

Oct. 31, 1961

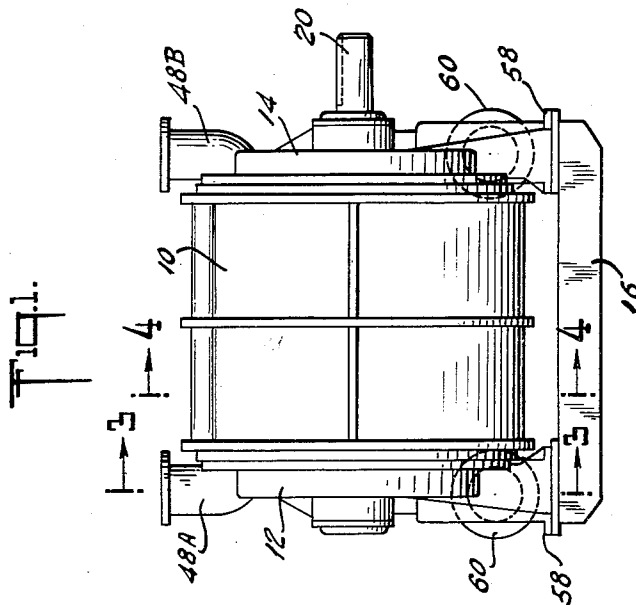
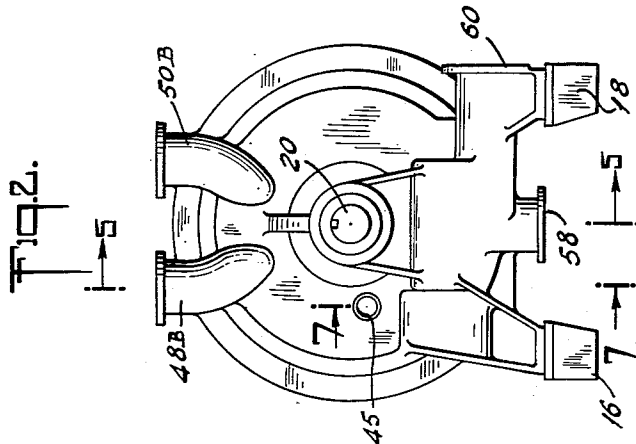
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3,006,533

COMPRESSOR

Filed Nov. 7, 1958

5 Sheets-Sheet 1



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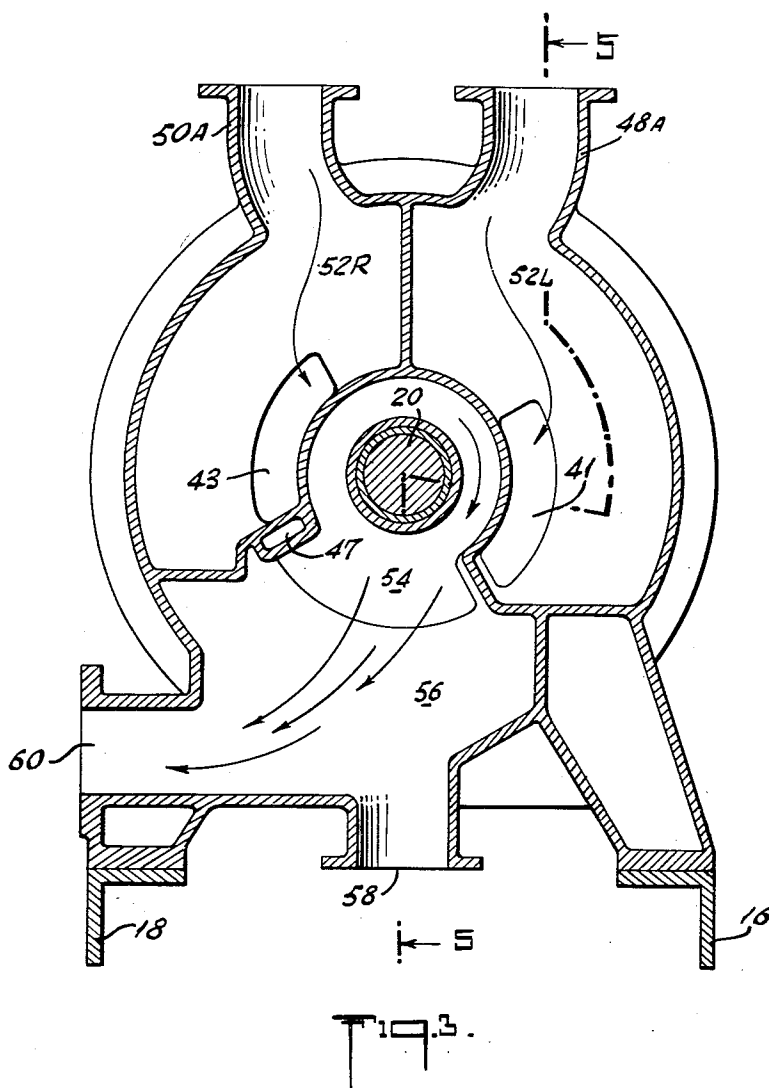
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5 Sheets-Sheet 2



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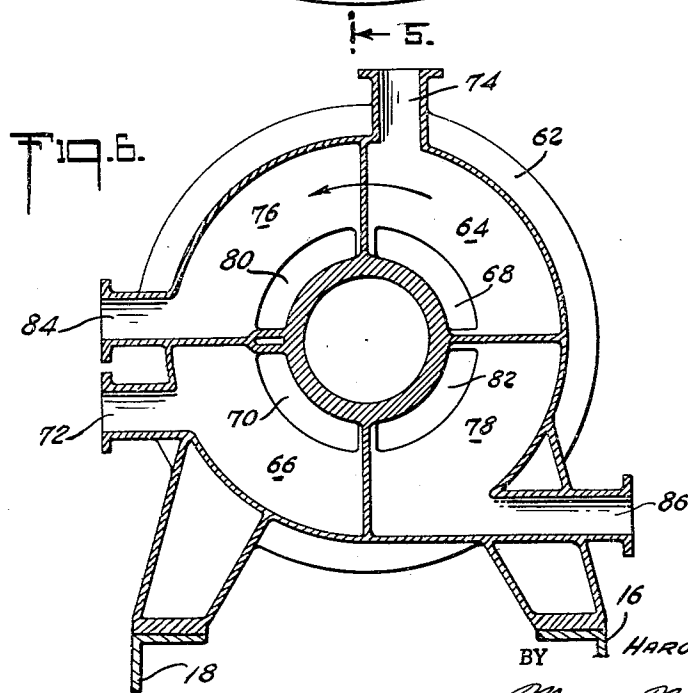
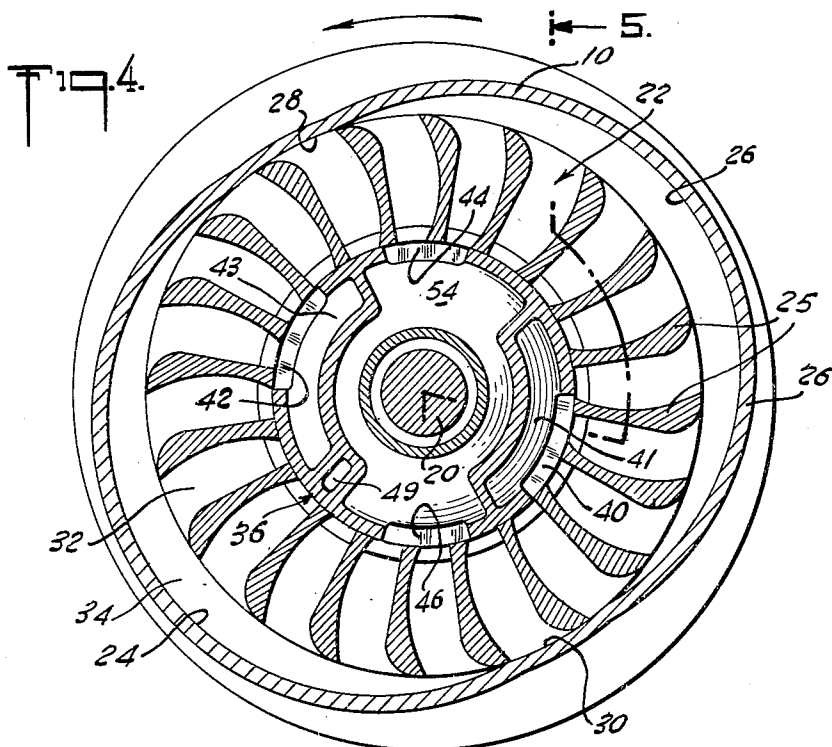
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5 Sheets-Sheet 3



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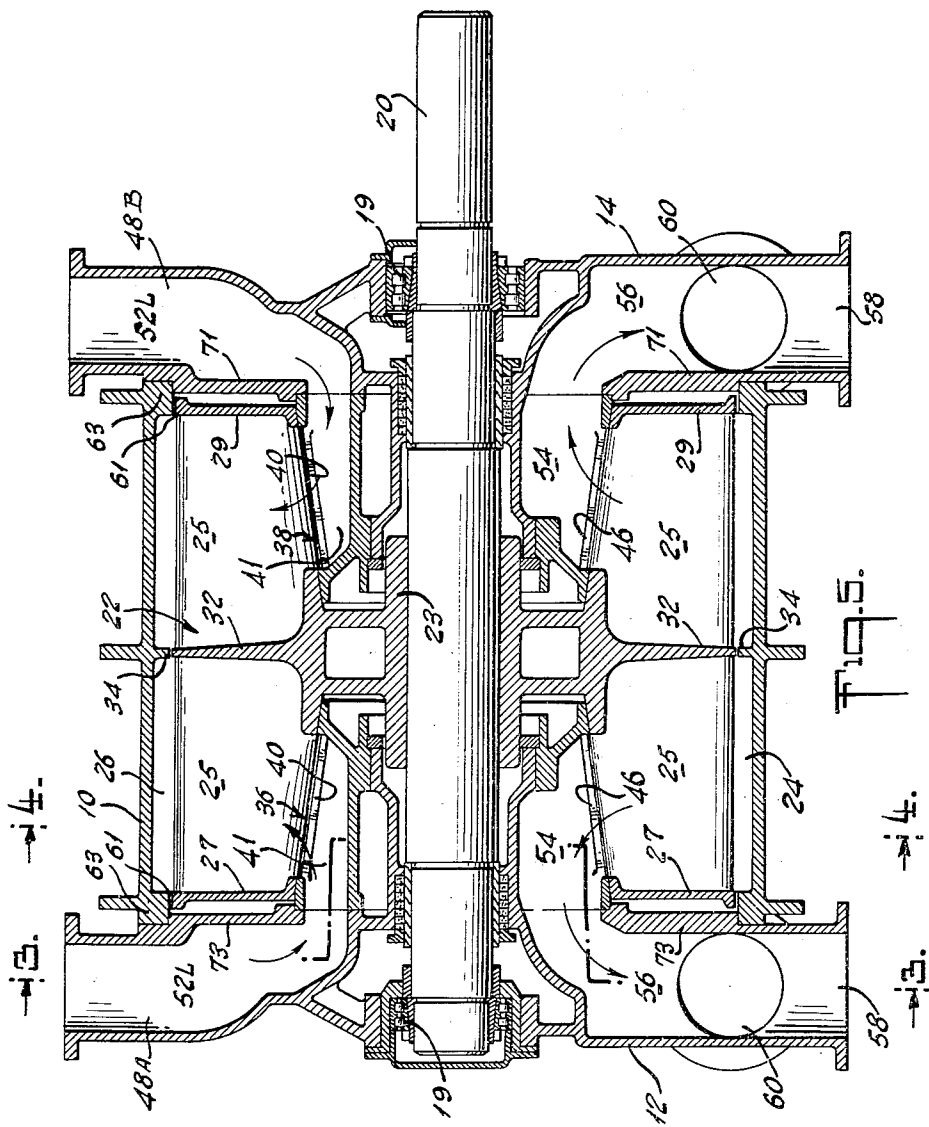
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5 Sheets-Sheet 4



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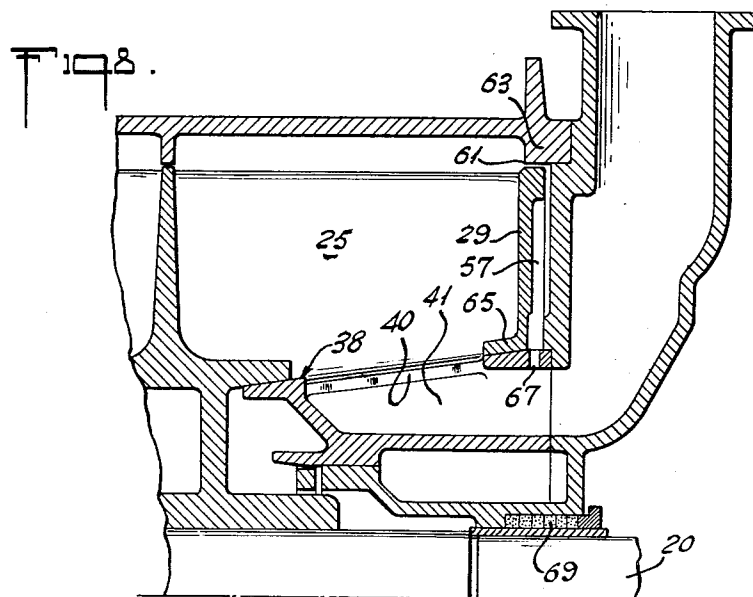
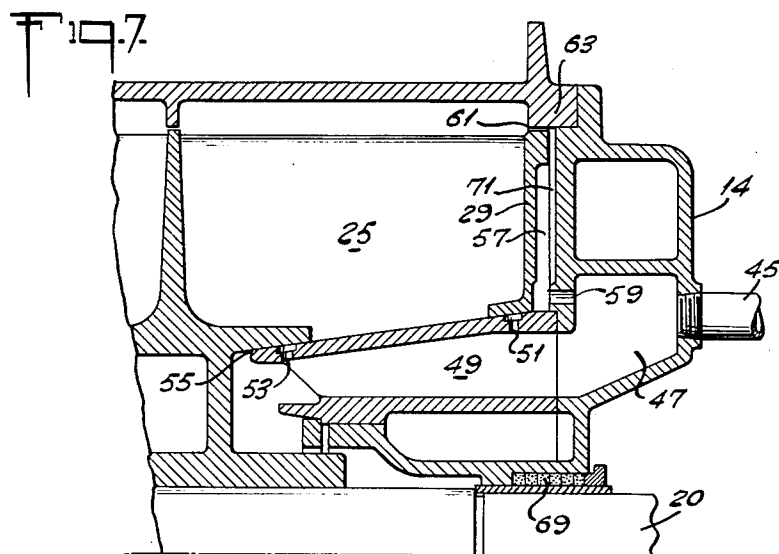
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5 Sheets-Sheet 5



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3,006,533

COMPRESSOR

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12 Claims. (Cl. 230-79)

This invention relates in general to pumps and particularly to a new and useful hydroturbine or a liquid ring type pump for creating suction pressures for a plurality of suction service requirements.

The present invention is similar to that disclosed and claimed in Patent No. 2,672,276, granted March 16, 1954, to the present inventor. The present invention is an improvement over the aforementioned patent particularly in respect to the improved head construction permitting multiple inlet and multiple outlet connections servicing each end of a double rotor impeller.

The present invention relates to the provision of four separate, independently acting pumps formed in a single housing and with a single rotor. The pump housing includes an interior wall defining a pumping chamber in which a main divided blade rotor is rotated. The construction forms two separate pumping chambers at each end of the pump. Each of the lobes of the pumping chambers are independently operable and may be independently connected to a separate suction service. That is, each lobe may be separately applied to a service requiring separate vacuum conditions, for example, a suction box of a paper making machine requiring ten inches of mercury pressure and a suction roll requiring fifteen or twenty inches of mercury pressure absolute. The present invention includes a central ported member at each end of the pump and housing members or heads which in conjunction define individualized passageways for four separate inlets and discharge connections. The invention includes refinements in the pump construction permitting the isolation of the pump into the four separate inlet and discharge portions by the complete isolation of the individual lobes of the pump by improved liquid sealing means.

In liquid ring type pumps, a liquid ring is formed by the rotation of the rotor and serves as a pumping medium. The liquid is caused to recede from and return to the center of rotation alternately, first to draw gas through an intake port and then to force it out through a discharge port.

In pumps of this nature it was usual to provide only single inlet pipe connections and single discharge pipe connections for the complete operating pump. In Patent No. 2,672,276, applicant presented a pump of this character which was of double rotor construction and provided with means at each end of the pump for a separate inlet and outlet for a respective end of the rotor. It was possible by means of the invention disclosed by this patent to operate two separate suction services from a single pump.

Pumps of this type could operate only with a separate suction and discharge at each end of the pump and thus were capable of servicing only two suction service requirements. In accordance with the present invention there is provided a separate inlet for each inlet port of each end of the pump, thus providing means for connecting separate service lines at four locations. With improvements made in the sealing and separation of the passageways of the present pump construction, it has been possible to divorce each of the two operating loads on each side of the double rotor so that the two inlet ports associated therewith may be applied to independent services requiring various ranges of suction conditions.

Accordingly, it is an object of this invention to provide

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a pump having multiple inlets for connections to individual suction applications corresponding to the number of liquid displacement portions within the pump.

A further object of the invention is to provide an improved hydroturbine type suction pump construction including a double inlet head at each end of the pump.

A further object of the invention is to provide an improved hydroturbine suction pump including at least three inlets for three separate service connections.

A further object of the invention is to provide an improved liquid ring type pump including a total of four inlets and four outlets capable of connection to individual service systems.

A further object of the invention is to provide a liquid ring type pump of the character described which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a side elevation of a pump constructed in accordance with the invention;

FIG. 2 is an end elevation of the pump shown in FIG. 1;

FIG. 3 is a vertical section taken on the line 3-3 of FIGS. 1 and 5;

FIG. 4 is a vertical section taken on the line 4-4 of FIGS. 1 and 5;

FIG. 5 is a transverse vertical section taken on the line 5-5 of FIGS. 2, 3 and 4;

FIG. 6 is a view similar to FIG. 3 but indicating an alternate embodiment of head construction;

FIG. 7 is a fragmentary, enlarged transverse section taken on the line 7-7 of FIG. 2; and

FIG. 8 is a fragmentary, enlarged section similar to FIG. 5, but showing the improved liquid ring sealing construction in accordance with the invention.

Referring to the drawings in particular the invention as embodied therein includes a central cylindrical rotor housing 10 covered at each end by two end casing manifolds or heads 12 and 14, respectively. The heads 12 and 14 are mounted on a set of longitudinally extending, laterally spaced feet or legs 16 and 18 which support the pump above floor level.

The central portion of each of the heads 12 and 14 is machined to receive a set of bearings 19, 19 for a rotor shaft 20 which carries a double rotor generally designated 22. The rotor 22 rotates within the cylindrical housing 10, the interior of which is machined to define a set of opposite lobes 24 and 26 and intervening lands 28 and 30.

The double rotor 22 comprises a hub portion 23 which is keyed to the shaft 20 for rotation therewith. Extending radially outwardly from the hub portion are a plurality of equally spaced identical blades or vanes 25 which are connected to one another through end shrouds 27 and 29, and a central partition 23. The partition 32 is aligned with and is closely adjacent an inwardly directed annular partition flange 34 formed in the housing 10. The partition flange 34 cooperates with the rotor partition 32 to divide the working pumping space into right-hand and left-hand pumping chambers (FIG. 5).

The inner boundary of the rotor is double conical in form, being adapted to maintain fine clearances with ported cones 36 and 38. Each cone 36 and 38 includes two diametrically opposed inlet ports 40 and 42 (see

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sage 84 connected to the outlet passage 76 and a lower oppositely extending lateral discharge conduit 86 connected to the discharge passage 78.

With the embodiment illustrated in FIG. 6 it is possible to have many variations of service connections. In this embodiment it is possible to separate the discharge passages as well as the inlet passages in those instances where it would be desirable.

Thus, the invention provides in a single pump construction a suction device which may be utilized for up to four different service connections each of which are to be operated over different pressure ranges.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A gas pump of the liquid ring type comprising in combination a body including at least two lobes, a rotor operative therein, the body and rotor including partition members for dividing the working space into two pumping chambers each including at least two independently operable lobe portions each capable of being applied to a separate pumping service, separate ported members defining the inner boundaries of the respective pumping chambers and including passages to transmit gas to and from the respective chambers and defining at least one independently operable inlet for each lobe portion of each chamber and at least one outlet for each pumping chamber, and heads closing the outer ends of the respective chambers and having passages therein constructed and arranged to transmit gas to and from the said ported members, each head being provided with a separate head inlet connecting each pumping chamber inlet and an outlet connecting each pumping chamber outlet whereby each chamber can be independently applied to at least two separate pumping services.

2. A gas pump of the liquid ring type comprising in combination a lobed body defining at least two lobe portions, a rotor operative therein, the body and rotor including partition members for dividing the working space into two pumping chambers each with two lobe portions, separate ported members defining the inner boundaries of the respective pumping chambers and including passages to transmit gas to and from the respective chambers, and heads closing the outer ends of the respective chambers and having passages therein constructed and arranged to transmit gas to and from said ported members, each head being provided with at least two separate inlets and an outlet whereby each chamber can be applied to at least two separate pumping services, means connecting said heads for supplying liquid seal to said inlets, said rotor having end shrouds spaced from said head and defining a sealing chamber therebetween, and passage means communicating with said sealing chamber and said inlets to continuously withdraw air therefrom and maintain said chamber full of liquid.

3. A gas pump of the liquid ring type comprising in combination a lobed body defining at least two lobe portions, a rotor operative therein, the body and rotor including partition members for dividing the working space into two pumping chambers each with two lobe portions, separate ported cone members defining the inner boundaries of the respective pumping chambers and including at least two inlet ports and a discharge port connected to each of said chambers, and heads closing the outer ends of the respective chambers and having passages therein connecting said ported cone members and arranged to transmit gas to and from the respective ported cone members, each head having a separate inlet in communication with each of said ported cone inlet ports whereby each chamber can be applied to two separate pumping services if desired.

4. A gas pump according to claim 3, wherein said

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heads are provided with connection means for supplying sealing liquid for the operation of said pump, communicating with the inlet passages of said pump, said rotor having end shrouds defining a sealing chamber space between said heads and said end shrouds and passage means communicating with said inlets and said sealing chamber.

5. A gas pump of the liquid ring type comprising a lobed body defining at least two lobe portions, a vaned rotor rotating within said body, said body and said rotor including partition members for dividing the pumping space into two pumping chambers each with two lobe portions, each pumping chamber having wall means communicating therewith having a plurality of ported inlets and separate first passages in communication with each of said inlets, heads enclosing the outer ends of the respective chambers and having a plurality of second passages therein, each one in alignment with associated ones of said first passages and with respective ported inlets whereby to form a separate inlet for each of said plurality of ported inlets, and a discharge passage defined in said heads.

6. A gas pump of the liquid ring type comprising in combination a housing including an interior formed with two opposite lobed portions connected by land portions, a rotor having substantially identical vanes rotatable within said housing, means for dividing the interior of said housing into two pumping chambers at each end thereof each including at least two independently operable lobe portions, central ported members defining at least two separate inlet passages, each connecting a respective lobed portion of said housing, and casing wall means at each end of said housing defining an outlet connecting each of said pumping chambers to the exterior of said housing and an inlet connecting each of said inlet passages.

7. A pump according to claim 5, wherein said casing wall means includes a head having partition means dividing it into at least two inlet passages and a discharge passage.

8. A pump according to claim 6, wherein said discharge passage includes at least two discharge conduits connected thereto.

9. A pump according to claim 5, including partition means dividing said head into at least two inlet passages and at least two discharge passages and separate conduit means connecting each of said passages.

10. A gas pump of the liquid ring type comprising in combination a housing including an interior formed with two opposite lobed portions connected by land portions, a rotor having substantially identical vanes with the shroud members at each end thereof rotatable within said housing, means for dividing the interior of said housing into two pumping chambers at each end thereof, end head members closing each end of said pump including a walled portion spaced from said rotor shroud members and forming a sealing chamber therebetween and including at least one separate interior inlet passages each capable of being applied to a separate pumping service separately connecting each respective lobed portion of each of said pumping chambers and separate interior discharge passages connecting each of said pumping chambers, passage means defining a liquid inlet connecting said inlet passages, and means connecting said sealing chamber to said liquid inlet passage means.

11. A gas pump of the liquid ring type comprising a housing having an interior pumping chamber including at least two lobe portions, a rotor operative in said pumping chamber, a ported member defining the inner boundary of said pumping chamber and including at least one independently operable inlet for each lobe portion and at least one outlet for said pumping chamber, a head means closing the ends of said pumping chamber having a separate inlet passage defined therein connecting each

lobe inlet, and an outlet passage defined therein connecting said outlet.

12. A gas pump according to claim 11, including means connecting said head for supplying liquid seal to said inlets, said rotor having an end shroud spaced from said head and defining a sealing chamber therebetween, and passage means communicating with said sealing chamber

and said inlets to continuously withdraw air therefrom and maintain said chamber full of liquid.

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