

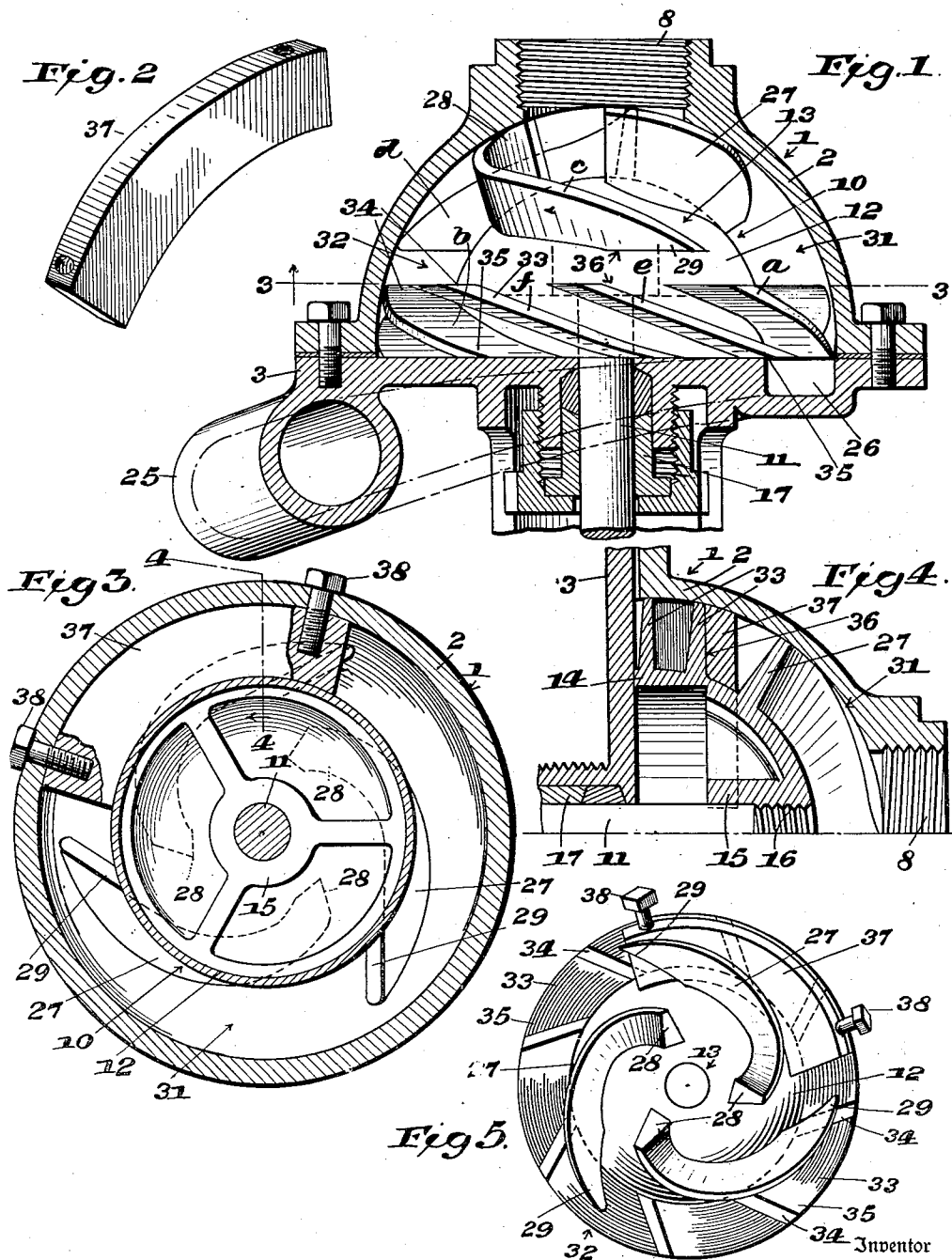
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PUMP

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PUMP

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4 Claims. (Cl. 103—88)

This invention relates to improvements in pumps, especially the pump of John P. Damonte disclosed in his application for patent filed April 22, 1939, Serial No. 269,536, Patent No. 2,236,706, dated April 1, 1941. That pump is of the turbine type, one of its characteristics being a set of widely spaced rotor blades of involute form, being carried by a hemispherical rotor which enables disposing the leading edges of the blades on a coarse pitch and the trailing edges thereof on a fine pitch, enabling a particularly good application of the screw principle to insure an efficient propulsion of a liquid or other fluid volume.

All of the principles of that pump are perpetuated in the instant pump, the latter embodying an improvement which actual experimentation shows to make the new pump approximately 70% more efficient at low speeds than the original pump. With this preamble in mind the objects of the invention are as follow:

First, to provide a pump for fluids, usually liquid but conceivably gaseous, especially contrived to insure the delivery of an exceptionally large volume.

Second, to provide a pump particularly adapted for use in circulating the water in a closed, fresh-water cooling system of a marine engine.

Third, to provide a pump for fluids, wherein the specially constructed blades on the revoluble rotor coact with a fixed fin on the stator for the purpose of checking a retrograde slippage of the fluid volume in transit.

Fourth, to provide a pump wherein the fine-pitch trailing edges of the widely spaced set of rotor blades are supplemented with a closely spaced and also finely-pitched sectional blade set, the two sets being separated by an annular space which is occupied in part by a relatively fixed fin.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawing, in which:

Figure 1 is a partially sectional and elevational view of the improved pump, particularly illustrating the new type of rotor.

Figure 2 is a detail perspective view of the fixed fin or insert which is adapted to occupy a working position in an annular space between the two sets of blades.

Figure 3 is a cross section taken on the line 3—3 of Fig. 1.

Figure 4 is a detail section taken on the line 4—4 of Fig. 3.

Figure 5 is a front elevation of the improved

rotor, illustrating the relationship of the fixed fin with the blades of the rotor.

The entire pump is generally designated 1, the outer shell 2 and back plate 3 of which constitute what is herein known as the stator or casing. This stator is mounted rigidly in any desired way, usually upon a base which has provision for screwing it down upon a foundation. A screw threaded inlet 8 is adapted to carry a pipe which is led off to the source of fluid. As indicated above, the particular use to which the instant pump is adapted is that of circulating the water in a closed, fresh-water cooling system of a marine engine. The current practice in the cooling of marine engines is to set up a circulation through its water jacket from the surrounding sea. While this is convenient, yet the practice is attended by a clogging of the cooling passages with marine deposits, which difficulty is overcome by providing a fresh water cooling system totally independent of the water through which the boat is driven.

This particular use makes it desirable to insure the moving of copious volumes of water through the pump, and by experimentation it has been found that the water can be kept going through the stator in the intended direction without the least indication of a retrograde movement such as might tend to occur upon evidence of a back pressure at the water outlet. The rotor 10 with which the improvement is largely concerned, consists of a hemispherical head 12 which is fixed to one end of a shaft 11. The crown 13 of the head comprises a rounded dome which confronts the inlet 8 as plainly shown in Fig. 1.

The free edge 14 (Fig. 4) of the head 12 confronts the back plate 3. The head is attached to the shaft 11 in any desired way, usually by supplying the head with a hub 15 (Fig. 4) into which the shaft is screwed at 16. A packing gland 17 provides for checking the leakage of water around the shaft, and in practice the shaft 11 is supplemented by bearings which both support it and prevent end movement.

A discharge conduit 25 is made integral with the exposed side of the back plate 3. The fluid outlet 26 is actually about a quarter circle in extent, and is in constant communication with the channel 31 established between the confronting surfaces of the head 12 and shell 2. The hemispherical head carries a set of widely spaced blades 27 (Figs. 1 and 5). Each blade when viewed from its leading edge 28 to its trailing

edge 29 (Fig. 5) is seen to be curved on a definitely spiral order.

This contour is eminently well suited to its disposition upon the crown 13, the resultant twist of each blade making the leading and trailing edges stand substantially at right angles to each other. The leading edge 28 coincides approximately with the fluid inlet 8 and is substantially parallel thereto. Said leading edge is also substantially parallel to the axis of the rotor. The advantage of this arrangement is that the leading portion of the blade exercises a definite centrifugal action on the fluid as the latter is drawn in at the inlet 8.

This centrifugal action drives the fluid back through the channel 31 toward the outlet 26, and in order to insure against a retrograde slippage of the water toward the inlet 8, either due to an abnormal back pressure in the discharge conduit 25 or due to the weight of the water in the large portion of the channel 31 adjacent to the outlet 26, provision is made of an auxiliary blade set generally designated 32. This blade set consists of a series of finely pitched blades 33, the leading edges 34 of which overlap the bodies of the succeeding blades so as to be well in advance of the trailing edges 35.

The two sets of blades are separated by an annular space 36. This space is comparatively narrow, but in any event is sufficiently wide to accommodate an insert or fixed fin 37 (Fig. 2). This fin is secured on the interior of the shell 2 by screws 38 or any desired equivalent. The relationship of this fin to the blade sets is well illustrated in Fig. 5 from which it can be seen that its angular extent is approximately the same as the distance between two trailing edges 29 of the widely spaced blades 27.

The fin 37 increases the pressure to a certain extent within the pump due to the fact that the space it occupies displaces a certain amount of water in proportion to the volume of the fin.

The contrast in spacing of the two sets of blades is well seen in Fig. 1. As already stated, the blades 27 are widely spaced as in the former application. The blades 33, which constitute an improvement on the structure in that application, are closely spaced. Their function, working in conjunction with the fixed fin 37 is to obtain and maintain a purchase on the final volume of liquid, holding the latter to such good advantage that slipping back is rendered virtually impossible. The distribution of the blades in the two sets is this; there are two of the auxiliary blades 33 between the continuations of each of a pair of the blades 27.

To make this clear, the continuations *a* and *b* of an adjacent pair *c*, *d*, of blades 27 (Fig. 1) have between them a pair *e*, *f*, of the fine-pitched blades 33. The fact that said blades are finely pitched and much more numerous than the blades 27, supports the foregoing statement that an adequate hold upon the liquid is obtainable in the region of its discharge from the channel 31 adjacent to the outlet 26.

In this particular pump the free edges of the blades in all instances are left perfectly plain. In other words, rubber strip inserts such as are disclosed in the original application as here omitted. This omission is solely to enable simplifying the drawing because said inserts are covered by the original application and are thought not to be necessarily shown again here.

I claim:

1. A pump comprising a stator having a fluid inlet at one end, a fluid outlet at the other end of the stator, a rotor revolvably supported by the stator, having a hemispherical head confronting said inlet, two distinctly contoured blade sets on the external surface of said head, said sets of blades being separated from each other in a plane perpendicular to the axis of the rotor to define an annular space, and a fin fixed internally of the stator occupying a portion of said space.

2. A pump comprising a stator having an axially central fluid inlet at one end, a fluid outlet at the other end of the stator situated in a plane perpendicular to the stator axis, a rotor revolvably supported by the stator having a hemispherical head confronting said inlet, a set of widely spaced blades of involute curvature carried by the rotor, each of said blades being twisted to fit the contour of the head on a spiral order, the composite involute curvature and twist providing leading edges substantially parallel to the axis and trailing edges substantially at right angles to said axis, a set of closely spaced auxiliary blades on the rotor, located contiguously to the fluid outlet, some of the blades of the second set constituting substantial continuations of contiguous blades of the first set, the two sets of blades being separated to define an annular space, and a fin fixed internally of the stator, occupying said space but being only a fraction of its length.

3. A pump comprising a stator having an axially central fluid inlet at one end, a fluid outlet at the other end of the stator situated in a plane perpendicular to the stator axis, a rotor revolvably supported by the stator, having hemispherical head confronting said inlet, a set of widely spaced blades of involute curvature carried by said rotor, each blade being twisted to fit the contour of the head on a spiral order, the composite involute curvature and twist providing a leading edge substantially parallel to the axis and defining a coarse pitch and a trailing edge substantially at right angles to said axis defining a fine pitch, an auxiliary set of closely spaced blades contiguous to the fluid outlet, the blades of said second set also carried by the rotor and being finely pitched in agreement with the trailing edges of the blades in the first set, the blades of the two sets being separated from each other to define an annular space, and a segmental fin fixed internally of the stator and occupying a portion of said annular space.

4. In a pump, a revolvable rotor having a hemispherical head, a set of widely spaced blades of involute curvature on the crown of the head, each of said blades having a spiral twist to fit said crown, the composite involute curvature and twist providing coarsely pitched leading edges substantially parallel to the axis and finely pitched trailing edges substantially at right angles to the axis, and a closely spaced set of blades also on said head, being separated from the first set of blades in the axial direction of the rotor to define an annular space, the blades of the second set being pitched in substantial agreement with the trailing edges of the blades in the first set, some of the blades of the second set being substantial continuations of the blades of the first set.

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