United States Patent

Lotesto

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[54] **TWO STROKE ROTARY COMBUSTION ENGINE**

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[51] **Int. Cl.**.....**F02b 53/00**

[58] **Field of Search**.....123/43 A, 44 B, 43 C, 44 A, 123/44 B, 44 C, 45; 418/49-53, 68, 164

[56] **References Cited**

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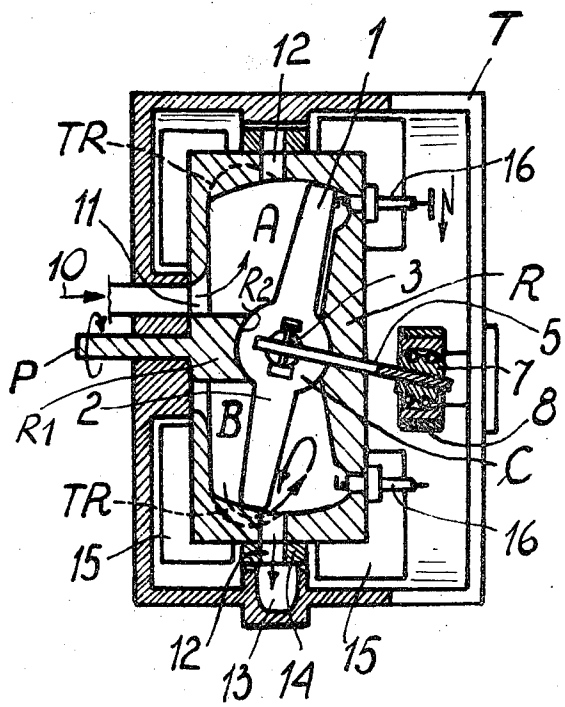
[57] **ABSTRACT**

A two stroke rotary combustion engine comprising a rotor rotably supported in a frame and having a cavity divided by an intermediate internal wall into two compartments at opposite parts, said internal wall having a through seat which rotatably houses intermediate portions of a plate like piston element having wing like portions which divide each part into, a front combustion chamber with ignition means and feeding and exhaust ducts, and a rear part.

3 Claims, 4 Drawing Figures



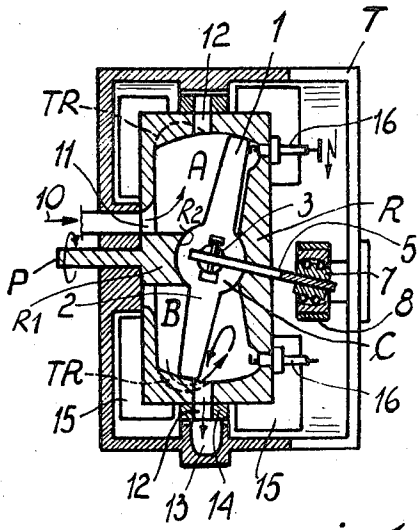


Fig. 1

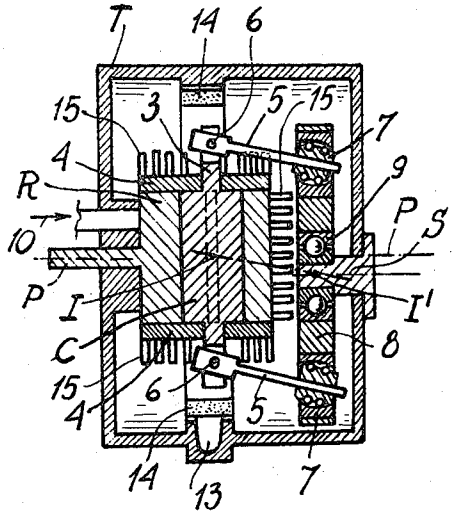


Fig. 2

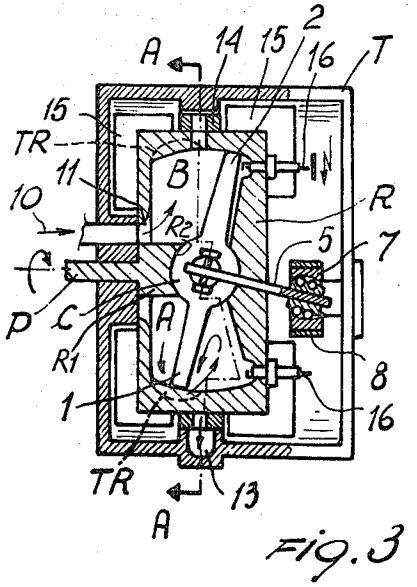


Fig. 3

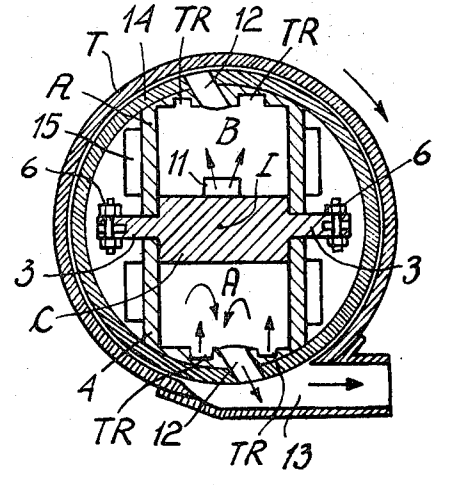


Fig. 4

TWO STROKE ROTARY COMBUSTION ENGINE

BACKGROUND OF THE INVENTION

The present invention relates to a two-stroke rotary combustion engine.

A rotary combustion engine is known, constructed by Cecil Hughes of Southampton, Great Britain and published in the automobile magazine "Sette Strade," No. 79 of Nov. 1961, Italy

This known rotary engine is of complex and costly construction, in that the pistons and the chambers in which the pistons move, have a toroidal shape.

The object of the present invention is to conceive a two-stroke rotary combustion engine, of simplified construction, of efficient and secure operation, of reduced dimensions and economically suitable.

SUMMARY OF THE INVENTION

These and other objects which will appear from the description that follows are achieved according to the invention by a two-stroke combustion engine characterized by the fact that it comprises a frame, a rotor rotably supported by said frame about a main axis, said rotor having a cavity, an intermediate internal wall dividing said cavity into two compartments situated at opposite parts of said main axis, a through seat provided in said intermediate wall, a plate-like piston element having one of its intermediate portions rotably housed in said seat about a second axis transverse to said main axis, said plate-like piston element having further wing portions extending radially from said intermediate portion, through all the cavity of said compartments, to divide in this way each of said parts into a front part defining the combustion chamber and a rear part, guide means suitable to guide in oscillation said plate-like piston element about a second axis, while said rotor rotates together with said plate-like piston element about said main axis, ignition means opening in said combustion chamber and feeding and exhaust ducts for said combustion chambers.

BRIEF DESCRIPTION OF THE DRAWING

A preferred embodiment of the invention will now be described by way of illustrative and not limiting examples, with reference to the accompanying schematic drawing, in which:

FIG. 1 shows an example of an embodiment of the rotary engine in an axial section,

FIG. 2 shows the same section with the engine rotated through 90°,

FIG. 3 shows the same section of FIG. 1 with the rotor rotated through 180°,

FIG. 4 is a section according to A—A of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENT

With reference to the drawing, the motor comprises a frame T of a casing form, in which the rotor R is housed rotably about the axis of the engine shaft P rigid to the rotor R. The rotor has a substantially parallelepiped shape, with the exception of two opposite walls having an arcuated shape matching with the cylinder shutter **14**, better described here in the following. The rotor R has internally a cavity divided by a central wall R1 into two compartments A and B. The central wall R1 has a through seat R2, to rotably house

therein the intermediate portion C of a plate like piston element, having wing like elements **1** and **2** respectively, extending radially from the central portion C. The cylindrical shape of the central portion C matches with the cylindrical seat R2 in such a way to separate by seal the compartment A from the compartment B. The plate like piston element is rotably supported through pins **3** (FIG. **4**) in suitable housings provided in the lateral walls **4** of the rotor R, defining in such a way an oscillation axis of the plate like piston element, perpendicularly extending to the motor shaft P. The seats which house the pins **3** can be in the form of bearings of known type. At the ends of the pins **3** rods **5** are articulated at **6**, whose free ends are guided in the spheroid bearings **7**, born by a rotating element **8**, rotatably supported by bearings **9** on the pin S, supported in the casing T. The axis of rotation defined by the bearings **9** is parallel to the main axis of the engine shaft P, but arranged on an excentric axis with respect to this latter axis.

From the foregoing it can be seen that when the rotor R rotates it also pulls in rotation the plate like piston element **1**, **2** which pulls in rotation the transmission rods **5** which in turn pull in rotation the rotating element **8**. During this rotation the guide connection between the rods **5** and the spheroid bearings **7** produces an oscillation of the plate like piston elements **1**, **2** about the axis defined by the pins **3**, so that the piston element completes oscillating head movements at the inside of the cavity of the rotor R. The wing piston element defines therefore a combustion chamber of a volume, variable, depending upon the oscillations of the element **1**, **2**.

For the feeding of the combustion mixture there is provided in the frame T a duct **10** while in the corresponding wall of the rotor, are provided circular ports **11** through which there can enter the mixture into the suction chamber situated at the part opposite to the combustion chamber, in relation to the plate like piston element. To allow the passage of the combustible mixture from the suction chambers into the combustion chambers, are provided some transfer grooves TR. For the discharge of the combustible gases there are provided in the rotor ports **12** and in the casing T, a discharge duct **13**. In the combustion chambers spark plugs **16** are provided. Fins **15** serve for the dissipation of heat. The operating of the rotary engine described is as follows: in FIG. **1**, the piston blade or wing **1** is in the dead upper point position while the piston blade or wing **2** is in the lower dead point position. The suction chamber has had a maximum expansion and has sucked the combustible mixture, while the combustion chamber has been compressed to reach its minimum volume. With regard to the blade piston **2** the combustion chamber has had the maximum expansion and has opened the discharge ports **12**, so that the combustion gases discharge, while at the same time, through the transfer groove TR, the combustible mixture passes from the suction chamber B to the combustion chamber of the piston blade **2** which makes the combustion gases discharge and at the same time fills the combustion chamber. In the position of FIG. **1**, the ignition phase has already occurred, with the usual preignition, so that the combustion of the combustible mixture transmits with its pressure a driving force to

the piston plate 1 and to the rotor R with the intervention of the guide kinematism of the oscillating motion of the plate pistons. After a rotation of 90° the different elements assume the position of FIG. 2. The body 8 pulled by the transmission rods 5, is passed from the horizontal position to a vertical position and in turn, acting by means of the transmission rods 5, has begun half an oscillation by the pin 3 so that the blade piston 1, shown by dotted lines in FIG. 2 is at half of its path. The blade pistons 1 and 2 although carrying out an oscillation with consequent relative sliding with respect to the rotor, simply complete, with respect to the frame T, a rotation at an axis different from that of the shaft P and that is the axis I and I' (FIG. 2).

After a rotation of 180° in the position illustrated in FIG. 1, the different elements arrive at the position illustrated in FIG. 3, in which with respect to FIG. 1, the blade piston 1 has assumed the preceding position occupied by the blade piston 2 and viceversa.

FIG. 4 shows the cylindrical shutter 14, rigid with the rotor R, which occludes the discharge groove as soon as the discharge rotatable port 12 has concealed it in a way to avoid the return of gas or of sound waves. The discharge groove 13 can be dimensioned in a way to allow a correct distribution.

The invention, is intended not to be limited by the embodiment described. Thus for example it is possible to provide the discharge port on a lateral wall 4 of the rotor, which by means of a short duct can communicate with the distribution duct which already has the feed duct. It is also possible to provide a second disc similar to that in which the feed duct 10 is provided, situated at the opposite part with respect to the rotor in order to dispose the discharge towards said disc. Obviously these variations must be in harmony with the guide kinematism of the oscillation. Also the kinematism illustrated in the embodiment can be modified, for example by directly connecting with mechanical transmission means the points I and I' providing a seat in the central part C of the blade piston and suitably opening the rotor wall.

From the foregoing, it will appear clear to an expert in the field that the motor described could be used also as a motor powered by fluid under pressure or it could be used also as an intake or compressor of fluid carried in rotation by an external motor.

As can be seen from the foregoing, this invention has the object to simplify the general structure and perfecting the distribution diagram of the engine of the English inventor Cecil Huges, which besides its extreme complex production (comprising even a compressor) and precariousness of operation, has chambers which were conceived so as cyclically to vary the volume while maintaining a low sliding velocity, and there is an absence of variations of velocity or inversions of movement in every engine element. Therefore this invention does not consist in the way with which the masses move, given that this merit is attributed to Hughes, but in succeeding to move in a particular way the masses of a volumetric system completely different, in its design and for the different distribution which also allows a correct phasing without requiring an uneconomic compressor; furthermore this invention has a kinematism absolutely new due to it being conceived suitably to resolve the problem originating from the necessity of impressing that particular movement to a completely different structure. However, the real essence of this invention consists in the conceiving of the main practical effects, which was to follow a circular orbit which is the center of gravity of each single piston.

From the preceding it can be seen that the two stroke rotary engine consists of two rotating bodies, one within the other, rotating in the same direction and at the same speed, but about axes which even if starting from the same point form between them an angle, in a way that the two bodies placed one on the one and one on the other axis have a relative cyclic movement at each turn.

In Hughes's engine the internal bodies were different and not fixed rigid to each other; by the internal body, which has the shape of a drum from which two blades project not necessarily at 180° each of which has the operation of a double effect piston, with an external pendular movement used, therefore, on the one hand for the suction precompression and on the other hand, for the compression expansion phases, a circular trajectory is followed different from that of the box-like or rotor body which contains it thanks to a kinematism which is outside of the rotor and which therefore guides it from the outside; furthermore in Hughes's engine the kinematism was on the inside of the rotor; this kinematism has the object of placing the two elements in harmony: 1) the internal body or pistons assembly because of their volumetric and operational necessities can move on the inside of the rotor only about the drum axis rigid with the two pistons (FIGS. 2–4 No. 3), 2) the same internal body or assembly of the pistons must follow a circular trajectory different from that of the rotor which contains it. This object has been achieved by articulating the diverging axis at the meeting point with the engine axis which also coincides with the oscillation axis of the internal body, in a way that this latter is impressed with only a movement which can occur relatively to the internal body and is disengaged from every other. In the Hughes's engine the articulation was at the center of each piston while in this case it is at the center of rotation; this in theory, while in practice, because of the necessity of applying on the drum rigid with the pistons, suitable seal segment, it is not possible to directly connect such point or points I (FIG. 2) with the oblique axis I–I'; therefore it needs controlling a way aided by pins 3 of the drum C (FIGS. 2–4), applying on them the two shutter articulations 6 connected by means of the elements 5, the spherical articulations 7 with the lever 8 which rotates at I'; the necessary element in every two strokes to ensure the suction or inlet phases, precompression and washing which in Hughes's requires a volumetric compression, in this case is formed from one of the two faces of the same pistons. The inlet and outlet of the gases occurs through ports suitably provided on the rotor, therefore rotatable, communicating by a sufficient seal with grooves or ducts provided on the frame, arranged and dimensioned in a way to ensure the correct distribution, in Hughes's engine the distribution was not correct. This volumetric system by means of suitable modifications at the phasing of the distribution and suppression of the transfer grooves can be used as a fluid engine, the fluid coming from the outside already under pressure, or if itself is pulled in rotation by any

engine first, can be used as an impeller or compressor of fluids.

I claim:

1. A two stroke rotary combustion engine which comprises a frame, a rotor rotably supported by said frame about a main axis, said rotor having a cavity, an intermediate internal wall dividing said cavity into two compartments situated at opposite parts to said main axis, a through seat provided in said intermediate wall, a plate like piston element having one of its intermediate portions rotatably housed in said seat about a second axis transverse to said main axis, said plate like piston element having further some wing like portions extending radially from said intermediate portion to it, through all the cavity of said compartments, to divide in this way each of said parts into a front part defining a combustion chamber and a rear part, guide means suitable to guide in oscillation said plate like piston element about a second axis, while said rotor rotates together with said plate like piston element about said main axis, ignition means leading in said combustion chamber and feeding and exhaust ducts for said combustion chambers.

2. An engine as claimed in claim 1, wherein said guide means comprise transmission rods connected by articulation with said intermediate portion of the piston element, a rotatable support element supported rotatably in said frame and having an axis of rotation offset with respect to said main axis of rotation, said transmission rods being connected by a spherical articulation with said rotatable element of support.

3. An engine as claimed in claim 1, wherein said feed and discharge ducts comprise inlet and outlet ports provided in the cavity of said rotor and transfer grooves provided in the internal surfaces opposite to the rotor cavity swept by the corresponding surfaces of the piston element.

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