

June 18, 1940.

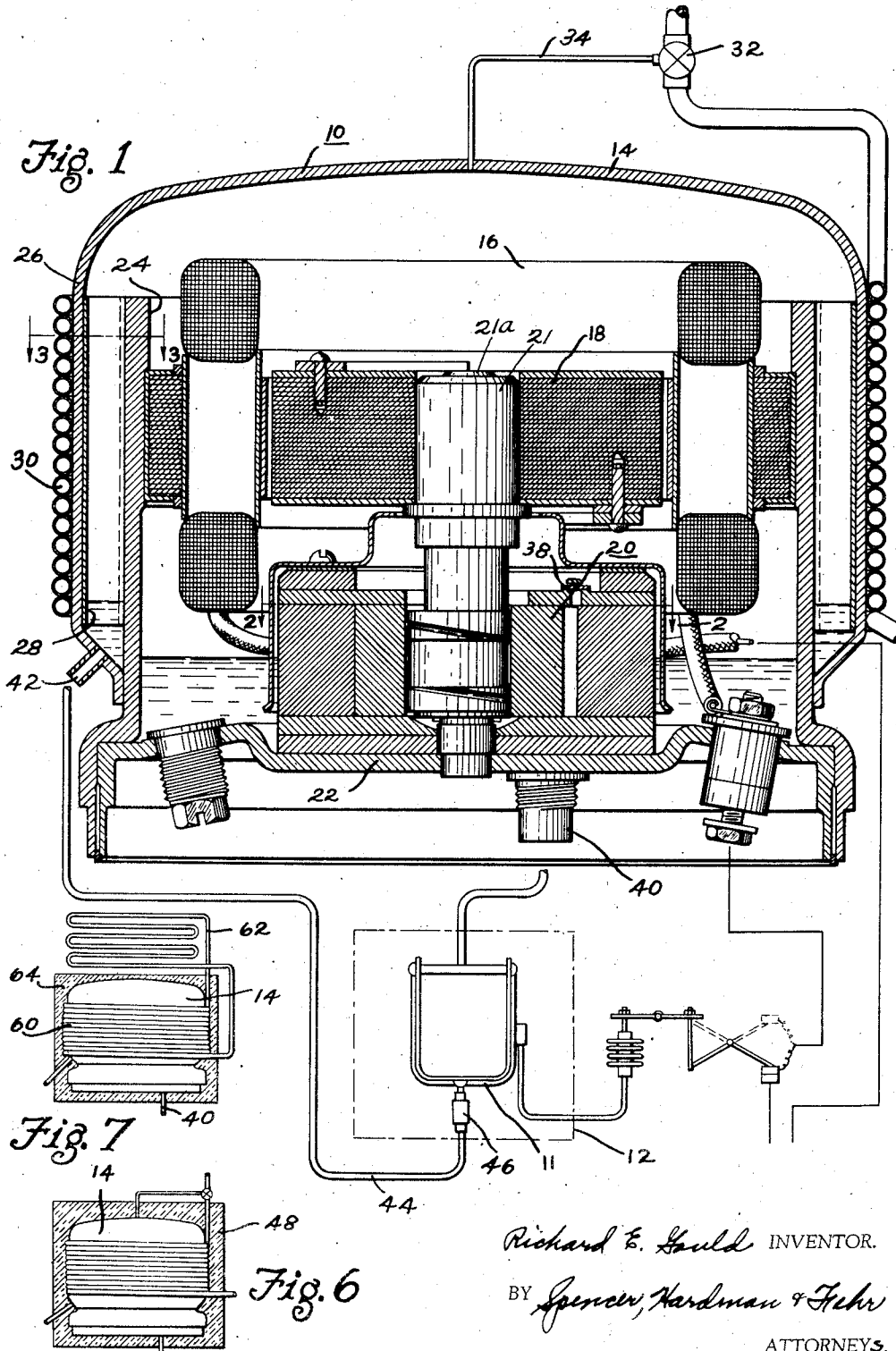
R. E. GOULD

2,205,138

REFRIGERATING APPARATUS

Filed Oct. 29, 1937

2 Sheets-Sheet 1



June 18, 1940.

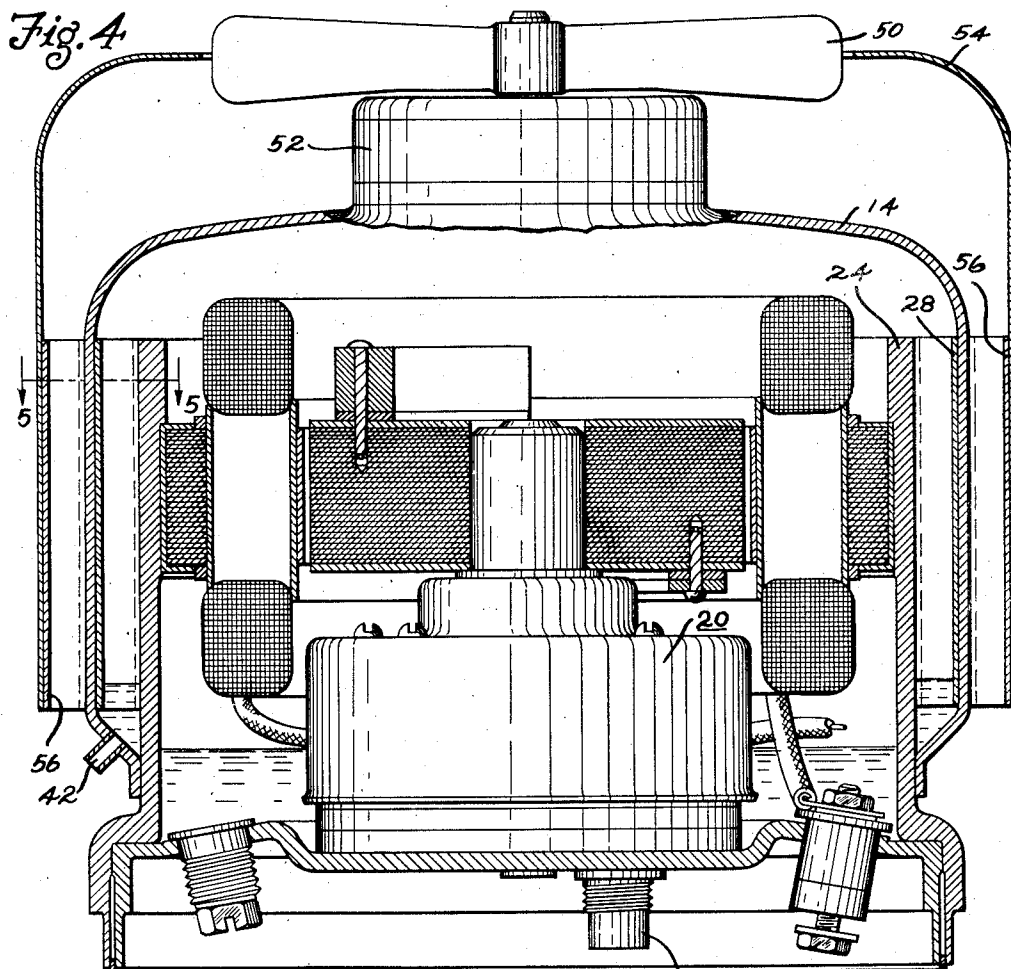
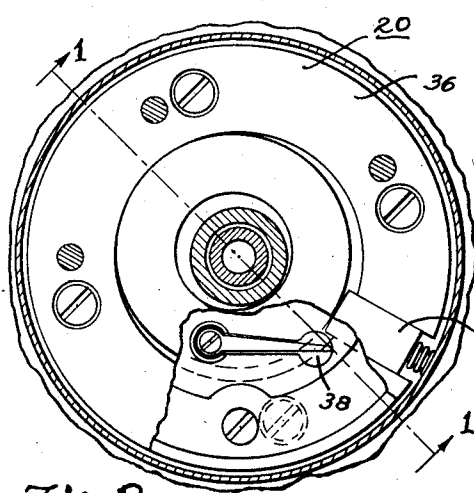
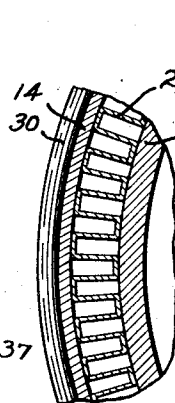
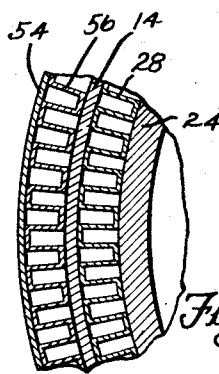
R. E. GOULD

2,205,138

REFRIGERATING APPARATUS

Filed Oct. 29, 1937

2 Sheets-Sheet 2



INVENTOR.

Richard E. Gould
BY *Spencer, Hardman & Fisher*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,205,138

REFRIGERATING APPARATUS

Richard E. Gould, Dayton, Ohio, assignor to
General Motors Corporation, Dayton, Ohio, a
corporation of Delaware

Application October 29, 1937, Serial No. 171,753

10 Claims. (Cl. 62—115)

This invention relates to refrigerating apparatus and more particularly to an improved refrigerant liquefying unit.

One of the objects of this invention is to provide a new and improved refrigerating system employing a motor-compressor unit wherein the casing for the motor and compressor is used in condensing and storing the refrigerant discharged by the compressor.

Another object of this invention is to provide a liquefying unit in which the same means is utilized for cooling the motor-compressor apparatus as is used for cooling the condenser.

Another object of this invention is to provide a simplified liquefying unit which is readily adapted for quantity production.

Still another object of this invention is to provide a combined motor-compressor-condenser-receiver unit of compact construction.

A further object of this invention is to provide a liquefying unit which may be enclosed within a sound deadening jacket without any decrease in operating efficiency.

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 cross-sectional view partly diagrammatic showing a refrigerating system embodying features of my invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 and showing a fragmentary portion of the valve plate in place;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is an elevational view, partly in section, showing a modified arrangement embodying features of my invention;

Fig. 5 is a fragmentary sectional view on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view showing a motor-compressor-condenser-receiver unit of the type disclosed in Fig. 1 mounted within a sound and heat insulating jacket; and

Fig. 7 is a sectional view showing a modified form of motor-compressor-condenser-receiver unit mounted within a sound and heat insulating jacket.

Referring now to the arrangement shown in Fig. 1, the reference numeral 10 designates a motor-compressor-condenser-receiver unit which is in refrigerant flow relationship with the evaporator 11 mounted within the cooling com-

partment 12. The motor-compressor-condenser-receiver unit comprises an outer shell 14 in which is mounted a conventional motor-compressor unit comprising a motor stator 16, a motor rotor 18 and a compressor 20. The main drive shaft 21 is hollow and is journaled on the post 21a carried by the base plate 22 which plate also supports an upwardly extending cylindrical portion 24 spaced from the outer wall 26 of the shell 14. In the space between the outer wall 26 and the extension 24, there is provided a corrugated fin structure 28 which serves to increase the heat absorbing surface. For this purpose hydrogen brazed steel fins may be used. The fins also serve to conduct heat from the motor-compressor unit to the outer casing or shell 14. With this arrangement it is not necessary to provide separate means for removing the motor heat nor is it necessary to provide cooling coils within the condenser chamber. Externally of the shell 14, there is provided a water cooling coil 30 through which water is caused to circulate. A control valve 32 is provided in the water supply main and controls the flow of water in accordance with the head pressure within the shell 14. For this purpose a pressure line 34 leads from the shell 14 to the pressure responsive valve 32.

The motor-compressor unit may be of any suitable type and for purposes of illustration, I have disclosed a compressor having the conventional form of cylinder 36, provided with a divider block 37 and a discharge valve 38. The refrigerant vapor leaving the evaporator 11 enters the compressor through the inlet 40 in the conventional manner. The compressed refrigerant flows through the outlet valve 38 and escapes into the main housing 14 and is required to flow into the space between the outer shell 14 and the cylindrical extension 24 on its way to the evaporator. The compressed refrigerant will condense on the relatively cold surfaces of the outer shell 14, the fin structure 28 and the outer surface of the wall 24. The condensed refrigerant will drain into the lower portion of the space between the wall and the shell 14 and is free to leave the outer casing through the outlet 42 which communicates with the usual form of liquid refrigerant line 44 leading to the restrictor 46 and the evaporator 11.

By virtue of my arrangement the condensing surface can readily be designed so that the condenser is capable of absorbing heat from the refrigerant as rapidly as the cooling water can remove the heat. Furthermore it is not necessary to have the water coil pass through the her-

metically sealed casing of the refrigerant system.

There are several advantages in the above described arrangement. The simplicity of the device obviously materially reduces the cost of construction. The arrangement is very compact and, therefore, occupies comparatively very little space. Furthermore, the arrangement is especially well adapted for use within a sound deadening jacket. Inasmuch as the cooling fluid which condenses the refrigerant also cools the motor-compressor unit, it is possible and practical to mount the entire motor-compressor-condenser-receiver unit within a sound deadening jacket 48, as illustrated in Fig. 6. This arrangement is especially desirable in that no internal cooling coils are necessary with the result that any leak in the water line may be repaired without disturbing the sealed refrigerant system. Furthermore, any water leaking from the cooling coil will have no chance to mix with the refrigerant, since the refrigerant is enclosed within the hermetically sealed system.

Referring now to Fig. 4, I have illustrated an air cooled motor-compressor-condenser-receiver unit, the internal mechanism of which is similar to the internal mechanism of the unit shown in Fig. 1. Mounted on the upper side of the outer shell 14 is a cooling fan 50. The cooling fan 50 may be operated by a separate motor or any other convenient type of drive mechanism, but preferably it is operated by means of a drive 52 of the type illustrated in Patent Nos. 2,093,471 and 2,093,496 in which the fan is driven by power derived from the gyrations of the motor-compressor unit. A shroud 54 is provided for directing air circulated by the fan into thermal exchange relationship with the outer shell 14. Heat radiating fins 56 are provided between the shroud 54 and the shell 14, as best shown in Fig. 5. The heat radiating fins serve the usual function of increasing the heat radiating surface and also serve to uniformly distribute the flow of air over the shell 14. In this modification, the air circulated by the fan 50 cools the outer shell 14 of the motor-compressor-condenser-receiver unit, with the result that the compressed refrigerant condenses on the inner wall of the casing 14 and the surfaces provided by the heat radiating fins 28 and the wall 24. In this modification, as in the first modification described, the same apparatus is utilized for condensing the refrigerant as is used for cooling the motor-compressor apparatus.

In Fig. 7, I have shown a still further modification in which a secondary refrigerant system is provided for cooling the motor-compressor-condenser-receiver unit. The unit shown in Fig. 7 is of the same type as that shown in Fig. 1 and is provided with a cooling coil 60 similar to the cooling coil 30, but connected to an external condenser 62 of a secondary refrigerant system. Hence, the cooling coil 60 constitutes an evaporator for a secondary volatile refrigerant which is condensed in the secondary condenser 62 located at some remote place. While I have not shown any means for cooling the secondary condenser 62, any of the well known means for cooling condensers may be employed. The secondary refrigerant employed may be water or any other well known volatile fluid suitable for secondary refrigerant systems. Sound deadening material 64 is provided around the unit and serves to prevent the collection of moisture on the cooling coils, as well as serving to silence the unit.

The above described units are especially well

adapted for use in household refrigeration units in which it is desirable to provide a small, inexpensive and quiet unit.

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 system including a sealed motor-compressor-condenser unit having a casing containing a motor, compressor and condenser, a rotatable fan, means for rotating said fan by vibrations of said casing, and means for directing air circulated by said fan in heat exchange relationship with said motor-compressor-condenser unit.

2. In combination, an evaporator unit and a condenser unit in refrigerant flow relationship, motor-compressor mechanism sealed within said condenser, means for circulating a cooling liquid in thermal exchange with the exterior of said condenser, a jacket of sound insulating material enclosing said condenser, said last named means including a secondary refrigerant system comprising a secondary evaporator in thermal exchange with said condenser, and a secondary condenser in refrigerant flow relationship with said secondary evaporator.

3. In combination, an evaporator, a condenser in refrigerant flow relationship with said evaporator, a compressor sealed within said condenser for withdrawing refrigerant from said evaporator and discharging compressed refrigerant into said condenser, means for flowing cooling fluid over said condenser, and means responsive to the pressure within said condenser controlling the flow of said cooling fluid.

4. In combination, an evaporator, a condenser in refrigerant flow relationship with said evaporator, a compressor sealed within said condenser for withdrawing refrigerant from said evaporator and discharging compressed refrigerant into said condenser, means for flowing cooling fluid over said condenser, means responsive to the pressure within said condenser controlling the flow of said cooling fluid, and sound deadening material enclosing said condenser.

5. A refrigerating system including an evaporator, a condenser in fluid flow relationship with said evaporator, said condenser comprising a drawn sheet metal casing, motor-compressor mechanism mounted within said casing, means whereby said mechanism withdraws refrigerant vapor from said evaporator and discharges the same within said casing, sheet metal heat conducting means between said mechanism and said casing, and means for cooling the exterior of said casing, said last named means comprising a water coil enclosed within a heat and sound insulating jacket.

6. A refrigerating system including a casing, a compressor within said casing, a motor within said casing for operating said compressor, said motor and said compressor being so constructed and arranged that operation of said motor and compressor causes vibration of said casing, condensing means within said casing utilizing a portion of said casing as a condensing surface, an evaporator in refrigerant flow relationship with said compressor and condensing means, a fan outside said casing circulating air thereover, and means for rotating said fan by vibrations of said casing.

7. A refrigerating system including a casing,

heat radiating means on said casing, a motor-compressor unit sealed within said casing and being so constructed and arranged that operation thereof induces vibration of said casing, condensing means within said casing utilizing a portion of said casing as a condensing surface, an evaporator, refrigerant connections whereby refrigerant evaporated in said evaporator is compressed in said compressor and condensed by said condensing means, a fan outside said casing circulating air in thermal exchange with said casing, and means for rotating said fan by vibrations of said casing.

8. A motor-compressor-condenser unit comprising in combination, a hermetically sealed casing, a motor and a compressor supported within said casing, said motor including baffle means within said casing and cooperating with said casing to form a condensing cavity, heat conducting fins arranged in said cavity around said motor, said unit being constructed for directing refrigerant vapor discharged by said compressor into the space between said casing and said baffle, and a coil arranged to direct a cooling liquid in thermal exchange relationship with said fins.

9. A motor-compressor-condenser unit comprising in combination, a support, a hermetically sealed casing enclosing said support and forming therewith an annular chamber providing at its lower portion a liquid refrigerant receiver, a motor-compressor unit enclosed within said casing, heat conducting means surrounding and in thermal exchange relationship with the motor of said unit and forming an enlarged condensing surface arranged in said chamber, and means for conducting cooling medium in heat exchange relation with the exterior of said casing, said heat conducting means being arranged to conduct heat from said motor to the walls of said casing.

10. In combination, an evaporator, a condenser comprising a sealed casing in refrigerant flow relationship with said evaporator, a motor-compressor unit sealed within said casing for withdrawing refrigerant from said evaporator and discharging compressed refrigerant into said sealed casing, heat conducting fins within said sealed casing providing extensive condensing surfaces, means for flowing cooling fluid in thermal exchange relationship with said fins, and means responsive to the pressure within said condenser controlling the flow of said cooling fluid.

RICHARD E. GOULD.