Nov. 26, 1935. H. J. KRATZER 2,022,207

POSITIVE DISPLACEMENT PUMP OF THE CONSTANT DELIVERY TYPE

Filed Sept. 15, 1933

Fig. 2.

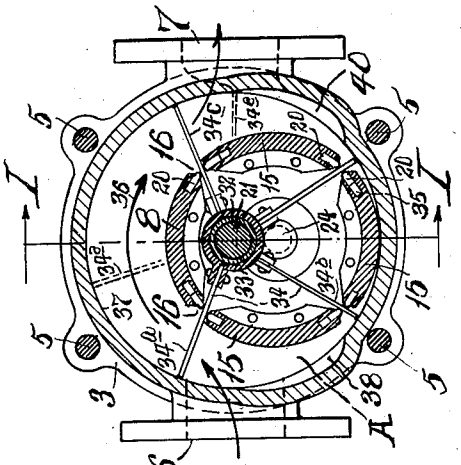


Fig. 3.

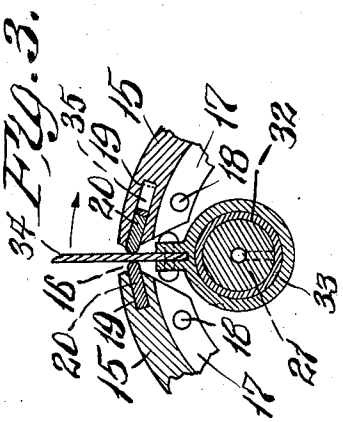


Fig. 1.

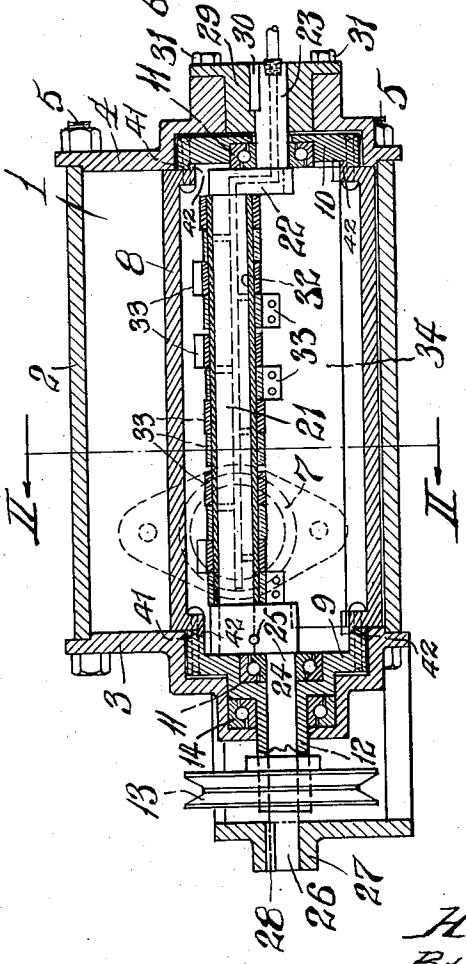
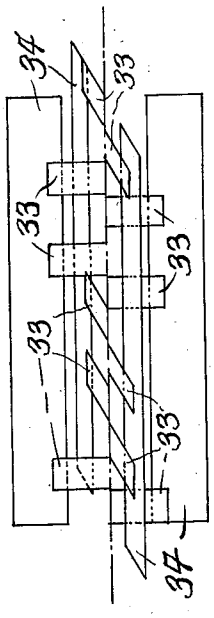


Fig. 4.



Inventor:
H. J. Kratzer.
By Herbert G. Fletcher Atty.

Patented Nov. 26, 1935 2,022,207

UNITED STATES PATENT OFFICE

2,022,207

POSITIVE DISPLACEMENT PUMP OF THE CONSTANT DELIVERY TYPE

Herbert J. Kratzer, St. Louis, Mo.

Application September 15, 1933, Serial No. 689,595

3 Claims. (Cl. 103—144)

This invention relates to certain improvements in positive displacement pumps and has for one of its objects to provide a reliable and a noiseless pump of simple manufacture, having a large capacity—to size ratio.

Another object of the invention is to provide a positive displacement pump wherein a minimum of surfaces friction.

A further object of the invention is in providing a pump of the constant delivery type with improved means in its construction whereby the operative parts compensate for natural wear, thus providing for efficient operation over a long service life.

A still further object of the invention, is in providing a positive displacement pump with improved means for compressing the charge prior to the displacement thereof.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawing, exemplifying the invention, and in which:—

Figure 1 is a longitudinal vertical section taken through this improved positive displacement pump on the line I—I of Fig. 2.

Figure 2 is a transverse vertical section taken approximately on the line II—II of Fig. 1.

Figure 3 is an enlarged fragmentary transverse section taken through a portion of the rotor and one of the vanes thereof.

Figure 4 is a schematic view of the vane assembly and the hinges thereof to the supporting axis.

Referring by numerals to the accompanying drawing, 1 designates a housing which comprises a cylindrical body 2 having end members 3 and 4, said body and end members being secured together by the tie bolts 5. The body 2 is provided on opposing sides with an intake connection 6 and a discharge connection 7.

Longitudinally disposed for operation within the housing 1 is a vane operating rotor 8 having end members 9 and 10, each being supported on a respective anti-friction bearing 11. The end member 9 of the rotor 8 is provided with a tubular extension 12 which extends through the end member 3 of the housing 1, and fixed on said tubular extension beyond the end member 3 is a driven pulley 13.

The end member 9 of the rotor 8 and the end member 3 of the housing 1, are designed so that an end thrust bearing 14 is cooperably disposed therebetween.

The rotor 8 is built from a plurality of longitudinal circumferential sections 15 which are circumferentially separated from each other for providing longitudinal gaps 16, each section 15 having end flanges 17 through which rivets 18 are passed for securing the sections to respective end members 9 and 10.

Each section 15 on respective longitudinal edges, is provided with a longitudinally extending groove 19, and mounted in each groove is a strip of "non-growing" packing 20, each packing strip 20 extending into a gap 16.

Longitudinally disposed in the rotor 8 and disposed eccentric thereto, is a shaft or member 21, said shaft being disposed concentrically in the housing 1 and is formed integral at one end with an arm 22 of a horizontal supporting portion 23. The opposite end of the shaft 21 is secured to an arm 24 by a pin 25, said arm 24 being integral with a horizontal supporting portion 26. The supporting portions 23 and 26 of the shaft 21 are disposed in horizontal alinement and are mounted through respective bearings 11 and end members 9 and 10 of the rotor 8, the supporting portion 26 of the shaft 21 extending through the tubular extension 12 of the end member 3 of the housing 1, and having an end support 27 to which the supporting portion 26 is fixedly secured by the key 28. The supporting portion 23 of the shaft 21 is fixed to a bushing 29 by a key 30 and the bushing 29 being fixed to the end member 4 of the housing 1 by the cap screws 31.

Mounted on the shaft 21 between the arms 22 and 24 thereof, is a bearing sleeve 32, and mounted on said sleeve are a plurality of hinges 33 which are disposed in sets for the support of a plurality of vanes or buckets 34, each vane extending through respective gaps 16 of the rotor 8 and between opposing pairs of packing strips 20.

One of the packing strips of each opposing pair of packing strips 20 is provided with a cooperating kinked leaf spring 35 for causing each spring related packing strip to follow up and continually engage respective vanes 34 against a respective opposed packing strip as the vanes are caused to slide between related pairs of packing strips during rotation of the rotor.

In the operation of the device, the pulley 13 upon being driven, will operate the rotor 8 in the direction of the arrow 36 shown in Fig. 2, and by reason of the shaft 21 supporting the hinges 33 to which the vanes 34 are secured, the vanes 34 of which there are four, will be traveled with the rotor in wearing contact at their outer ends with the inner periphery 37 of the housing 1. During travel of the vanes with the rotor, the fixed ec-

centric relation of the shaft 21 with the rotor will cause the vanes to spread a greater distance apart between cooperating pairs on the intake or suction side of the device and will further cause the cooperating pairs of vanes to be moved towards each other on the discharge side of the device. This action is brought about by reason of the fixed shaft 21 being disposed concentric to the housing 1 and in alinement with the intake and discharge connections 6 and 7, and the rotor being eccentrically disposed in the housing on an axis at a right angle to the intake and discharge connections, and the periphery of the rotor having a minimum clearance with the inner periphery of the housing.

With the above arrangement and disposition of parts, it will be seen from an inspection of Fig. 2 that the vane further designated as 34*a* has just cleared the opening of the intake connection 6, therefore an intake pocket A is determined between the vane 34*a* and the vane 34*b* into which fluid will be entrained from the intake opening as the vane 34*a* is caused to spread or move from the vane 34*b*, and the spread of the vane 34*a* will continue until it reaches the approximate position shown at 34*c*, and during which time the vane 34*b* reached the former position of vane 34*a* and in which position the vane 34*b* will have cut off further suction or intake charging. The spreading and faster swinging during travel of the vanes from the positions 34*a* to 34*c* is caused by the peripheral travel of the rotor being in closer proximity to the shaft or hinge support 21.

When a vane reaches the approximate position shown at 34*c*, it will begin to move more slowly by reason of the fulcrum point of contact of the rotor with the vane 34*c* shifting outwardly on the vane, and whereas the vane 34*a* will be moving faster towards vane 34*c* on account of the fulcrum point of contact of the rotor therewith being inward, the retarding action of vane 34*c* and the quicker moving forward action of 34*a*, compressing the fluid between the vanes 34*a* and 34*c*, and the compressing action on the fluid will continue until the vanes 34*a* and 34*c* simultaneously reach the approximate positions shown in dotted lines and designated as 34*d* and 34*e*, respectively.

Continued travel of the vanes now designated as 34*d* and 34*e* will communicate the compressed fluid charge between said vanes with the discharge opening of the discharge connection 7 into which the compressed fluid will be discharged.

Adjacent the intake side of the housing, a pocket 38 is formed for providing early loading of the fluid from the intake connection 6 behind each vane 34 as each vane travels into communication with the pocket. The opposite side of the housing 1 is provided with a pocket 40 adjacent the opening of the discharge connection 7, this pocket providing for complete discharge of the compressed fluid between pairs of operating vanes.

With further regard to the pockets 38 and 40, as shown in Fig. 2, attention is directed to the fact that a minimum of compressed fluid will be transferred from the pressure side of the housing to the suction side during the interval that the vanes are passing the dead sector of the housing.

During assembly of the device, the fixed shaft 21 on which the hinges 33 of the vanes 34 are supported, is mounted within the rotor 8 with the vanes there attached before the rotor is mounted in the housing 1. In this connection, the sections 15 of the rotor are first secured to the end member 9 by the rivets 18, and the sleeve 32 is next mounted on the shaft 21 before the shaft is pinned to the arm 24 ready for the reception of the hinges 33 of the vanes 34.

Each vane 34 is provided with three hinges 33, the hinges being arranged on each vane in a relation wherein they will stagger the hinges of other vanes when the hinges are mounted on the shaft 21. After the vanes through their hinges have been mounted on the shaft 21, the extending end of the shaft is then mounted in the arm 24 and secured thereto by pin 25, and the supporting portion 26 of the arm 24 is mounted in the tubular extension 12 of the end member 9 of the rotor 8. During the mounting of the shaft in the rotor, care is taken to dispose each vane 34 in a respective gap 16. The end member 10 is then mounted over the supporting portion 23 of the shaft 21 and secured to the rotor sections 15 by the rivets 18, after which the packing strips 20 are mounted in respective grooves 19 of the sections 15. This completes the assembly of the rotor and the vanes 34 thereof ready for mounting it in the housing 1, and for securing the driving pulley 13 to the tubular extension 12 of the rotor end member 9.

After the rotor 8 with the assembled vanes 34 has been mounted in the housing, the bushing 29 is then inserted in the end member 4 of the housing and secured thereto by the cap screws 31. The keys 28 and 30 are then fastened in the keyways of respective supporting portions 23 and 26 of the shaft 21 for fixedly securing said shaft against being turned in the bushing 29 and the end support 27.

The packing strips 20 are of the approximate length of the sections 15 of the rotor 8 and are adapted to engage respective inner surfaces of the end members 3 and 4 of the housing 1.

The packing strips 20 will provide efficient packing of respective cooperating vanes 34, particularly in view of the fact that one of the packing strips 20 of opposing pairs of packing strips is resiliently and yieldingly held against a respective vane by a cooperating kinked leaf spring 35.

The vanes 34 are of a length so as to be in approximate wearing contact with inner faces of respective end members 3 and 4 of the housing 1, and the extending end of each vane 34 is also adapted to be in approximate wearing contact with the inner periphery 37 of the cylindrical body 2 of the housing 1 so that cooperating pairs of vanes 34 will be efficient in compressing fluid charges therebetween as the fluid charges are conveyed from the intake side to the discharge side of the housing.

In the event of bearing wear on the hinges 33 of the vanes 34 and/or the sleeve 32 and the shaft 21, centrifugal force will carry and hold the vanes outwardly, thus the wear will be compensated for by reason of the outer edge of each vane contacting with the inner periphery 37 of the housing 1 whereby the contacting edge of each vane will automatically wear to size.

Each of the end members 9 and 10 on their inner sides is counter-bored to provide an annular shoulder 41, and in engagement with the shoulder of each end member, is an extending lip 42 formed on each end of each section 15 of the rotor, the under-engaging of the lips 42 of the sections 15 of the rotor, providing reliable means for carrying the centrifugal stress of the sections into the end members extraneous of the rivets 18.

A displacement pump of this improved char-

acter it is clear, can be ideally used for charging the cylinders of two-cycle motors as well as being useful for serving as a super-charger to a four-cycle motor, and in addition, the device can be used in operation as an independent unit for providing an air pressure for sand blasting and the like, or for any other purpose where a required pressure or partial vacuum is desired.

Having thus described my invention so that those skilled in the art will be able to practice the same, what I desire to secure by Letters Patent is defined in what is claimed, it being understood that various changes in the displacement pump shown and described above in detail and not amounting to invention may be made without departing from the spirit and scope of my invention.

What I claim is:—

1. A rotor for a displacement pump comprising end members each having a laterally projecting internal annular shoulder, circumferentially spaced longitudinal sections having end projecting lips, said sections being secured to said end members with their projecting lips under-engaging respective annular shoulders of the end members, said end members being of less diameter than the circumferentially spaced sections a vane extending through the space between pairs of sections, and a longitudinally disposed shaft within the rotor to which the inner ends of the vanes are turnably secured.

2. A pump comprising a housing having recessed ends, a rotor in said housing comprising circumferentially disposed spaced sections having end projecting lips and end members of less diameter than said circumferential sections, each end member having an internal shoulder under which the projecting lips of said circumferential sections are engaged and secured, a vane extending through the space provided between pairs of circumferential sections, means within the rotor for supporting the inner ends of said vanes, each end member of the rotor being disposed in a recess of the respective housing ends, and a packing strip engaging each side of each vane and having end abutment with the inner surface of respective housing ends outwardly of respective recesses thereof.

3. A displacement pump comprising a housing having eccentrically recessed end members, a rotor in the housing having end members disposed in the respective recesses of the housing and members, spaced gaps formed in the periphery of the rotor, a vane of the approximate length of the housing extending through respective gaps of the rotor, the periphery of the rotor through which the vanes extend being of larger diameter than the end members thereof, a packing strip in each gap on each side of a respective vane, said packing strips having end abutment with the inner surface of respective housing end members outwardly of the end members of the rotor, and a support for the vanes disposed longitudinally in the rotor and held in eccentric position thereto.

HERBERT J. KRATZER.