen at 31 and 32 in Figure 1.

The enlarged terminal areas at 19, 23 and 24 are provided for the purpose of concentrating as much of the mercury as possible about the electrodes disposed in the respective cavities when the mercury is entered therein, and the straight sides at 31 and 32 are provided to keep the mercury when disposed in the basal area 19 from flowing upwardly in either of the channels as the vehicle in which the device is installed sways to either side.

All of the electrodes are positioned at the time the body 10 is conformed so that they are held in place by the body material and provide airtight seals therewith.

A predetermined amount of mercury is disposed in the basal terminal area 19 of the cavity and air remaining in the cavity is exhausted therefrom and replaced with an inert gas in order to prolong the conductive efficiency of the electrodes.

Referring again to Figure 1, it will be observed that the quantity of mercury as shown at 20 is sufficient to extend upwardly into the channels 16 and 17 above the juncture of the inner sides thereof seen at 18. This is done for the purpose of confining the mercury to a substantial extent within the basal area 19 and keeping it from flowing as previously mentioned up to the channels 16 and 17 in response to the swaying movements of the vehicle. The projection of the electrodes into the bottom of the cavity also serves to stabilize the positioning of the mercury puddle.

When the device is tilted as shown in Figure 2, the mercury 20 runs through the downwardly disposed channel 16 and simultaneously breaks the electrical circuit between the electrodes 21 and 22, and makes two circuits by means of the electrodes 27, 28 and 30.

Attention is now directed to Figure 5 which is a schematic diagram showing the safety system of my invention and is seen to include the switch 10, an electrical alarm signal 33, a conventional ignition switch 34, a magneto cut out switch 35 serving the magneto which is shown collectively at 36, a conventional engine ignition system shown collectively at 37, and the battery 38 and ground connections 39 and 40.

As will be readily understood from an inspection of the diagram, as long as the switch 10 remains in the upright position as shown in Figure 5, the operation of the ignition system is normal. Current from the battery 38 is directed through the conductor 41 to the alarm signal 33 and to the mercury 20 in the basal cavity area 19 of the switch 10, and thence through the conductor 42 to the manually operated ignition switch 34 closure of which directs current through the conductor 43 to the ignition system 37 which, in turn, is grounded at 40.

As long as the switch 10 remains in the upright position, the operation of the system, as has been said, is normal, but when the switch is sufficiently tipped laterally in either direction to cause the mercury 20 to run through either of the channels 16 or 17 and into the end thereof, the circuit is broken at the electrodes 21 and 22 in the base of the switch, and the engine is stopped.

Attention is directed to the fact that corresponding electrodes in the upper portions 23 and 24 of the channels 16 and 17 are connected in parallel so that either set of electrodes is adapted to perform the switching functions involved in the complete safety system of my invention. The center electrodes 26 and 27 both communicate through the conductor 39-a with the ground 39; the inner electrodes 25 and 28 are joined at 44 and communicate with the magneto side of the switch; and the electrodes 29 and 30 disposed outwardly through the ends of the

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switch communicate through the conductor 45 with the ground side of the alarm signal 33.

Thus, as will be readily understood, if the switch is tipped laterally so that the mercury mass 20 moves through the channel 16 as indicated in Figure 2, the magneto circuit represented by the electrode 28 is grounded through the electrode 27 and the conductors 39-a and 39, and the electrode 30 is similarly grounded thereby activating a flow of current through the signal 33 from the battery 38 effective to sound the alarm signal.

Operation of the system in case the switch 10 were tilted to the right and the mercury 20 flowed through the channel 17 into contact with the electrodes 25, 26 and 29, would be identical.

Since the purpose of the alarm signal is to attract attention in case the vehicle were disabled in a secluded or inconspicuous location off the highway, the device would be adapted preferably to emit a sustained and distinctive signal which would arouse the curiosity of passersby or be immediately recognizable as a distress signal. Similarly a flashing light is used as the signal means in prototype systems now being tested on vehicles used largely in night driving across desert and rolling terrain.

To provide a further element of safety covering cases in which the vehicle might be tilted longitudinally rather than laterally, two of the switches such as 10 are installed in the vehicle, being positioned therein at right angles to each other.

Although in order to comply with the statute my invention has been set forth in considerable detail concerning one particular embodiment, it is to be understood that these details are subject to change and modification and the embodiment is open to substantial variation, and the invention itself is amenable to adaptation into a plurality of embodiments and therefore is not to be restricted to the form specified herein nor limited in any manner except as may be indicated by the extent of the appended claims.

What I claim as my invention is:

1. A switch for use in an automotive electrical system including an ignition unit, comprising: a solid, generally rectangular block of electrically non-conductive material having therein a closed V-shaped cavity including two oppositely disposed diagonal channels having their upper ends spaced apart adjacent the top of said block and converging in the lower central area of the block, said cavity further including a well constituting the bottom portion thereof and joining the converging portions of said channels, said well having, at the respective side extremities thereof, substantially vertical walls joined to the outer walls of said channels; a plurality of electrodes extending through the bottom of said block and into said well; and a quantity of electrically conductive liquid disposed in said cavity, covering said electrodes, extending above and sealed to the point of intersection of the inner walls of said channels, and thereby isolating the spaces within said channels from one another above said body of liquid, said vertical side extremity walls of said well functioning cooperatively with the sealing of said liquid body to said point of intersection of the channels, to resist deflection of the body of liquid outwardly into either of said channels in response to swaying movement communicated to said switch in the common plane of said channels; said electrodes being normally connected by said liquid body to constitute a series connection to said ignition unit and becoming electrically isolated upon tilting of the switch to a position in which the liquid may occupy the full length of one of said channels.

2. A switch as defined in claim 1, including electrodes extending into the upper ends of said channels for actuating an alarm circuit upon the occurrence of said tilting.

3. A switch as defined in claim 2, wherein there are a pair of electrodes at the upper end of each of said channels and including an alarm circuit in which an electrode of each of said pairs is disposed in parallel with one side

of an alarm device and the other electrode of each of said pairs is disposed in parallel with a source of electrical power for energizing said alarm device.

4. A switch for use in the ignition system of an automotive vehicle, comprising: a casing of electrically non-conductive material having therein a V-shaped cavity including two oppositely disposed diagonal channels having their upper ends spaced apart adjacent the top of said casing and converging to an intersection in the lower central area of the casing, said channels having enlarged recesses in their upper ends, and said cavity having a well constituting an enlargement of said intersection; a plurality of electrodes extending through the bottom of said casing and into said well in spaced relation, for constituting a series connection in said ignition system; a group of electrodes in each of the upper corners of said casing, each group including at least one pair of electrodes extending into the upper end portion of each of said channels, at least one electrode of each pair being disposed in the enlarged recess of said upper end, said pairs of electrodes being adapted for connection in parallel into an alarm circuit; and a quantity of electrically conductive liquid disposed in said cavity, covering said electrodes of said bottom well, normally establishing a connection between the same, and adapted, upon tilting of the switch upon either side thereof, to evacuate said well sufficiently to break the connection between the contacts of said well and to travel to the end of the channel which is lowered as the result of said tilting, so as to fill the recess in the upper end of said lowered channel and thereby establish an alarm connection between the pair of electrodes in said upper end portion of said lowered channel.

5. In combination with an automotive ignition system including an ignition unit and a battery and electric current generator connected in series to said ignition unit for

alternatively energizing the same, a switch comprising a solid, generally rectangular block of electrically non-conductive material having therein a V-shaped cavity including two oppositely disposed diagonal channels having their upper ends spaced apart adjacent the top of said block and converging to an intersection in the lower central area of the block, said cavity further including a well constituting an enlargement of said intersection, and including enlarged recesses at the upper ends of said channels; a quantity of electrically conductive liquid disposed in said cavity and normally filling said well; an alarm device; a pair of electrodes extending through the bottom of said block into said cavity and normally connected by said liquid to close a circuit between said battery and said ignition unit; groups of electrodes extending through each of the upper corners of said block and into the respective upper ends of said respective channels, each of said groups of electrodes consisting in three electrodes arranged in two pairs with one of the electrodes being common to both pairs for each group; one pair of electrodes of each group being arranged to establish a connection from said battery to said alarm device when connected by said body of liquid and the other pair of each group of electrodes being adapted to establish a connection to said alarm device from said current generator upon being connected by said liquid.

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