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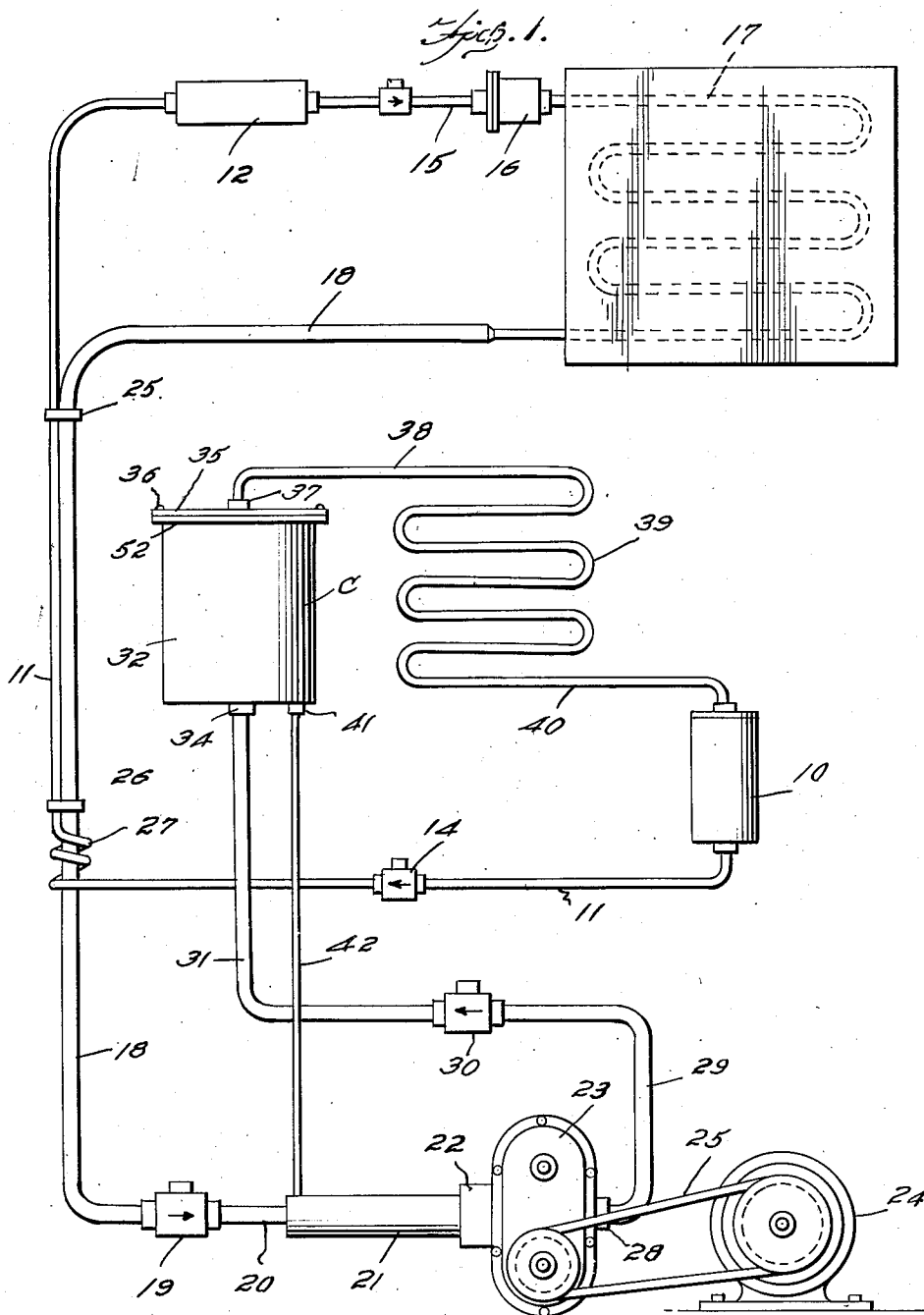
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2,610,480

MECHANICAL REFRIGERATING APPARATUS

Filed Oct. 12, 1949

2 SHEETS—SHEET 1



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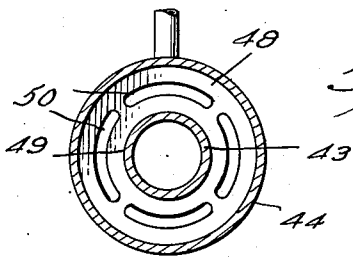
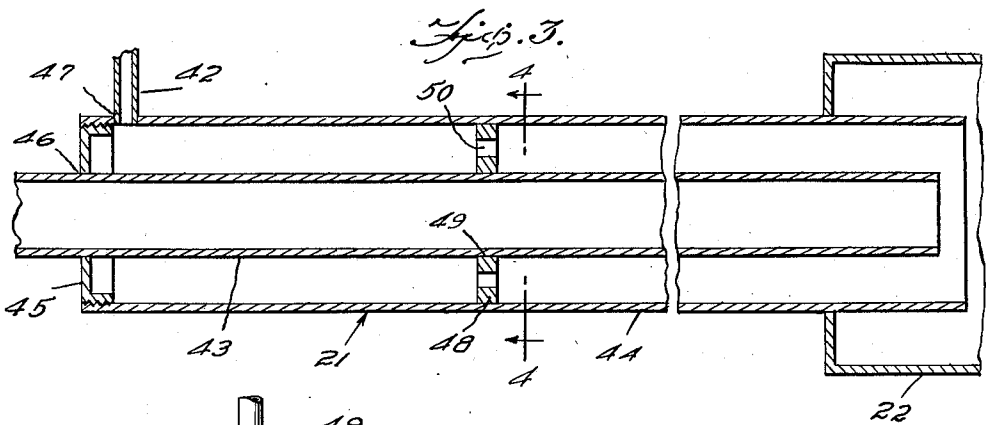
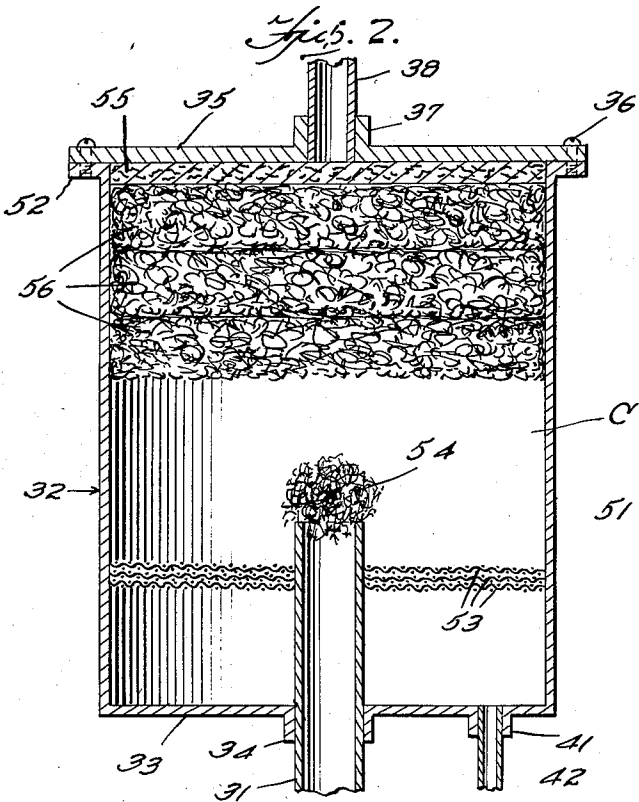
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2 SHEETS—SHEET 2



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MECHANICAL REFRIGERATING APPARATUS

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2 Claims. (Cl. 62-117.7)

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This invention relates to refrigerator units and the primary object of the invention is to provide a refrigerator unit adapted to be driven by a comparatively small motor since it does not have to start to function against strong head pressure.

Another object of the invention is to provide a refrigerator unit of the character indicated above adapted to be used in stationary systems as well as on automotive vehicles or the like.

A further object of the invention is to provide a refrigerator unit of the character indicated above adapted to be driven by the motor of an automotive vehicle when said motor runs at idling speed.

Another object of the invention is to provide a refrigerator unit the operating pressure of which is not affected by the speed at which the pump of the unit is run.

An additional object of the invention is to provide a refrigerator unit adapted to be built in an exceptional small size and at an exceptional low cost.

Another object of the invention is to provide a refrigerator unit adapted, when used on an automotive vehicle, to be placed entirely, with the exception of the expansion coil and the blowers, under the hood of the vehicle.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved refrigerator units whereby certain advantages are attained, as will be hereinafter more fully set forth.

In order that my invention may be better understood, I will now proceed to describe the same with reference to the accompanying drawings, wherein:

Figure 1 is a diagrammatical layout of a refrigerator unit in accordance with the present invention;

Figure 2 is a view in section of a separator used in connection with the refrigerating unit;

Figure 3 is a view in section of a mixer for mixing the refrigerant with the carrier material; and

Figure 4 is a view in section taken on the line 4-4 in Figure 3.

The refrigerator unit comprises a tank 10 for a refrigerant such as Freon or the like in condensed form. A high pressure pipe line 11 of comparatively small inside diameter leads from the tank 10 to a drier 12 and, if desired, a check valve 14 is inserted in the high pressure pipe line 11. From the drier 12 a high pressure pipe line 15 of the same inside diameter as the pipe line 11 leads to an expansion valve 16 connected with the

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inlet end portion of an expansion coil 17. The other end portion of said coil is connected with a suction pipe line 18 having a larger inside diameter than the expansion coil 17 and leading to a check valve 19. A pipe 20 having the same diameter as the pipe line 18 connects the check valve 19 with a mixer 21, the outlet end portion of which extends into the inlet port 22 of a pump 23 which is driven by a motor 24. While the drawing shows a belt connection 25 between the pump 23 and the motor 24 special attention is called to the fact that I do not wish to restrict myself to a belt drive but that any other suitable driving connection can be used.

The high pressure pipe line 11 leading to the drier 12 is disposed adjacent to the suction pipe line 18 and the two pipe lines are taped or soldered together, as indicated at 26 and a portion of the high pressure pipe line 11 is coiled about the suction pipe line 18, as at 27.

From the outlet port 28 of the pump 23 a high pressure pipe line 29 of approximately the same inner diameter as the suction pipe 18 leads to a check valve 30 and a high pressure pipe 31 leads from said check valve into a separator 32 which has a container C having a bottom 33 provided with an inlet port 34 through which the pipe 31 extends. The separator 32 has a lid 35 secured in position by bolts 36 or the like and provided with an outlet port 37 through which a high pressure pipe 38 extends. Said pipe 38 has an inner diameter of approximately the same size as the high pressure pipe 11 and leads to a condenser coil 39 from which a high pressure pipe 40 leads to the refrigerant tank 10.

The bottom 33 of the separator 32 is provided with a second outlet port 41 from which a drain pipe 42 of comparatively small diameter leads to the intake end portion of the mixer 21.

This mixer comprises an inner pipe 43 forming a continuation of the suction pipe 20 and arranged coaxially inside an outer pipe 44 of a larger diameter. The inlet end of said outer pipe, that is the end from which the inner pipe 43 enters, is closed by a screw plug 45 or the like provided with a centrally located hole 46 through which the inner pipe 43 extends. The small drain pipe 42 enters the outer pipe 44 through a hole 47 provided in the wall of said outer pipe adjacent to the inner end of the screw plug 45.

A disk 48 fitting snugly in the outer pipe 44 has a centrally located hole 49 permitting the inner pipe 43 to extend therethrough and is arranged inside the outer pipe 44 approximately

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halfway of the entire length of said pipe. A plurality of perforations 50 such as slots or the like is provided in the disk 48. The inner pipe 43 is slightly shorter than the outer pipe 44 the outlet end portion of which extends into the inlet port 22 of the pump 23.

The separator 32 comprises a peripheral wall 51 extending at right angles from the bottom 33 and provided at its end portion remote from the bottom with a flange 52 supporting the lid 35. A plurality of approximately hundred mesh screens 53 or the like are secured inside the separator and are spaced from the bottom 33. The high pressure pipe 31 extends through said screens and a wad 54 of copper wool or the like is forced into the end portion of said high pressure pipe 31.

A filter 55 made from tautly stretched heavy felt or any other suitable material is provided inside the separator 32 next to the lid 35 and a plurality of layers of a suitable oil proof, tightly pressed packing material 56 is also provided inside the separator 32 adjacent to the filter 55.

The tank 10 and the pipe line 11 are filled with a liquid refrigerant such as Freon or the like and the portion of the separator 32 next to the bottom 33, the drain pipe 42 and the outer pipe 44 of the mixer 21 is filled with a carrier material such as castor oil or the like. The motor 24 is started driving the pump 23 which sucks expanded refrigerant from the expansion pipe 17 through the suction pipe 18, the valve 19 and the pipe 20 into inner pipe 43 of the mixer 21 and sucks also carrier material through the outer pipe 44 so that the refrigerant and the carrier will be thoroughly mixed to form an emulsion when the refrigerant flows out of the inner pipe 43 and the carrier and the refrigerant together enter the pump 23 which drives the mixture under high pressure through the high pressure pipe 29, the valve 30 and the high pressure pipe 31 into the separator 32. Inside the separator the mixture is driven against the oil proof packing material 56 which will permit the refrigerant to pass but will retain the carrier. The latter passes through screens 53 so that clean carrier material will be contained in the bottom portion of the separator 32 from where it will return through the drain pipe 42 to the mixer 21.

Under the high pressure of the pump 23 the refrigerant passes through the layers 56 of packing material and through the filter 55 into the high pressure pipe 38, the pipe 40 into tank 10 and the high pressure pipe line 11, through the drier 12, the pipe line 15, the expansion valve 16 and the expansion coil 17 from where it is sucked through the suction pipe 18 as described above.

In operation, it is first to be understood that the check valve 30 is to be employed only when the refrigerating system is installed on a car or truck, due to the uneven running of the car or truck motor. However, in household or like use, a relatively small electric motor is to be employed to drive the pump and, here, the check valve 30 will be dispensed with, or otherwise be provided with a relatively small orifice or bypass (not shown), in order that the carrier (oil) content of the refrigerant emulsion, within the pipe line 29-31, can drain back toward the inlet side of the pump 23, thus effecting an equalization of the pressure throughout the system to the check valve 19. Now, since the expansion valve 16 will pass only so much of the refrigerant emulsion, which is normally under 150

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pounds pressure, any undue increase in the speed of the motor 24, driving the pump 23, will not affect a corresponding increase in the flow of the refrigerant emulsion through the system, but, with the motor and pump idle, the carrier content of the refrigerant emulsion, within the pipe line 29-31, will back slowly therein toward the outlet side of the pump and effect the desired equalization of the pressure, as before stated. As the refrigerant agent passes through and leaves the expansion coil 17, its pressure reduces to from 28 to 30 pounds, so that, with the check valve 30 omitted, or provided with the aforesaid bypass, and the motor and pump idle, the pressure equalizes throughout the system, thus, a minimum pressure is imposed on the intake side of the pump, when it and the motor are started up.

The above specification shows clearly that a refrigerator unit as embodied herein does require a by far smaller motor for actuating the unit than refrigerator units known heretofore since the refrigerator constructed in accordance with the present invention does not have to overcome a strong head pressure when being started. In consequence the unit may be built in a much smaller size than units known heretofore affording a saving on material, space and cost.

I claim:

1. In a mechanical refrigerating apparatus, a refrigerating agent supply tank, a power driven pump, a mixer directly connected to the inlet port of the pump, a circuit leading from the lower end of the tank for supplying the refrigerating agent at low pressure to the mixer, a separator containing a supply of a suitable carrier for the refrigerating agent, a pipe line leading from the lower end of the separator for supplying the carrier to the mixer, a second pipe line leading from the outlet port of the pump for discharging the resultant refrigerating emulsion to the separator, and still another pipe line leading from the top end of the separator for returning the refrigerating agent to the top of the tank as it is separated out from the carrier.

2. The invention as defined in claim 1, with a drier, an expansion valve and an expansion coil connected in the said circuit in the order named and in the direction of flow of the refrigerating agent from the tank to the mixer, a condenser coil connected in the said another pipe line between the separator and the tank, and check valves also connected in the circuit and the said second pipe line for regulating the flow of the refrigerating agent and the refrigerating emulsion.

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