J. NEWMANN.

BALL BEARING.

APPLICATION FILED AUG. 8, 1918.

1,303,712. **Patented May 13, 1919.**

Fig. 1,

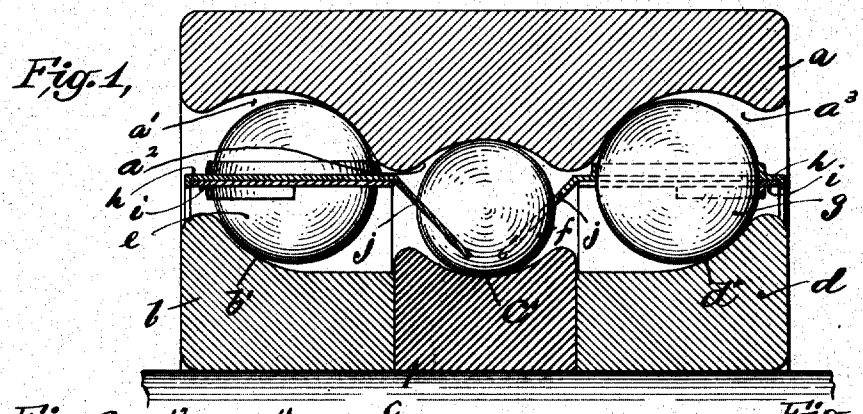


Fig. 2,

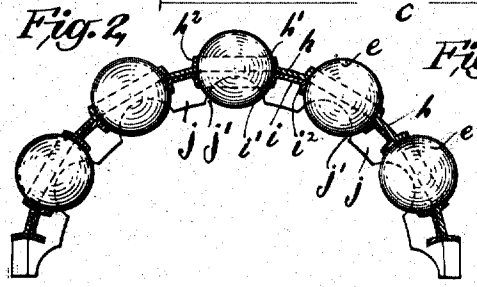


Fig. 3,

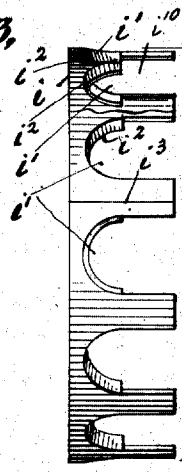


Fig. 4,

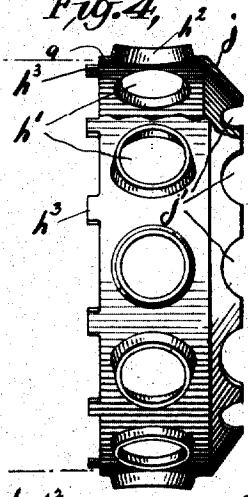


Fig. 5,

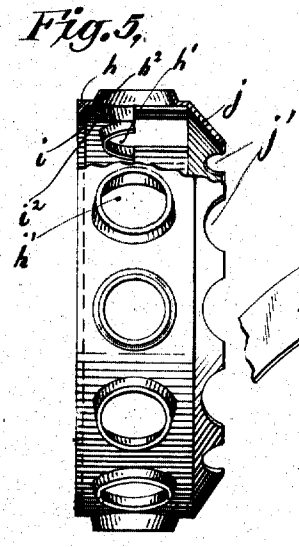


Fig. 6,

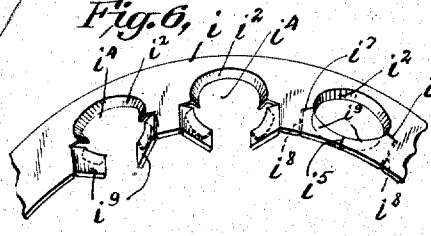
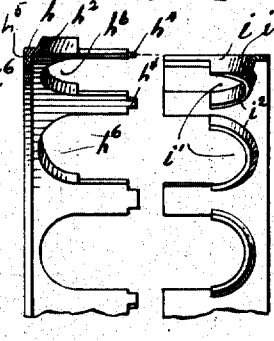


Fig. 7,



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UNITED STATES PATENT OFFICE.

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BALL-BEARING.

1,303,712. Specification of Letters Patent. Patented May 13, 1919.

Application filed August 8, 1918. Serial No. 248,857.

To all whom it may concern:

Be it known that I, JOHN NEWMANN, a citizen of the United States of America, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Ball-Bearings, of which the following is a specification.

The present invention relates to ball bearings particularly of the class in which cages are employed for holding and separating the balls.

The principal object of my invention is to provide an extremely simple, practical and inexpensive construction of a cage for a single, double or multiple ball bearing.

Another object of my invention is to provide a construction of a cage which can be used either for a double or triple ball bearing.

Other objects will be rendered clear from the following detailed description of the invention.

In the accompanying drawing which forms part of this specification and in which similar reference characters denote corresponding parts Figure 1 is a longitudinal section of a part of a triple ball bearing showing two cages each constructed according to the present invention; Fig. 2 is a cross section through one of the cages shown in Fig. 1 on a reduced scale; Figs. 3 and 4 are enlarged longitudinal sections through the inner and outer parts or rings composing the new cage; Fig. 5 is a similar section of the two parts assembled and in which the inner ring is slightly modified in construction; Fig. 6 is a perspective view of a part of the said modified inner ring and Fig. 7 is a longitudinal section of the two shells of the cage disassembled and each still further modified in construction.

Referring more specifically to the drawing and particularly to Fig. 1, the bearing comprises an outer shell or "cone" a, inner shells or "cones" b, c, d, and balls e, f, g. The outer shell is provided on its inner circumference with uninterrupted annular grooves or races a', a^2, a^3, one for each set of balls, each race being of circular cross section. In order to allow of the middle row of balls being easily and conveniently assembled within the central race a^2, the latter is arranged out of alinement with the end races, that is to say somewhat deeper or more toward the center of the shell as shown in Fig. 1 and the end shoulders a of the races a', a^2 are cut away as shown. The inner shells or cones are similarly formed with annular grooves of circular cross section b', c', d', the inner shoulders of each end cone b and d being cut away so that from the deepest point of their races to the inner edges thereof even cylindrical surfaces are formed.

The middle or central shell or cone c is inserted into the bearing before any of the rows of balls e, f, g are assembled and to enable the assembling of the balls f, the middle shell c is, according to the well known method, displaced into eccentric position relative to the axis of the outer shell and subsequently restored to its eccentric position. Upon the assembling of the central row of balls, the latter are spaced apart according to the construction of the spacers or cages forming the subject matter of my invention. An assembling of the middle row of balls may also be obtained by other well known methods.

Thus far the construction is well known and does not form part of my invention.

My new spacer or cage substantially consists of two interengaging ring shaped bodies h, i, each one preferably made of sheet metal and provided with perforations h', i' punched out so as to form spherically curved flanges projecting in opposite directions from the ring bodies and around said perforations. While the perforations of the outer ring are full circles, the perforations i' of the inner ring are semicircular, and the material on one side of the said perforations from the ends thereof to the opposite edge of the ring is cut away to form mouths or channels i^{10} leading into the said semicircular openings. When assembled the flanges h^2 of the ring h will project outwardly while the semi-spherical flanges i^2 of the inner ring i will project inwardly. The widest diameter of the perforations of each ring is equal to the diameter of the ball to be supported or borne therein (Fig. 2).

To interlock the two rings when assembled, the outer ring may, at one of its circumferential edges, be provided with one or several projections h^3 (Fig. 4) capable of being bent and compressed around the correspond-

ing edge of the inner ring so as to securely lock the rings together.

To allow of the assembling of the two rings and the balls therein, the inner ring may be split transversely as at i^3 so that after the insertion of the balls into the perforations h' of the outer ring from the inside thereof the inner ring i may be somewhat compressed after the separation of the edges at the incision and inserted into the space formed by the outer ring so as to engage the balls, whereupon the inner ring may be again expanded until its edges at the incision are restored to normal position.

The splitting of the inner ring is, however, not absolutely necessary. The ring being made of sheet metal is more or less flexible and can be easily bent so as to allow of its insertion into the outer ring and its engagement of the balls.

The cage constructed according to the aforesaid description is complete for a single ball bearing.

For a double ball bearing or a ball bearing with more rows of balls, such as the triple ball bearing shown in Fig. 1, the cage may be modified as follows:

The outer ring h may be formed at one of its circumferential edges with a conically shaped flange j, the surface of which is arranged at an angle of about 45° to that of the circumferential surface of the outer ring. This conical surface or flange j is provided with a number of semicircular perforations j' equidistantly distributed on the circumference of the said flange and which have their center on the free edge of the conical flange, thus forming semicircular indentations of a diameter equal to that of the balls they are to engage, as for instance the central row of balls f in the ball bearing shown in Fig. 1. It will be remembered that with the ball bearing of the construction shown in Fig. 1, the balls f are assembled between the shells a and c by the displacement of the inner shell c into eccentric position and its subsequent restoration to concentric position. After the insertion of one of the end cages h, i, j, the middle row of balls f can be spaced so as to engage the semicircular cavities or openings j' in the conical flange j whereby they will be held in the adjusted position. The conical flange may be made long enough to extend to a point near the bearing points of the balls. If the ball bearing is to comprise only two rows of balls, one of the cages just described would be sufficient to space the two rows of balls. But for a triple ball bearing a duplicate of the cage h, i, j can be used, which is inserted into the ball bearing and arranged in a reversed position relative to that of the other cage, so that the two conical flanges j, j will both engage the middle row of balls from different sides and thus insure a more perfect spacing of the central row of balls which incidentally will act as an interlocker of the two cages.

The two rings of the cage h and i instead of being joined together by the projections or edges h^3 shown in Fig. 4, may be joined together in the following manner:

Two or more of the perforations i' of the inner ring may be punched out in form of complete circles and a transversal incision i^5 (Fig. 6) made to extend from one side of said perforations to the corresponding edge of the ring so that at that side of the perforation the metal around the perforation can be bent open to permit the passage of the ball and thereupon bent back to engage around the ball, whereby the separation of the two rings h, i will be prevented.

To facilitate the bending of the material around the perforations i', lateral angular and short incisions i^6, i^7 and notches or furrows i^8 are provided (Fig. 6). When it is considered that no strain is exerted on the walls of the perforations receiving the balls and that the flaps i^9 formed by the incisions i^5, i^6 and i^7 are bent rarely or only once, at the insertion of the balls, then the weakening of the material by the furrows i^8 and the incisions i^5 and i^7 will be found to be unobjectionable.

To facilitate the assembling of the parts of the rings and of the balls, the perforations h^6 in the outer ring may be also made semicircular as those in the inner ring so that it will be possible to place the rings with their mouths or channels facing each other as shown in Fig. 7 and to engage the balls from opposite sides.

In all of the contructions described, there will be a spherically shaped rim or flange formed around the perforations. When the perforations are circular the flanges will be also complete circles in cross section and in case of semicircular perforations the flanges will be of semicircular cross section as shown in Fig. 7.

When providing flaps shown in Fig. 6, the perforations will be first punched out with the spherical flanges to extend all around the perforations and subsequently the incisions i^6, i^7, i^8 will be made so that each of the flaps i^9 will be formed with a part of the spherical flange which, when closed, will engage around the balls.

In the form shown in Fig. 7 the two rings may be joined together by providing, at one end of the outer ring, an annular centrally bent rim or flange h^5 and at the opposite end projections h^4 which, upon the engagement of the inner ring, could be bent around the corresponding edge of the latter just like the projections h^3 shown in Fig. 4. Instead of that, however, two or more of the perforations in the inner and outer rings or in one of them may be made in form of full circles

and provided with the incisions just like i^5, i^6, i^7 and furrows i^8 in order to form the flaps shown in Fig. 6 which, after the parts are assembled, can be bent to engage around the balls and thereby lock the latter in position and the two rings together.

What I claim and desire to secure by Letters Patent is:

1. In a ball bearing, the combination with outer and inner shells having annular non-interrupted grooves forming races, of a cage for the balls composed of two interengaging rings formed with circularly shaped sockets through which the balls protrude outwardly and having rims or flanges projecting around the said sockets and in opposite directions to each other to partly embrace said balls.

2. In a ball bearing, the combination with outer and inner shells having annular non-interrupted grooves forming races, of a cage for the balls composed of two interengaging rings each formed with perforations, the perforations of one of the rings being in form of full circles and those of the other ring being semicircular and open toward one edge of the said ring, and having spherically shaped rims or flanges surrounding said perforations.

3. In a ball bearing, the combination with outer and inner shells having annular non-interrupted grooves forming races, of a cage for the balls composed of two pliable interengaging ring shaped members each formed with spherically shaped outwardly open ball sockets protruding from said members in opposite directions and through which the balls project outwardly.

4. In a ball bearing, the combination with outer and inner shells having annular non-interrupted grooves forming races, of a cage for the balls composed of two pliable interengaged ring shaped members each punched out so as to form recesses surrounded by spherically shaped rims protruding from the said members in opposite directions and jointly serving as ball sockets.

5. In a ball bearing, the combination with outer and inner shells having annular non-interrupted grooves forming races, of a cage for the balls composed of two pliable interengaged ring shaped members each formed with sockets, the material around two or more of said sockets being incised to form flaps capable of being bent open to permit the passage of balls into said sockets and when closed to lock said balls and members in assembled position.

6. In a multiple ball bearing, a cage comprising two interengaged ring shaped members formed with sockets for one row of balls, one of the said members being formed with a conical extension having sockets for a second row of balls.

7. In a multiple ball bearing, a cage comprising two interengaged pliable ring shaped members in which spherically shaped ball sockets are punched out for one set of balls and of which the outer member is formed with a marginal extension having sockets for a second set of balls.

8. In a multiple ball bearing, a cage composed of two interengaging pliable ring shaped members having sockets for one set of balls and of which one of the said members has a marginal conical extension having sockets for a second row of balls.

9. In a ball bearing, the combination with three sets of balls, of two cages arranged in reverse direction relative to one another, each cage being composed of two interengaged rings formed with sockets for the end sets of balls, and of which one of said members has a marginal inwardly directed extension formed with sockets for the central set of balls.

10. In a ball bearing, the combination with three sets of balls, of two cages arranged in reverse direction relative to one another, each cage being composed of two interengaged rings formed with sockets for the end sets of balls, and of which one of said members has a marginal inwardly directed conical extension formed with sockets for the central set of balls.

11. A cage for ball bearings composed of two interengaged pliable rings in each of which perforations are punched out to form spherically curved flanges protruding from said members around said perforations, the flanges of said members being directed in opposite directions and means for locking said rings together.

In testimony whereof I affix my signature in presence of a witness.

JOHN NEWMANN.

Witness:
ROBERT R. VELIL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."