Sept. 4, 1934. M. R. HUTCHISON, JR 1,972,302

ROTARY PUMP, COMPRESSOR, OR THE LIKE

Filed Nov. 8, 1932

Fig. 2.

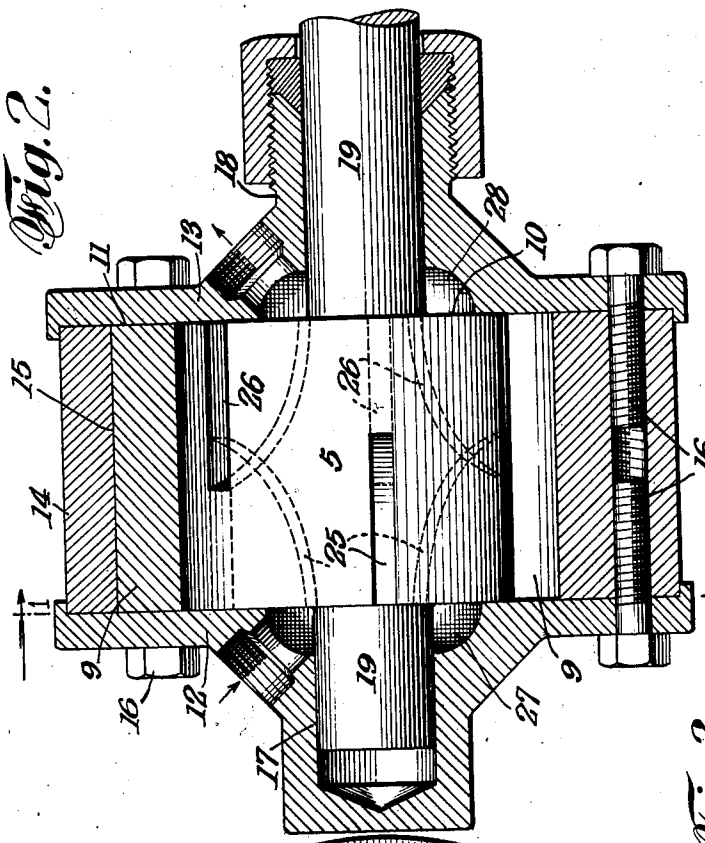


Fig. 3.

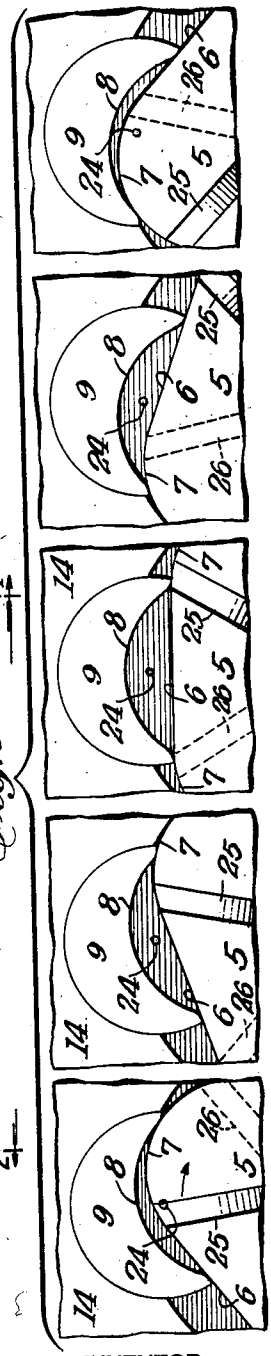
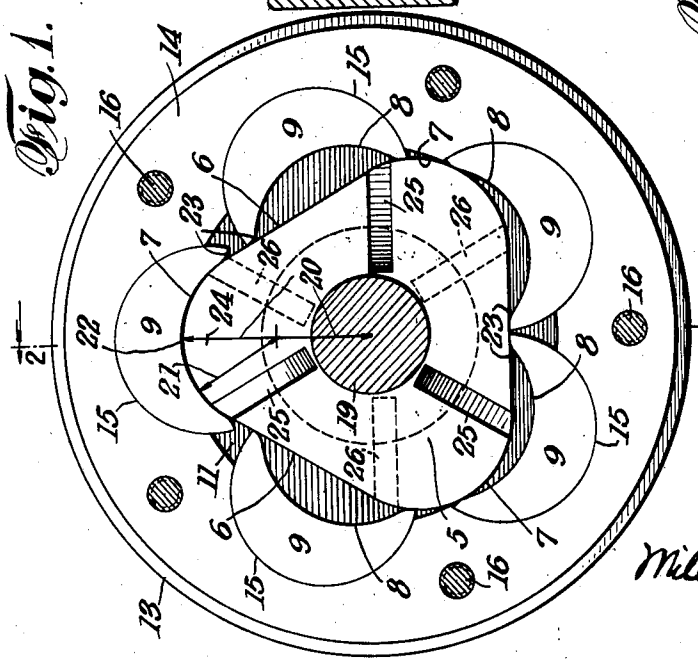


Fig. 1.



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ROTARY PUMP, COMPRESSOR, OR THE LIKE

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6 Claims. (Cl. 103—124)

This invention relates to rotary pumps, compressors and the like.

The objects of the invention are to obtain in a construction of this general character, high efficiency and practicability, simplicity of design, few operating parts, low cost, rugged character and large useful displacement.

These and other desirable objects are attained by the novel features of construction, combinations and relations of parts hereinafter described, illustrated and broadly covered in the claims.

The drawing accompanying and forming part of the specification illustrates a practical commercial embodiment of the invention, but as such illustration is primarily by way of disclosure, it will be appreciated that the actual physical structure may be modified and changed in various ways, all within the true intent and broad scope of the invention.

Fig. 1 in the drawing is an end elevation and part sectional view of the parts of a rotary pump embodying the invention, as they would appear with the end head of the pump removed, as on substantially the plane of line 1—1 of Fig. 2.

Fig. 2 is a sectional view as taken on substantially the plane of line 2—2 of Fig. 1, the rotor and shaft appearing in elevation.

Fig. 3 is a collective view illustrating different phases in the operation of one of the rockers.

By reference first to Fig. 1, it will be seen that the present illustrated embodiment of the invention comprises a three lobed cam or rotor 5, of generally triangular conformation and having the plane faces 6, joined by tangential cam lobes 7, these several flat and rounded faces cooperating with the hollowed faces 8 of the surroundingly mounted rocker elements 9, to constitute variable displacement volume chambers.

The rotor and the rockers are shown as having coincidental plane ends 10, 11, leaving the chambers as thus far described, open at opposite ends. These open ends of the chambers are closed, in the present illustrated form of the invention by the end heads 12, 13, of a casing structure, which in the surrounding portion 14 has the arcuate seats 15 for the rockers. Bolts 16 are shown removably securing the end heads to the intermediate body portion of the casing and these end heads are shown as carrying suitable bearings 17, 18, for the shaft 19 of the rotor.

The cam as here illustrated, is a generally triangular three-lobed structure, whose size is defined by the radius of a cylinder within which it lies and is tangent thereto at three equally spaced points. The radius of each of the circular arcs joining the plane surfaces is in each case equal to one half the radius of the cylinder. This follows whether there be three or more, or fewer lobes and it is this relation, which makes possible a continuous following action between rockers and rotor and maintenance of the proper seal therebetween in all positions. In the illustration, Fig. 1, the radius 20 represents that of the encompassing circle or cylinder and the radius 21 of half such size represents that of the cam lobe.

The hollow faces 8 of the rockers may be arcs identical with the contour of the cam lobes or they may be slightly or considerably deeper to provide a small or a greater degree of clearance, as indicated at 22, Fig. 1, in the minimum clearance volume position. At the ends, the hollows in the rockers merge into rounded nose portions 23, to ride the face of the cam and the backs of the rockers as well as the seats therefor, may be drawn as circular arcs upon the centers 24, located slightly within the cylindrical outline of the cam.

Passages for inlet and outlet of the fluid are provided and, in the present instance, by means of arcuate cuts 25, 26, extended in from the opposite plane faces of the rotor through the working face of the same, adjoining the opposite ends of the lobes. Thus, in the illustration there is an inlet slot 25, cut in from one end of the rotor to one end of a lobe, substantially at the junction with the adjoining plane surface and an outlet slot 26, extended in from the opposite end of the rotor, to the opposite end of the same lobe, substantially at its junction with the plane surface at the opposite side of the same. These passages or ports may be placed and the rockers be so designed as to prevent bridging over effect direct from intake to exhaust ports.

The passages for intake and exhaust purposes are completed in the illustration by annular chambers or manifolds 27, 28, in the opposite ends of the casing, the first registering with the outer ends of the intake ports 25 and the other registering with the outer ends of the exhaust ports or cuts 26.

The operation of the machine as a pump will be understood by a consideration of the action of a single rocker, such as the one shown at the top in Fig. 1, through the successive phases illustrated in Fig. 3. Starting with minimum clearance volume with an intake port 25 open to the hollow of the rocker, the clearance volume increases with movement of the rotor toward the right, to a maximum with the rocker overstanding a plane face of the rotor, at or about which

time an outlet port 26 comes into communication with the chamber and remains so while in the continued rotation, the clearance volume again reduces to a minimum. With a sufficient number of the rockers, pulsation may be reduced or eliminated and substantially continuous flow be produced. The rockers, in the illustration, accomplish all the valving action necessary for the operation of the machine as a pump or compressor. If the device is to be operated as a motor for delivering power, other or different valving means suitable to the purpose may be provided and the structure may be otherwise modified to suit the special purpose.

The lobed cam in its operation, is in effect an undulatory closure member for the chambered rockers and the latter are in effect chambered follower members, defining with the closure member a series of chambers of varying clearance volume. In order to reduce the rocking velocity between the rotor and the rockers, the undulating sealing surface may be provided by a flexible belt carried by a system of rollers, free to turn on their supporting axes and proportioned as the equivalent of a lobed solid cam, such as here illustrated. The inlet and outlet ports may be formed partly or wholly in the rockers instead of in the rotor and the swinging action of the rockers be then utilized for control of companion ports in or carried by the casing.

The rounded nose portions 23 at the ends of the rockers may be defined by laying out the cam in two different positions, one-half cycle apart and then drawing radial lines from the cam center out through the intersections of the rotor contours in such two positions. On these radial lines, at points intersected by the total radius of the cam, centers are located and from these centers arcs of circles are described which will coincide with the adjacent outlines of the cams in the two positions. These smaller arcs then form properly shaped rounded bearings at the ends of the cavital portions for sealing contact with the cam in all positions of the latter. While this and the method previously described of laying out the cam are at present preferred, it will be understood that these methods may be varied and other changes made, as will be clear from the broad scope of the claims covering this new construction which, by the relation of parts described, provides exceedingly large useful displacement for the size of the machine.

What is claimed is:

1. A machine of the character disclosed, comprising a casing having a generally cylindrical chamber provided with inlet and outlet passages and having a partly cylindrical bearing offset from the axis of said chamber in parallel relation therewith, a symmetrical rotor member rotating in said chamber and composed of tangentially related plane and outwardly convex surfaces, a partly cylindrical rocker member seated in said partly cylindrical bearing and thereby journalled on a fixed axis parallel with the axis of rotation of the rotor member, said rocker member having a hollow face opposed to the rotor member and having rounded bearings at opposite sides of the hollow in constant sealing engagement with the tangentially related plane and outwardly convex surfaces of the rotor member and one of said members described being ported to alternately connect the confined space between the cooperating members with said outlet and inlet passages in the casing.

2. A machine of the character disclosed, comprising a casing having a generally cylindrical chamber provided with inlet and outlet passages and having a partly cylindrical bearing offset from the axis of said chamber in parallel relation therewith, a symmetrical rotor member rotating in said chamber and composed of tangentially related plane and outwardly convex surfaces, a partly cylindrical rocker member seated in said partly cylindrical bearing and thereby journalled on a fixed axis parallel with the axis of rotation of the rotor member, said rocker member having a hollow face opposed to the rotor member and having rounded bearings at opposite sides of the hollow in constant sealing engagement with the tangentially related plane and outwardly convex surfaces of the rotor member, the rotor member having ports providing communication between the passages in the casing and space confined between the cooperating members.

3. A machine of the character disclosed, comprising a casing having a generally cylindrical chamber provided with inlet and outlet passages and having a partly cylindrical bearing offset from the axis of said chamber in parallel relation therewith, a symmetrical rotor member rotating in said chamber and composed of tangentially related plane and outwardly convex surfaces, a partly cylindrical rocker member seated in said partly cylindrical bearing and thereby journalled on a fixed axis parallel with the axis of rotation of the rotor member, said rocker member having a hollow face opposed to the rotor member and having rounded bearings at opposite sides of the hollow in constant sealing engagement with the tangentially related plane and outwardly convex surfaces of the rotor member, the rotor member having ports therein providing communication between the space confined between the cooperating members and one of the passages in the casing.

4. In combination, a lobed cam, chambered rockers concentrically disposed about said cam and having bearing edges at opposite sides of the chambers therein in sealing contact with said cam in all positions of relative rotation of the cam and rockers and means providing inlet and outlet passages to and from the chambers defined between said cam and followers.

5. In combination, a casing having arcuate seats disposed concentrically about a common center, a cam journalled in said casing on said center, chambered rockers mounted in said seats and having bearing edges at opposite sides of the chambers therein in dual sealing contact with said cam and means providing inlet and outlet passages to and from the chambers thereby provided between said cam and followers.

6. In combination, a casing having arcuate seats disposed concentrically about a common center, a cam journalled in said casing on said center, chambered rockers mounted in said seats and having bearing edges at opposite sides of the chambers in said rockers in dual sealing contact with said cam, means providing inlet and outlet passages to and from the chambers thereby provided between said cam and followers, including end heads to the casing having chambers opposed to the ends of the cam and said cam having inlet and outlet ports opening from the face of the cam at opposite sides of the lobes through opposite end walls of the cam.

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