March 25, 1958 A. DAVIDSON 2,828,382

IGNITION SYSTEM SAFETY SWITCH

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Fig. 1.

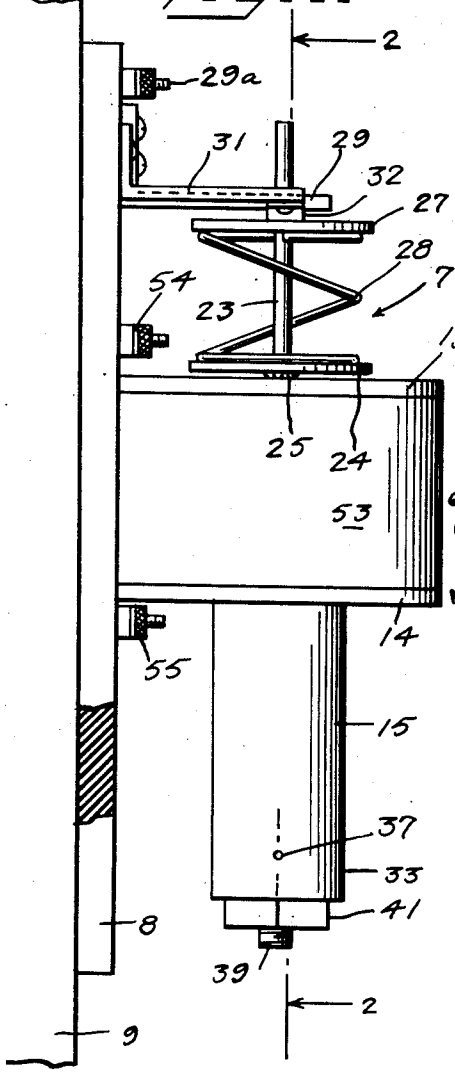
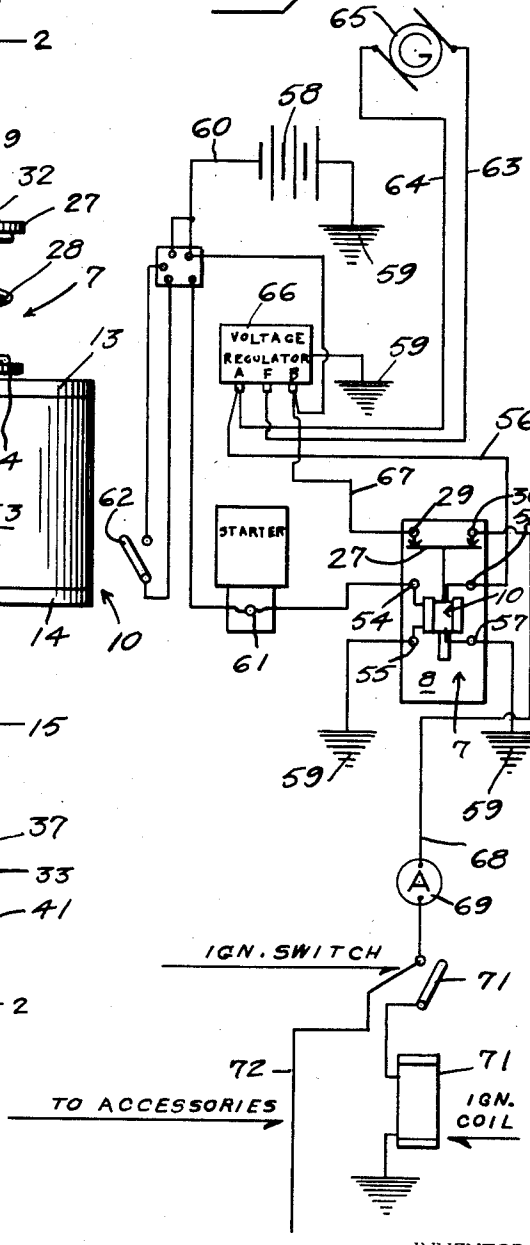


Fig. 3.



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FIG. 4

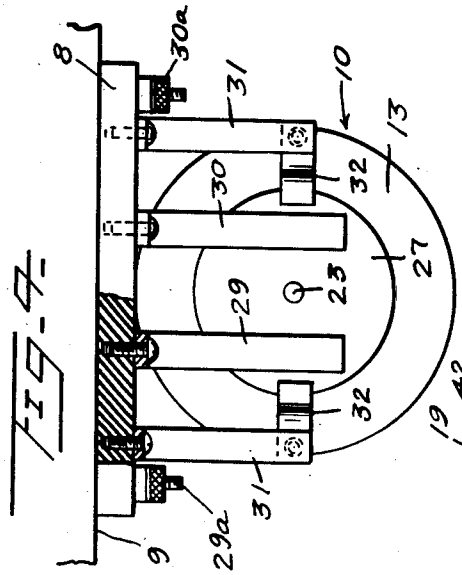


FIG. 5

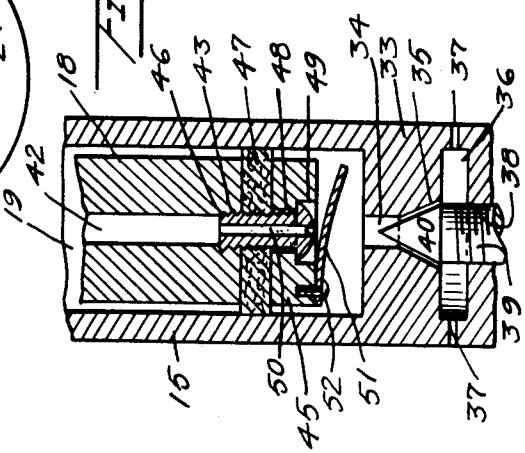
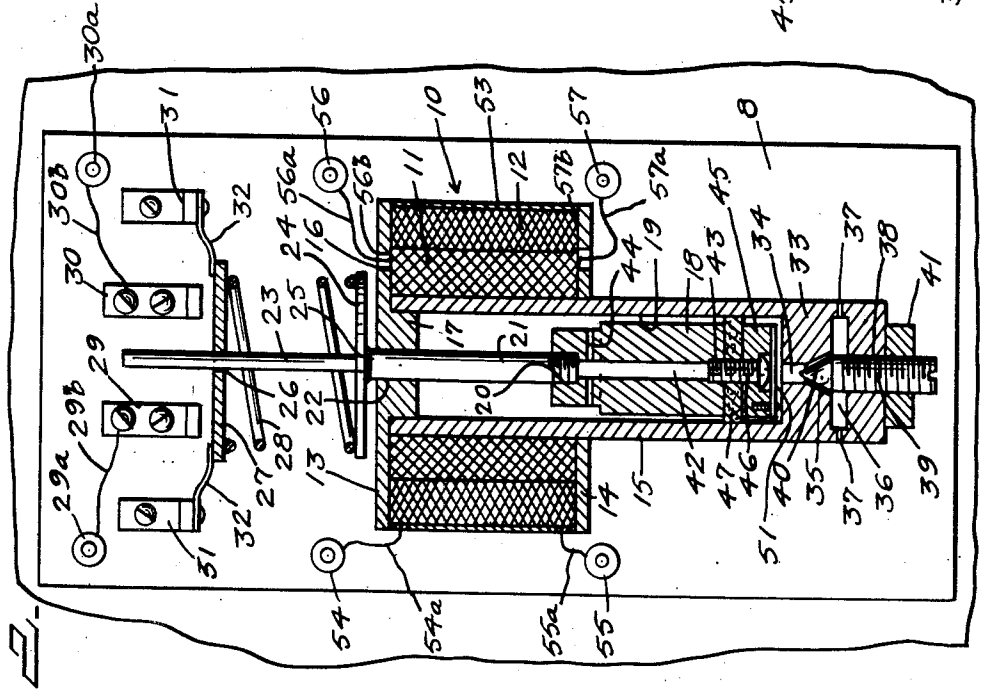


FIG. 2



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IGNITION SYSTEM SAFETY SWITCH

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Application February 13, 1956, Serial No. 565,149

2 Claims. (Cl. 200—97)

This invention relates to a safety switch for the ignition system of an engine and while primarily adapted for use in the ignition system of a motor vehicle engine, is equally well adapted for use with the ignition systems of other engines.

It is a primary object of the present invention to provide a safety switch which will function automatically to de-energize the ignition system and electrical accessories such as the lights, horn, radio and heater and similar electrical devices when the engine is not in operation or when the engine is left idling for a predetermined period of time.

More particularly, it is an object of the present invention to provide a novel switch which will effectively function to shut off an engine which is inadvertently left running at an idling speed at the same time that the switch disconnects the electrical accessories associated with the vehicle, to thus provide a safety switch which will not only eliminate the discharging of a battery due to electrically energized parts being left energized but which will additionally prevent possible loss of life due to carbon monoxide gases and which frequently occurs where vehicle engines are left operating.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view of the safety switch;

Figure 2 is a longitudinal sectional view thereof, taken substantially along a plane as indicated by the line 2—2 of Figure 1;

Figure 3 is a diagrammatic view of a part of an engine ignition system showing the safety switch interposed therein;

Figure 4 is a top plan view, partly in section, of the safety switch, and

Figure 5 is a fragmentary vertical sectional view on an enlarged scale of a portion of the safety switch and showing a different position of certain of the parts thereof from the positions of said parts as seen in Figure 2.

Referring more specifically to the drawings, the safety switch in its entirety and comprising the invention is designated generally 7 and includes a substantially flat base member or panel 8 which is formed of electrical insulating material and which is adapted to be secured to any suitable supporting surface 9, as for example the forward side of the fire wall of a motor vehicle.

The base or panel 8 is of elongated shape and an electromagnet, designated generally 10, is suitably secured to an outer side or face of said base 8 and intermediate of the ends thereof. The electromagnet 10 includes an inner winding 11 and an outer winding 12. The ends of the windings 11 and 12 are disposed between a disk-like head 13 and an annular end member 14. Said members 13 and 14 are formed of electrical conducting material. A guide sleeve 15 has an end portion extending through the open center of the end member 14 and through the inner winding 11 and which terminates in

an open end 16 into which extends a central boss 17 of the head 13. The guide sleeve 15 is likewise formed of an electrical conducting material. The electromagnet 10 also includes a core 18, formed of soft iron or a similar material, which is slidably disposed in the bore 19 of the sleeve 15. The core 18 has a threaded recess 20 opening outwardly of an inner end thereof in which is threadedly secured an end of a stem 21, which projects from said core end slidably through a central opening 22 of the central portion 17 of the head 13.

Beyond the head 13, the stem 21 is provided with an end part 23 of reduced diameter on which is mounted a disk or washer 24, forming a spring stop and which seats against the shoulder 25 of the stem 21 formed by the restricted stem portion 23. The stem portion 23, beyond the spring stop 24, extends slidably through a central opening 26 of a disk or washer 27 which forms an electrical conductor bridge. A coiled compression spring 28 is disposed between the spring stop 24 and the bridge 27. A pair of spaced electrical contacts 29 and 30 are suitably secured to and project outwardly from said aforementioned side of the base 8, adjacent one end thereof. The contacts 29 and 30 are disposed beyond the bridge 27 and in transverse alignment relative to one another. Said contacts 29 and 30 are electrically connected to spaced contact posts 29*a* and 30*a*, respectively, by electrical conductor wires 29*b* and 30*b*, respectively. The posts 29*a* and 30*a* are likewise secured to and project from said side of the base 8. A pair of brackets 31 are suitably secured to said base side, laterally outward with respect to the contacts 29 and 30. The brackets 31 support a pair of leaf springs 32 having inwardly extending free ends which bear against the side of the bridge 27, disposed remote from the spring 28, and which normally urge the conductor bridge 27 toward the electromagnet 10 and out of engagement with the contacts 29 and 30.

As best seen in Figures 2 and 5, the bore 19 does not extend to the other end of the sleeve 15 so that said sleeve includes an end portion 33, disposed remote from the electromagnet 10, which has a restricted port 34 opening into the bore 19 and having an opposite end communicating with the restricted end of a frusto-conical valve seat 35. The opposite end of the valve seat 35 opens into a chamber 36 which is provided with one or more restricted ports 37 which open laterally outwardly of the part 33. The chamber 36 may be formed in the part 33 in any suitable manner as by a cut made laterally into said part, after which the chamber 36 can be closed except for its connection with the valve seat 35 and a threaded bore 38. The ports 37 can then be drilled. The bore 38 is internally threaded and communicates with the chamber 36 and aligns with the valve seat 35. A needle valve 39 is threaded inwardly through the bore 38 and has an unthreaded conical inner end 40 which extends into the valve seat 35 and which is adjustable relative thereto and normally disposed so that a slight clearance exists between the wall of the valve seat 35 and the conical needle valve end 40, as seen in Figures 2 and 5. A jamb nut 41 is preferably threaded on the outer end of the needle valve 39 and abuts against the outer end of the portion 33 to maintain the needle valve in selected adjusted positions.

A bore 42 extends longitudinally through the core 18 and has an enlarged threaded end 43 disposed remote from the recess 20. The core 18 is also provided with one or more lateral passages 44 which open laterally outwardly thereof and into the bore 42, adjacent the inner end of the core which is provided with the recess 20. A relatively thick rigid disk 45 is disposed in the bore 19 beyond the outer end of the core 18 and is connected to the core by a headed screw 46 which extends loosely through the retaining member 45 and threaded engages in the threaded

bore end 43. A sealing member or washer 47, formed of felt or the like, is disposed between the retaining member 45 and the outer end of the core 18 and is clamped between said parts by tightening of the screw 46, which extends centrally through the sealing member 47. The sealing member 47 is slightly larger in diameter than the core 18 and retaining member 45 so that its periphery has a close fitting working engagement with the wall of the bore 19, as seen in Figures 2 and 5.

As best seen in Figure 5, the screw 46 extends loosely through a central opening 48 of the retaining member 45. Said opening 48 has an enlarged outer end 49 in which the head of the screw 46 is countersunk. The screw 46 has a bore 50 extending longitudinally therethrough the inner end of which communicates with the bore 42 and the outer end of which communicates with the bore 19 adjacent the port 34. A flap valve 51, which is preferably substantially disk shaped, is secured adjacent a peripheral portion thereof by a screw 52 to the outer face of the retaining member 45. The flap valve 51 normally assumes a position against the outer face of the retaining member 45 to seal the outer end of the opening 49 and the outer end of the bore 50. However, said flap valve 51 is capable of flexing away from the retaining member 45 to an open position as illustrated in Figure 5 from its normal position of Figure 2.

A cylindrical housing member 53, of electrical insulating material, may surround the outer winding 12 of the electromagnet 10. A pair of contact posts 54 and 55 are secured to and project from the front face of the base 8, preferably at one side of the electromagnet 10, and are connected to the outer winding 12 by conductor wires 54*a* and 55*a*, respectively, which extend through the housing member 53. A similar pair of contact posts 56 and 57 are mounted on the front face of the base 8, preferably at the opposite side of the electromagnet 10, and are connected to the inner winding 11 by conductor wires 56*a* and 57*a*, respectively, which extend through openings 56*b* and 57*b*, respectively, formed in the members 13 and 14, as seen in Figure 2.

For the purpose of illustrating a preferred application and use of the safety switch 7, said switch has been illustrated in Figure 3 in a portion of an ignition circuit of a motor vehicle, only a part of which has been shown. The ignition circuit portion as illustrated includes a storage battery 58 which is grounded in the conventional manner as at 59 to the vehicle frame. A conductor 60 leads from the other terminal of the battery 58 to a contact post 61 of the electric starter and thence to the contact post 54. The starter switch or button 62 is suitably interposed in the conductor wire 60. The contact post 55 is grounded to the vehicle frame, as seen at 59, as is also the contact post 57. Conductor wires 63 and 64 connect the posts of the ignition system generator 65 to the posts F and A, respectively, of a conventional voltage regulator 66. The conductor wire 64 continues on from the voltage regulator post A and is connected to the contact post 56. A conductor wire 67 leads from the contact post B of the voltage regulator to the contact post 29*a* and is thus connected to the switch contact 29. A conductor 63, which is connected to the contact post 30*a* and thus to the switch contact 30, extends through the vehicle ammeter 69 and ignition switch 70 and to the grounded ignition coil 71, and has a branch conductor 72 leading to various electrical accessories of the vehicle, not shown, such as the lights, horn, radio and heater, each of which is likewise grounded to the vehicle frame.

The spring 28 will normally hold the core 18 in its position of Figure 2 and the leaf springs 32 will maintain the conductor bridge 27 out of engagement with the switch contacts 29 and 30 when the spring 28 is thus substantially unloaded, so that the electrical connection will be broken between the conductor wires 67 and 68 to prevent current being supplied to the ignition, ignition coil or the electrical accessories. Accordingly, these elements cannot drain current from the storage battery 58.

To start an engine to which the ignition system is connected, the ignition switch 70 is initially closed even though no current is being supplied thereto and to the ignition coil. The starter button or switch 62 is then closed to supply current to the starter. As the wire 60 which supplies current to the starter from the battery 58 is grounded through the post 54, outer winding 12 and post 55, when the starter motor is energized, the outer winding 12 of the electromagnet will also be energized and the core 18 will be drawn toward the head 13 and within the bore of the guide sleeve 15, which is formed of an electrical conducting material. The stem 21, 23 will move upwardly with the core 18, as seen in Figure 2, carrying with it the spring stop 24. The spring 28 will be compressed between the stop 24 and bridge 27 sufficiently to overcome the strength of the leaf springs 32 so that the loaded spring 28 will force the bridge 27 against the contacts 29 and 30 to supply current to the vehicle ignition and electrical accessories through the conductor wires 68 and 72. During this upward movement of the core 18, air in the bore 19 between the core 18 and head 13 will enter the core bore 42 through the passages 44 and will pass through the bore 50 to unseat the flap valve 51, as illustrated in Figure 5, to vent the chamber of the bore located between the core 18 and the part 33, so that upward movement of the core 18 when the electromagnet 10 is energized will not be impeded to enable the bridge 27 to promptly form an electrical connection between the contacts 29 and 30. Sufficient clearance also exists between the bore 22 and stem 21 for venting the portion of the bore 19 located between the head 13 and core 18. The winding 12 may be of heavier wire than the winding 11 to insure that the core 18 will be magnetized when current is passed through the winding 12 by closing of the starter switch 62.

Upon starting of the engine and opening of the starter switch 62, electric current will be supplied from the generator 65 through the wire 56 to the inner winding 11 to maintain the core 18 magnetized to hold the bridge 27 in engagement with the contacts 29 and 30. The flap valve 51 will return to its closed position as seen in Figure 2 when the core 18 has ceased to move toward the head 13. Accordingly, if the engine is permitted to idle so that the generator 65 does not charge, the loaded spring 28 will tend to force the stem 21, 23 and the core 18 downwardly as seen in Figure 2. However, the closed valve 51 will prevent air from escaping from beneath the core 18 to above said core in the bore 19, through the bores 50 and 42, and the sealing washer 47 will prevent air escaping through the bore 19 around the core 18. Accordingly, the parts as shown in the bottom of Figure 2 and in Figure 5 function as a dashpot to effectively regulate the speed of movement of the core 18 away from the head 13, governed by the rate of escape of air from beneath the core 18 between the valve seat 35 and the needle valve end 40. Thus, a sufficient period of time will elapse after the core 18 is demagnetized before the spring 28 can become sufficiently unloaded to permit the leaf springs 32 to disengage the bridge 27 from the contacts 29 and 30. This time interval can be varied by adjustment of the valve end 40 relative to the valve seat 35 so that a normal idling period of a vehicle engine, as for example when stopping in traffic, will not result in disconnecting the ignition system and electrical accessories from the storage battery. However, if the vehicle engine is inadvertently left idling, the operation thereof will be stopped after a reasonable period of time by return of the core 18 to its position of Figure 2. Thus, the possibilty of a person being killed by carbon monoxide gases from an engine is eliminated. Additionally, it will be apparent that when the engine is shut off by opening of the ignition switch 70, that the electrical accessories will be disconnected from the storage battery after the

normal period of time required for the parts to resume their positions of Figure 2. This will likewise occur if operation of the engine is interrupted without opening of the ignition switch.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A safety switch of the character described comprising an electromagnet, a pair of electrical contacts, means supporting said contacts in spaced apart electrically insulated relation to one another and to the electromagnet and in a position toward which the core of the electromagnet is movable when magnetized, a bridge member of electrical conducting material, means connecting said bridge member to said core for movement of the bridge member into engagement with said electrical contacts when the core is magnetized, said means connecting the core to the conductor bridge comprising a stem connected to and projecting from the core toward said spaced contacts and extending slidably through said conductor bridge, a spring stop secured to said stem between the core and conductor bridge, and a compression spring interposed between the conductor bridge and spring stop and loaded by movement of the spring stop toward said spaced contacts for displacing the conductor bridge into engagement with the contacts when the core is magnetized and for displacing the core away from said spaced contacts, when the core is demagnetized, and spring means bearing against said conductor bridge for moving the conductor bridge out of engagement with the spaced contacts when the tension on the compression spring is diminished by movement of the demagnetized core away from said contacts.

2. A safety switch as in claim 1, a dashpot for retarding movement of the demagnetized core under the biasing action of the compression spring, said dashpot including a sleeve having a bore in which the core is slidably disposed, said sleeve having a restricted port opening to the atmosphere at an end of the sleeve disposed remote from said spaced contacts, a manually actuated valve regulating said port, sealing means carried by the core and engaging the wall of said bore to prevent the escape of air through the bore around the core, said core having an air passage extending therethrough and opening into the bore on opposite sides of said sealing means, and a check valve associated with said air passage and carried by the core to permit air to pass freely through the core and into the bore adjacent said restricted port and valve and preventing the passage of air through said passage in the opposite direction.

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