

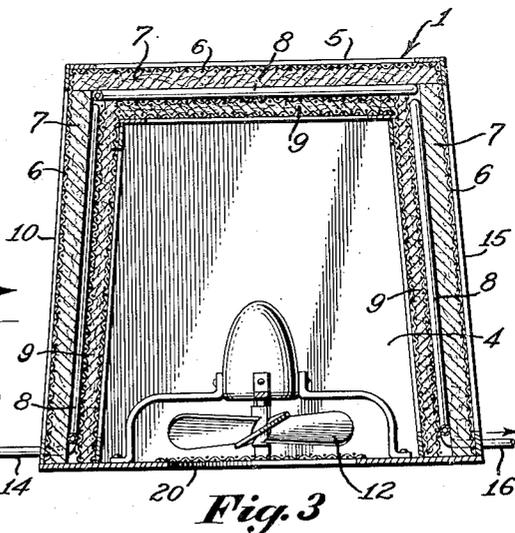
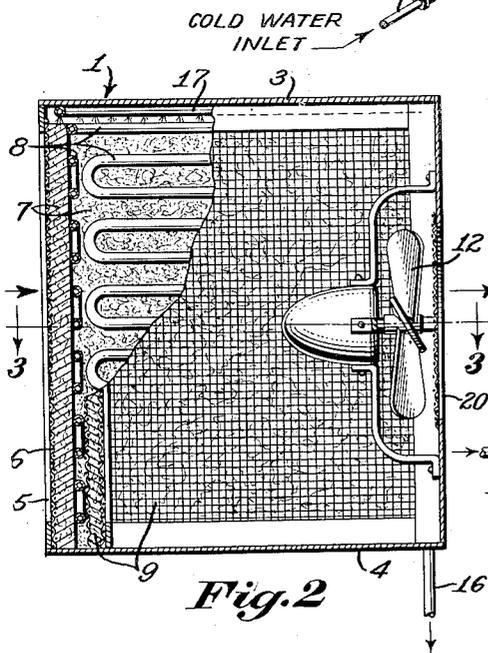
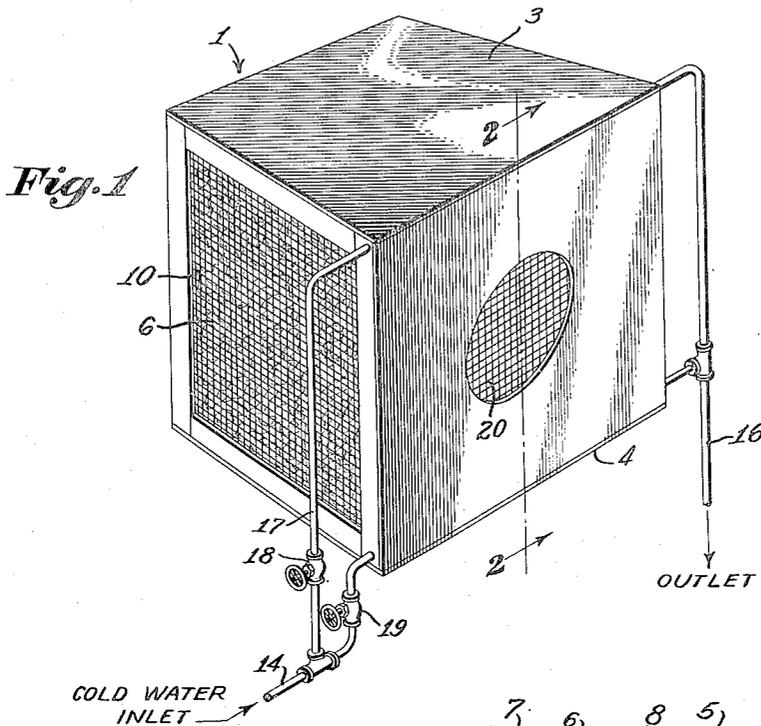
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APPARATUS FOR CONDITIONING AIR

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# UNITED STATES PATENT OFFICE

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## APPARATUS FOR CONDITIONING AIR

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4 Claims. (Cl. 261-11)

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This invention relates to method and apparatus for conditioning air by varying the humidity and temperature thereof.

Heretofore it has been common practice to cool and/or dehumidify air by passing the air over cooled surfaces. The dehumidifying action may be accentuated by holding the temperature of the surface below the dew point of the air so that the moisture in the air will be condensed and extracted therefrom. If the cooling surface is above the dew point, dehumidifying action, of course, would be very slight and primarily only cooling of the air would take place. Also, variations of the above have been known in the prior art such as by introducing a controlled amount of moisture into the air so that by evaporation a certain amount of heat is extracted from the air, thereby cooling the latter. This method has been used also in combination with cooling and dehumidifying by condensing the moisture out of the air.

The present invention, however, is directed to a novel method and apparatus whereby the moisture in the air is utilized to dampen a surface such as an absorbent filter, past which air is directed so that evaporation which takes place absorbs heat from the air and cools it. A certain amount of dehumidifying action will take place in view of the fact that the amount of moisture which is returned to the air by evaporation is smaller than the amount of moisture condensed out, as evaporation occurs at a lower rate than that at which the moisture is extracted from the air. Specifically, the present invention provides an arrangement wherein condensate from circulated air is utilized to maintain an absorbent filter layer in a damp condition, the conjoint cooling action and the evaporation of the condensate from the absorbent material serving to control the relative humidity.

Accordingly, a primary object of the present invention is to provide a novel and improved method and apparatus for conditioning air.

A further object is to provide a method and apparatus, generally outlined above, which will be simple, inexpensive to manufacture, and will require a minimum of space.

Other and further objects will become readily apparent from the following description when considered in connection with the accompanying drawings, illustrating an embodiment of the invention, and in which:

Figure 1 is a perspective view of an air conditioning apparatus made in accordance with the present invention;

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Figure 2 is a vertical sectional view on line 2-2 of Figure 1, a portion of the non-absorbent filter being broken away to show the arrangement of the cooling coils and the absorbent material; and

Figure 3 is a horizontal section on line 3-3 of Figure 2.

An embodiment of the present invention shown for the purpose of illustration comprises a box-like structure 1 which is preferably made of sheet iron construction. It will be readily apparent to those skilled in the art how such a unit could be fabricated and therefore it is not believed necessary to enlarge upon the method of construction. It will be readily understood that if desired the unit could also be constructed of wood. The essential features of the construction are that the unit be provided with open sides so that the air can be passed through it. The unit as shown has a solid top 3 and bottom 4, the two sides and the rear end being open. It will be readily understood that if desired the air could be passed through only one side or the rear end providing the area was great enough to accommodate the flow of air.

An opening 5 in the rear end and openings 10 and 15 in the respective sides are spanned by a suitable open mesh screen 6 which is adapted to be secured in any suitable manner to the frame of the unit. This arrangement is clearly shown in Figure 3. Just inside of the screen 6 an absorbent filter 7 is provided. Adjacent the absorbent filter 7 a flat serpentine cooling coil 8 is located. In actual practice this coil would preferably be made of material having high heat conductivity and be in very intimate contact with the absorbent filter 7 because as will be explained later, it is contemplated that a cooling medium be circulated through the coils to cool them and the primary purpose of the cooling coils is to cool the air and/or extract moisture therefrom which is absorbed by the absorbent filter 7. Just inside of the cooling coil 8 a non-absorbent filter layer 9 is disposed. The primary purpose of this latter filter is to remove dirt and excessive moisture from the air. It will be readily understood that the unit will accomplish the primary object of the invention without the use of the non-absorbent filters 9 although it is preferred to use these so that the velocity of air through the absorbent filter 7 and the cooling coils will be reduced in order to give sufficient time for the necessary heat exchange to take place.

As clearly shown in Figures 2 and 3, the front

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of the unit is provided with an opening 20 in which is mounted a suitable circulating fan 12, the purpose of which is to draw the air in through the filtering layers and out through the front of the unit. As would be the usual practice, this fan would be driven by a suitable electric motor energized from the conventional power sources.

The cooling coils 8 are provided with an inlet pipe 14 and an outlet 16, the inlet adapted to be connected with any suitable source of cold water and the outlet being adapted to connect to any suitable drainage system, or if desired, the outlet may be recirculated in accordance with conventional practice, using a well or cooling tower. A suitable branch pipe 17 connected to the cold water inlet 14 is connected with a suitable pipe which is arranged just above the upper edge of the absorbent filters 7 and is provided with very small perforations to supply a spray of water when it is desired to supply additional humidity to the air when and if conditions so demand. It will be readily understood that ordinarily the water spray would be used only when the relative humidity is extremely low. In order to control the flow of water into this branch pipe, a suitable valve 18 is provided. Also, the valve 19 is provided between the inlet 14 and the cooling coils 8 in the event it is necessary to drain the pipes in cold weather.

The invention is not limited to any specific type of absorbent or non-absorbent filter material. The only requirement is that the material have absorbent characteristics so that by reason of its intimate contact with the cooling coils 8 it will temporarily soak up and then permit the condensate deposited thereon to evaporate as the air flows through the filters and over the cooling coils. Preferably the cooling coils would be intimately embedded in the absorbent filter layer.

It will be readily apparent from the above description that the present invention provides a novel method for conditioning air by which the entrapped moisture in the air is extracted therefrom and is thereafter returned to the continuously circulated air at a controlled rate for the purpose of controlling the temperature and humidity of the air, a part of the moisture being evaporated into the external air; that is, external to the enclosure being air-conditioned. The air-conditioning unit 1 is adapted to be placed in an open window or any other opening between the outside air and an enclosure in such a manner that the outside air is drawn in through the open sides through the filter layers and past the cooling coils and is delivered by the fan to the enclosure in which it is desired to have air conditioning.

Although the invention has been described in considerable detail, it will be apparent to those skilled in the art that many variations are possible without departing from the inventive concept. It is therefore desired that the invention not be limited except insofar as may be necessary by the prior art and by the appended claims.

What is claimed is:

1. Air conditioning apparatus comprising a

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box-like housing having openings therein through which air may circulate, foraminous moisture-absorbent material readily pervious to flow of air therethrough disposed incident to the circulating air in said housing, cooling coils associated in intimate contact with said foraminous material to extract moisture from the circulated air and wet the absorbent material in contact therewith, and means for circulating air through said foraminous material and around said cooling means.

2. Air conditioning apparatus comprising a box-like housing having an inlet opening and an outlet opening, laminated air conditioning means in one of said openings, said air conditioning means comprising an outer layer of absorbent material disposed incident to the flow of air and which is pervious to the flow of air, cooling coils associated in intimate contact with said absorbent material and an inner layer of non-absorbent material and means for circulating air through said inlet and said outlet.

3. Air-conditioning apparatus comprising a box-like housing having an inlet opening and an outlet opening, an absorbent filter, cooling means in intimate contact with said filter for condensing moisture out of air passed through said filter and means for spraying water from an external source on said filter, whereby air passed through said filter may be conditioned by its intimate contact with said absorbent filter which is wetted by the moisture extracted from the flowing air and by moisture supplied from an external source to said absorbent filter.

4. Air-conditioning apparatus comprising a support having an inlet opening and an outlet opening, said inlet opening having an area pervious to the flow of air, a cooling surface for condensing moisture out of air passed through said area, a layer of absorbent filter material on the inlet side of said area and in intimate contact with said cooling surface whereby it will absorb moisture extracted from air flowing through said area, and means for spraying water from an external source on to said absorbent filter material, whereby air may be conditioned by its intimate contact with said absorbent filter material which is wetted by the moisture extracted from the flowing air and by moisture supplied from the external source.

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