S. G. WINGQUIST.

ROLLER BEARING.

APPLICATION FILED SEPT. 9, 1919.

1,415,969. Patented May 16, 1922.

4 SHEETS—SHEET 1.

Fig. 1.

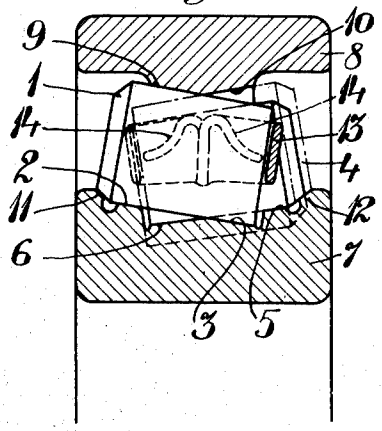


Fig. 2.

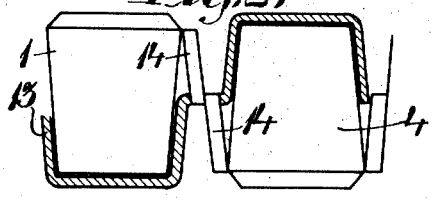


Fig. 3

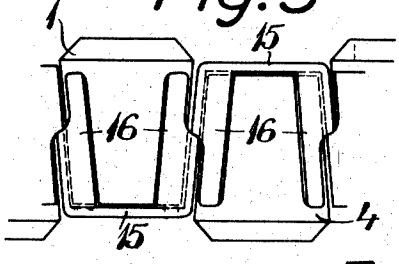


Fig. 4

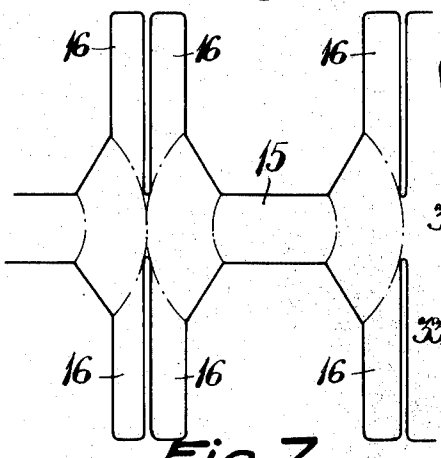


Fig. 5

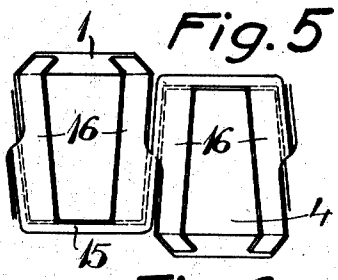


Fig. 6

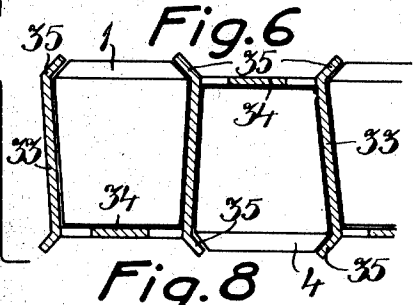


Fig. 7

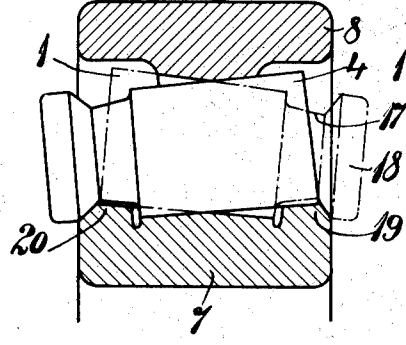
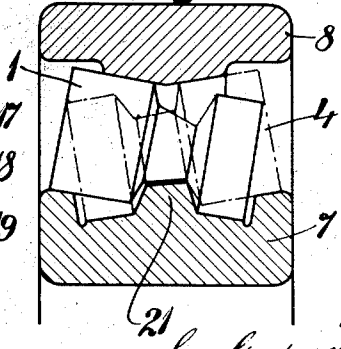


Fig. 8



Inventor:
Sven Gustaf Wingquist
By Attys
Fraser, Dent & Myers

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4 SHEETS—SHEET 2.

Fig. 9

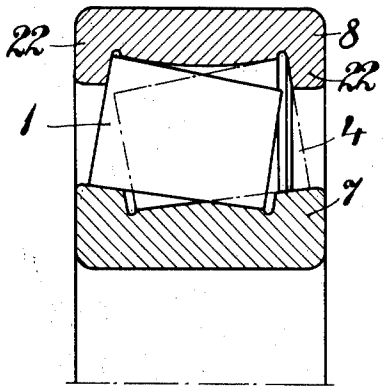


Fig. 10

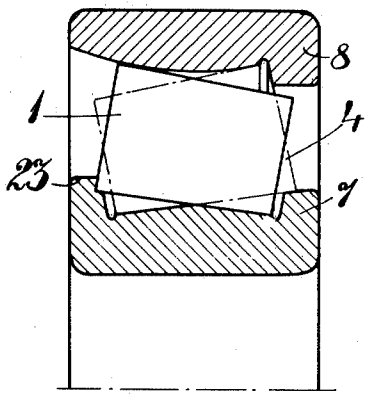


Fig. 11

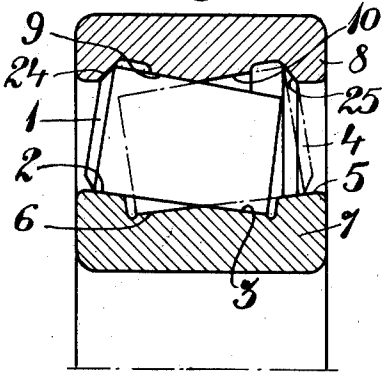


Fig. 12

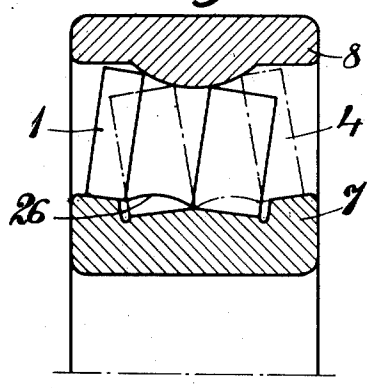


Fig. 13

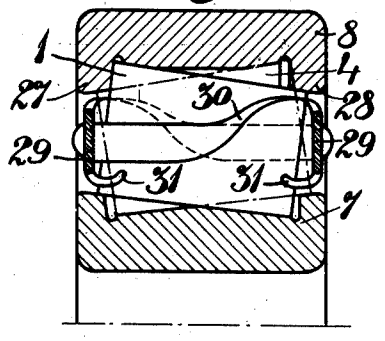
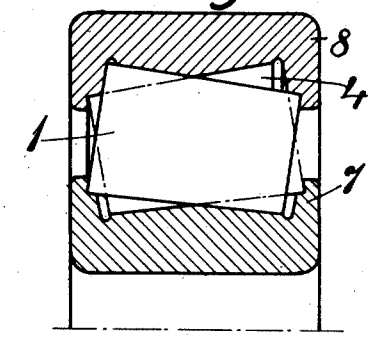


Fig. 14



Inventor:

Sven Gustaf Wingquist

By Attys.

Fraser, Dunlop & Myers

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4 SHEETS—SHEET 3.

Fig. 15.

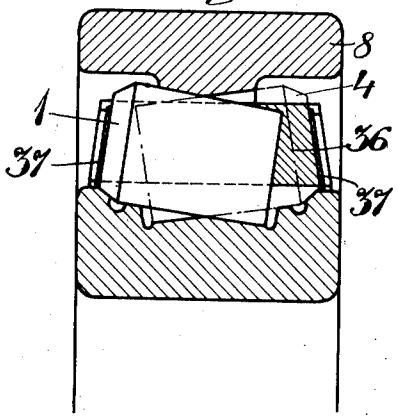


Fig. 19.

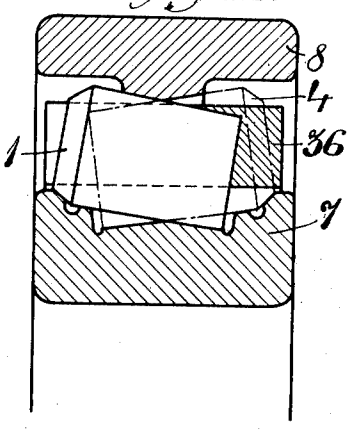


Fig. 16

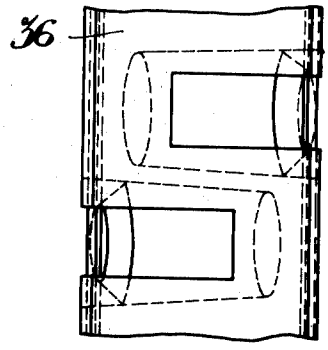


Fig. 17

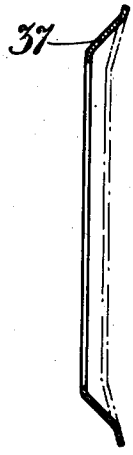
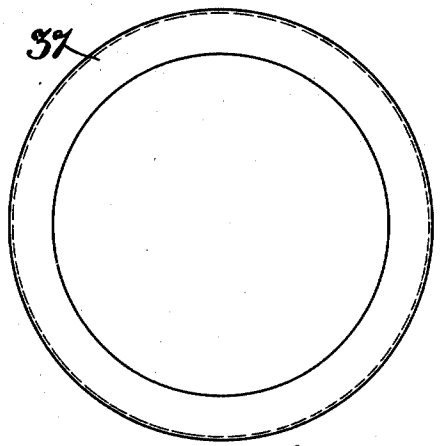


Fig. 18



Inventor:
Sven Gustaf Wingquist
By Attys
Fraser, Dunlop & Myers

S. G. WINGQUIST.

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APPLICATION FILED SEPT. 9, 1919.

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4 SHEETS—SHEET 4.

Fig. 20

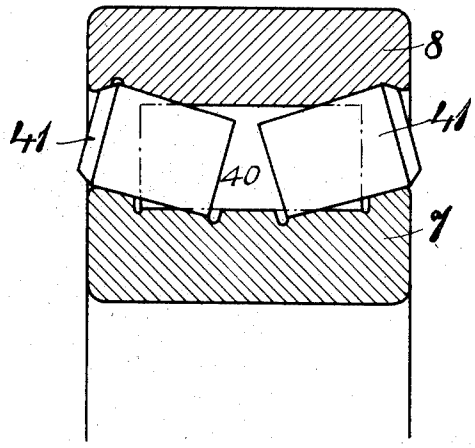
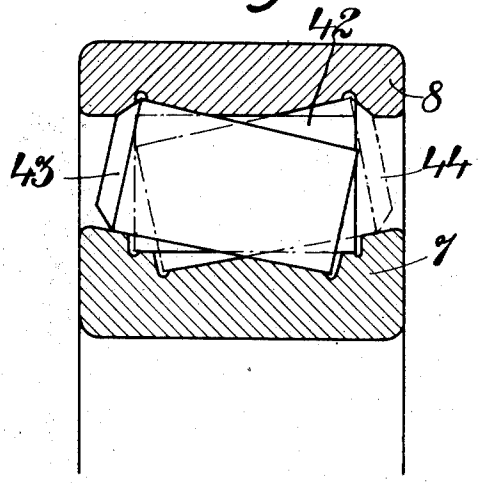


Fig. 21



Inventor:

Sven Gustaf Wingquist

By Attys

Fraser, Dunlap & Myers

UNITED STATES PATENT OFFICE.

SVEN GUSTAF WINGQUIST, OF GOTTENBORG, SWEDEN, ASSIGNOR TO AKTIEBOLAGET SVENSKA KULLAGERFABRIKEN, OF GOTTENBORG, SWEDEN, A CORPORATION OF SWEDEN.

ROLLER BEARING.

1,415,969. Specification of Letters Patent. Patented May 16, 1922.

Application filed September 9, 1919. Serial No. 322,753.

To all whom it may concern:

Be it known that I, SVEN GUSTAF WINGQUIST, a subject of the King of Sweden, residing at Gottenborg, in the Kingdom of Sweden, have invented new and useful Improvements in Roller Bearings, (for which I have filed an application in Sweden, September 3, 1918,) of which the following is a specification.

This invention relates to a roller bearing constructed with regard to the demands of modern technic on such a bearing. One of said demands is that the bearing, as the modern annular ball bearings, must form a unitary structure which may be manufactured in standard series and may be mounted on the place where it is to be used without the aid of any special assembling means. The size and shape of the roller bearing should correspond to those commonly used for annular ball bearings so that ball bearings already in use may be replaced by roller bearings, if desired. Each bearing ring should be manufactured in one piece so that no parts thereof may come loose, and the bearing should be what is termed self-contained, that is, so constructed as to be kept together by means of the rollers only, to form a structure which may be mounted as a whole. The rollers as well as the races for the rollers should be arranged so that a theoretically exact rolling movement will be obtained. Moreover, the bearing should be constructed for sustaining end thrust load, preferably in either direction. The bearing should permit utilization of substantially the whole width of the bearing for the rollers.

It should be noted that all of the conditions above stated need not be fulfilled but the bearing will be the better the more of them are fulfilled by the bearing.

To permit the sustaining of end-thrust loads, the bearing is constructed with at least two rows of rollers, preferably mounted on conical surfaces the apexes of which are directed oppositely to each other. It should be understood also that a roller bearing having only a single row of cylindrical rollers may sustain end-thrust to a certain degree, provided the bearing rings are formed with side-flanges, but when an unidirected end thrust arises at one end of the rollers the latter will tend to distort. Furthermore, undue friction will arise.

For the purpose of obtaining normal dimensions of the bearings the rollers of each row are mounted in the spaces between the rollers of the other row or rows, preferably in such a way, that the mid-point of all of the rollers will be in, or in close proximity to, the mid-section of the bearing. It is true that it has already been proposed, for the same purpose, to use two rows of obliquely arranged rollers with the rollers of each row situated between the rollers of the other row in the above manner. In such bearings as heretofore known it was not possible, however, to make use of the entire width of the bearing due to the placing of the conical races for the said rows on opposite sides of the radial mid-section of the bearing, so that the width of the roller could not be made greater than a little more than half the width of the bearing.

According to this invention, the rollers of one row bear at one race-ring or at both race-rings against track surfaces, preferably conical in shape, which may vary in width, which alternate with track surfaces (preferably conical in shape and converging in opposite direction to those above mentioned) for supporting the rollers of another row, whereby it is possible to use rollers having a great length relatively to the width of the bearing. The rollers are, preferably, conically shaped and the races as well as the rollers should have the apexes of their conical surfaces situated on the axis of rotation of the bearing, thus securing a theoretically exact rolling movement. This construction will thus afford a roller bearing which is able to carry great radial loads with small friction while automatically effecting an equal distribution of said loads on both of the rows of rollers, said roller bearing being further adapted to sustain great end-thrust loads in either direction. Moreover, the said construction of the bearing permits the filling in of the rollers without the use of divided rings and provides a safe guide for the rollers in lateral direction.

In the acompanying drawings several forms of roller bearings embodying this invention are shown. Fig. 1 shows an axial section of one embodiment of the bearing in which the rollers bear with both ends against the inner race-ring and between their ends against the outer race-ring. Fig. 2 is a plan of the roller cage, partly in section.

Fig. 3 is a plan of another embodiment of the roller cage. Fig. 4 shows the sheet metal blank of the roller cage shown in Fig. 3, preparatory to the pressing action. Fig. 5 is a plan of a modified form of the roller cage shown in Fig. 3. Fig. 6 shows in section a further modified form of the roller cage. Fig. 7 shows a roller bearing, similar to that shown in Fig. 1, but having a so called Timken-type guide for the roller. Fig. 8 shows an embodiment of the roller bearing having a central guiding flange on the inner race ring. Figs. 9 and 10 show two embodiments having a convex race on the outer ring. Fig. 11 shows an embodiment of the roller bearing, similar to that shown in Fig. 1, but having a lateral guide for the rollers arranged on the outer ring instead of on the inner ring. Fig. 12 shows an embodiment of a roller bearing having partly concave rollers. Fig. 13 shows an embodiment of the bearing in which the rollers bear at their opposite ends against the outer and inner rings respectively. Fig. 14 shows an embodiment similar to that shown in Fig. 13 but having a lateral guide for both ends of the rollers on the inner ring and also on the outer ring. Fig. 15 shows an embodiment of the bearing, similar to that shown in Fig. 1, but having the roller cage formed by a solid ring with a sheet metal cover for retaining the rollers. Fig. 16 shows the same roller cage in elevation. Figs. 17 and 18 show one of the sheet metal covers in central section and in elevation, respectively. Fig. 19 shows a roller bearing having a similar roller cage, but without sheet metal cover. Fig. 20 shows an embodiment of the roller bearing having two rows of oppositely directed conical rollers and a single row of cylindrical rollers. Fig. 21 shows a similar embodiment in which the conical rollers are formed with extensions and alternate with each other as well as with the cylindrical rollers.

In the bearing shown in Fig. 1, the rollers 1 of one row of rollers rest at their ends on conical surfaces 2, 3, while the rollers 4 of the other row of rollers rest at their ends on conical surfaces 5, 6 formed on the inner ring 7. As regards the outer ring 8, the rollers between their ends bear against conical races 9 and 10. The rollers of the two rows also rest at their larger ends on side-flanges 11, 12, respectively, formed on the inner ring and serving to prevent displacement of the rollers within the bearing. The roller cage 13 consists, preferably, of an annular folded ribbon, the folds of which serve to receive the rollers which will engage the folds with their smaller ends while being free at their larger ends (see also Fig. 2). Extending from one, (preferably the outer), edge of said ribbon, (or from both edges thereof), are tongues or laps 14 bent downwardly between the rollers to form auxiliary supporting means therefor. In the embodiment shown in Fig. 3 the rollers are partly embraced by the roller cage 15 and the laps 16 thereof, the latter being formed by projections of a sheet metal ring, as shown in Fig. 4. In the modified embodiment shown in Fig. 5 the said laps 16 are bent over the larger ends of the rollers, preferably so as to exert a slight resilient pressure in the axial direction on the roller.

The roller cage shown in Fig. 6 comprises, as the roller cage shown in Figs. 1 and 2, an annular folded ribbon 33, the folds of which receive the rollers, which engage the said folds with their smaller ends. Projecting from those parts 34 of the roller cage situated along said ends of the rollers are tongues 35 bent to conform with the larger, conical ends of the rollers so as to maintain the latter in their respective places.

It should be understood that the roller cages shown are referred to by way of example only, and that the construction and arrangement of the cages may be varied in many ways.

The rollers may, if desired, be so arranged as to bear upon the outer ends of the side-flange, as shown in Fig. 7, in which case the rollers of each row of rollers are formed at their smaller ends with reduced portions 17 ending in heads 18 which bear with their inner sides against the outer sides of flanges 19 or 20, on the inner ring, that is the rollers are formed with what is termed a Timken-type guide. Instead of having two such side flanges 19 and 20 on the inner ring I may arrange a central flange 21 on said ring, as shown in Fig. 8. The arrangement shown in Figs. 7 and 8 corresponds as to their other parts to the arrangement shown in Fig. 1.

The construction shown in Fig. 1 may also be so modified that the rollers will bear at the outer ring against a double-curved surface, as shown in Figs. 9 and 10. To prevent axial displacement of the rollers, the outer ring, (Fig. 9), or the inner ring, (Fig. 10), is formed with side-flanges 22 or 23, respectively. The arrangement may also be reversed, inasmuch as the rollers may bear against the outer ring at their ends while bearing against the inner ring or against a double-curved surface on said last-mentioned ring between their ends.

In Fig. 11 a further modified embodiment of the bearing according to Fig. 1 is shown, in which the flanges 11, 12 formed on the inner ring of the bearing shown in Fig. 1, are replaced by flanges 24, 25 formed on the outer ring. As to its other parts the arrangement corresponds to that shown in Fig. 1.

In the embodiment shown in Fig. 12, the outer ring is formed with a convex surface on its inner side, in somewhat the same way as shown in Figs. 9 and 10. The rollers are in this case provided between their ends with

a concave portion 26, bearing upon the convex surface on the outer ring. The said convex surface may, if desired, be substituted by two convex surfaces, one for each row of rollers. Also in this bearing the arrangement may be reversed by forming the convex surface or surfaces on the inner ring instead of on the outer ring.

In Fig. 13 a modified form of the bearing is shown in which the rollers bear with their ends against each of the bearing rings. Formed on the outer ring are two side-flanges 27, 28, each corresponding to one of the rows of rollers, and serving to prevent axial displacement of the rollers. The roller cage is formed by two sheet metal rings 29 connected by tongues 30, each of which projects between two adjacent rollers and is riveted to the opposite ring. Furthermore tongues 31 may be formed on the one (edge) preferably the inner (edge) of the rings, said tongues likewise extending between the rollers.

Also in the embodiment last described use may be made, if desired, of a so called Timken-type guide comprising, for instance, a flange at the mid-section of one of the race rings.

In Fig. 14 I have shown a bearing in which the rollers are guided at both of their ends by the outer ring as well by the inner ring. The arrangment corresponds otherwise to that shown in Fig. 13.

In the embodiment shown in Figs. 15 and 16, the roller cage comprises a solid ring 36 having conical borings for the rollers formed in both of its end surfaces. For securing the rollers in place I may use sheet metal covers 37 (Figs. 17 and 18) engaging in peripheral grooves formed at the outer edges of the ball cage ring. To this end the sheet metal cover 37 may be manufactured with a greater taper than the final one, as shown by full lines in Fig. 17. The covers, when placed in their proper positions, are then pressed by means of any suitable tool against the sides of the ball cage so as to be caused to engage the said peripheral grooves. The roller cage may also be formed without sheet metal covers, as shown in Fig. 19.

In the embodiment above described the rollers are preferably conical. If desired, a row of cylindrical rollers 40 may be used, as shown in Fig. 20. The end-thrust will in this case be carried by small conical rollers 41 arranged in pairs between adjacent cylindrical rollers, the rollers of each pair of conical rollers tapering in opposite directions. The bearing surfaces for the conical rollers formed on the inner ring or those on the outer ring or both of said surface alternate with bearing surfaces for the cylindrical rollers.

It should be noted that in the bearing shown in Fig. 20, only a single row of conical rollers need be used, in case the bearing is adapted to resist end-thrust in one direction only.

In Fig. 21 a bearing is shown which uses three rows of rollers, namely one row of cylindrical rollers 42 and two rows of conical rollers 43, 44. The rollers of said three rows are inserted between each other, preferably in such a way that each cylindrical roller is situated between two conical rollers tapering in opposite directions.

It is evident that the bearing may be further modified in many ways without departing from the principle of the invention.

The assembling of the rollers may be effected by placing the race-rings eccentrically with relation to each other, thereupon inserting such a number of rollers as is possible in the said relative position of the rings, and finally separating the rollers according to the Conrad-system (U. S. A. Patent No. 838,303, dated December 11, 1906). For the insertion of a larger number of rollers I may, preferably, use a filling opening in either side-flange or both.

The conical races of the rings may, of course, have a greater or smaller length, or even be reduced so as to effect contact in a point only, provided the races of both rings are convex.

What I claim is:—

1. In a roller bearing an inner and an outer ring, and a plurality of rows of rollers interposed between said rings, there being load carrying engagement between each roller and at least one of the rings at a plurality of spaced apart contact areas, at least one of the rings having a plurality of load carrying races for rollers of each row, the races for one row alternating in axial direction with the races for the other row.

2. A bearing according to claim 1, the inner and outer rings each formed in one piece.

3. A bearing according to claim 1, the rollers being conical, with their apices converging on the axis of the bearing.

4. In a roller bearing, an inner ring, an outer ring, and rows of rollers interposed between said rings, the said rings having separate races for each row of rollers, the races for one row alternating axially with the races for another row in such a way that each roller bears against one ring at both of its ends and against the other ring between its ends.

5. In a roller bearing, an inner ring, an outer ring, and two rows of rollers interposed between said rings, each ring formed with raceways for both rows of rollers, at least one ring having a plurality of spaced apart races for the rollers of each row, the races for one row alternating in axial direction with the races for the other row, and the rollers bearing at one circumferential

zone against a race on one ring, and at a different circumferential zone against a race on the other ring.

6. In a roller bearing, an inner ring, an outer ring, and rows of conical rollers interposed between said rings, said rings having separate races for each of said rows, the races for one row alternating axially with the races for another row, and one of the bearing rings having a guiding flange for a row of rollers, said guiding flange serving to cooperate with the larger ends of said conical rollers.

7. In a roller bearing, an inner ring, an outer ring, and rows of rollers interposed between said rings, said rings having separate races for each of said rows, the races for one row alternating axially with the races for another row in such a way that the rollers of each row of rollers bear at their ends against the inner ring and intermediate their ends against the outer ring, a flange being formed on one of the rings for each row of rollers to guide the larger ends of the rollers.

8. In a roller bearing, an inner ring, an outer ring, and rows of rollers interposed between said rings, the said rings having separate races for each row of rollers, the races for one row alternating axially with the races for another row in such a way that each roller bears against one ring at both of its ends and against the other ring between its ends, and the rollers and a ring reciprocally engaging to retain the parts in normal operative relation.

9. In a roller bearing, an inner ring, an outer ring, and rows of rollers interposed between said rings, the said rings having separate races for each row of rollers, the races for one row alternating axially with the races for another row in such a way that each roller bears against one ring at both of its ends and against the other ring between its ends, and one ring and the rollers of one row having respective bearing portions engaging to prevent endwise displacement of such rollers.

10. In a roller bearing, an inner ring, an outer ring, and rows of rollers interposed between said rings, the said rings having separate races for each row of rollers, the races for one row alternating axially with the races for another row in such a way that each roller bears against one ring at both of its ends and against the other ring between its ends, and one ring and the rollers of both rows having respective bearing portions engaging to prevent endwise displacement of the respective rollers.

11. A bearing according to claim 1, the rings and rollers engaging to form a unitary construction.

In testimony whereof I have signed my name.

SVEN GUSTAF WINGQUIST.