

Aug. 15, 1933.

H. B. HULL

1,922,091

REFRIGERATING APPARATUS

Original Filed May 30, 1930 2 Sheets-Sheet 1

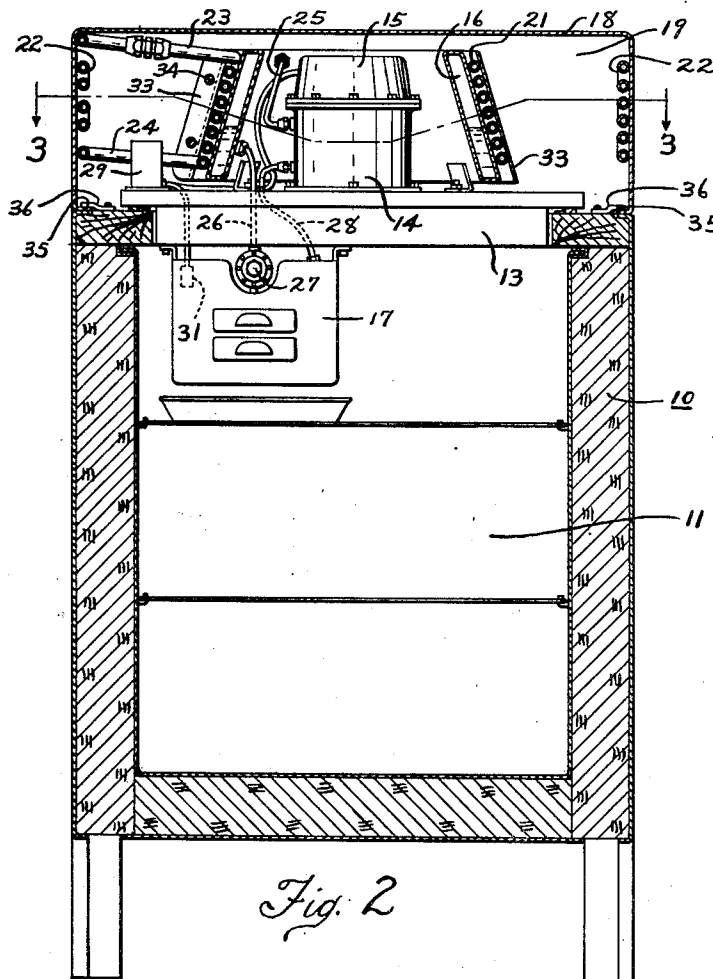


Fig. 2

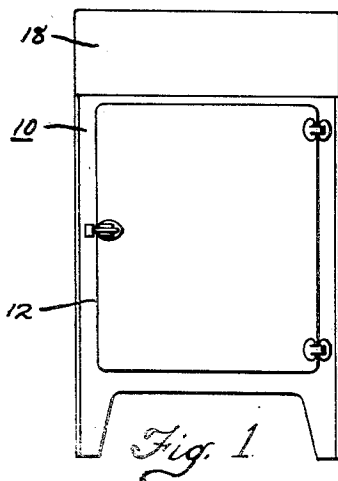


Fig. 1

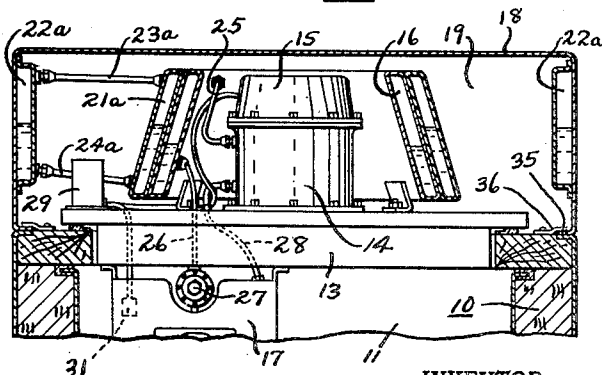


Fig. 6

INVENTOR
HARRY B. HULL.

BY
Spencer, Hardman, and Fitch,
HIS ATTORNEYS

Aug. 15, 1933.

H. B. HULL

1,922,091

REFRIGERATING APPARATUS

Original Filed May 30, 1930

2 Sheets-Sheet 2

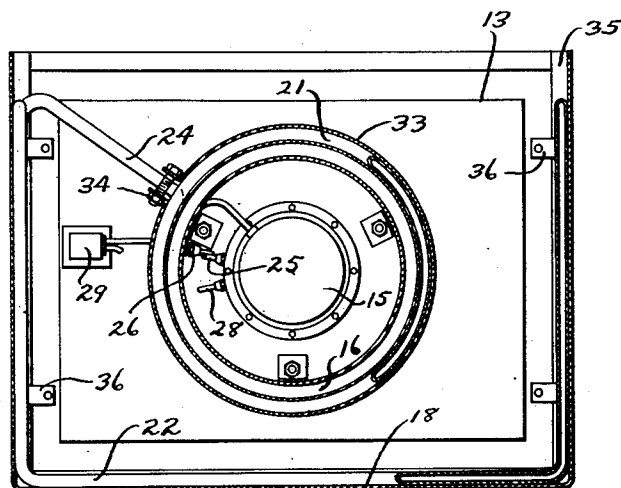
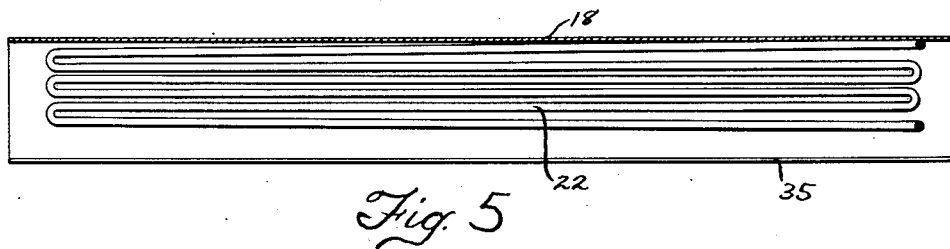
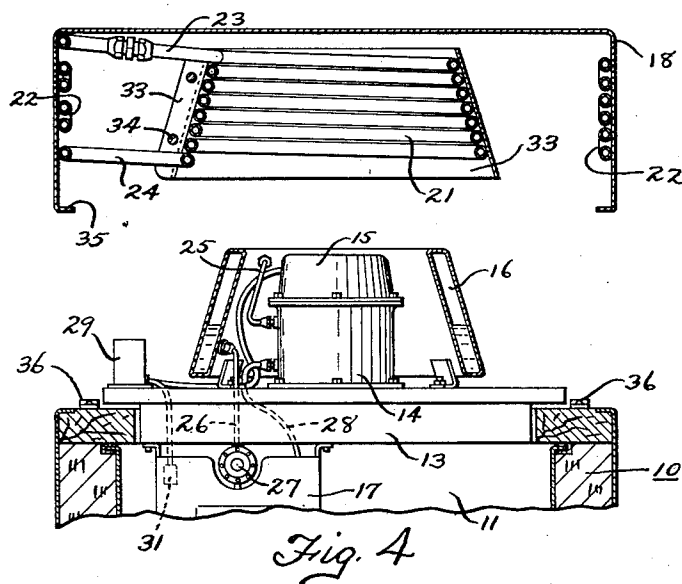


Fig. 3

INVENTOR
HARRY B. HULL.

BY
Spencer, Hardman, & Lake
HIS ATTORNEYS

UNITED STATES PATENT OFFICE

1,922,091

REFRIGERATING APPARATUS

Harry B. Hull, Dayton, Ohio, assignor to Frigidaire Corporation, Dayton, Ohio, a Corporation of Delaware

Application May 30, 1930, Serial No. 457,581
Renewed August 19, 1932

14 Claims. (Cl. 62—116)

The invention relates to refrigerating apparatus.

An object of the invention is to provide improved means for dissipating or removing the heat from a refrigerating apparatus. More particularly to provide a cabinet cooled by said refrigerating apparatus and having a part of its walls formed by or associated with this improved heat dissipating means.

Another object of the invention is to provide heat dissipating means for a refrigerant circulating unit located within a cabinet, which means may be removed from the unit and cabinet to afford access to the unit or removal thereof from the cabinet.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the present invention is clearly shown. In the drawings:

Fig. 1 is a front elevational view of a refrigerator cabinet embodying the present invention;

Fig. 2 is an enlarged horizontal sectional view of the refrigerator cabinet showing the construction of the refrigerating apparatus;

Fig. 3 is a sectional top view taken on the lines 3—3 of Fig. 2;

Fig. 4 shows the heat dissipating element of the present invention removed from the refrigerating unit and cabinet;

Fig. 5 is a diagrammatic view showing the heat dissipating portion of the dissipating element; and

Fig. 6 is a view similar to Fig. 2 showing a modified form of the invention.

Referring to the drawings, 10 designates a refrigerator cabinet having an insulated food storage compartment 11 therein. A door 12 (see Fig. 1) permits access to the compartment 11. Supported upon the cabinet framework at the top of compartment 11 there is mounted an insulated base 13 which forms the top wall of compartment 11. Base 13 has mounted thereon a compressor 14, motor 15, and a condenser 16. An evaporator or cooling unit 17 suspended from the base 13 extends into the food storage compartment 11 and is adapted to maintain compartment 11 at a predetermined temperature. The evaporator or cooling unit 17 may, if desired, comprise a refrigerant expansion coil submerged in a brine solution and contained within walls of the evaporator. Also supported upon the cabinet framework or compartment 11 there is located a removable member or hood 18 providing a compartment 19 which houses the compressor 14, motor 15, and condenser 16. The condenser 16 in the present invention is made of

sheet metal and is in the form of a cylindrical cone shaped tank. The hood 18 has its top and all sides except the back side closed. The back side of hood 18 is open to permit the escape of heat generated by the motor and compressor.

An improved means for dissipating heat from the refrigerating system is provided. This means may take the form of a heat interchanger or heat dissipating element to readily remove heat generated by the condenser 16 therefrom and to dissipate this heat to atmosphere outside the cabinet or compartment 19. The heat dissipator comprises a coil of pipe or portion 21 which surrounds the condenser 16 and is in heat exchange relation or intimate thermal contact therewith. A length of pipe or portion 22 of the heat dissipator is connected with the portion 21 by pipes or conduits 23 and 24 and is in intimate thermal contact with walls of the hood 18. The manner in which heat, generated by the condenser, is dissipated to atmosphere outside the cabinet will be more fully described hereinafter together with an explanation of the operation of this system.

Refrigerant is compressed by the compressor 14 and is directed to the condenser 16 through the pipe or conduit 25. Condensed liquefied refrigerant is then directed from the condenser 16 through the pipe or conduit 26 to expansion valve 27. The expansion valve 27 operates in response to pressure, created by operation of the compressor, in the system to permit refrigerant to enter an expansion coil submerged in a brine solution (not shown) within the evaporator 17. The outlet end of the expansion coil is connected with the compressor 14 by a pipe or conduit 28 which directs the evaporated or gaseous refrigerant from the evaporator 17 to the compressor 14. For the purpose of illustrating the present invention I have shown the motor 15 as being directly connected with the compressor 14 so as to provide a sealed unit. However it is to be understood that the compressor 14 and motor 15 for operating the compressor may be of any suitable construction. An electric switch 29 is actuated by a thermostat 31 connected therewith and positioned within the food storage compartment 11. Thermostat 31 may be responsive to temperatures of the evaporator 17 or to temperatures within the compartment 11 for starting or stopping the motor which operates the compressor.

During operation of the motor 15 and the compressor 14, which provides a refrigerant liquefying unit, heat is generated by the condenser 16. It is a purpose of this invention to readily dissipate this heat to atmosphere outside the cabinet 10 or compartment 19; therefore, the heat dissipator, which comprises portions 21 and 22, has a cooling or volatile fluid sealed therein. The

volatile fluid contained in portion 21 of the dissipator, which portion is disposed in heat exchange relation or intimate thermal contact with the condenser, will absorb heat from the condenser 16 and will vaporize. This vaporized fluid will rise in portion 21 of the dissipator and will flow through pipe 23 to the portion 22 of the dissipator which is in contact with walls of the cabinet or hood 18. Heat absorbed by the fluid from the condenser 16 will be transmitted to the walls of the cabinet or compartment 19 and will there be dissipated to the atmosphere outside cabinet 10. The volatile fluid upon dissipating its heat to the atmosphere will condense and the liquefied fluid will then be directed through pipe 24 from the lower portion of portion 22 of the dissipator to the lower portion of portion 21 thereof. The condensed liquefied fluid is thereby in condition to again absorb heat from the condenser 16 and to devaporize, thus continuing abstraction of heat from the condenser and dissipation of this heat to atmosphere outside the cabinet. Obviously circulation of the fluid in the heat dissipator will continue as long as the temperature of the condenser 16 is above that of the atmosphere outside the cabinet 10. It is to be understood that both portions 21 and 22 of the dissipator are arranged so that they are elevated throughout their length thus increasing the flow of vaporized fluid therein. The portion 22 of the dissipator is also disposed higher than the portion 21 to readily permit the flow of condensed liquefied fluid from portion 22 to portion 21.

A metal clamping band 33 surrounds the portion 21 of the heat dissipator and is secured in position thereon by bolts 34. The clamping band 33 permits the portion 21 of heat dissipator to be clamped tightly against or in intimate thermal contact with the condenser 16. The sides of the member or hood 18 are provided with an inwardly extending flange 35 which flange is adapted to be clamped by the clamps 36 to the cabinet. The hood 18 together with the portions 21 and 22 of the heat dissipator may be removed from the cabinet to permit access to the refrigerant circulating unit or to permit the unit to be removed from the cabinet. In order to remove the hood 18 and the heat dissipating element from the cabinet the clamps 36 are loosened and the bolts 34 are removed from the clamping band 33 thus permitting portion 21 of the dissipating element and the hood 18 to be raised to a height so that portion 21 of the dissipating element will clear the condenser 16 (see Fig. 4).

In Fig. 6 of the drawings I have shown a modified form of the invention. The portion 21a of the heat dissipator in the modified form is made similar to the construction of condenser 16, that is, the portion 21a is constructed from sheet metal to provide a cylindrical cone shaped tank which surrounds the condenser 16 instead of coils of pipe. The heat dissipating portion of the heat interchanger is also shown as a tank 22a forming the front and side walls of compartment 19. Obviously the tank portion 22a could also be made to form the top wall of compartment 19 if desired. The two tank portions 21a and 22a of the heat dissipator in the modified showing of the invention are connected by pipes or conduits 23a and 24a to permit thermal-siphon circulation of the cooling medium contained in portions 21a and 22a of the dissipator. In this modified form of the invention the use of clamping band 33 is not necessary as the portion 21a of the dissipator will fit

snugly against the cone shaped cylindrical condenser 16 and will be in intimate thermal contact therewith.

Although I have shown the back side of hood 18 as being open to permit the escape of heat generated by the compressor and motor, from the compartment 19 it is to be understood that the back may also be closed if desired. In a structure wherein the back is closed heat generated by the motor and compressor will be absorbed by the cooling liquid contained in the heat dissipator and will be dissipated to the atmosphere outside the compartment 19 in a manner similar to the method of extracting heat from the condenser.

It is thus apparent that I have provided an improved apparatus or refrigerant circulating unit in which heat generated by certain parts of the unit is extracted therefrom without the use of a fan for circulating air over the condenser. Consequently noises created by the fan and air moved thereby are also eliminated.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, means forming a compartment for said heat dissipating element and forming a confined space within said compartment for a cooling fluid, said means including a wall portion for said cooling fluid disposed in intimate thermal contact with a wall of said heat dissipating element, and said means also including another wall portion for said cooling fluid in intimate heat exchange relation with atmosphere exterior of said compartment.

2. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, means forming a compartment for said heat dissipating element and forming a confined space within said compartment for a cooling fluid, said means including a wall portion for said cooling fluid disposed in intimate thermal contact with a wall of said heat dissipating element, said means also including another wall portion for said cooling fluid in intimate heat exchange relation with atmosphere exterior of said compartment, and said means being removable from said refrigerating apparatus.

3. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipating element, walls forming a closed circuit within said compartment for a cooling fluid, a portion of the walls of said circuit being in intimate heat exchange relation with a wall of said heat dissipating element, and another portion of the walls of said circuit being in intimate heat exchange relation with a wall of said compartment.

4. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipa-

pating element, at least a portion of a wall of said compartment forming a wall of a closed circuit for a cooling fluid, said closed circuit also having another wall portion in intimate thermal contact with said heat dissipating element.

5 5. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with
10 said unit, a compartment for said heat dissipating element, a conduit forming a closed circuit within said compartment for a cooling fluid, a portion of said conduit being in intimate heat exchange relation with a wall of said heat dissipating element, and another portion of said conduit being in intimate heat exchange relation with atmosphere outside said compartment.

15 6. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipating element, a conduit forming a closed circuit within said compartment for a cooling fluid, means for
20 securing a portion of said conduit in intimate thermal contact with a wall of said heat dissipating element, and another portion of said conduit being secured in intimate thermal contact to a wall of said compartment.

25 7. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipating element, at least a portion of a wall of said compartment forming a wall of a chamber within said compartment, another chamber within said compartment having a wall thereof in intimate thermal contact with a wall of said heat dissipating element, said chambers being connected together to form a closed circuit for a cooling fluid.

30 8. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipating element, at least a portion of a wall of said compartment forming a wall of a chamber within said compartment, another chamber within said compartment having a wall thereof in intimate thermal contact with a wall of said heat dissipating element, said chambers being connected together to form a closet circuit for a cooling fluid, and said closed cooling fluid circuit being removable from said refrigerating apparatus.

35 9. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected with said unit, a compartment for said heat dissipating element, at least a portion of a wall of said compartment forming a wall of a closed circuit for a cooling fluid, said closed circuit also having another wall portion in intimate thermal contact with said heat dissipating element, the walls of said compartment and said closed cooling fluid circuit being removable from said refrigerating apparatus.

40 10. A refrigerating apparatus comprising, an evaporator, a refrigerant circulating unit including a heat dissipating element, said evaporator and said element being operatively connected

with said unit, a compartment for said heat dissipating element, a conduit forming a closed circuit within said compartment for a cooling fluid, a portion of said conduit being in intimate heat exchange relation with the wall of said heat dissipating element, and another portion of said conduit being in intimate heat exchange relation with atmosphere outside said compartment, the walls of said compartment and said conduit being removable from said refrigerating apparatus.

80 11. A refrigerating system comprising, a compressor, a condenser operatively connected with said compressor, an evaporator operatively connected with said condenser and with said compressor, and means having a portion thereof in intimate thermal contact with said condenser and forming a closed circuit containing a volatile fluid, said means being removable from said condenser.

85 12. A refrigerating system comprising, a compressor, a condenser operatively connected with said compressor, an evaporator operatively connected with said condenser and with said compressor, and means having a portion thereof in intimate thermal contact with said condenser and forming a closed circuit containing a volatile fluid, said means also including another portion forming a compartment enclosing said compressor and said condenser, and said means being removable from said compressor and said condenser.

90 13. A refrigerating apparatus comprising in combination, a cabinet having walls forming an insulated chamber therein, an evaporator mounted in said chamber, a refrigerant circulating unit including a heat dissipating element, said evaporator being operatively connected with said unit, means forming a compartment for said heat dissipating element and forming a confined space within said compartment for a cooling fluid, said means including a wall portion for said cooling fluid disposed in intimate thermal contact with a wall of said heat dissipating element, said means also including another wall portion for said cooling fluid in intimate thermal heat exchange relation with atmosphere exterior of said compartment, and a portion of said means being in the same plane with the exterior wall portions of said insulated chamber and forming a continuation of said cabinet walls.

100 14. A refrigerating apparatus comprising in combination, a cabinet having walls forming an insulated chamber therein, an evaporator mounted in said chamber, a refrigerant circulating unit including a heat dissipating element, said evaporator being operatively connected with said unit, means forming a compartment for said heat dissipating element and forming a confined space within said compartment for a cooling fluid, said means including a wall portion for said cooling fluid disposed in intimate thermal contact with a wall of said heat dissipating element, said means also including another wall portion for said cooling fluid in intimate thermal heat exchange relation with atmosphere exterior of said compartment, said means being in the same plane with the exterior wall portions of said insulated chamber and forming a continuation of said cabinet walls, and said means being removable from said heat dissipating element and said cabinet.

HARRY B. HULL.