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HERMETIC COMPRESSOR UNIT MOUNTING MEANS

Filed Dec. 11, 1958

FIG. 1

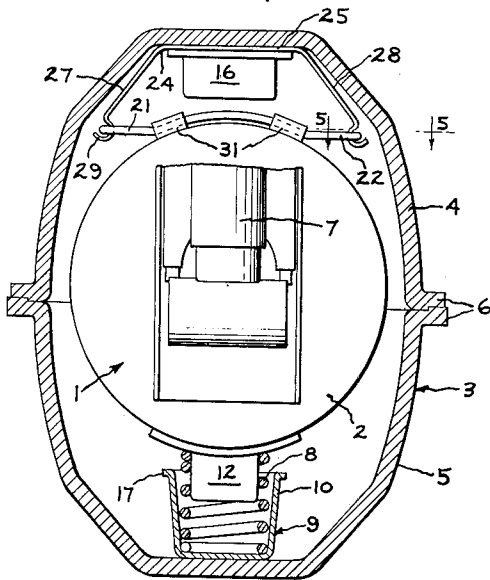


FIG. 3

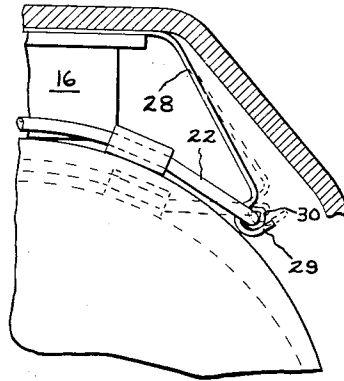


FIG. 2

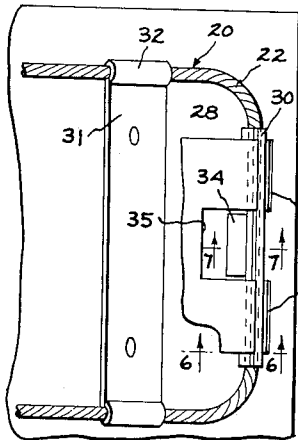


FIG. 5

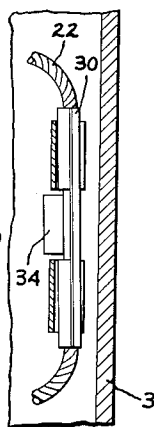


FIG. 4

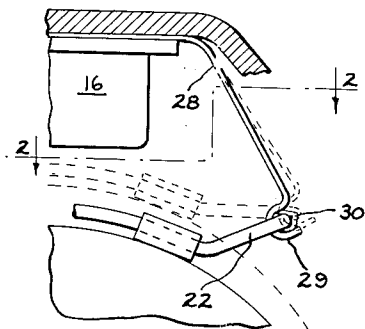


FIG. 6

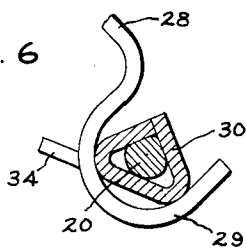
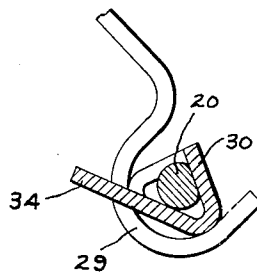


FIG. 7



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HERMETIC COMPRESSOR UNIT MOUNTING MEANS

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3 Claims. (Cl. 230—235)

The present invention relates to hermetic compressor units and is more particularly concerned with an improved means for mounting a compressor unit within a hermetic casing.

Hermetically sealed compressor units such as those used in the refrigeration industry comprise a compressor and a motor for driving a compressor suitably supported as a unit within a hermetically sealed casing. For the purpose of protecting the motor-compressor unit against damage during handling or shipment thereof and to absorb the normal operating vibrations of the unit, the unit may be resiliently supported within and in normally spaced relation with the casing. Some of the known sealed compressor units having internal supporting means capable of protecting the unit against extreme handling and shipping abuse without breakage or other damage to the support means or the unit have provided substantial clearances between the unit and casing so that the casings were relatively large as compared with the units. Others, to keep the clearances and hence the size of the casings small, have included expensive adjustment features and have been of such sturdy construction as to form exceptionally good paths for the transmission of the normal motor-compressor unit operating noises and vibrations to the casing. As a result, the units have such objectionably high external operating noise levels that they are objectionable for many uses as for example in household refrigerators, room air conditioners and the like.

It is an object of the present invention to produce a simple and low cost means for mounting a motor-compressor unit within a hermetic casing.

Another object of the invention is to produce an improved motor-compressor unit mounting designed to minimize noise transmission from the compressor unit to the casing while effectively protecting the unit from damage during shipping or handling thereof.

A further object of the invention is to provide an improved resilient mounting means for a motor-compressor unit composed of a relatively small number of parts and so designed as to greatly facilitate assembly of the hermetically sealed unit.

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

In accordance with the present invention there is provided a hermetic compressor including a casing and a motor-compressor unit vertically supported within the casing by spring means positioned between the bottom of the compressor unit and the casing. Means to stabilize and limit movement of the unit within the casing and to minimize the noise transmission from the unit to the casing comprises a stranded wire cable secured to the upper portion of the unit to form loops extending horizontally outwardly from the unit on opposite sides thereof and spring means connecting the loops to the casing.

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This spring and cable arrangement in which the springs maintain the loops under tension in a horizontal and neutral or non-load bearing position during normal operation of the compressor provides an improved noise isolating and stabilizing means for maintaining the unit in spaced relation with the casing during normal operation thereof.

For a better understanding of the invention reference may be had to the accompanying drawings in which:

Fig. 1 is an elevational view partly in section showing a hermetic compressor embodying the present invention; Fig. 2 is a fragmentary horizontal sectional view along line 2—2 of Fig. 1;

Figs. 3 and 4 are fragmentary elevational views illustrating the operation of the mounting means of the present invention in absorbing or snubbing vertical movement of the compressor unit within the casing;

Fig. 5 is a fragmentary sectional view taken generally along line 5—5 of Fig. 1 illustrating the operation of the present invention in limiting rotational movement of the compressor unit about a vertical axis; and

Figs. 6 and 7 are detail views taken respectively along lines 6—6 and 7—7 of Fig. 2.

With particular reference to Fig. 1 of the drawing, there is shown a hermetically sealed compressor comprising a compressor unit 1 comprising a motor 2 for driving a compressor 7, the unit being housed within a sealed casing 3. The casing comprises an upper portion 4 and a lower portion 5 secured together in fluid tight relation by the welding of the suitable flanges 6. As the detailed construction of the compressor unit forms no particular part of the present invention its specific construction features are neither shown nor described in detail.

For the purpose of resiliently supporting the compressor unit 1 within the casing 3 there is provided in the illustrated embodiment of the invention a single coil spring 8 disposed between the bottom of the unit and the bottom of the casing.

As the spring 8 normally supports the entire weight of the compressor unit, it preferably is positioned at approximately the center of gravity of the unit in order that the unit will be balanced as much as possible on its vertical support means. The spring is largely confined within a cup 9 having tapered side walls 10 which permit limited lateral or horizontal movement of the upper portions of the spring 8 and hence the unit compressor unit within the casing. The upper end of the spring 8 encompasses and closely engages a pin 12 secured to the bottom of the compressor unit 1, the pin 12 extending into the cup 9 so that contact of the portions of the spring 8 surrounding the pin 12 with the tapered side walls 10 of the cup will limit lateral displacement of the unit within the casing 3 under a severe shock.

The spring 8 resiliently supports the normal weight of the compressor unit and absorbs or resists some of the vertical vibration or other movement of the unit, maximum travel of the compressor unit in a vertical direction being limited either by contact of the top of the unit with a bumper 16 secured to the top of the casing 3 or by contact of the strengthening rim 17 of the cup 9. During normal operation of the compressor, the movement thereof will not cause the unit to reach either of these limiting positions, the bumpers being provided primarily for protection of the unit during shipping or other rough handling.

In order to stabilize the unit within the casing 3 and also to snub or resist vibratory movement of the compressor in a vertical, horizontal or rotational direction, the present invention provides a new and improved noise isolating and vibration absorbing mount connecting the upper portion of the unit to the upper portion 4 of the casing. The means for accomplishing this result includes

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a wire cable 20 connected to the top of the unit at spaced points in order to provide opposed loops of wire cable 21 and 22 extending outwardly from the unit on each of two opposed sides thereof, these loops being connected to the compressor case by spring means adapted to maintain the loops 21 and 22 in a horizontal position during the normal operation of the compressor and to maintain the compressor unit in spaced relation with the walls of the casing 3. In the illustrated embodiment of the invention the spring means comprises a flat member 24 having its mid section 25 secured along with the bumper 16 to the top of the case 3 by means of resistance welding or the like. The member 24 also comprises opposed pairs of spring fingers 27 and 28 extending downwardly on opposite sides of the unit and terminating in hook end portions 29 between the compressor unit and the casing. These spring fingers 27 and 28 and the cable loops 21 and 22 are so constructed that the spring fingers maintain the loops under tension during normal operation of the unit without exerting either an upward or a downward component of force on the unit.

In this construction the cable is the principal noise isolator in minimizing the transmission of the operational noises of the unit to the upper part of the casing although it is aided in this respect by means of the spring fingers 27 and 28 which maintain the loops 21 and 22 under tension and thereby limit noise transmission by damping vibrations of the individual wires forming the cable 20. For maximum strength and noise isolation, the cable is preferably composed of a plurality of wires twisted into strands and a plurality of strands twisted into the form of a cable or rope, the wire cable known as "aircraft quality cable" being particularly suitable in the application of the present invention to small and medium size compressor units such as those used in the household refrigerator and room air conditioner industries.

While any suitable means may be employed for securing the cable 20 to the unit to form the opposed loops 21 and 22, in the embodiment of the invention illustrated and for the purpose of facilitating assembly, the cable 20 is formed into a closed large loop employing for example a sleeve 30 such as that illustrated in Fig. 2 crimped into the ends of the cable to secure or anchor the two ends together. This large loop is then secured to the upper part of the unit by means of spaced straps 31 which are spot welded to the unit and which have their end portions 32 folded or rolled back over the cable and crimped in order to anchor the cable relative to the straps 31. By proper positioning of the straps 31 relative to the spring ends 29, the loops 21 and 22 are normally disposed in a horizontal plane so that a snubbing action is obtained upon vertical movement of the unit in either direction until the unit finally contacts either the bumper 17 or the cup 9.

The operation of the cable and spring arrangement in snubbing or damping vertical vibrations of the unit is illustrated in Figs. 3 and 4 of the drawing, it being understood that the operation of the spring fingers and cable loops on the opposite side of the compressor is the same as that of the spring fingers and cable loop illustrated.

With reference to Fig. 3, a movement of the compressor unit upwardly causes the cable loop 22 to move from its normal dotted line position in which it extends horizontally outwardly from the unit to, for example, the full line position. During this movement, the tension spring fingers 28 move from their normal dotted line positions to their full line position and in so doing apply an increasing tensional force on the cable which after the cable has passed off center or away from its horizontal position has a downwardly directed component opposing the upward movement of the unit. This snubbing action continues with a continued increase in the downwardly directed component of force acting on the cable until the unit contacts the bumper 16.

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In the reverse situation, that is when the movement of the compressor is downwardly within the casing 3 the cable loop as shown in Fig. 4 bends upwardly from the unit under the tensioning action of the spring fingers so that these fingers apply an upwardly directed force component opposing or snubbing the downward movement of the unit. At the same time the spring fingers 28 are pulled inwardly in the same manner as when the movement of the unit is upward as illustrated in Fig. 3. In both cases, the snubbing action increases as the compressor unit moves farther from its normal position thus furnishing continuously increased resistance to the movement of the unit until such time as the unit contacts the bumper 16 or the cup 9.

In order to prevent the spring fingers or more particularly the edges thereof from cutting the cable, a sleeve similar to the sleeve 30 which is employed to join the two ends of the cable is also provided in the opposite loops so that there is no direct contact between the cable and the spring fingers. In addition, this sleeve which extends beyond the outer edges of the pairs of spring fingers provides greater stability by preventing any flexing of the cable on or between the fingers so that both fingers in each pair of spring fingers will act uniformly on the cable in maintaining the cable loop in tension. Preferably, the outer ends of the sleeves 30 are bell-shaped in order to prevent the ends of these sleeves from cutting into and damaging the cable. A similar construction is also advisable on the crimped ends 32 of the straps 31.

In order to facilitate the assembly of the cable in the spring fingers and also to position the cable loops in the proper relationship with reference to spring fingers, each of the clips 30 are preferably provided with a tab 34 which fits relatively snugly into the slot or space 35 between the adjacent fingers of each pair. This construction will become more apparent from Figs. 6 and 7 of the drawing, in which the sleeve 30 is of roughly triangular cross-section in order to obtain maximum crimping action on the cable 20.

An additional function of the tab 34 is to maintain the cable loops in proper assembled relationship with reference to the spring fingers upon any rotational movement of the compressor unit about a vertical axis. The manner in which the vibrational movement is snubbed or absorbed is illustrated in Fig. 5. Upon counterclockwise movement of the compressor as viewed in Fig. 5 the upper spring finger 28 moves inwardly thus applying a greater tension to that portion of the loop 22 while tension on the lower finger 28 is relieved to some extent as that portion of the compressor and the cable connected thereto move toward the case 3. The reverse action occurs simultaneously with respect to the other pair of fingers 27. In the absence of the tab 34 the existing action would tend to cause the sleeve 30 to move axially or in other words slide through the hook end portions 29. However, upon contact of the tabs 34 with one or the other spring fingers this movement is limited and the unit is quickly returned to its normal position. For the purpose of preventing accidental dislodgment of the sleeve 30 from its cooperating spring fingers, all of the spring fingers 27 and 28 are preferably designed to that in their unstressed positions as illustrated by the lower fingers 28 in Fig. 5, they are sufficiently close to the case 3 to prevent the cable or more specifically the sleeve from passing out of the hook end portion 29 between those portions and the casing.

From the above description of the invention, it will be seen that there has been provided a resilient mount arrangement for a compressor which is of simple and low cost construction and which can be readily assembled along with the compressor unit. For example, after the member 24 has been secured to the top of the case, the compressor unit can be disposed within the case simply by placing it within the upper case portion 4 while that

portion is in an inverted position and hooking the cable

loops onto their cooperating spring fingers. Thereafter the spring 8 is slipped into the pin 12 and the lower section 5 of the case placed in position, the tapered walls of the cup 9 facilitating threading of the spring 8 into the cup during this operation. Finally, the flanges 6 are seam welded to seal the upper and lower portions of the case 4 and 5 into a unitary fluid tight structure. In addition the supporting and stabilizing means are so constructed so that in normal operation of the unit, normal vibrations thereof are quickly snubbed or limited so that the operating clearances between the unit and the case can be held to a minimum thus permitting the use of smaller volume casings.

While the present invention has been described with reference to a particular embodiment thereof, it will be understood that the invention is not limited thereto and it is intended by the appended claims to cover all such modifications as come within the true spirit and scope of the invention.

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

1. A vibration absorbing mounting for a resiliently supported motor compressor unit positioned within a casing comprising a spring member adapted to be secured to the top of said casing and having a pair of spaced spring fingers extending on each of two opposed sides of said unit, said fingers having hook-shaped end portions arranged in spaced relation with said casing and said unit, a stranded wire cable, fastening means for securing said cable to said unit to form a loop on each of said opposed sides of said unit, an inflexible sleeve enclosing each of said loops and having end portions disposed in the hooked end portions of the adjacent pair of said fingers, said pairs of said fingers subjecting said loops to horizontal tension forces to position said unit laterally in said casing, each of said sleeves including tabs extending between the spaced fingers of each of said pairs of fingers and in contact therewith for preventing axial displacement thereof relative to said fingers thereby to limit horizontal rotational movement of said unit relative to said casing, the hooked end portions of said fingers in their unstressed positions being spaced from said casing a distance less than the diameter of said sleeves to prevent disengagement of said sleeves from said fingers upon displacement of said unit to a position in which some of said fingers are unstressed.

2. A vibration absorbing mounting for laterally supporting a motor compressor unit within a casing comprising a flat spring member adapted to be fastened to

the top of said casing and having a pair of spaced spring fingers arranged to extend downwardly on each of two opposed sides of said unit, each of said fingers having hooked end portions normally disposed in spaced relation with said unit and said casing, a stranded wire cable adapted to be secured to the top of said unit to form a laterally extending loop of cable on each of said opposed sides of said unit, an inflexible sleeve enclosing a portion of each of said loops and disposed in said hooked end portions of the adjacent pair of said fingers whereby said opposed pairs of said fingers maintain said loops under tension to position said unit laterally in said casing and snub vertical vibrations of said unit, each of said sleeves including tabs extending between the spaced fingers in contact therewith for preventing axial displacement thereof relative to said fingers and thereby limit horizontal rotational movement of said unit relative to said casing.

3. A vibration absorbing and snubbing means for a motor compressor unit resiliently supported within a casing comprising a member adapted to be secured to the top of said casing and having spaced spring fingers adapted to be disposed in pairs on each of two opposed sides of said unit, said fingers including hook-shaped end portions, a flexible stranded wire cable, means for securing said cable to said unit to form a loop of cable on each of said opposed sides of said unit, an inflexible sleeve enclosing the portions of each of said loops and disposed in the end portions of said fingers, the opposed pairs of spring fingers maintaining said loops under tension in a horizontal plane thereby to position said unit laterally in said casing and to snub vertical vibrations of said unit, each of said sleeves including tabs extending between the spaced fingers in contact therewith for preventing axial displacement thereof relative to said fingers and thereby limit rotational movement of said unit.

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