

Jan. 11, 1966

U. SEGEBRECHT

3,228,587

LIQUID-RING GAS PUMPS

Filed Oct. 14, 1963

4 Sheets-Sheet 1

Fig. 1

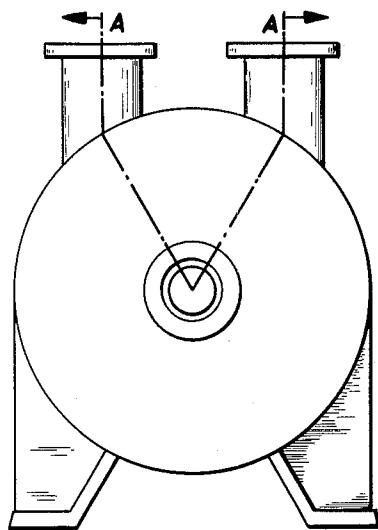
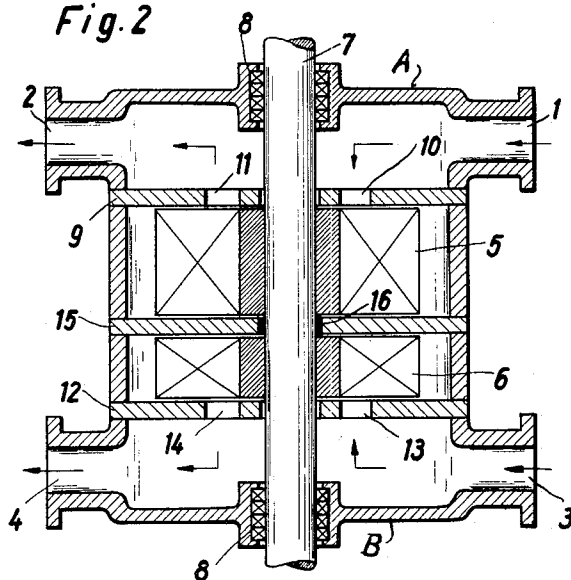


Fig. 2



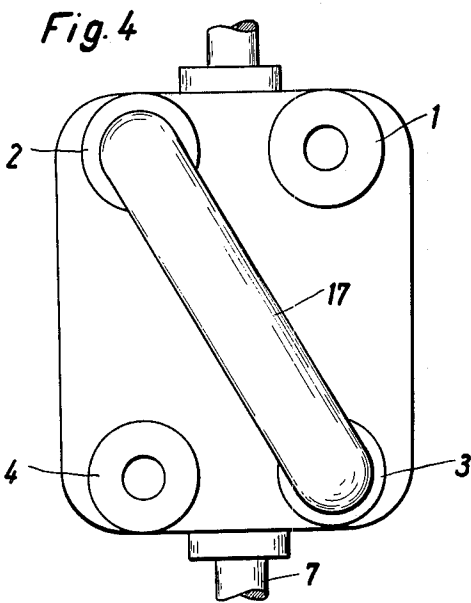
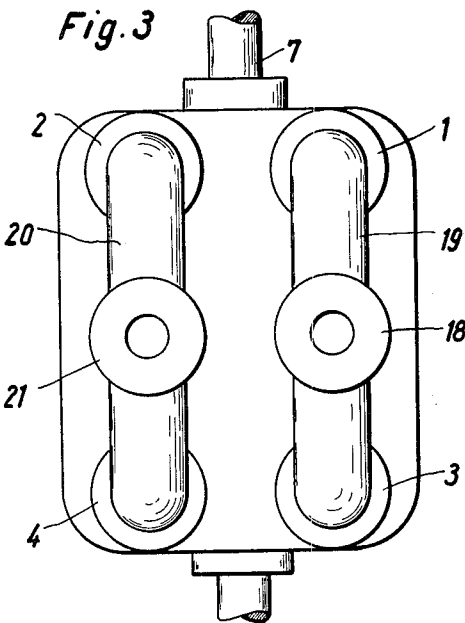
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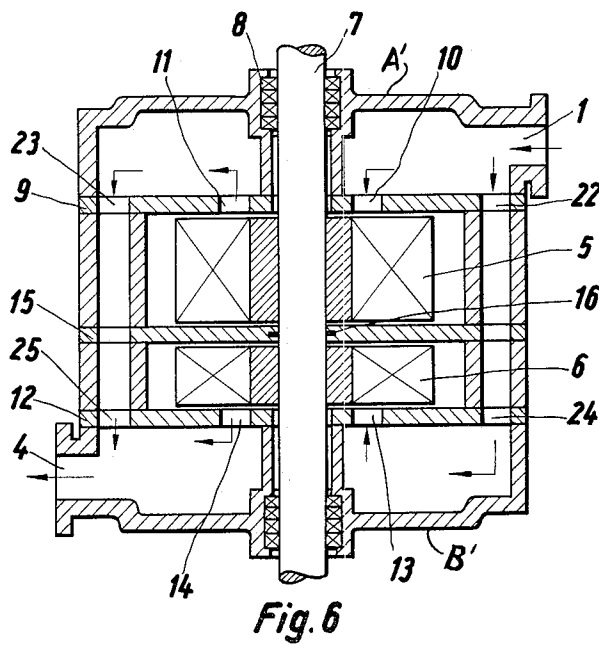
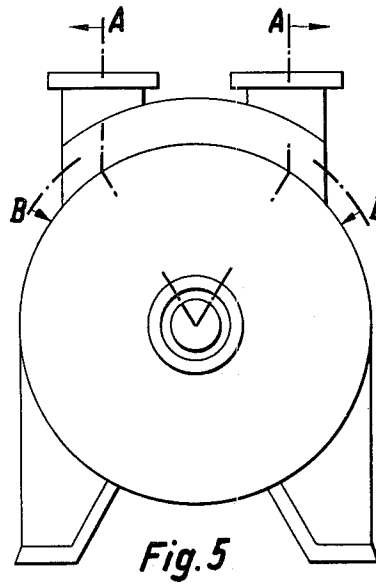
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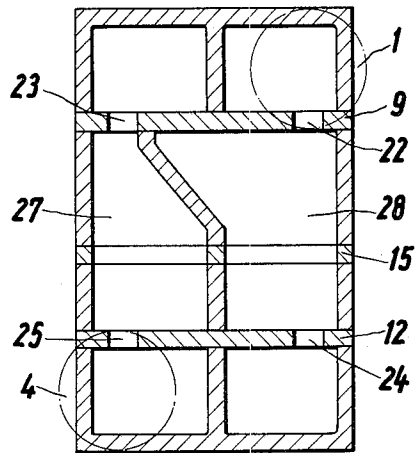


Fig. 7

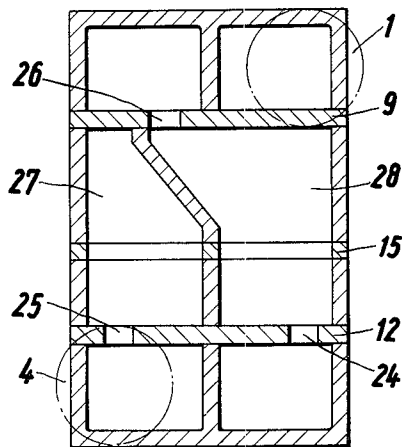


Fig. 8

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LIQUID-RING GAS PUMPS

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S 82,087

3 Claims. (Cl. 230—44)

This invention relates to a liquid-ring gas pump having seated on a shaft two impellers, the working spaces of which on the periphery and on both front sides of each impeller are formed by stationary casing parts.

In such pumps the two impellers can be connected in series so that a two-stage pump results, or they can be connected in parallel in a one-stage pump.

If the two impellers are connected in series, then in conventional manner the cross current principle is applied. This means that on one side of the pump on the suction cover the suction branch is arranged and on the other end the pressure cover provided with a pressure branch is located. The medium flows over the suction branch and the casing cover on the suction side to the first stage and arrives in an intermediate casing which is arranged between the two stages, flows from there to the second stage and leaves the latter through the pressure cover to a pressure branch. Thus, in the pump on both sides parts of the casing are located which take care of the supply and discharge of the medium and between the two stages a casing part is arranged which serves for conducting the medium from the first to the second stage.

According to a further known embodiment, the entire supply and discharge of the medium conveyed takes place over a distributing member which is located between the two stages. In comparison with the first embodiment described above, this pump has the advantage of having a shorter structure. However, the intermediate distributing casing has a rather complicated structure and it is difficult and expensive to produce it by casting, especially if the stages are not only single-acting, but double-acting.

In the parallel connection of two impellers in a pump it is possible to arrange the two impellers directly side-by-side and to arrange admission on both sides. The impeller contains in this case in the middle a separating wall which continues in the casing radially outside of the impeller. Through the gap between the separating wall of the impeller and the separating wall of the casing, a connection is formed between the working chambers of the two impellers, so that in this case the two impellers can be connected in fact in parallel only. A further possibility of connecting in parallel two impellers in a pump consists in that the entire supply and discharge of the medium conveyed is carried out over a distributing member arranged between the two stages. In the same manner as in the case of impellers connected in series, such distributing casing would have a rather complicated structure and would be correspondingly expensive.

The main object of the present invention is to provide a pump having two impellers and being as simple as possible in its construction, the two impellers being adapted to be connected in series as well as in parallel, without the necessity of substantial changes and with the use of parts which are as equal as possible.

This object is attained according to the present invention by arranging in a liquid-ring gas pump having two impellers arranged side-by-side, between the two impellers a casing wall being arranged, which extends up to about the pump shaft. The supply of the media conveyed to and from the conveying spaces takes place only over the casing covers on the suction side and pressure side of the pump. Thereby, it is irrelevant whether the guiding

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of the medium conveyed to both stages if connected in parallel or from the first to the second stage if connected in series, is carried out through channels cast in the pump casing or by means of tubes suitably arranged outside the casing.

It is of particular advantage to use channels cast-in in the casing parts, i.e. channels for connection in series as well as channels for parallel connection of the stages. By providing suitable recesses in the control discs certain channels are opened in each case so that various connections of the impellers are attained.

It is also of particular advantage in the present pump construction, to connect the stages relative to each other in such manner that a strain on the shaft in radial direction does not occur, or is extensively compensated for. If a complete removal of the load from the shaft is desired, both impellers should be designed double-acting. In this case too, the two working rooms of each impeller can be also connected parallel or in series.

In view of the fact that in case of a connection in series a considerable pressure drop may be present between the two stages, it is proposed according to the present invention to arrange a simple sealing between the two stages in the casing wall, in order to avoid losses.

Due to its short, compact structure, the pump is suitable for many applications in which such structure is preferred, particularly when the pump is combined with a permanent magnetic drive or with a canned motor (Spaltrohr-motor).

The appended drawings illustrate by way of example and without limitation a best way for carrying out the invention.

In the drawings

FIG. 1 illustrates a pump according to the invention in front view;

FIG. 2 is a sectional view of the pump along line A—A in FIG. 1;

FIG. 3 is a top view of the pump according to FIGS. 1 and 2; thereby both stages are connected in parallel by a corresponding arrangement by means of bypass pipes;

FIG. 4 illustrates a pump according to FIG. 1, in which the two stages are connected in series by means of a pipe arranged on the outside;

FIGS. 5–8 illustrate a modified embodiment of the invention, in which the diverting conduits are channels cast in the pump housing. The reference symbols in FIGS. 5–8 correspond to those used in FIGS. 1–4, while additional reference symbols 22–28 have been assigned to the inner diversions;

FIG. 6 is a section along line A—A in FIG. 5, while

FIGS. 7 and 8 are sections along line B—B in FIG. 5, FIG. 7 illustrating a connection of the two stages in parallel and FIG. 8 a connection in series;

FIG. 6 illustrates a parallel connection of the two stages.

In the various figures identical parts are denoted by the same reference symbols.

Referring now to the drawings in detail, reference symbol 1 denotes the suction branch and 2 denotes the pressure branch of the wide stage, in the head member or means A, 3 denotes the suction branch and 4 the pressure branch of the narrow stage, in the opposing head member or means B. The impellers 5 and 6 are arranged on the shaft 7 and the sealing or packing of the passing of the shaft in outward direction is brought about by the stuffing boxes 8, 8. The control disc 9 provided with the sucking slot 10 and the pressure slot 11 belongs to the wide stage of the pump and the control disc 12 provided with the suction slot 13 and the pressure slot 14 belongs to the narrow stage of the pump. Between the two stages or

steps a separating wall 15—which extends up to the shaft 7—is arranged and contains packing or sealing means 16 provided therein.

The medium to be conveyed by the pump flows—if the stages are connected in series—according to FIG. 4, first through the suction branch 1 into the suction space of the wide stage, passes through slot 10 into the cells of the impeller and leaves the latter through the pressure slot 11. Through the branch 2, it passes into the by-pass pipe 17 and from there through the branch 3 and sucking slot 13 into the cells of the impeller 6 of the second stage. It leaves the latter through the pressure slot 14 and pressure branch 4 into the pressure conduit.

If the two stages are connected in parallel according to FIG. 3, the medium to be conveyed is introduced through branch 18 of tube 19 into branches 1 and 3 of the two stages. The medium flows through the stages in corresponding analogy to the above description of the connection in series and passes through branches 2 and 4 into tube 20 and from there through 21 into the pressure conduit of the pump.

As already mentioned above, the supply of gas to both stages in the case of connection in parallel, and the guiding of gas from the first to the second stage in the case of connection in series, can be also effected through channels which are cast integrally into the casing. In this modification it is merely necessary to replace the tubes 17, 19 and 20 (see FIGS. 3 and 4) by corresponding channels located in the housing.

In the embodiment shown in FIG. 6, in the case of parallel connection, the medium to be conveyed enters through suction branch 1, in the head member or means A' of the pump into the suction space of the wide stage and through the bore 22 of the disc 9, the housing channel 28 and bore 24 in control disc 12, the suction space of the narrow stages, as shown in FIG. 7. The conveyed medium discharged through pressure slits 11 and 14 of the wide and narrow stages, respectively, passes to the pressure spaces of these stages and, from there, directly to the branch 4 and through bore 23 in the control disc 9, the housing channel 27 and bore 25 in control disc 12 to branch 4, which is located in the opposing head member or means B'.

In connecting the stages in series, as illustrated in FIG. 8, there are no bores 23 and 22 in control disc 9, but a bore 26 is provided for. The medium conveyed follows thereby the following path:

Through the branch 1 the medium passes to the suction space of the wide stage and over the suction slit 10 to the cells of impeller 5. Through the pressure slit 11 the medium passes to the pressure space of the first stage and through the bore 26 to the housing channel 28 and the bore 24 to the suction space of the second stage. From here the medium flows through suction slit 13 to the cell of impeller 6 and passes through pressure slit 14 of this stage through the pressure space to the branch 4 of the pump.

Thus, the parallel and the series connection can be brought about by simple corresponding bores in the control disc 9. It will be understood that the channels can be cast in the housing not only on top, but arranged also at any desired other place. If desired, the channels 27, 28 can be operated in the pump by regulating devices which are located outside of the pumps, so that the parts of the pump have entirely equal appearance.

What is claimed is:

1. A liquid-ring gas pump comprising a stationary housing including opposing head means, a stationary wall means positioned between the head means and defining a pump chamber, a shaft rotatably extending through the chamber and sealingly and rotatably extending through the opposing head means, said stationary wall means including a side wall means arranged axially of the shaft and a first and a second stationary control disc, said discs being structurally associated with the side wall means and extending transversely thereof and of the shaft and spaced apart along the axis of the shaft, said shaft passing through the discs, an imperforate partition fixed transversely between the wall means and having only a single transverse opening through which the shaft passes, sealing means between the shaft and the partition, said partition being interposed between the discs and disposed parallel thereto in spaced relation with the discs along the axis of the shaft to divide the chamber into two separate and independent chamber sections, two separate and individual impellers fixedly mounted on the shaft and disposed in spaced relation along the axis of the shaft, one of said impellers being operatively disposed in one of the chamber sections and the other of said impellers being operatively disposed in the other of said chamber sections, inlet means and outlet means for the conveyed medium structurally associated with the head means outwardly of the discs, said discs having passages for the conveyed medium, and means associated with the head means and associated with the chamber sections for selectively connecting said impellers in a two-stage series pump operation and connecting said impellers in a parallel one-stage pump operation.

2. The invention of claim 1, wherein said side wall means of the stationary wall means constitutes a connecting side wall between the opposing head means and said last means includes external piping structurally connected to the head means and in flow connection with the inlet and outlet means.

3. The invention of claim 1, wherein said head means are connected by a side wall and said side wall means of the stationary wall means is disposed within the side wall and said last means includes the provision of internal cast-in channels in the side wall in flow connection with the inlet and outlet means.

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