April 12, 1949. F. W. MURPHY ET AL 2,467,333

AUTOMATIC SAFETY IGNITION SWITCH

Filed Aug. 18, 1947

Fig. 1.

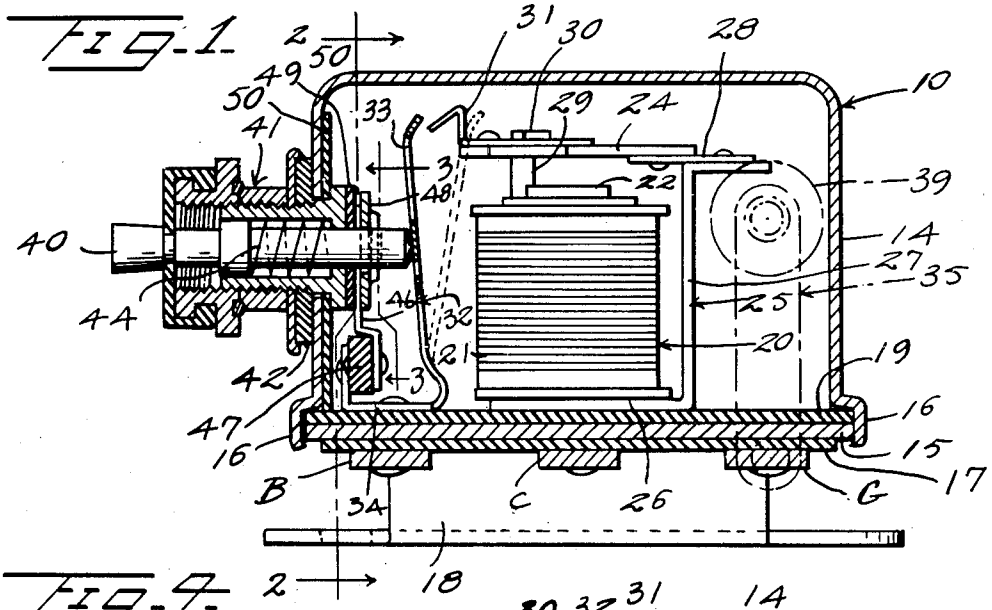


Fig. 4.

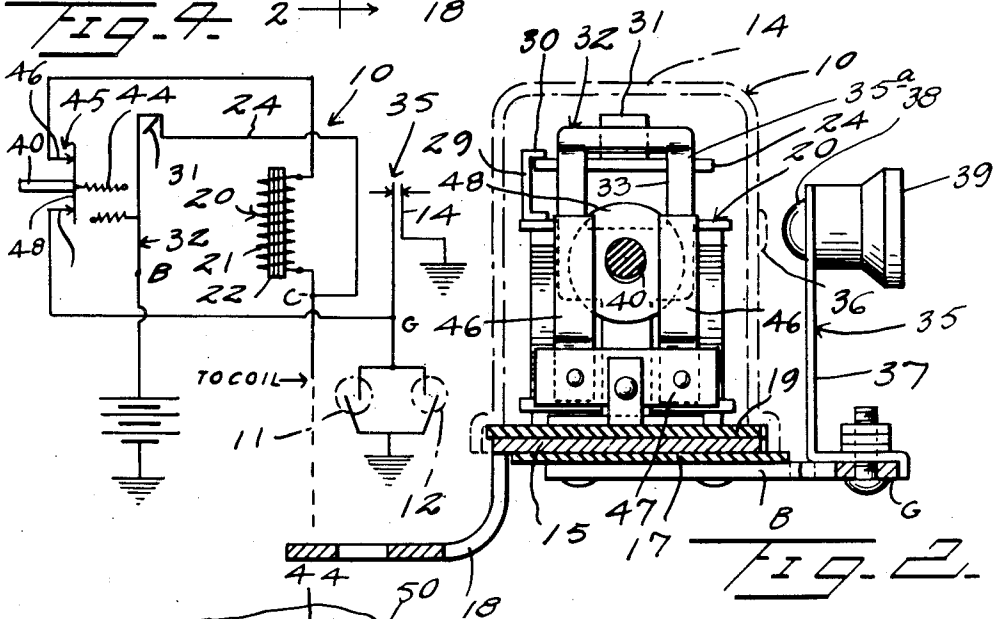
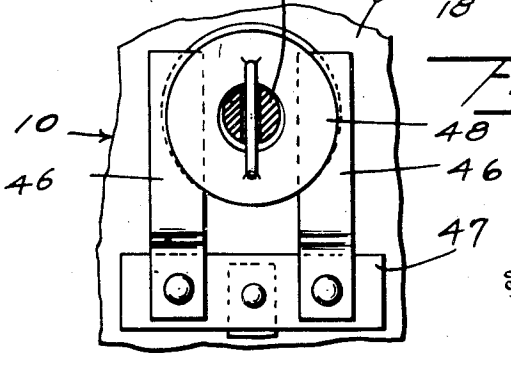


Fig. 2.

Fig. 3.



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AUTOMATIC SAFETY IGNITION SWITCH

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2 Claims. (Cl. 200—87)

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This invention relates to switches for automatically breaking the ignition circuit of an internal combustion engine or the like when the oil pressure drops to a predetermined low point, when the engine temperature rises to a determined high point, or when it is desired to manually shut down the engine by breaking the ignition circuit.

This switch is designed primarily for use on large internal combustion engines which are operated for long periods of time such as at power plants, pumping stations and the like where a single operator may supervise a number of engines or where the engines are run with little or no attention for prolonged periods of time. Such engines are apt to develop troubles which are not readily noted by the attendant and which would be exaggerated by the continued operation of the engine. As most all engine failures are noted either by a drop of oil pressure or by a rise of the temperature, suitable switches responsive to these engine failure symtoms are connected into the engine ignition circuit for breaking the ignition circuit upon the arising of excessive determined conditions of either the oil pressure or engine temperature. As it is not desirable that these symptom responsive switches be connected directly in the ignition circuit, it is an object of this invention to provide a switch in the ignition circuit upon which the pressure and temperature switches act as relays for breaking the ignition circuit.

Another object of this invention is to provide a safety cut-off switch of the kind to be more particularly described hereinafter, having a switch with an electro-magnetic operator for opening the switch, a manual reset button for closing the switch when once opened, the reset button also opening the circuit to the electro-magnetic switch operator when the button is being pushed to reset position so that the operator will not be biasing the switch open at the same time the button is trying to close the switch.

Still another object of this invention is to provide a switch of this kind having a manually operable switch connected substantially in parallel to the relays for manually closing the switch operator circuit when it is desired to stop the engine with the temperature and pressure relay switches in the open or normal position.

With the above and other objects in view, our invention consists in the arrangement, combination and details of construction disclosed in the

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drawings and specification, and then more particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a longitudinal section through an ignition safety cut-off switch constructed according to an embodiment of our invention,

Figure 2 is a transverse section taken on the line 2—2 of Figure 1,

Figure 3 is a fragmentary transverse section, partly broken away, taken on the line 3—3 of Figure 1; and

Figure 4 is a diagrammatic wiring diagram of the circuits through the switch.

Referring to the drawings, the numeral 10 designates generally a switch connected in the ignition circuit of an internal combustion engine which is connected to a pressure responsive switch 11 and a temperature responsive switch 12 for breaking the ignition circuit when the oil pressure switch 11 or engine temperature switch 12 is closed.

The safety switch 10 is formed of a housing 14 which is open, as at the bottom. A base plate 15 is provided for closing the bottom of the housing 14 and enclosing the switch operating parts therein. The housing 14 is fixed to the base plate 15 by downwardly extending lugs or ears 16 on each end of the housing 14 which are adapted to be crimped over the end edges of the plate 15 or secured by other suitable attaching means.

Three terminals, B, C, and G are carried on the lower side of the plate 15, which provide the terminals for the switch 10, for nnecting the switch 10 in the ignition coil circuit and to the pressure and temperature switches 11 and 12. The terminals B, C, and G are insulated from each other and from the base plate 15 by a strip 17 of insulating material fixed between the base and the terminals. An L-shaped attaching or mounting bracket 18 is fixed to or formed on one edge of the base plate 15 for mounting the switch 10 on a suitable panel and the cover or housing 14 may be removed while the base 15 is secured to the panel.

A second strip of insulating material 19 is fixed on the upper side of the base plate 15 for insulating the inner parts of the switch 10 therefrom.

An electro-magnet 20 is fixed on the base 15 substantially in the center thereof. The electro-magnet 20 includes a coil 21 about a core 22 in the conventional form of such magnets. An armature 24 is associated with the magnet 20 and is adapted to be drawn toward the end of

the core 22 when the coil 21 is energized. The armature 24 is supported above the electro-magnet 20 by L-shaped supporting bracket 25. The lower horizontal arm 26 of the bracket 25 is fixed above the insulating strip 19 on the base 15. The bracket 25 is made of metal or conductive material and is adapted to provide a part of the ignition circuit. The vertical arm 27 of the bracket 25 extends alongside the magnet 20 and slightly above the upper end. A flat spring 28 is fixed at one end to the upper end of the arm 27 of the bracket 25, and the armature 24 is fixed on the other end of the spring 28 so the armature is resiliently carried by the bracket 25 above the core 22 of the coil 21, the armature being biased upwardly by the spring 28. A stop member 29 is carried by the upper end of the electromagnet 20 and is formed with a horizontal upper arm 30. The upper side of the armature 24 is adapted to engage the lower side of the arm 30 for limiting the upward movement of the armature caused by the spring 28.

A hook or latch 31 is carried by the free end of the armature 24 and is bevelled or formed with a downwardly and outwardly inclined terminal end over which a latch is adapted to slide.

A latch 32 is carried by the base 15 above the insulating strip 19 adjacent the electro-magnet 20 opposite from the bracket 25 and adjacent the free end of the armature 24. The keeper 32 is formed of an L-shaped length of flat resilient metal. The lower arm 34 is fixed to the plate 15 and the vertical arm 35*a* is formed with a rectangular opening 33 adjacent the upper end thereof. The extreme upper end of the latch 32 is inclined upwardly and inwardly toward the hook 31 on the armature 24. The latch 32 is biased outwardly away from the armature 24 and the hook 31 is adapted for engagement into the opening 33 so the hook will engage the extreme upper end of the latch 32 for connecting the keeper and armature in hooked relation. The spring 28 biases the armature to hooked or keeper engaged relation and the electro-magnet, when energized, draws the armature downward, so the biased latch is spring-pressed away from the armature in a direct breaking position.

The ignition circuit of an engine is to be connected through the latch 32 and armature 24. The keeper 32 is connected by suitable circuit connecting means to the terminal B of the switch 10 which, in turn, is adapted to be connected to the hot lead of the battery for the engine. The bracket 25 is connected by suitable circuit connecting means to the terminal C of the switch 10, which terminal C, in turn, is adapted to be connected to the ignition coil of the engine. The ignition circuit then is completed through the terminal B, latch 32, armature 24, bracket 25 and terminal C. When the latch is out of engagement with the armature 24, the ignition circuit is opened and the engine will stop.

For stopping the engine automatically when abnormal running conditions arise, a normally open pressure responsive switch 12 and temperature responsive switch 11 are provided for connection to the electro-magnet 20. The switches or relays 11 and 12 are adapted to be closed when the engine temperature or oil pressure rise or drop respectively to a predetermined value. One side of each of the switches 11 and 12 is adapted to be connected to the battery ground and the other side to the terminal G of the switch 10. One end of the coil 21 is connected to the G terminal and the other end to the ignition circuit hot lead at C, so that the electro-magnet circuit will be completed or closed by the switches 11 and/or 12 being closed due to an abnormal engine condition. When the electro-magnet is energized the armature 24 is drawn down to release the latch 32 so that both the engine ignition circuit and the electro-magnet circuit will be open or broken to stop the engine and cut the battery out of both circuits.

For grounding the electro-magnet circuit manually to stop the engine, a switch 35 is provided which is carried by the switch 10. As the housing 14 is grounded through the base 15 and bracket 18, a contact member carried by the terminal G, when engaged with the housing 14 will ground the electro-magnet circuit parallel to the switches 11 and 12 for breaking the ignition circuit. A fixed contact 36 is carried by the housing 14, and a resilient arm 37 carried by the G terminal carries a correlated contact 38. An insulated knob 39 is fixed on the upper end of the arm 37 so an engineer may manually close the switch 35 by pressing the contact 38 into engagement with the contact 36.

A spring-pressed reset button 40 is carried by the housing 14 adjacent the latch 32. The reset button 40 is made of insulating material and is slidable through the end wall of the housing 14. The reset button 40 is insulated from the housing 14 and the adapter fittings or bearings 41 for slidably supporting the button 40 are also insulated as by the grommet 42. A spring 44 is carried by the fittings 41 for biasing the reset button outwardly to an idle or free position.

The inner end of the reset button 40 is engageable with the latch 32 below the opening 33 therein for pressing the latch inwardly for engagement with the armature 24. The button 40 is rod-like in shape to extend completely through the fittings 41, spring 44 and wall of the housing 14.

It is obviously desirable and sometimes necessary to open the circuit of the electro-magnet 20 while the ignition circuit is being reset. Rather than provide a separate switch and separate switch operator for this purpose, the switch 10 is designed so that pressing the button 40 in to reset the electromagnet circuit is opened simultaneously and remains open until the button 40 is released to its normal extended position. A switch 45 is associated with and operated by the reset button 40. A pair of metal contact strips 46 are carried by the base 15 on opposite sides of the button 40 within the housing 14. The strips or contacts 46 are fixed on an upturned end of the arm 34 and insulated therefrom by an insulating block 47. One contract 46 is connected to the ground terminal G, and the other contact 46 is connected to the free or ground end of the coil 21 of the electro-magnet 20. A bridging member 48 is fixed on the extreme inner end of the button or rod 40 and is biased by the spring 44 into normal contact with the contact members 46 for normally closing the ground connection of the coil 20. When the button 40 is pressed inwardly to reset the keeper into engagement with the armature 24, the bridging connector 48 is moved away from the contact strips to open the circuit to the electro-magnet irrespective of the positions of the switches 11, 12 and 35. The contacts 46 are insulated from the bearing 41 by an insulating washer 49 and the inner flanged end of the bearings 41 is insulated by an insulating sheet 50.

We do not mean to confine ourselves to the exact details of construction herein disclosed, but claim

all variations falling within the purview of the appended claims.

What we claim is:

1. An automatic safety ignition switch comprising a base plate, a battery terminal post on said base insulated therefrom, an insulated coil terminal post on said base, a ground terminal post on said base insulated therefrom, an electromagnet fixed on said base including a core and windings thereabout, a spring-pressed armature above said core biased out of engagement with said core, a cover for said switch fixed on said base, a resilent latch carried by said base and adapted when in set position to engage said armature to close the ignition circuit, an outwardly spring-pressed reset button slidably supported on said cover and extending therethrough engageable with said latch member, a pair of contact members carried by said base within said cover on opposite sides of said reset button, a bridging member carried by said button for connecting said contact members in the normal spring-pressed position of said reset button, circuit connecting means between one of said contact members and said ground post, the other contact

member and one end of said winding, the other end of said winding and said coil terminal post, said coil terminal post and said armature, and between said latch member and said battery contact post whereby said latch will become disengaged from said armature upon initial grounding of said ground contact post.

2. An automatic safety ignition switch as set forth in claim 1, including a manually operable resilient contact member carried by said ground terminal post engageable with said cover for grounding the switch.

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