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Speck

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[54] **CENTRIFUGAL PUMPS COMPOSED PRIMARILY OF PLASTIC COMPONENTS**

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[51] **Int. Cl.** **F04d 7/00**, F04d 7/02
[58] **Field of Search** 415/197, 200, 214

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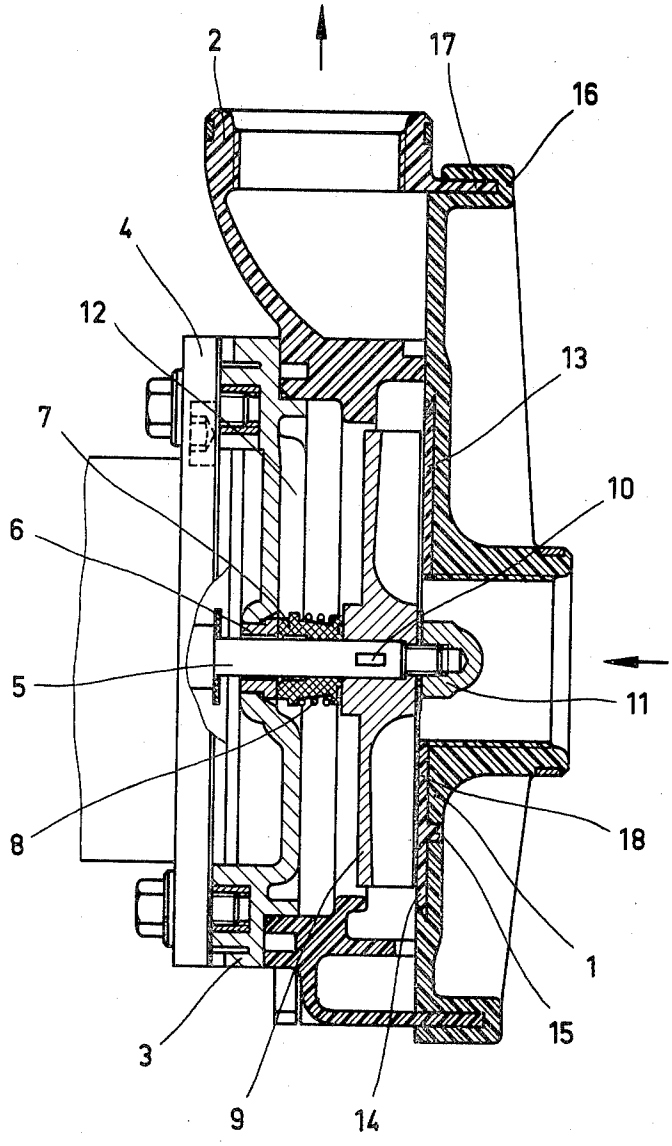
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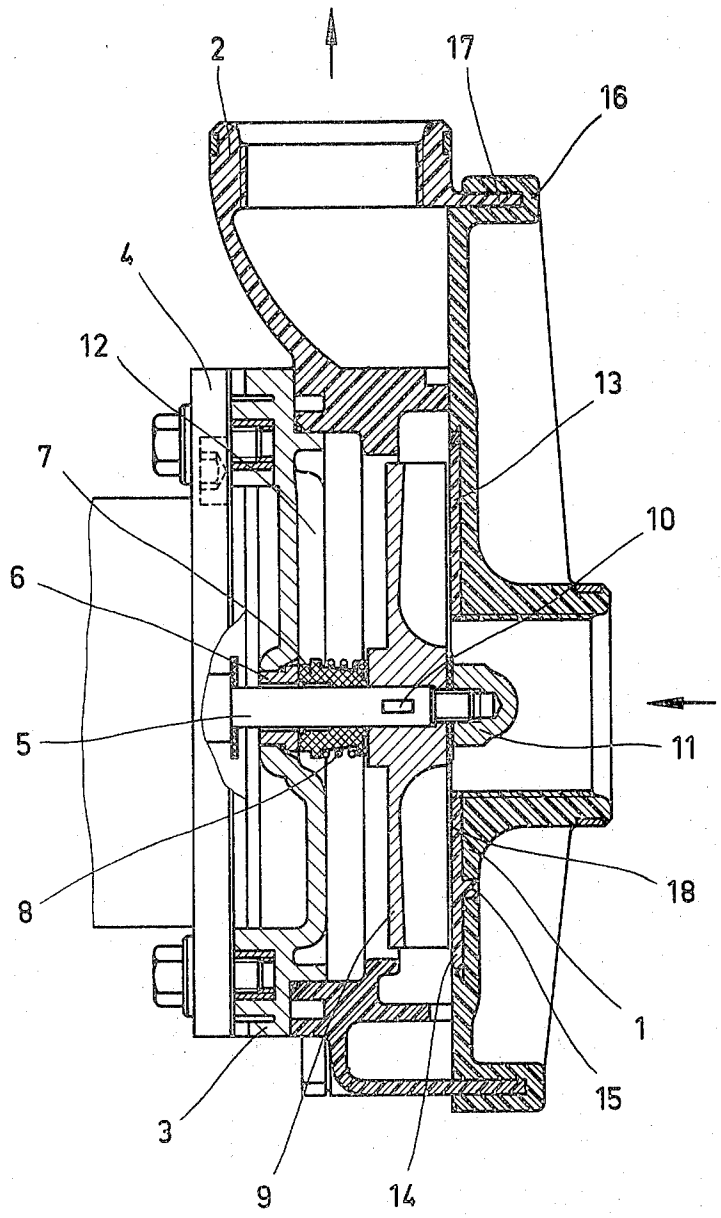
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[57] **ABSTRACT**

A centrifugal pump composed primarily of plastic components. The pump has a wall formed with an inlet through which liquid is sucked into the pump. A rotary impeller is coaxial with the inlet and located closely adjacent to the latter wall. This wall carries a wear-resistant disc which has an exposed surface directed toward and located closely adjacent to the impeller, defining a narrow gap therewith. Part of the wear-resistant disc is embedded in the housing wall, which is made of plastic, in such a way that part of the plastic material of the wall is situtated between the embedded portion of the disc and a plane which contains the exposed surface of the disc.

2 Claims, 1 Drawing Figure




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CENTRIFUGAL PUMPS COMPOSED PRIMARILY OF PLASTIC COMPONENTS

BACKGROUND OF THE INVENTION

The present invention relates to pumps.

More particularly, the present invention relates to centrifugal pumps which are composed primarily of plastic components and which are adapted to be used, for example, for circulating water in swimming pools.

It is already known to construct centrifugal pumps with individual housing components made of plastic. The housing includes a wall formed with a suction inlet through which water or other liquid is sucked into the pump, and located directly next to this inlet is a rotary impeller which is completely open at its portion which is directed toward the inlet. Between the impeller and the wall of the housing which is adjacent the impeller there is an extremely small gap. The liquid which is pumped, mostly water, has suspended therein small particles such as, for example, grains of sand which are drawn through a filter, in the case of a pump which is used to circulate water in a swimming pool. Travel of such particles through the gap between the impeller and the housing wall which defines the narrow gap therewith results in an intense wear at the impeller and at the housing wall which defines the narrow gap with the impeller. This wear can readily be taken care of in the case of the impeller since the impeller, especially when it is made of plastic, is inexpensive to manufacture and is easily replaced. On the other hand, the housing components are much more expensive to manufacture and much more difficult to disassemble. It has therefore become customary to locate at the housing component which is adjacent the impeller a disc which is made of a material which has a high resistance to wear. The fixing of this disc to the housing is brought about in known plastic pump constructions either by bonding or by way of suitable screws.

Experience has shown, however, that this type of fixing of the wear-resistant disc is extremely expensive, the maintenance of the desired tolerances is not assured, and the reliability of the fixing of the wear-resistant disc is not very great.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a pump construction which will avoid the above drawbacks.

Thus, it is an object of the invention to provide a centrifugal pump composed primarily of plastic components and having a wear-resistant disc which is mounted in an extremely simple manner while reliably maintaining the required tolerances and the required fixing of the wear-resistant disc to the housing.

It is furthermore an object of the present invention to provide a construction according to which the fixing of the wear-resistant disc to the housing takes place during molding of that part of the housing which carries the disc.

In accordance with the invention, the housing of the pump has a plastic wall formed with a pump inlet through which liquid is sucked into the pump. Directly next to this housing wall is a rotary impeller means. The latter housing wall carries immediately adjacent the impeller means a wear-resistant disc which has directed

toward the impeller means an exposed surface which defines a predetermined narrow gap with the rotary impeller means. A portion of the wear-resistant disc is embedded in the plastic material of the housing wall in such a way that part of the latter plastic material is located between the latter portion of the disc and a plane which contains the exposed surface of the wear-resistant disc. In this way the disc is reliably fixed to the plastic housing wall.

BRIEF DESCRIPTION OF DRAWING

The invention is illustrated by way of example in the accompanying drawing which forms part of this application and in which one possible embodiment of a centrifugal pump according to the invention is illustrated in a sectional elevation, the section of the drawing being taken in a plane which contains the axis of the impeller.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawing, there is shown therein a centrifugal pump composed primarily of plastic components. Thus, the pump includes a housing having the suction component **1** and the pressure component **2** which are made of plastic, by injection molding, for example. The side of the pressure housing component **2** which is opposite from the suction housing component **1** carries an intermediate flange **3** which is removably fixed by suitable bolts or the like to the housing component **2.** This intermediate flange **3** carries an exterior flange **4** which is removably fixed to the intermediate flange **3** and which carries the motor which drives the pump. The intermediate flange **3** is formed with a central opening through which the impeller drive shaft **5** extends, this shaft **5** being driven directly from the motor.

The intermediate flange **3** carries, with a sealed, fluid-tight fit a thrust ring **6** which surrounds but does not engage the impeller shaft **5.** By way of a key **10,** the shaft **5** is fixed with the rotary impeller means **9** which rotates together with the shaft **5.** A cap nut **11** is threaded onto the free end of the shaft **5** and presses a washer against the right end surface of the hub of the impeller **9,** as viewed in the drawing. A slidable sealing ring member **7** is situated between the thrust ring **6** and the impeller **9.** This slidable sealing ring component **7** rotates together with the shaft **5.** The seal between the thrust ring **6** and the sealing gland **7** is brought about by way of the pressure of a spring **8** which is coiled about the element **7.** In the illustrated example the sealing ring **7** is axially stretchable and the spring **8** is situated between and presses against a pair of outwardly directed annular flanges of the sealing ring **7** so that the spring **8** tends to axially stretch the sealing ring **7,** pressing the latter on the one hand against the right end surface of the thrust ring **6,** as viewed in the drawing, and against the left end surface of the hub of the impeller. In the event that the sealing ring **7** is replaced by a component which is not axially stretchable, the spring **8** presses at its right end, as viewed in the drawing, against a collar which forms part of the impeller **9.**

The inner surface of the flange or wall **3** which is directed toward the impeller **9** is formed with a radial or spirally curved liquid-guiding groove **12** which serves to deflect part of the pumped liquid into engagement with the sealing ring **7,** particularly the sealing surface

thereof, so that the sealing ring 7 is continuously cooled by the liquid which is pumped.

The component 1 of the pump housing is made of plastic, as was pointed out above, and defines with the impeller means 9 a narrow gap 18. The part of the wall 1 which is directed toward the impeller means 9 carries the illustrated wear-resistant disc 13 which has an exposed surface directed toward the impeller means 9 and defining the gap 18 therewith.

The wear-resistant disc 13 is bonded to the plastic of the housing wall 1 by molding the plastic of the wall 1, during the manufacture of the latter, directly onto that surface of the disc 13 which is directed away from the impeller 9. Thus, during injection molding of the wall 1 the latter is molded directly onto the disc 13. The disc 13 has a portion embedded in the plastic wall 1 with the latter situated between the embedded portion of the disc 13 and the plane which contains the exposed surface of the disc 13 which is directed toward the impeller 9 and defines part of the gap 18. In the illustrated example the embedded part of the disc 13 is formed by its peripheral edge 14. This peripheral edge 14 forms part of a cone whose apex is situated in the common axis of the impeller 9 and the inlet opening which is formed in the wall 1, at the side of the impeller which is opposite from the wall 1. Thus, it will be seen that the peripheral edge 14 tapers so that the surface of disc 13 directed away from the impeller has a greater diameter than the surface thereof which is directed toward the impeller, and thus part of the material of the wall 1 is situated between the peripheral edge 14 and the plane which contains the exposed surface of disc 13 which is directed toward the impeller 9. In this way an undercut type of embedding of the disc 13 in the plastic material of the wall 1 is achieved for providing a very reliable fixing of the disc 13 to the wall 1. Thus, when the wall 1 is molded onto the disc 13, the plastic material of the wall 1 flows around and completely embeds the tapered peripheral edge region 14 of the disc 13.

Furthermore, the disc 13 is provided with projections 15 in the form of bosses or the like, one of which is illustrated in the drawing. This projection is integral with the remainder of the disc and extends therefrom in a direction away from the impeller 9. During molding of the wall 1, the plastic material thereof also surrounds the projections 15, and in addition to providing a better holding of the disc 13 assembled with the wall 1, these projections 15 secure the disc 13 against any possible rotary movement with respect to the housing wall 1.

In order to reliably maintain the gap 18 between the impeller 9, which is surrounded by the housing component 2, and the wear-resistant disc 13 in the wall 1 of a uniform width at all locations, it is required that the housing components 1 and 2 be fixed to each other in such a way that they will resist any possible distortion. This connection between the housing components 1 and 2 is brought about in the illustrated example, in accordance with a further feature of the invention, by forming in the housing component 1, adjacent its periphery, a circular groove 16 which receives an elongated cylindrical portion 17 of the housing component 2. This cylindrical portion 17 extends into and fills the groove 16 and is bonded to the housing component 1 either by being welded thereto or by a suitable adhesive.

As pointed out above, it is sufficient to achieve the objectives of the invention if the plastic of the section housing component 1 during manufacture thereof is molded against that surface of the disc 13 which is directed away from the impeller, with the disc 13 situated directly in the injection molding form during injection molding of the wall 1. However, as shown in the illustrated example, it is preferred to provide the wear-resistant disc 13 with a portion such as its peripheral edge 14 and/or the projections 15 which are surrounded by the injection-molded plastic material, so that not only the projections 15 but also the peripheral edge 14 of the disc 13 achieve a type of hooking of the wear-resistant disc in the plastic material of the wall 1, as a result of the undercut embedding of part of the disc 13 in the material of the wall 1. If required, the wear-resistant disc can also have other types of projections which are surrounded by the plastic of the housing wall 1 during injection molding thereof.

Experience has shown that fixing of the wear-resistant disc to the plastic wall of the housing by gluing, for example, is an unsatisfactory solution to the problem. Therefore, it is not to be expected that the fixing of the wear-resistant disc by molding of the plastic of the housing wall directly onto the wear-resistant disc would provide a great improvement. Experience has shown, however, that as a result of injection molding of the housing wall directly onto the wear-resistant disc, an outstanding bond and fixing of the wear-resistant disc to the plastic material of the housing wall is achieved. The wear-resistant disc has substantial rigidity and can be made of a plastic material which is made of a relatively hard wear-resistant composition, or it may be made of bronze.

The embedding of the tapered peripheral edge of the disc in the material of the wall 1 further improves the mounting of the wear-resistant disc, and instead of embedding the entire periphery of the disc 13 in the wall 1 it is possible also to provide a construction according to which only part of the periphery is embedded in the wall 1. The security against any possible relative rotary movement between the disc 13 and the wall 1 is increased by providing the projections 15 which are also embedded in the plastic material. Furthermore, these projections 15 provide the added advantage of determining the position of the disc 13 in the injection mold in a far better manner than is possible if these projections were not provided.

It is important to maintain a predetermined gap 18 between the impeller 9 and the wall 1, and this maintenance of a gap of predetermined magnitude is achieved by fixing the housing components 1 and 2 to each other in such a way that they cannot become distorted. This maintenance of the housing components 1 and 2 fixed to each other in such a way that they cannot become distorted also reliably maintains the desired reduction in wear. Thus, the distortion is prevented by the above-described type of tongue-and-groove connection between the housing component 2 and the housing component 1 which is provided by receiving the cylindrical tongue 17 in the circular groove 16 with welding or gluing of the components 1 and 2 to each other as described above.

What is claimed is:

1. In a centrifugal pump which is adapted to be used for circulating water in a swimming pool and which is composed primarily of plastic components, a housing having a wall formed with an inlet through which liquid is sucked into the pump, rotary impeller means coaxial

with said inlet and located immediately adjacent said wall, the latter carrying a wear-resistant disc of substantial rigidity which has an exposed surface directed toward said rotary impeller means and defining a narrow gap therewith, said housing wall being made of plastic molded directly onto said disc to be bonded therewith and said disc having a portion embedded in the plastic of said wall, as a result of the molding of the latter onto said disc, with a part of the plastic of said wall situated between said portion of said disc and a plane which contains said exposed surface of said disc, so that said disc is reliably fixed to said wall, said portion of said disc being formed by a peripheral edge region of said disc which forms part of a cone whose apex is situated in the common axis of said impeller means and inlet at the side of said impeller means opposite from said inlet, so that said disc has directed away from said impeller means a surface of a greater diameter than said exposed surface and concentric therewith, said surface of said disc which is of said greater diameter being completely covered by the plastic of said wall and the plastic of said wall also covering the tapered periphery of said disc which is at the side thereof opposite from said surface of greater diameter.

2. The combination of claim **1** and wherein said disc carries projections which are directed away from said impeller means and which are also embedded in the plastic wall of said housing means.

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