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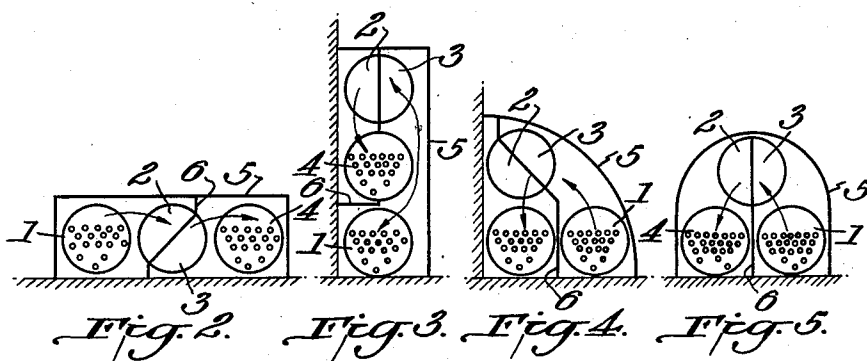
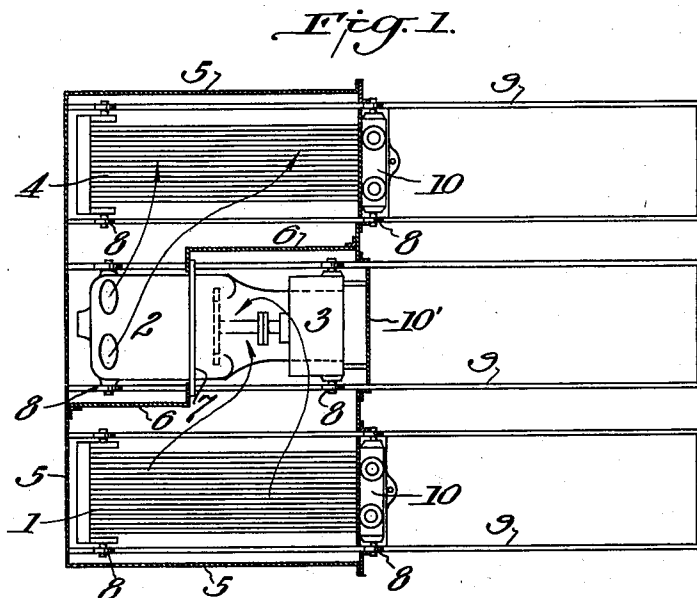
A. BAUMANN

1,935,538

REFRIGERATING MACHINE

Filed May 20, 1932

3 Sheets-Sheet 1



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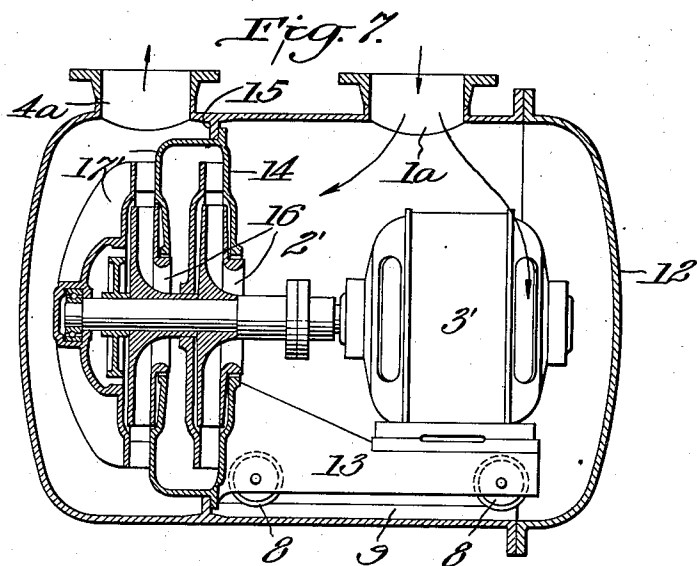
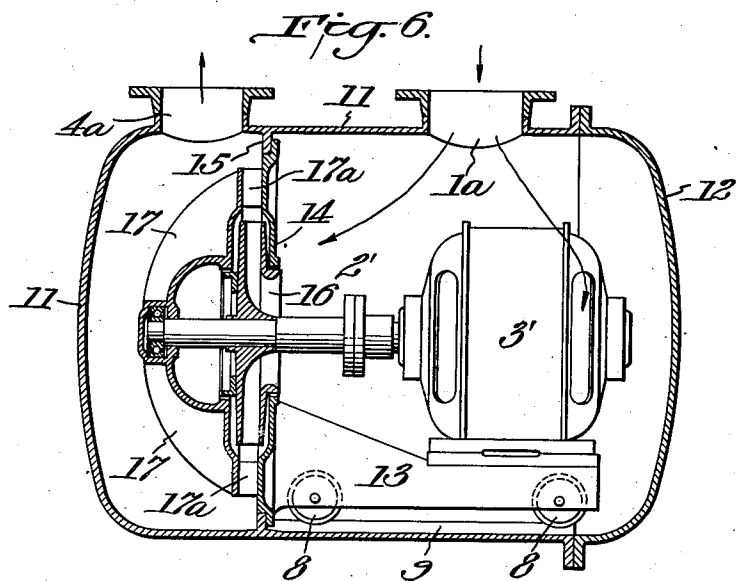
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REFRIGERATING MACHINE

Filed May 20, 1932

3 Sheets-Sheet 2



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Fig. 8.

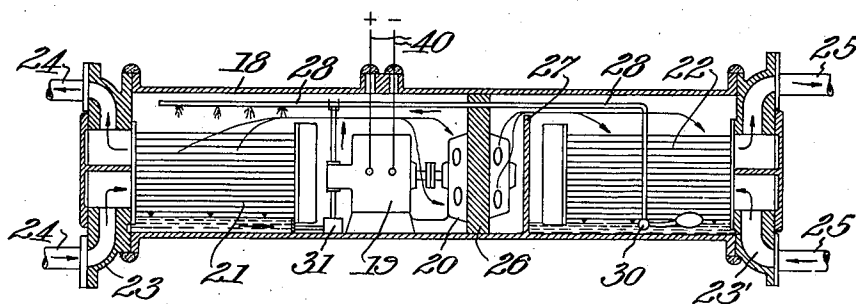


Fig. 9.

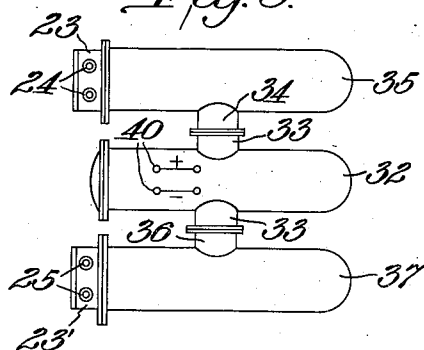
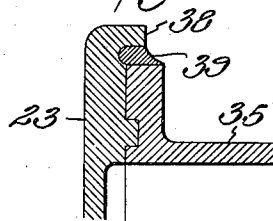


Fig. 10.



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UNITED STATES PATENT OFFICE

1,935,538

REFRIGERATING MACHINE

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Application May 20, 1932, Serial No. 612,598, and
in Germany August 11, 1930

14 Claims. (Cl. 62—115)

This invention relates to refrigerating machines of the type including a motor-compressor assembly, and particularly to machines in which the motor is housed within a part of the refrigerating circuit.

An object of the invention is to provide an enclosed refrigerating machine in which a casing or a plurality of casings provide the evaporator and the condenser compartments, and in which the motor and the suction side of the compressor are located within the evaporator compartment and the compressor is located within the condenser compartment. An object is to provide a refrigerating machine including a motor-compressor unit mounted in a housing, preferably of cylindrical form, and in which partition members formed by or cooperating with the compressor provide a wall dividing the housing into two compartments that may be directly connected with the condenser and evaporator compartments, respectively of the machine. A further object is to provide a machine having one or more cylindrical housings, and in which the motor-compressor unit and/or other elements of the refrigerating system are mounted on wheels to facilitate their introduction into and removal from the housing or housings. A further object is to provide a refrigerating machine in which a cylindrical housing or a plurality of parallel cylindrical housings provide sealed compartments in which the motor-compressor, the condenser and the evaporator are located; the arrangement permitting the entire system to be operated under pressure either higher or lower than atmospheric.

These and other objects and advantages of the invention will be apparent from the following specification when taken with the accompanying drawings, in which:

Fig. 1 is a horizontal sectional view of one embodiment of the invention,

Fig. 2 is a diagrammatic view, in transverse section, of the apparatus shown in Fig. 1,

Figs. 3, 4 and 5 are similar diagrammatic views showing other arrangements of the principal elements of machines embodying the invention,

Figs. 6 and 7 are vertical sections illustrating other forms of motor-compressor units,

Fig. 8 is a central vertical section showing another embodiment of the invention,

Fig. 9 is a plan view illustrating another arrangement of the elements shown in Fig. 8, and

Fig. 10 is an enlarged fragmentary section illustrating a form of housing joint that may be

used when the machine is operated under pressures differing substantially from atmospheric.

In the drawings, the reference numeral 1 identifies the evaporator from which refrigerant vapors are withdrawn by a compressor 2, operated by a driving motor 3, and forced to a condenser 4. The refrigerant liquefied in the condenser is returned by pipes, not shown, to the evaporator in the usual manner.

This assembly is housed within a casing 5 which may have the general form of a box with one closed end and with three circular openings in its opposite end. A partition 6 extends between the end walls of the casing 5 and has offset end portions and an intermediate portion which is parallel to the end walls of the casing, the intermediate portion having an opening in axial alinement with one of the openings in the casing 5. As shown in Fig. 1, the compressor 2 extends through the opening in the partition wall 6 and has a flange 7 thereon which seats against the partition 6 and cooperates therewith to divide the space within the casing 5 into an evaporator and a condenser compartment.

To facilitate removal of the several elements from the casing 5, the evaporator, the condenser and the motor-compressor unit are preferably mounted on rollers 8 which move on rails 9 that form trackways within and extending to the exterior of the casing. The evaporator 1 and condenser 4 preferably take the form of pipes extending between headers, and through which a liquid medium to be cooled and cooling water, respectively, are circulated. The outer headers 10 of these units may serve as the cover plates for closing the openings through which the units are inserted in the casing 5 and the closure plate 10' for the motor-compressor unit may be a separate plate or may be a part of the removable motor-compressor assembly.

The relative arrangement of parts, as shown in Figs. 1 and 2, may be varied at will in accordance with the space available for the machine. As shown in Fig. 3, the condenser 4 and the evaporator 1 may be arranged below and in vertical alinement with the motor-compressor unit, or as shown in Figs. 4 and 5, the condenser and evaporator may be arranged at one level with the motor-compressor unit above them.

According to another embodiment of the invention, the motor-compressor unit may be housed in a separate casing, the casing providing two compartments which open into the evaporator and into the condenser, respectively. As shown in Figs. 6 and 7, the motor-unit casing takes the

form of a cylindrical shell 11 with one closed end and a removable closure 12 for the opposite end. A truck or carriage 13 supports the centrifugal compressor 2' and motor 3', the truck having wheels 8 which run on tracks 9 within the casing 11. The frame 14 of the compressor has a projecting flange that seats against an internal rib 15 on the casing 11 to divide the interior of the casing into a suction and a pressure compartment. The motor 3' and the suction side of the compressor 2' are located in the suction compartment and the discharge side of the compressor is within the pressure compartment. At convenient points on the casing 11, flanged openings 1^a and 4^a are provided for connecting the suction compartment to the evaporator, and the discharge compartment to the condenser, respectively.

In a single stage compressor, as shown in Fig. 6, the rotor 16 has the central portion thereof shaped to provide the inlet or suction opening into the compressor and the frame 14 and cover 17 of the compressor are formed with outlets 17^a for delivering the compressed refrigerant vapors directly into the pressure compartment of the casing 11.

As shown in Fig. 7, a plurality of rotors 16 may be serially arranged by appropriately forming the cover members 17' to pass the compressed vapors discharged by one rotor unit to the intake of the succeeding unit of the multi-stage compressor.

Another arrangement of the apparatus, and one which is particularly useful in machines operating under pressure and with high pressure refrigerants, is illustrated in Fig. 8. The three main elements of the machine are axially arranged in a single cylindrical shell or casing 18, the motor 19 and compressor 20 being located at the central portion of the cylinder and the evaporator 21 and condenser 22 being inserted from the opposite ends of the cylinder. As in the embodiment illustrated in Fig. 1, the outer headers 23, 23' of the evaporator and condenser preferably constitute the closures for sealing the ends of the cylinder 18. The header 23 is provided with openings for receiving the ends of pipes 24 by which the brine or other circulating medium is passed through the pipes of the evaporator, and the header 23' of the condenser unit is similarly adapted for connection to the pipes 25 which supply the cooling water to the pipes of the condenser.

Cooperating parts 26 on the compressor 20 and casing 18 provide a partition extending across the casing to divide the same into two compartments, one housing the evaporator, the motor and the suction side of the compressor, and the other compartment housing the outlet side of the compressor and the condenser. A baffle plate 27 is arranged between the compressor and the condenser to provide a reservoir for the liquefied refrigerant and to direct the compressed vapors to the upper part of the condenser space. A pipe or conduit 28 extends from the lower portion of the condenser to spray nozzles 29 that are positioned above the evaporator, the pipe being provided with any suitable form of throttling or control valve 30.

The motor will be cooled by vapors passing from the evaporator to the compressor and, where additional cooling of the motor bearings is desired, a separate pump 31 may be provided for withdrawing unvaporized liquid from the bottom of the evaporator and passing the same around the bearings, and then to the liquid sup-

ply pipe 28. The openings through which the leads 40 for supplying current to the motor 19 enter the casing are sealed in any desired manner.

In place of the single cylindrical shell, two or more cylinders may be employed, as illustrated in Fig. 9. The motor-compressor unit may be of the general form shown in Figs. 6 and 7, and housed in a cylindrical casing 32 that has large flanged openings 33 for connecting the motor compartment or suction space of the cylinder 32 to a similar flanged opening 34 of the evaporator cylinder 35, and for connecting the pressure compartment of the cylinder 32 to the flanged opening 36 of the condenser cylinder 37. The evaporator and condenser cylinders each have one closed end and, as before, the headers 23, 23', respectively, of the evaporator and condenser units seal the opposite ends of the cylinders. The end flanges of the headers may be welded or soldered to the cylinders but the tight sealing is preferably effected by extending the flange 38 of a header 23 to overlie the flanged end of the cylinder 35, and placing a plastic sealing material 39 between the flanges to seal the joint.

Refrigerating apparatus constructed in accordance with the invention presents the advantage that it is fluid-tight and, the motor being located within the casing, no glands or packing are present to give rise to leakage during the operation of the machine.

It will be apparent that the invention is not limited to the specific constructions herein illustrated and described since various changes may be made in the several parts, their relative size, shape and location without departure from the spirit of the invention as set forth in the following claims.

I claim:

1. In a refrigerating machine of the completely enclosed type, a casing having walls defining an evaporator space and a condenser space, an evaporator and a condenser respectively in said spaces, and a motor-compressor unit within said casing; said motor and a portion of said compressor which includes the suction side thereof being located within the evaporator space, and a portion of said compressor which includes the outlet side thereof being located in the compressor space.

2. The invention as set forth in claim 1, wherein said evaporator, said condenser and said motor-compressor units are separate assemblies individually removable from and replaceable in said casing without disturbing the connections of the other of said separate assemblies.

3. The invention as set forth in claim 1, wherein said evaporator, said condenser and said motor-compressor unit are separate assemblies each mounted on rollers, and said casing is provided with internal runways for said rollers.

4. In a refrigerating machine, the combination with a casing having three openings at one end thereof, of a motor-compressor unit, an evaporator unit and a condenser unit, said units being insertable into and removable from said casing through the respective openings therein.

5. The invention as set forth in claim 4, wherein said evaporator unit comprises a pair of headers and a plurality of pipes extending between said headers, one of said headers constituting the closure for the casing opening through which said evaporator unit is introduced into said casing.

6. The invention as set forth in claim 4, where-

in said condenser unit comprises a pair of headers and a plurality of pipes extending between said headers, one of said headers constituting the closure for the casing opening through which said condenser unit is introduced into said casing.

ing a suction inlet and a pressure outlet, and a motor for driving said compressor, the compressor being positioned with its pressure outlet within the condenser space and with its suction inlet within the evaporator space.

7. In a refrigerating machine, a casing having an apertured partition extending transversely of the same, one end wall of said casing having an opening in line with the aperture of said partition, and a motor-compressor unit insertable through the opening in said end wall, said motor-compressor unit including a compressor casing having an annular flange adjacent the inlet side of the compressor, the said flange being adapted to seat against said partition when the delivery side of the compressor casing is passed through the aperture in said partition, whereby said compressor casing cooperates with said partition to divide the space within said first casing into two compartments.

11. The invention as set forth in claim 10, wherein said walls defining the condenser and evaporator space comprise the peripheral wall of a cylindrical casing, said motor and compressor being arranged at the central portion of said casing, and said evaporator and said condenser are arranged at opposite ends of said casing.

8. In a refrigerating machine, a cylindrical casing having one open end, a compressor and a motor within said casing, cooperating means on said casing and compressor dividing the space within said casing into two compartments and with the suction and delivery side of said compressor in different compartments, and means for connecting the said compartments to the evaporator space and the compressor space, respectively, of the machine.

12. In a refrigerating machine, an evaporator unit, a condenser unit and a motor-compressor unit, a cylindrical casing for housing said units, and means dividing said casing into two compartments; the condenser and outlet side of said compressor being in one compartment and the other compartment housing the motor, the inlet side of said compressor and the evaporator.

9. The invention as set forth in claim 8, wherein the said compressor is of the centrifugal type having a casing and a rotor element, and the central portion of said rotor element constitutes the suction inlet of said compressor.

13. In a refrigerating machine of the enclosed type, the combination with an evaporator unit, a motor-compressor unit and a condenser unit, of a plurality of cylindrical casings for housing said units, and means including the casing of said compressor for dividing the space within said cylindrical casings into an evaporator space and a condenser space, said motor and the suction side of said compressor being within the evaporator space and the delivery side of said compressor being within said condenser space.

10. In a refrigerating machine, the combination with walls defining a condenser space and an evaporator space, a condenser and an evaporator in the respective spaces, a compressor hav-

14. The invention as set forth in claim 13, wherein a cylindrical casing is provided for each of said units, said casings being arranged parallel to each other and each having one removable end closure, the removable closures being at correspondingly located ends of all of said casings.

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