BLADELESS PUMP IMPELLER

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1. This invention relates to impellers for centrifugal pumps, and has particular reference to a centrifugal pump impeller of a novel bladeless, non-clogging character, suitable especially for use in pumping fluids such as sewage, containing stringy, pulpy, and solid matter. The presently improved impeller however, is not limited to sewage pumps, as it may be readily embodied in centrifugal pumps having wide utility in the pumping of fluids generally.

In sewage systems employing prevailing or conventional centrifugal pumps such as those of bladed impeller types and the like, it is a common practice in order to minimize pump clogging, to use pumps of appreciably larger capacity than is otherwise necessary, to facilitate the pump passage of solids and stringy matter. The larger capacity pumps require, of course, correspondingly large operating motors, which thus increases initial costs of installations. Moreover, because of pump capacities above the optimum requirements, in many instances the pumps are operated only intermittently, whereas continuous operation is far preferable particularly in processes of bacteriological purification of sewage. The consequence then is a sacrifice of sewage purification efficiency for a reduction in the frequency of pump clogging. But even with oversized pumps, impeller clogging while of less frequency than attends the use of smaller pumps, occurs so often in many if not most installations, as to constitute a serious problem.

The foregoing is applicable in general, to many types of pumping systems other than sewage systems. Moreover, in instances of pumping systems utilized to convey or transfer food material, fish or other fragile or easily damaged material in suspension in a fluid carrier, use of the older, prevailing bladed impellers frequently results in high percentage losses in the material conveyed, consequent to impeller blade damage to such material.

Accordingly, the principal object of the present invention is to provide an improved centrifugal pump impeller which will obviate the foregoing disadvantages by affording a pump which may be utilized in sewage and other pumping systems, in sizes appreciably smaller than those now used in a given system, and which may be operated without clogging in normal operation.

Another object is to provide a centrifugal pump impeller of a bladeless, non-clogging character, having a single continuous passage therein between the axial inlet eye and the impeller periphery, wherein the single passage is devoid of sharp turns and projections outstanding therein.

2. Other objects and advantages of the invention will appear readily from the following description of a presently preferred embodiment thereof, as such is illustrated in the accompanying drawings, wherein:

Fig. 1 is a sectional view through a pump casing and an impeller of presently improved form, the section being taken along line 1—1 in Fig. 2;

Fig. 2 is an axial sectional view of the pump, illustrating in part the improved character of impeller now provided;

Fig. 3 illustrates the improved impeller in an enlarged end view thereof, with the impeller passage shown in phantom lines;

Figs. 4, 5, 6 and 7 are axial sections of the impeller as taken respectively, along lines 4—4, 5—5, 6—6 and 7—7 in Fig. 8, and Fig. 8 is a view in perspective, of a core utilized in casting the impeller passage in impeller formation, the core here being shown as an aid in illustrating the trend of the passage.

Referring first to Figs. 1 and 2, there is illustrated a centrifugal pump embodying an impeller constructed according to the present invention. The pump shown, includes a casing providing a central casing section 10 having an impeller chamber 11 terminating in a tangential discharge passage 12 (Fig. 1). The central casing section is closed at its opposite sides by casing closures 14 and 15, the closure 14 affording an axial inlet port 16 through which fluid is admitted to the pump. The opposite closure 15 provides a bearing and stuffing box assembly 18 for the pump impeller drive shaft 19, the latter operatively supporting the impeller 20 within the casing. Shaft 19 may be driven by an electric motor or other power means (not shown). As indicated in Fig. 2, the impeller has an axial suction eye 22 in register with the casing port 16, and a fluid passage shown in part only, at 23 and 24, leading to and opening in the impeller periphery, as will presently more fully appear.

The character and structural formation of the presently improved impeller 20, appear from the views of Figs. 3 through 7. As there shown, the impeller comprises a body 26 preferably although not necessarily, of a one-piece or unitary construction, providing a section 27 of circular periphery and a section 28 tapering inwardly and laterally from the periphery of the section 27 at one side of the latter, affording a smooth concavo-tapered surface 30. Axially in the opposite side 31 of the main body section 27 is a threaded bore 32 for receiving the threaded end 34 (Fig. 1) of the impeller drive shaft 19. Within the impeller body 26 is a single passage
A rotor for centrifugal pumps, comprising a unitary rotor body having a circular periphery and a single helical passage having its inlet end opened axially of the body at one side, said passage extending entirely within the body with at least one helical turn and having its discharge end inwardly adjacent the periphery of the body, said body further providing a discharge channel in communication with the discharge end of said passage and extending in the periphery of the body throughout substantially the entire circular extent thereof, with the channel depth gradually decreasing to merge with the periphery of the body, and said channel being positioned in the periphery of the body such that the longitudinal axis of the channel lies in a plane normal to the axis of the rotor.

2. In a centrifugal pump, the combination with a pump casing assembly providing a circular impeller chamber, a discharge passage extending tangentially from the chamber, and an inlet opening axially in one side of the casing assembly, of a centrifugal impeller rotatable in the casing assembly, said impeller comprising a unitary body having a circular periphery and a single tubular passage opening axially of the body at one side and in alignment with the casing inlet, said passage being entirely within the body and extending helically therein through substantially one helical turn and terminating in a discharge opening inwardly adjacent the circular periphery of the body, said body further providing a discharge distribution channel communicating with said discharge passage opening and extending in said periphery of the body throughout substantially the entire circular extent thereof, the channel depth gradually decreasing to substantial merging with said periphery of the body, and said discharge distribution channel being positioned in the periphery of the said body such that the longitudinal axis of the channel lies in a plane normal to the axis of the body.

3. In a centrifugal pump, the combination with a pump casing of volute form providing an axial inlet at one side of the casing and a tangential discharge outlet at the circumference of a unitary impeller rotatable in the volute casing, the impeller comprising an impeller body having a circular periphery and providing a single tubular passage opening axially of the body at one side and in alignment with said axial inlet of the volute casing, the tubular passage extending helically in the body through substantially one helical turn and terminating in a discharge outlet inwardly of the body adjacent the circular periphery thereof, said tubular helical passage being...
ing of uniform diameter throughout its length and constituting the sole displacement producing means of the impeller, and said body further having a discharge distribution channel open to said circular periphery of the body, extending from said discharge outlet of the helical passage throughout substantially the entire circular extent of the body periphery in decreasing depth to emergence with said periphery of the body, said channel being positioned in the body periphery such that its longitudinal axis lies in a plane normal to the rotary axis of the impeller body.

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