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[54] PUMP WITH PLASTIC HOUSING

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[51] Int. Cl. F04D 29/44

[58] Field of Search 415/219 C, 213, 214, 53, 415/121 G, 200

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[57]

ABSTRACT

A pump which has a plastic one-piece housing provided with a suction portion which defines a suction chamber and a pressure portion which defines a pressure chamber, the housing also having a separation portion integral with the suction and pressure portions and separating the suction chamber from the pressure chamber. This separation portion of the housing is formed with a suction opening through which the suction chamber communicates with the pressure chamber. The suction portion of the housing is preferably of a cylindrical configuration and is circular in cross section, the suction portion being formed with an opening at the top of the housing and the suction chamber tapering inwardly from the top of the housing and being free of any undercuts. The pressure portion is formed with an opening at a location other than the sides of the housing and also defines a pressure chamber which is free of undercuts. The separation portion tangentially intersects the suction portion where these portions are integral with each other.

10 Claims, 4 Drawing Figures

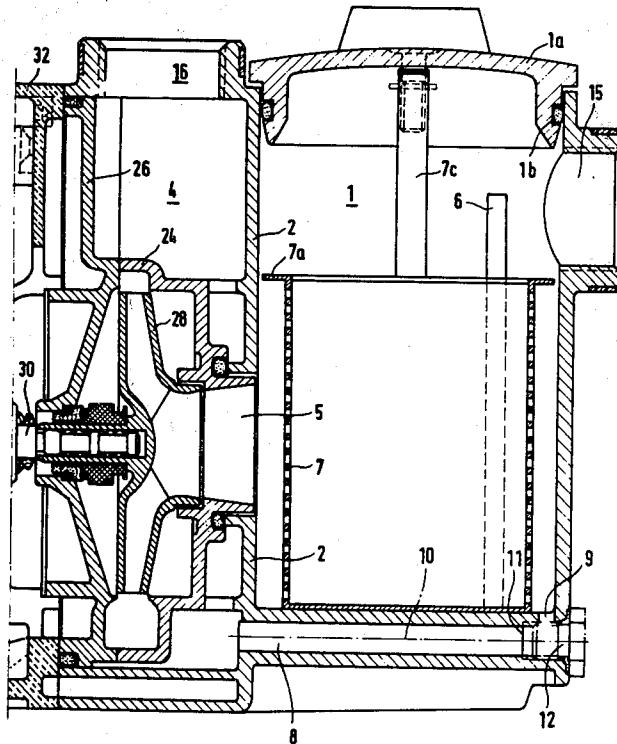


FIG. 1

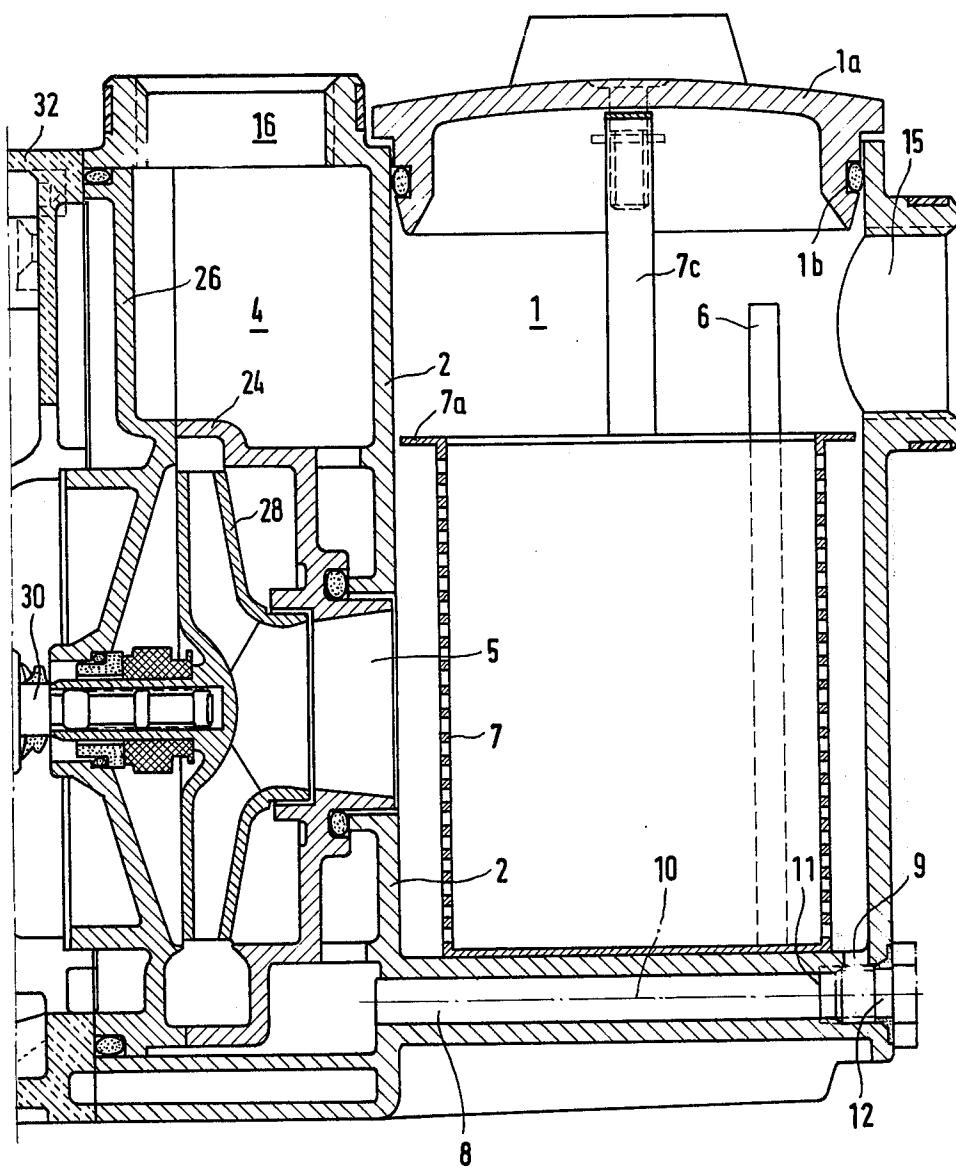


FIG. 2

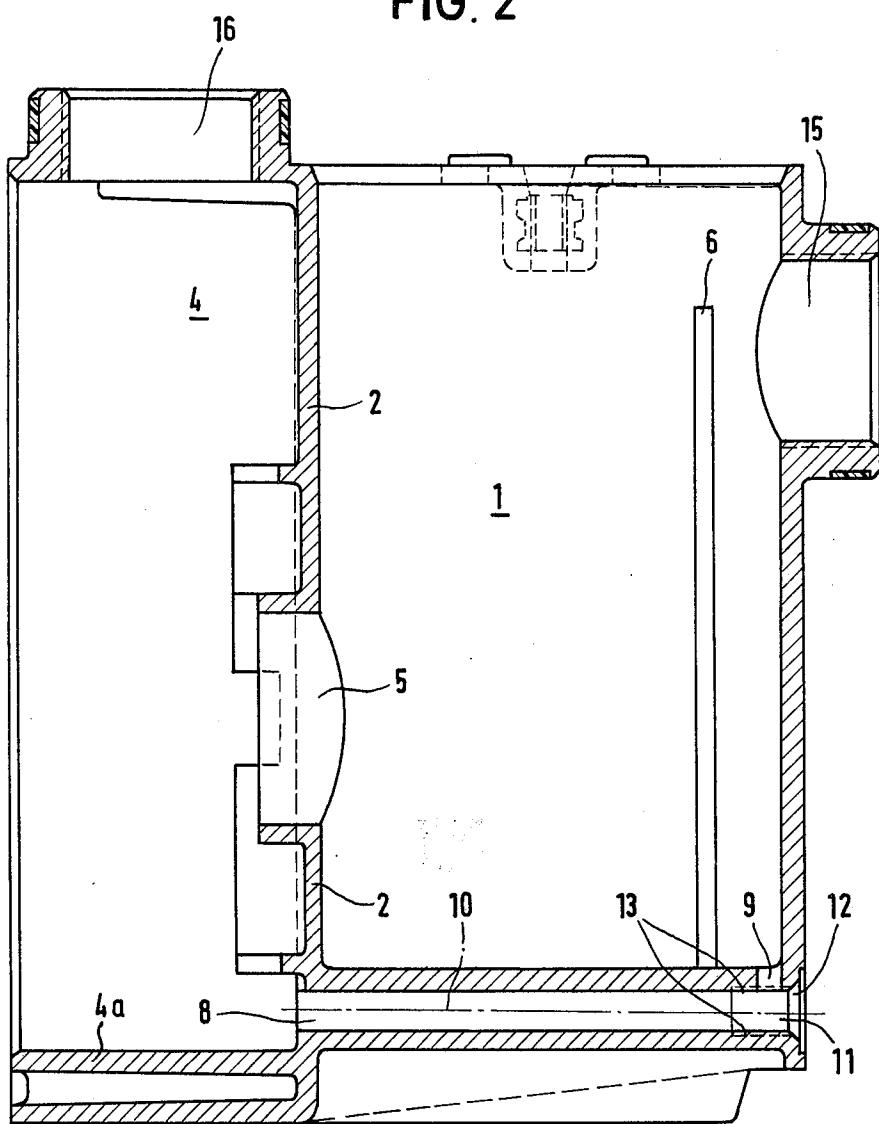


FIG. 3

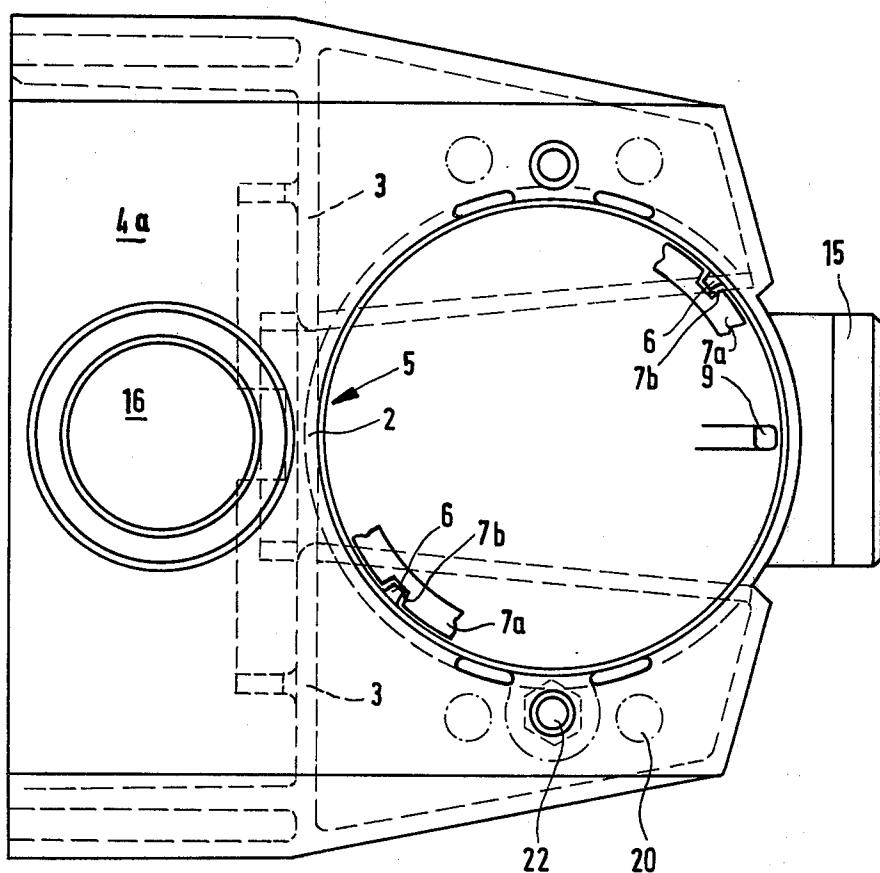
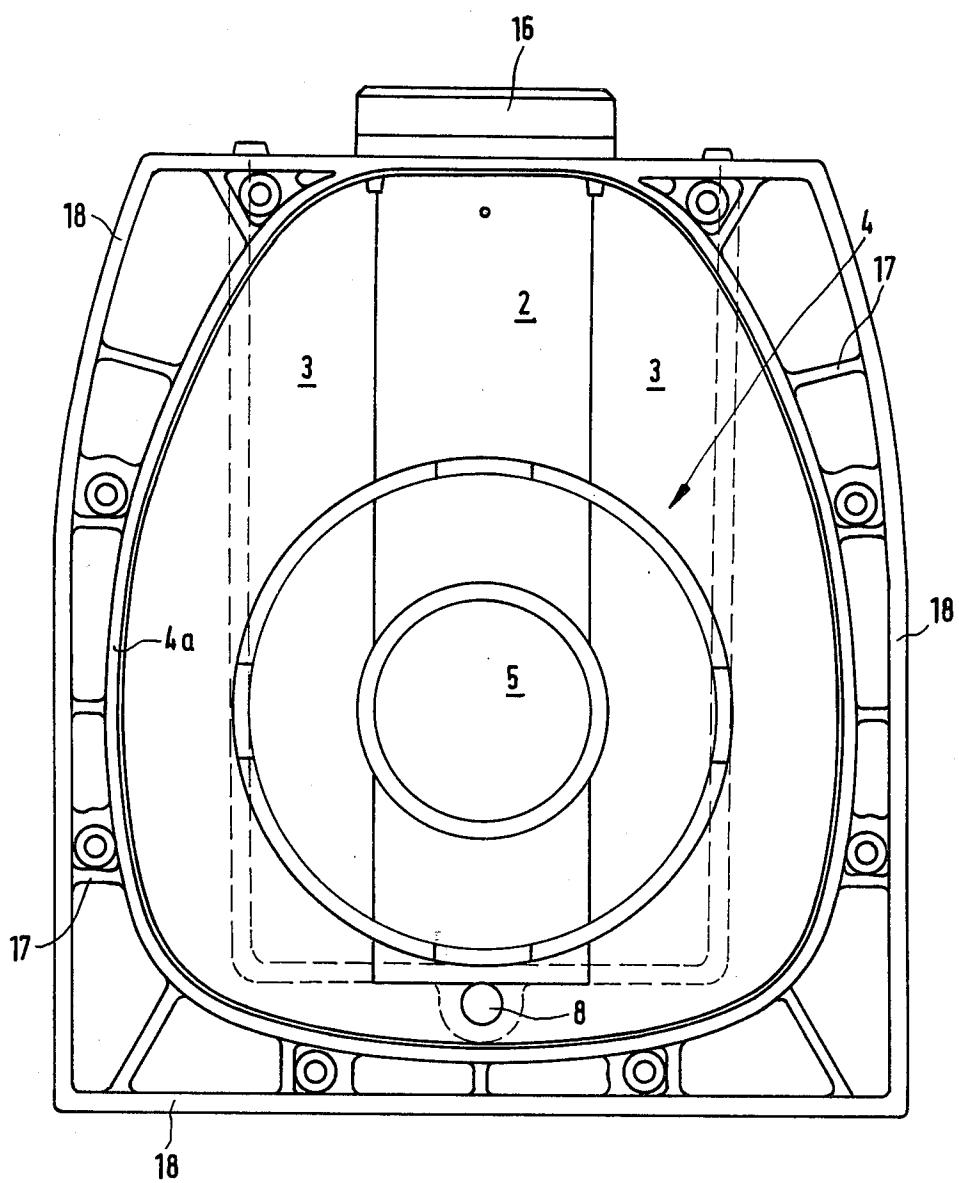


FIG. 4



PUMP WITH PLASTIC HOUSING

BACKGROUND OF THE INVENTION

The present invention relates to pumps.

In particular, the present invention relates to pump housings which are made of plastic material and which are particularly suitable for circulating pumps to be used in swimming pools, such pumps having a suction chamber, a pressure chamber, and a separation wall situated between and separating these chambers from each other, with the pressure chamber communicating through a suction opening with the suction chamber.

Pump housings of the above type have up to the present time required at least two and most often three parts which are connected with each other with a suitable adhesive or by welding. The manufacture of such adhered or welded pump housing is expensive and burdened by high labor costs. Moreover, sealing problems are always encountered with these conventional pump housings. Also, the stability or accuracy of pump housings having components which are adhered or welded to each other are frequently inadequate, and this latter inadequacy is a particular serious disadvantage in that the pump housing is subjected during operation to strong pressure pulses resulting from, for example, the rapid closing of valves or swingable flaps which form non-return valves.

A further advantage of conventional pump housings having components which are adhered to each other resides in the fact that such adhered connections often are inadequate to withstand temperature fluctuations, a factor which is of considerable importance in circulating pumps. Finally, pump housings composed of parts which are adhered or welded to each other suffer from the further serious disadvantage that as a result of the connection of the individual housing components by adhesive or welding, the use of reinforced plastic, particularly plastic reinforced with glass fibers, is excluded since such reinforced plastic, if it is used at all, can be adhered or welded only with extremely high cost and with poor results.

It is also known to provide pump housings of the above type where the individual housing components are assembled together and united by fasteners such as bolts and nuts. However, such pump housings require an extremely large number of such fasteners, which undesirably increases the cost of manufacture and renders the construction undesirably complex, so that to this extent these constructions are disadvantageous. Moreover, pump housings having components bolted together, or held together by screws, present sealing problems.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a pump housing of the above general type which avoids the above drawbacks.

In addition it is an object of the present invention to provide a pump housing of the above general type which is of an exceedingly compact construction.

Thus, it is an object of the present invention to provide a pump housing of the above general type which does not require separate components of the housing to be welded, adhered, or bolted to each other.

In addition it is an object of the present invention to provide a pump housing which will have an exceedingly accurate construction while having a high degree of

stability and capable of withstanding wide temperature fluctuations.

In particular, it is an object of the present invention to provide a pump housing of the above general type which is capable of being formed of a one-piece body.

Thus, it is an object of the present invention to provide a pump housing which can readily be injection molded, for example.

Also it is an object of the present invention to provide a pump housing which can be made of a plastic which is reinforced with glass fibers.

According to the present invention the pump includes a one-piece plastic pump housing having a suction wall means which defines a suction chamber, a pressure wall means which defines a pressure chamber, and a separation wall means separating the suction chamber and pressure chamber from each other and being integral with the suction wall means and the pressure wall means, this separation wall means being formed with a suction opening through which the pressure chamber communicates with the suction chamber.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a sectional elevation of a pump according to the present invention, the pump housing being shown in FIG. 1 assembled with other elements of the pump and the plane of FIG. 1 containing the axis of the impeller;

FIG. 2 is a sectional elevation taken in the same plane as FIG. 1 but showing only the pump housing of the present invention;

FIG. 3 is a top plan view of the housing of FIG. 2, FIG. 3 also showing fragmentarily parts of a filter; and

FIG. 4 is an end elevation of the housing of FIG. 2 as seen from the left of FIG. 2.

DESCRIPTION OF PREFERRED EMBODIMENTS

The embodiment of the present invention which is illustrated in the drawings includes a suction wall means 2 which defines a suction chamber 1. This suction chamber 1 is of a substantially cylindrical configuration, being circular in section. As is apparent particularly from FIGS. 2 and 3, the suction wall means 2 defines a suction chamber 1 which is formed with an opening at the top of the housing which is shown by itself in FIGS. 2-4.

The one-piece plastic body which forms the pump housing shown in FIGS. 2-4 includes also a pressure wall means 4a defining a pressure chamber 4 which is formed with an opening at the rear of the pump housing, and it will be noted particularly from FIG. 4 that

the pressure chamber 4 does not open at the opposed sides of the pump housing with the pressure chamber 4 having in cross section the configuration clearly apparent from FIG. 4, namely a cross section according to which the pressure chamber 4 has opposed concave substantially vertically extending inner surfaces merging into a top surface and merging into an upwardly directed concave bottom surface.

The suction chamber 1 and the pressure chamber 4 are separated from each other by a separation wall means 3 which is illustrated in FIGS. 3 and 4. Thus, the separation wall means 3 is in the form of a vertical substantially flat wall having its left surface, as viewed in FIG. 3, defining part of the pressure chamber 4, this left

surface of the wall 3 of FIG. 3 being visible in FIG. 4. It will be noted that the flat vertical separation wall means 3 extends tangentially with respect to the cylindrical wall means 2 which defines the suction chamber 1, with the walls 2 and 3 being integral with each other at the location where the wall 3 tangentially intersects the wall 2. At the place where the separation wall means 3 and the suction wall means 2 are integral with each other, the common wall structure is formed with a suction opening 5 through which the pressure chamber 4 communicates with the suction chamber 1 so as to be supplied with liquid through the suction opening 5.

At its upper front region the suction wall means 2 is formed with a suction inlet 15 through which liquid enters into the pump. The wall means 2 carries in the interior of the suction chamber 1 a pair of diametrically opposed vertically extending ribs 6 which are integral with the wall means 2. These ribs 6 serve to guide an apertured receptacle 7 which forms a filter which prevents foreign matter of a size greater than the apertures of the receptacle 7 from reaching the suction opening 5. The filter receptacle 7 has at its top end an outwardly directed flange 7a formed with notches 7b (FIG. 3) which receive the ribs 6 so that the latter serve not only to guide the receptacle 7 but also to prevent turning thereof.

The receptacle 7 is provided with a substantially U-shaped bail 7c (FIG. 1), to facilitate introduction and removal of the receptacle 7. The top opening of the suction chamber 1 can be fluid-tightly closed by a removable cover 1a provided with a sealing ring 1b, as illustrated in FIG. 1. Moreover, outwardly beyond the suction chamber 1, the top wall of the housing is formed with suitable openings 20, shown in phantom lines in FIG. 3, for receiving fastener elements such as mounting bolts 22 or the like for mounting the pump on a suitable supporting bracket or the like.

When the cover 1a is removed the operator can grasp the bail 7c so as to remove the receptacle 7 from the suction chamber 1, and after the receptacle 7 is cleaned it can be returned to the suction chamber 1, after which the cover 1a is replaced.

As is shown in FIG. 1, the pressure chamber 4 receives a pair of components 24 and 26 which define a chamber in which the rotary impeller 28 is located, this impeller being driven from a drive shaft 30 which extends through a rear closure wall 32 fastened to the rear end of the housing of the invention in any suitable way and mounted on a suitable support.

It will be noted that both the suction chamber 1 and the pressure chamber 4 have openings which are not situated at the sides of the housing and in addition the suction chamber 1 and the pressure chamber 4 are formed without any undercuts. In this latter connection it is to be noted that the suction chamber 1 tapers slightly from its top open end inwardly toward the bottom thereof.

Furthermore it will be noted that the pressure chamber 4 is formed at its upper wall with a pressure outlet 16, and the pressure chamber 4 is fully open at the rear of the housing where the pressure chamber opening extends throughout the interior height of the housing. Because the chambers 1 and 4 are completely free of any undercuts, a simple one-piece manufacture of the housing is possible, for example by injection molding.

In the particular example of the invention which is illustrated in the drawings, the pressure wall means 4a which defines the pressure chamber 4 is formed at a

lower region with an opening 8 through which the pressure chamber can be emptied. Also, a lower region of the suction wall means 2, which defines the suction chamber 1, is formed with an opening 9 through which the suction chamber can be emptied. The opening 8 is situated at the left end of an elongated emptying passage 10 (FIG. 1) which is formed in the suction wall means 2. This passage 10 is provided with an outlet 11 formed with inner threads, and it will be noted that the opening 9 is situated at the region of the outlet 11 so as to communicate therewith. As a result of this arrangement it is possible to close both the outlet 11 of the passage 10 and the opening 9 by way of the single closure means 12. This closure means 12 may take the form of 15 a plug which is threaded into the passage 10 at the inner threads formed at the outlet 11 thereof, and the length of the plug 12 is sufficiently great to enable the plug 12 to extend completely across the opening 9, closing the latter with a side surface of the plug 12 20 while the plug 12 also completely closes the passage 10. Thus, because the plug 12 closes the opening 9 the suction chamber 1 is maintained sealed from the pressure chamber 4. Such a sealing is required during operation of the pump. The plug 12 is removed for emptying the 25 chambers 1 and 4 through the openings 8 and 9 when the pump is not used, during the winter months, for example.

According to a further feature of the invention, as is shown in FIG. 4, the housing of the invention carries at 30 its exterior reinforcing ribs 17 which serve to strengthen and stiffen the housing. These ribs 17 are integrally formed at their outer ends with an exterior false housing wall 18 which serves to further strengthen the pump housing and which in addition enables the 35 pump housing to be provided with an esthetically pleasing appearance. The wall 18 is a false wall in the sense that the true housing wall is situated at the inner ends of the ribs 17.

The pump housing of the invention can be used, for example, both for self-priming and non-self-priming circulating pumps. Thus, to this extent there is no limitation on the structure of the invention.

The above-described pump housing structure of the present invention has the advantage that as a result of 45 the integration of the suction wall means and the separation wall means between the suction chamber and the pressure chamber, where the separation wall means forms a wall of the pressure chamber, an extremely compact construction is provided. A further extremely important advantage of the present invention resides in the fact that the illustrated pump housing, because of its compact construction and because of the configuration of the suction chamber and pressure chamber provided by the invention, enables the pump housing to be 50 manufactured in one piece preferably by extrusion or injection molding, so that on the one hand all problems encountered with the present state of the art in connection with the assembly of housing components are avoided and on the other hand an exceedingly inexpensive housing of exceedingly high quality can be manufactured. The fact that the pump housing of the invention can be manufactured in one piece out of a plastic material, for example by injection molding, so that subsequent adhering or welding of components to each 55 other are not required, provides the further extremely great advantage that it is possible to use in the manufacture of the pump housing of the invention plastic materials which are reinforced, particularly by glass fi-

bers, achieving in this way important advantages with respect to the accuracy of the structure, the stability thereof, and its lack of sensitivity to temperature fluctuations. In practice, polyamides reinforced with glass fibers have proved to be most suitable as the plastic material for the housing of the invention.

As is apparent from the above description, it is preferred to provide a suction chamber which is tangentially rendered integral with the separation wall, with this suction chamber being cylindrical and circular in section while tapering so that it becomes of a gradually smaller diameter from the top toward the bottom. However, it is to be understood that the invention is not limited to a cylindrical suction chamber of circular section. It is also possible to use other sectional configurations such as cylindrical chambers which have a polygonal or square cross section, for example.

Moreover, it will be noted that the receptacle 7 simply rests on the bottom surface of the suction chamber for the purpose of filtering the liquid before it reaches the opening 5.

A further important feature of the invention resides in the capability of using the single closure means 12 for closing not only the opening 9 but also the passage 10 as described above.

In addition it is to be noted that the ribs 17 and exterior false wall 18 not only provide the housing with an acceptable appearance but also contribute to the strength thereof.

What is claimed is:

1. In a pump, a one-piece plastic housing having suction wall means defining a suction chamber, pressure wall means defining a pressure chamber, and separation wall means integral with said suction wall means and pressure wall means and separating said suction chamber from said pressure chamber, said separation wall means being formed with a suction opening through which said pressure chamber communicates with said suction chamber, said housing having a top and opposed sides, said suction wall means being formed with an opening at said top of said housing and defining a suction chamber which is free of undercuts, and said pressure wall means being formed with an opening situated at a location other than said opposed sides of said housing and also defining a pressure chamber which is free of undercuts, said suction wall means having an inner surface surrounding a central axis of said suction chamber and providing the latter with a predetermined cross-sectional configuration, and said separation wall means extending tangentially with respect to said suction wall means at a location where said separation wall means is integral with and intersects said suction wall means.

2. The combination of claim 1 and wherein said surface of said suction wall means defines a cylindrical suction chamber of circular cross section at a location where said separation wall means is integral with and intersects said suction wall means.

3. The combination of claim 2 and wherein said suction wall means defines a suction chamber which tapers inwardly from said opening at said top of said housing.

4. The combination of claim 1 and wherein said suction wall means carries at least one rib situated in the interior of said suction chamber, and an apertured receptacle situated in said suction chamber for filtering liquid flowing therethrough to said suction opening, said receptacle being formed with a cutout which receives said rib.

5. The combination of claim 2 and wherein said suction wall means carries at least one vertically extending rib situated in the interior of said suction chamber, and an apertured receptacle situated in said suction chamber for filtering liquid flowing therethrough to said suction opening, said receptacle being formed with a cutout which receives said rib.

6. The combination of claim 1 and wherein said suction wall means and pressure wall means respectively have lower regions formed with openings through which said suction chamber and pressure chamber can be emptied.

7. The combination of claim 6 and wherein said suction wall means is formed with an emptying passage extending from said opening at said lower region of said pressure chamber, said opening at said lower region of said suction chamber communicating with said passage and said passage having an outlet at the exterior of said housing, said opening at said lower region of said suction chamber being situated adjacent said outlet, and closure means carried by said housing at said outlet for closing both said passage and said opening at said lower region of said suction chamber.

8. The combination of claim 7 and wherein said passage is formed with an internal thread at said outlet and said closure means including an externally threaded plug received by said internal thread and extending longitudinally across said opening at said lower region of said suction chamber for closing both the latter opening and said passage.

9. The combination of claim 1 and wherein said housing is made of a one-piece plastic body reinforced with glass fibers.

10. The combination of claim 1 and wherein said housing has exterior reinforcing ribs and an exterior false wall integral with said ribs.

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