Dec. 26, 1944. R. L. BENSON 2,365,673

COMPRESSOR

Original Filed April 11, 1942 2 Sheets-Sheet 1

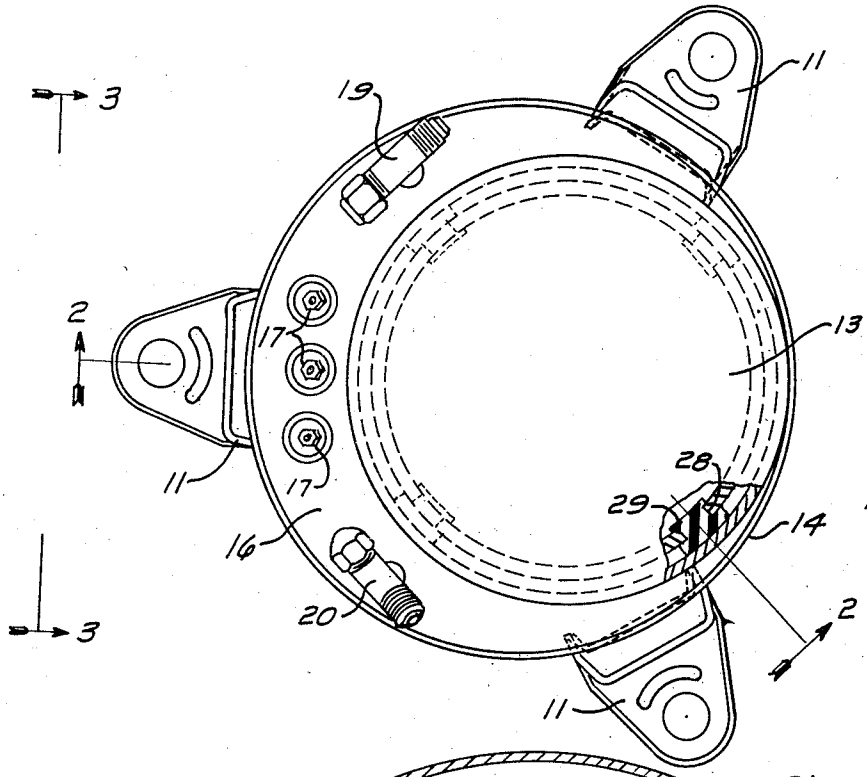

Fig. 1

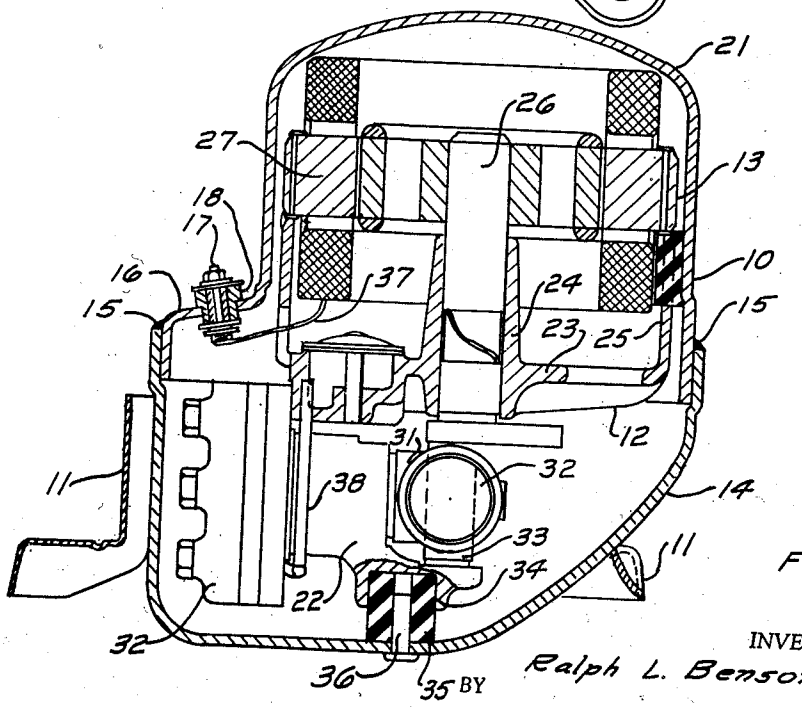

Fig. 2.

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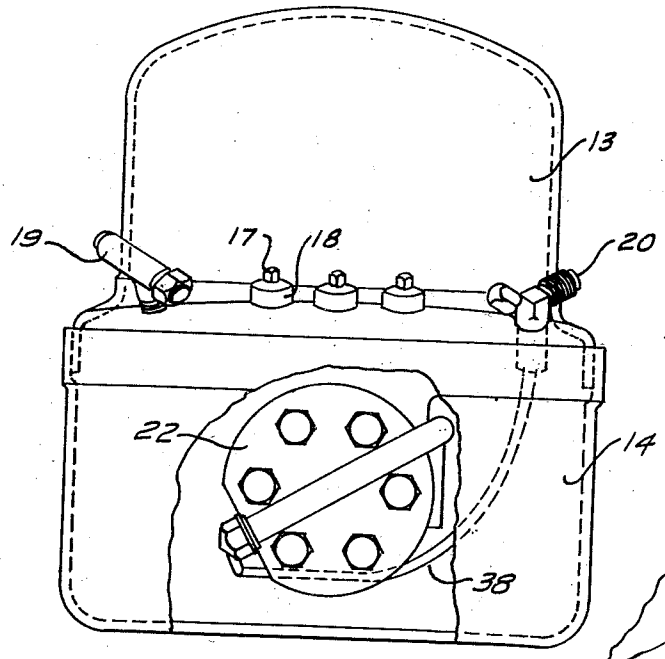

Fig. 3

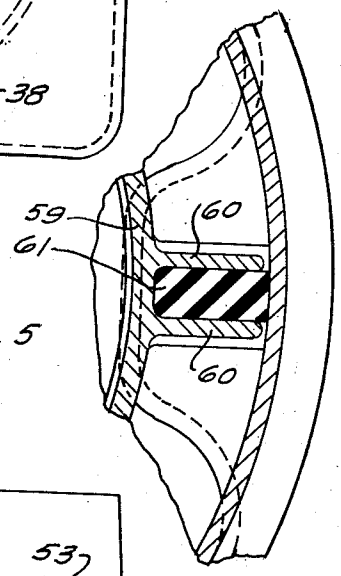

Fig. 5

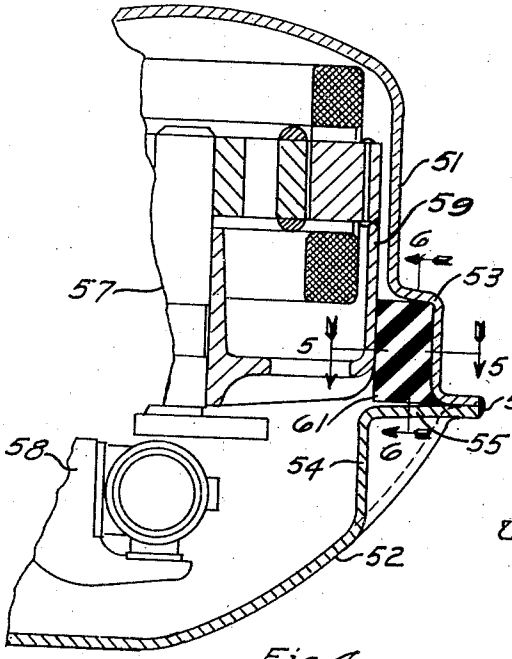

Fig. 4

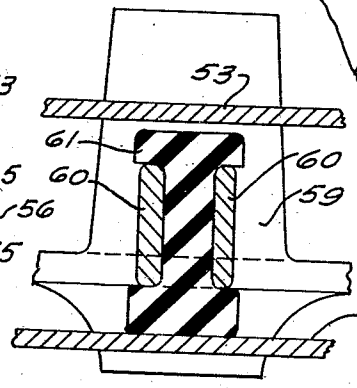

Fig. 6

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2,365,673

COMPRESSOR

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Original application April 11, 1942, Serial No. 438,547. Divided and this application July 15, 1942, Serial No. 450,984

7 Claims. (Cl. 230—58)

This invention relates to hermetic compressors for refrigerators, and more particularly to the means for mounting motor-compressor units within hemetically sealed metallic housings.

This application is a division of my copending application Serial No. 438,547, filed April 11, 1942.

In compressors of the type mentioned, it is common practice to assemble the motor and compressor as a unit and then install it within a metallic housing. The housing is hermetically sealed and is adapted to act as a container for either liquid or gaseous refrigerant. The suction and liquid lines from the compressor extend through the walls of the housing and are connected to the evaporator and condenser of the refrigerating apparatus. These lines are formed of relatively stiff metal tubing. Since at least one of these lines is usually rigidly connected to both the housing and the compressor, undue relative movement between the motor-compressor unit and the housing is likely to eventually fracture the line. Accordingly, it is desirable to mount the motor-compressor unit so that it has very little movement with respect to the housing. On the other hand, the mounting should be such that the noise due to operation of the compressor valves and the vibration of the motor is not transmitted to the housing and thereby unduly amplified.

Heretofore it has usually been the practice to press fit the motor-compressor unit into the housing, or to space the motor-compressor unit from the housing walls by means of coil springs. Neither of these solve both of the aforementioned problems. In the former case, while there is no danger of breaking the suction or liquid lines or the electrical leads from vibration, the compressor is excessively noisy because of the sounding board effect of the housing. In the case of the coil spring mounting, the movement of the motor-compressor unit is so violent that the refrigerant lines are very often broken. Furthermore, even the coil spring mounting does not effectively reduce the transmission of sound waves to the housing.

Accordingly, the principal object of the present invention is to provide a novel means for mounting the motor-compressor unit within the housing in spaced and substantially fixed relation thereto so as to eliminate the transmission of sound waves from the motor-compressor unit to the housing and at the same time limit to a very slight degree the relative movement of the motor-compressor unit and the housing.

For more detailed description of the invention, reference is had to the accompanying drawings, wherein:

Figure 1 is a top plan view of a hermetic compressor embodying the invention, a portion of the housing being broken away to show the interior construction;

Figure 2 is a cross-sectional view taken on substantially the line 2—2 of Figure 1;

Figure 3 is a side elevational view taken on substantially the line 3—3 of Figure 1, a portion of the housing being broken away;

Figure 4 is a fragmentary cross-sectional view of a modified form of the invention;

Figure 5 is a fragmentary cross-sectional view taken on substantially the line 5—5 of Figure 4; and

Figure 6 is a fragmentary cross-sectional view taken on substantially the line 6—6 of Figure 4.

Referring now to the drawings in more detail, and particularly to Figures 1 to 3 thereof, the invention is shown as embodied in a hermetic compressor comprising a hermetically sealed housing 10 to which are rigidly attached supports or legs 11. Located inside of the housing 10 is a motor-compressor unit 12.

The housing 10 is made up of two portions, an upper portion 13 and a lower portion 14. Both portions are deep drawn steel stampings. Their open ends are arranged to telescope one within the other and they are welded together at 15. The upper portion 13 of the housing is provided with a substantially horizontal wall 16 in which are formed a plurality of openings. In three of these openings electrical terminals 17 are mounted. The terminals are surrounded by bushings 18 of rubber or other suitable material which prevents leakage of refrigerant from the interior of the housing. Suitable fittings 19 and 20 for attachment to the hermetic compressor of the conduits which lead to the condenser and evaporator are located in the other two openings in the wall 16.

The motor-compressor unit 12 comprises an electric motor 21 and a compressor 22. The motor includes a one piece annular frame 23 having a central journal bearing 24 and an annular axially extending side wall 25. A rotor 26 is journaled in the bearing 24. A stator 27 is preferably welded to the annular side wall 25 in the manner disclosed in my co-pending application Serial No. 438,547, filed April 11, 1942.

Equi-distantly spaced about the periphery of the side wall 25 are four rectangular notches 28. Mounted in the notches are blocks of elastic sound

damping material 29. Preferably the blocks 29 are formed of a synthetic rubber which is highly resistant to the action of the refrigerant and lubricating oil within the housing. The blocks are generally H-shaped, as illustrated in Figure 1, and are placed in the notches so that the blocks overlap the interior and exterior surfaces of the side wall 25. The radial thickness of the blocks is such that the distance between the radially outer surfaces of the blocks at opposite sides of the frame is slightly greater than the internal diameter of the portion 13 of the housing. The reason for that will presently appear.

The compressor 22 comprises a casing 30 having a cylinder in which a piston 31 is mounted for reciprocatory movement. Attached to the piston 31 is a cross head 32 driven by a crank 33 on the shaft of the rotor 26 of the motor. The motor 21 and the compressor 22 are rigidly attached together in any suitable manner so that the two form a unitary construction which can be assembled within the housing as a unit.

In the lower end of the compressor casing 30, a recess 34 is formed to receive a cylindrical block 35 of a deformable material similar to that of the blocks 29. The block 35 has a central aperture which receives a locating pin 36 inserted through an opening in the housing 10.

The electrical leads 37 from the motor 21 are connected to the terminals 17. The discharge line 38 from the compressor is connected to the fitting 20 on the housing wall.

In assembling the hermetic compressor the elastic blocks 29 are inserted in the openings 28 and the unit is then forced into the upper portion 13 of the housing. In thus assembling the structure the blocks 29 are placed under initial radial compressive stress so as to hold the motor-compressor unit against appreciable lateral movement relative to the housing. The leads 37 and 38 are then connected to the terminals and fittings as above mentioned. Finally the lower portion 14 of the housing with the rubber block 35 attached thereto is telescoped over the upper portion 13 and the two portions 13 and 14 welded together at 15.

The entire hermetic compressor is mounted in a refrigerator by means of the support 11. Preferably the support 11 is mounted on coiled springs which absorb the vibrations of relatively great amplitude of the compressor. Such a mounting is necessary because some movement of the compressor is certain to occur and the rubber blocks 29 and 35 do not absorb this movement to any appreciable extent. The rubber blocks 29 and 35 are primarily for eliminating the transmission of sound waves from the motor-compressor unit to the housing.

The modification shown in Figures 4 to 6 is generally the same as that shown in Figures 1 to 3, but the mounting of the motor-compressor unit in the housing is somewhat different. In this modification the housing is formed of two portions 51 and 52. The upper portion of the housing is a deep drawn steel stamping and is provided adjacent its open end with an annular rabbet 53. The lower portion 52 of the housing is indented at four equi-distantly spaced intervals, as indicated at 54, to provide horizontally extending seats 55. The two portions are formed with flanges which butt together and are welded at 56 in a jig suitable for holding the two portions in proper engagement while the weld is being made.

The motor 57 and compressor 58 are substantially the same as the motor and compressor previously described. However, the annular side wall 59 of the motor frame is provided with four circumferentially spaced pairs of radially extending projections or lugs 60. These lugs are formed so that when the motor-compressor unit is placed within the housing the lugs terminate short of the side walls of the housing (see Figure 5).

Four blocks of deformable sound absorbing material are mounted between the pairs of lugs 60, as shown best in Figs. 5 and 6. The blocks are preferably of a synthetic rubber similar to the blocks 29. The blocks 61 are generally I-shaped in cross-section and are placed between the lugs so that the upper and lower ends of the blocks overlie the top and bottom edges of the lugs 60. The blocks extend radially beyond the ends of the lugs 60 (see Figures 4 and 5).

The structure shown in Figures 4 to 6 is assembled by attaching together the motor and compressor to form a unit and placing the blocks between the pairs of lugs 60. The unit is then inserted into the upper portion 51 of the housing so that the upper surface of each block abuts the horizontal portion of the rabbet 53 and the radially outer extremity of each block engages the vertical portion of the rabbet 53 and is compressed against the vertical portion. The lower portion 52 of the housing is then placed in position over the upper portion and welded thereto, as at 56. When the two parts of the housing are thus assembled, the horizontal seats 55 engage the bottom surfaces of the blocks 61 whereby to form support for the blocks and the motor-compressor unit which they carry.

It will be apparent that in this modification the blocks 61 provide both vertical and lateral support for the motor-compressor unit. There is no central support beneath the compressor similar to the blocks 35 shown in Figures 1 to 3.

It will be evident from the foregoing description that the invention provides a support for the motor-compressor unit within the metallic housing of the hermetic compressor which substantially eliminates the transmission of sound waves from the motor-compressor unit to the housing. There is no metal to metal contact between the unit and the housing. On the other hand, the employment of blocks of elastic material of relatively small size minimizes the relative movement of the motor-compressor unit and the housing. That eliminates the possibility of damage to the electrical leads and refrigerant conduits due to excess relative motion of the parts.

A further advantage of the present invention is that the motor-compressor unit can be easily installed and removed. In the prior devices employing a press fit between the motor-compressor unit and the housing, these parts had to be accurately sized and special means provided for pressing the former into and out of the latter. In the present invention, these objectionable features of the prior art are eliminated with attendant savings in cost of manufacture and ease of assembly.

The scope of the invention is indicated in the appended claims.

I claim:

1. A refrigerator compressor comprising a metallic housing, a motor-compressor unit contained within said housing, said unit comprising an annular frame having a plurality of radially extending circumferentially spaced pairs of

spaced apart lugs, and means for supporting said compressor unit in said housing comprising a plurality of blocks of deformable non-metallic sound insulating material seated between the lugs of each pair and extending radially outwardly beyond said lugs and engaging the side wall of the housing.

2. A refrigerator compressor as defined in claim 1 wherein said blocks are subjected to a compressive stress when said unit is assembled in said housing.

3. A refrigerator compressor comprising a metallic housing having a plurality of spaced apart horizontal portions extending radially inwardly from the side wall thereof, a motor-compressor unit contained within said housing, said motor-compressor unit including an annular frame having a plurality of radially outwardly extending circumferentially spaced pairs of spaced apart lugs, and means for supporting said motor-compressor unit, said means comprising a block of deformable non-metallic sound insulating material located between each pair of lugs and overlying the upper and lower edges of said lugs, said blocks being seated upon horizontal portions of said housing and engaging the upright walls of the housing.

4. A compressor comprising a housing, a motor-compressor unit contained within said housing, said unit including a frame having a plurality of spaced apart substantially parallel portions forming recesses therebetween, and means for supporting said compressor unit within said housing in spaced relation to the walls thereof comprising a plurality of cushioning members in said recesses, said cushioning members extending through said recesses and overlying the sides of said portions remote from each other, said cushioning members engaging said housing walls.

5. A compressor comprising a housing, a motor-compressor unit contained within said housing, said unit including an annular frame provided with a plurality of circumferentially spaced apart recesses in an axial extremity thereof, a resilient cushioning member in each of said recesses, each of said cushioning members extending in a circumferential direction beyond the sides of the corresponding recesses and overlying the radially inner and outer surfaces of said annular frame member, portions of said cushioning members engaging the side walls of said housing.

6. A compressor comprising a housing, a motor-compressor unit contained within said housing, said unit having an annular frame member provided with a plurality of circumferentially spaced pairs of radial projections, a resilient cushioning member mounted between each pair of projections and overlying opposite edges of said projections, portions of said cushioning members engaging the side walls of said housing.

7. A compressor comprising a housing, a motor-compressor unit contained within said housing, said unit including an annular frame having a plurality of circumferentially spaced apart portions forming recesses therebetween, and means for supporting said compressor unit within said housing in spaced relation to the walls thereof comprising a plurality of cushioning members in said recesses, the opposite ends of each of said cushioning members being of greater circumferential extent than the recess with which it is associated to provide an interlocking relationship between the cushioning members and the frame, said cushioning members engaging said housing walls.

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