

[54] METHOD OF FORMING A ROTARY
MOTOR OR PUMP

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[22] Filed: **Dec. 11, 1973**

[21] Appl. No.: **423,875**

[52] U.S. Cl. **29/156.4 R**; 418/255

[51] Int. Cl. **B23p 15/00**; F01c 1/00; F04c 1/00

[58] Field of Search 418/255; 29/156.4 R,
156.4 WL

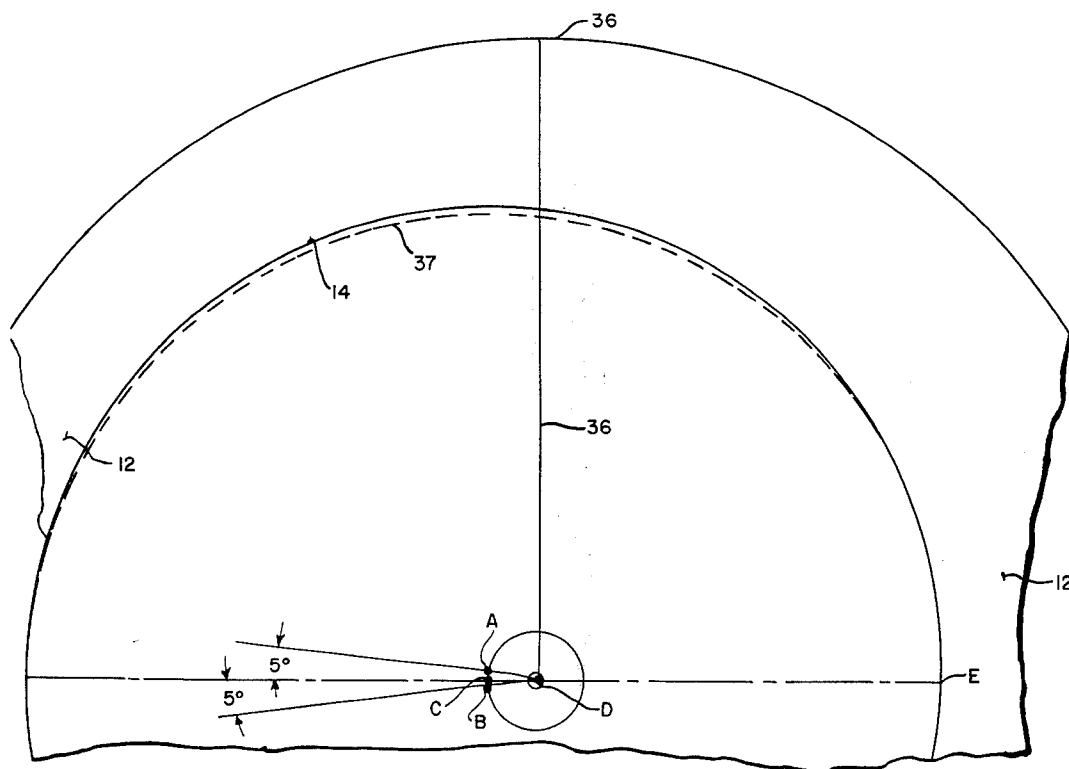
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[57] **ABSTRACT**

A device which is capable of operating as a pump or motor having a housing, an elliptically shaped cavity within the housing and a slideably mounted vane rotatably mounted within the cavity. It is essential that every diameter of the cavity passing through the central axis thereof be of equal length. As a result thereof the vane can be manufactured of a standard length and the device can operate with a minimum amount of wear as either a pump or motor.

1 Claim, 3 Drawing Figures



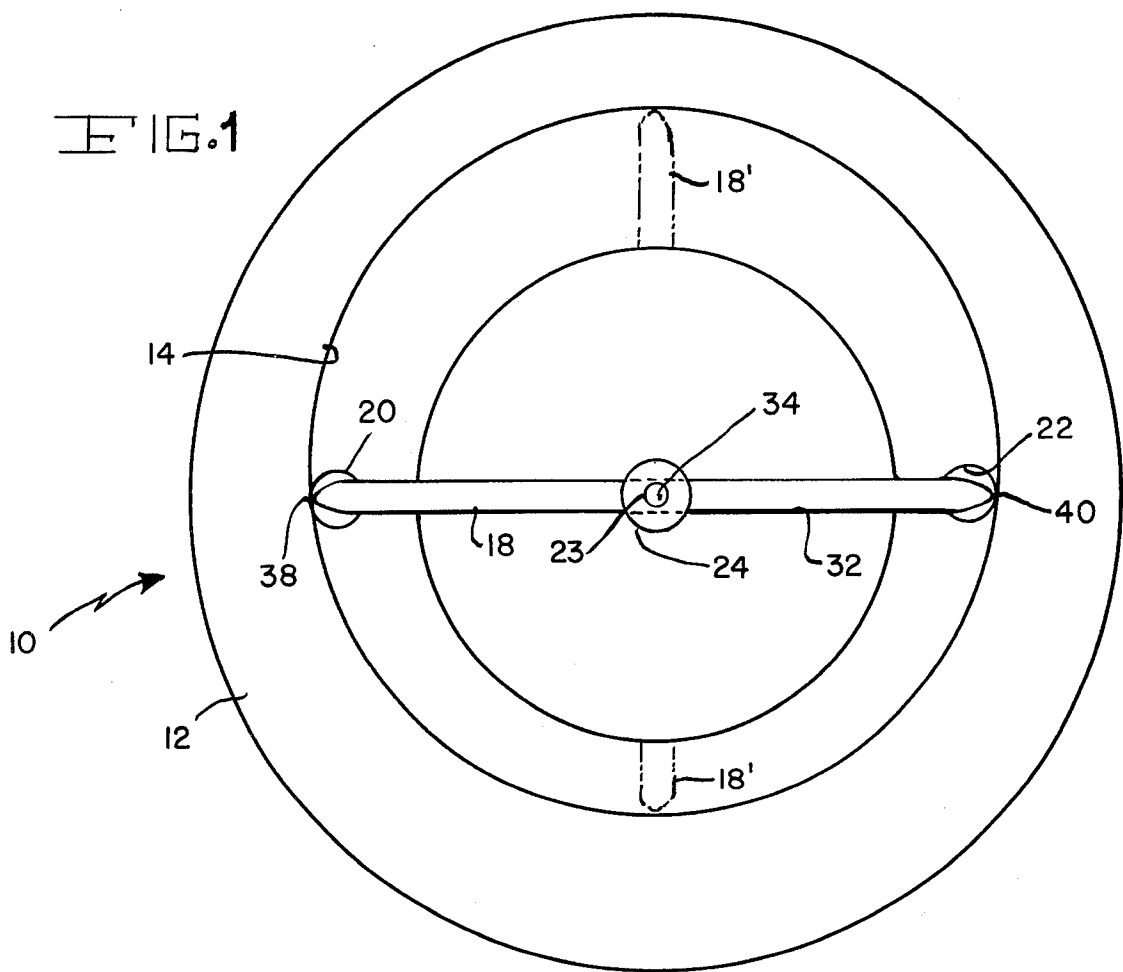
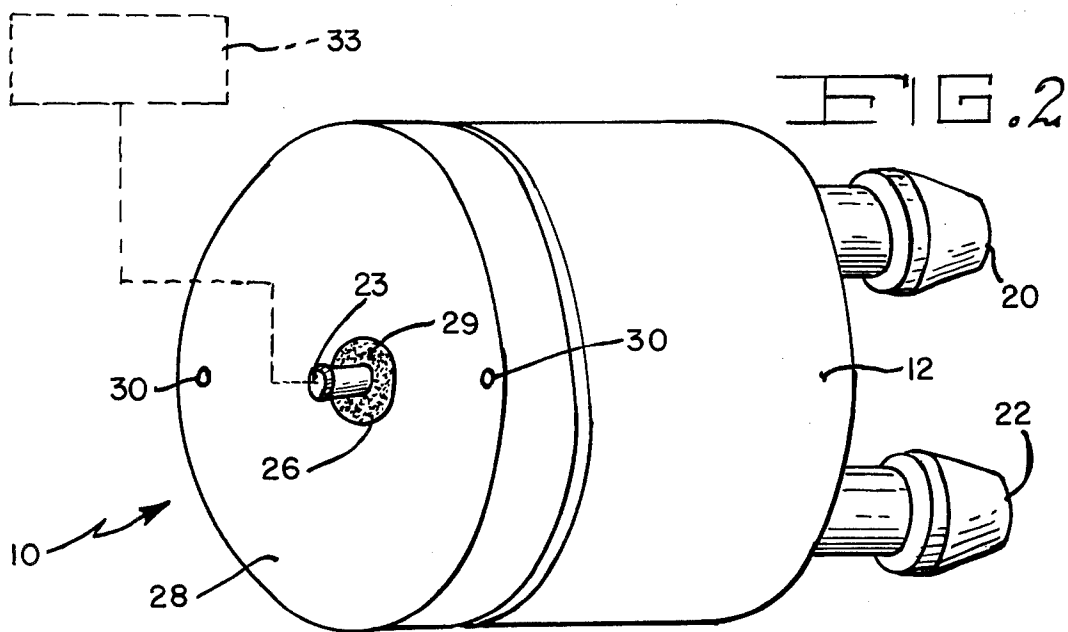
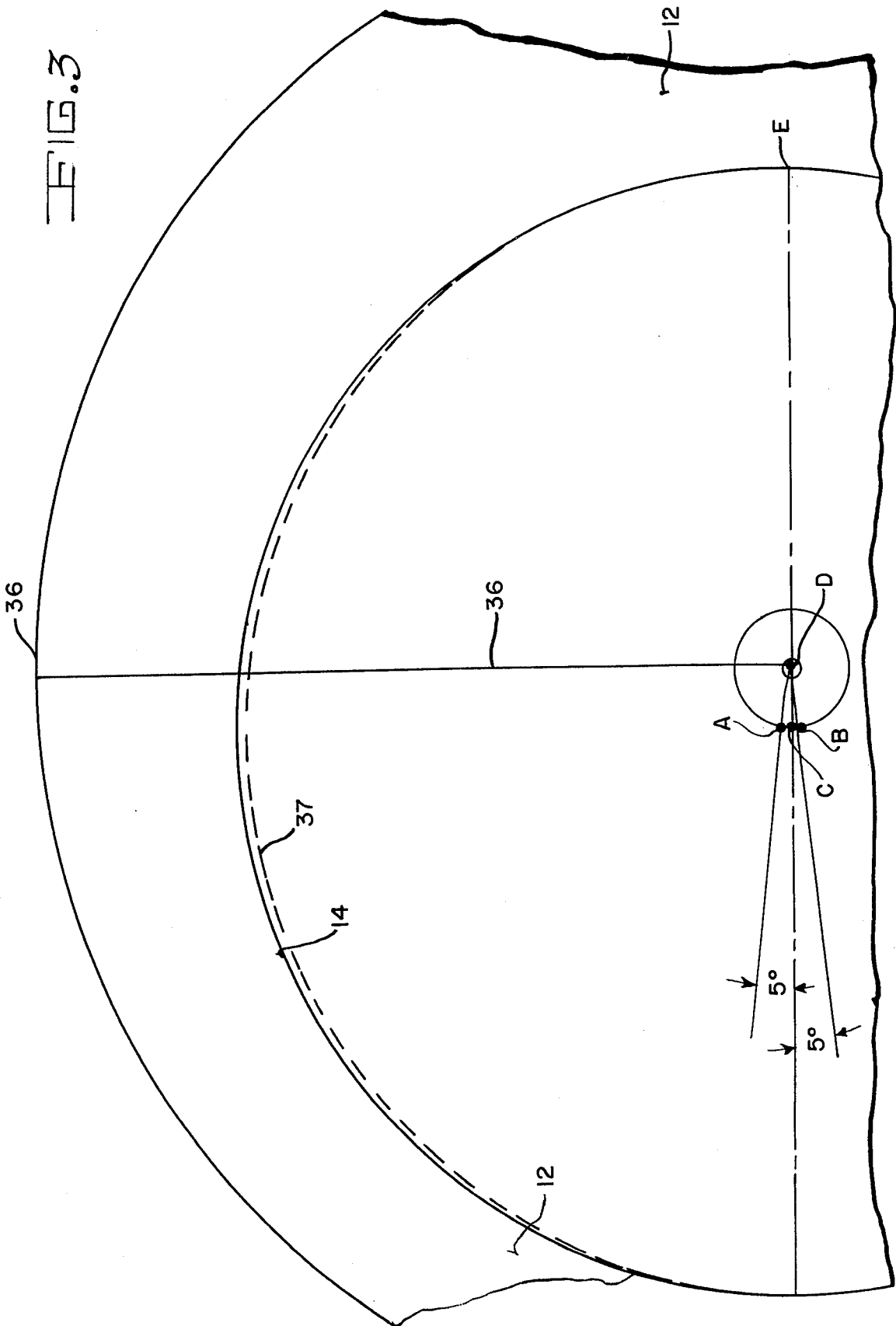


FIG. 3



METHOD OF FORMING A ROTARY MOTOR OR PUMP

BACKGROUND OF THE INVENTION

This invention relates generally to motors and pumps, and more particularly, to a device which operates as a motor when driven by a fluid force or a pump when actuated by an external power supply.

A machine that draws a fluid into itself through an entrance port and forces the fluid out through an exhaust port is considered to be a pump. Such a device may serve to move fluids, as in a cross-country pipeline; to lift fluids, as from a well or to the top of a tall building; or to put fluids under pressure, as in a hydraulic brake. In the mechanical pump the fluid is conveyed by direct contact with a moving part of the pumping machinery.

By utilization of the fluid force as the driving means the above mentioned pumping mechanism can be converted into a motor. To date, however, it has been uneconomical to utilize the same device as both a pumping device and motor due to the problems of wear and because of a variety of power requirements. Complex machinery is required for the convertability of pumps to motors if one wishes to maintain the efficiency of both. In addition to the above mentioned problems mechanical pumps of the past have relatively short life spans due to the extreme wear on moving parts.

SUMMARY OF THE INVENTION

The fluid flow motor-pump of this invention overcomes the problems set forth in detail hereinabove. The device presented in this invention is designed to be driven by fluid flow as a motor or may be used as a pumping device when driven by any rotary power source. The instant invention is constructed to produce a motor or pump with an absolute minimum of wear to the internal components thereof. In addition, it will operate efficiently as a motor on a minimum of fluid pressure and volume as well as functioning efficiently as a pump for fluids.

The motor-pump of this invention is made up of a housing into which is machined a pumping or power cavity having an elliptical shape centered about the axis of rotation of the motor-pump rotor. The machining for this cavity is performed in such a manner that the end result is that all diameters of the cavity measured through the above-mentioned central axis are the same. This configuration permits the use of one or more solid vanes precisely machined, sliding through the center point of the rotor acting as the driving or driven force of the motor-pump.

The solid vane or vanes are slideably mounted within a centrally located rotor and are held in position therein by a cover. Inlet and outlet openings are located within the pumping or power cavity so that the instant invention may be utilized as a pump or motor.

It is therefore an object of this invention to provide a device which will operate efficiently as a motor as well as a pump.

It is another object of this invention to provide a motor-pump which operates with a minimum amount of wear on its internal components.

It is a further object of this invention to provide a motor-pump which is capable of utilizing a solid vane for moving fluid as a pump or being moved by fluid when used as a motor.

It is still another object of this invention to provide a motor-pump which is economical to produce and which utilizes conventional currently available components that lend themselves to standard mass producing manufacturing techniques.

For a better understanding of the present invention together with other and further objects thereof reference is made to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of the motor-pump of this invention shown with the cover removed and with the vane shown in phantom in another position with the cavity;

FIG. 2 is a pictorial view of the motor-pump of this invention with all components in place; and

FIG. 3 is a schematic representation of a segment of the power cavity of the motor-pump of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is now made to FIGS. 1 and 2 of the drawing which best illustrate the motor-pump 10 of this invention. Motor-pump 10 is made up of a housing 12 having an elliptically shaped power or pumping cavity 14 therein. Rotatably mounted within cavity 14 is a rotor 16 having one or more slidably mounted vanes 18. At the bottom of cavity 14 is an entrance aperture 20 and exit aperture 22, the function of which will be explained hereinbelow.

Rotor 16 has a pair of opposed centrally located shafts 23, each shaft 23 being mounted on an upstanding element 24 on opposite sides of rotor 16. One shaft 23 of rotor 16 rotatably is mounted within an aperture (not shown) on the bottom surface of cavity 14. Any suitable seal is located within the aperture which allows for the rotation of shaft 23 but prevents any fluid leakage from housing 12. The other shaft 23 is rotatably mounted within an aperture 26 located in a cover 28 as shown in FIG. 2 of the drawing. A seal 29 is also positioned within aperture 26 to prevent any fluid leakage therefrom. Cover 28 is secured to housing 12 by any suitable securing means such as bolts 30.

In addition to shafts 23, rotor 16 has a slot 32 running the length of the diameter and crossing the midpoint thereof. Vane 18 is slideably mounted within slot 32 and operates in a manner to be explained hereinbelow. It should be noted that although only one slot 32 and vane 18 is shown in the drawing, a plurality of slots and vanes may be utilized with this invention. In addition, these slots need not be cut completely through rotor 16 but may be of a depth only sufficient to accommodate the sliding movement of the vane therein. Also, structural support outside of upstanding elements 24 may be added to rotor 16 if desired.

For the proper operation of motor-pump 10 of this invention it is essential that the internal power cavity 14 be of a specific elliptical configuration so that any diameter passing through the center axis 34 of rotor 16 is of the same length. In order to machine such a cavity 14 in housing 12 a procedure is set forth below utilizing specific dimensions. It should be noted, however, that these dimensions are merely for purposes of illustration, and that any other dimensions being proportionally equal to those above and which will result in form-

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ing an elliptical cavity 14 of the type described hereinabove can also be used.

Referring to FIG. 3 which illustrates a segment of housing 12, housing 12 is turned to the desired outside diameter, 36 of 1.625 for example, utilizing point D as the center thereof. Moving off center 0.0625 to point C, power cavity 14 is machined to a 1.1875 diameter shown by dotted line 37 being 0.500 deep. It is essential that this cavity 14 be extremely smooth.

Setting the cutting radius 0.003 smaller than the setting utilized to machine the original cavity 37 and removing the cutter center in progressive steps until reaching point A more material can be removed forming cavity 14. Point A should be no more than 5° off center but may be less than 5°. The desired goal is that the resultant cut should blend with the cavity wall at point E with no noticeable removal of material at that point. The cutter is now removed to point B which is no more than 5° off center and is operated utilizing the same procedures as set forth hereinabove with respect to point A.

With the proper machining, using the instructions set forth hereinabove the same diameter, 1.1875, will be maintained through point D the original center point. As there is so little material to remove to obtain the required results (approximately 0.003) extreme care must be taken during the machining operation. After completing the machining of cavity 14, one may now return to the original center (point D) and drill the desired aperture size for rotor shaft 23.

With the power cavity 14 having a configuration so that all diameters passing through the center axis 34 thereof are of equal length it is possible to construct a vane 18 having a length equal to that diameter. This vane is mounted within a slot 32 in rotor 16. The slot is located through the center axis of rotor 16. Upon the spinning of rotor 16 by any suitable motor 33 when motor-pump 10 is operated as a pump the vane or vanes

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18 (shown as 18' in a different position) will rotate within the cavity 14 and slide within slot 32 having its outer tips 38 and 40 contacting the internal surface of cavity 14. In this manner fluid may enter inlet 20 and expel from outlet 22. If desired this operation may take place in reverse with the flow of fluid through inlet 20 and exit 22 causing the rotation of vane 18 and thereby the subsequent rotation of rotor 16 as well as the rotor shafts 23.

Although this invention has been described with reference to a particular embodiment, it should be understood to those skilled in the art that this invention is also capable of alternate embodiments within the spirit and scope of the appended claims.

I claim:

1. A method for forming an elliptically shaped cavity in a housing having an axis at a preselected point therein so that all diameters of said cavity passing through said axis of the housing are substantially the same length, comprising the steps of:

- a. cutting a predetermined outside diameter of said housing utilizing said preselected point in said housing as the axis thereof,
- b. moving slightly off said axis of said housing and defining a new point,
- c. using said new point as the center thereof, forming a cavity within said housing having a diameter less than said housing diameter,
- d. defining at least one other point by moving said new center point no more than 5° to either side of a line drawn between said new center point and said axis of said housing at the same distance from said axis of said housing as said new center point, and
- e. forming said elliptical cavity from said original cavity by utilizing said other point as the center thereof.

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