April 19, 1932. O. RIDDER 1,854,670

ROTARY ENGINE

Filed Jan. 3, 1930 2 Sheets-Sheet 1

FIG. 1.

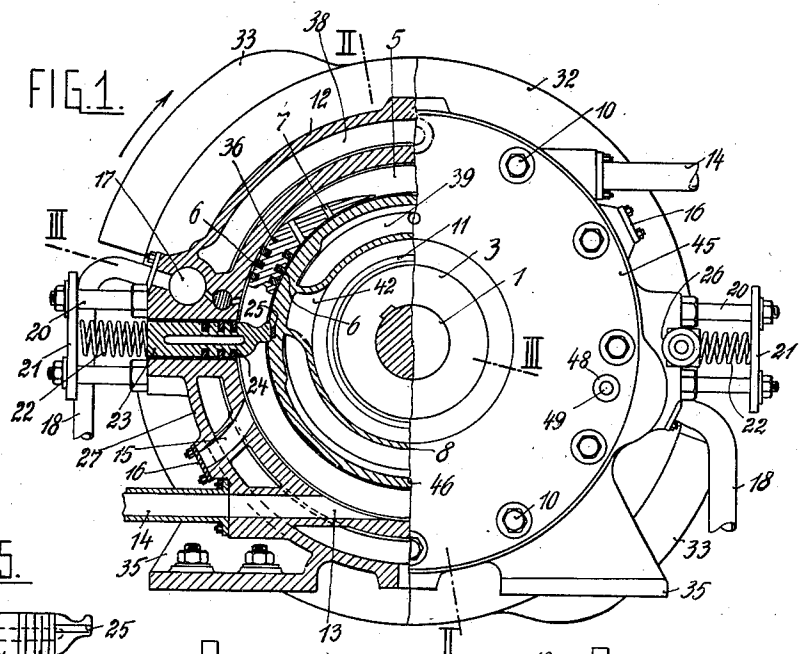


FIG. 5.

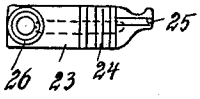


FIG. 2.

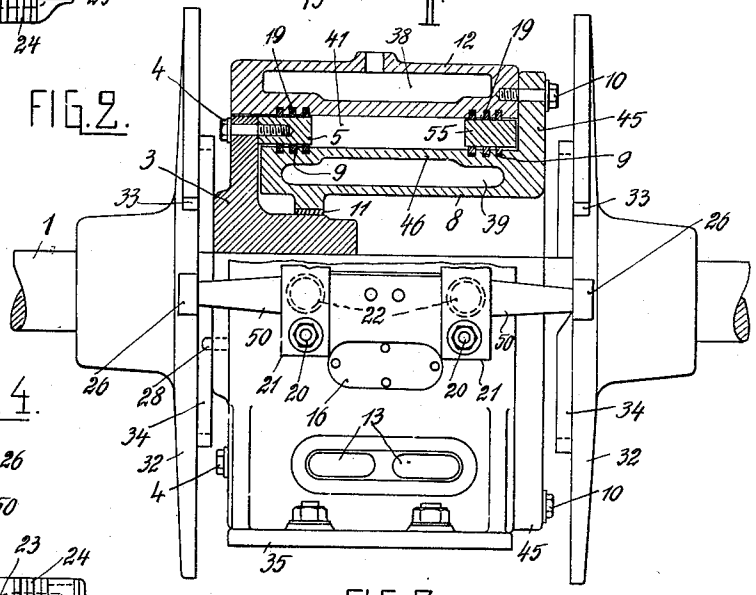


FIG. 4.

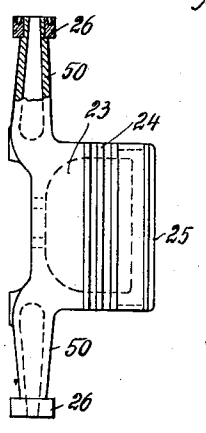
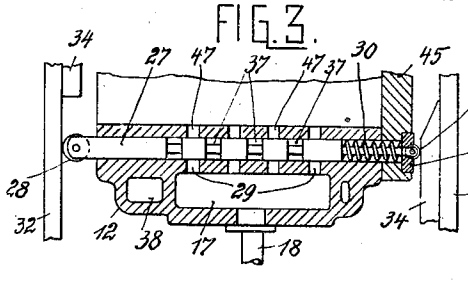


FIG. 3.



Inventor:
Otto Ridder
by
Atty.

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FIG. 6.

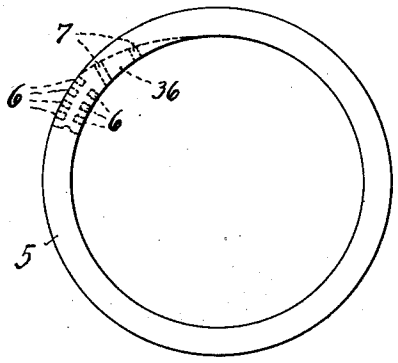
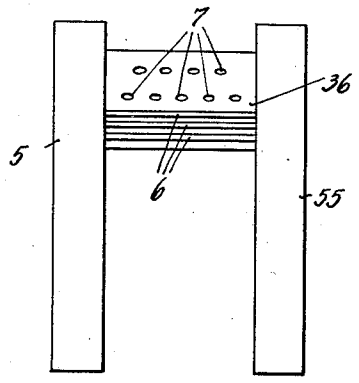


FIG. 7.



Inventor:
Otto Ridder
by Karl Reichard
Atty.

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1,854,670

UNITED STATES PATENT OFFICE

OTTO RIDDER, OF BRAKELSIEK, GERMANY

ROTARY ENGINE

Application filed January 3, 1930, Serial No. 418,257, and in Germany January 5, 1929.

My invention relates to rotary machines, engines or pumps, i. e. machines of the type in which the reciprocating piston of the usual crank mechanism is replaced by a piston or a set of pistons in the shape of a radial vane or a set of vanes, which rotate bodily about the axis of the machine.

It is an object of my invention to improve a machine of this type. To this end instead of providing the usual radial vanes in combination with a rotor with which they rotate and in which they are fitted to slide radially, I provide a ring which is free to rotate in the annular piston chamber of the engine and with this ring I connect a vane or piston which is packed against the walls of the chamber. As compared with the usual rotary piston vanes in combination with a rotor from which the vanes freely project into the piston chamber, the novel rotor offers the advantage that its piston is rigidly connected with and braced by the ring.

The piston may be cast or forged integral with the ring or it may be screwed, welded, or otherwise secured to the ring. In this manner not only a very rugged construction of the rotor is obtained, but the weight of the machine is also greatly reduced, as the usual solid rotor is replaced by the comparatively small and light ring.

In a preferred embodiment of my invention I provide a casing consisting of two separate parts which are connected by suitable means and, when connected, form an annular piston chamber in which the piston or pistons are fitted to rotate about the axis of the machine and are connected with two parallel rings. One of the rings is connected with the other ring by the piston at one side, and with a disc which is keyed onto the shaft, at the other side.

In the drawings affixed to this specification and forming part thereof a rotary engine embodying my invention is illustrated diagrammatically by way of example.

In the drawings

Fig. 1 is partly an elevation and partly a central vertical section of my machine,

Fig. 2 is partly a section on the line II—II in Fig. 1, and partly an elevation of the engine, viewed from the left in Fig. 1,

Fig. 3 is a part section on the line III—III in Fig. 1,

Fig. 4 is a plan view of one of the control slides of the engine,

Fig. 5 is an elevation of the control slide,

Fig. 6 is an elevation and

Fig. 7 is an end elevation viewed from the right in Fig. 6 showing the parallel rings by which the piston is supported.

Referring now to the drawings, 1 is a shaft of the engine, 32 and 34 are pairs of combined cam plates spaced apart on the shaft, and 8, 12 are the two parts constituting the casing of the engine which is arranged intermediate the pairs of cam plates 32, 34 as best seen in Fig. 2, and 3 is a disc which is keyed on the shaft.

The inner and outer parts 8 and 12 of the casing make up together an annular piston chamber 41, the outer part 12 being provided with a pair of standards 35, and the inner part being secured to the outer part by means of a flange 45 and screws 10. From this flange, a cylinder 46 projects inwardly, the outer radius of which is equal to the inner radius of the outer part 12, minus the radial height of the piston chamber 41. The outer face of the disc 3 is flush with the face of the casing 12. The boss of the disc 3 extends inwardly and is supported in a bearing 11 on the cylinder 46. Other bearings, not shown, may be provided for the shaft 1 at any suitable point beyond the pair of cam plate 32, 34.

5 and 55 are parallel rings as shown particularly in Figs. 6 and 7 inserted with some clearance near the outer ends of the piston space 41 and packed therein by means of rings 9 and 19. The ring 5 is connected with the disc 3 by any suitable means, for instance, screws 4. The two rings 5 and 55 are connected by a traverse 36 which will be referred to as "the piston". The trailing end of the piston is provided with parallel packing strips 6, 6 which fit the inner and outer walls of the chamber 41, under the pressure of suitable springs, not shown, and its leading end is pointed, as shown in Fig. 1, and perforated

at 7 for reducing the weight of the piston. The piston may be cast or forged in one with the two rings 5 and 55, or with one of them, or it may be made separately and secured to one, or both, rings by any suitable means, welding, riveting or screwing. In any case it makes a comparatively long and rigid connection between the two rings.

As compared with rotors having the usual radial vanes, my rotor is infinitely stronger and, as it comprises a piston, or a set of pistons, and the two rings only, is much lighter than the usual solid rotor in which the vanes are fitted to slide. Apart from this saving in weight, the space within the casing is available for providing the bearing 11, and a heating or cooling jacket 39 in the cylinder 46, whereas in the usual type of engine this space is occupied by the solid rotor. My rotor 5, 36, 55 is positively connected with the disc 3 by the screws 4 and the ring 5, so that the disc 3, the shaft 1 and the rotor rotate in unison. A heating or cooling jacket 38 may also be provided for the outer casing 12.

In the present instance it has been assumed that the engine is equipped with two pistons 36, one of which only is shown in Fig. 1, the other being arranged at an angle of 180 degs. with respect to the first piston. For two pistons, the annular piston chamber 41 must be divided into two compartments, which is effected by two control slides 23 in suitable recesses of the casing 12 which, like the pistons 36, are arranged at an angle of 180 degs. with respect to each other. The means for supplying the driving fluid to the piston chamber 41 are arranged in the vicinity of the slides 23.

In the present instance it has been assumed that the engine is driven by steam, but obviously it might be driven by any other suitable medium or mixture. 18 are steam pipes which are attached at opposite sides of the casing 12 by suitable flanges, and connected with steam chambers 17 as best seen in Fig. 3. From each chamber, ports 29 extend to the chamber of a piston valve 27, which is turned down at 37 in conformity with the ports 29, and 47 are ports extending from the chamber of the piston valve to the piston chamber 41 in line with the ports 29. In the position illustrated in Fig. 3 the ports 29 and 47 are separated by the full parts of the piston valve 27, but, when the piston valve is displaced to the right in Fig. 3, each of its turned-down parts connects a port 29 with the corresponding port 47, and steam is admitted to the chamber 41. The chamber 17 and the piston valve 27 are duplicated at the other side of the engine, the second valve 27 being shown in Fig. 1. 13, 13 are two exhaust passages which open into the chamber 41 at opposite sides and are connected with exhaust pipes 14.

Means may be provided for operating the engine as an internal combustion engine. A chamber 42 is partitioned from the heating jacket 39 of the cylinder 46, and a sparking plug, not shown, is inserted in the wall of the inner casing 8 for igniting the mixture supplied through the pipe 18. At the opposite side of the slide 23, a scavenging air passage 15 is provided which is closed by a lid 16, while the engine is operated with fluid. These parts are duplicated on the opposite side of the engine, the second lid 16 being shown in Fig. 1 at the right.

20 are stays arranged at either side of each slide 23, 21 are stay plates which are secured on the outer ends of the stays by screws or any other suitable means, and 22 is a spring inserted between each pair of stays and adapted to react on the slide 23. As will appear from Fig. 2, two pairs of stays 20, each with a plate 21 and a spring 22, are arranged for each slide. The slides 23 are preferably made of light metal or alloy, cast hollow as shown in Figs. 4 and 5 in order to reduce the inertia forces, and are provided with packing strips 24 for their upper and lower faces, and with angular strips 25 at their inner ends which, as shown in Fig. 1, are adapted to penetrate into a recess in the wall of the casing 8 and to engage the inner faces of the rings 5 and 55. 50 are arms, preferably hollow for the reasons stated, which extend from either side of the slide 23 and are provided with rollers 26 at their ends, and 33 are cams on the cam plates 32 which are adapted to move the slides 23 with their inner ends out of the piston space 41 against the action of the springs 22.

28 is a roller at one end of the piston valve 27, and 49 is a pin projecting from its other end, the pin 49 and the roller 28 being adapted to cooperate with the cams 34. 30 is a spring which is inserted between a shoulder on the piston valve 27 and a washer 48 in the flange 45, and which tends to hold the roller 28 engaged with the flat face of the cam 32 at the left, Fig. 3, in which position the piston valve breaks the connection of the ports 29 and 47. The cams 34 at the left and at the right are staggered with respect to each other so that when the roller 28 is engaged and moved to the left by cam 34 at the left, the pin 49 is permitted to slide down on the descent of the cam 34 at the right. In this manner the valve 27 is never free but is permanently held in positive engagement with one of the cams 34 and with the opposite cam plate 32.

The operation of my machine is as follows:

Driving fluid is permanently admitted to the chamber 17 through a suitable throttle valve, not shown, and through the port 29 to the piston valve 27. In the position illustrated in Fig. 1, the cams 33 on the cam plates 32 have just released the rollers 26

of the slides 23 and the slides have been closed by their springs 22. The cams 34 now move the piston valve 27 inwardly against the action of their springs 30, and the turned-down parts 37 of the valve 27 register with the ports 29 and 47. Fluid is admitted into the piston chamber 41 and moves the pistons 36 in clockwise direction. The exhaust passages 13 are permanently open and the exhaust is expelled by the advancing pointed ends of the pistons 36. When the packing strips 6 of one of the pistons have arrived at the nearest exhaust passage 13, which is the upper passage for the piston shown in section in Fig. 1, the corresponding piston valve 27 is allowed to return into closing position by the cams 34, and the fluid is cut off from the chamber 41 at the rear of the piston. In the case of an expanding fluid, such as steam, the operation of the piston valve 27 may be so timed with respect to the rotation of the piston 36, that the valve 27 closes before the exhaust passage is laid open by the piston and the fluid will expand. The piston 36 now approaches the slide 23 at the right. The slide is retracted by the corresponding cam 33, and held retracted, until the rear edge of the piston has moved past it, whereupon the slide returns into its closing position and a fresh supply of fluid is admitted by the piston valve 27 at the right, imparting impetus to the piston until it arrives at the lower exhaust passage 13. The slide 23 at the left is now retracted for permitting the piston to pass, and closed behind the piston, which is now again in the position illustrated in Fig. 1. The second piston obviously performs the same cycle of operations, but distorted at an angle of 180 degs. with respect to the cycle of the first piston.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim to any modification not covered by these claims is expressly reserved.

I claim:—

1. A rotary machine comprising a casing including an annular piston chamber having fixed walls, a pair of rings which are free to rotate in said chamber, a piston arranged between and connected with said rings, means for packing said piston and said rings against said chamber, a shaft, and means operatively connected with one of said rings for transmitting its rotation to said shaft.

2. A rotary machine comprising a casing having a cylindrical inner and outer part, the inside diameter of said outer part being larger than the outside diameter of said inner part, a flange on said inner part adapted to be secured to said outer part, so that said inner and outer part, when connected, make up an annular piston chamber, a pair of rings which are free to rotate in said chamber, a piston connected with said rings and packed against the walls of said chamber, a shaft, and means operatively connected with said rings for transmitting its rotation to said shaft.

3. A rotary machine comprising a casing including an annular piston chamber having fixed walls, a pair of rings which are free to rotate in said chamber, a piston connected with said rings and packed against the walls of said chamber, a shaft, a disc secured on said shaft and extending into said outer casing at the end of said inner casing, and means for connecting said rings with said disc.

4. A rotary machine comprising a casing including an annular piston chamber having fixed walls, a pair of rings which are free to rotate in said chamber, a piston connected with said rings and packed against the walls of said chamber, a shaft, means operatively connected with said rings for transmitting its rotation to said shaft, a partition adapted to subdivide said piston chamber, means operatively connected with said rings for advancing and retracting said partition in time with the movements of the piston in said chamber, fluid supply and exhaust means connected with said piston chamber, a valve for regulating the supply of fluid from said supply means to said chamber, and means operatively connected with said rings for operating said valve in time with the movements of said piston and said partition.

5. A rotary machine comprising a casing including an annular piston chamber having fixed walls, a pair of rings which are free to rotate in said chamber, a piston connected with said rings and packed against the walls of said chamber, a shaft, means operatively connected with said rings for transmitting its rotation to said shaft, a partition adapted to subdivide said piston chamber, means operatively connected with said rings for advancing and retracting said partition in time with the movements of the piston in said chamber, fluid supply and exhaust means connected with said piston chamber, a valve for regulating the supply of fluid from said supply means to said chamber, and means operatively connected with said rings and including a cam and a spring for operating said valve in time with the movements of said piston and said partition.

In testimony whereof I affix my signature.

OTTO RIDDER.