June 19, 1951 N. V. GIBSON 2,557,427

ROTARY PUMP OR HYDRAULIC TURBINE

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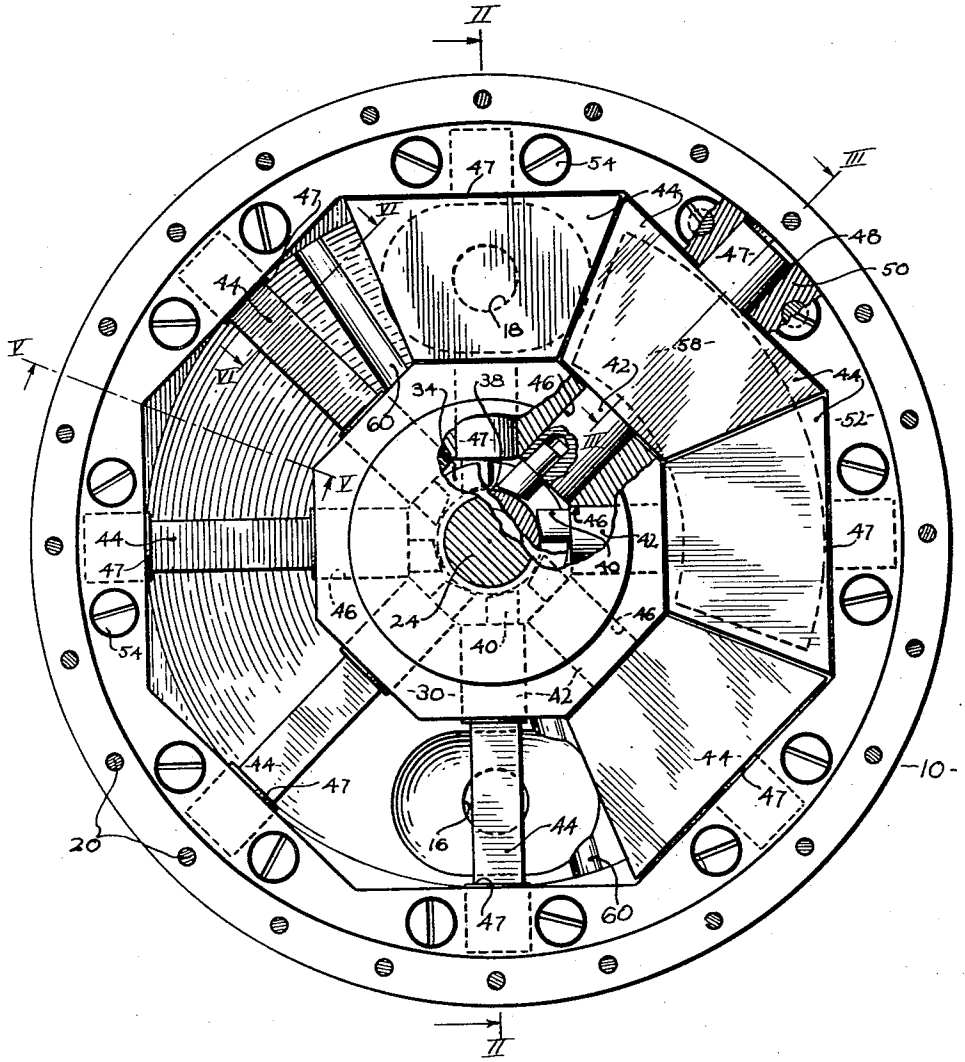


Fig. 1.

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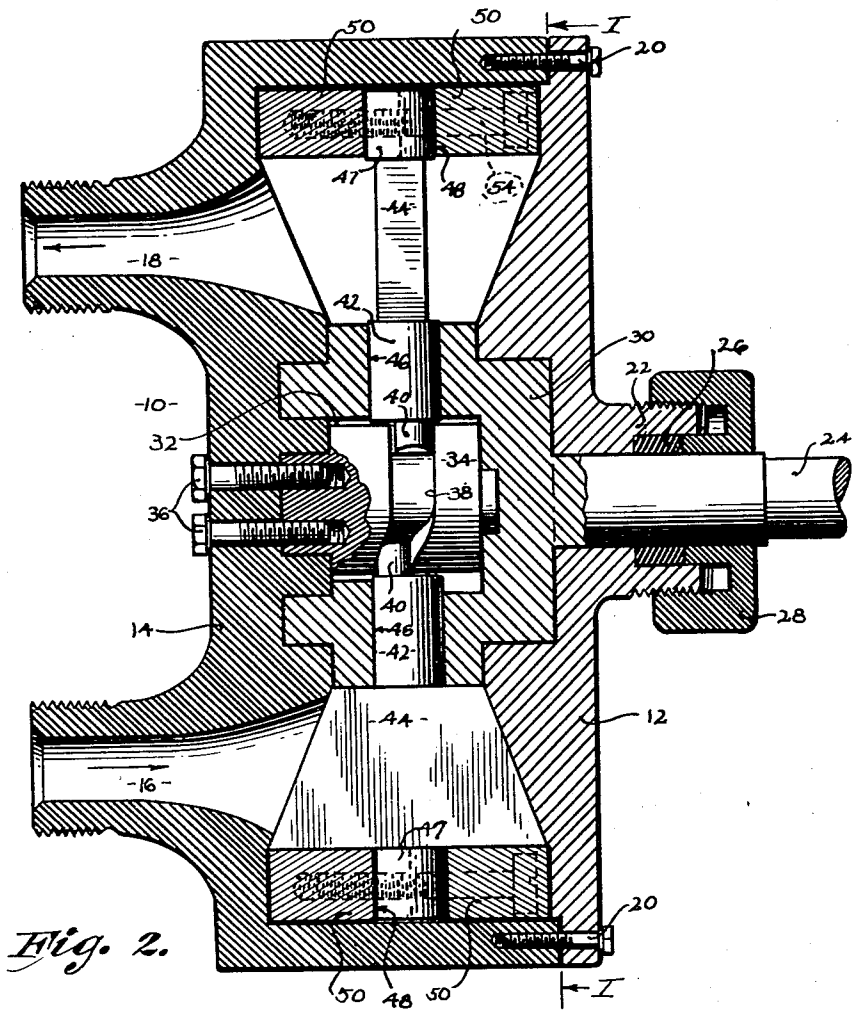


Fig. 2.

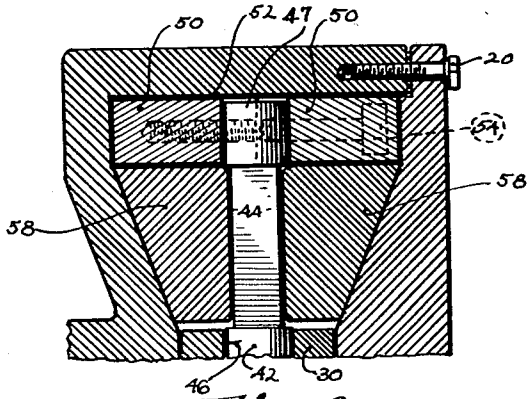


Fig. 3.

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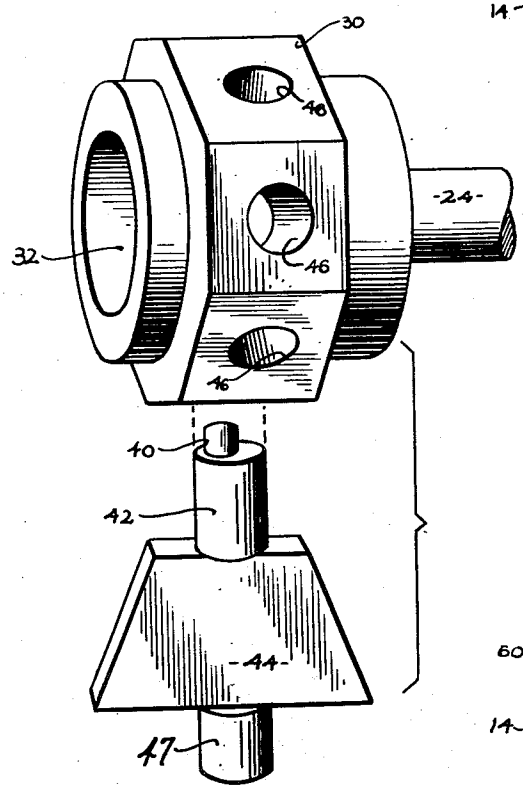


Fig. 4.

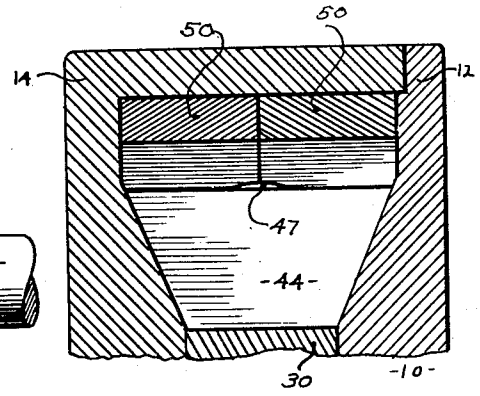


Fig. 5.

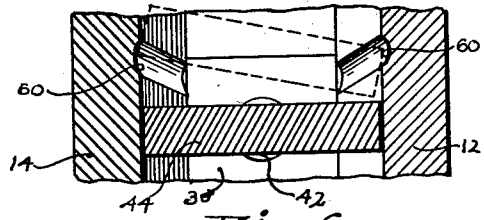


Fig. 6.

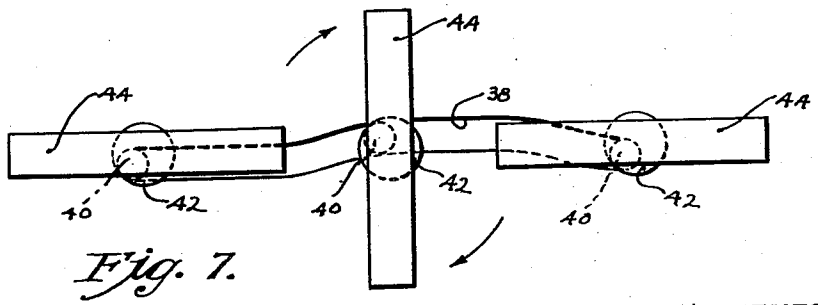


Fig. 7.

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UNITED STATES PATENT OFFICE

2,557,427

ROTARY PUMP OR HYDRAULIC TURBINE

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Application September 13, 1946, Serial No. 696,765

1 Claim. (Cl. 103—141)

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This invention relates to hydraulic structures in the nature of a pump or turbine wherein the fluid may pass through a specially constructed and assembled arrangement of parts to effectively serve the purposes for which the structure is employed and the primary aim of the invention is to provide hydraulic mechanism of the character just set down wherein the operating efficiency is high due to an unique arrangement of a series of vanes with respect to their movement as a unit and their ability to individually shift about their axes in an independent manner as the unit is rotated.

A further important object of this invention is to provide a structure for use as a rotary pump or hydraulic turbine wherein the rotating vanes are so positioned and disposed as to eliminate the use of gears or other mechanical interconnections between the drive and driven elements when the structure is employed either as a pump or turbine; it being possible to reverse the flow of fluid through the structure without altering the same and through a minimum amount of effort, all as will be made clear during the course of the following specification.

Further aims of the invention are to provide a structure of the hydraulic rotary character wherein the vanes constituting a part of the assembly are so disposed as to minimize friction, yet employ high working pressures without structural failure; to provide a rotary pump or hydraulic turbine capable of a relatively high throughput volume without losing operating efficiency because of the passage of the fluid employed into parts of the mechanism where detrimental effects would be experienced; and to provide in structure of the above mentioned character a group of strong and rugged parts that are assembled to operate economically, effectively and without likelihood of maladjustment.

All of the foregoing objects and many details of construction embodying minor aims of the invention will be clarified during the course of the following description, referring to the accompanying drawings, wherein:

Fig. 1 is a sectional view through a rotary pump or hydraulic turbine made in accordance with this invention taken on line I—I of Fig. 2, and looking in the direction of the arrows.

Fig. 2 is a sectional view through the structure taken on line II—II of Fig. 1, and looking in the direction of the arrows.

Fig. 3 is a fragmentary detailed sectional view taken on line III—III of Fig. 1.

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Fig. 4 is a detailed perspective view illustrating the manner in which the rotor and vanes are assembled.

Fig. 5 is a fragmentary sectional view taken on line V—V of Fig. 1.

Figure 6 is a fragmentary sectional view taken on line VI—VI of Fig. 1, looking in the direction of the arrows; and

Fig. 7 is a diagrammatical stretch-out view illustrating the cam-groove development and the manner in which the vanes are shifted from one position to another.

Referring now to the drawings in detail, the numeral 10 designates a case comprising at least two sections, one of which is in the nature of a cover plate 12 to cooperate with section 14 in forming a hollow block or body provided with a pair of ports, one of which is designated by the numeral 16 and constitutes an intake port under certain conditions of use while the other is designated by the numeral 18 and constitutes an outlet port when the structure is employed as an hydraulic turbine.

Section 12 of case 10 is bolted or otherwise secured as at 20 to section 14 thereof and when the parts are assembled, as clearly illustrated in Fig. 2, a bearing 22 on section 12 of case 10 creates a support for shaft 24. A packing and nut arrangement 26 and 28 respectively, cooperate with bearing 22 in not only sealing the case against leakage around shaft 24 but in completing a satisfactory bearing that is effective in mounting the shaft for movement about its axis with a rotor 30 formed on the inner end thereof. This rotor 30 is specially designed and is cup-shaped in form to present a cavity 32 therein for the reception of a cam member 34 attached to section 14 of case 10 by machine screws 36. This cam member 34 is provided with a cam groove 38 to receive the heads 40 of the inner pintles 42 integral with each of several radially disposed vanes 44.

Pintles 42 are journaled in rotor 30 and pass through openings 46 thereof, as clearly shown in Fig. 2. When the inner pintles of each vane 44 respectively are journaled in the opening 46 its head 40 will reside within cam groove 38. A pintle 47 rigid to the outermost edge of each vane 44 respectively, is in axial alignment with pintle 42 and is journaled in a perforation 48 of a ring-bearing comprising a pair of opposed annuli 50. These sections 50 combine to create a ring-bearing generally designated by the numeral 52 and are held together by screws or analogous means 54. The annular race-way

formed within case 10 receives the several radial vanes 44 and this race-way is equipped with a pair of opposed abutments 58 to restrict the size of the passage through which vanes 44 must travel. The distance between the inner and opposed faces of abutments 58 is substantially the same as the width of vanes 44 and as the vanes travel therebetween, they are in a position where their major planes are perpendicular to and intersect the axis of shaft 24. Cam groove 38 is offset as shown in Figs. 2 and 7 to insure that the vanes will be turned at the proper time to pass between abutments 58.

Grooves 60 formed in case 10 at points where vanes 44 are rotated about the axis of pintles 42 and 46 are shown in Figs. 1 and 6 and the use of such grooves allows the employment of relatively flat faces along the edges of vanes 44. Reference to Fig. 1 indicates the manner in which the vanes are disposed transversely across the annular race-way as they move from intake port 16 to port 18 and the manner in which the vanes are in edge to edge relation as they move through the arcuate path of travel from outlet port 18 toward inlet port 16. Thus—the full force of fluid under pressure entering port 16 will be exerted against the sides of vanes 44 and power will be transmitted to shaft 24 without those vanes 44 not under the influence of the fluid establishing a back pressure or retarding factor in the assembly.

As all of the vanes are moved about the axis of rotation of shaft 24 and rotor 30, the perforated ring-bearing will move therewith as a unit to equalize any tendency to wear and further to eliminate eccentricity due to the different positions of vanes 44. The only wear that may require replacement of parts is that caused by the friction between heads 40 and the sides of cam groove 38. These heads are separate elements from their supporting pintles 42 as illustrated in Fig. 1 and may be removed and replaced whenever the occasion necessitates.

It will thus be seen that the broad objects of the invention as set down above have been attained through the employment of structure just described and if the machine is to be employed as a pump, power may be applied to shaft 24 and fluid drawn through port 16 and forced out through port 18, all without altering the mechanical characteristics or arrangement of the component parts of the structure above defined. Quick reversibility is one of the advantages arising from the structure contemplated by this invention and when the device is a part of a system of pipes or conduits, any number of the pumps or turbines, as the case may be, might be incorporated to suit the particular condition.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

In a device of the kind described, a hollow case having a fluid inlet and a fluid outlet; an annulus in the case having a plurality of perforations therein; a shaft extending into the case; a rotor on the shaft in the case and concentric with said annulus, there being an opening in the rotor for each of said perforations respectively; a number of rotatable vanes in the case mounted between said annulus and the rotor, each vane having a pair of opposed, axially aligned pintles integral therewith, one pintle being rotatable in a corresponding perforation and the other pintle being rotatable in a corresponding opening; a member within said rotor and having a cam groove therein for controlling rotation of the vanes; and a head carried by each of said other pintles respectively, extending into the cam groove and disposed eccentrically with respect to the axis of rotation of the pintles, said vanes and said pintles being the sole means of interconnecting the rotor and the annulus, whereby the latter is rotated in the casing as the rotor and the shaft rotate.

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