Nov. 22, 1955 H. H. BIXLER 2,724,548

COMPRESSOR OIL PUMP

Filed April 1, 1953

Fig. 1.

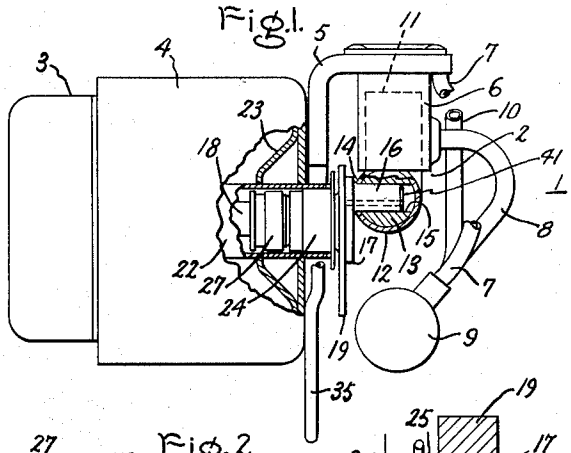


Fig. 2.

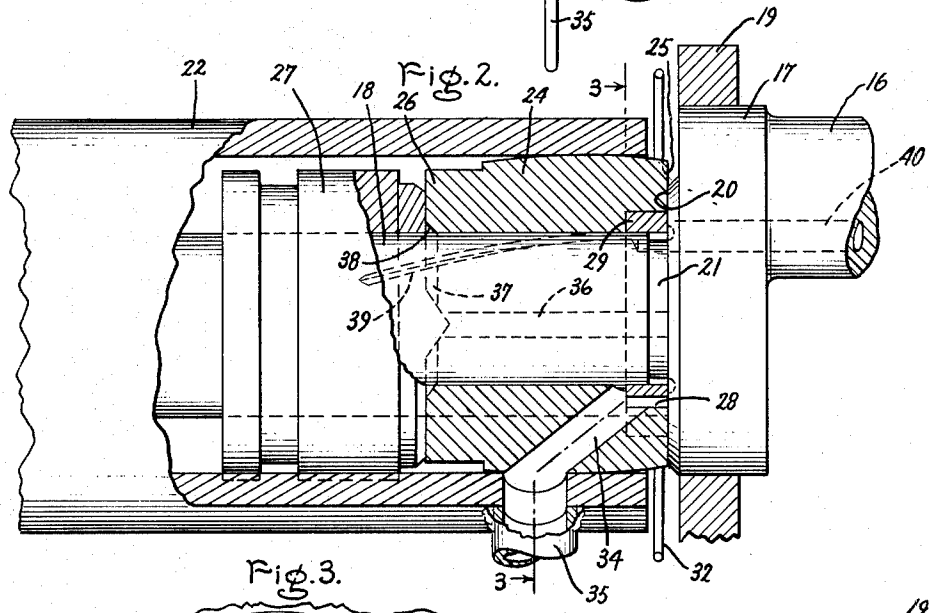


Fig. 3.

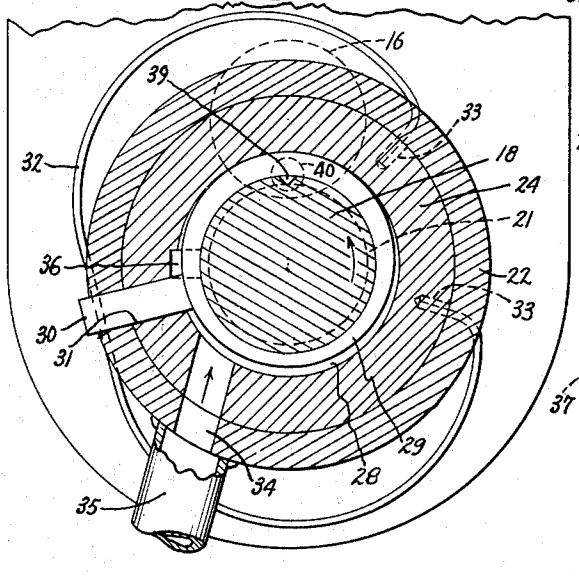
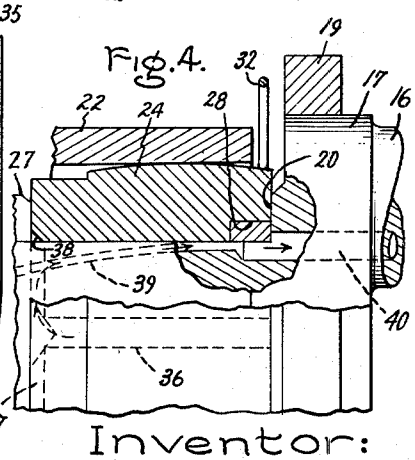


Fig. 4.



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COMPRESSOR OIL PUMP

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3 Claims. (Cl. 230—206)

My invention relates to compressors and pertains more particularly to lubrication systems of refrigerant compressors of the eccentric type.

The primary object of my invention is to provide in a refrigerant compressor of the eccentric type a new and improved oil pump.

Another object of my invention is to provide in a refrigerant compressor of the eccentric type an oil pumping arrangement associated with the compressor crankshaft and enabling a reduction to a minimum of the size of the crankshaft.

Another object of my invention is to provide with the crankshaft of a refrigerant compressor of the eccentric type eccentrically operating oil pumping means which allows substantially the full diameter and length of the shaft for bearing purposes.

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

In carrying out the objects of my invention, I provide in a refrigerant compressor of the eccentric type a crankshaft of minimum diameter. Formed on an end of the shaft is a shoulder carrying an eccentrically disposed crankpin. Provided in the crankshaft at the shoulder is a peripheral groove or relief permitting finish grinding of the shaft and the inner face of the shoulder. Fitted securely on the shaft over the relief is an eccentric element. Provided for having journaled therein the portion of the shaft immediately adjacent the shoulder is a bushing. The bushing is prevented from rotating with the shaft and includes a counterbore for receiving the eccentric. A blade resiliently retained in a radial slot in the bushing follows the surface of the eccentric. The bore, eccentric and blade all cooperate to provide an oil pump. The bushing is also formed to include inlet and outlet oil passages for the pump.

For a better understanding of my invention, reference may be had to the accompanying drawing in which

Fig. 1 is a side elevation view of a motor-compressor partially broken away to illustrate my invention;

Fig. 2 is an enlarged fragmentary detailed view of my invention;

Fig. 3 is a section taken along the lines 3—3 in Fig. 2 and looking in the direction of the arrows; and

Fig. 4 is an enlarged fragmentary detailed view illustrating the oil flow in my arrangement.

Referring to the drawing, in Fig. 1 I have shown a motor-compressor unit generally designated 1 and including an eccentric type compressor 2 and a compressor drive motor 3. The motor-compressor unit 1 is adapted for being suitably mounted and enclosed in a hermetically sealed vaporous refrigerant receiving case (not shown). Covering the major portion of the motor 3 is a cup-like frame 4. Suitably secured to the frame 4, as by welding, is an inverted L-shaped bracket 5. The bracket 5 supports a compression cylinder 6. Connected to the cylinder 6 by tubes 7 and 8 and adapted for damping intake and exhaust noises is a muffler 9. Provided for conducting vaporous refrigerant to the muffler 9 from the case (not shown) is an open-end tube 10.

Operating in the cylinder 6 is a piston cup shown in outline and designated 11. The piston cup 11 is suitably secured, as by welding, to a horizontal sleeve-like yoke 12. Slidably fitted in the yoke 12 is a cross slide 13. Extending through a horizontal slot 14 in the side of the yoke 12 and into a diametrical bore 15 in the cross slide 13 is a crankpin 16. As perhaps better seen in Fig. 2, the crankpin 16 is disposed eccentrically on a shoulder 17 formed concentrically on an end of a crankshaft 18. Fitted securely on the periphery of the shoulder 17 for overcoming effects of the eccentric operation of the crankpin 16 is a counterweight 19.

Formed in the crankshaft 18 at the inner face 20 of the shoulder 17 for permitting finish grinding of the crankshaft and the inner face of the shoulder is a peripheral groove or relief 21. The groove 21 renders the portion of the crankshaft just inwardly of the shoulder unavailable for bearing purposes. In a manner which will be described in detail hereinafter, my invention contemplates utilizing this portion of the crankshaft in the provision of oil pumping means, thereby making available for bearing purposes substantially the full diameter and length of the crankshaft, or in other words, the remaining surface of the crankshaft. My invention further contemplates utilizing the crankshaft in the provision of oil pumping means and in such a manner as to require no special machining of the crankshaft. This also will be described in detail hereinafter.

The crankshaft 18 is disposed in a sleeve 22, the sleeve being secured as by welding to the frame 4. Further support of the sleeve 22 is provided by a substantially conical bracket 23 welded to both the frame and the sleeve. Fitted in the extremity of the sleeve adjacent the shoulder 17 is a bushing 24 having an outer face 25 and an inner face 26. Journaled in the bushing 24 is the portion of the crankshaft immediately adjacent the shoulder 17. By suitable means (not shown) the bushing 24 is prevented from rotating about the longitudinal axis of the sleeve 22. Additionally, as seen in Figs. 2 and 4, the periphery of the bushing 24 is arcuate in cross section. Thus, the bushing is self-aligning in the sleeve.

Press fitted on the crankshaft 18 inwardly of the bushing 24 is a collar 27. The collar 27 is so positioned on the crankshaft as to maintain a predetermined spacing or "play" between the inner face 20 of the shoulder 17 and the outer face 25 of the bushing 24.

Formed in the outer face 25 of the bushing 24 is a counterbore 28. As seen in Figs. 1, 2 and 3, the counterbore 28 receives an eccentric element 29 press fitted on the crankshaft 18 over the peripheral groove 21. The counterbore 28 and the inner face 20 of the shoulder 17 cooperate to form a rotary pump cylinder and the eccentric element 29 serves as a pump rotor. To complete the rotary pump arrangement, a blade 30 is provided and fits slidably in a radial slot 31 also formed in the outer face of the bushing 24. Provided for causing the blade 30 to engage and follow the surface of the eccentric element or rotor 29 is a substantially C-shaped spring 32. At substantially its midpoint the spring 32 passes through a transverse passage in the outer end of the blade 30. The ends of the spring 32 are seated resiliently in radial bores 33 in the periphery of the bushing 24. Thus, the spring is retained in the position shown, in which position it effectively biases the blade 30 inwardly toward the rotor for engaging and following the rotor to divide the pump cylinder into low and high pressure sides.

Provided for admitting oil into the pump cylinder on

the low pressure side of the blade 30 is an inlet passage 34 extending obliquely through the sleeve 22 and the bushing 24. Provided for conducting oil to the passage 34 is a conduit 35. One end of the conduit 35 is secured to the sleeve 22 at the passage 34, as by soldering, and the other end extends downwardly and is adapted for extending into a sump of oil in the motor-compressor case (not shown).

Located on the high pressure side of the cylinder or on the side opposite the inlet passage 34 is an oil outlet passage 36. The outlet passage 36 consists of a groove extending longitudinally in the inner periphery of the bushing 24. The outlet passage 36 provides communication between the positive or high pressure side of the blade 30 and an annular chamber 37 formed by the collar 27 and a counterbore 38 in the inner face 26 of the bushing 24.

In the arrangement described to this point, rotation of the crankshaft 18 results in a pumping of oil from the sump of the case (not shown) into the rotary pump cylinder through the conduit 35 and the inlet passage 34 and a deliverance of oil at positive pressure through the outlet passage 36 to the annular chamber 37.

Formed in the periphery of the crankshaft 18 and extending inwardly from the groove 21 to a point beyond the annular chamber 37 is a spiral groove 39. The spiral groove 39 communicates with the annular chamber 37 and is adapted for conducting oil at positive pressure to the peripheral groove 21. Extending longitudinally through the crankpin 16 and communicating with the spiral groove 39 for receiving oil therefrom is a passage 40. In this arrangement, the eccentric element or rotor 29 is so oriented on the crankshaft 18 that the passage 40 in the crankpin 16 is on the positive pressure side of the pump. The passage 40 directs the oil into a chamber 41 formed by the diametrical bore 15 in the cross slide 13 and the yoke 12. From the chamber 41 the oil is delivered and metered by means not shown into the compression cylinder 6 for lubrication and valve noise damping purposes.

It will be seen that I have provided in a refrigerant compressor of the eccentric type a new and improved oil pump. It will be seen further that my pump arrangement does not require special machining of the crankshaft or machining which reduces substantially the effective diameter of the shaft, thus enabling a reduction to a minimum of the size of the shaft. Still further, it will be seen that in my pumping arrangement the pump rotor is fitted over the portion of the crankshaft containing the finish grinding groove or relief and, therefore, not available as a bearing surface, thus allowing substantially all of the remaining surface of the crankshaft for bearing purposes.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular form shown and described and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

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

1. In a compressor of the eccentric type a crankshaft, a shoulder formed on said crankshaft for carrying an eccentrically disposed crankpin, a peripheral groove formed in said crankshaft at said shoulder for enabling finish grinding of said crankshaft and the inner face of said shoulder, an eccentric element carried fixedly on said crankshaft over said peripheral groove for serving as a pump rotor, positioning of said eccentric element over said groove rendering the remaining surface of said crankshaft employable for bearing purposes, a bushing, said bushing having journaled therein the portion of said crankshaft immediately adjacent said shoulder, said bushing including a counterbore in the face thereof adjacent said shoulder, said counterbore and said inner face of said shoulder cooperating to form a rotary pump cylinder for receiving said eccentric element, said face of said bushing further including a radial slot, a blade slidably positioned in said slot and resiliently following said eccentric element thereby to divide said cylinder into low and high pressure sides, and oil inlet and outlet passages communicating with said low and high pressure sides of said cylinder, respectively.

2. In a compressor of the eccentric type a crankshaft, a shoulder formed on said crankshaft for carrying an eccentrically disposed crankpin, a peripheral groove formed in said crankshaft at said shoulder for enabling finish grinding of said crankshaft and the inner face of said shoulder, an eccentric element carried fixedly on said crankshaft over said peripheral groove for serving as a pump rotor, positioning of said eccentric element over said groove rendering the remaining surface of said crankshaft employable for bearing purposes, a bushing including inner and outer faces, said bushing having journaled therein the portion of said crankshaft immediately adjacent said shoulder, said bushing having said outer face thereof engaging said inner face of said shoulder, said bushing having a counterbore in said outer face thereof, said counterbore and said inner face of said shoulder cooperating to form a rotary pump cylinder for receiving said eccentric element, a radial slot in said outer face of said bushing, a blade slidably fitted in said radial slot and resiliently following said eccentric element thereby to divide said cylinder into low and high pressure sides, oil inlet and outlet passages communicating with the low and high pressure sides of said cylinder, respectively, a counterbore formed in said inner face of said bushing, a collar secured on said crankshaft and engaging said inner face of said bushing, said counterbore in said inner face of said bushing and said collar cooperating to form an oil chamber, said oil chamber communicating with said oil outlet passage and receiving oil therefrom at positive pressure, and a groove formed in said crankshaft for receiving oil from said chamber at positive pressure and conducting said oil to other parts of said compressor.

3. In a compressor of the eccentric type including a compression chamber and a piston for operating in said compression chamber, a crankshaft, a shoulder formed on said crankshaft, a peripheral groove formed in said crankshaft at said shoulder for enabling finish grinding of said crankshaft and the inner face of said shoulder, a crankpin eccentrically disposed on said shoulder for operating said piston in said compression chamber, a supporting sleeve receiving said crankshaft, an eccentric element carried fixedly on said crankshaft over said peripheral groove for serving as a pump rotor, positioning of said eccentric element over said groove rendering the remaining surface of said crankshaft employable for bearing purposes, a bushing fitted in the extremity of said sleeve adjacent said shoulder, said bushing including inner and outer faces, said bushing having journaled therein the portion of said crankshaft immediately adjacent said shoulder, said outer face of said bushing engaging said inner face of said shoulder, said bushing having a counterbore in said outer face thereof, said counterbore and said inner face of said shoulder cooperating to form a rotary pump cylinder for receiving said eccentric element, said bushing being restrained from rotating about the longitudinal axis of said sleeve, the peripheral surface of said bushing being arcuate in cross section for rendering said bushing self-aligning in said sleeve, a radial slot in said outer face of said bushing, a blade slidably fitted in said radial slot and resiliently following said eccentric element thereby to divide said cylinder into low and high pressure sides, an oil inlet formed by an oblique passage in said bushing communicating with said cylinder on said low pressure side thereof, an oil outlet formed by a longitudinal groove formed in the inner periphery of said bushing communicating with said cylinder on said high pressure side thereof,

said inner face of said bushing including a counterbore, a collar secured on said crankshaft and engaging said inner face of said bushing, said counterbore in said inner face of said bushing and said collar cooperating to form an oil chamber, said oil chamber communicating with said oil outlet and receiving oil therefrom at positive pressure, a spiral groove formed in the portion of said crankshaft journaled in said bushing for receiving oil from said

chamber at positive pressure, and a longitudinal passage in said crankpin communicating with said spiral groove and receiving oil therefrom at positive pressure for conduction to said compression chamber.

References Cited in the file of this patent

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