

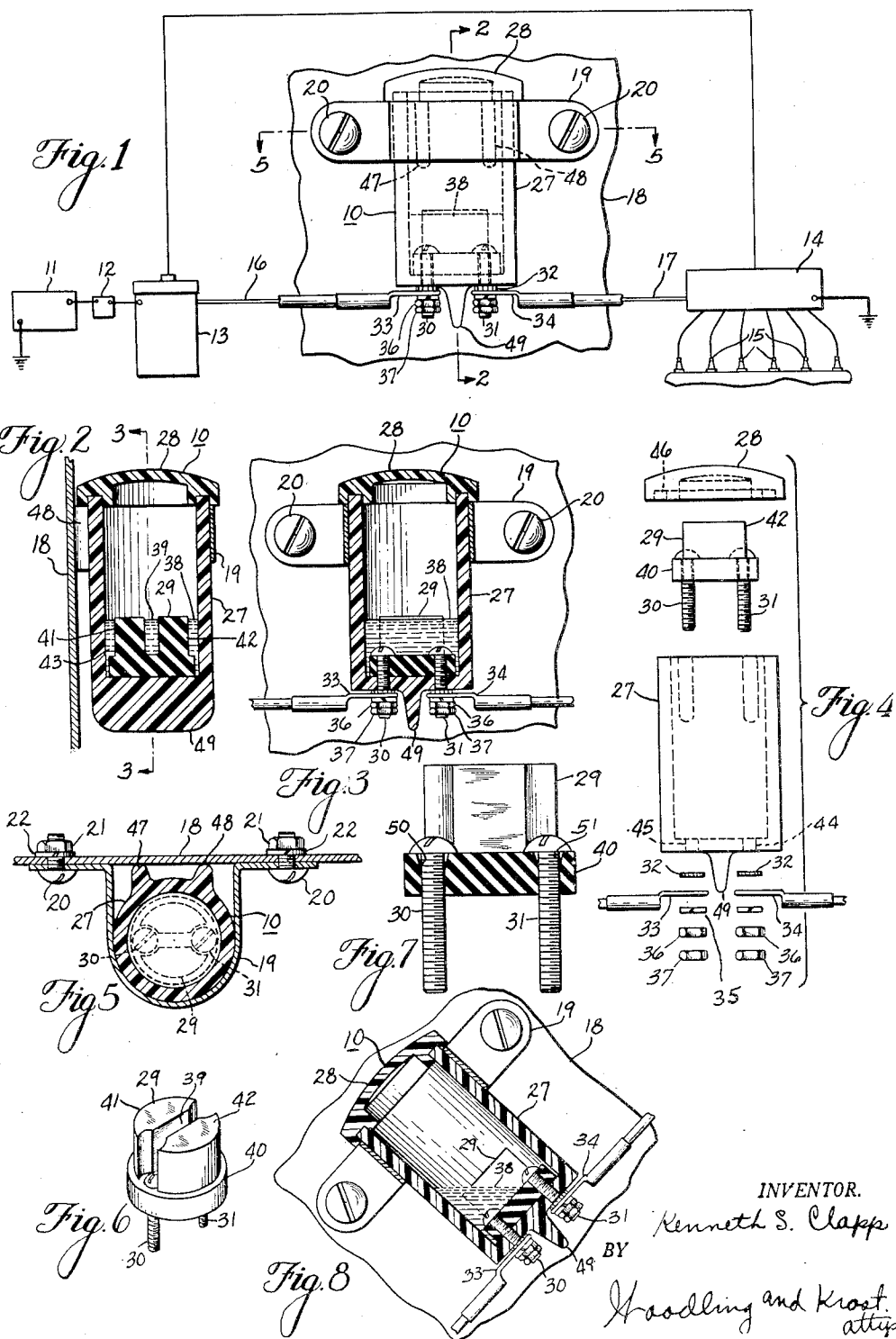
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K. S. CLAPP

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TURNOVER SAFETY SWITCH

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INVENTOR.

Kenneth S. Clapp

BY Hoodling and Krost attys

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TURNOVER SAFETY SWITCH

Kenneth S. Clapp, Dallas, Tex.

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8 Claims. (Cl. 200—52)

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This invention relates to a gravity actuated safety switch for engines of vehicles and aeroplanes, the engines of which employ electric current from a battery or magneto to spark plugs for igniting the gas vapors within the cylinders.

This application is a continuation-in-part of my pending application Serial No. 692,895, filed August 24, 1946, for "Safety Switch for Engine Driven Vehicles," now abandoned.

An object of this invention is to automatically and instantly shut off the flow of electric current in the ignition system of the engine when a vehicle or aeroplane turns on its side or upside down so that there will be no danger of fire from electric sparks, which frequently causes loss of life and damage to property, by igniting the gas vapors when the carburetor is in an inverted or semi-inverted position.

Another object of this invention is to provide a positive and fool-proof connection between the ignition switch and the coil or distributor for continuous operation of the engine when it is performing its normal operation, and in case of accident by the vehicle or aeroplane turning over to immediately break the ignition circuit.

Another object of my invention is the provision in a safety switch of a baffle in the form of an island surrounded by a pool of current conducting material and having a transversely disposed passageway extending thereacross to provide for the direct bridging of the contacts.

Another object of my invention is the provision in a safety switch of a baffle which prevents washing of the current conducting fluid away from the contacts under severe vibrations, jolting, or sudden turns and stops of the vehicle and yet provides a free flow of the current conducting fluid the instant that the vehicle is tilted so that the switch may act immediately to cut off the ignition.

Another object of my invention is the provision in a safety switch which provides three electrical paths through the current conducting material from one contact to the other.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a diagrammatic view of an ignition system of an engine for a vehicle or aeroplane, and showing my safety switch electrically connected in the system;

Figure 2 is a cross-sectional view of my safety switch, taken along the line 2—2 of Figure 1;

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Figure 3 is a cross-sectional view of my safety switch, taken along the line 3—3 of Figure 2;

Figure 4 is an exploded view of my safety switch, showing the parts prior to assembly;

Figure 5 is a cross-sectional view of my safety switch, taken along the line 5—5 of Figure 1;

Figure 6 is a perspective view of the baffle and the electrical contacts;

Figure 7 is an enlarged cross-sectional view of the baffle of Figure 6, taken transversely through the open slot or passageway and showing the two screw contacts; and

Figure 8 is a view similar to Figure 3, but shows the switch in a tilted position with the electrical circuit broken.

Hundreds of people have been burned to death while riding in a vehicle or aeroplane which accidentally turned over or crashed and the driver or pilot was temporarily unconscious because of shock or injury so that he was unable to turn off the ignition switch and gasoline or other combustible motor fuel leaked from the carburetor, broken fuel lines or gas tank onto the distributor, generator or shattered wires and caused instantaneous fire. An engine fuel fire spreads rapidly and engulfs the passengers rapidly before they can regain consciousness.

My ignition safety switch will definitely eliminate all fires caused by the engine continuing to run after an accident wherein the vehicle or aeroplane is overturned to any angle that might cause the motor fuel to leak from an inverted carburetor, fuel tank or broken fuel conduits to any electrical sparks of the engine.

My safety switch or circuit breaker will not deteriorate from use, is always positive in action when an accident occurs, and is an economical device for all types of vehicles and aeroplanes.

In the present specification and claims, the term "engine driven vehicle" will be used to designate both aeroplanes and engine driven vehicles such as automobiles, trucks and other vehicles employing engines for driving power.

The Figure 1 shows the preferred method of application of my safety switch, which is designated by the reference character 10, to the ignition system of an engine for an engine driven vehicle. The ignition system, as shown diagrammatically in Figure 1, comprises a source of current 11, an ignition switch 12, a high tension coil 13, a distributor 14 having distributing conductors leading to spark plugs 15. The other parts of the electrical wiring of the engine are not shown, such as the starter, relays, and lighting circuits. The source of current 11 may comprise a battery or a

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magneto. The high tension coil 13, distributor 14, or the spark plugs 15 may be characterized as high tension elements. Although as my preferred embodiment I have shown my safety switch 10 positioned in the primary circuit between the coil 13 and the distributor 14, it will be readily understood that my safety switch 10 may be positioned in any other place to cut off the ignition when the vehicle is tilted or turned over.

My safety switch 10 comprises generally a container 27, a mounting plate 18, a clamp 19 for mounting the container 27 on the mounting plate 18. The mounting plate 18 upon which the switch 10 is mounted may be the firewall or bulkhead panel separating the engine compartment from the passenger compartment. The switch 10 need not necessarily be mounted on the firewall or bulkhead panel, but may be mounted on a separate plate suitably fastened to the block or other part of the vehicle. As illustrated in Figure 5, the clamp 19 may be fastened to the mounting plate 18 by means of screws 20 which extend through the plate 18 and which are anchored thereto by means of nuts 21 and lock washers 22. The back side of the container 27 is provided with two reinforcing ribs 47 and 48 which press against the mounting plate 18 as the clamp 19 draws the container 27 toward the mounting plate. The ribs 47 and 48 reinforce the wall of the container and prevent the container from becoming distorted.

The top of the container 27 is provided with a closure cap 28. Any suitable means may be employed to securely fasten the closure cap to the top of the container, and to this end I provide an annular groove 46 on the underneath side of the cap which telescopically fits over the upper edge of the container. In order to provide a permanent water-proof seal between the cap and the container, the cap is bonded to the container by a suitable bonding material placed in the annular groove, after which the cap is pressed on tight with the bonding material thereafter setting to make the permanent bond.

The container 27 and the closure cap 28 are preferably constructed of molded polystyrene which is transparent so that one may observe the mercury within the container 27. The polystyrene has substantially zero porosity and thus prevents any moisture passing into the container.

Mounted in the bottom of the container 27 is an electrical insulating block or baffle 29 which is constructed of material having a high dielectric strength. As illustrated in Figures 6 and 7, the baffle 29 comprises a base 40 having mounted thereon two upright posts 41 and 42, between which posts is a transversely disposed passageway 39. The insulating baffle 29 is anchored to the bottom of the container 27 by means of two screws 30 and 31 which operate as two spaced electrical contacts bridged by the current conducting fluid 38 such, for example, as mercury, provided in the lower part of the container 27. The two contact screws 30 and 31 extend through openings 44 and 45 in the bottom of the container 27. Terminals 33 and 34 are respectively connected to the contact screws 30 and 31 and, as shown in Figure 1, the terminal 33 is connected to the coil 13 by means of a conductor 16 and the terminal 34 is connected to the distributor by means of a conductor 17. In mounting the terminals 33 and 34 to the contact screws 30 and 31, I first employ a star washer 32 which fits between the bottom surface of the container and the top

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surface of the terminals. The terminals are then each secured to the contact screws by means of a lock washer 35 and two nuts 36 and 37, the nut 37 acting as a lock nut to insure permanent mounting and thus preventing the terminals from becoming loose. Upon the tightening of the nuts 36 and 37, the insulating baffle 29 is firmly held down against the inside bottom surface of the container 27 to seal the container against moisture entering the container and against leakage of the mercury therefrom.

As shown in Figure 7, the openings 50 and 51 in the base of the baffle 29 through which the contact screws 30 and 31 threadably extend are tapered at their entrance end to enable the screws to be wedgingly pressed into the holes for easily starting and making their own threads. The contact screws 30 and 31 thus remain threadably fastened to the baffle 29. To provide proper electrical insulating properties, the baffle 29 is constructed of molded phenolic which has a high dielectric strength. The drawings are drawn substantially to scale and the clearance between the outside surface of the base 40 of the baffle 29 and the inside surface of the container is slightly less than $\frac{1}{8}$ of an inch; the clearance between the outside arcuate surface of the posts 41 and 42 and the inside surface of the container is slightly greater than $\frac{1}{8}$ of an inch, and the width of the passageway 39 is approximately $\frac{1}{8}$ of an inch. The top surface of the two posts 41 and 42 extends slightly above the level of the mercury 38. The baffle 29 is in the form of an island surrounded by a pool of mercury. The flow of current from one contact to the other may be directly through the mercury which fills the transversely disposed passageway 39, or the current may flow in a divided path between the contacts by flowing around the annular pool of mercury between the outside arcuate surface of the posts 41 and 42 and the inside surfaces of the container. In other words, the design of my baffle is such that there are three electrical paths through the mercury between the contacts 30 and 31. Should one of the electrical paths be interrupted, there are still two electrical paths for bridging the contacts. Moreover, should two of the electrical paths be interrupted, then there is still one electrical path for bridging the contacts. With the container in an upright position, it is substantially impossible to shake the container and break all three electrical contacts at once. Actual tests show that no amount of vibration, jolting, sudden turning or quick stopping of the vehicle is sufficient to break all three of the electrical paths at once, and thereby interrupt the ignition circuit. The action of my baffle 29 is such that it prevents the washing of the mercury away from the contacts under severe vibration, jolting, and sudden turns and stops of the vehicle, and yet provides a free flow of the mercury the instant that the vehicle is tilted so that the switch acts immediately to cut off the ignition. Without being bound by the consequences of a theory, reasons may be advanced why my baffle is so effective in preventing washing of the mercury away from the contacts. One reason which may be advanced is that just as soon as the mercury which is in the transverse passageway 39 tends to splash out it is immediately replenished by the mercury which is in the annular or circular clearance space 43 between the outside surface of the posts 41 and 42 and the inside surface of the container.

Another explanation why my baffle is effective in preventing the mercury from being washed away from the contacts is the fact that the mercury within the passageway 39 can not readily wash into the annular or circular clearance space 43 because the circular space is already filled. That is to say, the mercury within the passageway 39 is fenced in because there is no place for this mercury to wash unless it first washes away the mercury in the circular clearance space 43. Another way of explaining the action of my baffle is that the outside circle or annular pool of mercury holds the mercury in the passageway 39 from washing away from the contacts. It is noted that the ends of the passageway 39 terminate in enlarged arcuate areas whereby the screw heads for the crew contacts may be inserted into the openings 50 and 51 in the base of the baffle. The enlarged arcuate side walls through which the heads of the screws pass provide an extra volume of mercury directly over the screw heads and this extra volume of mercury offers resistance to being readily washed away because the width between the enlarged arcuate side walls above the screw heads is greater than the width between the side walls of the passageway 39. As the mercury is urged or caused to be washed back and forth in the passageway 39, it must restrict itself as it leaves the enlarged space above the screw heads and enters the space between the straight side walls of the passageway.

The switch is preferably mounted on the vehicle in such position that the passageway 39 is transversely disposed with respect to the vehicle, and thus when the vehicle tilts sideways, the switch will be as shown in Figure 8, with the mercury breaking the contacts.

In service, my safety switch operates as follows: When a vehicle driver or aeroplane pilot starts the engine by turning on the switch 12, the electrical current flows from the source of current 11 to the spark plugs and ignites the gas vapors within the cylinder. When a vehicle operator or aeroplane pilot has any type of accident which causes the vehicle or aeroplane to land in an inverted or semi-inverted position, the mercury or current conducting fluid flows toward the opposite end of the container 27, thereby breaking the electric current between terminals and instantly stopping the engine. This action takes place before any gas vapors could escape from an inverted carburetor or broken gasoline line or tank. A switch to be satisfactory for this type of service must be such that there is free flow of the fluid the instant that the car is tilted so that the switch may act immediately to cut off the ignition. It must be remembered that it takes less than a thousandths part of a second to cause a fire or explosion. Therefore, there must be no time delay in the free performance of the flow of the mercury. Yet at the same time, the switch must give such performance that excessive vibrations do not cause the circuit to be interrupted to cut off the ignition. If the circuit should be interrupted for a very brief interval resulting from vibration there is apt to be serious damage resulting from the danger of explosion of unburnt gases in the exhaust manifold and pipe even to the extent of blowing off the muffler. If unburnt gas is pumped into the exhaust manifold and the exhaust pipe and then with the restoration of ignition these unburnt gases immediately explode, serious damage will result. My switch solves a problem wherein ex-

tre conditions must be met substantially within a brief period of less than a very small fraction of a second.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. A gravity actuated ignition cut-off switch for an engine driven vehicle having an ignition system, said switch comprising a container mountable on said vehicle and tiltable therewith, spaced electrical terminals attached to the bottom portion of said container and electrically insulated from each other for connection in said ignition system, current conducting fluid positioned in the bottom of said container and electrically bridging said spaced terminals when the engine driven vehicle is in an operating position, baffle means positioned in the bottom portion of said container to prevent washing of the current conducting fluid, said baffle and container providing at least three electrical paths through said current conducting fluid for bridging said contacts, said baffle having internal wall means extending thereacross defining one of said paths and having first and second external side walls respectively spaced from said container defining the other two of said paths.

2. A gravity actuated ignition cut-off switch for an engine driven vehicle having an ignition system, said switch comprising a container mountable on said vehicle and tiltable therewith, spaced electrical terminals attached to the bottom portion of said container and electrically insulated from each other for connection in said ignition system, current conducting fluid positioned in the bottom of said container and electrically bridging said spaced terminals when the engine driven vehicle is in an operating position, baffle means positioned in the bottom portion of said container to prevent washing of the current conducting fluid, said baffle and container defining an annular space with a transversely disposed passageway extending thereacross for the current conducting fluid to provide at least three electrical paths for bridging said contacts.

3. A gravity actuated ignition cut-off switch for an engine driven vehicle having an ignition system, said switch comprising a container of transparent material mountable on said vehicle and tiltable therewith, a baffle mounted in the bottom of the container, spaced electrical terminals mounted on the baffle and extending externally from the bottom of the container for connection in said ignition system, and current conducting fluid positioned in the bottom of said container and electrically bridging said spaced terminals when the engine driven vehicle is in an operating position, said baffle and container defining an annular space with a transversely disposed passageway extending thereacross for the current conducting fluid to provide at least three electrical paths for bridging said contacts.

4. A gravity actuated ignition cut-off switch for an engine driven vehicle having an ignition system, said switch comprising a container of transparent material mountable on said vehicle and tiltable therewith, a baffle mounted in the

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bottom of the container, spaced electrical terminals mounted on the baffle and extending externally from the bottom of the container for connection in said ignition system, and current conducting fluid positioned in the bottom of said container and electrically bridging said spaced terminals when the engine driven vehicle is in an operating position, said baffle and container defining an annular space for the current conducting fluid to surround the baffle, said baffle comprising at least two upright posts with a passageway therebetween and providing direct communication for the current conducting fluid to bridge said terminals, said posts having sides respectively spaced from the container and defining two additional paths for the current conducting fluid to bridge said terminals.

5. A switch comprising a container, spaced electrical terminals in said container, current conducting fluid in said container, and baffle means in combination with said container for providing at least three electrical paths through said current conducting fluid for bridging said contacts, said baffle having internal wall means extending thereacross defining one of said paths and having first and second external side walls respectively spaced from said container defining the other two of said paths.

6. A switch comprising a container, spaced electrical terminals in said container, current conducting fluid in said container, and baffle means comprising at least two upright posts with a passageway therebetween and providing direct communication for the current conducting fluid to bridge said terminals, said posts having sides respectively spaced from the container and defining two additional paths for the current conducting fluid to bridge said terminal.

7. A switch comprising a container, spaced electrical terminals in said container, current con-

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ducting fluid in said container, and baffle means comprising at least two upright posts with a passageway therebetween and providing direct communication for the current conducting fluid to bridge said terminals, said passageway having oppositely disposed wall surfaces with certain oppositely disposed portions thereof spaced farther apart than other portions, said posts having sides respectively spaced from the container and defining two additional paths for the current conducting fluid to bridge said terminals.

8. A switch comprising a container, spaced electrical terminals in said container, current conducting fluid in said container, and baffle means comprising at least two upright posts with a passageway therebetween and providing direct communication for the current conducting fluid to bridge said terminals, said passageway having oppositely disposed wall surfaces with the oppositely disposed wall portions at the entrance ends thereof spaced farther apart than the intermediate portions, said posts having sides respectively spaced from the container and defining two additional paths for the current conducting fluid to bridge said terminals.

KENNETH S. CLAPP.

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