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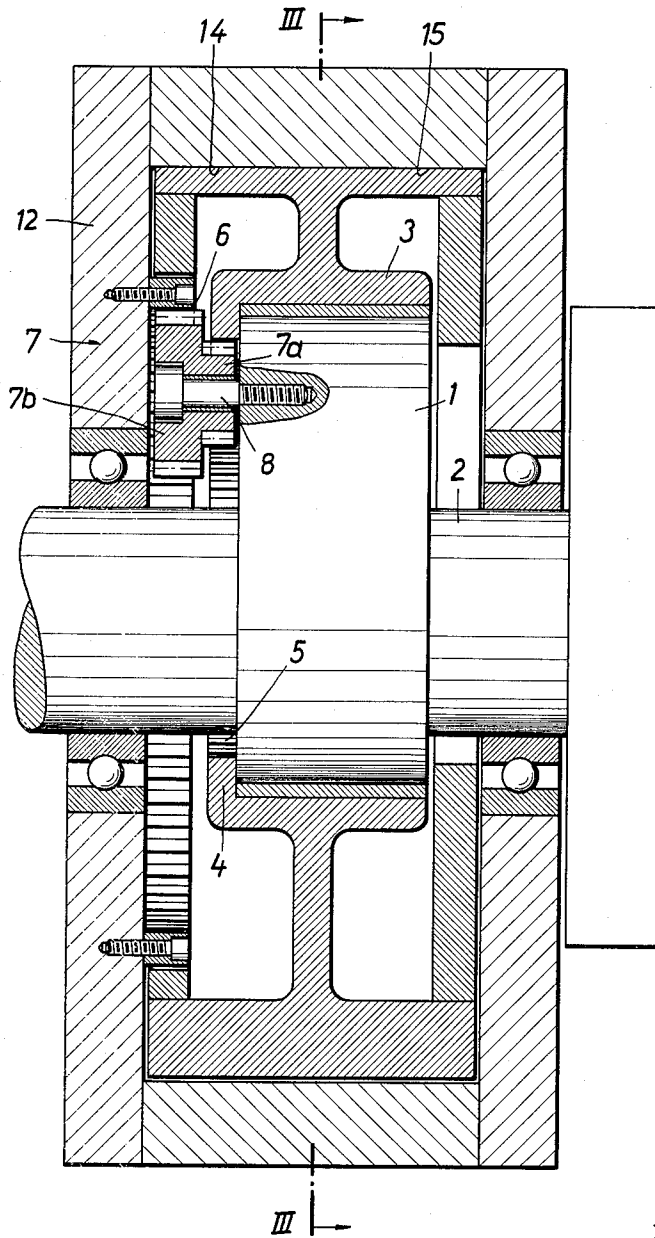
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ROTARY PISTON INTERNAL COMBUSTION ENGINE

Filed Sept. 24, 1962

3 Sheets-Sheet 1

Fig. 1



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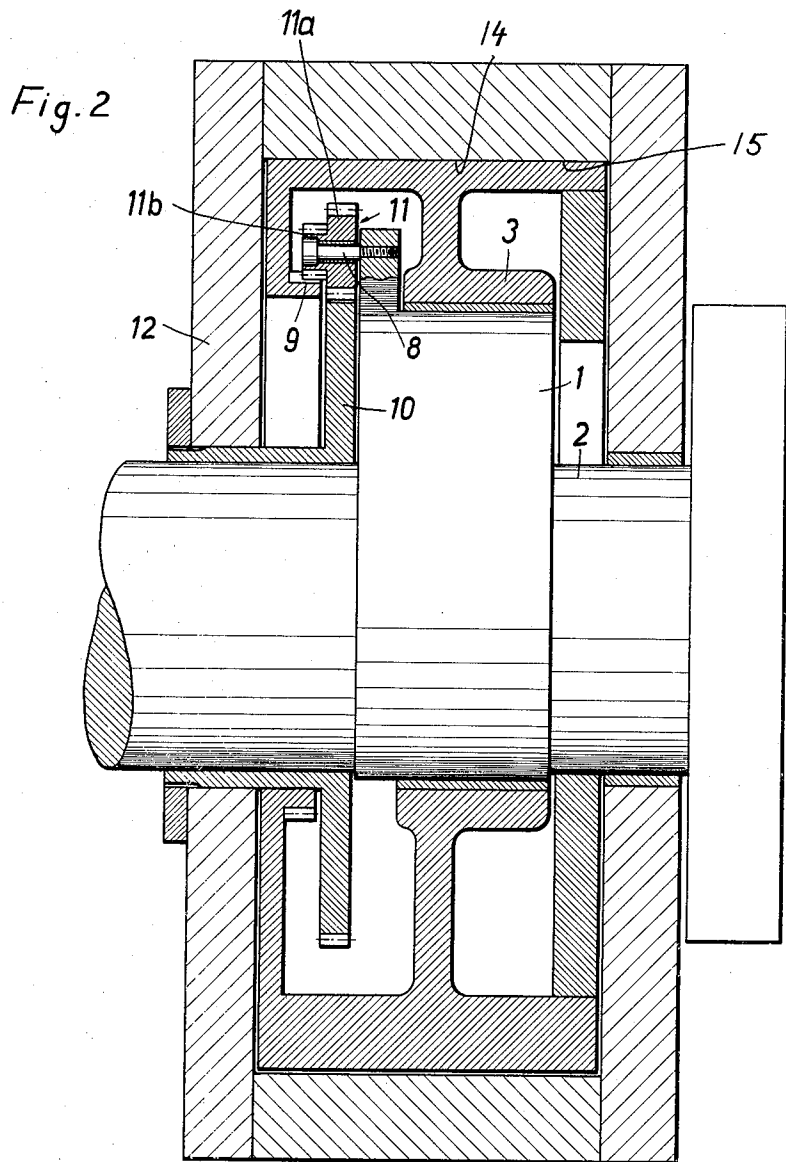
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Fig. 3

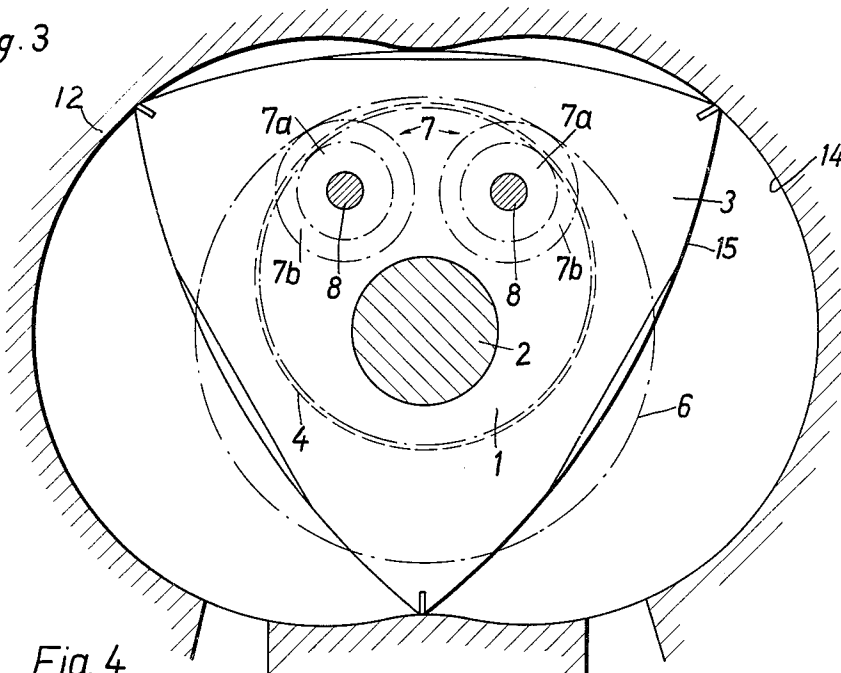
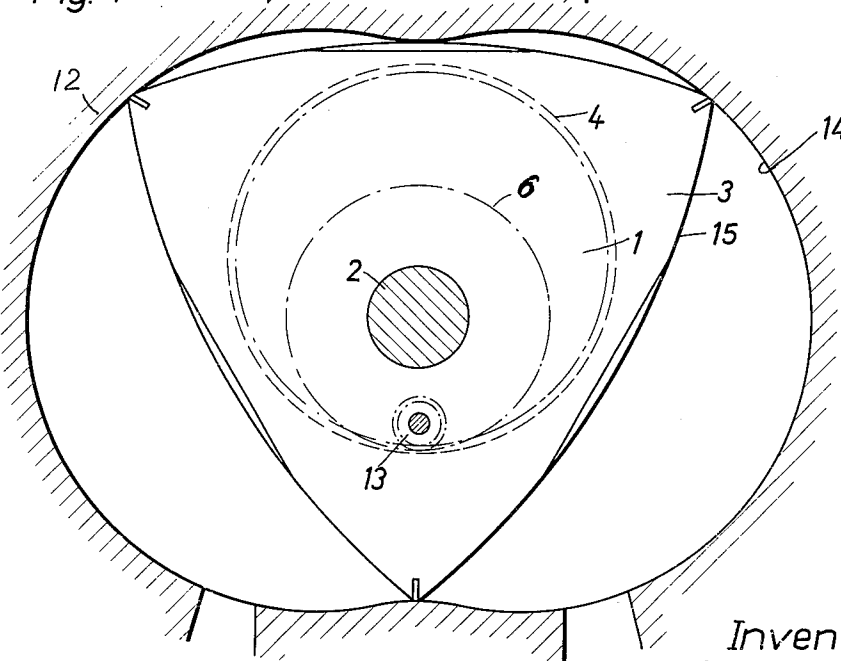


Fig. 4



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ROTARY PISTON INTERNAL COMBUSTION ENGINE

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The present invention relates to a rotary piston internal combustion engine with an engine body confining an inner rotor and together with the latter forming the working chambers, while the inner rotor is eccentrically journaled in the engine body and has its enveloping surface provided with at least two axis parallel apex edges. The rotary movement of the inner rotor on an eccentric is brought about by teeth on the inner rotor meshing with teeth on the engine body.

With heretofore known rotary piston internal combustion engines, the speed transmission between the eccentric shaft and the inner rotor is effected by a transmission which comprises a stationary gear with external teeth connected to the engine body, and also comprises a gear with inner teeth on the inner rotor which last-mentioned gear rolls on the gear with external teeth. With the heretofore known rotary piston internal combustion engines, the diameter of the gear connected to the housing is relatively small. Consequently, also the eccentric shaft which extends through the gear on the housing has a very small diameter. This construction together with the higher pressures occurring in the engine and the slight eccentricity of the eccentric shaft, brings about a very high specific load on the eccentric shaft.

It is therefore an object of the present invention to provide a rotary piston internal combustion engine which will overcome the above-mentioned drawback.

It is another object of this invention to provide a rotary piston internal combustion engine of the above-mentioned type in which the diameter of the eccentric shaft may be freely selected within certain limits.

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 illustrates a longitudinal section through a first embodiment of a rotary piston internal combustion engine according to the invention;

FIG. 2 is a section similar to FIGURE 1 in which the gears with internal teeth employed in FIGURE 1 have been replaced by gears with external teeth;

FIG. 3 is a section along the line III-III of FIG. 1;

FIG. 4 is a further modification.

The internal combustion engine according to the present invention is characterized primarily in that between the teeth of the inner rotor and a stationary gear there is provided a planetary gear wheel set comprising a smaller and a larger pinion, said set being rotatable on a shaft connected to the eccentric. In this way, the diameter of the eccentric shaft may be freely selected within certain limits. This is of particular importance when it is intended to drive a rotary piston internal combustion engine operating at high compression with fuel injection because in such an instance the eccentric shaft and the bearing therefor will be subjected to still higher loads than is the case with a heretofore known rotary piston internal combustion engine equipped with a carburetor.

Referring now to the drawing in detail, and FIG. 1 thereof in particular, the arrangement shown therein comprises an eccentric 1 on an eccentric shaft 2. Journaled on the eccentric 1 is the inner rotor or rotary piston 3 of the rotary piston internal combustion engine. Connected to the internal rotor 3 is a gear 4 which may

form one piece with the internal rotor 3 and has inner teeth 5. In the housing or engine body 12 which with the rotary piston 3 forms the working chambers of the internal combustion engine there is arranged a stationary gear 6 with internal teeth. As will be evident from the drawing, the gears 4 and 6 are drivingly interconnected by means of a planetary gear set 7. The planetary gear set 7 comprises a smaller pinion 7a and a larger pinion 7b and is rotatable on a shaft 8 connected to the eccentric 1. In conformity with FIG. 1, gear 4 meshes with the pinion 7a, whereas gear 6 meshes with the pinion 7b of the planetary gear set 7.

The arrangement of FIG. 2 differs from that of FIG. 1 in that instead of the gears with internal teeth, gears with external teeth are employed. Thus, a gear 9 is connected to the inner rotor 3 while a gear 10 is fixedly connected to the engine body 12. Both gears 9 and 10 are likewise drivingly interconnected through a planetary gear set 11 with a larger pinion 11a and a smaller pinion 11b. Gear 10 meshes with pinion 11a, whereas gear 9 meshes with pinion 11b.

As will be evident from FIGS. 1 and 2, the diameter of the entire engine can be kept small due to the arrangement of the planetary gear sets adjacent the eccentric 1 within the range of the largest radial extension of the eccentric from the central longitudinal axis of the eccentric shaft. When an eccentric is employed which, when viewing the entire circumference of the eccentric shaft, protrudes beyond the diameter of the eccentric shaft, a plurality of planetary gear sets may be connected to the eccentric. The eccentric may, as far as its radial extension is concerned, be so dimensioned that also within the range of the smallest radial extension of the eccentric from the central longitudinal axis of the eccentric, a planetary gear set may be provided.

FIG. 3 shows the arrangement of a plurality of planetary gear sets 7 on the wide portion of the eccentric. FIG. 4 shows that also within the range of the smallest radial extension of the eccentric from the longitudinal central axis of the eccentric, a planetary gear set 13 may be provided.

In addition to the different arrangements of the planetary gear sets, FIGS. 3 and 4 also show that the illustrated rotary piston internal combustion engine is of a type in which the inner rotor 3 is designed in conformity with the inner enveloping curve 14 of the epitrochoid. This inner enveloping curve 14 forms the inner confining surface of the engine body 12. The inner enveloping surface 14 of the engine body 12 and the enveloping surface 15 of the inner rotor 3 confine the working chambers of the engine.

The rotary piston internal combustion engine as illustrated in the drawing is of the type in which the inner rotor is designed in conformity with the inner enveloping curve of an epitrochoid. As starting curve, there may be selected a two-arched epitrochoid. This forms the inner confining surface of the engine body. Between the inner confining surface of the engine body and the enveloping surface of the inner rotary there are formed the working chambers of the engine.

The invention is highly advantageous particularly with all rotary piston internal combustion engines in which, due to the kinematic conditions inherent thereto, the gear through which the eccentric shaft extends, will have a small diameter when said gear is in direct connection with the teeth of the inner rotor.

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

What I claim is:

1. A rotary piston internal combustion engine which

comprises: a first engine member forming an outer engine body, a rotatable shaft journaled in said first engine member and having an eccentric thereon, a second engine member eccentrically arranged within said first engine member and rotatably journaled on said eccentric, said second engine member being rotatable relative to said first engine member while confining working chambers therewith, first internal gear means connected to the outside of said second engine member, second internal gear means stationarily arranged on said first engine member in coaxial relationship to said shaft, said second gear means having a larger pitch diameter than said first gear means, compound planet pinion means comprising a first pinion portion and a second pinion portion firmly connected to each other, said first pinion portion being smaller than said second pinion portion and meshing with said first gear means while said second pinion portion meshes with said second gear means, and stud means fixedly connected to one end of said eccentric and rotatably supporting said compound planet pinion means.

2. A rotary piston machine, especially an internal combustion engine which comprises; a housing member having a cavity therein which in cross-section is a multi-arched surface in the form of a epitrochoid, end wall portions fixed to said housing and closing said cavity at the ends, a shaft extending through said cavity and journaled on said end wall portions, an eccentric within said cavity fixed to said shaft and projecting radially from said shaft at all points, a multi-cornered piston journaled on said eccentric and slidably engaging the said surface of the cavity, a ring gear fixed to the inside of one of said end wall portions within the cavity and concentric with said shaft, an internal gear portion fixed on said piston, and a compound planet pinion rotatably mounted on one side of said eccentric and having one portion meshing with said ring gear and another portion meshing with said internal gear.

3. A rotary piston machine according to claim 2, in which said ring gear, said internal gear and said compound planet pinion are in their entirety located within the confines of said piston, a ring gear fixed to the inside of one of said wall portions within the cavity and concentric with said shaft, an internal gear carried by the piston, and compound planet pinion means mounted

rotatably on one end face of said eccentric and meshing with said ring gear and said internal gear, said compound planet pinion means comprising a plurality of compound planet pinions spaced circumferentially of said eccentric and each comprising one portion meshing with said ring gear and another portion meshing with said internal gear.

4. A rotary piston machine according to claim 2, in which said compound planet pinion is receivable within the radial confines of that portion of said eccentric which extends the smallest distance outwardly from said shaft.

5. A rotary piston machine, especially an internal combustion engine which comprises; a housing member having a cavity therein which in cross-section is a multi-arched surface in the form of a epitrochoid, end wall portions fixed to said housing and closing said cavity at the ends, a shaft extending through said cavity and journaled on said end wall portions, an eccentric within said cavity fixed to said shaft and projecting radially from said shaft at all points, a multi-cornered piston journaled on said eccentric and slidably engaging the said surface of the cavity, a ring gear fixed to the inside of one of said wall portions within the cavity and concentric with said shaft, an internal gear carried by the piston, and compound planet pinion means mounted rotatably on one end face of said eccentric and meshing with said ring gear and said internal gear, said compound planet pinion means comprising a plurality of compound planet pinions spaced circumferentially of said eccentric and each comprising one portion meshing with said ring gear and another portion meshing with said internal gear.

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