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(Description)

Purely Rolling Bearing

The present invention relates to a rolling bearing, particularly to a purely rolling bearing without sliding friction.

The usual rolling bearing comprises an inner race ring and an outer race ring, a number of rolling members and a retainer. The retainer is provided in the bearing for the rolling members to locate each other and for the relative location of the rolling members the bearing, no matter what the structure of the retainer is, no matter what material and smooth finish the retainer is, the rolling members are restricted by the retainer at high speed by means of sliding friction. However, such sliding friction resistance has serious influences on performance and life of the bearing. The relative sliding friction between the rolling members and the retainer will cause a series of problems when the bearing is running, especially under the circumstance of high speed or super high speed, for example, it's hard to be lubricated, the temperature rising of the bearing increases, noise becomes high. Under the circumstance of high temperature and high speed, the stress will increase rapidly, which results in ruin of the bearing, but with comparison to the sliding friction resistance, rolling friction resistance is little. The existing of the sliding friction also makes the load capacity of the bearing decline greatly. Under the circumstance of high speed, sliding friction force produced by the action of the centrifugal force between the rolling members and the retainer will suddenly increase, and friction stress concentration also lead to the rapid ruin of the bearing. Consequently, the raise of utmost speed of the rolling bearing is greatly confined by the sliding friction.

The object of the present invention is to provide a kind of new rolling bearing without normal retainer, using rolling constraint instead of sliding constraint.

To achieve the purpose, a positioning rolling members is assembled between the two adjacent rolling members along circumferential direction, the said positioning rolling members simultaneously ensure uniform circumferential spacing of the adjacent rolling members and confine the rolling member to axial location in the bearing. The axial and radial location of the positioning rolling members are restricted by the positioning rings on the raceways of the two opposite ends of the positioning rolling members. The contacts between the positioning rings and raceway are point contacts, so are the point contacts between the positioning rolling members and the adjacent rolling members. The positioning rolling members are running when the bearing is in use. The movement includes a self-rotation and revolution round the axis of the bearing. The relative velocity difference between the positioning rolling members and the rolling members at the contact points is zero, so is the relative velocity difference between the positioning members and the positioning rings. Therefore, the movements all belong to purely rolling movements. There is no relative sliding friction, it is "purely rolling bearing" really. The bearing defined in the present invention are easy to be assembled and manufactured, the present invention can therefore be applied easily and widely.

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The present invention will be described in details, made with reference to the preferred embodiment and the drawing.

Figure 1 showing the detailed structure of the present invention.

Referring to the Figure 1, a positioning rolling member 2 is assembled between every two adjacent rolling members 1 along the circumferential direction, and the positioning rolling member simultaneously ensures uniform circumferential spacing between two adjacent rolling members and confine the rolling members to the axial location in the bearing. The axial location and radial location of the positioning rolling members are restricted by positioning rings 6 on the raceways 5 of two opposite ends of the positioning rolling members. The contacts, between positioning rings 6 and raceway 5, between positioning rolling members 2 and the rolling members 1, between rolling members 1 and the inner race ring 3, between the rolling members 1 and the outer race ring 4 of the bearing are all point contacts, and the relative velocity differences between the two above mentioned objects at the contact points are all zero. Therefore, the bearing is a purely rolling bearing.

The positioning rolling members may be made into parted parts for the convenience of assembly and production, and may be fixed together by means of tight fit and the like.

Summary of the Invention

The object of the invention is to provide a purely rolling bearing, which is in a simple structure and easy to be assembled.

In order to realize the above object, the invention provides a purely rolling bearing which comprises an inner race ring, an outer race ring, a number of rolling members between the inner race ring and the outer race ring, positioning rolling members arranged in alternation with the rolling members and kept in rolling contact with the balls, and a positioning ring arranged on the race ways of the two ends of the positioning rolling members, wherein, the related positioning rings are all made up of unitary part, and in the rolling contact with the raceways.

The invention is put forward as follows:

Each positioning rolling member is assembled between the two adjacent rolling members. The positioning rolling members insure simultaneously uniform circumferential spacing of the adjacent rolling members and confine the rolling members to axial location in the bearing. The axial and radial location of the positioning rolling members are restricted by the positioning rings on the raceways of the two opposite ends of the positioning rolling members. The contacts between the positioning rings and any raceway of the positioning rolling members are point contacts, and so are the point contacts between any one of the positioning rolling member and the adjacent rolling member. The movements of the positioning rolling members include a self-rotation and a revolution round the axis of the bearing. The relative velocity difference between a contact point on any one of the location rolling bodies and the contact point on the rolling body contacted, both of which coincide each other, is zero, and so is the relative velocity difference between a contact point on either of the location rings and the contact point on the location rolling body contacted, both of which coincide each other. Therefore, those movements of the contact points all belong to purely rolling movements. There is not any relatively sliding friction. The bearing is a purely rolling bearing, which name matches reality. The assembly and production of the bearing of the invention are easy. So the invention could be extended and applied easily and widely.

The following will further describe in detail the invention in combination with a preferred embodiment together with the figures attached.

Brief Description of the Drawings

Fig. 1 is the radial section view of a rolling bearing of the invention.

Detailed Description of the Preferred Embodiments

Please refer to Fig.1, each positioning rolling member 2 is assembled between two adjacent rolling members 1 and along the circumferential direction. The positioning rolling members 2 insure simultaneously uniform circumferential spacing between two adjacent rolling members 1 and confine the rolling members to the axial location in the bearing. The axial location and radial location of the positioning rolling members are performed by positioning rings 6 on the raceways 5, which is a circular arc in cross section, of two opposite ends of the positioning rolling members. The contacts between either of the location rings 6 and any one of the raceways 5, any one of the location rolling bodies 2 and the rolling body 1 contacted and any one of the rolling bodies 1 and the inner race ring 3 or the outer race ring 4 of the bearing are all point contacts, and the relative velocity differences between any two points contacted with each other are all zero. Therefore the bearing is a purely rolling bearing.

The cross section of the raceway 5 is concave shape, the cross section of the positioning ring 6 is a convex shape, so that they form a rolling contact. On the contrary, let the cross section of the raceway 5 be a convex shape and the cross section of the positioning ring 6 be a concave shape, it is feasible too. In addition, the cross section of the raceway 5 and the central raceway 7 of any of the positioning rolling member 2 contacted with the rolling member 1 may be V-shaped, circular-arc-shaped or notch-shaped, and so on. The cross sections of the raceway of the inner race ring 3 and the outer race ring 4 may also be V-shaped, circular-arc-shaped or notch-shaped, and so on.

The positioning rolling member 2 may be made into parted parts, for the convenience of the assembly and production. That is, the two parts which form the two opposite end raceways 5 and the part which forms the central raceway 7 may be produced separately first, then be fixed through the tight fit or screw fit and so on. Of cause, the positioning rolling member 2 may be made into a single part.

A variety of equivalent variations may be made by the technicians familiar with the

technical realm on the basic of the invention, although the invention has been described above combined with a preferred embodiment. Therefore, the scope of the invention should be defined by the claims.

(Claims)

1. a purely rolling bearing, comprises an inner race ring (3), an outer race ring(4), a number of rolling members (1) between the inner race ring(3) and the race ring (4), wherein it also comprises positioning rolling members (2) provided in alternation with the rolling members (1) and kept in rolling contact, and positioning rings (6) provided on the raceways (5) of the two ends of the positioning rolling members(2) and kept in rolling contact.

2. the bearing according to claim 1, wherein the said positioning rolling members (2) are all single parts.

3. the bearing according to claim 1, wherein the said positioning rolling member are parted parts.

4. the bearing according to claim 1, wherein the cross sections of the two opposite ends of any one of the said positioning rolling member (2) may be in concave shape or convex shape.

5. the bearing according to claim 1, wherein the cross section of the said positioning rings(6)may be made into concave shape or convex shape, so that they cooperate with the raceways (5) of the positioning rolling members (2) and roll on them.

6. the bearing according to claim 4, wherein the cross section of the raceways (5) of the opposite ends of any one of the said positioning rolling members (2) and of the central raceway (7) of any one of the said positioning rolling members (2) rolling on the rolling members (1)may be V-shaped, circular-shaped or notch-shaped.

7. the bearing according to claim 1, wherein the cross sections of the raceways of the said inner race ring (3) and outer race ring (4) may be V-shaped, circular-arc-shaped or notch-shaped.

(Abstract)

The present invention relates to a purely rolling bearing of the new structure, particularly to a purely rolling bearing without cage members and sliding friction, replacing the usual rolling bearing which has cage members and sliding friction, and it comprises an inner ring, an outer ring, rolling members, positioning rolling members and positioning rolling rings, eliminating sliding friction caused by space positioning by means of the cage member, remarkably reducing the resistance, energy loss and noise, raising the utmost rotation speed and prolonging life of the bearing, remarkably improving mechanical and dynamic precision and reliability.