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L. R. SEINFELD
SINGLE SUCTION IMPELLER

2,547,786

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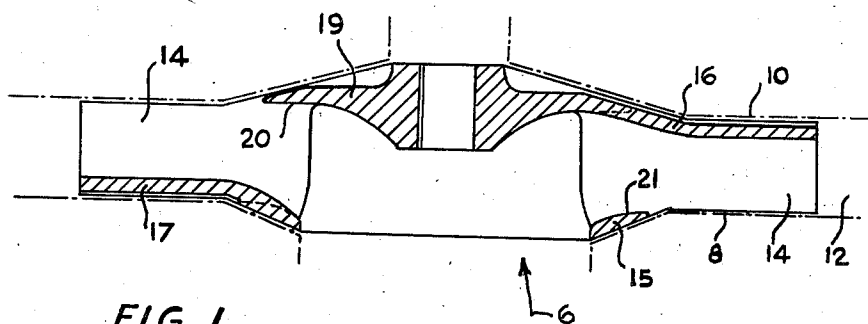


FIG. 1.

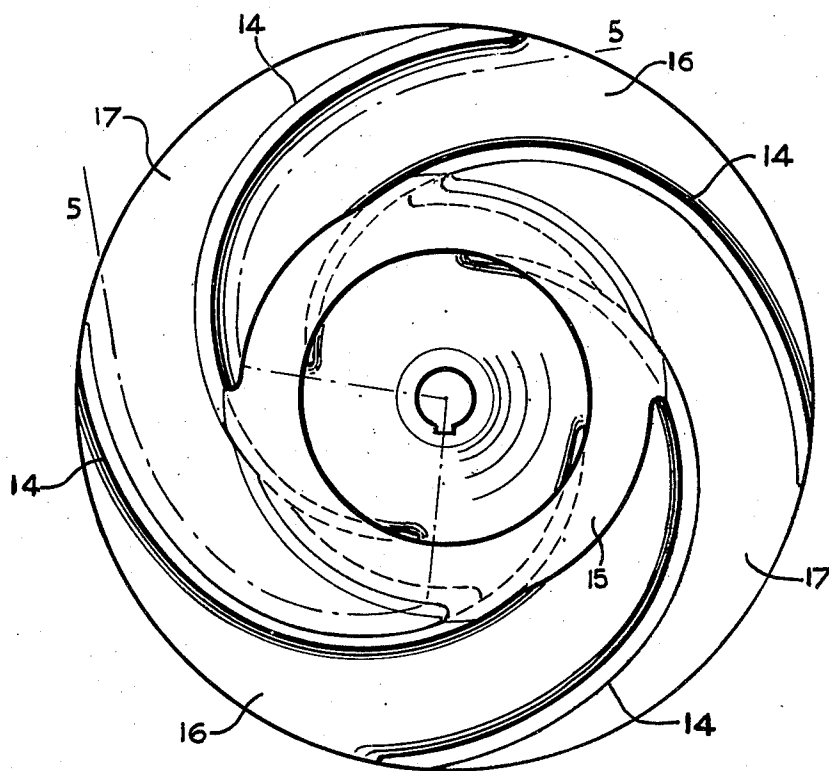


FIG. 2.

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UNITED STATES PATENT OFFICE

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SINGLE SUCTION IMPELLER

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2 Claims. (Cl. 103-115)

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This invention relates to centrifugal pumps and has particular reference to improved impeller construction therefor.

It is well known that open impellers are desirable for single suction slurry pumps. Said pumps are operated at low speeds and are built of erosion resistant castings. The impellers of slurry pumps are quite large generally which has made it impossible to use open impellers because the vanes of the impellers would break whenever solid particles should get lodged between said vanes and the pump casing.

The conventional manner of building impellers for large slurry pumps has therefore involved reinforcing the impeller vanes by providing two circular ribs, called shrouds, and providing narrow vanes on the outside of one or both shrouds to reduce excessive slip as well as to balance the axial thrust of such impellers. Said shrouds in cooperation with the pump casing wall, spaced from each other by close clearances only, create high turbulence which increases friction and wear, thus reducing the efficiency of the pump. Vanes enclosed by shrouds cannot be ground smooth, which fact increases pitting and deterioration of the impeller when pumping slurries.

In accordance with the present invention, low speed single suction impellers are constructed in such a way that the liquid entering the impeller eye through a short circular member is deflected into streams sweeping the pump casing walls alternately in front and in the back of the impeller. This effect is achieved by providing reinforcing ribs between pairs of impeller vanes in such a way that said ribs are located alternately near the back and near the front of said impeller. The ribs at the back of the impeller merge with the impeller hub and the ribs at the front of the impeller merge with said short circular member at the impeller eye.

Impellers with reinforcing ribs arranged as described have all the advantages of open impellers, i. e. accessibility of vanes for grinding, low axial thrust, and low pressure on the stuffing box of the pump, and in addition high resistance to breakage as well as lower impeller friction when compared with shrouded impellers.

The novel features which I consider as characteristic for my invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

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Fig. 1 is a section of the impeller along line 5-5 of Fig. 2, illustrating the incorporation of the invention in a single suction impeller; the vanes and ribs being shown in circumferential projection for clarity; and

Fig. 2 is an elevation showing the inlet side of the impeller in Fig. 1.

There is indicated at 19 the hub of an impeller 6 of single suction type which may be included in a conventional housing which is indicated by the construction lines 8 and 10. Discharge takes place into a conventional volute passage indicated at 12.

Vanes 14 are provided which are reinforced by curved members 16 and 17 providing, between adjacent vanes, ribs which serve to deflect the inflowing streams into portions sweeping alternately walls 8 and 10 of the casing, the hub 19 being arranged as indicated at 20 to form shrouds for short lengths of the back of the vanes which guide the liquid providing smooth flow alternately in cooperation with casing wall 10 and ribs 16.

Ribs 16 merge into a circular member 15 being arranged as indicated at 21 to form shrouds for short lengths of the front of the vanes 14 which guide the liquid providing smooth flow alternately in cooperation with casing wall 8 and rib 17. It will be noted that circular member 15 as provided also serves as means to balance the axial thrust of impeller 6.

The impeller thus constructed is particularly adapted for large slurry pump use. Alternating flow conditions along both walls of the pump casing are achieved and thereby the efficiency of the pump substantially improved with reduction of the turbulence and friction as compared with close clearance pumps provided with shrouded impellers heretofore constructed.

It will also be evident that the vanes are well reinforced by the rib arranged as described and consequently, safe operation with slurries can be achieved without danger of breakage when solid particles get lodged between impeller and pump casing.

Desirably, the construction is such that the reinforcing ribs are provided at a short distance from the end of the vanes, but this is not absolutely essential.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of pumps, differing from the types described above.

While I have illustrated and described the inventions as embodied in pump impellers of the single suction type, I do not intend to be limited

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to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. A pump impeller of the single suction type having opposite front and rear faces, said pump impeller comprising in combination a hub; a rear annular member surrounding said hub in the plane of said rear face of said pump impeller; vanes carried by said hub secured to said rear annular member; a front annular member surrounding the impeller eye in the plane of said front face of said pump impeller firmly secured to said vanes; and a plurality of ribs, one between each two consecutive vanes, said ribs being arranged alternately on the front and rear face of said pump impeller secured to said vanes and to the corresponding annular members extending from said annular members to the periphery of the impeller in such a manner as to form impeller channels which are alternately open on opposite faces of said impeller.

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2. A pump impeller of the single suction type having opposite front and rear faces, said pump impeller comprising in combination a hub; an annular member surrounding said hub in the plane of said rear face of said pump impeller; an even number of equally shaped vanes carried by said hub secured to said rear annular member; a front annular member surrounding the impeller eye in the plane of said front face of said pump impeller firmly secured to said vanes; and an even number of equally shaped ribs, one between each two consecutive vanes, said ribs being arranged alternately on the front and rear face of said pump impeller secured to said vanes and to the corresponding annular members extending from said annular members to the periphery of the impeller in such a manner as to form impeller channels which are alternately open on opposite faces of said impeller.

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