

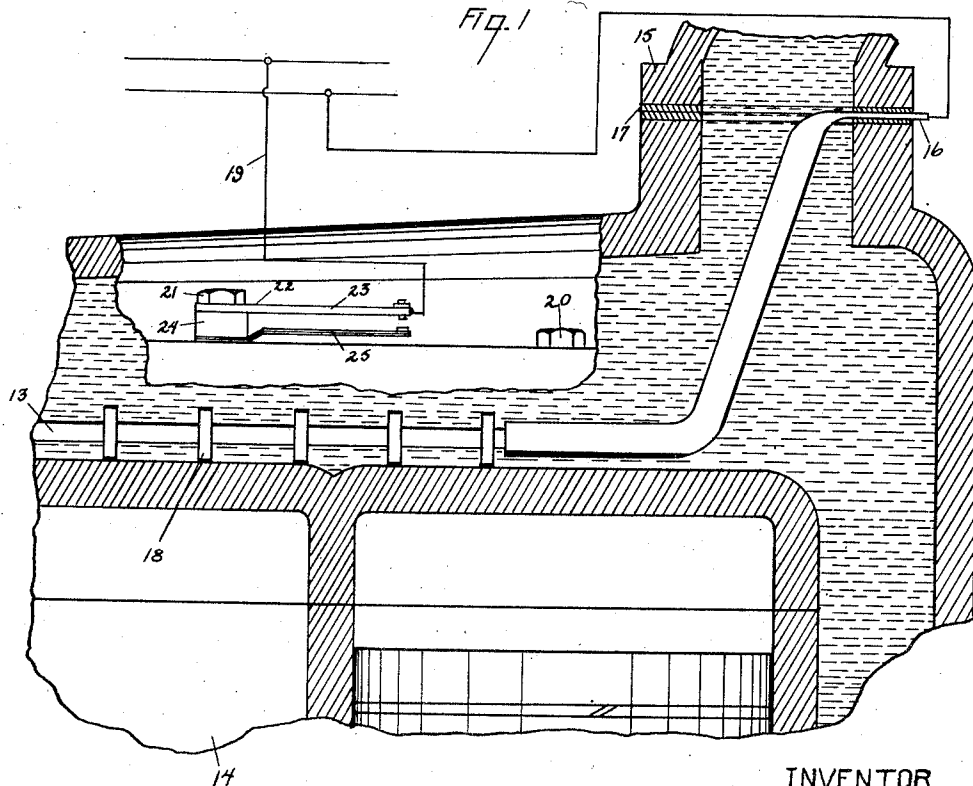
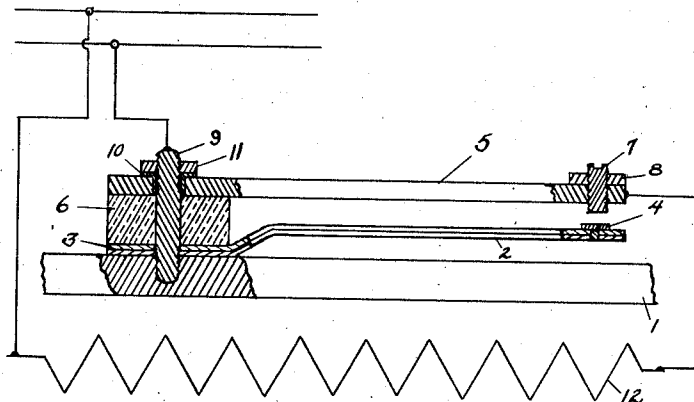
Oct. 23, 1934.

W. O. TWOMBLY
THERMOSTATIC SNAP SWITCH

1,978,065

Filed Feb. 18, 1932

2 Sheets-Sheet 1



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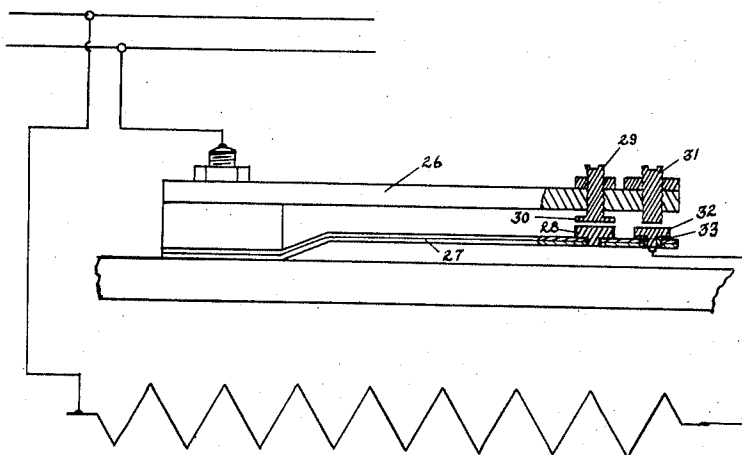


Fig. 3

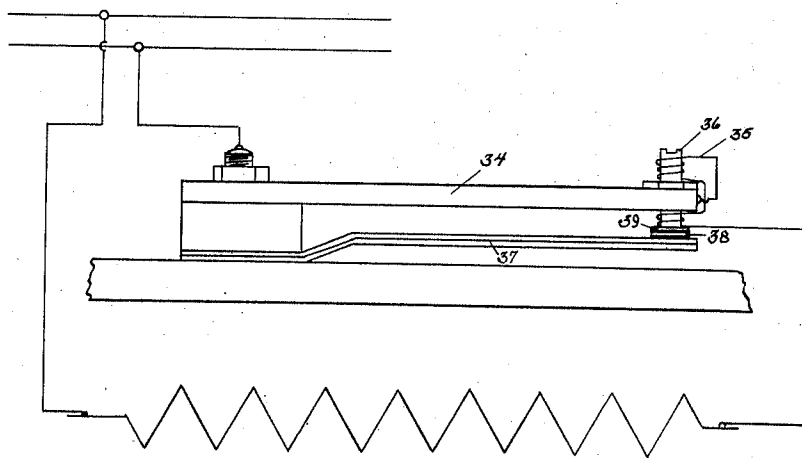


Fig. 4

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1,978,065

THERMOSTATIC SNAP SWITCH

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Application February 18, 1932, Serial No. 593,831

4 Claims. (Cl. 200—138)

This invention in its broadest aspect has application in any field in which there is employed an electrical heating unit or an electrically controlled heating unit and resides in a thermostatically controlled snap switch which may be inserted into any electrical circuit.

In circuit breaking switches it is necessary that the circuit be broken quickly to prevent arcing which has a very detrimental effect upon the contacts of the switch. The means commonly employed in switches for eliminating arcing is to provide the switch with some sort of cumbersome "snapping" mechanism for giving the contact a sudden movement when the switch is opened.

One of the objects of my invention is to provide a thermostatic controlled snap switch which is capable of making and breaking an electric circuit without arcing, yet is free from mechanical actuation.

Another object of this invention is to provide a thermostatic controlled snap switch which may be readily mounted upon the surface of the element subjected to heat regulation so that the heat of the element is directly conducted to the circuit breaking element of the switch thus providing an exceedingly sensitive control.

A further object of this invention is to provide a snap switch dependent upon a magnetic field to close the switch and the stress of differential expansion to overcome the magnetic field and open the switch.

With these and other objects which will become apparent as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth in the claims.

In the accompanying drawings wherein several convenient embodiments of my invention are set forth.

Fig. 1 is a side elevation of my improved snap switch with certain portions broken and shown in cross section.

Fig. 2 is a partial cross sectional elevation of a slightly modified embodiment of my improved snap switch shown controlling an electric heater for automotive engines.

Figs. 3 and 4 are side elevations similar to Fig. 1 of modified embodiments of my improved switch.

In Fig. 1 is shown one convenient embodiment of my improved thermostatically controlled make and break snap switch mounted upon a surface 1 which may be a portion of an electric flat iron or similar surface which is being subjected to a heating operation. The switch structure consists of a cantilever member 2 having a base portion 3

supported on the surface 1. The member 2 is constructed of thermostatic metal, e. g. a strip of invar steel and a strip of copper composition are rolled together to form a single bar. As the ratio of expansion of the copper portion of the member 2 is substantially 6 to 1 of that of the invar steel, the member 2 will be deflected as its temperature is varied. At the outer end of the member 2, a steel contact plate 4 is secured in any well known manner.

Mounted in vertical alignment with the member 2 is a bar magnet member 5 which is insulated from the base portion 3 of the member 2 by an insulated spacing insert 6. An adjustable contact screw 7 is threadedly engaged, in the outer end of the member 5, in vertical alignment with the contact 4. A locking nut 8 is provided to secure the screw 7 to various positions.

The assemblage is secured together and to the surface 1 by a threaded stud bolt which is insulated from the member 5 by a flanged tubular insulating insert 10. The bolt 9 may be threaded on both ends as shown and a nut 11 employed to firmly secure the assemblage to the surface 1.

Although the manner in which my improved switch is inserted into the electrical circuit or the relation the switch bears to the location of the heating element forms no part of my invention, for the purpose of illustration I have shown in Fig. 1 one convenient arrangement. In this particular embodiment, the switch is shown in series with heating resistance 12 which is heating the surface 1 by convection.

The operation of the switch shown in Fig. 1 is as follows: The bar magnet member 5 is equipped with a magnetic pole at its outer end and by proper adjustment of the contact screw 7 the steel contact plate 4 is attracted by the magnetic field and the thermostatic bar member 2 being more easily deflected than the member 5 is snapped upward and the contact of the plate 4 with the screw 7 completes the circuit through the bolt 9 which is insulated from the member 5.

With the circuit closed, the resistance 12 will heat the surface 1. This heat is then carried by conduction through the portion 3 to the thermostatic cantilever member 2. As the temperature of the member 2 is raised, the unequal expansion of the metals constituting it will tend to cause it to be deflected downward. When this internal stress becomes large enough due to increasing temperatures to overcome the magnetic field of the member 5, the contacts 4 and 7 are snapped apart without detrimental arcing. With the circuit open, the surface 1 will expe-

rience a drop in temperature which will be conducted to the member 2 and the contraction of the constituent parts of the member 2 will deflect it into the horizontal plane shown in Fig. 1 from which it will be again snapped upward to complete the circuit by the pull of the magnetic field.

The switch shown in Fig. 1 will operate equally as well when the temperature of the member 2 is raised by convection as by conduction. Furthermore, I anticipate the employment of my switch at any stage in heat transmission regardless of how remote from the heating source.

In Fig. 2 is shown the employment of the switch in an electrical circuit in which the liquid in the cooling system forms part of the electrical circuit.

As shown in Fig. 2, a resistance heating electrode 13 of the type disclosed in my co-pending application No. 593,832, filed the 18th day of February, 1932 is inserted into the cooling system of an automotive engine 14 by removing the outlet casting 15. The casting 15 is then replaced with the insulated terminal portion 16 of the electrode 13 extending out between the gaskets 17. The electrode 13 is insulated from the engine 14 by insulating washers 18. To complete the circuit, the conductor 19 leading to the power line is grounded to the engine 14 and the liquid in the cooling system completes the circuit.

In order to regulate the temperature to which the electrode 13 will heat the cooling liquid, one of the stud bolts 20 employed to secure the head to the block of the engine 14 is removed and a special bolt 21 substituted to secure the switch bar magnet member 23, insulating insert 24 and thermostatic cantilever member 25 in a manner similar to the bolt 9 in Fig. 1, being insulated from the bar 23 and in electrical contact with the member 25. When the cooling liquid is below a predetermined temperature the magnetic field will attract the member 25 to ground the conductor 19 to the engine 14 and thus complete the electrical circuit. With the member 25 in direct contact with the top of the engine, it is very sensitive to the raising and lowering temperatures of the cooling liquid and will hold the same to a constant temperature within a range of several degrees. Such control is essential when the heater 13 is connected to the power line all night during varying outside weather conditions.

In Fig. 3 is shown a modification of my improved switch in the form of a horse shoe magnet. This type of structure has an advantage over the switch shown in Fig. 1 in that the effective magnetic field of the bar magnet is doubled. The bar magnet 26 is not insulated from the cantilever bar 27 as is the case in Fig. 1 and the steel portion of bar 27 is thus magnetized producing two attracting poles at the outer end of the switch. In order to regulate the attraction of the cantilever members 26 and 27 for each other, a steel contact button 28 is secured to the top of the member 27 which is of thermostatic metal and passes through the member 27 into contact with the lower side of the member 27 which is likewise of steel. An adjustment screw 29 is threaded in the bar magnet 26 and has a contact plate 30 cooperating with the contact 28 to deflect the member 27 upward. The make and break electrical contact points 31 and 32 are mounted upon the extreme end of the members 26 and 27, respectively, at the point of maximum deflection resulting from temperature variation. The contact 32 is insulated from the member 27 by a flanged tubular insert 33.

In the operation of the switch shown in Fig. 3, the contacts 31 and 32 are brought together to close the electrical circuit by the magnetic attraction between the contacts 28 and 30, the magnetic attraction existing between the contacts being substantially double that existing between the contacts 4 and 7 of Fig. 1 when a similar bar magnet is employed. The opening of the switch shown in Fig. 3 is identical with that of the switch shown in Fig. 1.

As shown in Fig. 4, a non magnetic bar 34 may be substituted for the bar magnet and an electromagnet formed by passing a few coils of the electric conductor 35 around the adjustable contact screw 36 which would be of soft iron. The cantilever thermostatic metal bar 37 is insulated from the bar 34 in the manner in Fig. 1 and has a contact plate 38 coacting with a contact plate 39 secured to the adjustable screw 36. When the contact plates 38 and 39 are together the current flows through the conductor 35 and magnetizes the screw 36 with the result that the contact plates 38 and 39 are held together by a strong magnetic field. The circuit is opened in the same manner as heretofore set forth in the description of the operation of the switch shown in Fig. 1. The only objection to such a magnetic field for opposing the internal stress of the bar 37 as the temperature thereof is raised resides in the omission of the snap closing of the switch as it would be necessary to close the circuit before the screw 36 would be magnetized.

From the foregoing description it will be apparent to those skilled in the art that I have provided a thermostatic switch which may be readily inserted into any heating system where the heating unit is electrically controlled and it is capable of maintaining a substantially constant temperature. Furthermore, I have provided a snap break and make switch, which is substantially free from arcing, with the elimination of all mechanical actuation.

Having thus described my invention it will be seen that modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim as new and desire to be protected by Letters Patent is:

1. In combination with a supporting surface the temperature of which constitutes a regulating medium, of a thermostatic make and break switch comprising a thermostatic metal bar having one end in direct contact with said surface and the other end spaced from said surface and offset from said first end, a spacing member superimposed upon that end of said bar in contact with said surface, a permanent bar magnet spaced by said member supported from one end and substantially coextensive with said first bar, coacting electrical contacts on the free ends of said bars, said first bar being deflected in one direction by the combined action of temperature change and the magnetic field to close an electrical circuit and in the opposite direction by an increase in temperature to open said circuit.

2. In combination with a supporting surface the temperature of which constitutes a regulating medium, of a thermostatic make and break switch comprising a thermostatic metal bar having one end in direct contact with said surface and the other end spaced therefrom, a member superimposed upon that portion of said bar in contact with said surface, a permanent bar magnet supported from one end upon said member and co-

extensive with said first bar, coating electrical contacts on the free ends of said bars, said first bar being deflected in one direction by the combined action of temperature change and the magnetic field to close an electrical circuit and in the opposite direction by an increase in temperature to open said circuit.

5 magnetic field to close an electrical circuit and in the opposite direction by an increase in temperature to open said circuit, and a single means for fixedly securing said bars as a unit to said surface.

3. In combination with a supporting surface
10 the temperature of which constitutes a regulating medium, of a thermostatic make and break switch comprising a cantilever thermostatic metal bar in direct contact with said surface at one end and spaced from said surface at the other end to
15 permit deflection in opposite directions, a permanent bar magnet supported from one end and co-extensive with said first bar, an electrical insulating member inserted between said bars at one end and spacing the same throughout their length,
20 coating electrical contacts on the other end of said bars, said first bar being deflected in one

direction by the combined action of temperature change and the magnetic field to close an electrical circuit and in the opposite direction by an increase in temperature to open said circuit.

4. In combination with a supporting surface, of
80 a thermostatic make and break switch comprising a thermostatic metal bar having one end in contact with said surface and the other end spaced therefrom to permit deflection in opposite directions, a permanent bar magnet supported at
85 one end upon said metal bar to constitute a superstructure and being spaced therefrom at the other end, coating electrical contacts carried by the spaced ends of said bars, said first bar being deflected in one direction by the combined actions
90 of temperature change and the magnetic field to close an electrical circuit and in the opposite direction by an increase in temperature to open said circuit.

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