Dec. 26, 1967 KENICHI YAMAMOTO 3,360,191

ROTARY PISTON AND HOUSING THEREOF

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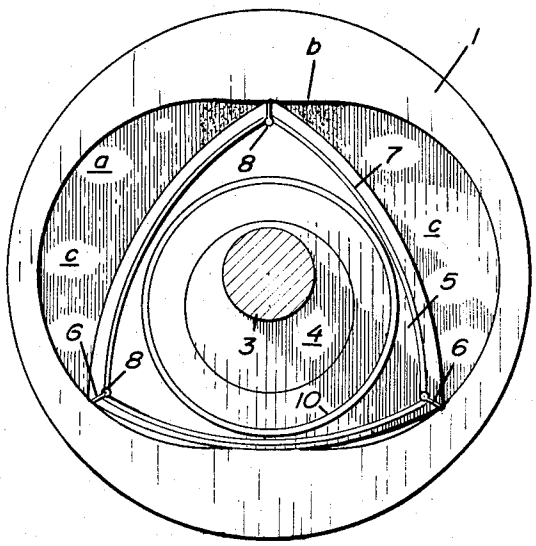


Fig. 2

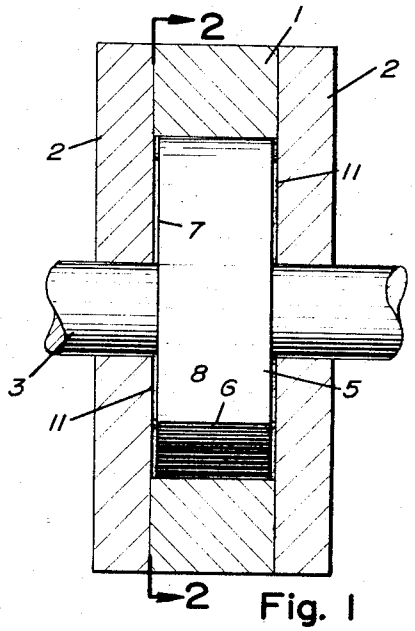


Fig. 1

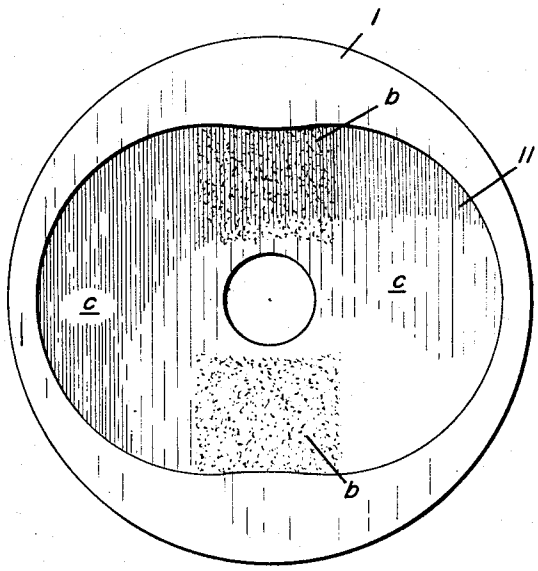


Fig. 3

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ROTARY PISTON AND HOUSING THEREOF

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ABSTRACT OF THE DISCLOSURE

A rotary piston, internal combustion engine having side wall inner faces provided with partially differentiated wear-resistivity for permitting frictional running of the sealing members of the rotary piston on the side wall inner faces with the continuous successions and the closer paths, due to the planetary motion of the piston, without uneven wear on the said side wall inner faces.

The present invention relates to a rotary piston internal combustion engine and more particularity to a combination of an eccentrically rotating rotor and a wear-resistant housing therefor.

A rotary piston internal combustion engine generally consists of a polygonally shaped rotor eccentrically rotatably mounted within a combustion chamber defined by an annular center casing having a trochoidal-shaped internal peripheral wall and side walls having flat internal surfaces. Said rotor is provided at each apex and the opposite flat end faces thereof with wear-resistant sealing members forming fluid tight seals between the rotor and the internal surface of the housing, so that the rotor can effect strokes accomplishing intake and compression of the fuel gases and exhaust of the products of the combustion by eccentric rotation of the rotor. This disadvantage of this type of engine is that the paths along which the various sealing members on the opposite ends of the rotor move in fluid tight contact with the inner surfaces of the side walls, are quite restricted and rapid localized frictional wear on the inner faces of the side walls is caused which results in early deterioration of the engine performance.

It is an object of the present invention to overcome this disadvantage by providing an improved combination of a rotor and housing.

Other and further objects of the invention will become apparent from the following specification and claims, taken together with the accompanying drawing, in which:

FIG. 1 is a longitudinal sectional view of a rotary piston engine according to the present invention;

FIG. 2 is a sectional view taken on the line **2—2** of FIG. 1; and

FIG. 3 is an elevation view similar to FIG. 2 showing the housing with other elements omitted for the sake of clearness.

An elliptically shaped combustion chamber *a* is defined by an annular center casing **1** having a trochoidal-shaped internal peripheral wall, and side walls **2** closing the opposite ends of the annular casing. Extending through the center of the combustion chamber *a* is a crankshaft **3** which is rotatably mounted within a center bore of the side walls. Integral with the crankshaft **3** and positioned within the combustion chamber is an eccentric portion **4**. Positioned within the chamber *a* is a triangular rotary piston **5** having an axial central bore within which the eccentric portion **4** of the crankshaft **3** is rotatably positioned. Each apex of the rotary piston has an apex seal **6** mounted in an axial groove at the apex, each seal forming a seal between the rotary piston and the annular casing during the rotation of the rotary piston.

Provided on the opposite end faces of the rotary piston adjacent the peripheral side edge and extending between each pair of apexes are side sealing members **7** which form seals between the rotary piston and the internal faces of the side walls. At each corner adjacent the apex on the end faces of the rotary piston **5** where the axial ends of the apex seals **6** and the ends of the side sealing members **7** meet, are positioned corner seals **8**, whereby the ends of the apex seals **6** and the side sealing members **7** are fluid tightly connected so as to produce the sealing effect. Provided on the flat end faces of the rotary piston adjacent the axial central bore and surrounding the bore is an oil seal ring **10** which also forms a seal between the rotary piston and the inner faces of the side walls in order to prevent the lubricant and other fluid material from leaking from around the shaft **3**.

Each side wall **2** is provided with a wear-resistant inner surface **11** which consists of a highly resistant area *b* which occupies a zone corresponding with the shorter radius portion of the elliptical combustion chamber *a*, and a normally resistant area *c* which occupies a zone corresponding to the longer radius portion of the chamber. These areas are shown clearly in FIG. 3. The wear-resistant inner surface **11** can be formed in various ways and various wear-resistant materials can be employed. If a carbon steel with an appropriately adjusted amount of carbon is employed as the side wall **2**, treatment of the inner surface thereof can be carried out by spraying molybdenum upon the hereinbefore described area *b*. In this case, the inner surface of the carbon steel side wall with the appropriately adjusted amount of carbon will act as the normal wear-resistant surface area *c*.

Intake and exhaust ports and a spark plug (not shown) will be appropriately located around the housing formed by the center casing and side walls.

During the operation of the engine, the rotary piston **5** rotates eccentrically along the elliptically and trochoidally shaped internal face of the annular casing **1** in fluid tight sealing relationship with the internal face of the annular casing and the side walls by the action of the sealing members **6**, **7**, **8** and **10**, which is a cause of uneven frictional wear on the inner surface of the side walls. The eccentric rotation of the rotary piston is performed with the center at the shaft **3**, and by the effect of the strokes accomplishing intake, compression and combustion of the fuel gases and exhausting of the product of the combustion.

Due to the eccentric rotation of the triangular rotary piston and the elliptically and trochoidally shaped internal surface of the casing **1**, as shown in FIG. 2, the longer radius area *c* of the inner face of the side wall **11** is exposed to the relatively limited and periodic frictional contact due to the sealing members sliding thereon, but the shorter radius area *b* is subject to continuous successions of frictional contact substantially without any break, and in addition, the paths along which the various sealing members slide are considerably closer to each other in these areas. Local frictional wear in the shorter radius area *b* due to this type of frictional contact is a difficult problem in this type of engine, but according to the present invention, abnormally rapid increasing of the frictional wear at the shorter radius areas *b* is prevented by the localized highly resistant surface in the areas *b*, and the durability of the engine is considerably improved.

I claim:

1. In a rotary piston internal combustion engine, the combination comprising an annular center casing having

an elliptically and trochoidally shaped internal peripheral wall defining the periphery of an elliptically shaped working chamber, side walls closing the opposite ends of said annular casing, each of said side walls having a main bearing bore opening through the center thereof, a crankshaft rotatably mounted in said main bearing bores, a triangular rotary piston having flat end faces at the opposite ends thereof and eccentrically, rotatably mounted on said crankshaft within said working chamber, sealing members fixed on the opposite flat end faces of the piston and at the apexes thereof for sealingly engaging said internal peripheral wall and said side walls and defining working chambers between the piston and the casing and side walls during the rotation of the piston, and said side walls each having the entire area thereof having at least the surface of reinforcing material, and further having portions thereof coated with additional reinforcing material in the regions where the paths of said sealing members come into close proximity with each other, so that said sealing member can trace said close paths on said side walls, during the rotation of the piston, without uneven wear thereon.

2. The combination as claimed in claim 1, wherein said side wall inner faces have said additional reinforcing material in the area corresponding to the shorter radius portion of said elliptically shaped working chamber.

3. The combination as claimed in claim 1, wherein said additional reinforcing material consists of molybdenum.

4. The combination as claimed in claim 1, wherein said reinforcing material consists of carbon steel.

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