June 14, 1955 R. W. AYLING 2,710,509

SELF-CONTAINED DEHUMIDIFYING UNIT

Filed Nov. 25, 1950 2 Sheets-Sheet 1

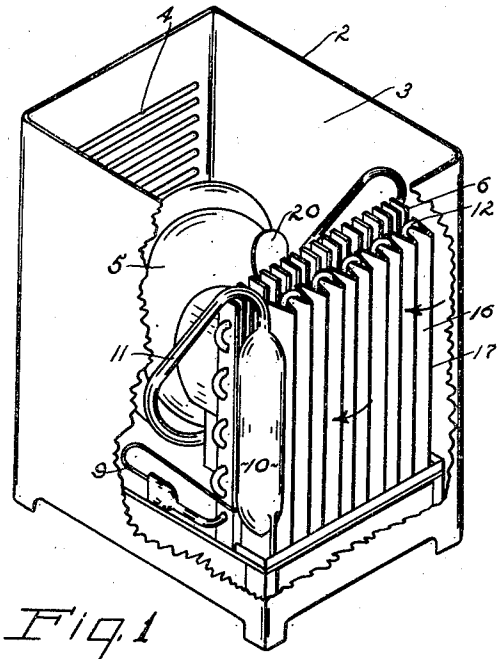


Fig. 1

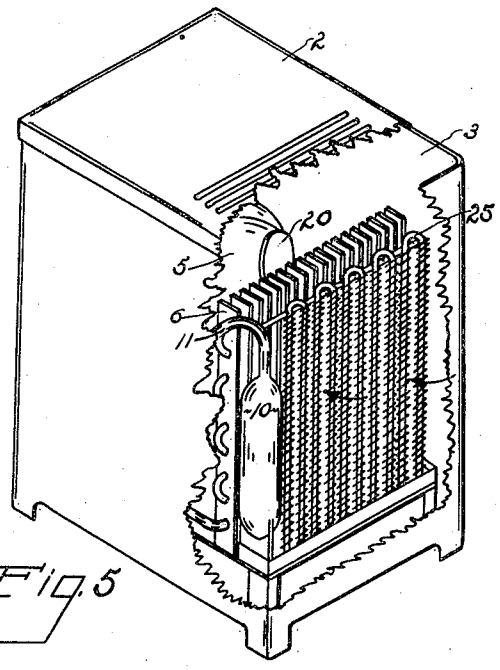


Fig. 5

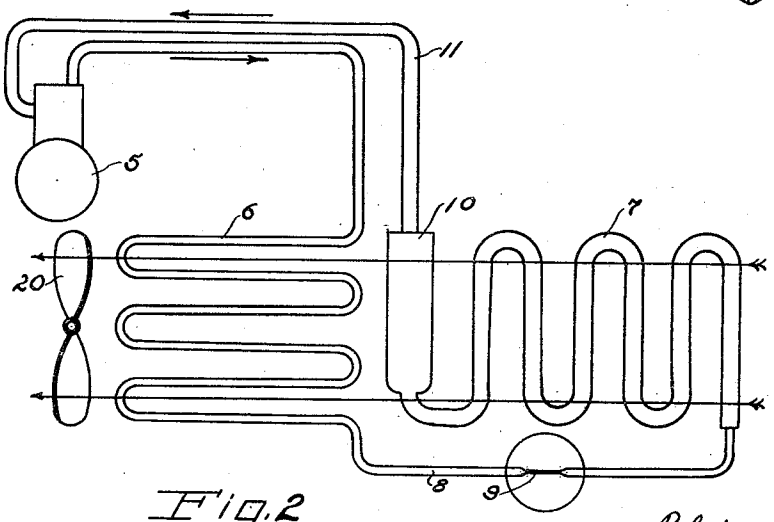


Fig. 2

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SELF-CONTAINED DEHUMIDIFYING UNIT

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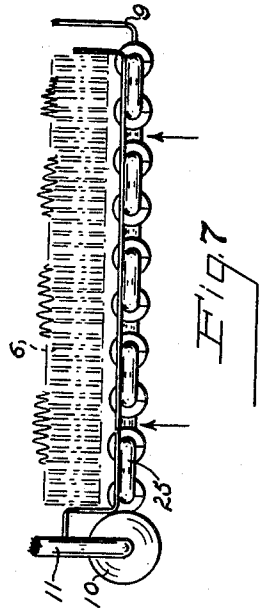


Fig. 7

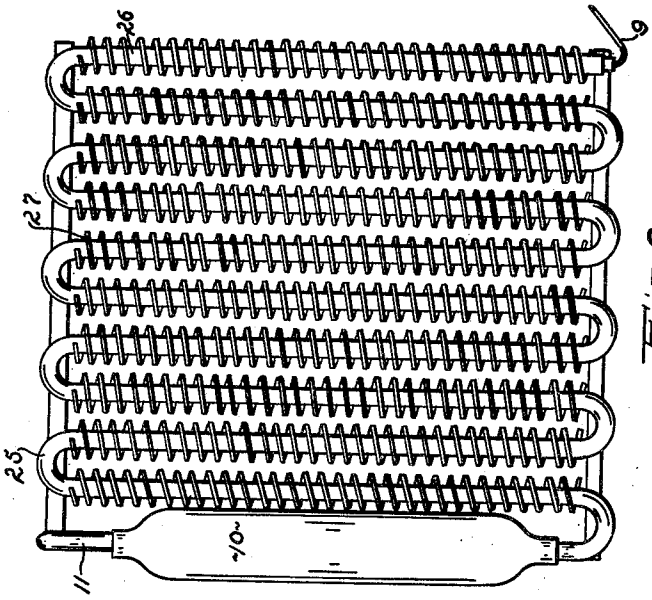


Fig. 6

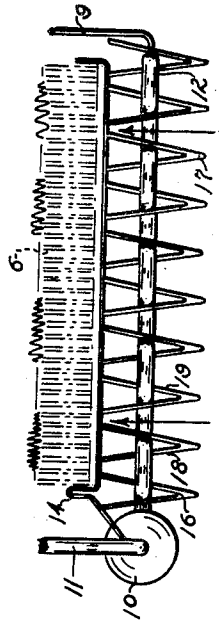


Fig. 4

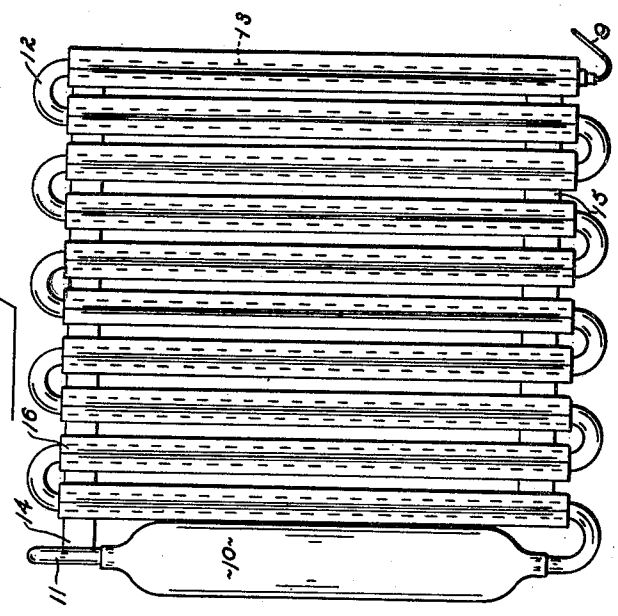


Fig. 3

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SELF-CONTAINED DEHUMIDIFYING UNIT

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Application November 25, 1950, Serial No. 197,626

5 Claims. (Cl. 62—140)

This invention relates to self-contained dehumidifying units and more particularly to a self-contained dehumidifying unit including a novel evaporator which greatly increases the efficiency of the unit.

It has been proposed that a refrigeration system be employed to eliminate excessive humidity from basements, playrooms, storage vaults, libraries, museums and similar enclosed places. While such units proposed heretofore satisfactorily remove moisture from the air of the space being treated, the moisture so removed is in a small volume if the unit be of small size. To eliminate excessive humidity, large units have been employed with resulting excessive initial cost, excessive operating costs, and excessive heating of the space.

The chief object of the present invention is to provide a self-contained dehumidifying unit of small size which may be operated at a relatively minor cost, and which is capable of removing large amounts of moisture from the air of a space being treated.

An object of the invention is to provide a self-contained dehumidifying unit which includes an evaporator of novel design which serves in effect to wring moisture from the air of a space being treated.

A further object is to provide a self-contained dehumidifying unit in which the evaporator is provided with heat exchange elements which greatly increases the time air passing through the unit is in contact with the cold surface, thereby assuring that all air which comes in heat exchange relation with such members is thoroughly dehumidified. Other objects of my invention will be readily perceived from the following description.

This invention relates to a self-contained dehumidifying unit for removing moisture from the air of an enclosed space which comprises in combination a casing forming a passage for air, a refrigeration system contained in the casing for removing moisture from air in the passage, said refrigeration system including an evaporator placed in the passage to reduce the dewpoint of air passing through the passage, said evaporator comprising a serpentine coil having its substantially straight sections extending in a vertical direction in the passage, and a plurality of heat exchange members secured to the straight sections of the coil, and a condenser placed in the passage rearward of the evaporator, and means to move air from the space containing the unit through the evaporator to precipitate moisture from the air and then through the condenser to reheat the air thereby increasing the capacity of air to absorb moisture.

The attached drawings illustrate a preferred embodiment of my invention in which

Figure 1 is an isometric view of the self-contained dehumidifying unit broken away to illustrate the evaporator;

Figure 2 is a diagrammatc view of the refrigeration system employed in the unit shown in Figure 1;

Figure 3 is a view in elevation of the evaporator embodied in the unit shown in Figure 1;

Figure 4 is a plan view of the evaporator shown in Figure 3;

Figure 5 is an isometric view similar to Figure 1 of a modification of the invention;

Figure 6 is a view in elevation of the evaporator embodied in the unit shown in Figure 5; and

Figure 7 is a plan view of the evaporator shown in Figure 6.

As shown in the attached drawings, the self-contained dehumidifying unit comprises a casing 2 forming a passage 3 through the unit. Suitable louvers (not shown) provide an inlet to passage 3. Louvers 4 serve as an outlet from the passage into the space being treated.

A refrigeration system is employed to reduce the dewpoint of air passing through passage 3 thereby precipitating moisture from the air. The condenser of the refrigeration system as hereinafter described is employed to reheat air passing through the passage thereby increasing its capacity to absorb moisture. The refrigeration system comprises a compressor 5 connected to a condenser 6 which in turn is connected to an evaporator 7 by a line 8. A restriction 9, such as a capillary tube for example, is employed to regulate passage of refrigerant from the condenser to the evaporator. It will be appreciated, of course, an expansion valve may be used in place of restriction 9. Gaseous refrigerant passes from evaporator 7 to accumulator 10. Suction line 11 connects accumulator 10 with compressor 5.

Evaporator 7 consists of a serpentine coil 12 having its substantially straight sections 13 extending in a substantially vertical direction in passage 3. An upper support element 14 is provided and a similar lower support element 15 is also provided to permit the evaporator to be held in desired position in the assembly. A plurality of vertically extending fins 16 are attached to sections 13 of the evaporator. Each fin 16 consists of a single sheet, the sheet being folded as shown at 17 to form the leading edge of the fin. The fold extends in a substantially vertical direction. The sides 18 and 19 of the fin extend rearward at an angle to each other with the inner surfaces thereof being attached to section 13; the fins thus extend in front of and in the rear of sections 13. The fins, of course, are cooled by the evaporator. Air passing through the evaporator is in contact with the fins assuring that the air coming in contact with the fin is in such contact for a sufficient time to cool the air below its dewpoint thereby removing the greater portion of the moisture contained in the air. The depth of the fins at an angle to the coil surface provides the time in contact with the coil surface which is necessary for satisfactory dehumidification of air. It will be appreciated of course, a portion of the air passing through the evaporator is not affected since it does not come in contact with the coil surface or the fins. However, that portion of the total air flow which passes through the evaporator in contact with the coil and fins is thoroughly dehumidified.

Evaporator 7 is placed within passage 3 in casing 2. Immediately in the rear of evaporator 7 is placed condenser 6. A fan 20 withdraws air from the space containing the unit, passes the air through the evaporator 7 to precipitate moisture from the air; then passes the air through condenser 6 to reheat the air thereby increasing its capacity to absorb moisture and discharges the air again into the space being treated. It will be appreciated moisture is in effect wrung from the air by reducing the dewpoint of the air to precipitate moisture therefrom.

In Figures 5, 6 and 7, I have illustrated a modification of the invention in which a different form of evaporator is employed. In the structure shown in Figures 5, 6 and 7, the evaporator comprises a serpentine coil 25 having its substantially straight sections 26 extending in a substantially vertical direction in passage 3. A continuous spiral fin 27 is wrapped about each section 26 so that moisture precipitated from the air passing through the evaporator

automatically flows down the fin surface in a spiral path. Preferably, the pitch of the spiral fin should be about 1" in 10" of fin length for most satisfactory results. The evaporator illustrated in Figures 5, 6 and 7 automatically clears itself of moisture which accumulates on its fins thereby permitting highly efficient coil operation even under conditions of high relative humidity. Further, the continuous descent of condensed moisture automatically keeps the evaporator surfaces clean, thus preventing the heat transfer from being adversely affected by accumulated dust, dirt, lint, etc. In other respects, the evaporator so shown is similar to the evaporator disclosed in Figures 3 and 4.

The present invention provides a small, highly efficient self-contained dehumidifying unit for removing moisture from an enclosed space. The evaporator provided in the present unit permits the removal of an amount of moisture much greater than could be removed by units heretofore employed. My invention permits a smaller unit to be employed to remove the same amount of moisture as units heretofore employed. My unit may be employed to remove perhaps 30 to 40% more moisture than units of similar size heretofore employed. The provision of the novel evaporator permits the use of smaller operating equipment thus greatly reducing the cost of operation and considerably reduces the initial cost of the unit.

While I have described a preferred embodiment of my invention, it will be understood my invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. The combination with a self-contained dehumidifying unit for removing moisture from air in enclosed spaces including a casing forming a passage for air; a refrigeration system in the casing for removing moisture from air in the passage including a condensing unit having substantially straight portions placed in the passage; and means to move air from the space containing the unit through the passage; of a serpentine coil placed in the passage forward of and adjacent the condenser and serving as the evaporator of the refrigeration system, said coil having its substantially straight portions extending in a vertical direction in the passage and having a plurality of heat exchange members secured to the straight portions of the coil, the straight portions of the condensing unit being inclined relative to the straight portions of the evaporator coil.

2. The combination with a self-contained dehumidifying unit for removing moisture from air in enclosed spaces including a casing forming a passage for air; a refrigeration system in the casing for removing moisture from air in the passage including a condensing unit having substantially straight portions placed in the passage; and means to move air from the space containing the unit through the passage; of a serpentine coil placed in the passage forward of and adjacent the condenser and serving as the evaporator of the refrigeration system, said coil having its substantially straight portions extending in a vertical direction in the passage and having a plurality of heat exchange members secured to the straight portions of the coil, the heat exchange members comprising vertically extending fins only attached to the straight portions of the coil, the straight portions of the condensing unit being inclined relative to the straight portions of the evaporator coil.

3. The combination according to claim 2 in which each fin consists of an integral folded metal sheet, the fold forming the leading edge of the fin and extending vertically, the inner surfaces of the folded sheet being attached to the straight portions of the coil, and the inner edges of the sheet being spaced from each other.

4. The combination with a self-contained dehumidifying unit for removing moisture from air in enclosed spaces including a casing forming a passage for air; a refrigeration system in the casing for removing moisture from air in the passage including a condensing unit having substantially straight portions placed in the passage; and means to move air from the space containing the unit through the passage; of a serpentine coil placed in the passage forward of and adjacent the condenser and serving as the evaporator of the refrigeration system, said coil having its substantially straight portions extending in a vertical direction in the passage and having a plurality of heat exchange members secured to the straight portions of the coil, each heat exchange member comprising a substantially continuous spiral fin attached to the vertically extending, straight portions of the coil, moisture automatically flowing down the fin surfaces in a spiral path, the straight portions of the condensing unit being inclined relative to the straight portions of the evaporator coil.

5. The combination according to claim 4 in which the pitch of the fin is about 1" in 10" of fin length thereby eliminating collection of moisture in small pools on the fins.

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