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GB A 2132287
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GB 1569326
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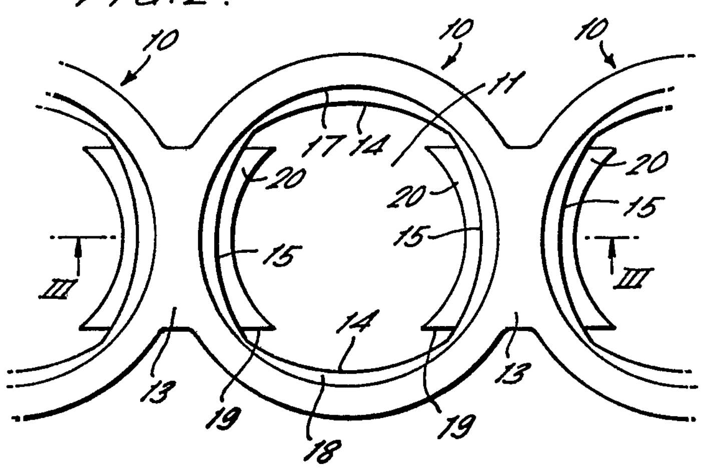
GB 0622805
US 3647269

(58) Field of search
F2A

(54) A ball bearing cage

(57) An integrally moulded plastics radial ball bearing cage comprises an annular series of rings 10 inter-connected with one another, each ring 10 defining a pocket for the reception of a ball. Each of the places 13 at which two adjacent rings 10 are connected with each other has a cross-section larger than that of the rest of the adjacent rings.

FIG. 2.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG. 1.

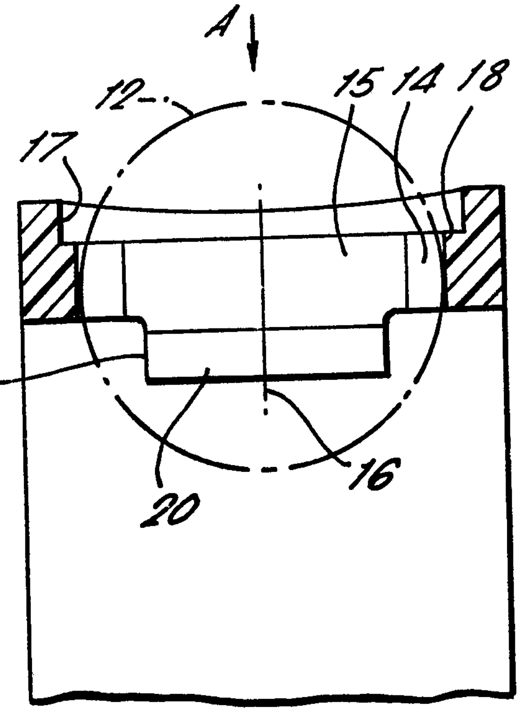

FIG. 2.

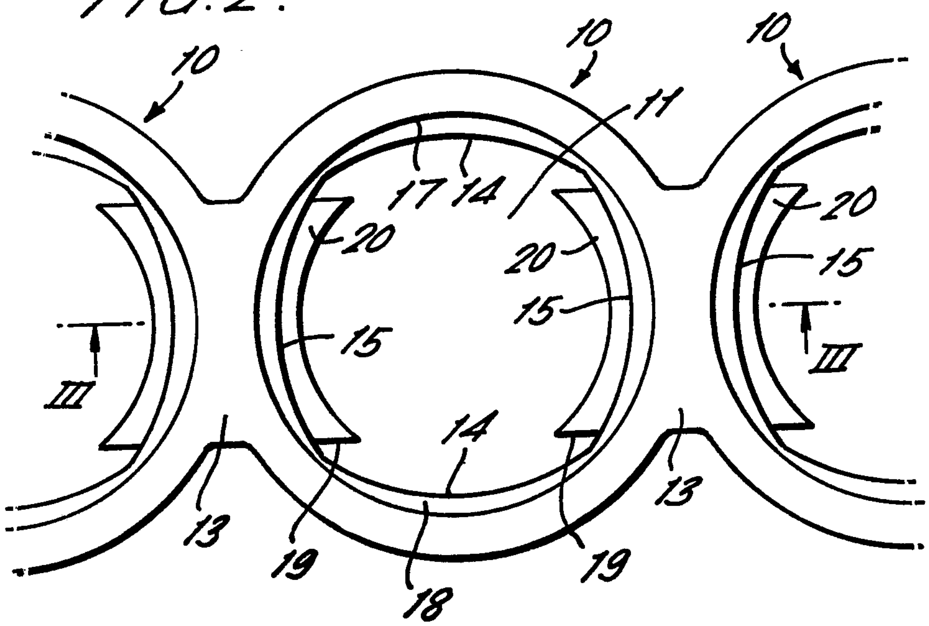

FIG. 3.

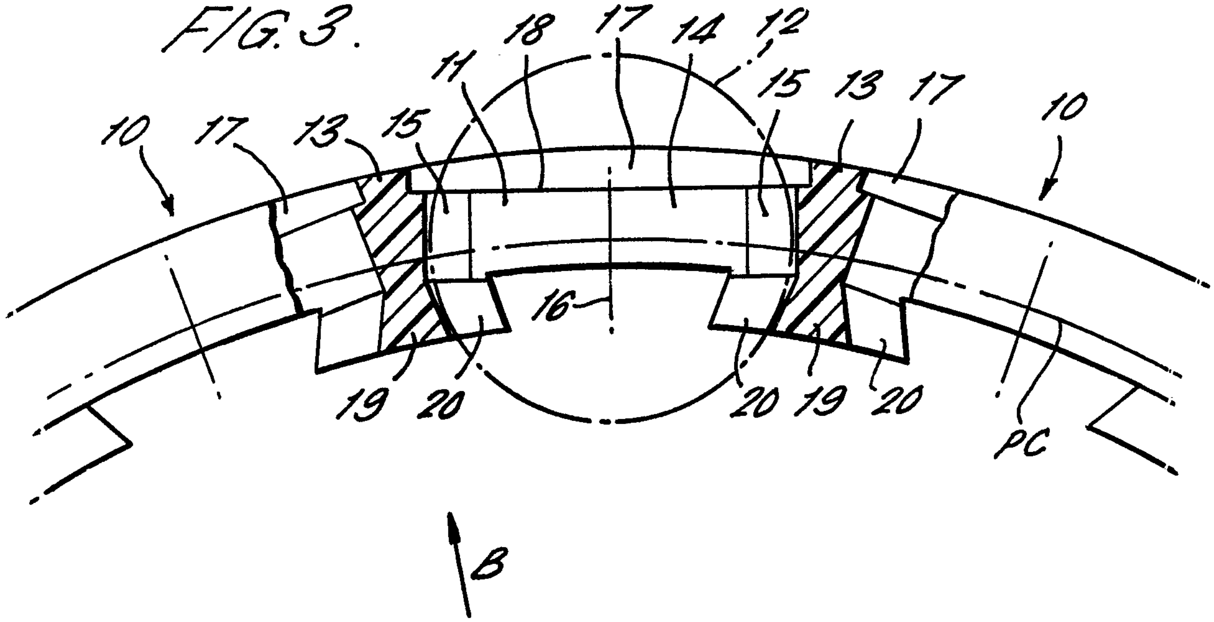

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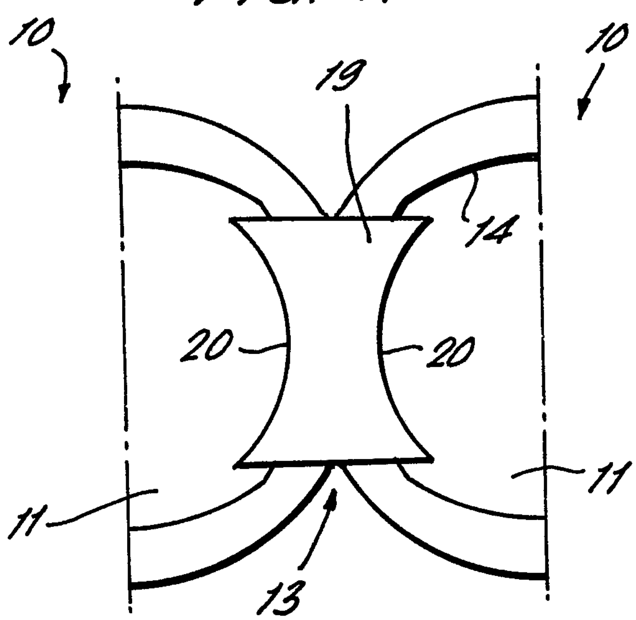
FIG. 4.



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SPECIFICATION

A ball bearing cage

This invention concerns a ball bearing cage, for example for a four point bearing.

Patent specification U.S. 3027206 discloses a bearing cage made from an annular strip of material such as brass. The strip has pockets for receiving balls and radially extending fingers which are bent over after the balls have been inserted in order to hold them in place. Such a cage can be expensive to produce and requires two stages for inserting the balls.

A cage of another construction comprises two separately formed corrugated rings which are joined together to form a cage having a plurality of pockets.

With four point bearings, a mounting procedure is to fit a cage having radially inwardly extending retaining projections in the bore of the outer race ring and then force the balls from radially inside the cage radially outwardly elastically deforming the cage and allowing the balls to "snap" into the pockets. If the retaining projections are spaced closely together, a large force is required to fit the balls into the pockets and this may break off the retaining projections. However, if the projections are spaced further apart, less force is required to fit the balls but also there are fewer balls because of the spacing and there is poor guidance of the cage by the balls.

The invention provides an integrally moulded plastics radial ball bearing cage comprising an annular series of rings interconnected with one another, each ring defining a pocket for the reception of a ball, each of the places at which two adjacent rings are connected with each other having a cross-section larger than that of the rest of the adjacent rings.

Each pocket may have two pairs of surfaces each of which is a part of the surface of a cylinder, the longitudinal axes of the part cylindrical surfaces being each spaced an equal distance from and extending parallel to a radial line extending from the longitudinal axis of the cage and through the centre of the pocket, the part cylindrical surfaces of each pair being diametrically opposed to each other, the radius of the cylindrical surfaces being greater than the radius of the balls for which the cage is intended, and the pitch circle of the cage lying on the surface of an imaginary cylinder, which imaginary surface intersects the part cylindrical surfaces.

Since there is only point contact between a sphere and a cylindrical surface of greater radius, the friction between the ball and the part cylindrical surfaces is only slight. Also the spaces remaining between the ball and the part cylindrical surfaces can be used for lubricant.

Each pocket may have a cylindrical surface extending radially inwardly from the radially outer circumferential surface of the cage, the longitudinal axis of the cylindrical surface is coincident with a radial line extending from the longitudinal axis of the cage and through the centre of the pocket, and the cylindrical surface leads to a step in the pocket at which the pocket narrows.

Each pocket may include two surfaces each a part of the surface of a cone, which part conical extend each from a respective one of the surfaces of one pair of opposed part cylindrical surfaces and from a location radially inside or outside of the pitch circle of the cage in a direction radially away from the pitch circle, which part conical surfaces as they extend in the said radial direction converge with each other.

The part conical surfaces may be provided by projections extending radially from the place at which adjacent rings are connected to each other.

An embodiment of the invention will now be described by way of example, reference being made to the accompanying drawings, of which:

Figure 1 is a part of a longitudinal section of a cage according to the invention;

Figure 2 is a view along arrow A of the cage shown in Figure 1;

Figure 3 is part of a view along the longitudinal axis of the cage with a part section on III - III as shown in Figure 2; and

Figure 4 is a view along arrow B of the cage shown in Figure 3.

The cage shown in the drawings is an integrally moulded plastics radial ball bearing cage. It can be viewed as comprising either of two structures: a first in which it comprises two wavy or corrugated end rings lying on a common axis and joined together by axially extending webs; or a second in which it comprises an annular series of rings 10 interconnected with one another. In either case, a series of pockets 11 are provided each for the reception of a ball 12 - shown in Figures 1 and 3 in chain dot - lying on a pitch circle PC. The places 13 where two adjacent rings 10 are connected with each have a cross-section larger than the rest of the adjacent rings, that is where the rings are not joined together, and the connection plates 13 extend axially for about half the cage width. The effect is that at the places 13 the cage is more resistant to elastic deformation than elsewhere.

Each pocket 11 has two pairs of surfaces 14 and 15. Each surface is part of the surface of a cylinder the radius of which is greater than the radius of the balls 12. The longitudinal axes of the part cylindrical surfaces 14 and 15 are each spaced an equal distance from and extend parallel to a radial line 16 extending from the longitudinal axis of the cage and passing through the centre of the pocket 11. The part cylindrical surfaces 14, 15 of each pair are diametrically opposed to each other with respect to the radial line 16. When viewed along the radial line 16 the cylindrical surfaces 14 and 15 appear as four intersecting arcs. The pitch circle PC of the cage lies on the surface of an imaginary cylinder, the imaginary surface of which intersects the part cylindrical surfaces 14 and 15. The part cylindrical surfaces 14 and 15 are disposed symmetrically about a plane extending perpendicular to the longitudinal axis of the cage and through the centre of each pocket, the plane intersecting the part cylindrical surfaces 15.

Each pocket 11 has a cylindrical surface 17 extending radially inwardly from the radially outer circumferential surface of the cage. The longitudinally axis of the cylindrical surface 17 is coincident with the radial line 16. The cylindrical surface 17 leads to a step 18 in the pocket 11 at which the pocket narrows and from which the part cylindrical surfaces 14 and 15 extend.

Projections 19 extend radially inwardly into the bore of the cage from the places 13 at which the rings 10 are connected to one another. Each projection 19 provides two surfaces 20 each of which is a part of the surface of a cone, one surface 20 for one pocket 11 and one surface 20 for an adjacent pocket. For each pocket therefore there are two part conical surfaces 20. Each of these part conical surfaces 20 extends from a respective one of the surfaces of the pair of part cylindrical surfaces 15 and from a location radially inside of the pitch circle PC. The part conical surfaces 20 at each pocket 11 extend radially inwardly away from the pitch circle PC and converge with each other.

A cage of the kind described and illustrated has a high degree of elasticity because of the design enabling the balls 12 to be fitted with a relatively small force. The relatively large cross-section of the places 13 where adjacent rings 10 are interconnected enables relatively high loads to be accommodated, and the converging part conical surfaces 20 radial guide the cage well on the balls 12.

Various modications are envisaged: for example, the projections 19 providing the part conical surfaces may be arranged to extend radially outwardly instead of radially inwardly; or the cage may be modified to have further projections, providing part conical surface, extending radially outwardly as well as projections extending radially inwardly.

The cage may be used not only for a four point ball bearing with a split or two part inner race ring but also, for example, a deep groove ball bearing having a split or two part inner race ring or a single row angular contact ball bearing.

CLAIMS

1. An integrally moulded plastics radial ball bearing cage comprising an annular series of rings interconnected with one another, each ring defining a pocket for the reception of a ball, each of the places at which two adjacent rings are connected with each other having a cross-section larger than that of the rest of the adjacent rings.

2. Cage as claimed in claim 1, wherein each pocket has two pairs of surfaces each of which is a part of the surface of a cylinder, the longitudinal axes of the part cylindrical surfaces being each spaced an equal distance from and extending parallel to a radial line extending from the longitudinal axis of the cage and through the centre of the pocket, the part cylindrical surfaces of each pair being diametrically opposed to each of other, the radius of the cylindrical surfaces being greater than the radius of the balls for which the cage is intended, and the pitch circle of the cage lying on the surface of an imaginary cylinder, which imaginary surface intersects the part cylindrical surfaces.

3. A cage as claimed in claim 1 or 2, wherein each pocket has a cylindrical surface extending radially inwardly from the radially outer circumferential surface of the cage, the longitudinal axis of the cylindrical surface is coincident with a radial line extending from the longitudinal axis of the cage and through the centre of the pocket, and the cylindrical surface leads to a step in the pocket at which the pocket narrows.

4. A cage as claimed in claim 2, wherein each pocket includes two surfaces each a part of the surface of a cone, which part conical surfaces extend each from a respective one of the surfaces of one pair of opposed part cylindrical surfaces and from a location radially inside or outside of the pitch circle of the cage in a direction radially away from the pitch circle, which part conical surfaces as they extend in the said radial direction converge with each other.

5. A cage as claimed in claim 4, wherein the part conical surfaces are provided by projections extending radially from the place at which adjacent rings are connected to each other.

6. A ball bearing cage substantially as herein described with reference to and as shown in the accompanying drawings.

7. A cage for a ball bearing, for example a plastics cage for four-point bearings, comprising two end rings and webs connecting them, which webs form pockets for accommodating the balls, in which pockets the balls are retained and guided on projections disposed on the cage webs, characterised in that the end rings are thin-walled and are of corrugated construction in peripheral direction, and in that thick webs in peripheral direction and relative to the wall thickness of the end rings, are arranged between the end rings, which webs extend in axial direction approximately over half the cage width.

8. A cage according to claim 7, characterised in that the walls of the cage pockets in the vicinity of the pitch circle are formed by four part cylindrical surfaces with centre axes extending parallel to the pocket centre axis and offset relative thereto.

9. A cage according to claim 7 or claim 8, characterised in that the radius of the part cylindrical surface is greater than the radius of the balls.

10. A cage according to any one of claims 7 to 9, characterised in that towards the circumferential surface of the cage the cage pockets have a cylindrical step.

11. A cage according to any one of claims 7 to 10, characterised in that two opposed part cylindrical surfaces of each cage pocket merge below and/or above the pitch circle with converging conical surfaces.

12. A cage according to claim 11, characterised in that the conical surfaces are disposed on projections of the webs protruding radially beyond the cage body.

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