

April 14, 1942.

P. S. RUSSEL

2,279,582

CONTROL DEVICE

Original Filed May 14, 19.

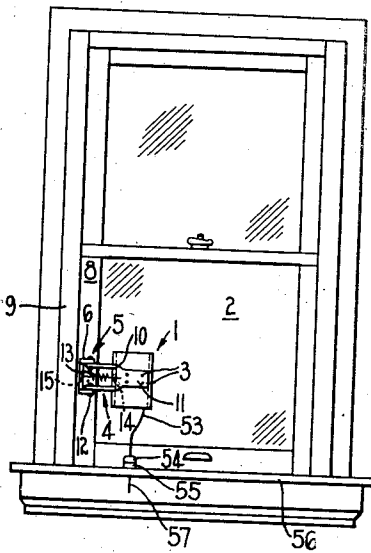


FIG. 1

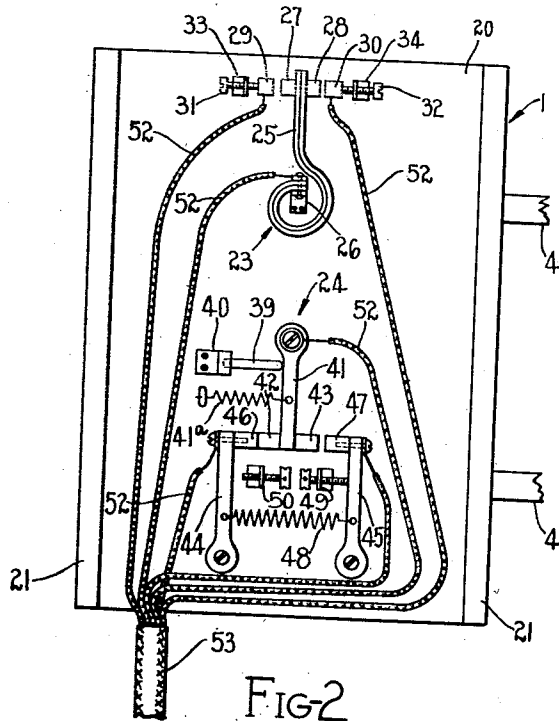


FIG. 2

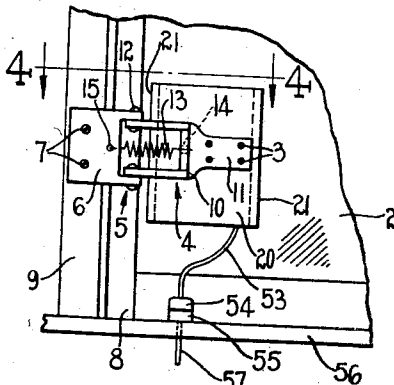


FIG. 3

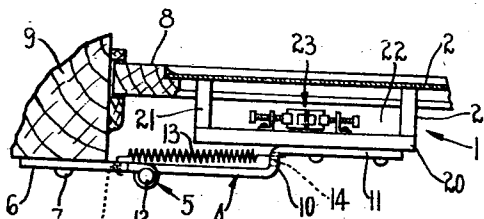


FIG. 4

INVENTOR
Philip S. Russel
BY
Andrew K. Foulds
his ATTORNEY

UNITED STATES PATENT OFFICE

2,279,582

CONTROL DEVICE

Philip S. Russel, Detroit, Mich., assignor to Detroit Lubricator Company, Detroit, Mich., a corporation of Michigan

Original application May 14, 1935, Serial No. 21,353. Divided and this application June 8, 1938, Serial No. 212,545

9 Claims. (Cl. 236-44)

My invention relates generally to apparatus for controlling the condition of air in a room or other enclosed space, and more particularly to the location of the apparatus relative to a room wall surface having substantially the temperature of the outside atmosphere.

One of the objects of my invention is to provide a new and improved apparatus for maintaining the highest possible relative humidity of the air in a room or other enclosed space for all outdoor temperatures below a given predetermined degree of temperature without resultant precipitation of the moisture of the room air on a window pane or other heat transmitting room wall surface.

Another object of my invention is to provide a new and improved apparatus for maintaining a given predetermined desired humidity in a room for all outdoor temperatures above a predetermined degree of temperature to prevent dehumidifying the air of the room to a point in excess of that necessary for comfort.

Another object of my invention is to provide a new and improved mounting to hold an apparatus adjacent a window pane and yet have the apparatus easily removable from the pane to facilitate cleaning thereof.

Another object of my invention is to provide a new and improved mounting whereby it is possible for the apparatus to be attached to the window frame and held against the window pane when in use and yet be easily removed so that the window sash can be raised.

Another object of my invention is to provide a new and improved mounting for a control apparatus whereby the apparatus is effectively made sensitive to the temperature of a cold surface within a room, and easily removed from the cold surface for adjustment or repair.

The invention consists in the cooperative relation of an air conditioning control apparatus with respect to a heat transmitting room wall surface and the means for effecting such relation, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated two methods by which my attachment may be made, and one detail of the construction of the apparatus, in which drawing—

Figure 1 is a view showing a control apparatus in cooperative relation to a window pane and embodying my invention;

Fig. 2 is an enlarged view of part of the apparatus of Fig. 1 and shows the control means of the apparatus as though looking through the window pane;

Fig. 3 is a view showing the control apparatus attached to a window frame and in cooperative relation to the window pane, and

Fig. 4 is an enlarged view in section taken along the line 4-4 of Fig. 3 and in the direction of the arrows, showing the mounting for and positioning of the control apparatus relative to a window pane.

Referring to the drawing by characters of reference the numeral 1 designates generally a control apparatus abutting a window pane 2 and being secured by a plurality of screws 3 to a leaf 4 of a hinge member, generally designated at 5. The other hinge leaf 6 of member 5 is secured by means of a plurality of screws 7 to a carrying member which may be the window sash 8, as shown in Fig. 1, or the window casing 9, as shown in Figs. 3 and 4. The hinge leaf 4 is offset, as at 10, so that when the apparatus 1 is in operating position, that is, against the pane 2, the portion 11 of the leaf 4 is in a plane parallel to but spaced toward the window pane 2 from the plane of leaf 6, which is secured to the carrying member. The hinge leaves 4 and 6 are bifurcated at their adjoining or hinged ends to form a plurality of hinge points or bearings 12. The aperture formed by the bifurcated ends is of sufficient width to accommodate a helical coil tension spring member 13, having one end attached within an aperture 14 located between the bifurcated ends of the offset portion 11 adjacent the offset 10, and having the other end attached within an aperture 15 located between and adjacent the bifurcated ends of the hinge portion 6. When the apparatus is in operating position the spring 13 has its longitudinal axis on the window pane 2 side of the hinge bearing points 12 and is urging the apparatus 1 against the window pane 2.

If the apparatus is rotated clockwise, as seen in Fig. 4, or away from window pane 2, the spring member 13 will pass between the bifurcated ends of the leaves 4, 6 and oppose rotational movement until the longitudinal axis has passed the center of the bearings 12. Upon movement past the center of the bearings 12 the spring member 13 will urge the apparatus 1 in a clockwise direction and hold it away from the window pane 2. If the construction shown in Figs. 3 or 4 is used, the apparatus 1 is out of the path of movement of the window sash 8 so that the sash may be raised without interference

with the apparatus 5. If the construction shown in Fig. 1 is used, then the apparatus 1 is movable with the sash 8 but may be removed from the window pane 2 to facilitate the cleaning of the pane.

The control apparatus comprises a mounting board or base 20 having a pair of side spacer members 21 extending perpendicular to and spacing the board 20 from the window pane 2, to form a vertical open ended passageway 22 for the gravity flow of air therethrough. Located within the passageway 22 there is a plurality of control means, of which one is a temperature responsive control comprising a single pole, double throw, thermostatic switch 23 and the other is a hydrometric control comprising a single pole, double throw, humidostat switch 24. The thermostat 23 comprises a bimetallic, thermostatic element 25 supported at one end by means of a support 26 attached to the base 20 within the passageway 22. The element 25 is subject to the temperature of the air therein, which temperature is substantially equal to the temperature of the inside of the window pane 2. The bimetallic element 25 carries at its free end, one on either side thereof, a pair of contacts 27, 28 which cooperate with a pair of spaced, adjustable contacts 29, 30. The contacts 29, 30 are carried by adjustment screws 31, 32 adjustably held in holding members 33, 34 which are secured to the base 20. The contact member 29 is adjusted by the adjustment screw 31 so that when a given predetermined low temperature of the window pane 2 is reached, contact 27 will be in an electrical circuit making position with contact 29, and contact 30 is so adjusted that with a given predetermined high temperature the contact 28 will be making an electrical circuit with contact 30.

The humidostat 24 comprises an expansible-contractible, thrust operating, moisture sensitive member 39 responsive to the relative humidity of the surrounding air within passageway 22. The member 39 is supported at one end by a holding member 40 secured to the base 20, and has the other end abutting a lever arm 41 which has one end pivoted on and for movement in a plane parallel to the base 20. A spring 41^a, secured at one end to the base 20 and at the other end to the lever arm 41, maintains the position of the arm 41 sensitive to changes in relative humidity of the surrounding air. The free end portion of the arm 41 has secured thereto a pair of contacts 42, 43 located one on each side of the arm 41. Pivoted on the base 20 are a pair of contact carrying arms 44, 45 having contacts 46, 47 carried by the free end portions thereof and which arms 44, 45 are spaced on either side of the lever arm 41. The contacts 46, 47 cooperate with the contacts 42, 43 respectively to form a single pole, double throw, electric switch operated by the moisture sensitive member 39. A spring 48 connects the carrying arms 44, 45 on the contact side of the pivot points and urges the contacts 46, 47 toward each other and toward their respective engaging contacts 42, 43 carried by the lever arm 41. Movement of the arms by the spring 48 toward each other is limited by spaced, adjustable stop members 49, 50 secured to the base 20. The stop member 50 is so adjusted that when a relative humidity of a minimum predetermined percentage has been reached the contacts 42, 46 will be in closed electrical circuit position, and when the relative humidity surrounding member 39 exceeds the predetermined minimum percentage

the contacts 42, 46 will open the electrical circuit therethrough. The stop member 49 is adjusted so that when a predetermined maximum percentage of relative humidity is reached, the contacts 43, 47 will be in an electrical circuit making position and upon a decrease in percentage of relative humidity below this point, the contacts 43, 47 will be in an open electrical circuit position. In usual air conditioning practice, the contacts 43, 47 will be in circuit making position for all relative humidities above 50% and contacts 42, 46 will be in circuit making position for all relative humidities below about 98%. Because of the overlapping of the interrelation of the maximum and minimum relative humidity settings, during the range of relative humidities from 50% to 98%, both sets of contacts 42, 46 and 43, 47 will be in circuit making relation and the arms 44, 45 will not be in engagement with their respective stops 50, 49 but will rock back and forth on their respective pivots according to the movement of lever arm 41. It may easily be seen that when contacts 42, 46 are in open position, arm 45 must be away from its stop 49 and when contacts 43, 47 are in open position arm 44 must be away from its stop 50. Connecting wires 52 are arranged within the passageway 22 and in such a manner that they interfere only slightly with the natural passage of air therethrough and are formed into a cable 53 which extends from the passageway 22. The extended end of the cable 53 terminates at and is connected to a plug 54 which is received by a socket 55 secured to the window sill 56. Connected to the socket 55 is one end of an electrical cable 57 which terminates at its other end at the apparatus to be controlled by the thermostat 23 and humidostat 24. The plug 54 may be removed from the socket 55 when the control apparatus is moved relative to the socket.

The operation of the control apparatus is as follows: In winter operation when the relative room humidity is being controlled and when the temperature of the thermostat 23, adjacent the window pane 2, is below the predetermined minimum temperature of say 44° F. for which it is set, and the free end of the bimetallic element 25 is bent toward the left, as seen in Fig. 2, an electrical circuit is complete between the contacts 27, 29 thereof. These contacts 27, 29 operate to energize a suitable circuit (not shown) by which contacts 42, 46 of the humidostat 24 are operable to control suitable apparatus governing the admission of water vapor to the room air of the controlled residence. As the relative humidity of the room air at the temperature of the window pane 2, as reflected by the air in passageway 22, increases to a predetermined percentage, the sensitive member 39 will expand and rotate the lever arm 41 counter-clockwise which will allow contact arm 44 to follow arm 41 and rotate clockwise, as seen in Fig. 2. The stop member 50 will prevent the contact arm 44 at the predetermined setting from further movement in a clockwise direction, and the contacts 42, 46 will separate upon further increase, to say 98%, to open the electrical circuit between contacts 42, 46 and stop the admission of more water vapor to the room. Upon a decrease in relative humidity, the member 39 contracts and lever arm 41, under the force of spring 41^a, moves in a clockwise direction, and contacts 42, 46 again engage and complete an electrical circuit therethrough. For any relative humidity below the predetermined setting, contacts 42, 46 will be in abutting relation and

the contact 44 will rotate back and forth under the influence of the lever arm 41. With this control, the relative humidity may be maintained by suitable equipment, relatively high within the room without any condensation of water vapor from the room air on the cold window surfaces as long as the minimum temperature of 44° F. is not exceeded. Upon an increase in temperature above 44° F., the bimetallic element 25 bends toward the right away from the contact 29 and opens the electrical circuit between contacts 27, 29, which operate to render the operation of the humidostat 24 ineffective.

In summer operation when the room relative humidity is being controlled and when the temperature of the thermostat 23 is above the predetermined maximum temperature, the free end of the bimetallic element 25 bends toward the right, as seen in Fig. 2, and the contacts 28, 30 engage and energize a suitable circuit (not shown) which makes it possible for the contacts 43, 47 to control the operation of a suitable dehumidifying apparatus (not shown) to remove the excess undesired moisture from the air within the residence so that an uncomfortably damp or excess temperature condition is not experienced by the occupants. When the thermostat 23 is subjected to temperatures intermediate minimum and maximum, then the free end of the bimetallic element 25 is not bent enough either to the right or to the left so that the contacts 27, 29 or 28, 30 do not make circuit and the thermostat is in open circuit position rendering the humidostat 24 ineffective. When the relative humidity decreases below the predetermined maximum percent, then the sensitive member 39 contracts and allows the spring 41a to rotate the lever arm 41 clockwise, as seen in Fig. 2. The contact arm 45 rotates counterclockwise and engages the stop member 49, which limits further rotation of the arm 45, and the contacts 43, 47 will separate and open the electrical circuit therethrough. Should the relative humidity increase, the sensitive thrust member 39 will expand and rotate the lever arm 41 in a counterclockwise direction and contacts 43, 47 will engage and the electrical circuit through the contacts will be completed. If the relative humidity further increases, the contact arm 45 will be rotated by the lever arm 41 in a clockwise direction away from stop 49, and rotate in accordance with the movement of lever arm 41 as long as the relative humidity remains above the predetermined maximum percent.

It may now be seen that I have a device which is compact and operable to control apparatus to automatically maintain a residence at comfortable, relative humidities without danger of damage caused by excess moisture condensing on cold surfaces. The device is automatically set for winter and summer operation, with no human control element. I have also provided a novel means for securing the apparatus to the window sash and which allows for easy movement of the apparatus should it be desired to open or clean the window, or adjust the apparatus. Due to the particular construction of the humidostat 24, I have a sensitive switch which is responsive to changes in relative humidity and which may be used in any place where a switch sensitive to relative humidity is desired, and for which an overlapping setting may be maintained so that under one set of conditions a given lower predetermined relative humidity may be maintained and by suitable switch means a second predetermined relative humidity may be maintained

higher than the lower predetermined humidity. It can also be seen that with my humidostat I can maintain a circuit therethrough between certain minimum and maximum conditions of relative humidity, and having a circuit which may be opened to control suitable apparatus upon the existence of a predetermined relative humidity, and another circuit opened at a second predetermined relative humidity.

This application is a division of my copending application, Serial No. 21,353, filed May 14, 1935, for Apparatus for and method of air conditioning.

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

1. A control device for arrangement with the inside surface of a window pane or other heat transmitting room wall surface comprising an element responsive to an air condition at said inside surface, and a movably mounted supporting means carrying said element and operable in one position to hold said element in close proximity to said inside surface and operable in another position to hold said element out of such proximity and in spaced relation to said inside surface.

2. A control device for arrangement with a window pane or other heat transmitting room wall surface comprising a control means having an element responsive to an air condition, a movably mounted supporting means for said element operable to support said element in close proximity to a window pane and also operable to move said element out of such proximity, and yieldable means operable to maintain said element in close proximity to the window pane.

3. A control device for arrangement with a window pane or other heat transmitting room wall surface comprising a casing having an open side and normally arranged in close proximity to a window pane with its open side disposed toward said window pane, said casing having a passage for room air therethrough, a control means having an element responsive to an air condition and disposed within said casing and in the path of the room air circulating therethrough, means pivotally supporting said casing, and means yieldably urging said casing toward said window pane.

4. A control device for arrangement with the inside surface of a window pane or other heat transmitting room wall surface comprising a control means, pivotal supporting means for said control means, said pivotal supporting means acting to hold said control means when in operative position in close proximity to said inside surface, said control means being movable on said pivotal supporting means out of the plane of its operative position, and spring means operable to urge said supporting means toward said inside surface.

5. A control device for arrangement with the inside surface of a window pane or other heat transmitting room wall surface comprising a temperature responsive element, a humidostat element, pivotally mounted supporting means for said temperature responsive element and said humidostat element and normally supporting said elements when in operative position in close proximity to said inside surface, said elements being movable with said pivotal supporting means out of the plane of their normal operative position, and means yieldably maintaining said supporting means and said elements in said operative position.

6. A control apparatus for controlling air con-

ditions in a room, comprising a supporting member, a plurality of sensitive switches supported thereon, one of said sensitive switches being responsive to the temperature adjacent a cold surface of the room, another of said sensitive switches being responsive to the relative humidity of the air in the room at the temperature of the cold surface, a hinge member having one leaf attached to a carrying member and the other leaf attached to said supporting member, and spring means operable overcenter to hold said supporting member adjacent the cold surface and to hold said supporting member away from said cold surface.

7. A control apparatus for location adjacent a window pane of a room comprising a hinge member having a pair of hinged leaves, control means in the room and sensitive to the moisture content of the air after being cooled to substantially the temperature of the window pane, and spring means attached to said leaves and operable to urge said control means against the window pane.

8. A humidity responsive control device comprising means responsive to humidity changes, control means operated by said responsive means, means whereby the temperature of a surface to which the device is attached may be

directly transmitted to said humidity responsive means so that the latter assumes the temperature condition of said surface, and means for pivotally mounting said device against said surface, said mounting means comprising a relatively stationary bracket having a pivoted arm projecting therefrom and attached to said device for holding the latter in operative position against said surface, whereby said device may be moved toward and away from said surface without disturbing the relatively stationary bracket.

9. A humidity responsive control device comprising a casing providing a channel having upper and lower openings for gravity air circulation, means in said channel and responsive to humidity changes, means securing said responsive means to said casing, control means operated by said responsive means, means for subjecting responsive means to the temperature of a wall surface, mounting means for said casing and comprising a bracket to be secured to a relatively stationary support, an arm pivotally secured to said bracket and connected to said casing for operatively holding said casing against said surface, and a spring resisting movement of said casing away from said surface.

PHILIP S. RUSSEL.