Feb. 1, 1966 F. LÜCK 3,232,523

ROTARY PISTON COMPRESSOR WITH ROTARY PISTONS ARRANGED ECCENTRICALLY ONE WITHIN THE OTHER

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Fig. 1

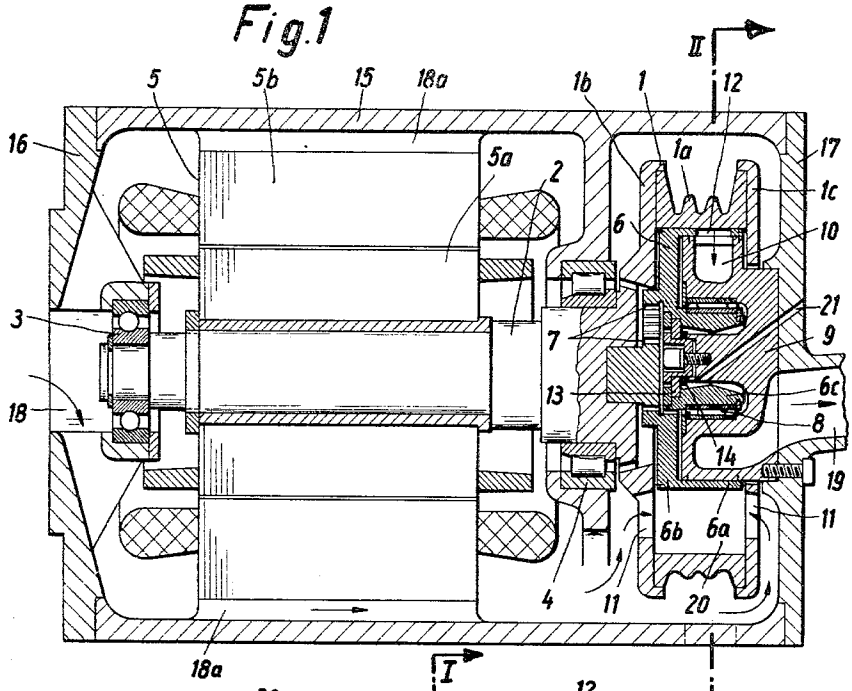
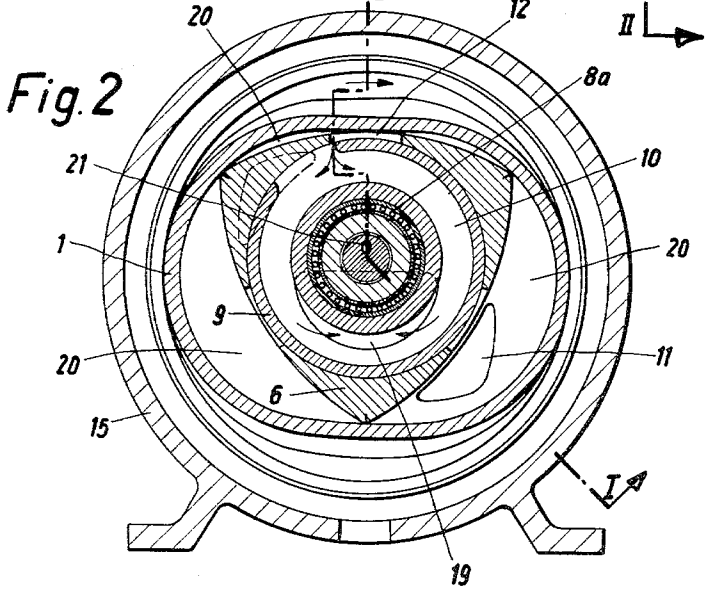


Fig. 2



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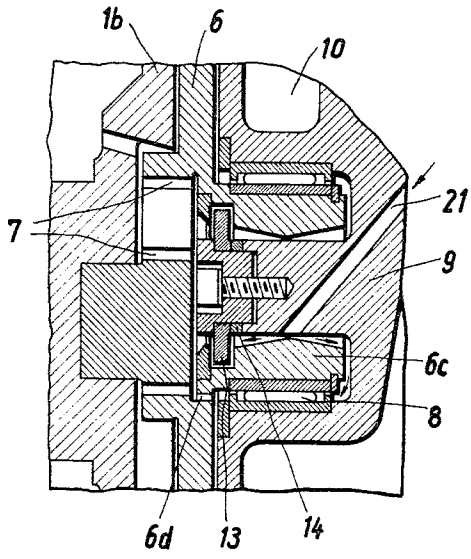
By Walter Burky

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ROTARY PISTON COMPRESSOR WITH ROTARY PISTONS ARRANGED ECCENTRICALLY ONE WITHIN THE OTHER

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Fig.3



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3,232,523

ROTARY PISTON COMPRESSOR WITH ROTARY PISTONS ARRANGED ECCENTRICALLY ONE WITHIN THE OTHER

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6 Claims. (Cl. 230—139)

The present invention relates to a rotary piston compressor which, for high differences in pressure and high circumferential speeds, is provided with two rotary pistons arranged eccentrically one within the other and coupled to each other, for instance by additional gears, the outer rotary piston being open at one end face and supporting a shaft journal at the other end face.

Rotary piston machines have become known which are suitable for medium pressure conditions and differences in pressure at high circumferential speeds and are also suitable for high differences in pressure at relatively low circumferential speeds.

With the first-mentioned designs as disclosed, for instance in German Patent 1,086,244, in the interior of the inner rotary piston there are, in addition to the central bearing therefor, also provided the suction as well as the pressure conduits. This arrangement, however, is not suitable when the machine is to be subjected to high differences in the pressure. In such instances, it would be necessary to reinforce the bearing to such an extent that the necessary space for the provision of the two conduits would be lacking.

According to the above-mentioned second design as described, for instance, in my copending application Ser. No. 253,845, filed January 25, 1963, which concerns a rotary piston machine sealed substantially by gaps, the question of space for the provision of the two conduits has been solved by arranging the conduits in the housing end wall which thus do not interfere with the bearing for the inner rotary piston. This type of machine, however, is somewhat limited as to its speed, because the main bearing is, for reasons of sealing at the working chambers, arranged in the compressor cross-sectional plane, whereby it becomes necessary to give the rotary piston machine a greater diameter. If high speeds are to be realized, the main bearing would have to be reduced and provided at another place. In such an instance, however, the overall design of the machine would have to be changed, particularly the gap sealing and the design of the conduits.

It is, therefore, an object of the present invention to provide a rotary piston compressor with rotary pistons arranged eccentrically with regard to each other, in which the rotary piston body will be so journalled that the life of the bearing will practically not be affected, while on the other hand, an efficient gas seal and a favorable design of the conduit means will be assured.

It is also an object of this invention to provide a rotary piston machine as set forth in the preceding paragraph, which will make it possible, without additional expenses, to mount a drive motor on the shaft of the outer rotary piston.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIGURE 1 represents a longitudinal section through a rotary piston machine according to the present invention, said section being taken along the line I—I of FIGURE 2;

FIGURE 2 is a cross-section through the machine of FIGURE 1 as taken along the line II—II of FIGURE 1;

FIGURE 3 illustrates in section on a larger scale than FIGURE 1 the central right-hand portion of FIGURE 1.

The problem underlying the present invention has been solved in conformity with the present invention by the combination of two features, viz (a) the pressure conduit only has been retained in the interior of the inner rotary piston while being passed around the large inner bearing in view of the eccentricity of the rotors, so that it will lead into the housing lid and (b) the main bearing of the outer rotary piston is located adjacent the compressor-cross-sectional plane. The considerable increase inherent thereto in the bearing load while simultaneously the bearing diameter has been reduced, is, to a great extent, compensated for by producing a favorable lever ratio by means of the fact that the bearing on the input side has been moved out further. At the same time, this creates the possibility of mounting the drive motor between the two bearings for the outer rotary piston.

More specifically, with reference to the drawings, the arrangement shown therein comprises an outer rotary piston **1** having two teeth and being composed of the central portion **1***a* and the end walls **1***b* and **1***c*. The rotary piston **1** has a shaft or stud **2** connected thereto which, in view of the high transverse pressures at the simultaneously occurring high rotary speeds, is provided with two spaced transverse bearings **3** and **4**, respectively. It is between these bearings **3** and **4** that the rotor **5***a* of the drive motor **5** is arranged and drivingly connected to shaft **2**, said drive motor having a stator **5***b*. The inner rotary piston **6** is, by means of a pair of gears **7** coupled to the outer rotary piston **1** and by means of a stud **6***a* arranged on the inner side of end wall **6***b*, is journalled on a housing part **9** extending into the interior of the stud **6***a*. Also, the pressure conduit **10** is journalled in housing part **9** and extends around said bearing **8** while leading to the end face of the housing. The end walls **1***b* and **1***c* of the outer rotary piston **1** are provided with inlet slots **11**, whereas outlet slots **12** are provided in the peripheral surface **6***a* of the inner rotary piston **6**. The inner rotary piston is. for instance, by means of a guiding disc **13** guided in axial direction relative to the housing part **9**. By selecting a gauge ring **14** of a corresponding thickness, the proper positions of the two rotary pistons relative to each other may be adjusted. The compressor and motor are confined by a housing **15** common thereto, the lids **16** and **17** of which have an inlet opening **18** and an outlet opening **19**.

The working medium intermixed with lubricating oil passes through inlet opening **18** into the housing and flows through passages **18***a* through inlet slots **11** into the working chambers **20** of the compressor. Here the working medium is compressed and leaves the machine through outlet slots **12**, pressure conduit **10** and outlet opening **19** of the machine. In this way, the bearings **3** and **4** are lubricated and are, together with the driving motor **5**, cooled in an effective manner. The lubrication of the inner rotary piston bearing as well as of the gears is effected by oil under pressure which, for instance, is passed through bore **21** into the direct vicinity of the axial bearing **13**, said oil under pressure being under the gas pressure of the compressor.

More specifically, the oil under pressure passes, for instance, through bore **21** to the bearing stud **6***c* of the inner rotary piston **6** and from there, aided by the centrifugal force passes on one hand to bearing **8** from where it can flow off through one or more compensating bores **6***d*, and on the other hand flows to the axial bearing **6***c*–**13**. Through the necessarily provided bearing gap in the axial bearing, the oil passes through the pair of gears **7**.

The axial bearing is composed of the hollow rotary bearing stud *6c*, the stationary guiding disc **13** and the ring connected to the rotary bearing stud. The play in the bearing will be secured, as mentioned above by the insertion of a fitting ring **14** of corresponding thickness. The inner rotary piston **6** consists of a single piece. The inner or hub portion of said rotary piston **6** has been designated with the reference numeral *6c*, whereas that portion forming the end face is designated with the reference numeral *6b*. That portion of the rotary piston **6** which carries the rotor teeth has been designated with the reference numeral *6a*.

It is, of course, to be understood, that the present invention is, by no means, limited to the particular construction shown in the drawing, but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. A rotary piston compressor, especially for a refrigerating medium, which includes: outer and inner rotary piston means rotatably and eccentrically arranged one within the other and drivingly connected to each other, said inner and outer piston means confining with each other chamber means varying in volume in response to a rotation thereof for receiving and compressing a medium to be compressed, one of said piston means having inlet means for admitting a medium to be compressed to said chamber means, housing means housing said outer and inner rotary piston means and having an intake port communicating with said inlet means and connectable to a supply of a medium to be compressed, said housing means also having a discharge port for discharging the compressed medium, said outer piston means being open at one end face and having a shaft journal connected to its other end face, bearing means arranged in spaced relationship to each other and supporting said shaft journal at spaced portions thereof, driving motor means having a rotor arranged between said bearing means and drivingly connected to said shaft journal, additional bearing means connected to said housing means and substantially centrally rotatably supporting said inner rotary piston means, and conduit means extending around said additional bearing means and communicating with said discharge port, said inner rotary piston means being provided with outlet means operable in response to a certain relative position of said inner and outer piston means to convey compressed medium from said chamber means to said conduit means and thereby to said discharge port.

2. A rotary piston compressor according to claim **1**, which includes adjustable bearing means arranged within the interior of said inner rotary piston means for axially guiding said inner rotary piston means.

3. A rotary piston compressor according to claim **1**, in which said outer rotary piston means includes end walls, and in which said inlet means are provided in each of said end walls.

4. A rotary piston compressor, especially for a refrigerating medium, which includes: outer and inner rotary piston means rotatably and eccentrically arranged one within the other and drivingly connected to each other, said inner and outer piston means confining with each other chamber means varying in volume in response to a rotation thereof for receiving and compressing a medium to be compressed, one of said piston means having inlet means for admitting a medium to be compressed to said chamber means, said outer piston means being open at one end face and having a shaft journal connected to its other end face, bearing means arranged in spaced relationship to each other and supporting said shaft journal at spaced portions thereof, driving motor means having a rotor arranged between said bearing means and drivingly connected to said shaft journal, housing means common to said motor means and said inner and outer piston means and housing the same including said bearing means, said housing means having that end portion thereof which is remote from said inner and outer piston means provided with at inlet port communicating with said inlet means around said motor means and connectable to a supply of a medium to be compressed, said housing means also having a discharge port for discharging the medium compressed in said chamber means, additional bearing means connected to said housing means and substantially centrally rotatably supporting said inner rotary piston means, and conduit means extending around said additional bearing means and communicating with said discharge port, said inner rotary piston means being provided with outlet means operable in response to a certain relative position of said inner and outer piston means to convey compressed medium from said chamber means to said conduit means and thereby to said discharge port.

5. A rotary piston compressor according to claim **4**, in which said housing means housing said motor means and said inner and outer piston means is to its major extent cylindrical, said motor means and said inner and outer rotary piston means forming a single unit.

6. A rotary piston compressor according to claim **1**, which includes gear means drivingly interconnecting said inner and outer rotary piston means, and also includes lubricant conveying conduit means communicating with said gear means and with all of said bearing means for conveying oil under pressure thereto, said conduit means being under the pressure of the medium compressed by said compressor.

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