Jan. 27, 1953 M. E. PORTER 2,627,003

THERMOSTATIC CONTROL DEVICE

Filed Oct. 25, 1949

Fig. 1.

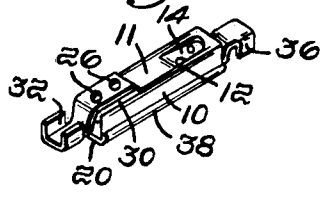


Fig. 2.

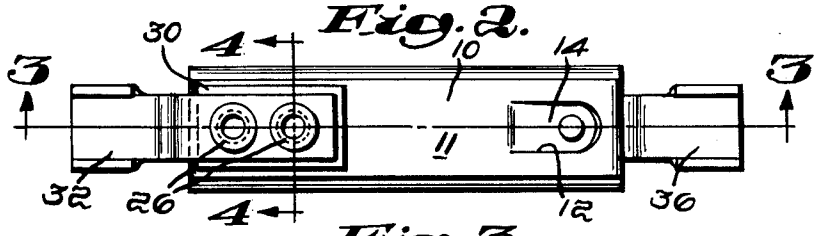


Fig. 3.

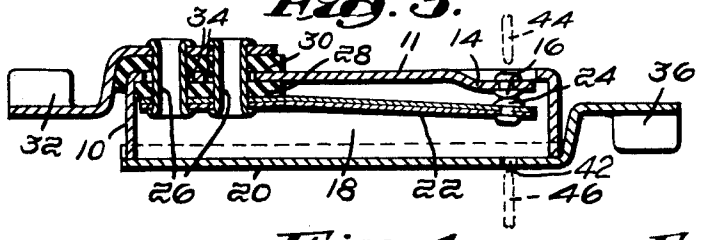


Fig. 4.

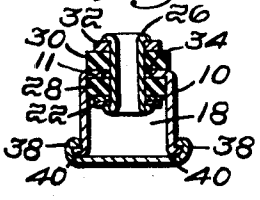


Fig. 6.

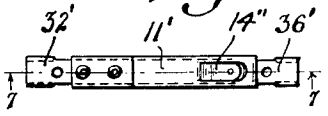


Fig. 7.

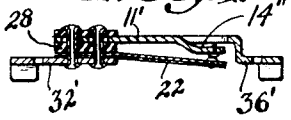
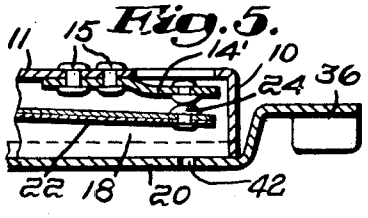


Fig. 5.



Inventor:
Malcolm E. Porter
By John H. McKenna
Attorney

Patented Jan. 27, 1953

2,627,003

UNITED STATES PATENT OFFICE

2,627,003

THERMOSTATIC CONTROL DEVICE

Malcolm E. Porter, Middleboro, Mass., assignor to The Lobl Manufacturing Company, Middleboro, Mass., a corporation of Massachusetts

Application October 25, 1949, Serial No. 123,335

3 Claims. (Cl. 200—138)

1

This invention relates to improvements in thermostatic control devices and more particularly to such devices which may be manufactured economically on principles of mass production and which can be uniformly calibrated without need for any adjusting screws or means for retaining the adjustments of such screws. The control devices of the invention may be made in any suitable sizes for embodiment in electric heating pads, electric blankets or in any other electrical device or system where effective automatic control of temperature is desired.

In my Patent No. 2,474,190, dated June 21, 1949, I have disclosed a thermostatic control device wherein two identical insulating housing sections are secured together to define an interior chamber within which two contact elements have operative coacting extent, the contact elements being secured between the casing sections with terminal portions projecting exteriorly of the casing, and the casing having access holes in opposite sides through which the contact elements may be accurately calibrated after assembly of the control device. My present invention provides definite and important improvements in thermostatic control devices of the general type disclosed in my said patent in that a relatively short contact tongue is adapted to stand substantially rigid in any of selective positions to which it may be bent during calibration of the control device, for coaction with a longer thermally responsive contact element such as a bimetal strip. In a preferred form, a casing of metal is employed, or a casing having at least one metallic wall, and the relatively short contact tongue may be an integral part of a metal wall of the casing, depressed inward out of the plane of the wall, or may be a separate piece of metal secured to the metal wall of the casing with its free end set inward from the plane of the wall. The longer thermally responsive strip has one end secured to the casing in insulated relation to the metal wall which carries the contact tongue, and has its free end in coacting relation to the contact tongue. The control device may be calibrated prior to complete enclosure of the contacts within the casing by suitably bending the contact tongue relative to the thermally responsive strip, after which the contact tongue will stand substantially rigid in its set position. Preferably, however, accurate calibration of the control device is effected simply and uniformly after the control device is completely assembled and while it is electrically connected in a circuit and subjected to conditions

2

simulative of actual service conditions. The contact tongue is exposed through an opening in the adjacent wall of the casing and may be pressed inward as may be desired by an implement inserted through the opening. In the event it gets pressed too far inward, the same or another implement may be inserted through an opening in the opposite casing wall for engaging the thermally responsive strip and, by pressing it inward against the contact tongue, the latter may be pressed in outward direction. By pressing the tongue first inward and then outward, while observing the thermal response of the device with the tongue in different positions, a precise accurate calibrated setting of the device ultimately and relatively quickly may be attained, and the calibration will be of a nature to endure indefinitely as distinguished from the calibrations of control devices requiring adjusting screws to effect their settings, and nuts or other means for maintaining the settings, which are difficult to calibrate accurately and uniformly, and whose screws, nuts and the like, have a habit of working loose and upsetting the predetermined calibration.

Hence, it is an object of the invention to provide a thermostatic control device wherein a casing wall is of conducting material and has a contact tongue thereon with its contact portion disposed within the casing of the device for coaction with a second contact element, the tongue being of a nature whereby its contact portion may be selectively positioned by a removable implement pressed against the tongue from the exterior of the casing after assembly of the device and will stand substantially rigid in the selected position when said instrument is removed.

Another object is to provide a thermostatic control device wherein two contact elements are in coacting relation within a metallic casing, a portion of one metallic wall of which constitutes one of the said contact elements, both of said contact elements being accessible from the exterior of the casing after assembly of the device to permit selective relative positioning of said contact elements by means inserted into engagement with the respective contact elements and removable following a predetermined precise calibrated setting of the contact elements.

It is, moreover, my purpose and object generally to improve the structure and calibration characteristics of thermostatic control devices and particularly such devices which are devoid of any adjusting screws and which can be ac-

curately and uniformly calibrated in the process of assembly or, and preferably, after the devices have been completely assembled.

In the accompanying drawing:

Fig. 1 is a perspective view of a thermostatic control device embodying features of the invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a cross-sectional view on line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view on line 4—4 of Fig. 2;

Fig. 5 is a cross-sectional view, similar to Fig. 3, but showing a modified form of contact tongue;

Fig. 6 is a top plan view of a modified form of thermostatic control device not having any cover; and

Fig. 7 is a cross-sectional view on line 7—7 of Fig. 6.

Referring to the drawing, the invention is illustrated, in Figs. 1–5, as it may be embodied in a control device having a sheet metal casing 10 which, conveniently, may be of generally rectangular shape. One wall 11 of the casing 10 has a contact tongue 14 displaced out of the plane of the wall and the tongue preferably is provided at its inner side with a contact point 16. The metal stock from which the casing 10 is formed preferably will be of a nature to strongly resist forces which may tend to distort the casing but to remain in any state to which it may be deformed or bent with relatively small resilient tendency. Hence the free end portion of the tongue 14, when the tongue is pressed inward out of the plane of the wall 11, becomes disposed slightly within the chamber 18 defined by the casing walls, and the tongue constitutes a substantially rigid element in its pressed-in position. However, it is a feature of the invention that this substantially rigid contact tongue 14 may be selectively positioned after assembly of the control device, as will later appear herein.

The metal casing 10 may be stamped or otherwise formed to provide a rectangular casing part having its side opposite the wall 11 initially left open and ultimately closed by the plate 20.

A bimetal strip contact element 22 is mounted within the chamber 18, one end portion thereof being secured to wall 11 of the casing and the other end portion preferably having a contact point 24 for coaction with the contact point 16 of tongue 14. The securement of strip 22 conveniently and economically may be by means of the two rivets or eyelets 26, an insulating member 28 intervening between wall 11 and the secured end portion of the strip, and a similar insulating member 30 being on the outer side of wall 11, between the wall and a terminal element 32. The rivets or eyelets 26 pass through strip 22, insulating member 28, wall 11, insulating member 30, and terminal element 32, wall 11 having relatively large openings 34 through which the rivets or eyelets pass without coming in contact with the metal of wall 11. Or a single larger opening in wall 11 might accommodate both of the rivets or eyelets 26.

A second terminal element 36 conveniently may be an integral projection on the cover plate 20, as shown, although it obviously may be secured directly to the cover wall 20, or may be on the adjacent casing end wall, if desired. Or, the element 36 may be an integral projection on or secured to any of the other walls of the casing 10.

After the rivets or eyelets 26 are in place, the initially open side of casing 10 is closed by the plate 20, which may be held in place in any known manner, it being herein shown as a slide with turned-over side edges at 38 which engage over out-turned side flanges 40 on the side walls of casing 10. Friction alone may be sufficient to maintain the plate against accidental sliding to open or partially open position, or the plate may be positively secured by a gob of solder or other securing means.

As earlier explained herein, calibration of the device may be effected before the cover plate 20 is put in place. Preferably, however, the device will be calibrated after complete assembly.

When the unit has been completely assembled, as earlier described herein, it may be accurately and relatively quickly calibrated by precisely positioning the contact point of tongue 14 from the exterior of the closed casing. For this purpose, a single hole 42 is provided in the cover plate 20 opposite the movable end portion of the bimetal strip element 22 which, in turn, is opposite the contact tongue 14. It will be apparent that the tongue 14 is directly accessible through the opening in wall 11. Hence, an implement 44 may be inserted through this opening to press the tongue 14 inward, and an implement 46 may be inserted through hole 42 in plate 20 to press strip 22 against tongue 14 for pressing the tongue outwardly. Or the tongue may be drawn outwardly by a hook-type implement inserted through the opening in wall 11, in which case the hole 42 could be dispensed with. As earlier mentioned, the contact tongue 14 is of a nature to stand substantially rigid in any position to which it may be pressed. During the calibrating, if pin 44 presses the tongue too far inward, the pin 46, acting through the bimetal strip, can push it back, and the pins can be worked back and forth until the exact predetermined calibration is effected. Obviously, a single pin alternately inserted through the respective openings, can effect a similar calibrating result. Also, if desired, the tongue may be a separate element 14′ secured to the wall 11 by the rivets 15, as shown in Fig. 5.

Figs. 6 and 7 illustrate a modified form of the invention having no casing but which is adapted for insertion into a cavity in a molded or otherwise formed insulating body. A metal strip 11′ has the tongue 14″ displaced out of its plane, comparable to the tongue 14. One end of a bimetal strip 22 is secured to strip 11′ at a suitable distance from tongue 14″, with an insulating element 28 intervening between the two strips. One terminal 36′ may be integral with strip 11′, and a second terminal 32′ may be in contact with the secured end of bimetal strip 22, maintained by the same means which secure the strips 11′ and 22 together. In this case, the tongue 14″ is accessible for being bent toward or from the free end of the bimetal strip 22 to properly set the tongue for calibrated coaction with the bimetal strip, the tongue being of a nature to stand substantially rigid in any selected position as in the case of tongues 14, 14′. This calibrated unit conveniently and economically may be inserted and secured in a suitable cavity provided in a molded or otherwise formed insulating body, such as in a molded portion of a flatiron, for example.

The structure as herein disclosed is particularly advantageous in the manufacture of thermostatic control devices for electric heating pads, electric blankets, and the like, but the control devices, made in any suitable sizes, may have

general utility wherever a precise calibrated thermostatic control of any electrical device or system is desired. By employing a metal casing, the predetermined proper relation of parts may be more accurately preserved under different temperature and atmospheric conditions, as compared with casings of molded insulation materials which have a tendency to warp. Also, casings of stamped metal may be made in substantially smaller sizes than is commercially practical when casings have to be molded, although it should be understood that the casings may be made as large as may be desired, and that the invention is not limited to the details of construction as shown and described but that various changes may be made without departing from the scope of the invention as defined in the claims.

I claim as my invention:

1. A thermostatic control device comprising a generally flat sheet metal body member, a relatively short sheet metal strip element secured at one of its ends to said body member and having a contact end portion disposed in general parallelism with said body member at a location to one side of the general plane of said body member, a relatively long thermally responsive bi-metal strip secured at one of its ends to said body member and insulated therefrom, said bimetal strip extending from its said end securement in spaced relation to said body member with its free end movably disposed in co-acting relation to said contact end portion of said sheet metal strip element, said sheet metal strip element being difficultly bendable to position its said contact end portion closer to and further from said movable free end of the bi-metal strip and having the character that it stands relatively rigid in any of said positions, and a pair of terminals of which one is connected to said body member and the other is connected to said bi-metal strip.

2. A thermostatic control device comprising a rectangular stamped sheet metal casing having length substantially greater than its width, said casing being formed of two sections of stamped metal stock of which one section is a cover section applied after the control device is otherwise completely assembled, a relatively long bi-metal strip enclosed within the casing and secured at one of its ends to the wall of said casing which is opposite said cover section, said bi-metal strip being insulated from said wall and having substantial extent in spaced relation to said wall whereby its free end is movable toward and from the plane of said wall in response to temperature changes in the bi-metal strip, there being an opening through said wall opposite the free end of the bi-metal strip, a relatively short strip-form tongue of stamped metal secured at one of its ends to said wall and having extent within said casing between said wall opening and the free end of said bi-metal strip, said tongue being substantially rigid but being difficultly bendable at the region of its connection to said wall in response to inward pressure applied to it through said opening, there being a relatively small hole through said cover section through which pressure may be applied to the free end of said bi-metal strip and through it in outward direction to said tongue.

3. A thermostatic control device comprising a rectangular stamped sheet metal casing closed at all six sides of the casing, a relatively long bi-metal strip within the casing and secured at one of its ends to and insulated from a wall of the casing, said bi-metal strip having substantial extent within the casing in spaced relation to said wall whereby its free end is movable within the casing generally toward and from the plane of said wall in response to temperature changes in said bi-metal strip, a relatively short strip-form tongue of metal partially severed from said wall of the casing and displaced out of the plane of said wall to a location within the casing in opposed co-acting relation to said free end of the bi-metal strip, the sheet metal of which said strip-form tongue is formed being such that said tongue is substantially rigid but can be forcibly bent at its end region which is connected to said wall to position the other end portion of said tongue at different distances from the plane of said wall, there being a relatively small opening through the casing wall opposite the wall on which said tongue is mounted whereby an instrument may be inserted through said opening to apply pressure transversely of the extents of said bi-metal strip and said tongue for effecting a said bending of the tongue in direction toward said plane of the first mentioned casing wall.

MALCOLM E. PORTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,331,038	Woodbury	Feb. 17, 1920
1,791,225	Rankin	Feb. 3, 1931
2,235,697	Cornell, Jr.	Mar. 18, 1941
2,328,342	Howard	Aug. 31, 1943
2,474,190	Porter	June 21, 1949

FOREIGN PATENTS

Number	Country	Date
109,934	Austria	June 11, 1928
143,497	Switzerland	Jan. 16, 1931