April 30, 1929. M. MACKIE 1,710,884

SWITCH

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Fig. 1.

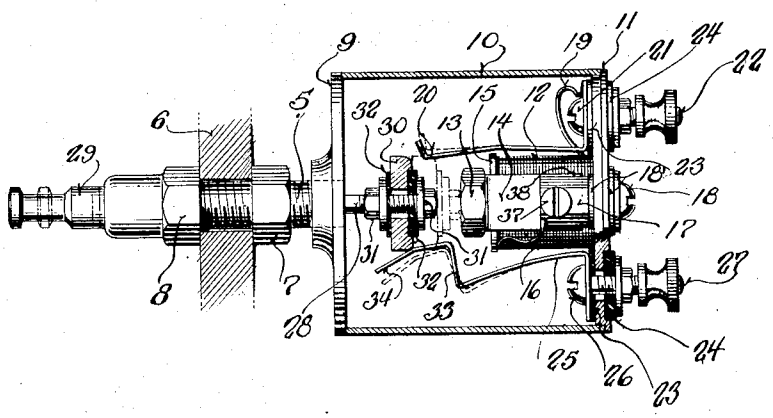
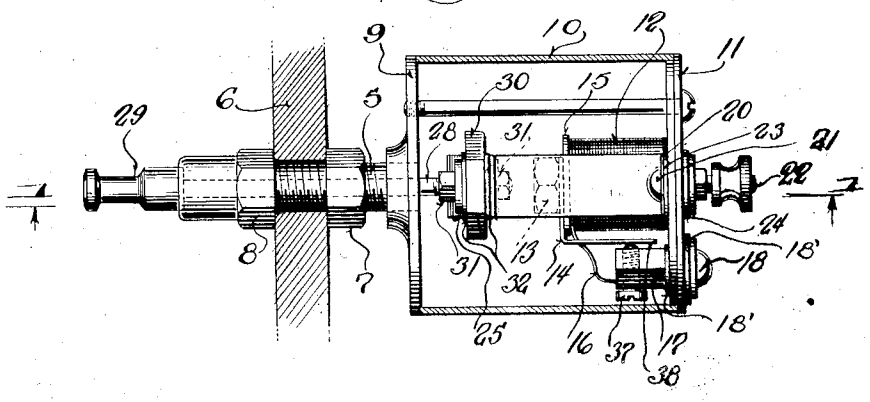


Fig. 2.



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Fig. 3.

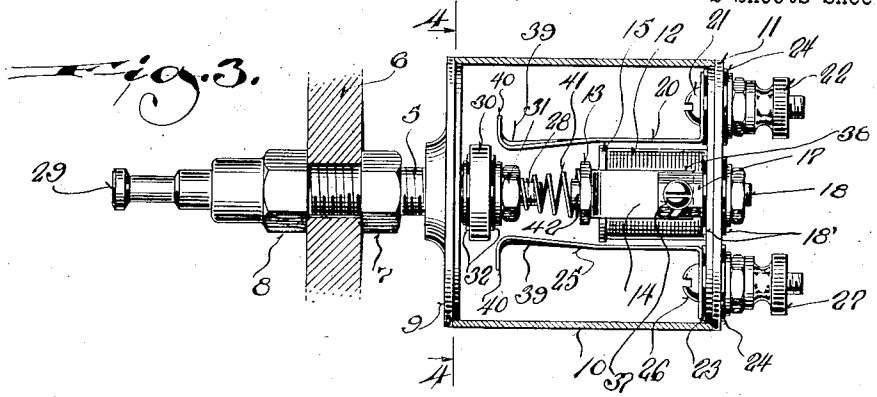


Fig. 4.

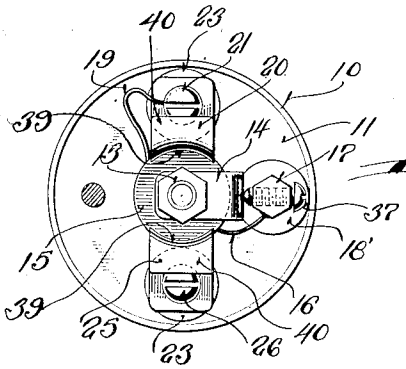
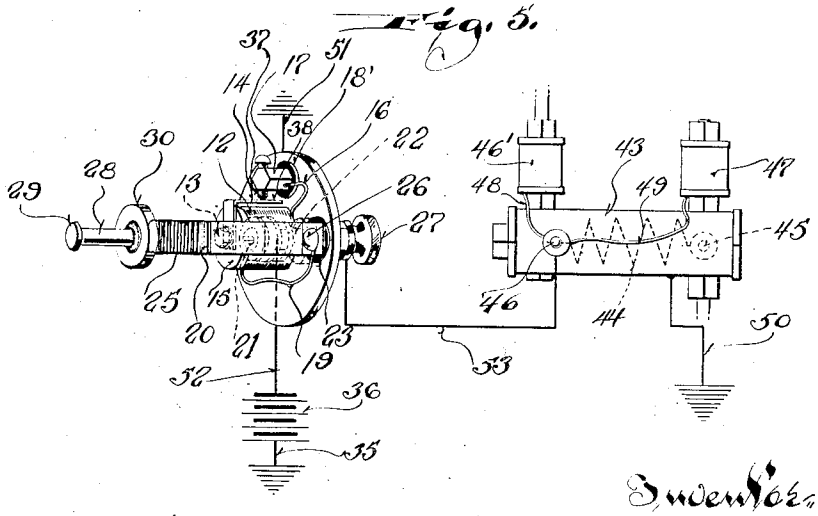


Fig. 5.



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Patented Apr. 30, 1929. 1,710,884

UNITED STATES PATENT OFFICE.

MITCHELL MACKIE, OF WAUKESHA, WISCONSIN.

SWITCH.

Application filed February 1, 1924. Serial No. 690,064.

This invention relates to certain new and useful improvements in switches and refers more particularly to a switch adapted for use in connection with devices of that nature including an electrical circuit adapted to be closed for a predetermined period of time.

It is one of the objects of this invention to provide a switch adapted to be used in connection with an electrically controlled, internal combustion engine, priming device, or any other type of device necessitating the closing of an electrical circuit for a predetermined period having means for automatically opening the circuit after the predetermined period of time has elapsed.

Another object of this invention resides in a switch of the character described having means permitting the ready adjustment of the time element thereof.

This invention has for another of its objects to provide a switch of the character described having a coil shunted across the circuit thereof and exerting a magnetic pull on the movable contact to secure the same in switch closing position, said coil providing means for opening the circuit after a predetermined time to permit the opening movement of the switch.

A further object of this invention resides in the provision of a switch structure of the character described having a movable and a substantially stationary contact, the stationary contact normally tending to urge the movable contact to switch opening position.

It is a further object of this invention to provide a switch of the character described having broad contact making surfaces.

And a still further object of this invention resides in the provision of a timing switch of the character described which is so constructed and designed as to insure the quick breaking of the circuits to reduce arcing at the contacts to a minimum, and which is fully protected and enclosed by a strong casing supported by a threaded post to facilitate its ready application to the dash board of a vehicle or any other place

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated two complete examples of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of a switch embodying my invention, said view being taken on the plane of the line 1—1 of Figure 2 and parts thereof being broken away and in section to illustrate structural details;

Figure 2 is a view similar to Figure 1 of another side of the switch;

Figure 3 is a view similar to Figure 1 of a slightly modified switch construction;

Figure 4 is a view taken transversely through Figure 3 on the plane of the line 4—4, and

Figure 5 is a diagrammatic view illustrating the manner of wiring my improved switch.

Referring now more particularly to the accompanying drawings in which like numerals designate like parts throughout the several views; the numeral 5 designates an externally threaded, tubular post or bolt adapted to be secured to a suitable support 6, such as the dash board of an automotive vehicle by clamping nuts 7 and 8, and having the inner end or cover 9 of a cylinder or casing 10 secured thereto.

The outer end of the cylinder is closed by a plate or cover 11 on which is centrally mounted a coil 12 having a core 13 preferably in the form of a cap screw threaded in the plate and having one end of a thermostatic member 14 confined between its head and the adjacent spool end 15 of the coil. One end 16 of the coil 12 is electrically connected with a post 17 secured to plate 11 by a screw or other means 18, the post being insulated from the plate by suitable washers 18'. The other end 19 of the coil is electrically connected with a substantially fixed contact 20, now about to be described.

Contact 20 is preferably formed from a strip of resilient metal having its lower end directed laterally and secured to plate 11 by a screw 21 which extends through the plate and provides a contact terminal 22. The lower end of the contact 20 is insulated from plate 11 by a washer or disc 23 of insulating material and screw 21 is insulated from the

plate by disc 23 and a second insulating disc 24, in the manner illustrated in Figure 1 in connection with contact blade 25, now to be described. Contact blade 25 is preferably formed of resilient material and has its lower end directed laterally and secured to plate 11 by a screw 26 which extends through the plate and provides a contact terminal 27. Washers 23 and 24 provide the means for insulating contact 25 from the plate 11.

A center pin or actuating rod 28 is slidably mounted in the tubular post 5 with its ends extended therebeyond and has a control button 29 on its outer end and a movable contact member 30 on its inner end disposed within cylinder 10. In Figures 1 and 2, contact member 30 is of a hexagon shape providing a plurality of opposed flat contact surfaces and is secured to the inner end of the rod 28 by opposed binding nuts 31, the contact member being insulated from rod 28 by washers 32. In that form of my invention illustrated in Figure 1, contact 25 is directed inwardly at a point adjacent the head of the core 13, as at 33, and then upwardly and slightly outwardly, as at 34, to provide a spring extending beyond the end of the contact blade 20 and adapted to yieldably exert a pressure against contact 30 to hold the same out of engagement with contact 20.

The thermostatic member 14 is electrically connected with the plate 11 through the magnetic coil core 13, to electrically connect the end 16 of the coil with the negative side of the battery or other source of electrical energy 36 which is grounded to the frame of the vehicle, as at 35. The free end 38 of the thermostatic member 14 normally engages the adjustable contact 37 carried by the post. The member 14 is preferably in the form of a bimetallic strip, one metal of which has a higher coefficient of expansion than the other, and is so disposed that the metal having the lower coefficient of expansion is adjacent the coil so that expansion of the member, through the influence of heat generated by coil 12, produces an inward movement of the free end 38 of the thermostatic member to break the electrical connection between it and the contact 37. As will be readily obvious, the time element of the switch may be readily adjusted by varying the pressure exerted on the free end 38 of the thermostatic member by the adjustable contact 37, when the coil is deenergized.

In that form of my invention illustrated in Figures 3 and 4, contact member 30 is of circular form to provide an unbroken contact surface and the contacts 20 and 25 have their outer end portions curved, as at 38, to conform with the circumference of the member 30 and the extreme outer ends 40 thereof are directed laterally to provide guides to insure the passage therebetween of the member 30. As best shown in Figure 3, the contact members have their outer free ends directed inwardly to produce a spring pressure on the member 30 and insure a positive electrical connection between the member 30 and the contacts 20 and 25.

The member 30 is normally urged to an inoperative position by an expansible spring 41 confined between the adjacent ends of the core 13 and the pin 28, the head of the core being preferably provided with a tit or boss 42 and the pin 28 extended beyond the clamp nut 31 to receive the adjacent ends of the spring. With the exception of the minor changes above described, the construction illustrated in Figures 3 and 4 is substantially identical with that illustrated in Figures 1 and 2, and, therefore, further description of that form of my invention depicted in Figures 3 and 4 is deemed unnecessary.

The improved switch depicted in the drawings and described above may be used with various appliances and devices and in Figure 5 I have illustrated its application in connection with an initial starting device for an internal combustion engine of that type described in my copending application Serial No. 647,635. This type of device broadly comprises a cylinder 43 having a heating element 44 mounted therein with one end grounded to the cylinder 43 by a securing screw 45 and the other end of which is insulated from the casing and provided with a terminal 46. The inlet and outlet of the cylinder are normally closed when the engine is running and the device thus rendered inoperative, and the inlet and outlet are held open, when the switch device is actuated, by means of magnetic coils, not shown, enclosed with casings 46′ and 47, these coils having one end grounded to the instrument and their other ends connected with the terminal 46 by leads 48 and 49, respectively.

The circuit illustrated in Figure 5 being of the single wire type, the casing 43 is grounded, as at 50, and the plate 11 is grounded, as at 51, the negative side 35 of the battery or source of electrical energy 36 being grounded as previously described. The positive side of the battery 36 is connected with the terminal 22 of the contact 20 by a conductor 52 and the contact 25 is connected with the terminal 46 of the instrument 43 by a conductor 53. With this wiring, the coil 12 and the instrument 43 are in parallel and their circuits are initially closed at the contacts 20 and 25.

To operate the device, button 29 is pushed inwardly against the spring action of the contact 25, when that form of my invention illustrated in Figure 1 is employed, or the action of spring 41 when the other form is employed, the contact member 30 bridging contacts 20 and 25. Upon the bridging of the contacts 20 and 25, coil 12 is energized the circuit being from the positive side of the battery through the conductor 52, contacts 20, 30 and 25, to the end 19 of the coil, through the coil

to the post 17, through the end 16, adjustable contact 37, thermostatic member 14, core 13 to the plate 11 and thence to the negative side 35 of the battery through the ground by reason of its connection 51. The core 13 thus becomes a magnet and holds the inner end of pin 28 against the energy of either contact 25 or the spring 41. The heating element 44 and the magnetic coils within the casings 46' and 47 are energized simultaneously with coil 12, the circuit being closed through the conductor 52, contacts 20, 30 and 25, conductor 53, terminal 46, through the heating element 44 to the negative side of the battery, through the conductor 50, thence to the coils through the conductors 48 and 49, the other sides of which are connected with the negative side 35 of the battery by the conductor 50.

As previously described, the heat generated by the coil 12 causes the free end 38 of the thermostatic member to move inwardly from the contact 37 and when the member 14 and contact 37 separate, the continuity of the circuit in which the coil 12 is included is broken, the spring of the contact 25, in the structure illustrated in Figure 1, or the spring 41, in the structure illustrated in Figure 3, exerting itself, as the core 13 is de-magnetized upon de-energization of the coil, moving the contact 30 out of engagement with the contacts 20 and 25 and breaking the continuity of the circuit in which the instrument is included.

What I claim as my invention is:

1. In a device of the character described, a yieldable stationary contact having its outer end portion flared, a magnet coil located adjacent the contact and having a core positioned near the contact flared end, an armature movable into and out of engagement with the core, and a movable contact carried by the armature and adapted to be electrically engaged with the yieldable contact, the movable contact holding the yieldable stationary contact under tension when the armature is in engagement with the core, the coil being energized upon electrical connection of said contacts to magnetize the core and hold the armature against the tension of the yieldable contact.

2. In a device of the character described, a yieldable contact having its outer end portion flared, a magnet coil located adjacent the contact and having a core positioned near the contact flared end, an armature movable into and out of engagement with the core, and a contact movable with the armature to electrical engagement with the yieldable contact, the base of the flared end of the yieldable contact overlying the core whereby the movable contact, when energized therewith, holds the same under a tension normally tending to separate the contacts, the coil being energized upon electrical connection of said contacts to magnetize the core and hold the armature against the tension of the yieldable contact.

3. A device of the character described, comprising a stationary contact, a movable mounted rod, a movable contact fixed to said rod and adapted to be moved to and from electrical engagement with said stationary contact, a magnetic coil disposed adjacent said stationary contact, and a core member passed through said coil and having one end adapted to be engaged by one end of said rod when the movable contact is engaged with the stationary contact, said magnetic coil being energized upon engagement of the movable contact with the stationary contact and magnetizing the core to attract said rod thereto and secure the movable contact in engagement with the stationary contact.

4. A device of the character described, comprising a yieldable stationary contact, a movably mounted rod, a movable contact fixed to said yieldable rod and adapted to be moved to and from the electrical engagement with said stationary contact, said stationary contact being under a tension during the period the movable contact is in electrical engagement therewith, a magnetic coil disposed adjacent said stationary contact, and a core member passed through said coil and having one end adapted to be engaged by one end of said rod when the movable contact is engaged with the stationary contact, said magnetic coil being energized upon engagement of the movable contact with the yieldable stationary contact and magnetizing the core to attract said rod and secure the movable contact in engagement with the yieldable stationary contact, the yieldable stationary contact normally urging said movable contact to a position out of engagement therewith.

5. A device of the character described comprising a pair of spaced stationary contacts having their inner ends free, a magnetic coil mounted between said contacts, a core extended beyond the end thereof adjacent the free ends of said contacts, a reciprocally mounted rod disposed in substantially axial alignment with said core, means normally urging said rod to a position with its inner end spaced from the core, said rod being movable against said urging means to engage its inner end with said core, and a contact member carried by said rod inner end and movable by actuation of said rod to bridge the stationary contacts.

6. A device of the character described, comprising a pair of spaced stationary contacts having their inner ends free, a magnetic coil mounted between said contacts, a core extended beyond the end thereof adjacent the free ends of said contacts, a reciprocally mounted rod disposed in substantially axial alignment with said core, means normally urging said rod to a position with its inner end spaced from the core, said rod being movable against said urging means to engage its inner end with said core, a contact

member carried by said rod inner end and movable by actuation of said rod to bridge the stationary contacts, said coil being energized upon the electrical engagement of the stationary and movable contacts and magnetizing the core to attract the rod and hold the same in operative position, and means influenced by the coil and operable within a predetermined time to de-magnetize the core and permit movement of said rod by said urging means to disengage the movable and stationary contacts.

7. A device of the character described, comprising a casing, plates closing the ends of said casing, a magnetic coil secured to one of said plates, a core for said coil having its inner end extended beyond the inner end of said coil, a pair of stationary contact members carried by one plate and disposed on opposite sides of said coil with their inner ends free and terminating adjacent said core inner end, a reciprocally mounted rod having its inner end extended into said casing through the plate opposite the one mounting the magnetic coil, the inner end of said rod being engageable with the inner end of said core upon movement of the rod into the casing, a movable contact fixed to the inner end portion of said rod and adapted to bridge said stationary contacts upon engagement of the inner end of said rod with the core, and means normally urging said rod outwardly of the casing to maintain said movable contact out of engagement with said stationary contacts, said magnetic coil being energized upon engagement of the movable and stationary contacts to magnetize the core thereof and attract the inner end of said rod and retain the movable contact in electrical engagement with the stationary contacts against said urging means.

In testimony whereof I affix my signature.

MITCHELL MACKIE.