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C. A. CLIFTON

IMPELLER FOR CENTRIFUGAL PUMPS

Filed Sept. 14, 1926

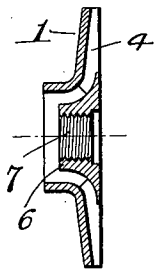


Fig. 1

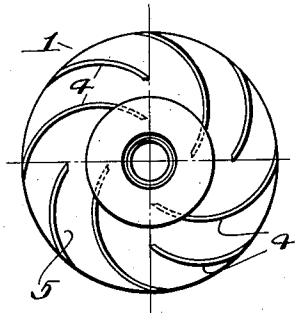


Fig. 2

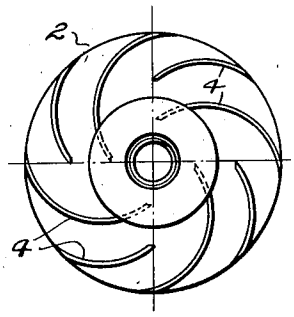


Fig. 3

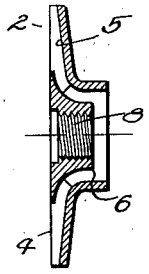


Fig. 4

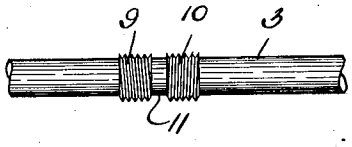


Fig. 5

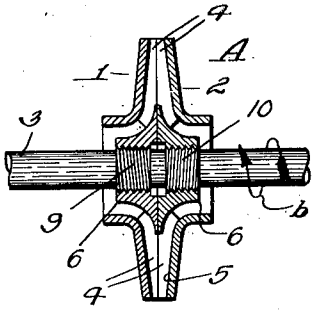


Fig. 6

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UNITED STATES PATENT OFFICE.

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IMPELLER FOR CENTRIFUGAL PUMPS.

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This invention relates broadly to pumps and, more specifically, to pumps of the double-suction centrifugal type, an outstanding object of the invention being to provide in a pump of this character an improved type of impeller, wherein the impeller is formed to include two complemental sections or halves, which when assembled on a common shaft, in proper relation to each other, form and constitute the complete impeller assembly. The formation of the impeller in two mating parts permits of the accurate machining and forming of the impeller blades or vanes and adjacent pockets to procure maximum efficiency, overcomes the defects and obstructions inherent in the commonly used integrally cast construction, permits of convenience and economy in foundry practice and, among other features, enables smaller and more compact impellers to be utilized successfully than can be provided under previous methods of casting the impeller in one piece.

In accordance with the invention an impeller assembly is provided consisting of two complemental sections having the plane abutting surfaces thereof formed with registering blades or vanes and adjacent pockets, and wherein the sections are formed to include hub portions which in one section are internally threaded in a right hand direction and in the other section are internally threaded in a left hand direction. These threaded hubs are receivable upon correspondingly threaded portions of a common operating shaft, so that upon the rotation of a shaft in a predetermined direction the two parts of the impeller may be brought together and locked in secured properly mating registration, the construction permitting of the locking of the sections against relative displacement upon the operating shaft when the pump is in normal operation.

For a further understanding of the invention reference is to be had to the following description and to the accompanying drawing, wherein:

Figure 1 is a vertical sectional view taken through one of the impeller sections,

Figure 2 is a front elevation of the impeller sections shown in Figure 1,

Figure 3 is a similar view of the other impeller section,

Figure 4 is a vertical sectional view through said last named impeller section,

Figure 5 is a detail elevation of the pump shaft, showing the threaded portions thereof,

Figure 6 is a vertical sectional view taken through the assembled impeller and discloses the same mounted on its common operating shaft.

The impeller A comprising the present invention consists of two halves or sections designated by the numerals 1 and 2 which, when assembled on the common operating shaft 3 provided therefor, and in proper registration with respect to each other, form and constitute the complete impeller, which is shown especially in Figure 6. It will be noted that each section is formed with blades or vanes 4 of the same number, shape and relative arrangement as the other half, but with this difference; the blades of one half are curved in a direction opposite to that of the blades of the other half, when the sections or halves are viewed as shown in Figures 2 and 3. Thus, when the open faces of the two halves are placed in conjunction or in registration, the curvature of the blades in both halves correspond in direction. The blades in this instance are integrally formed with each section and are disposed in tangentially curved order with regard to the axis of the shaft 3. Between the vanes or blades 4 there is provided in each section the usual pockets or depressions 5 which constitute the outlet nozzle of the impeller. The nozzles open to each side of the impeller contiguous to the center of the latter to permit of the inflow of liquid into the impeller from each side of the latter.

Each section is formed to include a hub portion 6 provided with internal threads 7 and 8, the threads in the hub of the section 1 are right hand in direction and the threads 8 in the section 2 are left hand in direction. The portion of the shaft 3 on which the impeller is to be located is of a diameter larger than the remainder of the shaft, on which enlarged portions are cut a series of threads, designated by the numerals 9 and 10, and between these two threaded portions is a short space of reduced diameter, which space being designated by the numeral 11, having no threads thereon. It will be observed that the threads 9 are adapted to receive the section 1 of the impeller and are cut to conform with the threads 7 in the hub of said section, while the threads 10 of the shaft are adapted to receive the impeller section 2

and are cut to correspond with the threads 8.

It will be apparent that, when the two impeller sections are started on their respective threaded portions of the shaft, continuous rotation of the shaft in the direction indicated by the arrow *b*, in Figure 6, will cause the two sections to approach each other, and that when their contiguous faces are brought into contact tightly, no further motion of the shaft relative to the impeller, and in the same direction, is possible. The opposing threaded joints of the impeller section and shaft therefore constitute a locking device which prevents motion of either impeller section lengthwise of the shaft, or relative to each other in a direction opposite to that indicated by the arrow *b*. The blades 4 in the two sections can be located opposite to one another by rotating one or both halves of the impeller relative to each other while yet slightly separated on the shaft, and by holding them in this proper alignment while revolving the shaft in the direction necessary to bring them into tight contact, thereby the desired registration of the blades on the opposing sections can be conveniently and accurately effected.

Since normal operation of the pump requires that motion be imparted to the impeller by the shaft when rotating in the direction indicated by the arrow *b*, the resistance against the impeller of the liquid being pumped, will be in a direction such as to maintain the two halves in their initial position of contact. This position on the shaft can not be altered unless the two halves are rotated on the shaft in opposite directions with respect to each other. It is possible to shift the impeller to any position lengthwise of the shaft within the limit of the unthreaded portion 11 by rotating the two halves in opposite directions on the shaft and then locking the same in the desired location.

In view of the foregoing it will be seen that the present invention provides an assembled impeller consisting of a plurality of sections which are capable of being separately formed and machined so as to secure accuracy in design and workmanship and at the same time to effect an economy in impeller design generally. In the case of small impellers particularly the design is useful in that the blades and pockets of the impeller sections can be properly shaped or machined to prevent obstruction of the nozzles and also to overcome the above recited disadvantages present in integral or one piece constructions.

The construction described, therefore, provides an impeller so divided as to permit of ready access to the interior passages for the purpose of cleaning and smoothing to the desired degree of finish and accuracy the nozzle forming surfaces of the impeller. Again, the construction permits of varying the width of the opening at the outer perimeter of the complete impeller by varying the width of each half by machining similar castings in a varying manner. It will be observed that the impeller is attached to its operating shaft by means of threads, without resorting to the use of keys, pins or other locking devices. Due to the peculiar manner of mounting the sections on the shaft it is possible to conveniently bring the blades of each half into proper alignment with each other and then to automatically maintain such alignment. The threaded shaft also permits the impeller to be adjusted lengthwise thereof and maintained in such position without the use of other fastening means.

What is claimed is:

A pump impeller comprising a pair of separable sections, said sections being formed to include plane abutting surfaces having curved registering blades formed therewith, an axial support for said sections including right and left hand threaded portions arranged to receive the correspondingly threaded portions formed in the hubs of said sections, a clearing space being provided between said sections and said shaft, whereby the impeller sections may be adjusted longitudinally of said shaft and locked in relative positions of registration.

In testimony whereof I affix my signature.

CHARLES A. CLIFTON.