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(54) Clog resistant pump.

(57) The invention concerns a non-clogging pump of centrifugal or axial flow type.

The regular vanes (6), (11) of the impeller or the pump housing are completed with a number of additional vanes (8), (13) between the regular vanes and so arranged that their front edges (9), (14), as seen in the direction of the flow, are located in front of the front edges (7), (12) of the regular vanes.

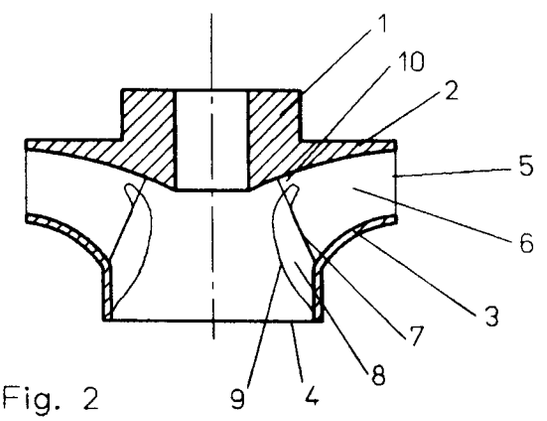

Fig. 2

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This invention concerns a rotodynamic pump comprising an impeller rotating in a pump housing. Such pumps may roughly be categorized as centrifugal pumps and axial pumps.

The centrifugal pump comprises an impeller consisting of a hub, at least one cover disc on said hub and a number of vanes, a so-called open impeller. A closed impeller is provided with two cover discs and intermediate vanes. Common for the two types is that the liquid is sucked into the centre of the impeller in an axial direction and leaves it tangentially at the periphery.

The axial flow pump differs from the centrifugal pump in that the liquid leaves the pump in a substantially axial direction. This linking of the fluid is taken care of by a number of vanes in the pump housing after the impeller. These vanes also normally serve as supporting elements in the housing construction.

When pumping sewage water and certain types of process water containing elongated fibres, the pumping may be disturbed by rags, fibres etc getting stuck to the front edges of the vanes on the impeller and in the pump housing. Such build-ups can initially create vibrations in the pump, consequently the efficiency decreases and finally the pump might get totally clogged. One way to make the objects leave the vanes is to let the pump rotate backwards at certain intervals, but this is of course not an acceptable solution. Another way to diminish the clogging risk is to provide the pump with cutting means which divide the pollutions into pieces before they are sucked into the impeller. An example of such a solution is shown in the Swedish Pat No 820 5774-6. A disadvantage with this solution is that the cutting means may be quickly worn-out which might cause the clogging problem to become even worse.

The purpose of this invention is to solve the clogging problems mentioned above in a totally new and different way. The solution is obtained by help of the device stated in the claims.

The invention is described more closely below with reference to the enclosed drawings.

Fig 1 shows a conventional impeller for a centrifugal pump. Fig 2 shows a corresponding impeller according to the invention, while Fig 3 shows a housing for an axial flow pump having vanes designed according to the invention.

In the drawings 1 stands for the hub of an impeller, 2 and 3 cover discs, 4 and 5 inlet and outlet respectively and 6 regular impeller vanes with front edges 7. 8 stands for additional impeller vanes with front edges 9, while 10 stands for a slot between the vane 8 and the cover plate 2. 11 stands for regular vanes with front edges 12, 13 additional vanes with front edges 14 and 15 finally a slot at the end of the vane 13.

Referring now to Fig 1 a conventional impeller comprises a hub 1 with upper and lower cover discs 2 and 3 respectively, inlet and outlet 4 and 5 respectively and vanes 6. On the front edges 7 of the latter, fibres etc often get stuck.

As is shown in Fig 2 a number of additional vanes 8 are arranged in the gaps between the regular vanes 6. The additional vanes are attached to one of the cover plates 3 and extend with strongly backwards swept front edges 9 towards the other cover plate 2, however, without making contact with the latter.

The front edges 9 of the additional vanes 8 are so arranged that they are located in front of the front edges 7 of the regular vanes as seen in the direction of the flow. This means that elongated objects in the liquid are caught by said edges 9, the objects then sliding along the edge in the direction of the cover disc 2 and finally through the slot 10 between the vane and the cover disc.

As the front edge 9 of the additional vane 8 is strongly swept backwards, the pollutions will have passed the front edges 7 of the regular vanes 6 when they have reached the slot 10. This means that the pollutions will not attach to the regular vanes but pass in the gaps between them towards the outlet. The risk of clogging has thus been almost eliminated.

The number of regular vanes of the impeller is adapted to the operating conditions of the impeller and the number of additional vanes depends thereof as these vanes are located between the regular ones. The distance between the front edges of the regular and additional vanes may also depend on the actual operating conditions. According to the invention, however, the front edge of the additional vane must always be swept backwards to such extent, that its free end is always located behind the front edge of the regular vane as seen in the direction of the flow.

In Fig 3 an axial flow pump is shown. Such a pump is thus characterized by the pumped liquid being linked in such a way that it leaves the pump in an essentially axial direction. The linking is obtained by help of vanes 11 arranged downstream of the impeller, the vanes at the same time serving as supporting elements of the driving unit.

In order to diminish or totally eliminate the risk of elongated objects getting stuck to the front edges 12 of the vanes 11, a number of additional vanes 13 are arranged between the original ones. The vanes 13 are only attached at one end as they do not need to serve as supporting elements and their front edges 14 are strongly swept backwards. As was the case in the impeller described above, also the vanes 13 are so arranged that their front edges 14 are located in front of the front edges 12 of the regular vanes 11, thus making sure that the

pollutions are caught by the former. Thanks to the design with the front edge swept backwards in the direction of the slot 15 where the vane is free, the pollutions go easily through. Here, the pollution have also passed the front edges of the regular vanes and will therefore not stick to those.

By help of the invention a device is obtained which essentially diminishes the risk of clogging in pumps working with liquids containing elongated fibres, rags and the like. A big advantage with subject invention as compared with known solutions is its simplicity which gives good results even if different types of pollutions occur or if the pump is worn.

Claims

1. A pump comprising a rotating impeller and a surropunding housing, the impeller or alternatively the impeller as well as the housing being provided with a number of vanes (6), (11), characterized in that the impeller and/or the pump housing are provided with a number of additional vanes (8), (13) in the gaps between the regular vanes and so arranged that their front edges (9), (14) are positioneed in front of the front edges (7), (12) of the regular vanes as seen in the direction of the flow.

2. A pump according to claim 1, characterized in that the additional vanes (8), (13) are swept backwards in the direction of the flow.

3. A pump according to claim 1, characterized in that the additional vanes (8), (13) are so attached to the impeller or the pump housing that there is always a slot (10), (15) between the vane (8), (13) and the hub (1), alternatively the cover disc (2) or the surrounding pump housing.

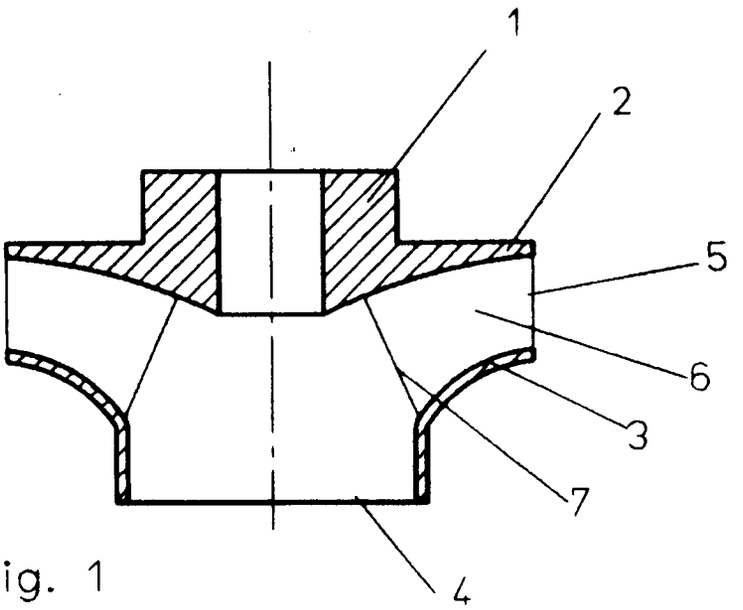

Fig. 1

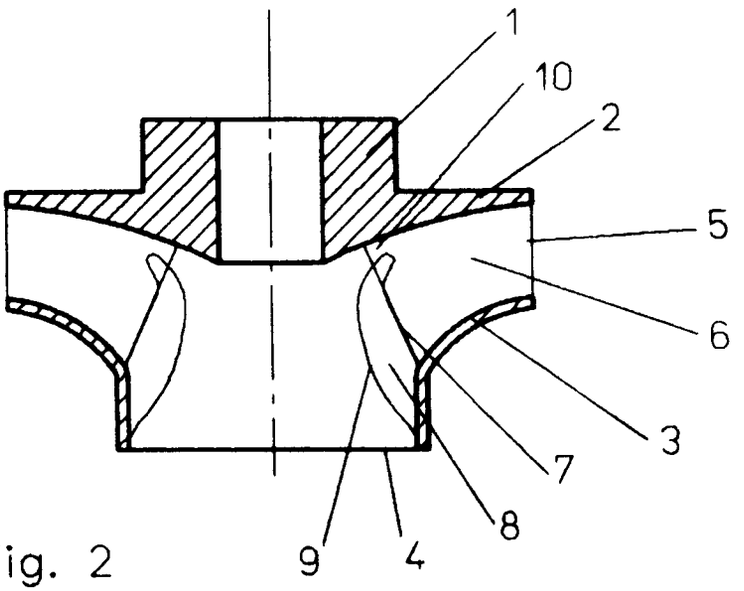

Fig. 2

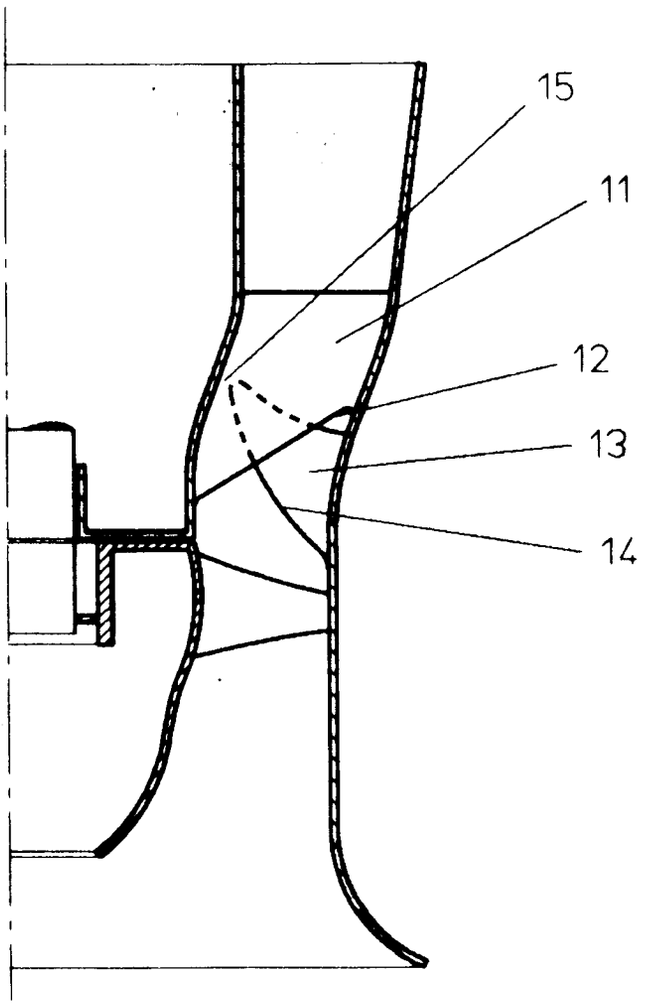

Fig.3

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EUROPEAN SEARCH REPORT

Application Number

EP 91 85 0116

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	BE-A-535 864 (STORK) * page 1, line 1 - line 4 * * page 1, line 30 - line 46; figure * ---	1	F04D7/04 F04D29/22 F04D7/00 F04D29/54
A	SOVIET INVENTIONS ILLUSTRATED Section PQ, Week E14, 19 May 1982 Derwent Publications Ltd., London, GB; Class Q51, AN D9511E/14 & SU-A-840 416 (SHILMAN A KH) 28 June 1981 * abstract * ---	1	
A	SOVIET INVENTIONS ILLUSTRATED Section PQ, Week 9129, 4 September 1991 Derwent Publications Ltd., London, GB; Class Q56, AN 91213914/29 & SU-A-1 549 186 (POPOV I K) 15 January 1991 * abstract * -----	3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5) F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 DECEMBER 1991	ZIDI

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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