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(54) Water pump impeller.

(57) The invention provides a water pump impeller for an i.c. engine made as an injection moulding of glass filled nylon with an embedded aluminium alloy die cast ring (22) which acts as a reinforcement to hold the impeller as a force-fit on its drive shaft but without contact between the metal ring (22) and the shaft.

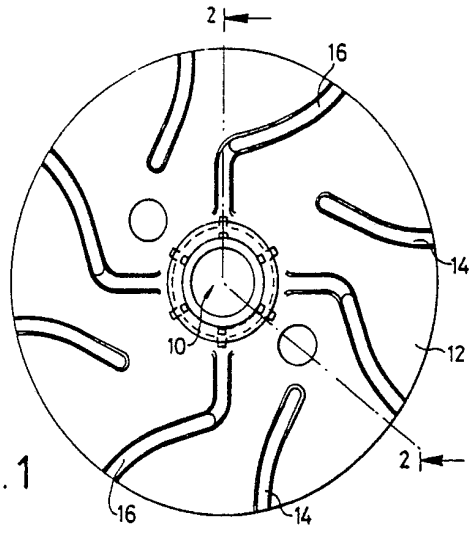


Fig. 1

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WATER PUMP IMPELLER

This invention relates to impellers for water pumps used in internal combustion engine cooling systems. The industry standard for such impellers has effectively been an iron casting, necessarily having a machined bore usually made as a force-fit on its drive shaft.

As mentioned in the preamble to BP 1 386 937 it is known to make water pump impellers of plastics material, for example for washing machines where the water temperature is essentially below 100 degrees C and the rotating speed usually below 3000 rpm, but in an i.c. engine the pump speed may be very much higher and (which is more important) because of the use of a pressurised cooling system, the temperature is also substantially higher. The washing machine pump impeller is found to be unsatisfactory in such i.c. engine situations. The said Patent 1 386 937 provides a solution in which metal is used for a hub which fits onto the drive shaft, and plastics for the vane portion. However, in order to anchor the metal and plastics together, the metal hub has radial projections and because of the manufacturing cost in making the bore of the metal hub of appropriate dimensions and tolerance to be a force fit on the drive shaft and providing the radial projections, the manufacturing cost for that combination may offer little or any advantage compared with the use of a metal casting which also provides the vanes.

The object of this invention is to provide a new solution allowing a plastics impeller to be provided and which does offer economic advantage.

According to the invention we use metal for a reinforcing ring used only to hold the impeller to the drive shaft but not itself contacting the drive shaft at any point. As a consequence, the manufacturing tolerance for the metal is much wider than would otherwise be possible, and machining of the metal can be completely avoided. Moreover, if (as in the prior art) the metal hub is to contact the shaft to give driving engagement, then erosion of the hub for example as a result of corrosion may result in unsatisfactory drive engagement. By avoiding any such metal-to-metal contact in the present invention, this risk is avoided.

Accordingly the invention provides an injection moulded plastics water impeller primarily for an i.c. engine comprising an injection moulded plastics component having a disc-like portion provided with drive vanes and characterised in that a tubular sleeve-like portion of the plastics material is provided to make drive engagement with the drive shaft of the impeller, in combination with a metal reinforcing ring wholly embedded in the plastics material, surrounding said sleeve-like portion, and spaced from the bore of said sleeve-like portion.

Conveniently the metal ring is partly of the same axial length as the sleeve-like portion of plastics, and then it can be located in the injection moulding die by being clamped between the die halves. The ring may have castellations at its ends or other apertures to allow flow of plastics into the ring to form the plastics sleeve as a complete lining for the ring as well as to completely surround the ring.

Preferably the material for the ring is an aluminium alloy made as a die casting and left rough and unmachined, and that for the plastics is a glass filled nylon.

One embodiment of the invention is more particularly described with reference to the accompanying drawings in which:-

Figure 1 is an elevation of an impeller;

Figure 2 is a section taken on the line 2,2 of Figure 1;

Figure 3 is an elevation of the reinforcing ring used in the impeller of Figure 1, on an enlarged scale;

Figure 4 is a sectional elevation of the same taken along the line 4 4 of Figure 3; and

Figure 5 is a sectional plan view taken on the line 5 5 of Figure 3.

Referring now to the drawings, the impeller has a bore 10 to receive the drive shaft (not shown) and comprises a disc 12, Figure 1, of suitable contour as seen in Figure 2, and provided with four sets of vanes 14,16. The impeller is made as an injection moulding of glass-filled nylon 66.

Embedded in the moulding is the insert ring or reinforcement as shown in Figures 3-5. This comprises a short cylindrical tubular portion 20 having a plurality of regularly spaced axially extending external ribs or fins 22 which project beyond the ends of the tube as best seen in Figure 5 and the spaces between those projecting ends form castellations 24.

The insert is a diecasting made of an aluminium alloy, left unfinished, that is un-machined, with its natural surface finish.

The axial length of the ribs is identical to that of the impeller moulding. This enables the insert to be located in the mould cavity and clamped between the parts of the mould, and the said parts may meet at a plane containing the periphery of the disc 10. The insert is thereby fixed in position concentrically of a core plug (part of the die) which forms the bore 10.

The plastics material forming the moulding may be injected at any suitable point (s) and flows through the castellations between the annular

space surrounding the core plug and inside the tube 20 to form a sleeve 21, and the space outside the tube 20. When the plastics material has solidified this means that the insert is embedded and keyed to the plastics material, and the bore is formed in the plastics material. The hardness of the plastics material makes it suitable to be force fitted to the drive shaft and provides a wide tolerance in dimensions.

The expansion characteristics of the aluminium and that of the nylon are not greatly dissimilar so that when the plastics at an elevated temperature is injected into the mould containing a relatively cold insert (thereby heating the insert albeit to a lower temperature) and then the plastics cools, a good tight embrace of the metal insert by the plastic moulding is obtained.

Claims

1. A water pump impeller primarily for an i.c. engine cooling system, comprising an injection moulded plastics component having a disc-like portion 12 provided with drive vanes 14, 16, and characterised in that a tubular sleeve-like portion 21 of the plastics material is provided to make drive engagement with the drive shaft of the impeller, in combination with a metal reinforcing ring 20, 22 embedded in the plastics material, surrounding said sleeve-like portion, and spaced from the bore of said sleeve-like portion.

2. An impeller as claimed in Claim 1 wherein said ring is generally tubular and of the same axial length as the impeller so as to be located in the die cavity forming the injection moulding with its ends clamped between respective parts of the forming die.

3. An impeller as claimed in Claim 2 wherein the ring has castellated ends 22, 24 to allow flow of injected plastics material between the sleeve and disc.

4. An impeller as claimed in any of Claims 1-3 wherein the ring is an unmachined aluminium or aluminium alloy die casting.

5. An impeller as claimed in any of Claims 1 to 4 wherein the plastics is a glass filled nylon.

6. An impeller as claimed in Claim 4 wherein the ring has a plurality of radial ribs 22 extending along its length.

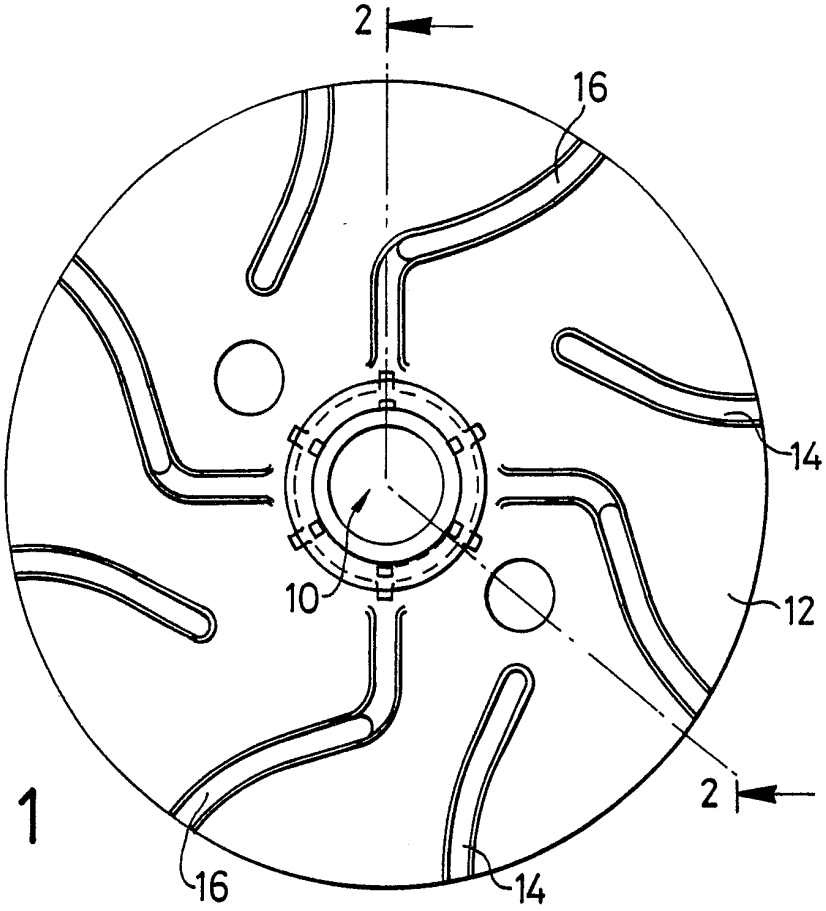


Fig. 1

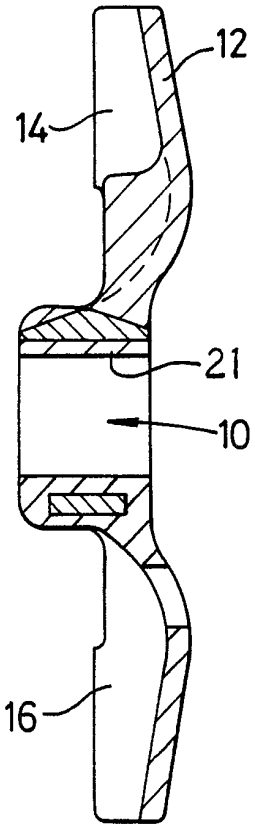


Fig. 2

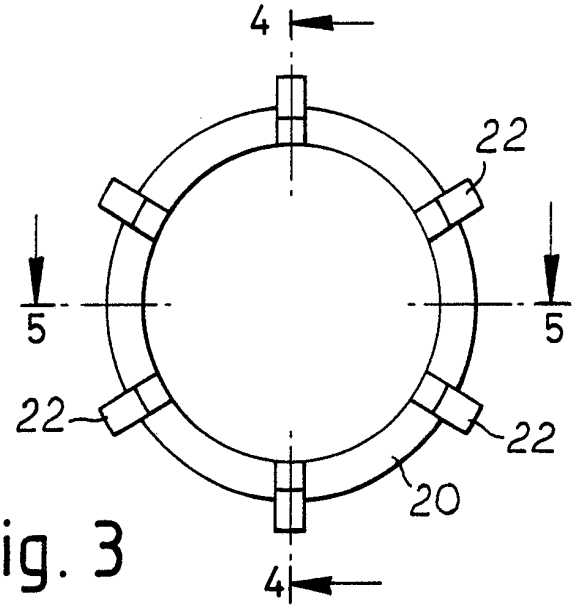


Fig. 3

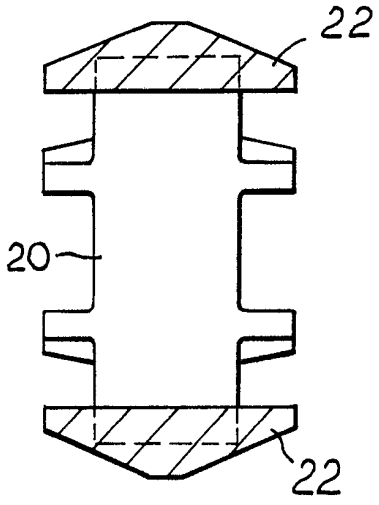


Fig. 4

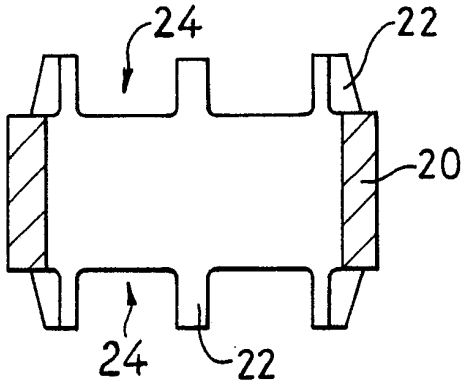


Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 30 4171

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	GB-A- 869 049 (GUEYTRON) * Page 1, lines 9-16; page 3, lines 73-76,102-116; figures 1,3,5 *	1	F 04 D 29/22 B 29 C 45/14
A	DE-A-3 307 386 (WILDEN) * Page 3, lines 1-5; page 5, lines 24-27; page 7, lines 3-5; figure 2 *	1,2,5	
A	LU-A- 67 438 (S.I.M.I.) * Figures 1,2,5,6 * & GB-A-1 386 937 (Cat. D)	3	
A	FR-A- 517 113 (PRATT) * Page 1, lines 1-9; page 2, lines 65-103; figures 3,4 *	6	
A	DE-A-3 311 793 (SKF) * Claim 1; figures 1,3 *	1,2	
A	FR-A-2 462 596 (PARIS RHONE) * Figures 1-3 *	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 04 D
B 29 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31-08-1988	WALVOORT B.W.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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