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COMPACT REFRIGERATION UNIT FOR COOLING AIR

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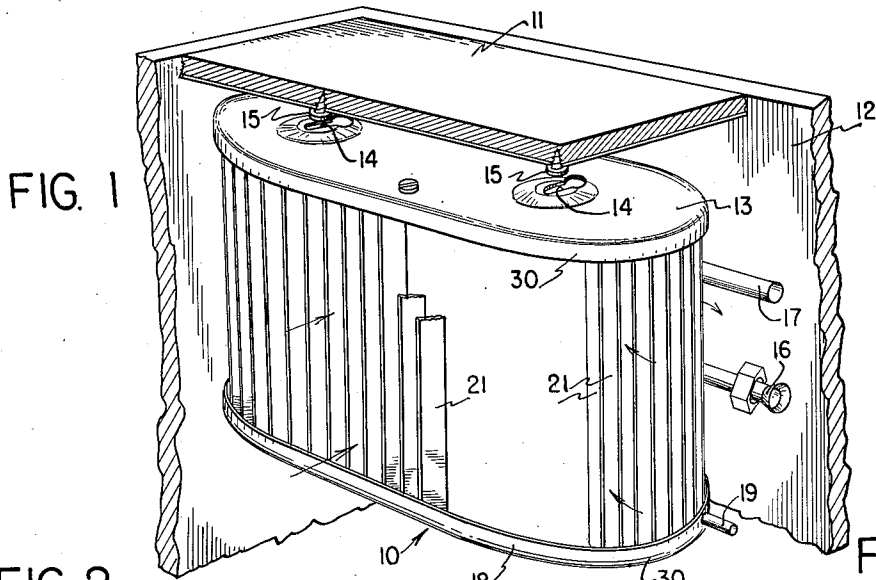


FIG. 1

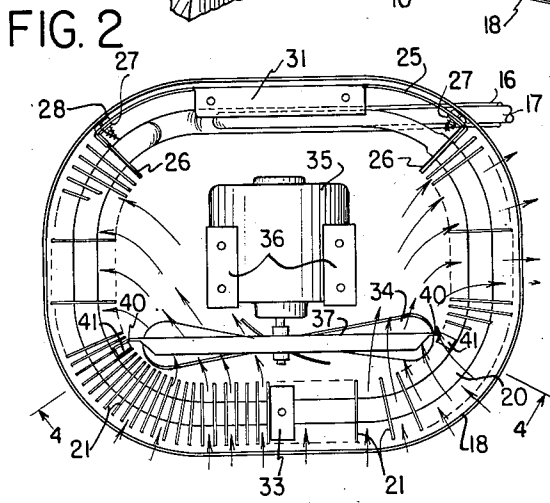


FIG. 2

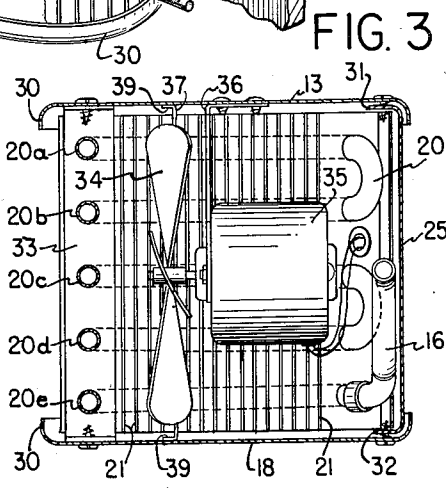


FIG. 3

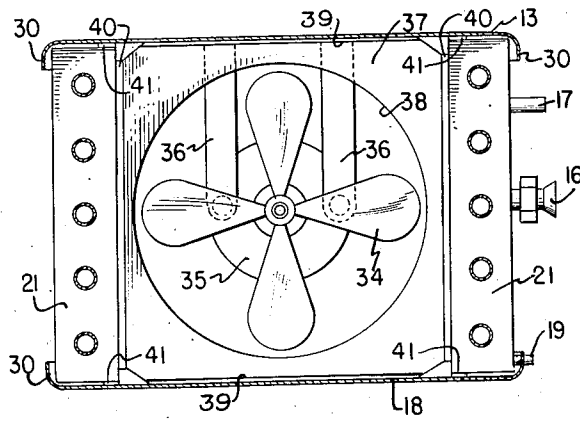


FIG. 4

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COMPACT REFRIGERATION UNIT FOR COOLING AIR

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4 Claims. (Cl. 62-140)

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This invention relates generally to a refrigeration or cooling unit and more particularly to a small cooling unit for use in small display cases or the like.

The use of refrigerated cases as display counters, beverage bars, etc. has become very common and refrigeration units having coils through which cooling fluid is circulated to cool such cases are commercially available. However, in the past, such refrigerating units have been relatively large and therefore have been impractical for small refrigerators, beverage counters, back-bars and the like. The development of small refrigerated units for such uses has been difficult as, in order to provide the required change in temperature of the circulated cooling air, it is necessary to pass the air over a plurality of cooling coils. Because of this prior refrigerating units have been relatively complicated and expensive and not practical where small units are required.

It is, therefore, an object of the present invention to provide a small, compact and inexpensive refrigeration unit.

Another object of this invention is to provide a refrigeration unit including a single tubular coil for the cooling fluid with means for circulating air over the coil a plurality of times.

A further object of this invention is to provide a small refrigeration unit adapted to be secured against a wall and with the air circulating means completely enclosed by the unit so that the unit does not require a large amount of useful space.

A feature of this invention is the provision of a small refrigeration unit including a coil formed in a channel shape with a fan and motor therefor inside the channel and a baffle about the fan so that air drawn into the unit is passed over a part of the coil and then discharged from the unit over the remainder of the coil.

A further feature of this invention is the provision of a refrigerating unit adapted to be secured against a wall including a single tubular coil having spaced superposed U-shaped portions extending from the wall and air circulating means within the space defined by the coil and the wall.

Further objects and features and the attending advantages will be apparent from a consideration of the following description when taken in connection with the accompanying drawing in which:

Fig. 1 is a perspective view illustrating the refrigerating unit in accordance with the invention and a portion of a case in which it might be used;

Fig. 2 is a cross sectional plan view of the unit of Fig. 1;

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Fig. 3 is a cross sectional side view of the unit; and

Fig. 4 is a cross sectional elevation view of the refrigeration unit.

In practicing the invention there is provided a refrigeration unit including a single tubular coil having U-shaped interconnected portions positioned one above the other through which cooling fluid may flow. A back plate is provided across the ends of the U-shaped portions, and top and bottom plates are provided to completely enclose the unit. The top plate includes provisions for mounting the unit and the bottom plate serves to collect moisture which is condensed within the unit. A fan and motor for driving the same are supported within the enclosure. A baffle is provided about the fan and engages the coil to divide the coil into intake portions through which air is drawn by the fan and discharge portions through which the air is discharged. Air circulated through the unit is therefore passed over the coil two times so that a substantial change in temperature can be imparted thereto. To facilitate transfer of heat from the air to the coil, fins are provided on the coil.

Referring now to the drawings, in Fig. 1 the refrigeration unit 10 is illustrated in a case having a top wall 11 and a back wall 12. The unit 10 includes a top plate 13 having slots formed therein for receiving screws 15 secured in the top wall 11 of the case. The unit may, by the use of these provisions, be easily positioned in such a case with the back of the unit adjacent the back wall 12. A tube 16 extends from the unit into which a cooling fluid may be admitted and tube 17 is provided for the return of the fluid to the compressor. A bottom plate 18 is provided which serves to collect moisture which may be picked up by the unit and includes a drain tube 19 through which the moisture may be disposed of in any desired manner.

From Figs. 2, 3 and 4 it is apparent that the refrigeration unit 10 includes a single tubular coil 20 which includes a plurality of U-shaped portions positioned one above the other as indicated by the portions 20a, 20b, 20c, 20d and 20e of Fig. 3. The inlet tube 16 is connected to the lowermost U-shaped portion with the fluid passing through the portions and being discharged from the portion 20a to the outlet tube 17 through which it is returned to the compressor. Positioned on the coil are a plurality of fins 21 which are intimately connected to the coils so that effective heat exchange is provided therebetween. The coils together with the fins form a pervious vertically

extending channel structure which serves as a partial enclosure for the refrigeration unit.

For closing the back of the channel-shaped structure, a back plate 25 is provided which is secured to heavier fins 26 at each end of the coil. These fins 26 have angular extensions 27 to which the back plate 25 is secured as by screws 28. A top plate 13 and a bottom plate 18 are provided in the coil unit, being secured to projections 31 and 32 of the back plate 25, and to a heavy center fin 33 at the front of the unit. Actually the top plate 13 forms the main supporting member of the unit and includes slots 14 for fastening the unit in a case as previously stated. The plates 13 and 18 have cupped edges 30 which permit the bottom plate 18 to serve as a collector for moisture which enters the unit. As previously stated a drain pipe 19 is provided at the bottom plate 18 through which the moisture can be removed as desired.

Supported within the enclosure formed by the coil unit and the back, top, and bottom plates, are air circulating means including the fan 34 and the motor 35. The air circulating means are supported from the top plate 13 by brackets 36 which may be secured to the motor by bolts, as illustrated. Positioned about the fan 34 is a baffle 37 having a circular opening 38 of such a diameter to just clear the fan blades. The baffle 38 has top and bottom projections 39 which engage the top and bottom plates 13 and 18 respectively. Angular side extensions 40 are provided on the baffle 38 which extend between heat exchange fins 21. Tabs 41 are provided on the side extensions 40 at the top and bottom thereof and extend over the fins 21 for supporting the baffle in the unit.

The baffle 37, therefore, divides the enclosure into two compartments. Each of these compartments is partly defined by the coil and fin structure. The fan 34 operates to draw air in through one compartment and discharge it out through the other compartment. More specifically the first compartment is defined by the front part of the coil and fin structure and the baffle, and the second compartment is defined by the sides of the coil, the back plate and the baffle. As illustrated in Fig. 2, the fan operates to draw air in through the front of the coil unit and discharge the air through the sides thereof. The air, therefore, is cooled by the coil and fin structure when it is drawn in through the front thereof and is cooled again as the air is discharged over the coil structure at the sides. It is obvious that the direction of air circulation can be reversed, with the air being drawn in through the sides and discharged through the front, merely by reversing the direction of rotation of the motor. The particular direction of air circulation may be used which may be more desirable for the particular application in which the unit is being used.

It is seen from the above that a very compact refrigeration unit is provided having a single coil for the cooling fluid. The arrangement is such that the medium to be cooled is passed over the coil two different times so that a relatively large heat exchange can take place between the medium and the coil. Since the refrigeration unit is compact and the arrangement is such that it can be mounted against a back wall and also up against a top wall, a minimum amount of useful storage space is required for the unit. It is obvious that the unit might be installed at the bottom of a case with the bottom plate 18 forming the supporting unit if this is desirable. The

units have been found to be highly satisfactory for use in small cases for which suitable units were not formerly available. Although a single layer coil has been disclosed and such a coil will be adequate for small units since the air is circulated over the coil two times, it is to be pointed out that the advantages set forth above will also be present in units having a coil with a plurality of layers.

Although one embodiment of the invention which is illustrative thereof has been described, it is obvious that various changes and modifications can be made therein without departing from the intended scope of the invention as defined in the appended claims.

I claim:

1. A refrigeration unit comprising a coil for cooling fluid, said coil including a plurality of horizontal U-shaped coil portions positioned one above the other to form a vertically extending pervious channel, housing members secured to said channel including top, bottom and back plates, said top plate including means for securing the unit to supporting means, said bottom plate forming a container for receiving moisture which enters the unit, air circulating means within said channel including a fan and motor means for driving said fan, and baffle means about said fan dividing said channel into an air intake portion including parts of said U-shaped coil portions intermediate the ends thereof and an air discharge portion including the end parts of said U-shaped coil portions, with the parts of the coil portions in said air intake and air discharge portions having substantially equal areas, said fan drawing air through said air intake portion and discharging the same through said air discharge portion so that all the air is passed over two parts of said coil portions and cooled thereby two times.

2. A refrigerating unit including in combination, a coil for receiving cooling fluid having a plurality of horizontal U-shaped coil portions positioned one above the other to form a vertically extending pervious channel, housing members secured to said channel including top, bottom and back plates, said top plate including means for securing the unit to the supporting means, said bottom plate forming a container for receiving moisture which enters the unit, air circulating means within said channel including a fan and motor means for driving said fan, and baffle means about said fan dividing said channel into a first compartment defined by parts of said U-shaped coil portions intermediate the ends thereof and a second compartment defined by the end parts of said U-shaped coil portions, with the parts of said coil portions defining said first and second compartment having substantially equal areas, said fan drawing air into said channel over the coil parts defining one of said compartments and discharging the same over the coil parts defining the other of said compartments, so that air is circulated by said fan over two different parts of said coil and cooled thereby two times.

3. A refrigerating unit including in combination, a coil for receiving a cooling fluid including a plurality of interconnected tubular portions positioned with respect to each other to form a pervious channel of generally U-shaped cross section having side sections at the ends of the U and an intermediate section between said side sections, housing means secured to said coil for closing the open ends and the open side of said

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channel to form an enclosure, baffle means within said enclosure having first and second portions adjacent said coil, said baffle means dividing said enclosure into a first compartment defined by the parts of said coil forming said intermediate section of the U of said channel, and a second compartment defined by the parts of said coil forming said side sections of the U of said channel, with the parts of said coil defining said first and second compartments having areas of the same order of magnitude, air circulating means within said enclosure for drawing air into one of said compartments over the coil parts defining the same and for discharging air from the other of said compartments over the coil parts defining said other compartment, so that the air is circulated by said fan over two different parts of said coil and cooled thereby two times.

4. A refrigerating unit in accordance with claim 1 in which said air circulating means is supported from said top plate, with said fan and said baffle means being positioned closer to said intermediate parts of said coil portions than to said back plate, and said motor means

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being positioned between said fan and said back plate, and in which said coil portions are interconnected to form a single continuous channel for the cooling fluid, and which refrigerating unit includes vertically extending fin means having openings therein for receiving said coil portions.

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