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TEMPERATURE AND MOISTURE CONTROL DEVICES

Filed July 21, 1958

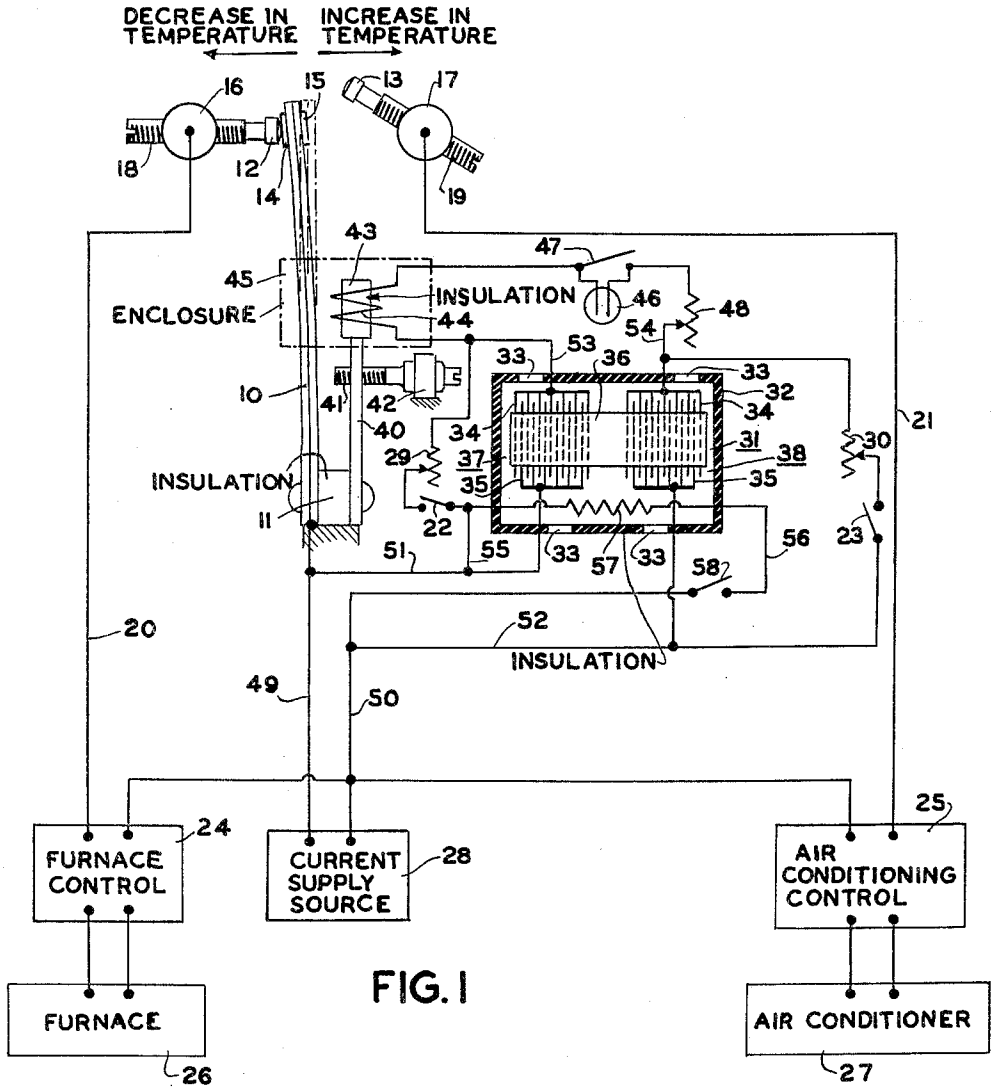


FIG. 1

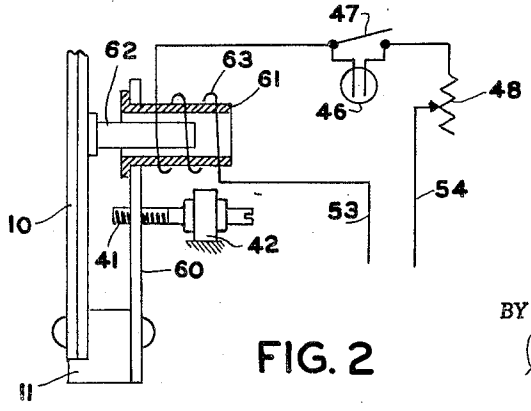


FIG. 2

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TEMPERATURE AND MOISTURE CONTROL DEVICES

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The present application relates to temperature and moisture control devices and more particularly to a control device which is responsive to temperature and moisture for controlling furnaces and air conditioners.

This application is a continuation-in-part of my application, Serial Number 727,490, filed April 9, 1958 for Moisture Responsive Devices.

An object of the invention is the provision of a temperature responsive means influenced by circuit moisture means to produce a control that is responsive to temperature and moisture.

Another object of the invention is the provision of temperature responsive means influenced by a moisture circuit means.

A further object of the invention is the provision of a temperature responsive means controlled by a moisture circuit means to thereby influence said temperature responsive means in accordance with the moisture.

Another object of the invention is the provision of temperature responsive means influenced by localized heat means energized by a moisture circuit means.

Another object of the invention is the provision of temperature responsive means influenced by electromagnetic means energized by a moisture circuit means.

Another object of the invention is the provision of locally heating the moisture circuit means.

Another object of the invention is the provision of moisture circuit means having spaced electrical conductors between which a current conducting coating extends to conduct current in response to moisture on the coating and locally heating the moisture circuit means to modify the moisture circuit means with respect to the surrounding ambient temperature.

Another object of the invention is the provision of arresting the influence of the moisture circuit means upon the temperature responsive means when the moisture content is below a predetermined value.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a diagrammatic showing of a temperature and moisture control circuit wherein the bimetal temperature responsive means is influenced by a localizing heating means which is governed by a moisture circuit means; and

FIGURE 2 is a fragmentary view of FIGURE 1 showing a modified arrangement wherein the bimetal temperature responsive means is influenced by an electromagnet instead of a localized heating means shown in FIGURE 1.

With reference to FIGURE 1, the invention comprises a temperature responsive means or bimetal element **10** which is influenced by a local heat coil **44** governed by a moisture circuit means **31**. The bimetal element **10** is supported at its lower end by an insulating support member **11**. The free upper end of the bimetal element **10** operates between a furnace contact **12** and an air-conditioning contact **13**. An intermediate furnace contact **14** is maintained on the left-hand side of the bimetal element **10** for engaging the furnace contact **12** and an intermediate air-conditioning contact **15** is maintained on the right-hand side of the bimetal element **10** for engaging the air-conditioning contact **13**. The furnace contact **12** is carried by an adjustable screw **18** which is supported by a turnable support **16** so that the furnace contact **12** may be moved out of the path of the free end of the bimetal element **10** during the summer season when the furnace is not in operation. The air-conditioning contact **13** is carried by an adjustable screw **19** which is supported by a turnable support **17** so that the air-conditioning contact **13** may be moved out of the path of the free end of the bimetal element **10** when the air-conditioner during the winter season is not in operation. As shown in the drawing, the furnace control contact **12** is in operative position with the free end of the bimetal element **10** and the air-conditioning contact **13** has been turned about the turnable support **17** so as to be out of the path of the bimetal element.

In the winter season, the furnace **26** is controlled by a furnace control **24** and the circuit for energizing the furnace control **24** extends from a current supply source **28** through a conductor **49**, the bimetal element **10**, the contacts **14** and **12** and a conductor **20**. In the summer season, the air-conditioner **27** is controlled by an air-conditioning control **25**. The circuit for controlling the air-conditioning control **25** extends from the current supply source **28** through the conductor **49**, the bimetal element **10**, the contacts **15** and **13** and a conductor **21**. The moisture circuit means **31** is mounted in an insulating housing **32** which is completely enclosed except for ventilating openings **33**. The insulating housing **32** is shown in section but in actual practice, the insulating housing **32** is a complete enclosure. Mounted on the bottom of the insulating housing **32** is a plurality of spaced conductors **34** and **35**. The spaced conductors **34** and **35** may be provided on the bottom of the insulating housing **32** in any suitable manner and for the present invention, a printed circuit appears to be satisfactory. Extending across the top of the spaced conductors **34** and **35** is a current conducting coating **36**. When the air within the insulating housing **32** is dry, substantially no current flows between the spaced conductors **34** and **35**, but when the air in the insulating housing **32** becomes damp, current flows between the spaced conductors **34** and **35**. The moisture control circuit may be substantially the same as that disclosed in my application Serial No. 727,490 of which is application is a continuation-in-part and the disclosure in my application Serial No. 727,490 is hereby incorporated in this application.

The spaced conductors **34** and **35** are preferably arranged in two parts which may be referred to as the left-hand part **37** and the right-hand part **38** as shown in the drawing. The circuit for energizing the local heat coil **44** for influencing the bimetal element **10** may be traced as follows: Beginning with the conductor **49**, current flows through a conductor **51**, the left-hand part **37** of the moisture circuit means, a conductor **53**, the local heat coil **44**, either a switch **47** or a diode lamp **46**, an adjustable resistor **48**, a conductor **54**, the right-hand part **38** of the moisture circuit means, and a conductor **52** to the supply conductor **50**. The local heat coil **44** is carried by a heat insulation support **43** which is mounted upon the free end of an adjustable support member **40** which has its lower end mounted on the insulation support member **11**. The local heat coil **44** may be moved relative to the bimetal element **10** by means of an adjustable screw **41** which is turnably supported by a support **42**. Accordingly the degree of influence of the local heat coil **44** upon the bimetal element **10** may be varied by adjusting the adjustable screw **41**. It is to be noted that as the bimetal element **10** moves to the right under a condition of increasing temperature, the local heat coil **44** influences the bimetal element **10** to a greater amount. In other words, the higher the temperature, the more the local heat coil **44** influences the bi-

metal element. Conversely, the colder the temperature, the less the local heat coil 44 influences the bimetal element. The manner in which moisture effects human comfort in combination with temperature and air velocity is shown in applicant's Patent No. 2,191,208 and particularly FIGURES 3, 4 and 5 thereof.

The insulated housing 32 has mounted therein a local heating element 57 which is energized by the supply conductors 49 and 50 through conductors 51, 55, 56 and a switch 58. One purpore of the local heating element 57 is to maintain the temperature within the insulated housing 32 at a higher value than the surrounding ambient temperature so that the moisture circuit means is not directly influenced by changes in ambient temperatures. Also the local heating element 57 tends to dry out the current conducting coating 36 so that there is always a tendency for the moisture circuit means to be less conducting than would normally tend to be if the current conducting coating were allowed to soak up the moisture. That is to say, the local heating element 57 tends to help the moisture evaporate from the current conducting coating 36 so as to give instantaneous response. As illustrated by the dot-dash line 45, the local heat coil 44 and a portion of the bimetal element 10 may be enclosed in a suitable enclosure 45 to render the heat coil 44 ineffective. The enclosure 45 may be of any suitable insulating material having proper ventilating openings.

When the switch 47 is closed, the local heat coil 44 is continually influenced by the moisture circuit means 31 from a gradual dry condition to a gradual damp condition. When the switch 47 is open, the circuit is controlled by a diode lamp 46 which may be in the form of a small neon light bulb of a very low wattage. The light bulb or the diode lamp 46 becomes conducting only as the moisture has reached a predetermined level, such, for example, as approximately 35 to 40 percent relative humidity. Therefore, when the diode lamp 46 is in the circuit, the local heat coil 44 does not influence the bimetal element 10 until the diode lamp becomes conducting. In operation for furnace control, the combined temperature and moisture control is such that with an increase in moisture in a given heated room, the actual temperature is lower than what it would normally be because the presence of the moisture in the room makes one feel warmer. Therefore, when there is moisture in the room, the intermediate furnace contact 14 breaks away from the furnace contact 12 sooner than it would normally do without the influence of the local heat coil 44.

For air-conditioning control, the presence of more moisture tends to hold the intermediate air-conditioning contact 15 against the air-conditioning contact 13 longer than just temperature alone would normally hold the circuit closed, under which case the air-conditioner continues to operate to take moisture out of the air. When the moisture in the air has been decreased to a low value, then the air-conditioning contacts open to stop the operation of the air-conditioner. Accordingly, either for furnace or air-conditioning control, the temperature responsive means is influenced to provide the greatest amount of human comfort.

The local heat coil 44 is of very low wattage as the current flow through the moisture circuit means is in the order of milliamperes. The amount of the current flow may also be adjusted by the adjustable resistor 48. As a modification, the local heat coil 44 may be replaced by a diode lamp, such as for example, a very low wattage neon lamp. In this modification, the diode lamp 46 may be dispensed with in which case the diode lamp and the local heat coil would be one and the same thing. Also the diode lamp would operate as an indicator to show when the moisture circuit means is conducting current.

FIGURE 2 shows a modified form of the invention in that the moisture circuit means 31 governs an electromagnet comprising a coil 63 which is supported on an iron core 61 carried by an adjustable support 60. An armature

62, which is connected to the bimetal element 10, is mounted within the iron coil support. This entire arrangement produces an electromagnet which influences the movement of the bimetal element 10. The pull produced by the electromagnet is very small because the current flow through the moisture circuit means is in the order of milliamperes. The amount of the pull of the electromagnet of the bimetal element 10 may also be adjusted by the adjustable resistor 48. The operation of the electromagnet and its influence on the bimetal element is substantially the same as that described with reference to the local heat coil 44 in FIGURE 1.

The moisture circuit means 31 may be further controlled by two adjustable resistors 29 and 30 which may be introduced respectively across the left-hand and right-hand parts 37 and 38 by closing the switches 22 and 23. The resistors 29 and 30 when introduced in the circuit will enable a larger amount of current to flow to the heat coil 44 or the magnetic coil 63. In other words, the resistors 29 and 30 are in parallel respectively with the left-hand part 37 and the right-hand part 38.

For control of furnaces and air-conditioners, the bimetal 10 is operated through a relatively small range so far as the temperature is concerned and in this type of operation, the heat coil 44 may be wrapped directly around the bimetal 10 and enclosed in a heat insulating covering so that all of the heat produced by the heat coil 44 is directly utilized by heating the bimetal 10.

A bimetal strip and a local heater may be employed as a milliampere instrument to read the moisture content of the air. In this instrument the bimetal would be calibrated to read substantially zero on the scale at a temperature which is higher than the room temperature so that changes in the room temperature will not effect the zero reading of the meter. As current is passed by the moisture circuit means to energize the heat coil, then the movement of the bimetal would be a direct measurement of the moisture content of the air. The instrument would be substantially the same as the bimetal 10 and the heat coil 44, except that there would be no contacts and a pointer would move in accordance with the movement of the bimetal.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In combination, furnace means, air conditioning means, furnace control means including furnace contact means to control said furnace means, air conditioning control means including air conditioning contact means to control said air conditioning means, intermedite contact means movable between said furnace contact means and said air conditioning contact means, temperature responsive means to operate said intermediate contact means, moisture circuit means responsive to moisture, electrical means to influence said temperature responsive means, said moisture circuit means comprising electrical insulating means having spaced electrical conductors thereon over which and between which a current conducting coating directly adhering to said insulating means extends to conduct leakage current in response to moisture on said coating, electrical connection means to conduct said leakage current to said electrical means to energize same and thereby influence said temperature responsive means, and heating element means to heat said moisture circuit means.

2. In combination, furnace means, air conditioning means, furnace control means including furnace contact means to control said furnace means, air conditioning control means including air conditioning contact

means to control said air conditioning means, intermediate contact means movable between said furnace contact means and said air conditioning contact means, temperature responsive means to movably support said intermediate contact means, electrical heater means mounted on a support adjacent said temperature responsive means to effect movement thereof toward said heater means upon increase in temperature, adjustable means to adjust said heater means relative to said temperature responsive means, an enclosure enclosing said electrical heater means and at least part of said temperature responsive means for effective heat transfer therebetween, moisture circuit means responsive to moisture, said moisture circuit means comprising electrical insulating means and first and second spaced electrical conductor means thereon over which and between which a current conducting coating extends to conduct leakage current in response to moisture on said coating, electrical connection means including gaseous diode means and resistance means to conduct said leakage current to said electrical heater means to energize same and thereby influence said temperature responsive means, a housing enclosing said moisture circuit means and having openings therein to permit passage of ambient air, and heating element means within said housing to heat said moisture circuit means to a temperature above the ambient air outside said housing so that said moisture circuit means is not directly influenced by changes in the temperature of the ambient air outside said housing and whereby said temperature responsive means and said furnace control means and air conditioning control means are, thus, responsive both to the ambient air temperature and to the ambient humidity.

3. In combination, furnace means, furnace control means including furnace contact means to control said furnace means, movable contact means movable into engagement with said furnace contact means, temperature responsive means including a bimetallic blade to movably support said movable contact means, electrical heater means mounted on a support adjacent the low expansion side of said bimetal blade, adjustable means to adjust said support relative to said bimetal blade, an enclosure enclosing said electrical heater means and at least part of said bimetal blade for effective heat transfer therebetween, moisture circuit means responsive to moisture, said moisture circuit means comprising electrical insulating means and first and second spaced electrical conductor means thereon over which and between which a current conducting coating extends to conduct leakage current in response to moisture on said coating, electrical connection means including gaseous diode means and resistance means to conduct said leakage current to said electrical heater means to energize same and thereby influence said temperature responsive means, a housing enclosing said moisture circuit means and having openings therein to permit passage of ambient air, and heating element means within said housing to heat said moisture circuit means to a temperature above the ambient air outside said housing so that said moisture circuit means is not directly influenced by changes in the temperature of the ambient air outside said housing and whereby said temperature responsive means and said furnace control means are, thus, responsive both to the ambient air temperature and to the ambient humidity.

4. In combination, furnace means, air conditioning, means, furnace control means including furnace contact means to control said furnace means, air conditioning control means including air conditioning contact means to control said air conditioning means, intermediate contact means movable between said furnace contact means and said air conditioning contact means, temperature responsive means including a bimetallic blade to movably support said intermediate contact means, electrical heater means mounted on a support adjacent the low expansion side of said bimetal blade, adjustabe means to adjust said support relative to said bimetal blade, an enclosure enclosing said electrical heater means and at least part of said bimetal blade for effective heat transfer therebetween, moisture circuit means responsive to moisture, said moisture circuit means comprising electrical insulating means and first and second spaced electrical conductor means thereon over which and between which a current conducting coating directly adhering to said insulating means extends to conduct leakage current in response to moisture on said coating, electrical connection means including gaseous diode means and resistance means to conduct said leakage current to said electrical heater means to energize same and thereby influence said temperature responsive means, a housing enclosing said moisture circuit means and having openings therein to permit passage of ambient air, and heating element means within said housing to heat said moisture circuit means to a temperature above the ambient air outside said housing so that said moisture circuit means is not directly influenced by changes in the temperature of the ambient air outside said housing and whereby said temperature responsive means and said furnace control means and air conditioning control means are, thus, responsive both to the ambient air temperature and to the ambient humidity.

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