In a two-way impeller in a centrifugal pump having a vertical drive shaft the impeller channels are formed such that a circulation flow is provided outwardly in the lower part thereof and inwardly in the upper part. By openings in the impeller between the two impeller inlets a suction effect is induced in a direction toward the upper inlet of the impeller. On the pump drive shaft and below the two-way impeller a centripetal-inducer may be mounted.

2 Claims, 1 Drawing Figure
TWO-WAY IMPELLER IN A CENTRIFUGAL PUMP HAVING VERTICAL DRIVE SHAFT

The invention relates to a two-way impeller in a centrifugal pump having a vertical drive shaft, and the invention is developed in particular with relation to so-called submersible centrifugal pumps, utilized for the pumping of cargo in the tanks of ships.

As the level of the cargo in the tank of a ship sinks, problems of air intermixture arise which substantially reduce the efficiency of the pump. It is possible to improve this condition to a great degree by arranging the suction opening of the pump upwardly; however, the advantage of a pump having the suction opening thereof facing downwardly is then lost, this advantage being the possibility of positioning the suction opening as close to the bottom of the tank as possible. If a two-way impeller is used, i.e., an impeller having suction openings both at the top and at the bottom and having a common blade channel outlet for the two suction inlets, it is possible to a certain degree to combine the advantages of the two arrangements of pump impeller. The invention relates to such a two-way impeller and the object is to provide a construction such that the lower part of the impeller also can be vented. In accordance with the invention, this is achieved in that the impeller channels are formed so as to provide a circulation flow outwardly in the lower part and inwardly in the upper part of the outlet, on zero distribution in the upper half part.

Advantageously, openings may be provided in the impeller between the two outlets formed so as to create a suction effect in a direction toward the upper impeller inlet in order to provide venting.

In the meridian section, the lower part of the impeller channel may have a relatively larger inlet cross-section than the upper part in order to achieve the intended improvement in suction effect. To achieve the circulation flow, the edge of the blade outlet in the meridian section follows a bent line, and the bent edge of the blade outlet extends, for example, vertically at its lower part, and in the upper part of the impeller channel, inclines inwardly toward the longitudinal axis of the pump.

Advantageously, a centripetal-inducer is mounted below the two-way impeller on the same drive shaft, this centripetal-inducer delivering liquid to the downwardly facing inlet when the liquid level approaches zero.

The invention is further described hereinbelow with reference to the drawing which illustrates a section through a two-way impeller in accordance with the invention.

In the drawing, the drive shaft is signified by 1. A two-way impeller 2 is mounted on the drive shaft in a manner known per se, and a centripetal-inducer 3 is mounted at the end of the drive shaft.

The two-way impeller is provided with an upper suction inlet 4 and a lower suction inlet 5 with blade channels 6 common to the two suction inlets. The bearing housing of the drive shaft 1 is signified by 7 and the pump housing is indicated at 8. The flow directions are indicated by arrows at the suction side and outlet of the two-way impeller, and the flow direction in the centripetal-inducer also is indicated by an arrow.

In the blade channel 6 indicated, the curved arrow indicates a circulation flow which can be produced by several known methods. In the embodiment example, the circulation flow is induced in that the lower part of the blade channel is of greater diameter than the upper part. In the meridian section illustrated, the edge of the blade outlet follows a bent line and extends vertically at 9 in the lower part and inclines inwardly at 10 toward the longitudinal axis of the pump in the upper part of the blade channel. Upon so-called zero distribution, this embodiment will induce the circulation flow indicated. This effects venting in the lower channels also.

In order further to increase the venting effect, openings 11 may be provided, as illustrated, formed such that an overpressure is formed on the underside thereof, a suction effect indicated by the symbols + and – being produced on the upper side.

Having described my invention, I claim:

1. A vertical centrifugal pump comprising a casing, an impeller, means mounting said impeller for rotation in said casing about a vertical axis, said impeller comprising upper and lower annular end members that are vertically spaced apart and spaced radially outwardly from the axis of rotation of said impeller, a partition member disposed between and spaced from said end members, blades interconnecting each of said end members with said partition member to define channels between said end members and said blades and said partition member that open radially outwardly and upwardly and downwardly, said casing having passages communicating radially outwardly with said channels between said end members and upwardly with said channels between said upper end member and said partition member, said partition member having upwardly extending openings there through to vent the lower of said channels to the upper of said channels, the upper of said end members being of less diameter than the lower of said end members to provide a flow path of recirculation.

2. A centrifugal pump as claimed in claim 1, and a centripetal inducer mounted on and below said impeller.

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