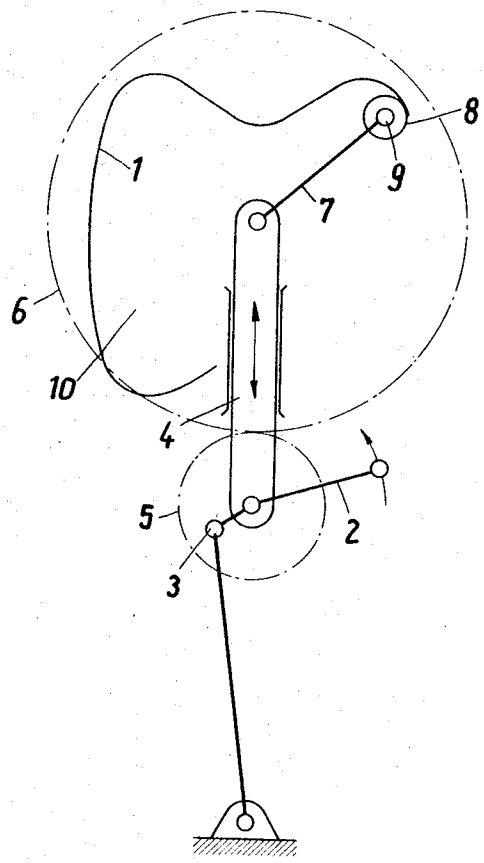
Sept. 5, 1967 R. LOESCHER 3,339,532

MACHINE OF THE ROTARY PISTON TYPE

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Fig. 1



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MACHINE OF THE ROTARY PISTON TYPE

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Fig. 2

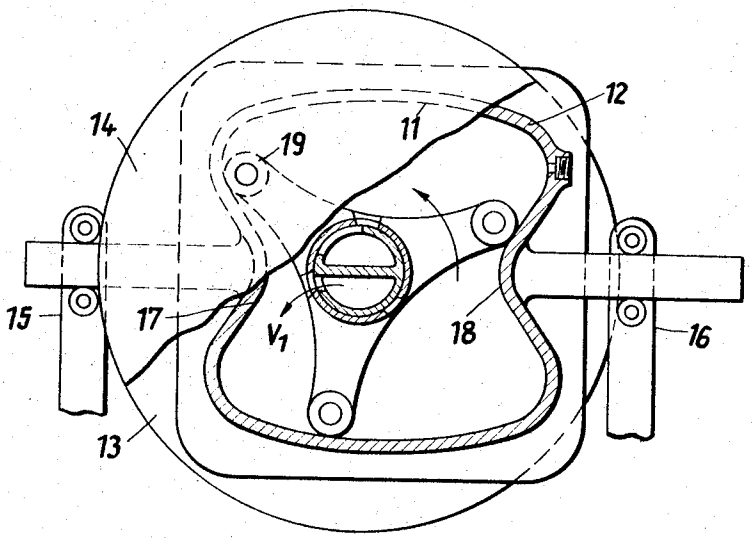
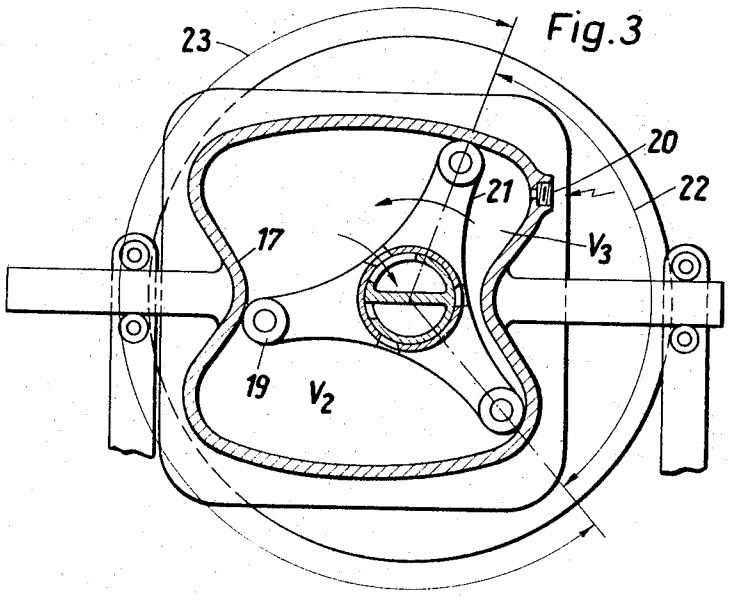


Fig. 3

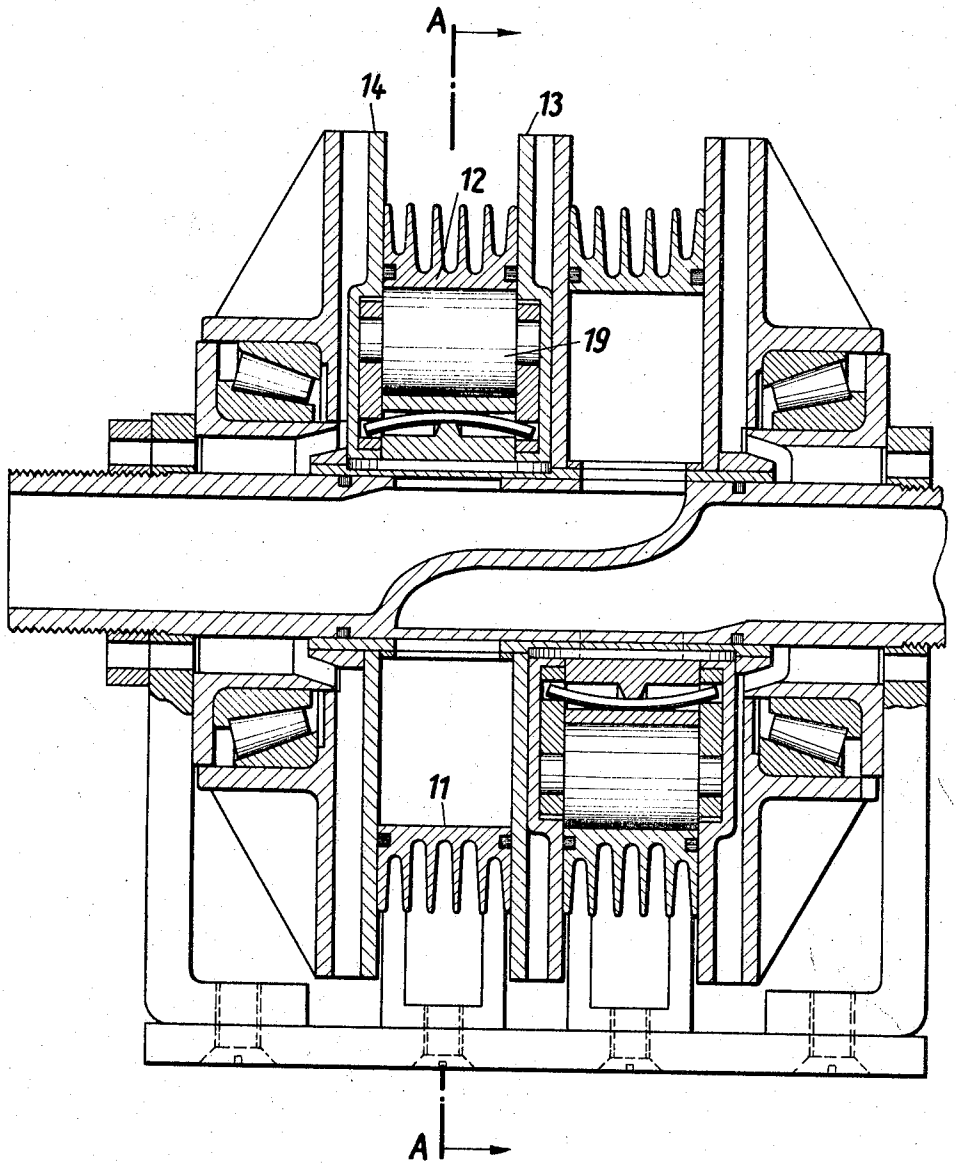


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Fig. 4



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MACHINE OF THE ROTARY PISTON TYPE

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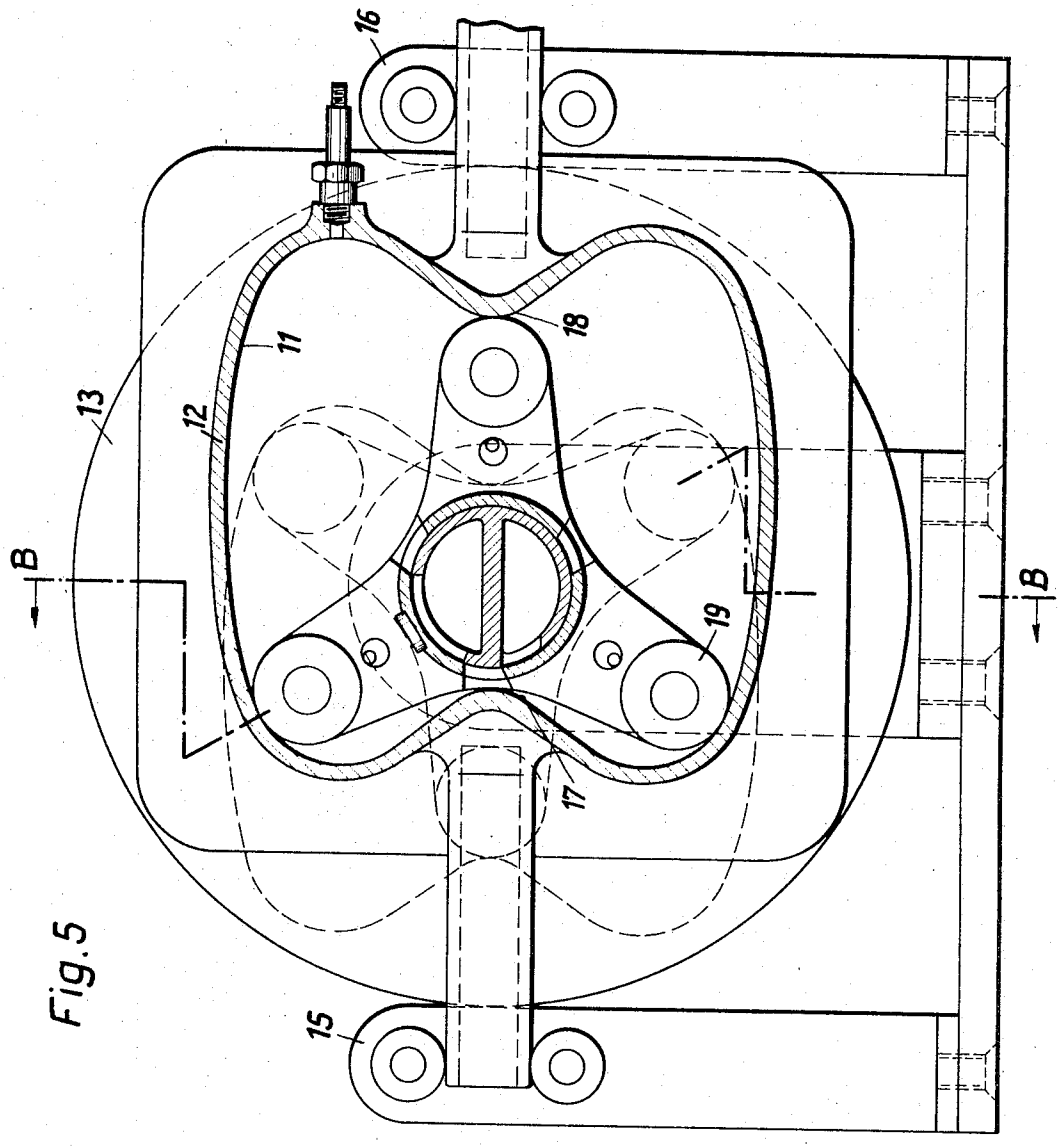


Fig. 5

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Fig. 6

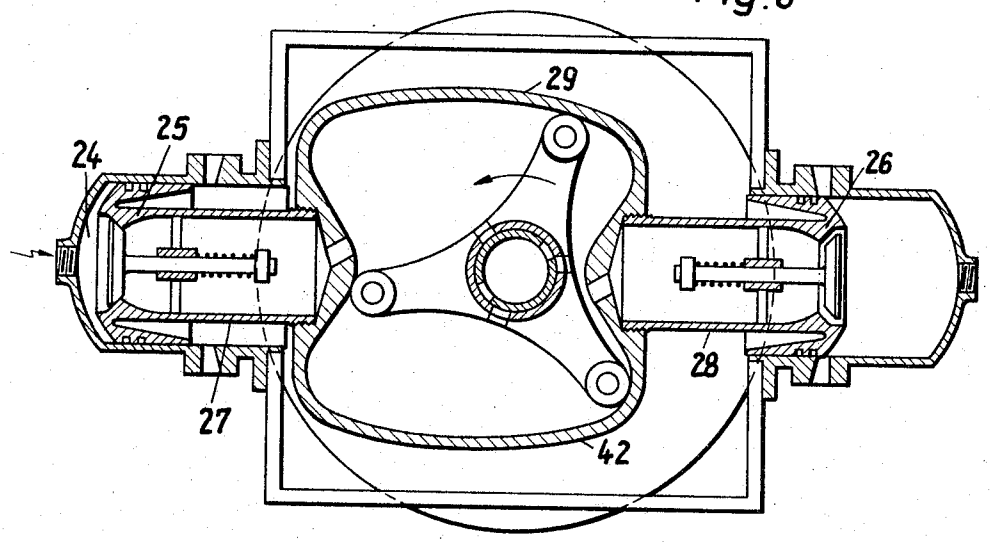
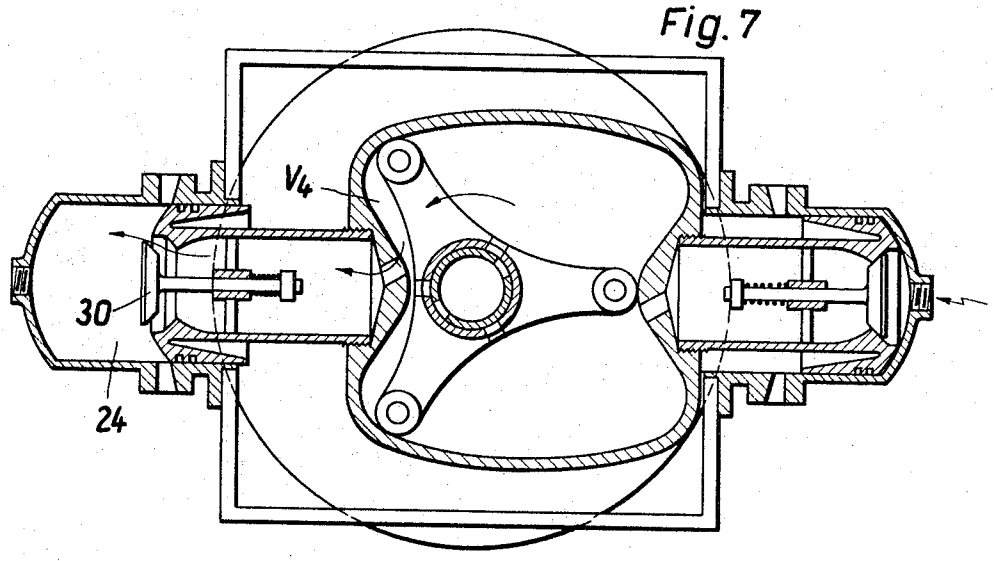


Fig. 7



United States Patent Office 3,339,532 Patented Sept. 5, 1967

3,339,532

MACHINE OF THE ROTARY PISTON TYPE

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Claims priority, application Germany, Nov. 12, 1964, L 49,272
5 Claims. (Cl. 123—8)

My invention has for its object a machine of the rotary piston type and more particularly an itnernal combustion engine of the rotary piston type wherein the rotary piston provided with a plurality of arms or sides defines, as it rotates, a number of variable volume chambers inside an annular casing enclosing said piston and closed on both sides, said casing being provided with an incurved runway in contact with which the projecting sections of the piston are engaged, while a succession of longitudinal portions of said runway extending along different angular directions form, at the opposite ends of a horizontal diameter, alinged wedge-shaped sections facing each other or away from each other.

In all known machines of such a type, it is necessary to locate eccentrically the axis of the rotary piston and to provide a mechanism including an eccentric member and toothed wheels.

Now, my invention has for its object to provide an arrangement which cuts out the necessity of locating eccentrically said axis of the rotary piston.

According to my invention, this result is achieved primarily through the fact that the annular casing is shiftable with reference to the rotary axis of the piston so as to define, in association with the piston, the successive chambers reaching, for either extreme position of the path of said casing, the position corresponding to a minimum volume and for which the mixture is ignited, while the thrust exerted on the arc of the annular casng limiting said chamber of a minimum volume urges the wedge-shaped section of the annular casing runway diametrically opposed to said first-mentioned arc against an apex of the piston and transmits a rotary torque to the latter.

This arrangement, according to my invention, allows retaining a central location for the rotary axis of the piston. The primary advantage of my invention consists in fact in that more favorable torque conditions are ensured through the action of the wedge-shaped projections, that it is possible to obtain a more favorable shape for each chamber, that the arc which is nearest the axis acts after the manner of a piston in a cylinder and forms a chamber wall adapted to execute a rectilinear movement and finally that the yield is improved by reason of the minimum volume chamber expanding speedily as a consequence of the angular shifting of the piston.

In the accompanying drawings, I have illutsrated a number of embodiments of my improved machine. In the 7 figures of said drawings:

FIG. 1 illustrates an arrangement for executing the curve defining the runway inside the annular casing,

FIGS. 2 and 3 are diagrammatic views of a machine provided with a runway in the shape of a figure eight and associated with a three-armed piston, said figures corresponding to successive stages of operation,

FIG. 4 is a longitudinal section through line IV—IV of FIG. 5 illustrating a double unit including two rotary piston machines.

FIG. 5 is a cross-section through lines V—V of FIG. 4,

FIGS. 6 and 7 are diagrammatic views of a modified embodiment at two stages of its operation.

The curve defining the runway inside the annular casing is produced by means of a milling system, said curve being illustrated for instance in FIG. 1 as a curve **1** in the shape of a figure eight. The connecting rod **2** being caused to rotate, the carriage **4** is constrained to reciprocate

through the agency of the eccentric member **3**. Said carriage carries the toothed wheels **5** and **6** which engage each other with a speed-reducing ratio 1:3 and it carries also a rocking arm **7** carrying in its turn a tailed cutter **8** through the agency of the spindle **9** carrying said cutter. The rocking arm carrying the cutter and which is subjected to a shifting under the action of the reciprocation of the carriage and of the rotation of the toothed wheels, allows cutting in a flat piece of work an outline **10** defining the curve in the shape of a figure eight.

Said curve forming a figure eight defines the runway **11** illustrated in FIGS. 2 and 3, which runway forms the inner peripheral surface of the annular casing **12**. The latter may move with reference to the axis of the rotary piston, between the side walls **13** and **14**, in parallelism with the horizontal diameter of the casing. The bearings provided for the sliding of the casing are illustrated at **15** and **16**. The throttled sections of the curve in the shape of a figure eight form the wedge-shaped guiding projections **17** and **18** which face each other and form on the runway projections directed towards each other and towards the axis of the piston P. In a manner corresponding to the speed reduction ratio equal to 1:3 selected for the toothed wheels **5–6** (FIG. 1), of the cutting or milling system, I resort to a rotary piston having three arms or three sides. The amplitude of the shifting of the annular casing **12** corresponds to the amplitude of the shifting of the carriage **4** and the diameter of the rollers **19** carried by the rotary piston corresponds to the diameter of the cutter **8**.

Upon rotation of the piston in an anticlockwise direction, the volume of the chamber V1 (FIG. 2), increases up to a maximum volume V2 (FIG. 3). The reduction in pressure thus obtained ensures the suction of the mixture of fuel and air. Inside the chamber V3 showing a minimum volume, the compressed mixture is ignited at **20**. The thrust exerted on the arc **22** of the runway defining the annular casing, which arc extends over the chamber V3, urges the wedge-shaped section **17** formed along the outer arc **23** of the runway against the outer end of the arm **19** of the piston whereby a rotary torque is transmitted to the piston.

When associating in series two operative units on the same shaft as illustrated in FIGS. 4 and 5 and angularly shifting the corresponding rotary pistons, operative thrusts are obtained in continuous alternation in the two units.

As illustrated in FIGS. 6 and 7, the rotary piston machine can operate as a compressor, which leads to the important advantage of producing a number of operative strokes for each revolution of the piston. Upon ignition of the fuel-and-air mixture in the cylinder chamber **24** of FIG. 6, the two pistons **25–26** are shifted towards the right hand side. This shifts simultaneously the annular casing **29** inserted between the ends facing each other of the hollow piston rods **27** and **28** so that the rotary piston is driven into rotation by said shiftng of the annular casing. The fuel-and-air mixture compressed by the rotation of the rotary piston passes out of the chamber V4 showing a minimum volume as illustrated in FIG. 7, and raises the valve head **30** so as to enter the cylinder chamber **24** through the hollow piston rod. Upon continuation of the rotation of the piston, the mixture enters the other cylinder chamber.

What I claim is:

1. A rotary piston machine comprising an annular casing adapted to reciprocate along a predetermined elongated path and the inner surface of which forms a runway including two inwardly projecting diametrically opposed wedge-shaped sections, sidewalls parallel with said path and closing laterally the casing, a rotary piston including a plurality of substantially radial projections engaging said runway and forming with the latter a plurality of closed chambers, said piston being adapted to

revolve inside the casing round a stationary axis perpendicular to the side walls to thereby ensure a positive relationship between the reciprocation of the casing and the rotation of the piston to thereby constrain the closed chambers to vary in volume, each extreme position of the casing on its path corresponding to the formation, between the wedge-shaped section located at the end of the path leading to said extreme position and the surface of the piston facing last-mentioned wedge-shaped section, of a chamber of a minimum volume while the other wedge-shaped section is operatively engaged by a radial projection on the piston.

2. In a rotary piston machine as claimed in claim **1**, adapted to operate as an internal combustion engine, the provision of igniting means in registry with the location of the minimum volume chamber to produce the ignition of a combustible mixture therein and thereby a shifting of the reciprocatable casing, the other wedge-shaped section of which urges the piston into rotation.

3. In a rotary piston machine as claimed in claim **1** wherein the runway is in the shape of a figure eight, the provision of three radial arms on the piston, two of which extend to either side of one wedge-shaped section of the runway on the casing, when the latter is in one of the extreme positions of its path and said wedge-shaped section is nearer the axis of the piston, to form the minimum volume chamber while the third arm engages a side of the other wedge-shaped section lying furthest from the piston axis.

4. In combination with a rotary piston machine as claimed in claim **1** adapted to act as a compressor, the provision of two cylinder and piston units extending outside the casing in alignment with the common axis of the two wedge-shaped sections, each unit including a piston rod engaging the casing at a point registering with the cooperating wedge-shaped section and means for feeding a gasiform mixture compressed inside the chambers of the rotary piston machine into the cylinders of said units.

5. An arrangement for defining the outline of the runway of the casing of the machine claimed in claim **1**, comprising a carriage adapted to reciprocate along a predetermined path, the length of which is equal to that of the path of the casing, means controlling the reciprocation of said carriage, interengaging toothed wheels pivotally carried by said carriage, a rod adapted to rock round the axis of one of said wheels, a cutter revolvably carried by the outer end of said rod and adapted to cut the desired outline, the radius of said cutter being equal to the radius of curvature of the outer ends of the radial projections, the speed reducing ratio between the wheels being equal to the number of radial projections on the piston.

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