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CAGE FOR NEEDLE BEARINGS

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FIG. 1

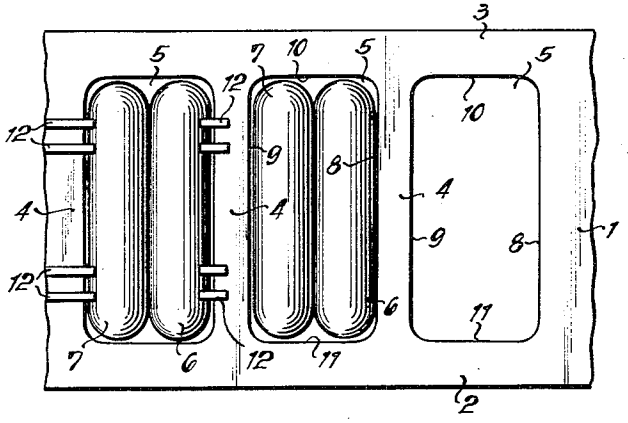


FIG. 2

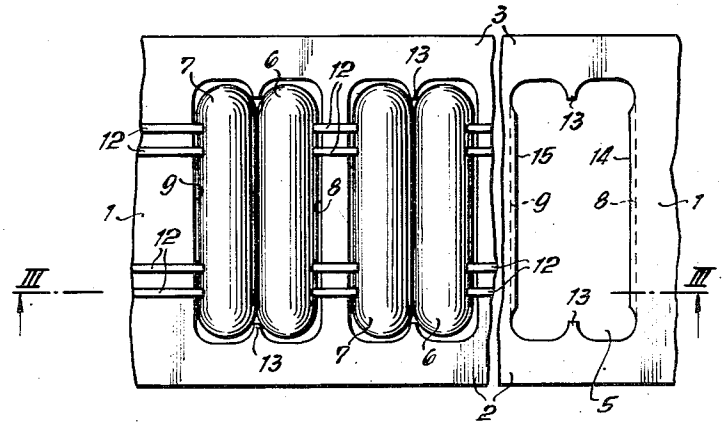
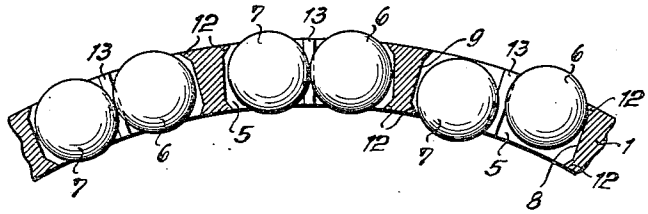


FIG. 3



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FIG. 4

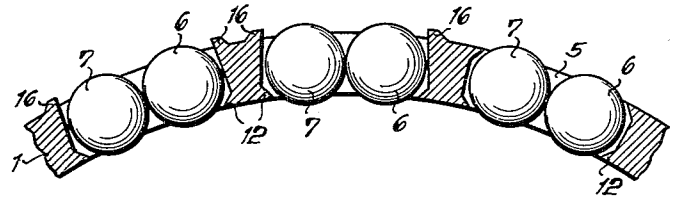


FIG. 5

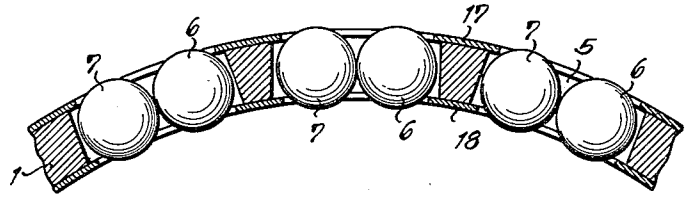


FIG. 6

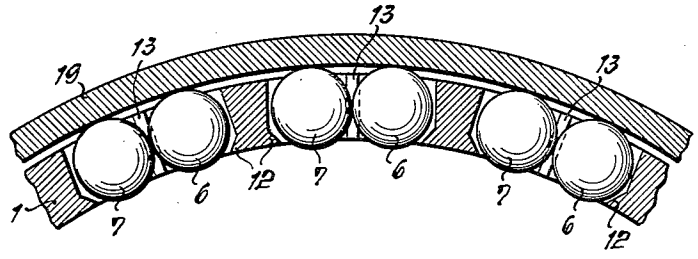
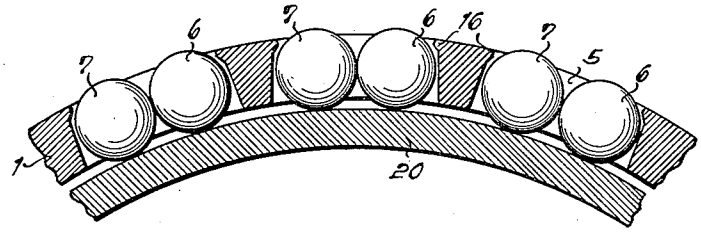


FIG. 7



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FIG. 8

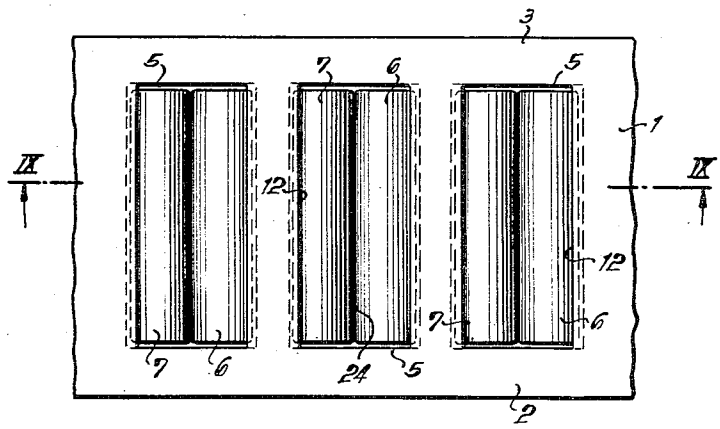


FIG. 9

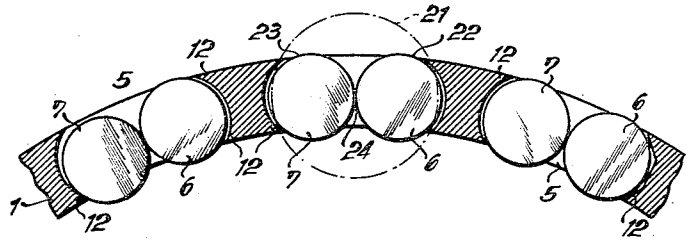
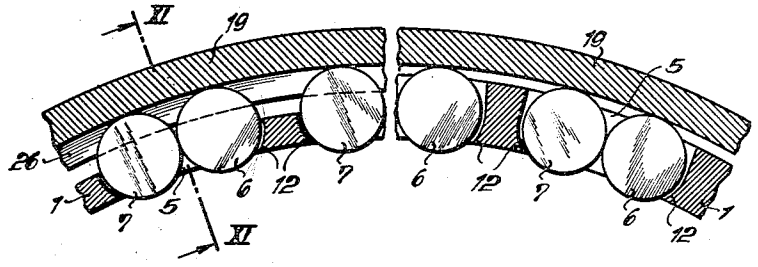


FIG. 10



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FIG. 11

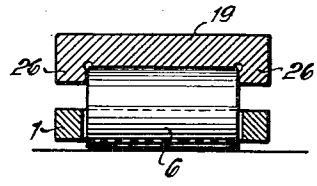


FIG. 12

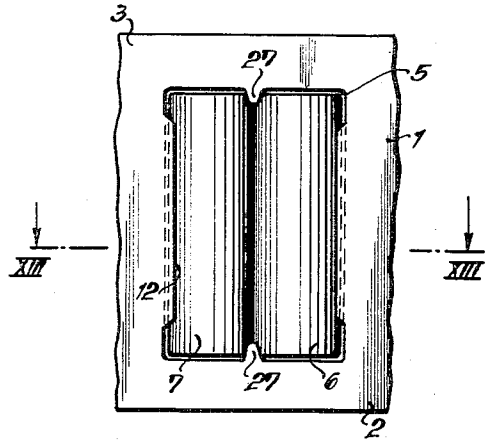
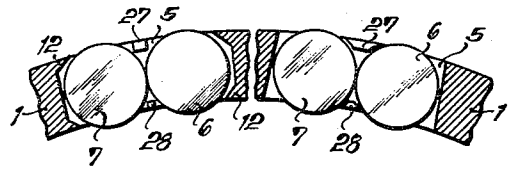


FIG. 13



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United States Patent Office 2,772,128 Patented Nov. 27, 1956

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CAGE FOR NEEDLE BEARINGS

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Application June 11, 1954, Serial No. 436,161
Claims priority, application Germany June 13, 1953
2 Claims. (Cl. 308—217)

Individual guiding of the roller members has largely become the current practice in the construction of roller bearing cages, but an exception is formed by the needle bearing wherein, because of the relatively high supporting capacity required, the solid needle construction has been retained as far as possible. The number of webs is kept as low as possible in the means employed for guiding and retaining the needle so that groups of needles bear against one another and only the outer needles are directly guided in an axially parallel position by the few webs. The modern method of individually guiding each needle in an aperture has shown, however, that the guiding means is also of great importance for the supporting capacity, and it has been recognised that, between the two extremes of, on the one hand, constructing the cage with few webs just sufficeint for stability and, on the other hand, of constructing the cages with individual guiding of the needles and with webs equal to the number of needles, optimum supporting capacity can be obtained if it is possible to increase the number of needles and to effect the guiding with the same action as is found with individual guiding. This fact becomes more important in proportion as the diameter of the roller members becomes smaller.

Thus, on the one hand, the number of needles is of decisive importance in the bearings in question, while, on the other hand, it is impossible to neglect exact axially parallel guiding of the needles. This condition is fulfilled by the invention in that two needles are always arranged in a cage aperture in such manner that each needle is guided by the adjoining web surface which forms a plane surface or a surface adapted to the surface of the needle. The arrangement in pairs reduces the number of webs, while the width of the web, which can be made small corresponding to manufacturing technique, can remain unaltered. For example, if a bearing with an inner race of 18 mm. diameter has 13 needles of 2.5 mm. diameter, which are individually accommodated, 18 needles can be fitted if individual guiding of pairs is employed, and this represents an increase of 38%. The number of webs is reduced from 13 to 9.

Another feature of the invention is the retention of the needles, with individual guiding in pairs, in an aperture in the cage, and also the construction of the retaining means. In cages having apertures and individually guided roller members, it is known to use retaining means consisting in projections of material from the webs into the apertures, the distances between which are less than the diameter of one roller member, for example of one roller or needle.

When two roller members are arranged in an aperture in the cage, the curvatures of the generated surfaces which touch one another in the centre of the apertures make it possible, upon the raising or lowering of the roller members in opposite radial directions, for the said two roller members to take up less space in tangential width than corresponds to the sum of their two diameters.

Thus, a width of the web projections which would suffice in the individual arrangement is no longer effective as a retaining means when the roller members are in varying radial positions, and the roller members may drop out seriatim.

According to another feature of the invention, the dropping of the needles out of the cage alone or out of the cage in combination with the inner or outer race thereof is obviated in different ways having the common feature that projections are contrived on the web or on the end surface of the recess, which projections limit the movement of one needle around the other along the surface lines thereof.

Thus, the pairs of needles can be so retained that their movement around one another is so limited on the webs alone, that is to say on the surface of the needles, that only the radial clearance necessary for operation is permitted.

The web flanks are so fashioned as mainly to form part of a hollow cylinder around the needles, the diameter of which hollow cylinder is only greater by the necessary clearance than the diameter of the needle. The result is therefore obtained that the surfaces of the boundary webs project into an imaginary cylinder mainly on those sides of the web close to the bore of the cage or on those sides of the web which are on the external diameter of the cage, which imaginary cylinder would be described by the needles when altering their position relatively to the pitch cycle of the cage and when contacting one another by their inner generated surfaces.

However, with needles having tapered ends, blocking webs can be contrived radially in the cage in the centre of the end faces of the apertures, and the said blocking members permit radial movement of each individual needle but limit tangential movement thereof. Thus, the projections on one side of the inner and outer edges of the web for each needle alone suffice for radial retention, the amount of tangential movement of each needle being less than the size of the tangential projection of the cage.

In the construction of these retaining means, in the manner hereinbefore described, only on the surfaces or in the bore surface of the cage, there is obtained satisfactory retention of the needles, if desired, together with retention of the inner or outer race.

In cages for roller bearings or needle bearings, a number of possible constructions are known which can also be employed for retaining roller members disposed in pairs, and these constructions can be used for the present purpose if there is a simultaneous guiding of each needle on the adjoining web. The invention can be applied to the most diverse types of cages such, for instance, as flat cages, divided cages or multi-row cages.

For a better understanding of the invention and to show how the same can be carried into effect, reference will now be made to the drawings, wherein:

Figure 1 is a plan view of a cage aperture having the needles;

Figure 2 is an aperture as in Figure 1 but with blocking webs on the end parts of the cage apertures;

Figure 3 is a section on the line III—III of Figure 2;

Figure 4 is a section through a special construction of a cage;

Figure 5 is a section through a cage wherein the needles are retained by rings;

Figure 6 is a section through a cage wherein the needles are retained on the outside by a race;

Figure 7 is a section through a cage wherein the needles are retained on the inside by a race;

Figure 8 is an upper plan view of a cage part wherein the end faces of the needles are flat;

Figure 9 is a section along the line IX—IX of Figure 8;

Figure 10 is a section through a cage part in a special construction of the cage;

Figure 11 is a section along the line XI—XI in Figure 10;

Figure 12 is an upper plan view of a cage aperture in a special constructional form; and

Figure 13 is a section on the line XIII—XIII of Figure 12.

Referring to Figure 1, the cage **1** has end faces **2** and **3** through which the webs **4** are interconnected, with the result that the apertures **5** are formed, fitted in each of which are two needles **6** and **7**. The figure shows that the needles are guided by the edges **8** and **9** of the apertures **5** and are prevented from lengthwise movement by the edges **10** and **11**.

The left-hand part of Figure 1 shows how, for retaining purposes, the needles can be secured, for example, by lug-like retaining projections **12** such as are generally known in the roller bearing art.

Also apparent in Figure 2 are the retaining projections **12** which retain the needles **6** and **7**, but in addition webs **13** are provided which extend substantially over the entire wall thickness of the cage, as can be clearly seen in Figure 3. The webs **13** prevent the needles from dropping out, and co-operate with the projections **12**, as can be seen clearly in Figure 3. This is clearly apparent from the right-hand side of Figure 3, where the two needles **6** and **7** are illustrated in their extreme positions. The right-hand side of Figure 2 also shows that, instead of using the individual retaining projections **12**, it is also possible to contrive, on the edges **8** and **9**, retaining surfaces **14** and **15** which can be produced, for example, by deformation.

Figure 4 shows one possible way in which the deformations might be produced. In this case, projections **16** are contrived on the cage elements which are produced, for example, by injection moulding, and the projections **16** are deformed before or after the fitting of the needles **6** and **7** so as to assume the position illustrated on the right-hand side of Figure 4.

Figure 5 shows how the said retaining projections can be replaced by special retaining strips **17** and **18** known per se. It is of course possible to provide one of these rings on one side and material deformations or the like on the other side.

In Figure 6, the retaining projections on the outer periphery of the cage have been replaced by the race **19**, and in the construction according to Figure 7 the retaining projections on the inner periphery of the cage have been replaced by the race **20**.

Figures 8 and 9 illustrate another method of retaining the needles. It is apparent, more particularly from Figure 9, that the cross-sections of the projections lie within an imaginary cylinder **21**, the axis of which is the line of contact between the two needles **6** and **7** and the radius of which corresponds at least substantially to the diameter of one needle less the clearance for the needles in the apertures. The line of contact between the needles is designated by **24**. Parts of the retaining means **12** in the constructional example illustrated must always lie inside the imaginary cylinder, the said parts being those which may have to accommodate movements of adjacent needles as permitted by the existing clearance.

Figures 10 and 11 illustrate another constructional form wherein the needles **6** and **7** are guided and retained by the cage **1** underneath their centres. In this case, the race **19**, which is disposed in a manner similar to that shown in Figure 6, has a flange **26**.

On the right-hand side of Figure 10 the intermediate web **13** illustrated in Figure 6 has been omitted, but to compensate for this the projections **12** are drawn in closer to the needles so that the condition as explained with reference to Figure 9 is fulfilled.

In the construction according to Figures 12 and 13, there are provided within the aperture **5** in the cage **1** projections **27** and **28** which, as shown in Figure 13, do not extend over the entire wall thickness of the cage **1**, in contrast to the intermediate webs **13**. The projections **27** and **28** are so disposed as to project above and below the pitch circle into the free space between the needles, and it is advantageous for the inner projection **28** to be narrower than the outer projection **27**. It is readily apparent from the right-hand side of Figure 13 that, when projections such as **27** and **28** are used, additional retaining means in the cage **1** such, for example, as the deformations **12** and **14** in the earlier figures, can be omitted.

We claim:

1. A cylindrical bearing cage for needles comprising a pair of parallel end faces, a plurality of parallel webs interconnecting said end faces and thereby forming a plurality of spaced apertures, a pair of tapered ended needles adjoiningly arranged in each of said apertures, protruding surfaces formed on said webs, and web-like projections formed centrally on said end faces intermediate of said webs extending radially in said apertures for coacting with said webs to effect individual guidance of said adjoining needles and for coacting with said protruding surfaces for effecting retention of said adjoining needles within said aperture.

2. A cylindrical bearing cage for needles comprising a pair of parallel spaced end faces, a plurality of parallel spaced webs formed transversely of said end faces for interconnecting them and thereby forming a plurality of spaced sockets, a pair of adjoining tapered ended needles rotatably arranged in each of said sockets, protruding edges formed on the edges of said webs and extending within the space of said sockets, and web projections extending radially in the cage within the sockets and formed on said end faces for engaging said tapered ends of said adjoining needles thereby to effect individual guidance of said adjoining needles and to coact with said protruding edges for retaining said adjoining needles within said sockets.

References Cited in the file of this patent

UNITED STATES PATENTS

1,318,092	Lockwood	Oct. 7, 1919
1,341,873	Arnot	June 1, 1920
1,871,150	Brown	Aug. 9, 1932
2,062,041	Robinson	Nov. 24, 1936

FOREIGN PATENTS

3,587	Great Britain	1898
11,527	Great Britain	1901
567,829	Germany	Jan. 12, 1933