May 2, 1967 C. J. DE GROAT 3,317,121

COMPRESSOR MANIFOLD SEAL

Filed Oct. 24, 1965

FIG. 3

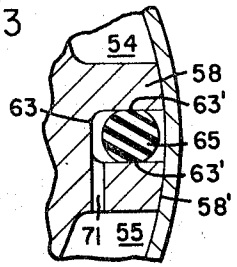
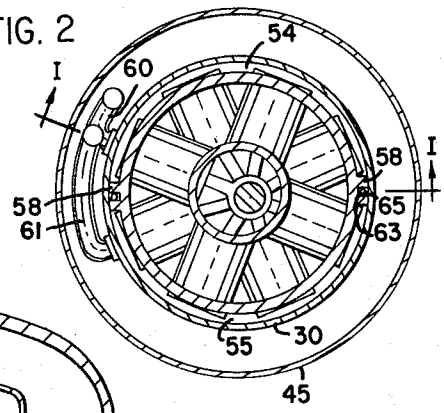


FIG. 2



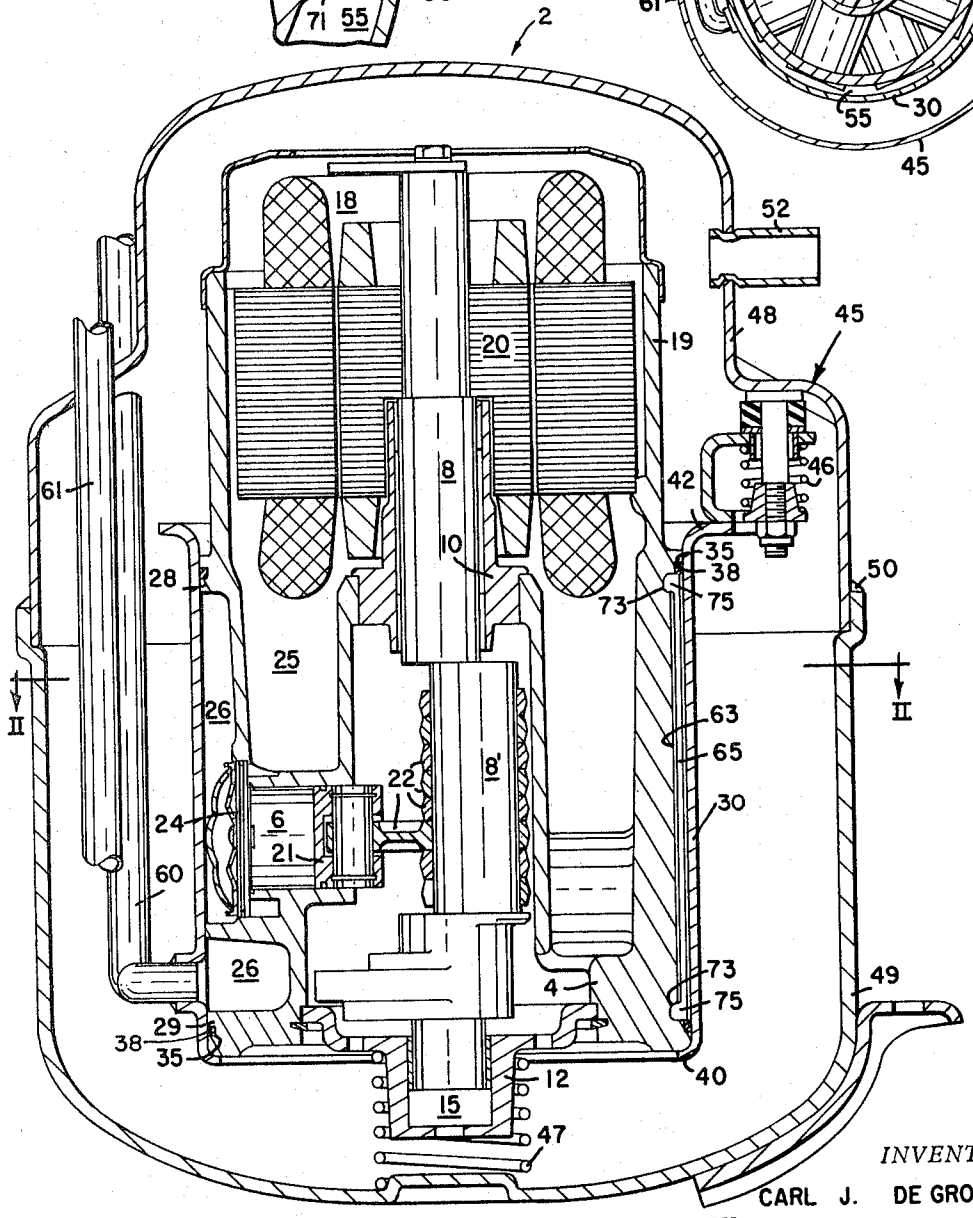


FIG. 1

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COMPRESSOR MANIFOLD SEAL

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3 Claims. (Cl. 230—58)

This invention relates to hermetic motor compressors and, more particularly, to a manifold sealing arrangement for hermetic motor compressors.

In hermetic motor compressors the advantages realized, particularly in terms of economy and simplicity, in the use of a common discharge manifold render that construction highly desirable. However, in multi-cylinder versions of the compressor, it is often desired to operate the compressor at reduced capacity. A reduction in compressor capacity may be effected advantageously by interconnecting the discharge and suction sides of some of the compressor cylinders thereby neutralizing any compressive effect by those cylinders. Where the compressor has individual or paired discharge manifolds, this form of compressor reduction is readily applicable since the several discharge manifolds are each sealed from and independent of the other. Where the compressor uses a common discharge manifold, however, it is necessary that some arrangement be provided for sub-dividing the discharge manifold to permit a part of the discharge manifold to be connected with the suction side of the compressor without impairing effective operation of other cylinders operatively joined to the remaining part of the discharge manifold.

It is a principal object of the present invention to provide a new and improved hermetic motor compressor apparatus.

It is an object of the present invention to provide, in a hermetic motor compressor apparatus of the type having a common discharge manifold, an improved arrangement for isolating one part of the discharge manifold from another part of the manifold to enable the compressor to be unloaded.

It is an object of the present invention to provide a simple, economical and effective sealing arrangement for separating the discharge manifold of a hermetic motor compressor into plural sections to permit part capacity operation of the compressor.

It is a further object of the present invention to provide a unique discharge manifold sealing arrangement adapted at a decrease in pressure in one section of a hermetic motor compressor manifold to sealingly isolate the remaining section of the compressor discharge manifold.

This invention relates to a hermetic motor compressor apparatus comprising in combination a housing defining a generally cylindrical chamber; a compressor block telescopically received in the chamber; the block having first and second annular sides projecting therefrom engageable with the inner wall of the housing to define in cooperation therewith a substantially annular discharge manifold; the part of the block between the first and second projecting sides defining a plurality of radially oriented cylinders opening into the discharge manifold; a crankshaft rotatably journalled in the block; a piston slidably received in each cylinder operatively secured to the crankshaft; a suction manifold; valve means regulating communication of each cylinder with the suction manifold and the discharge manifold; and means for subdividing the discharge manifold into a first manifold section communicating with at least one of the cylinders and a second manifold section to permit the first manifold section to be connected with the suction manifold to thereby render the one cylinder ineffective including, an outwardly projecting flange on the block on each side of the one cylinder engageable with the inner wall of the housing, the flanges extending between the first and second projecting sides, the outer surface of each flange having a groove therewithin continuing from the first projecting side to the second projecting side, a length of resilient seal arranged in each flange groove, the depth of the flange grooves being greater than the thickness of the seals to permit disposition of the seals below the surface of the flanges, the dimension across the width of the seals being slightly greater than the width of the flange grooves whereby the seals tightly engage the side walls of the flange grooves; and port means connecting the interior of each flange groove with the manifold second section, discharge pressure in the manifold second section urging the seals outwardly against the inner wall of the shell upon connection of the manifold first section with the suction manifold.

Other objects and advantages will be apparent from the ensuing description and drawings in which:

FIGURE 1 is a view partly in section along lines I—I of FIGURE 2 of the hermetic motor compressor apparatus of the present invention;

FIGURE 2 is a cross-sectional view taken along lines II—II of FIGURE 1; and

FIGURE 3 is an enlarged view showing the sealing arrangement of the present invention.

Referring to the drawings, a multi-cylinder hermetic type reciprocating compressor **2** is therein shown incorporating a split discharge manifold which enables one section of the discharge manifold to be connected with the suction manifold to render the cylinders associated with that manifold section ineffective without impairing operation of the other compressor cylinders. Compressor **2** has an open ended block **4** with plural cylinders **6** emanating radially therefrom. Crankshaft **8** is rotatably journalled in upper and lower bearing members **10, 12** fixedly supported on block **4**. Crankshaft **8** is drivingly connected to a suitable oil pump **15** housed within lower bearing member **12**.

Drive motor **18**, fastened within the upper end **19** of compressor block **4**, has rotor **20** thereof drivingly secured to crankshaft **8**. A piston **21** is movably disposed within each cylinder **6**. Each piston **21** is operatively secured to eccentric portion **8'** of crankshaft **8** by a connecting rod **22**. A suitable suction and discharge valve mechanism **24** operatively communicates each cylinder **6** with suction and discharge manifolds **25, 26**, respectively.

Compressor block **4** has outwardly projecting annular flanges **28, 29** adapted to tightly abut the inside wall of cylindrical inner shell **30**. The outer dimension of flanges **28, 29** is substantially equal to or slightly greater than the inside dimension of shell **30**. Cylinder block **4**, including flanges **28, 29** thereof and inner shell **30**, cooperate to delimit the generally annular discharge manifold **26**. Recess or groove **35** in flanges **28, 29** has O-ring seal **38** therewithin.

The base of inner shell **30** is formed inwardly at **40** to support compressor block **4** therewithin. The top of shell **30** is flanged outwardly at **42**. Springs **46** fasten inner shell **30** and compressor block **4** to outer shell **45** while spring **47** centrally supports block **4** through lower bearing member **12**. Outer shell **45** may be comprised of generally cylindrical upper and lower parts **48, 49**, respectively, which are sealed together at **50**.

Opening **52** in outer shell **45** communicates compressor **2** with a suitable source of suction gas. Suction gas entering opening **52** flows through motor **18** to cool motor **18** and into suction manifold **25**.

Discharge manifold **26** is, in the exemplary showing, divided into two sections **54, 55** by flanges **58**. Flanges

58 projecting outwardly from cylinder block 4, extend from annular flange 28 to flange 29. The outer faces of flanges 58 are adapted to tightly abut the inside wall of inner shell 30. Flanges 58 are configured to pass between selected compressor cylinders. In the exemplary compressor construction, flanges 58 are substantially vertical separating one-half of the cylinders 6 from the remaining half. Discharge conduits 60, 61 are connected to manifold sections 54, 55, respectively.

Flanges 58 are grooved at 63. Grooves 63 extend between grooves 35 in flanges 28 and 29. A cord-like seal 65 is disposed in each groove 63. Seals 65 are comprised of a suitable elastomeric material having a high resiliency. Seals 65 are preferably a material which swells when exposed to a refrigerant atmosphere, for example neoprene.

The depth of grooves 63 is greater than the dimension of seals 65 and seals 65, when inserted in grooves 63, are below the surface of flange 58. The width of grooves 63 is preferably slightly less than the dimension of seals 65, the sides of seals 65 tightly engaging the side walls 63' of grooves 63. One or more pressure ports 71 communicate the interior grooves 63 with discharge manifold section 55.

The opposite ends of each groove 63 are recessed at 73. The terminal ends of seals 65 are enlarged at 75 to fit snugly within recesses 73 to restrain seals 65 against longitudinal movement during compressor assembly. The terminal ends of seals 65 abut the sides of O-ring seals 38 in groove flanges 28, 29.

For assembly of compressor 2, seals 65 are inserted within flange grooves 63. The engagement of seals 65 with sides 63' of grooves 63 and the snug fit of ends 75 of seals 65 within recesses 73 retains seals 65 in position while compressor block 4 is forced into inner shell 30. The disposition of seals 65 in flange grooves 63 below the surface of flange faces 58' obviates movement, and possible stretching and damage, to seals 65 upon relative movement between compressor block 4 and inner shell 30 during assembly of compressor 2.

Where compressor 2 is operated at part capacity, discharge manifold section 54 may be connected by suitable means (not shown) with the suction manifold 25 to unload those compressor cylinders associated with manifold section 54. The communication of manifold section 54 with suction manifold 25 decreases pressure in manifold section 54. The relatively high pressure gas in discharge manifold section 55 and pressure ports 71 forces seals 65 radially outward into tight engagement with the inside wall of inner shell 30 to isolate manifold section 55 from section 54 and prevent the loss of discharge pressures in manifold section 55. It is understood that where seals 65 are comprised of a material which swells on exposure to refrigerant atmosphere, the effectiveness of the seal established between the sides of seals 65 and the side walls 65' of flange grooves 63 and at the juncture of seals 65 with O-ring seals 38 is enhanced.

While I have described a preferred embodiment of this invention, it will be understood that the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In a hermetic motor compressor apparatus, the combination of a housing defining a generally cylindrical chamber; a compressor block telescopically received in said chamber, said block having first and second annular sides projecting therefrom engageable with the inner wall of said housing to define in cooperation therewith a substantially annular discharge manifold; the part of said block between said first and second projecting sides defining a plurality of radially oriented cylinders opening into said discharge manifold; a crankshaft rotatably journalled in said block; a piston slidably received in each cylinder operatively secured to said crankshaft; a suction manimold; valve means regulating communication of each cylinder with said suction manifold and said discharge manifold; and means for subdividing said discharge manifold into a first manifold section communicating with at least one of said cylinders and a second manifold section to permit said first manifold section to be connected with said suction manifold to thereby render said one cylinder ineffective including an outwardly projecting flange on said block on each side of said one cylinder engageable with the inner wall of said housing, said flanges extending between said first and second projecting sides, the outer surface of each flange having a groove therewithin continuing from said first projecting side to said second projecting side, a length of resilient seal arranged in each flange groove, the depth of said flange grooves being greater than the thickness of said seals to permit disposition of said seals below the surface of said flanges, the dimension across the width of said seals being slightly greater than the width of said flange grooves whereby said seals tightly engage the side walls of said flange grooves, and port means connecting the interior of each flange groove with said manifold second section, discharge pressure in said manifold second section urging said seals outwardly against the inner wall of said housing upon connection of said manifold first section with said suction manifold.

2. A hermetic motor compressor apparatus according to claim 1 in which each flange groove is recessed at opposite ends thereof, said seals each having an enlargement receivable in said groove recesses and adapted to hold said seals against longitudinal movement upon insertion of said block within said housing.

3. A heremtic motor compressor apparatus according to claim 2 including an annular groove in the periphery of each of said block first and second sides, and a second length of seal in each of said first and second side grooves, said flange grooves opening into said first and second side grooves, the length of said flange seals being such that the terminal leads thereof abut said second seals.

References Cited by the Examiner

UNITED STATES PATENTS

3,008,628	11/1961	Gerteis et al.	230—58
3,229,901	1/1966	Parker	230—206

ROBERT M. WALKER, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,317,121 May 2, 1967

Carl J. De Groat

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 55, for "65′" read -- 63′ --; column 4, line 52, for "leads" read -- ends --.

Signed and sealed this 2nd day of January 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents