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INDIRECT COOLING SYSTEM FOR BUILDINGS

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FIG. 1

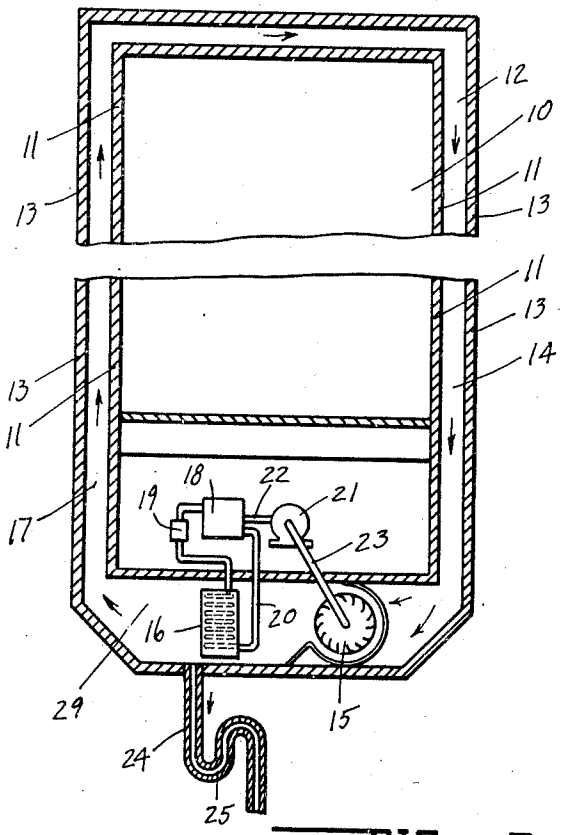
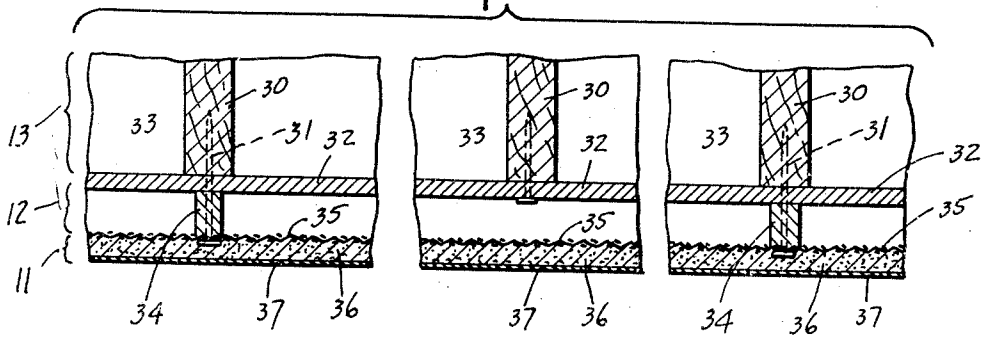


FIG. 2



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INDIRECT COOLING SYSTEM FOR BUILDINGS

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2 Claims. (Cl. 62—140)

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This invention relates to an indirect temperature changing system peculiarly applicable for cooling purposes insofar as the same is applied to a compartment, room or the like of a home or other building structure.

Cooling by the direct application of a cooling medium, such as chilled air supplied to a room or the like and withdrawn therefrom, presents no objectionable factors. However, when such cooling is desired and an indirect system is utilized, the results become progressively objectionable the higher the temperature differential becomes and the higher the relative humidity of the atmosphere of the room. This being the problem, the objection may be stated as follows:

One or more walls of the room or compartment are cooled for heat transfer through that wall so that the temperature in that room or compartment will be lowered and will be held at the desired temperature. Obviously, any circulation of air in that room incident to its use or air flow from other rooms, etc., results in a temperature change in the air in that room and there also occurs relative humidity change since occupancy, of necessity, results in the discharge of alveolar air coupled with moisture.

In an indirect cooling system, as is well-known, moisture-laden air engaging a cooling surface not only transfers heat that surface but there is also deposited on that surface or condensed from that air the water vapor. The result is a sliming of floors and a sweating of walls and ceilings on such surfaces as are of the heat abstracting character, more particularly.

It will be obvious that any indirect system will result in progressive increase of condensation on the heat transferring surface of the room or compartment. If the walls are painted the result may be failure of the paint. If such surface be provided with a cover, such as canvas or paper, the result is possible mildewing of the same. More objectionable than that is the breaking down of the cementitious union between that covering and the supporting wall surface.

The chief object of the present invention is directed to the solution of the aforesaid problem and the removal of the aforementioned objection.

The chief feature of the present invention resides in the inclusion in an indirect cyclic cooling system for a heat transferring surface of a room or compartment, such surface being of semi-porous type, the porosity thereof being insufficient to pass any appreciable amount of air from the room to the cooling system proper but of sufficient amount to permit the free passage

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of water vapor. Thus it may be said that within the terms of this disclosure only water vapor is passed through the heat transferring wall.

It has been ascertained that opposite sides of such transferring wall are subjected to air pressures which are substantially equal whereas opposite sides of said wall are subjected to vapor pressures which are generally unequal, the problem and objection hereinbefore noted being substantially negligible when the vapor pressures are substantially equal, which condition seldom obtains.

From the foregoing it will be readily apparent that as the vapor pressures progressively differ the objection progressively increases, so that the greater the temperature normal to the room or compartment to be cooled and the greater the relative humidity therein, the greater will be the vapor pressure difference.

As stated, the present invention is directed to the elimination of this objection and such elimination is accomplished by comparatively inexpensive means.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings

Fig. 1 is a schematic diagram of a conventional indirect cyclic cooling system embodying the invention.

Fig. 2 is an enlarged sectional view through a wall structure capable of functioning as previously set forth and an essential part of the invention.

In Fig. 1 of the drawings 10 indicates a room having bounding surfaces 11 and this wall structure forms one wall of a plenum space or passage 12, the remainder thereof being indicated by the numeral 13. For example, the invention is shown applied to but a single room or compartment but, obviously, it may be extended to a plurality of rooms by having the resulting passageway or passageways 12 connected in series or in multiple or in series-multiple relation.

Herein the air is withdrawn from the plenum space 12 through the conduit or passage 14 by means of a fan 15 and the resulting warmed air is then forced through and over a cooling coil 16 and then passes to the discharge passageway 17 which connects to the several plenum passages 12 aforesaid.

This cooling coil is connected to a combination condenser compressor-unit if the cooling sys-

tem is of that type and same is designated by the numeral 18. 19 designates an intermediate control and 20 designates the return connection from the coil to the compressor. 21 designates the motor which, as at 22, drives the compressor and which, as at 23, drives the fan. Thus a single motor can simultaneously drive both fan and refrigerating unit.

Since the air drawn by the fan from the plenum space is moisture-laden, as will be more fully explained hereinafter, upon being cooled the moisture condenses on the coil and as it accumulates it can be removed by water showering or the like intermittently or at predetermined intervals by means not shown herein. Such showering water and melted frost will waste from the drain 24 having the air seal 25 in the form of a trap structure.

Fig. 1 illustrates a closed cycle system and it is obvious that the interior wall or walls 11 are cooled by the circulating air stream. The control 19 can be automatically regulated, as well as the motor, to insure circulation of the forced feed type of the cooling medium whenever the temperature rises above that set by the thermostat exposed to the room. Since the majority of the aforesaid apparatus is conventional, such as a thermostatic control for the motor and the member 19, it is believed that the same requires no further illustration.

Reference will now be had to Fig. 2. In this figure there is illustrated one embodiment of the wall structure comprehended within this invention. In this figure 30 indicates the joists or studs of such a wall structure to which is secured as at 31 by nails or other means, a surface forming medium such as a metal sheet or a board 32. The other side of this wall is not illustrated. If Fig. 2 is representative of an interior wall, the opposite side will be similarly constructed. This means that the space designated by the numeral 33 is a comparatively dead air space.

This is particularly true if Fig. 2 illustrates an outside wall. In certain types of construction this space 33 then may be filled with insulating material such as mineral wool, cork or the like, well-known in the building industry.

Suitably secured as by welding, cementing or by other retaining means, or even by the anchoring members 31, are the hangers 34. These may take any desired shape. The wall structure indicated at 11 by way of example only in Fig. 1 is herein illustrated, see Fig. 2, as comprised of metal lath or the like 35, suitably secured at spaced intervals to the spaced hangers 34. Secured to such metal lath or the like is an inner wall material 36. This may be conventional plaster, unpainted, having a grain structure which permits the flow of water vapor while restraining the flow of air.

This wall structure may also comprise plaster or gypsum board suitably supported on a lath structure or on furring strips carried by the hangers. The interior room or compartment exposed surface of this wall structure may have secured to it a covering material 37. This may be paper mounted in the usual manner or may be canvas mounted in the usual manner or may comprise a flat paint.

It is to be understood that the present invention does not contemplate that this surface 37 will include a so-called varnished paper or a high-gloss paint comprised of cross-brushed coats or cross-brushed varnish or shellac coats, because these materials provide substantially completely sealed surfaces or interpose a completely sealed layer through which it is impossible for the water vapor to pass, the prevention of vapor passage being directly opposed to the primary objective of this invention.

As previously set forth, there is a pressure differential between the vapor pressure in the plenum chamber or passage and that in the room. The wall structure 11 (see Fig. 2) is subjected to a circulating air stream at a temperature below that of the room temperature. The room defined by the wall 11 gives up its heat thereto and the heat is transferred to the air stream. Thus the wall 11 is invariably cooler than the room atmosphere and, were it not for the vapor passing type of construction of the wall 11, water vapor would condense and collect on that wall. However, due to the semi-porosity thereof, and due to the pressure differential of the vapor pressures in the plenum space and the room, water vapor does pass through the wall 11 and does enter the air stream. Thus water does not condense and collect on the interior or room side of the wall 11. This moisture-laden, slightly-warmed air of the cooling air stream, is drawn by the fan 15 to the cooling mechanism and then forced over and through the same and then re-circulated.

In passing through the coil and the like, the moisture is removed so that the vapor pressure in the discharge 17 is different from the vapor discharge in the intake 14 and, of course, both are different from the vapor pressure in the room 10.

Whenever desired or required, for example, there may be included in the cooling chamber designated by the numeral 29, a dehumidifying unit such as a calcium chloride container positioned over the drain 24. In that event, of course, there will be little or no frosting of the cooling coil and all that would be required would be for the cooling chamber 29 to be provided with a door to permit the householder to obtain access to the interior for weekly or monthly replenishment of the calcium chloride supply only, the waste, as it accumulates, draining to drain 24—25.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A system of indirect cooling and dehumidifying of a room and the like having a defining wall with one side exposed to the room and an opposite side, comprising directly subjecting the opposite side to a cooling and dehumidifying air stream without substantial transfer through the wall of air to and from the room and from and to the air stream respectively, said wall having physical charactertistics permitting substantially water vapor transfer only from the room to the air stream and transference of heat from the room to the air stream.

2. A system of indirect cooling and dehumidification including in combination a substantially closed cycle circulating cooling air stream providing means, a room defining walls, each wall

having a room exposed side and an opposite side, the sides being subjected to air pressures incident to room atmosphere and the air stream, which air pressures are substantially equal, the sides also being subjected to vapor pressures, the room vapor pressure being generally greater than that of the air stream vapor pressure resulting in a flow of moisture from the room air to the room wall, said wall having physical characteristics permitting substantially water vapor transfer only from the room to the air stream and heat transfer but without any substantial air transfer from the room to the air stream, and means for removing from the air stream, remote from the room, the moisture transferred therefrom and from the air stream for reestablishing the

vapor pressure differential in the air stream prior to re-circulating of the air.

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