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W. B. ANDERSON ET AL

2,279,272

REFRIGERATING APPARATUS

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2 Sheets-Sheet 1

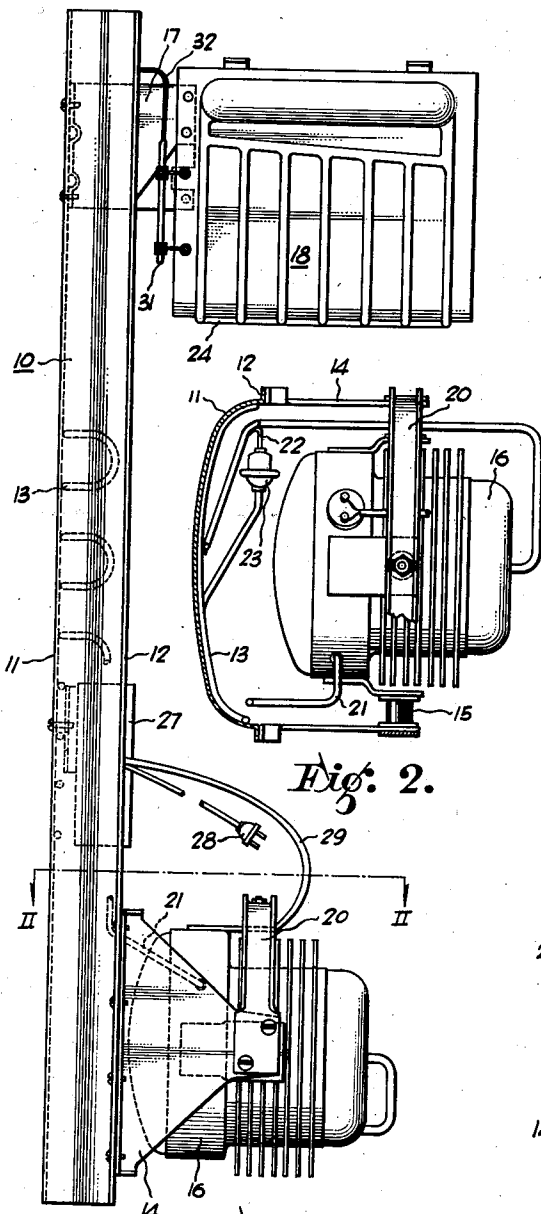


Fig. 2.

Fig. 1.

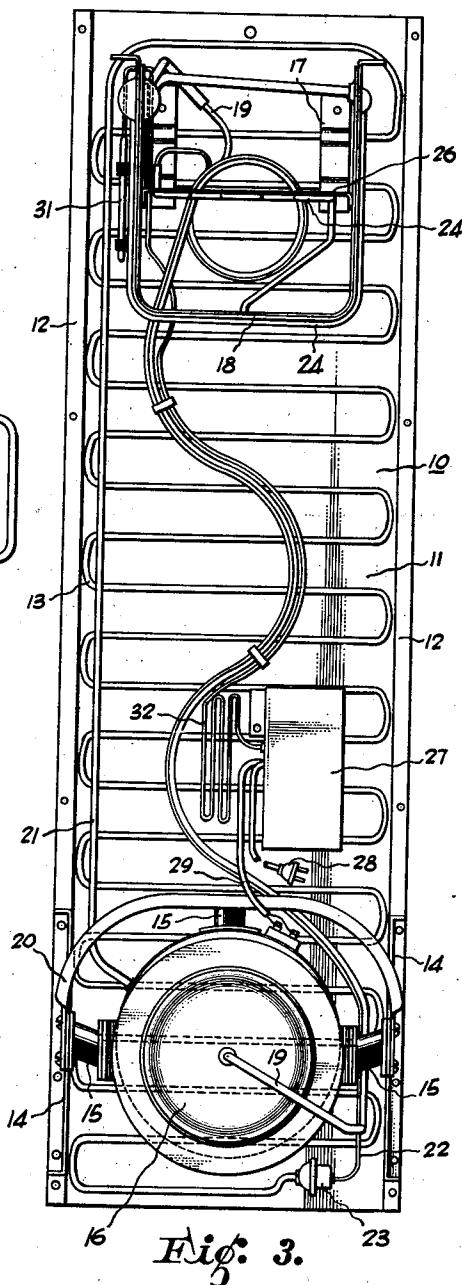


Fig. 3.

WITNESSES:

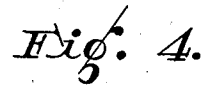
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,279,272

REFRIGERATING APPARATUS

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Application December 16, 1939, Serial No. 309,554

4 Claims. (Cl. 62—116)

The invention relates to mechanical refrigerating apparatus and more particularly to the arrangement of the parts and a method for testing the apparatus.

The manufacture of domestic mechanical refrigerators frequently includes the step of shipping completely assembled refrigerating units for long distances prior to their installation in cabinets.

One object of the invention is, therefore, to provide refrigerating apparatus which is readily packaged for shipment and easily installed in refrigerating cabinets.

Another object of the invention is to provide a reinforced plate type condenser to which the refrigerant compressing unit and evaporator are secured during shipment.

A further object is to provide refrigerating apparatus in which the refrigerant compressing unit is supported solely by the condenser during the testing and shipping of the apparatus and during the normal operation thereof in a cabinet, the apparatus being adapted for installation in the cabinet without disturbing the support of the refrigerant compressing unit.

A still further object is to provide improved means for cooling the compressor unit and the condenser.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings forming a part of this application, in which:

Fig. 1 is a side elevation of the packaged refrigerating apparatus;

Fig. 2 is a section on the line II—II of Fig. 1;

Fig. 3 is a front elevation of the packaged refrigerating apparatus; and,

Fig. 4 is a view of the apparatus installed in a refrigerating cabinet, with parts of the cabinet broken away to show the apparatus.

Referring specifically to the drawings for a detailed description of the invention, reference numeral 10 designates a plate condenser comprising a channeled metal plate 11 formed of a single thickness of metal, two marginal side edges 12 of which are bent outwardly to form attachment flanges. An undulating tube 13 is preferably brazed to the concave or inner surface of the metal plate 11. Brackets 14 are secured by screws to the flanges 12 and support a refrigerant compressor unit 16 by means of a yoke 20 and rubber mountings 15. The refrigerating unit 16 comprises, for example, a sealed casing which encloses a reciprocating refrigerant pump and a motor (not shown) for driving the same, substantially as shown in the copending application of Elliott E. Grover, filed January 10, 1939, Serial No. 250,192. The rubber mounting of the refrigerating unit is described and claimed in the ap-

plication of Elliott E. Grover et al., filed December 30, 1939, Serial No. 311,880. Both of the above applications are assigned to the assignee of the present invention.

A second set of brackets 17, secured to the other end of the plate condenser 10 by means of screws, support an evaporator 18. The evaporator 18 is connected with the refrigerant compressing unit 16 by means of a suction tube 19, and a pressure tube 21 connects the compressing unit with the upper end of the undulating tube 13. The lower end of the tube 13 connects with a capillary tube 22 through a screening device 23. The other end of the capillary tube 22 connects to a second tube 24 brazed to the shelf 26 of the evaporator 18. The tube 24 connects with the interior of the bottom of the evaporator 18.

As thus far described, the apparatus comprises a refrigerating mechanism in which the refrigerant vapor is compressed in the compressor unit 16 and is conveyed to the upper portion of the plate condenser 10 wherein the vapor condenses to a liquid which flows through the screening device 23, through the capillary tube 22 to the shelf 26 of the evaporator, and to the evaporator 18 where it absorbs heat and evaporates. The vapor returns through the tube 19 to the compressor unit 16.

The operation of the compressor unit 16 is governed by a controlling device 27 which comprises suitable mechanism (not shown) for establishing electrical contact between a power supply comprising the plug 28 and a conduit 29 which leads to the compressor unit 16. The controlling device 27 also comprises a bulb 31 located adjacent the evaporator 18 and connected to the controlling device 27 by a tube 32. The tube 32 is convoluted adjacent the controlling device for a purpose to be described presently. The bulb 31 contains a volatile liquid, the pressure of which controls the mechanism for establishing electrical contact.

The single thickness metal plate 11, because of its channeled construction, is sufficiently rigid to support the refrigerant compressing unit 16 during the test run of the apparatus, during the transportation of the packaged apparatus, and during the normal operation of the refrigerating apparatus in a refrigerator cabinet.

In assembling the refrigerator, the apparatus is installed in a cabinet 33 as shown in Fig. 4. The cabinet 33 comprises an insulated chamber 36 formed by an inner metal liner 37 and an outer metal shell 38 between which insulating material 34 is packed. The insulated chamber 36 is provided with a door 35 and has an opening 42 in its rear wall through which the evaporator 18 may be inserted. The outer metal shell 38 is continued downwardly beyond the insulated chamber 36 to provide a machine compartment

39. The machine compartment 39 is provided with an opening 41 in its rear portion for a purpose presently to be described.

When assembling the refrigerating unit in the cabinet, the evaporator supporting brackets 17 are removed, and the evaporator is inserted through the opening 42 of the insulated chamber 36 and is secured to the upper wall thereof. The various tubes connected to the evaporator are of sufficient length to permit this installation. The plate condenser 10 is then secured by screws to the rear wall of the cabinet 33 in such a manner that the refrigerant compressing unit 16 enters through the opening 41 and projects into the machine compartment 39. The condenser 10 and the rear wall of the cabinet 33 form a closed vertical duct 50. The controlling device 27 is removed from the plate 11 and secured to an intermediate wall 44 in the machine compartment 39, the tube 32, because of its convolutions when packaged, being of sufficient length to permit such mounting. The controlling device 27 includes an adjustment which comprises a shaft 45 which projects through an opening 46 in the intermediate wall 44. A large disc 47 is secured to the shaft 45, the edge of which disc 47 projects through a slit 48 in the machine compartment 39 located directly below the door 35 so that, when the door 35 is opened, the disc 47 may be turned to the desired position. To facilitate the proper setting of the regulator, the edge of the disc 47 is provided with markings showing the degrees of temperature which will be maintained in the insulated chamber 36 at the various settings of the disc 47. The opening 42 in the rear wall of the refrigerated chamber is closed by an inner cover 52 and an outer cover 53, between which covers insulating material is packed.

The cooling air for the compressor unit 16 enters through a grille 49 at the lower front edge of the machine compartment 39 and passes out through the opening 41 in the rear wall of the machine compartment and then rises upwardly through the duct formed by the channeled plate condenser 10 and the rear wall 36 of the cabinet. The cooling air for the condenser enters at the lower end of the duct formed by the channeled plate condenser 10 and flows upwardly and passes out through the upper end of this duct. A similar cooling current also sweeps upwardly along the outside of the plate condenser 10.

It will be observed that this invention provides refrigerating apparatus which is readily packaged for shipment, is of sufficient rigidity to support the component parts of the packaged apparatus and also provides a support for the refrigerant compressing unit when in operation. The apparatus is also readily assembled in a refrigerator cabinet. The permanent mounting of the refrigerant compressing unit to the plate condenser also permits testing the vibration and noise damping characteristics of the mounting of the compressor unit at the place of manufacture.

While we have shown our invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What we claim is:

1. In a mechanical refrigerator, the combination of a cabinet comprising an insulated chamber, an evaporator associated therewith for cooling said chamber, a compressor for withdrawing refrigerant vapor from the evaporator and compressing said vapor, and a condenser comprising a sheet of metal and a convoluted metal tube bonded integrally and substantially throughout its length to the surface of said sheet to provide a good metallic heat-conducting path therebetween, said plate being secured to an outer wall of said cabinet, said compressor discharging the compressed vapor into said tube to liquefy the vapor.

2. In a mechanical refrigerator, the combination of a cabinet comprising an insulated chamber, an evaporator associated therewith for cooling the chamber, a compressor for withdrawing refrigerant vapor from the evaporator and compressing said vapor, a condenser comprising a sheet of metal bent into the form of a channel and secured to an outer wall of said cabinet to form a vertical duct, and a convoluted tube integrally bonded substantially throughout its length to the surface of said sheet of metal to provide a good metallic heat-conducting passage therebetween, the convolution of said tube conducting the refrigerant substantially horizontally back and forth across said plate and downwardly from one of said back and forth passages to another, thereby avoiding the formation of pockets between adjacent convolutions of said tube wherein refrigerant liquid can collect.

3. In a mechanical refrigerator the combination of a cabinet having at least one vertical wall, said cabinet comprising a food storage compartment in the upper portion and a machine compartment in the lower portion thereof, said machine compartment having an opening in said vertical wall, a condenser comprising a metal plate and a convoluted metal tube bonded thereto throughout its length, said plate being bent into the shape of a single channel and secured at its edges to said vertical wall to form a vertical air duct therewith, said plate overlying the opening in the machine compartment, a support secured at each vertical edge of the plate, said supports extending through the opening into the machine compartment, and a housing for a motor-compressor unit secured to said supports.

4. In a mechanical refrigerator the combination of a cabinet having at least one vertical wall, said cabinet comprising a food-storage compartment in the upper portion and a machine compartment in the lower portion thereof, said machine compartment having an opening in said vertical wall, a condenser comprising a metal plate and a convoluted metal tube bonded thereto throughout its length, said plate being bent into the shape of a single channel and secured at its edges to said vertical wall to form a vertical air duct therewith, said plate overlying the opening in the machine compartment, supporting means secured at each vertical edge of the plate, said supporting means extending through the opening in the machine compartment, and a motor-compressor unit secured to said supporting means.

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ELLIOTT E. GROVER.