July 26, 1938. H. M. HANSON 2,124,918

ROTARY VANE PUMP

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Fig. 1.

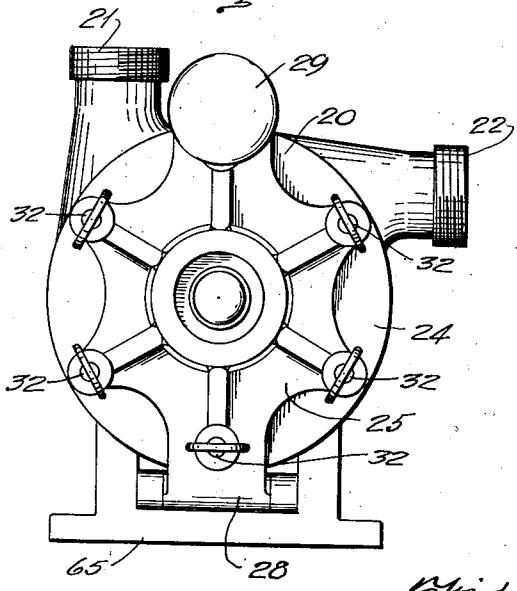


Fig. 2.

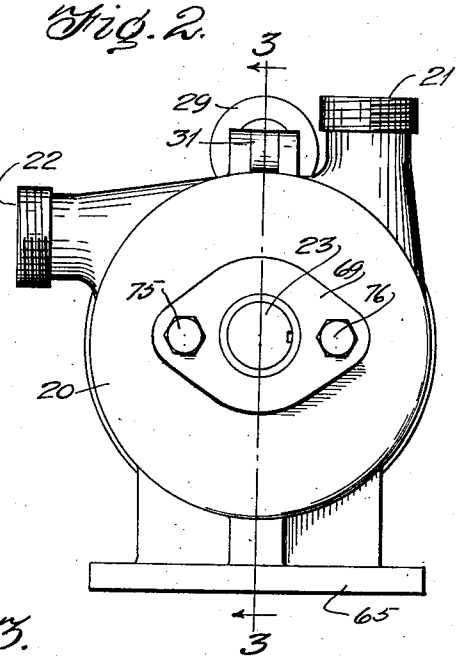
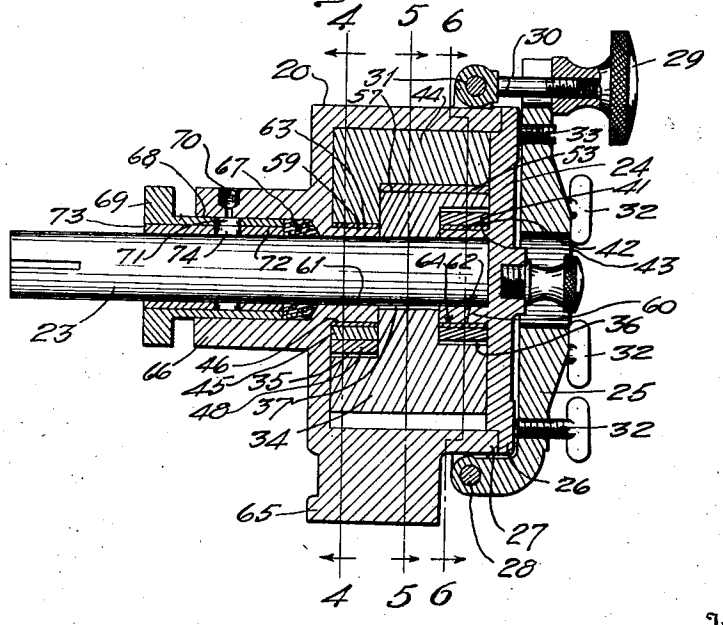


Fig. 3.



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Fig. 4.

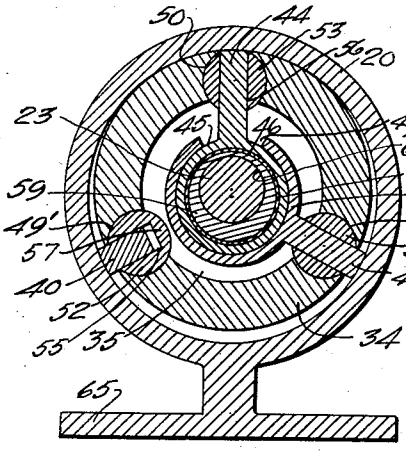


Fig. 5.

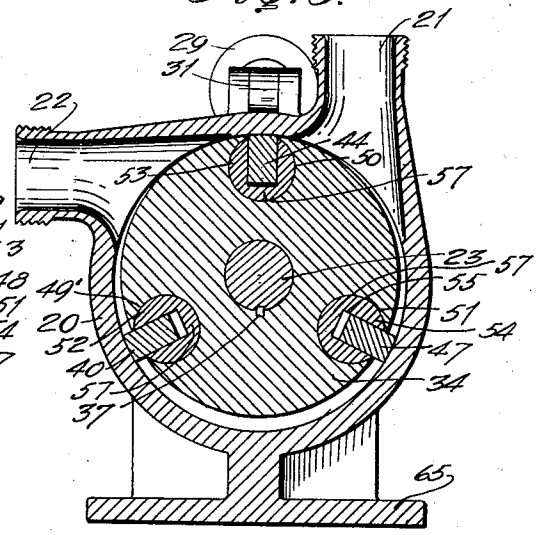


Fig. 6.

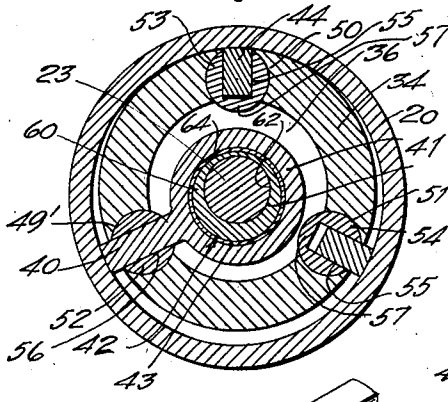


Fig. 7.

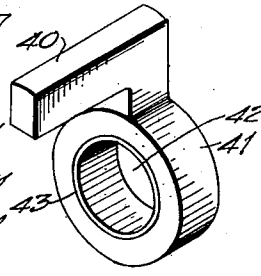


Fig. 10.

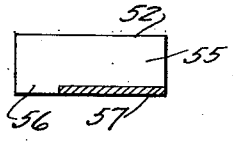


Fig. 9.

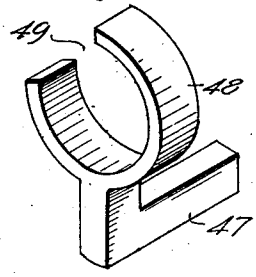
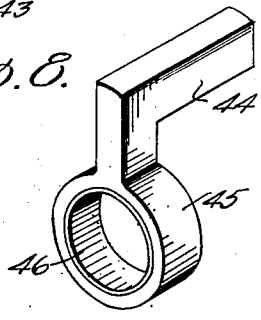


Fig. 8.



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UNITED STATES PATENT OFFICE

2,124,918

ROTARY VANE PUMP

Hans Magnus Hanson, Oshkosh, Wis.

Application June 25, 1937, Serial No. 150,401

4 Claims. (Cl. 103—144)

This invention relates to rotary vane pumps and more particularly to an improved pump construction of this type.

One object of this invention is to provide a new and improved pump of the rotary vane type. Another object is to provide a pump of this type which is readily assembled. Yet other objects are to provide a pump construction which is easy to make, is efficient in operation and which is easily lubricated. Other objects and advantages of this invention will appear in the following specification taken in connection with the accompanying drawings.

Figures 1 and 2 show side elevations of the opposite sides of a pump incorporating the improved features of this invention, Figure 1 showing the removable side wall and Figure 2 the fixed side wall. Figure 3 is an axial cross section on the line 3—3 of Figure 2. Figure 4 is a transverse cross section through the pump on the line 4—4 of Figure 3 showing certain features of the impeller arrangement. Figure 5 is a view on the line 5—5 of Figure 3 showing the central portion of the rotor and parts of the impellers. Figure 6 is a transverse cross section on the line 6—6 of Figure 3 showing the bearing arrangement of the other impeller. Figures 7, 8 and 9 show perspective views of the various impellers. Figure 10 is a cross section through one of the rollers.

The pump comprises a housing 20 with inlet and outlet openings 21 and 22 and interiorly thereof a series of impellers carried in a rotor driven from the shaft 23. The parts are arranged so that fluids may be drawn into the pump through the opening or port 21 and forced out of the pump through the port 22, or vice versa. One side of the pump housing is formed by a removable side wall member 24 which is secured in place by the bracket 25. The side wall member 24 is undercut to provide an annular flange 26 which seats against the pump housing end wall 27 to seal the interior. The bracket 25 is pivotally supported at 28 upon the housing 20 of the pump and is latched in position by means of a thumb-nut 29 which latter screws upon a bolt 30 pivotally secured at 31 to the housing. By tightening up on the nut 29 the bracket 25 is forced against the side wall 24. To compensate for any slight irregularities in the outer surface of this side wall a plurality of adjustable wing nuts 32 are secured in the bracket and spaced about the periphery thereof so that they may be adjusted to provide a uniform application of pressure against the side wall member. Adjacent the locking nut the machine screw 33 is used instead of a wing nut.

Inside of the housing is arranged the rotor 34 having circular counterbores 35, 36. The rotor is secured upon shaft 23 by means of a key 37 so as to provide a direct drive between the rotor and its drive shaft which latter may be driven by any appropriate source of power.

Two or more impellers are arranged to rotate with the rotor. In the drawings a pump is illustrated which contains three of these impellers but it is equally contemplated as within the scope of this invention to use two, three or four impellers. The impellers used in a three-impeller pump of the type illustrated are shown more clearly in Figures 7, 8 and 9. The impeller of Figure 7 comprises an L-shaped blade portion 40 and an annular or cylindrical bearing portion 41. In the central bore 42 is placed a bushing 43 to act as one of the wear members of the pump so that a bushing may be replaced instead of having to replace one of the impeller members. In Figures 8 and 9 impellers of the type which may nest together are shown. The impeller in Figure 8 likewise comprises an L-shaped blade portion or sleeve 44 and an annular bearing portion 45 with the inset bushing 46. The impeller members in Figures 7 and 8 are similar insofar as the blade portion is concerned but they may or may not be similar in the bearing portion. In the drawings, this latter portion in Figure 7 is of greater thickness than that in Figure 8. However, these impeller members may be made so that they will be interchangeable. In Figure 9 the impeller again comprises an L-shaped portion which is the blade 47, but in this case the bearing portion 48 is discontinuous having a gap 49. This gap is arranged so that impellers of Figures 8 and 9 may be nested together and provides for a limited relative rotary movement with respect to each other.

Considering the figures in greater detail, it will be observed that a single impeller, like that of Figure 7, is mounted in the counterbore 36 of the rotor. The blade 40 projects through one of a group of cylindrical slots 49', 50 and 51. These cylindrical slots are spaced equally about the circumference of the rotor and are provided with rollers 52, 53 and 54 respectively. One of these rollers is shown in greater detail in Figure 10. Each roller is provided with a slot 55 extending axially of it and with a transverse slot 56, through which that portion of the blade which connects with the bearing may extend. The roller wall 57 serves to close the back or central part of each slot.

In the other counterbore 35 of the rotor are mounted the two impellers 44 and 47 which are shown in nested relation in Figure 4.

The removable end wall **24** and the fixed end wall **58** each has an annular flange which extends into the bore of the housing. These flanges are numbered **59** and **60** respectively. As will be observed in Figures 3, 4 and 6, these annular bearing flanges provide a bearing for the shaft of the rotor and also a bearing for the bearing portions of the impellers. The axis of the inner peripheries **61**, **62** respectively of the flanges are eccentric with respect to the axis of the bore of the housing. In this manner the rotor will rotate about a definite axis which is spaced from the axis of the bore of the housing so that the rotor wall will be spaced from portions of the adjacent wall of the bore.

The exterior or outer peripheries **63** and **64** provide a bearing surface which is concentric with the axis of the bore of the housing and which is eccentric with respect to the axis of the rotor.

Most of the wear in the pump will take place on the bushings **43** and **46** which are placed between the bearing portions of the impellers and the bearing flanges. There will be very little relative rotary movement between the bearing portion **48** and the bearing portion **45** of the two impellers and for this reason it will be unnecessary to place a bushing between them.

The pump housing **20** is provided with an appropriate base **65** arranged to support the pump in position and with an outwardly extending cylindrical flange **66** acting as the main bearing for the pump. An appropriate packing gland **67** is forced into the counterbore **68** of this flange to seal it. A sleeve member **69** is arranged to fit within the counterbore **68** and is secured to the housing **20** by means of bolts **75** and **76**. For the purpose of lubricating the bearing an oil port **70** is provided which is arranged to be aligned with an opening **71** in the sleeve. Positioned interiorly of the sleeve and about the shaft of the pump are two annular members **72** and **73** which are spaced apart and provide therebetween an annular oil groove **74**. Oil supplied through opening **70** will flow through the sleeve into this annular groove and onto the shaft. Appropriate oil grooves may be provided in the shaft or rings.

It will now be readily understood that while the shaft **23** is causing the rotor to turn upon an axis eccentrically located with respect to the housing that the impellers will rotate at the same time and will move about an axis which is coaxial with the axis of the housing. Any tendency to bind as a result of these two movements of the impeller and the rotor about these two separate axes is readily eliminated by the action of the rollers. The rotation of the rotor and its impellers will cause fluid to be drawn into the pump by the consecutive impellers, carried around to the outlets, and then forced out of the pump.

It will be appreciated that a very compact and readily constructed pump has been described having many very desirable features and that although the description has been directed to the illustrated construction using three impellers, that one, two, three or four impellers may be equally well used.

Modifications within the true spirit and scope of the invention are covered by the appended claims.

What I claim is:

1. In a rotary vane pump having a housing with inlet and outlet ports, the combination therewith of a rotor in said housing rotating about an axis which is eccentric with respect to the axis of the bore of the housing, a plurality of impeller blades carried by said rotor and arranged to rotate about an axis concentric with the bore of the housing and said blades having cylindrical bearing portions and L-shaped blade portions, said rotor having circular counterbores in which said bearing portions are housed, one of said blades having its bearing portions in one counterbore and the other blades having their bearing portions housed within the other counterbore portion of the rotor, the ends of the pump housing having inwardly extending flanges on which said bearing portions are mounted, one of said bearing portions nested in concentric relation within another of said bearing portions, said last named bearing portion being incomplete so that the blade of said one bearing portion passes therethrough.

2. In a rotary vane pump having a housing with inlet and outlet ports, the combination therewith of a rotor in said housing rotating about an axis which is eccentric with respect to the axis of the bore of the housing, a plurality or impeller blades carried by said rotor and arranged to rotate about an axis concentric with the bore of the housing and having cylindrical bearing portions and L-shaped blade portions, said rotor having circular counterbores in its opposite sides in which said bearing portions are housed and having axially and transversely extending slots through which said blade portions extend, the ends of the pump housing having inwardly extending flanges on which said bearing portions are journaled, one of said blades having its bearing portion in one counterbore of the rotor, and the other of said blades having their bearing portions nested in concentric relation with respect to each other and housed within the other counterbore portion of said rotor, one of said last named cylindrical bearing portions being incomplete to allow passage therethrough of the blade from another of the last-named cylindrical bearing portions.

3. In a rotary vane pump having a housing with inlet and outlet ports, the combination therewith of a rotor in said housing rotating about an axis which is eccentric with respect to the axis of the bore of the housing, a plurality of impeller blades carried by said rotor and arranged to rotate about an axis concentric with the bore of the housing and said blades having cylindrical bearing portions and L-shaped blade portions, said rotor having circular counterbores in which said bearing portions are housed, one of said blades having its bearing portions in one counterbore and the other blades having their bearing portions housed within the other counterbore portion of the rotor, one of said bearing portions nested in concentric relation within another of said bearing portions, said last named bearing portion being incomplete so that the blade of said one bearing portion passes therethrough.

4. In a rotary vane pump having a housing with inlet and outlet ports, the combination therewith of a rotor in said housing rotating about an axis which is eccentric with respect to the axis of the bore of the housing, a plurality of impeller blades carried by said rotor and arranged to rotate about an axis concentric with the bore of the housing and having cylindrical bearing portions and L-shaped blade portions, said rotor having circular counterbores in its opposite sides in which said bearing portions are

housed and having axially and transversely extending slots through which said blade portions extend, one of said blades having its bearing portion in one counterbore of the rotor, and the other of said blades having their bearing portions nested in concentric relation with respect to each other and housed within the other counterbore portion of said rotor, one of said last named cylindrical bearing portions being incomplete to allow passage therethrough of the blade from another of the last named cylindrical bearing portions.

HANS MAGNUS HANSON.