July 6, 1965 L. PÉRAS 3,193,186

PACKINGS FOR ROTARY ENGINES

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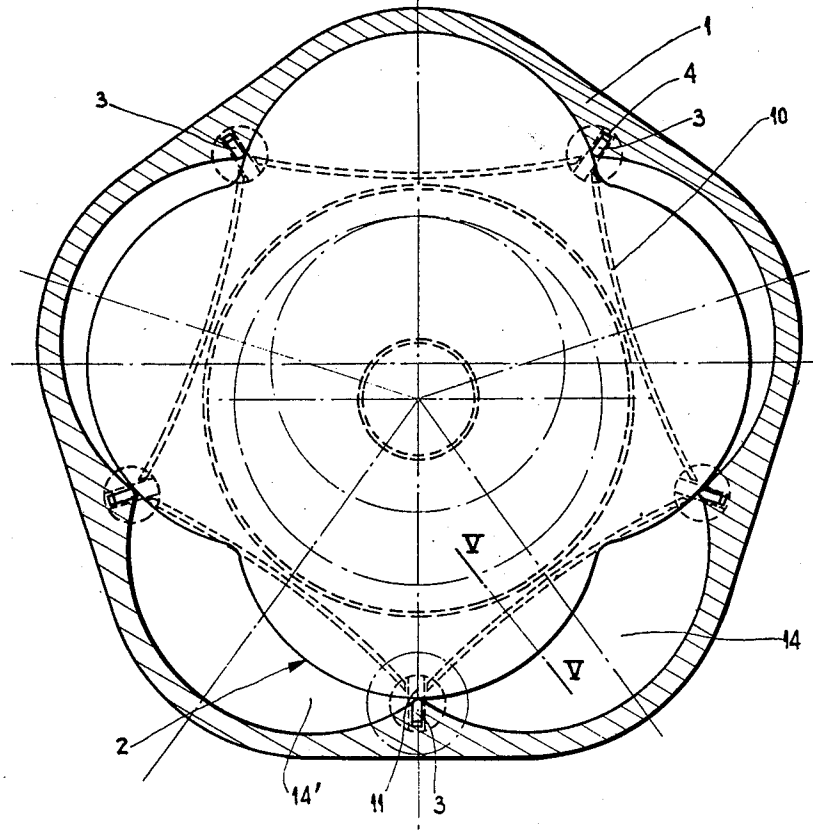
Fig. 1



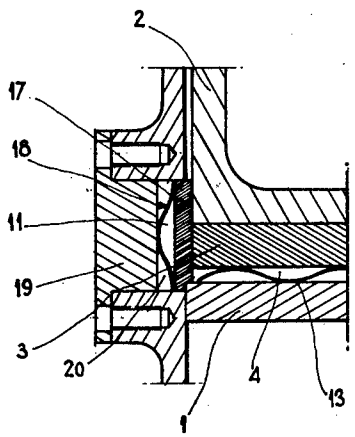


Fig. 4

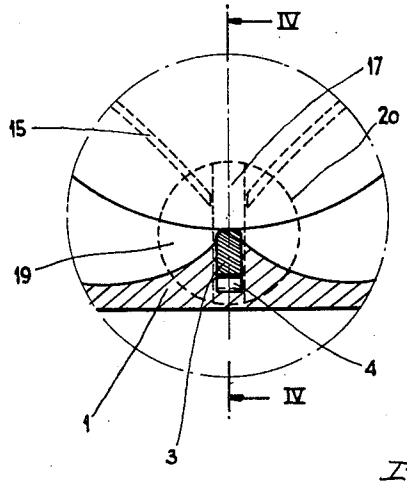


Fig. 3

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Fig_2

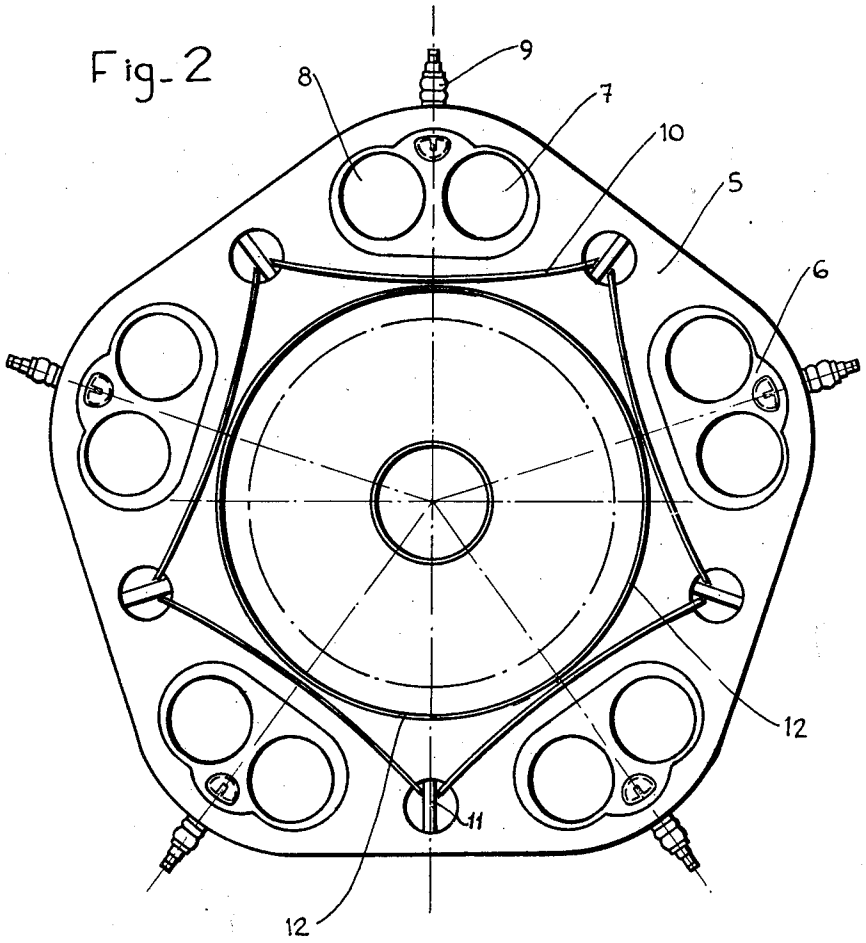

Fig_5

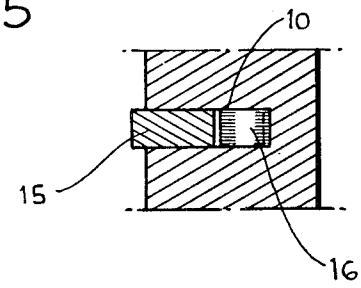

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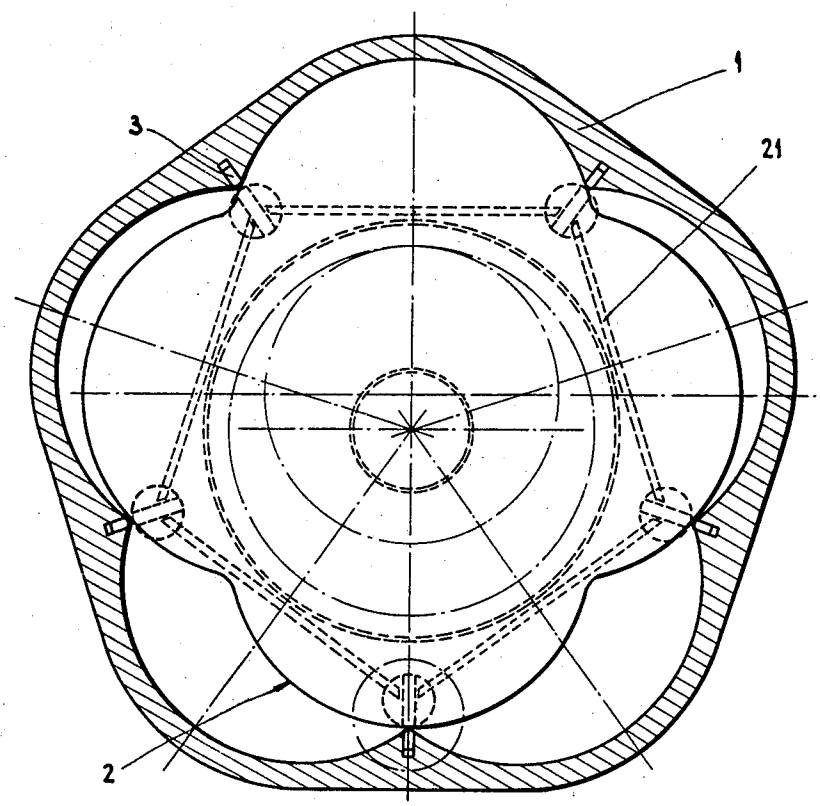
Fig. 6



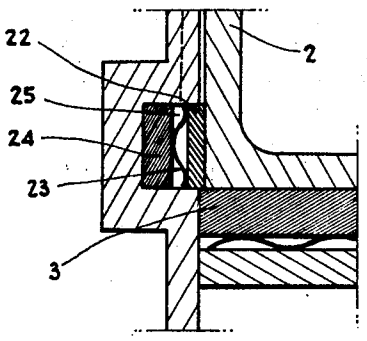


Fig. 8

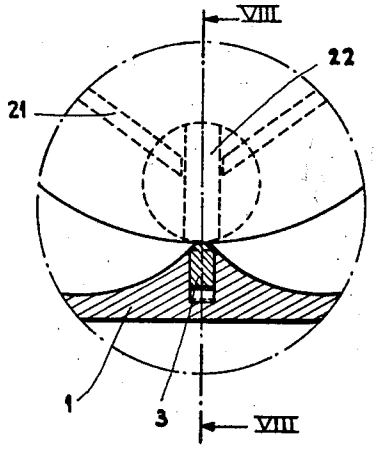


Fig. 7

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Fig. 9

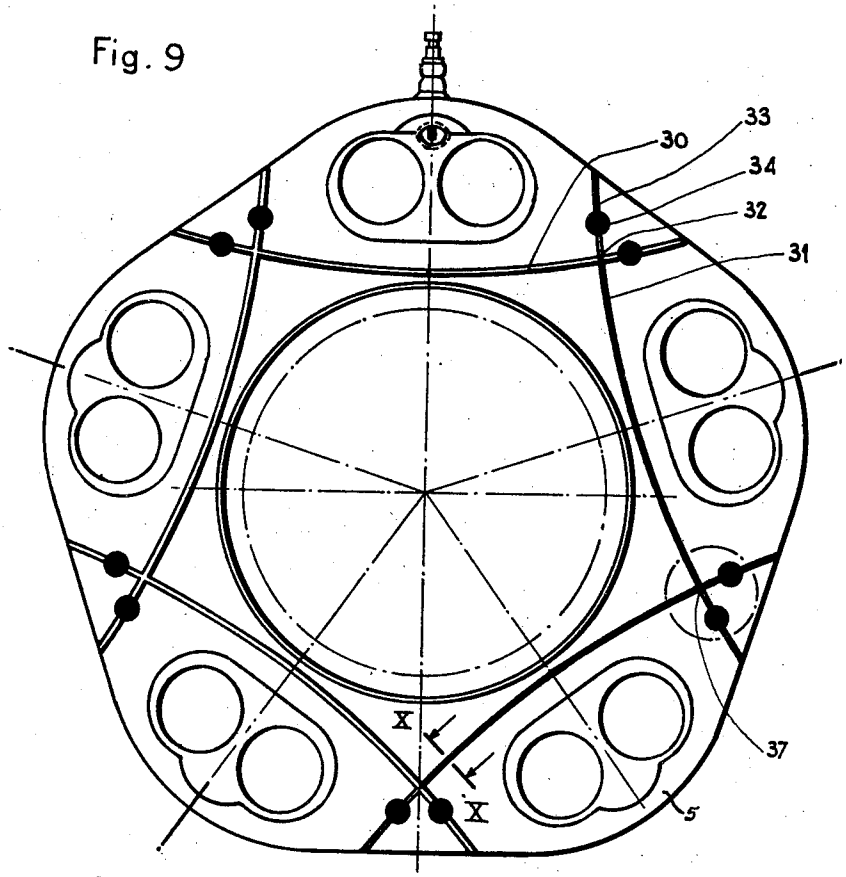


Fig. 10

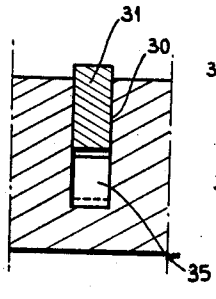


Fig. 12

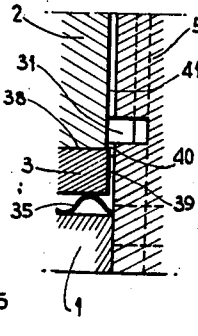
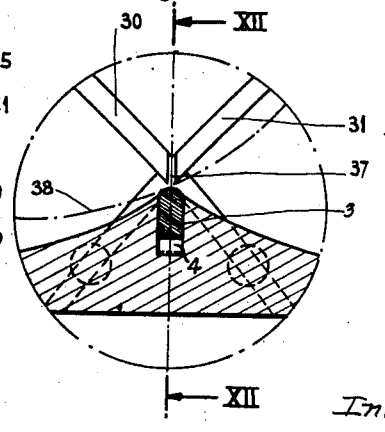


Fig. 11



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PACKINGS FOR ROTARY ENGINES

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Filed Aug. 24, 1961, Ser. No. 133,631
Claims priority, application France, Sept. 17, 1960, 838,869, Patent 1,274,666
8 Claims. (Cl. 230—145)

This invention relates to rotary engines of the lobar type comprising a rotor having an epicyclic contour with 2N lobes and a stator with $2N+1$ lobes, and more particularly to sealing or packing means therefor.

It is known that in engines of this general character the number of points of contact between the two contours of the rotor and stator equals the number of lobes of the envelope curve, that is, of the stator, and it is this number $(2N+1)$ that determines the number of working chambers in which the engine cycle takes place. Associated with these $(2N+1)$ working chambers are $(2N+1)$ combustion chambers in which the inlet and exhaust valves and the spark plugs are mounted.

According to a particularly advantageous arrangement described in a prior patent application No. 115,657, filed on June 8, 1961, now Patent No. 3,148,667, for "Rotary Engine," the combustion chambers are formed in the lateral walls of the stator.

In this prior patent application, the rotary engine comprises a rotor having a contour corresponding to a shortened epicycloid with two arcs, and a stator comprising three lobes separated by sealing strips constantly engaging the stator contour. Associated with each one of the three peripheral working chambers of the variable-volume type, which are formed by construction between the rotor and the stator, are constant-volume combustion chambers formed in the lateral walls of the stator, these auxiliary ridge-shaped chambers receiving the inlet and exhaust valves having their axes inclined to the engine axis as well as the spark plug mounted in the vicinity of said valves.

In hitherto known engines of this character, the joints between the working chamber and the eccentric member on which the rotor is mounted were sealed against gas and oil leakages by elements carried by the rotor proper. However, this arrangement is characterized by drawbacks notably in that these elements are subjected to the detrimental influence of inertia and/or centrifugal force.

According to the present invention not only the aforesaid sealing or packing elements usually provided between two successive working chambers but also those intended for isolating said chambers from the central eccentric are mounted in the stator, whereby these members remain stationary during the operation of the engine.

These and other features and advantages of the invention will appear more clearly as the following description proceeds with reference to the accompanying drawings illustrating typical embodiments of the invention. In the drawings:

FIGURE 1 is a diagrammatical section taken across the engine axis, the upper or front cover thereof being removed to show the rotor inside the stator;

FIGURE 2 is a view taken from the inner side of the upper or front cover to show the combustion chamber as well as the packing elements;

FIGURE 3 is a detail view showing on a larger scale the packing disposed between the working chambers;

FIGURE 4 is a fragmentary section taken upon the line IV—IV of FIG. 3 to show the sealing between the stator and rotor;

FIGURE 5 is a fragmentary section taken upon the line V—V of FIG. 1;

FIGURE 6 is a view similar to FIG. 1 but showing an alternate embodiment of the packing;

FIGURES 7 and 8 are views similar to FIGS. 3 and 4 which correspond to the embodiment of FIG. 6;

FIGURE 9 is a view similar to FIG. 2 but showing another form of embodiment of the polygonal sealing device;

FIGURE 10 is a section taken upon the line X—X of FIG. 9;

FIGURE 11 is a detail view showing on a larger scale the sealing device between two working chambers corresponding to the modified embodiment of FIG. 9, and

FIGURE 12 is a section taken upon the line XII—XII of FIG. 11.

According to this invention, a rotary engine of the aforesaid lobar type is sealed against gas and liquid leakages by providing fixed partioning means inserted in the stationary or non-rotating cases, that is, in the stator and in the side covers. These partitioning means are constructed according to three main types:

(1) Radial partitioning means disposed between the adjacent working chambers.

In this case, the partitioning means consist of strips or sections housed in suitable recesses formed in the stator at the junctions of adjacent lobes. These strips bear resiliently on the rotor along one generatrix.

(2) Polygonal lateral partitioning means carried by the lateral walls or covers.

They consist of straight or arcuate strips or sections inserted in grooves interconnected to form a polygon of which the sides are so designed that they are not uncovered by the rotor during its rotation, and that on the other hand these partitioning strips or sections be located as close as possible to the combustion chambers.

According to a specific form of embodiment, members for interconnecting the strips are provided with a view to avoid leakages from one chamber to another externally of the polygon, or to permit the sealing relative engagement between the radial and lateral strips.

(3) Circular lateral partitioning means disposed inside the polygonal partitioning strips which are also housed in the lateral flanges or covers and are intended more particularly to avoid oil leakages.

In the exemplary form of embodiment of a rotary engine which is illustrated in FIGS. 1 to 4 of the drawings, the reference numeral **1** designates the stator, **2** is the rotor and **3** the radial sealing strips fitted in grooves **4** formed in the stator. FIG. 2 illustrates the lateral cover **5** in which the combustion chambers **6** containing the inlet and exhaust valves **7**, **8** and the spark plug **9** are disposed.

This cover as well as the opposite cover is forged with grooves **10** constituting together a polygon of which the vertices register with the strips **3**, the sides of the polygon being either straight (FIG. 6) or curved (FIG. 2), and their design such that they cannot be uncovered by the rotor while being located as close as possible to the combustion chambers.

These grooves **10** open at their vertices into cavities **11** also formed in the covers.

On the other hand, these covers are also provided with circular grooves **12** receiving the oil sealing device which may be of any suitable type.

Thus, as shown in FIGS. 3 and 4, the radial strips **3** inserted in grooves **4** are urged by corrugated leaf springs **13** for resilient engagement with the suitable rotor contour so as to prevent the gases from communicating from one working chamber **14** to an adjacent chamber.

To seal the chambers against gas leakages to and from the central portion in which the eccentric is mounted, adequate sections **15** are inserted in the grooves **10** and urged by springs **16** (FIG. 5).

The lateral fluid-tightness in the engine is obtained by causing the ends of two adjacent sections to engage the slides of a blade 17 housed in a recess 11, the outer face of this blade being also engaged by the end of strip 3. Furthermore, these blades are pressed by springs 18 (FIG. 4).

Preferably, each recess 11 is of slot configuration and formed in a plug 19 secured on the cover, and force-fitted in a circular cavity 20. By removing this plug, it is possible to have access to the strips 3 for inspection or replacement.

FIGS. 6 to 8 illustrate a modified embodiment wherein the polygonal sealing strips 21 are straight and the lateral sealing device is disposed differently.

In this alternate embodiment, as shown notably in FIGS. 7 and 8, the strips 3 engage directly with their end faces the inner faces of the covers (FIG. 8) with the minimum operative clearance, but they are engaged in turn by small laminae 22 resiliently pressed against the side faces of the rotor by springs 23 reacting against washers 24 housed in blind holes 25. As in the preceding case the ends of the sealing strips 21 engage the laminae 22.

Finally, according to another modified embodiment illustrated in FIGS. 9 to 12, the polygonal grooves, instead of leading into the recess receiving the strips 17 or 22, are extended outwardly and open externally of the case in order to facilitate the machining thereof and permit the use of circular tools of relatively large diameter. Thus, as shown, the grooves 30 intersect one another as at 32 and the inoperative portions thereof are sealed by plugs 34. This arrangement is also advantageous in that connecting members can be dispensed with.

Housed in the grooves 30 are strips 31 urged by corrugated spring blades 35 disposed in the bottom of the relevant grooves. These sealing strips 31 of polygonal configuration are assembled at their ends but a small gap 37 is left therebetween for thermal expansion.

The intersections of these polygonal grooves are coincident with the radial grooves 4 of the stator and the corresponding strips 3 fitted therein constantly engage the epicyclic contour 38 of rotor 2 throughout their length with a surface having an adequate contour.

FIGURE 12 illustrates the assembly of sealing strips as consistent with the conditions of operation of the engine.

The reference numeral 1 designates the stator, 2 is the rotor and 5 the lateral cover, 3 is one of the radial sealing strips housed in the stator 1 and engaging the epicyclic contour 38 of the rotor.

Each radial strip 3 is mounted in its groove with a moderate clearance 39 at either end. Thus, a certain leakage 40 is left between the adjacent working chambers.

On the other hand, the lateral strips 31 constantly engage one lateral face 41 of the rotor.

At their junction they permit a moderate leakage through the gap 37 which adds itself to the leakage 40.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and appended claims.

I claim:

1. Sealing device for a rotary engine of the lobar type comprising a rotor having 2N lobes and a stator provided with a chamber having $2N+1$ lobes and lateral covers closing said chamber, wherein the rotor contour is an epicycloid and the stator chamber contour an envelope curve constituting a conjugate contour of the rotor epicycloid, the rotor being eccentrically mounted within said stator for rolling interengagement of said stator and rotor lobes to form expansible and contractible fluid working chambers therebetween, said sealing device comprising lateral and radial partitioning means carried only by the stator and by fixed elements rigid with said stator, said partitioning means consisting on the one hand of radial strips disposed between the working chambers and housed in grooves formed at the junctions between adjacent stator lobes, and on the other hand of strips inserted in polygon forming grooves formed in the lateral cover of the stator chamber, the contour of said polygon forming grooves being so designed that they are constantly inside the area covered by the rotor, and being located in the stator they remain stationary during the operation of the engine and are free of any inertia force or centrifugal effect.

2. The device of claim 1, wherein said partitioning means carried by said grooves formed in said stator and in the lateral covers of the engine is urged by spring means towards the registering bearing face of the rotor to provide a sealing joint therewith.

3. The device of claim 1, wherein said partitioning means comprises further strip-like elements disposed in circular grooves formed in the lateral covers of the stator chamber, said grooves surrounding the shaft carrying the rotor and extending into said covers.

4. The device of claim 1, wherein said partitioning means comprises further at the vertices of said polygon forming grooves other strip elements pressed by spring means outward from the bottom of their recesses and engaged by the elements of said polygon forming partitioning means and also by said radial strips.

5. The device of claim 4, wherein said other strip elements are disposed end to end and constitute the extensions of said radial strips.

6. The device of claim 4, wherein said other strip elements are coincident with said radial strips but somewhat shifted in the radial direction in relation thereto in order to constitute a shoulder for said strips.

7. The device of claim 4, wherein the recesses for receiving said other strip elements consist of slots formed in a detachable plug carried by the stator.

8. The device of claim 1, wherein said polygon forming grooves extend to the outer edges of the covers, and plug means, closing inoperative portions of said grooves.

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