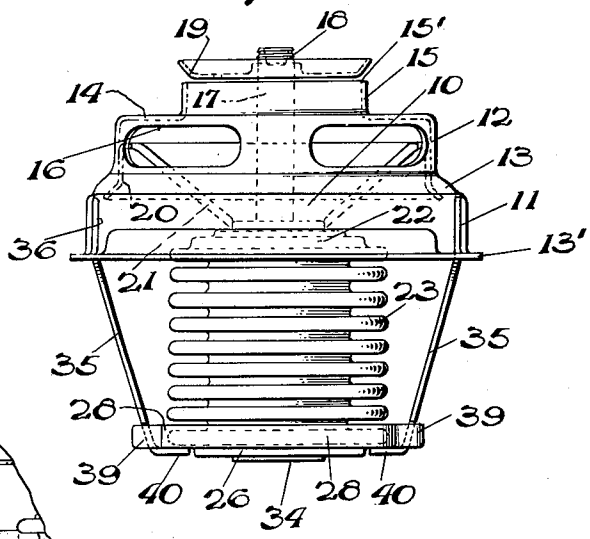
Feb. 5, 1952 J. V. GIESLER ET AL 2,584,443

MOUNTING MEANS FOR BELLOWS TYPE THERMOSTATICALLY OPERATED VALVE MECHANISMS

Filed Feb. 9, 1948 2 SHEETS—SHEET 1

Fig. 1.



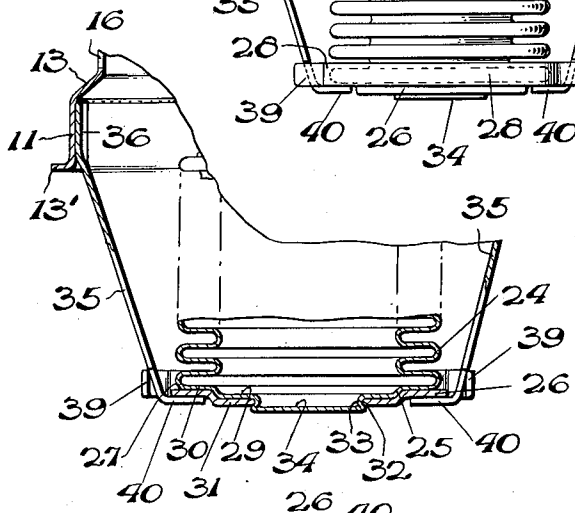


Fig. 2.

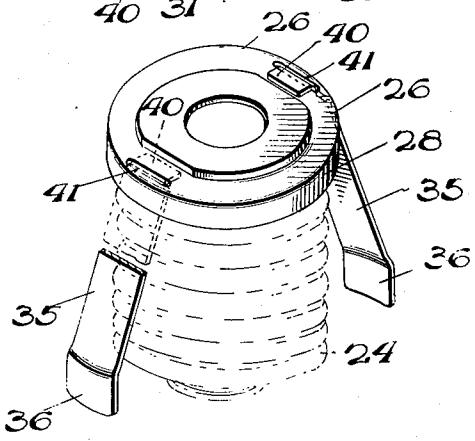
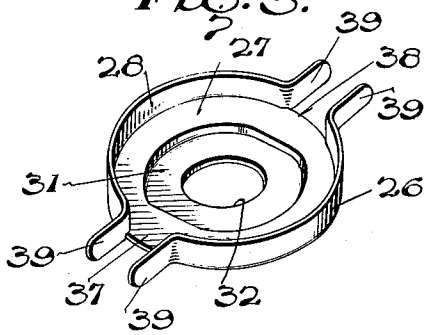


Fig. 4.

Fig. 3.



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Filed Feb. 9, 1948 2 SHEETS—SHEET 2

Fig. 5.

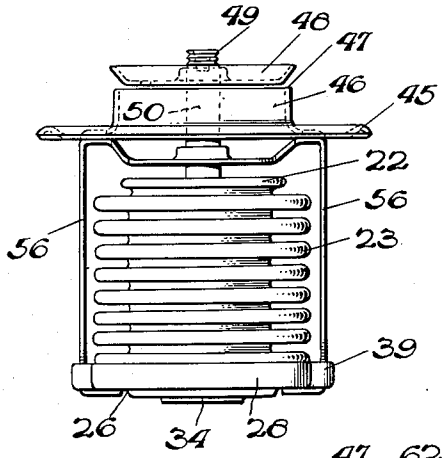
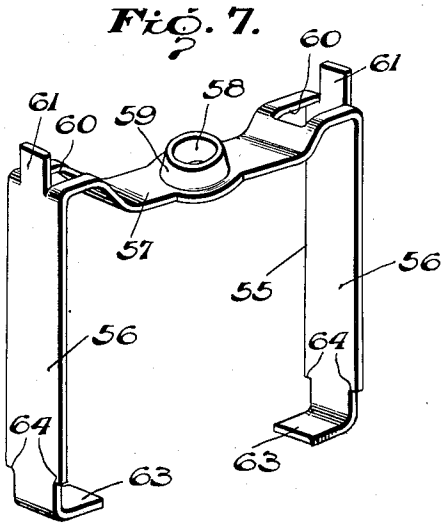


Fig. 7.



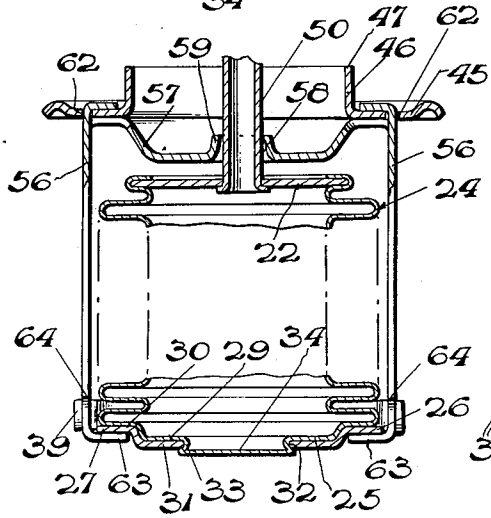


Fig. 6.

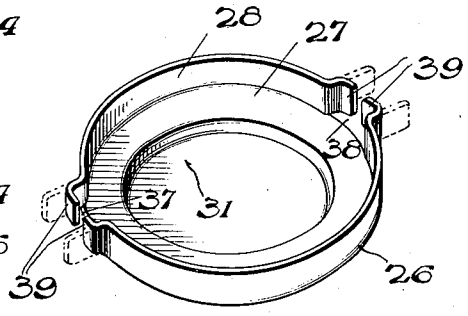


Fig. 8.

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MOUNTING MEANS FOR BELLOWS TYPE THERMOSTATICALLY OPERATED VALVE MECHANISMS

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Application February 9, 1948, Serial No. 7,188

5 Claims. (Cl. 236—34)

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This invention relates to temperature regulators, and more particularly to temperature regulators of the type commonly employed for controlling the circulation of cooling medium through the cooling systems of internal combustion engines, although temperature regulators embodying the present invention are susceptible to other uses as will be apparent to those skilled in the art.

Temperature regulators of the type referred to commonly comprise a thermostatically operated valve mechanism wherein the thermostat is mounted on or suspended from a housing or frame member, each of which will hereinafter be referred to generically as a supporting member, adapted to be mounted in the path of flow of the cooling medium so that the thermostatically operated valve mechanism will control the circulation of cooling medium in conformity with variations in the temperature thereof. Where, as here preferred, the thermostat is of the type employing an expansible and collapsible corrugated tubular wall or bellows one end of which must be mounted stationarily with respect to the supporting member referred to, a wide variety of constructions have heretofore been proposed for securing the stationary end of the thermostat in position with respect to said supporting member.

It is an object of this invention to provide an improved construction of the character referred to wherein the elements for mounting the thermostat on the supporting member are of simplified construction to the end that they may be fabricated and assembled at reduced cost and at increased speed so as to provide for a more economical production of the regulator unit than has heretofore been the case.

Another object of this invention is to provide an improved device of the type characterized which includes a simple and highly efficient provision for attaching the stationary end of the thermostat to the element or elements by which it is mounted on the supporting member.

Another object of this invention is to provide an improved device of the type characterized which includes a simplified construction for attaching the stationary end of the thermostat to the supporting member which facilitates rapid assembly of the parts.

Another object of this invention is to provide an improved device of the type characterized which enables a guide for the valve stem to be readily formed in one piece with the elements for supporting the thermostat from the supporting member.

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Another object of this invention is to provide an improved device of the type characterized which includes a provision for mounting the stationary end of the thermostat on the supporting member that employs structural members that can be stamped from sheet metal and rapidly assembled with the thermostat and the supporting member by procedures involving a minimum number of simple operations.

Other objects will appear as the description of the invention proceeds.

The invention is capable of receiving a variety of mechanical expressions four of which are illustrated on the accompanying drawings, but it is to be expressly understood that the drawings are for purposes of illustration only and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Referring in detail to the accompanying drawings, wherein the same reference characters are used to designate corresponding parts in the several figures,

Fig. 1 is an elevation of one embodiment of the present invention;

Fig. 2 is a fragmentary view illustrating the novel manner of securing the stationary end of the thermostat to the means for mounting the latter on the supporting member;

Fig. 3 is a perspective view of the member to which the stationary end of the thermostat is secured;

Fig. 4 is an inverted view of the thermostat to show another manner of attaching the straps to the end member of Fig. 3;

Fig. 5 is an elevation of a further embodiment of the present invention;

Fig. 6 is a view partly in vertical section of the embodiment of Fig. 5;

Fig. 7 is a perspective view of the unitary member constituting both a valve stem guide and supporting straps; and

Fig. 8 is a perspective view of a modified form of the member to which the stationary end of the thermostat may be secured.

Referring first to the embodiments of Figs. 1, 2 and 3 wherein is disclosed a known type of temperature regulator for the cooling system of an internal combustion engine, 10 designates a supporting member in the form of a housing illustrated as composed of two generally cylindrical portions 11 and 12 of different diameters connected by a shoulder 13, portion 11 having a flange 13' to facilitate mounting the unit in position in such a cooling system. Portion 12 is connected

to a cylindrical neck-like extension 15 by a shoulder 14, neck-like extension 15 terminating in a valve seat 15'. Portion 12 is also provided with a suitable number of valve ports 16 disposed around its circumference. Mounted on a valve stem 17 and secured thereto in any suitable way, as by the threaded connection indicated at 18, is a valve disk 19 disposed for cooperation with the valve seat 15'. Also mounted on said valve stem 17 is a generally cylindrical valve member 20 slidably mounted in the housing portion 12 for opening and closing the ports 16 and shown as carried by a generally spider-shaped member 21 so as to provide for the axial flow of cooling medium through valve member 20. Valve stem 17 is mounted on the movable end wall 22 of a thermostat 23, here shown as in the form of an expansible and collapsible chamber defined by a deeply corrugated expansible and collapsible tubular wall or bellows 24 having an end wall 25, at the opposite extremity thereof from said movable end wall 22, to be mounted in stationary position. As so far described, the thermostatic regulator unit is a known construction and is selected as representative or typical of any suitable form of temperature regulator of the type employing two valve members for controlling the flow of cooling medium through a main conduit and a by-pass conduit, opening and closing the valve disk 19 with respect to its seat 15' predetermining the flow through one of said conduits and opening and closing of the ports 16 by the valve member 20 controlling the flow through the other of said conduits.

The present invention provides novel means for mounting the thermostat 23 in what may be characterized as a suspended relationship from the supporting member provided by the housing 10 whereby a material saving may be effected in the cost of fabricating and assembling the thermostatically operated valve members with said supporting member. As shown in Fig. 3, a stationary mounting member 26, which may be readily stamped from sheet metal, is shown as of generally circular configuration with a bottom portion 27 and an upstanding peripheral flange 28 so that said member 26 is of generally cup-shaped formation. However, if preferred, the flange 28 may be omitted. Bottom portion 27 is so shaped as to conform with the configuration of the end wall 25 of the thermostat and hence where, as shown, said end wall 25 has a portion 29 displaced axially with respect to the wall 30 of the last corrugation, bottom portion 27 is provided with a depression 31 for receiving the displaced portion 29 of end wall 25 when wall 30 engages the portion surrounding said depression. Bottom portion 27, 31 is also provided with a centrally arranged aperture 32, and as originally formed end wall 25 of the thermostat 23 is provided with a centrally arranged tubular extension 33 of a size adapted to be received freely but snugly in said aperture 32. The flange 28 when used on member 26 may be of such internal diameter as to surround closely the end of the corrugated wall 24, as appears more particularly from the relationship shown in Fig. 1, and when so received, with the portions 29 and 30 of end wall 25 in contact with the portions 31 and 27 of mounting member 26, tubular extension 33 projects through the aperture 32 to the exterior of member 26. With this relationship and the parts supported in any suitable way against relative displacement, pressure may be applied to the end wall 34 of said tubular extension 33 so as to upset said extension 33 to this end that its peripheral wall will bend around the edge of aperture 32 into the clamping relationship shown more particularly in Fig. 2. Thereby mounting member 26 is permanently and securely locked to the end wall 25 of thermostat 23.

While in the broader aspects of this invention mounting member 26 may be secured to the supporting member 10 in any suitable way, the preferred embodiment includes a pair of strap-like side elements 35 which may be secured to housing 10 in any suitable way, as by brazing or soldering the extremities 36 to the inner face of housing portion 11, said ends 36 of elements 35 being bent with respect to the body of said elements so that when said elements are secured in position to housing portion 11 they extend in the proper direction to cooperate with the mounting member 26 as next to be explained.

The flange 28 of member 26, as shown in Fig. 3, is cut away at two diametrically disposed points to form slots 37 and 38 with tabs 39 defining the opposite sides of said slots. Said pairs of tabs are so spaced as to receive freely but snugly the ends 40 of strap-like elements 35, said elements 35 being preferably so formed that said ends 40 have a bend as shown for engagement with the outer face of mounting member 26 when assembled in the slots 37 and 38. Then, as shown more particularly in Figs. 1 and 2, the tabs 39 may be bent into embracing relationship with said strap-like elements 35, whereby the mounting member 26 is securely locked to the strap-like elements 35 against relative displacement. Thus the thermostat is fixedly attached to the supporting member 10 in proper position for the valve members 19 and 20 to cooperate wtih valve seat 15' and ports 16.

In place of providing diametrically opposed slots 37 and 38 by means of outwardly projecting tabs 39 as shown in Fig. 3 the supporting member 26 may be made of somewhat larger diameter and slotted at diametrically disposed points inside of the flange 28, so that when the strap-like elements 35 are engaged in said slots and the end portions 40 properly bent as heretofore described, the mounting member 26 will be locked to the strap-like elements 35 against relative displacement. Thus, as shown in Fig. 4, the mounting member 26 may be made of larger diameter than the end wall of the thermostat 23 so as to provide space between the flange 28 and the periphery of the corrugated wall 24, and bottom portion 27 of mounting member 26 is provided, adjacent but inside of the flange 28, with a pair of diametrically disposed slots 41 of appropriate size to receive the ends 40 of the strap-like elements 35. When inserted into said slots through the space between the flange 28 and the periphery of the corrugated wall 24, the ends 40 of the strap-like elements 35 may be bent over into engagement with member 26, so that they then extend analogously as in the embodiment of Figs. 1 to 3, to lock the member 26 securely and fixedly to the strap-like elements 35.

The aforesaid manner of attaching mounting member 26 to the supporting member 10 may also be employed when the end wall of thermostat 23 is attached to said member 26 in any other suitable way than above described and also when mounting members of other suitable forms and configurations are used.

Referring now to Figs. 5 to 8, inclusive, the invention is shown as embodied in a known type of temperature regulator for the cooling system of

an internal combustion engine of the character wherein the thermostat controls a single poppet valve for regulating the flow of cooling medium. As here shown, the supporting member takes the form of a generally disk-shaped element 45 provided with a right angularly extending flange 46 adapted to form a valve seat at its extremity 47. The valve member 48 of any suitable construction is attached in any suitable way, as by the threaded connection shown at 49, to a valve stem 50 appropriately attached to the movable end wall 22 of a thermostat 23, here again shown as in the form of an expansible and collapsible chamber defined by a deeply corrugated expansible and collapsible corrugated wall or bellows 24, said movable end wall 22 and an opposite stationary end wall 25 here shown as of the same configuration as illustrated in Fig. 2, like parts being given like reference characters. As in the embodiments of Figs. 1 to 4 a mounting member 26, here shown as of the same construction as illustrated in Fig. 3, and therefore like parts being identified by like reference characters, is secured to the movable end wall 25 of said thermostat 23 in the same manner as heretofore described although other suitable means of attachment may be used.

While mounting member 26 may be attached to supporting member 45 in the same way as heretofore described in conjunction with Figs. 1 to 4, this embodiment illustrates a construction whereby the strap-like side elements may be formed integrally with a valve stem guide. Referring to Fig. 7, the combined valve stem guide and straps are shown as in the form of a unitary U-shaped member 55, which may be stamped out of sheet metal, and composed of a pair of strap-like side portions 56 integrally connected by a bridging portion 57 which, midway of its length, is provided with an aperture 58 of appropriate size to guidingly receive the valve stem 50, said aperture being shown as surrounded by a generally cylindrical flange 59 which may be drawn from the metal of the bridging portion 57 during the stamping operation. Bridging portion 57 may be given any proper shape, the central portion thereof being shown as depressed with respect to the extremities thereof for a purpose that will appear.

Each end of the bridging portion 57 is slotted as shown at 60, and the metal from the slots is bent outwardly to provide tabs 61. Supporting member 45, as clearly shown in Fig. 6, is provided with a pair of diametrically disposed slots 62 of appropriate size to receive said tabs 61, and with said tabs 61 inserted through said slots 62 said tabs may be bent downwardly into engagement with the face of member 45 to lock the ends of the bridging portion 57 rigidly against the inner face of the member 45 with the central portion containing the guide aperture 58 spaced from member 45. As originally formed the strap-like side members 56 are preferably provided with bent ends 63 so that when assembled with member 26 the ends of said side members are received in the slots 37 and 38 in member 26, with the end portions 63 of said side members 56 in engagement with the mounting member 26 (compare Fig. 6) after which the tabs 39 are bent to lock said member securely and rigidly to the side members 56.

In order to exactly predetermine the location of mounting member 26 with respect to the side members 56, said side members 56 are preferably made somewhat wider than the slots 37 and 38,

and the end portions thereof are made of narrower width so as to be received in said slots, providing shoulders 64 in such relationship that when the ends of the side members are received in the slots 37 and 38 the tabs 39 will engage said shoulders 64. Thereby, when the tabs 39 are bent into engagement with the outer face of the side members 56, member 26 is rigidly locked between said bent over end portion 63 and the shoulders 64.

This provision for predetermining the location of the mounting member 26 with respect to the strap-like elements and securing a rigid interlock between the shoulders and the bent over extremities of the strap-like elements may also be employed in the embodiments of Figs. 1 to 4. Also, if preferred, the side elements may be attached to the supporting member in any of the embodiments by tabs and slots as in Figs. 5 to 8 whether the guiding means is formed separately or not provided.

While it is preferred to attach the stationary end wall of the thermostat to the mounting member 26 by the upset tubular extension 33 as so far described, this is not essential within the broader aspects of the invention of providing a simplified, more rapid and less expensive manner of assembling the thermostat with its mounting member of any appropriate form with the supporting member. Thus as shown in Fig. 8 the bottom of member 26 may be unperforated so that the end wall of the thermostat may be soldered or otherwise suitably secured thereto, or other appropriate means for securing the end wall of the thermostat to member 26 may be used, and if the end wall of the thermostat lies in one plane the depression 31 may also be omitted. Also, if preferred, the end of the bellows 24 may be sealed directly to said member 26 so that said member constitutes the end wall of the chamber within the thermostat instead of providing a separate end wall for the thermostat chamber. Tabs for securing the stationary end of the thermostat to the strap-like side elements may also be provided on other forms of stationary end walls of thermostats as well as on other forms of mounting members for connection therewith.

From the foregoing it will be perceived that all of the members used in mounting the thermostat on the supporting member are of very simple construction and can be formed at low cost by stamping and shaping from sheet metal. By initially providing the bellows end wall 25 with the cylindrical extension 33 the mounting member 26 may be easily and rapidly secured to the thermostat by merely upsetting the cylindrical extension 33 in the aperture 32 so that the mounting member is gripped to end wall 25 at the edge of the aperture 32. While this is a preferred construction other forms of attachment of end wall 25 to a mounting member may be used. Mounting member 26 may then be secured to the supporting member by merely passing the extremities of the strap-like side elements, which may be made of thicker gauge metal than member 26, into the slots provided in the mounting member and the parts thereupon may be locked rigidly together by merely bending the tabs into engagement with the strap-like side elements to rigidly lock the parts together against displacement. This manner of assembly is also available if the tabs are provided on the end wall of the thermostat or other appropriate member connected thereto. Simi-

larly, the strap-like side elements may be rigidly secured to the supporting member, by brazing or soldering as in the embodiments of Figs. 1 to 4 or by passing tabs on said elements through slots in the supporting member and bending the same into locking relationship therewith analogously as in the embodiment of Figs. 5 to 7. The latter embodiment has the further advantage that when a valve stem guide is desired it may be formed integrally with the strap-like side elements in one stamping operation, and as the valve stem guide is thereby integral with the strap-like side elements, no separate forming or assembling operation is required in order to incorporate such a guide in the regulator unit.

It will therefore be perceived that by the present invention the elements for mounting a thermostat on the supporting member are of simplified construction that may be fabricated and assembled at reduced cost and at increased speed so as to provide for a more economical production of regulator units. Simple and highly efficient means have been provided for attaching the stationary end of the thermostat to the mounting member and the mounting member to the supporting member which permits of rapid assembly, and simple and highly efficient means have been provided for rigidly interlocking the component elements which enables assembly by use of only simple operations. The use of tabs for securing the mounting member or end wall of the thermostat to the strap-like side elements affords a simple and high-speed operation and within the broader aspects of the invention this manner of attachment may be used by providing the tabs on other suitable members, forming a part of or connected to the thermostat, for bending into embracing relationship with strap-like side elements or other comparable elements.

While the embodiments of the invention illustrated on the drawings have been described with considerable particularity, it is to be expressly understood that the invention is not limited thereto as the same may receive a variety of mechanical expressions, as will now be apparent to those skilled in the art, while changes may be made in the details of construction, size, arrangement, proportion, etc., certain of the features disclosed may be replaced by equivalent features, etc., features illustrated as applied to one embodiment may be used in other embodiments, and certain features may be used without other features, without departing from the spirit of this invention. Reference is therefore to be had to the appended claims for a definition of the invention.

What is claimed is:

1. In a temperature regulator of the type including a supporting member, a valve mechanism and a thermostat for operating said valve mechanism, means for attaching said thermostat to said supporting member including a mounting member provided with a centrally arranged aperture and slots defined by outwardly extending tabs, said thermostat including a tubular extension projecting into and having a flattened upset in said aperture, and strap-like elements secured to said supporting member and having their opposite ends projecting through said slots provided on said mounting member with said tabs bent into engagement with said opposite ends of said strap-like elements and said opposite ends being bent into engagement with said mounting member to lock said strap-like elements to said mounting member.

2. In a temperature regulator of the type including a supporting member, a valve mechanism and a thermostat for operating said valve mechanism, means for attaching said thermostat to said supporting member including strap-like side elements secured to said supporting member and tabs extending from said thermostat to provide slots receiving said strap-like side elements and bent into embracing relationship with said strap-like side elements, said strap-like side elements being bent beyond said tabs into embracing relationship with said thermostat.

3. In a temperature regulator of the type including a supporting member, a valve mechanism and a thermostat for operating said valve mechanism, means for attaching said thermostat to said supporting member including strap-like side elements secured to said supporting member, and a member unitarily associated with said thermostat and including tabs to provide slots receiving said strap-like side elements, said tabs being bent into embracing relationship with said strap-like side elements, and said strap-like side elements beyond said tabs being bent into embracing relationship with the last said member.

4. In a temperature regulator of the type including a supporting member, a valve mechanism and a thermostat for operating said valve mechanism, means for attaching said thermostat to said supporting member including a mounting member connected to the end of said thermostat and provided with slots, strap-like side elements having their ends projecting through said slots and secured to said mounting member, said supporting member also provided with slots, tabs on said side elements projecting through said last named slots and bent into engagement with said supporting member, and guide means for said valve mechanism bridging the space between said side elements and integral therewith.

5. In a temperature regulator of the type including a supporting member, a valve mechanism and a thermostat for operating said valve mechanism, means for attaching said thermostat to said supporting member including a mounting member connected to the end of said thermostat and having outwardly extending tabs defining slots, and strap-like side elements secured to said supporting member at one end and having their opposite ends projecting through said slots and provided with bends in engagement with said mounting member with said tabs bent into engagement with said side elements to secure the same to said mounting member.

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