



- (51) International Patent Classification:
B60B 27/00 (2006.01) *B60B 33/00* (2006.01)
B60B 27/02 (2006.01)
- (21) International Application Number:
PCT/EP2013/074273
- (22) International Filing Date:
20 November 2013 (20.11.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
12193511.8 21 November 2012 (21.11.2012) EP
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, 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).

Published:

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

(54) Title: AN ASSEMBLY COMPRISING A WHEEL HUB AND A UNIVERSAL JOINT ASSEMBLY

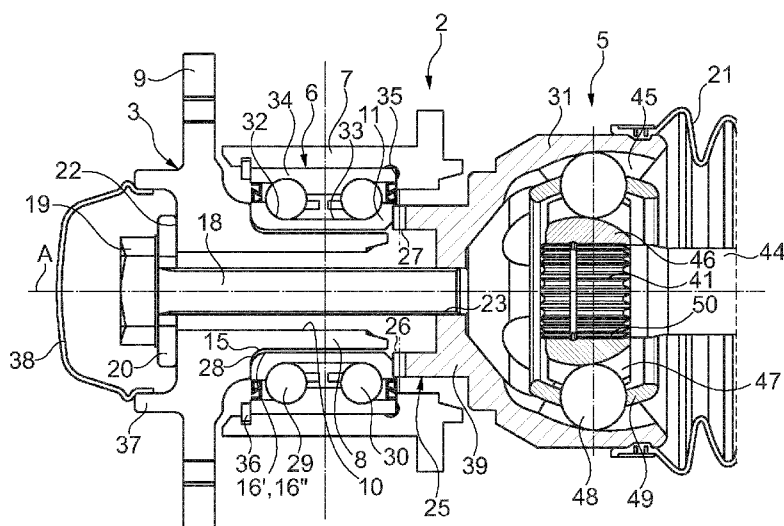


Fig. 1

(57) Abstract: A wheel hub/universal joint assembly comprising a wheel hub (3) with a wheel flange (9) for connecting a wheel, and with a hub sleeve portion (8) for receiving a wheel bearing (6); a constant velocity universal joint (5) with an outer joint part (31); clamping means (8) for axially clamping the wheel hub (3) to the outer joint part (31), wherein the clamping means (18) pass through the wheel hub (3); the outer joint part (31), at an end face facing the wheel hub (3), comprises axial coupling (25, 25') with axially extending projections and recesses (26, 26', 27, 27'); the wheel bearing (6) comprising a bearing inner race carrier (11), which at an end face facing the constant velocity universal joint (5), comprises axial coupling (25, 25') with projections and/or recesses (26, 26', 27, 27'); the bearing inner race carrier (11) being rotationally fixed to the sleeve portion (8) by radial coupling.

AN ASSEMBLY COMPRISING A WHEEL HUB AND A UNIVERSAL JOINT ASSEMBLY

The invention relates to a wheel hub/universal joint assembly for the driveline of a motor vehicle. Such wheel hub/universal joint assemblies serve for drivingly connecting a constant velocity universal joint arranged at the wheel end of a driveshaft of a motor vehicle to the wheel hub received by a wheel carrier arranged at the vehicle. The wheel hub generally comprises a hub sleeve portion for being rotationally supported in a wheel bearing which is held at its outer diameter in the wheel carrier and a wheel flange for connecting a wheel, respectively the central wheel disc of a wheel.

From DE 10 2005 054 283 A1 there is known a wheel hub/universal joint assembly with a constant velocity universal joint and a wheel hub. For torque transmitting purposes, the constant velocity universal joint and the wheel hub are connected to one another via inter-engaging face toothings. First face teeth are provided at the outer joint part of the constant velocity universal joint and second face teeth are provided at the beaded collar of the wheel hub. The wheel bearing cannot be exchanged.

DE 197 51 855 C 1 proposes a connecting assembly between an outer joint part of a constant velocity universal joint and a wheel hub. The transmission of torque from the outer joint part to the wheel hub is effected by an intermediate annular member. Via shaft teeth, the annular member is connected to a hub sleeve portion of the wheel hub in a form-locking way. The end of the annular member provided at the wheel hub end forms a bearing groove for the wheel bearing. After the annular member has been slid on to the wheel hub, the end of the wheel hub is widened, so that the annular member forms a collar for axial fixing purposes. At its joint end, the annular member comprises face teeth which, for torque transmitting purposes, form-lockingly engage corresponding spur teeth of the outer joint part. For axial fixing purposes, the region of the spur teeth is provided with outer grooves which are engaged by a securing ring.

WO2012/059129 A1 describes a wheel hub/universal joint assembly comprising a wheel hub with a wheel flange for connecting a wheel and with a sleeve portion for receiving a

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wheel bearing and a constant velocity universal joint with an end face facing the wheel hub comprising axially extending form-engaging means. The wheel hub comprises a through-aperture, wherein an intermediate element is arranged. The intermediate element comprises second form-engaging means extending radially. The intermediate element comprises a through-aperture for clamping means for axially clamping the wheel hub to the joint. The clamping means is axially supported at the wheel hub and at the joint component.

It is the object of the present invention to propose a wheel hub/universal joint assembly which saves weight, comprises fewer components, shortened axial assembly path and can easily be assembled and disassembled and repaired.

The objective is achieved by providing a wheel hub and universal joint assembly comprising:

a wheel hub, a wheel bearing and a constant velocity universal joint the bearing having an inner race carrier supported by the hub, an outer race carrier supported by the wheel carrier attached to the vehicle body; clamping means for axially clamping the wheel hub to the constant velocity universal joint. The bearing inner race carrier is fixed releasably to the hub. The bearing inner race carrier having at an end face adjacent to the constant velocity universal joint a releasable axial coupling comprising projections and/or recesses.

The advantage of the axial coupling provided in the end face of the wheel bearing adjacent to the constant velocity joint is to achieve a short axial assembly path, a reduced number of components and ease of assembly/disassembly and repair. In the course of the assembly process, for example, first the wheel bearing is press-fitted on the hub. The hub may have a generally tube formed hub sleeve portion to receive at its outer diameter the inner diameter of the wheel bearing. Subsequently, the outer joint part of the constant velocity joint and wheel-bearing inner race carrier are mounted to engage one another in a form-locking way. Thus, in the mounted condition the axial coupling between the bearing inner race carrier and the outer joint part of the constant velocity joint forms a torsionally stiff coupling for transmitting torque from the constant

velocity joint to the wheel bearing inner race carrier. Due to the form-engaging coupling between the bearing inner race carrier and the hub sleeve portion torque is further transmitted to the wheel hub.

5 The form-engagement means, respectively the torsionally stiff coupling, can generally be provided in any form which is suitable for releasably connecting parts. The axial coupling of the outer joint component with the wheel bearing inner race carrier is preferably designed in the form of a face teeth coupling or a dog clutch or a recess coupling. By using the bearing inner race carrier and face adjacent to constant velocity
10 joint, there is no need for complicated design measures or forging operations for the wheel hub sleeve portion facing the joint. More particularly, it is also possible to use a wheel bearing with separate inner bearing races, which is particularly advantageous for certain applications. Overall, the solution in accordance with the invention offers an axially short, rotationally fixed connection between the constant velocity joint component
15 and the wheel hub, and more particularly, the axial assembly path required for producing the rotationally fixed axial coupling is easy to assemble/disassemble and allows removal of the bearing from the hub for replacement.

The constant velocity universal joint preferably comprises an outer joint part, an inner
20 joint part and torque transmitting elements which, for torque transmitting purposes, are effectively arranged between the outer joint part and the inner joint part. The joint component to be connected to the wheel bearing is the outer joint part of the constant velocity universal joint. In principle the constant velocity universal joint can be any joint, for instance a universal ball joint which can be provided in the form of a fixed joint or
25 plunging joint, or a tripod joint.

According to a preferred embodiment, the constant velocity universal joint is provided in the form of a universal ball joint. The outer joint part of the constant velocity ball joint comprises outer ball tracks and the inner joint part comprises inner ball tracks. In each
30 pair of opposed outer and inner ball tracks, there are arranged torque transmitting balls which are held by a ball cage in the angle bisecting plane. The outer joint part of the constant velocity joint, is connected to the wheel bearing inner race carrier in a

rotationally fixed way by axially extending toothings arranged circumferentially in adjacent faces of inner race carrier and outer joint part.

According to a preferred embodiment, the form-engaging coupling of the wheel bearing
5 inner race carrier to the hub sleeve portion is a radial coupling with relative to the axis of rotation an inner toothing at the wheel bearing inner race carrier which engages a corresponding outer toothing of the hub sleeve portion of the wheel hub. Via these shaft toothings which form a splined connection, torque is transmitted from the bearing inner
10 race carrier to the wheel hub. More particularly, it is proposed that the wheel hub comprises a through-aperture which extends from the wheel mounting end to the joint end. Instead of shaft splines it is in principle, also possible to provide other means for torque transmitting purposes, for instance it is possible to use an out-of-round profile, such as a polygonal profile which is able to engage a correspondingly shaped aperture of the bearing inner race carrier in a rotationally fixed way.

15 Alternatively the bearing inner race carrier may be releasably attached to the hub by axially extending toothing in adjacent faces at the wheel end of the bearing and hub. In this case the bearing inner race carrier at both of its end faces has form engagement means in the form of a face teeth coupling or a dog clutch or a recess coupling.

20 Alternatively the hub sleeve portion may a separate component and may be releasably attached to the hub by axially extending toothing in adjacent faces at the wheel end of the hub sleeve portion and hub. In this case the hub sleeve portion at both of its annular end faces has form engagement means in the form of a face teeth coupling or a dog
25 clutch or a recess coupling.

The wheel hub and bearing comprise a central through-aperture which extends along the entire length of the bearing and through which the sleeve portion of the hub can be passed through. The inner toothing of the bearing inner race carrier may
30 extend over the complete length of the bearing. Preferably the bearing comprises two separate inner bearing races in which the two rows of bearing balls run. Preferably the length of the inner toothing of the bearing inner race carrier corresponds with the length

of a separate bearing race. In one embodiment the length of the inner toothing of the bearing inner race carrier corresponds with the length of a separate bearing race adjacent to the joint. Clamping means can be passed through the hub for fixing the outer joint part to the wheel hub. The inner diameter of the through-aperture of the hub is slightly larger than the outer diameter of the clamping means which could comprise a bolt for example.

The flange portion of the hub next to the wheel mounting preferably comprises a supporting face which is or can be axially supported against the bearing inner race carrier of the wheel bearing. The supporting face in assembled position points axially towards the constant velocity joint and is preferably provided in the form of an annular face around the axis of rotation. By tightening the clamping means which are supported on the joint component, the wheel bearing is loaded towards the wheel hub, with the supporting face of the hub coming into contact against the inner bearing race carrier and towards the outer joint part of the constant velocity joint. By further tightening of the clamping means, the wheel bearing is axially pre-tensioned. Conversely, by releasing the clamping means, the entire wheel hub/universal joint assembly can be dismantled in a simple way. More particularly, by removing the joint component, the wheel bearing becomes accessible, so that, if necessary, it can easily be repaired or replaced. By suitably calculating the axial length of the hub flange portion between the supporting face, which supports the inner bearing race, and the plane which is formed by the axial coupling at the outer joint part of the constant velocity joint, it is possible, in an advantageous way, to achieve a tolerance adjustment between the bearing shoulder and the toothing at the outer joint part. This is particularly advantageous if the supporting face at the hub for the bearing inner race carrier comprises axially extending toothing towards the wheel end of the bearing in the form of a face teeth coupling or a dog clutch or a recess coupling between hub and bearing inner race carrier.

According to a preferred embodiment, the axial coupling of the bearing inner race carrier towards the outer joint part of the constant velocity joint are provided at the flange portion of the inner bearing race component, i.e. at the end face of the bearing inner race carrier flange portion which faces the joint, the end face being of generally annular

shape. The inner diameter and outer diameter of this annular shaped end face are designed to transmit the required torque between joint and hub. The annular shaped end faces inner diameter is greater than the diameter of the clamping means. For torque transmitting purposes, the form-engaging means between the outer joint part and the bearing inner race carrier preferably are arranged on a greater diameter than the the

5 bearing inner race carrier preferably are arranged on a greater diameter than the the hub sleeve portion. The outer diameter of this end face annular shape may preferably correspond to the outer diameter of the bearing. The inner diameter of this end face may extend towards the rotational axis to about the diameter of the clamping means.

According to a first possibility, the axial coupling(s) are provided in the form of face

10 tothing and jointly form a face teeth coupling. According to a second possibility, the axial coupling(s) are provided in the form of a dog clutch. Both the two above-mentioned rotationally fixed axial coupling(s) are advantageous in that they comprise a short axial construction and assembly length. The term "face tothing" refers to all conceivable face teeth which form a rotationally stiff coupling, more particularly including Hirth teeth or

15 crown teeth. Apart from the short assembly length, face toothings are additionally advantageous in that, as a result of the radial tooth geometry, the joint component is centered relative to the wheel bearing. The latter particularly applies to bearing inner race carrier with axial couplings arranged towards the and towards the outer joint part of the constant velocity joint.

20 According to a further embodiment which is particularly suitable for being applied to a dog clutch or a recessed coupling, centering means are arranged between the wheel bearing and the outer joint part of the constant velocity joint in order to center the hub and the joint component coaxially relative to the axis of rotation. It goes without saying

25 that the centering means, in their entirety, can be conical. The centering means are preferably arranged radially inside the form-engaging means in the end face of the bearing inner race carrier, so that the transmission of torque takes place on a relatively large radius, which advantageously affects the component load in the region of the form-engaging means.

30 According to a preferred embodiment, the clamping means comprise a bolt which is radially supported on the wheel hub and is threaded into a threaded bore of the hub

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sleeve portion. Alternatively, it is also conceivable that, at the base of the joint component, there is formed on a threaded pin which passes through the through-aperture of the wheel hub with a nut being threaded on to the end of same.

5 Preferred embodiments will be explained below with reference to the drawings. Figure 1 shows a longitudinal section through an inventive wheel hub/universal Figure 1 shows a wheel hub/universal joint assembly 2 which comprises a wheel hub 3, and a constant velocity universal joint 5. By means of a wheel bearing 6, the wheel hub 3 is supported in a wheel carrier 7 connected to the vehicle body so as to be rotatable
10 around the axis of rotation A. The wheel hub 3 comprises a hub sleeve portion 8 for receiving the wheel bearing 6, as well as a generally disc shaped wheel flange 9 for threading on the wheel disc of a wheel (not illustrated). The hub sleeve portion 8 comprises an outer diameter onto which the bearing inner race carrier 11 of the wheel bearing 6 is mounted in a rotationally fixed way for the purpose of transmitting torque
15 from the bearing inner race carrier 11 to the hub 3. Into the through-aperture 10 of hub 3 the clamping element 18 is inserted.

To form a radial coupling 15 of the bearing inner race carrier and the hub sleeve portion 8 comprises an outer (from the perspective of the rotational axis "A") shaft toothing 16',
20 which, for torque transmitting purposes, is engaged in a rotationally fixed way by a corresponding inner shaft toothing 16'' of bearing inner race carrier 11 of bearing 6. The outer shaft toothing 16' and inner shaft toothing 16'' can also be referred to as outer and inner shaft splines. It can be seen that the hub 3 comprises a through-aperture 10 through which there is inserted clamping means 18 for axially clamping the wheel hub 3
25 to the constant velocity universal joint 5. In the present embodiment, the clamping means 18 are provided in the form of a bolt whose head 19 is axially supported via an annular disc 20 on an outer supporting face 22 of the wheel hub 3 facing hub cover 38. The bolt 18 is threaded into a corresponding threaded bore 23 in the outer joint part 31 of the constant velocity universal joint 5. At the wheel end, the wheel hub 3 comprises
30 an annular web 37 to which there is attached a hub cover 38 for protecting the clamping means 18.

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For connecting the bearing inner race carrier 11 with the joint 5 the torsionally stiff axial coupling 25 is provided in the form of a dog clutch, more particularly in form of a crossed recess coupling. For this purpose the outer joint part 31 of the constant velocity joint in its end face 39 which is adjacent to the bearing 6 is provided with two or more axial
5 projections 26 which are circumferentially distributed, whereas the end face of the bearing inner race carrier 11 which is adjacent to the outer joint part 31, 39 comprises corresponding recesses. To achieve a rotationally fixed, form-locking connection, the projections 26 engage the recesses 27, so that torque can be transmitted from the outer joint part 31 to the bearing inner race carrier 11 and the hub 3 via shaft toothing 16', 16".
10 The form locked axial projections 26 and recesses 27 build an axial coupling 25. The radially extending form locked shaft toothings 16', 16" build a radial coupling 15.

The form and number of projections 26, respectively recesses 27 is generally arbitrary. For example, there can be provided two or more single projections 26, respectively
15 recesses 27, which are circumferentially distributed at the end faces of the outer joint part 31 and the end face of the bearing inner race carrier facing each other. It is also conceivable that there are provided two or more groups of projections 26, respectively recesses 27, each group comprising two or more single projections 26, respectively recesses 27. The single projections 26, respectively recesses 27, of each group are
20 preferably arranged parallel to each other. A specifically symmetric design is achieved if there are provided two, three or four single projections 26, respectively recesses 27 arranged over the circumference, or two, three or four groups of projections 26, respectively recesses 27.

25 The wheel bearing 6 comprises two rows of bearing balls 29, 30 which each run in outer and inner bearing races 32, 33. The bearing inner race carrier 11 may consist of two axially separated outer and inner sections each housing one of the corresponding bearing races 32, 33. Furthermore, the wheel bearing 6 comprises a common outer bearing race carrier 34 which receives both rows of bearing balls 29, 30 and which is
30 fixed in the wheel carrier 7. The outer bearing race carrier 34 is axially supported in a first axial direction against a corresponding shoulder 35 of the wheel carrier 7. For axial fixing purposes in the opposed second axial direction, there is provided a securing ring

36 which is inserted into an annular groove of the wheel carrier 7 and which axially supports the outer bearing race carrier 34. By tightening the clamping means 18 of the outer joint part 31 and thus the bearing 6 are axially loaded towards the wheel hub 3, with an inner supporting face 28 coming to rest against the bearing inner race carrier 11.

5 In this way, the wheel bearing 6 is pre-tensioned by the clamping means 18. This is particularly advantageous if the inner supporting face 28 at the hub 3 for the bearing inner race carrier 11 comprises axially extending toothing (projections and recesses circumferentially distributed) towards the wheel end of the bearing 6 in the form of a face teeth coupling or a dog clutch or a recess coupling between hub 3 and bearing inner
10 race carrier 11. In a preferred embodiment the hub sleeve portion 8 is a component separate to the hub 3 and of generally cylindrical shape with annular cross section. In this case the separate component hub sleeve portion and may be releasably attached to the hub 3 and the outer joint 31 by axially extending toothing in adjacent faces at the wheel end of the hub sleeve portion 8 and hub 3 and y axially extending toothing 25 in
15 adjacent faces at the outer joint 39 and the corresponding end the hub sleeve portion. In this case the hub sleeve portion at both of its annular end faces has form engagement means in the form of a face teeth coupling or a dog clutch or a recess coupling.

The constant velocity universal joint 5 comprises an outer joint part 31 with outer ball
20 tracks 45, an inner joint part 46 with inner ball tracks 47, torque transmitting balls 48 each arranged in a pair of opposed outer and inner ball tracks, as well as a ball cage 49. The ball cage 49 holds the balls 48 in the angle-bisecting plane between the axis of the outer joint part 31 and the inner joint part 46 when the constant velocity joint 5 is articulated. The inner joint part 46 comprises a central bore 50 with inner shaft splines
25 41 into which a sideshaft 44 with corresponding shaft splines is inserted in a rotationally fixed way. A convoluted boot 21 is provided for sealing the constant velocity joint 5, a first end being fixed to the outer joint part 3 and a second end being fixed to the sideshaft 44.

30 Figure 2 shows an inventive wheel hub/universal joint assembly in a second embodiment which largely corresponds to that shown in Figure 1, so that, as far as common characteristics are concerned, reference is made to the above description.

Identical components have been given the same reference numbers, whereas modified components have been given indices with an apostrophe. The axial coupling 25' includes projections 26' and recesses 27' with radially inward centering sections 13. The centering sections 13, in their entirety, can be conical. It is to be understood that the
5 centering sections may be arranged radially inward of axial coupling 25'.

List of reference numbers

- 2 wheel hub/ universal joint assembly
- 3 wheel hub
- 5 constant velocity universal joint
- 6 wheel bearing
- 7 wheel carrier
- 8 hub sleeve portion
- 9 wheel flange
- 10 through-aperture
- 11 bearing inner race carrier
- 13 centering sections
- 15 outer shaft toothings of shaft spline
- 16' outer shaft toothings of hub sleeve portion
- 16'' inner shaft toothings of bearing inner race carrier
- 18 clamping means
- 19 bolt head
- 20 annular disc
- 21 convoluted boot
- 22 outer supporting face at wheel hub
- 23 threaded bore
- 25, 25' axial coupling
- 26, 26' projections at bearing inner race carrier to build axial coupling
- 27, 27' recesses at base of the outer joint part to build first form-engaging means
- 28 supporting face at wheel hub inner
- 29 bearing ball
- 30 bearing ball
- 31 outer joint part of constant velocity universal joint
- 32 outer bearing race on bearing inner race carrier
- 33 inner bearing race on bearing inner race carrier
- 34 outer bearing race carrier for wheel bearing

35 shoulder at wheel carrier to support outer bearing race

36 securing ring received in wheel carrier

37 annular web to receive hub cover

38 hub cover

39 outer joint part of constant velocity universal joint with form engagement means

41 shaft splines of constant velocity universal joint

44 sideshaft of constant velocity universal joint

45 outer ball tracks of constant velocity universal joint

46 inner joint part of constant velocity universal joint

47 inner ball tracks of constant velocity universal joint

48 balls of constant velocity universal joint

49 ball cage of constant velocity universal joint

50 bore of constant velocity universal joint

A axis of rotation

Claims

1. A wheel hub/universal joint assembly (2) comprising a wheel hub (3), a wheel bearing (6) and a constant velocity universal joint (5) with an outer joint part (31, 39);

the bearing having an inner race carrier (11) supported by the hub (3), an outer race carrier (34) supported by the wheel carrier (7) attached to the vehicle body;

clamping means (18) for axially clamping the wheel hub (3) to the outer joint part (31, 39) of the constant velocity universal joint (5);

the bearing inner race carrier (11) being fixed releasably to the hub (3);

the outer joint part (31, 39) having at an end face adjacent to the wheel bearing (6) a releasable axial coupling (25, 25') comprising axially extending projections and recesses (26, 26', 27, 27').

2. Wheel hub/universal joint assembly according to claim 1 wherein the bearing inner race carrier (11) having at an end face adjacent to the constant velocity universal joint (5) a releasable axial coupling (25, 25') comprising axially extending projections and recesses (26, 26', 27, 27').

3. Wheel hub/universal joint assembly according to claim 2, wherein the end of the bearing inner race carrier (11) adjacent to hub (3) comprises releasable axial coupling with axially extending projections and recesses.

4. Wheel hub/universal joint assembly according to one or more of the preceding claims, wherein axially extending projections and recesses form a dog clutch.

5. Wheel hub/universal joint assembly according to one or more of the preceding claims, wherein axially extending projections and recesses form crossed recess coupling.
6. Wheel hub/universal joint assembly according to one or more of claims 1 to 5, wherein the end face of the bearing inner race carrier adjacent to the constant velocity universal joint (5) is of annular shape.
7. Wheel hub/universal joint assembly according to one or more of claims 1 to 5, wherein the end face of the bearing inner race carrier adjacent to the hub (3) is of annular shape.
8. Wheel hub/universal joint assembly according to claim 6 and 7, wherein the annular end face of the bearing inner race carrier adjacent to the hub (3) and the annular end face of the bearing inner race carrier adjacent to the outer joint part (31, 39) form a releasable axial coupling (25, 25') comprising axially extending projections and recesses (26, 26', 27, 27').
9. Wheel hub/universal joint assembly according to claim 1 wherein the fixation of the bearing inner race carrier (11) to the hub (3) comprises a hub sleeve portion (8) having at an end face adjacent to the constant velocity universal joint (5) a releasable axial coupling (25, 25') comprising axially extending projections and recesses (26, 26', 27, 27').
10. Wheel hub/universal joint assembly according to claim 9 wherein the hub sleeve portion (8) is a component which is of general cylindrical shape with annular cross section and is separate from the hub (3).
11. Wheel hub/universal joint assembly according to claim 10, wherein the annular end faces of the separate hub sleeve portion component (8) adjacent to the hub (3) and adjacent to the outer joint part (31, 39) are of annular shape and comprise axially extending projections and recesses (26, 26', 27, 27').

12. Wheel hub/universal joint assembly according to one or more of claims 1 to 11, wherein the hub (3) comprises a through-aperture (10) for inserting clamping means (18) for axially clamping the wheel hub (3) to the constant velocity universal joint (5).

13. Wheel hub/universal joint assembly according to claim 12, wherein the outer diameter of the annular shaped end face of the bearing inner race carrier (11) adjacent to the constant velocity universal joint (5) corresponds to the outer diameter of the bearing inner race carrier (11).

14. Wheel hub/universal joint assembly according to claim 12, wherein the outer diameter of the annular shaped end face of the bearing inner race carrier (11) adjacent to the constant velocity universal joint (5) corresponds to the inner diameter of the wheel carrier (7).

15. Wheel hub/universal joint assembly according to one or more of claims 12 to 14, wherein the inner diameter of the annular shaped end face of the bearing inner race carrier (11) adjacent to the constant velocity universal joint (5) corresponds to the inner diameter of the wheel bearing (6).

16. Wheel hub/universal joint assembly according to one or more of claims 1 to 15 wherein the releasable fixation of the bearing inner race carrier (11) to hub (3) comprise spline toothing.

17. Wheel hub/universal joint assembly according to one or more of claims 1 to 15 wherein the releasable fixation of the bearing inner race carrier (11) hub (3) comprise out of round cross-sections on the bearing inner race carrier (11) and corresponding cross-sections on the hub (3).

18. Wheel hub/universal joint assembly according to one or more of claims 1 to 17 comprising at least one centering section (13) arranged in the inner bearing race carrier's (11) end face adjacent to outer joint part (31, 39) of constant velocity joint (5).

19. Wheel hub/universal joint assembly according to one or more of claims 1 to 17 comprising at least one centering section (13) arranged in hub sleeve portion's (8) end face adjacent to outer joint part (31, 39) of constant velocity joint (5).

20. Wheel hub/universal joint assembly according to claims 18 or 19, wherein the centering sections (13) is arranged radially inwardly in the outer joint part (31, 39) of constant velocity joint (5).

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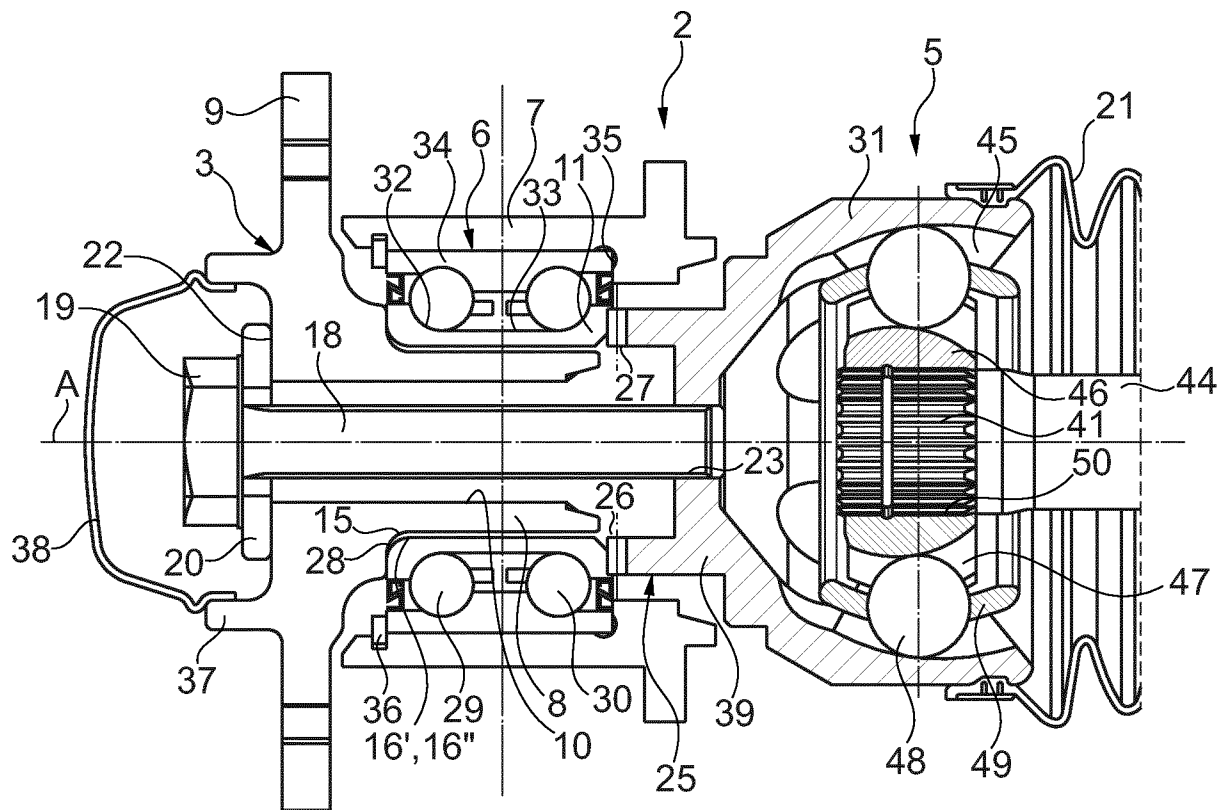


Fig. 1

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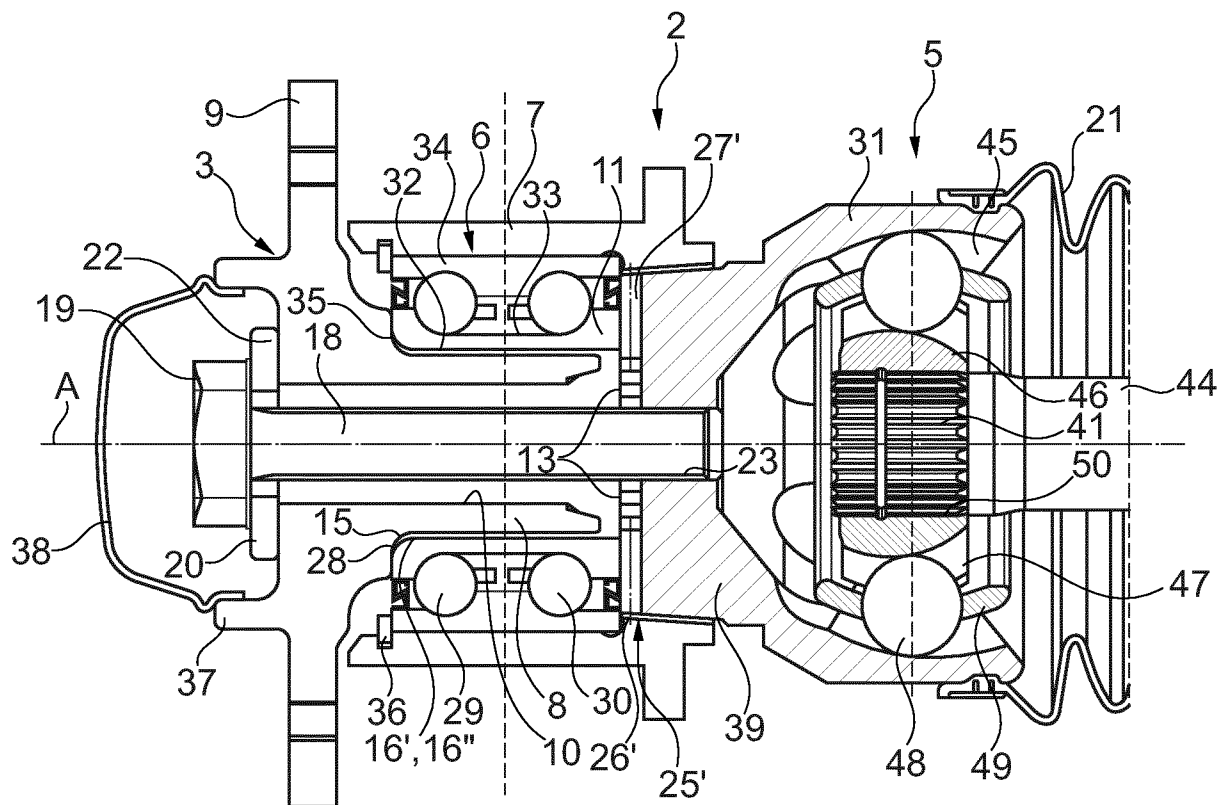


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/074273

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60B27/00 B60B27/02 B60B33/00
ADD.

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)
B60B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 105 321 A1 (JTEKT CORP [JP]) 30 September 2009 (2009-09-30) paragraph [0044] - paragraph [0050]; figures 6-8	1-20
X	EP 2 042 755 A2 (JTEKT CORP [JP]) 1 April 2009 (2009-04-01) figures 10,11	1-17
X	DE 10 2006 033116 A1 (SCHAEFFLER KG [DE]) 24 January 2008 (2008-01-24) paragraph [0038] - paragraph [0039]; figure 1	1-17
X	FR 2 605 557 A1 (LOEHR & BROMKAMP GMBH [DE]) 29 April 1988 (1988-04-29) figures 2,4	1-17



Further documents are listed in the continuation of Box C.



See patent family annex.

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21/02/2014

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/074273

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