April 8, 1947. W. A. DEHN ET AL 2,418,762

THERMOSTAT

Filed Oct. 27, 1943

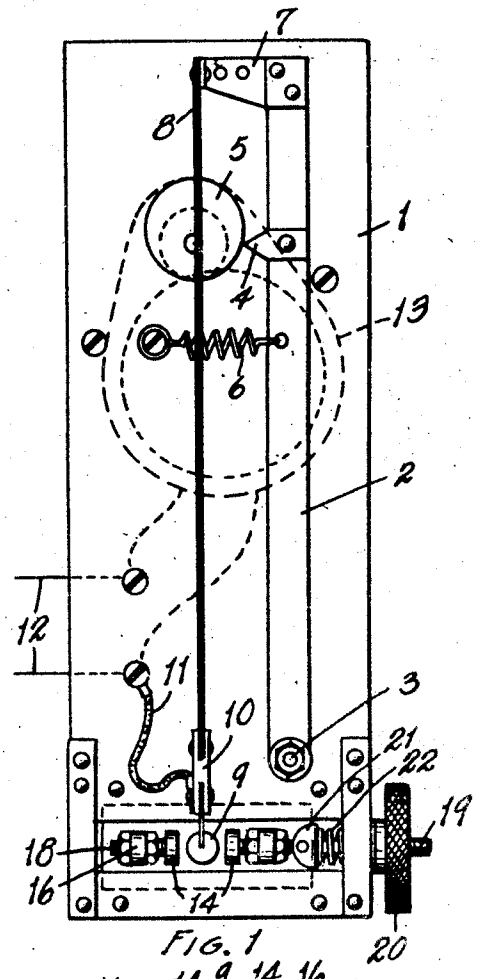


FIG. 1

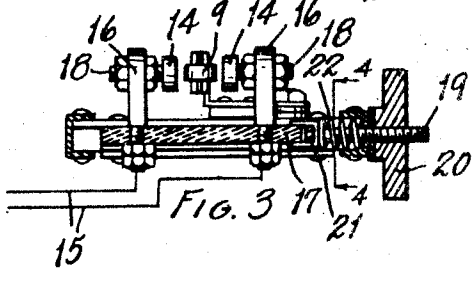


FIG. 3

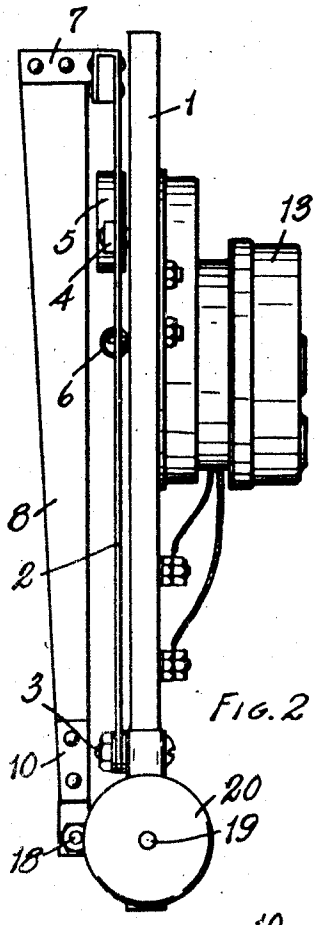


FIG. 2

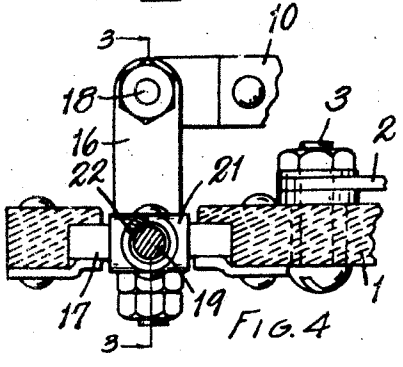


FIG. 4

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THERMOSTAT

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12 Claims. (Cl. 200—139)

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This invention relates to improvements in thermostats.

The main objects of this invention are:

First, to provide a thermostat which is well adapted for use in controlling space heaters or space heating systems.

Second, to provide a thermostat adapted for such uses which acts on a relatively slight variation in temperature in the space to be controlled.

Third, to provide a control thermostat for heating systems in which the contact points are of such relative movement as to prevent the thermostat becoming inoperative through accumulations of dust or dirt or the "freezing" of the coacting contact members and to prevent arcing.

Fourth, to provide a structure having these advantages which may be very easily adjusted to the desired temperature.

Fifth, to provide a control thermostat having the several advantages which is economical to produce and durable in use and not likely to become inoperative.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a front elevation of a structure embodying the features of our invention.

Fig. 2 is a side elevation looking from the right of Fig. 1.

Fig. 3 is a transverse section on line 3—3 of Fig. 4.

Fig. 4 is an enlarged fragmentary view partially in section on line 4—4 of Fig. 3.

The embodiment of our invention illustrated comprises a plate-like base 1 preferably of insulating material such as hard fibre or wood. An arm 2 is pivotally mounted on this base at 3 for oscillating movement, the arm being provided with a pointed follower 4 coacting with the cam 5. The spring 6 urges the follower against the cam.

At its swinging end, the arm 2 is provided with a laterally projecting bracket 7 having an offset end portion to which the bimetallic blade-like thermal element 8 is secured. This thermal element is provided at its swinging end with a cylindrical contact 9 secured to the bimetallic blade

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by means of the insulating blade 10, the contact 9 being connected by the connector 11 to the electrical circuit 12.

The cam 5 is driven from the motor 13 which is preferably a synchronous motor.

A pair of contact members 14 are provided for coaction with the contact 9 of the thermostatic element, these contact members 14 being connected to the controlled circuit 15. The contact members 14 are mounted on brackets 16 carried by the slide support 17 arranged in suitable ways on the base for adjustment transversely of the thermal element. These brackets or posts 16 receive the threaded stems 18 of the contact members 14, nuts being provided at each side of the posts or brackets for providing spacing adjustment of the members 14 and permitting their individual adjustment relative to each other and to the contact 9 of the thermal element.

These contact members 14 are simultaneously adjusted by adjusting the slide through the adjusting screw 19 having the finger piece 20 threaded thereon, this screw being connected to the member 17 by means of the U-coupling 21, a spring 22 being arranged on the screw to urge the slide in one direction and hold the adjusting finger piece 20 against the edge of the base.

With this arrangement of parts, it will be noted that the contact point 9 carried by the thermal element is caused to move in a somewhat arcuate path inclined to a line connecting the contact members 14, as the thermal element support is oscillated on its pivot. This performs two functions—that is, it causes it to swing toward and from the associated contact members and also when engaged therewith to engage them with a wiping action, thus keeping them free of dirt, preventing "freezing" and arcing. The adjustment of the member 17 determines the relation of the contacts 14 to the contact point of the thermal element which positioning determines room temperature setting point. In normal setting, the contact members 14 are so adjusted relative to the contact 9 of the thermal element when positioned at desired room temperature which can be designated normal room temperature that the member 9 is not brought into contact with either of the contact members 14 as a result of the oscillating movement of the thermal element. However, forward movement

of the contact 9 beyond its normal oscillation will cause electrical contact between the thermal element contact and one of the members 14 at one end of the oscillating movement. For example, if the temperature of the area or space controlled falls below that of the setting called for by the thermostat, the thermal element is affected and causes contact with the contact member 14 connected to the control designed to supply additional heat units. The duration of this contact is determined by the amount contact 9 moves from its normal position, the period of electrical contact being in proportion to the amount the controlled area is below the thermostat setting. The electrical impulses are intermittent due to the cam and also due to the rate of rotation of the cam. As the added heat units raise the controlled area to the temperature called for by the setting of the thermostat, the thermal element resumes its normal position and thus the electrical impulses cease. In the event the controlled area temperature raises above the temperature setting of the thermostat, the thermal element moves in the opposite direction where its contact makes intermittent contact with the other contact element 14 and proportional electrical impulses go to the heat input apparatus reducing the amount of heat input to the controlled area.

As stated, the contact 9 is so located relative to the pivot 3 that a brushing and wiping motion results, thus eliminating the "freezing" or sticking and minimizing arcing.

Thermostats embodying our invention are particularly desirable for controlling heating systems, this thermostatic unit being positioned in the control space of the system.

We have illustrated and described our invention in an embodiment which we have found highly practical. We have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt our invention as may be desired.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. In a thermostat, the combination with a base plate, of an arm pivotally mounted on one side of said base plate and provided with a laterally projecting forwardly offset bracket at its swinging end, a bimetallic blade-like thermal element mounted on said bracket in substantially parallel relation to said arm, said thermal element being provided with a contact element at its free end, a cam, a follower on said arm coacting with said cam, a spring acting to urge said follower to said cam, a synchronous motor on the opposite side of said base plate having driving connection to said cam, a contact member supporting slide mounted on said base plate for adjustment transversely of said thermal element, threaded adjusting means for said slide, and a pair of contact members mounted on said slide for coaction with said contact on said thermal element.

2. In a thermostat, the combination of a pivotally mounted arm provided with a laterally projecting bracket at its swinging end, a bimetallic blade-like thermal element mounted on said bracket in substantially parallel relation to said arm and with its free end adjacent the pivot of said arm, said thermal element being provided with a contact element at its free end, means for swinging said arm on its pivot, a contact support member mounted for adjustment transversely of the swinging end of said thermal element, rotatable means threaded for effecting adjustment of said support member, and contact members mounted on said support member for coaction with said contact on said thermal element, said contact members being mounted on the support member for independent adjustment relative to each other and relative to said contact element on said thermal element, said contact element having curved surfaces, and said contact element being so disposed relative to said contact members and to the pivot of said arm as to permit said surfaces to wipingly engage the contact members.

3. In a thermostat, the combination of a pivotally mounted arm provided with a laterally projecting bracket at its swinging end, a bimetallic blade-like thermal element mounted on said bracket in substantially parallel relation to said arm and with its free end adjacent the pivot of said arm, said thermal element being provided with a contact element at its free end, means for swinging said arm on its pivot, a contact support member mounted for adjustment transversely of the swinging end of said thermal element, rotatable means threaded for effecting adjustment of said support member, and contact members mounted on said support member for coaction with said contact on said thermal element, said contact element having curved surfaces, and said contact element being so disposed relative to said contact members and to the pivot of said arm as to permit said surfaces to wipingly engage the contact members.

4. In a thermostat, the combination of a pivotally mounted arm, a blade-like thermal element mounted on the swinging end of said arm, said thermal element being provided with a contact element at its free end, means for oscillating said arm, a contact member support mounted for manual adjustment transversely of said thermal element, means including a rotatable member threaded for effecting the manual adjustment of said support, and contact members mounted on said support for coaction with said contact element on said thermal element, said contact members being mounted on the support for independent adjustment relative to each other and relative to said contact element on said thermal element.

5. In a thermostat, the combination of a pivotally mounted arm, a blade-like thermal element mounted on the swinging end of said arm, said thermal element being provided with a contact element at its free end, means for oscillating said arm, a contact member support mounted for manual adjustment transversely of said thermal element, and contact members having contact surfaces and mounted on said support for coaction with said contact element on said thermal element, the path of movement of said contact element about the pivot of said arm being inclined to the contact surfaces of said contact members to permit of the contact element wipingly engaging the contact members.

6. In a thermostat, the combination of an oscillating support, a thermal element mounted on said support, means for periodically oscillating said support, and contact members having flat faces disposed in opposed spaced relation and mounted for simultaneous lateral adjustment relative to said thermal element and also for independent adjustment, said thermal element being provided with a contact element disposed

between said contact members for cooperation therewith, said contact element on said thermal element having curved contact surfaces, the path of movement of said contact element being inclined to a line connecting said contact members to permit of said curved contact surfaces wipingly coacting with the flat faces of said contact members as the thermal element is actuated by its oscillating support.

7. In a thermostat, the combination of an oscillating support, a thermal element mounted on said support, means for periodically oscillating said support, and contact members disposed in opposed spaced relation and mounted for simultaneous lateral adjustment relative to said thermal element and also for independent adjustment, said thermal element being provided with a contact element disposed between said contact members for cooperation therewith, said oscillating support being disposed to move said contact element toward one and simultaneously away from the other of said contact members, said thermal element, upon bending due to changes in temperature, being disposed to also move said contact element toward one and away from the other of said contact members, said contact members being spaced relative to each other to permit said contact element to be oscillated therebetween without engaging either of said contact members after a predetermined temperature is reached, and permitting engagement of said contact element with one or the other of said contact members upon a change of temperature from said predetermined temperature.

8. In a thermostat, the combination of an oscillating support, a thermal element mounted on said support, means for periodically oscillating said support, and contact members disposed in opposed spaced relation and mounted for manual adjustment relative to said thermal element, said thermal element being provided with a contact element disposed between said contact members for cooperation therewith, said contact element on said thermal element having curved contact surfaces, the path of movement of the contact element being inclined to the contact surfaces of the contact members to permit said curved contact surfaces of the contact element wipingly coacting with the said contact members as the thermal element is actuated by its oscillating support.

9. In a thermostat, the combination of an oscillating support, a thermal element mounted on said support, means for periodically oscillating said support, and contact members disposed in opposed spaced relation and mounted for manual adjustment relative to said thermal element, said thermal element being provided with a contact element disposed between said contact members for cooperation therewith, said oscillating support being disposed to move said contact element toward one and simultaneously away from the other of said contact members, said thermal element, upon bending due to changes in temperature, being disposed to also move said contact element toward one and away from the other of said contact members, said contact members being spaced relative to each other to permit said contact element to be oscillated therebetween without engaging either of said contact members after a predetermined temperature is reached, and permitting engagement of said contact element with one or the other of said contact members upon a change of temperature from said predetermined temperature.

10. In a thermostat, the combination of a pivotally mounted arm, a blade-like thermal element mounted on the swinging end of said arm in laterally offset substantially parallel relation thereto, said thermal element being provided with a contact element at its free end which is adjacent the pivoted end of said arm, whereby said contact element is moved in an arcuate path, means for synchronously oscillating said arm on its pivot, and coacting contact members mounted for independent adjustment relative to each other and also for simultaneous adjustment relative to said contact element on said thermal element, said oscillating arm being disposed to move said contact element toward one and away from the other of said contact members, said thermal element, upon bending due to a change in temperature, being disposed to also move said contact element toward one and away from the other of said contact members, said contact members being spaced relative to each other to permit said contact element to be oscillated therebetween without engaging either of said contact members after a certain predetermined temperature is reached and permitting engagement of said contact element with one or the other of said contact members upon a change of temperature from said predetermined temperature.

11. In a thermostat, the combination of a pivotally mounted support, a blade-like thermal element mounted on the swinging end of said support, said thermal element being provided with a contact element at its free end which is adjacent the pivoted end of said support whereby said contact element is moved in an arcuate path as the support is oscillated on its pivot, means for synchronously oscillating said support on its pivot, and manually adjustable contact members operatively assocated with said contact element on said thermal element, said oscillating support being disposed to move said contact element toward one and simultaneously away from the other of said contact members, said thermal element, upon bending due to changes in temperature, being disposed to also move said contact element toward one and away from the other of said contact members, said contact members being spaced relative to each other to permit said contact element to be oscillated therebetween without engaging either of said contact members after a predetermined temperature is reached, and permitting engagement of said contact element with one or the other of said contact members upon a change of temperature from said predetermined temperature.

12. In a thermostat, the combination of a pivotally mounted support, a thermal element mounted on the swinging end of said support and provided with a contact element at its free end which is adjacent the pivoted end of said support, means for synchronously oscillating said arm on its pivot, and coacting contact members mounted for independent adjustment relative to each other and also for simultaneous adjustment relative to said contact element on said thermal element, said oscillating support being disposed to move said contact element toward one and simultaneously away from the other of said contact members, said thermal element, upon bending due to changes in temperature, being disposed to also move said contact element toward one and away from the other of said contact members, said contact members being spaced relative to each other to permit said contact ele-

ment to be oscillated therebetween without engaging either of said contact members after a predetermined temperature is reached, and permitting engagement of said contact element with one or the other of said contact members upon a change of temperature from said predetermined temperature.

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