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MEANS FOR CONTROLLING DEWPOINT

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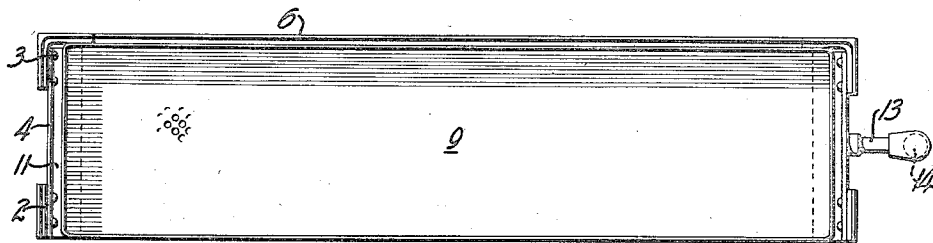


Fig. 2

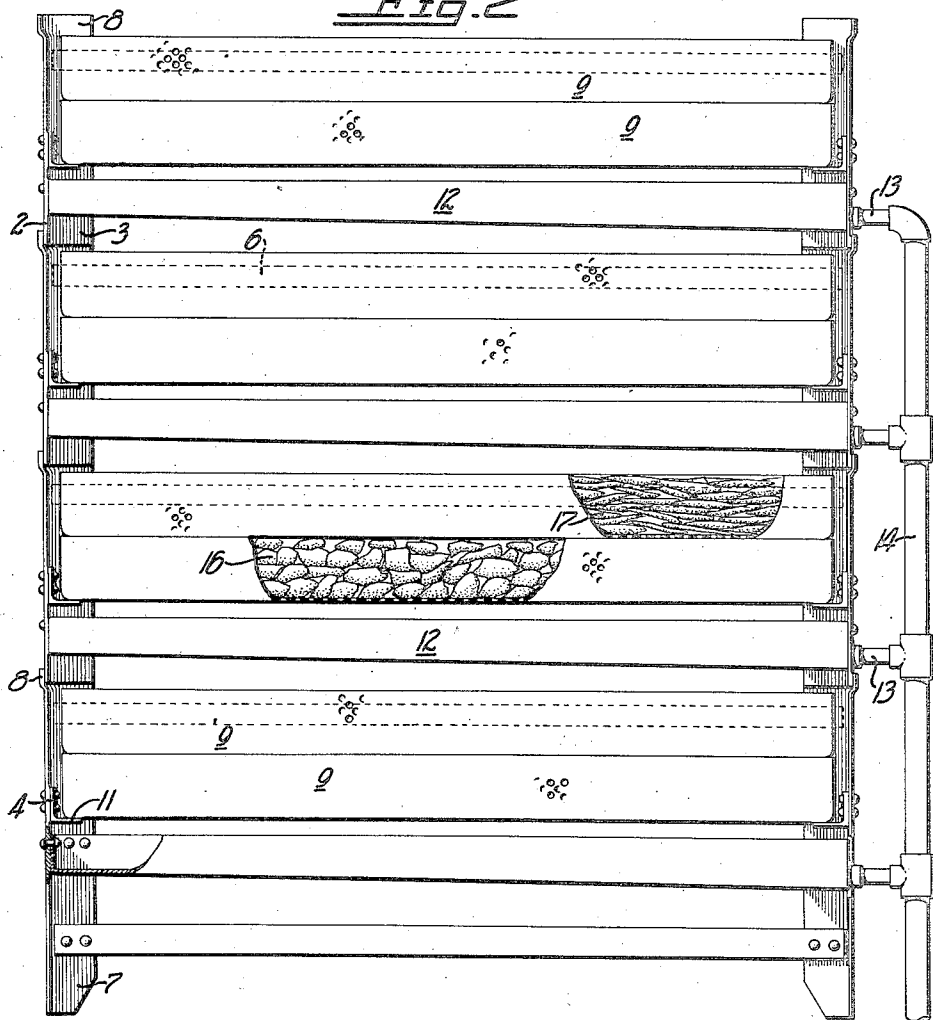


Fig. 1

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MEANS FOR CONTROLLING DEWPOINT

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2 Claims. (Cl. 183—4)

My invention relates to the control of humidity and more particularly to the control of dewpoint.

It is among the objects of my invention to prevent the oxidation and corrosion due to condensation of moisture on metallic surfaces.

Another object of my invention is to maintain a condition of atmosphere such that fungus growth cannot develop.

A more specific object of my invention is to provide means for protecting a ship's cargo by eliminating the "sweating" that occurs in the hold.

A further object of my invention is to provide a dewpoint control unit which is compact in construction and inexpensive in initial and maintenance costs.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be understood that I do not limit myself to this disclosure of species of my invention, as I may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawing:

Figure 1 is a front view of my dewpoint control unit, portions of the trays being broken away to show the layers of contained material; and

Figure 2 is a top view of the unit.

In terms of broad inclusion, my method of controlling dewpoint to preserve perishable articles comprises enclosing the articles in a chamber together with a body of dehydrating material, preferably deliquescent, and an associated body of porous material. The associated bodies of materials comprise my dewpoint control unit, and are preferably arranged in layers with a layer of porous material underlying each layer of dehydrating material. A suitable holder is provided for supporting the layers in my unit, whereby the latter may be conveniently installed in the chamber, such as a ship's hold, in which the atmospheric conditions are to be regulated. The holder is preferably sectional in construction, so that additional layers of the active and porous materials may be added to the unit to take care of the different volumes of air present in different size chambers.

In greater detail, and referring particularly to the drawing, the dewpoint control unit embodying my invention comprises a frame or holder built up of a plurality of stacked sections. The sections are of open construction

and preferably comprise corner bars 2 and 3 tied together by suitable cross bars 4 and 6. The rear corner bars 3 are preferably of angle bar construction to give rigidity, while the forward corner bars 2 are preferably of flat strip material so that the front is left open and unobstructed. The corner bars of the bottom section preferably project downwardly to provide legs 7, and the upper ends 8 of the corner bars in each section are preferably flared outwardly to provide seats in which the overlying sections may nest.

A plurality of apertured trays 9 are nested in each section and are supported on the flanges 11 of the angle bars 4. Two trays are shown in each section. It is to be understood however that this is merely for purposes of illustration and that the individual sections may be made larger to hold additional trays, say four for example. The supporting framework and trays may conveniently be made of metal, but the materials of which they are made, as well as the details of their construction, may be varied within wide limits.

The trays are preferably of shallow construction, and are designed so that an upper tray rests upon a lower one. Both the sides and bottoms of the trays are preferably perforated, as illustrated. Each of the frame sections is also preferably provided with a drain trough 12, preferably mounted adjacent the lower end of the section and underlying the trays 9. The bottoms of the troughs are preferably sloping, and the deeper ends are preferably connected by drain pipes 13 with a manifold 14.

The underlying tray in each section is filled with a layer 16 of granular porous material, such as crushed pumice stone. The broken pieces of pumice stone are preferably from one-half to one inch thick, and when placed in the tray preferably form a layer about two inches thick. The function of this layer of particles is to form a porous medium, and it is obvious that other porous materials, such as coke or broken pieces of brick, may be used. Other and different means may be employed to form this porous layer, for example a series of screens could be used, one placed on top of the other until the desired thickness was obtained. Still other means for producing a porous layer will suggest themselves, but the layer of granulated porous material has been found economical and entirely satisfactory, and is preferred.

The overlying tray in each section contains a layer 17 of dehydrated material. This layer is

also preferably about two inches thick, and is of a material having hygroscopic characteristics tending to absorb more moisture at low temperatures than at high temperatures. In other words the dehydrating material employed is one which takes up moisture most readily at temperatures when the moisture of the air is most likely to condense. By thus reducing the moisture content of the air, the condensation that would otherwise take place is prevented. The dehydrating material is also preferably deliquescent, that is, one which liquefies upon the taking up of water. I have used crystalline calcium chloride, preferably the commercial flake product, with good results and prefer to employ this material in my control unit. Other dehydrating materials, such as caustic soda or dry lime, may be employed. Of the latter two, the former would be preferred because, like calcium chloride, it is deliquescent.

As shown in Figure 1, my dewpoint control unit comprises essentially a plurality of layers of dehydrating material separated by layers of porous material; an underlying porous layer being associated with each layer of dehydrating material. The function of the porous layers is to provide ventilating passages under the layers of dehydrating material, in order to expose a greater surface of the latter material to the air, and also to provide a cellular layer structure through which the liquefied deliquescent dehydrating material may filter. The slow passage of the liquefied dehydrating material through the circulating air in the porous layer causes the dehydrating material to take up the maximum of moisture.

Furthermore, the passage of liquid downwardly through the porous layer provides movement which promotes air movement and circulation in the porous layer. These functions all tend to promote the maximum moisture absorption by the dehydrating material. By this arrangement I have been able to increase over sixty percent the efficiency of the calcium chloride in taking up moisture over an equivalent amount of calcium chloride merely held in a container, and it is to be noted that the improved result is effected without the use of a fan or other mechanical device producing a forced draft.

As the liquefied dehydrating material passes out of the porous layer it drips into the receiving trough 12 and is conducted away from the

unit through the drain manifold 14. By the sectional construction of the supporting frame, additional tray holding sections may be added as desired to take care of the volume of air in a particular chamber, such as a ship's hold, in which the dewpoint is to be controlled. Since the control is effected by withdrawing moisture from the air so as to maintain the dewpoint continually below that which would normally exist at a given temperature, it is clear that a greater amount of dehydrating material will be needed to condition the air in a large chamber than in a small one.

In connection with the prevention of "sweating" in a ship's hold I have found by actual test that a unit constructed in accordance with the teachings of my invention and containing about two hundred and twenty pounds of calcium chloride was amply sufficient to control the dewpoint and prevent the condensation of moisture in a hold of sixty thousand cubic feet on a round trip from San Francisco to New York via the Panama Canal.

I claim:

1. A unit for controlling the moisture content of air, comprising a holder, a plurality of perforate trays arranged in overlying relation in the holder, said holder comprising an open frame work to allow air from the surrounding atmosphere to circulate horizontally through the unit, layers of deliquescent dehydrating material in alternating trays, layers of porous material in the trays underlying each of the trays containing the dehydrating material and through which the liquefied dehydrating material may trickle, and pans underlying each of the trays containing the porous material for collecting the liquid dripping from the latter trays and for preventing said liquid from passing to an underlying layer of the dehydrated material.

2. In a unit for controlling the moisture content of air, a frame comprising a plurality of demountable stacked sections, each section comprising a pair of overlying perforate trays, a layer of deliquescent dehydrating material in the overlying tray, a layer of porous material in the underlying tray and through which the liquefied dehydrating material may trickle, and a pan for each section and underlying the trays for preventing the fluid from dripping on the dehydrating material of an underlying section.

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