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METHOD OF MAKING BEARINGS

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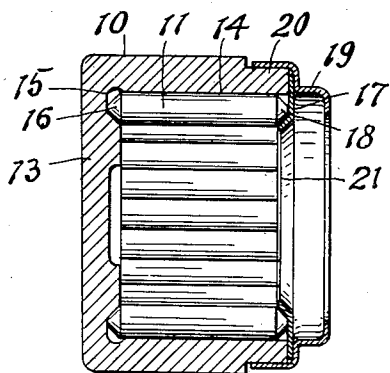


Fig. 2.

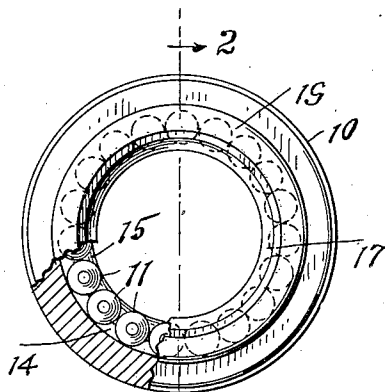


Fig. 1.

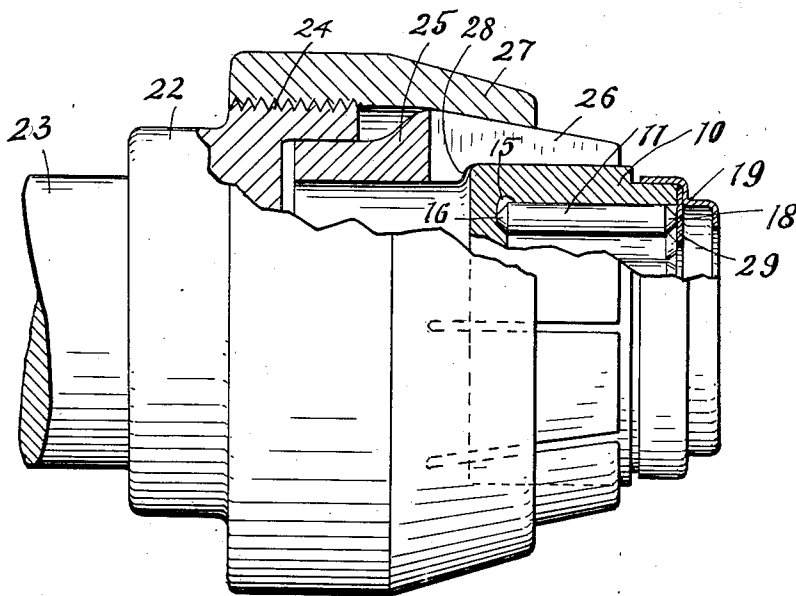


Fig. 3.

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METHOD OF MAKING BEARINGS

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8 Claims. (Cl. 29—84)

This invention relates to a novel method of assembling devices of the type having a plurality of similar elements in desired arrangement in a holder, and more particularly to a novel method of making bearings.

5 An object of my invention is to provide a novel method of making bearings, and like devices having a plurality of similar elements in desired arrangement in a holder, which involves the step of subjecting the elements to the action of centrifugal force to cause them to assume the desired arrangement.

10 Another object of my invention is to provide a novel method of making devices of the type referred to, wherein the loose elements are introduced into a holder and by rotation of the holder are caused to assume the desired arrangement therein.

15 Another object of my invention is to provide a novel method of making bearings, of the type embodying a series of uncaged bearing elements, wherein the elements are arranged in a holder by subjecting them to the action of centrifugal force and introducing element retaining means while the centrifugal force is still acting.

20 A further object of my invention is to provide a novel method of making devices of the type referred to, wherein the loose elements are introduced into a body having bendable means thereon and after movement of the elements into the desired arrangement in the body by rotation thereof, the bendable means is deflected to retain the elements substantially in said desired arrangement.

25 Still another object of my invention is to provide a novel method of making bearings, of the type mentioned, wherein the loose elements are introduced into a holder provided with bendable means and having a viscous substance therein, and are centrifugally moved into the desired arrangement in the holder by rotation of the latter and are permanently retained in such desired arrangement by spinning said bendable means into element retaining position.

30 The invention may be further briefly summarized as consisting in certain novel and related steps of procedure, hereinafter described, and particularly set out in the appended claims.

In the accompanying sheet of drawing,

35 Figure 1 is an end view, with parts broken away, of a device constructed according to my invention.

Fig. 2 is a sectional view taken through the device on line 2—2 of Fig. 1, and

40 Fig. 3 is an elevational view, partly in section,

illustrating one manner in which my novel method may be carried out.

Detailed reference will now be made to the accompanying drawing in connection with the disclosure of my novel method of making bearings, and like articles, embodying a desired arrangement of similar elements within a holder. In disclosing my invention I have illustrated, and have referred specifically to a bearing assembly or unit, but it will be understood, of course, that my novel method may be applied to the construction or assembly of various other articles and devices, and that the method may be carried out with various other forms of apparatus than herein disclosed.

Before proceeding with the detailed description of the novel method of my invention, I shall describe, as one of the articles produced by this method, the bearing assembly illustrated in Figs. 1 and 2 of the drawing. This bearing assembly is of the type sometimes known as a "needle" bearing and comprises a casing or holder 10, which is frequently termed a race, and an annular series of uncaged needles or rolling contact elements 11 retained in the holder.

The casing may be of any suitable construction, such as that herein illustrated, comprising a hollow metal body, which is closed at one end thereof by the transverse wall 13, and which is provided with a smooth cylindrical inner surface 14 constituting a bearing face for cooperation with the needles. The needles themselves are of elongated cylindrical form and are of relatively small diameter. The size of these needles may vary in accordance with the use to which the bearing is to be put, but when embodied in a universal joint of the kind disclosed in copending application Ser. No. 602,730, filed April 2, 1932, these needles may be of approximately one-eighth of an inch in diameter.

45 As shown in Figs. 1 and 2, the needles are arranged substantially in contact with each other to form a closed annular series which contacts with the cylindrical surface or wall 14. The needles are preferably, though not necessarily, reduced in size at their ends and are retained in the desired arrangement within the holder by providing the transverse wall 13 with an annular groove 15 which receives the reduced ends 16 of the needles, and by applying a sheet metal retaining ring 17 to the open end of the holder for cooperation with the reduced ends 18 of the needles. The retaining ring may be connected to the holder by any suitable means, such as the tubular sheet metal shell 19 which has a press

fit with the cylindrical portion 20 of the holder. The free inner edge of the retaining ring is spun or deflected inwardly toward the wall 13 to provide the angularly disposed annular lip 21 which cooperates with the annular groove 15 in retaining the needles in the desired arrangement within the holder.

According to my novel method of constructing the bearing unit illustrated in Figs. 1 and 2, and like articles having a desired arrangement of similar elements in a holder, I subject the loose or uncaged elements to the action of centrifugal force to cause these elements to assume the desired annular or zone arrangement within the holder. While the elements are still in such desired arrangement into which they have been moved by centrifugal force, I apply retaining means to the needles for permanently retaining the same in such desired arrangement.

In carrying out my novel method, I first assemble the retaining ring 17 and the sheet metal shell 19 on the hollow body constituting the holder 10, with the retaining ring held against the open end of the holder by the sheet metal shell, as shown in Fig. 3 of the drawing. The holder is then mounted for rotation in a suitable device or machine, such as the chuck 22 illustrated in Fig. 3. In this instance the chuck comprises a rotatable shaft 23, which may be driven from any suitable source of power, and which is provided with a head or enlargement 24 having a jaw member 25 mounted therein. This jaw member is hollow so as to receive the holder, and is provided with an annular series of resilient fingers or jaws 26 which may be moved into clamping engagement with the holder by the wedging action of the tapered sleeve 27. This tapered sleeve is preferably screwed onto the head 24, so that by rotation of the sleeve relative to the head, the resilient fingers may be moved into, or released from, clamping engagement with the holder. If desired, the jaw member may be provided with an internal wall or shoulder 28 for limiting the extent to which the holder may be inserted into the opening of the chuck.

After the holder 10 has been inserted into the chuck, I introduce into the recess of the holder a quantity of viscous substance, such as a grease or other suitable lubricant, which substance performs a function presently to be explained. A desired number of the loose needles or elements 12 is then introduced into the opening of the holder, after which the holder is rapidly rotated, about its own axis, by rotating the chuck in which it is held. During this rotation the needles are subjected to the action of centrifugal force which causes the needles to move outwardly into engagement with the race or annular wall 14, and to assume the position of a substantially closed annular series, as shown in Figs. 1 and 2. The lubricant, introduced into the opening of the holder, is distributed over the surfaces of the needles and over the inner surface of the annular wall of the holder during rotation of the latter and facilitates this movement of the needles into the desired annular arrangement and, by reason of its viscous nature, tends to retain the needles in such desired arrangement.

After movement of the needles into the desired annular arrangement by centrifugal force, I apply a suitable tool to the free inner edge 29 of the retaining ring 17 and thereby deflect this portion of the retaining ring to the angularly

disposed position, illustrated in Fig. 2, whereby the needles are retained in the desired annular arrangement in the holder. In deflecting the inner edge of the ring 17 to the retaining position illustrated in Fig. 2, I prefer to subject the metal of this ring to a spinning operation by applying the tool to the ring while the latter is being rotated with the holder, and while the needles are still retained in engagement with the surface 14 by the action of centrifugal force and, to some extent, by the action of the viscous lubricant.

Although the ring 17 provides a simple and efficient means for retaining the needles in the desired relation, various other suitable retaining means may be employed. When the retaining means is of a bendable nature as herein disclosed, the bending step may, if desired, be performed, by the use of suitable apparatus, after the holder has been removed from the chuck and while the needles are retained in the annular arrangement by the viscous substance.

When the inner edge of the ring 17 has been deflected inwardly to the retaining position shown in Fig. 2, it will be seen that the needles are retained with their reduced ends extending, respectively, into the annular groove 15 and into the annular channel defined by portions of the ring, thereby preventing the needles from dropping out of position. With the needles thus retained in the desired annular arrangement in the holder, it will be seen that the bearing can be handled as a unit for purposes of stocking and transportation, and for assembly with other machine parts. The viscous fluid introduced into the body at assembly of the needles, also serves as a lubricant for protecting the needles and other parts of the bearing assembly against corrosion, and may also constitute an initial supply of lubricant for use in the normal functioning of the needles when the bearing has been embodied in a device or machine.

It will now be readily seen that I have provided a novel and extremely simple method of assembling bearings, and like devices, having a plurality of similar elements in desired arrangement within a holder. The utilization of centrifugal force in obtaining a desired distribution of the elements eliminates the slow and tedious hand operations heretofore required in assembling the numerous small elements into the desired arrangement in the holder.

While I have disclosed my novel method in a detailed manner, it should be understood, however, that I do not wish to be limited to the precise steps of procedure disclosed herein nor to the use of any particular form of apparatus in carrying out my method, but regard my invention as including such changes and modifications as do not involve a departure from the spirit of the invention and scope of the appended claims.

Having thus described my invention, I claim:

1. The method of making devices of the character described which comprises introducing into a hollow body having an annular wall a plurality of loose elements in number at least sufficient to substantially fill an annular zone adjacent said wall, and rotating said body to cause said elements to assume such zone arrangement adjacent the annular wall of the body.

2. The method of making devices of the character described which comprises introducing into a hollow body having an annular wall a plurality of loose elements in number at least suffi-

cient to form a substantially full annular series of such elements adjacent said wall, rotating said body whereby said elements assume such series arrangement adjacent said wall, and applying annular means to the body for retaining said elements in the desired series arrangement.

3. The method of making bearing assemblies of the type having a hollow body provided with an annular wall and an annular series of rolling contact elements engaging said wall, said method comprising inserting into said hollow body a plurality of loose rolling contact elements in number at least sufficient to form said annular series, rotating said hollow body to cause said elements to be moved by centrifugal force into said annular series adjacent said wall, and applying annular means to said body to retain said elements in said series arrangement.

4. The method of assembling bearing parts which comprises inserting into a hollow holder having an annular wall a plurality of loose bearing elements in number at least sufficient to form a desired annular series of such elements adjacent said wall, rotating said holder to centrifugally arrange said elements in the desired annular series adjacent said wall, and applying retaining means to said elements while centrifugal force is acting thereon.

5. The method of making bearings which comprises inserting into a hollow body having an annular wall with annular bendable means thereon a plurality of loose bearing elements in number at least sufficient to form a substantially full annular series of such elements adjacent said wall, rotating said body whereby said elements assume such series arrangement adjacent the wall, and deflecting said annular bendable means into cooperating relation with said elements while centrifugal force is acting on the latter to thereby retain the elements in the desired series arrangement.

6. The method of making devices of the character described which comprises introducing a viscous substance into a hollow body having an annular wall, inserting a plurality of loose elements into said body in number at least sufficient to form a desired annular series of such elements adjacent said wall, and rotating said body whereby centrifugal force causes said elements to assume such desired series arrangement in said body and whereby said viscous substance is distributed over said element and said annular wall to cause the elements to be retained in the desired series arrangement.

7. The method of making devices of the character described which comprises introducing a viscous substance into a hollow body having an annular wall, inserting a plurality of loose elements into said body in number at least sufficient to form a desired annular series of such elements adjacent said wall, rotating said body whereby said elements are moved into the desired series arrangement by centrifugal force and are retained in the desired arrangement by said viscous substance, and applying an annular member to said body for permanently retaining said elements in the desired series arrangement in the body.

8. The method of making needle bearings which comprises introducing a viscous substance into a hollow body having an annular wall with bendable annular means thereon, inserting a plurality of loose needles into said body in number at least sufficient to form a substantially full annular series adjacent said wall, rotating said body whereby said needles assume the desired series arrangement adjacent the wall and said viscous substance is distributed over the surfaces of the wall and said needles, and deflecting said bendable means into cooperating relation with said needles for retaining the latter in the desired series arrangement in the body.

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