

[54] VARIABLE JAWS FOR VANE PUMP

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[58] Field of Search.....418/31

[56]

References Cited

UNITED STATES PATENTS

2,170,786	8/1939	McElroy et al.	418/31
3,547,562	12/1970	Cynor	418/31
2,458,023	1/1949	Pine	418/31
3,560,118	2/1971	Palachik	418/31

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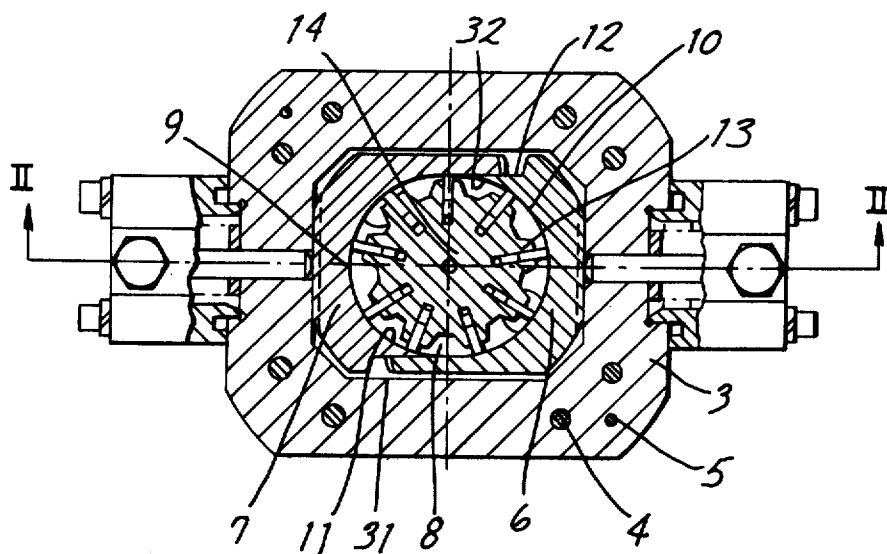
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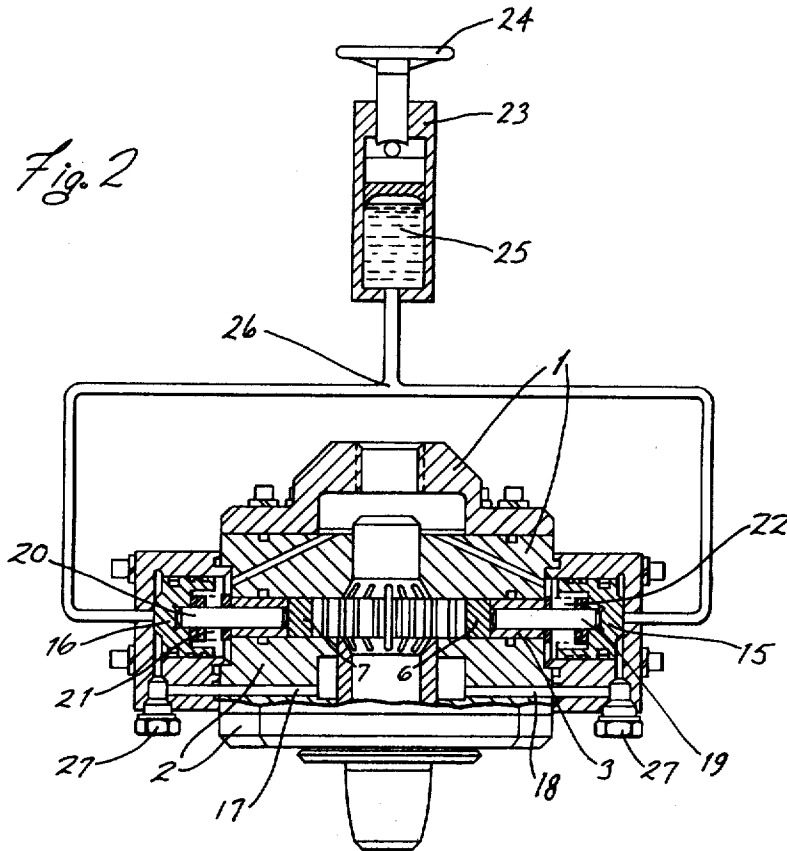
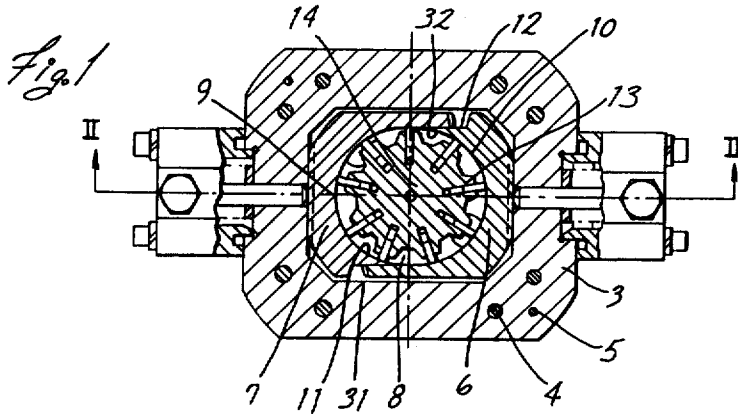
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ABSTRACT

Adjustable housing for a rotary pump. In a rotary pump having radially shiftable blades there is provided an adjustable housing comprising two identical blocks which, when properly related to each other and interfitted, create a housing for the rotor. The two blocks slide with respect to each other to vary the volume of the pump space defined.

2 Claims, 5 Drawing Figures





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FIG. 3

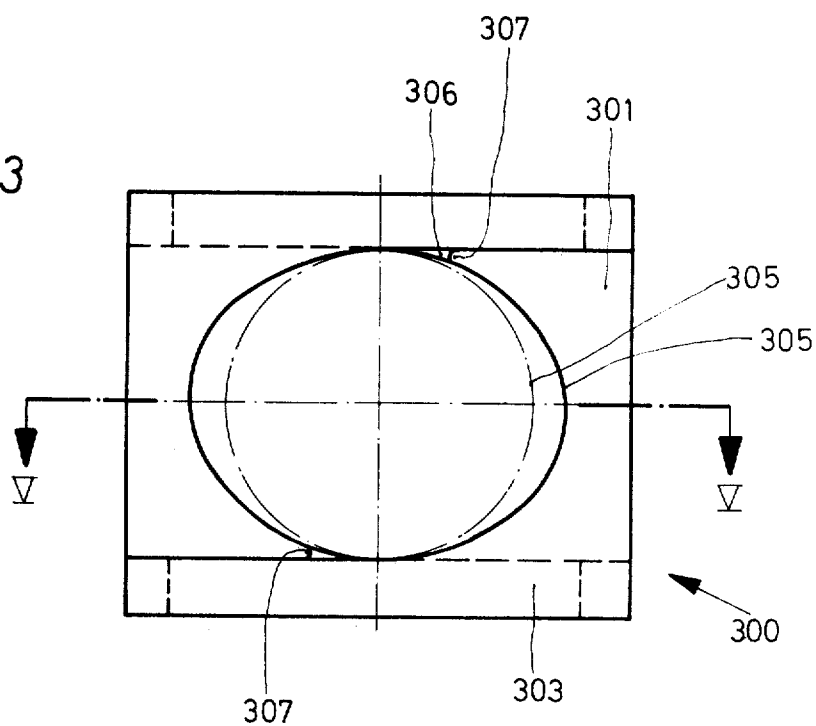
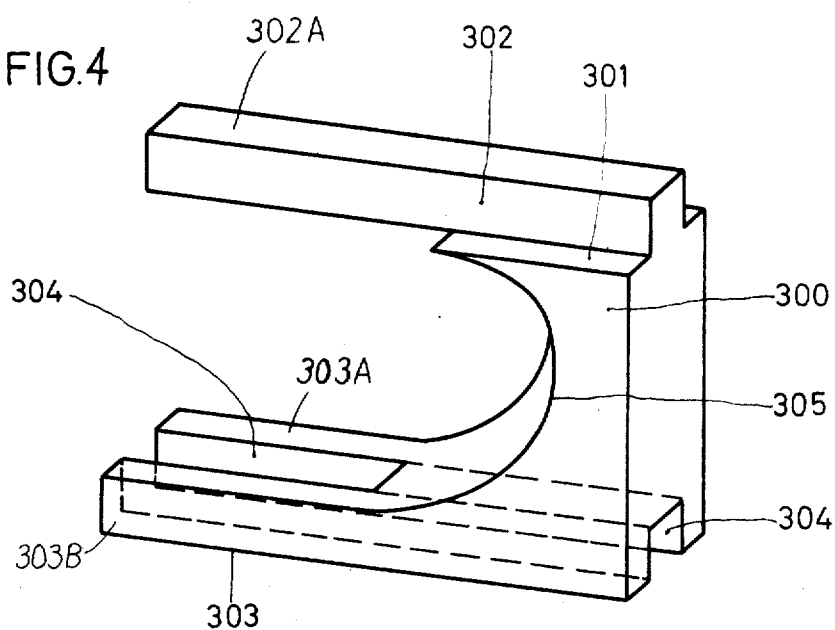
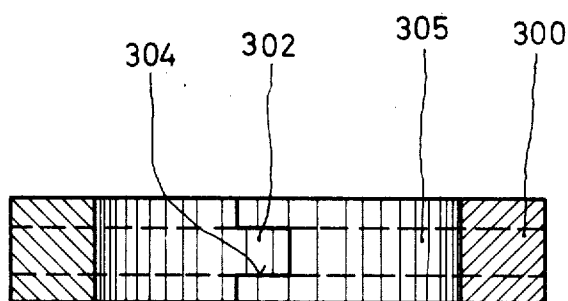


FIG. 4



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FIG. 5



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VARIABLE JAWS FOR VANE PUMP

FIELD OF THE INVENTION

This invention generally relates to a rotary pump which includes blades which are radially shifted with respect to the rotor body and further includes adjustable jaws which are movable along a defined path so as to permit ready adjustment of the size of the discharge zone.

BACKGROUND OF THE INVENTION

Various types of pumps have been suggested which include elastic as well as radially adjustable bearing surfaces. Such devices usually include two dividers or abutments which separate the intake and discharge zones. One of these dividers is usually stationary while the other is radially adjustable. Alternately, prior pumps have included elastic parts which are unilaterally clamped and span the interstices. The blades move uniformly at any selected pump output. With respect to such an arrangement there are generally two abutments which are curved in shape and rest upon a stationary block. Due to the system elasticity there may occur a distortion of the discharge zone of the pump. If the pump is to be used in high pressure applications such elastic constructions are generally unsatisfactory as they do not permit accurate regulation of the delivery rate. Under such conditions the elastic elements of the pump often produce a continuous vibration, and therefore adversely affect the accuracy and regulation of the pump. Furthermore, with respect to such arrangements, the various mating surfaces must be machined and finished to very close tolerances. With respect to such arrangements the elastic ring may be caused to move from its full position between the stationary blocks and thus produce an annular slit. Such a condition greatly increases operating noise.

In other arrangements there are a variety of internal components which, in addition to their manufacturing cost, must be assembled in proper relation to each other and thereby add materially to the assembly portion of the manufacturing cost.

Accordingly, it is desirable to provide means for adjusting the volume of the pump chamber which means will require a minimum number of component parts, which parts can be effectively and accurately molded from conventional plastics material and which can be readily and quickly assembled in a foolproof manner for effective cooperation with the pump blades.

In accordance with the illustrated embodiment, a semicircular recess is defined by the running jaws and continues beyond the region of the outlet openings in the form of an Archimedes spiral. The jaws may if desired be fabricated of molded plastics material. This spiral intersects with a straight edge to form a tangent thereto thereby forming a tapered end or tip. Additionally in the region adjacent each of such tips there may be provided pressure relief grooves which extend into the corresponding intake zone.

Other features and advantages of this invention will become apparent through reference in the following description and accompanying drawings.

FIG. 1 is a sectional view of a rotary pump illustrating certain features of this invention.

FIG. 2 is a sectional view taken along the line II—II of FIG. 1.

FIG. 3 is a schematic of the jaws in the null or zero pump position.

FIG. 4 is an enlarged oblique view of FIG. 3 illustrating the construction of the jaws.

FIG. 5 is a sectional view taken along the line V—V of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the pump jaws comprising the present invention are adaptable to a wide variety of specific rotary pump designs, they have been particularly designed for use with a pump shown in U.S. application, Ser. No. 769 651 and hence will be illustrated in connection with such use. It will be understood,

however, that such association is for illustrative purposes only and that the drawings and description herein appearing taken from said Ser. No. 769 651 are presented for convenience in reference only and that no limiting significance is intended.

With respect to the embodiment somewhat schematically illustrated in FIGS. 1 and 2, the rotary pump includes several sections which in a known manner form an intake housing 1 at the intake side of the pump and form a discharge housing 2 at the exhaust side thereof. Secured about the housings 1 and 2 is a delivery conveyor frame 3 secured by means of screws 4 and alignment pins 5. Within the frame 3 are a pair of mating jaws 6 and 7 which are arranged so that they may be radially shifted. The semicircular running surfaces 9 and 10 of the jaws 6 and 7 define a pumping zone 8. The relative movement of the running jaws 6, 7 produces an adjustment in the volume of the pumping zone 8. Thus, it is appreciated that the zone 8 may be decreased or enlarged as the cross sectional area defined by the surfaces 9 and 10 varies between that of a circle and that of an oval as illustrated in FIG. 1. As the volume of the output zone 8 is varied, the pumping blades 13, which are spring biased outwardly, will be urged toward the center of the rotor body 14. By this rather simple arrangement it is possible to selectively vary the volume of the pumping zone of the pump. The delivery rate can be easily adjusted by either varying the regulation of the pressure or by changing the driving power supplied to the pump. For this purpose, liquid pressure is applied to the control pistons 15, and 16, and then exhausts through the fluid passageways 17 and 18. Radial movement of the pistons 15 and 16 produces a corresponding shift in the regulating pins 19 and 20 in the jaws 6 and 7.

The jaws 6 and 7 are similarly shaped and are radially shiftable with respect to the rotor. Each thereof is generally block shaped having a concave contour 305 for one-half of the pumping zone, defining the working side of the base portion 300. A guide bar 302 projects from one, here the upper, side 301 of the base portion and a channel 304 is provided in the opposite, here the lower, side thereof. Since the base portion 300 terminates at the respective upper and lower ends of the contour 305, the guide bar 302 projects beyond, here leftwardly, the base portion as indicated at 302A and the groove 304 continues to be defined by projecting portions 303A and 303B of the lower side 303 of said base portion. The guide bar 302 is dimensioned for a snug sliding fit into the groove 304 of an adjacent similarly formed sliding jaw member.

As clearly shown in FIG. 3, the lower side of bar 302 is a tangential continuation of the upper end of the surface 305 and the upper surfaces of the bars 303A and 303B are tangential continuations of the lower end of surface 305.

A pair of said sliding jaws are then fitted together as shown in FIGS. 3 and 5 to define between the respective contours 305 the pumping zone 8 referred to above.

Thus, only a single component part is required to provide the desired jaws 6 and 7 and said part is of sufficient structural simplicity that it is readily adaptable to manufacture by plastics molding techniques, such as particularly injection molding techniques. During movement the jaws 6 and 7 provide mutual support by means of their mating guide surfaces 11 and 31, and 12 and 32 respectively.

In order to reduce the weight of the pump, and also in order to increase the manufacturing feasibility, the running jaws are preferably fabricated of a molded plastics material. Such a material resists wear and tear, and exhibits a much lower specific gravity than suitable metallic materials. Further, such plastics materials can usually be molded within narrow dimensional tolerances, thus eliminating any refinishing operations.

Serving to regulate output flow are spring groups 21 and 22. The delivery rate is manually adjusted by means of a regulation means 23. Rotary actuation of a handwheel 24 increases the pressure within a cylinder 25. This pressure variation is transferred through conduits 26 to the pistons 15 and 16 and upon the regulation pins 19 and 20. In this manner, the jaws 6 and 7 are caused to shift, thus changing the volume of the delivery zone and produce a regulating effect upon the output

of the pump as previously mentioned. As illustrated in FIG. 2, adjustment of fluid flow through the channels 17 and 18 is accomplished by means of adjusting screws 27.

A radius 307 is provided as shown to minimize areas of wear.

Thus, by the adjustment of a handwheel 24 pressure is applied as desired to the pistons 15 and 16 for radial adjustment against springs 21 and 22 of the jaws 6 and 7. This varies as desired the volume of the pumping zone but the pump vanes can still slide in constant contact along the interior surface 305 of said jaws within the entire adjustment range.

It will be evident that other means may also be provided as desired, such as the alternate means shown in said above mentioned Ser. No. 769 651, for adjusting the position of said jaws 6 and 7.

Since a given pump vane running off the point 306 of a given jaw will be picked up by the ribs 303A and 303B of the mating jaw 7, same will then continue onto the semicircular contour of the other jaw smoothly and without crossing any discontinuity which could lead to interference and wear.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a vane pump having a plurality of radially movable vanes on a rotor rotatably mounted in a pumping zone, the combination comprising: a pair of identically formed, radially slidable jaws for adjusting the volume of said pumping zone, each of said jaws comprising a body portion having an elongated arcuate wall for defining one side of the pumping zone, a pair of horizontally spaced and parallel ribs projecting outwardly from one side of said body portion and defining a guide space therebetween, said pair of ribs each having a first surface extending in tangential relationship to said wall, a single rib projecting outwardly from the other side of said body portion and extending coextensively and in parallel relationship to said pair of ribs, said single rib having a second surface extending in tangential relationship to said wall and parallel to said first surfaces on said pair of ribs, said guide space and said single rib being of such dimensions that two of said body portions can interfit each other with said single rib of one body portion being received between a pair of ribs of the mating body portion in a snug sliding fit relationship and said walls of said body portion cooperating to define said pumping zone, said single rib and said pair of ribs extending in overlapping relationship to said body portion whereby to create a continuous wall for said pumping zone at any spacing between said jaws.
2. A vane pump according to claim 1, wherein said wall is provided with a radius at the end which runs out to a point.

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