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(54) A plastics snap cage for a radial ball bearing

(57) A plastics snap cage (1) comprises pockets (2) and openings (7). Each pocket (2) has a radially extending first cylindrical surface (2*a*) which opens to the radially outer surface of the cage, an adjoining conically extending surface (2*b*) and a second cylindrical surface (2*c*) adjoining the narrower end of the conically extending surface and opening to the radially inner surface of the cage. The opening (7) is defined by facing planar parallel radially and axially extending surfaces (8).

There is line contact (6) between the ball (3) and the conical surface (2*b*) and the facing surfaces (8) intersect only the first cylindrical surface (2*a*) to keep the line contact (6) to a maximum.

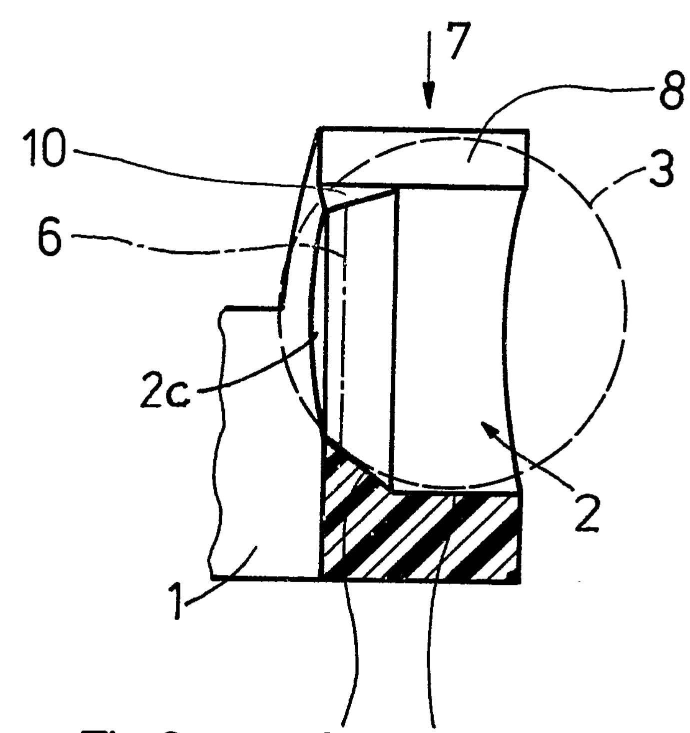


Fig. 3

GB 2 066 381 A

Fig. 1

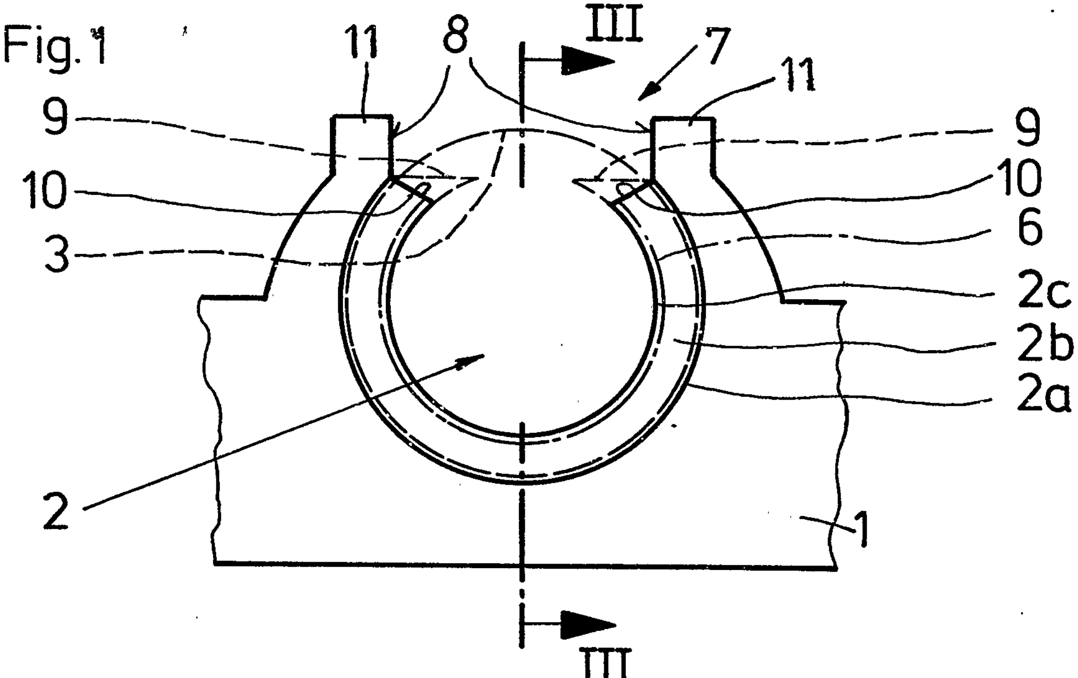


Fig. 2

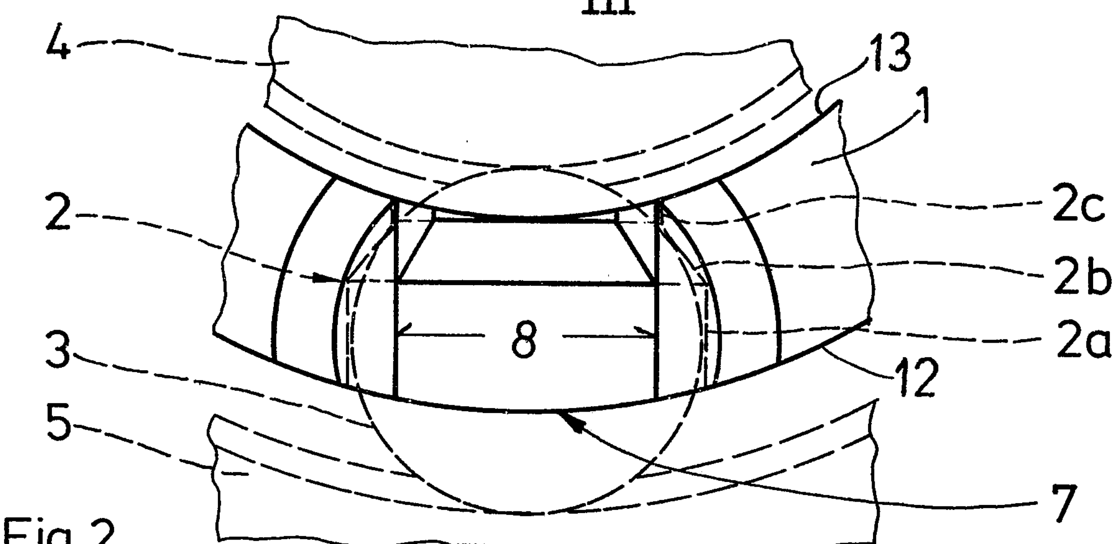
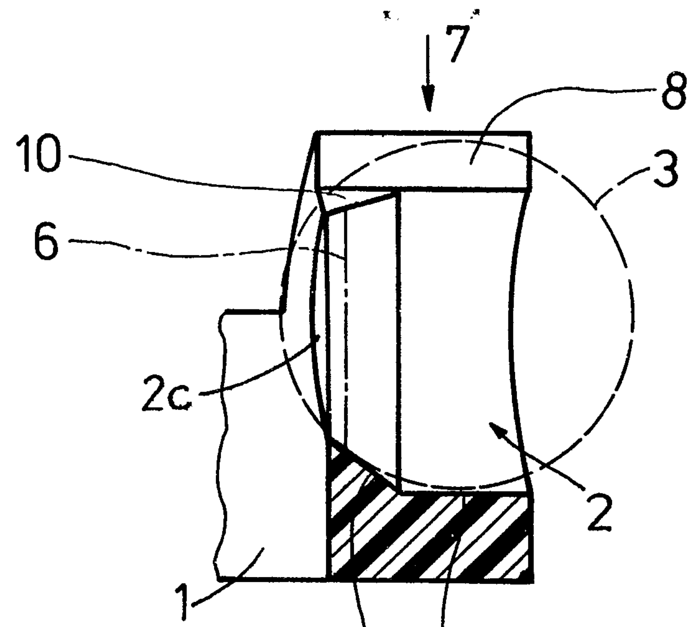


Fig. 3



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SPECIFICATION

A plastics snap cage for a radial ball bearing, and a radial ball bearing having the plastics snap cage

This invention is concerned with a plastics snap cage for a radial ball bearing and includes a radial ball bearing having the plastics snap cage.

The invention provides a plastics snap cage for a radial ball bearing, the cage having a plurality of pockets each for accommodating a ball for which the cage is intended, and a plurality of openings, one for each pocket, in one axial end face of the cage, each opening being defined by facing planar parallel faces extending symmetrically on opposite sides of a plane in which lies the longitudinal axis of the cage, each pocket having a first cylindrical surface the axis of which extends radially of the cage and which opens to the radially outer circumferentially extending surface of the cage, the first cylindrical surface being adapted to accommodate a ball for which the cage is intended, a conically extending surface adjoining the radially inner end of the first cylindrical surface to bear on a ball for which the cage is intended, the conically extending surface narrowing in the radial direction away from the first cylindrical surface, and a second cylindrical surface adjoining the narrower end of the conically extending surface, the first and second cylindrical surfaces and the conically extending surface all having a common radially extending axis, and the facing planar parallel surfaces intersecting the first cylindrical surface but not the conically extending surface nor the second cylindrical surface.

The opening defined by the facing planar parallel surfaces may extend over the whole radial width of the cage, and each surface extending between one of the facing planar parallel surfaces and the conically extending surface may form an acute angle with the said plane in which lies the longitudinal axis of the cage.

The invention also includes a radial ball bearing having a plastics snap cage according to the invention.

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

Figure 1 shows part of a plastics snap cage according to the invention viewed radially of the cage;

Figure 2 shows a part of a radial ball bearing with the part of the cage shown in Figure 1, and viewed on the longitudinal axis of the cage; and

Figure 3 shows a section on III—III of the part of the cage shown in Figure 1.

Figures 1, 2 and 3 illustrate a part of an annular cage 1 for a radial ball bearing, the cage having a plurality of pockets 2 each accommodating a ball 3 (shown in dashed line), only one pocket being shown.

The part of the radial ball bearing shown in Figure 2 comprises an inner member or race ring 4 (shown in dashed line) providing an inner raceway surface for the balls 3, and an outer member or race ring 5 (shown in dashed line) providing an outer raceway surface for the balls.

Each pocket 2 of the cage 1 has a first cylindrical surface 2*a*, the axis of which surface extends radially of the cage 1 and which surface opens to the radially outer circumferentially extending surface 12 of the cage. Adjoining the radially inner end of the first cylindrical surface 2*a* is a conically extending surface 2*b*, which conically extending surface narrows in the radial direction away from the first cylindrical surface. A second cylindrical surface 2*c* adjoins the narrower end of the conically extending surface 2*b* and opens to the radially inner circumferentially extending surface 13 of the cage 1. The second cylindrical surface 2*c* is much shorter, in its axial length, than either the first cylindrical surface 2*a*, or the conically extending surface 2*b*. The first and second cylindrical surfaces 2*a* and 2*c* and the conically extending surface 2*b* all have a common radially extending axis.

The first cylindrical surface 2*a* of the pocket 2 has a diameter slightly greater than the diameter of the ball 3, so that the ball is accommodated by the first cylindrical surface with slight play.

Upon contact of the conically extending surface 2*b* with the ball 3, the conically extending surface extends tangentially to the surface of the ball and a line 6 (shown in chain-dot) of contact is formed between the two surfaces. When the radial ball bearing shown in Figure 2 is running at a high speed, there is a correspondingly high rate of rotation of the cage 1 which causes the cage to expand slightly radially outwardly due to centrifugal force. This outward movement of the cage 1 causes the conically extending surface 2*b* to bear firmly against the ball 3.

The ball 3 projects through the short second cylindrical surface 2*c* without contacting it.

The cage 1 has a plurality of opening 7, one for each pocket 2, in one axial end face of the cage. Each opening 7 is defined by facing planar parallel faces 8 extending symmetrically on opposite sides of a plane in which lies the longitudinal axis of the cage 1. Looking at Figure 1, the plane can be considered as extending on the section line III—III and perpendicular to the plane of the paper. The opening 7 defined by the facing planar parallel surfaces 8 extends over the whole radial width of the cage 1 and the surfaces 8 determine the clear internal width of the opening 7.

The distance between the facing planar parallel surfaces 8 is determined by the diameter of the ball 3, the resilience of the cage material in the snap-on operation, and by the construction of the cage 1. In the illustrated embodiment, the cage 1 has two walls 11 for each pocket 2, which walls extend axially and radially of the cage and provide the facing planar parallel surfaces 8 of the opening 7.

To mount the cage 1 on the bearing shown in Figure 2, the balls 3 are located between the race rings 4 and 5 and the cage is brought up axially and urged between the race rings until the balls snap through the openings 7 into the pockets 2, the walls 11 deforming resiliently outwardly as the balls enter through the openings.

Since the opening 7 extends completely over the whole radial width of the cage 1, a region of the conically extending surface 2*b* is missing from the pocket 2 and thereby reduces the length of the line 6 of the contact between that surface and the ball 3.

To keep this reduction in length to a minimum, the facing planar parallel surfaces 8 intersect only the first cylindrical surface 2*a* of the pocket 2 and not the conically extending surface 2*b* nor the second cylindrical surface 2*c*. This then keeps the axial depth of the opening 7 into the pocket 2 to a minimum and maintains as large as possible length of the line 6 of contact between the conically extending surface 2*b* and the ball 3. Referring to Figure 1, the pocket 2 will then have a configuration with two relatively thin portions 9 (shown in dashed line) providing parts of the conically extending surface 2*b* and the second cylindrical surface 2*c*. The axially outwardly facing surfaces of these portions 9 lie on a plane perpendicular to the longitudinal axis of the cage (perpendicular to the plane of the paper showing Figure 1), which plane defines the limit of the clear axial depth of the opening 7 into the pocket 2.

Since the portions 9 are relatively thin and provide sharp edges which may break off when the balls 3 snap into the pockets 2, the portions 9 are bevelled off to provide surfaces 10, each of which surfaces extends between one of the facing planar parallel surfaces 8 and the conically extending surface 2*b* and forms an included acute angle with a plane in which lies the longitudinal axis of the cage 1 and which extends mid-way between and parallel to the surfaces 8. This reduces slightly the length of the line 6 of contact between the conically extending surface 2*b* and the ball 3, but the length of contact is still substantially greater than if the axial depth of the opening 7 into the pocket 2 were greater than that shown and described, than if for example the facing planar parallel surfaces 8 intersected the second cylindrical surface 2*c*.

The ball 3 in the pocket 2 contacts the pocket at a constant location, that is the conically extending surface 2*b*, and the length of the linear contact between the ball and the conically extending surface is kept to a maximum by the facing planar parallel surfaces 8 of the opening 7 only intersecting the first cylindrical surface 2*a* and not the conically extending surface 2*b* nor the second cylindrical surface 2*c*. Thus there is good guidance and retention of the cage 1 on the balls 3 so that even when the bearing is running at a high speed, the cage runs smoothly.

CLAIMS

1. A plastics snap cage for a radial ball bearing, the cage having a plurality of pockets each for accommodating a ball for which the cage is intended, and a plurality of openings, one for each pocket, in one axial end face of the cage, each opening being defined by facing planar parallel faces extending symmetrically on opposite sides of a plane in which lies the longitudinal axis of the cage, each pocket having a first cylindrical surface the axis of which extends radially of the cage and which opens to the radially outer circumferentially extending surface of the cage, the first cylindrical surface being adapted to accommodate a ball for which the cage is intended, a conically extending surface adjoining the radially inner end of the first cylindrical surface to bear on a ball for which the cage is intended, the conically extending surface narrowing in the radial direction away from the first cylindrical surface, and a second cylindrical surface adjoining the narrower end of the conically extending surface, the first and second cylindrical surfaces and the conically extending surface all having a common radially extending axis, and the facing planar parallel surfaces intersecting the first cylindrical surface but not the conically extending surface nor the second cylindrical surface.

2. A plastics snap cage as claimed in claim 1, wherein the opening defined by the facing planar parallel surfaces extends over the whole radial width of the cage, and each surface extending between one of the facing planar parallel surfaces and the conically extending surface forms an acute angle with the said plane in which lies the longitudinal axis of the cage.

3. A plastics snap cage substantially as herein described with reference to and as shown in the accompanying drawings.

4. A radial ball bearing having a cage as claimed in any preceding claim.

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