

[54] **HOLDOVER COOLING UNIT**

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62/426

[51] Int. Cl..... **F25d 11/04**

[58] Field of Search 62/DIG. 7, 514, 430, 439,
62/426

[56] **References Cited**

UNITED STATES PATENTS

1,556,734	10/1925	Taylor.....	62/514
2,013,848	9/1935	Heideman.....	62/439
2,534,272	12/1950	Kleist.....	62/DIG. 7
2,538,016	1/1951	Kleist.....	62/430
2,560,453	7/1951	Kleist.....	62/DIG. 7
2,570,250	10/1951	Kleist.....	62/DIG. 7
2,607,201	8/1952	Kleist.....	62/DIG. 7
2,893,638	7/1959	Rimsha.....	62/514
3,001,374	9/1961	Hutton.....	62/514
3,307,372	3/1967	Kenison.....	62/514
3,423,953	1/1969	Spiller.....	62/514
3,491,547	1/1970	Watkins.....	62/514
3,673,810	7/1972	Hales.....	62/514

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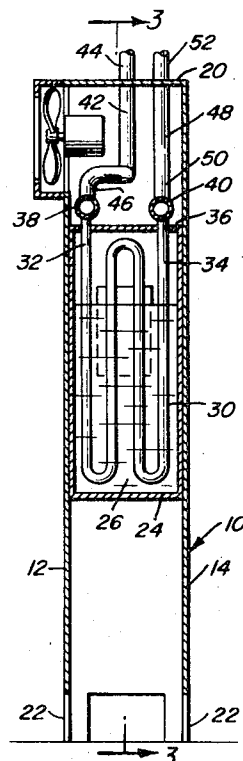
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[57]

ABSTRACT

A cooling unit for mounting within a container to be maintained refrigerated or which may be utilized as a temporary portable and substantially self-contained air conditioning unit. The unit includes an outer cabinet or housing which may be closed at its top, provided with depending support legs and open at its bottom. The cabinet includes an upper air outlet opening in an upper wall portion thereof and a blower assembly is operatively associated with the air outlet opening for blowing air from within the upper portion of the cabinet outwardly therefrom, circulation air for the interior of the cabinet being drawn thereinto through the open bottom thereof. The interior of the cabinet contains one or more hollow tanks constructed of good heat conducting material and each tank is partially filled with a eutectic solution. Further, each tank has a coil of good heat transmitting material disposed therein with the inlet and outlet ends of the coil opening outwardly of the tank. The outlet ends of the coils open into an exhaust manifold which may discharge to the exterior of the cabinet and the inlet ends of the coils open into an inlet manifold provided with a supply line therefor whose inlet end is accessible from the exterior of the cabinet, the supply line being adapted for connection with a source of liquid nitrogen.

5 Claims, 5 Drawing Figures



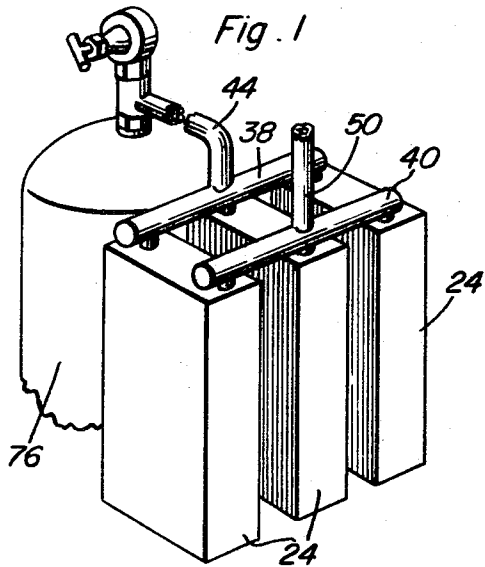
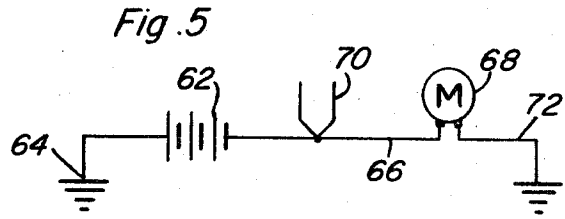
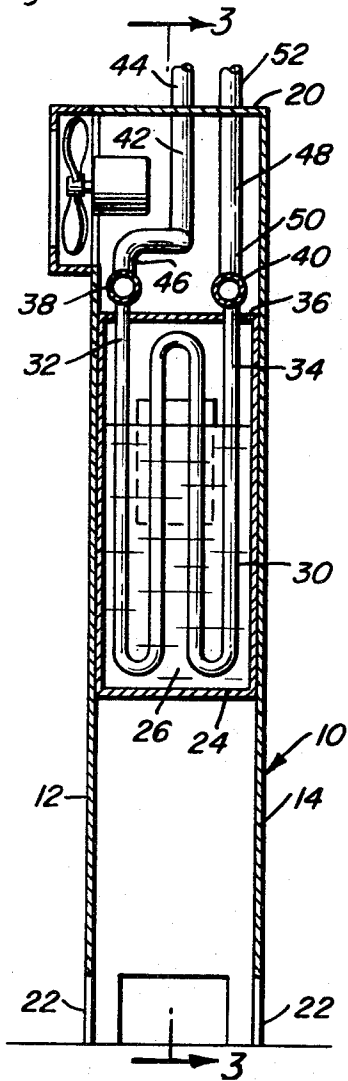
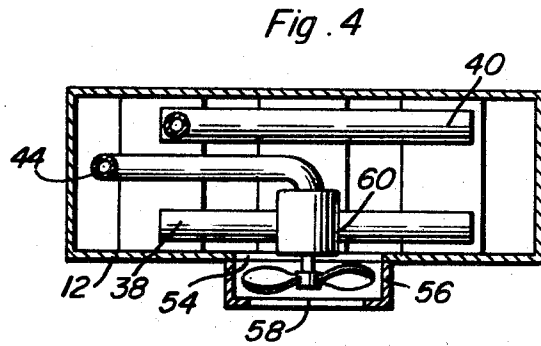
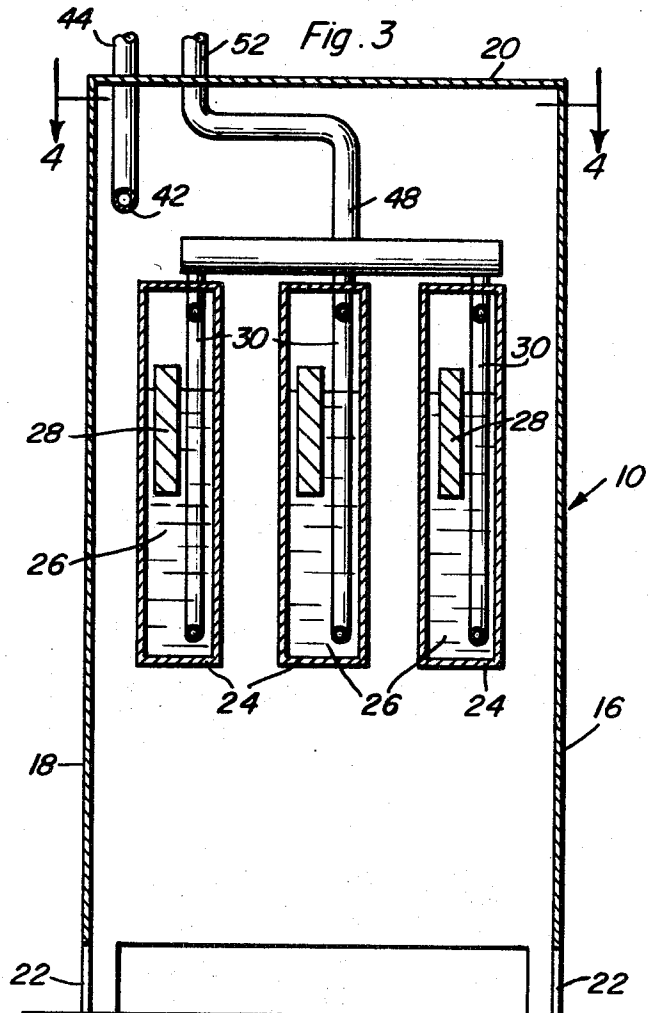


Fig. 2



HOLDOVER COOLING UNIT

This invention comprises an improvement over the HOLDOVER COLD PLATE COOLING UNIT disclosed in my copending U.S. application Ser. No. 240,047, filed Mar. 31, 1972 now U.S. Pat. No. 3,744,271.

The holdover cooling unit of this invention has been designed primarily for use as a holdover cooling unit to be utilized in mobile refrigeration units such as railway refrigerated cars and refrigerated truck bodies. However, the instant invention may also be utilized, in instances where breakdown of existing mechanical refrigeration units cannot be tolerated, as a standby extremely low-power consumption refrigeration unit.

The main object of this invention is to provide a holdover cooling unit with increased capacity for a given size and weight.

Another important object of this invention is to provide a holdover cooling unit which may be rapidly "charged" with a minimum of effort and required experience.

A further object of this invention is to provide a eutectic blower unit capable of being rapidly charged to a sufficiently low temperature for the purpose of maintaining prolonged subfreezing temperatures in an associated enclosure to be maintained refrigerated.

A still further object of this invention is to provide a eutectic blower unit which will utilize substantially all of the heat absorbing potential of the liquid nitrogen utilized to "charge" the blower unit.

A final object of this invention to be specifically enumerated herein is to provide a holdover cooling unit in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the internal structure of the holdover cooling unit with the cabinet and associated blower removed;

FIG. 2 is a vertical sectional view taken substantially upon a plane passing through a cabinet in which the holdover cooling unit is disposed, the cabinet being provided with a conventional blower unit;

FIG. 3 is a vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken substantially upon the plane indicated by the section line 4—4 of FIG. 3; and

FIG. 5 is a diagrammatic view of a simple thermostatically controlled circuit for the blower of the holdover cooling unit.

Referring now more specifically to the drawings, the numeral 10 generally designates a cabinet of simple construction including front and rear walls 12 and 14 interconnected by means of right and left side walls 16 and 18. The upper ends of the walls 12, 14, 16 and 18 are interconnected by means of a top wall 20 and the

lower end of the cabinet 10 is open and includes four depending legs 22.

Three sealed hollow metal tanks 24 are disposed within the cabinet 10 below the upper end thereof and secured between the front and rear walls 12 and 14 in any convenient manner. Each of the tanks 24 is not quite fully filled with a suitable eutectic solution 26 and a somewhat compressible block 28 of a specific gravity less than the eutectic solution 26 is disposed in each tank 24. Further, each tank 24 has a coil 30 of good heat transmitting material disposed therein. Each coil 30 has an inlet end 32 and an outlet end 34 which opens upwardly through the corresponding tank top wall 36. The inlet ends or end portions 32 open into an inlet manifold 38 and the outlet ends 34 open into an outlet manifold 40. A supply line 42 is provided and includes an inlet end 44 which opens upwardly through the top wall 20 of the cabinet 10 and an outlet end 46 which opens into the inlet manifold 38. An outlet line 48 is provided and includes an inlet end 50 communicated with the interior of the outlet manifold 40 and an outlet end 52 which opens through the top wall 20 of the cabinet 10 and is vented to the ambient air at a non-enclosed location.

In addition, it will be noted that the upper portion of the front wall 12 of the cabinet 10 has an opening 54 formed therein and that a blower housing 56 including a forward outlet opening 58 is secured to the outer surface of the front wall 12 in registry with the opening 54. A blower assembly referred to in general by the reference numeral 60 is provided within the housing 56 and is operative to pump air from within the upper portion of the cabinet 10 outwardly through the opening 58.

A source 62 of electrical potential is provided and grounded as at 64. A conductor 66 extends from the source 62 to the motor 68 and has a temperature responsive switch 70 serially disposed therein. In addition, a conductor 72 extends from the motor 68 to the ground.

In operation, if the cabinet 10 is mounted within a mobile refrigerated container, such as a boxcar or a truck body, when it is desired to cool the enclosure within which the cabinet 10 is disposed, liquid nitrogen is introduced into the coils 30 by means of a supply line 44 connected to a tank 76 of liquid nitrogen. As the liquid nitrogen is introduced into the coil 30, the liquid nitrogen will absorb heat from the eutectic solution and become vaporized for discharging through the outlet end 34, the outlet manifold 40 and the outlet line 48. However, the coil 30 is constructed in a manner such that even the cool vaporized liquid nitrogen absorbs substantial quantities of heat from the eutectic solution 26 before being discharged from the coil 30. In this manner, large quantities of extremely cool nitrogen gases are not vented from the line 52. Rather, the large quantities of nitrogen gas discharged from the line 52 are at reasonably warm temperatures, in comparison to the vapor point of liquid nitrogen. The blocks 28 serve to allow for expansion as the eutectic solution 26 changes from a liquid to a solid.

If the cabinet 10 is to be utilized as a standby air conditioning unit, the tank 76 of liquid nitrogen under pressure will be disposed in an area adjacent the cabinet 10. Then, when a critical air conditioning unit malfunctions and it is necessary that the holdover cooling unit serve as a portable refrigeration system, liquid nitrogen is introduced into the coils 30 in the aforemen-

tioned manner and the circuit illustrated in FIG. 5 may be actuated. If it is desired, the blower unit may be powered by battery supply in order that substantial air conditioning capacity may be afforded without requiring an outside source of electrical potential.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. In combination with a source of liquid nitrogen under pressure, a housing including air inlet and air outlet openings and blower means operatively associated with the housing for pumping air through the housing and out the air outlet opening, at least one closed tank disposed within the housing for the passage of air being pumped through the housing in heat transfer relation with the outer surfaces of the tank, a quantity of eutectic solution disposed within the tank, and a coil of good heat transmitting material disposed within the tank and including inlet and outlet ends opening outwardly of the tank, fluid flow controlled

means communicating the inlet end of the coil with said source of liquid nitrogen under pressure, said outlet end being free of gas flow restricting means for free venting of vaporized liquid nitrogen therefrom.

2. The combination of claim 1 wherein said housing is vertically elongated, provided with depending support legs and said air inlet opening is defined in the bottom of said housing, said air outlet opening being defined in an upper portion of said housing.

3. The combination of claim 2 wherein said tank is disposed within said housing below said air outlet opening.

4. The combination of claim 3 wherein said blower assembly is disposed within said housing above said tank.

5. The combination of claim 1 wherein a plurality of eutectic solution tanks are disposed within said housing and each of said tanks has a coil disposed therein having inlet and outlet ends opening outwardly of the tanks, the inlet ends of said coils opening into an inlet manifold within said housing into which a supply line opens, the inlet end of the supply line opening exteriorly of said housing, said fluid flow controlled means communicating said source with said inlet end of said supply line.

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