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Description

The present invention relates to a hydraulic pump, particularly for dishwashers or the like.

As is known, in dishwashing machines it is necessary to use the same pump to feed the delivery conduits of two or more separate hydraulic circuits, such as for example the circuit of the sprinkler of the upper dish-holder and that of the lower dish-holder. A first type of hydraulic pump is known which is constituted by a casing which accommodates an impeller and defines, around said impeller, a diffusion chamber with a passage cross section which increases in the direction of the liquid propelled by the impeller. The diffusion chamber is connected in output, i.e. at its greater passage cross section, to a first delivery duct which feeds the sprinkler of the lower dish-holder. A second delivery duct extends from said first duct after the pump and feeds the sprinkler of the upper dish-holder.

A second type of hydraulic pump is also known; said pump is constituted by a casing which accommodates an impeller and defines, about said impeller, a diffusion chamber which is connected to two delivery ducts having angularily spaced inlets with respect to the axis of the impeller; said delivery ducts respectively feed the sprinkler of the lower dish-holder and the sprinkler of the upper dish-holder. The diffusion chamber is practically divided into two chambers, the passage cross sections whereof increase in the direction of the liquid propelled by the impeller towards the related inlet of one of the delivery ducts. In this case the pump can be assimilated to two pumps which have an equal head and a capacity which is proportional to the arc of extension of the related diffusion chamber and separately feed the two delivery ducts.

Some dishwashing machines, which use pumps of the first type, can wash dishes contained in the lower dish-holder, for example in case of small loads. In such machines the upper sprinkler may be manually overturned so that the two sprinklers strike the dishes contained in the lower dish-holder with the pump's entire capacity.

In other kinds of machine, the flow-rate can be adjusted in one of the delivery ducts by acting manually on a valve arranged on a duct to be adjusted, generally on the delivery duct which feeds the upper sprinkler.

Such known types of machine, though they respectively allow to wash the dishes contained in a single dish-holder or to adjust the flow-rate along one of the delivery ducts, have the disadvantages of requiring a manual intervention on the part by the user and of not allowing a satisfactory adjustment of the flow-rate and/or of the head on the delivery ducts according to the actual requirements of the machine's washing cycles.

From GB Patent No 1,379,075 it is known a radial flow turbo-machine, i.e. a centrifugal pump or fan, including a multipart wall, the relative positions of the parts of said multipart wall being adjustable radially as to enable the cross-sectional area of each flow passage to be varied and thereby to provide a control over flow through the volute chamber.

The described system cannot allow to modify substantially the ratio between the two flows, but only to adjust the value of both, from a maximum to a minimum, may be zero.

From Japan Patent application No 58-133407 it is known a multi-vane fan, where a movable damper plate is turnably fitted on the inside of the casing, allowing in a first position to close a first delivery port, in a second position to close a second delivery port, and, in an intermediate position, to increase the air flow through the second delivery port while additional air is sucked through the first delivery port, which is turned into a supply port.

Fans however are machines that work on physical laws different of those regulating liquid pumps; in fact air (and gas in general) are well compressible, while liquids are incompressible; problems and behaviour are very different.

The aim of the present invention is to obviate the above described disadvantages by providing a hydraulic pump, in particular for dishwashers, which allows to feed one or both of the delivery ducts automatically according to the requirements.

Within the scope of this aim, an object of the invention is to provide a hydraulic pump which allows to automatically adjust the flow-rate on the two delivery ducts fed by said pump and/or of the head on only one of said ducts .

Another object of the invention is to provide a pump which fully meets the various requirements of the preset washing cycles.

Still another object of the invention is to provide a pump which reduces consumption and noise, particularly in the cycles which require low hydraulic power, such as for example during rinsing or in so-called economy cycles.

Not least object of the invention is to provide a pump in which the various possible adjustments can be controlled by an automatic programming element.

This aim, as well as these and other objects which will become apparent hereinafter, are achieved by a hydraulic pump, particularly for dishwashers or the like, comprising a casing which rotatably accommodates an impeller and defines, peripherally to said impeller, a diffusion chamber which has a first inlet for a first delivery duct and a second inlet for a second delivery duct, said two inlets being located on approximately diametrically

opposite positions, and wherein, proximate to at least the second one of said inlets, adjustment means are provided in said diffusion chamber, and can be controllably actuated to vary the degree of opening of said second one of said inlets, characterised in that said adjustment means comprise a movable element, which, in a first position, divides said diffusion chamber into two partial diffusion chambers, hydraulically substantially independent from one another, each of said partial diffusion chambers being connected to one of said inlets, and, in a second position, closes said second inlet realising only one diffusion chamber, which connects to said first inlet.

Further characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of the pump according to the invention, illustrated only by way of non-limiting example in the accompanying drawings, wherein:

figure 1 is a schematic sectional view of the pump according to the invention, taken along a plane which is perpendicular to the axis of the impeller, in an operating condition; and

figure 2 is a schematic sectional view of the pump according to the invention, similar to figure 1, in another operating condition.

With reference to the above described figures, the pump according to the invention, generally indicated by the reference numeral 1, comprises a casing 2 which, like known pumps, rotatably accommodates an impeller 3 with vanes 4. The casing 2 defines a diffusion chamber 5 around the impeller 3; said chamber has a first inlet 6, to be connected for example to a first delivery duct 7 which feeds the lower sprinkler of a dishwasher, and a second inlet 8, to be connected for example to a second delivery duct 9 which feeds the upper sprinkler. The diffusion chamber 5 is shaped so that its passage cross section increases concordantly with the direction of the liquid propelled through said chamber by the impeller 3.

The first inlet 6 is arranged in output to the diffusion chamber 5, i.e. at the greater passage cross section of said chamber, while the second inlet 8 is arranged ahead of the first inlet 6 with respect to the direction of flow of the liquid propelled by the impeller 3.

According to the invention, adjustment means 10 are provided proximate to the second inlet 8 in the diffusion chamber 5 and can be controllably actuated to vary the degree of opening of the second inlet 8.

More particularly, the adjustment means 10 are constituted by a movable element 11 in the shape of a vane which is concave on the side directed toward the impeller 3 and can be controllably moved from an opening position, in which it keeps the second inlet 8 open, to a closure position, in which it completely closes said inlet 8, with the possibility of intermediate positions.

One of the ends of the vane 11 is pivoted to the casing 2 proximate to the wall thereof which radially delimits the diffusion chamber 5, while the opposite end extends proximate to the second inlet 8. The vane 11 can oscillate controllably about an axis 12 which is parallel to the axis 23 of the impeller 3 to pass from the opening position to the closure position or vice versa.

The impeller 11 has, on its side directed toward the impeller 3, a curved profile which is connected to the inner surface of the casing, which radially delimits the diffusion chamber 5, when said vane is in its closure position and connects to the perimeter of the impeller 3 when the vane is in its opening position.

Proximate to its free end, on its side directed oppositely to the impeller, the vane 11 has a first portion 11a which connects to the perimeter of the impeller in its opening position and a second portion 11b which is concave on its side directed towards the inlet 8 and connects the first portion 11a to the inlet 8.

A cavity 13 is advantageously defined on the wall of the casing which radially delimits the diffusion chamber 5; said cavity is adapted to partially accommodate the vane 11 in its closure position.

In this manner, by virtue of its configuration and of the cavity 13, the vane 11 has its free end close to the impeller in its opening position and divides the diffusion chamber 5 into two hydraulically independent partial diffusion chambers; each chamber is connected to one of the inlets 6 and 8 and its passage cross section increases towards the related inlet.

In order to move the vane 11 from its opening position to its closure position, or to an intermediate position, actuation means 15 can be used which act on the pivoting pin 14 of the vane 11 or directly on the vane 11. In the illustrated embodiment said actuation means are advantageously constituted by a known linear motor 16 which is associated with the casing 2 proximate to the cavity 13 and has a control rod 17 pivoted with its free end to the vane 11. More particularly, the free end of the actuation rod 17 is pivoted in a slot 18 defined in the vane 11. Elastic means 19 are furthermore provided between the vane 11 and the casing 2; said means are constituted for example by a spring and elastically bias the action of the linear motor 16.

In order to vary the flow-rate and the head of the pump under invariant hydraulic conditions set by positioning the vane 11, the impeller 3 may be advantageously actuated by an electric motor of a known type, not illustrated, having a controllably

variable rpm rate.

The operation of the pump according to the invention is as follows.

If both the upper sprinkler and the lower sprinkler must be fed, the vane 11 is moved to its open position (figure 1). In this manner the pump behaves like two independent pumps which separately feed the two delivery ducts 7 and 9.

If only the lower sprinkler is to be fed, the vane 11 is moved to its closure position so as to close the second inlet 8 (figure 2). In this manner the pump's entire capacity is conveyed to the lower sprinkler.

During the steps of the washing cycle which require a reduced head and/or capacity both on the first delivery duct 7 and on the second delivery duct 9 or only on the second delivery duct 9, the rotation rate of the motor which actuates the impeller 3 can be reduced according to the various requirements, keeping the vane 11 respectively in its opening position or in its closure position.

A further variation of the flow-rate and/or the head on the two ducts 7 and 9, according to the requirements, can be obtained by appropriately arranging the vane 11 in an intermediate position between its opening position and its closure position.

In practice it has been observed that the pump according to the invention fully achieves the intended aim, since it allows to automatically adjust the flow-rate and/or the head on the two delivery ducts or on a single duct so as to fully meet the most disparate washing requirements of a dishwasher, and furthermore achieves greater washing efficiency and a reduction in costs. With such adjustments it is furthermore possible to adapt the pump's hydraulic characteristics even to operating conditions which require reduced flow-rates, thus avoiding noise.

Claims

1. Hydraulic pump, particularly for dishwashers or the like, comprising a casing (2) which rotatably accommodates an impeller (3) and defines, peripherally to said impeller, a diffusion chamber (5) which has a first inlet (6) for a first delivery duct (7) and a second inlet (8) for a second delivery duct (9), said two inlets being located on approximately diametrically opposite positions, and wherein, proximate to at least the second one (8) of said inlets, adjustment means are provided in said diffusion chamber, and can be controllably actuated to vary the degree of opening of said second one of said inlets, characterised in that said adjustment means comprise a movable element (11), which, in a first position (fig. 1), divides said diffusion chamber (5) into two partial diffusion chambers, hydraulically substantially independent from one another, each of said partial diffusion chambers being connected to one of said inlets, and, in a second position (fig. 2), closes said second inlet (8) realising only one diffusion chamber (5), which connects to said first inlet (6).

2. Hydraulic pump, according to claim 1, characterised in that said movable element (11) is constituted by a vane which is concave on its side directed towards said impeller (3) and has one of its ends pivot to said casing (2), proximate to the wall which radially delimits said diffusion chamber (5), said vane being oscillable about an axis (12) which is parallel to the axis (23) of said impeller (3) to move its other end towards said impeller or away therefrom to close said second inlet (8).

3. Hydraulic pump, according to one or more of the preceding claims, characterised in that said movable element (11) has, on its side directed towards said impeller (3), a curved profile which connects to the inner surface of said casing (2) which radially delimits said diffusion chamber (5) when said movable element is in said closure position and which connects to the perimeter of said impeller (3) when said movable element is in said opening position.

4. Hydraulic pump, according to one or more of the preceding claims, characterised in that said movable element (11) has, on its side directed opposite to said impeller (3), a first portion (11a) which connects to the perimeter of said impeller (3) and a second concave portion (11b) which is directed towards said second inlet (8) and connects said first portion (11a) with said second inlet (8) when said movable element is in said opening position.

5. Hydraulic pump, according to one or more of the preceding claims, characterised in that on the wall of said casing (2) which radially delimits said diffusion chamber (5), a cavity (13) is formed and is adapted to contain at least partially said movable element (11) in said closure position.

6. Hydraulic pump, according to one or more of the preceding claims, characterised in that when said movable element (11) is in its closure position the cross section of said diffusion chamber (5) increases towards said first inlet (6), and when said movable element is in its opening position the cross section of said dif-

fusion chamber (5) increases towards said second inlet (8) and increases from said movable element towards said first inlet (6).

7. Hydraulic pump, according to one or more of the preceding claims, characterised in that said impeller (3) is actuated by a motor with a variable rpm rate.

8. Hydraulic pump, according to one or more of the preceding claims, characterised in that it comprises actuation means (15) which act on said movable element (11) to vary the degree of opening of said second inlet (8).

9. Hydraulic pump, according to claim 8, characterised in that said actuation means comprises a linear motor (16) which is supported by said casing (2) and has an actuation rod (17) pivoted to said movable element (11), said linear motor (16) being arranged with said movable actuation rod along a direction which has a radial component with respect to said impeller (3).

10. Hydraulic pump, according to one or more of the preceding claims, characterised in that said movable element (11) can oscillate about said axis (12) which is parallel to the axis (23) of said impeller (3) in contrast with elastic means (19) or by virtue thereof.

Patentansprüche

1. Hydraulische Pumpe, insbesondere für Geschirrspülmaschinen oder dergleichen, bestehend aus einem Gehäuse (2), in dem drehbar ein Flügelrad (3) angeordnet und peripherisch zum Flügelrad (3) eine Diffusionskammer (5) vorgesehen sind, die eine erste Einlaßöffnung (6) für eine erste Zuführungsleitung (7) und eine zweite Einlaßöffnung (8) für eine zweite Zuführungsleitung (9) aufweist, welche beiden Einlaßöffnungen in ungefähr diametral gegenüberliegenden Positionen angeordnet sind, wobei in der Nähe mindestens der zweiten Einlaßöffnung (8) Regulierungsvorrichtungen in der Diffusionskammer (5) vorgesehen sind, die gesteuert betätigt werden können, um den Öffnungsgrad der zweiten Einlaßöffnung (8) zu variieren, **dadurch gekennzeichnet**, daß die Regulierungsvorrichtungen ein bewegliches Element (11) aufweisen, das in einer ersten Position (Fig. 1) die Diffusionskammer (5) in zwei partielle Diffusionskammern teilt, die im wesentlichen hydraulisch voneinander unabhängig sind, wobei jede der partiellen Diffusionskammern mit einer der Einlaßöffnungen verbunden ist, und in einer zweiten Position (Fig. 2) die zweite Einlaßöffnung (8) schließt und nur eine Diffusionskammer (5) realisiert, die mit der ersten Einlaßöffnung (6) verbunden ist.

2. Hydraulische Pumpe nach Anspruch 1, dadurch gekennzeichnet, daß das bewegliche Element (11) aus einem Blatt besteht, das auf seiner zum Flügelrad (3) gerichteten Seite konkav ist und mit einem seiner Enden drehbar im Gehäuse (2) nahe der Wand gelagert ist, die die Diffusionskammer (5) radial begrenzt, wobei das Blatt verschwenkbar auf einer Achse (12) gelagert ist, die parallel zu der Achse (23) des Flügelrades (3) angeordnet ist, um sein anderes Ende zum Flügelrad (3) hin oder von diesem weg zu bewegen, um die zweite Einlaßöffnung (8) zu schließen.

3. Hydraulische Pumpe nach einem der oder nach den beiden vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß das bewegliche Element (11) auf der zum Flügelrad (3) gerichteten Seite ein Kurvenprofil aufweist, das sich an die innere Oberfläche des Gehäuses (2) anschließt, welches die Diffusionskammer (5) radial begrenzt, wenn das bewegliche Element (11) in der Verschließposition ist, und welches sich an die Peripherie des Flügelrades (3) anschließt, wenn das bewegliche Element (11) in der Öffnungsposition ist.

4. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das bewegliche Element (11) auf seiner dem Flügelrad (3) direkt gegenüberliegenden Seite ein erstes Teilstück (11a), das an der Peripherie des Flügelrades (3) anliegt, und ein zweites konkaves Teilstück (11b) aufweist, das auf die zweite Einlaßöffnung (8) gerichtet ist und das erste Teilstück (11a) mit der zweiten Einlaßöffnung (8) verbindet, wenn das bewegliche Element sich in der Öffnungsposition befindet.

5. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß in der Wand des Gehäuses (2), die die Diffusionskammer (5) radial begrenzt, eine Vertiefung (13) ausgeformt und ausgelegt ist, um zumindest teilweise das bewegliche Element (11) in der Schließposition aufzunehmen.

6. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß dann, wenn das bewegli-

che Element (11) sich in seiner Schließposition befindet, der Querschnitt der Diffusionskammer (5) zur ersten Einlaßöffnung (6) hin zunimmt, und wenn das bewegliche Element (11) sich in seiner Öffnungsposition befindet, der Querschnitt der Diffusionskammer (5) zur zweiten Einlaßöffnung (8) hin zunimmt und von dem beweglichen Element (11) zur ersten Einlaßöffnung (6) hin zunimmt.

7. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Flügelrad (3) von einem Motor mit veränderlicher Drehzahl angetrieben ist.

8. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie Betätigungsmittel (15) aufweist, die das bewegliche Element (11) betätigen, um den Öffnungsgrad der zweiten Einlaßöffnung (8) zu variieren.

9. Hydraulische Pumpe nach Anspruch 8, dadurch gekennzeichnet, daß die Betätigungsmittel (15) aus einem Linearmotor (16), der am Gehäuse (2) befestigt ist, und einer Betätigungsstange (17) bestehen, die an dem beweglichen Element (11) angelenkt ist, und daß der Linearmotor (16) mit der bewegbaren Betätigungsstange in einer Richtung angeordnet ist, die in bezug auf das Flügelrad (3) eine radiale Komponente aufweist.

10. Hydraulische Pumpe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das bewegliche Element (11) um die Achse (12), die parallel zur Achse (23) des Flügelrades (3) angeordnet ist, gegenüber elastischen Mitteln (1) oder durch die Kraft dieser verschwenkt werden kann.

Revendications

1. Pompe hydraulique, notamment destinée à des lavevaisselle ou analogues, comprenant un carter (2) qui loge une roue (3) qui peut tourner et qui délimite, à la périphérie de la roue, une chambre (5) de diffusion qui a une première entrée (6) destinée à un premier conduit (7) de distribution et une seconde entrée (8) destinée à un second conduit (9) de distribution, les deux entrées étant à des positions qui sont approximativement diamétralement opposées, et dans laquelle, à proximité de la seconde entrée (8) au moins, un dispositif d'ajustement est placé dans la chambre de diffusion et peut être commandé de manière réglable afin qu'il fasse varier le degré d'ouverture de la seconde des entrées, caractérisée en ce que le dispositif d'ajustement comporte un élément mobile (11) qui, dans une première position (figure 1), divise la chambre de diffusion (5) en deux chambres partielles de diffusion, qui sont pratiquement indépendantes l'une de l'autre au point de vue hydraulique, chacune des chambres partielles de diffusion étant raccordée à l'une des entrées et, dans une seconde position (figure 2), ferme la seconde entrée (8) et ne forme qu'une seule chambre de diffusion (5) qui se raccorde à la première entrée (6).

2. Pompe hydraulique selon la revendication 1, caractérisée en ce que l'élément mobile (11) est constitué par une palette qui est concave du côté tourné vers la roue (3) et qui a une première extrémité qui peut pivoter sur le carter (2) à proximité de la paroi qui délimite radialement la chambre de diffusion (5), la palette pouvant osciller autour d'un axe (12) qui est parallèle à l'axe (23) de la roue (3) afin que son autre extrémité soit déplacée vers la roue ou à distance de la roue pour la fermeture de la seconde entrée (8).

3. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce que l'élément mobile (11) a un profil courbe du côté tourné vers la roue (3), ce profil étant raccordé à la surface interne du carter (2) qui délimite radialement la chambre de diffusion (5) lorsque l'élément mobile est dans la position de fermeture, et qui se raccorde à la périphérie de la roue (3) lorsque l'élément mobile est dans la position d'ouverture.

4. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce que l'élément mobile (11) possède, du côté opposé à la roue (3), une première partie (11a) qui se raccorde à la périphérie de la roue (3) et une seconde partie concave (11b) qui est dirigée vers la seconde entrée (8) et raccorde la première partie (11a) à la seconde entrée (8) lorsque l'élément mobile est dans la position d'ouverture.

5. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce qu'une cavité (13) est formée sur la paroi du carter (2) qui délimite radialement la chambre de diffusion (5) et elle est destinée à loger au moins partiellement l'élément mobile (11) dans la position de fermeture.

6. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce que, lorsque l'élément mobile (11) est dans sa position de fermeture, la section de la chambre de diffusion (5) augmente vers la première entrée (6), et, lorsque l'élément mobile est dans sa position d'ouverture, la section de la chambre de diffusion (5) augmente vers la seconde entrée (8) et augmente de l'élément mobile vers la première entrée (6).

7. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce que la roue (3) est entraînée par un moteur ayant une vitesse variable de rotation.

8. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce qu'elle comporte un dispositif de manoeuvre (15) qui agit sur l'élément mobile (11) afin qu'il fasse varier le degré d'ouverture de la seconde entrée (8).

9. Pompe hydraulique selon la revendication 8, caractérisée en ce que le dispositif de manoeuvre comporte un moteur linéaire (16) qui est supporté par le carter (2) et qui a une tige de manoeuvre (17) qui est articulée sur l'élément mobile (11), le moteur linéaire (16) étant disposé de manière que la tige mobile de manoeuvre soit dans une direction qui possède une composante radiale par rapport à la roue (3).

10. Pompe hydraulique selon une ou plusieurs des revendications précédentes, caractérisée en ce que l'élément mobile (11) peut osciller autour dudit axe (12) qui est parallèle à l'axe (23) de la roue (3), en s'opposant à l'action d'un dispositif élastique (19) ou grâce à cette action.

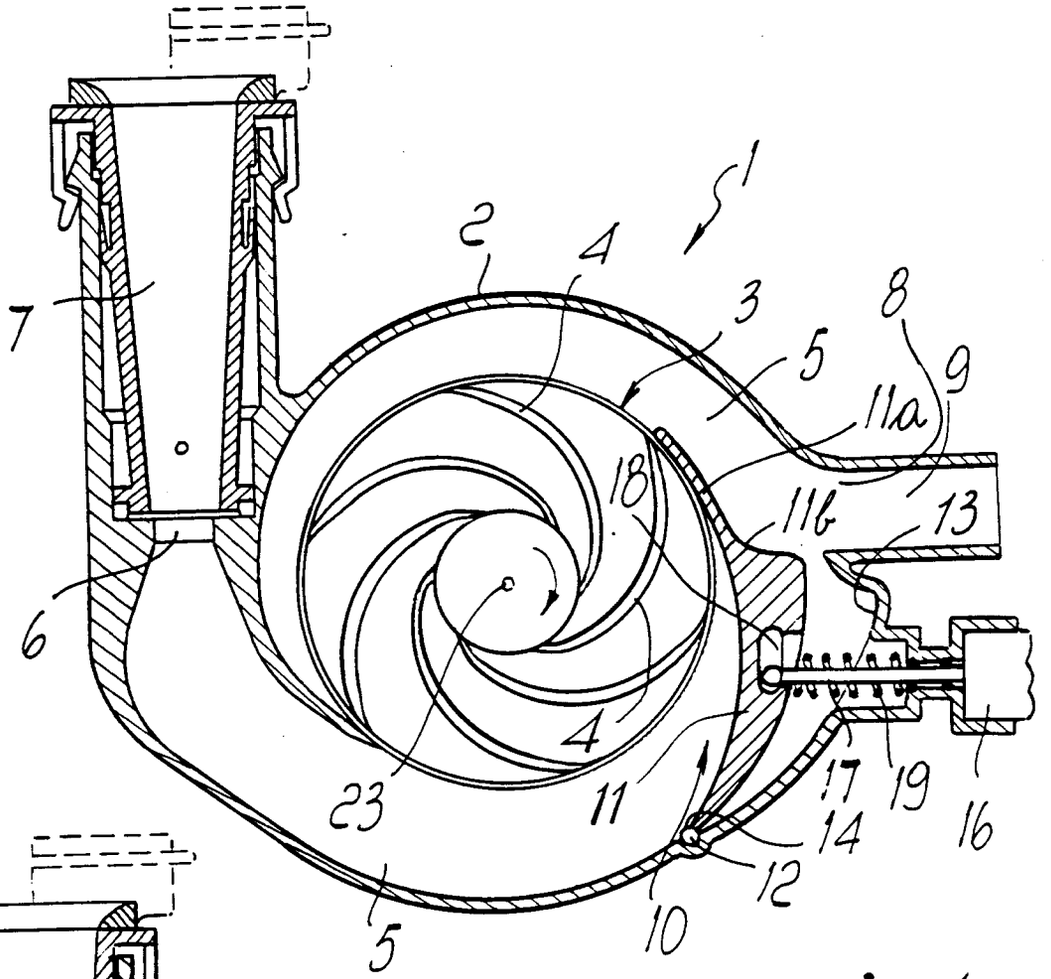
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Fig. 1

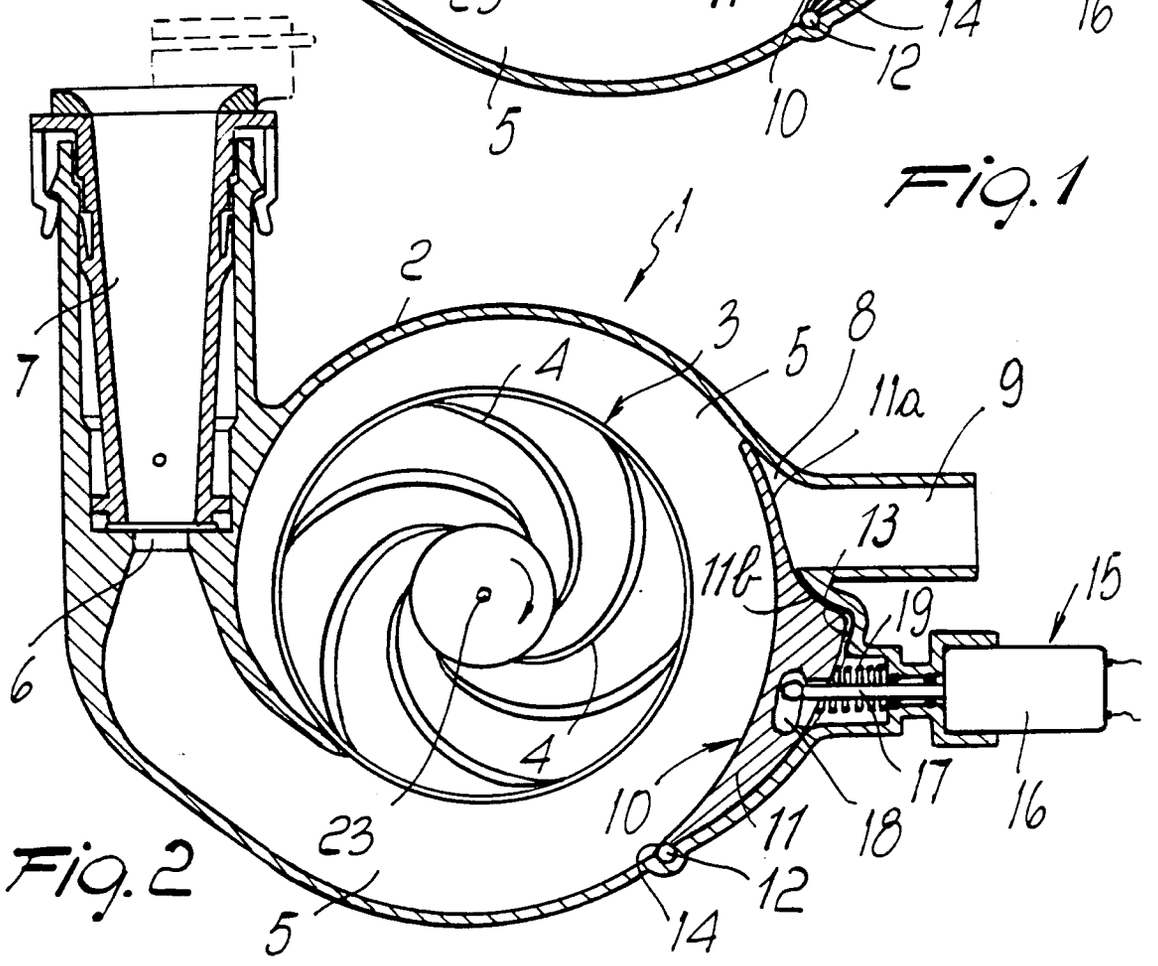
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Fig. 2