The present invention refers to a leakageless water pump in which the rotation of the motor is transmitted to the impeller by means of a pair of plates on which magnets are equipped. A partition is mounted in the casing of the pump to separate the pair of blades with each other. One side of the partition is the rotating axle on which one of the pair of plates is fixed. On the other side of the partition is a stationary axle on which the other plate integral with the impeller is freely rotatable supported. The pump can be used in a car to eliminate the leakage of the water and to prolong the life of the pump.
AUTOMOBILE WATER PUMP WITH PERMANENT MAGNETIC COUPLING

FIELD OF THE INVENTION

[0001] The present invention relates to a pump, in particular to a leakproof water pump with a permanent magnetic coupling.

BACKGROUND OF THE INVENTION

[0002] A typical structure of a conventional water pump used in an automobile is shown in FIG. 2, wherein a belt pulley 21 is driven by an engine which is not shown in the figure via a belt. The rotation of the belt pulley 21 is transmitted to a pump impeller 25 installed in a pump casing 26 through a rotary shaft 22. The impeller 25 is rotated to carry out water pumping operation such that water flows in a direction indicated by the arrows shown in FIG. 2. A bearing 23 surrounds the shaft 22 and is placed between the belt pulley 21 and the impeller 25. A sealing means 24 surrounds the shaft 22 and is positioned between the bearing 22 and the impeller 25 so as to prevent water from invading into the region where the bearing 23 is located. The sealing means 24 is provided to assure that water cannot cross over the bearing 23 and there is no leakage below the belt pulley 21 along the shaft 22. However, on the one hand, there must be a clearance between the sealing means 24 and the shaft 22 so that the shaft 22 may freely rotate. On the other hand, the sealing means is worn off due to the shaft 22 rotating at a high speed, causing the clearance between the sealing means 24 and the shaft 22 becomes increasingly larger. Thus, water leaks into the region where the bearing 23 is located through the clearance. Subsequently it is inevitable that water leaks out of the pump casing below the belt pulley 21 along the shaft 22, no matter how much the leakage is. Water leakage into the bearing 23 will rust the bearing and therefore reduces the lifetime of the whole pump. Meanwhile, the leakage causes water contained in the radiator lost rapidly, resulting in performance of the water cooling system of an automobile deteriorated. In addition, the automobile has to be supplied with water more frequently, otherwise the operation of the automobile will be damaged. The leakage may be decreased a little by improving the sealing means 24. However, the above disadvantages are principally attributed to the structure and design principles of conventional water pumps. Therefore, it is impossible to get rid of these disadvantages merely by improving the sealing filling configurations.

SUMMARY OF THE INVENTION

[0003] It is, therefore, an object of the present invention to overcome the above mentioned disadvantages of the prior art, by providing a leakproof water pump with a permanent magnetic coupling.

[0004] The water pump according to the present invention comprises: a pump casing provided with a partition therein; a rotary shaft in the pump casing; a stationary shaft separated from the rotary shaft by the partition in the pump casing and having two ends, one of which is fixed to the pump casing; a pump impeller sleeved on the other end of the stationary shaft; and a panel type permanent magnetic coupling comprising a driving magnetic plate coupled to the rotary shaft, and a driven magnetic plate coaxial and positioned at opposite sides of the partition.

[0005] The driving magnetic plate of the panel type permanent magnetic coupling is identical to the driven magnetic plate of the panel type permanent magnetic coupling, each of the magnetic plates has a surface with magnets fitted thereon, the surface of the driving magnetic plate is faced with that of the driven magnetic plate.

[0006] Each magnetic plate of the panel type permanent magnetic coupling consists of an annular ferrous plate and a plurality of permanent magnets arranged at a surface of the ferrous plate. The magnets are arranged along the circumference of the annular surface into an annular ring and magnetized with alternative N and S poles. The number of the magnets is preferably even.

[0007] Adjacent magnets may closely contact with each other. But, there may be clearance between each two adjacent magnets.

[0008] The partition is made from non-magnetic metallic material or macromolecule non-metallic material.

[0009] Preferably, a bearing is positioned between the impeller and the stationary shaft.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0010] In the drawings:

[0011] FIG. 1 is schematic illustration showing the structure of a pump according to the present invention;

[0012] FIG. 2 is schematic illustration showing the structure of a conventional automobile pump in the prior art;

[0013] FIG. 3 is schematic illustration showing the structure of a panel type permanent magnetic coupling used in the pump according to the present invention;

[0014] FIG. 4 is schematic illustration showing the structure of water lubricating slide bearing.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0015] The present invention will now be described with reference to accompanying drawings. As it is shown in FIG. 1, a pump according to the present invention comprises a pump casing 18, a rotary shaft 12, a panel type permanent magnetic coupling, an impeller 15, and a stationary shaft 19. The casing 18 is provided with a partition 17 therein, which divides the space defined by the pump casing 18 into two portions. The rotary shaft 12 and the stationary shaft 19 are located at opposite sides of the partition 17 respectively. That is to say, the rotary shaft 12 and the stationary shaft 19 are separated by the partition 17 and located in different portions of the pump casing 18. The partition 17 causes water flow as indicated in FIG. 1. Thus, the rotary shaft 12 and the bearing 13 are completely separate from the region where water flows through. Hence, it is impossible to have water leaked out of the pump casing along the rotary shaft 12. The permanent magnetic coupling includes a driving magnetic plate 14 and a driven magnetic plate 16 wherein the two plates are spaced and positioned at opposite sides of the partition 17. The driving magnetic plate 14 and the driven magnetic plate 16 may be identical to each other. A surface of each magnetic plate is fitted with a plurality of magnets 32. The surface with magnets 32 of the driving magnetic plate 14 faces the surface with magnet 32 of the
driven magnetic plate 16. The diving magnetic plate 14 is coupled to the rotary shaft 12 and the driven magnetic plate 16 is coupled coaxial and mechanically to the impeller 15. The engine drives the belt pulley 11 to rotate and in turn the rotary shaft 12 and the driving magnetic plate 14 are driven accordingly. Although the driven magnetic plate 16 is separated from the driving magnetic plate 14 by the partition 17, power from the engine is transmitted to the driven magnetic plate 16 of the panel type permanent magnetic coupling by means of the magnetic field formed between the driving and driven magnetic plates 14 and 16. Then the driven magnetic plate 16 makes the pump impeller 15 rotate so as to perform water pumping operation. As shown in FIG. 4, a sliding bearing 20 is sleeved on the stationary shaft 19 and positioned between the stationary shaft 19 and the impeller 15. The sliding bearing 20 provides a radial constriction to the rotation of the impeller 25. A shaft head 10 is provided on one end of the stationary shaft 19 to prevent the impeller 15 from rising along the stationary shaft 19 (please see FIG. 4). Unlike the rotary shaft 12, the stationary shaft 19, the other end of which is fixed to the pump casing 18, is not rotatable.

[0016] If the pump casing 18 is cast from non-magnetic material, the partition 17 may be an integrated portion of the pump casing. As an alternative, the partition 17 may be made from non-magnetic metallic material or macromolecule non-metallic material.

[0017] As shown in FIG. 3, the driving and driven magnetic plates 14 and 16 are a pair of magnetic plates with completely the same structure and the same size. Each magnetic plate consists of an annular ferrous plate 31 and a plurality of permanent magnets 32 arranged at a surface of the ferrous plate 31. The number of the said magnets 32 is even. The magnets are arranged along the circumference of the annular surface into an annular ring and magnetized with alternative N and S poles. Each magnet may closely contact with adjacent magnets. But there may be clearance between adjacent magnets.

[0018] FIG. 4 shows interrelationship among the impeller 15, the stationary shaft 19 and the water lubricated sliding bearing 20. The reference numeral 10 denotes the shaft head.

ADVANTAGES OF THE PRESENT INVENTION

[0019] The present invention employs a permanent magnetic coupling which can make transmission of both motion and power over a distance possible and feasible. Thus it is possible to completely separate the water flowing portion from the transmission portion. When it is used in an automobile, the problem of water leakage is eliminated. The lifetime of the pump is prolonged accordingly. The coolant in the radiator of an automobile will not be lost and the automobile can ran under normal temperature. Thus, the reliable performance of the automobile is assured.

What I claim is:

1. A water pump with a permanent magnetic coupling comprising:
   a pump casing provided with a partition therein;
   a rotary shaft in said pump casing;
   a stationary shaft separated from said rotary shaft by said partition in said pump casing and having two ends, one of which is fixed to said pump casing;
   a pump impeller sleeved on the other end of the stationary shaft; and
   a panel type permanent magnetic coupling comprising a driving magnetic plate coupled to said rotary shaft, and a driven magnetic plate coupled to said impeller, said two magnetic plates are coaxial and positioned at opposite sides of said partition.

2. The pump according to claim 1, wherein said driving magnetic plate of said panel type permanent magnetic coupling is identical to said driving magnetic plate of said panel type permanent magnetic coupling, each of said magnetic plates has a surface with magnets fitted thereon, said surface of said driving magnetic plate is faced with that of said driven magnetic plate.

3. The pump according to claim 1, wherein each magnetic plate of said panel type permanent magnetic coupling consists of an annular ferrous plate and a plurality of permanent magnets arranged at a surface of said ferrous plate, said magnets are arranged along the circumference of the annular surface into an annular ring and magnetized with alternative N and S poles, the number of the said magnets 32 is even.

4. The pump according to claim 3, wherein adjacent magnets closely contact with each other, or there is clearance between each two adjacent magnets.

5. The pump according to claim 1, wherein said partition is made from non-magnetic metallic material or macromolecule non-metallic material.

6. The pump according to claim 1, wherein a bearing is positioned between said impeller and said stationary shaft.