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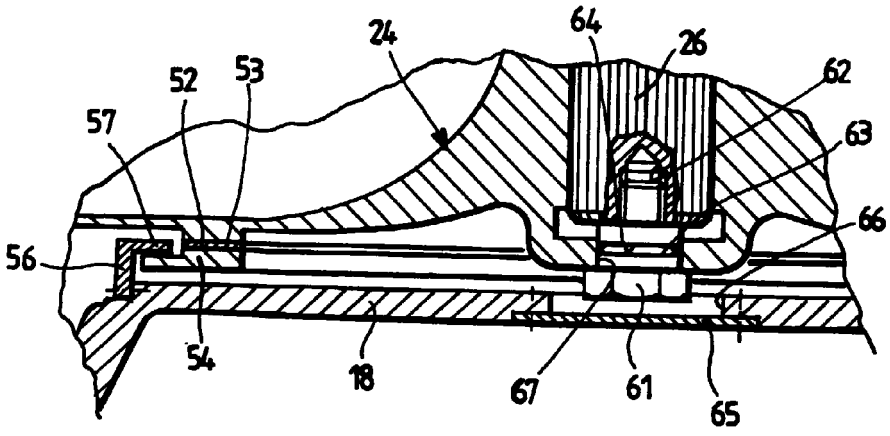
(54) Balanced pump with suction and delivery on the same axis

(57) A simple to disassemble balanced pump with suction and delivery on the same axis comprising a shell (12), containing an impeller (24) connected to which is a drive mechanism (16), the shell provided on one side with a suction port (19) and on the other side with a delivery port (20) located on the same axis, in which the shell (12) has a cover (18) that can be freely removed from below, the shell being designed raised on a part thereof open at the side, the impeller (24) also fitted with further wear rings (31, 54) facing outwards on radial surfaces that collaborate with other wear rings (32, 51) integral to the shell and/or lower cover (18); in said pump free perimetric ends of the lower wear rings (54, 51) are partially covered and enclosed by a shaped fixed ring (56, 57) that establishes a labyrinth passage for a pumped fluid.

Fig.3



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Description

[0001] The present invention relates to a balanced pump with suction and delivery on the same axis.

[0002] The applicant of this application is the holder of an application for European patent 99202217.8 referring to a simple to disassemble pump with suction and delivery on the same axis. In this application the pump, with minimum removal of fixed parts, in particular of the actuator component and suction and delivery pipes, permits operations to be performed on the pump to replace the impeller, seals, any wear rings and other internal parts in general, with extreme simplicity.

[0003] Such a pump is particularly beneficial in the naval field owing to the complicated position, which leaves restricted operating spaces available.

[0004] However, in such a pump it is possible for heavy inflow of liquid to occur between the bottom wear rings positioned in the area between the lower cover and the base of the impeller.

[0005] When this occurs, the rising pressure of the fluid causes an upward thrust and lifts the impeller so that greatest wear occurs on the top wear rings integral to the top part of the impeller and the wear rings integral to the inside of an intermediate part of the shell.

[0006] This causes rapid worsening in the optimal operating condition of the entire pump and the wear rings require to be replaced frequently, with deleterious disassemblies and time loss.

[0007] The object of the present invention is therefore to provide a pump of the aforesaid type with regular deterioration of the wear rings and which does not require repeated and frequent replacement operations.

[0008] A further object is to provide a pump that in any case is of extremely simple construction, although with excellent seal and outstanding operation.

[0009] These objects according to the present invention are obtained by providing a simple to disassemble balanced pump with suction and delivery on the same axis as claimed in claim 1. Further features are claimed in the accompanying claims.

[0010] The features and advantages of a balanced pump according to the present invention are more clearly highlighted in the following description, given merely for illustrative and non limiting purposes, referring to the accompanying schematic drawings in which:

figure 1 shows a cross-section of a balanced pump equipped with the new device according to the present invention;
figure 2 shows an enlarged detail of part of the pump illustrated in figure 1, and
figure 3 shows an enlarged detail of a further example of pump according to the present invention.

[0011] With reference to figure 1, the best part of a balanced pump with suction and delivery on the same axis is shown, indicated as a whole with the reference number 11.

[0012] In its essential parts the pump 11 comprises a shell 12 with fixed to the top, in line with a flanged part 15, a drive mechanism 16, such as an electric motor, a diesel motor, a turbine, etc.. A lower part of the shell 12 is open 17 to house a lower cover 18 which is fixed to the shell itself by means of bolts 14.

[0013] The shell 12 also has a suction port 19 on one side and a delivery port 20 on the other side. From the upper drive mechanism 16 a driving shaft 21 extends inside the shell 12; this fits into a cupped end part 22 of control shaft 23 for an impeller 24.

[0014] Moreover, in this pump the driving shaft 21 is anchored axially to the control shaft 23 by means of a key 25 and fastened by a grub screw 30, thus preventing it from sliding downward. The control shaft 23 rotates the impeller 24 integrally by means of a splined coupling device 26; in fact, the impeller 24 is free to disengage and slide axially, both during operation and when the lower cover 18 is removed.

[0015] The shaft 23 can in any case be replaced by extending the shaft 21 of the drive mechanism 16, wherever the use of special material for the shaft 23 is not required.

[0016] As in the previous application by the aforesaid applicant, seal components, shown and not described, are established.

[0017] The top part of the impeller 24 is equipped with wear rings 31 facing outwards on radial surfaces which collaborate with further wear rings 32 integral to the shell 12. The wear rings 31 and 32 can be provided under the form of rings in a wear-resistant material, either fitted subsequently or integral, placed opposite one another. The presence of radial rings prevents damage to the pump parts.

[0018] Moreover, in the lower part, according to the present invention, in a first example a different layout of wear rings is established, better explained hereunder and also illustrated in figure 2.

[0019] In fact, a wear ring 51, for example in stainless steel, integral to the lower cover 18, is provided in a ring seat 50. In the part integral to the impeller 24, on a supporting surface 52, a first stainless steel ring 53 is positioned, to support a second ring 54, with larger outward radial dimensions, for example in antifriction material. The facing surfaces of the two rings 53 and 54 are joined together with a bonding agent (not shown).

[0020] The ring 51 and the rings 53 and 54 are in turn fastened to the cover 18 and the impeller by means of screws, the axes 55 of which are shown.

[0021] It is mentioned that the rings 51 and 54 may have a similar maximum diameter and in any case projecting in relation to the maximum overall dimensions of the supporting surface 52.

[0022] It is also pointed out that, according to the present invention, a shaped fixed ring 56 is provided, which surrounds the free perimetric ends of these rings 51 and 54 with an extension 57 facing inward according

to a radial direction.

[0023] This shaped ring 56 may be made of stainless steel and establishes a labyrinth passage for the pumped fluid that attempts to flow between the cover 18 and the lower central part of the impeller 24.

[0024] The shaped ring 56 is a balancing element that regulates the inflow of fluid and stabilises the pressure acting on the impeller from below and tending to move this upward.

[0025] The shaped ring 56 may be fastened to the cover 18 by means of a series of radial grub screws 58.

[0026] It is also pointed out that, owing to the knurled coupling between shaft 23 and impeller 24, a cap 59 is fitted that can be anchored to a lower hole 60 made in the lower central part of the impeller 24. This stainless steel cap 59 can also collaborate centrally with a disc 33, facing upward or towards the lower end of the control shaft 23, which in this case is covered. In this way it may be used in the event of accidental breakage of the shaft to avoid direct contact with the lower cover 18, thus preventing further damage to the entire pump.

[0027] According to the invention, this is all added to the simple removability of the cover 18.

[0028] The advantage of this device is immediate when it becomes necessary to perform disassembly.

[0029] The particular shape and location of the lower wear rings 51 and 54 combined with the shaped ring 56 and relevant extension 57 guarantee increased useful life of the pump. In fact, balanced thrust is obtained, which limits wear on the upper rings 31 and 32 and keeps the position of the impeller 24 centred. This device with lower wear rings 51 on the shell is particularly suitable for use with wet start-up of the pump.

[0030] The presence of the splined coupling 26 and cap 59 facilitate operations to remove the impeller 24, should this be necessary.

[0031] Removal of the cover and impeller from under the base 13 and extraction of the mechanical seal 28 from the control shaft 23 are made much easier.

[0032] The impeller 24 may thus be overhauled or replaced, as may any wear ring with excessive wear.

[0033] The balancing of thrust permits maintenance of axiality and precise alignment of the moving parts inside the shell 12.

[0034] It is thus possible, for example, to replace the wear rings 31 and 54 on the impeller 24, while the wear rings 32 and 51 on the shell 12 and cover 18 can be manufactured in particularly heavy-duty material and not require frequent replacement.

[0035] Also in this case, as the impeller and other parts associated to it do not require to be fastened in relation to the axis, no thrust is transmitted to the drive mechanism fitted above.

[0036] Impeller thrusts are absorbed by the radial wear rings and by the lower central part between the cover and the impeller which centre the pump components with improved performance.

[0037] Figure 3 shows a second example of the pump according to the invention, particularly suitable for dry start-up. In this example the same reference numbers are used for the same components. It can thus be noted that the lower wear ring 51 integral to the cover 18 has been eliminated, while the layout of the rings 53 and 54 integral to the impeller 24 has been maintained. Moreover, the impeller 24 is integral to the control shaft 23 by means of a bolt 61 screwed into a hole 62 in the shaft 23, after having been fitted in a through hole 67 in the base of the impeller itself 24.

[0038] Seal components 63 positioned in a sunken perimetric seat 64 on the bolt itself guarantee seal in the hole 67. In this way the impeller 24 is driven by the shaft 23 and the bolt 61 can be removed by moving a covering 65 provided to close a hole 66 in the cover 18.

[0039] In this way, even with dry start-up, the wear rings are not involved and the pump has no operating problems.

[0040] The presence of the shaped ring 56 establishes in any case a labyrinth passage for the pumped fluid which collaborates in the correct positioning of the impeller 24 during operation.

Claims

1. Simple to disassemble balanced pump with suction and delivery on the same axis comprising a shell (12), containing an impeller (24) connected to which is a drive mechanism (16), on one side of the shell is a suction port (19) and on the other side a delivery port (20) positioned on the same axis, wherein the shell (12) includes a cover (18) that can be freely removed from below, as the shell is designed raised on a part thereof open at the side, with the impeller (24) also fitted with wear rings (31, 54) facing outwards on radial surfaces that collaborate with other wear rings (32, 51) integral to said shell (12) and/or lower cover (18); characterized in that free perimetric ends of said lower wear rings (54, 51) are partially covered and enclosed by a shaped fixed ring (56, 57) that establishes a labyrinth passage for a pumped fluid.

2. Balanced pump as claimed in Claim 1, characterized in that said shaped fixed ring comprises a ring part (56) fixed to said cover (18) and an extension (57) facing inward according to a radial direction.

3. Balanced pump as claimed in Claim 1, characterised in that said shaped ring (56, 57) is fixed to said cover (18) by means of a series of radial grub screws (58).

4. Balanced pump as claimed in Claim 1, characterised in that a stainless steel ring (53) is provided between said impeller (24) and said wear ring (54).

5. Balanced pump as claimed in Claim 1, character-

ised in that said lower wear rings (53, 54) are fastened only to said impeller (24) and no wear ring integral to said cover is provided.

6. Balanced pump as claimed in Claim 1, characterised in that said lower wear rings (54, 51) extend to a maximum diameter in relation to the maximum overall dimensions of a supporting surface (52) located on said impeller (24).

7. Balanced pump as claimed in Claim 1, characterised in that a lower end of a shaft (23) projecting from said drive mechanism (16) and said impeller (24) are connected by a knurled coupling (26).

8. Balanced pump as claimed in Claim 7, characterised in that said impeller (24) is provided with a lower hole (60) to receive a cap (59) that can be freely anchored to it.

9. Balanced pump as claimed in Claim 1, characterised in that said impeller (24) is provided with a lower hole (67) through which a bolt (61) with seals (63, 64) is fitted to make said impeller (24) integral to a control shaft (23) projecting from said drive mechanism (16).

10. Balanced pump as claimed in Claim 9, characterised in that said bolt (61) can be removed by moving a covering (65) provided to close a hole (66) made in said cover (18).

11. Balanced pump as claimed in Claim 1, characterised in that said wear rings (31, 32, 54, 51) are of the removable type.

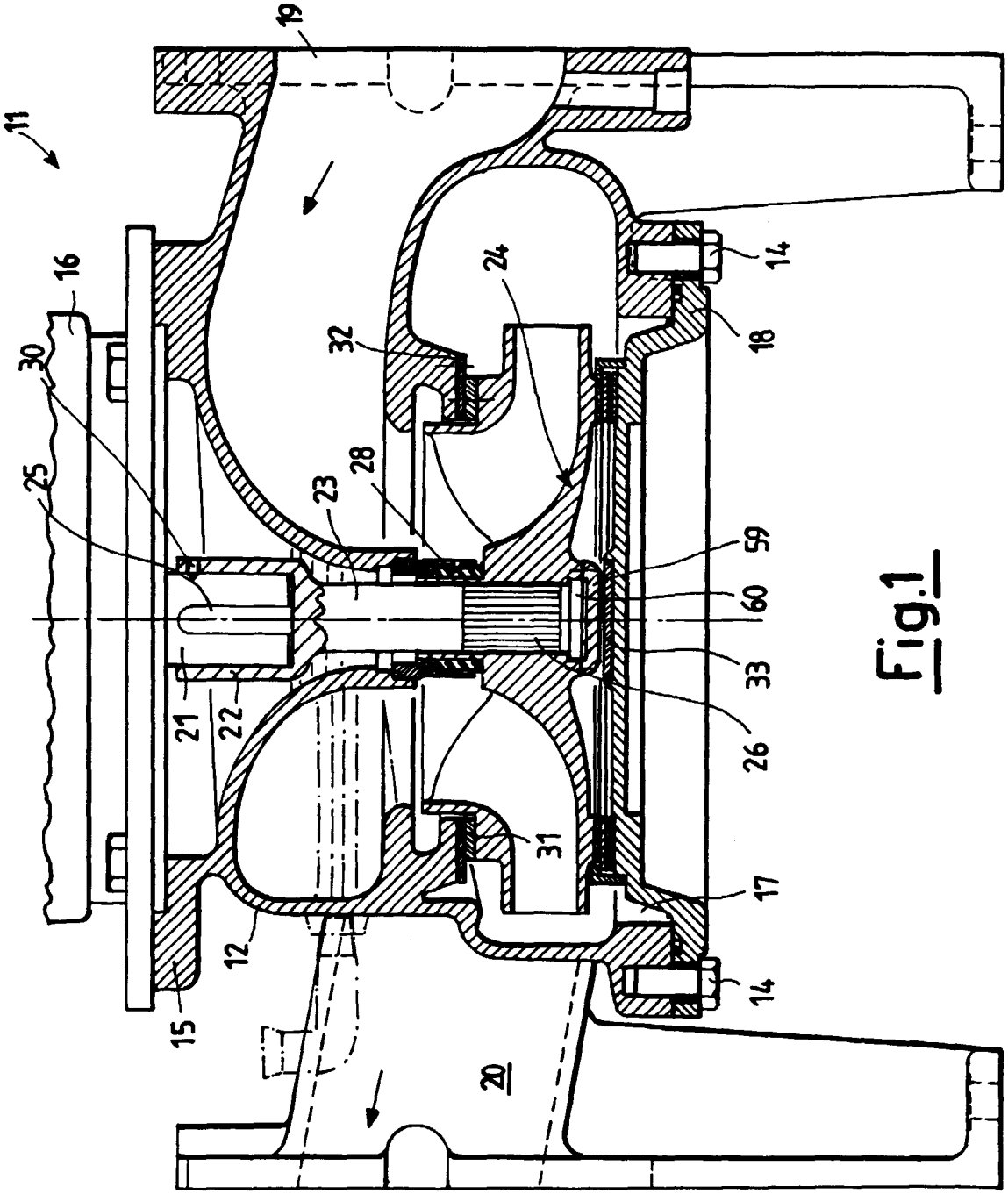

Fig.1

Fig.2

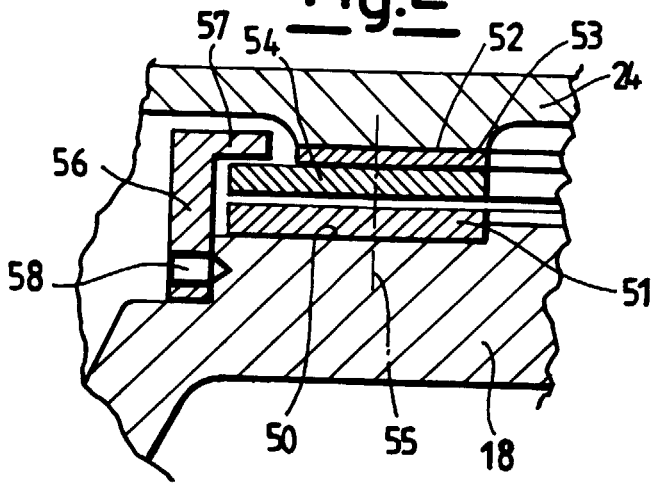
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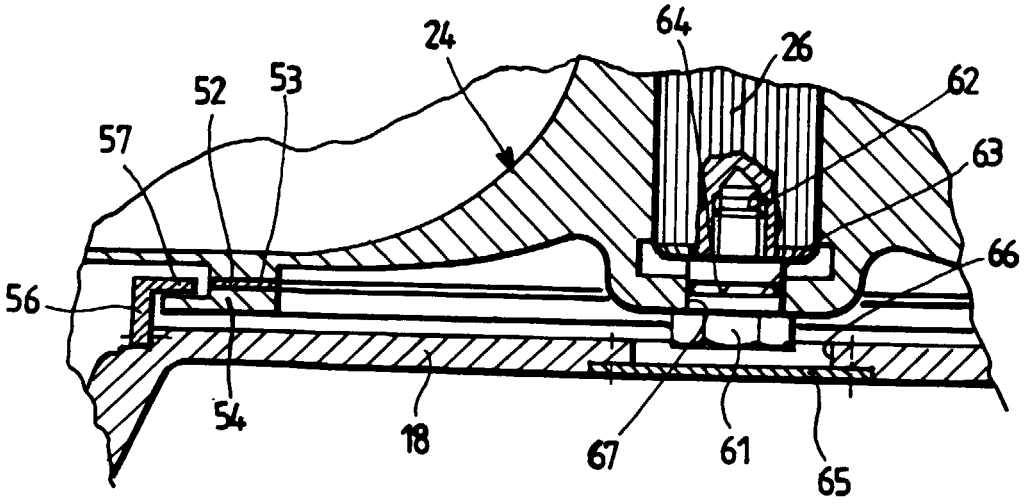
Fig.3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