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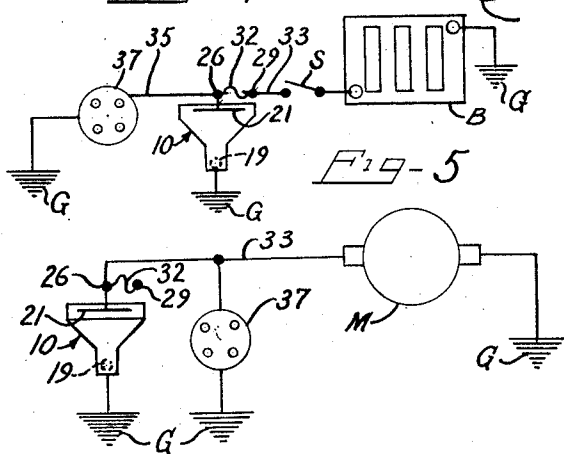
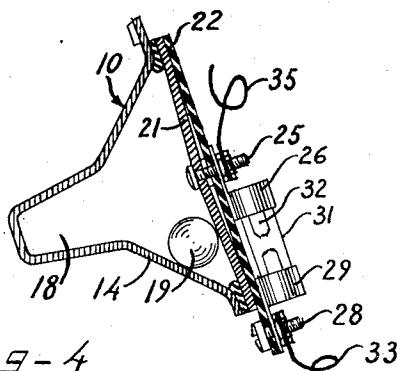
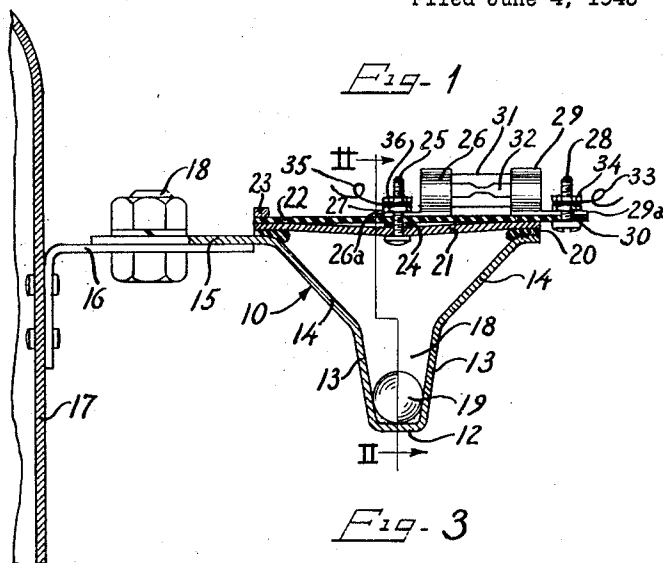
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2,365,262

TIP-SWITCH

Filed June 4, 1943

2 Sheets-Sheet 1



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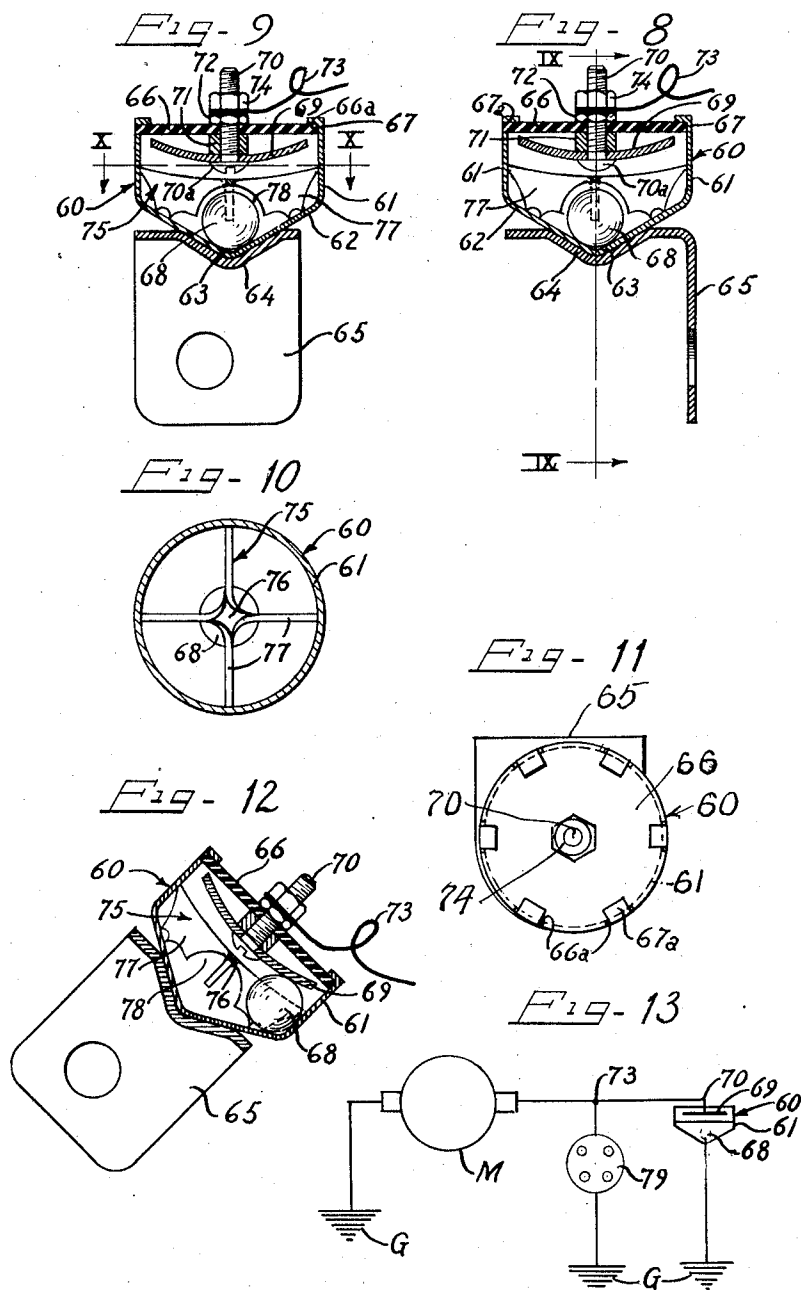
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TIP-SWITCH

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,365,262

TIP-SWITCH

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Application June 4, 1943, Serial No. 489,595

4 Claims. (Cl. 200—52)

This invention relates to switches adapted to automatically function when tilted beyond a predetermined angle.

Specifically, the invention relates to tip-switches for vehicles adapted to short-circuit the electrical system of such vehicles whenever the vehicles are overturned or tilted beyond a predetermined angle.

In accordance with this invention, vehicles such as automobiles, trucks, tractors and the like are equipped with simple switches which automatically function to stop the motors of the vehicles whenever the vehicles are overturned or tilted to a dangerous angle. The tip-switches of this invention include metal ball elements mounted for rolling in metal containers into contact with electrical conductors for electrically connecting such conductors with the containers to ground the electrical system of the vehicle and thereby automatically stop the motor to prevent fires and accidents, as when the vehicle is about to be overturned or reaches a dangerous angle.

The metal containers for the ball elements are so shaped that the ball normally rides in a pocket in the bottom of the container in spaced relation from a conductor suspended into the top of the container in insulated relation from the container walls. Normal vibration of the vehicle will not move the ball sufficiently to contact the conductor, but as soon as the container is tilted beyond a predetermined angle, the ball will roll out of the pocket along the container walls into contact with the conductor to immediately ground the electrical system.

In one form of the invention the tip-switch is provided with a fuse between the source of electrical power and the conductor. Whenever the ball in the switch grounds the conductor, the fuse will blow to stop flow of current to the motor of the vehicle. In this form of tip-switch, the fuse can be removed or not used to adapt the switch for use in magneto-equipped vehicles such as tractors, for grounding the magneto whenever the vehicle is tilted to a dangerous angle.

In another form of the invention the tip-switch is equipped with a grounded metal container having a conductor suspended in insulated relation therein, which conductor is connected to the source of electrical power. The ball in the container will ground the electrical system whenever the container is tilted beyond a predetermined degree.

In still another form of the invention the metal container is equipped with a shield between the conductor and the pocket in the bottom of the container so that the ball cannot be vibrated into contact with the conductor, but can freely roll into contact with the conductor whenever the container is tilted beyond a predetermined angle.

It is, then, an object of this invention to pro-

vide safety switches for motorized vehicles having electrical systems to ground such electrical systems whenever the vehicle is tilted to or beyond a dangerous angle.

5 A further object of the invention is to provide tip-switches having ball elements functioning as conductors.

A still further object of the invention is to provide safety tilt switches of inexpensive design made from inexpensive materials.

10 A still further object of the invention is to provide a tip-switch composed of a metal cup, an insulated conductor in the cup, and a metal ball.

15 A specific object of the invention is to provide a switch wherein a free-rolling metal ball element functions to operate the switch.

20 A still further object of the invention is to provide a tip-switch composed of a container having a pocket in the bottom thereof, a ball normally riding in said pocket, a conductor spaced from said pocket in the container, and walls on the container on which the ball can roll into contact with the conductor whenever the container is tilted beyond a predetermined degree.

25 Further objects of the invention will become apparent to those skilled in the art from the following detailed descriptions of the annexed sheets of drawings which, by way of preferred examples only, illustrate three embodiments of the invention.

On the drawings:

30 Figure 1 is a longitudinal cross-sectional view, with parts in side elevation, of a tip-switch according to this invention mounted on the dashboard of a vehicle.

35 Figure 2 is a transverse cross-sectional view, with parts in elevation, taken along the line II—II of Figure 1.

40 Figure 3 is a view similar to Figure 1 illustrating the switch in tipped or tilted position.

Figure 4 is a wiring diagram illustrating the use of the switch of Figures 1 to 3 in a battery-controlled ignition circuit of an automobile.

45 Figure 5 is a wiring diagram illustrating the use of the tip-switch of Figures 1 to 3 in a magneto-controlled electrical system of a tractor.

50 Figure 6 is a transverse cross-sectional view, with parts in elevation, of a modified form of tip-switch according to this invention.

Figure 7 is an end elevational view of the switch of Figure 6.

55 Figure 8 is a longitudinal vertical cross-sectional view of a further modified tip-switch according to this invention.

Figure 9 is a transverse cross-sectional view of the switch of Figure 8 taken along the line IX—IX of Figure 8.

60 Figure 10 is a horizontal cross-sectional view taken along the line X—X of Figure 9.

Figure 11 is a top plan view of the switch of Figure 9.

Figure 12 is a view similar to Figure 9 showing the switch in tilted or tipped position.

Figure 13 is a wiring diagram illustrating the use of the switches of Figures 6 and 7 or Figures 8 to 12 in a magneto circuit.

As shown on the drawings:

As shown in Figures 1 to 3, the reference numeral 10 designates one form of tip-switch according to this invention composed of a rather narrow metal cup with vertical side walls 11, 11, a flat bottom wall 12, and end walls 13, 13 extending upwardly from the bottom wall 12 along a steep inclined path and merging into outwardly flaring wall portions 14, 14 providing an enlarged open top for the cup. One end wall 14 projects laterally from the cup as at 15 and is mounted on a bracket 16 carried by the dash 17 of an automotive vehicle. A bolt 18 can pass through apertures in the flange 15 and bracket 16 for securing the cup in vertical position on the automobile.

The cup thus has a pocket 18 in the bottom portion thereof and a metal ball 19 is snugly seated in this pocket 18 and is normally disposed on the bottom wall 12 of the cup. The ball 19, however, is adapted to roll out of the pocket 18 toward the open top of the cup whenever the cup is tilted and, in so rolling, will be on one of the walls 11 or 14 of the cup.

A gasket of rubber or other insulating material 20 is mounted on the mouth of the cup and a conductor strip 21 is supported on this gasket 20 and extends across the mouth of the cup.

A cover 22 of insulation material such as hard rubber, Bakelite, fiber, or the like, closes the open top of the cup and is secured to the cup by means of bent-over fingers 23 at spaced intervals around the mouth of the cup.

A washer 24 is disposed between the cover 22 and the strip 21 at the center of the cup to deflect the strip 21 into the cup for cooperating with the end walls 14, 14 to provide converging paths into the upper corners of the cup.

A metal bolt 25 is passed through the center of the strip 21, the washer 24, and the cover 22 with the head thereof disposed in the cup. A fuse clamp 26 is seated on the cover 22 and an apertured mounting flange 26a receiving the bolt 25 therethrough. A nut 27 is threaded onto the bolt against the clamp 26, to hold the clamp on the cover 22.

As shown in Figures 1 and 3, the cover 22 projects beyond an end wall 14 and a bolt 28 is passed through this projecting end of the cover. A second clamp 29 is disposed on the cover and has a mounting flange 29a on the projecting portion of the cover, receiving the bolt 28 therethrough. A nut 30 is threaded on the bolt 28 against the mounting flange 29a to secure the clamp 29 on the cover. The clamps 26 and 29 have spring fingers receiving a conventional fuse 31 therein with a fuse element 32 electrically connecting the clamps and thus electrically connecting the bolts 25 and 28. A wire 33 is disposed around the bolt 28 and held thereon by means of a second nut 34. This wire 33 is a power wire leading from a source of electrical current such as a battery. A second wire 35 is disposed around the bolt 25 and held thereon by means of a nut 36. This wire 35 connects the conductor strip 21 with the electrical system of the vehicle.

When the cup is mounted in vertical position as shown in Figures 1 and 2, the ball 19 will ride in the pocket 18 but, when the cup is tilted beyond a predetermined angle, as shown in Figure 3, the ball 19 will ride out of the pocket 18 along a wall 14 or 11 of the cup into contact with the conductor strip 21 thereby electrically connecting the conductor strip to the ground through the cup, bracket 16, and dashboard 17. As a result the power connection 33 will be short-circuited through the fuse element 32 and this element will be destroyed.

As shown in the wiring diagram of Figure 4, the power wire 33 is connected through the usual ignition switch S to a source of power such as a battery B which, as conventional, is grounded as at G to the automobile chassis. The cup of the switch 10 is also grounded to the chassis through the dash 17.

The wire 35 is connected to the electrical system of the vehicle such as to the distributor 37 which system is grounded as through spark plugs or the like (not shown). Now, when the cup of the switch 10 is tilted as shown in Figure 3, the fuse element 32 will be grounded and thus destroyed thereby disconnecting the battery B from the electrical system 37.

When it is desired to use the switch 10 in electrical systems having magnetos wherein the magnetos are stopped by grounding the same as in tractors, the fuse element 32 need not be used and the fuse 31 can be removed from the switch.

A magneto circuit embodying the switch 10 is shown in Figure 5, wherein the magneto M supplies the power wire 33 and the electrical system 37. The power wire 33, instead of being connected to the fuse clamp 29, is directly connected to the fuse clamp 26. Then, whenever the ball 19 contacts the conductor 21, the magneto will be grounded and will cease functioning. The clamp 29 of the switch 10 is not used in a magneto installation.

In the embodiment in Figures 6 and 7, the switch 40 is composed of a metal cup 41 with vertical side walls 42, a horizontal bottom wall 43, steeply sloping end walls 44, and outwardly flaring end wall portions 45 providing a pocket 46 with an enlarged mouth portion. One of the side walls 42 extends higher than the other side wall and provides a mounting bracket 47.

The top of the cup 41 is closed by means of a cover 48 of insulation material which is clamped to the top of the cup by means of bent-over fingers 49 provided at the ends of the cup.

A conductor strip 50 is suspended from the cover 48 in the cup on a bolt 51 having a head 51a supporting the strip. The strip 50 terminates short of the side and end walls of the cup and is thus mounted in the cup in insulated relation therefrom.

The bolt 51 has a nut 52 thereon bottomed on the cover 48 to clamp the conductor 50 between the inner face of the cover 48 and the bolt head 51a. A second nut 53 is also threaded on the bolt 51 and a wire 54 is adapted to be disposed between the nuts 52 and 53.

In this modification of Figures 6 and 7, the switch 40 only has one wire connection.

A ball 55 is disposed in the cup 41 and normally rides in the pocket 46 of the cup but, whenever the cup is tilted beyond a predetermined angle, the ball will roll out of the pocket to join the cup with the conductor 50 and thereby ground the electrical system of a vehicle on which the switch is used.

In the embodiment of this invention of Figures 8 to 12, a tip-switch 60 has a cylindrical metal cup 61 with a tapered bottom wall 62 converging to provide a well or pocket 63 at the axial center of the cup. The bottom 62 is secured in the recess 64 of a mounting bracket 65 adapted to be attached to the dashboard or other grounded part of a vehicle.

A disk 66 of rigid insulating material such as Bakelite, hard rubber or the like is seated on top of the cup 61 and has notches 66a at intervals therearound receiving tangs 67 of the cup 61 therethrough. These tangs 67 are bent over the top of the disk 66 as at 67a to clamp the disk to the top of the cup.

A well or pocket portion 63 of the tapered bottom wall 62 receives a metal ball 68. This ball 68 normally rides in the pocket in spaced relation from a conductor disk 69 suspended on a bolt 70 from the cover 66 in spaced relation from the cup. The conductor disk 69 has a convex bottom face against which the ball 68 can ride when the switch is tilted.

A spacer 71 around the nut 70 holds the disk 69 in spaced relation beneath the cover 66. A nut 72 is threaded on the bolt 70 against the cover 66 to secure the disk 69 in clamped relation between the head 70a of the bolt and the spacer 71. A wire 73 is wrapped around the bolt 70 above the nut 72 and is held on the bolt by means of a second nut 74.

Since the cup 61 is preferably quite small and may vibrate to an appreciable extent when in use, the ball 68 may roll due to vibration but it is kept from unauthorized rolling into contact with the conductor 69 by means of a shield or baffle 75. This shield or baffle has a central portion 76 with four radially extending wings 77 secured to the side wall and bottom of the cup. The wings 77 have cut-out inner portions providing a fragmental spherical recess 78 in spaced relation above the well or pocket portion 63 of the cup bottom 62. The ball 68 normally riding in the pocket portion 63 of the bottom 62 is free to vibrate and roll in the recess 78 of the baffle but is held against rolling in an upward spiral path into contact with the conductor 69 by the central portion 76 and the wings 77. Vibration of the cup will, therefore, never result in rolling the ball on the cup walls into contact with the conductor 69. However, as shown in Figure 12, whenever the cup 61 is tilted beyond a predetermined angle to move the ball out from under the central portion 76 of the shield, it is free to roll between the wings 77 of the shield into contact with the conductor 69, thereby electrically connecting the conductor 69 with the cup 61. The inner edges of the wings providing the recess 78 can not hold the ball in the recess during tilting even if they are in the direct line of tilting movement since they are quite thin and a ball cannot be retained on a line edge during movements attendant with the tipping of a vehicle to a dangerous angle. However, the wings 77 can be positioned at 45° from the expected directions of tilt if desired so that they will not be in the direct line of tilt.

As shown in the wiring diagram of Figure 13, the wire 73 connects the conductor 69 with a magneto M which is grounded as at G. The electrical system such as the distributor 79 of the vehicle is also connected to the wire 73. The cup 61 is grounded and, whenever the cup is tilted to move the ball 68 into contact with a conductor 69, the wire 73 will be grounded to G

and stop the magneto M, thereby stopping flow of current to the electrical system 79 of the vehicle.

The tip-switch 40 of Figures 6 and 7 is used in an identical circuit with the tip-switch 60 as shown in Figure 13. Both tip-switches 40 and 60 are also adapted for use in battery circuits resulting in a short-circuiting of the battery whenever the switches are tipped to move the balls thereof into contact with the conductors thereof.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A tip-switch comprising a cylindrical metal cup having a tapered bottom, a metal ball riding on said bottom, a shield in said cup overlying said ball in spaced relation whenever the cup is in vertical position, a conductor suspended in said cup in insulated relation therefrom above said shield, and said ball adapted to ride on said cup from under said shield into contact with said conductor for electrically connecting the conductor and cup whenever the cup is tilted beyond a predetermined angle.
2. A tip-switch comprising a metal cup having a sloping bottom wall providing a central pocket, a metal ball in said cup disposed in said pocket whenever the cup is in vertical position, a shield having a central portion and radially extending wings in said cup defining a recess overlying the ball in spaced relation and providing channels freely receiving the ball whenever the cup is tilted, and a conductor suspended in said cup above said shield in insulated relation from the cup adapted to be contacted by the ball and electrically connected to the cup whenever the cup is tilted beyond a predetermined angle.
3. A tip-switch comprising a metal cup having an inclined bottom wall providing a central pocket, a metal ball in said cup disposed in said pocket whenever the cup is in upright position, baffles secured in said cup in spaced upright relation to accommodate movement of the ball therebetween but holding the ball against rolling in an upward spiral path on the inclined wall of the cup, and a conductor suspended in the cup in insulated relation therefrom and spaced from the baffles to be contacted by the ball only when the cup is tilted beyond a predetermined angle.
4. A tip-switch comprising a metal cup having an inclined bottom providing a well at the axial center of the cup, a cover of insulation material for said cup having notches around the periphery thereof, tangs on said cup extending through said notches and having bent-over end portions overlying the cover to retain the cover on the cup, a conductor stud extending through the central portion of the cover, a conductor carried by said stud in the cup in spaced relation from the wall of the cup, a metal ball seating in the well of the cup adapted to ride on the inclined wall of the cup into contact with the conductor for joining the conductor and cup in current-conducting relation, and baffle means in the cup obstructing upward spiral movement of the ball while accommodating rolling of the ball on the cup wall whenever the cup is tilted beyond a predetermined angle.

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