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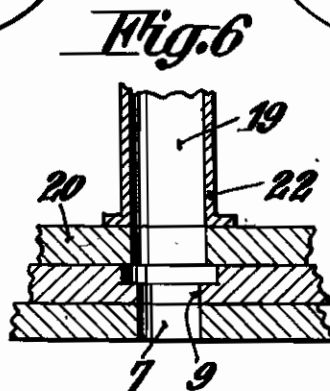
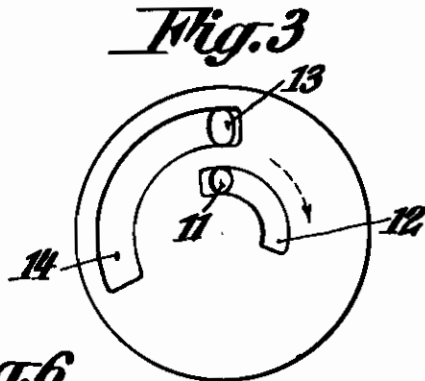
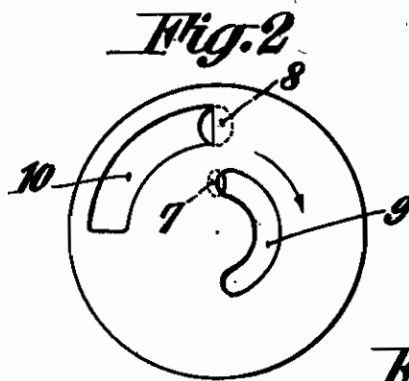
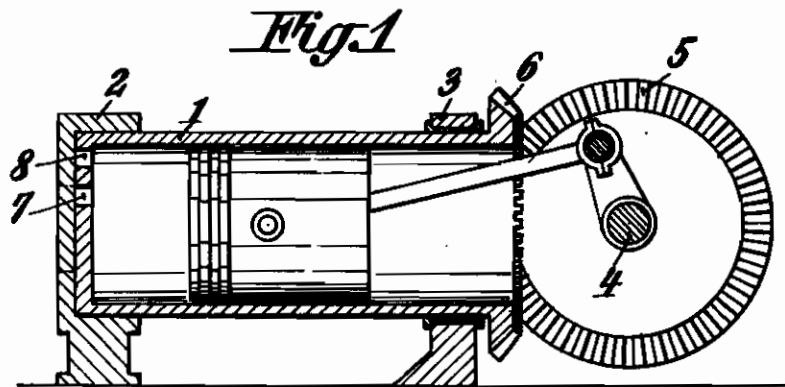
MAY 11, 1943. VALVE GEAR FOR PISTON ENGINES OR MACHINES

417,719

BY A. P. C.

Filed Nov. 3, 1941

2 Sheets-Sheet 1



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Fig. 4

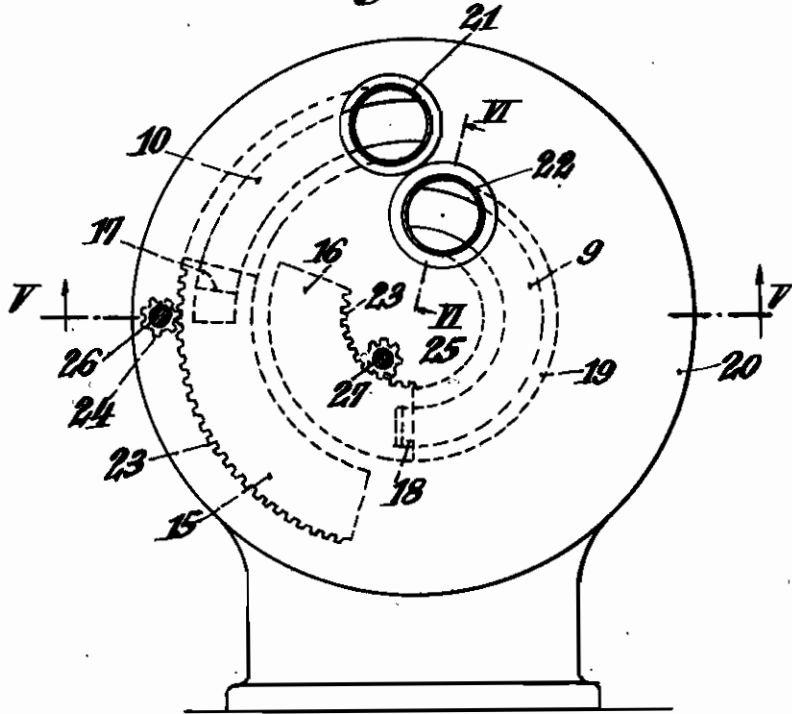
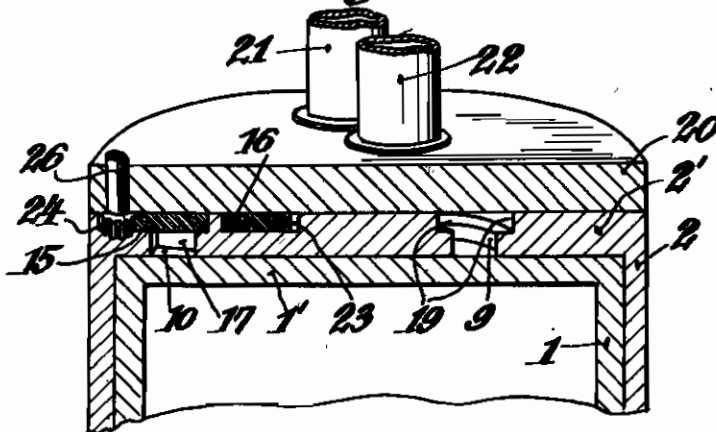


Fig. 5



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ALIEN PROPERTY CUSTODIAN

VALVE GEAR FOR PISTON ENGINES OR MACHINES

Paul Reichsfeld, Vienna 1, Germany; vested in the Alien Property Custodian

Application filed November 3, 1941

This application is a continuation of my co-pending application Serial No. 144,717, filed May 25, 1937. This invention relates to valve control gear for piston engines and machines, and more particularly for piston compressors.

Regulating devices for internal combustion engines in which the cylinders rotate about their axes while the fuel is admitted axially through the cylinder head are known. With such arrangements the ports for admission and discharge in the stationary cap are disposed in the same radial distance from the center and registering with a single common port in the cylinder head. Types of valve control gear for prime movers, more particularly steam engines, are also known, consisting of a continuously rotating control disc which fulfills the function of the control member, and which is provided with inlet and outlet ports disposed in offset relation to each other, and of a rotatable closing disc which is adapted to regulate the degree of admission to the cylinders. All these known types of construction, insofar as they relate to internal combustion engines, make no provision for varying the respective duration of admission, compression and exhaust.

The present invention relates to a valve control, for piston machines, particularly piston compressors, having a cylinder coupled for rotation with the crank-shaft of the machine and adapted to rotate in a stationary cap, characterized by the provision in the cylinder head and also in the cap head of separate ports disposed at different radial distances from the axis of rotation of the cylinder head in such a way, that the admission ports are disposed near the axis of rotation and the discharge ports in the margin zone of the rotating cylinder. The ports are arranged concentrically to each other and also to the axis of rotation, and so arranged and dimensioned that on rotation of the cylinder head these ports coact with each other and control the admission to and discharge from the working cylinder, independently one of the other, in a manner appropriate to the working cycle of the machine.

By disposing the control openings on rotating cylinders in this way, the result is obtained, that the medium such as air, gas or the like entering the cylinder near the axis of rotation will be distributed by centrifugal force from the middle of the cylinder towards the margin of the cylinder and compressed in the margin zone, while the medium leaving the cylinder is forced by centrifugal force through the outlet openings arranged near the margin of the cylinder. The ro-

tating cylinder acts in the manner of a separator and compresses the medium, which has entered the cylinder near the axis of rotation towards the marginal zone, so that in the middle where the inlet openings are disposed a suction effect appears and a greater amount of the medium is sucked in, while the medium which is to be discharged is pressed by the centrifugal effect in the margin zone, where the outlet openings are disposed and is forced through said outlet openings, whereby a more effective emptying of the cylinder is obtained. The disposition of the admission ports near the center and of the discharge ports in the margin zone in combination with a rotating cylinder, according to the invention, therefore, when used for compressors, or pumps, increases the volumetric effect, and when used for engines, such as internal combustion engines increases the output in such a manner as is only obtained by a super charging device.

The process, according to the invention, therefore, is characterized by introducing the gaseous medium into the rotating cylinder near the axis of rotation, distributing and compressing the said medium towards the marginal zone of the cylinder by centrifugal force exerted by the rotation of the said cylinder and afterwards discharging the said medium under the action of the said centrifugal force at a place in the margin zone of the said cylinder.

Moreover the valve gear according to the invention is particularly simple. This simplicity of construction is due to the fact that the valve gear consists substantially of only two parts, namely, a rotating part formed by the cylinder head itself, and a stationary part formed by the cap, to which parts the inlet and outlet conduits may be directly connected.

The control means provided by the present invention is of particular advantage when applied to compressors, especially to compressors used in refrigerating machines.

By virtue of the present invention it becomes possible, owing to the provision of the ports in the head of the cylinder cap, to vary the effective length of these ports by the insertion of sliding shutters or diaphragms, by which means the degree of compression or the rate of admission of the cold vapor may be regulated as required to suit varying conditions.

The arrangement may be such that in the stationary cap there are provided control ports which are adapted to register temporarily with the ports in the cylinder head, and the lengths of arc of which are adjustable independently of one

another by means of shutters, diaphragms, or similar means, for the purpose of separately altering the length of the openings period of the outlet and of the inlet.

In the accompanying drawing several constructional examples of the invention are illustrated.

In the drawing:

Fig. 1 is a sectional view of a machine equipped with the control means according to the invention.

Fig. 2 shows an arrangement of the control ports in the cap head and in the cylinder head for a compressor or the like.

Fig. 3 shows an arrangement of the control ports in the cap head and in the cylinder head for a machine working on the four-stroke principle.

Fig. 4 is an elevational view of the end of the cylinder showing means for varying the length of the orifice of the ports in the cap.

Fig. 5 is a sectional view taken on the line V—V of Fig. 4.

Fig. 6 is a section taken on the line VI—VI of Fig. 4.

Fig. 1 shows a constructional form of the invention, in which one part of the valve gear is formed directly by the cylinder itself. The cylinder 1 is journaled so as to rotate about its axis in a cap 2 and in a bearing 3 and is driven from the crank shaft 4 through a bevel wheel gearing 5, 6. The end wall or head of the cylinder 1 bears in a fluid-tight manner against the cap 2 and is provided with ports which, when the cylinder rotates about its axis are adapted to register temporarily with ports provided in the end wall of the cap 2.

Fig. 2 shows an arrangement of the control ports in which slot-shaped ports are provided in the stationary cap head, and hole-shaped ports in the rotary cylinder head or an arrangement for use in a compressor. The end wall of the cylinder is provided with the inlet port 7 and the outlet port 8 and adapted to rotate in the direction of the arrow, while the stationary end wall of the cap 2 is provided with an inlet port 9 and an outlet port 10. The control means is shown in the position in which the intake commences, that is to say about when the piston has reached its top dead centre position. On the end wall of the cylinder rotating out of the position shown in the direction of the arrow, the inlet port 7 registers for a period with the port 9 and the inflow into the cylinder continues as long as the port 9 which is in the form of an arc of a circle slides past the opening 7, the length of the orifice of the port 8 determining the length of the inflow period. At the same time however, the outlet port 8 moves in the direction of the arrow during which the outlet opening 10 in the end wall of the cap or cap head bears against the solid part of the cylinder head and is thereby kept closed. As the cylinder head continues to rotate, the inlet port 7 passes over the end of the port 9 in the cap head, so that this opening is closed by the solid part of the cap head. Compression is effected by virtue of the fact, that during the compression stroke of the piston the exhaust port 8 slides against the solid part of the cap head until it registers with the exhaust port 10, the length of the slot determining the degree of the compression. As the rotary motion of the cylinder continues the outlet port 8 registers with the outlet port 10, and the duration of the opening period is determined by the

length of the orifice of the port 10. As the drawing shows, the openings controlling the inlet are arranged on a different radius from that on which the opening controlling the outlet is disposed so that the openings controlling the inlet and those controlling the outlet have no influence on one another, the inlet ports being arranged near the center of the cylinder and the outlet ports in the margin zone. After the completion of one revolution of the crank shaft the cycle of operations in the cylinder recommences, since this engine operates on a two-stroke cycle. For this reason in this engine the rotary cylinder must be driven by the crank shaft with a ratio of transmission of 1:1.

Fig. 3 shows the arrangement of the control ports for a piston machine working on the four-stroke principle, or an internal combustion engine. As the cylinder head rotates, the hole-shaped inlet port 11 therein registers with the inlet slot 12 in the cap head, while the outlet slot 14 coacts with the hole-shaped outlet port 13 to control the exhaust. As may be seen from the figure of the drawing, it is possible, by suitable dimensioning of the slots as regards their length, to obtain the most favorable duration of opening for the admission and for the exhaust.

By arranging the slots and openings at different radial distances from the axis of rotation it is possible to obtain opening periods of the valve gear of different duration for the suction and for the exhaust.

The control ports may also be provided in a cylinder head or cylinder end formed in accordance with any body of rotation, and be adapted to coact with openings in a correspondingly shaped cap. The arrangement of the control ports directly in the cylinder head has the advantage that the clearance is reduced to a minimum. The slot shaped ports may also be arranged in the cylinder head and the hole shaped ports in the cap head.

The valve gear according to the invention may of course also be used for double acting piston engines or machines, in which case both cylinder ends or end walls may be provided with ports adapted to coact with caps (2).

The rotary valve member or the cylinder may be driven by any suitable transmission members, such as toothed wheels (Figure 1), a chain or the like.

The valve gear or control means may also be so constructed that the openings periods can be altered by varying the effective length of the slots, in which case the adjustable slots will be provided in the stationary part of the control arrangement. The effective length of the control slots may be varied by the insertion of shutters or slidable shutter-like members.

Figs. 5, 6 and 7 show an arrangement for a compressor, according to Fig. 3, in which the length of the slot-shaped control ports is variable. In the control slots for discharge 10 and for admission 9 in the cap head 2' there are inserted shutters 15 and 16 which slide with a tight fit by means of tongues 17, 18 against the cylinder head 1'. The shutters 15 and 16 are guided in recess 19 in the cap head between the cap head 2' and a covering plate 20 having holes to which are connected the conduits 21, 22. The shutters 15, 16 are provided on their edges with teeth 23 meshing respectively with gear wheels 24, 25 by means of which the shutters may be adjusted in the arcuate guideways 18 in the cap by rotation of the shafts 26, 27. Since the space

beneath the shutter 16 is closed off from the interior of the conduit 22 the control means are cut off when the control port 9 in the cap head 2' is covered over by the tongue 18 as shown.

The medium to be compressed is introduced into the rotating cylinder 1 near the axis of rotation through the admission ports 7, 8, arranged in the cylinder head 1' and in the cap head 2' respectively while the piston is moving down. At the same time the medium will be distributed and compressed towards the margin zone of the cylinder 1 by centrifugal force exerted by the rotation, thereby allowing a greater amount of the medium to enter the cylinder. Thereafter com-

pression follows by upward movement of the piston and discharge under the action of the centrifugal force through the discharge ports 9, 10, arranged in the cylinder head 1' and in the cap head 2', respectively, the admission and discharge periods being variable by the adjustable shutters 16 and 15, respectively.

The control arrangement according to the invention is applicable with advantage to other kinds of machines and the like operating with pistons, such as for instance compressed air motors, steam engines, pumps, internal combustion engines and the like.

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