May 9, 1933.

C. STEENSTRUP

1,907,603

REFRIGERATING MACHINE

Filed Sept. 23, 1932

Fig. 1.

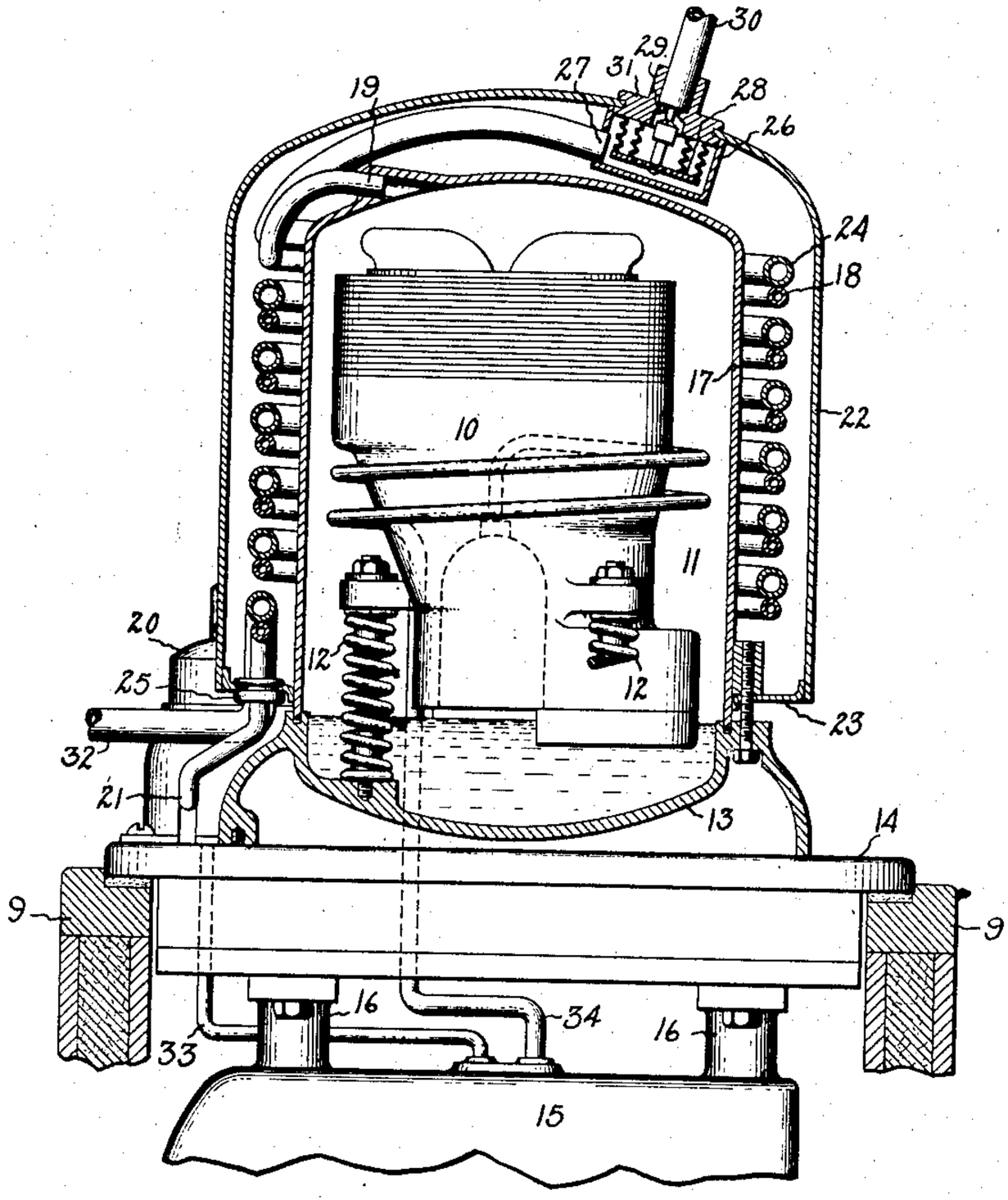
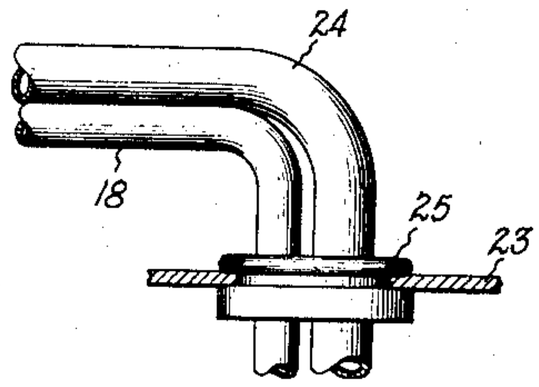


Fig. 2.



Inventor
Christian Steenstrup
by Charles J. Tulla
His Attorney

Patented May 9, 1933 1,907,603

UNITED STATES PATENT OFFICE

CHRISTIAN STEENSTRUP, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

REFRIGERATING MACHINE

Application filed September 23, 1932. Serial No. 634,542.

My invention relates to refrigerating machines and more particularly to such machines of the water cooled type.

In mechanical refrigerating machines it is desirable to keep the condenser and compressor temperatures as low as possible within the working range of the machine. In household refrigerators it has been found sufficient to provide an air cooled condenser over which air circulates by natural draft. However, when the capacity of the machine is increased, it is sometimes desirable to cool the condenser and the compressor casing by circulating water. This circulating water may corrode the wall of the compressor casing so that it will not withstand the pressure to which it is subjected.

Accordingly, it is an object of my invention to provide a refrigerating machine having a water cooling system arranged about the compressor casing in such manner as to prevent corrosion and deterioration of the compressor casing.

Further objects and advanages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a sectional elevation of a refrigerating machine having a cooling device constructed in accordance with my invention; and Fig. 2 is an enlarged side elevation of a fluid-tight seal having conduits passing therethrough.

Referring to the accompanying drawing, in Fig. 1 I have shown a refrigerating machine comprising a motor and compressor unit 10 resiliently mounted on helical springs 12 within a compressor casing 11. The base 13 of the casing 11 is rigidly secured to the removal refrigerator top 14, which is supported in an opening in the top of a cabinet 9, and an evaporator 15 for cooling the cabinet is suspended below the top 14 on legs 16. A shell 17 forms the upper main portion of the compressor casing 11, and a condenser 18 is arranged about the casing in the form of a helical conduit connected to the casing 11 at 19, the other end of this conduit being connected to a refrigerant flow control device 20 as shown at 21.

In accordance with my invention I provide a water cooling conduit for cooling the condenser coil, and the compressor casing, and enclose the compressor casing, the water cooling conduit, and the condenser coil in a jacket containing a suitable liquid or other substance which efficiently transfers heat to the water cooling conduit. In the construction illustrated the casing 11 and condenser 18 are enclosed by a jacket 22, which is secured to the casing by a flanged ring 23 welded to the casing and to the jacket. A helical cooling water conduit 24 is arranged in contact with the condenser coil and is soldered thereto to obtain good heat transfer between them. In order to cool the compressor casing I fill the jacket 22 with a cooling fluid, which for the sake of clearness, is not shown on the drawing. The heat of the compressor casing heats this fluid and sets up circulating convection currents therein over the surface of the casing and the cooling water conduit. A fluid-tight seal 25 is provided to prevent leakage where the condenser and cooling water conduit pass through the ring 23. The upper end of the conduit 24 enters a valve chamber 26 at 27 and within this chamber is a thermostatic control device 28 in the form of an expansible bellows which regulates the outlet valve 29 for maintaining the desired flow of the cooling water. The outlet pipe 30 passes out of the casing 22 through a fluid-tight seal 31.

In order to prevent deterioration of the casing, which might result in leakage of refrigerant therefrom, and possibly in the bursting of the compressor casing in the type of machine illustrated, it is necessary that the cooling liquid which fills the jacket 22 shall not corrode or rust the shells and the other parts within the jacket. I therefore employ a cooling fluid which is substantially chemically inert with respect to the material of the casing and conduits. I have found that glycerine, or solutions of

potassium carbonate, or sodium silicate in water are satisfactory to prevent corrosion of steel parts. It is apparent that any other suitable liquid may be used to prevent deterioration of the parts, and these parts may be made of other materials.

Referring again to Fig. 1, in the operation of the refrigerating machine the refrigerant is compressed in the chamber 11 and passes out through the connection 19 into the condenser conduit 18. The cooling water flows in through the inlet 32 of the cooling water conduit 24 and out through the outlet 30 at a rate controlled by the thermostatic device 28. As the compressed refrigerant passes downward through the helical coils of the condenser conduit 18, it is cooled and condensed into a liquid by the cooling water and finally passes through the connection 21 into the flow controlling device 20. From the flow controlling device 20 the liquid refrigerant flows through the conduit 33 into the evaporator 15 where it is vaporized upon absorbing heat from the refrigerator cabinet 9, and the refrigerant vapor is then drawn back into the compressor through the conduit 34. The cooling water conduit 24 also cools the liquid in the cooling jacket 22 which in turn cools the compressor casing 17 and the mechanism therein sufficiently to obtain satisfactory operation, but not to such an extent as to cause undue condensation of refrigerant in the casing. The temperature in the condenser 18 will be considerably lower than the temperature in the casing 11 because of the direct cooling of the condenser by the cooling water flowing in conduit 24.

Although I have shown a particular embodiment of my invention in connection with a compression refrigerating machine, I do not desire my invention to be limited thereto, and intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A refrigerating machine including a compressor casing, means including a cooling jacket having a liquid therein for cooling said casing, means including a conduit passing through the said cooling jacket for condensing compressed refrigerant, and means including a cooling water conduit passing through said cooling jacket in heat exchanging relation to said refrigerant condensing means for cooling said condenser and said casing.

2. A refrigerating machine including a compressor casing, means including a cooling jacket having a liquid therein for cooling said casing, means including a conduit passing through the said cooling jacket for condensing compressed refrigerant, means including a cooling water conduit passing through said cooling jacket in heat exchanging relation to said refrigerant condensing conduit for cooling said condenser and said casing, and thermostatically actuated means arranged within said jacket for controlling the flow of water through said cooling water conduit.

3. A refrigerating machine including a compressor casing, a cooling jacket substantially surrounding said casing, a body of liquid in said jacket in contact with said casing for cooling the same, said liquid being substantially chemically inert with respect to the material of said casing, and means including a cooling water conduit passing through said cooling jacket for cooling the said liquid.

4. A refrigerating machine including a compressor casing, a cooling jacket substantially surrounding said casing, a body of liquid in said jacket in contact with said casing for cooling the same, said liquid being substantially chemically inert with respect to the material of said casing, means including a cooling water conduit passing through said cooling jacket for cooling the said liquid, and thermostatically actuated means arranged within said jacket for controlling the flow of water through said cooling water conduit.

5. A refrigerating machine including a compressor casing, a refrigerant condenser arranged about said casing, a cooling water conduit arranged in heat exchanging relation with said condenser, a cooling jacket surrounding said casing, said condenser and said cooling water conduit, a fluid substantially filling said jacket, said fluid being substantially chemically inert with respect to the material of said casing.

6. A refrigerating machine including a compressor casing, a refrigerant condenser arranged about said casing, a cooling water conduit arranged in heat exchanging relation with said condenser, a cooling jacket surrounding said casing, said condenser and said cooling water conduit, a fluid substantially filling said jacket, said fluid being substantially chemically inert with respect to the material of said casing, and thermostatically controlled means arranged within said jacket for regulating the flow of water through said cooling water conduit.

7. A refrigerating machine including a compressor casing, a water cooled refrigerant condenser arranged thereon, said condenser including a refrigerant conduit leading from said casing to a flow control device and having a helical portion surrounding and spaced from said casing, a cooling water conduit having a helical portion in heat exchanging relation with the helical portion of said refrigerant conduit, a fluid-tight cooling jacket surrounding the helical portions of said conduits and the greater portion of said compressor casing, a liquid in said cooling jacket, and means for controlling the flow of water

through said cooling water conduit, said means being responsive to the temperature of the cooling water at the outlet end of said cooling water conduit.

8. A refrigerating machine including a compressor casing, a fluid-tight cooling jacket surrounding the greater portion of said compressor casing, a refrigerant conduit having one end connected to said compressor casing and having a helical portion within said cooling jacket, a cooling water conduit passing through said cooling jacket and having a helical portion in heat exchanging relation with the helical portion of said refrigerant conduit, a liquid substantially chemically inert with respect to the material of said casing and substantially filling said cooling jacket for cooling said compressor casing, connections providing for the flow of water through said cooling water conduit in a direction opposite to the flow of refrigerant in said refrigerant conduit, and means responsive to the temperature of said flowing water as it leaves said cooling water conduit for controlling the rate of flow of said cooling water.

In witness whereof, I have hereunto set my hand.

CHRISTIAN STEENSTRUP.