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(54) Improved endothermic rotary piston engine

(57) Endothermic rotary piston engine, comprising a stator (1), two rotors (2, 3), a shaft (4) on which the two rotors (2, 3) are mounted. The stator (1) has two spaced, opposed, cylinder chambers (A, B) that are misaligned and joined in a single block. Each chamber (A, B) is equipped with a turret (13, 19), the turret (13) in A being equipped with a partition bulkhead (6), the turret (19) in B being equipped with a sealing skid (2∅), pushed towards the center by springs (21, 22) and offset with respect to A. The chambers (A) and (B) are connected by a "compression tunnel" (5). Offset between the turrets (13, 19) is affected by the tunnel (5) and by the center of rotation; an inlet pipe (26) and an exhaust pipe (36) complete the stator (1).

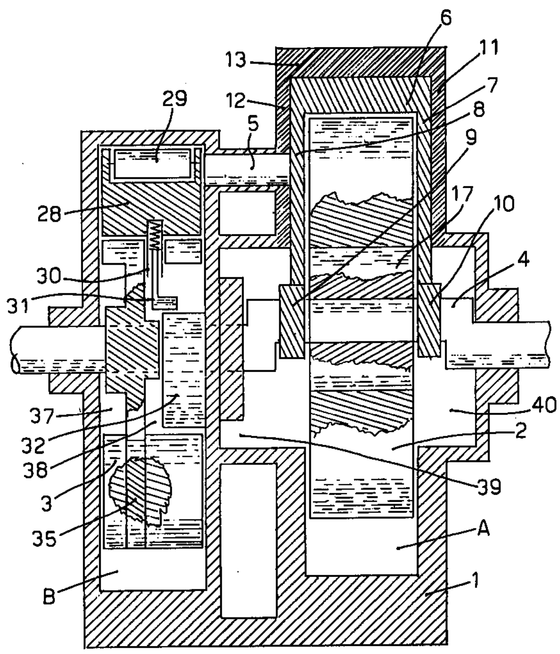

FIG. 1

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Description

BACKGROUND OF THE INVENTION

This invention refers to an improved endothermic rotary piston engine.

The present Applicant is the holder of the prior Italian Patent No. 1,187,953, issued December 23, 1987 and likewise relating to an endothermic rotary piston engine.

The present application relates to improvements and modifications in the general structural arrangement of the engine described in this prior patent, suitable to make it more functional and simple and to increase its efficiency.

SUMMARY OF THE INVENTION

The main features of this invention are listed in the characterizing part of the appended Claims.

The subject engine will now be described in detail with particular reference to the attached drawings, provided as a non-limiting example and schematically showing the novel concepts of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic longitudinal section through the engine according the invention, with the chambers shown "on the same axis" instead of being offset, as it happens in practice, for clarity reasons;
Fig. 2 is a vertical section of the compressor rotor;
Fig. 3 is a vertical section of the drive rotor;
Fig. 4 shows the collar matching compressor rotor to crank;
Fig. 5 shows the bulkhead and the desmodromic actuating device thereof;
Figs. 6a and 6b show the skid and the desmodromic actuating device thereof, similar to the part in Fig. 5.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

As it clearly appears from the Figures, the engine of the present invention comprises three parts: a stator 1, or fixed part, two rotors or rotary pistons 2 and 3, and a shaft 4 crossing the stator 1, on which shaft the two rotors 2 and 3 are mounted.

The stator 1 has two mutually spaced cylinder chambers, A and B, with opposed bottoms, said chambers being misaligned and integrally joined in a single block.

Each chamber is equipped with a turret 13, 19 forming a single body with the stator 1 and being adapted to house two different members: the turret 13 in chamber A housing a special bulkhead 6, sliding into a suitable groove 11, 12, and operating as a partition; the turret 19 in chamber B housing a sealing skid 2Ø, pushed towards the recess center by springs 21, 22. The turret 19 in chamber B is clockwise-offset with respect to chamber A, to establish the direction of engine rotation.

Next to the turrets 13, 19, but on opposite sides, two perfectly aligned holes of the same size are obtained on the bottoms of chambers A and B, said holes being connected by a tunnel 5 that makes said chambers intercommunicate; this tunnel 5 is the so-called "compression tunnel".

The hole through which the shaft 4 moves corresponds to the center of chamber A but not to the center of chamber B, that therefore is offset with respect to the first one. Obviously, the center of rotation for the shaft is common. The offset angle between the two turrets 13, 19, is affected by two basic elements: the compression tunnel 5 and the center of rotation.

The stator 1 is completed by the intake pipe 16 and the exhaust pipe 36, whose mouths are parts of the block.

The rotors 2 and 3 are box-shaped cylinder bodies, having a diameter which is less than that of the respective chambers, and being adapted to rotate inside them. A rotor 2 operates as compressor in chamber A, the other one 3 operates as driving member in chamber B. The latter rotor has a core inside, in 35, to allow both the securing thereof to the shaft 4 and the arrangement of other members which will be described below.

The shaft 4 consists, for the half of its lenghth, of a crank next to chamber A, and, for the other half, of the power takeoff next to chamber B.

The compressor rotor 2 idly rotates on the crank 4, to which it is matched by a suitable, double-shell collar 17, performing in addition to a rotary motion on the axis thereof, an orbital motion inside chamber A, constantly keeping a tangent point between its edge and the edge of the chamber itself. It follows that, while the crankshaft 4 rotates in a direction, the rotor 2 rotates in the opposite one.

The drive rotor 3, instead, is fitted on the shaft 4 and rotates eccentrically with respect to the chamber cavity, so as to make its edge contact with the skid 2Ø of the turret 8, said skid having a sealing function.

In the drive rotor 3, a skid 28 reciprocatingly slides into a suitable groove, said skid being preferably provided with a roller 29, whose function is to remain constantly in contact with the edge to make the volume of chamber B, where it operates, vary according to rotation. Thus, while on one side the expansion stage occurs, on the other side there occurs the ejection stage for exhaust gases burnt during the previous stage. The reciprocating motion of the skid 28, combined with the rotary one, is obtained through a telescopic rod 3Ø, driven by a circular cam 32 fixed to the stator 1 and operating also as support for the shaft 4. The resilient connection to the cam 32 and the particular roundness of the skid 28 are provided to compensate for the different angle of incidence occurring during rotation.

The drive rotor 3 also includes, formed in a peripheral recess, the explosion chamber 25. This is equipped with an intake hole 26 that is overlapped, at a given time, with the outlet hole 27 of the compression tunnel 5 from which it takes the compressed mixture for the explosion.

Both rotors are equipped with lateral sealing members.

Volume variability in chamber A is obtained through the bulkhead 6 mentioned above, whose reciprocating motion is desmodromically guaranteed by two oscillating boxes 9, 1Ø, one on each rotor side, actuated by the crank 4. The bulkhead 6, equipped with a skid 14 that, through a spring 15, continuously presses on the edge of rotor 3, divides chamber A, together with the orbital motion, into two parts, allowing on one side to generate vacuum and therefore suction of the explosive mixture, and on the other side to generate compression of the mixture sucked during the previous stage. The resilient connection, through the spring 15, is due to the need for compensating for the different angular incidence of the bulkhead with respect to the rotor during rotation.

In the stator 1, two rotors rotate: one indicated with 2 in chamber A and one indicated with 3 in chamber B. The first one, idly rotating on the crank of the shaft 4, carries out an orbital motion inside the chamber, sucking through the intake pipe 16 the explosive mixture and compressing the one sucked during the previous stage, that, through the hole 18, is sent to the compression tunnel 5. Division between sucking part and pressing part is obtained through the bulkhead 6, equipped with the sealing skid 14 and desmodromically actuated through the connection rods 7 and 8 of the oscillating boxes 9 and 1Ø.

Opening and closing of the compression tunnel 5 are effected automatically by rotation of the rotors, namely the inlet normally remains open except when the mixture is transferred into the explosion chamber 25, whereas the outlet normally remains closed except for the above-mentioned event.

The drive rotor 3 is supplied with compressed mixture through the intake hole 26, and after that, by means of the spark plug 24, the explosion occurs and generates the movement thereof in the same rotary direction as the compressor rotor 2. At the same time, while gases expand, generating the motive power, the skid 28 will eject, through the exhaust pipe 36, all the gases burnt during the previous stage.

In particular, it is possible to obtain the desmodromic drive of the skid 28, while maintaining the resilient connection, through the "oscillating cage"-type device shown in Fig. 6a and 6b, in the same way as already described for the bulkhead 6 of the compressor 2.

This counterbalances the centrifugal force of the skid itself and keeps its pressure constantly below a prearranged value under any operating condition.

The oil-bath boxes 37, 38, 39 and 4Ø guarantee an easy lubrication of moving members, both for reciprocating and for rotary motions, while a suitable pump (not shown) is provided for the fixed skid and the bulkhead.

Claims

1. Improved endothermic rotary piston engine, comprising a stator (1), two rotors (2, 3), a shaft (4) that crosses the stator (1) and on which the two rotors (2, 3) are mounted; the stator (1) having two mutually spaced cylinder chambers (A, B), with opposed bottoms, said chambers being misaligned and integrally joined in a single block, characterized in that each chamber (A, B) is equipped with a turret (13, 19) forming a single body with the stator (1), the turret (13) in chamber A is equipped with a bulkhead (6) sliding in a suitable groove (11, 12) and operating as a partition, the turret (19) in chamber B is equipped with a sealing skid (2Ø), pushed towards the recess center by springs (21, 22) and clockwise-offset with respect to chamber A, to establish the direction of engine rotation; two holes of the same size being obtained on the bottoms of chambers (A) and (B), on opposite sides, said holes being connected by a tunnel (5) that makes said chambers intercommunicate and forming the so-called "compression tunnel" (5); the hole through which the shaft (4) moves corresponding to the center of chamber A but not to the center of chamber B, that therefore is offset with respect to the first one; the offset angle between the two turrets (13, 19) being affected by the compression tunnel (5) and by the center of rotation; an intake pipe (26) and an exhaust pipe (36) completing the stator (1).

2. Engine according to Claim 1, wherein the rotors (2, 3) are box-shaped cylinder bodies having a diameter which is less than that of the respective chambers (A, B) and being adapted to rotate inside them, a rotor (2) operating as compressor in chamber A, the other one (3) being the drive rotor in chamber B, characterized in that this latter one (3) has a core inside (in 35), both to allow the securing thereof to the shaft (4) and the arrangement of other members.

3. Engine according to Claim 1 and 2, characterized in that the shaft (4) consists, for the half of its length, of a crank next to chamber A and, for the other half, of the power takeoff next to chamber B.

4. Engine according to the previous Claims, characterized in that the compressor rotor (2), that idly rotates on the crank (4), is matched thereto by a suitable, double-shell collar (17), performing in addition to a rotary motion on the axis thereof, an orbital motion inside chamber A, constantly keeping a tangent point between its edge and the edge of the chamber itself, so that, while the crank-shaft (4) rotates in a direction, the rotor (2) rotates in the opposite one.

5. Engine according to the previous Claims, characterized in that the drive rotor (3) is fitted on the shaft (4) so that it rotates eccentrically with respect to the chamber cavity, so that the edge thereof gets in contact with the skid (2∅) of the turret (19), which operates as sealing member; in said drive rotor (3), a skid (28) reciprocatingly slides into a suitable groove, said skid being preferably provided with a roller (29) which constantly remains in contact with the edge to make the volume of the chamber where it operates vary according to rotation, so that, while on one side the expansion stage occurs, on the other side there occurs the ejection stage for exhaust gases burnt during the previous stage.

6. Engine according to the previous Claims, characterized in that the reciprocating motion of the skid (28), combined with the rotary one, is obtained through a telescopic rod (3∅), driven by a circular cam (32) fixed to the stator (1) and operating as support for the shaft (4); the resilient connection to the cam (32) and the particular roundness of the skids (28) and (14) being provided to compensate for the different angle of incidence occurring during rotation.

7. Engine according to the previous Claims, characterized in that the drive rotor (3) includes, formed in a peripheral recess, the explosion chamber (25), equipped with an intake hole (26) that is overlapped, at a given time, with the outlet hole (27) of the compression tunnel (5) from which it takes the compressed mixture for the explosion.

8. Engine according to the previous Claims, characterized in that both rotors (2, 3) are equipped with lateral sealing members.

9. Engine according to the previous Claims, characterized in that volume variability in chamber A is obtained through the bulkhead (6) whose reciprocating motion is desmodromically guaranteed by two oscillating boxes (9, 1∅), one on each side of rotor (2), actuated by the crank (4); said bulkhead (6) being equipped with a skid (14) that, through a spring (15), continuously presses on the edge of rotor (2) and divides chamber A, together with the orbital motion, into two parts, allowing on one side to generate vacuum and therefore suction of the explosive mixture, and on the other side to generate compression of the mixture sucked during the previous stage.

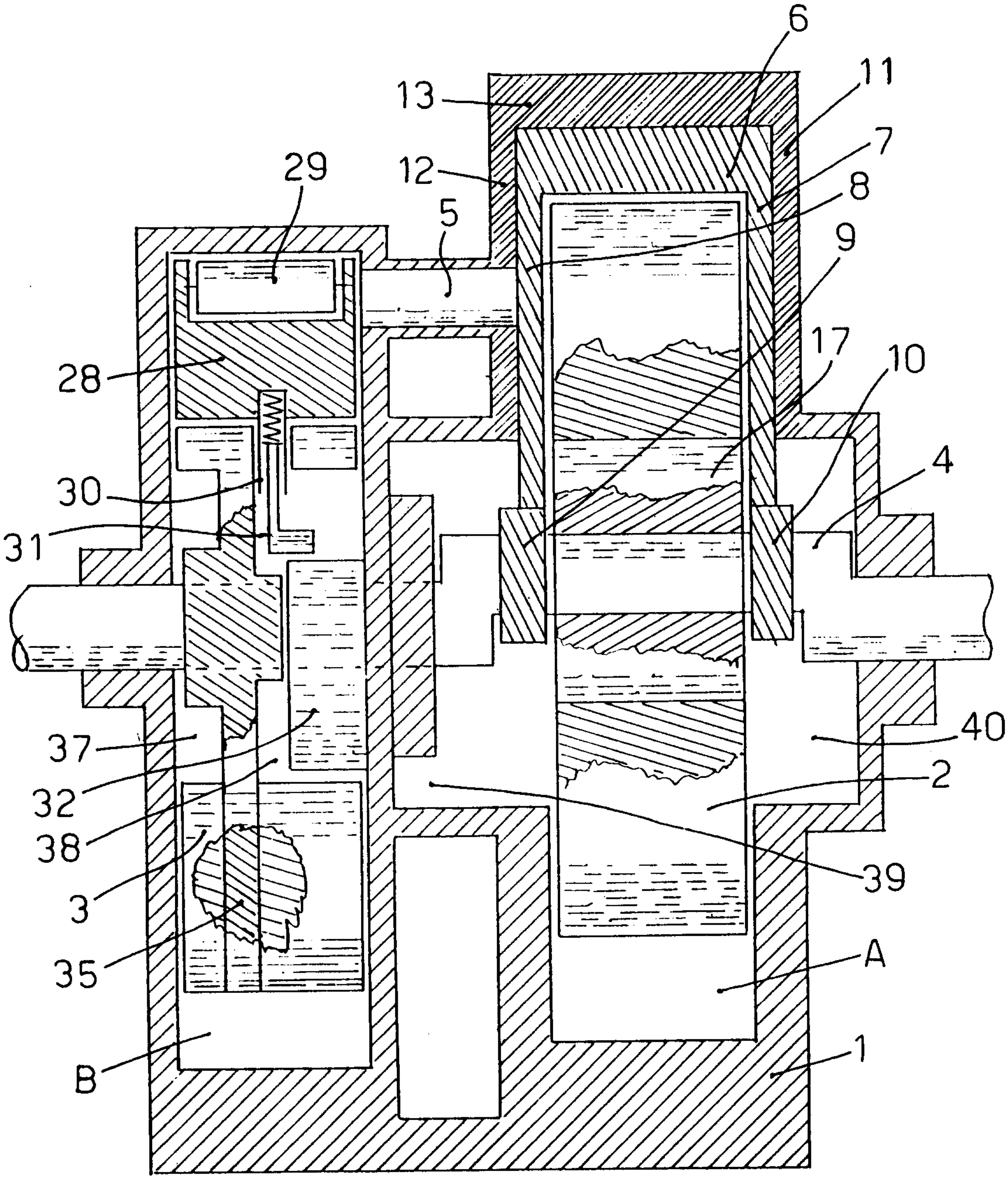

FIG. 1

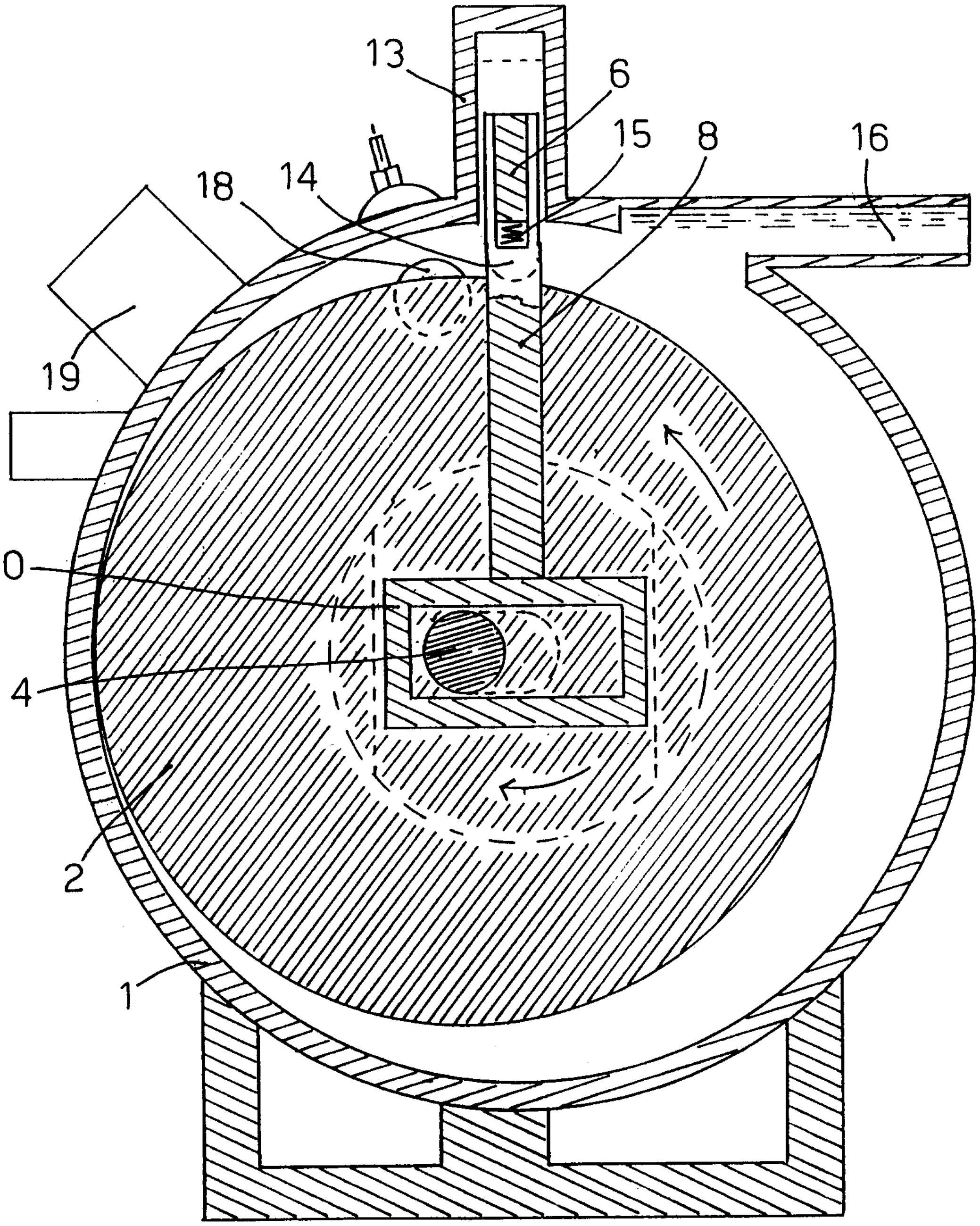

FIG. 2

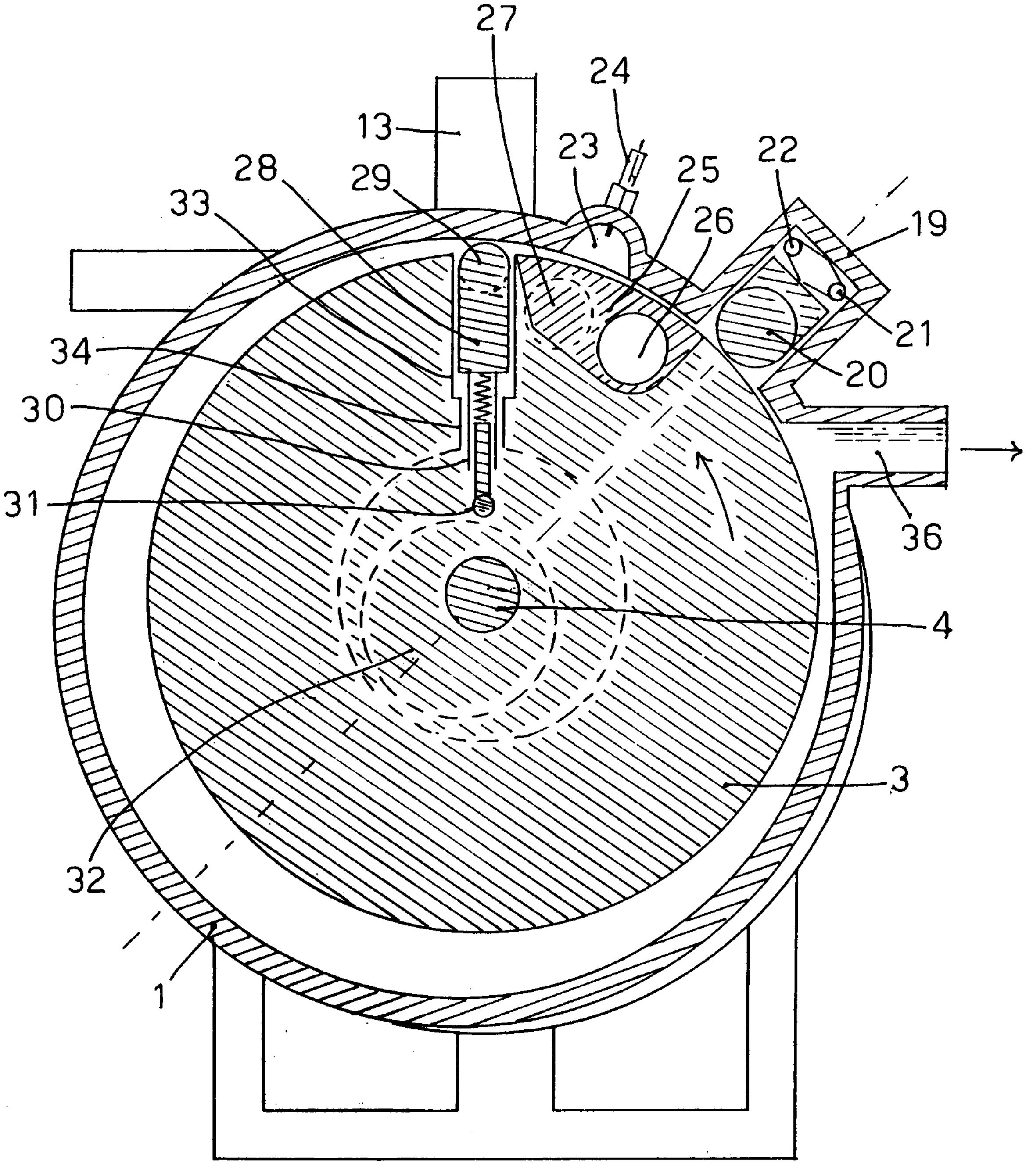

FIG. 3

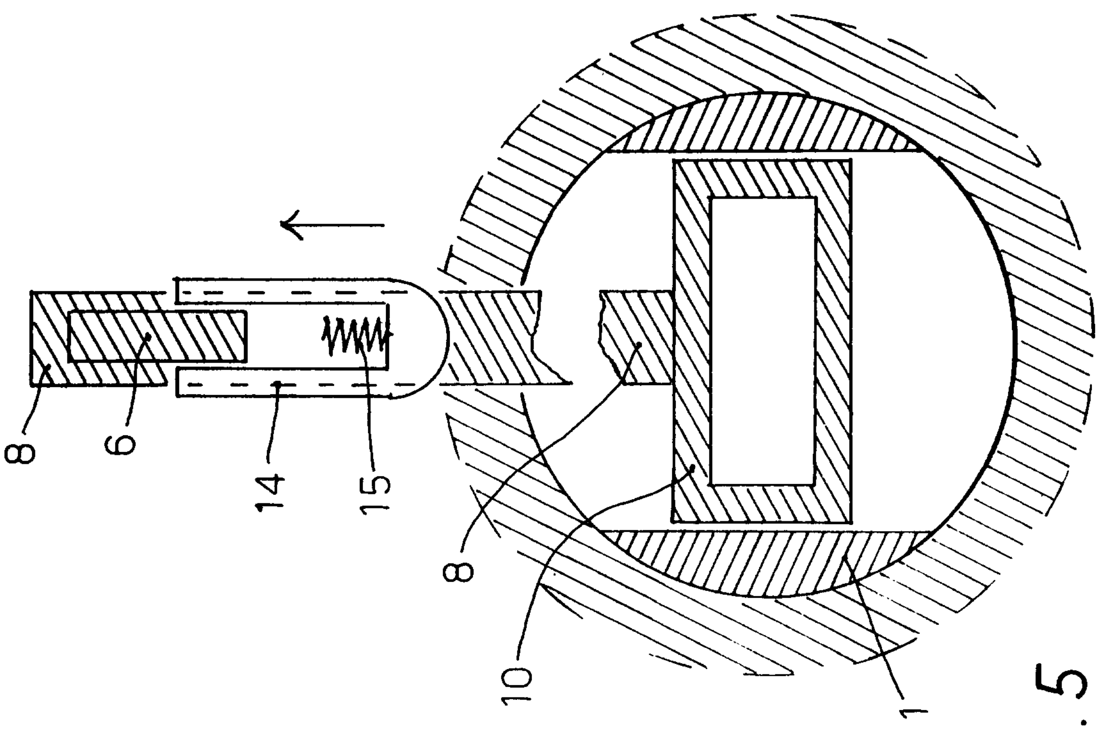

FIG. 5

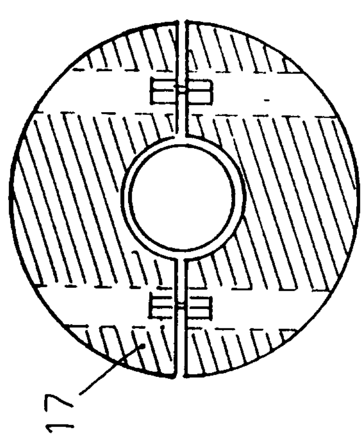

FIG. 4

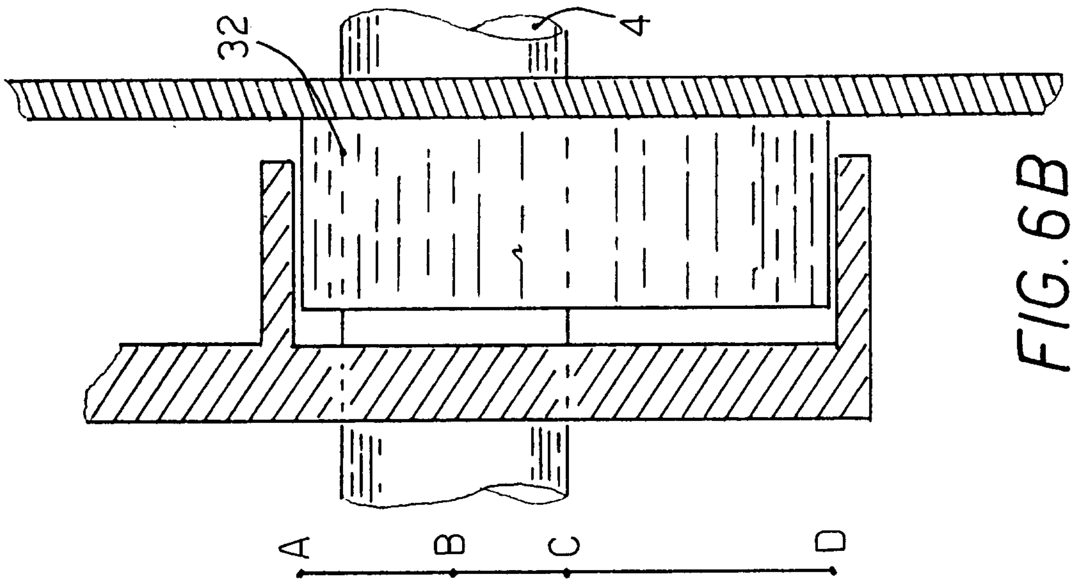

FIG. 6B

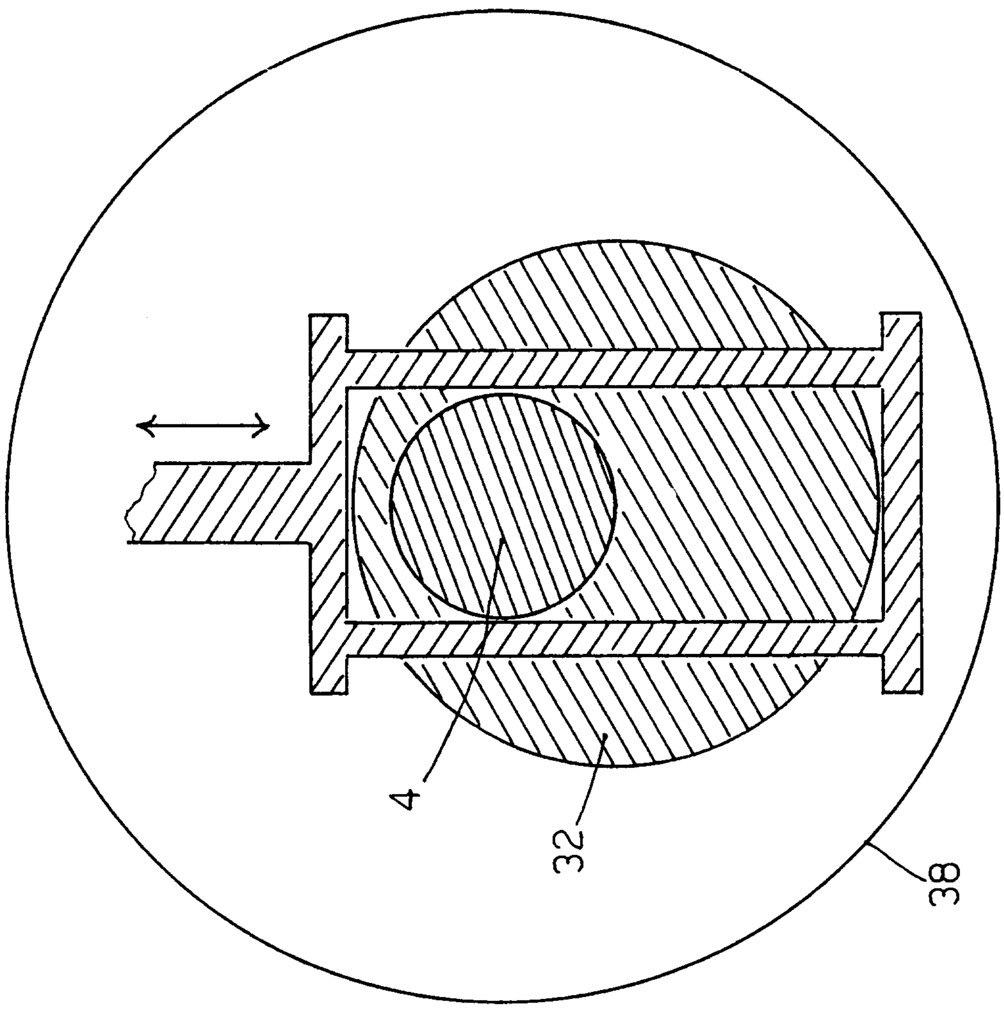

FIG. 6A