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[Continued on next page]

(54) Title: TRANSMISSION ONE-WAY CLUTCH ASSEMBLY

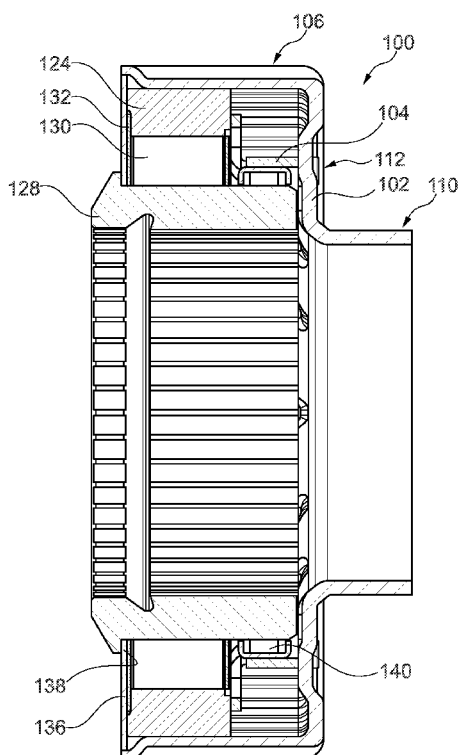


Fig. 3

(57) Abstract: A one-way clutch assembly for a transmission includes a housing and a bearing support plate. The housing has an outer circumferential portion with an undulating spline profile, an inner circumferential portion, and a radial portion connecting the outer and inner circumferential portions. The bearing support plate is fixed to the housing radial portion. In an example embodiment, the inner circumferential portion includes an outer surface including a spline for engaging a transmission component. In an example embodiment, the bearing support plate includes integral rivet posts for fixing to the radial portion.





TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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— *with international search report (Art. 21(3))*

TRANSMISSION ONE-WAY CLUTCH ASSEMBLY

FIELD

[0001] The invention relates generally to a one-way clutch, and more specifically to a one-way clutch assembly for a transmission.

BACKGROUND

[0002] One-way clutches for transmissions are known. One example is shown in commonly-assigned United States Patent No. 9,145,927.

BRIEF SUMMARY

[0003] Example aspects broadly comprise a one-way clutch assembly for a transmission including a housing and a bearing support plate. The housing has an outer circumferential portion with an undulating spline profile, an inner circumferential portion, and a radial portion connecting the outer and inner circumferential portions. The bearing support plate is fixed to the housing radial portion. In an example embodiment, the inner circumferential portion includes an outer surface including a spline for engaging a transmission component. In an example embodiment, the bearing support plate includes integral rivet posts for fixing to the radial portion.

[0004] In some example embodiments, the one-way clutch assembly includes an outer race with an outer spline profile engaged with the housing outer circumferential portion. In an example embodiment, the bearing support plate includes a radial wall for axial placement of the outer race in the housing. In some example embodiments, the one-way clutch assembly includes an inner race and a plurality of rollers engaged with the inner and outer races. In an example embodiment, the one-way clutch assembly includes a cage for retaining the rollers and a plurality of springs, each spring being in contact with the cage and one of the rollers. In an example embodiment, the one-way clutch assembly includes a hardened side plate. The inner race includes a radial wall and the side plate is disposed axially between the inner race radial wall and the rollers.

[0005] In an example embodiment, the one-way clutch assembly includes an inner race and a bearing disposed radially between the inner race and the bearing support plate. In an example embodiment, the one-way clutch assembly includes an inner race with a cutting spline for press-fitting onto a transmission component.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The nature and mode of operation of the present invention will now be more fully described in the following detailed description taken with the accompanying drawing figures, in which:

5 Figure 1 is a front perspective view of one-way clutch assembly according to an example aspect;

Figure 2 is a back view of the one-way clutch assembly of Figure 1;

Figure 3 is a section view of the one-way clutch assembly of Figure 1 taken generally along line 3-3 in Figure 2;

10 Figure 4 is a back view of a bearing support plate;

Figure 5 is a side view of the bearing support plate of Figure 4;

Figure 6 is a front perspective view of an outer race;

Figure 7 is a back view of the outer race of Figure 6;

15 Figure 8 is a section view of the outer race of Figure 6 taken generally along line 8-8 in Figure 7;

Figure 9 is a front view of the outer race of Figure 6;

Figure 10 is a front perspective view of a cage;

Figure 11 is a front view of a cage assembled with an outer race;

20 Figure 12 is a back view of the cage and outer race assembly of Figure 11.

DETAILED DESCRIPTION

[0007] At the outset, it should be appreciated that like drawing numbers appearing in different drawing views identify identical, or functionally similar, structural elements. Furthermore, it is understood that this invention is not limited only to the particular
25 embodiments, methodology, materials and modifications described herein, and as such may, of course, vary. It is also understood that the terminology used herein is for the purpose of describing particular aspects only, and is not intended to limit the scope of the present invention, which is limited only by the appended claims.

[0008] Unless defined otherwise, all technical and scientific terms used herein have the
30 same meaning as commonly understood to one of ordinary skill in the art to which this invention belongs. Although any methods, devices or materials similar or equivalent to those described

herein can be used in the practice or testing of the invention, the following example methods, devices, and materials are now described.

[0009] The following description is made with reference to Figures 1-5. Figure 1 is a front perspective view of one-way clutch assembly according to an example aspect. Figure 2 is a back view of the one-way clutch assembly of Figure 1. Figure 3 is a section view of the one-way clutch assembly of Figure 1 taken generally along line 3-3 in Figure 2. Figure 4 is a back view of a bearing support plate. Figure 5 is a side view of the bearing support plate of Figure 4.

[0010] One-way clutch assembly 100 includes housing 102 and bearing support plate 104. Assembly 100 is for a transmission (not shown). Housing 102 includes outer circumferential portion 106 with undulating spline profile 108, inner circumferential portion 110, and radial portion 112 connecting the outer and inner circumferential portions. Bearing support plate 104 is fixed to housing radial portion 112. Inner circumferential portion 110 includes outer surface 114 including spline 116 for engaging a transmission component such as a transmission shaft (not shown), for example.

[0011] Bearing support plate 104 includes integral rivet posts 118 for fixing to radial portion 112. That is, rivet posts 118 are protrusions extending from body 120 of support plate 104 through apertures 122 of radial portion 112. Posts 118 may be expanded, or “upset” as is known as a term of art for riveting, to connect the support plate to the radial portion.

[0012] One-way clutch assembly 100 includes outer race 124 with outer spline profile 126 engaged with housing outer circumferential portion 106. That is, undulating spline profile 108 and outer spline profile 126 are complementary such that outer race 124 is axially slidable and rotationally fixed with respect to housing 102. In other words, torque received by housing 102 is transmitted to outer race 124, and vice versa. Bearing support plate 104 includes radial wall 126 for axial placement of outer race 124 in housing 102. Alternatively stated, the bearing support plate restricts axial displacement of the outer race within the housing.

[0013] One-way clutch assembly 100 includes inner race 128, rollers 130, cage 132, and springs (not shown). The rollers are engaged with inner race 128 and outer race 124 and retained by the cage. Cage 132 is retained within outer race 124 in a manner similar to that shown and described in commonly-assigned United States Patent Application Serial No. 15/058,555 titled ROLLER ONE WAY CLUTCH CAGE RETENTION, hereby incorporated by reference as if set forth fully herein. Each spring contacts the cage and one of the rollers, urging the rollers away

from the cage and into contact the races. Together, these components cooperate to permit free rotation of the inner race relative to the outer race in a first rotational direction and to block rotation of the inner race relative to the outer race in a second rotational direction, opposite of the first rotational direction. The springs urge the rollers into contact with the races such that a
5 ramped surface on the outer race permits sliding between the rollers and the races in the first rotational direction, and clamps the rollers between the two races in the second rotational direction. The cage is provided to retain the rollers and springs for easier assembly.

[0014] One way clutch assembly 100 includes hardened side plate 136. Inner race 128 includes a radial wall 138 and the side plate is disposed axially between the inner race radial wall
10 and the rollers. Bearing 140 is disposed radially between inner race 128 and bearing support plate 104. Inner race 128 includes cutting spline 142 for press-fitting onto a transmission component (not shown). That is, spline 142 includes is installed with a force onto a transmission component to ensure a tight connection between one-way clutch assembly 100 and the transmission component. Spline 142 includes chip groove 144 similar to that shown and
15 described in commonly-assigned United States Patent Publication No. 2016/0025143 titled BEARING ASSEMBLY HAVING SPLINE CUTTING INNER RACE, hereby incorporated by reference as if set forth fully herein.

[0015] Of course, changes and modifications to the above examples of the invention should be readily apparent to those having ordinary skill in the art, without departing from the
20 spirit or scope of the invention as claimed. Although the invention is described by reference to specific preferred and/or example embodiments, it is clear that variations can be made without departing from the scope or spirit of the invention as claimed.

CLAIMS

What We Claim Is:

1. A one-way clutch assembly for a transmission comprising:
5 a housing including:
 - an outer circumferential portion with an undulating spline profile;
 - an inner circumferential portion; and,
 - a radial portion connecting the outer and inner circumferential portions; and,a bearing support plate fixed to the housing radial portion.
10
2. The one-way clutch assembly of claim 1 wherein the inner circumferential portion includes an outer surface including a spline for engaging a transmission component.
3. The one-way clutch assembly of claim 1 wherein the bearing support plate includes
15 integral rivet posts for fixing to the radial portion.
4. The one-way clutch assembly of claim 1 further comprising an outer race with an outer spline profile engaged with the housing outer circumferential portion.
- 20 5. The one-way clutch assembly of claim 4 wherein the bearing support plate includes a radial wall for axial placement of the outer race in the housing.
6. The one-way clutch assembly of claim 4 further comprising:
 - an inner race; and,
 - 25 a plurality of rollers engaged with the inner and outer races.
7. The one-way clutch assembly of claim 6 further comprising:
 - a cage for retaining the rollers; and,
 - a plurality of springs, each spring being in contact with the cage and one of the rollers.
30

8. The one-way clutch assembly of claim 6 further comprising a hardened side plate, wherein the inner race includes a radial wall and the side plate is disposed axially between the inner race radial wall and the rollers.
- 5 9. The one-way clutch assembly of claim 4 further comprising:
an inner race; and,
a bearing disposed radially between the inner race and the bearing support plate.
- 10 10. The one-way clutch assembly of claim 4 further comprising an inner race with a cutting spline for press-fitting onto a transmission component.

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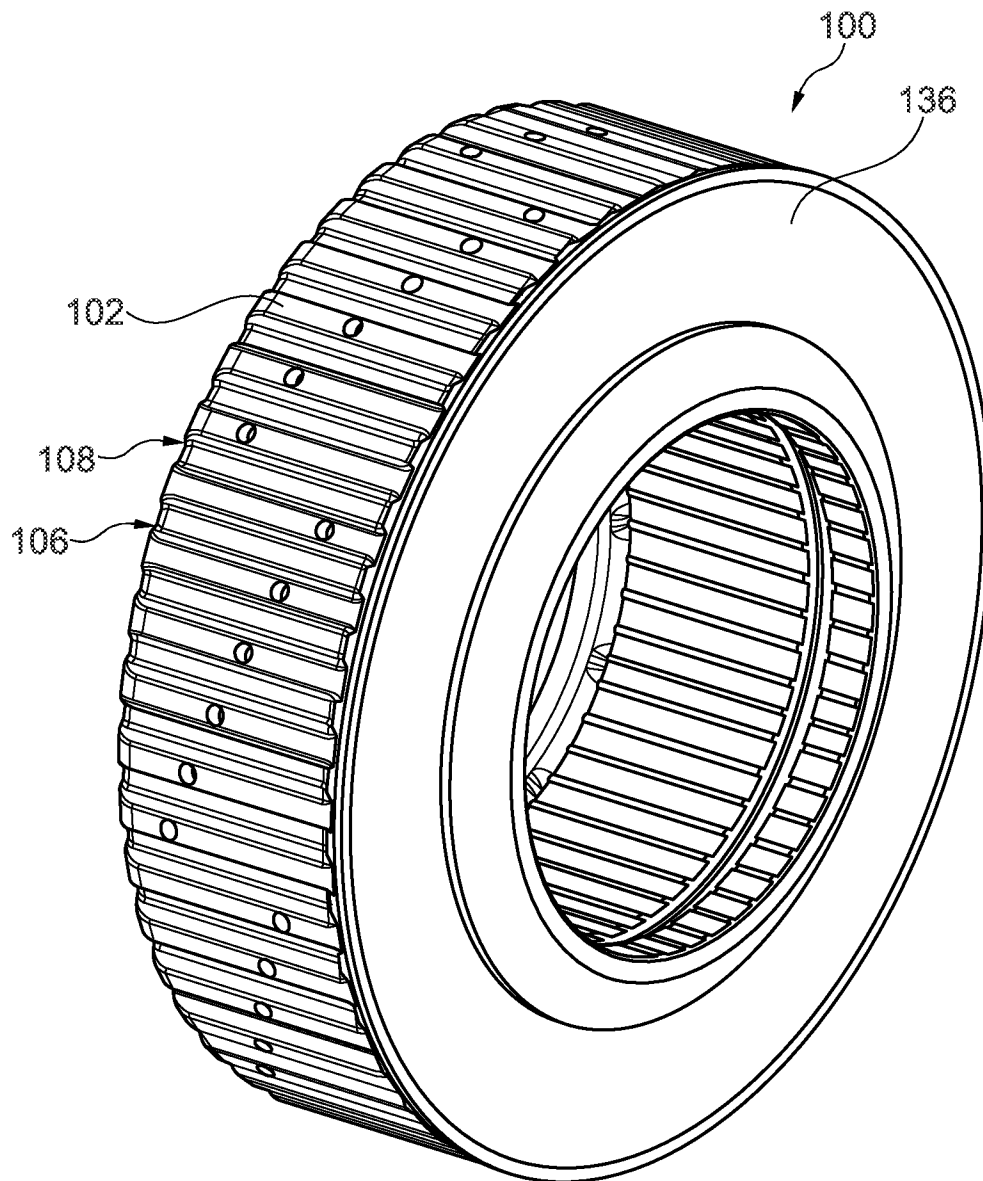


Fig. 1

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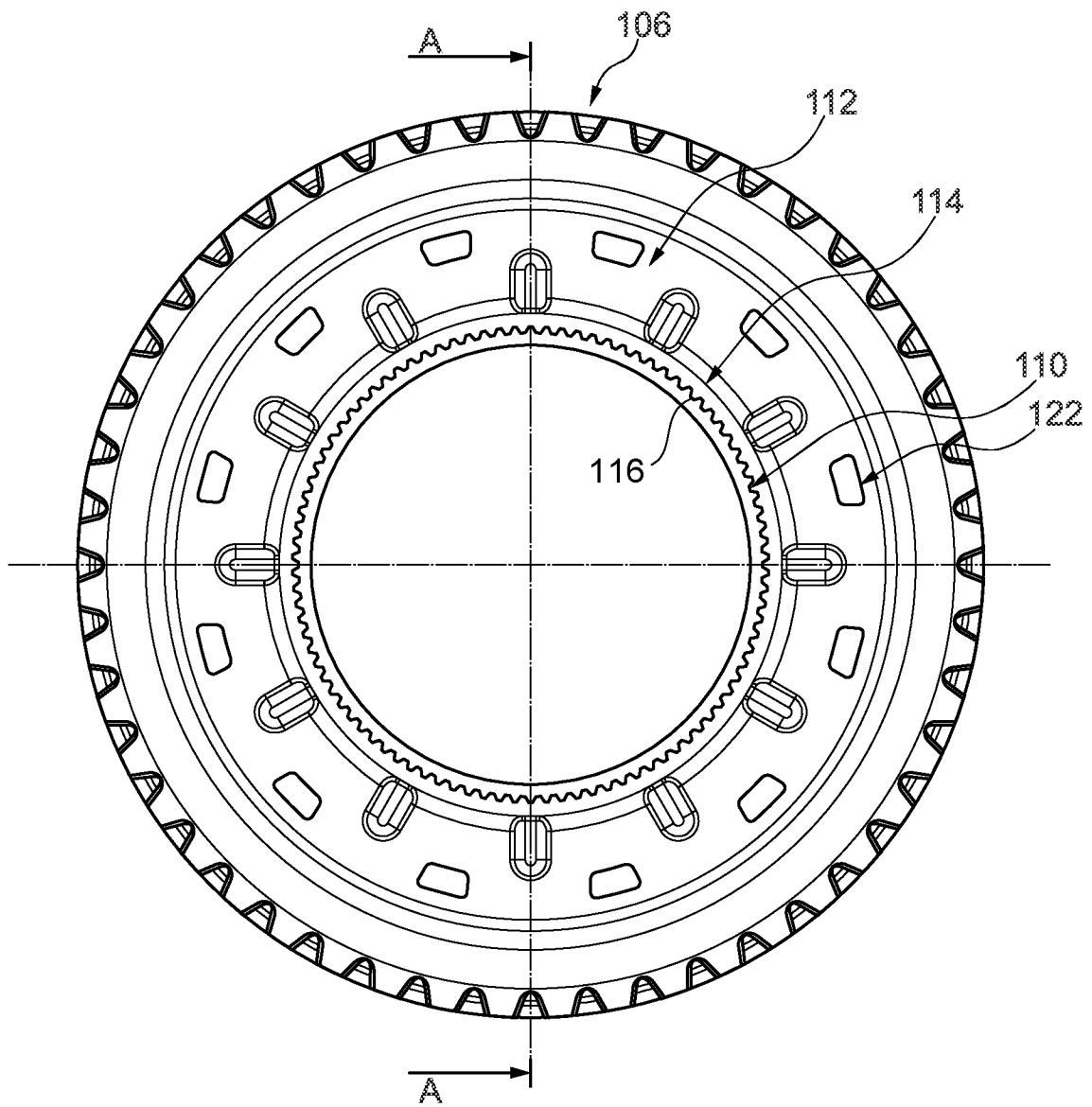


Fig. 2

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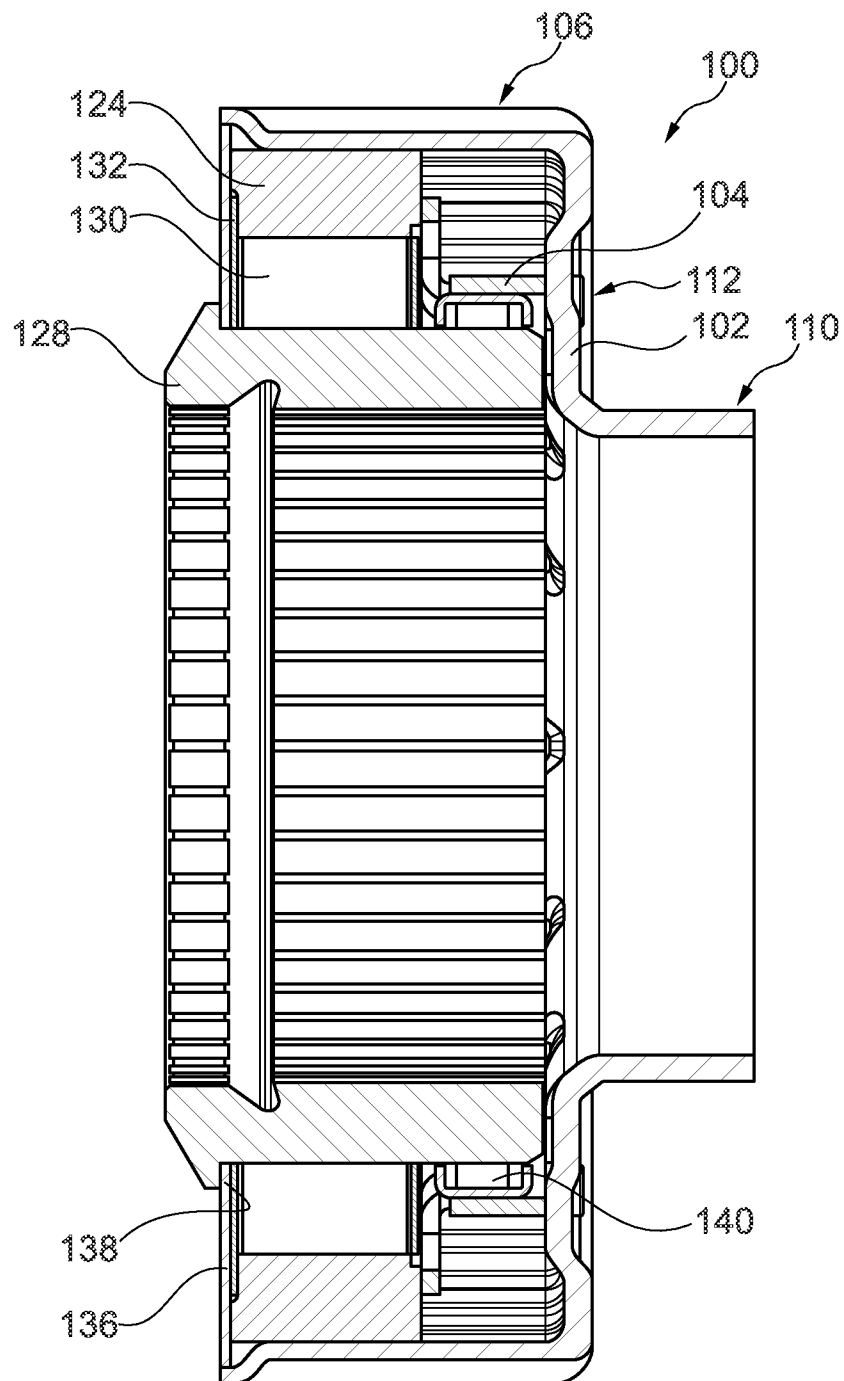


Fig. 3

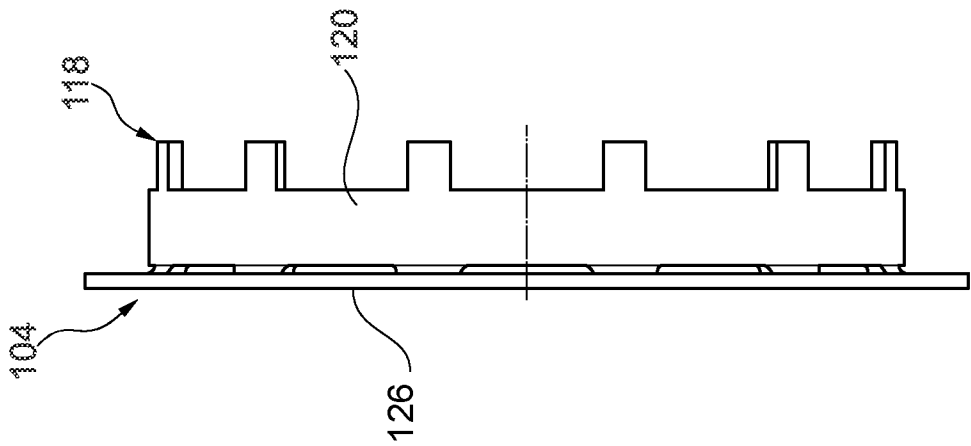


Fig. 5

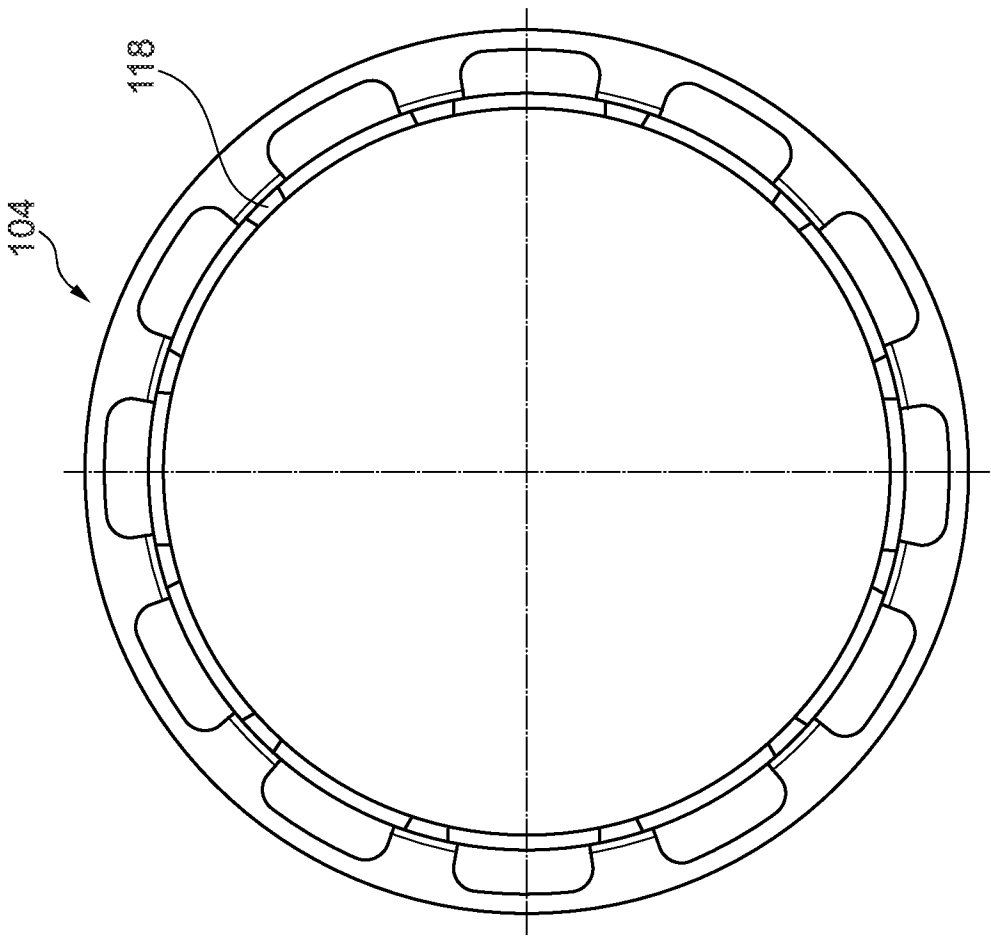


Fig. 4

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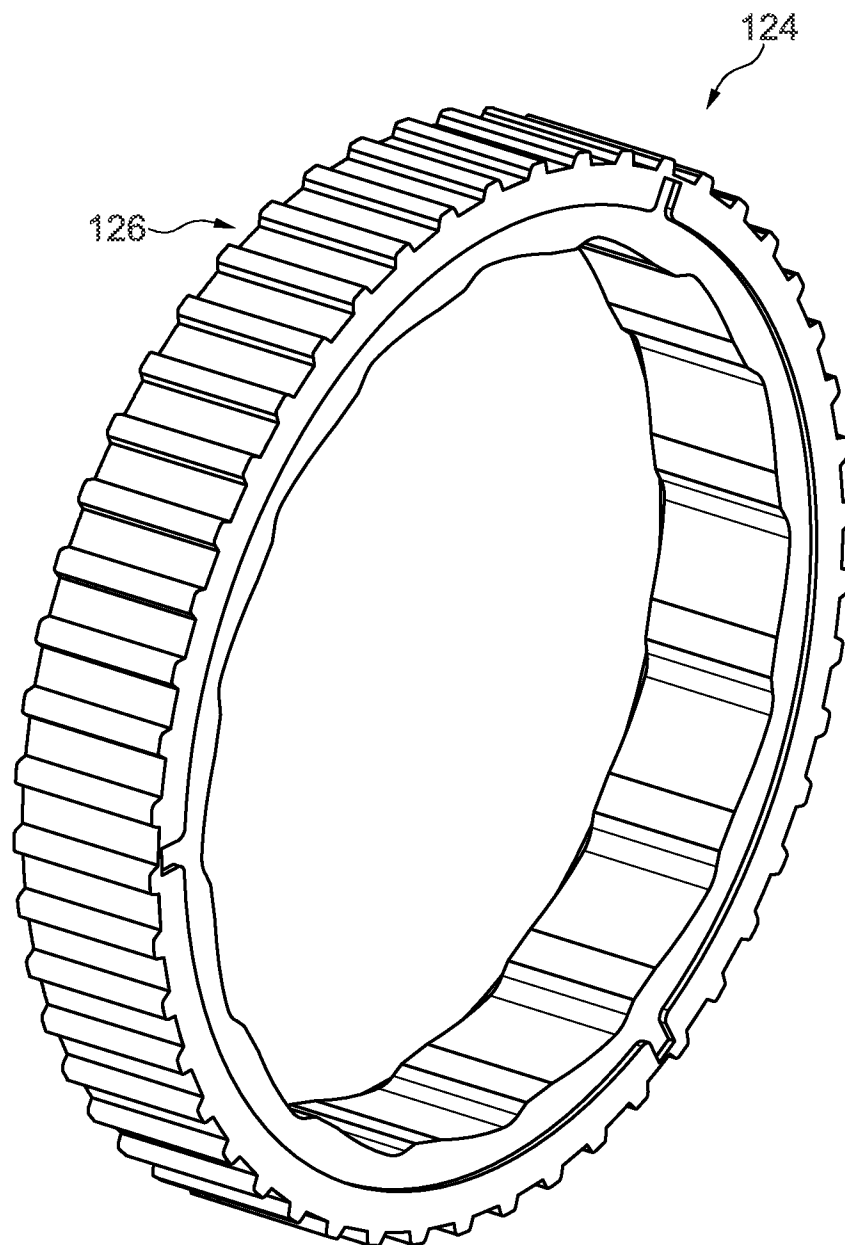


Fig. 6

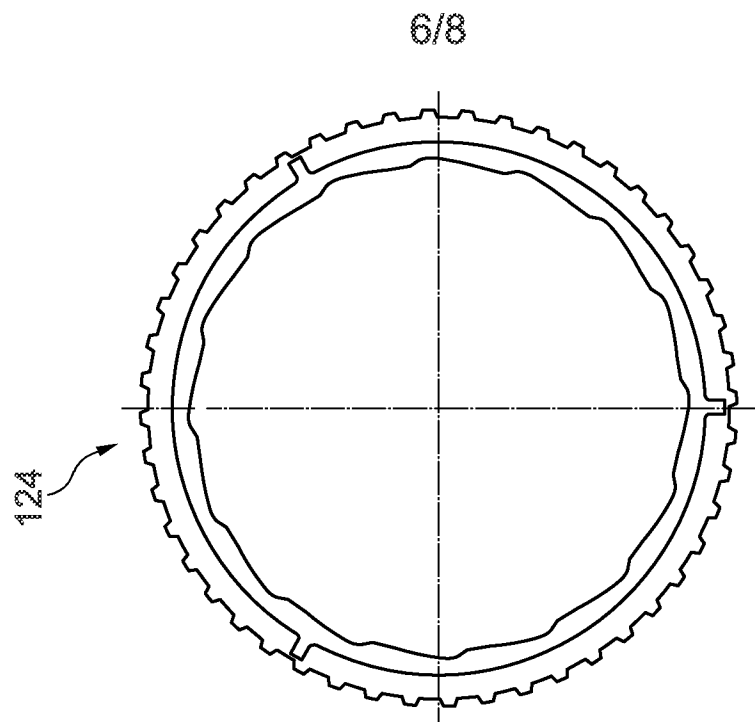


Fig. 9



Fig. 8

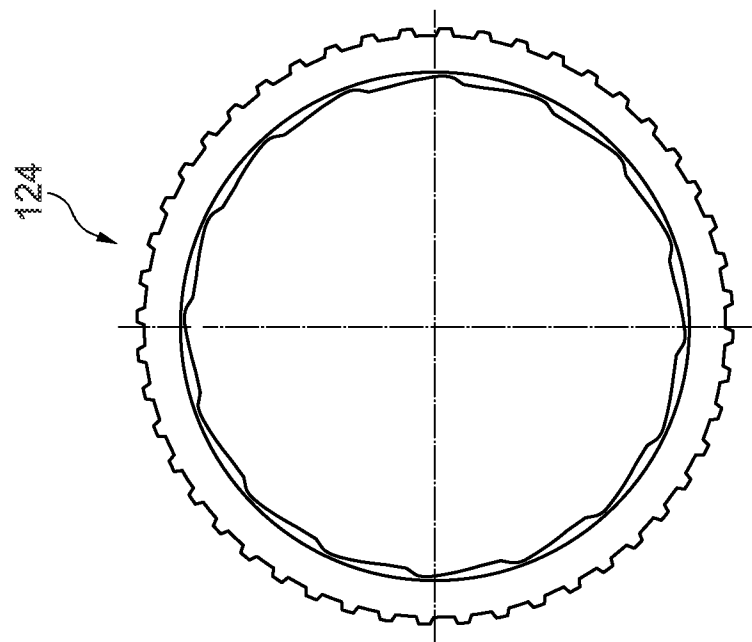


Fig. 7

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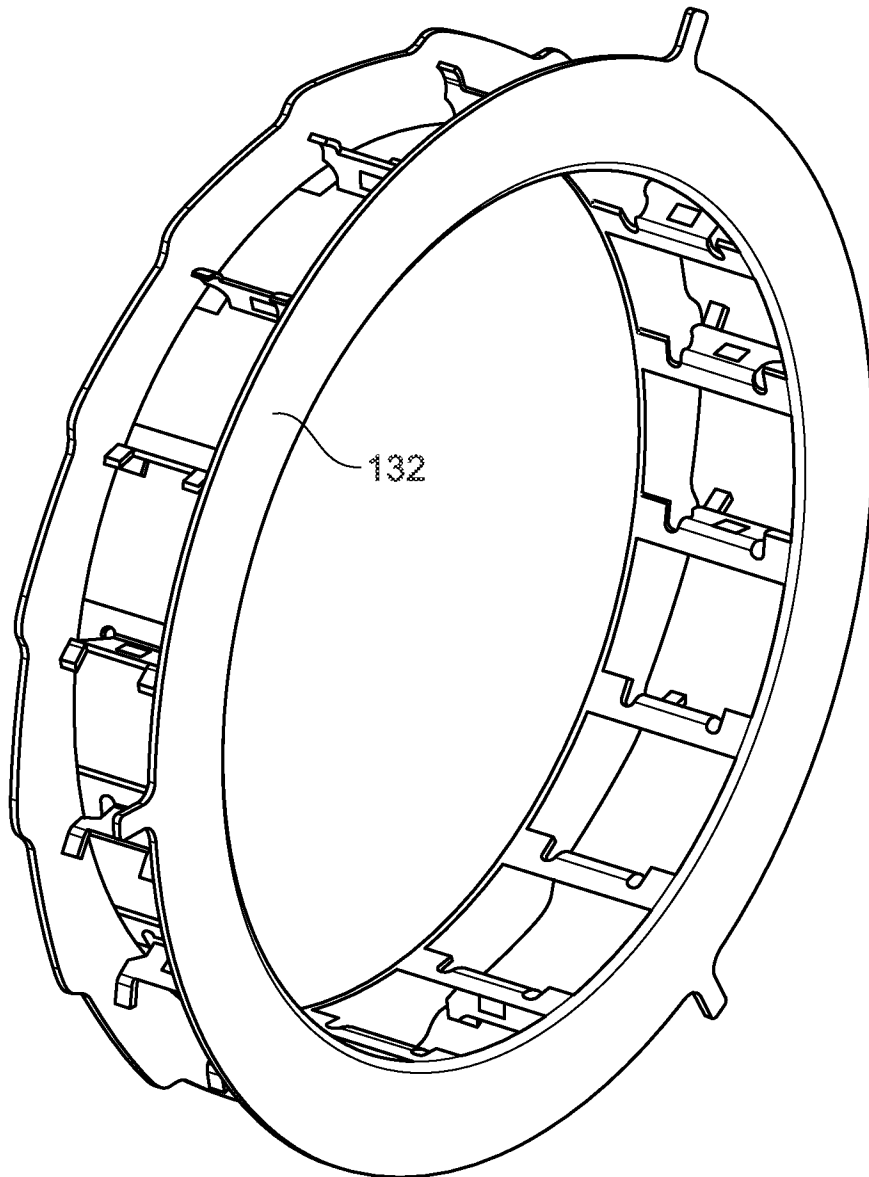


Fig. 10

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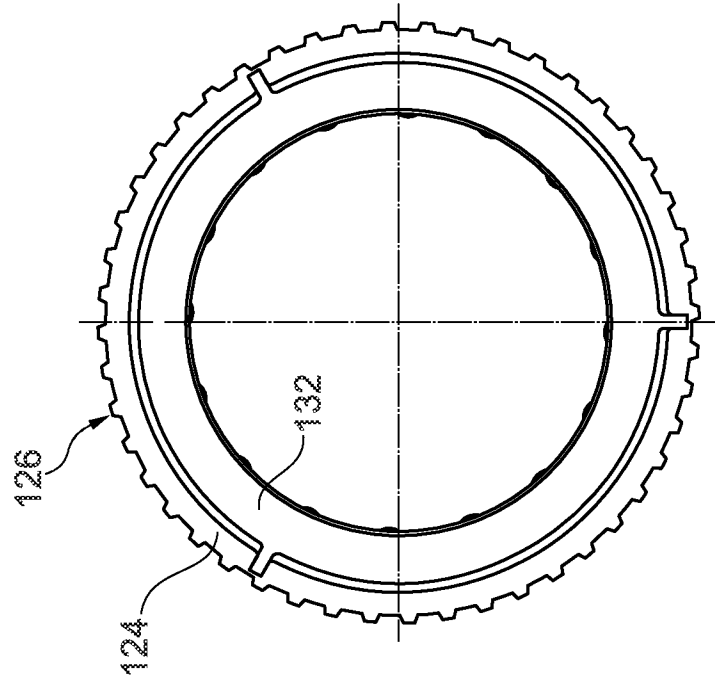


Fig. 12

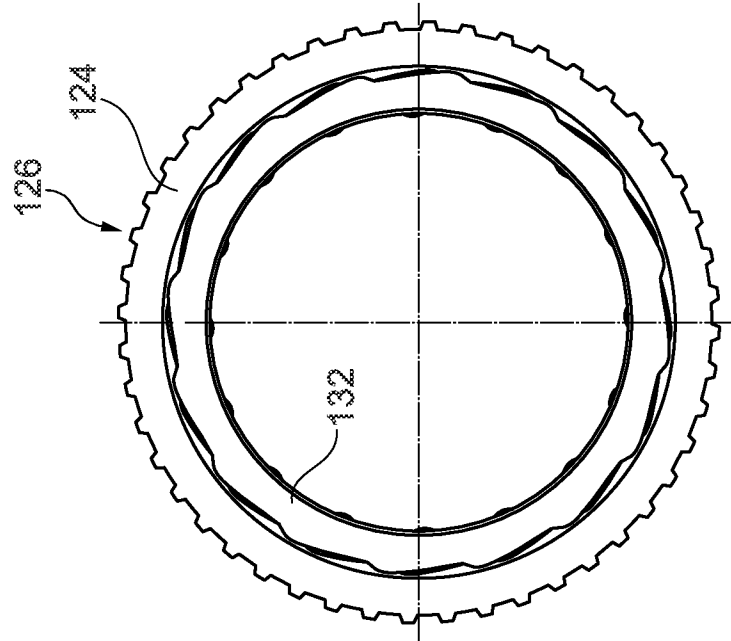


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/022302**A. CLASSIFICATION OF SUBJECT MATTER****F16D 41/064(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16D 41/064; F16H 45/02; F16D 11/10; F16C 35/063; F16C 3/02; F16D 41/067; F16D 13/58; F16H 41/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: one-way clutch, outer circumferential portion, inner circumferential portion, radial portion, bearing support plate, inner race, outer race

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2014-0353110 A1 (SCHAEFFLER TECHNOLOGIES GMBH & CO. KG) 04 December 2014 See paragraphs [0023]-[0025]; and figures 2-5.	1-10
Y	US 2012-0205214 A1 (STEINBERGER et al.) 16 August 2012 See paragraphs [0029]-[0030]; and figure 1.	1-10
Y	US 2003-0034218 A1 (HU et al.) 20 February 2003 See paragraph [0023]; and figure 3.	8
A	US 2016-0025143 A1 (SCHAEFFLER TECHNOLOGIES AG & CO. KG) 28 January 2016 See paragraphs [0012]-[0015]; and figure 1.	1-10
A	WO 2014-062761 A1 (SCHAEFFLER TECHNOLOGIES AG & CO. KG et al.) 24 April 2014 See paragraphs [0015]-[0023]; and figures 2-5.	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 June 2017 (12.06.2017)

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2017/022302

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014-0353110 A1	04/12/2014	CN 105637250 A EP 3004678 A1 US 9145927 B2 WO 2014-193747 A1	01/06/2016 13/04/2016 29/09/2015 04/12/2014
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US 2016-0025143 A1	28/01/2016	None	
WO 2014-062761 A1	24/04/2014	CN 104822973 A DE 112013005045 T5 JP 2015-532405 A US 2014-0110207 A1 US 9046140 B2	05/08/2015 06/08/2015 09/11/2015 24/04/2014 02/06/2015