Jan. 9, 1962 J. M. MURPHY ET AL 3,016,183

REFRIGERATING APPARATUS

Filed April 19, 1957 4 Sheets-Sheet 1

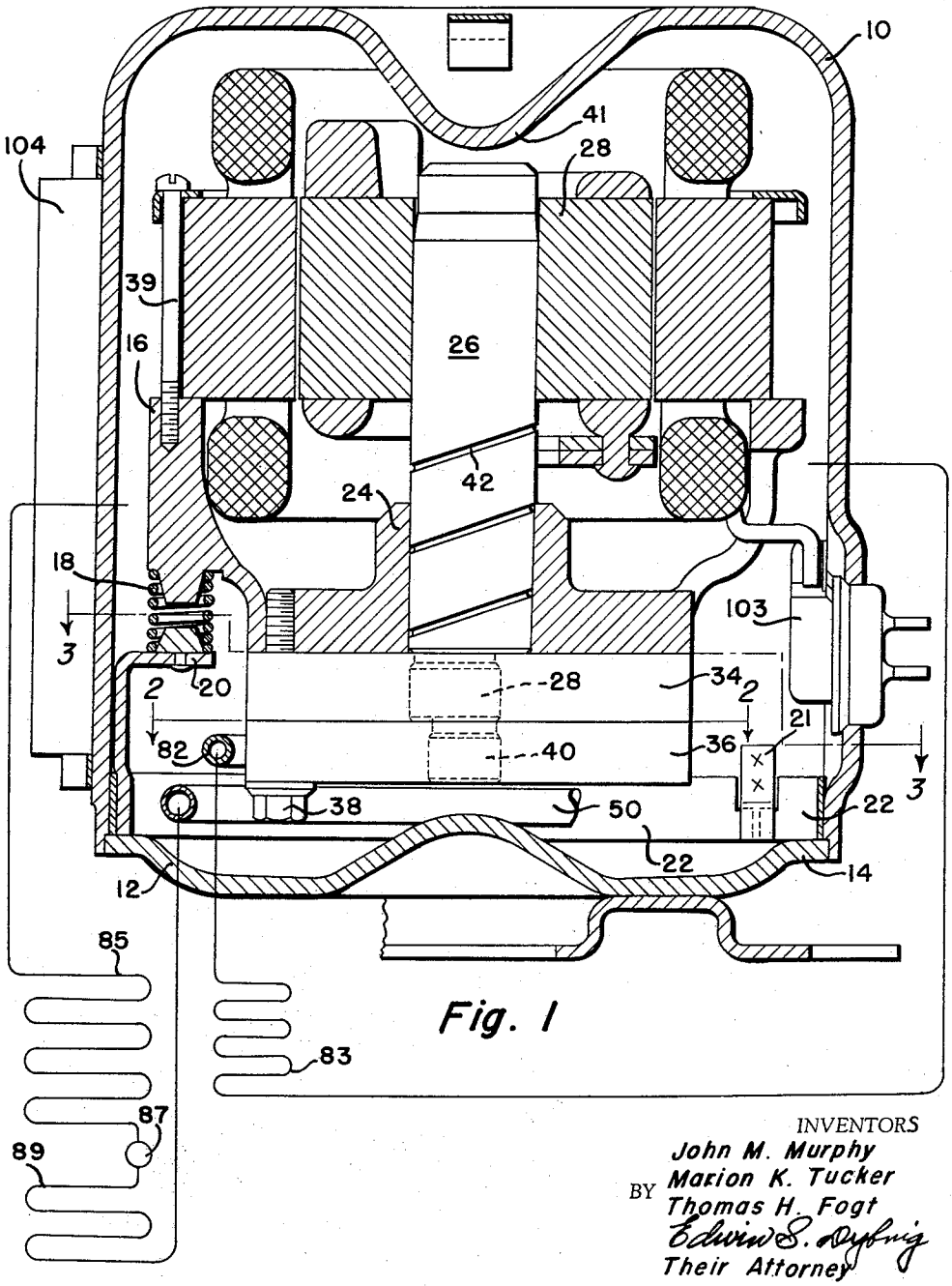


Fig. 1

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REFRIGERATING APPARATUS

Filed April 19, 1957 4 Sheets-Sheet 2

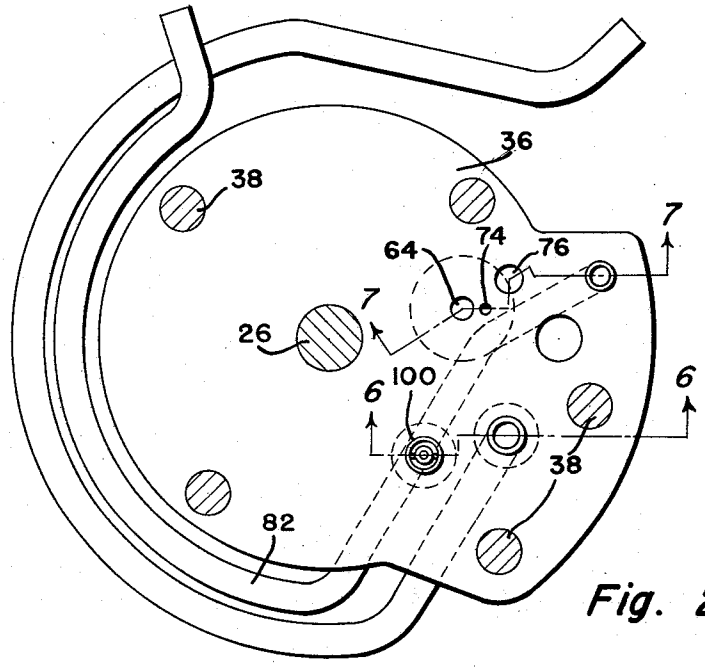


Fig. 2

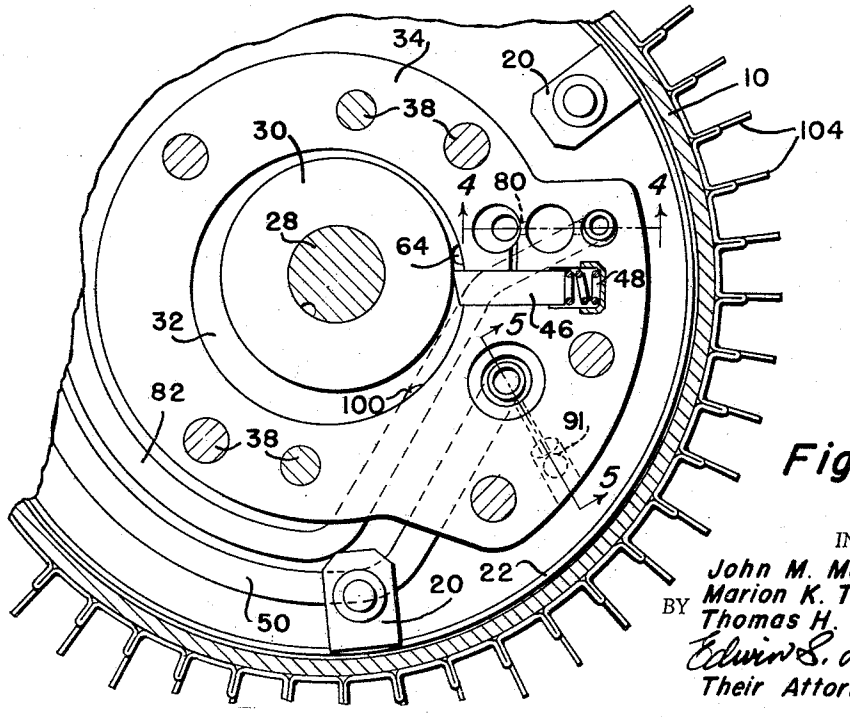


Fig. 3

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REFRIGERATING APPARATUS

Filed April 19, 1957 4 Sheets-Sheet 3

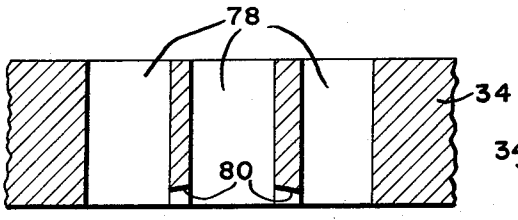


Fig. 4

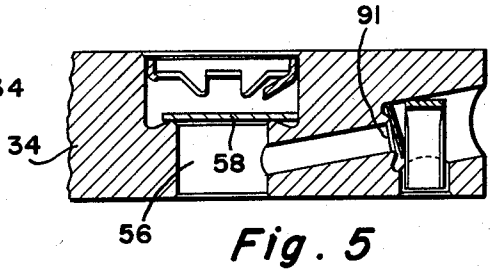


Fig. 5

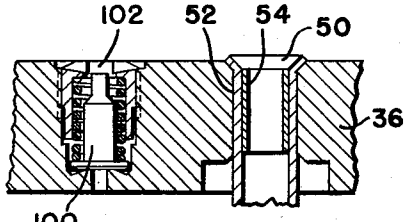


Fig. 6

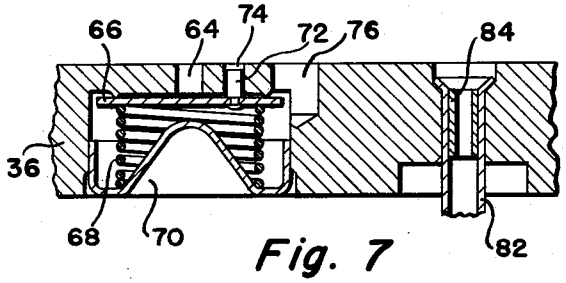


Fig. 7

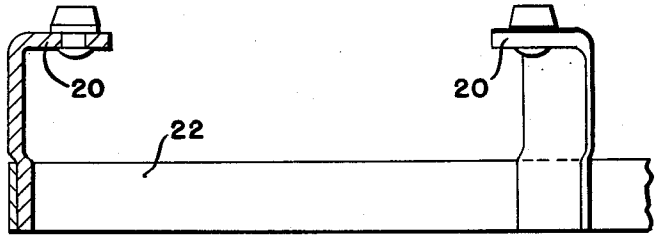


Fig. 8

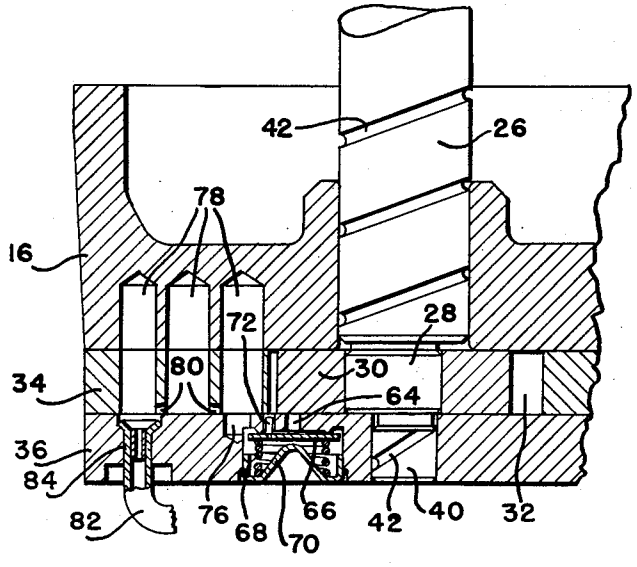


Fig. 9

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REFRIGERATING APPARATUS

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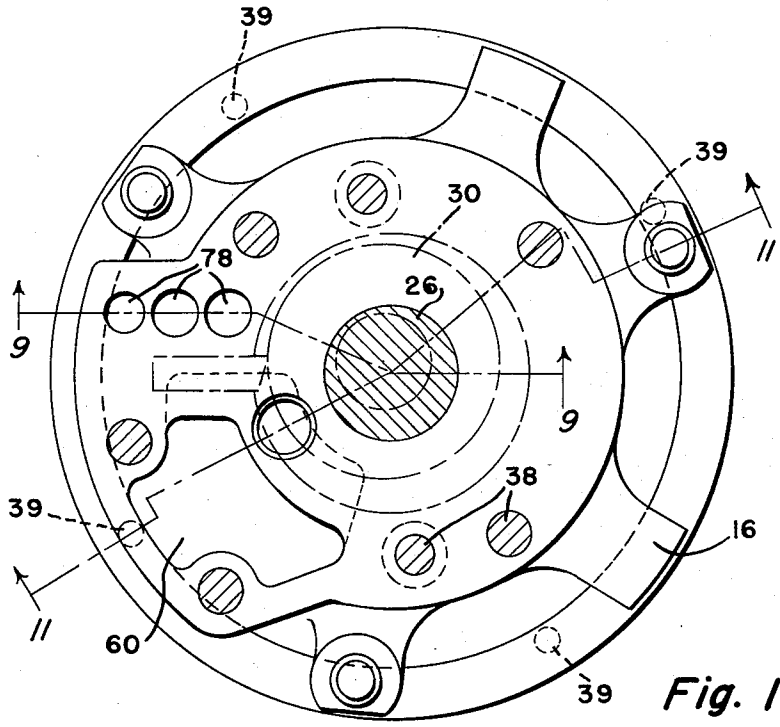


Fig. 10

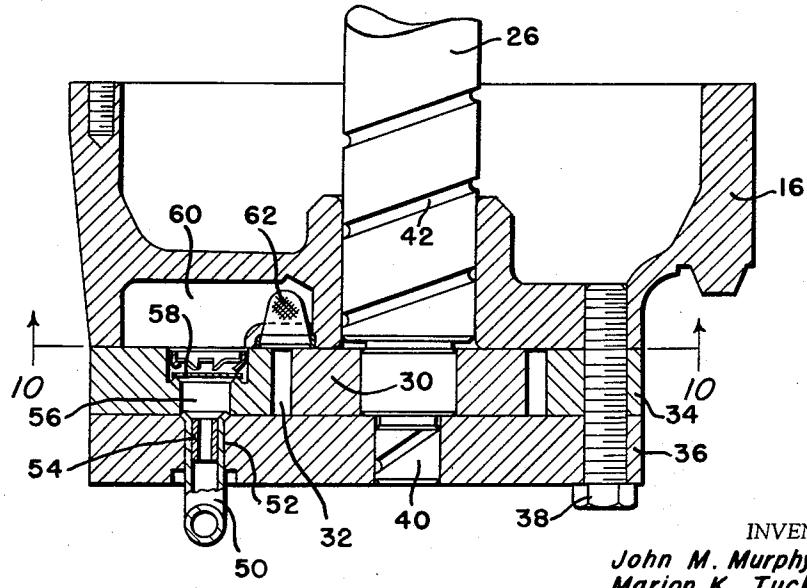


Fig. 11

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3,016,183

REFRIGERATING APPARATUS

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Filed Apr. 19, 1957, Ser. No. 654,030
2 Claims. (Cl. 230—139)

This invention relates to refrigerating apparatus and more particularly to a sealed motor compressor unit.

It is an object of this invention to provide a motor compressor unit which lends itself to mass production methods.

Another object of this invention is to provide a motor compressor design wherein a change either in the motor or a change in the size of a compressor cylinder serves to change the output of the compressor without the need for materially changing any of the components.

Still another object of this invention is to provide an improved arrangement for mounting a motor compressor mechanism within a casing.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a vertical sectional view showing a preferred embodiment of the invention and includes a schematic showing of the refrigerant circuit;

FIGURE 2 is a fragmentary sectional view taken substantially on line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken substantially on line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary sectional view on an enlarged scale taken substantially on line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary sectional view on an enlarged scale taken substantially on line 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary sectional view on an enlarged scale taken substantially on line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary sectional view on an enlarged scale taken substantially on line 7—7 of FIGURE 2;

FIGURE 8 is a view partly in section showing a portion of the mounting ring which is used in supporting the motor compressor mechanism;

FIGURE 9 is a fragmentary sectional view taken substantially on line 9—9 of FIGURE 10 showing the arrangement of the discharge muffler chambers and the discharge check valve;

FIGURE 10 is a sectional view taken on line 10—10 of FIGURE 11 and showing in dot dash lines the relative location of portions of the compressor mechanism; and

FIGURE 11 is a sectional view taken substantially on line 11—11 of FIGURE 10.

Referring now to the drawings wherein a preferred embodiment of the invention has been shown, reference numeral 10 designates an inverted cup-shaped casing element which serves to enclose the motor compressor mechanism which has secured thereto at its open end a plate 12. The plate 12 is preferably welded to the casing portion 10 at 14. The motor compressor mechanism comprises a main casting 16 which is resiliently supported within the casing 10 by means of coil springs 18 which rest on supporting brackets 20.

In the compressor shown, three of these mounting brackets 20 are provided whereas the actual number may be varied without departing from the spirit of the invention. The mounting brackets 20 are welded to a split ring like element 22 which has its lower edge resting on the bottom plate 12 as best shown in FIGURE 1. A single

cleat 21, which has its upper end spot welded to the casing portion 10, loosely overlies the reduced ends of the split ring 22, as shown in FIGURE 1, so as to position the ring and limit its upward movement.

The casting 16 is provided with a central bearing boss 24 in which the main drive shaft 26 is journalled. A motor rotor 28 is secured to the upper end of the shaft 26 and the lower end of the shaft 26 is provided with an eccentric portion 28 which serves to drive an impeller 30 which operates within the compression chamber 32 formed in the cylinder plate 34. The plate 34 is held in place between the bottom of the casting 16 and a lower end plate 36 by means of cap screws 38. A motor stator rests on the top surface of the casting 16 and is held in place by means of several cap screws 39. The top surface of the casting 16 is made perfectly flat so that it is possible to shift the motor stator sidewise on the casting 16 so as to adjust the alignment of the stator with the motor rotor. The casing 10 is provided with an inturned boss 41 which limits the upward movement of the motor shaft 26. The lower end of the shaft 26 is provided with a reduced bearing portion 40 which is journalled in the end plate 36. Suitable oil feed grooves 42 are provided on the shaft for feeding oil to the bearing surfaces.

The cylinder plate 34 as best shown in FIGURE 3 of the drawing, serves to slidably support a divider block 46 which is urged into sliding engagement with the impeller 30 by means of a coil spring 48. The gas to be compressed is supplied to the compressor through the suction line 50 which is in the form of a copper or aluminum tube having its end projecting into a passage 52 provided in the lower end plate 36 as best shown in FIGURES 6 and 11. A steel sleeve 54 is driven into the end of the tube 50 so as to securely hold the tube in place without any leaks between the walls of passage 52 and the outer walls of the tube 50. By virtue of this construction, the need for silver soldering or brazing the tube in place has been eliminated and this has the added advantage that it is possible to disconnect the tube from the compressor without damaging the compressor.

The gas to be compressed flows from the tube 50 into a valve chamber 56 in which a check valve 58 is located. After flowing past the check valve 58, the gas enters a chamber 60 formed in the lower portion of the main casting 16. The chamber 60 not only serves to muffle the noise usually produced by the suction gas but also serves as an unloading chamber. Thus, after the compressor has been standing idle for a period of time, a certain amount of gas will tend to leak past the compressor parts and will find its way into the unloading chamber 60 where the pressure will quickly build up as the check valve 58 prevents any appreciable flow of gas from the chamber 60 into the low pressure side of the system. When the compressor first starts operating after a period of shut down, the gas in the unloading chamber 60 will be at substantially the same pressure as the gas at the outlet of the compressor with the result that during the first few revolutions of the compressor, the compressor will not be required to operate with a high pressure differential. Consequently it is possible to use a motor with a lower starting torque than would otherwise be possible. The gas leaving the unloading chamber 60 passes through a wire screen or filter element 62 before entering the compression chamber 32. The unloading chamber is formed during the casting of the frame 16 and consequently it does not add materially to the cost of the compressor.

The compressed gas leaves the compression chamber 32 through a discharge port 64 (see FIGURES 2, 7 and 9). A check valve 66 is provided adjacent the discharge port 64, as best shown in FIGURE 9. This valve includes a coil spring 68 which is held in place by means of a stamping 70 whereby spring pressure is applied continu-

ously to the valve 66 for biasing it towards the closed position. The check valve plate 66 is provided with a pin 72 which registers with a hole 74 in the plate 36 so as to prevent rotation and needless wear on the plate 66. The gas which flows past the discharge plate 66 is directed into an aperture 76 which leads to a series of muffler chambers 78 which are formed by drilling aligned holes in the cylinder plate 34 and the lower surface of the casting 16 as best shown in FIGURE 9. Communication between the muffler chamber 78 is provided by cutting slots 80 in the walls which separate the muffler chambers from one another. The compressed gas leaves the muffler chamber 78 through the line 80 which is also held in place within an aperture formed in the lower end plate 36 by means of a steel sleeve 84 which is pressed into the flared end of the tube 82.

The line 82 leads to a super heat removing coil 83 which is mounted exteriorly of the compressor in accordance with standard practice. The outlet of the super heat removing coil discharges the compressed refrigerant back into the casing 10 so as to deposit entrained oil in the casing 10 before the compressed refrigerant is discharged into the condenser 85. The condensed refrigerant flows from the condenser through an expansion valve 87 and into the evaporator 89 before returning to the suction line 50. A conventional processing valve 91 for use in evacuating and charging the system with refrigerant is provided as shown.

A pressure operated valve 100 is arranged in the lower end plate 36 and is of the type which is designed to open when the pressure in the main compressor casing exceeds a safe value such as 600 to 800 pounds per square inch. Opening of the valve 100 serves to feed the high pressure gas directly into the compression chamber 32 via the port 102 so as to overload the compressor and thereby cause the usual thermal overload switch 103 to stop further operation of the compressor. Without this feature there are certain circumstances under which dangerously high refrigerant pressures may build up in the compressor housing 10. Thus if a very minute leak should develop in the evaporator so as to allow air and moisture to enter the suction line at a very small rate, the incoming moisture would eventually cause freeze-up of the restrictor or expansion valve leading to the evaporator so that the high side pressure would very gradually build up by very small increments until the pressure in the compressor casing 10 and coils 83 and 85 would become high enough to damage the refrigeration parts. Due to the very small amount of moisture in the air entering the compressor through the leak, the compressor never becomes overloaded unless the valve 100 opens so as to completely fill the compression chamber with the high pressure gas and thereby cause stalling of the motor so as to cause the conventional thermal overload protector switch to stop the motor.

The exterior of the compressor housing 10 is provided with sheet metal fin means which are formed by punching out tongue-like fin projections 104 from a strip of sheet metal and then foreshortening the edges of the strip by forming plaits in the edges of the strip between the adjacent fin elements so as to bring the fin elements closer together.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerant compressor, the combination, an inverted cup-shaped stamping forming an outer casing element, a closure means for the open end of said inverted cup-shaped stamping, a split mounting ring resting on said closure means, a cleat carried by said cup-shaped stamping for engaging the ends of said split ring for holding the same in place against said closure means, compressor mounting brackets having their lower ends secured to said split ring and having spring seats at their upper ends, spring means resting on said seats, a motor compressor supporting frame resting on said spring means so as to be resiliently supported within said casing, a cylinder plate secured to the bottom of said frame and having a circular compression chamber formed therein and closed on the one side by said frame, an end plate secured to said cylinder plate for closing the other side of said compression chamber, piston means operating within said compression chamber, and motor means carried by said frame for operating said piston means.

2. In a refrigerant compressor, the combination, an inverted cup-shaped stamping forming an outer casing element, a closure means for the open end of said inverted cup-shaped stamping, a split mounting ring resting on said closure means, a cleat carried by said cup-shaped stamping for engaging the ends of said split ring for holding the same in place against said closure means, compressor mounting brackets having their lower ends secured to said split ring and having spring seats at their upper ends, spring means resting on said seats, a motor compressor supporting frame resting on said spring means so as to be resiliently supported within said casing, a cylinder plate secured to the bottom of said frame and having a circular compression chamber formed therein and closed on the one side by said frame, an end plate secured to said cylinder plate for closing the other side of said compression chamber, piston means operating within said compression chamber, motor means carried by said frame for operating said piston means, means for directing the compressed refrigerant leaving said compression chamber into thermal exchange relationship with said casing element, and a stamped sheet metal fin strip secured to the exterior of said casing element, said strip having integrally formed tongue like fins projecting from its central portion and having plaits formed in its edge portions.

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