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(54) Double delivery bi-directional pump

(57) A double-delivery pump for dishwashers and the like includes an impeller made up of a hub provided with a first blading (C), an intermediate ring provided with a second blading (A) and a peripheral rim (B), and a cover ring (T), one of said bladings (A, C) having a spiral shape suitable for the clockwise rotation of the impeller and the other for the counter-clockwise rotation. The housing within which the impeller rotates is divided by the intermediate ring into an external chamber (E) with a first delivery duct (H) and an internal chamber (F) with a second delivery duct (J), separated along the periphery by a labyrinth seal (G) consisting of the peripheral rim (B) introduced into a corresponding channel (D), the orientation of the ducts (H, J) being consistent with the direction of rotation of the blading (A, C) in each chamber (E, F). This pump is capable of handling two separate hydraulic circuits connected to the two ducts (H, J) simply by reversing its direction of rotation, thus allowing to dispense with the valves to control the supply to the two circuits.

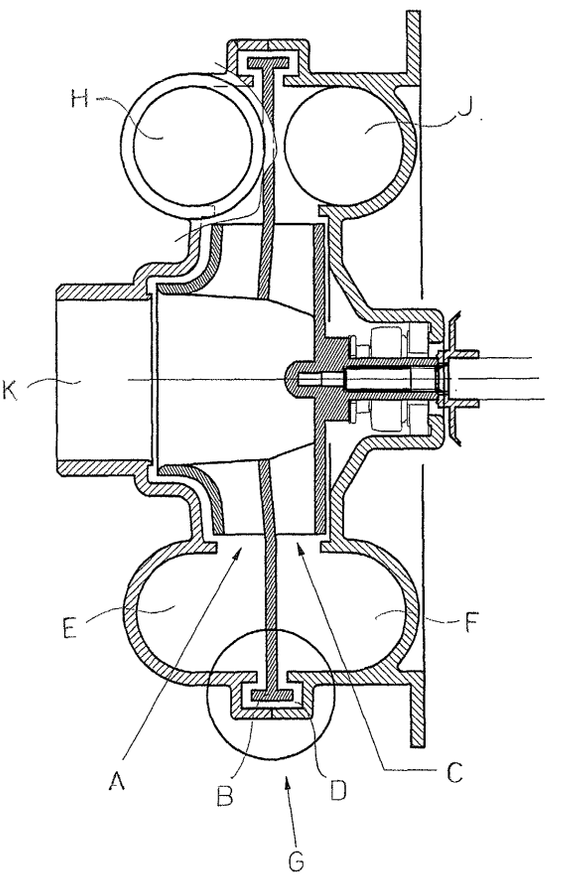

Fig.1

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Description

[0001] The present invention relates to pumps for dishwashers and the like, and in particular to a double-delivery bidirectional pump in which the direction of rotation determines through which delivery the water is delivered. Specific reference will be made in the following to the application of said pump to a dishwasher, but it is clear that what will be said can be adapted also to the use of the present pump in a washing machine or other domestic appliance.

[0002] It is known that in modern dishwashers the user is often offered the possibility of running a "half load", i.e. a washing cycle in which only one of the sprinklers is used, or an "alternate" wash in which the two sprinklers are alternately supplied thus allowing to extend the washing of the dishes in one of the two racks.

[0003] This type of program is usually obtained through a single-delivery washing pump and a flow distribution valve controlled by the control unit of the machine to direct the water flow to the upper or lower sprinkler. As an alternative, there may be provided a double-delivery pump with two valves independently controlling the supply to the two sprinklers.

[0004] Other valves may be provided to supply a hydraulic circuit for the periodical cleaning of the dishwasher filters, or a short-length heating circuit to reduce the energy waste during the water heat-up phase. In addition to the washing pump there is also provided a draining pump to drain the water out of the tank at the end of the washing cycle.

[0005] Clearly, the presence of one or more valves and of two pumps implies an increase in the machine manufacturing cost, as well as a decrease in reliability since the failure or clogging of a valve or a pump can jeopardize the correct machine operation.

[0006] Therefore the object of the present invention is to provide a pump which allows to overcome said drawbacks. This object is achieved by means of a double-delivery pump capable of handling two separate hydraulic circuits simply by reversing its direction of rotation.

[0007] The main advantage of the pump according to the present invention is exactly that of allowing to dispense with the valve(s) to control the supply to two different hydraulic circuits, or that of combining the functions of washing pump and draining pump.

[0008] Another advantage of this pump stems from the fact that said functionality is achieved through a very simple structure substantially without mobile members, with positive results as to cost and reliability.

[0009] These and other advantages and characteristics of the pump according to the present invention will be clear to those skilled in the art from the following detailed description of two embodiments, with reference to the annexed drawings wherein:

Fig.1 is a vertical sectional view of the hydraulic group of the pump in a first embodiment;

Fig.2 is an exploded vertical sectional view of the members which make up the pump impeller;

Fig.3 is a vertical sectional view of the pump showing the path of the water flow when the pump is driven counter-clockwise;

Fig.4 is a vertical sectional view of the hydraulic group taken along line A-A of fig.3;

Fig.5 is a vertical sectional view of the pump showing the path of the water flow when the pump is driven clockwise;

Fig.6 is a vertical sectional view of the hydraulic group taken along line B-B of fig.5;

Fig.7 is a vertical sectional view of the pump in a second embodiment; and

Fig.8 is a horizontal sectional view of the hydraulic group taken along line C-C of fig.7.

[0010] Referring to figs.1-6 above, there is seen that the hydraulic group of the pump according to the invention includes a housing, made up of an external half-shell coupled to an internal half-shell, and an impeller rotatably arranged within said housing. More specifically, the impeller is made up of three connected coaxial members, namely a hub S provided with a blading C, an intermediate ring R also provided with a blading A as well as with a peripheral rim B, and a cover ring T.

[0011] The external half-shell has a mouth K, connected to the supply duct, through which the water enters a first external chamber E which ends at the top with a first delivery duct H, and is separated by ring R from a second internal chamber F which ends at the top with a second delivery duct J. The connection between the two chambers E, F is achieved through the central opening of rings T, R in that along the periphery rim B is introduced into a corresponding channel D so as to form a labyrinth seal G.

[0012] The novel aspect of the present pump is the particular configuration of the impeller and delivery ducts, which allows to obtain a "double" pump which can be driven alternately in one direction or the other. In fact, as shown in figs.4 and 6, while blading C of hub S has a counter-clockwise spiral shape and the relevant duct J of chamber F is directed leftward, blading A of ring R has an opposite clockwise shape and the relevant duct H of chamber E is directed rightward.

[0013] From the description above and referring in particular to figs.3 and 5, the simple and reliable operation of the pump according to the invention is readily understood.

[0014] When motor M drives the impeller in the counter-clockwise direction (fig.3), the incoming water flow W is captured only to a very small extent by blading A which is designed for the clockwise rotation, whereby the water passes through ring R and is pushed by blading C out through the delivery duct J, which for example is connected to one of the sprinklers.

[0015] Similarly, when motor M drives the impeller in the clockwise direction (fig.5), the incoming water flow

W is captured mostly by blading A, which is exactly designed for the clockwise rotation, and is pushed out through the delivery duct H, which for example is connected to the other sprinkler. The water passing through ring R is just a small amount, and in any case blading C is designed for the counter-clockwise rotation and therefore results ineffective.

[0016] The direction of rotation of the electric motor M and therefore of the impeller can be controlled in various ways well known to a person skilled in the art. For example, in the case of a nonsynchronous single-phase motor a switch may be provided to change the sequence of supply to the windings to obtain the clockwise or counter-clockwise rotation. This switch may be part of an electromechanical timer or it can be part of an electronic board to achieve even more sophisticated functions, such as a slow start at every reversal of the direction of rotation (to reduce the noise) or the activation on the basis of the signals coming from sensors which detect the presence of dishes to decide to which sprinkler the water flow must be directed.

[0017] As mentioned in the introductory portion, the two ducts H, J may obviously be connected to two hydraulic circuits of any kind, not only to those of the upper and lower sprinkler. Therefore the pump may act as washing pump when rotating in a first direction, supplying both sprinklers, and the rotation in the opposite direction may serve to supply a secondary hydraulic circuit for heating the water or for cleaning the filters.

[0018] In the same way it may act as draining pump when rotating in the opposite direction, thus allowing to dispense with the draining pump. However in this case it is necessary to separate the supply ducts entering the pump to prevent the dirt present in the water already used for washing from re-entering the circuit.

[0019] To this purpose the hydraulic group may be modified as illustrated in figs.7 and 8, by providing an intermediate ring R' with a central opening U which is smaller and shaped with a neck extending outward to which there is connected a supply duct L separate from the duct connected to mouth K.

[0020] In this way the pump can take clean water for washing through a supply duct and dirty water to be drained through the other duct, the mixing between the two chambers being negligible.

[0021] It is clear that the above-described and illustrated embodiments of the pump according to the invention are just examples susceptible of various modifications. In particular, the exact shape of bladings A and C may be somewhat changed as long as they are designed for rotation in the two opposite directions, and the same applies to the labyrinth of seal G which may have a different configuration, e.g. by making it double. Moreover, the direction of rotation may obviously be inverted with respect to what is depicted in the figures, i. e. by designing the blades for the counter-clockwise rotation in the external chamber and for the clockwise rotation in the internal chamber. Similarly, the position of the delivery ducts may be changed along the periphery of the hydraulic group (e.g. at the bottom or on a side) as long as the orientation remains consistent with the direction of rotation of the blading in each chamber.

Claims

1. Double-delivery pump made up of an electric motor (M) and a hydraulic group including an impeller driven into rotation by said motor (M) and arranged within a housing with two delivery ducts (H, J) and a mouth (K) connected to a supply duct, **characterized in that** said impeller is made up of a hub (S) provided with a blading (C), an intermediate ring (R; R') provided with a blading (A) and a peripheral rim (B), and a cover ring (T), one of said bladings (A, C) having a spiral shape suitable for the clockwise rotation of the impeller and the other for the counter-clockwise rotation, said housing being divided by said intermediate ring (R; R') into an external chamber (E) with a first delivery duct (H) and an internal chamber (F) with a second delivery duct (J), said chambers (E, F) being separated along their periphery by a labyrinth seal (G) consisting of said peripheral rim (B) introduced into a corresponding channel (D), the orientation of said ducts (H, J) being consistent with the direction of rotation of the blading (A, C) in each chamber (E, F) and the motor (M) being provided with means for controlling its direction of rotation.

2. Double-delivery pump according to claim 1, **characterized in that** the ducts (H, J) are formed at the top of the respective chambers (E, F).

3. Double-delivery pump according to claim 1 or 2, **characterized in that** the motor (M) is a nonsynchronous single-phase motor and the means for controlling its direction of rotation consist of a switch which changes the sequence of supply to the windings.

4. Double-delivery pump according to one or more of the preceding claims, **characterized in that** the intermediate ring (R') has a central opening (U) shaped with a neck extending outward to which there is connected a supply duct (L) for supplying water to the internal chamber (F), said duct (L) being separate from the supply duct connected to the mouth (K).

5. Dishwasher **characterized in that** it includes a double-delivery pump according to one or more of the preceding claims.

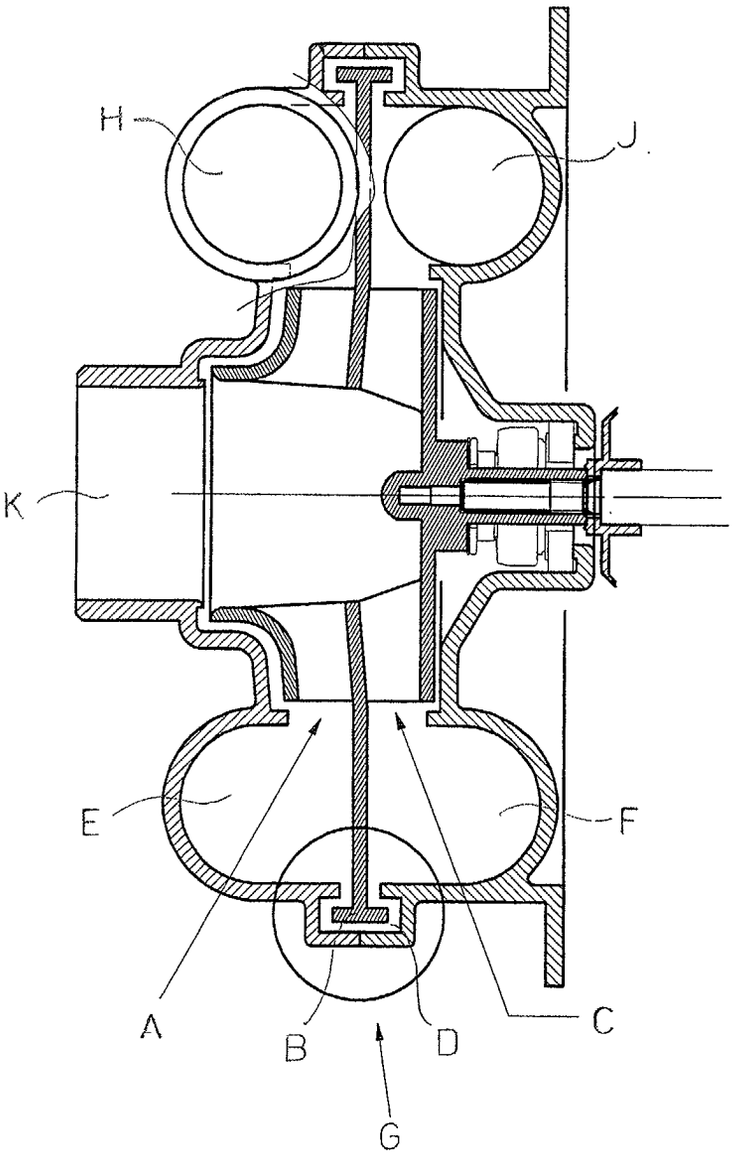


Fig.1

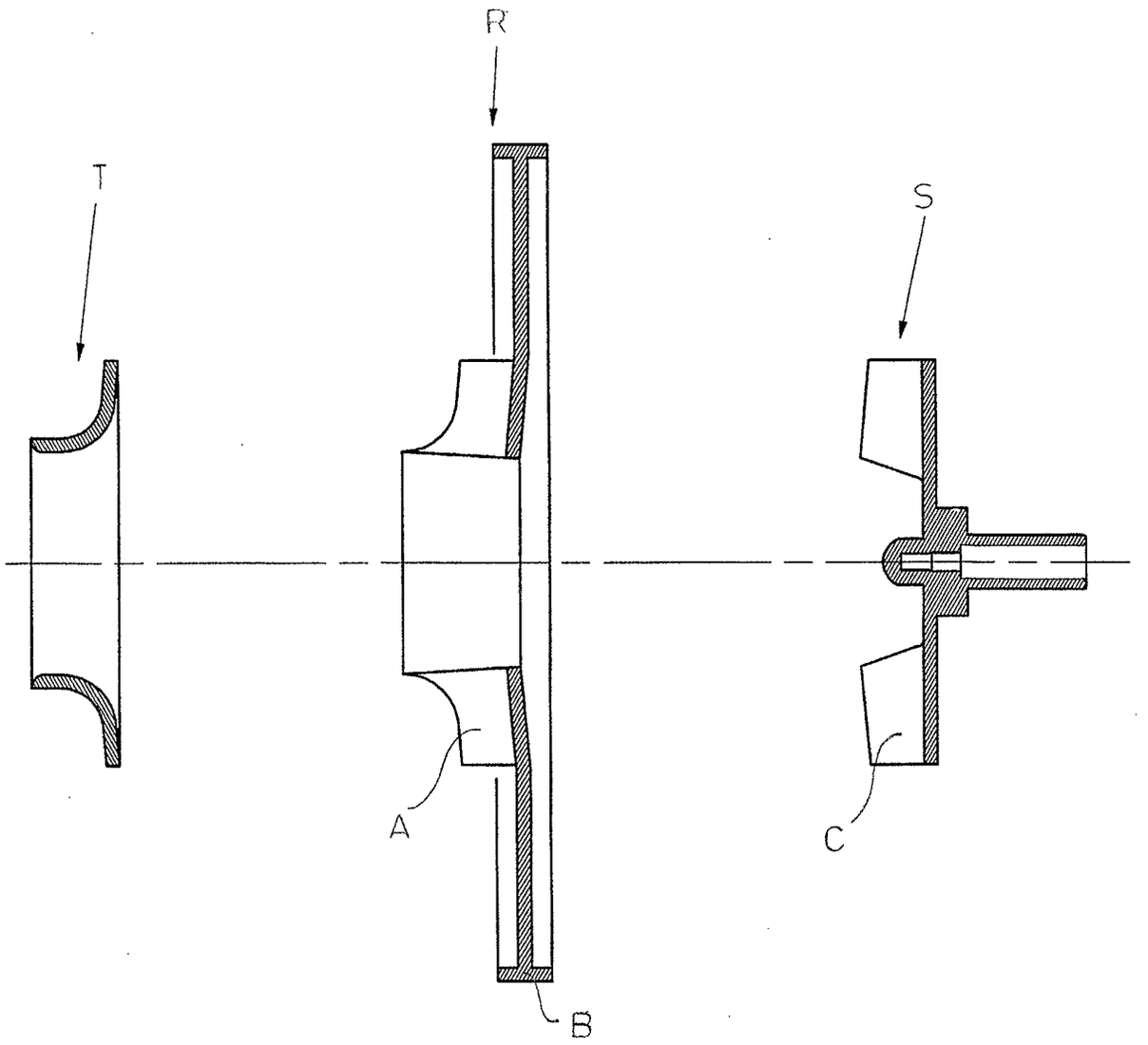


Fig.2

Fig.3

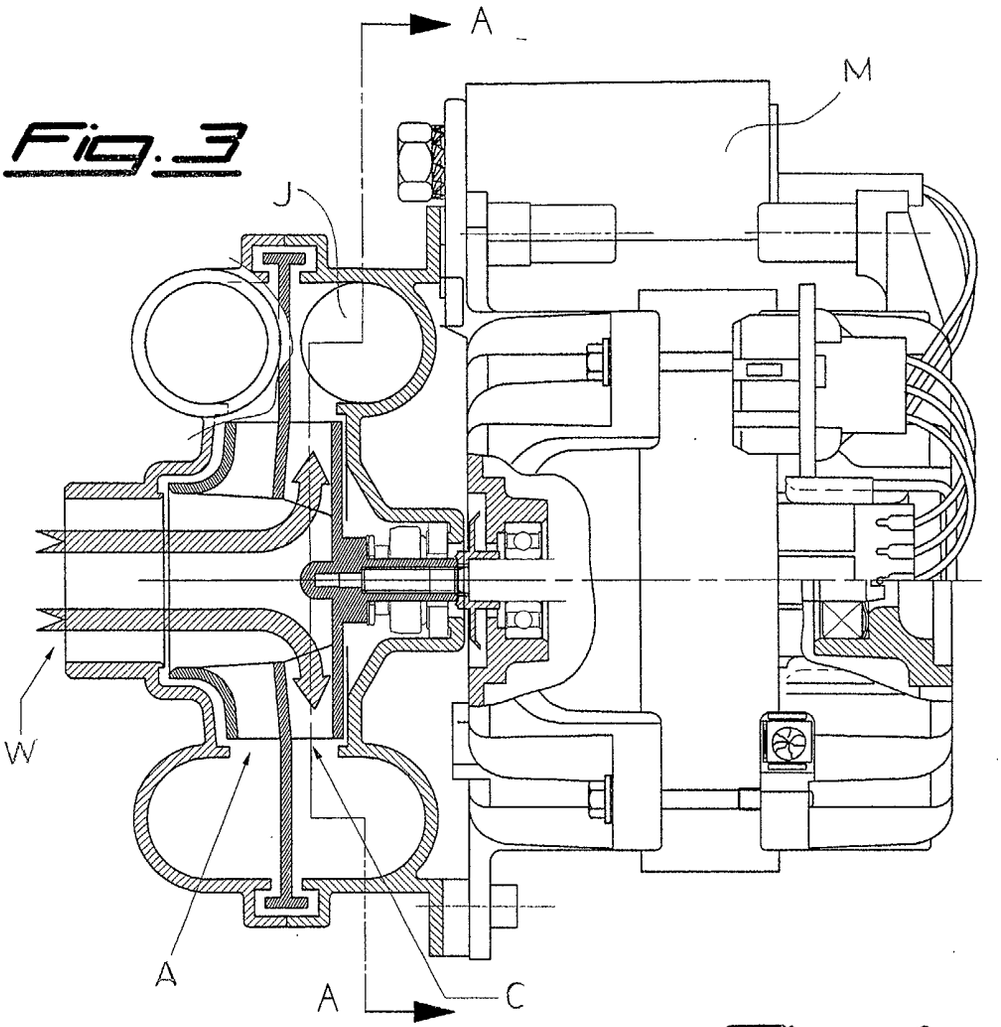


Fig.4

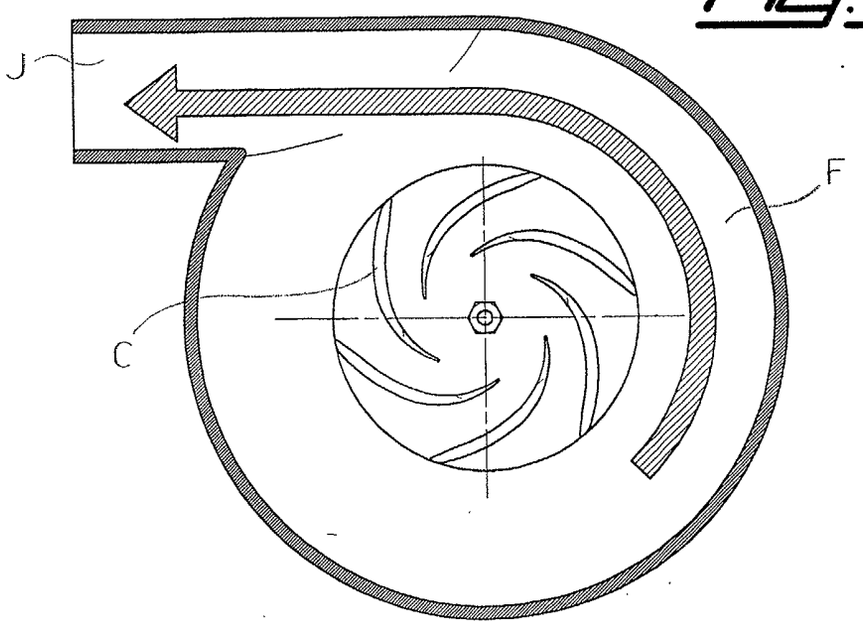


Fig.5

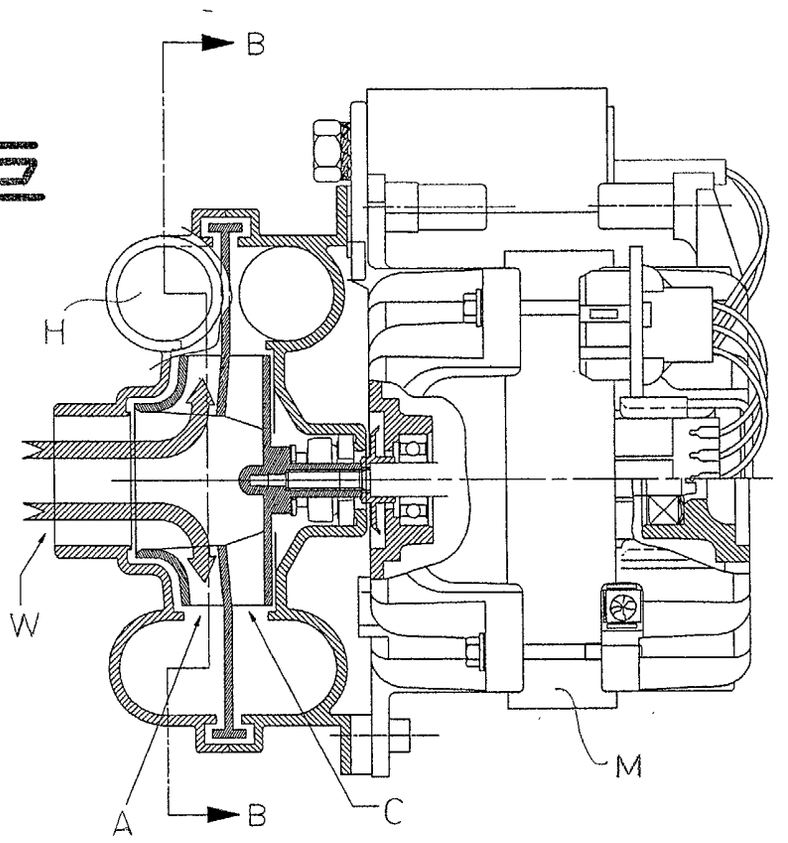
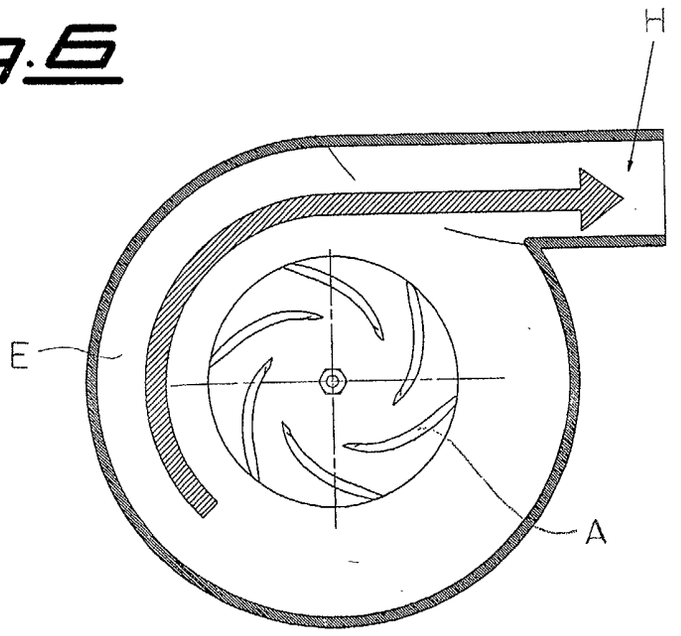


Fig.6



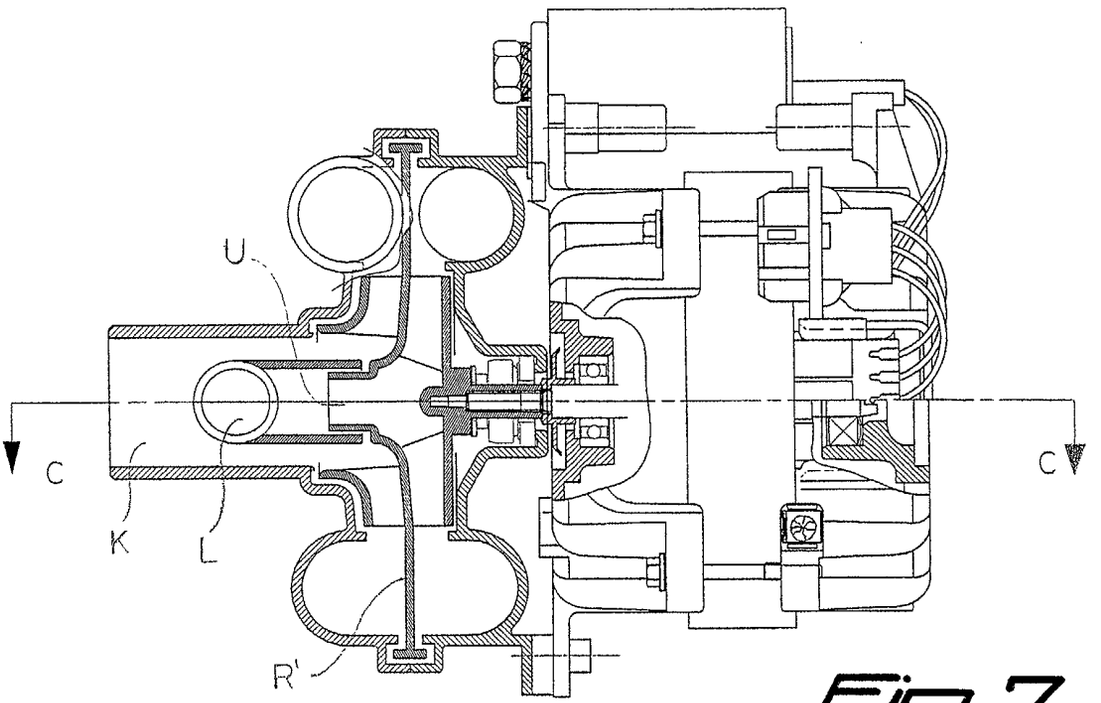


Fig. 7

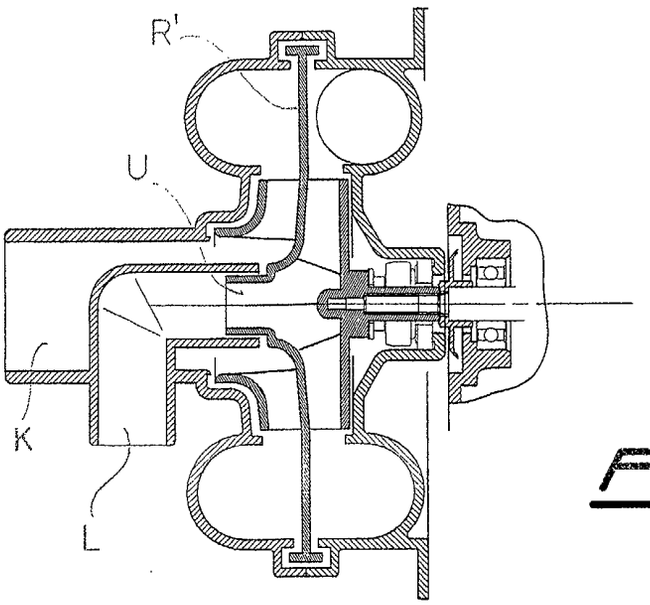


Fig. 8

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Application Number
EP 01 83 0499

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 December 2001	Ingelbrecht, P

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