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August 21, 2024

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OF:**

APPLICATION NUMBER: 17/815,833

FILING DATE: *July 28, 2022*

PATENT NUMBER: 11598376

ISSUE DATE: *March 07, 2023*



Certified by

Katherine Kelly Vidal

Performing the Functions and Duties of the
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for Intellectual Property
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Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82A (07-13)

Approved for use through 03/31/2021. OMB 0651-0035

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Application Number	
Filing Date	July 28, 2022
First Named Inventor	Michael Walter Hopson
Title	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Art Unit	
Examiner Name	
Attorney Docket Number	265038

SIGNATURE of Applicant or Patent Practitioner

Signature	/James D. Miller/	Date (Optional)	
Name	James D. Miller	Registration Number	46932
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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American Axle v. Neapco - IPR2025-00090
PET_AAM_1005-0002

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B (07-13)

Approved for use through 01/31/2018. OMB 0851-0035

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Application Number

Filing Date

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC



Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

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The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

9/27/17

Name

KEITH E. SANFORD

Title

PRESIDENT

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Total of forms are submitted.

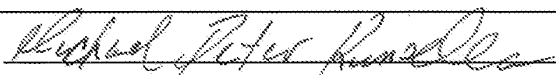
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American Axle v. Neapco - IPR2025-00090

PET_AAM_1005-0003

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

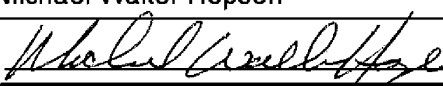
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Michael Peter Kinsella</u> Date (Optional): <u>4-6-2013</u> Signature: <u></u> Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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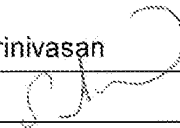
DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Michael Walter Hopson</u> Date (Optional): <u>1/9/12</u> Signature: <u></u> Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
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Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: <u>Arvind Srinivasan</u> Date (Optional): _____ Signature: <u></u> Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/815,833

RECEIPT DATE / TIME
07/28/2022 04:49:58 PM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 60822141

FILING DATE -

CUSTOMER # 43935

FIRST NAMED INVENTOR Michael Walter Hopson

CORRESPONDENCE ADDRESS -

AUTHORIZED BY James Miller

Documents

TOTAL DOCUMENTS: 7

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
265038_ADS.pdf	9	Application Data Sheet	2141 KB
265038_Application.pdf	16	-	167 KB
265038_Application-SPEC.pdf	(1-11) 11	Specification	161 KB
265038_Application-CLM.pdf	(12-15) 4	Claims	100 KB
265038_Application-ABST.pdf	(16-16) 1	Abstract	92 KB
265038_Declarations_Filed.p	3	Oath or Declaration filed	2591 KB

df

265038__Drawings.pdf	3	Drawings-only black and white line drawings	114 KB
265038__POA.pdf	2	Power of Attorney	267 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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New International Application Filed with the USPTO as a Receiving Office

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APPLICATION #
17/815,833

RECEIPT DATE / TIME
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PATENT CENTER # 60822141

AUTHORIZED BY James Miller

CUSTOMER # 43935

FILING DATE -

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Michael Walter Hopson

Payment Information

PAYMENT METHOD
DA / 505605

PAYMENT TRANSACTION ID
E20227RG50461409

PAYMENT AUTHORIZED BY
Christine Golupski

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1111	UTILITY PATENT APPL. SEARCH FEE	700.00	1	700.00
1011	BASIC FILING FEE - UTILITY (PAPER FILING ALSO REQUIRES NON-ELECTRONIC FILING FEE UNDER 1.16(T))	320.00	1	320.00
1311	PATENT APPL. EXAMINATION FEE	800.00	1	800.00
TOTAL AMOUNT:				\$1,820.00

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HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is a continuation of U.S. Pat. Appl. No. 15/966,085, filed April 30, 2018, which claims the benefit of U.S. Provisional Application No. 62/500,821, filed on May 3, 2017. The entire disclosure of each of the above applications is incorporated herein by reference.

FIELD

[0002] The present technology relates to joint assemblies, particularly to a propeller shaft constant velocity joint with a plug-on interface that provides a high retention force and service access for disassembly thereof.

INTRODUCTION

[0003] This section provides background information related to the present disclosure which is not necessarily prior art.

[0004] Joint assemblies, including various universal and constant velocity joints, are common components in automotive vehicles for applications requiring a transmission of torque through an angle. Universal joints can be used to join portions of a driveshaft. Constant velocity joints (CV joints or CVJs) are typically used to transmit torque at an angle from a powertrain transmission (transmission or four wheel drive system, for example) of a vehicle to final drive components with a constant velocity or speed.

[0005] One type of CV joints are referred to as plug-on CV joints. Plug-on CV joints are used for attachment of a drive or propeller shaft of the vehicle to the powertrain or to the final drive components without requiring the use of threaded fasteners or bolts to secure the joints. Typically, the plug-on CV joint includes an outer joint member and an inner joint member. Internal splines formed on either the inner joint member or the outer joint member couple with external splines formed on the powertrain or a final drive component shaft and secured with an expanding snap ring. The snap ring secures or locks the CV joint axially when corresponding grooves of the internal splines and the external splines are aligned.

[0006] Generally, the plug-on CV joints are used for vehicles such as passenger cars and light truck applications having independent suspensions, wherein the drivelines are not subjected to high cyclic axial thrust loading incurred from rapid movement of live beam axles. Disadvantageously, the snap rings used to axially retain or lock the CV joint to the powertrain or final drive components are entirely covered and not easily accessible after assembly. As a result, the snap ring is not easily accessible for disassembly or disengagement with tools during maintenance. To overcome this disadvantage, the snap ring and corresponding grooves are configured to permit forced disassembly with pry tools employing relatively minimal axial loads, generally less than about 500 pounds.

[0007] However, these plug-on CV joints with the snap ring are unable to withstand higher thrust loads applied to the driveline on live beam axle applications, while still permitting easy access to the snap ring for maintenance.

[0008] It would be desirable to provide a robust plug-on CV joint configured for maximized axial retention of the CV joint to a powertrain or final drive components while maximizing an ease of maintenance thereof.

SUMMARY

[0009] The present technology includes articles of manufacture, systems, and processes that relate to a joint assembly, including a robust plug-on CV joint, which is configured for maximized axial retention of the plug-on CV joint to a powertrain or final drive component while maximizing an ease of maintenance thereof. The joint assembly can include a joint having splines formed therein and a shaft having splines formed thereon coupled to the joint, where the splines of the shaft engage the splines of the joint. An access window is formed on the joint and a ring retains the shaft to the joint, where a portion of the ring is accessible through the access window.

[0010] In certain embodiments, a joint assembly is provided that includes a first member, a second member, a window, and a retaining means. The first member has a first engagement means and the second member has a second engagement means. A portion of the second member is disposed within the first member, where the second engagement means engages the first engagement means to provide a coupling of the second member to the first member. The window is formed within the first member where the portion of the second member is disposed within the

first member. The retaining means is configured to retain the coupling of the second member to the first member, where at least a portion of the retaining means is accessible through the window. A joint, such as a constant velocity joint, can be coupled to one of the first member and the second member.

[0011] In certain embodiments, a joint assembly is provided that includes a first member, a second member, a window, and a retaining ring. The first member has an open end and a first plurality of splines formed within the open end. The second member has a second plurality of splines formed thereon. A portion of the second member is disposed within the first member, where the second plurality of splines engages the first plurality of splines to provide a coupling of the second member to the first member. The window is formed within the first member where the portion of the second member is disposed within the first member. The retaining ring is configured to retain the coupling of the second member to the first member and a portion of the retaining ring is accessible through the window. The first member includes an interior surface annular recess that receives a portion of the retaining ring and the second member includes an exterior surface annular recess that receives another portion of the retaining ring.

[0012] In certain embodiments, a method of servicing a joint assembly is provided that includes manipulating the retaining means through the window to release the coupling of the second member to the first member. The first member and the second member are then separated by disengaging the second engagement means from the first engagement means. In this way, one of the first member and the second member can be replaced with another of the first member and the second member to form another joint assembly.

[0013] Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

[0014] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0015] Figure 1 is an exploded perspective view of an embodiment of a joint assembly according to the present technology.

[0016] Figure 2 is an assembled perspective view of the embodiment of the joint assembly of Figure 1.

[0017] Figure 3 is a fragmentary cross-sectional view of the joint assembly taken along plane 3-3 in Figure 2.

DETAILED DESCRIPTION

[0018] The following description of technology is merely exemplary in nature of the subject matter, manufacture and use of one or more inventions, and is not intended to limit the scope, application, or uses of any specific invention claimed in this application or in such other applications as may be filed claiming priority to this application, or patents issuing therefrom. Regarding methods disclosed, the order of the steps presented is exemplary in nature, and thus, the order of the steps can be different in various embodiments. “A” and “an” as used herein indicate “at least one” of the item is present; a plurality of such items may be present, when possible. Except where otherwise expressly indicated, all numerical quantities in this description are to be understood as modified by the word “about” and all geometric and spatial descriptors are to be understood as modified by the word “substantially” in describing the broadest scope of the technology. “About” when applied to numerical values indicates that the calculation or the measurement allows some slight imprecision in the value (with some approach to exactness in the value; approximately or reasonably close to the value; nearly). If, for some reason, the imprecision provided by “about” and/or “substantially” is not otherwise understood in the art with this ordinary meaning, then “about” and/or “substantially” as used herein indicates at least variations that may arise from ordinary methods of measuring or using such parameters.

[0019] All documents, including patents, patent applications, and scientific literature cited in this detailed description are incorporated herein by reference, unless otherwise expressly indicated. Where any conflict or ambiguity may exist between a document incorporated by reference and this detailed description, the present detailed description controls.

[0020] Although the open-ended term “comprising,” as a synonym of non-restrictive terms such as including, containing, or having, is used herein to describe and claim embodiments of the present technology, embodiments may alternatively be described using more limiting terms such as “consisting of” or “consisting essentially of.” Thus, for any given embodiment reciting materials, components, or process steps, the present technology also specifically includes

embodiments consisting of, or consisting essentially of, such materials, components, or process steps excluding additional materials, components or processes (for consisting of) and excluding additional materials, components or processes affecting the significant properties of the embodiment (for consisting essentially of), even though such additional materials, components or processes are not explicitly recited in this application. For example, recitation of a composition or process reciting elements A, B and C specifically envisions embodiments consisting of, and consisting essentially of, A, B and C, excluding an element D that may be recited in the art, even though element D is not explicitly described as being excluded herein.

[0021] The present technology relates to joint assemblies, including those having various joints or couplings, including universal joints or constant velocity joints and shafts, which can be used in vehicle transmissions and drivelines. Although examples are provided herein with reference to CV joints, the present technology can apply to other types of joint assemblies used in other applications. Joint assemblies according to the present disclosure are configured to facilitate a transmission of rotational forces and torque between components, such as driveline components of a vehicle. Such joint assemblies provide a robust plug-on joint configured for maximized axial retention of the joint to a powertrain or final drive component while maximizing an ease of maintenance thereof.

[0022] A joint assembly is provided having a first member with a first engagement means, a second member with a second engagement means, a window formed within the first member, and a retaining means configured to retain the coupling of the second member to the first member. A portion of the second member is disposed within the first member so that the second engagement means engages the first engagement means to provide a coupling of the second member to the first member. The window formed within the first member is located where the portion of the second member is disposed within the first member. A portion of the retaining means is accessible through the window.

[0023] Other aspects of the joint assembly include where the first member can include an open end and the first engagement means of the first member can be formed within the open end. In this case, the portion of the second member disposed within the first member can accordingly be disposed within the open end, where the portion of the second member disposed within the first member can also include the second engagement means. The window can be continuous with the open end. That is, the window can provide a pathway from the open end of the first

member down a length of a side of the first member. The first engagement means and the second engagement means can be configured to couple the first member and second member in various ways, including various fasteners, keys and keyways, male-female couplings, interlocking features, and so on. In certain embodiments, the first engagement means can include a first plurality of splines and the second engagement can include a second plurality of splines. The first plurality of splines and the second plurality of splines can be complementary, where one can be a set of male splines and the other a set of female splines.

[0024] Further aspects of the joint assembly include where the first member has an interior surface recess that receives a portion of the retaining means and the second member has an exterior surface recess that receives another portion of the retaining means. The retaining means can be configured as a retaining ring configured to operate within an interior surface annular recess and an exterior surface annular recess. The joint assembly can include a seal configured to cover the window. In this way, the seal can prevent unwanted material, such as dust or debris, from entering the window. The seal can be moved to uncover the window, allowing access to the retaining means.

[0025] The joint assembly can include a joint designed to transmit rotary motion across a static or variable angle. Examples include where a constant velocity joint is coupled to one of the first member and the second member of the joint assembly. In this way, the joint assembly can be configured as a snap-on constant velocity joint. The joint can be configured as a tripod-type or ball-type constant velocity joint. However, it is understood that the joint can be configured as any constant velocity joint or joint assembly of any type having an inner joint member and an outer joint member, as desired. Additional examples of a joint that can be used in the present technology include various universal joints, Cardan joints, double Cardan joints, Tracta joints, Rzeppa joints, Weiss joints, and Thompson couplings. Particular examples of various types of joints further include those described in U.S. Pat. No. 6,739,422, U.S. Pat. No. 6,251,019, U.S. Pat. No. 7,922,590, and U.S. Pat. No. 8,231,475. The joint assembly can be configured as part of or coupled to a transfer case, transmission output shaft, axle pinion shaft, drive shaft or propeller shaft. The joint assembly can be configured for use with half-shaft inboard joints or wheel end or outboard joints or any other joints as desired. It is to be understood that the joint assembly can be employed with any rotational members configured for transmitting torque from one component to another component. Additional examples include a vehicle driveline comprising one or more

of the joint assemblies provided herein and include a vehicle comprising one or more of the joint assemblies provided herein.

[0026] A configuration of joint assemblies according to the present technology optimizes the serviceability thereof. In particular, methods of servicing a joint assembly are provided with respect to the joint assemblies described herein. Such methods include manipulating the retaining means through the window to release the coupling of the second member to the first member. The first member and the second member are then separated by disengaging the second engagement means from the first engagement means. Where the joint assembly further includes a seal configured to cover the window, the method can further comprise uncovering the window from the seal prior to manipulating the retaining means through the window to release the coupling of the second member to the first member. Servicing the joint assembly can also include coupling the separated first member with another second member to form another joint assembly or coupling the separated second member with another first member to form another joint assembly. For example, a damaged member can be easily replaced in this fashion, a different type of joint installed, or the configuration of the joint assembly can be changed by including a member having different dimensions and/or operational properties. The method can also include replacing the retaining means with another retaining means and coupling the separated first member with the separated second member to reform the joint assembly. For example, different retaining means can be swapped in and out that have different retention properties and/or thrust load limits.

[0027] The present technology therefore provides a plug-on CV joint with more robust retaining ring locking that can withstand significantly higher thrust loads applied to the driveline on live beam axle applications, while still allowing disassembly for field service repairs. To accomplish this, a more robust retaining ring retention system can provide at least 1,500 lb of retention force to prevent unseating or disassembly during vehicle use on live beam axle driveline applications. The snap ring may be thicker, have sharper corners, or use deeper grooves in the corresponding splined components in order to increase axial retention force.

[0028] To maintain the ability to disassemble the CV joint for field service repairs, the retaining ring can contain outward facing tabs and an access window on the internally splined outer race extension to allow access to the tabs for the purpose of unseating the retaining ring for disassembly without the use of heavy prying tools and permanently damaging components.

EXAMPLE

[0029] With reference now to Figures 1-3, an embodiment of a joint assembly according to the present technology is shown at 100.

[0030] The joint assembly 100 includes a first member 110, a second member 120, a window 130, and a retaining ring 140. The first member 110 has an open end 150 and a first plurality of splines 160 formed within the open end 150. The second member 120 has a second plurality of splines 170 formed thereon. A portion 180 of the second member 120 is disposed within the open end 150 of the first member 110, where the second plurality of splines 170 engages the first plurality of splines 160 to provide a coupling of the second member 120 to the first member 110. The window 130 is formed within the first member 110 where the portion 180 of the second member 120 is disposed within the first member 110. The retaining ring 140 is configured to retain the coupling of the second member 120 to the first member 110. A portion 190 of the retaining ring 140 is accessible through the window 130. The first member 110 includes an interior surface annular recess 200 that receives a portion 210 of the retaining ring 140 and the second member 120 includes an exterior surface annular recess 220 that receives another portion 230 of the retaining ring 140. The joint assembly 100 includes a seal 240 configured to cover the window 130 when the joint assembly 100 is assembled. As shown, the seal 240 can be coupled to the second member 120 and configured to be slidably disposed over the first member 110. A joint 250, such as a constant velocity joint, is coupled to the first member 110; however, the joint 250 could be coupled to the second member 120. It is also possible to have the joint 250 coupled to one of the first member 110 and the second member 120 and have another joint (not shown) coupled to the other of the first member 110 and the second member 120.

[0031] As shown, the first member 110 includes internal splines 160 and the second member 120 includes external splines 170, but other engagement means can be employed to couple the first member 110 and second member 120. The retaining ring 140 is configured as a discontinuous annular expandable snap ring, where ends 260 of the retaining ring 140 form a portion 190 that is accessible through the window 130. The ends 260 can be biased towards or away from each other to permit expansion of the retaining ring 140 within the interior surface annular recess 200 of the first member 110 when the second member 120 is received within the

open end 150 of the first member 110 and contraction of the retaining ring 140 when positioned within the exterior surface annular recess 220 of the second member 120.

[0032] The window 130 is formed in an outer surface 270 of the first member 110 and receives the portion 190 of the retaining ring 140 that is accessible therethrough. As shown, the window 130 can be T-shaped, where a first portion 280 of the window 130 is continuous with the open end 150 of the first member 110 and a wider second portion 290 extends laterally from the first portion 280 along a circumference of the outer surface 270 of the first member 110. It can be seen that the first portion 280 of the window 130 can have a width that is less than a width of the second portion 290. The ends 260 of the retaining ring 140 extend into the window 130 to permit manipulation thereof, including contraction of the retaining ring 140 to release the coupling of the first member 110 to the second member 120 and to permit separation of the first member 110 and the second member 120 by disengaging the second plurality of splines 170 from the first plurality of splines 160.

[0033] The seal 240 can be configured as a boot for sealing not only the window 130, but also the interface of the first member 110 with respect to the second member 120. Additional sealing means can be employed (not shown), where the seal 240 can work in conjunction with one or more O-rings or compression devices, such as spring clamps, wire clamps, and ear clamps. More than one seal 240 can be used, as well.

[0034] To assemble the joint assembly 100, the retaining ring 140 can be positioned within the open end 150 of the first member 110 at the interior surface annular recess 200, which can be formed on the first plurality of splines 160. To position the retaining ring 140, the portion 190 including the ends 260 is slidably received through the first portion 280 of the window 130 until the ends 260 are positioned within the wider second portion 290. The second member 120 is received within the open end 150 of the first member 110, where the internal first plurality of splines 160 engages the external second plurality of splines 170. As the second member 120 is received in the open end 150, the second member 120 is consequently received through the retaining ring 140. The retaining ring 140 expands or is expanded as the second member 120 passes therethrough until the retaining ring 140 can contract and engage the exterior surface annular recess 220 formed on the second member 120. The wider second portion 290 of the window 130 permits the ends 260 of the retaining ring 140 to expand as the second member 120 passes therethrough. Once the retaining ring 140 is positioned within the exterior surface annular

recess 220 formed on the second member 120, the first member 110 is retained or locked to the second member 120 to militate against an undesired axial displacement of the first member 110 with respect to second member 120. The retaining ring 140 can be configured to accommodate substantial thrust loads while also remaining accessible to manipulation and release thereof. The seal 240 can then be positioned to cover the interface of the first member 110 and the second member 120, including the window 130.

[0035] Advantageously, during servicing or maintenance of the joint assembly 100, the window 130 permits easy access to the retaining ring 140, where a tool can be employed to expand the retaining ring 140 for ease of separation of the first member 110 and the second member 120. The joint assembly 100 of the present technology, for example, can facilitate at least 1,500 pounds of retention force to militate against unseating or disassembly of the first member 110 from the second member 120, including where the joint assembly 100 is used in vehicles having live beam axle driveline applications. It is understood that other retention force amounts can be used as desired. The retaining ring 140 configuration of the present technology is more robust than other configurations, while being easily accessible and ergonomically configured for maintenance purposes. The retaining ring 140 can be thicker and/or stronger than other retaining devices or rings known in the art. The retaining ring 140 have also be configured with abrupt or sharp corners formed thereon for enhanced engagement to the interior surface annular recess 200 and/or the exterior surface annular recess 220, which can facilitate maximized retention force. Additionally, the interior surface annular recess 200 and/or the exterior surface annular recess 220 can have a depth greater than other grooves used with retaining rings, which can further facilitate maximized retention force. The retaining ring 140 can have alternate cross-sectional shapes such as circular, square, rectangular, or elliptical, for example, or any other shape as desired, and the interior surface annular recess 200 and/or the exterior surface annular recess 220 can have a corresponding cross-sectional shape. Varying cross-sectional shapes and thicknesses of the retaining ring 140 as well as the cross-sectional shape, sharpness of corners of, and depth of the interior surface annular recess 200 and/or the exterior surface annular recess 220 can be dependent on the retention force required for a desired application.

[0036] It is also possible to have the retaining ring 140 pre-installed on the interior surface annular recess 200 formed on the internal first plurality of splines 160 of the first member 110. However, where the second member 120 includes the external second plurality of

splines 170, the retaining ring 140 may be preinstalled in the exterior surface annular recess 220 formed on the external splines 170 of the second member 120. Furthermore, the retaining ring 140 can be configured to require spreading the ends 260 apart from each other to disassemble the first member 110 and second member 120, as shown, or the retaining ring 140 can be configured to require a pinching or closing of the ends 260 with respect to each other to disassemble the first member 110 and second member 120.

[0037] Example embodiments are provided so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms, and that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies are not described in detail. Equivalent changes, modifications and variations of some embodiments, materials, compositions and methods can be made within the scope of the present technology, with substantially similar results.

CLAIMS

What is claimed is:

1. A joint assembly comprising:
 - a first member having a first engagement means and an interior surface recess;
 - a second member having a second engagement means and an exterior surface recess, a portion of the second member disposed within the first member, the second engagement means engaging the first engagement means to provide a coupling of the second member to the first member;
 - a window formed within the first member where the portion of the second member is disposed within the first member;
 - a retaining means configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining means are accessible through the window, wherein the distal ends of the retaining means extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer surface of the first member, and wherein the retaining means is received partially into each of the interior surface recess of the first member and the exterior surface recess of the second member when the retaining means retains the coupling of the second member to the first member; and
 - a seal configured to cover the window formed in the first member, wherein the seal is coupled to the second member adjacent an end of the first member and wherein the seal is coupled to the first member adjacent the window.
2. The joint assembly of Claim 1, wherein the first member includes an open end and the first engagement means of the first member is formed within the open end.
3. The joint assembly of Claim 2, wherein the portion of the second member disposed within the first member is disposed within the open end and includes the second engagement means.
4. The joint assembly of Claim 2, wherein the window is continuous with the open end.

5. The joint assembly of Claim 4, wherein the seal is coupled to the first member adjacent an end of the window disposed distally from the open end of the first member.
6. The joint assembly of Claim 1, wherein the first engagement means includes a first plurality of splines and the second engagement means includes a second plurality of splines.
7. The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.
8. The joint assembly of Claim 1, wherein the seal includes a cylindrical portion directly engaging the outer surface of the first member adjacent the window.
9. The joint assembly of Claim 8, wherein at least a portion of the cylindrical portion directly covers the window.
10. The joint assembly of Claim 8, wherein at least a portion of the cylindrical portion is disposed directly radially outwardly of the window.
11. The joint assembly of Claim 8, wherein the cylindrical portion is disposed directly radially outwardly of the retaining means.
12. The joint assembly of Claim 8, wherein the cylindrical portion covers the retaining means.
13. The joint assembly of Claim 8, wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion.
14. The joint assembly of Claim 13, wherein the corrugated portion is disposed radially outwardly of each of the first member and the second member.
15. The joint assembly of Claim 13, wherein at least a portion of the corrugated portion is disposed radially outwardly of the window.

16. A method of servicing a joint assembly comprising:
- providing a joint assembly, the joint assembly including:
 - a first member having a first engagement means and an interior surface recess;
 - a second member having a second engagement means and an exterior surface recess,
 - a portion of the second member disposed within the first member, the second engagement means engaging the first engagement means to provide a coupling of the second member to the first member;
 - a window formed within the first member where the portion of the second member is disposed within the first member;
 - a retaining means configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining means are accessible through the window, wherein the distal ends of the retaining means extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer surface of the first member, and wherein the retaining means is received partially into each of the interior surface recess of the first member and the exterior surface recess of the second member when the retaining means retains the coupling of the second member to the first member; and
 - a seal configured to cover the window formed in the first member, wherein the seal is coupled to the second member adjacent an end of the first member and wherein the seal is coupled to the first member adjacent the window;
 - uncovering the window via adjustment of the seal to provide access to the distal ends of the retaining means;
 - manipulating the retaining means through the window to release the coupling of the second member to the first member; and
 - separating the first member and the second member by disengaging the second engagement means from the first engagement means.
17. The method of Claim 16, wherein the first member includes an open end and the window is continuous with the open end.

18. The method of Claim 17, wherein uncovering the window includes sliding the seal axially towards the open end of the first member.
19. The method of Claim 18, wherein the sliding of the seal axially occurs until the retaining means is uncovered.
20. The method of Claim 16, wherein the seal includes a cylindrical portion and a corrugated portion, wherein at least a portion of the window is covered by the cylindrical portion.

ABSTRACT

A joint assembly includes a first member having splines formed therein. A second member includes splines formed thereon and is coupled to the first member. The splines of the first member engage the splines of the second member. An access window is formed on the first member. A ring retains the first member to the second member. A seal extends across a joint between the first member and the second member and covers the access window. A portion of the ring is accessible through the access window following removal of the seal, where the ring can be manipulated to release the first member from the second member.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

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☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

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Inventor	1				Remove	
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Prefix	Given Name	Middle Name	Family Name	Suffix		
	Michael	Walter	Hopson			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Clinton Township	State/Province	MI	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	43844 Leelanau Trail					
Address 2						
City	Clinton Township	State/Province	MI			
Postal Code	48038	Country i	US			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Arvind		Srinivasan			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Sterling Heights	State/Province	MI	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	6216 Waters Edge Ct					
Address 2						
City	Sterling Heights	State/Province	MI			
Postal Code	48314	Country i	US			
Inventor	3				Remove	
Legal Name						
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	Michael	Peter	Kinsella			
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		Application Number			
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY				
City	White Lake	State/Province	MI	Country of Residence	US
Mailing Address of Inventor:					
Address 1		605 Sunnybeach Drive			
Address 2					
City	White Lake	State/Province	MI		
Postal Code	48386	Country	US		
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Title of the Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY				
Attorney Docket Number	265038	Small Entity Status Claimed ☐			
Application Type	Nonprovisional				
Subject Matter	Utility				
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)		1	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

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This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15966085	2018-04-30
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15966085	Claims benefit of provisional	62500821	2017-05-03
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

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When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h) (1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant		1 Remove	
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear			
☒ Assignee		☐ Legal Representative under 35 U.S.C. 117	
☐ Joint Inventor			
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name		NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC	
Mailing Address Information For Applicant:			
Address 1		38900 Hills Tech Drive	
Address 2			
City		Farmington Hills	State/Province MI
Country US		Postal Code	48331
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
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Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:

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NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	James D. Miller/		Date (YYYY-MM-DD)	2022-07-28	
First Name	James D.	Last Name	Miller	Registration Number	46932
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	265038
		Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

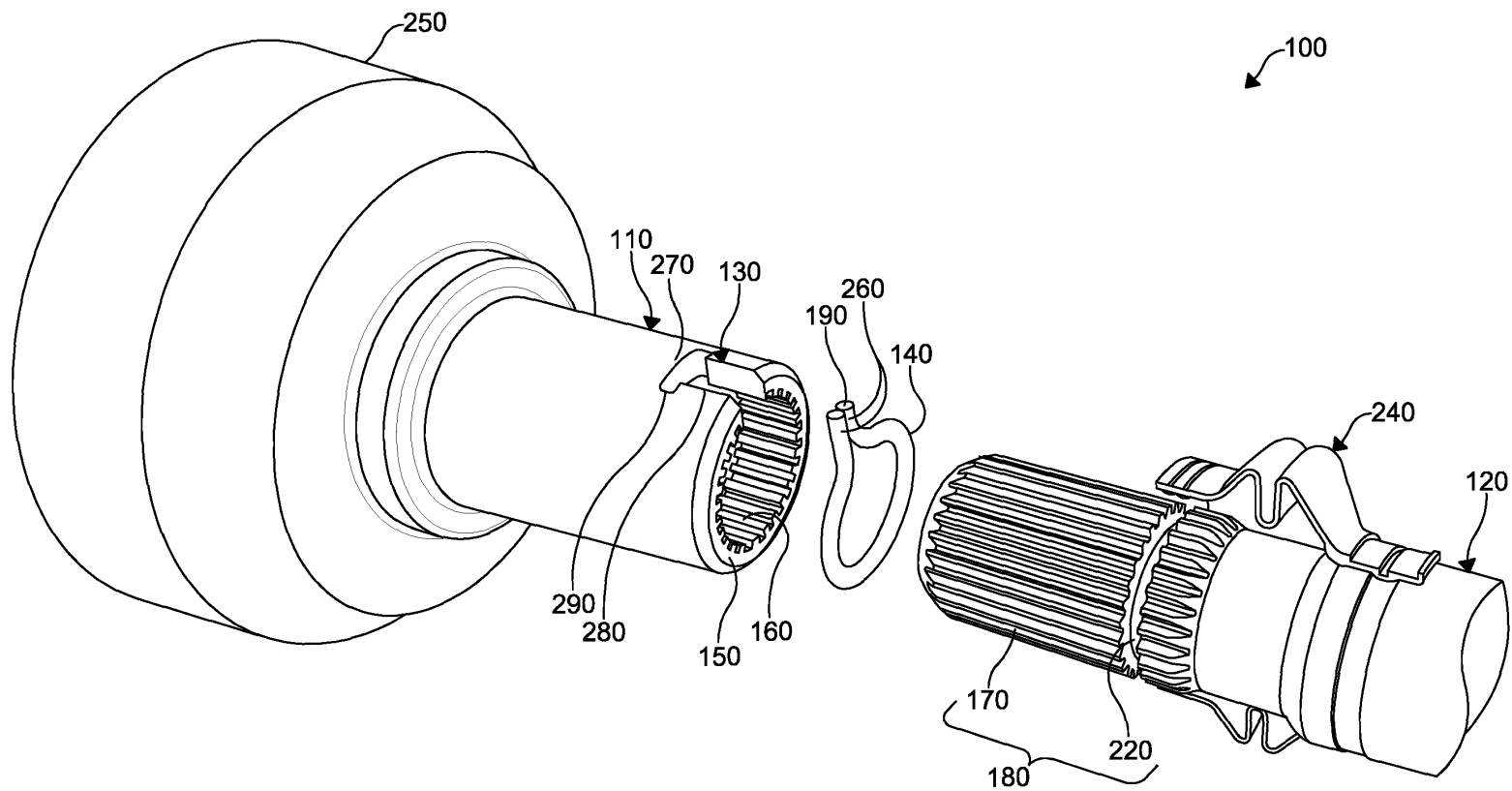
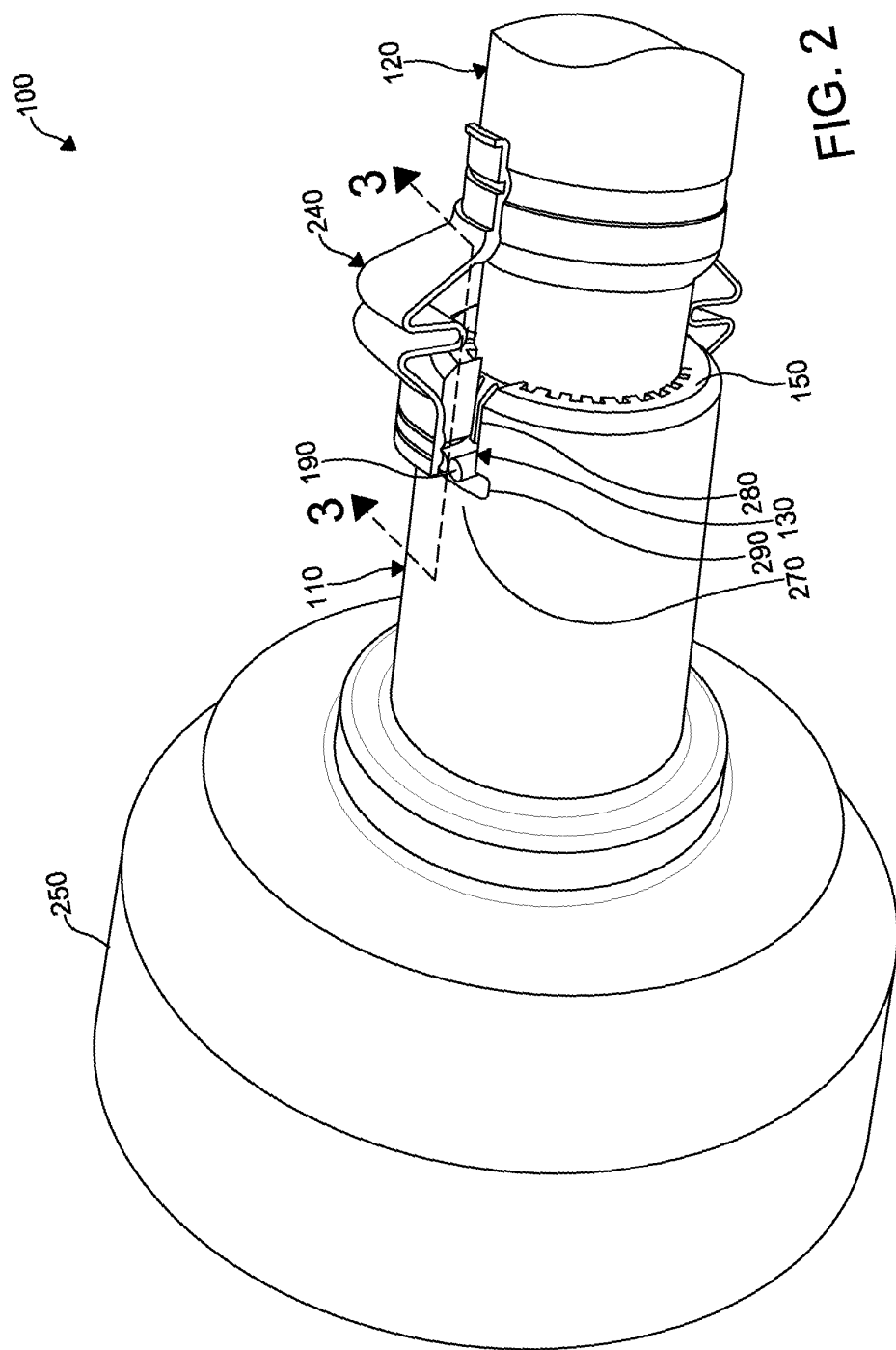
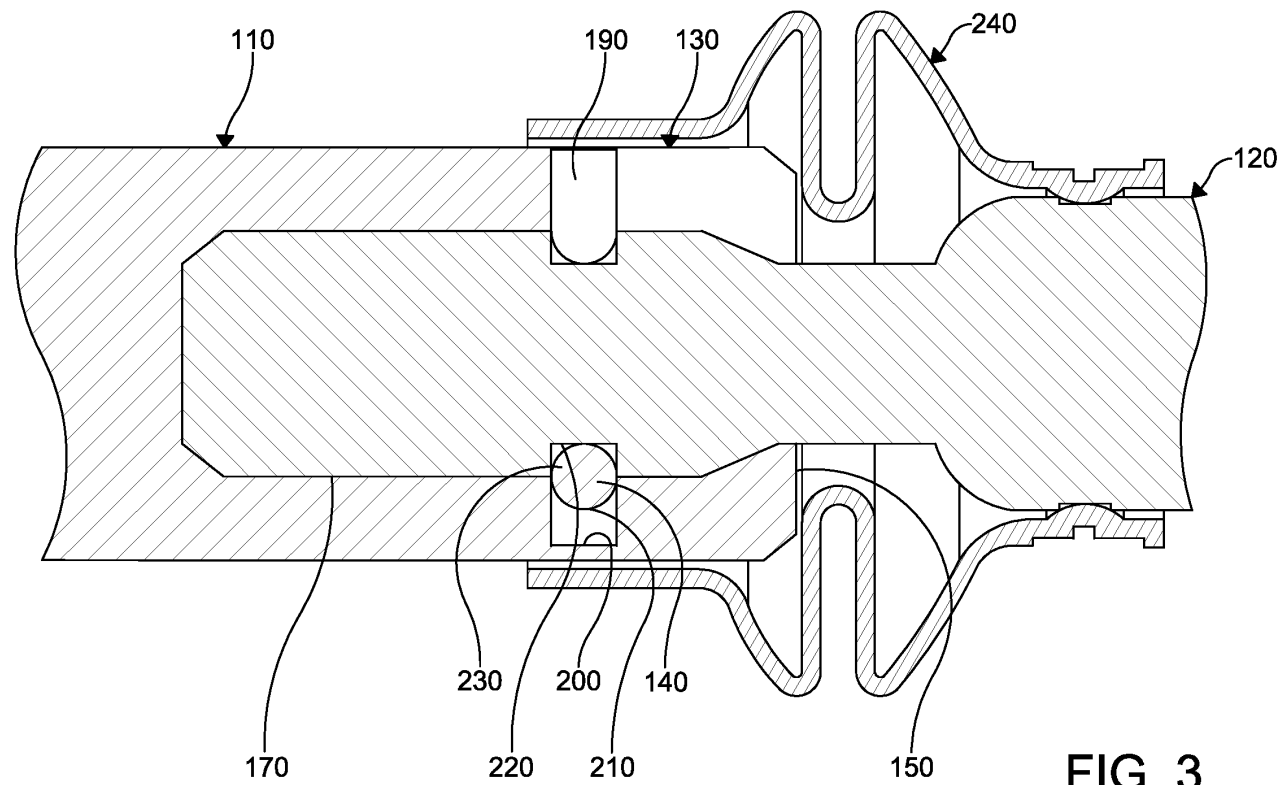


FIG. 1





PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 17/815,833				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800			
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *				x 100 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *				x 480 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820			
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=		x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		x	=
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
TOTAL ADD'L FEE									TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=		x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		x	=
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
TOTAL ADD'L FEE									TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/815,833	07/28/2022	2833	1820	265038	20	2

CONFIRMATION NO. 9742

43935
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

FILING RECEIPT



0000000135863489

Date Mailed: 08/08/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Michael Walter Hopson, Clinton Township, MI;
Arvind Srinivasan, Sterling Heights, MI;
Michael Peter Kinsella, White Lake, MI;

Applicant(s)

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, Farmington Hills, MI;

Power of Attorney: The patent practitioners associated with Customer Number 43935

Domestic Priority data as claimed by applicant

This application is a CON of 15/966,085 04/30/2018
which claims benefit of 62/500,821 05/03/2017

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 08/05/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/815,833**

Projected Publication Date: 11/17/2022

Non-Publication Request: No

Early Publication Request: No
Title

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Preliminary Class

439

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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page 2 of 4

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Shumaker, Loop & Kendrick, LLP
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Toledo, OH 43604-5573
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Application	Document	Mailroom Date	Attorney Docket No.
17815833	APP.FILE.REC	08/08/2022	265038

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PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)

Approved for use through 05/31/2024. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17815833
	Filing Date		2022-07-28
	First Named Inventor	Michael Walter Hopson	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	265038	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	7722089	B2	2010-05-25	Nauer	
	2	6739422	B2	2004-05-25	Krude et al.	
	3	6251019	B1	2001-06-26	Hofmann et al.	
	4	7922590	B2	2011-04-12	Pallante	
	5	8231475	B2	2012-07-31	Felchner et al.	
	6	6739422	B2	2004-05-25	Krude et al.	
	7	8864591	B2	2014-10-21	Sugiyama et al.	
	8	10883545	B2	2021-01-05	Sugiyama et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17815833
	Filing Date		2022-07-28
	First Named Inventor	Michael Walter Hopson	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	265038	

	9	7722089	B2	2010-05-25	Nauer	
	10	7946274	B2	2011-05-24	Kofuji	
	11	8092312	B2	2012-01-10	Duncan	
	12	8690690	B2	2014-04-08	Conger et al.	
	13	8870489	B2	2014-10-28	Langer et al.	
	14	3357206	A	1967-12-12	C.E. CHRISTIE	
	15	3992117	A	1976-11-16	Ristau	
	16	4124318	A	1978-11-07	Sagady	
	17	4136982	A	1979-01-30	Sagady	
	18	4859110	A	1989-08-22	Dommel	
	19	6582151	B2	2003-06-24	Hopson	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17815833
	Filing Date		2022-07-28
	First Named Inventor	Michael Walter Hopson	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	265038	

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	
	1	20180003240	A1	2018-01-04	Sugiyama et al.		
	2	20090233723	A1	2009-09-17	Kofuji		

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	1	2016034228	WO	A	2016-03-10	GKN DRIVELINE DEUTSCHLAND GMBH		×
	2	10008182	DE	A1	2001-09-13	GKN AUTOMOTIVE GMBH		☒
	3	1681477	EP	A1	2006-07-19	PIOLAX INC		☒
	4	10008183	DE	C1	2001-12-13	GKN AUTOMOTIVE GMBH		☒

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	Filing Date		2022-07-28
	First Named Inventor	Michael Walter Hopson	
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73 Patentinhaber:
GKN Automotive GmbH, 53797 Lohmar, DE
74 Vertreter:
Harwardt Neumann Patent- und Rechtsanwälte,
53721 Siegburg

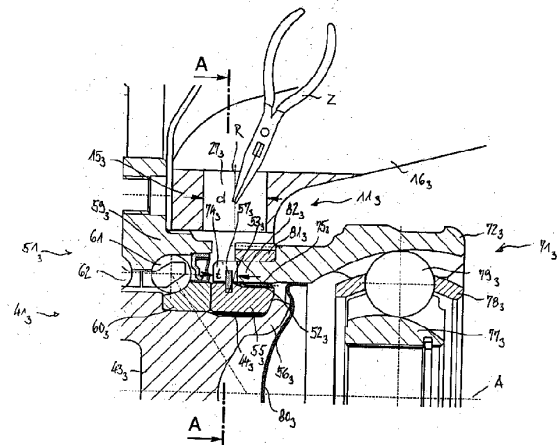
72 Erfinder:
Krude, Werner, Dipl.-Ing., 53819
Neunkirchen-Seelscheid, DE; Fuchs, Heinzwilli,
53783 Eitorf, DE

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DE 197 51 855 C1
DE 197 00 313 A1
WO 99 13 232 A1

54 Baueinheit zur Lagerung und Antriebsverbindung eines Rades

57 Baueinheit zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger 11, der am Kraftfahrzeug anbringbar ist und ein Ringteil 15 und mehrere Lenkerarme 16 umfaßt, eine Radnabe 41, die drehbar im Ringteil 15 des Radträgers 11 gelagert ist und einen Flansch zum Anschrauben des Rades aufweist, ein Wälzlager mit zwei Wälzkörperreihen 60, 61 zur Lagerung der Radnabe 41 im Radträger 11, das in das Ringteil 15 des Radträgers 11 einsetzbar ist, und ein Gleichlaufgelenk 71, das ein Gelenkaußenteil 72 aufweist, das mit der Radnabe 41 lösbar verbindbar ist, und ein Gelenkinnenteil 77 aufweist, das mit der Antriebswelle verbindbar ist, wobei am Radträger 11 im Ringteil 15 eine etwa radial ausgerichtete Bohrung 27, insbesondere eine solche zur späteren Aufnahme eines ABS-Sensors, ausgebildet ist und wobei bei im Radträger 11 festgelegtem Wälzlager und bei mit der Radnabe 41 verbundenem Gelenkaußenteil 72 die beiden Ringnuten axial korrespondierend zur Bohrung 27 liegen.



DE 100 08 183 C 1

[0001] Die Erfindung betrifft eine Baueinheit zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger, der am Kraftfahrzeug anbringbar ist und ein Ringteil und mehrere Lenkerarme umfaßt, eine Radnabe, die drehbar im Ringteil des Radträgers gelagert ist und einen Flansch zum Anschrauben des Rades aufweist, ein Wälzlager mit zwei Wälzkörperreihen zur Lagerung der Radnabe im Radträger, das in das Ringteil des Radträgers einsetzbar ist, und ein Gleichlaufgelenk, das ein Gelenkaußenteil aufweist, das mit der Radnabe lösbar verbindbar ist, und ein Gelenkinnenteil aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe und dem Gelenkaußenteil mittels ineinandergreifender Verzahnungen hergestellt ist, von denen eine erste Verzahnung an einem Teil der Radnabe und eine zweite Verzahnung an einem Hülsenansatz am Gelenkaußenteil ausgebildet ist, und wobei die axiale Sicherung der ineinandergreifenden Verzahnungen mittels eines Sicherungsringes hergestellt ist, der in zwei Ringnuten eingreift, von denen eine erste Ringnut an dem Teil der Radnabe im Bereich der ersten Verzahnung und eine zweite Ringnut an dem Hülsenansatz im Bereich der zweiten Verzahnung ausgebildet ist, wobei an dem Hülsenansatz im Bereich der zweiten Verzahnung eine umfangsbegrenzte und axial begrenzte Ausklinkung ausgebildet ist, die die zweite Ringnut unterbricht und die bei mit der Radnabe verbundenem Gelenkaußenteil die erste Ringnut und den Sicherungsring umfangsbegrenzt freilegt, wobei am Radträger im Ringteil eine etwa radial ausgerichtete Bohrung ausgebildet ist und wobei bei im Radträger festgelegtem Wälzlager und bei mit der Radnabe verbundenem Gelenkaußenteil die beiden Ringnuten axial korrespondierend zur Bohrung und zur Ausklinkung liegen.

[0002] Aus der gattungsbildenden WO 99/13232 ist eine Baueinheit der genannten Art bekannt, bei der der Sicherungsring zur Montage in die Ringnut auf der Radnabe eingesetzt und mittels einer Klammer so kontrahiert wird, daß er vollständig innerhalb des Fußdurchmessers der Verzahnung liegt oder bei der der Sicherungsring in die Ringnut im Gelenkaußenteil eingesetzt wird und mittels eines Keils so expandiert wird, daß er vollständig außerhalb des Fußdurchmessers der Verzahnung liegt. Danach wird das Gegenstück montiert, das heißt das Gelenkaußenteil aufgeschoben bzw. die Radnabe eingeschoben, bis die darin ausgeformte Ringnut mit dem Sicherungsring axial in Überdeckung liegt und die Klammer bzw. der Keil radial nach außen entfernt. Hierbei expandiert der Sicherungsring, so daß er in die Ringnut in dem Gelenkaußenteil eingreift bzw. der Sicherungsring kontrahiert, so daß er in die Ringnut in der Radnabe eingreift. In beiden Ausführungen ist eine Ausklinkung am Ende des Gelenkaußenteils vorgesehen, die die Klammer bzw. den Keil sowie radial abgebogene Enden des Sicherungsringes aufnimmt. Zur Manipulierbarkeit des Sicherungsringes mittels eines Entfernens der Klammer bzw. des Keils bei im Radträger montierter Radnabe ist eine Radialbohrungen Radträger vorgesehen, die in axialer Übereinstimmung mit den Ringnuten bzw. mit der Ausklinkung am Gelenkaußenteil liegt und Zugriff zu einem Laschenansatz an der Klammer bzw. dem Keil von außerhalb des Radträgers ermöglicht. Ist die Montage der Baueinheit durch Entfernen der Klammer bzw. des Keils abgeschlossen, ist eine Demontage nur noch unter Zerstörung des Sicherungsringes durch Aufbringen von Axialkräften zwischen Radnabe und Gelenkaußenteil möglich.

[0003] Aus der DE 197 00 313 A1 ist eine Anordnung der genannten Art bekannt, bei der der Sicherungsring nach Art

eines Schnapprings, der selbständig in die Innennut in der Innenverzahnung des Gelenkaußenteils eingreift, ausgeführt ist. Eine derartige Anordnung ist nicht zerstörungsfrei zu demontieren. Vielmehr wird der Sicherungsring beim gewaltsamen axialen Entfernen von Radnabeinheit und Gleichlaufgelenk zerquetscht, wobei zugleich Schäden an den Verzahnungen auftreten können. Aus der DE 197 51 855 C1 ist eine Anordnung der eingangs genannten Art bekannt, bei der der Sicherungsring radial von außen frei zugänglich ist und axial zur Gelenkseite vor dem Ringteil des Radträgers liegt. Zu diesem Zweck ist mit der Radnabe ein Treibring verbunden, der in die entsprechende Verzahnung zum Verzahnungseingriff mit dem Gelenkaußenteil trägt, welcher axial über das Nabenende hinaus verlängert ist. Hiermit verlängert sich die Gesamtlänge der Baueinheit, wodurch gleichzeitig verfügbare Länge für die Gelenkwelle verlorengeht, deren Bestandteil das Gleichlaufgelenk ist. Diese Länge ist ein besonders kritischer Punkt, da mit einer Verkürzung der Gelenkwelle bei vorgegebenen maximalen Gelenkwinkeln eine Verringerung der Lenkwinkel bzw. der Federwege verbunden ist.

[0004] Der vorliegenden Erfindung liegt die Aufgabe zugrunde, eine Baueinheit der genannten Art so weiterzubilden, daß eine erleichterte Montage und Demontage des Gleichlaufgelenks und damit zugleich eine verbesserte Möglichkeit zum Austausch von Gelenkwellen am Kraftfahrzeug möglich wird. Die Lösung hierfür besteht darin, daß der Durchmesser d der Bohrung kleiner ist, als die Umfangserstreckung b der Ausklinkung und der Sicherungsring mittels eines Zangenwerkzeuges durch die Bohrung hindurch handhabbar ist. Mit den hier angegebenen Mitteln kann eine Gelenkwelle montiert und insbesondere zerstörungsfrei demontiert werden, ohne daß das Fahrzeugrad von der Radnabe und die Radnabe vom Radträger demontiert werden muß und ohne daß der Radträger in irgendeiner Weise vom Kraftfahrzeug gelöst werden muß. Der für die Montage und Demontage erforderliche Verschiebeweg zum Lösen der ineinandergreifenden Verzahnungen ist im differentialseitigen Gleichlaufgelenk konstruktiv notwendigerweise vorhanden. Trotz Minimierung der Bohrung im Verhältnis zur Umfangserstreckung der Ausnehmung ist das Fassen des Sicherungsringes in einer üblichen Zangenbewegung möglich.

[0005] Nach einer günstigen Ausgestaltung ist vorgesehen, daß die axiale Tiefe t der Ausklinkung kleiner ist als der Durchmesser d der Bohrung. Hiermit wird eine möglichst geringe Schwächung des Gelenkaußenteils durch die Ausklinkung eingehalten. Hierbei ist vorgesehen, daß nach außen aufgebogene Enden des Sicherungsringes in die Ausklinkung eingreifen und gegenüber dieser gegen Verdrehung sichern.

[0006] Die Bohrung kann nach der Montage der Baueinheit zur Aufnahme eines ABS-Sensors dienen. Hierzu ist in unmittelbarer Nachbarschaft zur Lage des Sicherungsringes ein Impulsgeberring beispielsweise auf dem Gelenkaußenteil anzuordnen.

[0007] Aus Fertigungsgründen ist es günstig, wenn die erste Verzahnung am Nabenkörper an einem separaten Treibring ausgebildet ist, der auf die Radnabe aufgeschoben und auf dieser unlösbar festgelegt ist. Hierbei können zur Verdrehsicherung zwischen beiden Teilen diese wieder ihrerseits mit ineinandergreifenden Längsverzahnungen versehen sein. Der Treibring kann hierbei insbesondere durch eine Umbördelung des Nabenkörpers axial auf der Radnabe gesichert sein. Dabei kann der Treibring axial gegen einen inneren Lagerring einer ersten Wälzkörperreihe anliegen, der ebenfalls auf den Nabenkörper aufgeschoben ist und der zugleich von dem Treibring gegen einen inneren Lagerring

einer zweiten Wälzkörperreihe verspannt ist. Der zweite innere Lagerring ist hierbei in der Regel unmittelbar aus dem Nabenkörper ausgebildet.

[0008] In vorteilhafter Weise bietet der Gegenstand der vorliegenden Erfindung eine kurzbauende Baueinheit der genannten Art, die mit einfachen Hilfsmitteln zerstörungsfrei und ohne Lösen der Baugruppen Radträger und Radnabeneinheit von dem Gleichlaufgelenk einer Gelenkwelle getrennt werden kann.

[0009] Bevorzugte Ausführungsbeispiele von erfindungsgemäßen Baueinheiten zur Anbringung an einem Kraftfahrzeug werden nachstehend anhand der beigefügten Zeichnungen erläutert.

[0010] Fig. 1 zeigt eine komplett montierte Baueinheit mit radialer Bohrung im Ringteil des Radträgers im Längshalbschnitt;

[0011] Fig. 2 zeigt die Baueinheit nach Fig. 1 in einem Querschnitt gemäß der Schnittlinie A-A;

[0012] Fig. 3 zeigt die komplett montierte Baueinheit in Schattendarstellung in radialer Ansicht auf die Bohrung im Ringteil;

[0013] Fig. 4 zeigt die Baueinheit nach Fig. 1 bei demontiertem Gelenkaußenteil in Schattendarstellung in radialer Ansicht auf die Bohrung im Ringteil.

[0014] In Fig. 1 ist im Längshalbschnitt eine montierte Baueinheit 10₃ gezeigt, die eine Nabenanordnung 41₃ und ein Gleichlaufgelenk 71₃ umfaßt. Am Nabenkörper 45₃ ist ein Zwischenboden 43₃ vorgesehen. Eine Umbördelung 56₃ am Nabenkörper 45₃ hält einen Treibring 55₃, der mit dem Nabenkörper 45₃ über Längsverzahnungen 44₃ ineinandergreift. Der Treibring 55₃ hält seinerseits einen Lagerinnenring 60₃ eines Radlagers 51₃. Eine Dichtung 59₃ dichtet das Radlager ab. Zwei Wälzkörperreihen 61₃, 62₃ und der Lageraußenring 59₃ des Radlagers 51₃ sind ebenfalls dargestellt. Am Treibring 55₃ ist eine Außenverzahnung 52₃ und eine Ringnut 53₃ erkennbar. Das Gleichlaufgelenk 71₃ umfaßt ein Gelenkaußenteil 72₃ mit einem Hülsenansatz 82₃, ein Gelenkinnenteil 77₃, einen Käfig 78₃ und Kugeln 79₃. An der Stirnseite 73₃ des Hülsenansatzes 82₃ ist eine Ausklinkung 74₃ erkennbar. Eine Innenverzahnung 75₃ am Hülsenansatz 82₃ wirkt mit einer Außenverzahnung 52₃ am Treibring 55₃ zusammen. Am Umfang trägt das Gelenkaußenteil 72₃ einen Geberring 81₃, für einen ABS-Sensor.

[0015] Von einem Radträger 11₃ ist nur ein Ringteil 15₃ im Schnitt dargestellt, an dem ein Lenkerarm 16₃ abgebrochen gezeichnet ist. In axialer Zuordnung zur Ringnut 53₃ ist im Ringteil 15₃ eine radiale Bohrung 27₃ mit zur Achse A der Baueinheit 10₃ etwa radialer Mittelachse R ausgeführt. Ein Zangenkörper Z soll andeuten, daß über diese Bohrung 27₃ und die Ausklinkung 74₃ freier Zugriff zum Sicherungsring 57₃ gegeben ist. Der Durchmesser d der Bohrung 27₃ ist größer als die axiale Tiefe t der Ausklinkung 74₃. In die Bohrung 27₃ ist nach der Gelenkmontage der genannte ABS-Sensor einsetzbar.

[0016] In Fig. 2 sind im Querschnitt gemäß der Schnittlinie A-A nach Fig. 1 folgende Einzelheiten von innen nach außen erkennbar: Nabenkörper 45₃, Verzahnung 44₃, Treibring 55₃, Sicherungsring 57₃ in Ringnut 53₃ und in Ringnut 76₃, Hülsenansatz 82₃ am Gelenkaußenteil, alle jeweils im Querschnitt, Ausklinkung 74₃ im Hülsenansatz 82₃ und Geberring 81₃ jeweils in Ansicht, Gelenkaußenteil 72₃ in Ansicht, Ringteil 15₃ des Radträgers mit radialer Bohrung 27₃ im teilweise weggebrochenen Querschnitt. Am Sicherungsring sind die Enden 65₃ und 66₃ bezeichnet, die von der Zange Z durch die Bohrung 27₃ hindurch ergriffen und zusammengeführt werden, so daß der Sicherungsring 57₃ aus der Innennut 76₃ im Hülsenansatz 82₃ am Gelenkaußenteil austritt und das Gelenkaußenteil von der Radnabe zerstö-

rungsfrei demontiert werden kann. Der Durchmesser d der Bohrung 27₃ ist kleiner als die Umfangserstreckung b der Ausklinkung 74₃.

[0017] In Fig. 3 sind der Radträger 11₃, die Radnabeneinheit 41₃ und das Gleichlaufgelenk 71₃ bezeichnet, wobei Einzelheiten in gleicher Weise beziffert sind, wie in den vorherigen Figuren. An der Radnabeneinheit ist weiter ein Radflansch 46₃ bezeichnet. Im Ringteil 15₃ ist die radiale Bohrung 27₃ gezeigt, die einen durchgehenden Dichtungsring 54₃ sowie die freien, nach radial außen umgebogenen Enden 65₃, 66₃ des Sicherungsringes 57₃ erkennen läßt. Hiermit kann über den Zugriff mittels der Zange Z und Zusammendrücken der Enden 65₃, 66₃ der Sicherungsring 57₃ so reduziert werden, daß er tiefer in die Ringnut 53₃ im Treibring 55₃ eintritt und dabei gleichzeitig aus der Innenringnut 76₃ im Gelenkaußenteil 72₃ herausgleitet, so daß das Gleichlaufgelenk 71₃ zerstörungsfrei axial von der Nabeneinheit 41₃, d. h. speziell vom Treibring 55₃ gelöst werden kann.

[0018] In Fig. 4 ist die Baueinheit 10₃ nach dem Entfernen des Gleichlaufgelenkes 71₃ gezeigt. Durch die radiale Bohrung 27₃ wird hierbei die Außenverzahnung 52₃ der Nabenanordnung 41₃ mit der eingedrehten Ringnut 53₃ und dem Sicherungsring 57₃ erkennbar. Die Radnabe 41₃ ist im Radlager 51₃ so gedreht, daß wieder die Enden 65₃, 66₃ des Sicherungsringes 57₃ sichtbar werden, die auf diese Weise durch die radiale Bohrung manipulierbar sind.

Bezugszeichenliste

- 10 Baueinheit
- 11 Radträger
- 15 Ringteil
- 16 Lenkerarm
- 27 Bohrung
- 41 Radnabe
- 43 Zwischenboden
- 44 Verzahnung
- 45 Nabenkörper
- 46 Flansch
- 51 Radlager
- 52 Außenverzahnung
- 53 Ringnut
- 54 Dichtungsring
- 55 Treibring
- 56 Umbördelung
- 57 Sicherungsring
- 59 Lageraußenring
- 60 Lagerinnenring
- 61 Wälzkörperreihe
- 62 Wälzkörperreihe
- 65 Ende
- 66 Ende
- 71 Gleichlaufgelenk
- 72 Gelenkaußenteil
- 73 Stirnseite
- 74 Ausklinkung
- 75 Innenverzahnung
- 76 Ringnut
- 77 Gelenkinnenteil
- 78 Käfig
- 79 Kugel
- 81 Geberring
- 82 Hülsenansatz

Patentansprüche

1. Baueinheit (10) zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Ra-

des mit einer Antriebswelle, umfassend einen Radträger (11), der am Kraftfahrzeug anbringbar ist und ein Ringteil (15) und mehrere Lenkerarme (16) umfaßt, eine Radnabe (41), die drehbar im Ringteil (15) des Radträgers (11) gelagert ist und einen Flansch (46) zum Anschrauben des Rades aufweist, ein Wälzlager (51) mit zwei Wälzkörperreihen (61, 62) zur Lagerung der Radnabe (41) im Radträger (11), das in das Ringteil (15) des Radträgers (11) einsetzbar ist, und ein Gleichlaufgelenk (71), das ein Gelenkaußenteil (72) aufweist, das mit der Radnabe (41) lösbar verbindbar ist, und ein Gelenkinnenteil (77) aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe (41) und dem Gelenkaußenteil (72) mittels ineinandergreifender Verzahnungen (52, 75) hergestellt ist, von denen eine erste Verzahnung (52) an einem Teil der Radnabe (41) und eine zweite Verzahnung (75) an einem Hülsenansatz (82) am Gelenkaußenteil (72) ausgebildet ist, und wobei die axiale Sicherung der ineinandergreifenden Verzahnungen (52, 75) mittels eines Sicherungsringes (57) hergestellt ist, der in zwei Ringnuten (53, 76) eingreift, von denen eine erste Ringnut (53) an dem Teil der Radnabe (41) im Bereich der ersten Verzahnung (52) und eine zweite Ringnut (76) an dem Hülsenansatz (82) im Bereich der zweiten Verzahnung (75) ausgebildet ist, wobei an dem Hülsenansatz (82) im Bereich der zweiten Verzahnung (75) eine umfangsbegrenzte und axial begrenzte Ausklinkung (74) ausgebildet ist, die die zweite Ringnut (76) unterbricht und die bei mit der Radnabe (41) verbundenem Gelenkaußenteil (72) die erste Ringnut (53) und den Sicherungsring (57) umfangsbegrenzt freilegt, wobei am Radträger (11) im Ringteil (15) eine etwa radial ausgerichtete Bohrung (27₃) ausgebildet ist und wobei bei im Radträger (11) festgelegtem Wälzlager (51) und bei mit der Radnabe (41) verbundenem Gelenkaußenteil (72) die beiden Ringnuten (53, 76) axial korrespondierend zur Bohrung (27₃) und zur Ausklinkung (74) liegen, **dadurch gekennzeichnet**, daß der Durchmesser d der Bohrung (27₃) kleiner ist, als die Umfangserstreckung b der Ausklinkung (74) und der Sicherungsring (57) mittels eines Zangenwerkzeuges durch die Bohrung (27₃) hindurch handhabbar ist.

2. Baueinheit nach Anspruch 1, dadurch gekennzeichnet, daß die axiale Tiefe t der Ausklinkung (74) kleiner ist als der Durchmesser d der Bohrung (27₃).

3. Baueinheit nach einem der Ansprüche 1 und 2, dadurch gekennzeichnet, daß nach außen aufgebogene Enden (65, 66) des Sicherungsringes (57) in die Ausklinkung (74) eingreifen und gegenüber dieser gegen Verdrehung sichern.

4. Baueinheit nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die erste Verzahnung (52) an einem separaten Treibring (55) ausgebildet ist, der auf die Radnabe (41) aufgeschoben und auf dieser unlösbar festgelegt ist.

5. Baueinheit nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß der Treibring (55) axial gegen einen inneren Lagerring (60) einer ersten Wälzkörperreihe (61) anliegt, der auf die Radnabe (41) aufgeschoben ist und gegen einen inneren Lagerring einer zweiten Wälzkörperreihe (62) gespannt ist.

6. Baueinheit nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Bohrung (27₃) zur Aufnahme eines ABS-Sensors dient.

Hierzu 4 Seite(n) Zeichnungen

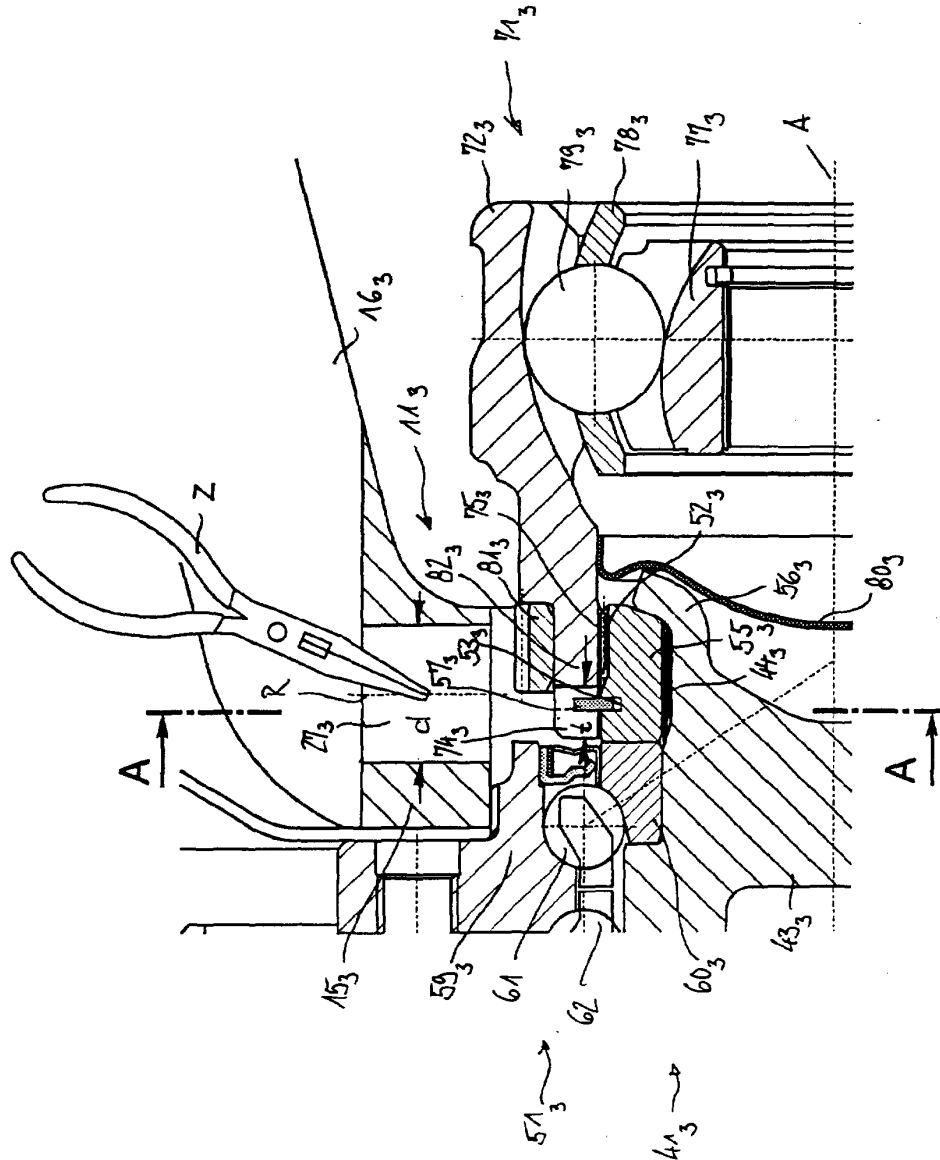


Fig. 2

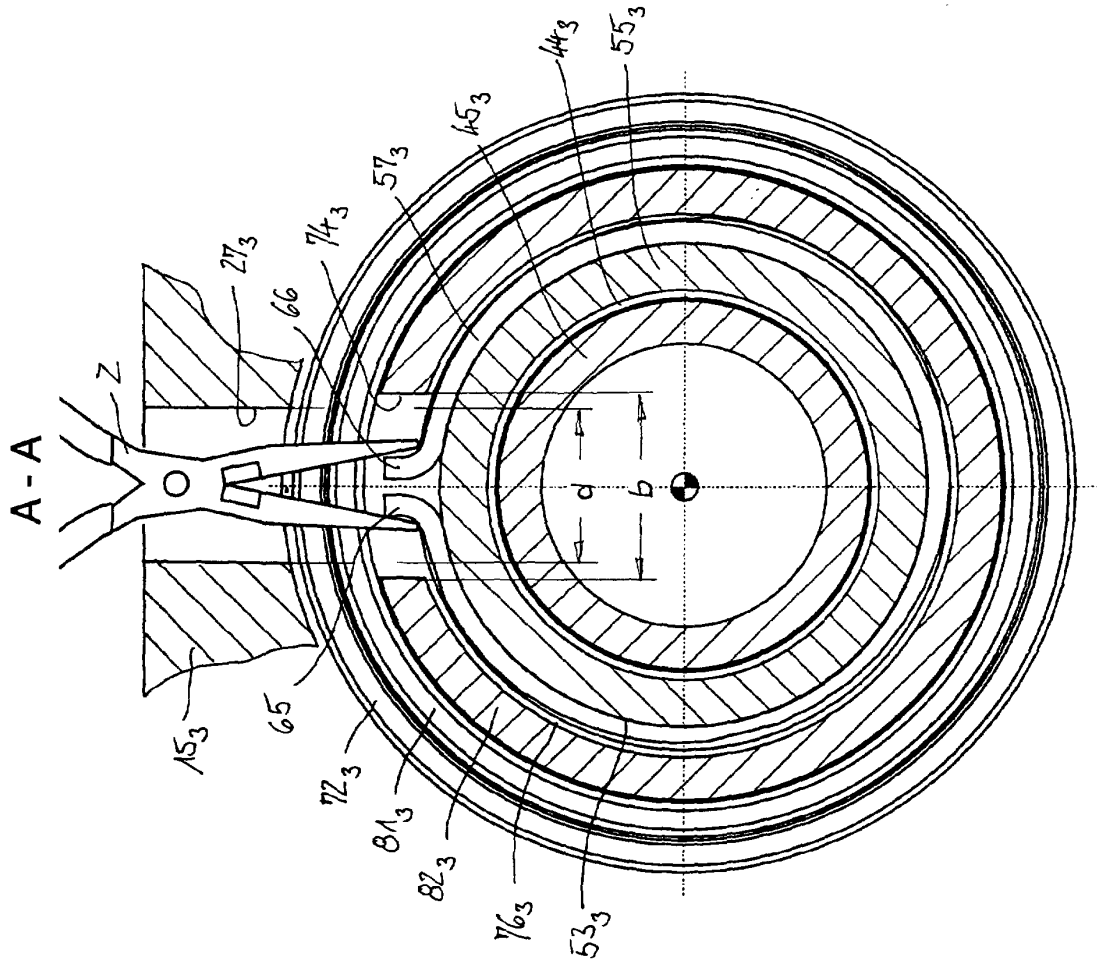


Fig. 3

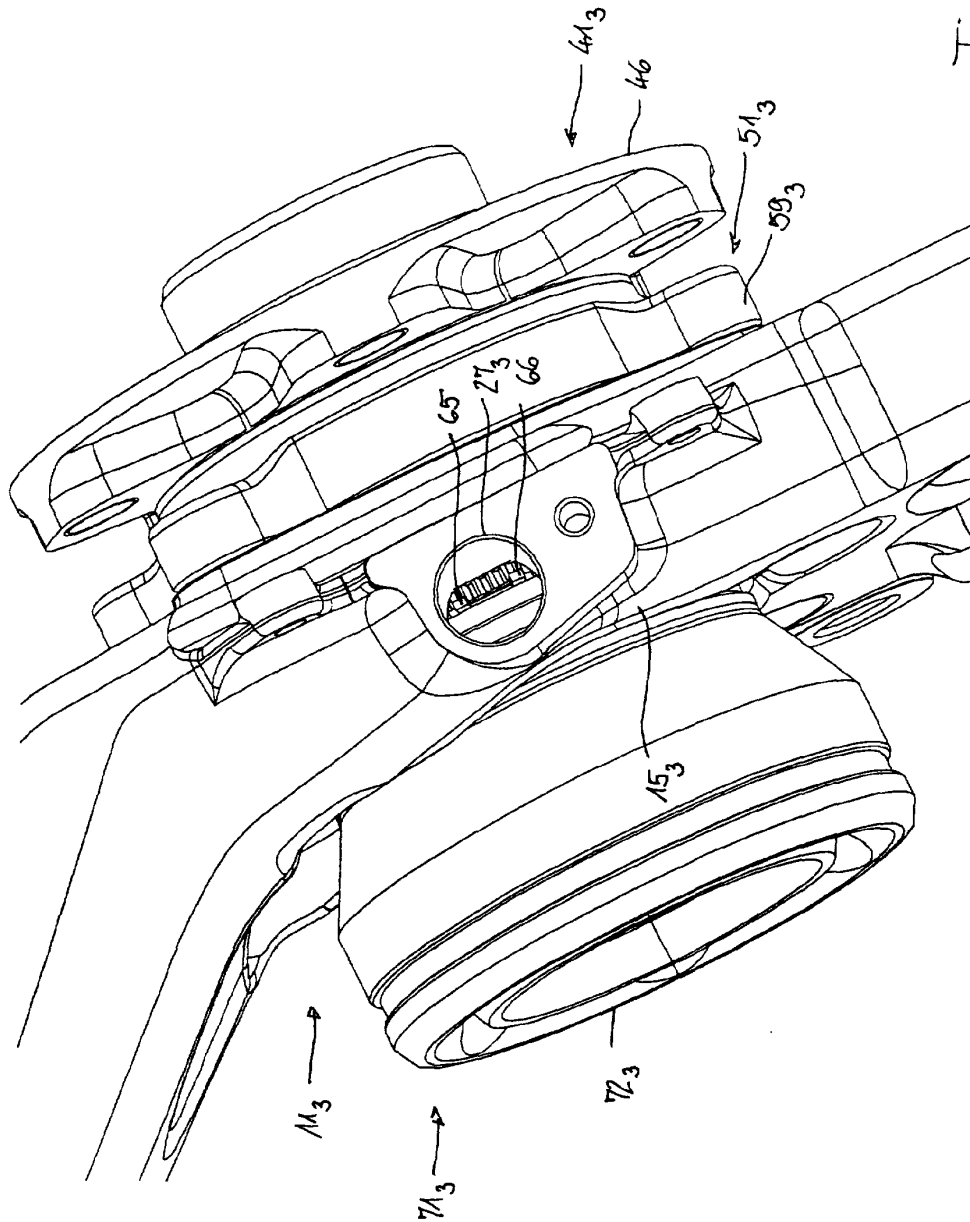
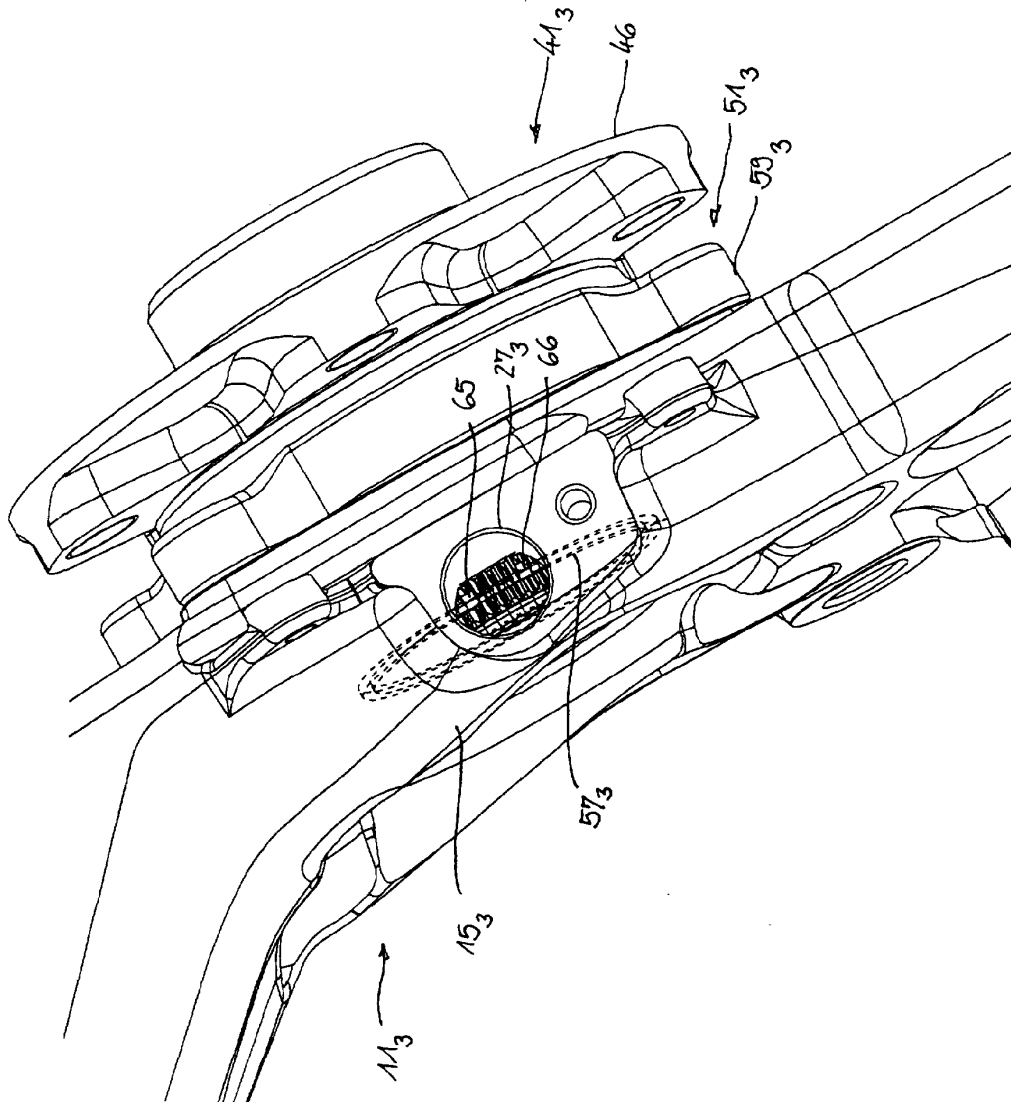


Fig. 4



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PATENT-FAMILY-ID: 7631920

INVENTOR-INFORMATION:

NAME	COUNTRY
FUCHS HEINZWILLI	DE
KRUDE WERNER	DE

APPLICANT:

NAME	COUNTRY
GKN AUTOMOTIVE GMBH	DE

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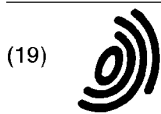
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ABSTRACT:

The wheel driving and mounting component includes a CV joint (71) comprising a joint outer section (72) which can be attached to the wheel hub (41) and a joint inner section for connecting to the drive shaft. The joint between the wheel hub and the joint outer section is in the form of meshing teeth. There is a gap or boring (27) in the annular piece (15) of the wheel support to take a circlip.



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(72) Inventor: **Matsumoto, Shinichi**
Piolax, Inc.
Yokohama-shi
Kanagawa (JP)

(30) Priority: 13.01.2005 JP 2005006336

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser
Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

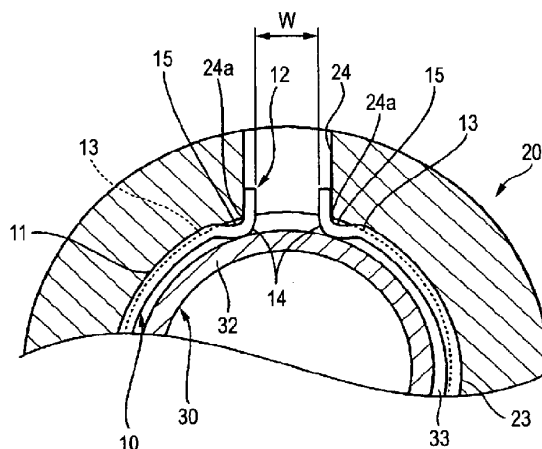
(71) Applicant: **Piolax Inc.**
Yokohama-shi,
Kanagawa-ken (JP)

(54) Snap ring

(57) A snap ring (10) includes a circumferential portion (11), which is curved in a circular shape, and a pair of projecting end portions (12), which extend substantially in parallel to each other from both ends of this circumferential portion (11) and are bent radially outwardly and are inserted in an engaging groove (24). Each of the projecting end portions (12) extends radially outwardly or inwardly via a first bent portion (13), which is bent inwardly resp. outwardly from the circumferential portion (11),

and a second bent portion (14), which continues from the first bent portion (13) and is bent outwardly resp. inwardly. Further, a portion (15) extending from the circumferential portion (11) to the projecting end portion (12) of the snap ring (10) does not come into contact with a corner portion (24a) of the engaging groove (24), so that wear is difficult to occur, and backlash is also made difficult to occur. Since the projecting end portions (12) are substantially parallel to each other, the projecting end portions (12) are held stably in the engaging groove (24).

FIG. 4



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a snap ring for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member.

2. Description of the Related Art

[0002] Conventionally, a snap ring is used for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member.

[0003] JP Sho.63-142413 U has disclosed a snap ring 1C of the shape shown in Fig. 6A. This snap ring 1C has a circular shape for fitting over an outer periphery of a shaft 2, and has such a shape that its both projecting end portions 1c (distal end portions) are bent toward the outer peripheral side. Further, the bent projecting end portions 1c abut against an engaging groove 3 (notched groove) formed in a holding member 1 (mating member) into which the shaft 2 is inserted, to thereby couple the shaft 2 to the holding member 1 in such a manner as to be prevented from disconnecting from the holding member 1.

[0004] As for the above-described snap ring 1C, however, as shown in Fig. 6A, arcuately bent portions 1d of the bent projecting end portions 1c are likely to come into contact with corner portions 4 of the engaging groove 3 of the holding member 1. For this reason, the bent portions 1d and the corner portions 4 become worn, and backlash occurs between the shaft 2 and the holding member 1.

[0005] To overcome the above-described problem, as shown in Fig. 6B, JP Hei.1-156390 U has disclosed a snap ring 1C (stop ring 10) in which the radius of the arcuately bent portion 1d of each projecting end portion 1c (projection 14) is made large to ensure that the arcuately bent portion 1d does not come into contact with the corner portion 4 of the engaging groove 3 (notched portion 13) of the holding member 1 (female body 3).

SUMMARY OF THE INVENTION

[0006] However, with the snap ring 1C disclosed in JP Hei.1-156390 U, since the interval W between the both projecting end portions 1c becomes narrow, the snap ring 1C cannot be closed with the both projecting end portions 1c with the projecting end portions 1c being sufficiently reduced in diameter. For this reason, there have been cases where the snap ring 1C cannot be inserted into a hole defining an inner periphery of the holding member 1.

[0007] Accordingly, the invention provides a snap ring

in which the shaft inserted in the hole of the holding member can be prevented from disconnecting from and/or rotating with respect to the holding member with small backlash and with an increased engaging force, and which can be easily inserted into the holding member.

[0008] To attain the above object, in accordance with a first aspect of the invention, a snap ring for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member, includes a circumferential portion and a pair of projecting end portions. The circumferential portion is curved in a circular shape fitting an outer periphery of the shaft or an inner periphery of the hole of the holding member. The pair of projecting end portions extend substantially in parallel to each other from both ends of the circumferential portion with being bent radially outwardly. The projecting end portions are inserted in an engaging groove formed in the inner periphery of the hole. The circumferential portion and the pair of projecting end portions are made of a spring wire. Each of the pair of projecting end portions extends radially outwardly via a first bent portion, which is bent inwardly from the circumferential portion, and a second bent portion, which continues from the first bent portion and is bent outwardly.

[0009] According to this structure, each of the projecting end portions extends radially outwardly via the first bent portion, which is bent inwardly from the circumferential portion, and the second bent portion, which continues from the first bent portion and is bent outwardly. Therefore, the portion extending from the circumferential portion to the projecting end portion does not come into contact with a corner portion of the engaging groove formed in the inner periphery of the holding member into which the shaft is inserted. For this reason, both the corner portions of the engaging groove and the snap ring are made difficult to be worn, and the backlash entailed thereby is also made difficult to occur.

[0010] In addition, since the projecting end portions are substantially parallel to each other, the projecting end portions are brought into line contact with the inner periphery of the engaging groove and are held stably, which makes it possible to increase the engaging force.

[0011] Furthermore, since the interval between the both projecting end portions can be made wide, when the snap ring is closed, the diameter of the snap ring can be made sufficiently small. Thus, the snap ring can be easily inserted into the inner periphery of the holding member, and workability in assembling the shaft and the holding member is improved.

[0012] In accordance with a second aspect of the invention, a snap ring for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member, includes a circumferential portion and a pair of projecting end portions. The circumferential portion is curved in a circular shape fitting an outer periphery of the shaft or an inner periphery of the hole of the holding member. The pair of projecting end portions extend substantially in parallel to

each other from both ends of the circumferential portion with being bent radially inwardly. The projecting end portions are inserted in an engaging groove formed in the outer periphery of the shaft. The circumferential portion and the pair of projecting end portions are made of a spring wire. Each of the pair of projecting end portions extends radially inwardly via a first bent portion, which is bent outwardly from the circumferential portion, and a second bent portion, which continues from the first bent portion and is bent inwardly.

[0013] According to this structure, each of the projecting end portions extends radially inwardly via the first bent portion, which is bent outwardly from the circumferential portion, and the second bent portion, which continues from the first bent portion and is bent inwardly. Therefore, the portion extending from the circumferential portion to the projecting end portion does not come into contact with a corner portion of the engaging groove formed in the outer periphery of the shaft. For this reason, both the corner portions of the engaging groove and the snap ring are made difficult to be worn, and the backlash entailed thereby is also made difficult to occur.

[0014] In addition, since the projecting end portions are substantially parallel to each other, the projecting end portions are brought into line contact with the inner periphery of the engaging groove and are held stably, which makes it possible to increase the engaging force.

[0015] In accordance with a third aspect of the invention, in the above-described first or second aspect of the invention, the first bent portion and the second bent portion are formed into circular arcs having a substantially identical radius.

[0016] According to this structure, it is ensured that the portion extending from the circumferential portion to the projecting end portion is not brought into contact with the corner portion of the engaging groove, and the projecting end portions can be easily extended in parallel to each other.

[0017] According to the snap ring of the invention, since each of the projecting end portions extends radially outwardly or inwardly via the first bent portion, which is bent from the circumferential portion, and the second bent portion, which continues from the first bent portion and is bent, the portion extending from the circumferential portion to the projecting end portion does not come into contact with the corner portion of the engaging groove. Thus, both the corner portions of the engaging groove and the snap ring are made difficult to be worn, and the backlash is also made difficult to occur. In addition, since the projecting end portions are substantially parallel to each other, the projecting end portions are brought into line contact with the inner periphery of the engaging groove and are held stably, which makes it possible to increase the engaging force.

[0018] Furthermore, according to the first aspect of the invention, since the interval between the both projecting end portions can be made wide, when the snap ring is closed, the diameter of the snap ring can be made suffi-

ciently small. Thus, the snap ring can be easily inserted into the hole defining the inner periphery of the holding member, and the operating efficiency in assembly improves.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a perspective view of an embodiment of a snap ring in accordance with the invention, as well as a holding member and a shaft to which it is applied; Fig. 2 is a plan view of the snap ring;

Figs. 3A and 3B show a case where pipes are connected together by applying the snap ring, in which Fig. 3A is a cross-sectional view of one side thereof, and Fig. 3B is a cross-sectional view taken in the direction of arrows along line D - D in Fig. 3A;

Fig. 4 shows a case where the pipes are connected together by applying the snap ring, and is an enlarged cross-sectional view in which Fig. 3B is rotated 90 degrees clockwise;

Fig. 5 is an enlarged cross-sectional view of another embodiment of the snap ring in accordance with the invention and a case in which pipes are connected together by applying it;

Fig. 6A is a plan view illustrating an example of a conventional snap ring; and

Fig. 6B is a plan view illustrating another example of a conventional snap ring.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0020] Referring now to Figs. 1 to 4, a description will be given of a snap ring 10 according to an embodiment of the invention.

[0021] This snap ring 10 is used at a time when, in an automobile, for example, a shaft is prevented from disconnecting from and/or rotating with respect to a gear, or when a piston pin for coupling a connecting rod and a piston is prevented from disconnecting. Alternatively, this snap ring 10 is used to couple a female member and a male member of a pipe joint as the pipe joint at a time when pipes are connected together.

[0022] Figs. 1 and 3 show an example in which the snap ring 10 is used as a pipe joint. Namely, an example is shown in which a holding member 20 (functioning as a female member) and a shaft 30 (functioning as a male member), which is inserted into the female member, are coupled together by using the snap ring 10 so as to connect pipes.

[0023] The holding member 20 has a substantially tubular shape, and a hole 21 is formed therein with such an inner diameter that the shaft 30 can be inserted therein. A tapered portion 22 whose diameter is gradually reduced is formed in such a manner as to extend from one end face thereof along an axial direction. A notch 23 is

formed in a circumferential portion in such a manner as to extend from the end face thereof along the axial direction. This notch 23 has a tapered shape, which expands toward the end face along the axial direction, and an engaging groove 24 extending along the circumferential direction is formed on an inner side of the notch 23. Further, a concave groove 25 for fitting the snap ring 10 is formed along an inner periphery of the hole 21 in alignment with the position of the engaging groove 24. In addition, an annular rib 26 projecting radially inwardly is formed on the inner periphery of the hole 21, and serves to position the shaft 30 when it is inserted. Further, an annular groove 27 is formed in the inner periphery of the hole 21, and a seal ring 40 is fitted in this annular groove 27 and ensures sealability at the time of coupling with the shaft 30. Then, a pipe A is inserted so as to abut against the rib 26 of the holding member 20.

[0024] The shaft 30, which is inserted in the hole 21 of the holding member 20, has a large-diameter hollow cylindrical portion 31 and a small-diameter hollow cylindrical portion 32 whose diameter is slightly smaller than the large-diameter hollow cylindrical portion 31 and which extends in the axial direction. A concave groove 33 in which the snap ring 10 is fitted is provided in an outer periphery of the small-diameter hollow cylindrical portion 32. In addition, a pipe B is inserted into an enlarged-diameter inner periphery of the large-diameter hollow cylindrical portion 31.

[0025] As shown in Fig. 2, the snap ring 10 is integrally made of a spring wire. The snap ring 10 has a circumferential portion 11 and a pair of projecting end portions 12. The circumferential portion 11 is curved in a circular shape fitting the concave groove 33 formed in the outer periphery of the shaft 30 or the concave groove 25 formed in the inner periphery of the holding member 20. The pair of projecting end portions 12 extend substantially in parallel to each other from both ends of this circumferential portion 11 with being bent radially outwardly. The pair of projecting end portions 12 are inserted in the engaging groove 24 of the holding member 20.

[0026] In addition, each of the projecting end portions 12 extends radially outwardly via a first bent portion 13, which is bent inwardly from the circumferential portion 11, and a second bent portion 14, which continues from the first bent portion 13 and is bent outwardly.

[0027] It should be noted that the first bent portion 13 is bent with a circular arc of a radius R_1 having a center on the inward side, while the second bent portion 14 is bent with a circular arc of a radius R_2 having a center on the outward side. In this embodiment, the radius R_1 of the first bent portion 13 and the radius R_2 of the second bent portion 14 are substantially equal to each other.

[0028] Next, a description will be given of a method of using the snap ring 10 according to this embodiment of the invention as well as its operation.

[0029] First, the pipes A and B are respectively inserted in advance into the inner peripheries of the holding member 20 and the shaft 30 by such means as press

fitting such that the pipes A and B do not disconnect. Then, the snap ring 10 is fitted to the shaft 30. Namely, the projecting end portions 12 of the snap ring 10 are outwardly deflected and widened, and then, the snap ring 10 is fitted in the concave groove 33 of the shaft 30, to thereby attach the snap ring 10 on the outer periphery of the shaft 30.

[0030] Next, the small-diameter hollow cylindrical portion 32 of the shaft 30 is inserted into the hole 21 of the holding member 20. At this time, the projecting end portions 12 of the snap ring 10 are pushed in in alignment with the notch 23 of the shaft 30. Then, the circumferential portion 11 of the snap ring 10 is inwardly deflected by being pressed by the tapered portion 22, and the projecting end portions 12 are inwardly deflected by being pressed by the notch 23.

[0031] Then, when the circumferential portion 11 reaches the concave groove 25 of the holding member 20 and the projecting end portions 12 reach the engaging groove 24, these portions are resiliently restored, such that the circumferential portion 11 is fitted into the concave groove 25, and the projecting end portions 12 are engaged with the inner periphery of the engaging groove 24. As a result, the shaft 30 is coupled to the holding member 20 with being prevented from disconnecting from the holding member 20. At the same time, the pipes A and B are connected together (see Figs. 3A and 3B).

[0032] Fig. 4 shows the state of the snap ring 10 when the holding member 20 and the shaft 30 are connected together. In this case, as for the snap ring 10, since each of the projecting end portions 12 extends radially outwardly via the first bent portion 13, which is bent inwardly from the circumferential portion 11, and the second bent portion 14, which continues from the first bent portion 13 and is bent outwardly, a portion 15 extending from the circumferential portion 11 to the projecting end portion 12 does not come into contact with a corner portion 24a of the engaging groove 24 of the holding member 20. For this reason, both the corner portions 24a of the engaging groove 24 and the snap ring 10 are made difficult to be worn, and the backlash entailed by the wear is also made difficult to occur.

[0033] In addition, since the projecting end portions 12 are substantially parallel to each other, the projecting end portions 12 are brought into line contact with the inner periphery of the engaging groove 24 and are held stably, which makes it possible to increase the engaging force.

[0034] Furthermore, since the interval W between the both projecting end portions 12 can be made wide, when the snap ring 10 is closed, the diameter of the snap ring 10 can be made sufficiently small. Thus, the snap ring 10 can be easily inserted into the inner periphery of the holding member 20, and workability in assembling the shaft 30 and the holding member 20 can be improved.

[0035] In addition, since the radius R_1 of the first bent portion 13 and the radius R_2 of the second bent portion 14 are substantially equal to each other, the portion 15 extending from the circumferential portion 11 to the pro-

jecting end portion 12 can be made not to come into contact with the corner portion 24a of the engaging groove 24, and the projecting end portions 12 can be easily extended in parallel to each other.

[0036] It should be noted that although the shaft 30 is not provided with a detent with respect to the holding member 20, a detent means may be formed on the shaft 30 or the holding member 20 to provide a detent.

[0037] Fig. 5 shows the snap ring 10 according to another embodiment of the invention.

[0038] A snap ring 10a of this embodiment differs from that of the above-described embodiment in that projecting end portions 12a extend in the opposite direction to that of the above-described embodiment, and in that an unillustrated notch is formed in a shaft 30a in such a manner as to extend from its end face along the axial direction, and in that an engaging groove 34 is formed in the innermost recess of this notch, while the notch 22 and the engaging groove 24 are not formed in the holding member 20.

[0039] Further, the snap ring 10a is integrally made of a spring wire. The snap spring 10a has the circumferential portion 11 and the pair of projecting end portions 12a. The circumferential portion 11 is curved in a circular shape fitting to the concave groove 33 formed in the outer periphery of the shaft 30 or the concave groove 25 formed in the inner periphery of the holding member 20. The pair of projecting end portions 12a extend substantially in parallel to each other from both ends of this circumferential portion 11 with being bent radially inwardly. The pair of projecting end portions 12a are inserted in the unillustrated engaging groove of the shaft 30.

[0040] In addition, each of the projecting end portions 12a extends radially inwardly via a first bent portion 13a, which is bent outwardly from the circumferential portion 11, and a second bent portion 14a, which continues from the first bent portion 13a and is bent inwardly.

[0041] It should be noted that the first bent portion 13a is bent with a circular arc of a radius R_1' having a center on the outward side, while the second bent portion 14a is bent with a circular arc of a radius R_2' having a center on the inward side. In this embodiment, the radius R_1' of the first bent portion 13a and the radius R_2' of the second bent portion 14a are substantially equal to each other.

[0042] The above-described snap ring 10a is used as follows.

[0043] The pipes A and B are respectively inserted in advance into the holding member 20 and the shaft 30 by such means as press fitting, and the snap ring 10a is fitted to the shaft 30. Namely, the projecting end portions 12a of the snap ring 10a are outwardly widened, the circumferential portion 11 is fitted in the concave groove 33, and the projecting end portions 12a are engaged with the inner periphery of the engaging groove 34, to thereby attach the snap ring 10a on the outer periphery of the shaft 30.

[0044] Next, if the shaft 30 is inserted into the hole 21 of the holding member 20, the circumferential portion 11

and the projecting end portions 12a of the snap ring 10a are pressed by the tapered portion 22 and are inwardly deflected. Then, upon reaching the concave groove 25 of the holding member 20, the circumferential portion 11 and the projecting end portions 12a are resiliently restored and are respectively fitted in the Concave groove 25 and the engaging groove 34. As a result, the shaft 30 is coupled to the holding member 20 in such a manner as to be prevented from disconnecting from the holding member 20. At the same time, the pipes A and B are connected together.

[0045] In this case as well, as shown in Fig. 5, since each of the projecting end portions 12a extends radially inwardly via the first bent portion 13a, which is bent outwardly from the circumferential portion 11, and the second bent portion 14a which continues from the first bent portion 13a and is bent inwardly, a portion 15a extending from the circumferential portion 11 to the projecting end portion 12a does not come into contact with a corner portion 34a of the engaging groove 34 of the shaft 30. For this reason, both the corner portions 34a of the engaging groove 34 and the snap ring 10a are made difficult to be worn, and the backlash entailed thereby is also made difficult to occur.

[0046] In addition, since the projecting end portions 12a are substantially parallel to each other, the projecting end portions 12a are brought into line contact with the inner periphery of the engaging groove 34 and are held stably, which makes it possible to increase the engaging force.

[0047] The snap ring according to the invention can be used as one in which the shaft inserted in the hole of the holding member can be prevented from disconnecting from and/or rotating with respect to the holding member with small backlash and with an increased engaging force.

Claims

1. A snap ring for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member, comprising:

a circumferential portion, which is curved in a circular shape fitting an outer periphery of the shaft or an inner periphery of the hole of the holding member; and

a pair of projecting end portions, which extend substantially in parallel to each other from both ends of the circumferential portion with being bent radially outwardly, the projecting end portions being inserted in an engaging groove formed in the inner periphery of the hole, the circumferential portion and the pair of projecting end portions being made of a spring wire, wherein:

each of the pair of projecting end portions extends radially outwardly via a first bent portion, which is bent inwardly from the circumferential portion, and a second bent portion, which continues from the first bent portion and is bent outwardly. 5

2. A snap ring for preventing a shaft inserted in a hole of a holding member from disconnecting from and/or rotating with respect to the holding member, comprising: 10

a circumferential portion, which is curved in a circular shape fitting an outer periphery of the shaft or an inner periphery of the hole of the holding member; and 15
a pair of projecting end portions, which extend substantially in parallel to each other from both ends of the circumferential portion with being bent radially inwardly, the projecting end portions being inserted in an engaging groove formed in the outer periphery of the shaft, the circumferential portion and the pair of projecting end portions being made of a spring wire, wherein: 20 25

each of the pair of projecting end portions extends radially inwardly via a first bent portion, which is bent outwardly from the circumferential portion, and a second bent portion, which continues from the first bent portion and is bent inwardly. 30

3. The snap ring according to claim 1 or 2, wherein the first bent portion and the second bent portion are formed into circular arcs having a substantially identical radius. 35

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FIG. 1

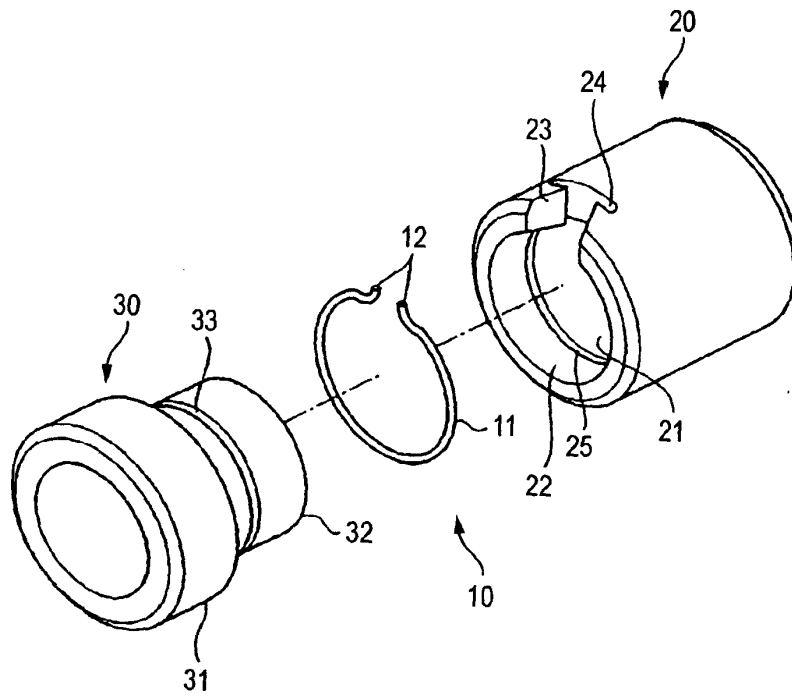


FIG. 2

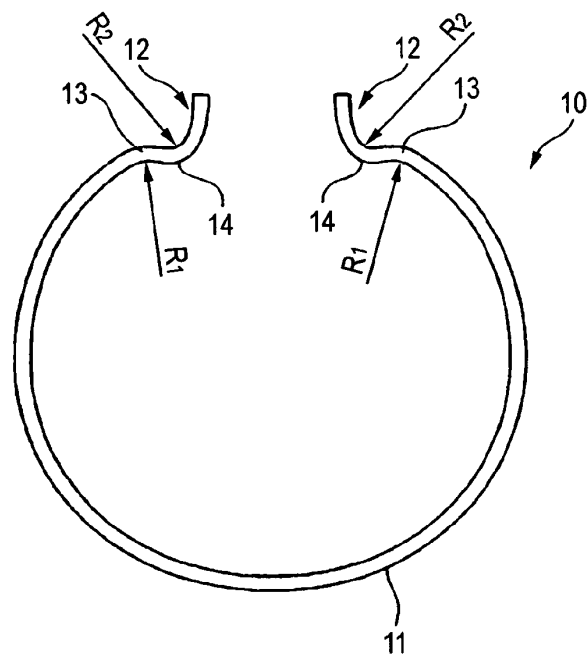


FIG. 4

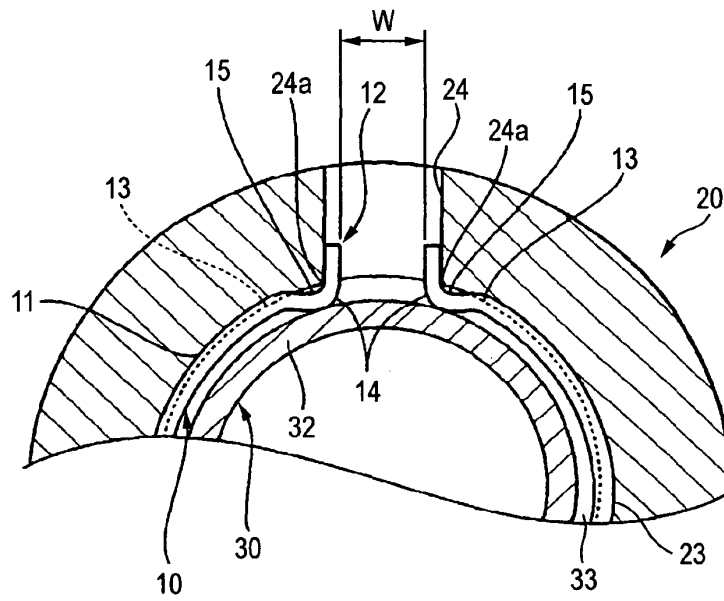


FIG. 5

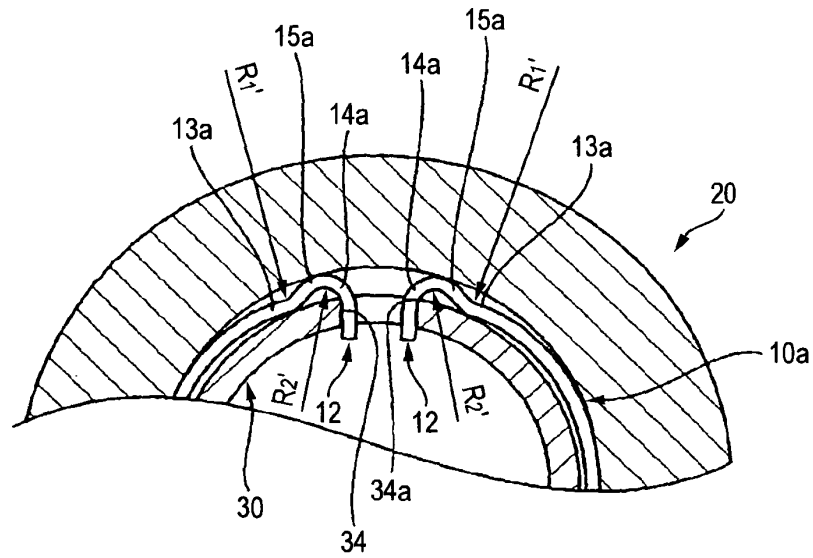


FIG. 6A

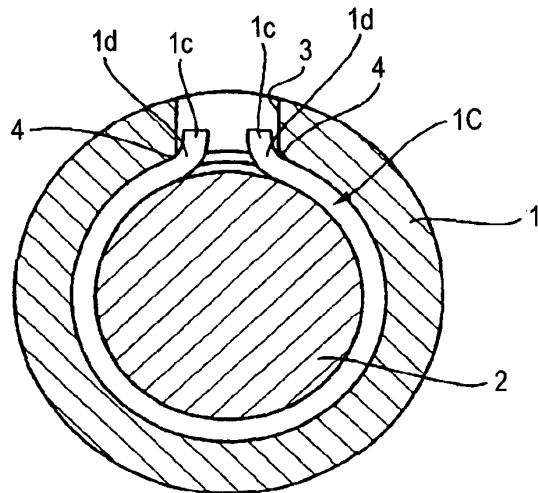
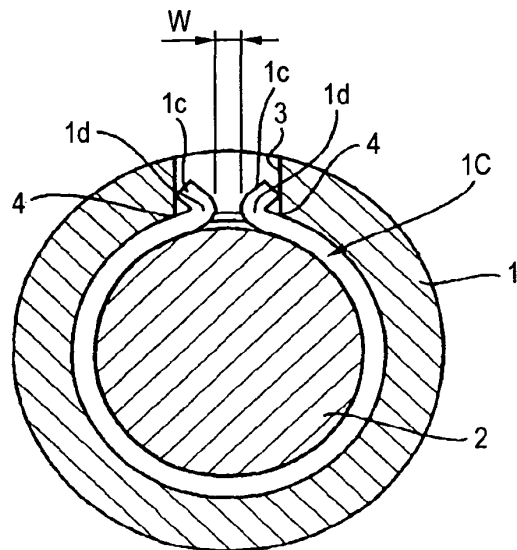


FIG. 6B





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 02 8745

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 785 957 A (THE AUTOMOTIVE ENGINEERING COMPANY LIMITED) 23 August 1935 (1935-08-23) * page 2, line 80 - page 3, line 57; figures 1-3,5-7 *	1-3	F16B21/18
A	GB 1 223 050 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) 17 February 1971 (1971-02-17) * figures *	1,2	
A	FR 1 125 551 A (PHILIPPE LEGOUHY) 2 November 1956 (1956-11-02) * the whole document *	1,2	
			TECHNICAL FIELDS SEARCHED (IPC)
			F16B F16L F16D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		20 March 2006	Martin, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 06 82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 02 8745

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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20-03-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 785957	A	23-08-1935	NONE	
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FR 1125551	A	02-11-1956	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

PUB-NO: EP001681477A1
DOCUMENT-IDENTIFIER: EP 1681477 A1
TITLE: Combination of a snap ring with a shaft and a holding member
PUBN-DATE: July 19, 2006
PATENT-FAMILY-ID: 36010903

INVENTOR-INFORMATION:

NAME	COUNTRY
MATSUMOTO SHINICHI	JP

APPLICANT:

NAME	COUNTRY
PIOLAX INC	JP

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JP 2005006336 A	20050113

CPC-CURRENT:

TYPE	CPC	DATE
CPCI	F16B21/18	20130101

INT-CL-CURRENT:

TYPE	IPC	DATE
IPCP	F16B21/18	20060101

REF-CITED:

PHASE-COUNTRY/NUMBER/KIND/DATE-NPL-INFO
APC JP H01156390 U 19891027
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SER FR 1125551 A 19561102

SER GB 1223050 A 19710217

SER FR 785957 A 19350823

ABSTRACT:

A snap ring (10) includes a circumferential portion (11), which is curved in a circular shape, and a pair of projecting end portions (12), which extend substantially in parallel to each other from both ends of this circumferential portion (11) and are bent radially outwardly and are inserted in an engaging groove (24). Each of the projecting end portions (12) extends radially outwardly or inwardly via a first bent portion (13), which is bent inwardly resp. outwardly from the circumferential portion (11), and a second bent portion (14), which continues from the first bent portion (13) and is bent outwardly resp. inwardly. Further, a portion (15) extending from the circumferential portion (11) to the projecting end portion (12) of the snap ring (10) does not come into contact with a corner portion (24a) of the engaging groove (24), so that wear is difficult to occur, and backlash is also made difficult to occur. Since the projecting end portions (12) are substantially parallel to each other, the projecting end portions (12) are held stably in the engaging groove (24).

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(19) Weltorganisation für geistiges
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(71) Anmelder: GKN DRIVELINE DEUTSCHLAND
GMBH [DE/DE]; Carl-Legien-Straße 10, 63073
Offenbach am Main (DE).

(72) Erfinder: HOHMANN, Tristan; Kupferhammerweg,
61440 Oberursel (DE).

(74) Anwalt: ROESSLER, Matthias; KNH Patentanwälte
Kahlhöfer Neumann Rößler Heine, Postfach 103363,
40024 Düsseldorf (DE).

BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK,
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KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
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RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM,
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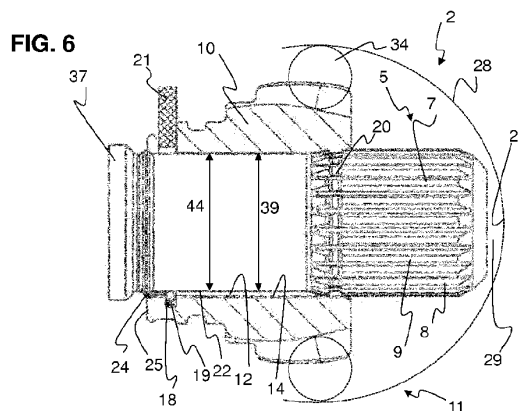
Veröffentlicht:

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jede verfügbare nationale Schutzrechtsart): AE, AG, AL,
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(54) Title: METHOD FOR MOUNTING A DRIVE SHAFT ASSEMBLY IN A MOTOR VEHICLE, AND CORRESPONDING
MOTOR VEHICLE

(54) Bezeichnung : VERFAHREN ZUR MONTAGE EINER LÄNGSWELLENANORDNUNG IN EINEM KRAFTFAHRZEUG,
SOWIE ENTSPRECHENDES KRAFTFAHRZEUG



(57) Abstract: The invention relates to a method for mounting a drive shaft assembly (1), comprising at least a first shaft (37) and a displacement unit (35), which are connected to each other, to a motor vehicle (4) between a first connection point (2) and a second connection point (3), wherein the drive shaft assembly (1) can be connected to the first connection point (2) by means of a first end (5) on the first shaft (37) and can be connected to the second connection point (3) by means of a second end (6) on the displacement unit (35); wherein at least of the first end (5) and the first connection point (2), one is designed as a pin (7), which at least partially has a first set of splines (9) on an outer circumferential surface (8), and the other is a joint inner part (10) of a constant velocity rotary joint (11), wherein the joint inner part (10) has a receptacle (12) for the pin (7), which receptacle has a second set of splines (13) on an inner circumferential surface (14); and the method comprises at least the following steps: i. arranging the pin (7) in front of the receptacle (12); ii. sliding the pin (7) into the receptacle (12) beyond the operating position (15) and displacing the drive shaft assembly (1) in a first direction (16); iii. arranging the second end (6) at

[Fortsetzung auf der nächsten Seite]

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the second connection point (3); iv. sliding the pin (7) back and displacing the drive shaft assembly (1) in a second direction (17) such that the pin (7) and the receptacle (12) are arranged in the operating position (15) in relation to each other; and v. connecting the second end (6) to the second connection point (3).

(57) Zusammenfassung: Verfahren zur Montage einer Längswellenanordnung (1), umfassend zumindest eine erste Welle (37) und eine Verschiebeeinheit (35), die miteinander verbunden sind, zwischen einem ersten Anbindungspunkt (2) und einem zweiten Anbindungspunkt (3) an einem Kraftfahrzeug (4), wobei die Längswellenanordnung (1) über ein erstes Ende (5) an der ersten Welle (37) mit dem ersten Anbindungspunkt (2) und über ein zweites Ende (6) an der Verschiebeeinheit (35) mit dem zweiten Anbindungspunkt (3) verbindbar ist; wobei zumindest von erstem Ende (5) und erstem Anbindungspunkt (2) einer als ein Zapfen (7) ausgebildet ist, der an einer Außenumfangsfläche (8) zumindest teilweise eine erste Keilverzahnung (9) aufweist und der andere ein Gelenkinnenteil (10) eines Gleichlaufdrehgelenkes (11) ist, wobei das Gelenkinnenteil (10) eine Aufnahme (12) für den Zapfen (7) aufweist mit einer zweiten Keilverzahnung (13) an einer Innenumfangsfläche (14); und das Verfahren zumindest die folgenden Schritte umfasst: i. Anordnen des Zapfens (7) vor der Aufnahme (12); ii. Einschieben des Zapfens (7) in die Aufnahme (12) über die Betriebsposition (15) hinaus und dabei Verschieben der Längswellenanordnung (1) in eine ersten Richtung (16); iii. Anordnen des zweiten Endes (6) an dem zweiten Anbindungspunkt (3); iv. Zurückschieben des Zapfens (7) und Verschieben der Längswellenanordnung (1) in einer zweiten Richtung (17), so dass Zapfen (7) und Aufnahme (12) zueinander in der Betriebsposition (15) angeordnet sind, und v. Verbinden des zweiten Endes (6) mit dem zweiten Anbindungspunkt (3).

Verfahren zur Montage einer Längswellenanordnung
in einem Kraftfahrzeug, sowie entsprechendes Kraftfahrzeug

Die vorliegende Erfindung betrifft ein Verfahren zur Montage einer Längswellenanordnung in bzw. an einem Kraftfahrzeug. Im Allgemeinen umfasst eine solche Längswellenanordnung eine erste Welle und eine zweite Welle und erstreckt sich insgesamt von einem ersten Ende zu einem zweiten Ende. Die beiden Wellen sind über eine Verschiebeeinheit (z. B. ein Gleichlaufverschiebegelenk, Ball-Spline, ein Slip-Spline, ein Double-Offset Gelenk, ein Verschiebe-Löbro-Gelenk, ein Tripode-Gelenk, etc.) miteinander verbunden, um eine Antriebsseite des Kraftfahrzeugs mit einer Abtriebsseite des Kraftfahrzeugs zu verbinden. Im Folgenden wird vorrangig auf die Ausführungsform der Verschiebeeinheit als Gleichlaufverschiebegelenk Bezug genommen, ohne dass dies generell für hier angesprochene Längswellenanordnungen beschränkend ist. Die Längswellenanordnung wird regelmäßig zur Übertragung eines Drehmoments vom Antrieb (z. B. Motor und/oder Getriebe) zum Abtrieb (z. B. Differential, Achsgetriebe, Getriebe) des Kraftfahrzeugs eingesetzt, wobei die Längswellenanordnung sich im Wesentlichen in (Fahrt-)Richtung des Fahrzeugs erstreckt. Beim Einbau des Antriebs im vorderen Bereich des Fahrzeugs überträgt die Längswellenanordnung das Drehmoment auf die hinteren Räder bzw. bei Anordnung des Antriebs im hinteren Bereich auf die vorderen Räder.

Das zwischen erster Welle und zweiter Welle eingesetzte Gleichlaufverschiebegelenk verfügt über einen begrenzten Verschiebeweg in axialer Richtung. Durch den Verschiebeweg des Gleichlaufverschiebegelenkes werden die im üblichen Betrieb auftretenden Bewegungen von einzelnen Komponenten der Längswellenanordnung oder des Kraftfahrzeuges in Längsrichtung des Fahrzeugs (axiale Richtung) kompensiert. Zudem werden durch das Gleichlaufverschiebegelenk auch im Betrieb auftretende Verschränkungen der Wellen zueinander durch Beugung des Gleichlaufverschiebegelenkes ausgeglichen. Verschiebeweg und

Verschwenkbereich der Längswellenanordnung sind entsprechend ausgelegt und beschränkt.

Es sind auch Ausgestaltungen von Längswellenanordnungen möglich, bei denen
5 mehr als zwei oder auch lediglich eine Welle die Längswellenanordnung bilden.
Wird die Längswellenanordnung durch mehr als zwei Wellen gebildet, ist zumindest zwischen zwei Wellen eine Verschiebeeinheit angeordnet. Die jeweils äußeren Wellen weisen ein erstes Ende und ein zweites Ende auf, zwischen denen sich die Längswellenanordnung erstreckt. Wird die Längswellenanordnung durch nur
10 eine Welle gebildet, ist an dem, dem ersten Ende gegenüberliegenden zweiten Ende der einen Welle die Verschiebeeinheit angeordnet. Der nicht mit der Welle verbundene und damit gegenüber der Welle verschiebbare Teil der Verschiebeeinheit bildet dann das zweite Ende der Längswellenanordnung.

15 In den folgenden Ausführungen wird im Wesentlichen auf eine Längswellenanordnung mit zwei Wellen Bezug genommen, ohne dass dies generell für hier angesprochene Längswellenanordnungen beschränkend ist.

Zur Fixierung der Längswellenanordnung (mit erster Welle und zweiter Welle) an
20 dem Kraftfahrzeug ist an der Längswellenanordnung regelmäßig eine zentrale Lagerung vorgesehen, die an zumindest einer der beiden Wellen angeordnet ist. Diese zur Führung der Längswellenanordnung eingesetzte Lagerung dient zusätzlich der Dämpfung und Reduzierung der auftretenden Schwingungen der Längswellenanordnung.

25 Längswellenanordnungen der vorgenannten Art sind auf den jeweiligen Einsatzfall, insbesondere hinsichtlich der zu übertragenden Antriebskraft, auszulegen. Weitere Gestaltungsgrößen sind insbesondere die Baulänge und das Gewicht der Längswellenanordnung, das verfügbare Platzangebot im Kraftfahrzeug, das Gewicht des Kraftfahrzeuges, die Anforderungen betreffend das Verhalten im Crash-Fall.
30

Bei der Montage einer bekannten Längswellenanordnung im Kraftfahrzeug wird die Längswellenanordnung zwischen zwei Anbindungspunkten im Kraftfahrzeug angeordnet und über das erste Ende mit dem ersten Anbindungspunkt und über
5 das zweite Ende mit dem zweiten Anbindungspunkt verbunden. Dabei ist zumindest ein Ende, insbesondere beide Enden, der Längswellenanordnung bzw. der Anbindungspunkt (die Anbindungspunkte) im Kraftfahrzeug als eine Zapfen-Gleichlaufgelenk-Verbindung ausgeführt, die bei der Montage der Längswellenanordnung ausgebildet wird. Es sind aber auch andere Ausgestaltungen von Verbindungen möglich. Üblicherweise sind zum Zeitpunkt der Montage der Längswellenanordnung im Kraftfahrzeug die Anbindungspunkte bereits in Bezug auf
10 ihre Lage fixiert. Daher muss die Längswellenanordnung, gegenüber der in der Betriebsposition (Einbauzustand der Längswellenanordnung bei Betrieb des Kraftfahrzeuges) vorliegenden Erstreckung zwischen dem ersten Ende und dem
15 zweiten Ende, auf eine Montagelänge verkürzt werden. Nur infolge dieser Verkürzung können erstes Ende und zweites Ende sowie erster Anbindungspunkt und zweiter Anbindungspunkt (nacheinander) jeweils miteinander verbunden werden.

Diese Verkürzung wird durch eine entsprechende Gestaltung der Verschiebeeinheit (des Gleichlaufverschiebegelenks) zwischen erster Welle und zweitem Ende
20 oder zwischen erster Welle und zweiter Welle der Längswellenanordnung realisiert. Der Verschiebeweg des Gleichlaufverschiebegelenks ist dafür so lang bzw. groß ausgelegt, dass die für die Montage/Demontage benötigte Verkürzung der Längswellenanordnung bereitgestellt wird. Eine entsprechend gestaltete Verschiebeeinheit (Gleichlaufverschiebegelenk) weist daher einen deutlich größeren
25 Verschiebeweg auf, als für die im üblichen Betrieb auftretenden Bewegungen von einzelnen Komponenten der Längswellenanordnung oder des Kraftfahrzeuges in Längsrichtung des Fahrzeugs benötigt wird. Die Bereitstellung eines größeren Verschiebewegs erfordert aber eine größere und schwerere Ausführung der Verschiebeeinheit (des Gleichlaufverschiebegelenkes).
30

Aufgabe der Erfindung ist es daher, die mit Bezug auf den Stand der Technik geschilderten Probleme zumindest teilweise zu lösen und insbesondere eine eingang beschriebene Längswellenanordnung in verbesserter Ausführung bereitzustellen, die im Kraftfahrzeug einfach montiert und demontiert werden kann. Die Längswellenanordnung soll dabei ein reduziertes Gewicht aufweisen. Bezüglich des Montageverfahrens ist zudem eine vorgegebene Reihenfolge von Montageschritten einfach und sicher einzuhalten, die Gefahr von Beschädigungen zu minimieren und eine entsprechende Anwendung für eine Reihe unterschiedlicher Fahrzeugkonzepte anzustreben.

Diese Aufgaben werden gelöst mit einer Längswellenanordnung gemäß den Merkmalen des Patentanspruchs 1. Weitere vorteilhafte Ausgestaltungen der Längswellenanordnung sind in den abhängigen Patentansprüchen angegeben. Es ist darauf hinzuweisen, dass die in den abhängigen Patentansprüchen einzeln aufgeführten Merkmale in beliebiger, technologisch sinnvoller, Weise miteinander kombiniert werden können und weitere Ausgestaltungen der Erfindung definieren. Darüber hinaus werden die in den Patentansprüchen angegebenen Merkmale in der Beschreibung näher präzisiert und erläutert, wobei weitere bevorzugte Ausgestaltungen der Erfindung dargestellt werden.

Zur Lösung wird folglich ein Verfahren zur Montage einer Längswellenanordnung, umfassend zumindest eine erste Welle und eine Verschiebeeinheit, die miteinander verbunden sind, zwischen einem ersten Anbindungspunkt und einem zweiten Anbindungspunkt an einem Kraftfahrzeug vorgeschlagen, wobei die Längswellenanordnung über ein erstes Ende an der ersten Welle mit dem ersten Anbindungspunkt und über ein zweites Ende (hier) an der Verschiebeeinheit mit dem zweiten Anbindungspunkt verbindbar ist. Dabei ist zumindest einer aus der Gruppe erstes Ende und erster Anbindungspunkt als ein Zapfen ausgebildet, der an einer Außenumfangsfläche zumindest teilweise eine erste Keilverzahnung aufweist. Der andere aus der Gruppe von erstem Ende und erstem Anbindungspunkt ist ein Gelenkinnenteil eines Gleichlaufdrehgelenkes, wobei das Gelenkin-

nenteil eine Aufnahme für den Zapfen aufweist mit einer zweiten Keilverzahnung an einer Innenumfangsfläche. Der Zapfen und die Aufnahme sind im Betrieb des Kraftfahrzeuges in einer Betriebsposition zueinander angeordnet. Das Verfahren umfasst zumindest die folgenden Schritte:

- 5 i. Anordnen des Zapfens vor der Aufnahme;
- ii. Einschieben des Zapfens in die Aufnahme über die Betriebsposition hinaus und dabei Verschieben der Längswellenanordnung in einer ersten Richtung;
- iii. Anordnen des zweiten Endes an dem zweiten Anbindungspunkt;
- 10 iv. Zurückschieben des Zapfens und Verschieben der Längswellenanordnung in einer zweiten Richtung, so dass der Zapfen und die Aufnahme zueinander in der Betriebsposition angeordnet sind, und
- v. Verbinden des zweiten Endes mit dem zweiten Anbindungspunkt.

- 15 Insbesondere wird ein Verfahren zur Montage einer Längswellenanordnung, umfassend zumindest eine erste Welle und eine zweite Welle, die über eine Verschiebeeinheit (z. B. ein Gleichlaufverschiebegelenk) miteinander verbunden sind, zwischen einem ersten Anbindungspunkt und einem zweiten Anbindungspunkt an einem Kraftfahrzeug vorgeschlagen, wobei die Längswellenanordnung über ein
- 20 erstes Ende an der ersten Welle mit dem ersten Anbindungspunkt und über ein zweites Ende an der zweiten Welle mit dem zweiten Anbindungspunkt verbindbar ist.

Die Längswellenanordnung kann im Wesentlichen so aufgebaut sein, wie das eingangs erläutert wurde und weist in der Betriebsposition eine (gerade bzw. langgestreckte) Erstreckung von dem ersten Ende zu dem zweiten Ende auf. In dem hier vorgeschlagenen Verfahren wird die Längswellenanordnung insbesondere nicht (durch ein Zusammenschieben der Verschiebeeinheit) verkürzt (oder nur in einem geringen Maße), sondern die gesamte Längswellenanordnung wird (auch) um

30 einen Verschiebeweg verschoben, so dass ein (verlängerter) Verschiebeweg in der Verschiebeeinheit (im Gleichlaufverschiebegelenk) zwischen erstem Ende an der

ersten Welle und dem zweitem Ende der Längswellenanordnung nicht erforderlich ist (oder im Falle einer Längswellenanordnung mit zwei Wellen: zwischen erster Welle und zweiter Welle). Diese Verschiebung der gesamten Längswellenanordnung wird in der Verbindung zwischen erstem Ende und erstem Anbindungspunkt
5 realisiert.

Insbesondere ist das Gleichlaufdrehgelenk (am ersten Ende oder am ersten Anbindungspunkt) ein Festgelenk, bevorzugt ein Kugelgleichlaufdrehgelenk. Es können aber auch andere Typen von Gleichlaufdrehgelenken hier vorgesehen
10 sein, z. B. auch Gleichlaufverschiebegelenke.

Insbesondere ist das Gelenkinnenteil einteilig ausgeführt. Das Gelenkinnenteil kann aber auch mehrteilig ausgeführt sein, also z. B. über Hülsen o. ä. mit dem Zapfen verbunden werden.
15

In Schritt i. des Verfahrens werden Zapfen und Aufnahme so zueinander positioniert (angeordnet), dass sie in einem nachfolgenden Schritt ii. ineinandergeschoben werden können (also insbesondere fluchtend). Während Schritt i. erstreckt sich das zweite Ende über den zweiten Anbindungspunkt hinaus, so dass eine
20 Montageposition hier nicht gegeben ist.

In Schritt ii. des Verfahrens wird die Längswellenanordnung (insgesamt bzw. ausgerichtet) in einer ersten Richtung hin zum ersten Anbindungspunkt verschoben, so dass der Zapfen in die Aufnahme eingeschoben wird. Infolge dieser Verschiebung der Längswellenanordnung in die erste Richtung ist die Längswellenanordnung auch gegenüber dem zweiten Anbindungspunkt verschoben positioniert. Das zweite Ende kann nun vor dem zweiten Anbindungspunkt so positioniert (angeordnet) werden (Schritt iii.), dass in einem nachfolgenden Schritt iv. das zweite Ende und der zweite Anbindungspunkt, die insbesondere ebenfalls als
25 Zapfen und Aufnahme ausgebildet sind, ineinandergeschoben werden können.
30

Nach Schritt iii. sind also Zapfen und Aufnahme am zweiten Ende bzw. zweiten Anbindungspunkt insbesondere fluchtend zueinander angeordnet.

5 In dem Schritt iv. wird die Längswellenanordnung (insgesamt bzw. ausgerichtet) in die zweite Richtung (entgegengesetzt zur ersten Richtung) verschoben, so dass Zapfen und Aufnahme am ersten Ende und ersten Anbindungspunkt nun in einer Betriebsposition zueinander angeordnet sind. In dieser Betriebsposition werden Zapfen und Aufnahme miteinander verbunden und somit in ihrer Lage zueinander fixiert. Infolge dieser Verschiebung der Längswellenanordnung in der zweiten
10 Richtung werden insbesondere Zapfen und Aufnahme am zweiten Ende bzw. zweiten Anbindungspunkt ineinandergeschoben und können in einem nachfolgenden Schritt miteinander verbunden werden (und so in ihrer Lage zueinander fixiert werden).

15 Weiter kann dann auch eine Verbindung der Längswellenanordnung am ersten Ende bzw. dem ersten Anbindungspunkt vorgenommen werden. Damit ist die Längswellenanordnung zwischen den beiden Anbindungspunkten lagebestimmt zum Kraftfahrzeug ausgerichtet montiert und kann dann ggf. auch noch über eine mittige Lagerung an dem Kraftfahrzeug fixiert sein.

20

Gemäß einer vorteilhaften Weiterbildung des Verfahrens werden der Zapfen und das Gelenkinnenteil in der Betriebsposition (Position von Zapfen und Gelenkinnenteil nach Schritt iv. bzw. am Ende des Montageverfahrens) durch einen Sicherungsring fixiert, der in der Aufnahme in einer ersten Ringnut und auf dem Zapfen
25 in einer zweiten Ringnut angeordnet wird, wobei der Sicherungsring vor Schritt i. zunächst (nur) in der ersten Ringnut angeordnet wird und zumindest während Schritt ii. gespreizt ist, so dass der Sicherungsring während Schritt ii. über die zweite Ringnut hinaus verschoben werden kann.

Der Sicherungsring erstreckt sich insbesondere zwischen zwei Sicherungsringenden ringförmig und ist elastisch verformbar. Insbesondere wird für das Spreizen des Sicherungsringes ein Distanzstück verwendet.

- 5 Hierfür wird insbesondere ein Distanzstück für einen ringförmigen elastischen Sicherungsring mit einer Öffnung zwischen zwei Sicherungsringenden vorgeschlagen (der Sicherungsring weist also keine geschlossene Ringform auf). Das Distanzstück ist in der Öffnung zwischen zwei Sicherungsringenden anordenbar, in dem der Sicherungsring elastisch aufgebogen (gespreizt) wird. Die Sicherungsringenden liegen an dem Distanzstück an, so dass der Sicherungsring gespreizt bleibt. Damit kann der Sicherungsring in einer, an einer Innenumfangsfläche einer Aufnahme angeordneten ersten Ringnut gespreizt und unverlierbar angeordnet werden, so dass eine (kraftfreie) Verschiebung eines Zapfens in der Aufnahme in einem Schritt ii. des erfindungsgemäßen Verfahrens ermöglicht wird, ohne dass der
- 10 Sicherungsring beim Verschieben entlang des Zapfens in die dort angeordnete zweite Ringnut eingreift.

Weiter wird vorgeschlagen, dass der gespreizte Sicherungsring zusammen mit dem montierten Distanzstück einen kleinsten ersten Innendurchmesser aufweist,

20 der mindestens dem zweiten Innendurchmesser des gespreizten Sicherungsringes entspricht.

Insbesondere wird der Sicherungsring in der ersten Ringnut bereits vor Schritt i. angeordnet und durch das Distanzstück gespreizt und ist damit unverlierbar in der

25 ersten Ringnut angeordnet. Insbesondere erfolgt die Spreizung durch das Distanzstück so, dass der kleinste erste Innendurchmesser des gespreizten Sicherungsringes zusammen mit montiertem Distanzstück mindestens so groß (oder größer) ist, wie der größte Außendurchmesser (der ersten Keilverzahnung) am Zapfen. Insbesondere ist so ein Einschieben des Zapfens in die Aufnahme möglich, ohne

30 dass durch den Sicherungsring weitere Reibkräfte hervorgerufen werden.

Insbesondere wird der Sicherungsring so gespreizt, dass er sich in der ersten Ringnut anlegt und dadurch zentriert wird. Die Zentrierung stellt sicher, dass der Sicherungsring an seiner gesamten Innenumfangsfläche einen gleichen Abstand zur Außenumfangsfläche des Zapfens aufweist. Damit kann während des Ein-
5 schiebens des Zapfens in die Aufnahme das Auftreten von Reibkräften zwischen Sicherungsring und Zapfen verhindert werden.

Bevorzugt wird das Distanzstück nach Schritt ii. und vor Schritt iv. entfernt. Nach Entfernung des Distanzstücks federt der Sicherungsring zurück und liegt auf einer
10 äußeren Zapfenumfangsfläche auf.

Insbesondere weist die äußere Zapfenumfangsfläche einen Außendurchmesser auf, der mindestens dem Außendurchmesser der zweiten Ringnut entspricht. Insbesondere ist der Außendurchmesser der äußeren Zapfenumfangsfläche kleiner als
15 der kleinste Innendurchmesser der zweiten Keilverzahnung an der Innenumfangsfläche der Aufnahme. Insbesondere sind der Außendurchmesser der äußeren Zapfenumfangsfläche und der Außendurchmesser der zweiten Ringnut kleiner als der größte Außendurchmesser (der ersten Keilverzahnung) am Zapfen.

Bevorzugt weist die erste Keilverzahnung zumindest eine (umlaufende) Fase auf, durch die der Sicherungsring während Schritt iv. weiter gespreizt wird. Die Fase ermöglicht, dass bei dem Zurückschieben des Zapfens in der zweiten Richtung der Sicherungsring auf die erste Keilverzahnung am Zapfen aufgeschoben werden
20 kann, wobei die für das Zurückschieben erforderliche Kraft dadurch nur unwesentlich (oder nicht) erhöht wird. Bei weiterem Zurückschieben des Zapfens gleitet der Sicherungsring über die erste Keilverzahnung und kann so in der zweiten Ringnut am Zapfen angeordnet werden.
25

Insbesondere stehen zumindest während der Schritte ii., iii., iv. und v. die erste
30 Keilverzahnung und zweite Keilverzahnung ständig miteinander in Eingriff. Eine Verdrehung des Zapfens gegenüber der Aufnahme in Umfangsrichtung wird so-

mit verhindert. Das Zurückschieben in Schritt iv. wird dadurch erleichtert oder erst möglich.

Es ist aber auch möglich, dass die erste Keilverzahnung und die zweite Keilverzahnung zumindest (nur) während Schritt iii. (und ggf. auch zumindest teilweise während Schritt ii. und iv.) nicht mehr miteinander im Eingriff stehen. In diesem Fall könnte zumindest die erste Welle gegenüber dem ersten Anbindungspunkt verdreht werden. Eine solche Verdrehung könnte z. B. bei der Suche nach einem Wuchtpunkt notwendig sein.

10

Bevorzugt wird in Schritt ii. der Zapfen in die Aufnahme eingeschoben und dieses Einschieben durch einen Anschlag begrenzt. Insbesondere ist der Anschlag an dem Zapfen ausgebildet und wirkt mit einer ersten Stirnseite des Gelenkinnenteils zusammen. Alternativ ist der Anschlag an einem Gelenkboden eines Gelenkaußenteils des Gleichlaufdrehgelenkes angeordnet und wirkt mit einer zweiten Stirnseite des Zapfens zusammen.

15

Gemäß einer bevorzugten Weiterbildung wird in Schritt ii., ausgehend von der Betriebsposition, der Zapfen gegenüber der Aufnahme um einen ersten Verschiebeweg von mindestens 25 mm [Millimeter], bevorzugt von mindestens 35 mm, in der ersten Richtung weiter verschoben.

20

Es wird weiter ein Kraftfahrzeug mit einer Längswellenanordnung vorgeschlagen, wobei die Längswellenanordnung zumindest eine erste Welle und eine zweite Welle aufweist, die über ein Gleichlaufverschiebegelenk miteinander verbunden sind. Die Längswellenanordnung wird zwischen einem ersten Anbindungspunkt und einem zweiten Anbindungspunkt an einem Kraftfahrzeug montiert, wobei die Längswellenanordnung über ein erstes Ende an der ersten Welle mit dem ersten Anbindungspunkt und über ein zweites Ende an der zweiten Welle mit dem zweiten Anbindungspunkt verbunden ist. Zumindest einer aus der Gruppe erstes Ende und erster Anbindungspunkt ist als ein Zapfen ausgebildet, der an einer Außenum-

25

30

fangsfläche zumindest teilweise eine erste Keilverzahnung aufweist, wobei der andere ein Gelenkinnenteil eines Gleichlaufdrehgelenkes ist, wobei das Gelenkinnenteil eine Aufnahme für den Zapfen mit einer zweiten Keilverzahnung an einer Innenumfangsfläche aufweist. Der Zapfen und die Aufnahme sind in einer Betriebsposition zueinander angeordnet. Ein Gelenkaußenteil des Gleichlaufdrehgelenks weist eine Aussparung im Bereich eines Gelenkbodens auf, so dass eine Montage nach dem erfindungsgemäßen Verfahren erfolgen kann, indem der Zapfen über die Betriebsposition hinaus in das Gelenkaußenteil hinein verschiebbar ist.

10

Insbesondere wird vorgeschlagen, dass die Längswellenanordnung zusätzlich über eine Lagerung zwischen dem ersten Ende und dem zweiten Ende an dem Kraftfahrzeug angebunden ist.

15 Die Ausführungen zu dem Verfahren sind auf die montierte Längswellenanordnung am Kraftfahrzeug übertragbar und umgekehrt.

Die Erfindung und das technische Umfeld werden nachfolgend anhand der Figuren näher erläutert. Es ist darauf hinzuweisen, dass die Figuren besonders bevorzugte Ausführungsvarianten der Erfindung zeigen, auf die sie jedoch nicht beschränkt sind. Für gleiche Gegenstände werden in den Figuren auch gleiche Bezugszeichen verwendet. Es zeigen schematisch:

Fig. 1: eine montierte Längswellenanordnung in der Betriebsposition(nach
25 Schritt v.);

Fig. 2: eine Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung in perspektivischer Ansicht; Verfahren gemäß Schritt i.;

30

Fig. 3: die Verbindung aus Fig. 2 im Querschnitt;

- Fig. 4: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt ii.;
- 5
- Fig. 5: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt ii.;
- 10
- Fig. 6: Verbindung zwischen einem ersten Ende und einem ersten Anbindungspunkt nach Schritt ii.;
- Fig. 7: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung nach Schritt ii. und vor Schritt iv.;
- 15
- Fig. 8: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt iv.;
- 20
- Fig. 9: Verbindung zwischen einem ersten Ende und einem ersten Anbindungspunkt nach Schritt iv.;
- Fig. 10: Distanzstück in einer frontalen Ansicht;
- 25
- Fig. 11: Distanzstück in einer Seitenansicht;
- Fig. 12: Distanzstück in perspektivischer Ansicht;
- 30
- Fig. 13: Sicherungsring mit Distanzstück in einer frontalen Ansicht; und

Fig. 14: Sicherungsring mit Distanzstück in einer Seitenansicht.

Figur 1 zeigt eine Längswellenanordnung 1 eines Kraftfahrzeugs 4 in einer Betriebsposition 15. Die Anordnung der Längswellenanordnung 1 im Kraftfahrzeug 4 erfolgt im Wesentlichen parallel zur Fahrtrichtung des Kraftfahrzeugs 4, also parallel zur ersten Richtung 16 und zweiten Richtung 17. Die Längswellenanordnung 1 setzt sich zumindest aus einer ersten Welle 37 und einer zweiten Welle 38 zusammen, die über das in der Mitte gezeigte (Kugel-) Gleichlaufverschiebegelenk 35 miteinander verbunden sind. An der ersten Welle 37 ist an einem ersten Ende 5 der Längswellenanordnung ein Zapfen 7 angeordnet, der in einem Gelenkinnenteil 10 eines Gleichlaufdrehgelenks 11 aufgenommen ist. Das erste Ende 5 ist über den Zapfen 7 an dem ersten Anbindungspunkt 2 des Kraftfahrzeuges 4 befestigt. Der erste Anbindungspunkt 2 des Kraftfahrzeuges 4 wird hier durch das Gleichlaufdrehgelenk 11 mit Gelenkaußenteil 28, Kugeln 34 und Gelenkinnenteil 10 gebildet. Die Längswellenanordnung 1 ist auch an dem zweiten Ende 6 über ein Gleichlaufdrehgelenk 11 mit einem Zapfen 7 verbunden, wobei der Zapfen 7 hier den zweiten Anbindungspunkt 3 des Kraftfahrzeuges 4 bildet. Die Längswellenanordnung 1 ist über eine Lagerung 30 (hier an der zweiten Welle 38) ebenfalls an das Kraftfahrzeug 4 angebunden.

In der Betriebsposition 15 hat die Längswellenanordnung 1 eine Erstreckung 41 zwischen erstem Ende 5 und zweitem Ende 6. Die Anbindungspunkte 2, 3 des Kraftfahrzeuges 4 weisen eine Distanz 42 auf, die geringer ist als die Erstreckung 41. Für die Montage der Längswellenanordnung 1 muss die Längswellenanordnung 1 also verkürzt werden. Diese Verkürzung wurde bisher durch einen entsprechend langen zweiten Verschiebeweg 40 im Gleichlaufverschiebegelenk 35 ermöglicht. Hier wird nun vorgeschlagen, dass die Verkürzung der Längswellenanordnung 1 (zumindest im Wesentlichen, insbesondere ausschließlich) durch eine besondere Gestaltung der Verbindung zumindest zwischen erstem Ende 5 und erstem Anbindungspunkt 2 realisiert wird.

Insbesondere ist zumindest einer der Anbindungspunkte 2, 3 am Kraftfahrzeug (am ersten Anbindungspunkt 2 das Gelenkinnenteil 10; am zweiten Anbindungspunkt 3 der Zapfen 7) abbeugbar, so dass die Längswellenanordnung 1 zuerst an dem abbeugbaren Anbindungspunkt (hier erster Anbindungspunkt 2) angeordnet wird (Schritt i.). Dann wird die gesamte Längswellenanordnung 1 in einer ersten Richtung 16 verschoben, so dass der Zapfen 7 über die Betriebsposition 15 hinaus in das Gelenkinnenteil 10 eingeführt wird (Schritt ii.). Dabei dringt der Zapfen 7 in eine Aussparung 29 des Gelenkaußenteils 28 ein. Diese Verschiebung um einen ersten Verschiebeweg 36 (siehe Fig. 7) reicht aus, dass die Längswellenanordnung 1 nun zurückgeschwenkt und das zweite Ende 6 an dem zweiten Anbindungspunkt 3 angeordnet werden kann (Schritt iii.). Die gesamte Längswellenanordnung 1 wird erneut verschoben, nun in der, der ersten Richtung 16 entgegengesetzten zweiten Richtung 17, so dass an dem ersten Ende 5 Zapfen 7 und Aufnahme 12 zueinander in der Betriebsposition 15 angeordnet sind (Schritt iv.) und das zweite Ende 6 mit dem zweiten Anbindungspunkt 3 verbunden werden kann (Schritt v.).

Die Verschiebung in Schritt ii. kann durch einen Anschlag 24 am Gelenkboden 27 des Gelenkaußenteils 28 begrenzt werden, der mit der zweiten Stirnseite 26 am Zapfen 7 zusammenwirkt.

Fig. 2 zeigt eine Verbindung zwischen einem Zapfen 7 und einem Gelenkinnenteil 10 an einem ersten Ende 5 einer Längswellenanordnung 1 in perspektivischer Ansicht und das Verfahren gemäß Schritt i.. Fig. 3 zeigt die Verbindung aus Fig. 2 im Querschnitt in einer Seitenansicht. Die Längswellenanordnung 1 wird über das erste Ende 5 (hier der Zapfen 7) an dem ersten Anbindungspunkt 2 (hier das Gelenkinnenteil 10) des Kraftfahrzeuges 4 angebunden.

Die erste Welle 37 endet als Zapfen 7 und bildet das erste Ende 5 der Längswellenanordnung 1. Ausgehend von der zweiten Stirnseite 26 (siehe Fig. 3) des Zapfens 7 ist an der Außenumfangsfläche 8 des Zapfens 7 eine erste Keilverzahnung

9 angeordnet. Zwischen erster Keilverzahnung 9 und Anschlag 24 erstreckt sich die (insbesondere glatte) äußere Zapfenumfangsfläche 22. Im Bereich der ersten Keilverzahnung 9 ist eine umlaufende zweite Ringnut 20 vorgesehen, die mit einer ersten Ringnut 19, die im Gelenkinnenteil 10 angeordnet ist, zusammenwirkt, so dass ein Sicherungsring 18 darin aufgenommen werden kann. Das Gelenkinnenteil 10 weist eine Aufnahme 12 auf, an deren Innenumfangsfläche 14 eine zweite Keilverzahnung 13 ausgebildet ist.

Der Sicherungsring 18 wird durch ein Distanzstück 21 gespreizt und ist daher in der ersten Ringnut 19 so angeordnet, dass der Zapfen 7 in die Aufnahme 12 eingeschoben werden kann.

Fasen 23 sind an der ersten Keilverzahnung 9 vorgesehen, so dass die Einführung des Zapfens 7 in die Aufnahme 12 erleichtert wird und ggf. der Sicherungsring 18 weiter gespreizt werden kann.

Fig. 4 zeigt die Verbindung zwischen einem Zapfen 7 und einem Gelenkinnenteil 10 an einem ersten Ende 5 einer Längswellenanordnung 1 während Schritt ii.. Ausgehend von der Darstellung in Fig. 3 ist der Zapfen 7 entlang der ersten Richtung 16 in die Aufnahme 12 des Gelenkinnenteils 10 eingeschoben worden.

Fig. 5 zeigt eine Verbindung zwischen einem Zapfen 7 und einem Gelenkinnenteil 10 an einem ersten Ende 5 einer Längswellenanordnung 1 während Schritt ii. Ausgehend von Fig. 4 ist der Zapfen 7 entlang der ersten Richtung 16 weiter in die Aufnahme 12 des Gelenkinnenteils 10 eingeschoben worden. Das Distanzstück 21 verhindert, dass der Sicherungsring 18 in die zweite Ringnut 20 am Zapfen 7 einrastet. Der Zapfen 7 ist daher gegenüber der Aufnahme 12 weiter entlang der ersten Richtung 16 verschiebbar.

Fig. 6 zeigt eine Verbindung zwischen einem ersten Ende 5 und einem ersten Anbindungspunkt 2 nach Schritt ii. Der Zapfen 7 ist so weit in das Gleichlaufdrehge-

lenk 11 eingeschoben worden, dass der Zapfen 7 über die Aufnahme 12 hinaus in die Aussparung 29 zwischen Gelenkinnenteil 10 und Gelenkaußenteil 28 eindringt. Die Verschiebung des Zapfens 7 gegenüber der Aufnahme 12 (und der gesamten Längswellenanordnung 1 gegenüber dem ersten Anbindungspunkt 2) entlang der ersten Richtung 16 wird durch den Anschlag 24 an der ersten Welle 37, der mit der ersten Stirnseite 25 des Gelenkinnenteils 10 zusammenwirkt, gestoppt. Erste Keilverzahnung 9 und zweite Keilverzahnung 13 sind auch in dieser Position im Eingriff miteinander, so dass eine gegenseitige Verdrehung von Zapfen 7 und Gelenkinnenteil 10 verhindert wird. Der Außendurchmesser 39 des Zapfens 7 im Bereich der äußeren Zapfenumfangsfläche 22 ist kleiner als der kleinste Innendurchmesser 44 der zweiten Keilverzahnung 13 der Aufnahme 12.

Der Anschlag 24 kann (wie in Fig. 1 angedeutet) auch am Gelenkboden 27 des Gelenkaußenteils 28 angeordnet sein, so dass der Anschlag 24 mit der zweiten Stirnseite 26 des Zapfens 7 dann zusammenwirkt (in Fig. 6 nicht dargestellt).

In dieser Position ist die Längswellenanordnung 1 am ersten Ende 5 um einen ersten Verschiebeweg 36 gegenüber den Anbindungspunkten 2, 3 und einer Betriebsposition 15 verschoben angeordnet. Diese Verschiebung ist ausreichend, dass die Längswellenanordnung 1 mit ihrem zweiten Ende 6 an dem zweiten Anbindungspunkt 3 angeordnet werden kann.

Fig. 7 zeigt eine Verbindung zwischen einem Zapfen 7 und einem Gelenkinnenteil 10 an einem ersten Ende 5 einer Längswellenanordnung 1 nach Schritt ii. und vor Schritt iv. Ausgehend von der Darstellung in Fig. 6 wurde hier das Distanzstück 21 von dem Sicherungsring 18 entfernt, so dass der Sicherungsring 18 nicht mehr gespreizt ist und sich an die äußere Zapfenumfangsfläche 22 (außerhalb der ersten Keilverzahnung 9) anlegt. Der Außendurchmesser 39 der äußeren Zapfenumfangsfläche 22 ist mindestens so groß wie der Außendurchmesser der zweiten Ringnut 20 und insbesondere kleiner als der größte Außendurchmesser der ersten Keilverzahnung 9. Ausgehend von der Position am Anschlag 24 kann nun der

Zapfen 7 gegenüber dem Gelenkinnenteil 10 in einer zweiten Richtung 17 um einen ersten Verschiebeweg 36 verschoben werden, bis zu der Betriebsposition 15, in der der Sicherungsring 18 in die zweite Ringnut 20 am Zapfen 7 eingreift.

- 5 Fig. 8 zeigt eine Verbindung zwischen einem Zapfen 7 und einem Gelenkinnenteil 10 an einem ersten Ende 5 einer Längswellenanordnung 1 während Schritt iv. Der Zapfen 7 ist hier so weit gegenüber dem Gelenkinnenteil 10 verschoben worden, dass der Sicherungsring 18 über die Fase 23 auf die Außenumfangsfläche 8 des Zapfens 7 mit der ersten Keilverzahnung 9 gelangt.

10

Infolge dieser Verschiebung bewegt sich die Längswellenanordnung 1 mit ihrem zweiten Ende 6 hin zu dem zweiten Anbindungspunkt 3 und kann dort angebunden werden.

- 15 Fig. 9 zeigt eine Verbindung zwischen einem ersten Ende 5 und einem ersten Anbindungspunkt 2 nach Schritt iv. Der Zapfen 7 ist hier so weit gegenüber dem Gelenkinnenteil 10 verschoben worden, dass der Sicherungsring 18 in die zweite Ringnut 20 am Zapfen 7 eingreift. Der Sicherungsring 18 liegt nun sowohl in der ersten Ringnut 19 als auch in der zweiten Ringnut 20 und fixiert damit die Position von Zapfen 7 und Gelenkinnenteil 10 zueinander (und damit zwischen Längswellenanordnung 1 und erstem Anbindungspunkt 2). In Bezug auf das erste Ende 5 und den ersten Anbindungspunkt 2 ist die Betriebsposition 15 erreicht.

- 25 In der Betriebsposition 15 ist auch das zweite Ende 6 mit dem zweiten Anbindungspunkt 3 verbindbar. Die Längswellenanordnung 1 hat die Betriebsposition 15 eingenommen. Ggf. kann abschließend die Längswellenanordnung 1 über die Lagerung 30 am Kraftfahrzeug 4 angebunden werden.

- 30 Das Verfahren ist insbesondere auch für die Demontage der Längswellenanordnung 1 geeignet. Dafür muss lediglich der Sicherungsring 18 erneut gespreizt werden, so dass Zapfen 7 und Aufnahme 12 gegeneinander verschoben werden

können. Ggf. ist die Verbindung zwischen der Lagerung 30 und dem Kraftfahrzeug 4 zu lösen. Weiterhin muss die Verbindung zwischen zweitem Ende 6 und zweitem Anbindungspunkt 3 gelöst werden, so dass die gesamte Längswellenanordnung 1 in der ersten Richtung 16 hin zum ersten Anbindungspunkt 2 verschoben werden kann. Infolge dieser Verschiebung kann das zweite Ende 6 vollständig von dem zweiten Anbindungspunkt 3 gelöst werden und die Längswellenanordnung 1 insbesondere aus der Betriebsposition 15 herausgeschwenkt werden. Nachfolgend kann die Längswellenanordnung 1 in die zweite Richtung 17 verschoben und so die Verbindung zwischen erstem Ende 5 und erstem Anbindungspunkt 2 vollständig gelöst werden.

Fig. 10 bis 12 zeigen ein Distanzstück 21 in verschiedenen Ansichten.

Fig. 13 und 14 zeigen einen Sicherungsring 18 mit Distanzstück 21 in mehreren Ansichten. Das Distanzstück 21 ist in der Öffnung 31 zwischen zwei Sicherungsringenden 43 des ringförmigen elastischen Sicherungsrings 18 angeordnet. Die Sicherungsringenden 43 liegen an dem Distanzstück 21 an, so dass der Sicherungsring 18 gespreizt wird. Der gespreizte Sicherungsring 18 zusammen mit dem montierten Distanzstück 21 weist einen kleinsten ersten Innendurchmesser 32 auf, der mindestens dem zweiten Innendurchmesser 33 des gespreizten Sicherungsrings 18 entspricht. D. h., der zweite Innendurchmesser 33 des gespreizten Sicherungsrings 18 wird durch das montierte Distanzstück 21 an keiner Stelle verringert.

Die vorliegende Erfindung ermöglicht eine Vereinfachung der Montage und Demontage einer Längswellenanordnung bei einem Kraftfahrzeug. Die Längswellenanordnung kann als Vormontagegruppe mit montiertem Distanzstück und gespreiztem Sicherungsring an den Verbauort geliefert werden, an dem die Längswellenanordnung in das Kraftfahrzeug eingebaut wird. Die zentral oder an einem Ende der Längswellenanordnung angeordnete Verschiebeeinheit (Gleichlaufverschiebegelenk) kann nun kleiner und leichter ausgeführt werden, da der für die

Montage im Kraftfahrzeug benötigte erste Verschiebeweg nun zwischen erstem Anbindungspunkt und erstem Ende realisiert wird.

Bezugszeichenliste

	1	Längswellenanordnung
	2	Erster Anbindungspunkt
5	3	Zweiter Anbindungspunkt
	4	Kraftfahrzeug
	5	Erstes Ende
	6	Zweites Ende
	7	Zapfen
10	8	Außenumfangsfläche
	9	Erste Keilverzahnung (Sicherung in Umfangsrichtung)
	10	Gelenkinnenteil
	11	Gleichlaufdrehgelenk
	12	Aufnahme
15	13	Zweite Keilverzahnung
	14	Innenumfangsfläche
	15	Betriebsposition
	16	Erste Richtung
	17	Zweite Richtung
20	18	Sicherungsring
	19	Erste Ringnut
	20	Zweite Ringnut
	21	Distanzstück
	22	Äußeren Zapfenumfangsfläche
25	23	Fase
	24	Anschlag
	25	erste Stirnseite
	26	Zweite Stirnseite
	27	Gelenkboden
30	28	Gelenkaußenteil

	29	Aussparung
	30	Lagerung
	31	Öffnung
	32	Erster Innendurchmesser
5	33	Zweiter Innendurchmesser
	34	Kugel
	35	Verschiebeeinheit/ Gleichlaufverschiebegelenk
	36	Erster Verschiebeweg
	37	Erste Welle
10	38	Zweite Welle
	39	Außendurchmesser
	40	Zweiter Verschiebeweg
	41	Erstreckung
	42	Distanz
15	43	Sicherungsringende
	44	Kleinster Innendurchmesser

Patentansprüche

1. Verfahren zur Montage einer Längswellenanordnung (1), umfassend zu-
mindest eine erste Welle (37) und eine Verschiebeeinheit (35), die mitei-
5 nander verbunden sind, zwischen einem ersten Anbindungspunkt (2) und
einem zweiten Anbindungspunkt (3) an einem Kraftfahrzeug (4), wobei
die Längswellenanordnung (1) über ein erstes Ende (5) an der ersten Welle
(37) mit dem ersten Anbindungspunkt (2) und über ein zweites Ende (6)
an der Verschiebeeinheit (35) mit dem zweiten Anbindungspunkt (3)
10 verbindbar ist; wobei einer aus der Gruppe erstes Ende (5) und erster An-
bindungspunkt (2) als ein Zapfen (7) ausgebildet ist, der an einer Außen-
umfangsfläche (8) zumindest teilweise eine erste Keilverzahnung (9) auf-
weist und der andere ein Gelenkinnenteil (10) eines Gleichlaufdrehgelen-
kes (11) ist, wobei das Gelenkinnenteil (10) eine Aufnahme (12) für den
15 Zapfen (7) aufweist mit einer zweiten Keilverzahnung (13) an einer In-
nenumfangsfläche (14); wobei der Zapfen (7) und die Aufnahme (12) im
Betrieb des Kraftfahrzeuges (4) in einer Betriebsposition (15) zueinander
angeordnet sind; wobei das Verfahren zumindest die folgenden Schritte
umfasst:
- 20 i. Anordnen des Zapfens (7) vor der Aufnahme (12);
 - ii. Einschieben des Zapfens (7) in die Aufnahme (12) über die Be-
triebsposition (15) hinaus und dabei Verschieben der Längswellen-
anordnung (1) in einer ersten Richtung (16);
 - 25 iii. Anordnen des zweiten Endes (6) an dem zweiten Anbindungspunkt
(3);
 - iv. Zurückschieben des Zapfens (7) und Verschieben der Längswel-
lenanordnung (1) in einer zweiten Richtung (17), so dass Zapfen
(7) und Aufnahme (12) zueinander in der Betriebsposition (15) an-
geordnet sind, und

- v. Verbinden des zweiten Endes (6) mit dem zweiten Anbindungspunkt (3).
2. Verfahren nach Patentanspruch 1, wobei der Zapfen (7) und das Gelenkin-
5 nenteil (10) in der Betriebsposition (15) durch einen Sicherungsring (18)
fixiert sind, der in der Aufnahme (12) in einer ersten Ringnut (19) und auf
dem Zapfen (7) in einer zweiten Ringnut (20) angeordnet wird, wobei der
Sicherungsring (18) vor Schritt i. zunächst in der ersten Ringnut (19) an-
geordnet wird und zumindest während Schritt ii. gespreizt ist, so dass der
10 Sicherungsring (18) während Schritt ii. über die zweite Ringnut (20) hin-
aus verschoben werden kann.
3. Verfahren nach Patentanspruch 2, wobei der Sicherungsring (18) durch ein
Distanzstück (21) gespreizt wird.
- 15 4. Verfahren nach Patentanspruch 3, wobei der Sicherungsring (18) in der
ersten Ringnut (19) bereits vor Schritt i. durch das Distanzstück (21) ge-
spreizt wird und damit unverlierbar in der ersten Ringnut (19) angeordnet
ist.
- 20 5. Verfahren nach Patentanspruch 3 oder 4, wobei das Distanzstück (21) nach
Schritt ii. und vor Schritt iv. entfernt wird und der Sicherungsring (18) da-
nach auf einer äußeren Zapfenumfangsfläche (22) aufliegt.
- 25 6. Verfahren nach einem der vorhergehenden Patentansprüche 2 bis 5, wobei
die erste Keilverzahnung (9) zumindest eine Fase (23) aufweist, durch die
der Sicherungsring (18) während Schritt iv. weiter gespreizt wird.
- 30 7. Verfahren nach einem der vorhergehenden Patentansprüche, wobei zumin-
dest während der Schritte ii., iii. und iv. die erste und zweite Keilverzah-
nung (9, 13) ständig miteinander in Eingriff stehen.

8. Verfahren nach einem der vorhergehenden Patentansprüche, wobei in Schritt ii. der Zapfen (7) in die Aufnahme (12) eingeschoben wird und dieses Einschieben durch einen Anschlag (24) begrenzt wird.
- 5
9. Verfahren nach Patentanspruch 8, wobei der Anschlag (24) an dem Zapfen (7) ausgebildet ist und mit einer ersten Stirnseite (25) des Gelenkinnenteils (10) zusammenwirkt oder an einem Gelenkboden (27) eines Gelenkaußenteils (28) des Gleichlaufdrehgelenkes (11) angeordnet ist und mit einer
- 10 zweiten Stirnseite (26) des Zapfens (7) zusammenwirkt.
10. Verfahren nach einem der vorhergehenden Patentansprüche, wobei in Schritt ii., ausgehend von der Betriebsposition (15), der Zapfen (7) gegenüber der Aufnahme (12) um einen ersten Verschiebeweg (36) von mindestens
- 15 25 mm in der ersten Richtung (16) weiter verschoben wird.
11. Verfahren nach einem der vorhergehenden Patentansprüche, wobei die Längswellenanordnung (1) zusätzlich zumindest eine zweite Welle (38) umfasst, die über die Verschiebeeinheit (35) mit der ersten Welle (37) verbunden ist, wobei die Längswellenanordnung (1) über das zweite Ende
- 20 (6) an der zweiten Welle (38) mit einem zweiten Anbindungspunkt (3) am Kraftfahrzeug verbindbar ist.
12. Kraftfahrzeug (4) mit einer Längswellenanordnung (1), umfassend zumindest eine erste Welle (37) und eine Verschiebeeinheit (35), die miteinander verbunden sind, wobei die Längswellenanordnung (1) über ein erstes Ende
- 25 (5) an der ersten Welle (37) mit einem ersten Anbindungspunkt (2) und über ein zweites Ende (6) an der Verschiebeeinheit (35) mit einem zweiten Anbindungspunkt (3) des Kraftfahrzeugs (4) verbunden ist, wobei einer
- 30 aus der Gruppe erstes Ende (5) und erster Anbindungspunkt (2) als ein Zapfen (7) ausgebildet ist, der an einer Außenumfangsfläche (8) zumindest

teilweise eine erste Keilverzahnung (9) aufweist und der andere ein Gelenkinnenteil (10) eines Gleichlaufdrehgelenkes (11) ist, wobei das Gelenkinnenteil (10) eine Aufnahme (12) für den Zapfen (7) aufweist mit einer zweiten Keilverzahnung (13) an einer Innenumfangsfläche (14); wobei
5 Zapfen (7) und Aufnahme (12) in einer Betriebsposition (15) zueinander angeordnet sind; wobei ein Gelenkaußenteil (28) des Gleichlaufdrehgelenkes (11) eine Aussparung (29) im Bereich eines Gelenkbodens (27) aufweist, so dass eine Montage nach dem Verfahren gemäß einem der vorhergehenden Patentansprüche erfolgen kann, indem der Zapfen (7) über
10 die Betriebsposition hinaus in das Gelenkaußenteil (28) hinein verschiebbar ist.

13. Kraftfahrzeug (4) gemäß Patentanspruch 12, wobei die Längswellenanordnung (1) zusätzlich zumindest eine zweite Welle (38) umfasst, die über die
15 Verschiebeeinheit (35) mit der ersten Welle (37) verbunden ist, wobei die Längswellenanordnung (1) über das zweite Ende (6) an der zweiten Welle (38) mit einem zweiten Anbindungspunkt (3) am Kraftfahrzeug (4) verbindbar ist

20 14. Kraftfahrzeug (4) gemäß Patentanspruch 13, wobei die Längswellenanordnung (1) zusätzlich über eine Lagerung (30) zwischen dem ersten Ende (5) und dem zweiten Ende (6) an dem Kraftfahrzeug (4) angebunden ist.

25

FIG. 1

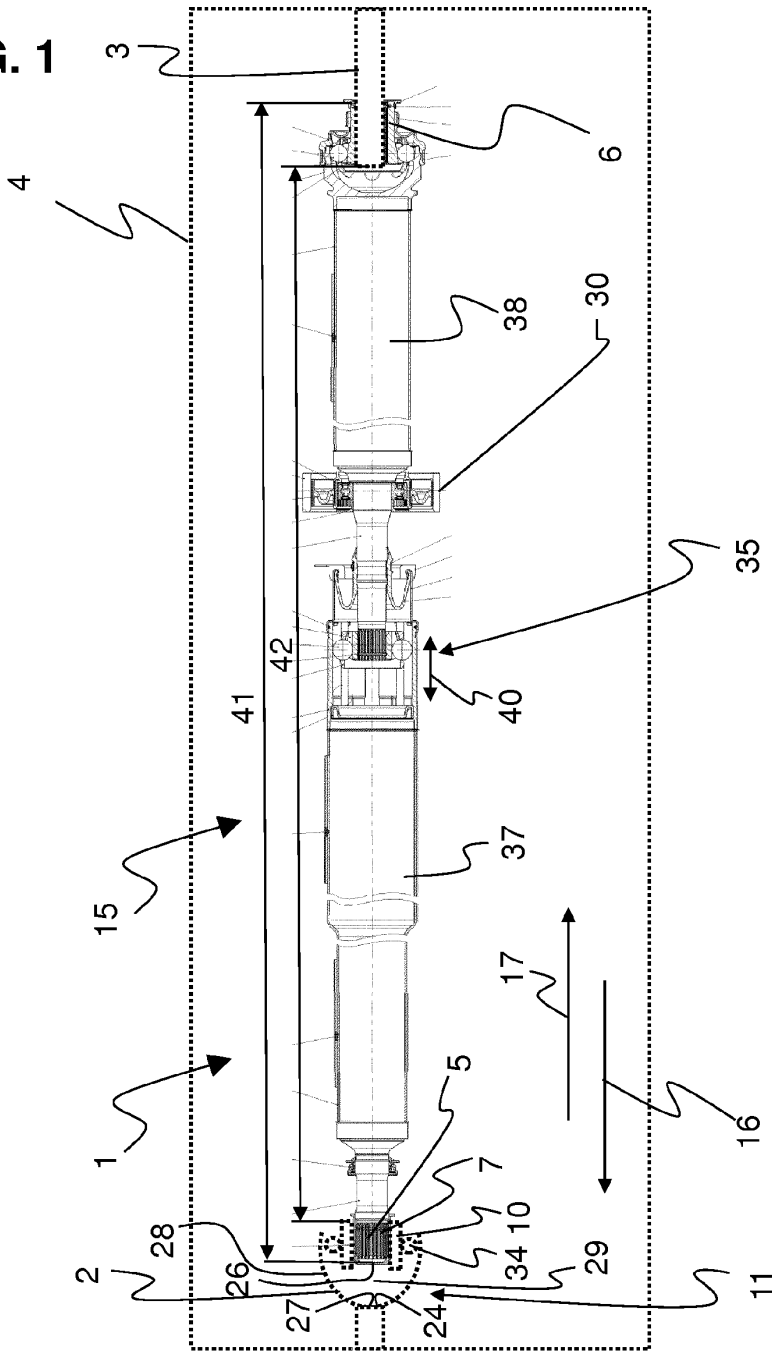


FIG. 2

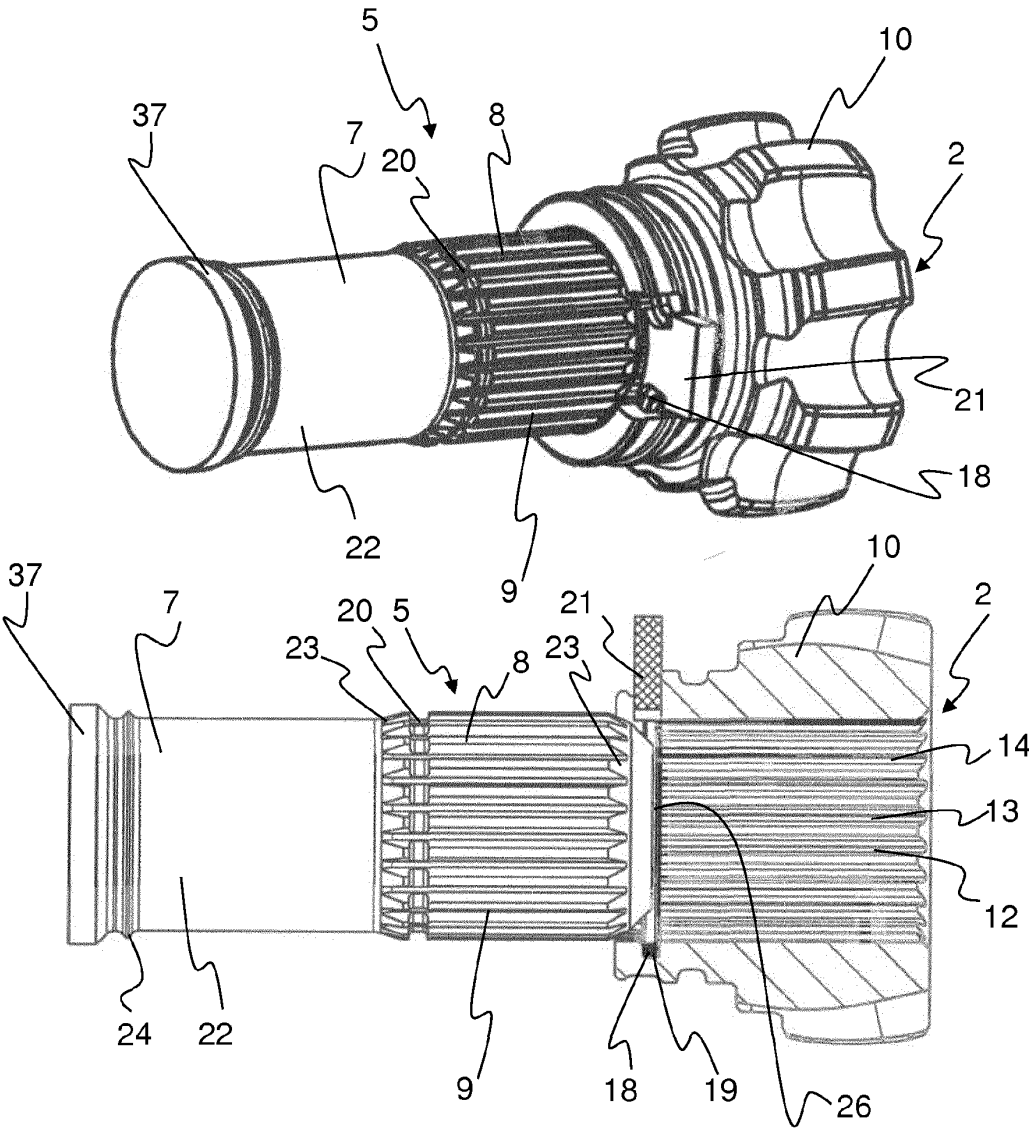
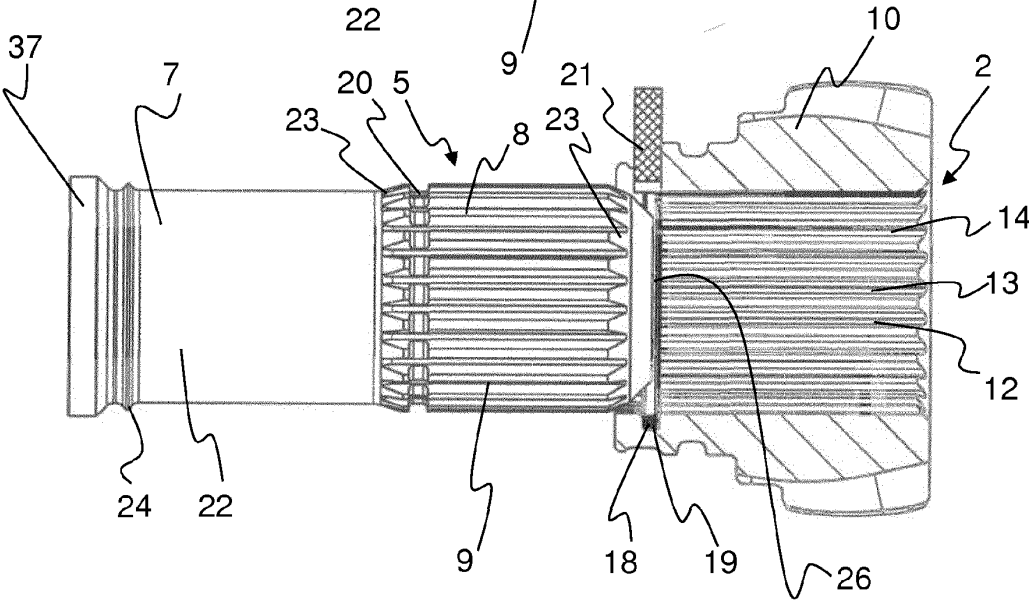
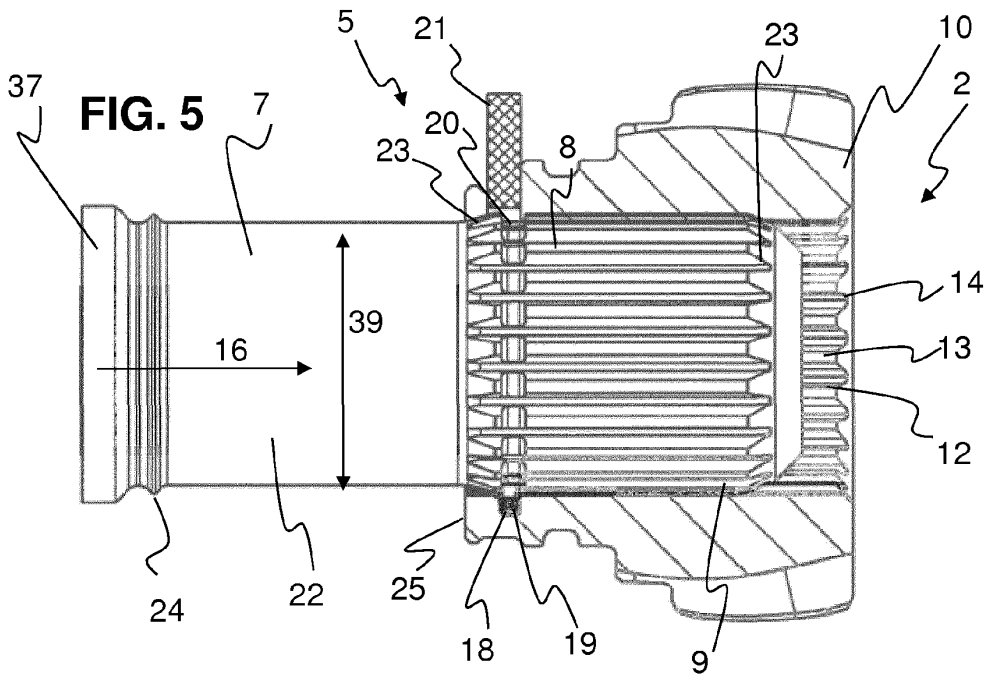
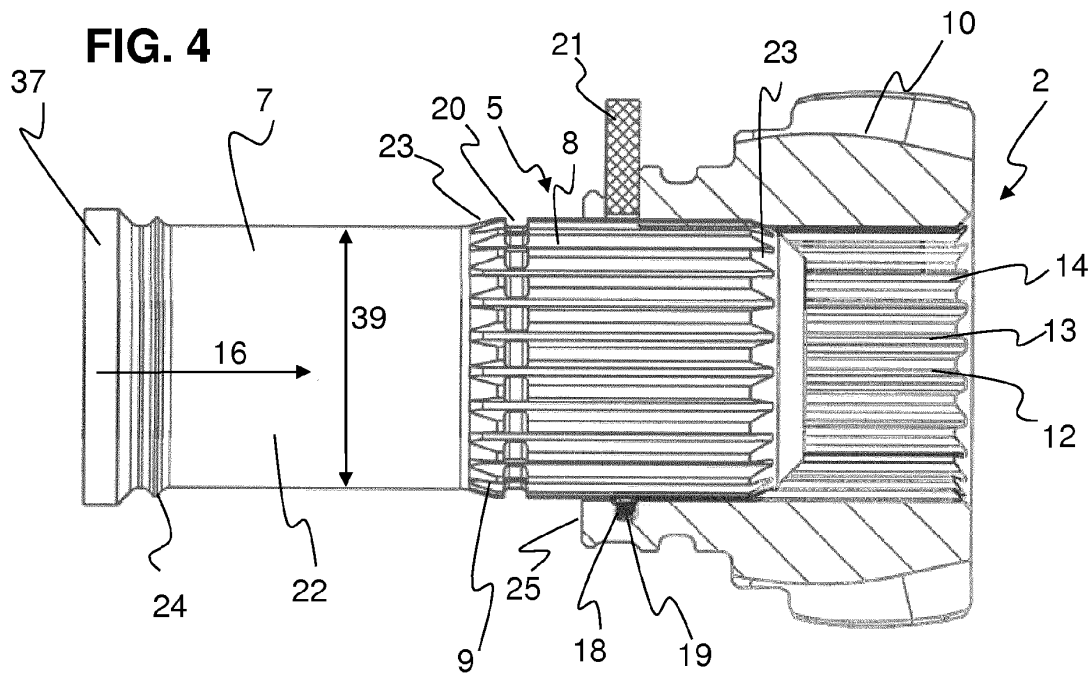


FIG. 3





4/6

FIG. 6

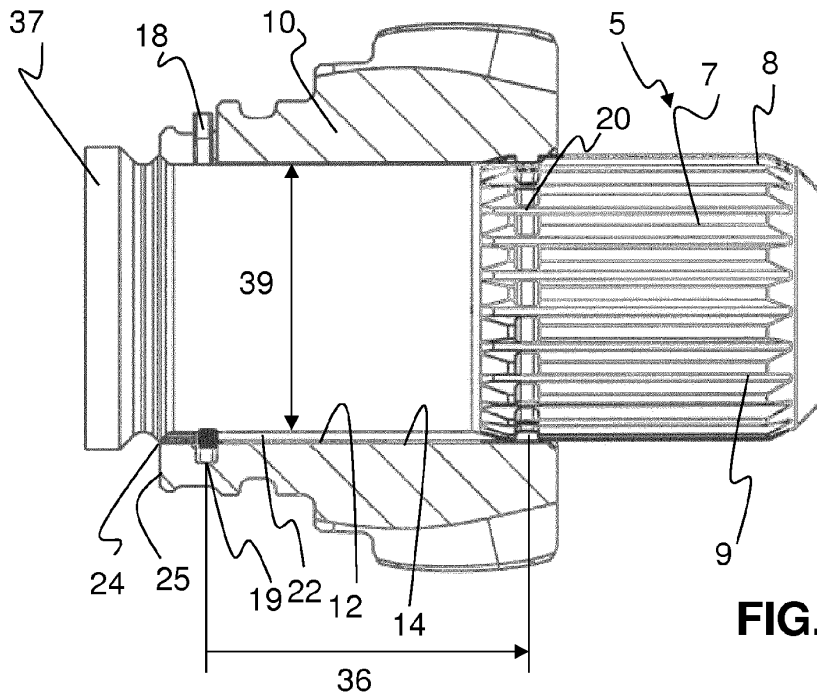
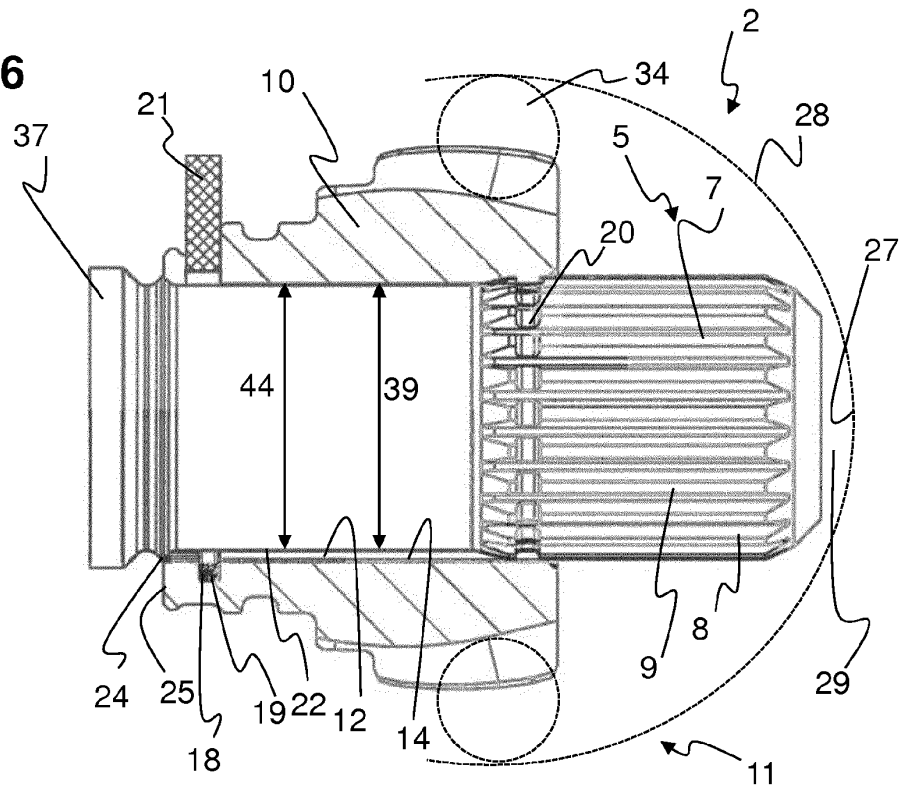


FIG. 7

FIG. 8

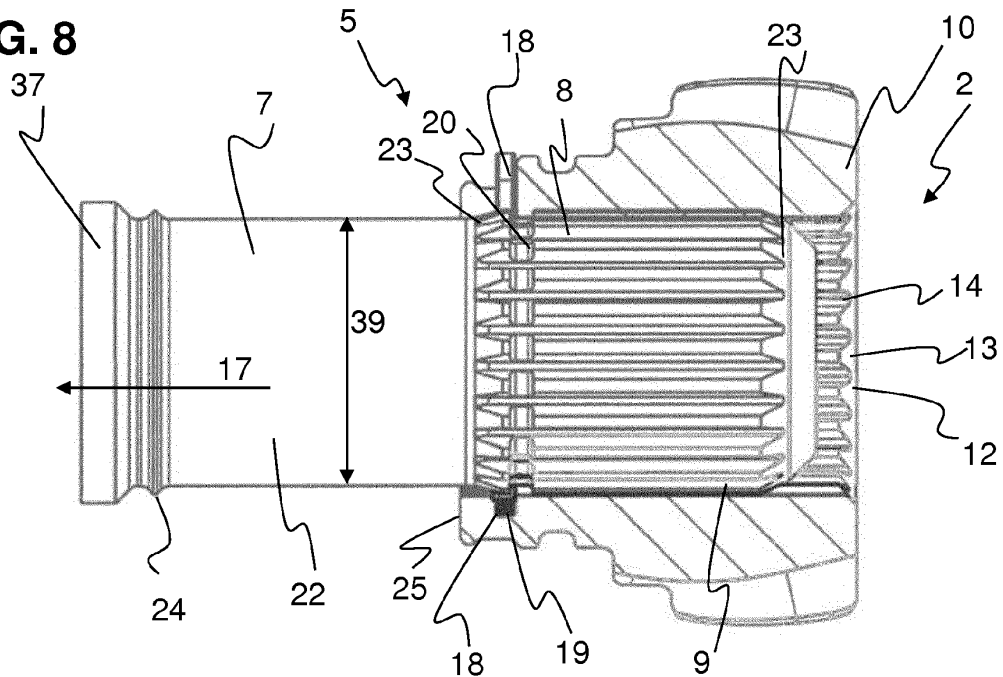


FIG. 9

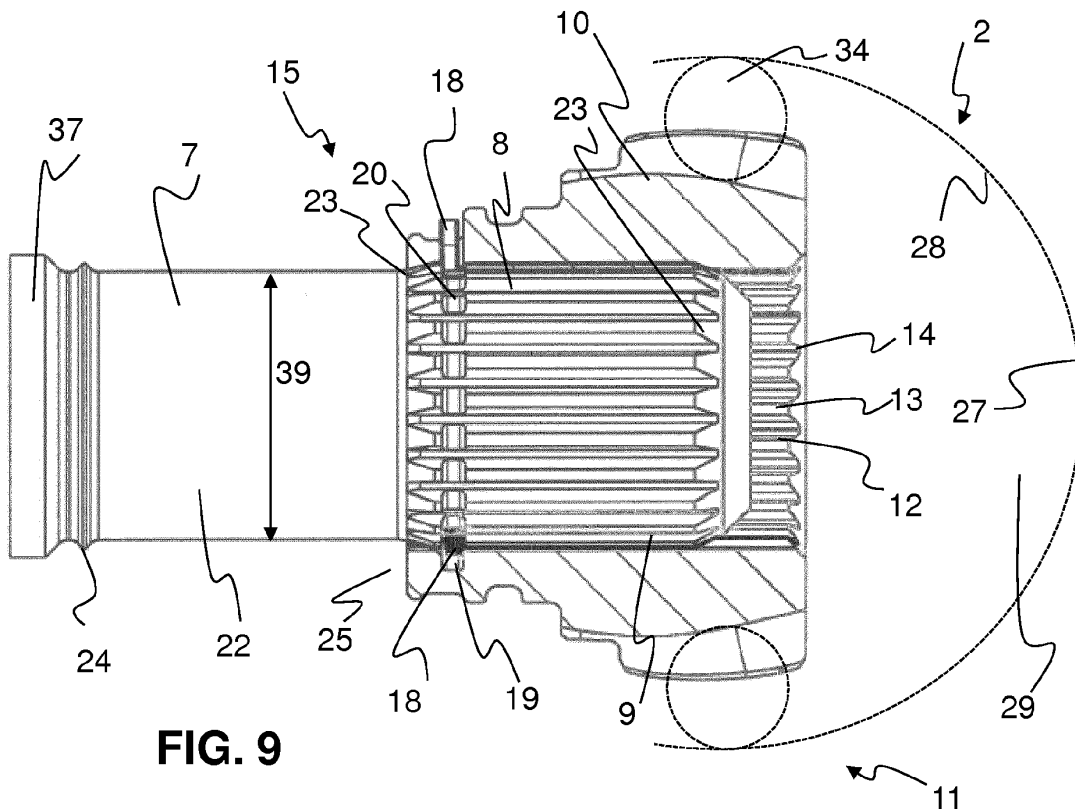


FIG. 10

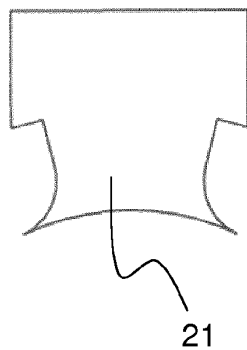


FIG. 11

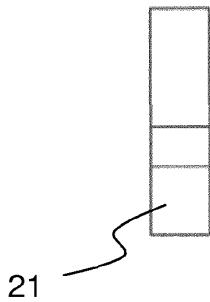


FIG. 12

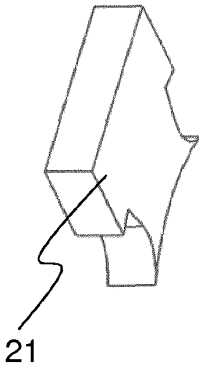


FIG. 13

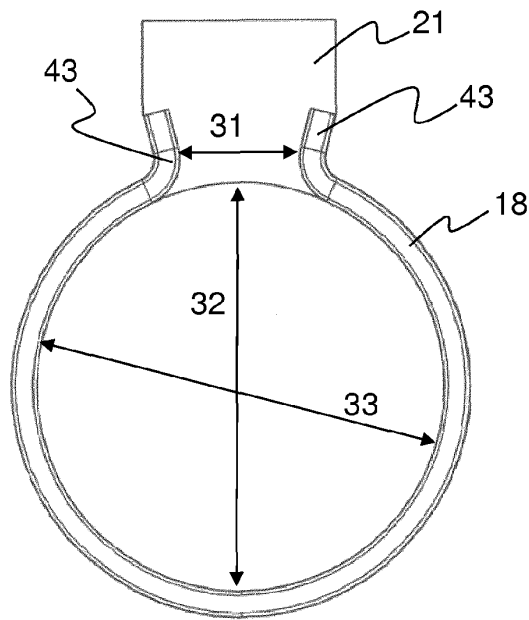
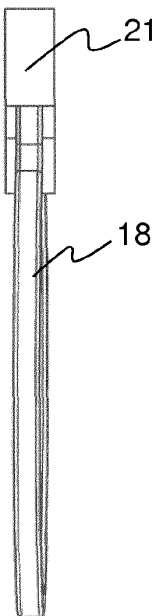


FIG. 14



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/068777

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16D3/227
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)

F16D

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)

EP0-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.
A	WO 2014/121832 A1 (GKN DRIVELINE DEUTSCHLAND GMBH [DE]) 14 August 2014 (2014-08-14) page 17, line 2 - page 23, line 2; figures 1-14 -----	1-14
A	JP H03 292419 A (KUBOTA KK) 24 December 1991 (1991-12-24) the whole document -----	1
A	DE 10 2008 009363 A1 (GKN DRIVELINE DEUTSCHLAND GMBH [DE]) 20 August 2009 (2009-08-20) paragraph [0020] - paragraph [0036]; figures 1-4 -----	1

☐ 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

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"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

10 June 2015

Date of mailing of the international search report

14/07/2015

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Arboreanu, Antoniu

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/068777

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2014121832	A1	14-08-2014	NONE	

JP H03292419	A	24-12-1991	NONE	

DE 102008009363	A1	20-08-2009	DE 102008009363 A1	20-08-2009
			US 2009209354 A1	20-08-2009

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen
PCT/EP2014/068777

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
INV. F16D3/227
ADD.

Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
F16D

Recherchierte, aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)
EPO-Internal, WPI Data

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	WO 2014/121832 A1 (GKN DRIVELINE DEUTSCHLAND GMBH [DE]) 14. August 2014 (2014-08-14) Seite 17, Zeile 2 - Seite 23, Zeile 2; Abbildungen 1-14 -----	1-14
A	JP H03 292419 A (KUBOTA KK) 24. Dezember 1991 (1991-12-24) das ganze Dokument -----	1
A	DE 10 2008 009363 A1 (GKN DRIVELINE DEUTSCHLAND GMBH [DE]) 20. August 2009 (2009-08-20) Absatz [0020] - Absatz [0036]; Abbildungen 1-4 -----	1

☐ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen ☒ Siehe Anhang Patentfamilie

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 "&" Veröffentlichung, die Mitglied derselben Patentfamilie ist

Datum des Abschlusses der internationalen Recherche 10. Juni 2015	Absendedatum des internationalen Recherchenberichts 14/07/2015
Name und Postanschrift der Internationalen Recherchenbehörde Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bevollmächtigter Bediensteter Arboreanu, Antoniu

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

PCT/EP2014/068777

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
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JP H03292419 A	24-12-1991	KEINE	
DE 102008009363 A1	20-08-2009	DE 102008009363 A1	20-08-2009
		US 2009209354 A1	20-08-2009

Formblatt PCT/ISA/210 (Anhang Patentfamilie) (April 2005)

PUB-NO: WO2016034228A1
DOCUMENT-IDENTIFIER: WO 2016034228 A1
TITLE: METHOD FOR MOUNTING A DRIVE SHAFT ASSEMBLY IN
A MOTOR VEHICLE, AND CORRESPONDING MOTOR
VEHICLE
PUBN-DATE: March 10, 2016
PATENT-FAMILY-ID: 51492318

INVENTOR-INFORMATION:

NAME	COUNTRY
HOHMANN TRISTAN	DE

APPLICANT:

NAME	COUNTRY
GKN DRIVELINE DEUTSCHLAND GMBH	DE

APPL-NO: EP 2014068777 W
APPL-DATE: September 4, 2014

PRIORITY-DATA:

PRIORITY-NO	PRIORITY-APPL-DATE
EP 2014068777 W	20140904

CPC-CURRENT:

TYPE	CPC	DATE
CPCI	F16D1/116	20130101
CPCA	F16D2001/103	20130101

INT-CL-CURRENT:

TYPE	IPC	DATE
IPCP	F16D3/227	20060101

REF-CITED:

PHASE-COUNTRY/NUMBER/KIND/DATE-NPL-INFO
DE 102008009363 A1 20090820

JP H03292419 A 19911224
WO 2014121832 A1 20140814

ABSTRACT:

The invention relates to a method for mounting a drive shaft assembly (1), comprising at least a first shaft (37) and a displacement unit (35), which are connected to each other, to a motor vehicle (4) between a first connection point (2) and a second connection point (3), wherein the drive shaft assembly (1) can be connected to the first connection point (2) by means of a first end (5) on the first shaft (37) and can be connected to the second connection point (3) by means of a second end (6) on the displacement unit (35); wherein at least of the first end (5) and the first connection point (2), one is designed as a pin (7), which at least partially has a first set of splines (9) on an outer circumferential surface (8), and the other is a joint inner part (10) of a constant velocity rotary joint (11), wherein the joint inner part (10) has a receptacle (12) for the pin (7), which receptacle has a second set of splines (13) on an inner circumferential surface (14); and the method comprises at least the following steps: i. arranging the pin (7) in front of the receptacle (12); ii. sliding the pin (7) into the receptacle (12) beyond the operating position (15) and displacing the drive shaft assembly (1) in a first direction (16); iii. arranging the second end (6) at the second connection point (3); iv. sliding the pin (7) back and displacing the drive shaft assembly (1) in a second direction (17) such that the pin (7) and the receptacle (12) are arranged in the operating position (15) in relation to each other; and v. connecting the second end (6) to the second connection point (3).



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PATENT AND TRADEMARK OFFICE

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/815,833

RECEIPT DATE / TIME
10/04/2022 04:33:07 PM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 61033288

FILING DATE 07/28/2022

CUSTOMER # 43935

FIRST NAMED
INVENTOR Michael Walter Hopson

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY James Miller

Documents

TOTAL DOCUMENTS: 5

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
265038_IDS.pdf	6	Information Disclosure Statement (IDS) Form (SB08)	1242 KB
DE10008182A1.pdf	14	Foreign Reference	1155 KB
DE10008183C1.pdf	10	Foreign Reference	483 KB
EP1681477A1.pdf	16	Foreign Reference	545 KB
WO2016034228A1.pdf	39	Foreign Reference	2012 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
265038_IDS.pdf	456FA930F1EB2733CFBB71D31DF21FC16A029DE94ADCABDF 697EB688D8DBB1E608438568236446EC55BCBA1248FAFE25C C29386D6500BED7306BBC192BF61C26
DE10008182A1.pdf	79BFAC0EB5B0099BC3CB2CF5928FA275E29FEE37315FA94E2 C8BC682C423DE204FED0934EB7356CC7F5D4982C713C0DC3 E602B555D65F4664397629273C2B214
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EP1681477A1.pdf	F74FD29D00C85BB215B6F9A01C36225BF2FE3A47E6F24CF60 9FFB0174272CE44C2E921D2E7808469DEAB23260DF0A493645 5B52985A61B101DD82B61881894D9
WO2016034228A1.pdf	0D3C4EFFDA7DAD2BBD80B2808B015EBE4AD14557642C5CE AC4EC99504DE6E8ED69D7889215102AC019A8979C85BE4253 5FD7CE14D513A1959FC7F619EFA4E1EC

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New International Application Filed with the USPTO as a Receiving Office

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19 **BUNDESREPUBLIK
DEUTSCHLAND**



**DEUTSCHES
PATENT- UND
MARKENAMT**

12 **Offenlegungsschrift**
10 **DE 100 08 182 A 1**

51 Int. Cl.⁷:
B 60 B 27/04
B 60 K 17/22

21 Aktenzeichen: 100 08 182.7
22 Anmeldetag: 23. 2. 2000
43 Offenlegungstag: 13. 9. 2001

DE 100 08 182 A 1

71 Anmelder:
GKN Automotive GmbH, 53797 Lohmar, DE
74 Vertreter:
Harwardt Neumann Patent- und Rechtsanwälte,
53721 Siegburg

72 Erfinder:
Krude, Werner, Dipl.-Ing., 53819
Neunkirchen-Seelscheid, DE; Fuchs, Heinzwilli,
53783 Eitorf, DE

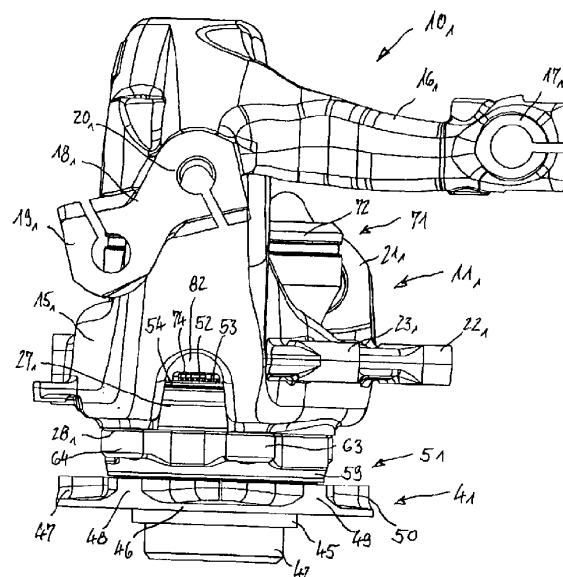
56 Entgegenhaltungen:
DE 197 51 855 C1
DE 197 00 313 A1
WO 99 13 232

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

Prüfungsantrag gem. § 44 PatG ist gestellt

54 Baueinheit zur Lagerung und Antriebsverbindung eines Rades

57 Baueinheit 10 zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger 11, der am Kraftfahrzeug anbringbar ist und ein Ringteil 15 und mehrere Lenkerarme 16 umfaßt, eine Radnabe 41, die drehbar im Ringteil 15 des Radträgers 11 gelagert ist und einen Flansch 46 zum Anschrauben des Rades aufweist, ein Wälzlager 51 mit zwei Wälzkörperreihen zur Lagerung der Radnabe 41 im Radträger 11, das in das Ringteil 15 des Radträgers 11 einsetzbar ist, und ein Gleichlaufgelenk 71, das ein Gelenkaußenteil 72 aufweist, das mit der Radnabe 41 lösbar verbindbar ist, und ein Gelenkinnenteil aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe 41 und dem Gelenkaußenteil 72 mittels ineinandergreifender Verzahnungen hergestellt ist, wobei am Radträger 11, im Ringteil 15, in zumindest einer Umfangsposition eine Ausbrechung 27₁ ausgebildet ist, so daß ein Sicherungsring mittels eines Zangenwerkzeuges durch die Ausbrechung 27₁ hindurch handhabbar ist.



DE 100 08 182 A 1

Die Erfindung betrifft eine Baueinheit zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger, der am Kraftfahrzeug anbringbar ist und ein ringförmiges Teil und mehrere Lenkerarme umfaßt, eine Radnabe, die drehbar im ringförmigen Teil des Radträgers gelagert ist und einen Flansch zum Anschrauben des Rades aufweist, ein Wälzlager mit zwei Wälzkörperreihen zur Lagerung der Radnabe im Radträger, das in das ringförmige Teil des Radträgers einsetzbar ist, und ein Gleichlaufgelenk, das ein Gelenkaußenteil aufweist, das mit der Radnabe lösbar verbindbar ist, und ein Gelenkinnenteil aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe und dem Gelenkaußenteil mittels ineinandergreifender Verzahnungen hergestellt ist, von denen eine erste Verzahnung an einem Teil der Radnabe und eine zweite Verzahnung an einem Hülsenansatz am Gelenkaußenteil ausgebildet ist, und wobei die axiale Sicherung der ineinandergreifenden Verzahnungen mittels eines Sicherungsringes hergestellt ist, der in zwei Ringnuten eingreift, von denen eine erste Ringnut an dem Teil der Radnabe im Bereich der ersten Verzahnung und eine zweite Ringnut an dem Hülsenansatz im Bereich der zweiten Verzahnung ausgebildet ist.

Aus der WO 99/13232 ist eine Baueinheit der genannten Art bekannt, bei der der Sicherungsring zur Montage in die Ringnut auf der Radnabe eingesetzt und mittels einer Klammer so kontrahiert wird, daß er vollständig innerhalb des Fußdurchmessers der Verzahnung liegt. Danach wird das Gegenstück montiert, das heißt das Gelenkaußenteil aufgeschoben bzw. die Radnabe eingeschoben, bis die darin ausgeformte Ringnut mit dem Sicherungsring axial in Überdeckung liegt, und die Klammer bzw. der Keil radial nach außen entfernt. Hierbei expandiert der Sicherungsring, so daß er auch in die Ringnut im Gelenkaußenteil eingreift bzw. der Sicherungsring kontrahiert, so daß er auch in die Ringnut in der Radnabe eingreift. In beiden Ausführungen ist eine Ausklinkung am Ende des Gelenkaußenteils vorgesehen, die die Klammer bzw. den Keil sowie radial abgebogene Enden des Sicherungsringes aufnimmt. Zum Darstellen der Manipulierbarkeit des Sicherungsringes im Wege eines Entfernens der Klammer bzw. des Keils bei im Radträger montierter Radnabe ist eine Radialbohrung im Radträger vorgesehen, die in axialer Übereinstimmung mit den Ringnuten bzw. mit der Ausklinkung am Gelenkaußenteil liegt und Zugriff zu einem Laschenansatz an der Klammer bzw. dem Keil von außerhalb des Radträgers ermöglicht. Ist die Montage der Baueinheit durch Entfernen der Klammer bzw. des Keils abgeschlossen, ist eine Demontage nur noch unter Zerstörung des Sicherungsringes durch Aufbringen von Axialkräften zwischen Radnabe und Gelenkaußenteil möglich.

Aus der DE 197 00 313 A1 ist eine Anordnung der genannten Art bekannt, bei der der Sicherungsring nach Art eines Schnappings, der selbständig in die Innennut in der Innenverzahnung des Gelenkaußenteils eingreift, ausgeführt ist. Eine derartige Anordnung ist nicht zerstörungsfrei zu demontieren. Vielmehr wird der Sicherungsring beim gewaltsamen axialen Entfernen von Radnabeneinheit und Gleichlaufgelenk zerquetscht, wobei zugleich Schäden an den Verzahnungen auftreten können. Aus der DE 197 51 855 C1 ist eine Anordnung der eingangs genannten Art bekannt, bei der der Sicherungsring radial von außen frei zugänglich ist und axial zur Gelenkseite vor dem Ringteil des Radträgers

liegt.

Zu diesem Zweck ist mit der Radnabe ein Treibring verbunden, der in die entsprechende Verzahnung zum Verzahnungseingriff mit dem Gelenkaußenteil trägt, welcher axial über das Nabenende hinaus verlängert ist. Hiermit verlängert sich die Gesamtlänge der Baueinheit, wodurch gleichzeitig verfügbare Länge für die Gelenkwelle verlorengeht, deren Bestandteil das Gleichlaufgelenk ist. Diese Länge ist ein besonders kritischer Punkt, da mit einer Verkürzung der Gelenkwelle bei vorgegebenen maximalen Gelenkwinkeln eine Verringerung der Lenkwinkel bzw. der Federwege verbunden ist.

Der vorliegenden Erfindung liegt die Aufgabe zugrunde, eine Baueinheit der genannten Art so weiterzubilden, daß eine erleichterte Montage und Demontage des Gleichlaufgelenks und damit zugleich eine verbesserte Möglichkeit zum Austausch von Gelenkwellen am Kraftfahrzeug möglich wird. Eine Lösung hierfür besteht darin, daß im Radträger im Ringteil in zumindest einer Umfangsposition eine Ausbrechung ausgebildet ist, die von der Radseite in das Ringteil axial einschneidet, und daß bei im Radträger festgelegtem Wälzlager und bei mit der Radnabe verbundenem Gelenkaußenteil die beiden Ringnuten axial korrespondierend zur Ausbrechung liegen, so daß der Sicherungsring mittels eines Zangenwerkzeugs durch die Ausnehmung hindurch handhabbar ist. Eine andere Lösung besteht darin, daß am Radträger im Ringteil in zumindest einer Umfangsposition eine Ausbrechung ausgebildet ist, die von der Gelenkseite in das Ringteil axial einschneidet, und daß bei im Radträger festgelegtem Wälzlager und bei mit der Radnabe verbundenem Gelenkaußenteil die beiden Ringnuten axial korrespondierend zur Ausbrechung liegen, so daß der Sicherungsring mittels eines Zangenwerkzeugs durch die Ausbrechung hindurch handhabbar ist. Mit den hier angegebenen Mitteln kann eine Gelenkwelle montiert und insbesondere zerstörungsfrei demontiert werden, ohne daß das Fahrzeugrad von der Radnabe und die Radnabe vom Radträger demontiert werden muß und ohne daß der Radträger in irgendeiner Weise vom Kraftfahrzeug gelöst werden muß. Der für die Montage und Demontage erforderliche Verschiebeweg zum Lösen der ineinandergreifenden Verzahnungen ist im differentialseitigen Gleichlaufgelenk konstruktiv notwendigerweise vorhanden. Ohne die Festigkeit des Ringkörpers wesentlich zu beeinträchtigen, erlaubt die Gestaltung der Ausbrechung den notwendigen Zugriff zum Sicherungsring. Hierzu ist die Welle mit dem Gelenkaußenteil in eine Drehposition zu bringen, in der die Enden des Sicherungsringes radial betrachtet unterhalb der Ausklinkung zu liegen kommen. Dabei liegt der Sicherungsring axial betrachtet innerhalb der Längserstreckung der Ausbrechung.

Nach einer günstigen Ausgestaltung für beide Lösungen ist vorgesehen, daß in Umfangsrichtung unmittelbar zu beiden Seiten der Ausbrechung Verschraubungen zwischen dem Ringteil des Radträgers und dem Lageraußenring des Wälzlagers vorgesehen sind. Hiermit wird die Materialreduzierung am Ringkörper infolge der Ausbrechung festigkeitsmäßig durch die Anbindung an den Lageraußenring ausgeglichen.

Nach einer günstigen Weiterbildung der zweitgenannten Lösung ist vorgesehen, daß die Ausbrechung im Bereich eines Lenkerarms liegt, in den sie radial einschneidet. Auch hierdurch wird die Materialreduzierung am Ringkörper infolge der Ausbrechung durch die überbrückende Funktion des Lenkerarms egalisiert.

Um Belastungsspitzen auszuschließen und einen harmonischen Kräfteverlauf sicherzustellen, ist die Ausbrechung in axialer Ansicht im wesentlichen U-förmig bzw. gegebenenfalls in axialer Ansicht im wesentlichen U-förmig ausge-

bildet.

Vorzugsweise sind die Verzahnungen am Hülsenansatz und an der Radnabe ineinandergreifende Naben- und Wellenverzahnungen, wobei am Hülsenansatz im Bereich der Nabenverzahnung eine umfangsbegrenzte und axial begrenzte Ausklinkung ausgebildet ist, die die zweite Ringnut unterbricht und die bei mit der Radnabe verbundenem Gelenkaußenteil die erste Ringnut in der Wellenverzahnung der Radnabe und den Sicherungsring umfangsbegrenzt freilegt. In die Ausklinkung können dann die Enden des Sicherungsringes eingreifen und sich an dieser in Umfangsrichtung abstützen. Die über die Ausklinkung nach außen vorstehenden Enden des Sicherungsringes sind hier durch die Ausbrechung hindurch für den zur Montage und Demontage notwendigen Zugriff frei.

Aus Fertigungsgründen ist es günstig, wenn die erste Verzahnung am Nabenkörper an einem separaten Treibring ausgebildet ist, der auf die Radnabe aufgeschoben und auf dieser unlösbar festgelegt ist. Hierbei können zur Verdrehsicherung zwischen beiden Teilen diese mit ineinandergreifenden Längsverzahnungen versehen sein. Der Treibring kann hierbei insbesondere durch eine Umbördelung des Nabenkörpers axial auf der Radnabe gesichert sein. Dabei kann der Treibring axial gegen einen inneren Lagerring einer ersten Wälzkörperreihe anliegen, der ebenfalls auf den Nabenkörper aufgeschoben ist und der zugleich von dem Treibring gegen einen inneren Lagerring einer zweiten Wälzkörperreihe verspannt ist. Der zweite innere Lagerring ist hierbei in der Regel unmittelbar aus dem Nabenkörper ausgebildet.

In vorteilhafter Weise bietet der Gegenstand der vorliegenden Erfindung eine kurzbauende Baueinheit der genannten Art, die mit einfachen Hilfsmitteln zerstörungsfrei und ohne Lösen der Baugruppen Radträger und Radnabeinheit von dem Gleichlaufgelenk einer Gelenkwelle getrennt werden kann. Hierbei sind gute Zugänglichkeit für die Montage und im wesentlichen unbeeinträchtigte Festigkeit sichergestellt.

Bevorzugte Ausführungsbeispiele von erfindungsgemäßen Baueinheiten zur Anbringung an einem Kraftfahrzeug werden nachstehend anhand der beigefügten Zeichnungen erläutert.

Fig. 1 zeigt eine komplett montierte Baueinheit in einer ersten Ausführung mit flanschseitiger Ausbrechung von oben,

a) in Liniendarstellung

b) in Schattendarstellung;

Fig. 2 zeigt die Baueinheit nach **Fig. 1** demontiert mit vom Radträger getrennter Radnabe und Gelenkaußenteil ohne Sicherungsring,

a) in Liniendarstellung

b) in Schattendarstellung;

Fig. 3 zeigt den Radträger nach den **Fig. 1** und **2** als Einzelheit in Schrägansicht von der Flanschseite in Schattendarstellung;

Fig. 4 zeigt eine komplett montierte Baueinheit in einer zweiten Ausführung mit gelenkseitiger Ausbrechung,

a) im Längsschnitt durch die Drehachse in Liniendarstellung

b) in Ansicht von der Gelenkseite mit Phantomdarstellung des Gleichlaufgelenks in perspektivischer Schattendarstellung;

Fig. 5a zeigt die Baueinheit nach **Fig. 4** mit vom Radträger getrennter Radnabe und Gelenkeinheit im Längsschnitt gemäß **Fig. 4a**;

Fig. 5b zeigt die Baueinheit nach **Fig. 4** mit vom Radträger getrennter Radnabe und Gleichlaufgelenk in Schattendarstellung gemäß **Fig. 4b**.

Fig. 6 zeigt den Radträger nach den **Fig. 4** und **5** als Einzelheit in perspektivischer Schattendarstellung.

Die **Fig. 1a** und **1b** werden nachfolgend gemeinsam beschrieben. Eine erfindungsgemäße Baueinheit **10₁** umfaßt einen Radträger **11₁**, eine Radnabe **41** und ein Gleichlaufgelenk **71**. Am Radträger **11₁** ist ein zentrales Ringteil **15₁** erkennbar, an dem ein erster Lenkerarm **16₁**, mit einem Befestigungsauge **17₁**, und ein zweiter Lenkerarm **18₁**, mit zwei Befestigungsaugen **19₁**, **20₁** erkennbar sind. Weitere Befestigungsaugen **21₁**, **22₁**, **23₁** sind mit unterschiedlicher Bohrungsrichtung unmittelbar am Ringteil **15₁** angeformt. Im Ringteil **15₁** ist eine zur Radnabeinheit **41** hin offene Ausbrechung **27₁**, die sich parallel zur Achse des Ringteils bis zu einer Flanschfläche **28₁** des Ringteils **15₁** erstreckt und in dieser mündet. Die Radnabeinheit **41** umfaßt ein Radlager **51** mit einem Lageraußenring **59**, an dem Anschraubaugen **63**, **64** zur Anschraubung an der Flanschfläche **28₁** des Ringteils **15₁** erkennbar sind, die unmittelbar zu beiden Seiten der Ausbrechung **27₁** liegen. Im Radlager **51** ist der Nabenkörper **45** gelagert, der einen Radflansch **46** trägt, der vier Flanschaugen **47-50** erkennen läßt. Auf die Radnabe **41** ist eine Kappe **42** aufgesetzt. Die Gleichlaufgelenkeinheit **71** zeigt ein Gelenkaußenteil **72** mit einem Hülsenansatz **82**, an dem in der radnabenseitigen Stirnfläche **73** eine Ausklinkung **74** ausgeführt ist, die in Übereinstimmung mit der Ausbrechung **27₁** im Ringteil **15₁** des Radträgers **11₁** gedreht ist. Durch diese Ausklinkung **74** ist eine Außenverzahnung **52** sichtbar, in der eine Ringnut **53** eingedreht ist. Weiter ist noch ein Dichtungsring **54** durch die Ausbrechung **27₁** sichtbar.

In **Fig. 2** sind die gleichen Einzelheiten wie in **Fig. 1** mit gleichen Bezugszeichen beziffert. Auf die entsprechende Beschreibung wird Bezug genommen. Radnabeinheit **41**, Radträger **11₁** und Gleichlaufgelenkeinheit **71** sind längs an der Drehachse in Explosionsdarstellung gespreizt gezeigt. Am Radträger **11₁** sind über die bereits in **Fig. 1** bezeichneten Einzelheiten hinaus keine weiteren erkennbar. An der Radnabeinheit **41** ist die Außenverzahnung **52** in ihrer gesamten axialen Erstreckung und mit ihrer Ringnut **53** deutlich erkennbar. Am Gelenkaußenteil **72** des Gleichlaufgelenks **71** ist durch die Ausklinkung **74** eine Innenverzahnung **75** sichtbar, in der eine weitere Ringnut **76** eingedreht ist. Die Innenverzahnung **75** kommt bei montierter Baueinheit **10** mit der Außenverzahnung **52** an der Radnabe **41** in Eingriff, wobei dann die Ringnut **53** mit der Ringnut **76** in Überdeckung kommt und beide gemeinsam einen Sicherungsring **57** aufnehmen können.

In **Fig. 3** ist das Ringteil **15₁** des Radträgers **11₁** von der Flanschfläche **28₁** her in Ansicht gezeigt, wobei die radiale Erstreckung der Ausbrechung **27₁** sehr deutlich wird. Am Ringteil **15₁** sind weitere Augen **24₁**, **25₁**, **26₁** mit parallel zur Achse verlaufenden Bohrungen sichtbar sowie weitere größere Augen **29₁**, **30₁** für Drehzapfen bzw. Lenker. In der Flanschfläche **28₁** sind Gewindebohrungen **31₁**, **32₁**, **33₁**, **34₁** zur Anschraubung des Lageraußenrings **59** ausgeführt. Weiter ist eine Ringnut **36₁** zur Aufnahme des bereits angesprochenen Dichtungsringes **54** im Durchgangsloch **35₁** des Ringteils **15₁** erkennbar.

In den **Fig. 4 bis 6** sind die gleichen Einzelheiten wie in den **Fig. 1 bis 3** mit gleichen Ziffern bezeichnet. Die Einzelheiten des abweichenden Radträgers sind mit dem Index **2** bezeichnet. In **Fig. 4a** ist abweichend von der Darstellung der **Fig. 1 bis 3** im Radträger **11₂**, dessen Lenkerarm **16₂** abgebrochen dargestellt, und von dem weiterhin das Lagerauge **29₂** geschnitten dargestellt ist, ist eine Ausbrechung **27₂** ausgebildet, die sich im wesentlichen parallel zur Drehachse der Baueinheit **10₂** erstreckt und zugleich von dieser aus radial in den Lenkerarm **16₂** hineinreicht. Von der Radnabeinheit **41** sind der Nabenkörper **45** und der Radflansch **46** erkennbar. Vom Radlager **51** sind über den Lage-

raußenring **59** hinaus zwei Wälzkörperreihen **61**, **62** sowie ein Lagerinnenring **60** erkennbar, der auf dem Nabenkörper **45** sitzt. Dieser ist mit einem Treibring **55** verbaut, in dem die Ringnut **53** ausgeführt ist. Am Ende des Nabenkörpers **45** befindet sich eine Umbördelung **56**, mit dem der Treibring **55** gehalten ist. In die Ringnut **53** ist ein Sicherungsring **57** eingesetzt. Im Radlager **51** ist ein Dichtungsring **58** und der bereits angesprochene Dichtungsring **54** erkennbar. Am Gleichlaufgelenk **71** sind außer dem Gelenkaußenteil **72** mit der Ausklinkung **74** noch ein Gelenkinnenteil **77**, ein Kugelkäfing **78** und drehmomentübertragende Kugeln **79** dargestellt sowie ein abdichtender Blechdeckel **80** erkennbar. Das Gelenkaußenteil **72** ist auf den Treibring **55** aufgeschoben, wobei der Sicherungsring **57** in die beiden in Übereinstimmung befindlichen Ringnuten **53**, **76** eingreift.

In **Fig. 5a** sind die Komponenten der Baueinheit **10** Radträger **11**, Radnabeneinheit **41** und Gleichlaufgelenk **71** entlang ihrer Achse explosionsartig auseinandergezogen. In **Fig. 5b** sind insbesondere die an den Ringenden **65**, **66** liegenden Aufbiegungen zu erkennen. Diese kommen in der Ausbrechung **27** zu liegen und bilden zugleich eine Verdreh-sicherung gegenüber der Ausbrechung **27**. Anstelle der Aufbiegungen können auch vergrößerte Augen oder dergleichen an den Ringenden **65**, **66** vorgesehen werden.

In **Fig. 6** ist der Radträger **11** mit den bereits erläuterten Einzelheiten erkennbar, die hier in gleicher Weise beziffert sind. Es ist besonders deutlich die radseitige Ausbrechung **27** erkennbar, die sich symmetrisch zur Längsachse der Bohrung **35** und radial in den Lenkerarm **16** hinein erstreckt. Es ist nachvollziehbar, daß unter Nutzung der Ausbrechung **27** ein freier Zugriff auf den die Radnabeneinheit **41** und das Gleichlaufgelenk **71** verbindenden Sicherungsring **57** gegeben ist.

Bezugszeichliste

10 Baueinheit
11 Radträger
12
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15 Ringteil
16 Lenkerarm
17 Auge
18 Lenkerarm
19 Auge
20 Auge
21 Auge
22 Auge
23 Auge
24 Auge
25 Auge
26 Auge
27 Ausbrechung
28 Flanschfläche
29 Auge
30 Auge
31 Gewindebohrung
32 Gewindebohrung
33 Gewindebohrung
34 Gewindebohrung
35 Durchgangsloch
36 Ringnut
37
38
39
41 Radnabe
42 Kappe

43
44
45 Nabenkörper
46 Radflansch
47 Flanschauge
48 Flanschauge
49 Flanschauge
50 Flanschauge
51 Wälzlager
52 Wellenverzahnung
53 Ringnut
54 Dichtungsring
55 Treibring
56 Umbördelung
57 Sicherungsring
58 Dichtungsring
59 Lageraußenring
60 Lagerinnenring
61 Wälzkörperreihe
62 Wälzkörperreihe
63 Auge
64 Auge
65 Ringende
66 Ringende
67
68
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70
71 Gleichlaufgelenk
72 Gelenkaußenteil
73 Stirnfläche
74 Ausklinkung
75 Innenverzahnung
76 Ringnut
77 Gelenkinnenteil
78 Kugelkäfing
79 Kugel
80 Deckel
82 Hülsenansatz

Patentansprüche

1. Baueinheit (**10**) zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger (**11**), der am Kraftfahrzeug anbringbar ist und ein Ringteil (**15**) und mehrere Lenkerarme (**16**) umfaßt, eine Radnabe (**41**), die drehbar im Ringteil (**15**) des Radträgers (**11**) gelagert ist und einen Flansch (**46**) zum Anschrauben des Rades aufweist, ein Wälzlager (**51**) mit zwei Wälzkörperreihen (**61**, **62**) zur Lagerung der Radnabe (**41**) im Radträger (**11**), das in das Ringteil (**15**) des Radträgers (**11**) einsetzbar ist, und ein Gleichlaufgelenk (**71**), das ein Gelenkaußenteil (**72**) aufweist, das mit der Radnabe (**41**) lösbar verbindbar ist, und ein Gelenkinnenteil (**77**) aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe (**41**) und dem Gelenkaußenteil (**72**) mittels ineinandergreifender Verzahnungen (**52**, **75**) hergestellt ist, von denen eine erste Verzahnung (**52**) an einem Teil der Radnabe (**41**) und eine zweite Verzahnung (**75**) an einem Hülsenansatz (**82**) am Gelenkaußenteil (**72**) ausgebildet ist, und wobei die axiale Sicherung der ineinandergreifenden Verzahnungen mittels eines Sicherungsringes (**57**) hergestellt ist, der in zwei Ringnuten (**53**, **76**) eingreift, von denen eine erste Ringnut (**53**) an dem Teil der Radnabe (**41**) im Bereich der ersten Verzahnung (**52**) und eine zweite Ringnut (**76**) an dem

Hülsenansatz (82) im Bereich der zweiten Verzahnung (75) ausgebildet ist, **dadurch gekennzeichnet**, daß am Radträger (11₁) im Ringteil (15₁) in zumindest einer Umfangsposition eine Ausbrechung (27₁) ausgebildet ist, die von der Radseite in das Ringteil (15₁) axial einschneidet und daß bei im Radträger (11₁) festgelegtem Wälzlager (51) und bei mit der Radnabe (41) verbundenem Gelenkaußenteil die beiden Ringnuten (53, 76) axial korrespondierend zur Ausbrechung (27₁) liegen, so daß der Sicherungsring (57) mittels eines Zangenwerkzeuges durch die Ausbrechung (27₁) hindurch handhabbar ist.

2. Baueinheit (10) zur Lagerung eines Rades eines Kraftfahrzeuges und zur Antriebsverbindung des Rades mit einer Antriebswelle, umfassend einen Radträger (11), der am Kraftfahrzeug anbringbar ist und ein Ringteil (15) und mehrere Lenkerarme (16) umfaßt, eine Radnabe (41), die drehbar im Ringteil (15) des Radträgers (11) gelagert ist und einen Flansch (46) zum Anschrauben des Rades aufweist, ein Wälzlager (51) mit zwei Wälzkörperreihen (61, 62) zur Lagerung der Radnabe (41) im Radträger (11), das in das Ringteil (15) des Radträgers (11) einsetzbar ist, und ein Gleichlaufgelenk (71), das ein Gelenkaußenteil (72) aufweist, das mit der Radnabe (41) lösbar verbindbar ist, und ein Gelenkinnenteil (77) aufweist, das mit der Antriebswelle verbindbar ist, wobei die Verbindung zwischen der Radnabe (41) und dem Gelenkaußenteil (72) mittels ineinandergreifender Verzahnungen (52, 75) hergestellt ist, von denen eine erste Verzahnung (52) an einem Teil der Radnabe (41) und eine zweite Verzahnung (75) an einem Hülsenansatz (82) am Gelenkaußenteil (72) ausgebildet ist, und wobei die axiale Sicherung der ineinandergreifenden Verzahnungen mittels eines Sicherungsringes (57) hergestellt ist, der in zwei Ringnuten (53, 76) eingreift, von denen eine erste Ringnut (53) an dem Teil der Radnabe (41) im Bereich der ersten Verzahnung (52) und eine zweite Ringnut (76) an dem Hülsenansatz (82) im Bereich der zweiten Verzahnung (75) ausgebildet ist, dadurch gekennzeichnet, daß am Radträger (11₂) im Ringteil (15₂) in zumindest einer Umfangsposition eine Ausbrechung (27₂) ausgebildet ist, die von der Gelenkseite in das Ringteil (15₂) axial einschneidet und bei im Radträger (11₂) festgelegtem Wälzlager (51) und daß bei mit der Radnabe (41) verbundenem Gelenkaußenteil die beiden Ringnuten (53, 76) axial korrespondierend zur Ausbrechung (27₂) liegen, so daß der Sicherungsring (57) mittels eines Zangenwerkzeuges durch die Ausbrechung (27₂) hindurch handhabbar ist.

3. Baueinheit nach einem der Ansprüche 1 und 2, dadurch gekennzeichnet, daß in Umfangsrichtung unmittelbar zu beiden Seiten der Ausbrechung (27) Verschraubungen (63, 64) zwischen dem Ringteil (15) des Radträgers (11) und dem Lageraußenring (59) des Wälzlagers (51) vorgesehen sind.

4. Baueinheit nach Anspruch 2, dadurch gekennzeichnet, daß die Ausbrechung (27₂) im Bereich eines Lenkerarms (16₂) liegt, in den sie radial einschneidet.

5. Baueinheit nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Ausbrechung (27) in radialer Ansicht im wesentlichen U-förmig ist.

6. Baueinheit nach Anspruch 4, dadurch gekennzeichnet, daß die Ausbrechung (27₂) in axialer Ansicht im wesentlichen U-förmig ist.

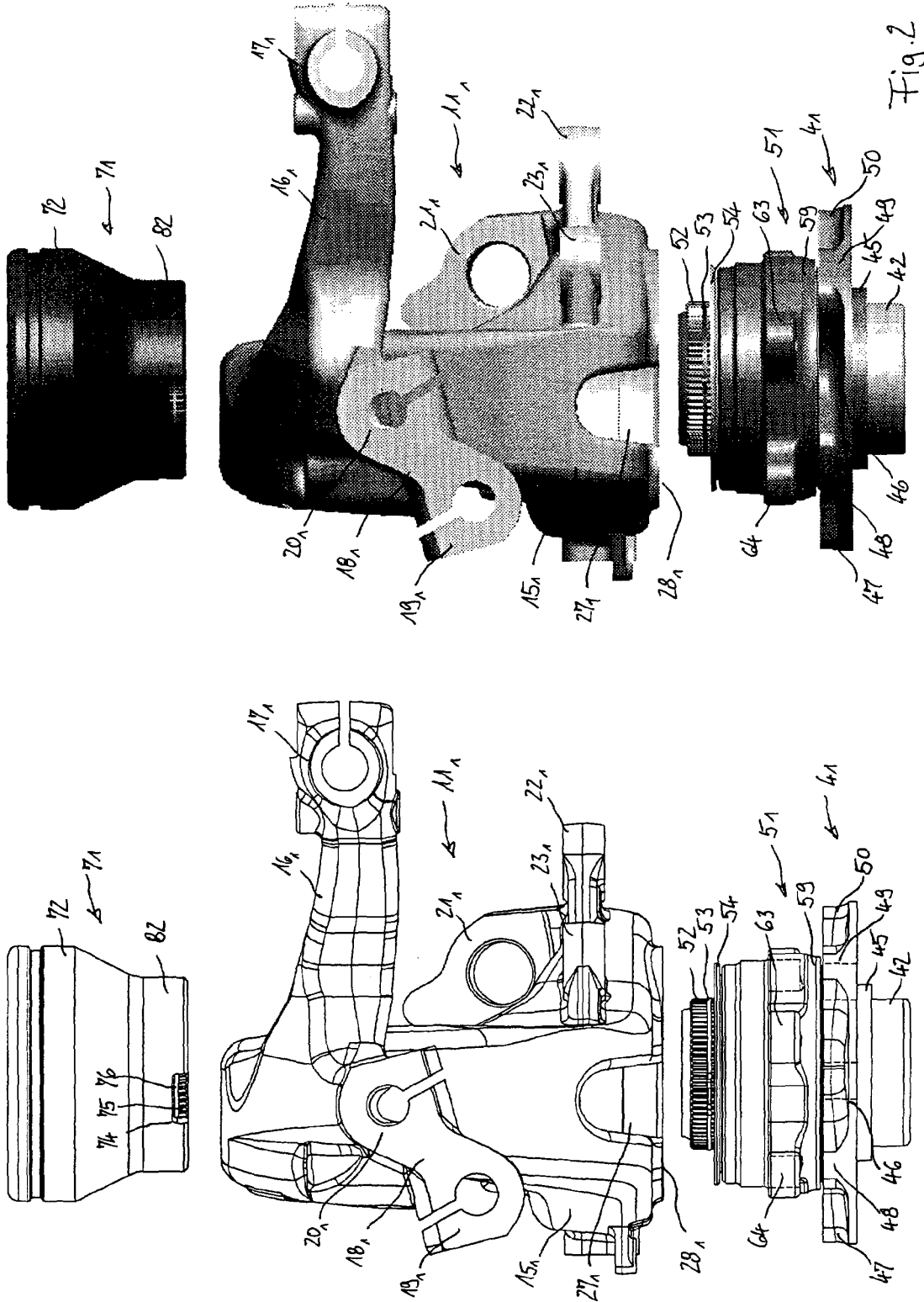
7. Baueinheit nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die Verzahnungen (52, 75) ineinandergreifende Naben- und Wellenverzahnungen

sind und am Hülsenansatz (82) im Bereich der Nabenverzahnung eine umfangsbegrenzte und axial begrenzte Ausklinkung (74) ausgebildet ist, die die zweite Ringnut (76) unterbricht und die bei mit der Radnabe (41) verbundenem Gelenkaußenteil (72) die erste Ringnut (53) in der Wellenverzahnung der Radnabe (41) und den Sicherungsring (57) umfangsbegrenzt freilegt.

8. Baueinheit nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die erste Verzahnung (52) an einem separaten Treibring (55) ausgebildet ist, der auf die Radnabe (41) aufgeschoben und auf dieser unlösbar festgelegt ist.

9. Baueinheit nach Anspruch 8, dadurch gekennzeichnet, daß der Treibring (55) axial gegen einen inneren Lagerring (60) einer ersten Wälzkörperreihe (61) anliegt, der auf die Radnabe (41) aufgeschoben ist und gegen einen inneren Lagerring einer zweiten Wälzkörperreihe (62) gespannt ist.

Hierzu 7 Seite(n) Zeichnungen



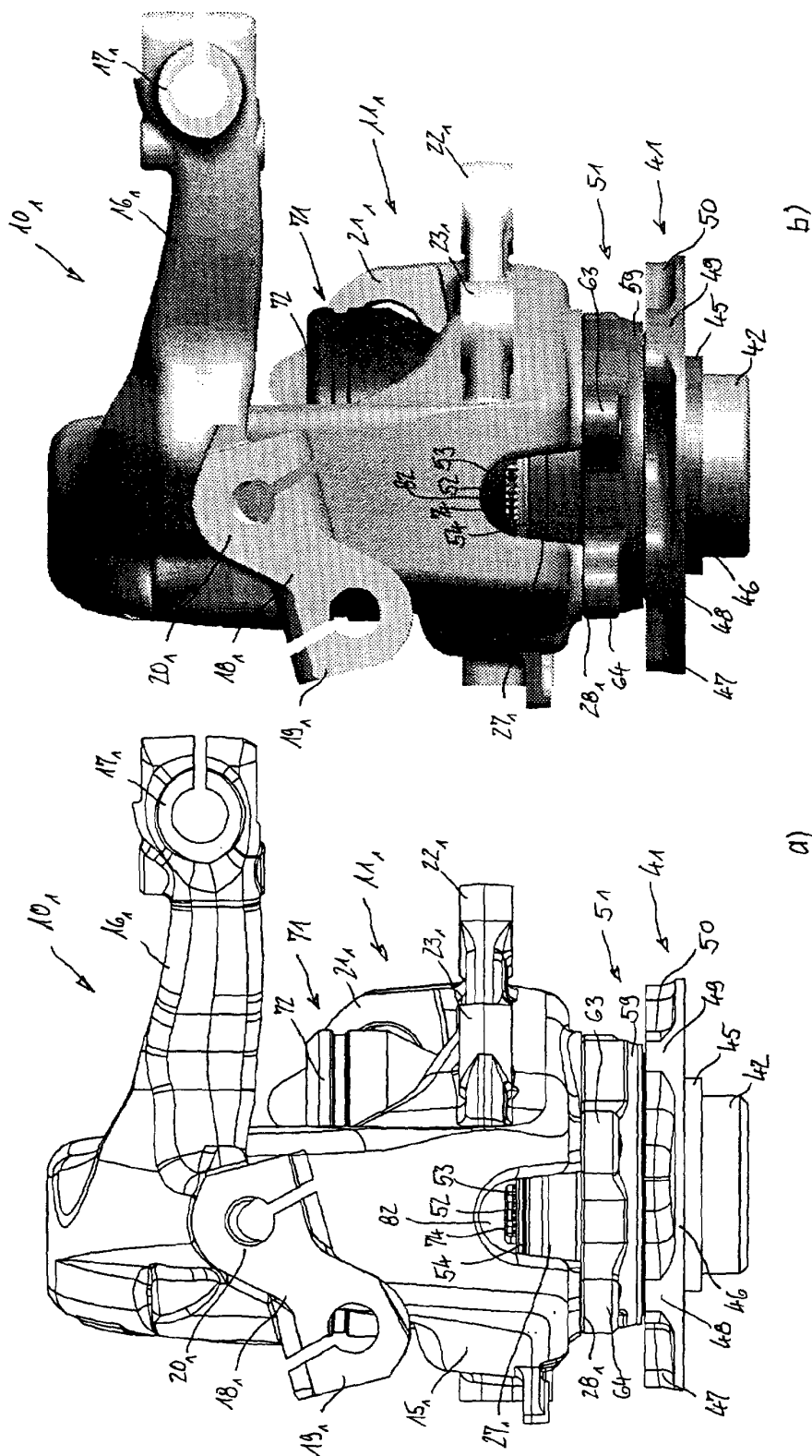
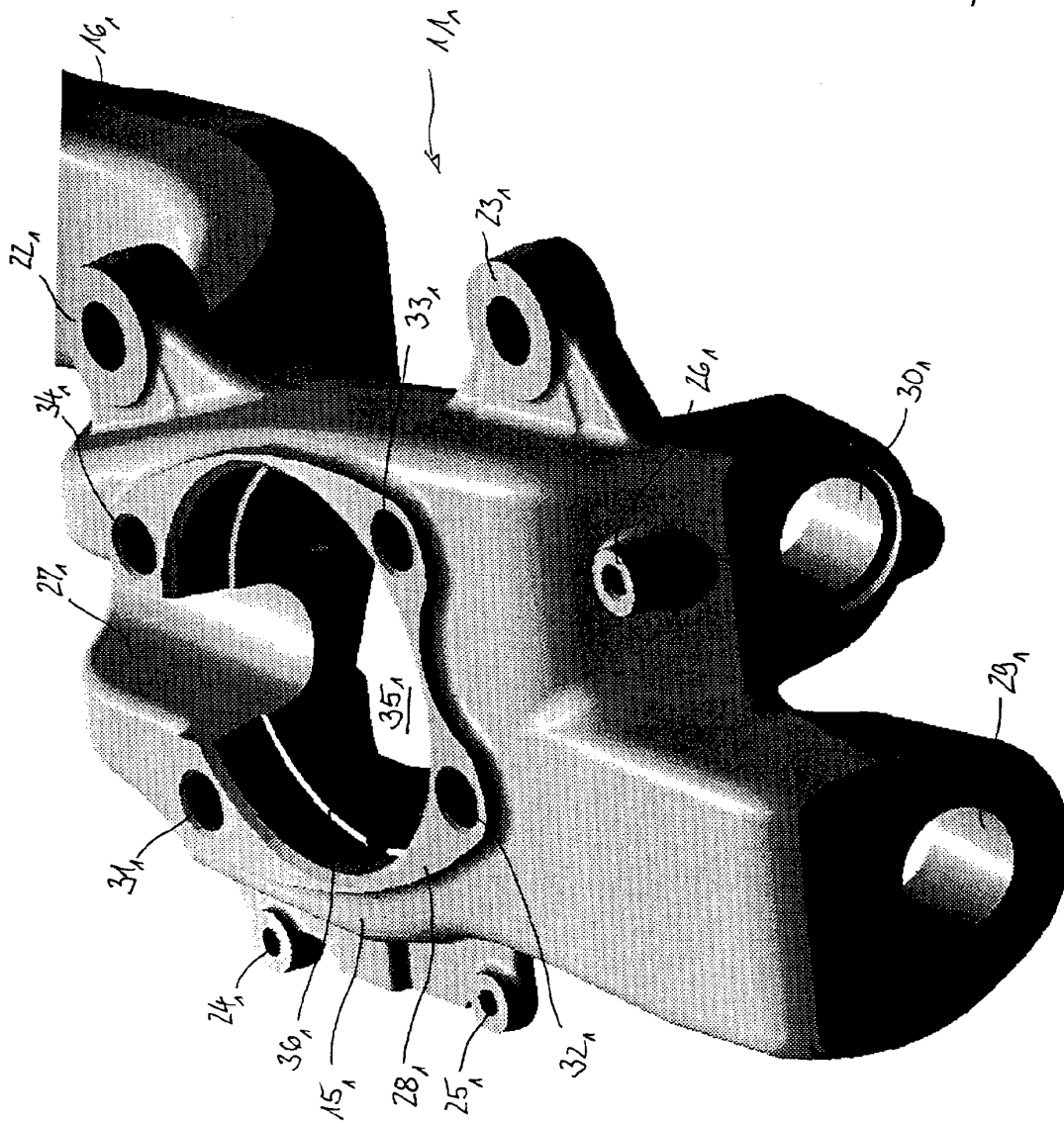
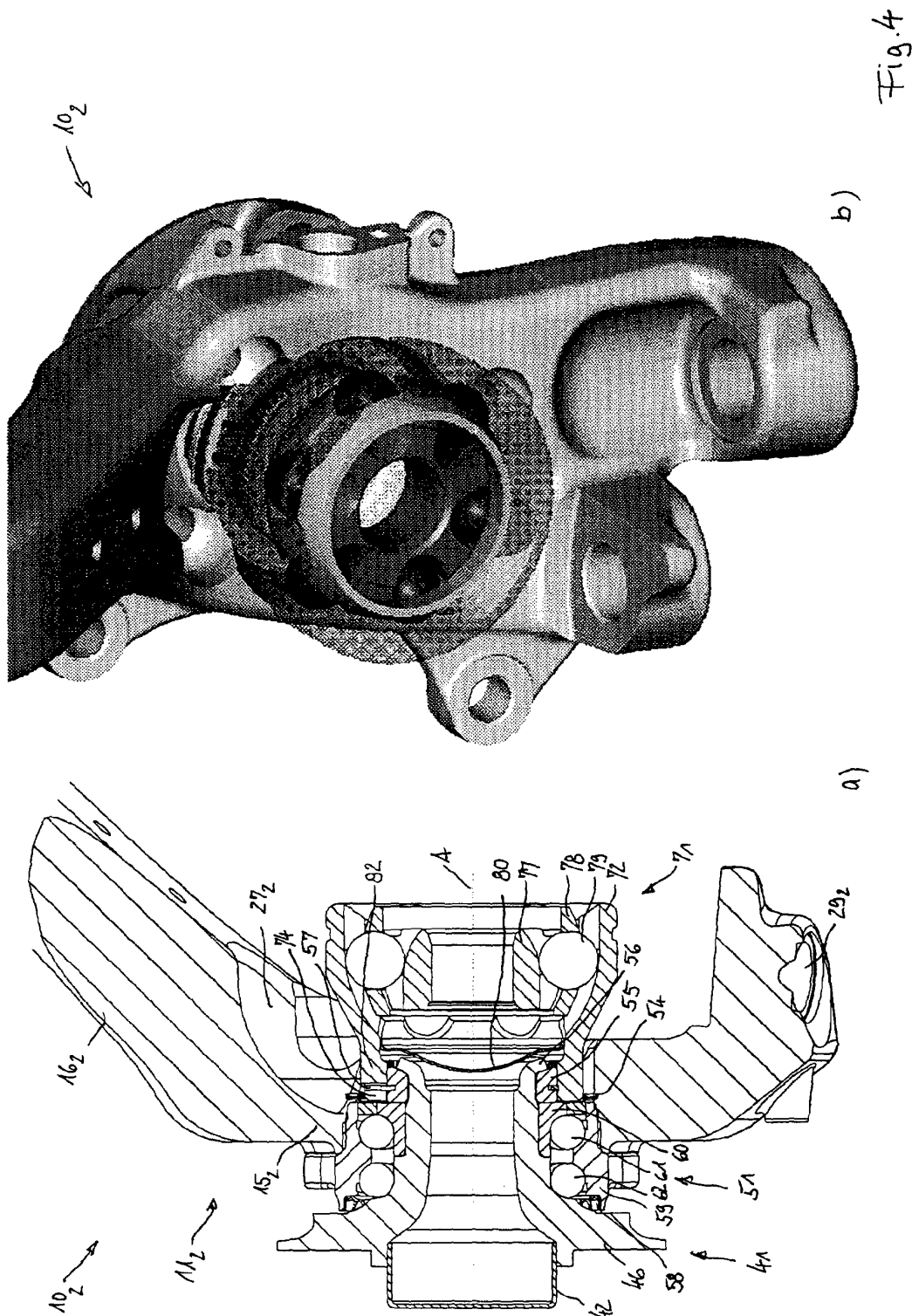


Fig. 3





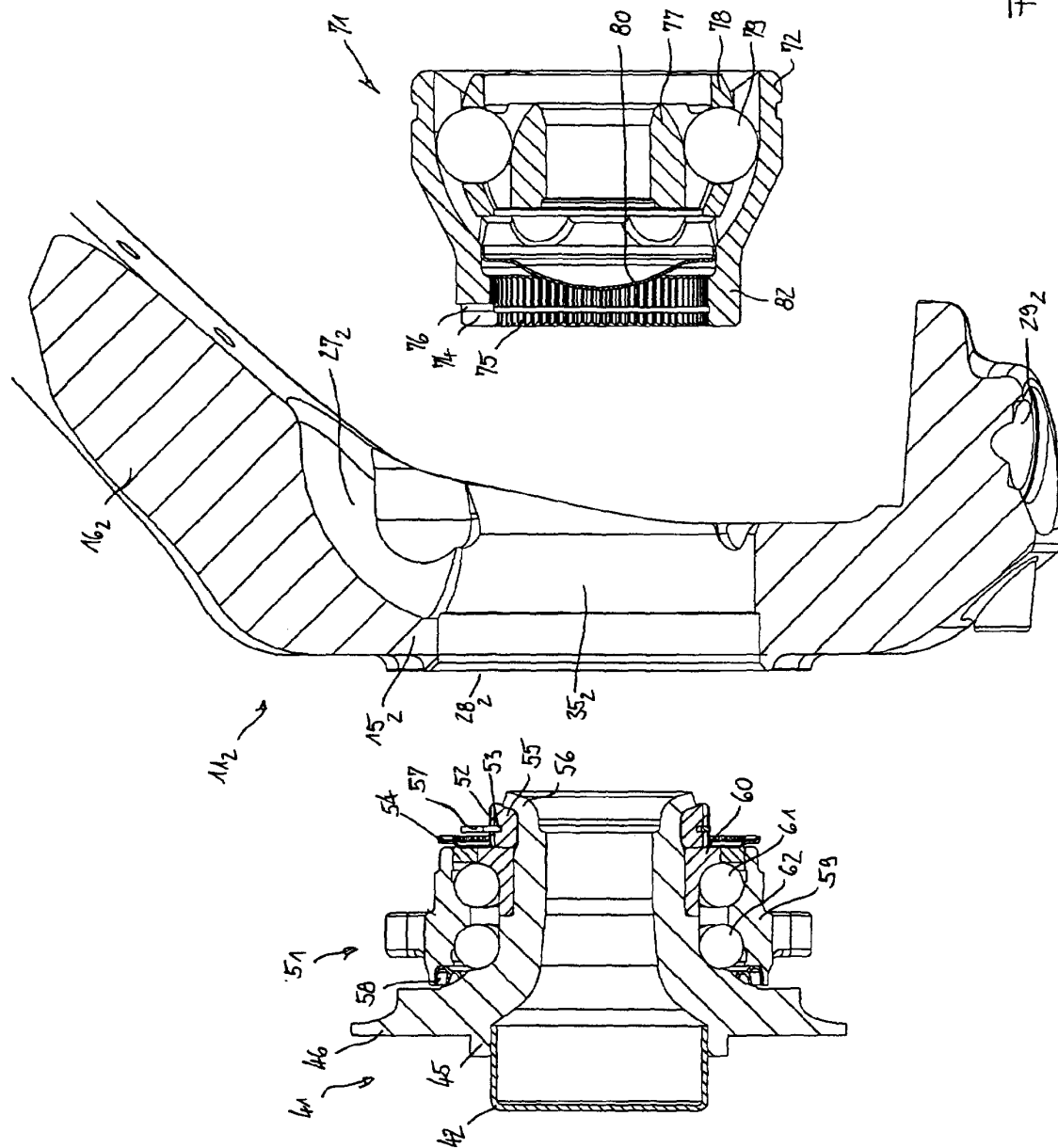
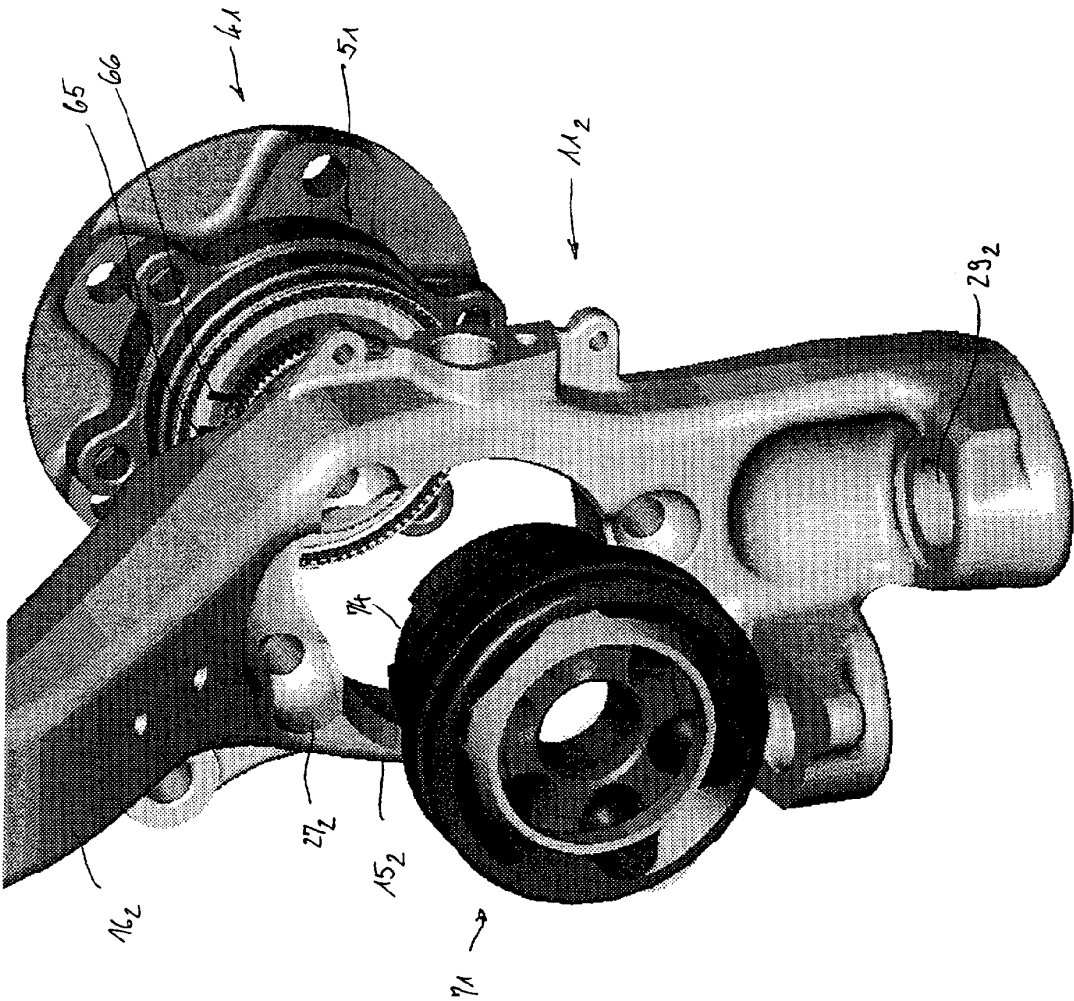


Fig. 5a

Fig. 5b



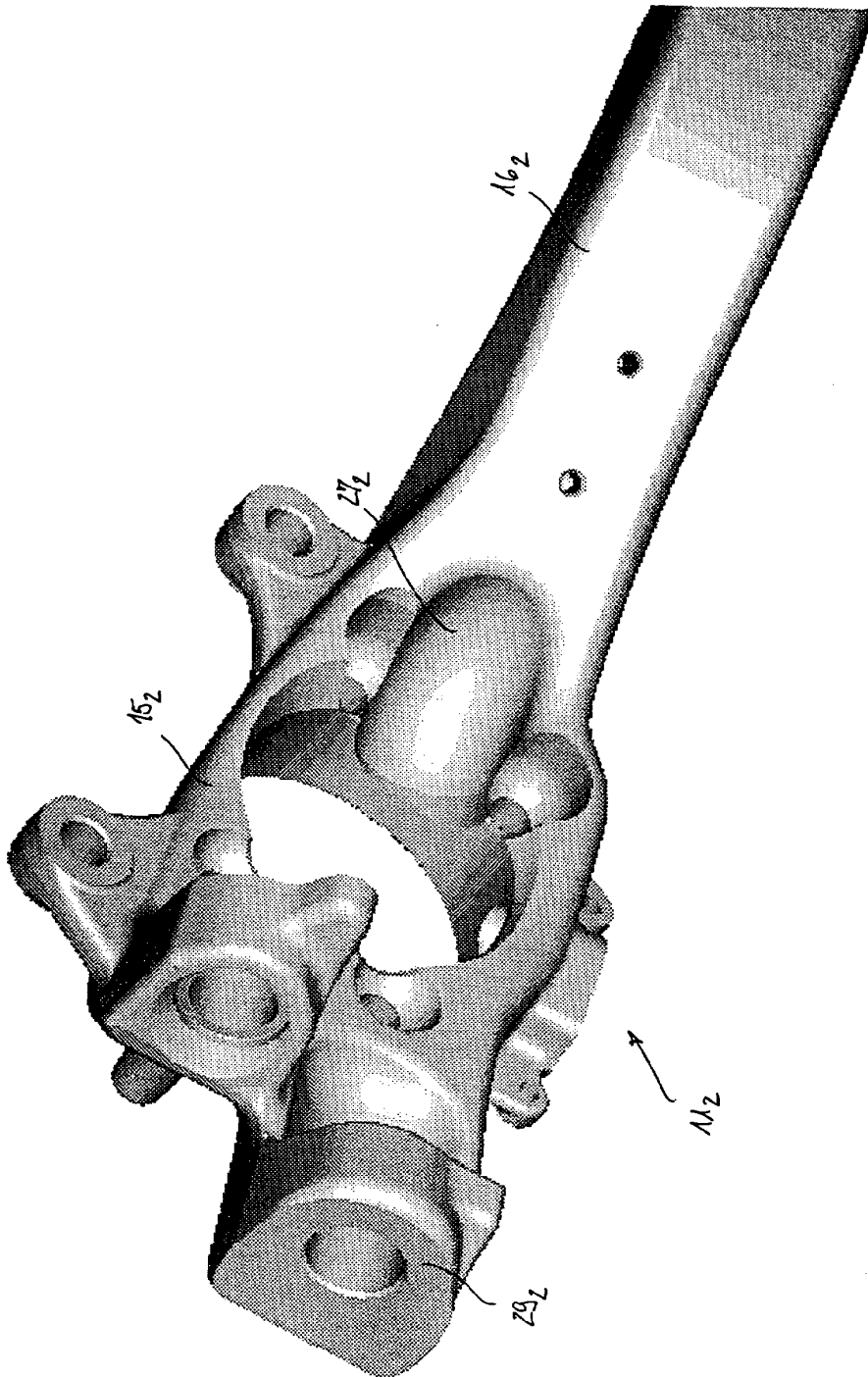


Fig. 6

PUB-NO: DE010008182A1
DOCUMENT-IDENTIFIER: DE 10008182 A1
TITLE: Wheel driving and mounting component has CV joint comprising detachable joint outer section linked to hub and inner section for connecting to drive shaft
PUBN-DATE: September 13, 2001
PATENT-FAMILY-ID: 7631919

INVENTOR-INFORMATION:

NAME	COUNTRY
FUCHS HEINZWILLI	DE
KRUDE WERNER	DE

APPLICANT:

NAME	COUNTRY
GKN AUTOMOTIVE GMBH	DE

APPL-NO: DE 10008182 A
APPL-DATE: February 23, 2000

PRIORITY-DATA:

PRIORITY-NO	PRIORITY-APPL-DATE
DE 10008182 A	20000223

CPC-CURRENT:

TYPE	CPC	DATE
CPCI	F16D3/2237	20130101
CPCI	F16D1/116	20130101
CPCI	B60B27/00	20130101
CPCI	F16D1/108	20130101
CPCA	F16D2003/22326	20130101
CPCA	F16D2300/12	20130101

INT-CL-CURRENT:

TYPE	IPC	DATE
IPCP	B60B27/00	20060101
IPCS	F16D3/2237	20110101
IPCS	F16D3/223	20110101
IPCS	F16D1/116	20060101
IPCS	F16D1/108	20060101

REF-CITED:

PHASE-COUNTRY/NUMBER/KIND/DATE-NPL-INFO

SER WO 9913232 A1 19990318
 SER DE 19700313 A1 19970731
 SER DE 19751855 C1 19990429

ABSTRACT:

The wheel driving and mounting component includes a CV joint (71) comprising a joint outer section (72) which can be attached to the wheel hub (41) and a joint inner section for connecting to the drive shaft. The joint between the wheel hub and the joint outer section is in the form of meshing teeth. There is a gap or boring (27) in the annular piece (15) of the wheel support to take a circlip.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/815,833	07/28/2022	Michael Walter Hopson	265038

CONFIRMATION NO. 9742

PUBLICATION NOTICE



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43935
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

Title:HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Publication No.US-2022-0364607-A1

Publication Date:11/17/2022

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To: tlopez@shumaker.com,dmiller@shumaker.com,cgolupski@shumaker.com
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742
43935	7590	12/06/2022		
Shumaker, Loop & Kendrick, LLP 1000 Jackson Street Toledo, OH 43604-5573			EXAMINER MCMAHON, MATTHEW R	
			ART UNIT 3678	PAPER NUMBER
			NOTIFICATION DATE 12/06/2022	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

cgolupski@shumaker.com
dmiller@shumaker.com
tlopez@shumaker.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Status of the Claims

Claims 1-20 are pending in the application.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to

file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-l.jsp.

Claims 1-4, 6-9, 11, 13-14, 16, and 20 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-6, 8, and 15 of U.S. Patent No. 11,434,958. Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims are anticipated by the reference patent claims.

The following claims of the instant application	are anticipated by the following claims of U.S. Patent No. 11,434,958
1	1
2	2
3	3
4	4
6	5
7	6
8-9	1
11	8
13-14	1
16	15
20	15

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

Claims 1-12 and 16-19 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Krude (US Patent Application Publication 2002/0070506).

Re Claim 1: Krude discloses a joint assembly (see Figs. 1, 2, and 4) comprising:

a first member (29) having a first engagement means (46; Fig. 4) and an interior surface recess (42; Fig. 2);

a second member (wheel hub 11, including driving ring 26 and sealing ring 23) having a second engagement means (45; Fig. 4) and an exterior surface recess (41), a portion (at 26; Fig. 4) of the second member disposed within the first member (29), the second engagement means (45) engaging the first engagement means (46) to provide a coupling of the second member to the first member;

a window (radial slot 39) formed within the first member (29) where the portion (26) of the second member is disposed within the first member;

a retaining means (securing ring 36) configured to retain the coupling of the second member to the first member, wherein distal ends (37, 38; Fig. 2) of the retaining means are accessible through the window (39), wherein the distal ends (37, 28) of the retaining means extend in a direction radially outwardly into the window (39) to a point at or radially inwardly from an outer surface (externally cylindrical face 47; Fig. 4) of the first member (29), and wherein the retaining means (36) is received partially into each of the interior surface recess (42) of the first

member and the exterior surface recess (41) of the second member when the retaining means retains the coupling of the second member to the first member; and

a seal (resilient sleeve 13; Fig. 4) configured to cover the window (39) formed in the first member, wherein the seal (13) is coupled to the second member (at sealing ring 23) adjacent an end of the first member (29) and wherein the seal (13) is coupled (at 47; Fig. 4) to the first member (29) adjacent the window (39).

Re Claim 2: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the first member (29) includes an open end (the left-hand end of projection 29; Figs. 1 and 4) and the first engagement means (46) of the first member is formed within the open end.

Re Claim 3: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the portion (26) of the second member (11) disposed within the first member (29) is disposed within the open end (the left-hand end of projection 29; Figs. 1 and 4) and includes the second engagement means (45).

Re Claim 4: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the window (39) is continuous with the open end (the left-hand end of projection 29; Figs. 1 and 4).

Re Claim 5: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the seal (13) is coupled (at 47; Fig. 4) to the first member (29) adjacent an end of the window (39) disposed distally from the open end (the left-hand end of projection 29; Figs. 1 and 4) of the first member.

Re Claim 6: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the first engagement means includes a first plurality of splines (46) and the second engagement means includes a second plurality of splines (45).

Re Claim 7: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the retaining means (36) is configured as a retaining ring (securing ring 36).

Re Claim 8: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the seal (13) includes a cylindrical portion (the cylindrical body of resilient sleeve 13) directly engaging the outer surface (47; Fig. 4) of the first member (29) adjacent the window (39).

Re Claim 9: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein at least a portion of the cylindrical portion (the cylindrical body of resilient sleeve 13) directly covers the window (39).

Re Claim 10: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein at least a portion of the cylindrical portion (the cylindrical body of resilient sleeve 13) is disposed directly radially outwardly of the window (39).

Re Claim 11: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the cylindrical portion (the cylindrical body of resilient sleeve 13) is disposed directly radially outwardly of the retaining means (36).

Re Claim 12: Krude discloses a joint assembly (see Figs. 1, 2, and 4), wherein the cylindrical portion (the cylindrical body of resilient sleeve 13) covers the retaining means (36).

Re Claim 16: Krude discloses a method of servicing a joint assembly comprising:
providing a joint assembly (see Fig. 1, 2, and 4), the joint assembly including:

- a first member (29; Figs. 1 and 4) having a first engagement means (46)
and an interior surface recess (42; Fig. 2);

- a second member (wheel hub 11, including driving ring 26 and sealing ring 23) having a second engagement means (45) and an exterior surface recess (41), a portion (26) of the second member disposed within the first member (29), the second engagement means (45) engaging the first engagement means (46) to provide a coupling of the second member to the first member;

- a window (39) formed within the first member (29) where the portion (26) of the second member is disposed within the first member;

a retaining means (36) configured to retain the coupling of the second member to the first member, wherein distal ends (37, 38; Fig. 2) of the retaining means are accessible through the window (39), wherein the distal ends (37, 38) of the retaining means extend in a direction radially outwardly into the window (39) to a point at or radially inwardly from an outer surface (47; Fig. 4) of the first member (29), and wherein the retaining means (36) is received partially into each of the interior surface recess (42) of the first member and the exterior surface recess (41) of the second member when the retaining means retains the coupling of the second member to the first member; and

a seal (13) configured to cover the window (39) formed in the first member, wherein the seal (13) is coupled to the second member (at sealing ring 23) adjacent an end of the first member and wherein the seal (13) is coupled to (at 47; Fig. 4) the first member adjacent the window (39);

uncovering the window (39) via adjustment of the seal (13) to provide access to the distal ends (37, 38) of the retaining means (Examiner notes that in order to engage the bent ends 37, 38 to “permit the securing ring to be widened radially from the outside” so as to be able to release the connection, the seal 13 must be adjusted in order to make room for the “tool” to enact such a widening; see parags. [0006] and [0021]);

manipulating the retaining means (36) through the window (39) to release the coupling of the second member to the first member; and

separating the first member (29) and the second member (11) by disengaging the second engagement means (45) from the first engagement means (46).

Note: Applicant is reminded that, under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed

method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986). See MPEP 2112.02.

Re Claim 17: Krude discloses a method, wherein the first member (29) includes an open end (the left-hand end of projection 29; Figs. 1 and 4) and the window (39) is continuous with the open end.

Re Claim 18: Krude discloses a method, wherein uncovering the window (39) includes sliding the seal (13) axially towards the open end of the first member (in order to allow the “tool” to engage with the bent ends 37, 38 to enable “widening” of the securing ring 36).

Re Claim 19: Krude discloses a method, wherein the sliding of the seal (13) axially occurs until the retaining means (39) is uncovered (in order to allow the “tool” to engage with the bent ends 37, 38 to enable “widening” of the securing ring 36).

Claims 1-8 and 16-19 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Brunetti (US Patent 7,896,750).

Re Claim 1: Brunetti discloses a joint assembly (see Fig. 1) comprising:

a first member (20) having a first engagement means (23) and an interior surface recess (25);

a second member (hub 10, including driving ring 18 and bearing inner race 14) having a second engagement means (19) and an exterior surface recess (26), a portion (18) of the second member disposed within the first member (20), the second engagement means (19) engaging the first engagement means (23) to provide a coupling of the second member to the first member;

a window (27) formed within the first member (20) where the portion (18) of the second member is disposed within the first member;

a retaining means (securing ring 24) configured to retain the coupling of the second member to the first member, wherein distal ends (29, 29; see Fig. 6) of the retaining means (24)

are accessible through the window (27), wherein the distal ends (29, 29) of the retaining means extend in a direction radially outwardly into the window (27; see Fig. 1) to a point at or radially inwardly from an outer surface (for example, at the radially outermost surface of joint bell 20 at cylindrical surface 38) of the first member (20), and wherein the retaining means (24) is received partially into each of the interior surface recess (25) of the first member and the exterior surface recess (26) of the second member when the retaining means retains the coupling of the second member to the first member; and

a seal (sealing device 30) configured to cover the window (27) formed in the first member, wherein the seal (30) is coupled to the second member (at the intersection between inner bearing race 14 and driving ring 18; Fig. 1) adjacent an end (36) of the first member (20) and wherein the seal (30) is coupled (at tubular projection 22) to the first member (20) adjacent the window (27).

Re Claim 2: Brunetti discloses a joint assembly (see Fig. 1), wherein the first member (20) includes an open end (36) and the first engagement means (23) of the first member is formed within the open end.

Re Claim 3: Brunetti discloses a joint assembly (see Fig. 1), wherein the portion (18) of the second member (10) disposed within the first member (20) is disposed within the open end (36) and includes the second engagement means (19).

Re Claim 4: Brunetti discloses a joint assembly (see Fig. 1), wherein the window (27) is continuous with the open end (36).

Re Claim 5: Brunetti discloses a joint assembly (see Fig. 1), wherein the seal (30) is coupled (at 22) to the first member (20) adjacent an end of the window (27) disposed distally from the open end (the 36) of the first member.

Re Claim 6: Brunetti discloses a joint assembly (see Fig. 1), wherein the first engagement means includes a first plurality of splines (23) and the second engagement means includes a second plurality of splines (19).

Re Claim 7: Brunetti discloses a joint assembly (see Fig. 1), wherein the retaining means (24) is configured as a retaining ring (securing ring 24).

Re Claim 8: Brunetti discloses a joint assembly (see Fig. 1), wherein the seal (30) includes a cylindrical portion (at 30; Fig. 1; specifically, the portion engaged by circumferential clamping spring 3) directly engaging the outer surface of the first member (20) adjacent the window (27).

Re Claim 16: Brunetti discloses a method of servicing a joint assembly comprising: providing a joint assembly (see Fig. 1), the joint assembly including:

- a first member (20) having a first engagement means (23) and an interior surface recess (25);

- a second member (hub 10, including driving ring 18 and bearing inner race 14) having a second engagement means (19) and an exterior surface recess (26), a portion (18) of the second member disposed within the first member (20), the second engagement means (19) engaging the first engagement means (23) to provide a coupling of the second member to the first member;

- a window (27) formed within the first member (20) where the portion (18) of the second member is disposed within the first member;

- a retaining means (securing ring 24) configured to retain the coupling of the second member to the first member, wherein distal ends (29, 29; see Fig. 6) of the retaining means (24) are accessible through the window (27), wherein the distal ends (29, 29) of the retaining means extend in a direction radially outwardly into the window (27; see Fig. 1) to a point at or radially inwardly from an outer surface (for example, at the radially outermost surface of joint bell 20 at cylindrical surface 38) of the first member (20), and wherein the retaining means (24) is received partially into each of the interior surface recess (25) of the first

member and the exterior surface recess (26) of the second member when the retaining means retains the coupling of the second member to the first member; and

a seal (sealing device 30) configured to cover the window (27) formed in the first member, wherein the seal (30) is coupled to the second member (at the intersection between inner bearing race 14 and driving ring 18; Fig. 1) adjacent an end (36) of the first member (20) and wherein the seal (30) is coupled (at tubular projection 22) to the first member (20) adjacent the window (27);

uncovering the window (27) via adjustment of the seal (30) to provide access to the distal ends (29, 29) of the retaining means (in order to allow for access to the locking ring 24 for disengagement; see Col. 4 lines 1-7);

manipulating the retaining means (24) through the window (27) to release the coupling of the second member to the first member; and

separating the first member (20) and the second member (10) by disengaging the second engagement means (19) from the first engagement means (23).

Note: Applicant is reminded that, under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986). See MPEP 2112.02.

Re Claim 17: Brunetti discloses a method, wherein the first member (20) includes an open end (36) and the window (27) is continuous with the open end.

Re Claim 18: Brunetti discloses a method, wherein uncovering the window (27) includes sliding the seal (30) axially towards the open end of the first member .

Re Claim 19: Brunetti discloses a method, wherein the sliding of the seal (30) axially occurs until the retaining means (29) is uncovered.

Allowable Subject Matter

Claims 13-15 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Each of claims 13 and 20 require that the seal includes a “**corrugated portion**” (emphasis added). Examiner notes that the term “corrugated” can be defined as “having the shape of a series of regular folds that look like waves” (www.oxfordlearnersdictionaries.com/us/definition/english/corrugated). Such a corrugated portion of the instant seal (240) is clearly shown in instant Figs. 1-3 in the central portion of the seal (240) located between the two generally cylindrical end portions.

As discussed in the prior art rejections above, Krude and Brunetti are considered to be the closest prior art of record to the instant claims. Neither Krude nor Brunetti disclose a seal with such a “corrugated portion”. Rather, the seal (13) of Krude, as can be seen in Figs. 1 and 4, has strictly a cylindrical sleeve shape. In Brunetti, the seal (30) has a cylindrical portion (shown at 30 in Fig. 1 where the seal is engaged by spring 32) and a curved portion (at 34), which is described as a “substantially tubular portion 34”. This tubular portion, while it is curved in the state shown in Fig. 1, it does not comprise a series of folds or waves and thus cannot be considered “corrugated”, as claimed.

Further, it would not have been obvious to modify Krude, Brunetti, nor any of the other prior art devices of record to have a seal with such a “corrugated portion” since there would have been no teaching, suggestion, or motivation to do so.

For at least these reasons, claims 13 and 20 are considered to be allowable over the prior art of record. Claims 14-15 are considered to be allowable over the prior art of record at least due to their dependency from claim 13.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW R MCMAHON whose telephone number is (571)270-3067. The examiner can normally be reached Mon-Fri 9am-5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amber Anderson can be reached on (571) 270-5281. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about

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/MATTHEW R MCMAHON/
Primary Examiner, Art Unit 3678

<i>Notice of References Cited</i>	Application/Control No. 17/815,833		Applicant(s)/Patent Under Reexamination Hopson et al.	
	Examiner MATTHEW R MCMAHON		Art Unit 3678	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20020070506-A1	06-2002	Krude, Werner	F16C33/76	277/391
*	B	US-11226008-B2	01-2022	Finke; Aaron M.	F01D5/026	1/1
*	C	US-5794988-A	08-1998	Gill; Ajit Singh	F16L21/08	285/308
*	D	US-11181150-B2	11-2021	Tomogami; Shin	F16D1/116	1/1
*	E	US-9016385-B2	04-2015	Veit; Jan	E21B17/02	166/242.6
*	F	US-6186560-B1	02-2001	Gill; Ajit Singh	F16L21/08	285/308
*	G	US-2898130-A	08-1959	HANSEN HOWARD J	F16L37/088	285/317
*	H	US-7896750-B2	03-2011	Brunetti; Marco	B60B27/0042	464/178
	I					
	J					
	K					
	L					
	M					

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

CPC - Searched*		
Symbol	Date	Examiner
F16D 1/108, 112, 116		
F16D 2001/103		
F16B 21/18, 183, 186		
Y10T 403/7026, 7033, 31		
F16J 15/52, 525		
F16D 2003/22326		
Reviewed and updated previous searches above from Parent Case (app. no. 15/966,085)	11/30/2022	MRM

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor names and Applicant search	11/30/2022	MRM
PE2E SEARCH (see attached search history)	12/01/2022	MRM

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
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<i>Search Notes</i> 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	15/966085.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/07 12:02 PM
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L5	5	"10008182".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/08 09:39 AM
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		A1).did. AND PGPB.dbnm.) OR ((US-6739422-B2 OR US-8231475-B2 OR US-8690690-B2 OR US-8092312-B2 OR US-4859110-A OR US-8870489-B2 OR US-6582151-B2 OR US-7946374-B2 OR US-7922590-B2 OR US-4124318-A OR US-8864591-B2 OR US-3992117-A OR US-7722089-B2 OR US-10883545-B2 OR US-6251019-B1 OR US-4136982-A OR US-3357206-A OR US-6102447-A OR US-6386596-B1 OR US-6186560-B1 OR US-5794988-A OR US-2898130-A OR US-3151891-A OR US-11226008-B2 OR US-9016385-B2).did. AND USPT.dbnm.) OR ((EP-1681477-A1 OR DE-10008183-C1 OR DE-10008182-A1).did. AND EPAB.dbnm.) OR ((DE-10008183-C1 OR DE-10008182-A1 OR DE-10008182-B4).did. AND FPRS.dbnm.)	USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:13 PM
L9	3081	F16D2003/22326.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/08 12:17 PM
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		A1 OR US- 20080029363-A1 OR US-11226008-B2 OR DE-112019002486-T5 OR JP-2001235058-A OR JP-2015059488-A OR JP-2004308668-A OR JP-2001099370-A OR WO-2021049129- A1).did.					
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		USOC).dbnm.					
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L16	3937	F16J15/52.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:05 PM
L17	545	F16J15/525.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:05 PM
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L19	69	F16D2001/103.cpc. . AND @pd>="20211108"	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:09 PM
L20	41	F16B21/18,183,186.cpc. . AND @pd>="20211108"	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:09 PM
L21	3	Y10T403/7033.cpc. . AND @pd>="20211108"	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:09 PM

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L23	752	F16D2003/22326.cpc. AND (seal OR bellows)	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 02:17 PM
L24	870	F16D2003/22326.cpc. AND (seal OR bellows OR boot)	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 03:28 PM
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L30	1	"3357206".pn.	(USOCR)	ADJ	ON	ON	2022/04/20 09:04 AM
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L40	31	Y10T403/7026,7033,31. cpc. AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:38 AM
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		near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.					
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L50	5	"10008182".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:29 PM
L51	0	(09/993873).APP.	(USPAT; USOCR)	ADJ	ON	ON	2022/11/30 02:53 PM
L52	6	("2002/0070506").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/11/30 02:54 PM
L53	7	("6139216" "6354952" "7270483" "20020070506").pn. OR ("7896750").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/11/30 03:04 PM
L54	40	(Artificial Intelligence) More like doc: US-7896750-B2 Text: (EP-1942014-A1 OR US-20080174112-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	ADJ	ON	ON	2022/11/30 03:25 PM

		OR EP-1942014-B1 OR KR-20080064715-A OR JP-2008162582-A OR US-7850531-B2 OR US-20080182674-A1 OR KR-101450878-B1 OR EP-1950055-B1 OR JP-2008185213-A OR KR-20080071063-A OR EP-2202092-A1 OR EP-2202092-B1 OR JP- 5265935-B2 OR US- 20110151982-A1 OR US-6286909-B1 OR US-6135571-A OR EP- 0936086-A2 OR US- 6296321-B1 OR DE- 112008001445-B4).did.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	43	(Artificial Intelligence) More like doc: US-20020070506-A1 <u>Text:</u> (DE-10154254-B4 OR DE-10154254-A1 OR DE-20019546-U1 OR US-20080174112-A1 OR EP-1942014-A1 OR US-7896750-B2 OR EP-1942014-B1 OR KR-20080064715-A OR CN-101797870-B OR CN-101797870-A OR JP-2008162582-A OR US-20080182674-A1 OR US-7850531-B2 OR EP-1950055-A1 OR WO-2007134157-A3 OR JP-2008185213-A OR EP-1950055-B1 OR KR-101450878-B1 OR EP-2202092-A1 OR US-20100197414- A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/11/30 03:32 PM
L56	45	(Artificial Intelligence) Similar to: 17/815,833 with 0 CPC Selections and 0 Text Selections <u>Text:</u> (US-11434958-B2 OR US-20180320742-A1 OR CN-107559290-A OR CN-107559290-B OR US-10883545-B2 OR US-20180003240- A1 OR JP-6717688-B2 OR JP-2018003925-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	ADJ	ON	ON	2022/11/30 03:35 PM

		OR US-10422388-B2 OR KR-101321588-B1 OR DE-102014109473-A1 OR CN-107304789-A OR JP-2020526711-A OR EP-3649358-B1 OR WO-2008154916-A3 OR CN-102667200-A OR DE-102016121785-A1 OR JP-2013511000-A OR JP-5850844-B2 OR US-11441610-B2 OR EP-2499388-B1 OR US-20120282020-A1 OR EP-2499388-A1 OR WO-2011058000-A1 OR WO-2019010382-A1 OR EP-3649358-A1 OR DE-102014109472-A1 OR DE-102009052791-A1 OR GB-2321945-A OR JP-6717647-B2 OR US-20210148411-A1 OR DE-102012022308-A1 OR DE-102018125349-B4 OR JP-4584077-B2 OR US-9388860-B2 OR GB-1387576-A OR JP-2008024296-A OR CN-101112867-B OR CN-101112867-A OR CN-101839287-B OR US-8322941-B2 OR US-20080018170-A1 OR JP-2007064361-A OR US-7811176-B2 OR BR-PI1003220-A2 OR JP-5215601-B2 OR CN-101839287-A OR CN-107654518-A OR US-20090208278-A1 OR DE-2342940-A1).did.					
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Similarity Search)

Ref #	Application Number	Text Selections	CPC Selections
L56	17/815,833	No selections	No selections

Bibliographic Data

Application No: 17/815,833

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

/MATTHEW R MCMAHON/

Examiner's Signature

Initials

Title:

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT
ASSEMBLY

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/28/2022	403	3678	265038
RULE			

APPLICANTS

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, Farmington Hills, MI, UNITED STATES

INVENTORS

Michael Walter Hopson, Clinton Township, MI, UNITED STATES

Arvind Srinivasan, Sterling Heights, MI, UNITED STATES

Michael Peter Kinsella, White Lake, MI, UNITED STATES

CONTINUING DATA

This application is a CON of 15966085 04/30/2018 PAT 11434958

15966085 has PRO of 62500821 05/03/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/05/2022

STATE OR COUNTRY

UNITED STATES

ADDRESS

Shumaker, Loop & Kendrick, LLP

1000 Jackson Street

Toledo, OH 43604-5573

UNITED STATES

FILING FEE RECEIVED

\$1,820

Doc code: IDS

PTO/SB/08a (01-22)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 05/31/2024. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17815833
	Filing Date	2022-07-28
	First Named Inventor	Michael Walter Hopson
	Art Unit	
	Examiner Name	
	Attorney Docket Number	265038

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	7722089	B2	2010-05-25	Nauer	
	2	6739422	B2	2004-05-25	Krude et al.	
	3	6251019	B1	2001-06-26	Hofmann et al.	
	4	7922590	B2	2011-04-12	Pallante	
	5	8231475	B2	2012-07-31	Felchner et al.	
	6	6739422	B2	2004-05-25	Krude et al.	
	7	8864591	B2	2014-10-21	Sugiyama et al.	
	8	10883545	B2	2021-01-05	Sugiyama et al.	

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	First Named Inventor	Michael Walter Hopson	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	265038	

9	7722089	B2	2010-05-25	Nauer	
10	7946274	B2	2011-05-24	Kofuji	
11	8092312	B2	2012-01-10	Duncan	
12	8690690	B2	2014-04-08	Conger et al.	
13	8870489	B2	2014-10-28	Langer et al.	
14	3357206	A	1967-12-12	C.E. CHRISTIE	
15	3992117	A	1976-11-16	Ristau	
16	4124318	A	1978-11-07	Sagady	
17	4136982	A	1979-01-30	Sagady	
18	4859110	A	1989-08-22	Dommel	
19	6582151	B2	2003-06-24	Hopson	

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	1	20180003240	A1	2018-01-04	Sugiyama et al.		
	2	20090233723	A1	2009-09-17	Kofuji		

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	1	2016034228	WO	A	2016-03-10	GKN DRIVELINE DEUTSCHLAND GMBH		×
	2	10008182	DE	A1	2001-09-13	GKN AUTOMOTIVE GMBH		☒
	3	1681477	EP	A1	2006-07-19	PIOLAX INC		☒
	4	10008183	DE	C1	2001-12-13	GKN AUTOMOTIVE GMBH		☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17815833
	Filing Date		2022-07-28
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	Filing Date		2022-07-28
	First Named Inventor	Michael Walter Hopson	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	265038	

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/James D. Miller/	Date (YYYY-MM-DD)	2022-10-04
Name/Print	James D. Miller	Registration Number	46932

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	892	12/06/2022	265038
	1449	12/06/2022	265038

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265038

In re Application of: Michael Walter Hopson et al.

Application No.: 17/815,833

Filed: 7/28/2022

For: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

The applicant, NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 11,434,958 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

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/James D. Miller/

Signature

December 19, 2022

Date

James D. Miller

Typed or printed name

Attorney for Applicant

Title

419-341-9000

Telephone Number

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APPLICATION #
17/815,833

RECEIPT DATE / TIME
12/19/2022 11:35:06 AM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 61318362

AUTHORIZED BY James Miller

CUSTOMER # 43935

FILING DATE 07/28/2022

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Michael Walter Hopson

Payment Information

PAYMENT METHOD
DA / 505605

PAYMENT TRANSACTION ID
E2022B1B35260338

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Christine Golupski

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES
PATENT AND TRADEMARK OFFICE

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/815,833

RECEIPT DATE / TIME
12/19/2022 11:35:06 AM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 61318362

FILING DATE 07/28/2022

CUSTOMER # 43935

FIRST NAMED INVENTOR Michael Walter Hopson

CORRESPONDENCE ADDRESS -

AUTHORIZED BY James Miller

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
265038 Terminal Disclaimer.pdf	2	Terminal Disclaimer Filed	116 KB
265038 Amendment Filed.pdf	8	Amendment/Request for Reconsideration-After Non-Final Rejection	142 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
265038 Terminal Disclaimer.pdf	A1FF74D5C958D15B278E8E285395F4111E0755B48682F67433

5FAA29CDEB496C8FA1229B324BA2BC402BFBCDA2F2F9ABFA
42F5054B7F2F02995270F3E9FB8D64

265038 Amendment Filed.pdf DA67620C334880F78664DB037FF5DB48CAACDB185F011C3F9
CDDAD8001E634677A1EB26ED22B434BBBA64A3188ACAAB31
82A4A74FD4D844124A0047F40897EF0

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Application Number * 17/815,833 *	Application/Control No. 17/815,833	Applicant(s)/Patent under Reexamination Hopson et al.	
	Examiner MCMAHON, MATTHEW R	Art Unit 3678	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed: <u>19 December 2022</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/FELICIA D ROBERTS/ Technology Center: <u>OPLC</u> Telephone: <u>(571)272-0550</u> <u>11,434,958</u>

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 17/815,833		Filing Date 07/28/2022		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)	(Column 2)								
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)					
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A							
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A	N/A							
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A							
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =	*	x \$100 =							
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	x \$480 =							
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL							
APPLICATION AS AMENDED - PART II											
		(Column 1)	(Column 2)	(Column 3)							
AMENDMENT	12/19/2022	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(j))	* 17	Minus	** 20	= 0	x \$100 =		0			
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	x \$480 =		0			
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
						TOTAL ADD'L FEE		0			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(j))	*	Minus	**	=	x \$0 =					
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =					
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
						TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/CRYSTAL QUEEN/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".											
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.											

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 17/815,833
Confirmation No.: 9742
Filing Date: July 28, 2022
Applicant: Michael Walter Hopson et al.
Group Art Unit: 3678
Examiner: Matthew R. McMahon
Title: HIGH RETENTION FORCE SERVICEABLE PLUG-ON
JOINT ASSEMBLY
Attorney Docket: 265038

December 19, 2022

Mail Stop Amendment
Commissioner for Patents
P. O. Box 1450
Alexandria VA 22313-1450

AMENDMENT

Honorable Commissioner:

In response to the non-final Office Action mailed December 6, 2022, please amend the patent application as follows and consider the remarks set forth below.

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

1. A joint assembly comprising:
 - a first member having a first engagement means and an interior surface recess;
 - a second member having a second engagement means and an exterior surface recess, a portion of the second member disposed within the first member, the second engagement means engaging the first engagement means to provide a coupling of the second member to the first member;
 - a window formed within the first member where the portion of the second member is disposed within the first member;
 - a retaining means configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining means are accessible through the window, wherein the distal ends of the retaining means extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer surface of the first member, and wherein the retaining means is received partially into each of the interior surface recess of the first member and the exterior surface recess of the second member when the retaining means retains the coupling of the second member to the first member; and
 - a seal configured to cover the window formed in the first member, wherein the seal is coupled to the second member adjacent an end of the first member and wherein the seal is coupled to the first member adjacent the window, wherein the seal includes a cylindrical portion directly engaging the outer surface of the first member adjacent the window, wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion.
2. (Original) The joint assembly of Claim 1, wherein the first member includes an open end and the first engagement means of the first member is formed within the open end.

3. (Original) The joint assembly of Claim 2, wherein the portion of the second member disposed within the first member is disposed within the open end and includes the second engagement means.
4. (Original) The joint assembly of Claim 2, wherein the window is continuous with the open end.
5. (Original) The joint assembly of Claim 4, wherein the seal is coupled to the first member adjacent an end of the window disposed distally from the open end of the first member.
6. (Original) The joint assembly of Claim 1, wherein the first engagement means includes a first plurality of splines and the second engagement means includes a second plurality of splines.
7. (Original) The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.
8. (Canceled)
9. (Currently Amended) The joint assembly of Claim [[8]], wherein at least a portion of the cylindrical portion directly covers the window.
10. (Currently Amended) The joint assembly of Claim [[8]], wherein at least a portion of the cylindrical portion is disposed directly radially outwardly of the window.

11. (Currently Amended) joint assembly of Claim [[8]], wherein the cylindrical portion is disposed directly radially outwardly of the retaining means.
12. (Currently Amended) The joint assembly of Claim [[8]], wherein the cylindrical portion covers the retaining means.
13. (Canceled)
14. (Currently Amended) The joint assembly of Claim [[13]], wherein the corrugated portion is disposed radially outwardly of each of the first member and the second member.
15. (Currently Amended) The joint assembly of Claim [[13]], wherein at least a portion of the corrugated portion is disposed radially outwardly of the window.

16. (Currently Amended) A method of servicing a joint assembly comprising:

providing a joint assembly, the joint assembly including:

a first member having a first engagement means and an interior surface recess;

a second member having a second engagement means and an exterior surface recess,

a portion of the second member disposed within the first member, the second engagement means engaging the first engagement means to provide a coupling of the second member to the first member;

a window formed within the first member where the portion of the second member is disposed within the first member;

a retaining means configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining means are accessible through the window, wherein the distal ends of the retaining means extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer surface of the first member, and wherein the retaining means is received partially into each of the interior surface recess of the first member and the exterior surface recess of the second member when the retaining means retains the coupling of the second member to the first member; and

a seal configured to cover the window formed in the first member, wherein the seal is coupled to the second member adjacent an end of the first member and wherein the seal is coupled to the first member adjacent the window;

uncovering the window via adjustment of the seal to provide access to the distal ends of the retaining means;

manipulating the retaining means through the window to release the coupling of the second member to the first member; and

separating the first member and the second member by disengaging the second engagement means from the first engagement means, wherein the seal includes a cylindrical portion and a corrugated portion, wherein at least a portion of the window is covered by the cylindrical portion.

17. (Original) The method of Claim 16, wherein the first member includes an open end and the window is continuous with the open end.
18. (Original) The method of Claim 17, wherein uncovering the window includes sliding the seal axially towards the open end of the first member.
19. (Original) The method of Claim 18, wherein the sliding of the seal axially occurs until the retaining means is uncovered.
20. (Canceled)

REMARKS

Claims 1-7, 9-12, and 14-19 are pending in the patent application.

Claims 1, 9-12, and 14-16 are currently amended. Support for the amendments is found in the patent application as originally filed.

Claims 8, 13, and 20 are canceled.

No new matter is added.

Favorable reconsideration of the application in view of the following remarks is respectfully requested.

DOUBLE PATENTING REJECTIONS

The Examiner made the double patenting rejections:

Claims 1-4, 6-9, 11, 13-14, 16, and 20 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-6, 8, and 15 of U.S. Patent No. 11,434,958. Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims are anticipated by the reference patent claims.

Applicants file herewith a Terminal Disclaimer. Thus, withdrawal of the rejections is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 102

The Examiner made the following art based rejection:

Claims 1-12 and 16-19 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Krude (US Patent Application Publication 2002/0070506).

Claims 1-8 and 16-19 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Brunetti (US Patent 7,896,750).

However, the Examiner also indicated the following:

Claims 13-15 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Independent Claim 1 is amended by incorporating therein features of intervening Claim 8 and allowable Claim 13, effectively rewriting Claim 13 in independent form. It is submitted that

Claim 1 is allowable. Claims 2-7, 9-12, and 14-15 which depend from Claim 1 are also allowable.

Independent Claim 16 is amended by incorporating therein features of allowable Claim 20, effectively rewriting Claim 16 in independent form. It is submitted that Claim 16 is allowable. Claims 17-19 which depend from Claim 16 are also allowable.

It is submitted that all claims are now allowable.

Withdrawal of the rejections is respectfully requested.

CONCLUSION

It is believed that the claims of record are patentable over the cited art. Accordingly, a formal Notice of Allowance is respectfully solicited. If the Examiner believes that personal communication will expedite prosecution of this application, it is requested that a telephone interview be had with Applicants' undersigned attorney.

Respectfully submitted,



J. Douglas Miller
Reg. No. 46,932

SHUMAKER, LOOP & KENDRICK, LLP
1000 Jackson Street
Toledo, Ohio 43604
419-241-9000 (Office)
419-241-6894 (Fax)

JDM/ceg



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NOTICE OF ALLOWANCE AND FEE(S) DUE

43935 7590 01/27/2023
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

EXAMINER

MCMAHON, MATTHEW R

ART UNIT

PAPER NUMBER

3678

DATE MAILED: 01/27/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742

TITLE OF INVENTION: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/27/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
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Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

43935 7590 01/27/2023
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742

TITLE OF INVENTION: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCAHON, MATTHEW R	3678	403-359500

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

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NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742
43935	7590	01/27/2023	EXAMINER	
Shumaker, Loop & Kendrick, LLP 1000 Jackson Street Toledo, OH 43604-5573			MCMAHON, MATTHEW R	
			ART UNIT	PAPER NUMBER
			3678	
DATE MAILED: 01/27/2023				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/815,833	Applicant(s) Hopson et al.	
	Examiner MATTHEW R MCMAHON	Art Unit 3678	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to See Continuation Sheet.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-7,9-12 and 14-19. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
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Continuation of 1. This communication is responsive to: Applicant's response filed 19 December 2022 and the Terminal Disclaimer filed 20 December 2022

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Status of the Claims

Claims 1-7, 9-12, and 14-19 are pending in the application.

In Applicant's response filed 19 December 2022, claims 1, 9-12, and 14-16 were amended and claims 8, 13, and 20 were cancelled. These amendments have been entered.

Double Patenting

The nonstatutory double patenting rejection set forth in the previous Office Action mailed 06 December 2022 has been overcome by the filing of a Terminal Disclaimer on 19 December 2022.

Allowable Subject Matter

Claims 1-7, 9-12, and 14-19 are allowed.

The following is an examiner's statement of reasons for allowance:

Independent claim 1 has been amended to incorporate the subject matter of previous claim 13. Independent claim 16 has been amended to incorporate the subject matter of previous claim 20. Accordingly, claims 1 and 16 are considered allowable over the prior art of record for the reasons given for claims 13 and 20, respectively, in the previous Office Action mailed 06 December 2022. The remaining dependent claims are considered allowable at least due to their dependence from one of claims 1 and 16.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the

issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

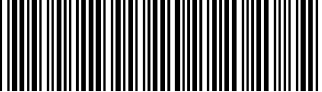
Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW R MCMAHON whose telephone number is (571)270-3067. The examiner can normally be reached Mon-Fri 9am-5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amber Anderson can be reached on (571) 270-5281. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MATTHEW R MCMAHON/
Primary Examiner, Art Unit 3678

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

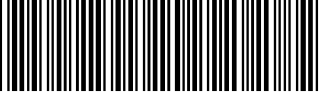
CPC						
Symbol					Type	Version
F16D	/	1	/	116	F	2013-01-01
F16B	/	21	/	18	I	2013-01-01
F16B	/	21	/	186	I	2013-01-01
F16D	/	2001	/	103	A	2013-01-01
F16D	/	2003	/	22326	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
/		/			

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678 (Primary Examiner)	04 January 2023 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230104

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

INTERNATIONAL CLASSIFICATION			
CLAIMED			
F16D		1	116
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
403	359.5

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678 (Primary Examiner)	04 January 2023 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230104

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47																
CLAIMS																
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Original
1	1	9	10	17	19											
2	2	10	11		20											
3	3	11	12													
4	4		13													
5	5	12	14													
6	6	13	15													
7	7	14	16													
	8	15	17													
8	9	16	18													

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678 (Primary Examiner) _____ (Date) _____		04 January 2023 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230104

<i>Search Notes</i> 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

CPC - Searched*		
Symbol	Date	Examiner
F16D 1/108, 112, 116		
F16D 2001/103		
F16B 21/18, 183, 186		
Y10T 403/7026, 7033, 31		
F16J 15/52, 525		
F16D 2003/22326		
Reviewed and updated previous searches above from Parent Case (app. no. 15/966,085)	11/30/2022	MRM
Previous searches updated	01/04/2023	MRM

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor names and Applicant search	11/30/2022	MRM
PE2E SEARCH (see attached search history)	12/01/2022	MRM
PE2E SEARCH (see attached search history)	01/04/2023	MRM

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
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<i>Search Notes</i> 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	USPGpub database text search (see attached search history)	01/04/2023	MRM
F16D	1/116	01/04/2023	MRM
F16B	21/18, 186	01/04/2023	MRM
F16D	2001/103	01/04/2023	MRM
F16D	2003/22326	01/04/2023	MRM

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
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Bibliographic Data

Application No: 17/815,833

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

/MATTHEW R MCMAHON/

Examiner's Signature

Initials

Title:

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT
ASSEMBLY

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/28/2022	403	3678	265038
RULE			

APPLICANTS

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, Farmington Hills, MI, UNITED STATES

INVENTORS

Michael Walter Hopson, Clinton Township, MI, UNITED STATES

Arvind Srinivasan, Sterling Heights, MI, UNITED STATES

Michael Peter Kinsella, White Lake, MI, UNITED STATES

CONTINUING DATA

This application is a CON of 15966085 04/30/2018 PAT 11434958 /M.R.M/ (01/04/2023)

15966085 has PRO of 62500821 05/03/2017 /M.R.M/ (01/04/2023)

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/05/2022

STATE OR COUNTRY

UNITED STATES

ADDRESS

Shumaker, Loop & Kendrick, LLP

1000 Jackson Street

Toledo, OH 43604-5573

UNITED STATES

FILING FEE RECEIVED

\$1,820

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	15/966085.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/07 12:02 PM
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		USOC).dbnm.					
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L18	61	F16D1/108,112,116.cpc. . AND @pd>="20211108"	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 01:09 PM
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L24	870	F16D2003/22326.cpc. AND (seal OR bellows OR boot)	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 03:28 PM
L26	149	F16J15/52.cpc. AND (((retaining (ring OR clip)) OR circlip)	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/04/19 03:36 PM
L27	6	("2075483" "4433934" "5964664" "20100143075" "20140349771").pn. OR ("11181150").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/20 06:18 AM
L28	19	("4325232" "5221233" "6152825" "7396284" "7604545" "7621816" "7632189" "7806773" "7854658" "20080104844" "20080318693" "20090208276" "20090317182" "20100105488" "20100275429").pn. OR ("8690690").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/20 06:29 AM
L29	1	"2898130".pn.	(USOCR)	ADJ	ON	ON	2022/04/20 09:02 AM
L30	1	"3357206".pn.	(USOCR)	ADJ	ON	ON	2022/04/20 09:04 AM
L31	6	("2075483" "4433934" "5964664" "20100143075" "20140349771").pn. OR ("11181150").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/20 09:23 AM
L32	38	("472342" "2805089" "2898130" "3151891"	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/20 09:34 AM

		"3381983" "3521911" "3559681" "4007953" "4565392" "5172941" "5498042" "5681060" "5794988" "5876071" "5882044" "6102447" "6186560" "6386596" "6932391").pn. OR ("7722089").urpn. AND (PGPB USPT USOC).dbnm.					
L33	2	15/966085.app.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 06:39 AM
L35	0	"17815833".app.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 06:40 AM
L36	1	"17/815833".app.	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 06:40 AM
L37	145	F16D1/108,112,116.cpc . AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:35 AM
L38	188	F16D2001/103.cpc. AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:38 AM
L39	127	F16B21/18,183,186.cpc . AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:38 AM
L40	31	Y10T403/7026,7033,31. cpc. AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:38 AM
L41	91	F16J15/52,525.cpc. AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:39 AM
L42	24	F16D2003/22326.cpc. AND @pd>="20220419"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 11:39 AM
L43	286	((("HOPSON") near3 ("Michael"))) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	ADJ	ON	ON	2022/11/30 01:08 PM
L44	29	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY")	(USPAT)	ADJ	ON	ON	2022/11/30 01:08 PM

		near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.					
L45	91	L43 AND joint	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:10 PM
L46	19	("10883545" OR "20090233723" OR "20180003240" OR "3357206" OR "3992117" OR "4124318" OR "4136982" OR "4859110" OR "6251019" OR "6582151" OR "6739422" OR "7722089" OR "7922590" OR "7946274" OR "8092312" OR "8231475" OR "8690690" OR "8864591" OR "8870489").pn.	(US-PGPUB; USPAT)	ADJ	ON	ON	2022/11/30 01:24 PM
L47	4	"10008183".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:27 PM
L48	8	"1681477".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:27 PM
L49	2	"2016034228".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:28 PM
L50	5	"10008182".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2022/11/30 01:29 PM
L51	0	(09/993873).APP.	(USPAT; USOCR)	ADJ	ON	ON	2022/11/30 02:53 PM
L52	6	("2002/0070506").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/11/30 02:54 PM
L53	7	("6139216" "6354952" "7270483" "20020070506").pn. OR ("7896750").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/11/30 03:04 PM
L54	40	(Artificial Intelligence) More like doc: US-7896750-B2 Text: (EP-1942014-A1 OR US-20080174112-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	ADJ	ON	ON	2022/11/30 03:25 PM

		OR EP-1942014-B1 OR KR-20080064715-A OR JP-2008162582-A OR US-7850531-B2 OR US-20080182674-A1 OR KR-101450878-B1 OR EP-1950055-B1 OR JP-2008185213-A OR KR-20080071063-A OR EP-2202092-A1 OR EP-2202092-B1 OR JP- 5265935-B2 OR US- 20110151982-A1 OR US-6286909-B1 OR US-6135571-A OR EP- 0936086-A2 OR US- 6296321-B1 OR DE- 112008001445-B4).did.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L55	43	(Artificial Intelligence) More like doc: US-20020070506-A1 <u>Text:</u> (DE-10154254-B4 OR DE-10154254-A1 OR DE-20019546-U1 OR US-20080174112-A1 OR EP-1942014-A1 OR US-7896750-B2 OR EP-1942014-B1 OR KR-20080064715-A OR CN-101797870-B OR CN-101797870-A OR JP-2008162582-A OR US-20080182674-A1 OR US-7850531-B2 OR EP-1950055-A1 OR WO-2007134157-A3 OR JP-2008185213-A OR EP-1950055-B1 OR KR-101450878-B1 OR EP-2202092-A1 OR US-20100197414- A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/11/30 03:32 PM
L56	45	(Artificial Intelligence) Similar to: 17/815,833 with 0 CPC Selections and 0 Text Selections <u>Text:</u> (US-11434958-B2 OR US-20180320742-A1 OR CN-107559290-A OR CN-107559290-B OR US-10883545-B2 OR US-20180003240- A1 OR JP-6717688-B2 OR JP-2018003925-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	ADJ	ON	ON	2022/11/30 03:35 PM

		OR US-10422388-B2 OR KR-101321588-B1 OR DE-102014109473-A1 OR CN-107304789-A OR JP-2020526711-A OR EP-3649358-B1 OR WO-2008154916-A3 OR CN-102667200-A OR DE-102016121785-A1 OR JP-2013511000-A OR JP-5850844-B2 OR US-11441610-B2 OR EP-2499388-B1 OR US-20120282020-A1 OR EP-2499388-A1 OR WO-2011058000-A1 OR WO-2019010382-A1 OR EP-3649358-A1 OR DE-102014109472-A1 OR DE-102009052791-A1 OR GB-2321945-A OR JP-6717647-B2 OR US-20210148411-A1 OR DE-102012022308-A1 OR DE-102018125349-B4 OR JP-4584077-B2 OR US-9388860-B2 OR GB-1387576-A OR JP-2008024296-A OR CN-101112867-B OR CN-101112867-A OR CN-101839287-B OR US-8322941-B2 OR US-20080018170-A1 OR JP-2007064361-A OR US-7811176-B2 OR BR-PI1003220-A2 OR JP-5215601-B2 OR CN-101839287-A OR CN-107654518-A OR US-20090208278-A1 OR DE-2342940-A1).did.					
L57	8	F16D1/108,112,116.cpc . AND @pd>="20221130"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2023/01/04 10:08 AM
L58	8	F16D2001/103.cpc. AND @pd>="20221130"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2023/01/04 10:08 AM
L59	4	F16B21/18,183,186.cpc . AND @pd>="20221130"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2023/01/04 10:09 AM
L60	1	Y10T403/7026,7033,31. cpc. AND	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	ADJ	ON	ON	2023/01/04 10:09 AM

		@pd>="20221130"	JPO)				
L61	1	F16J15/52,525.cpc. AND @pd>="20221130"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2023/01/04 10:09 AM
L62	0	F16D2003/22326.cpc. AND @pd>="20221130"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	ADJ	ON	ON	2023/01/04 10:09 AM
L63	62	((US-20180320742-A1 OR US-20080029363- A1 OR US- 20080111377-A1 OR US-20020070506-A1 OR US-20180023629- A1 OR US- 20220364607-A1 OR US-20090233723-A1 OR US-20180003240- A1 OR US- 20080174112-A1).did. AND PGPB.dbnm.) OR ((US-6739422-B2 OR US-8231475-B2 OR US-8690690-B2 OR US-8092312-B2 OR US-4859110-A OR US- 8870489-B2 OR US- 6582151-B2 OR US- 7946374-B2 OR US- 7922590-B2 OR US- 4124318-A OR US- 8864591-B2 OR US- 3992117-A OR US- 7722089-B2 OR US- 10883545-B2 OR US- 6251019-B1 OR US- 4136982-A OR US- 3357206-A OR US- 6102447-A OR US- 6386596-B1 OR US- 6186560-B1 OR US- 5794988-A OR US- 2898130-A OR US- 3151891-A OR US- 11226008-B2 OR US- 3574362-A OR US- 5876071-A OR US- 5490694-A OR US- 2440452-A OR US- 11181150-B2 OR US- 6991380-B2 OR US- 8267435-B2 OR US- 9016385-B2 OR US- 11434958-B2 OR US- 7946274-B2 OR US- 7896750-B2 OR US- 8206228-B2).did. AND USPT.dbnm.) OR ((EP-	(US-PGPUB; USPAT; USOCR; FIT (AU, BE, BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2023/01/04 10:15 AM

		1681477-A1 OR DE-10008183-C1 OR DE-10008182-A1 OR EP-1942014-A1).did. AND EPAB.dbnm.) OR ((DE-10008183-C1 OR DE-10008182-A1 OR DE-10008182-B4 OR WO-2016034228-A1).did. AND FPRS.dbnm.) OR ((EP-1681477-A1 OR US-20200217370-A1 OR WO-2007000023-A1 OR EP-1942014-A1 OR DE-20019546-U1).did. AND DWPI.dbnm.) OR ((WO-2012171613-A1 OR WO-2017187947-A1 OR DE-102018125349-B4).did. AND FTDB.dbnm.) OR ((US-2898130-A OR US-3357206-A).did. AND USOC.dbnm.)					
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PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	238	F16D1/116.cpc.	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:18 PM
N2	701	F16D2001/103.cpc.	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:19 PM
N3	267	F16D2003/22326.cpc.	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:19 PM
N4	401	F16B21/18,186.cpc.	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:19 PM
N7	180	joint AND (engagement OR spline) AND recess AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:20 PM
N8	115	joint AND (engagement OR spline) AND recess AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated AND (distal WITH ends)	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:21 PM
N9	80	joint AND (engagement OR spline) AND recess	(US-PGPUB)	ADJ	ON	ON	2022/04/22 01:21 PM

		AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated AND (distal WITH ends) AND perimeter					
N10	261	F16D1/116.cpc.	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:24 AM
N11	417	F16B21/18,186.cpc.	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM
N12	739	F16D2001/103.cpc.	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM
N13	275	F16D2003/22326.cpc.	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM
N14	186	joint AND (engagement OR spline) AND recess AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM
N15	121	joint AND (engagement OR spline) AND recess AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated AND (distal WITH ends)	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM
N16	85	joint AND (engagement OR spline) AND recess AND window AND (retaining OR ring) AND (seal OR boot OR bellows) AND cylindrical AND corrugated AND (distal WITH ends) AND perimeter	(US-PGPUB)	ADJ	ON	ON	2023/01/04 10:25 AM

PE2E SEARCH - Search History (Similarity Search)

Ref #	Application Number	Text Selections	CPC Selections
L56	17/815,833	No selections	No selections

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

43935 7590 01/27/2023
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742

TITLE OF INVENTION: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	04/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCAHON, MATTHEW R	3678	403-359500

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Shumaker, Loop & Kendrick, LLP

2

3 James D. Miller

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

FARMINGTON HILLS, MICHIGAN

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 505605

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /James D. Miller/Date January 27, 2023Typed or printed name James D. MillerRegistration No. 46,932



UNITED STATES
PATENT AND TRADEMARK OFFICE

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/815,833

RECEIPT DATE / TIME
01/27/2023 02:47:34 PM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 61505668

FILING DATE 07/28/2022

CUSTOMER # 43935

FIRST NAMED INVENTOR Michael Walter Hopson

CORRESPONDENCE ADDRESS -

AUTHORIZED BY James Miller

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
265038 Issue Fee Filed.pdf	1	Issue Fee Payment (PTO-85B)	121 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
265038 Issue Fee Filed.pdf	A6414A0616D9EA00830F390711B8A22500E214B3A6F48D6ED7 15CE228C0EA174E27B78B1D0FE208598B2D2AA9B3B464BB3E 3B85C7371DC0F1C2D936FD1290F43

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as

described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #
17/815,833

RECEIPT DATE / TIME
01/27/2023 02:47:34 PM ET

ATTORNEY DOCKET #
265038

Title of Invention

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 9742

FILED BY Christine Golupski

PATENT CENTER # 61505668

AUTHORIZED BY James Miller

CUSTOMER # 43935

FILING DATE 07/28/2022

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Michael Walter Hopson

Payment Information

PAYMENT METHOD
DA / 505605

PAYMENT TRANSACTION ID
E20231QE47534569

PAYMENT AUTHORIZED BY
Christine Golupski

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1501	UTILITY ISSUE FEE	1200.00	1	1200.00
TOTAL AMOUNT:				\$1,200.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage

submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

To: tlopez@shumaker.com,dmiller@shumaker.com,cgolupski@shumaker.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 43935

Jan 27, 2023 03:22:29 AM

Dear PAIR Customer:

Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 43935 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

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Application	Document	Mailroom Date	Attorney Docket No.
17815833	NOA	01/27/2023	265038

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Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

PRINTER RUSH
(PTO ASSISTANCE)

Application: 17815833

Examiner: McMahon

GAU: 3678

From:

Location: IDC

Creation Date: 01/31/2023

Week Date: 1/23/2023

<u>DOC CODE</u>	<u>DOC DATE</u>	<u>MISCELLANEOUS</u>
☐ 1449	<u>12/19/2022</u>	☐ Continuing Data
☐ IDS		☐ Foreign Priority
☒ CLM		☐ Document Legibility
☐ IIFW/FWCLM		☐ Fees
☐ SRFW		☐ Petition (TC)
☐ DRW		☐ Other
☐ OATH		
☐ 312		
☐ SPEC		

[RUSH] Message:

Beginning of original claim 11 appears to be incomplete.

Please resolve

[XRUSH] Response:

Initials: _____

Examiner: PUBS contact - James Leija, (703) 756-1197

NOTE: This form will be included as part of the official USPTO record with the response document coded as XRUSH.

REV: AUG 16

Page 1/1

American Axle v. Neapco - IPR2025-00090
PET_AAM_1005-0218



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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	07/28/2022	Michael Walter Hopson	265038	9742
43935	7590	02/07/2023		
Shumaker, Loop & Kendrick, LLP 1000 Jackson Street Toledo, OH 43604-5573			EXAMINER MCMAHON, MATTHEW R	
			ART UNIT 3678	PAPER NUMBER
			NOTIFICATION DATE 02/07/2023	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

cgolupski@shumaker.com
dmiller@shumaker.com
tlopez@shumaker.com

Supplemental Notice of Allowability	Application No. 17/815,833	Applicant(s) Hopson et al.	
	Examiner MATTHEW R MCMAHON	Art Unit 3678	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Applicant's response filed 19 December 2022 and The Notice of Allowance mailed 1/27/2023.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-7,9-12 and 14-19. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. ____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ____	6. ☐ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____	7. ☐ Other ____
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date ____	

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	
--	--

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Claim 11 was amended as follows:

--11. ~~joint assembly of Claim 1~~, The joint assembly of Claim 1, wherein the cylindrical portion is disposed directly radially outwardly of the retaining means.--

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW R MCMAHON whose telephone number is (571)270-3067.

The examiner can normally be reached Mon-Fri 9am-5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amber Anderson can be reached on (571) 270-5281. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MATTHEW R MCMAHON/
Primary Examiner, Art Unit 3678

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

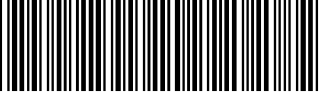
CPC						
Symbol					Type	Version
F16D	/	1	/	116	F	2013-01-01
F16B	/	21	/	18	I	2013-01-01
F16B	/	21	/	186	I	2013-01-01
F16D	/	2001	/	103	A	2013-01-01
F16D	/	2003	/	22326	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
/		/			

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	02 February 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20230202

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

INTERNATIONAL CLASSIFICATION			
CLAIMED			
F16D		1	116
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
403	359.5

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678 (Primary Examiner)	02 February 2023 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230202

Issue Classification 	Application/Control No. 17/815,833	Applicant(s)/Patent Under Reexamination Hopson et al.
	Examiner MATTHEW R MCMAHON	Art Unit 3678

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47																
CLAIMS																
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Original
1	1	9	10	17	19											
2	2	10	11		20											
3	3	11	12													
4	4		13													
5	5	12	14													
6	6	13	15													
7	7	14	16													
	8	15	17													
8	9	16	18													

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 17	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678 (Primary Examiner) _____ (Date) _____		02 February 2023 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230202

PRINTER RUSH
(PTO ASSISTANCE)

Application: **17815833**

Examiner: **McMahon**

GAU: **3678**

From:

Location: **IDC**

Creation Date: **01/31/2023**

Week Date: **1/23/2023**

<u>DOC CODE</u>	<u>DOC DATE</u>	<u>MISCELLANEOUS</u>
☐ 1449	<u>12/19/2022</u>	☐ Continuing Data
☐ IDS		☐ Foreign Priority
☒ CLM		☐ Document Legibility
☐ IIFW/FWCLM		☐ Fees
☐ SRFW		☐ Petition (TC)
☐ DRW		☐ Other
☐ OATH		
☐ 312		
☐ SPEC		

[RUSH] Message:

Beginning of original claim 11 appears to be incomplete.

Please resolve

[XRUSH] Response:

Original claim 11 amended with attached Examiner's Amendment to correct the beginning of claim 11

/M.R.M/ (02/02/2023)

Initials: _____

Examiner: PUBS contact - James Leija, (703) 756-1197

NOTE: This form will be included as part of the official USPTO record with the response document coded as XRUSH.

REV: AUG 16

Page 1/1

American Axle v. Neapco - IPR2025-00090
PET_AAM_1005-0226



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/815,833	03/07/2023	11598376	265038	9742
43935	7590	02/15/2023		
Shumaker, Loop & Kendrick, LLP 1000 Jackson Street Toledo, OH 43604-5573				

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Michael Walter Hopson, Clinton Township, MI;
Arvind Srinivasan, Sterling Heights, MI;
Michael Peter Kinsella, White Lake, MI;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, Farmington Hills, MI;

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IR103 (Rev. 10/09)

American Axle v. Neapco - IPR2025-00090
PET_AAM_1005-0227

To: tlopez@shumaker.com,dmiller@shumaker.com,cgolupski@shumaker.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 43935

Feb 23, 2023 12:18:59 PM

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Toledo, OH 43604-5573
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Application	Document	Mailroom Date	Attorney Docket No.
17815833	ISSUE.NTF	02/15/2023	265038

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Mar 01, 2023 11:52:04 AM

Dear PAIR Customer:

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