May 19, 1936. W. N. MISCHLER 2,041,566

THERMOSTAT

Filed March 15, 1934

Fig. 1.

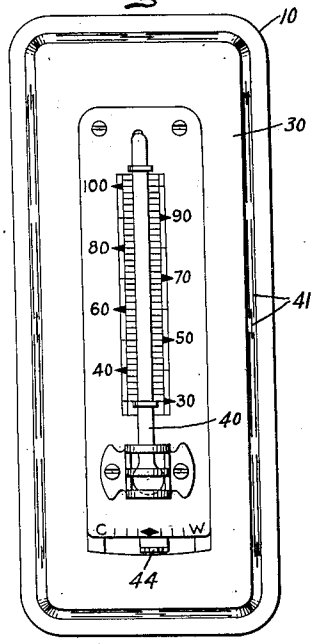


Fig. 2.

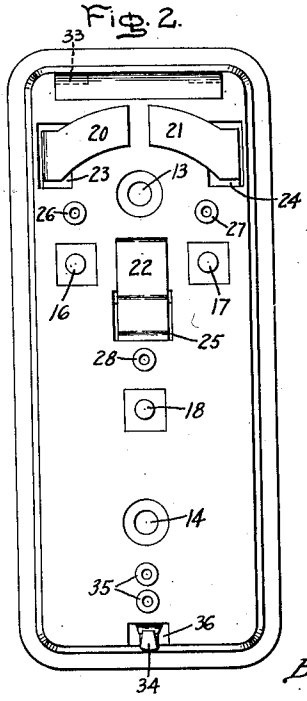


Fig. 3.

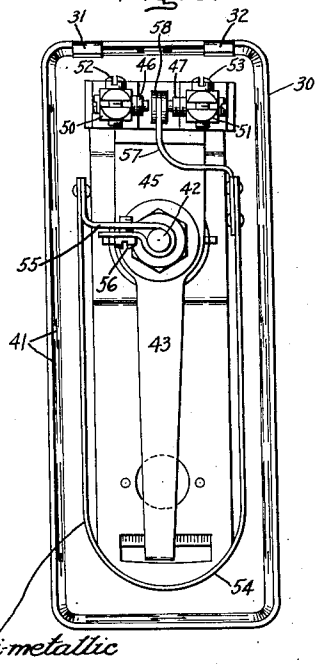


Fig. 4.

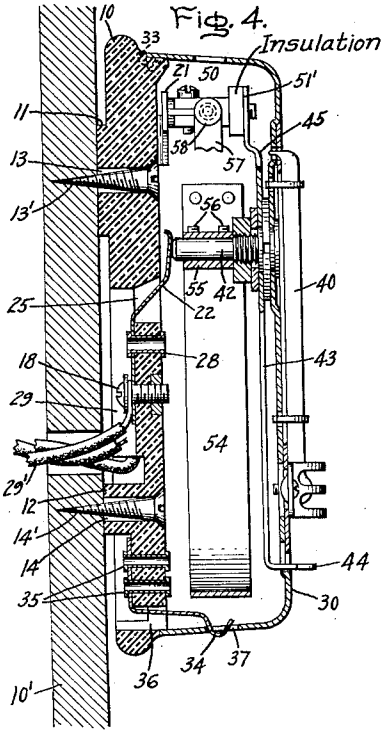


Fig. 5.

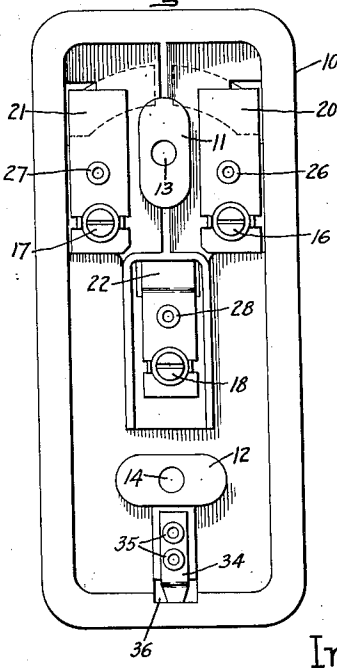
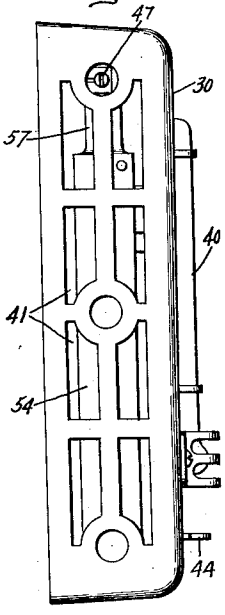


Fig. 6.



Inventor:
William N. Mischler,
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His Attorney.

Patented May 19, 1936

2,041,566

UNITED STATES PATENT OFFICE

2,041,566

THERMOSTAT

William N. Mischler, Scotia, N. Y., assignor to General Electric Company, a corporation of New York

Application March 15, 1934, Serial No. 715,631

11 Claims. (Cl. 200—139)

My invention relates to thermostats and provides an improved type of thermostatic switch which is particularly adapted for installation on the wall of a room in temperature regulating service but which also may be employed in other service if desired.

One of the principal objects of my invention is to improve the construction of room thermostatic switches so that the temperature sensitive element thereof will be highly sensitive to the true temperature of the atmosphere in the room wherein the switch is located and will be substantially unaffected by the radiation or conduction of heat to or from the wall of the room.

Another object is an improved construction wherein the thermostatic switch mechanism and the adjusting means therefor are mounted as a unit upon a ventilated cover which may be easily removed from the wall mounted base having all the wiring terminals thereon. This improved construction facilitates installation, adjustment and repairs and also renders the whole device relatively inexpensive and simple to manufacture.

In accordance with my invention I have provided means for mounting the base plate of my improved regulator in spaced relation to a supporting wall to allow for the free circulation of air around all sides of the regulator, and have mounted a temperature-sensitive element upon and in thermal conductive relation to the outer wall of a perforated cover which is arranged to be detachably secured to the base plate. Further, the temperature-sensitive element is so disposed with relation to the walls of the perforated cover that it will be exposed to the free circulation of the air surrounding the cover.

The manner in which I carry out my invention to attain the objects above outlined is set forth in the following description when read in conjunction with the accompanying drawing in which I have illustrated an example of my invention in its preferred embodiment.

In the drawing, Fig. 1 is a view of the front of the cover of the regulator showing a thermometer mounted thereon and an indicator scale by which the position of the regulator arm pointer may be determined.

Fig. 2 is a view in elevation of the front of the base plate showing the relative positioning of the spring contacts.

Fig. 3 is a rear elevational view of the cover showing the disposition of the adjusting arm with the regulator contacts mounted thereon and the disposition of the temperature-sensitive element within the cover.

Fig. 4 is a sectional elevation showing the relation of the various parts when the cover is mounted upon the base.

Fig. 5 is a rear elevation view of the base plate showing the relative location of the spring contact wiring terminals and the mounting bosses.

Fig. 6 is a side elevation of the cover showing the perforations or grill work therein.

Referring to the drawing, 10 represents a wall plate or mounting base made of a molded electrically and thermally insulating material and provided with two projecting mounting bosses 11 and 12 through which pass countersunk openings 13 and 14 for the accommodation of screws 13' and 14' for securing the plate to a wall or other support 10'. The surfaces of these bosses are made small in comparison with the overall area of the plate. Since the bosses project slightly from the rear of the plate, the plate is in contact with the support at only two points, the contact areas thereof being relatively small. The resulting clearance between the plate and the support has two functions: the preventing of springing or warping of the base due to irregularities of the support and the provision of a ventilating air space to minimize the transfer of heat between the support and the thermostat cover assembly described hereinafter. In addition to the thermal insulation provided by the free circulation of air through the ventilating space, the thermal insulating material of the wall plate and the small contact area between the wall plate and the support further prevents transfer of heat between the support and the thermostat and hence the temperature-sensitive element of the cover assembly as hereinafter described is more accurate and sensitive in its measurement of the ambient temperature of the room or other enclosure.

The mounting base serves as a terminal block, the lead wires to the thermostat being attached to wiring terminals or binding posts 16, 17 and 18 mounted upon the rear of the base. In electrically conductive relation with these binding posts are spring contacts 20, 21 and 22 respectively which extend through openings 23, 24 and 25 respectively to the front of the base and which are secured in place by means of rivets 26, 27 and 28 respectively. The base is recessed on its rear side as shown at 29 to allow for concealed connections between the lead wires, one of which is designated as 29', and the binding posts. No wires pass through to the front of the base.

Cover 30, constructed of thin sheet metal having high thermal conductivity, is adapted to be detachably mounted upon the front of the mounting base 10 and is provided at each side of its upper rim with clips 31 and 32, which engage the grooves 33 molded in the top of the base. The base is provided adjacent its lower edge with a spring clip 34 which is secured to the base by rivets 35 and protrudes through the opening 36 in the base to engage opening 37 at the middle of the lower rim of the cover, thereby completing a quick detachable three-point support for the cover 30 on the base 10. Undesirable distortion of the cover due to relatively different expansion of the base and cover is prevented by this arrangement of three supports. It is contemplated, however, that the supports may be otherwise arranged to accomplish the same result.

Upon the outer wall of the cover is mounted a thermometer 40 with its associated temperature scale and also a C—W (Cold-Warm) scale. The sides and ends of the cover are provided with perforations or grill work 41 for reasons hereinafter to be set forth. Projecting inwardly from the inner face of the outer wall of the cover is a stub-shaft 42. Mounted upon the stub-shaft and adapted to swing loosely thereabout is a regulating lever arm 43 having at its lower end a pointer 44 protruding through a slot in the cover to cooperate with the C—W scale on the outside of the cover for indicating the setting of the regulator. The upper end of the lever arm 43 is enlarged to provide a contact-carrying plate 45 which has mounted thereon a pair of screw-threaded contacts 46 and 47 supported by bifurcated contact-carrying posts 50 and 51 respectively. These contact-carrying posts are insulated from the lever arm as shown at 51'. Contacts 46 and 47 may be screwed in or out of the contact-carrying posts for individual adjustment and may be fixed in adjusted position by means of the set-screws 52 and 53.

The temperature-sensitive element of the thermostat comprises a U-shaped thermostatic strip 54 of conventional bimetallic construction which is disposed within the cover and mounted at one end upon the stub-shaft 42 by means of the clamping arm 55 which is held rigidly in place upon the stub-shaft 42 by means of the clamping screws 56. This clamping arrangement, besides providing support, also provides intimate thermal conductivity through the stub-shaft from the cover to the thermostatic strip or vice versa, as heat is imparted to or abstracted from the metal cover by changes in room temperature. In effect the cover serves as a heat transfer member for facilitating the transfer of heat between the room air and the temperature sensitive element. The body of the thermostatic strip is located within the cover as close as practicable to the inner walls thereof. This increases the sensitivity of the thermostatic strip because the air entering the ventilating slots 41 more readily comes in contact therewith. The ventilating slots are made as large as possible to allow maximum circulation of air around the thermostatic strip. Due to the difficulty of producing uniform bimetallic elements in large numbers and the attendant uncertainty of calibration, the free end of the thermostatic strip is provided with an extension strip 57 of spring metal which carries the contact 58 disposed between the contacts 46 and 47. This extension strip may be easily bent to compensate for any distortion of the bimetallic strip that may have resulted from heat treating during production thereof. It also facilitates recalibration of the instrument after use for a period of time.

In the installation of the thermostat the lead wires, which may be passed through an opening in the wall or support upon which the thermostat is to be mounted as illustrated, are connected to the proper ones of the binding posts on the rear of the wall plate which is then fastened to the wall or support by means of the screws 13' and 14'. Due to the recessing 29 in the rear of the plate, the connections will be concealed and the plate will have a neat appearance on the wall. The cover assembly is then clipped into place on the wall plate. Spring contact 22 will engage the end of stub-shaft 42 to complete the electrical circuit between the binding post 18 and the temperature-sensitive element 54. Spring contacts 20 and 21 will frictionally engage contact-carrying posts 51 and 50 respectively to complete the electrical circuit from binding posts 16 and 17 to contacts 47 and 46 respectively. The clearance between the contacts 47 and 46 will previously have been adjusted and the contacts fixed by means of set screws 53 and 52. The frictional wiping contact between the spring contacts on the wall plate and the contact-carrying posts on the cover will serve the purpose of holding the loosely mounted lever arm 43—45 in adjusted position and will also tend to keep the contact surfaces clean.

In operation the temperature-sensitive element responds in a conventional manner to a change in temperature and is arranged to move to the right (as viewed from the front of the assembled thermostat), as the temperature of the room decreases. This causes contact 58 to engage contact 46 which closes the circuit between the contact terminals 22 and 21 which "calls for heat" or is "satisfied" in the case of a heating plant or a cooling equipment respectively. An increase in room temperature causes the movable contact 58 to move in the opposite direction to engage contact 47 thus closing the circuit between the contact terminals 22 and 20 which is "satisfied" in the case of a heating plant or "calling for cold" in the case of a cooling plant. The length and frequency of the cooling or heating cycles depends upon the clearance or gap between the stationary contacts 46 and 47 which clearance may be adjusted by means of the screws 52 and 53 respectively. Changing the relative position of the stationary contacts on the thermostatic strip, by moving the adjusting lever 43, changes the range in which the thermostat acts; for example, moving the lever to the right toward the "W" on the "C—W" scale increases the maintained temperature.

In addition to the adjustment of the contacts made possible by the set screws 52 and 53, the temperature-sensitive element may be calibrated by bending the spring strip extension 57. After assembly of the cover upon the plate, the thermostat may be adjusted by means of movement of the lever arm 43 as above pointed out, an indication of the adjustment being given by the pointer 44 in conjunction with the C—W scale. Provision is made also for insertion of a screw driver through certain of the perforations 41 for the individual adjustment of the contacts after the cover is mounted on the plate. Since all the operating parts are assembled on the cover and the base is independently mounted upon the wall, moving or twisting of the base upon the wall does not affect the calibration of the thermostat as it would ordinarily do in the usual thermostat.

It has been found that the temperature-sensitive element will respond quickly to temperature changes of the atmosphere therearound and also will be unaffected by transfer of heat from or to the support. Cover **10**, being made of thin sheet metal having high thermal conductivity, such as aluminum, will be light in weight and have low heat capacity. Large radiating surface is provided by the cover. By making the contact between the stub-shaft **42**, arm **55** and the temperature-sensitive element **54** as tight as possible, high thermal conductivity is assured between the cover and the temperature-sensitive element. This results in rapid conduction of heat from the element out through the large radiating surface of the cover when the temperature of the atmosphere is reduced. Conversely, if the temperature of the atmosphere is rising, the cover quickly absorbs heat from the atmosphere and conducts it rapidly to the temperature-sensitive element. Thus the element is highly sensitive and responds quickly to small changes in the ambient room temperature. Further sensitivity is assured by the free passage of air through the perforations in the cover into intimate contact with the body of the temperature-sensitive element which is disposed close to the walls of the cover.

The quick detachable feature provided by the assembly of all the operating parts of the thermostat upon the separable cover makes for ease of assembly and disassembly. A further important advantage of this construction is that there are no wiring connections within the cover or between the cover and the base to interfere with the operation of the thermostatic element.

It has been found that by constructing a thermostat in accordance with my invention, wherein the most important features are the assembling of the temperature-sensitive element upon the inside of the outer wall of the cover so that it will respond quickly to change in temperature of the cover and be exposed to free circulation of air in addition to the combination of expedients for insulating the cover and the temperature-sensitive element from transfer of heat from the wall or other support, a pronounced improvement has been effected in the sensitivity and accuracy with which the thermostat measures the ambient temperature of the enclosure in which it is located. In actual practice it has been found that the temperature differential with a thermostat constructed in accordance with my invention is in the order of one and one-half degrees, and that a very efficient control of the cooling or heat supplying device is made possible.

That which I believe to be new and novel is set forth in the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a thermostatic regulator adapted to be mounted on the wall of a room, a mounting plate, spaced apart binding posts carried by said plate and electrically insulated from each other, a quick detachable cover for said plate, a pair of spaced apart electrical contacts mounted upon the cover and electrically insulated from each other, an elongated thermostatic element having one end thereof mounted on the inside face of and in thermal conductive relation to the cover and the other end thereof extending between said electrical contacts, and means associated with said plate for electrically connecting individual ones of said binding posts to said element and said contacts respectively when the cover is mounted upon said plate.

2. A room thermostatic electrical regulator comprising a base plate of electrical and thermal insulating material, means for mounting said plate on a supporting wall including means integral with the rear of said plate for spacing the same from the wall, binding posts mounted in spaced apart relation on the rear of said plate, a quick detachable metallic cover for the front of said plate, a pair of spaced apart electrical contacts mounted upon the inner face of said cover and insulated from each other, an elongated heat responsive element mounted at one end upon the inner face of said cover and having its other end extending between said electrical contacts, and means associated with said binding posts for electrically connecting individual ones of the same to said heat-responsive element and said contacts respectively when said cover is supported on said plate.

3. In a thermostatic switch, a base plate, a plurality of binding posts mounted on said base plate, a cover for said base plate, means on said base plate cooperating with said cover for detachably supporting said cover on said base plate, a metallic stub-shaft mounted on the inner face of said cover and in heat conductive relation thereto, a contact-carrying plate movably mounted on said stub-shaft and provided with a pair of spaced apart electrical contacts insulated from each other and said contact-carrying plate, a thermostatic element having one end thereof mounted rigidly on and in electrical conductive relation with said stub-shaft and having the other end thereof disposed between said contacts, means associated with said contact-carrying plate for moving said contacts with relation to said thermostatic element, means associated with two of said binding posts for engaging said electrical contacts when said cover is mounted on said base plate, and means associated with another of said binding posts for engaging said stub-shaft when said cover is mounted on said base plate.

4. In a thermostatic switch, the combination of a base having spaced apart spring contact wiring terminals, a cover provided with means for removably mounting the cover on the base, an adjustable arm movably mounted upon and inside the cover and having spaced apart contacts each for engaging independently of the adjustment of said arm a corresponding one of the spring contact wiring terminals on said base when the cover is mounted thereon and a bimetallic thermostatic element having one end thereof mounted upon and inside the cover and provided with a contact at its free end for operating between the said spaced apart contacts in accordance with temperature variations and having a contact electrically connected to its fixed end for engaging a predetermined one of said spring contact wiring terminals when the cover is mounted on the base.

5. A room thermostatic electrical regulator comprising a base plate, a cover for the base plate provided with a plurality of ventilating openings, a pair of spaced apart contacts mounted within the cover, an elongated thermostatic element having one end thereof mounted on the inside face of the cover in heat conductive relation thereto and having the body thereof extending in proximity with said ventilating openings with the free end thereof interposed between said electrical contacts for cooperation therewith in

accordance with temperature variations, and electrical connection means for each of said contacts and for said element.

6. A room thermostatic electrical regulator comprising a base plate of heat and electrical insulating material provided with means for mounting the same in spaced relation to a supporting wall, a metallic cover for the base plate provided with a plurality of ventilating openings, a pair of spaced apart contacts mounted upon the inner wall of the cover, an elongated thermostatic element disposed inside the cover with one end thereof fixedly mounted upon the cover in heat conductive relation therewith and extending in proximity with said ventilating openings with the free end thereof interposed between said electrical contacts to cooperate therewith in accordance with temperature variations, and electrical connection means for each of said contacts and said element.

7. In a thermostatic regulator, a mounting base of thermal insulating material provided with means for securing the base in spaced relation to a support including a plurality of screw bosses of relatively small area with relation to the area of the base projecting from the rear of the base to provide a relatively small bearing surface between the support and the base, electrical binding posts mounted on said base, a cover provided with means for detachably securing the same to the base at points so disposed in spaced relation to each other as to prevent distortion of the cover upon warping of the base, a pair of electrical contacts mounted on and inside the cover, a thermal responsive element disposed inside the cover with one end fixedly mounted on the cover in thermal conductive relation thereto and the free end thereof extending between said electrical contacts, a contact mounted on the cover in electrical conductive relation to the fixed end of said element and means associated with the binding posts on the base for respectively engaging predetermined corresponding ones of the contacts on the cover when the cover is mounted on the base.

8. A thermostatic regulator comprising a mounting base, a detachable cover for the base, a stub-shaft mounted upon the inside of the cover in efficient thermal conductive relation thereto, a plate movably mounted upon the stub-shaft and carrying a pair of spaced apart electrical contacts, an elongated thermostatic element fixedly mounted at one end upon the stub shaft in efficient thermal conductive relation therewith and having its free end extending between said contacts, an arm extending from the plate and moving the plate to regulate the position of said contacts with relation to the free end of said element, and spring contact wiring terminals on said base each positioned to engage one of said contacts and the stub shaft respectively when the cover is mounted upon the base.

9. A room thermostatic regulator comprising a mounting base constructed of a low thermal conductive material and provided with means for mounting the base upon a wall of the room in spaced relation thereto to provide an insulating air space between the base and the support, an air heat transfer member mounted on and in substantially spaced apart relation with the base and having a large radiating area and constructed of thin sheet material with high thermal conductivity, a bimetallic thermostatic element mounted upon the heat transfer member in efficient thermal conductive relation thereto and regulating means operated by the thermal element.

10. A room thermostatic regulator comprising a mounting base constructed of a low thermal conductive material and provided with means for mounting the base on a supporting wall in spaced relation thereto to provide an insulating air space between the base and the wall, a hollow cover member having means for mounting the same on said base with one wall of the cover in spaced relation to the base, said cover being constructed of thin sheet material with high thermal conductivity and having a large heat radiating area, a bimetallic thermostatic element having one end mounted on the inside of the said wall of the cover member in efficient thermal conductive relation thereto, a pair of spaced apart electrical contacts mounted in position to cooperate with the free end of said element upon movement of the same in response to temperature variations of the air surrounding the cover member and electrical connection means mounted respectively in conductive relation with each of said contacts and said element.

11. In a thermostatic regulator, the combination of a mounting base, a detachable cover for the base, a pivot stud mounted on the inside of the cover, a plate loosely mounted on said stud to swing freely thereabout, a pair of spaced apart electrical contacts carried by said plate, a bimetallic thermostatic element fixedly mounted at one end upon the inside of the cover and having its free end interposed between the spaced apart contacts to cooperate therewith in response to temperature changes, means for adjusting the position of the spaced apart contacts with respect to the free end of said element including an arm extending from said loosely mounted plate, and spring contact wiring terminals mounted on the base and positioned to frictionally engage with the spaced apart contacts to maintain the adjusted position thereof when the cover is mounted upon the base.

WILLIAM N. MISCHLER.

CERTIFICATE OF CORRECTION.

May 19, 1936.

Patent No. 2,041,566.

WILLIAM N. MISCHLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 57, claim 8, for "and" read for; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of August, A. D. 1936.

Henry Van Arsdale

Acting Commissioner of Patents.

(Seal)

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