Sept. 5, 1933. F. G. HUTH 1,925,760

THERMOSTATICALLY OPERATED ELECTRICAL SWITCH

Filed Feb. 15, 1932

Fig. 1

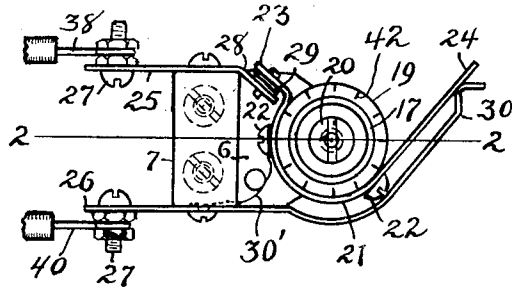


Fig. 3

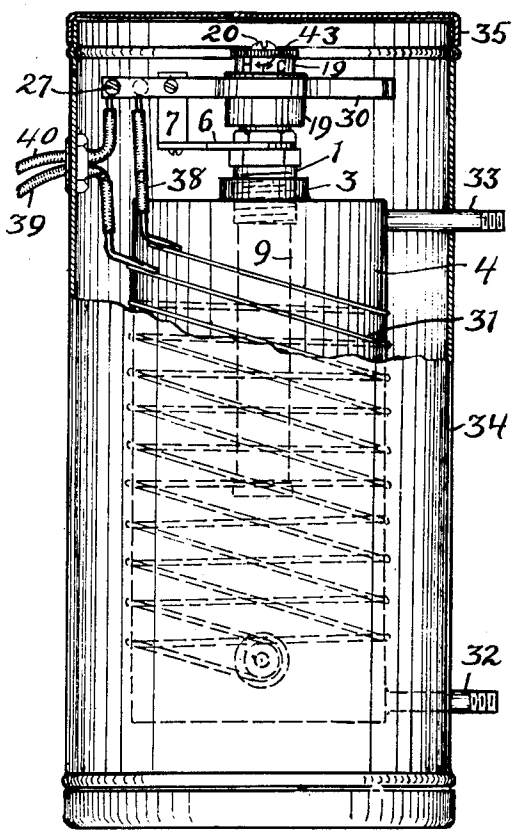


Fig. 2.

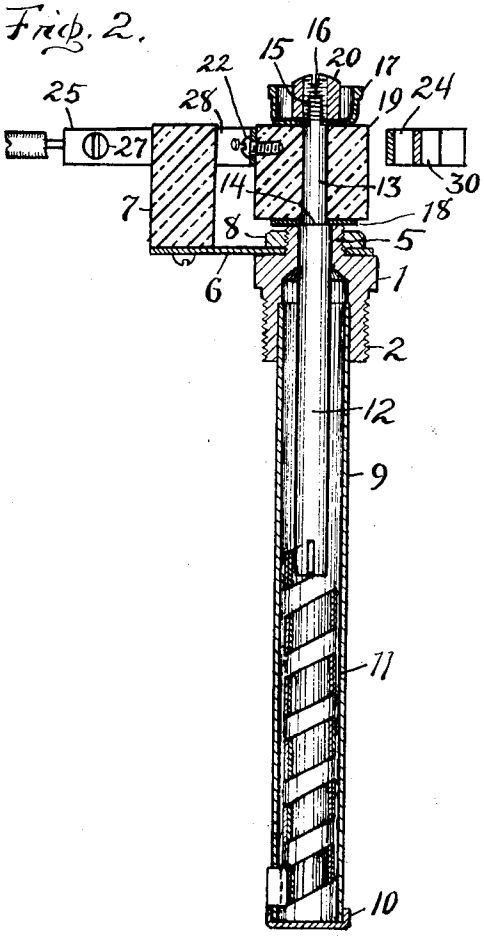
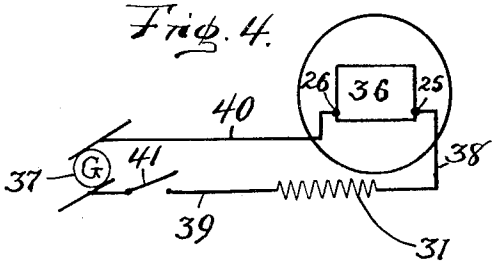


Fig. 4.



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THERMOSTATICALLY-OPERATED ELECTRICAL SWITCH

Frank G. Huth, Fort Wayne, Ind.

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3 Claims. (Cl. 200—138)

This invention relates to improvements in thermostatically operated electrical switches of a type adapted for regulating the supply of current for the thermo-electric element in water heating apparatus.

One of the objects of the invention is to provide an assembly in which are included an electric switch for controlling the circuit of a heating element and a thermostat by which the switch is operated, and also to provide simple and accessible adjusting means to vary the make and break periods of the switch with respect to the normal operating temperature of the thermostat. Other objects and advantages of the invention will appear hereinafter.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which:—

Fig. 1 is a top plan view of an assembly in which the invention is embodied;

Fig. 2 is a vertical elevation projected from Fig. 1 in section on the line 2—2 thereof;

Fig. 3 is a side elevation of a water heater equipped with the invention, a portion being broken away; and

Fig. 4 is a diagrammatical view of the electrical connections for the apparatus.

The illustrative embodiment of the invention comprises a head fixture 1 having an externally threaded sleeve 2 adapted to close the neck 3 of a vessel when the apparatus is installed in operating position. The upper end of the fixture has an externally threaded stud 5 upon which is secured a bracket 6 for the support of a terminal block 7 of insulating material. The bracket 6 is secured to the fixture by a nut 8 on the stud 5.

A tubular casing 9 is secured at one end in the sleeve 2, the joint being soldered to prevent leakage, and the other end is closed by a cap 10. The casing contains therein a thermostatic coil 11 of usual form, one end of which projects through the wall of the casing and is soldered in place to provide a firm anchorage for the coil and prevent leakage through the joint. The opposite end of the coil 11 has secured thereto a shaft 12 that projects through and has bearing in the stud 5 of the fixture 1. The upper end of the shaft has a concentric stem 13 and a shoulder 14 at their juncture. The upper end of the stem is threaded and shaped so as to have opposite flat side faces 15 and constitutes a tip 16. A cup 17 is positioned on the tip with its bottom fitting snugly against its flat faces so that relative turning movement between the stem and cup is prevented.

Upon the stem is disposed a washer 18 that rests upon the shoulder 14 and forms a seat for a cylindrical rotor 19 that is concentrically positioned on the stem between the seat and cup. The tip has thereon a sleeve nut 20 which when tightened against the cup causes the rotor and the washer to be clamped between the shoulder 18 and the cup. By this arrangement the stem may be conveniently adjusted rotatively in the rotor, as by loosening the nut 20 and holding the rotor stationary, the cup may be adjustably turned relative thereto and again secured by tightening the nut. When the cup is thus adjustably turned the shaft 12 is correspondingly turned and the tension of the coil 11 altered accordingly.

Upon the rotor 19, which is of insulating material, is secured a current conducting switch member 21 consisting of a bar bent in its middle portion to fit part way around the perimeter of the rotor to which it is secured by screws 22. One end of the bar extends radially outward from the rotor and constitutes a switch arm 23, and the opposite end extends tangentially from the rotor and constitutes a lever 24.

To the sides of the block 7 are respectively secured terminal bars 25 and 26, each being provided with a lead binder 27. The bar 25 has an extension constituting a switch arm 28 that projects into the path of the complemental switch arm 23, and said arms have contact points 29 that meet when the arms are in closed position. The bar 26 has an extension that constitutes a pressure spring 30 that bears against the lever 24 and thereby the switch arm 23 is yieldingly held in closed position, and the electrical circuit is completed through the contact of the spring and lever, and also by a flexible connection 30' attached to the switch member 21 and the bar 26.

In use, the assembly is installed in connection with an apparatus such as for heating water electrically. In the example shown in Fig. 3, the water tank 4 has a heating element 31 coiled around its exterior and secured in the usual manner, and is provided with an inlet 32 and outlet 33 respectively through which water is supplied to and discharged from the tank. The casing 9 extends into the tank when the head fixture is screwed into the neck 3 thereof and is immersed when the tank is filled with water. Preferably, the tank is provided with a jacket

34 which also encloses the upper portion of the assembly, there being provided a removable cover 35 on the jacket to permit convenient access thereto.

The thermostatically controlled switch 36 is connected in electrical series with the heating element 31 and a suitable source of energy 37. For example: One end of the heating element 31 and the switch terminal bar 25 are connected by a conductor 38, and the opposite end of the element and the switch terminal bar 26 are connected respectively with the source of energy by the circuit leads 39 and 40, one of which leads has connected therein a manually operated switch 41 by which the current is turned on and off as desired.

In operation, the stem of the shaft is adjusted in the rotor as previously described so that the contact points 29 are held together by the pressure of the spring 30 against the lever 24 and the torque of the coil 11 when the water in the tank is at normal temperature. Thus, upon closing the switch 41 the circuit is complete and the element 31 is energized causing the water in the tank and the coil 11 to become heated. When the coil 11 is heated sufficiently the shaft 12 is turned by the consequent unwinding movement of the coil so that the rotor is turned in opposition to the spring 30 and the switch arm 23 is moved to open position, thus breaking the energizing circuit. As the temperature of the water in the tank is reduced the coil retracts and the shaft and rotor thereon aided by the pressure of the spring 30 are turned so that the switch arm 23 is thereby moved to its contacting position, thus closing the energizing circuit. The heating operation is then resumed and continued until the temperature again reaches the degree at which the switch opens.

The pressure exerted by the spring 30 upon the lever 24 resists opening of the switch, and such resistance is augmented or counteracted more or less by adjusting the stem of the shaft rotatively in the rotor correspondingly in opposite directions from a neutral point. For instance: Upon adjusting the cup 17 on the rotor clockwise from the neutral point initial torque is developed in the coil that reacts so that the pressure between the contact points 29 is thereby increased, and when adjusted from the neutral point counterclockwise initial torque is developed in the coil that reacts so that the pressure of the spring 30 is opposed and the pressure between the contact points is thereby decreased. The coil unwinds as its temperature is increased and accordingly the pressure between the contact points is correspondingly decreased.

When the temperature is raised sufficiently the pressure of the spring 30 is overcome by opposing torque of the coil, whereupon the switch is opened and the energizing circuit broken. By properly adjusting the coil with respect to the rotor, the switch may be caused to open approximately when the water in the tank reaches the desired maximum degree of temperature.

As a guide for the operator in adjusting the stem in the rotor, the top of the rotor is provided with scale marks 42 and the cup has indices 43 thereon whereby the extent of the adjustments may be observed as they are made.

I claim:

1. In an appliance of the class described, a fixture, a rotative shaft mounted in the fixture and having a shoulder, a rotor on said shaft seated on said shoulder and rotatively adjustable relative to the shaft, a member splined on said shaft for adjustably turning said shaft in said rotor and adapted to have clamping engagement with said rotor, a nut threaded on said shaft for clamping said member against the rotor to secure the shaft and rotor in adjusted positions, a current conducting member on the rotor having an extending switch arm, said member having also an extending part constituting a lever, two terminal members having supported connection with said fixture, one of said terminal members having an extending arm disposed to have contact with the first mentioned arm, the other terminal member having an extension constituting a pressure spring that bears against said lever whereby said arms are yieldingly held in contact, and a thermostatic coil suitably supported in connection with said fixture, and being connected with said shaft so that said shaft is actuated thereby and the contact between said arms broken.

2. In apparatus of the class described, a fixture, a thermostatic coil having a supporting member therefor secured to said fixture and provided with a shaft rotatively actuated thereby extending through said fixture, an insulated rotor mounted upon said shaft rotatively adjustable thereon, means on said shaft for adjustably turning said shaft in said rotor and securing the shaft and rotor in adjusted positions, a terminal block having supported connection with said fixture, two terminal members on said block, one of said members having a contactor, a switch arm on said rotor having electrical connection with the other terminal and adapted to have contact with said contactor when said rotor is in circuit closing position, and means operatively related with said rotor to yieldingly hold said rotor in circuit closing position, said coil being adapted to turn said rotor through the medium of the shaft out of circuit closing position upon being heated to a predetermined temperature.

3. In apparatus of the class described, an electrical circuit make and break means including a controlling rotor therefor, a spring having connected relation with said rotor for holding said rotor in circuit closing position, a thermostatic means including a coil and a shaft rotatively actuated thereby and operatively related with said rotor and in which said shaft is rotatively adjustable, and means for securing said shaft and rotor in adjusted positions, said thermostatic means being adapted to turn said rotor in opposition to said spring out of circuit closing position when heated to a predetermined point.

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