March 9, 1943. G. A. HALFVARSON 2,313,472

REFRIGERATION APPARATUS

Filed May 7, 1941 2 Sheets-Sheet 1

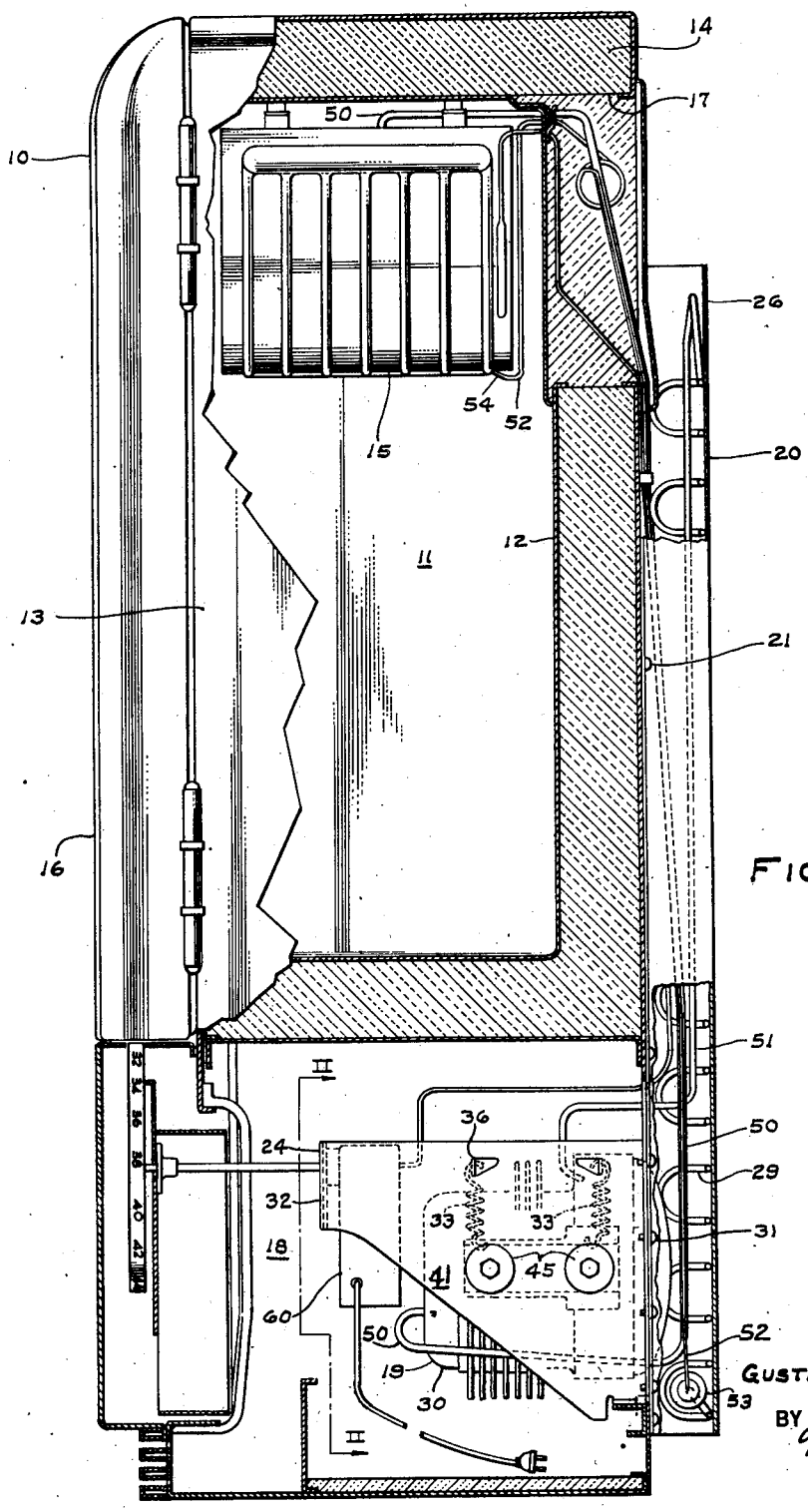


FIG. 1.

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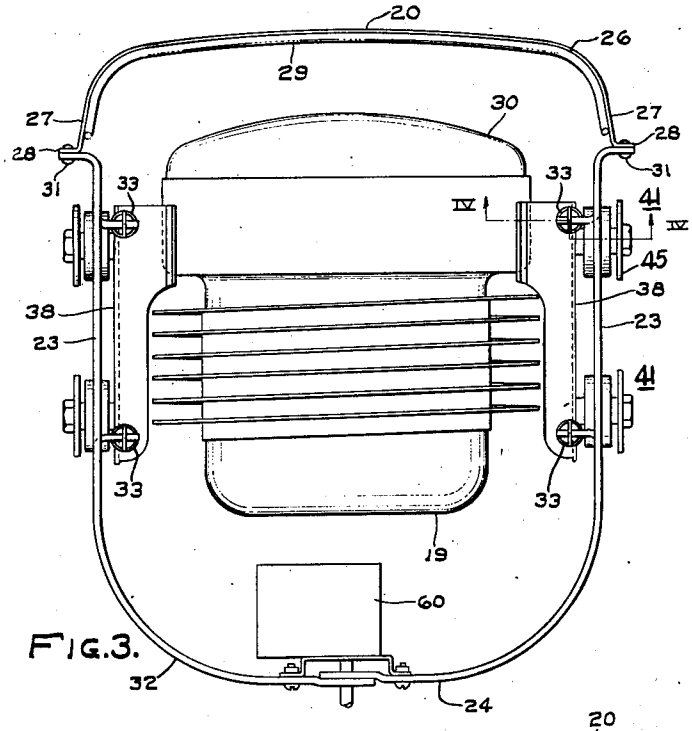


FIG. 3.

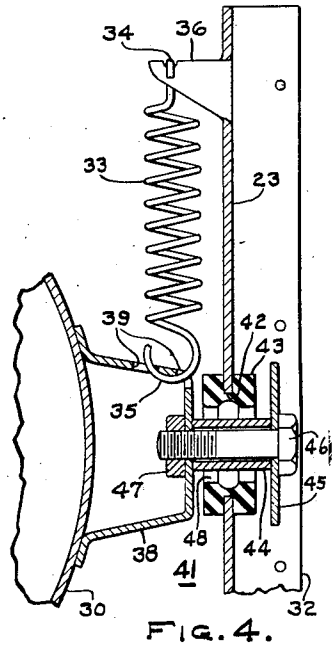


FIG. 4.

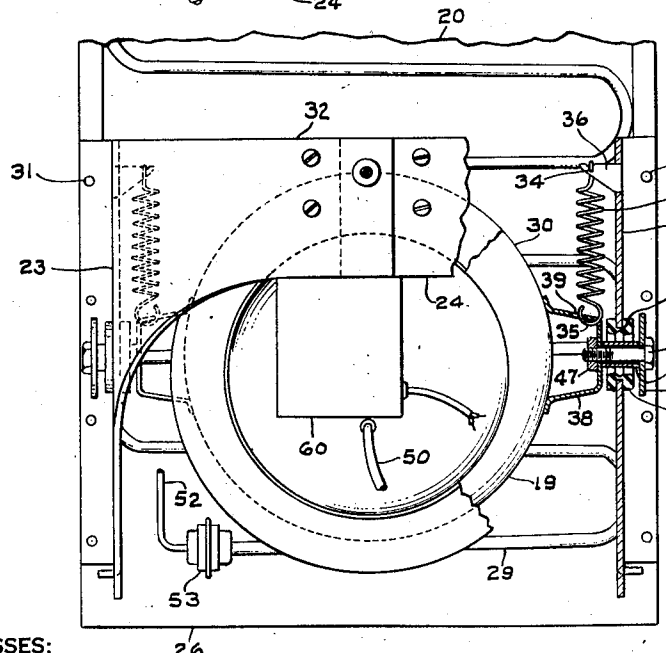


FIG. 2.

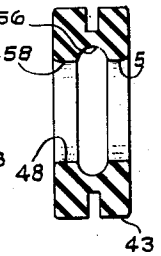


FIG. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE

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REFRIGERATION APPARATUS

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Application May 7, 1941, Serial No. 392,195

7 Claims. (Cl. 62—1)

This invention relates to mechanical refrigeration apparatus, particularly to refrigeration apparatus of the household or domestic type, and it has for an object to provide improved apparatus of this type.

It is an object of the invention to provide an improved mounting for a compressor which is supported on a plate condenser of a domestic refrigerator.

A further object is to provide an improved resilient mounting for the compressor of a refrigerator.

A still further object is to provide an improved mounting for the compressor of a refrigerator, wherein a minimum of the vibrations set up by the compressor is transmitted to the condenser.

With most resilient mountings for compressors of refrigerators, it is necessary to provide shipping bolts or ties to hold the compressor stationary in order to prevent injury to the resilient mounting when shipping the refrigerator. Accordingly, it is an object of this invention to provide an improved resilient mounting for the compressor of a refrigerator wherein the assembled refrigerator may be shipped without the use of additional shipping bolts or ties for the compressor and without injury to the resilient mounting of the compressor.

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 a refrigerator embodying this invention, with parts broken away for the sake of illustration;

Fig. 2 is a view approximately as seen on line II—II of Fig. 1;

Fig. 3 is a top plan view of Fig. 2; and,

Fig. 4 is a section taken on line IV—IV of Fig. 3.

Fig. 5 is a detail of a soft rubber grommet.

Referring specifically to the drawings for a detailed description of this invention, numeral 10 designates generally a domestic refrigerator cabinet. The cabinet 10 comprises an insulated chamber 11 formed by an inner metal liner 12 and an outer metal shell 13 between which insulating material 14 is packed. An evaporator 15 for cooling the chamber 11 is supported in the upper portion thereof. The chamber 11 is provided with a door 16 and has an opening 17 in its rear wall through which the evaporator 15 is inserted. The outer metal shell 13 continues downwardly beyond the insulated chamber 11 to provide a machinery compartment 18 for housing a compressor 19. The machinery compartment has an opening in the rear thereof, the purpose of which will be explained hereinafter.

A plate condenser 20 is attached to the back of the cabinet 10 by screws 21, or any other suitable means. The compressor unit 19 is permanently mounted on and supported by the condenser 20. The compressor is inserted through the opening in the back of the machinery compartment 18 and projects into the machinery compartment when the condenser 20 is positioned on the back of the cabinet 10.

The condenser 20 comprises a channeled metal plate 26 formed of a single thickness of metal having two marginal side edges 27 which are bent outwardly to form attachment flanges 28. An undulating tube 29 is preferably brazed to the concave or inner surface of the metal plate 26.

The compressor unit 19 comprises a sealed casing 30 which encloses a reciprocating pump and a motor (not shown) for driving the same, substantially as shown in the copending application of Elliott E. Grover, Serial No. 250,192, filed January 10, 1939, and assigned to the assignee of the present application.

A U-shaped yoke or bracket 32, including side portions 23 and an end portion 24, is attached to the flanges 28 of the condenser by rivets 31, or some other suitable means. The compressor unit 19 is resiliently supported on the bracket 32 by four closely-wound coiled tension springs 33. As seen from Figs. 1 and 3, these springs are positioned two on a side of two opposite sides of the unit 19. The springs 33 have hooked ends 34 and 35, and the upper ends 34 of the same are carried on tabs 36 which are punched out of the sides 23 of the bracket 32 and extend substantially normal from the same. Brackets 38 are attached to two opposite sides of the compressor casing 30, by welding or some other suitable means, and extend substantially longitudinally of the compressor casing. Each of these brackets has holes 39 provided in its end portions into which the lower hooked ends 35 of the springs 33 are hooked. Vibration of the compressor unit 19 incident to its operation is absorbed by the springs 33.

Referring again to Fig. 1, it will be noted that two snubbers, indicated generally by the reference numeral 41, are provided on each of two opposite sides of the compressor unit 19. Each snubber 41 includes an aperture 42 in a side 23 of the bracket 32 substantially opposite one of

the brackets 38 into which a soft rubber grommet 43 having a center opening 48 therein is positioned. As shown best by Fig. 5 each grommet 43 has a groove 56 in its bumper surface. This groove divides the bumper surface of the grommet into two narrow portions 57 and 58. These narrow portions are more resilient than a single wide bumper surface and they absorb shock more effectively than a single wide surface. A nipple 44 extends through the center opening in the grommet 43 and a washer 45, which is larger than the center opening 48 in the grommet, fits against the end of the nipple 44. A bolt 46 extends through the washer 45, the nipple 44, and the bracket 38, and a nut 47 is threaded on the bolt 46 to clamp the nipple 44 and the washer 45 to the bracket 38. As seen from Figs. 1 and 3, the two snubbers 41 on each side of the compressor are located between the two springs 33 on the respective side of the unit; however, it will be understood that the snubbers may be arranged in any satisfactory manner.

The springs 33 have sufficient tension to freely support the compressor unit so that the nipples 44 of the snubbers 41 do not normally touch the portions 57 and 58 of the grommets 43, but if the compressor receives a bump or jar, for instance, during shipping, sufficient to overcome the tension of the springs 33, the unit moves upwardly or downwardly until the nipples 44 strike the portions 57 and 58 of the soft rubber grommets 43, which absorb the shock. Likewise, if the compressor unit 19 receives a sidewise bump or jar, the effect of the same is transmitted to the soft rubber grommets by the brackets 38 and the washers 45. Accordingly, the snubbers 41 permit free suspension of the compressor unit 19 from the condenser 20 by the springs 33, but prevent any abnormal movement of the compressor unit such as might overload and permanently distort the springs 33, or break loose the tubing connections.

The evaporator 15 is connected with the refrigerant compressing unit 19 by means of a suction tube 50, and a pressure tube 51 connects the compressor unit with the upper end of the undulating tube 29. The lower end of the tube 29 connects with a capillary tube 52 through a screening device 53. The other end of the capillary tube 52 connects to a second tube 54 which connects with the interior of the bottom of the evaporator 15. Refrigerant vapor is compressed in the compressor unit 19 and is conveyed to the upper portion of the plate condenser 20, wherein the vapor condenses to a liquid which flows through the screening device 53, through the capillary tube 52 to the evaporator 15, where it absorbs heat and evaporates. The vapor returns through the tube 50 to the compressor unit 19.

Cyclic operation of the compressor unit is governed by a well-known temperature-responsive controlling device 60 which comprises suitable mechanism (not shown) for establishing electrical contact between a power supply and the compressor unit 19.

An advantage of the compressor mounting provided by this invention is that the snubbers 41 limit movement of the compressor in all directions and the refrigerator may be shipped without providing any additional shipping bolts or ties and without danger of injuring the resilient mounting of the compressor or breaking loose any of the tubing joints.

From the foregoing description taken in connection with the drawings, it will be seen that this invention provides improved refrigeration apparatus of the household or domestic type having the compressor permanently mounted and resiliently supported on the condenser. It will also be seen that vibrations incident to the operation of the compressor are absorbed by the compressor mounting rather than being transmitted to the condenser.

While I have shown my 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 I claim is:

1. In a mechanical refrigerator, the combination of a cabinet, an insulated compartment therein, a machine compartment below the insulated compartment, a plate condenser secured to the rear wall of said cabinet and extending downwardly to the machine compartment, a refrigerant compressing unit in the machine compartment, a bracket attached to the plate condenser and projecting into the machine compartment, and tension springs coacting between said bracket and said refrigerant compressing unit and resiliently supporting said refrigerant compressing unit from said bracket.

2. In a mechanical refrigerator, the combination of a cabinet, an insulated compartment therein, a machine compartment below the insulated compartment, a plate condenser secured to the rear wall of said cabinet and extending downwardly to the machine compartment, a refrigerant compressing unit in the machine compartment, a bracket attached to the plate condenser and extending into the machine compartment, a plurality of tension springs coacting between the bracket and the refrigerant compressing unit and resiliently supporting said refrigerant compressing unit from said bracket, and other resilient means coacting between the refrigerant compressing unit and said bracket and limiting the magnitude of extension of said springs, thereby preventing overloading or permanent distortion of said springs.

3. In a mechanical refrigerator, the combination of a plate condenser, a U-shaped bracket attached by its legs to the marginal edges of said condenser, a refrigerant compressing unit located between the legs of said U-shaped bracket, tension springs connected to each leg of said bracket, said springs extending substantially vertically from said brackets and having their lower ends attached to said refrigerant compressing unit and resiliently supporting said refrigerant compressing unit from said bracket, and other resilient means coacting between said U-shaped bracket and said refrigerant compressing unit and limiting the magnitude of extension of said tension springs thereby preventing overloading or permanent distortion of said springs.

4. In a mechanical refrigerator, the combination of a plate condenser, a bracket attached to said condenser, a refrigerant compressing unit, resilient means coacting between said bracket and at least two sides of said compressing unit and resiliently supporting said compressing unit from said bracket, and other resilient means loosely coacting between said bracket and at least two sides of said compressing unit, said second resilient means serving to limit the magnitude

of vertical movement of said first resilient means and to limit the sidewise movement of said compressing unit and absorb the vibrations incident to the sidewise movement of the compressing unit.

5. In a mechanical refrigerator, the combination of a plate condenser, a U-shaped bracket attached to said condenser, a refrigerant compressing unit located between the legs of said bracket, second brackets attached to each of two opposite sides of said compressing unit, each of said second brackets being adjacent to one leg of said U-shaped bracket, two tension springs coacting between each leg of said U-shaped bracket and the second bracket adjacent the respective leg of said U-shaped bracket and resiliently supporting said compressing unit from said U-shaped bracket, soft rubber grommets positioned in apertures in the legs of said U-shaped bracket, and means extending from said second-mentioned brackets and projecting through said grommets, said means serving to limit the magnitude of extension of said tension springs to prevent overloading or permanent distortion of the same, said grommets serving to absorb the shock incident to said means contacting the same and the vibrations set up by the sidewise movement of said compressing unit.

6. In a mechanical refrigerator, the combination of a cabinet, an insulated compartment therein, a machinery compartment below the insulated compartment, a plate condenser secured to the rear wall of said cabinet and extending downwardly to the machinery compartment, means for resiliently supporting said refrigerant compressing unit from said plate condenser, said means including a bracket attached to said plate condenser and projecting into said machinery compartment and springs coacting between said bracket and said refrigerant compressor unit.

7. In a mechanical refrigerator, the combination of a cabinet, an insulated compartment therein, a machine compartment below the insulated compartment, a condenser secured to the rear wall of said cabinet and extending downwardly to the machine compartment, a refrigerant compressing unit in the machine compartment, means supporting said refrigerant compressing unit from said condenser, said means including a bracket attached to the condenser and projecting into the machine compartment and springs coacting between said bracket and said refrigerant compressor unit, and snubbers limiting the magnitude of deflection of said springs, thereby preventing overloading or permanent distortion of said springs.

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