March 4, 1924. 1,485,414

H. JUNKERS

ROTARY PUMP

Filed June 29, 1920

Fig.1

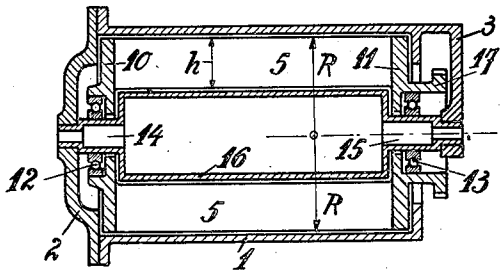


Fig.2

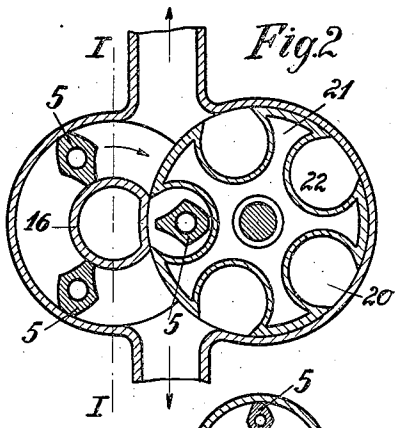


Fig.3

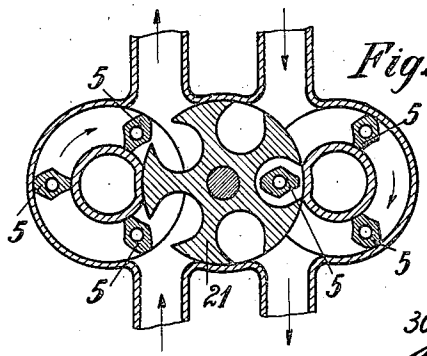


Fig.4

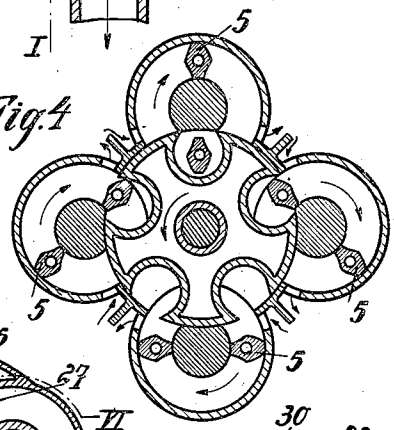
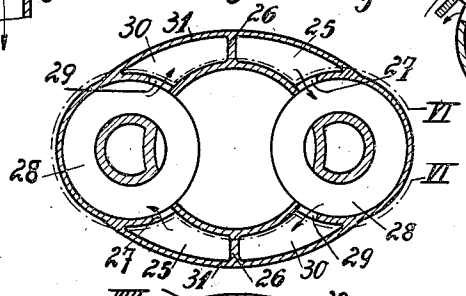


Fig.5



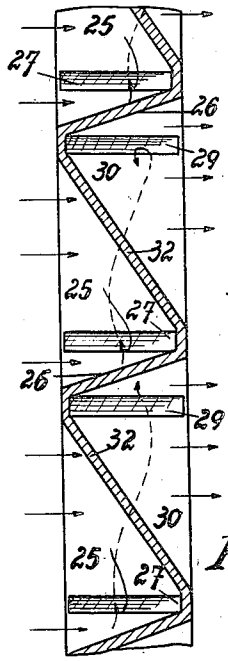
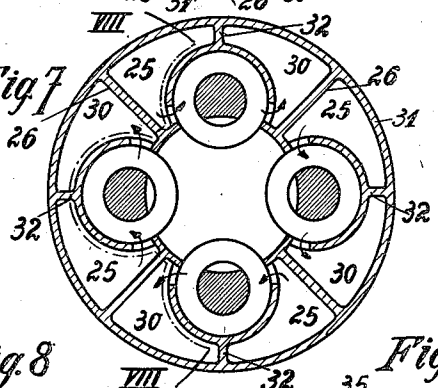


Fig.8

Fig.7



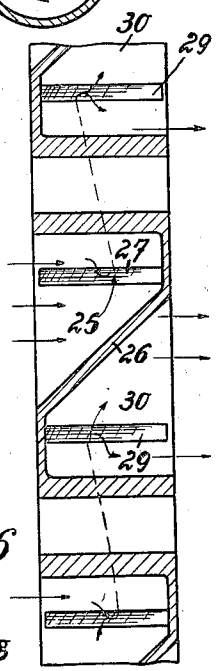
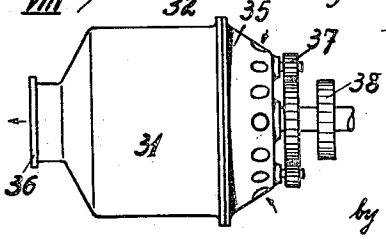


Fig.6

Fig.9



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by [illegible]
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UNITED STATES PATENT OFFICE.

HUGO JUNKERS, OF DESSAU, GERMANY.

ROTARY PUMP.

Application filed June 29, 1920. Serial No. 392,333.

To all whom it may concern:

Be it known that I, HUGO JUNKERS, a citizen of the German Empire, residing at Dessau, Germany, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

My invention refers to rotary pumps and more especially to the so-called rotary piston pumps, in which in a ring chamber several rotary pistons revolve at uniform speed and thereby force the medium to be pumped from a suction chamber into a pressure chamber, while a rotary valve cooperates with the rotary pistons.

My invention aims at providing a rotary piston pump of little weight and simple design which is nevertheless adapted to safely withstand the stresses caused by the piston revolving at high speed (up to 2000 revolutions per minute), such pump being particularly useful for the purpose of feeding scavenging air into light weight high speed internal combustion engines.

In the drawings affixed to this specification and forming part thereof different modifications of a pump embodying my invention are illustrated by way of example. In the drawings—

Figs. 1 and 2 are a longitudinal section on line III—III in Fig. 2, and a cross-section, respectively, of a pump comprising a single piston body cooperating with a rotary valve.

Figs. 3 and 4 are cross-sections of two further modifications with a plurality of piston bodies cooperating with a simple rotary valve.

Figs. 5 and 6 are a cross-section and a developed section respectively, of a fourth modification, the section in Fig. 6 being taken on the line VIII—VIII in Fig. 5, and

Figs. 7 and 8 are like views of a fifth modification.

Fig. 9 is a side elevation.

Referring to Figs. 1 and 2 of the drawings, 1 is the pump casing and 2 is a cover disposed at one end thereof, while 3 is an arm, at the other end forming a bearing for the journal 15 of the central filling body 16 which is supported at the other end in the cover 2 by another journal 14. 10, 11 are annular discs surrounding the journals 14 and 15, respectively, ball bearings 12, 13 being inserted between said discs and said journals so that the discs are firmly supported on said journals in revolving around them. 17 is a toothed rim disposed on one of said discs and projecting from said casing so as to serve for driving said discs and the pistons 5, 5 extending between them and formed integral therewith, the discs and pistons then forming a rigid, well balanced rotary body evenly supported on bearings at both its ends. In consequence thereof the resistance of the rotary pistons against the action of the centrifugal forces is considerably increased as compared with the arrangements hitherto in use, and a noiseless working free from vibrations is ensured even at high speed.

21 is the rotary valve cooperating with the pistons in a well known manner.

In order to be able to increase the height h of the rotary pistons in comparison to the radius R of the space covered by them and thus to make them resist better the centrifugal forces, the valve is designed so that the number of its gaps is greater than the number of the rotary pistons; then the valve is bound to revolve slower than the rotary piston body in inverse proportion of these numbers. With such a valve a considerably greater freedom is attained as to the arrangement of the gaps and it is possible to put to use up to 80% of the entire cylinder space of radius R covered by the rotary pistons for pumping air.

In Fig. 2 a pump fitted with such a valve is shown. Valve 21 has five gaps 20 engaging with three rotary pistons 5. The number of revolutions of the rotary piston body is to that of the valve as 5:3.

The enlargement of the space necessarily required for the pump caused by this enlargement of the valve can be balanced by making such a valve containing a comparatively large number of gaps to engage with several rotary piston bodies. Some examples are shown in Figs. 3 and 4.

According to Fig. 3 one valve containing five gaps engages with two rotary piston bodies containing three rotary pistons each.

According to Fig. 4 four piston bodies containing two rotary pistons each are arranged around a valve also containing five gaps.

In both cases the separate rotary pistons engage with the valve so that the pumping cycles overlap each other; whereby a very even flow of air is obtained.

As the arrangement of several rotary piston bodies around a single rotary valve involves a very complicated design of the admission and exhaust channels and, in consequence thereof, greater resistance to the flow of the medium to be pumped, I prefer conducting it in the manner shown in Figs. 5 to 9.

In the modification disclosed in Fig. 5, the two piston cases 28 are enclosed in the pump case formed by a jacket 31, the helical walls 26 of which divide it into wide chambers 25, 30. At one or the other end of the pump, the air or other medium enters the chambers 25 in axial direction, as indicated by arrows in Fig. 6 and is guided therein by the helical walls 26 which offer but little resistance to the flow of the medium, to the admission ports 27 of the piston cases 28. Having been carried along by the rotary pistons, the medium then flows from the piston cases 28 through the outlets 29 into wide chambers 30 separated from the chambers 25 by the helical walls 26 and enclosed between the jacket 31 and the walls 26 and therefore offering but little resistance, and from here to the opposite end of the pump case, where it enters the collecting main. The medium to be led to and away from the piston cases 28 thus flows in the suction as well as in the delivery space in but one direction, viz, that of the pump axis. By providing several piston cases and surrounding them with a jacket as described, the entrance and the outlets of the separate piston cases 28 are formed by plain channels of large section involving but small and gradual deviations and little resistance to the flow of the medium. The connections for the suction or delivery pipes conveying the pumped air can also be designed and mounted in a simple manner.

Fig. 7 shows a pump with four piston cases 28 arranged around one valve. In accordance with the arrangement of Fig. 5, the four piston cases 28 are enclosed in a pump case formed by a cylindrical jacket 31, the helical walls 26, 32 of which divide the pump case into four wide chambers 25, 30 which lead the medium to and away from the piston cases 28. The medium to be pumped enters the chambers 25 on one side of the pump, as indicated by arrows in Fig. 8, these chambers guiding it through the admission ports 27 of the rotary piston cases 28 into said cases. After having been carried along by the rotary pistons, the medium flows through the outlets 29 of the piston cases 28 into the chambers 30 and from here into the collecting main.

As can be seen by inspection of the developed section shown in Fig. 8 (following the line VIII—VIII in Fig. 7), the entrance and outlet sections for the flow of the medium to be pumped are very large and the resistance to the flow is correspondingly very small. In the Figures 7 and 8 the flow of the medium is indicated by arrows.

Fig. 9 is a side view of a pump constructed according to the arrangement of Fig. 7. The air sucked in from outside enters the perforated front face 35 of the pump case at the right and, having been pumped, leaves the pump case through the collecting main 36 arranged on the other front face of the pump case. The valve and the piston bodies are driven by the toothed wheel gear 37, the driving means for the pump, which may be a belt pulley or a toothed wheel, being marked 38. The gear 37 may of course be arranged inside the front plate 35.

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.

I claim:

1. In a rotary pump in combination a stationary casing, a plurality of rotary pistons adapted to rotate about a common axis within said casing, lateral discs rigidly connected to the ends of said pistons, a bearing associated with each disc for supporting it rotatably in said casing and driving means fitted to one of said discs.

2. In a rotary pump in combination, a stationary casing, a plurality of rotary pistons adapted to rotate about a common axis within said casing, lateral discs rigidly connected to the ends of said pistons, a filling body enclosed between said rotary pistons and said lateral discs, journals extending from said filling body through borings of said lateral discs and fixing said filling body in position in said casing and a bearing associated with each disc for supporting it rotatably on one of said journals.

3. In a rotary pump in combination, a stationary casing a plurality of rotary pistons adapted to rotate about a common axis within said casing lateral discs rigidly connected to the ends of said pistons, a filling body enclosed between said rotary pistons and said lateral discs, a rotary valve adapted to co-operate with said pistons and enclosed in said casing, and axially directed entrance and discharge channels for the medium to be conveyed.

4. In a device of the kind described in

combination, a plurality of rotary pistons adapted to rotate about a common axis, lateral disks common to said pistons and rigidly connected therewith, a rotary valve adapted to co-operate with said pistons, a casing surrounding both said valve and said pistons, a mantle surrounding said casing, two channels for each piston following each other in axial direction and extending between said casing and said mantle and helical partitions connecting the front faces of said casing and separating said channels.

In testimony whereof I affix my signature.

HUGO JUNKERS.