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Laing et al.

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[54] **TEMPERATURE CONDITIONING MEANS**

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Related U.S. Application Data

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[30] **Foreign Application Priority Data**

Jan. 8, 1969 Austria A121/69

[52] **U.S. Cl.** **126/400,** 165/105
[51] **Int. Cl.** **F24h 7/06**
[58] **Field of Search** 165/105; 126/400

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Assistant Examiner—Wiliam C. Anderson
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[57] **ABSTRACT**

A temperature conditioning device for controlling temperature in a room where said device has a heat source wall, a heat sink wall, and a chamber between the walls adapted to be filled with a saturated vapor of a low boiling point heat carrier whereby the vapor of the condensate serves to transfer heat between the walls. A temperature responsive condensate control valve may be included to control flow of condensate of the heat carrier from one wall on which it may condense to the other wall on which it vaporizes such that the valve serves to regulate transfer of heat between the walls.

A method of charging a temperature conditioning device with a low boiling point heat carrier which includes cooling the device, evacuating a chamber in the device, and then injecting in liquid form a low boiling point heat carrier into the chamber.

26 Claims, 10 Drawing Figures

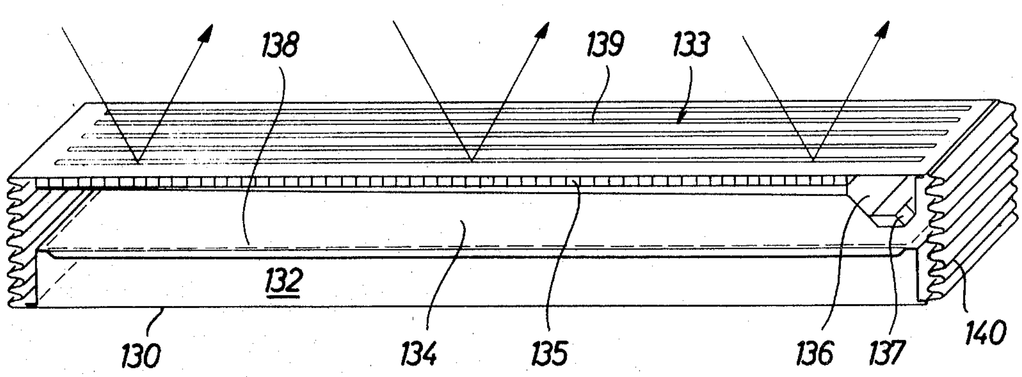


FIG. 1

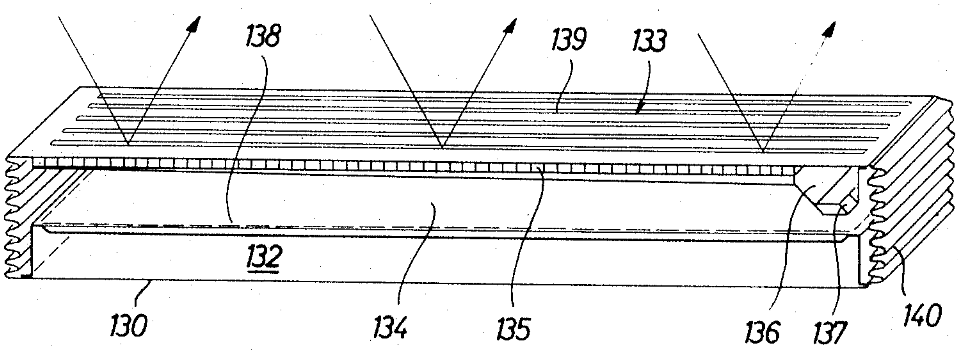


FIG. 2

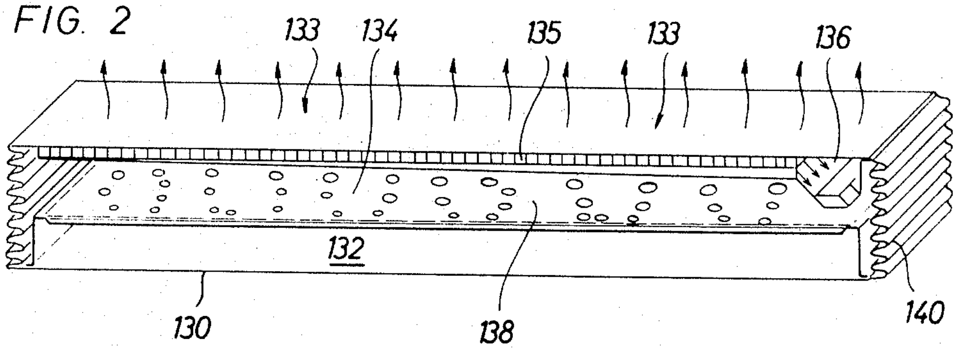


FIG. 3

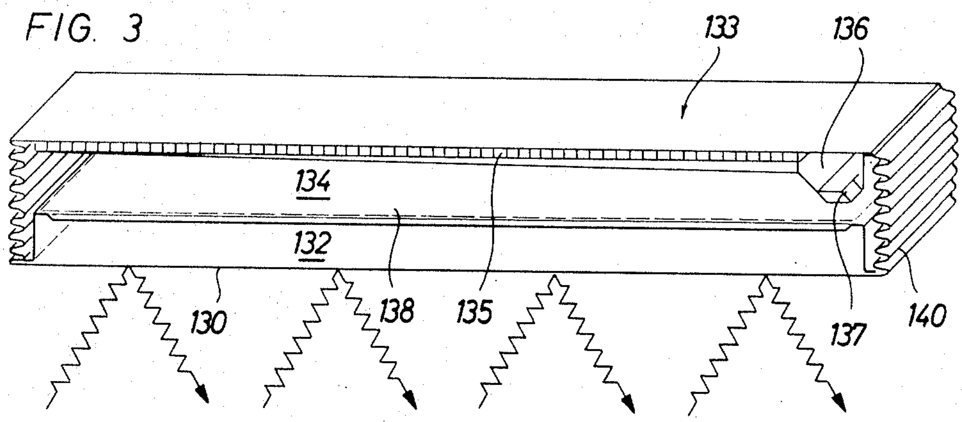


FIG. 4

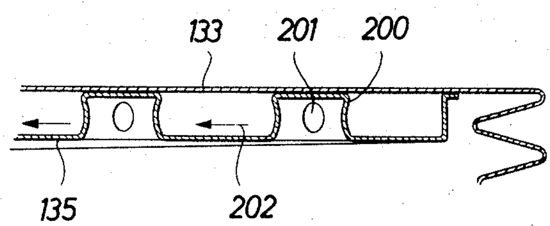


FIG. 5

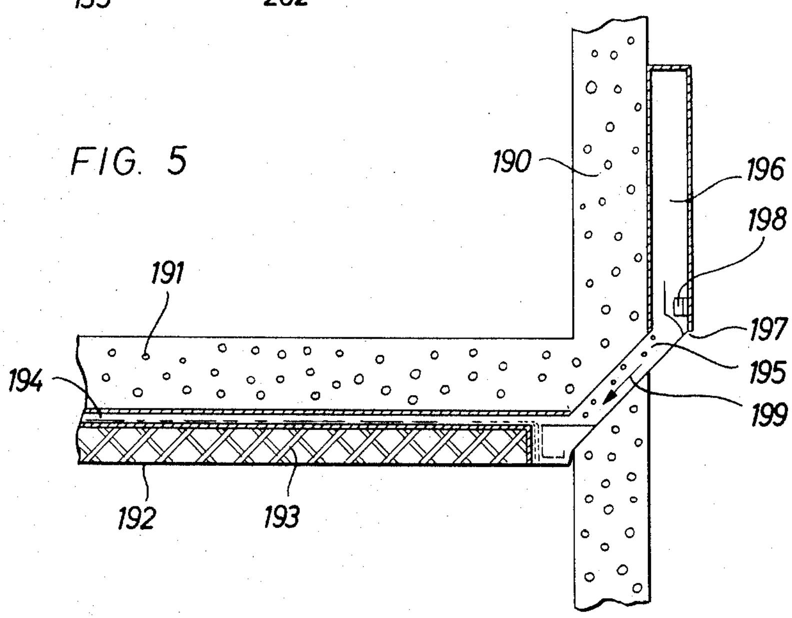


FIG. 6

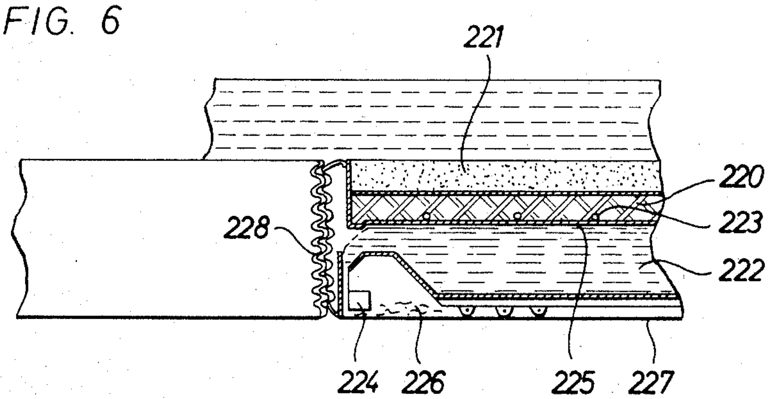


FIG. 7

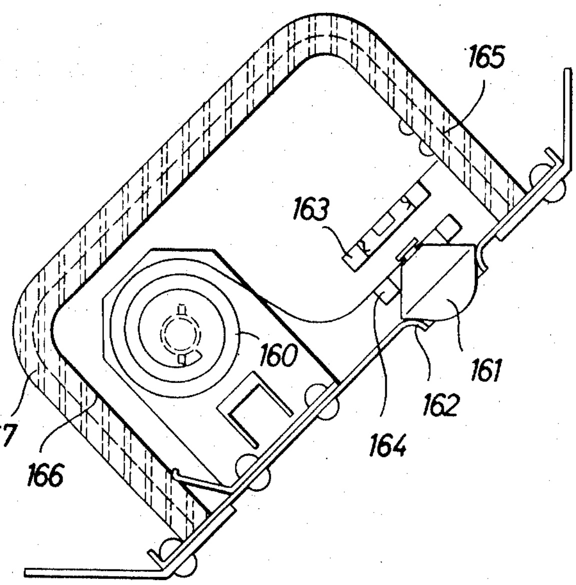


FIG. 8

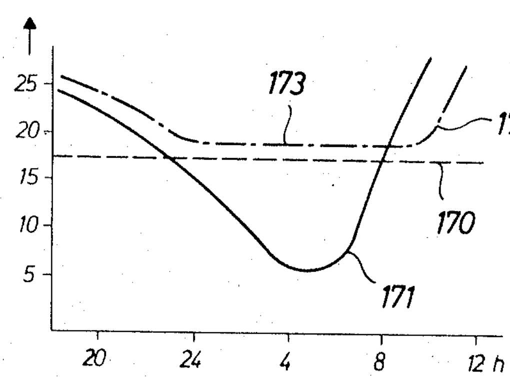
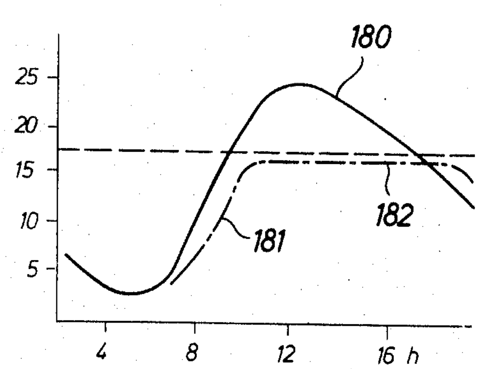


FIG. 9



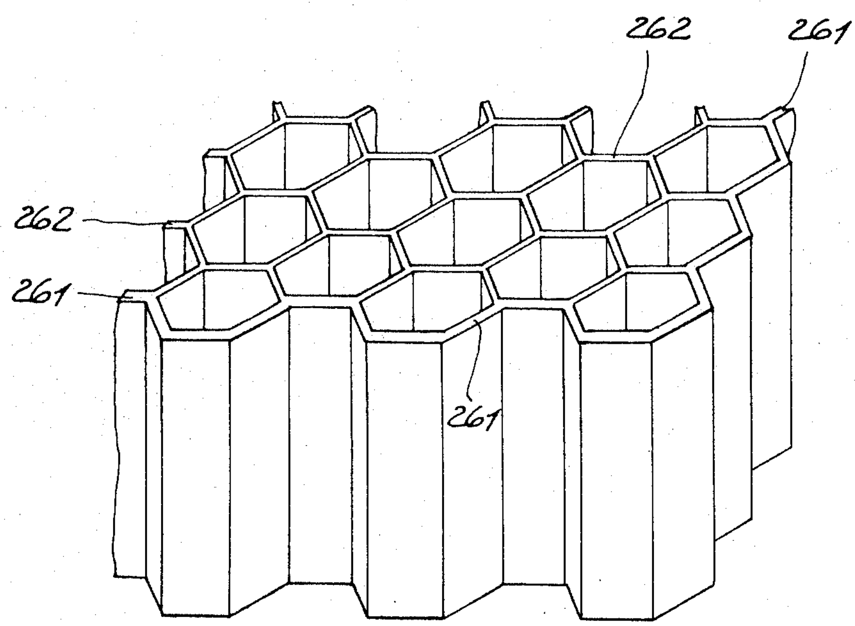


FIG. 10

TEMPERATURE CONDITIONING MEANS

REFERENCE TO OTHER APPLICATIONS

This application is a division of our copending application Ser. No. 830,457 filed June 4, 1969 and now U.S. Pat. No. 3720198.

GENERAL SUMMARY OF THE INVENTION

The invention relates generally to a temperature conditioning device which in one form may be utilized to keep the temperature of a room within a predetermined range by controlling flow of heat from the interior of a room to the exterior thereof through the use of storage elements when the device is used as an air conditioner. It is known that heat storage elements may be used to maintain temperature in a room within a desired range where the heat storage elements absorb heat from a room during the day and release the same to the exterior of a room during the night. Such storage bodies which act as heat sinks have the same effect as walls of rooms having extremely high heat capacity, as for example basement walls or rooms having very thick walls where the temperature of the walls during the day is substantially below the outside temperature and where the heat accumulated by the walls during the day is transferred to the exterior of a room at night when the outside temperature drops below that of the walls.

The invention is directed towards controlling temperature of a room in the same general manner as that provided by the use of thick walls of high heat storage capacity but by providing structure which accomplishes this in a more efficient manner. Broadly, the invention comprises a temperature conditioning device having a wall acting as a heat sink adapted to face the interior of a room and a wall acting as a heat source adapted to face the exterior of a room when the device is used to cool a room. The wall acting as a heat source may comprise a heat storage element. A hermetic chamber is provided between the walls and is adapted to be filled with a saturated vapor of a low boiling point heat carrier. Control means are provided to regulate flow of the condensate of the heat carrier from the heat source wall upon which the vapor of the heat carrier condenses to the heat sink wall or storage element upon which the condensate vaporizes. When the condensate is allowed to flow to the heat storage element, the vapor formed by the evaporation of the condensate contacting the storage element will serve as a means to carry the heat from the storage element to the heat source wall and thus to the exterior of a room where the heat absorbed by the heat storage element during the day may be discharged at night. When the condensate is prevented from flowing on to the heat storage element, the conditioning device acts as an insulation means to prevent passage of heat between the heat storage element and the heat source wall. Such a device acts as a temperature conditioning means in a more efficient degree than a wall of extremely high heat capacity (i.e. thick brick walls) in that heat may be discharged directly from the room without first discharging the heat in the wall.

A device constructed according to the invention further has the advantage that it can be easily combined with heating elements in order to heat a room. This can be accomplished by including a heat storage element having heating means connected thereto to heat the same and a means for controlling flow of a saturated

vapor of the heat carrier from the heat storage element to a heat emitting or heat source wall of the device facing the room. Where the device is included in the ceiling of the room. capillary means are provided to carry the condensate from the heat source wall on which the vapor condenses and which faces the ceiling of a room upwardly to the heat storage element.

The invention also relates in a further form to a temperature conditioning device which acts as an insulation panel. In this embodiment the device need not include any heat storage element but may comprise only the heat source and heat sink walls separated by a hermetic chamber having a condensate of a low boiling point heat carrier therein. Preferably the device is in panel form with the heat source wall facing the exterior of a room and the heat sink wall facing the interior of the room. During the day when the outdoor temperature is above the condensation temperature of the saturated vapor of the heat carrier, no condensate will form on the heat source wall and no heat will be transferred between the walls such that the device acts as an insulation means. At night when the outdoor temperature drops below the condensation temperature, condensate will form on the heat source wall, move to the heat sink wall where it is vaporized and condense again on the heat source wall transferring heat during the process from the interior of a room to the outdoors.

The invention also relates to a temperature responsive control valve to automatically provide a rectifier effect to the conditioning device, either when used as an air conditioner or as an insulation means, to shut off flow of condensate to the heat sink wall when the average outside temperature drops below the desired room temperature over a prolonged period of time, such as occurs during the winter. The valve also, however, must allow transfer of heat when the outside temperature drops below the room temperature over brief time spans, as for example during the night in the summertime. Alternatively, a manually operated control valve may be utilized to control condensate flow.

Broadly the control valve comprises a bimetallic coil which opens and shuts a valve in response to temperature change to control flow of condensate from the heat source wall of the device on which the vapor of the heat carrier condenses to the heat sink wall. The valve is housed in a casing which is immersed in condensate. The casing walls preferably have two heat storage substances therein with one substance having a crystallization temperature slightly above the crystallization temperature of the main heat storage substance associated with the heat storage element and the other substance having a crystallization temperature slightly below that of the main substance. This construction will in effect increase the response time of the valve to temperature change and compensate for periods of the year when outdoor temperatures over a prolonged period of time are below the desired room temperature but which may rise briefly during the day to the desired room temperature, as for example might occur during an autumn day. The effect of increasing the response time is to assure that the valve remains closed during those short periods of time that the temperature is at or above the desired room temperature.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end view of a temperature conditioning device constructed according to the invention in panel form with the end of the panel removed and illustrating a phase of operation when the panel may cool a room, as for example during a summer day;

FIG. 2 is a view of the device of FIG. 1 illustrating a phase of operation when the device discharges heat to the exterior of a room, as for example during a summer night;

FIG. 3 is a view of the device of FIG. 1 when acting as an insulation panel, as for example during the winter;

FIG. 4 is an enlarged partial sectional view of a condensate collecting dish for use in the conditioning device of FIG. 1;

FIG. 5 illustrates a further embodiment of a temperature conditioning device used as an intermediate ceiling member with a condenser portion on the outer wall of a building;

FIG. 6 illustrates a further embodiment of a temperature conditioning device in panel form having a supplementary electrical heating means and used for heating a room;

FIG. 7 is a sectional view of a condensate control valve for use with a conditioning device of the type shown in FIG. 1;

FIG. 8 illustrates the mode of operation of the condensate control valve of FIG. 7 in summer during brief periods of cooling;

FIG. 9 illustrates the mode of operation of the condensate control valve of FIG. 7 in winter during brief periods of heating; and

FIG. 10 is a perspective view of a secondary support structure that may be included in a heat storage element used in a temperature conditioning device constructed according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1 there is illustrated a temperature conditioning device in panel form comprising an inner heat absorbing wall **130** acting as a heat sink adapted to face a room the temperature of which is to be regulated and an outer heat emitting wall **133** acting as a heat source adapted to be exposed to the exterior of a room. A heat storage element **132** joins and is in heat conductive connection with the inner wall **130** and may be considered as comprising part of heat sink wall **130.** The heat storage element which acts as a heat sink to abosrb heat from the interior of a room during day time operation is preferably filled with a meltable heat storage substance, for example sodium sulphate octohydrate, and preferably a material having a crystallization temperature below 18°C. A chamber **134** is included between the outer heat source wall **133** and the heat storage element **132** which chamber may be substantially filled with an insulation material, for example a permeable, porous, loose filling cellular insulation material. An apertured wall member **135** is positioned directly below the outer wall **133** and acts as a collecting means for collecting condensate that forms on the wall **133.**

A condensate of a low boiling point heat carrier having a boiling point less than the maximum operating temperature of the device, for example a chlorinated hydrogen floride having a boiling point over 50°C., is included in the chamber **134.** A saturated vapor of the carrier may then pass through the insulating material filling the chamber **134** and on through the apertures **201** of the apertured wall member to reach the heat source wall **133** where the vapor is condensed into a condensate. The member **135,** as more clearly shown in FIG. 4, has a plurality of cell-like indentations **200** with apertures **201** in the sides of the indentations such that the condensate which collects on wall **133** will fall onto the area of the member **135** between the indentations **200** and flow in the direction of arrow **202** to a condensate collecting channel **136.** A condensate flow valve means **137** is included in channel **136** and serves to regulate flow of condensate back to chamber **134.** The flow valve is preferably of bimetallic form and responsive to temperature of the condensate.

The top of the storage element **132** is covered by an absorbant layer of paper **138** whereby the condensate that flows back through valve **137** will be evenly distributed over the top of the storage element.

The heat source wall **133** of the device may comprise sheet metal or concrete. When the wall is of sheet metal, grooves **139** may be provided to act as a stiffening means. The side walls **140** of the device connecting the walls **130** and **133** are corrugated with the waves of the corrugations extending parallel to the walls **130** and **133** which effectively increase the length of the side walls to increase the resistance to heat flow in the side walls in the direction of the temperature gradient. The corrugated construction is such that adjacent panels may be interlocked.

Preferably the low boiling heat carrier has a high molecular weight so that its vapor will likewise have a high molecular weight in order that the resultant Brownian molecular speed, which determines the kinetic heat transfer of the vapor, remains low. In addition it is desirable that the cellular construction of the insulating material be so dimensioned that it coincides in the order of magnitude with the free mean path of the vapor molecules to further reduce heat transfer. This combination of molecular weight of the vapor and cellular size of the insulating material results in an insulating layer having a coefficient of thermal conductivity much smaller than that of a layer made up of the best air filled insulating materials.

The operation of the conditioning device is as follows. When the heat source wall **133** becomes heated as during the day as shown in FIG. 1, the temperature responsive valve means **137** is closed. This prevents condensate from flowing into chamber **134** so that the device acts as an insulating panel in preventing heat from the outside of the room entering the room. At the same time, the heat storage element which is thermally connected to the heat sink wall **130** will absorb heat from the interior of the room to cool the same.

When the temperature of the heat source wall **133** and the condensate in channel **136** drops below the critical temperature of the storage element, 18°C. where the storage element has a material therein which crystallizes at 18°C., the temperature responsive valve **137** will open thus allowing condensate to flow from the channel **136** onto the absorbant paper **138** where it is distributed over the storage element. This phase of operation which usually occurs during the night when the outdoor temperature drops is illustrated in FIG. 2. The condensate on the storage element will then be heated up by the heat stored in the element and vaporize such that a saturated vapor of the heat carrier will rise to contact the heat source wall **133** where the vapor will condense thus carrying heat from the storage element to the wall **133** during the process. The condensate will then again flow back through the open valve 137 to the storage element such that there is a continuous evaporation and condensation cycle which serves to discharge the heat absorbed by the storage element during the day to the outdoors during the night. During summer the conditioning device thus acts as an air conditioning unit but without the disadvantage of air currents, noise, power consumption and maintenance. The only mechanical element in the device is the condensate valve 137 which has no sliding parts and hence no parts are subject to wear.

During winter the conditioning device as shown in FIG. 1 would continuously transport heat from the interior of a room to the outdoors, even during the day time, if there were no provisions made to close the valve 137. This is because the valve is set to normally open when the temperature of the heat source wall 133 and condensate in channel 136 drops below that of the crystallization temperature of the storage element. Manual or automatic means are therefore provided for closing the valve during winter or other periods of prolonged low temperature.

Referring to FIG. 3, there is illustrated the room conditioning device shown operating in the wintertime and where it acts only as an insulation device. In this instance the valve 137 is locked closed and thus prevents flow of condensate from the channel 136 back to the chamber 134 so that there will be no transfer of interior heat through the chamber 134.

If the device is to act only as an insulation means, it is not necessary to include a heat storage element. In such event the structure of the insulation means would be the same as that shown in FIGS. 1–3 without the storage element 132 and the operation of the device would be the same as previously described.

Further if the device were to be used only in warm climates not subjected to prolonged periods of low temperature, it would not be necessary to include a condensate flow control valve. In this instance, during the day the heat source wall 133 would be above the condensation temperature of the vaporized heat carrier and there would be no heat transfer between the walls. At night, the carrier would condense on the wall 133 and flow back to wall 130 where it would be vaporized to again condense on wall 133 transferring heat during the process.

FIG. 5 illustrates a further form of the invention where the conditioning device is adapted to be applied to a ceiling 191 of a room and where the heat emitting portion of the device is to be affixed to the exterior wall 190 of an upper room. The storage element 192 is generally similar to the storage element 132 of FIG. 1 and contains a meltable storage material 193. A space 194 is provided above the element 192 and communicates by tube 195 to a condenser 196 mounted on the wall 190. The condenser includes a condensate collecting means 197 having therein a temperature responsive condensate flow valve 198 which regulates flow of condensate in the direction of the arrow 199 towards the heat storage element. In this instance the portion of the device facing the interior of a room and on which the storage element is mounted corresponds to the heat sink wall of FIG. 1, the side walls of the condenser to the heat source wall of FIG. 1, and the space 194, the interior of the tube 195 and of the condenser 196 to the chamber of FIG. 1.

The operation of this device is generally similar to that of FIG. 1 in that heat is absorbed during the day by the storage element 192 to cool a room. When the outside temperature and temperature of the condensate in collecting means 197 drops below the crystallization temperature of the heat storage substance 193, the temperature responsive valve 198 opens allowing condensate to flow through tube 195 onto element 192. The condensate is then vaporized and rises to the condenser where the vapor is condensed and flows back to valve 197. The saturated vapor thus serves to transfer heat absorbed by the storage substance during the day to the condenser where the heat is emitted to the exterior of a room during the night.

The principal of the invention is also applicable for use with devices to heat a room. Referring to FIG. 6, a conditioning device is shown which includes a heat storage element 220 disposed between two insulation layers 221 and 222 with the former layer being hermetically separated from the latter layer. The storage element contains a meltable heat storage substance having a crystallization temperature above the desired operating temperature of the room to be heated, for example sodium sulphate octahydrate having a melting point over 32°C. Conventional electrical heating elements 233 are provided to charge the heat storage element 220, for example during the night when electricity tariffs are low. A condensate 226 of a heat carrier having a boiling point above the maximum operating temperature of the device is included in the device. A valve 224 controlled by a room thermostat is opened to establish a connection between a capillary skin means 225 and the condensate 226 when it is desired to withdraw heat from the heat storage element to heat a room.

The condensate which is carried to the heat storage element by the capillary skin means 225 contacts the element and vaporizes with the saturated vapor then moving to contact the wall 227 facing the interior of a room and on which it condenses. The saturated vapor thus serves to transfer heat from the heat storage element to the wall 227 which then becomes a heat emitting or heat source wall while the heat storage element acts as a heat sink wall. When the temperature of the room reaches a predetermined level, the thermostat controlled valve 224 will close thus breaking the vaporization-condensation cycle to stop transfer of heat. Since the insulation layer 221 is hermetically separated from the saturated vapor, there is heat transfer only from the element 220 towards the surface 227.

While electrical heat elements 223 are disclosed, the conditioning device is also applicable for use with hot oil heating. Hot oil installations usually have maximum operating temperatures on the order of 400°C. and the pipes used to transmit the hot oil to the point of use usually have small cross sections such that when operated continuously during the day. the heat loss occurring is considerable because of the high temperatures utilized. This loss however may be minimized if the devices are operated for short cycles, for example on the order of two hours, in conjunction with heat storage devices of the type shown in FIG. 6.

Panels of the type shown in FIG. 6 may be intermixed with panels such as the type shown in FIG. 1 such that full air conditioning can be also obtained as well as full heating.

Referring to FIG. 7 there is illustrated in greater detail a temperature responsive valve similar to valve 137 of FIG. 1. A bimetallic coil 160 pivotally mounts a valve disc 161 so that it may seat and unseat with respect to valve seat **162** to control flow of condensate through the valve seat. A magnet **163** is positioned on the opposite side of the valve disc **161** from the seat **162** and cooperates with the magnet **164** mounted on the valve disc to insure a definite two point change over of temperatures at which the valve disc **161** will move. The coil, as well as the magnets, are installed with an insulation casing **165,** which is situated in a condensate collecting channel. The casing walls in turn preferably have two chambers containing two layers **166** and **167** of meltable heat storage substances having different temperatures of crystallization with the crystallization temperature of one layer being a few degrees above the crystallization temperature of the storage substance **132** and the crystallization temperature of the other layer being a few degrees below the crystallization temperature of the storage substance **132.** Alternatively, the casing may contain a single storage substance which is the same as the heat storage substance **132.** This insulation of the valve including the heat substances insures that the change over from summer operation to winter operation of the conditioning device will occur only after relatively long periods of temperature change rather than over a short period of change as might occur for example on a summer night where outdoor temperature drop is for a short period.

The functional operation of the bimetallic control valve in the insulated casing is more clearly explained by reference to FIGS. **8** and **9.** In FIG. **8,** temperature is shown plotted on the Y axis and time plotted on the X axis. Line **170** represents the temperature at which the valve is closed which is the temperature limit below which no heat is to be withdrawn from the conditioning unit, i.e. crystallization temperature of the storage substance **132.** Line **171** represents the temperature change that may occur during a brief period of cooling as for example during a summer night. Line **172** represents the temperature within the insulated casing with the horizontal portion **173** of the line being equivalent to the crystallization temperature of the storage material **167** contained in the casing. It is seen that if the portion **173** is longer in duration of time than the portion of line **171** below the change over temperature **170,** that the valve will remain open and not interrupt the discharge of heat from the conditioning device, i.e. the heat transfer from the heat sink wall **130** to the heat source wall **133.**

FIG. **9** illustrates a period of heating such as occurs on a sunny day during the wintertime. During the winter the valve disc **161** remains seated on its seat to shut off flow of condensate such that the temperature conditioning device acts as an insulator. The line **180** represents the daily temperature variation for a sunny day. The line **181** represents the temperature of the interior of the casing with the horizontal portion **182** corresponding to the crystallization temperature of the storage material **166.** When the outdoor temperature rises briefly during the day, as represented by line **180,** the interior of the casing will remain at a lower temperature represented by line **182** thus assuring that the valve will remain closed. When seasonal temperature variations of long duration occur, there will be an automatic change over from heat insulation operation of the device as represented in FIG. **3** to a heat equalization operation as shown in FIGS. **1** and **2.**

The heat storage element of the device may include secondary support structure as for example, a honeycomb structure **260** as illustrated in FIG. **10,** to increase structural strength of the conditioning device or to provide a means for positioning seed crystals within the storage substance contained in the storage element. As shown the edge walls **261** of the honeycomb structure are reinforced with respect to the inner walls **262** such that mechanically rigid panel elements are formed.

The heat storage element when used with the device may be included within the chamber between the heat sink and heat source walls as shown in FIG. **1** or outside of the chamber and thermally connected to a heat sink wall as shown in FIG. **5.** Further the storage element may be encased in a plastic sheet container.

The storage substance used in the storage element preferably should have a crystallization temperature below the desired room temperature during the day and above the lowest outdoor temperature when the device is used to cool a room, namely in the region 10°C.–20°C. A suitable substance comprises one-half a mixture of sodium sulphate and sodium chloride and the other half a mixture of borax and water.

A temperature conditioning device of the type shown in FIGS. **1** and **5** is charged with a heat carrier utilizing the following steps. The device is cooled below the crystallization temperature of the storage substance **132.** The interior of the chamber **134** is evacuated by applying negative pressure thereto. A heat carrier, for example a chlorinated hydrogen chloride with a boiling point above 50°C. is introduced into the chamber such that the absorbant layer **138** is completely impregnated and the groove **136** is partially filled with liquid heat carrier in the operating temperature. The chamber is then sealed and the device allowed to return to ambient temperature at which time it will be ready for use to condition the temperature of a room.

What is claimed is:

1. A temperature conditioning device for conditioning the temperature of a room where said device is adapted to form part of a wall or ceiling of a room and where said device comprises a hollow body member having a first wall adapted to act as a heat absorbing sink and a second wall adapted to act as a heat emitting source and where the first and second walls are adapted to face zones of different temperatures, characterized in that said hollow body member forms a hermetic chamber, in having a heat carrier medium in said chamber where said medium is in the form of a saturated vapor and a condensate of said vapor, in having an insulation material in said chamber where said insulation material is permeable to the saturated vapor in the direction of the temperature gradient, and in having a condensate return means for conveying condensate from said second wall acting as a heat emitting source to said first wall acting as a heat absorbing sink.

2. A temperature conditioning device according to claim **1** further characterized in having a heat storage element in heat conductive communication with said first wall acting as a heat absorbing sink and where said first wall is adapted to face the room to be conditioned.

3. A temperature conditioning device according to claim **2** further characterized in that said heat storage element is positioned within the hollow body member.

4. A temperature conditioning device according to claim **2** further characterized in that said heat storage element comprises a meltable latent storage substance having a crystallization temperature below the desired room temperature during the day and above the lowest temperature of the heat emitting source during the night when said device is used to cool a room.

5. A temperature conditioning device according to claim **2** further characterized in that said heat storage element comprises a meltable latent storage substance, the crystallization temperature of which is between 10°C. and 20°C.

6. A temperature conditioning device according to claim **2** further characterized in having a plastic sheet container enclosing said heat storage element.

7. A temperature conditioning device according to claim **2** further characterized in that approximately one-half of said heat storage element comprises a mixture of sodium sulphate and sodium chloride and the other half a mixture of borax and water.

8. A temperature conditioning device according to claim **2** further characterized in that the heat storage element comprises a meltable latent heat storage substance the crystallization temperature of which is above the desired room temperature and is below the highest temperature of the second wall when said device is used to heat a room.

9. A temperature conditioning device according to claim **8** further characterized in having absorbent means in said chamber adjacent said second wall acting as a heat emitting source and extending to said heat storage element, and where said second wall is adapted to face the interior of a room to be heated whereby condensate collected on said second wall will be distributed to said heat storage element.

10. A temperature conditioning device according to claim **9** further characterized in having a heating means in said device in heat conductive communication with said heat storage element.

11. A temperature conditioning device according to claim **9** wherein said heat storage substance comprises sodium sulphate octohydrate.

12. A temperature conditioning device according to claim **2** further characterized in that said condensate return means includes an intercepting member positioned between said second wall acting as a heat emitting source and said heat storage element wherein said intercepting member has a plurality of cell-like indentations for collecting condensate with apertures on the sides of said indentations through which vapor may pass.

13. A temperature conditioning device according to claim **2** further characterized in having a secondary support structure within said heat storage element.

14. A temperature conditioning device according to claim **1** further characterized in that said condensate return means includes a vapor permeable separating wall disposed between said first and second walls for intercepting condensate formed on one of said walls.

15. A temperature conditioning device according to claim **14** further characterized in having a collecting channel for collecting condensate intercepted by said separating wall and in having a valve for controlling flow of condensate from said collecting channel to said first wall acting as a heat absorbent sink.

16. A temperature conditioning device according to claim **1** further characterized in that said condensate return means includes a separating wall disposed between said first and second walls wherein said separating wall has perforations through which vapor may flow, a trough for collecting condensate formed on said second wall, and an aperture leading from said trough to said first wall means whereby condensate may flow to said first wall means.

17. A temperature conditioning device according to claim **16** further characterized in having an absorbent means in said chamber for conducting condensate over said first wall means.

18. A temperature conditioning device according to claim **17** further characterized in that said absorbent layer is disposed between said storage element and said insulation material.

19. A temperature conditioning device according to claim **16** further characterized in having a valve for controlling flow of condensate through said aperture.

20. A temperature conditioning device according to claim **19** further characterized in that said valve is temperature responsive to close below a predetermined temperature.

21. A temperature conditioning device according to claim **20** further characterized in having a housing the walls of which contain a first meltable latent heat storage mass enclosing said valve.

22. A temperature conditioning device according to claim **21** further characterized in having a second meltable latent heat storage mass in the walls of said housing and having a main meltable latent heat storage substance in said chamber and wherein said first and second meltable heat storage masses have a crystallization temperature respectively a few degress above and below the crystallization temperature of said main meltable latent storage substance.

23. A temperature conditioning device according to claim **1** further characterized in having side walls connecting said first and second walls wherein said side walls have heat-resistance properties decreasing the flow of heat in the direction of the temperature gradient.

24. A temperature conditioning device according to claim **23** further characterized in that said side walls are corrugated to increase their effective length between said first and second walls and thus increase the resistance to heat flow.

25. An insulation panel adapted to form part of a wall or ceiling of a room and where said panel comprises a hollow body member having a first wall adapted to act as a heat absorbing sink and a second wall adapted to act as a heat emitting source and where the first wall is adapted to face a zone of a lower temperature and the second wall is adapted to face a zone of a higher temperature, characterized in that said hollow body member forms a hermetic chamber, in having a heat carrier medium in said chamber where said medium is in the form of a saturated vapor and a condensate of said vapor and where said vapor has a condensation temperature which is above said lower temperature, in having an insulating material in said chamber where said insulating material is permeable to the saturated vapor in the direction of the temperature gradient, and in having a condensate return means for conveying condensate from said second wall acting as a heat emitting source to said first wall acting as a heat absorbing sink.

26. A temperature conditioning device for conditioning the temperature of a room where said device is adapted to form part of a wall or ceiling of a room and where said device comprises a hollow body member having a first wall adapted to act as a heat absorbing sink and a second wall adapted to act as a heat emitting source and where the first and second walls are adapted to face zones of different temperatures, characterized in that said hollow body forms a hermetic chamber, in having a heat carrier medium in said chamber where said medium is in the form of a saturated vapor and a condensate of said vapor, in having an insulating material in said chamber where said insulating material is permeable to the saturated vapor in the direction of the temperature gradient, in having a condensate return means for conveying condensate from said second wall acting as a heat emitting source to said first wall acting as a heat absorbent sink, in having a heat storage element in heat conductive communication with said first wall acting as a heat absorbing sink said element comprising a meltable latent heat storage substance and in having a support structure distributed through said substance carrying seed crystals where said crystals are held uniformally throughout said substance.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,785,365 Dated January 15, 1974

Inventor(s) Ingeborg Laing and Nikolaus Laing

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

column 8, lines 60 and 61, delete "and where said first wall is adapted to face the room to be conditioned";

column 9, line 6, after "latent" insert -- heat --;

column 10, line 9, after "latent" insert -- heat --;

Signed and sealed this 5th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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