8518388

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 21, 2024

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS OF:

APPLICATION NUMBER: ***15/966,085***
FILING DATE: ***April 30, 2018***
PATENT NUMBER: ***11434958***
ISSUE DATE: ***September 06, 2022***

UNITED STATES PATENT AND TRADEMARK OFFICE · DEPARTMENT OF COMMERCE

Certified by

Katherine Kelly Vidal

Performing the Functions and Duties of the
Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	April 30, 2018
First Named Inventor	Michael Walter Hopson
Title	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Art Unit	
Examiner Name	
Attorney Docket Number	206898/58974-1

SIGNATURE of Applicant or Patent Practitioner

Signature	/James D. Miller/	Date (Optional)	2018-04-30
Name	James D. Miller	Registration Number	46,932
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

Doc Code: PA..
Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 43935

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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)

SIGNATURE of Applicant for Patent

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 C. SANFORD		
Title	PRESIDENT		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Filer:	James D. Miller/Christine Golupski
Attorney Docket Number:	206898/58974-1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1720**

Electronic Acknowledgement Receipt	
EFS ID:	32479931
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	30-APR-2018
Filing Date:	
Time Stamp:	10:51:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1720
RAM confirmation Number	043018INTEFSW00015314505605
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	206898_ADS_Filed_04302018.pdf	1866708 46628df400ca535f3b46fe07d84264331ccbf323	no	9
Warnings:					
Information:					
2	Oath or Declaration filed	206898_Declarations_Filed_04302018.pdf	783344 6c9cc67f9a71b405a5ddb0caebe02a95338aca62	no	3
Warnings:					
Information:					
3	Drawings-only black and white line drawings	206898_Drawings_Filed_04302018.pdf	116968 ad6e2fafb137e6a0e5572303fdde27f0c3b29316	no	3
Warnings:					
Information:					
4		206898_Application_Filed_04302018.pdf	147219 cdaecf33372c943200ab436e68068e2988bef56e	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	11
	Claims	12	14
	Abstract	15	15

Warnings:					
Information:					
5	Power of Attorney	206898_POA_Filed_04302018.pdf	144131 aaff6be52e8b40d710e7f239a11866cf7dd01a85	no	2

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	35497 859ccf0f32b229a5523c65e3ce40b9e1caeadb87	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3093867		

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 a 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.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	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.

Secrecy Order 37 CFR 5.2:

☐ 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.)

Inventor Information:

Inventor 1 Remove

Legal Name

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	State/Province	Country of Residence
Clinton Township	MI	US

Mailing Address of Inventor:

Address 1	43844 Leelanau Trail
Address 2	
City	Clinton Township
State/Province	MI
Postal Code	48038
Country	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	State/Province	Country of Residence
Troy	MI	US

Mailing Address of Inventor:

Address 1	3703 Timbercrest Drive
Address 2	
City	Troy
State/Province	MI
Postal Code	48083
Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Michael	Peter	Kinsella	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0009

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	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

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	43935		
Email Address	dmiller@slk-law.com	Add Email	Remove Email

Application Information:

Title of the Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY		
Attorney Docket Number	206898/58974-1	**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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0010

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY	

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)
Customer Number	43935		

Domestic Benefit/National Stage Information:

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)
	Claims benefit of provisional	62500821	2017-05-03

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0011

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY	

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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0012

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY	

Authorization or Opt-Out of Authorization to Permit Access:

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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0013

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	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:

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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0014

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	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.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

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)	2018-04-30
First Name	James D.	Last Name	Miller	Registration Number	46932

Additional Signature may be generated within this form by selecting the Add button. Add

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0015

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	206898/58974-1
	Application Number	
Title of Invention	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY	

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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.

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LEGAL NAME OF INVENTOR

Inventor: Michael Peter Kinsella Date (Optional): 4-6-2018

Signature: Michael Peter Kinsella

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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LEGAL NAME OF INVENTOR

Inventor: Michael Walter Hopson Date (Optional): 4/9/12

Signature: _____

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LEGAL NAME OF INVENTOR

Inventor: Arvind Srinivasan Date (Optional): _____

Signature: _____

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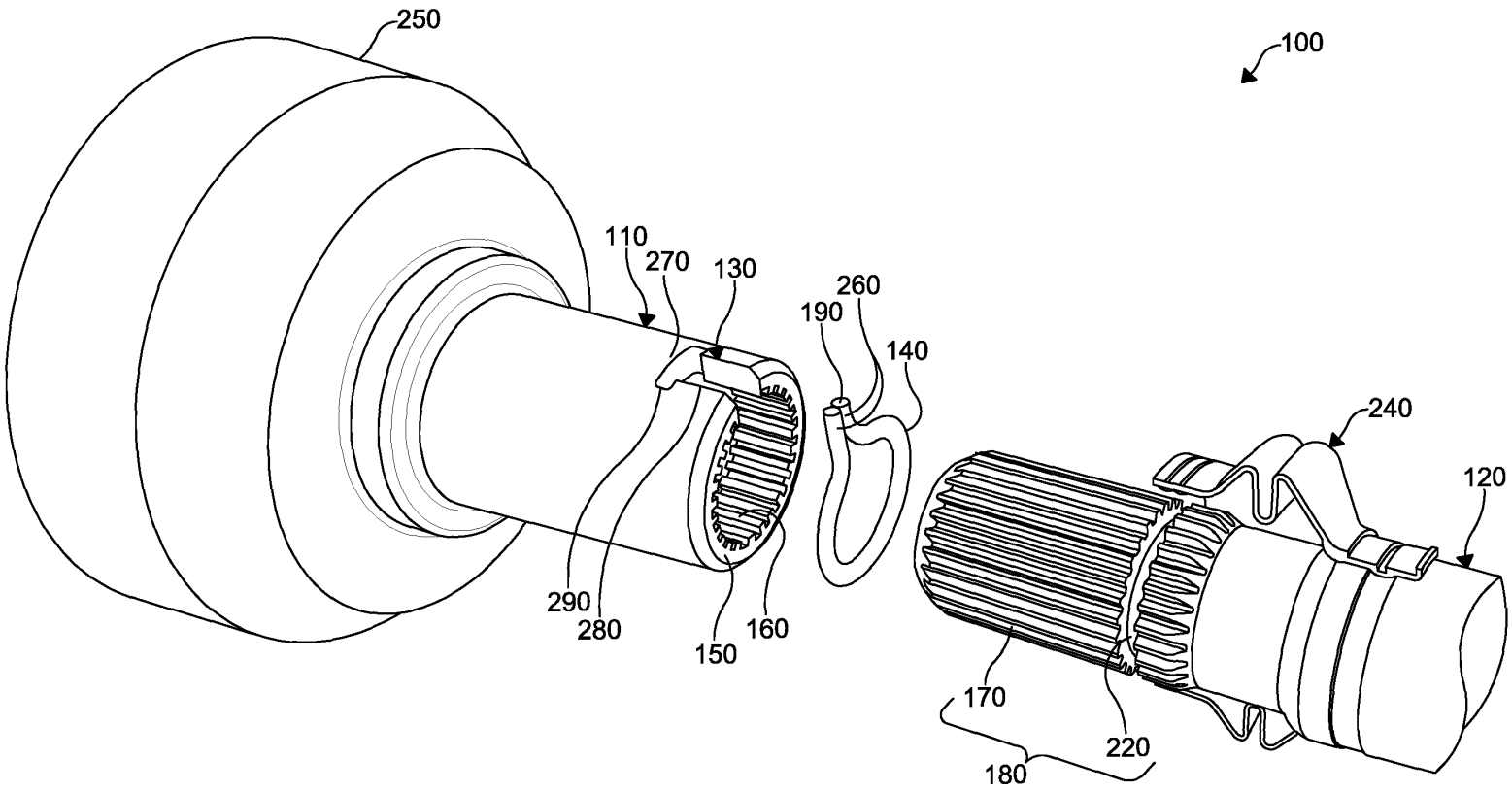

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FIG. 1

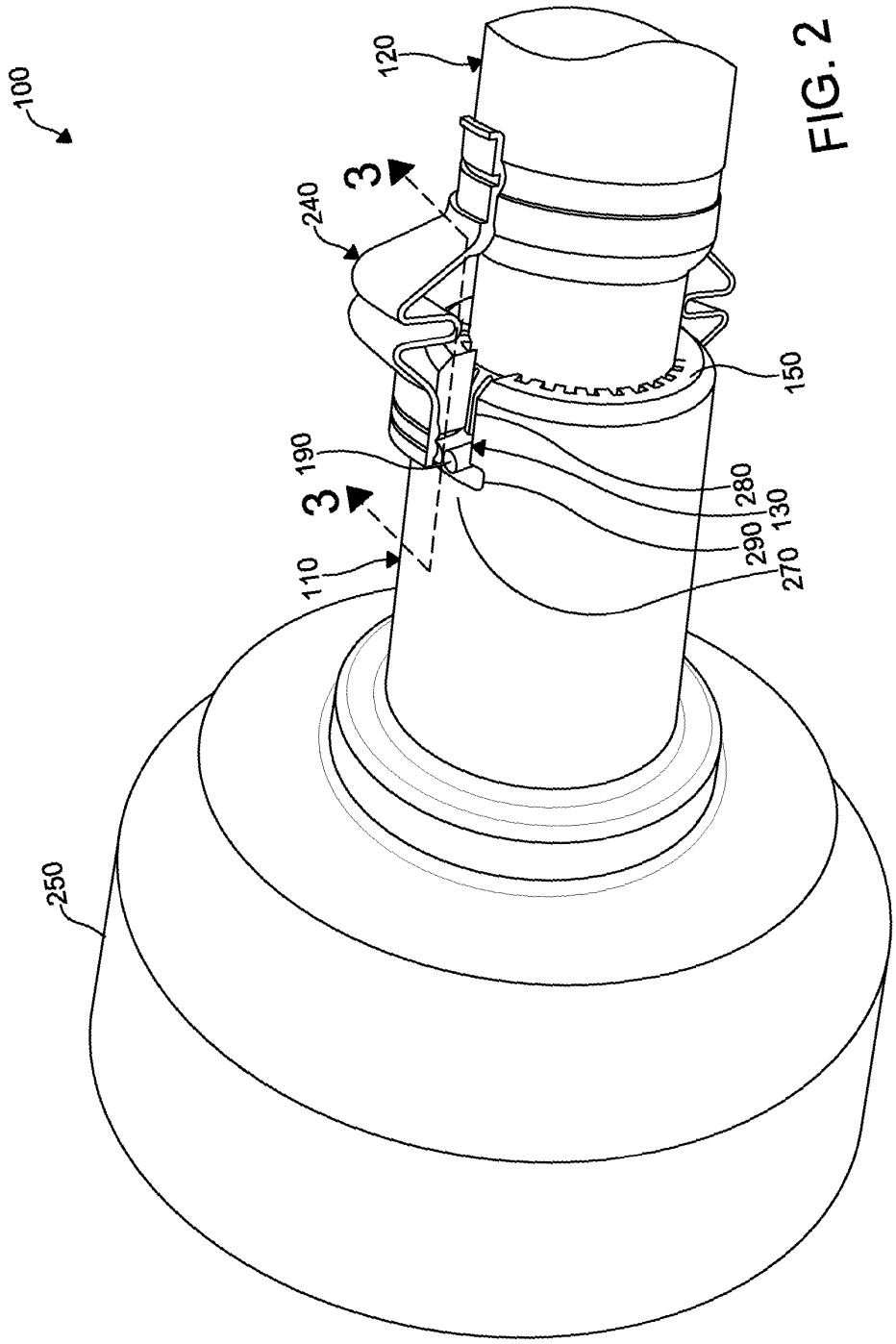


FIG. 2

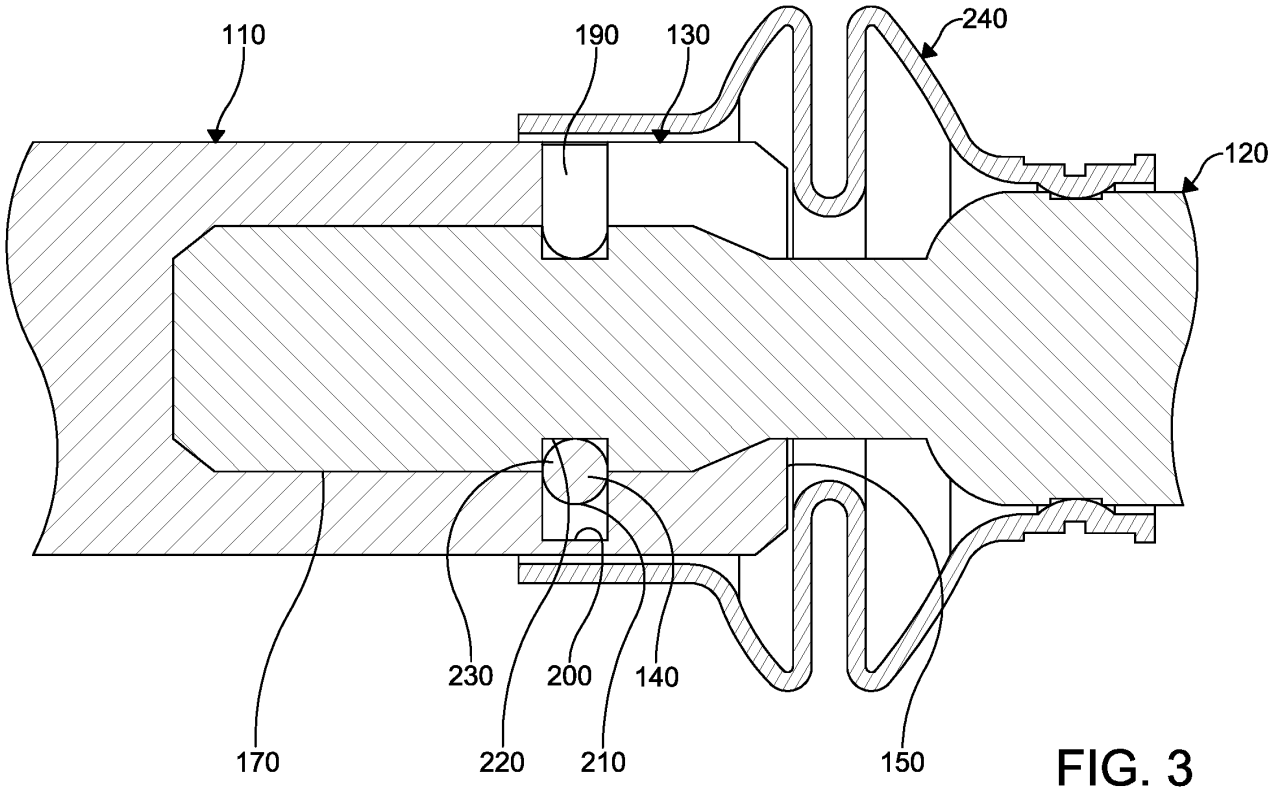


FIG. 3

TITLE

HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/500,821, filed on May 3, 2017. The entire disclosure of the above application 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.

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[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

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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.

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[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

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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

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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

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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.

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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 bias towards 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

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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 140 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 expansion of the retaining ring 140 to release the coupling of the second member 120 to the first member 110 and 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 slidingly 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 200 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

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annular recess 200 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

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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 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.

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CLAIMS

What is claimed is:

1. A joint assembly comprising:
   a first member having a first engagement means;
   a second member having a second engagement means, 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; and
   a retaining means configured to retain the coupling of the second member to the first member, a portion of the retaining means accessible through 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 1, wherein the first engagement means includes a first plurality of splines and the second engagement means includes a second plurality of splines.

6. The joint assembly of Claim 1, wherein the first member includes an interior surface recess receiving a portion of the retaining means and the second member includes an exterior surface recess receiving another portion of the retaining means.

7. The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. The joint assembly of Claim 1, further comprising a seal configured to cover the window.

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9. The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. A vehicle driveline comprising the joint assembly of Claim 1.

11. A vehicle comprising the joint assembly of Claim 1.

12. A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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; and

a retaining ring configured to retain the coupling of the second member to the first member, a portion of the retaining ring accessible through the window, the first member including an interior surface annular recess receiving a portion of the retaining ring and the second member including an exterior surface annular recess receiving another portion of the retaining ring.

13. The joint assembly of Claim 12, further comprising a seal configured to cover the window.

14. The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

15. A method of servicing a joint assembly comprising:

providing a joint assembly, the joint assembly including:

a first member having a first engagement means;

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a second member having a second engagement means, 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; and

a retaining means configured to retain the coupling of the second member to the first member, a portion of the retaining means accessible through the window;

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.

16. The joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. The joint assembly of Claim 1, wherein the joint assembly further comprises a seal configured to cover the window and the method further comprises 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.

18. The joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. The joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. The joint assembly of Claim 1, further comprising replacing the retaining means with another retaining means and coupling the separated first member with the separated second member to reform the joint assembly.

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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 portion of the ring is accessible through the access window, where the ring can be manipulated to release the first member from the second member.

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
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	Application Number	15966085
	Filing Date	2018-04-30
	First Named Inventor	Michael Walter Hopson
	Art Unit	2833
	Examiner Name	
	Attorney Docket Number	206898/58974-1

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	6739422	B2	2004-05-25	Krude et al.	
	2	6251019	B1	2001-06-26	Hofmann et al.	
	3	7922590	B2	2011-04-12	Pallante	
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PET_AAM_1004-0039

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15966085
	Filing Date	2018-04-30
	First Named Inventor	Michael Walter Hopson
	Art Unit	2833
	Examiner Name	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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PET_AAM_1004-0040

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15966085
	Filing Date	2018-04-30
	First Named Inventor	Michael Walter Hopson
	Art Unit	2833
	Examiner Name	
	Attorney Docket Number	206898/58974-1

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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.

☒ A certification statement is not submitted herewith.

SIGNATURE

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)	2018-05-22
Name/Print	James D. Miller	Registration Number	46932

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

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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.

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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)).

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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.

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Electronic Acknowledgement Receipt

EFS ID:	32687556
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	22-MAY-2018
Filing Date:	30-APR-2018
Time Stamp:	11:39:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	206898_IDS_Filed_05222018.pdf	1067808 c8b1f89753ee189ba6b45472e667fc6e8c677086	no	4

Warnings:

Information:	
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If a new application is being filed and the application includes the necessary components for a 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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/966,085

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 460 =	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	1720

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	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
15/966,085	04/30/2018	2833	1720	206898/58974-1	20	3

CONFIRMATION NO. 9702

FILING RECEIPT

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

OC00000009973088

Date Mailed: 05/24/2018

Receipt is acknowledged of this non-provisional 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 APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Michael Walter Hopson, Clinton Township, MI;
Arvind Srinivasan, Troy, 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 appln 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: 05/22/2018

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0046

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/966,085**

Projected Publication Date: 11/08/2018

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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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0047

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0048

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

May 24, 2018 04:35:39 AM

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Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573
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Application	Document	Mailroom Date	Attorney Docket No.
15966085	APP.FILE.REC	05/24/2018	206898/58974-1

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1

CONFIRMATION NO. 9702

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

PUBLICATION NOTICE

OC000000103695619

Title:HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Publication No.US-2018-0320742-A1
Publication Date:11/08/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

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American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0050

To: tlopez@slk-law.com,dmiller@slk-law.com,cgolupski@slk-law.com
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Application	Document	Mailroom Date	Attorney Docket No.
15966085	NTC.PUB	11/08/2018	206898/58974-1

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

43935 7590 01/22/2021

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

EXAMINER
CAMERO, ALEXUS

ART UNIT	PAPER NUMBER
3678	

NOTIFICATION DATE	DELIVERY MODE
01/22/2021	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

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0052

Office Action Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.	
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 30 April 2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 30 April 2018 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0053

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.

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

Status of Claims

The office action is being examined in response to the application filed by the applicant on 30 April 2018.

Claims 1-20 are currently pending and have been examined.

This action is made NON-FINAL.

Information Disclosure Statement

The information disclosure statement (IDS) filed on 22 May 2018 is in compliance with the provisions of 37 CFR 1.97, and the information referred to therein have been considered by the examiner.

Specification

The disclosure is objected to because "window 140" in line 3 of Paragraph 0032 should read --window 130--. Appropriate correction is required.

Claim Objections

Claims 15-20 are objected to because of the following informalities:

- With respect to Claim 15, "providing a joint assembly" in line 2 should read --providing the joint assembly--.
- With respect to Claims 16 and 18-19, "The joint assembly of Claim 15" should read --The method of servicing the joint assembly of Claim 15--.

- With respect to Claim 17 and 20, "The joint assembly of Claim 1" should read --The method of servicing the joint assembly of Claim 15--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(d):

> (d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

> Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claim 20 is rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.

Claim 20 recites the limitation "replacing the retaining means with another retaining means". Therefore, Claim 20 fails to include all the limitations of the claim upon which it depends, particularly the "retaining means" of Claim 15.

Applicant may cancel the claim, amend the claim to place the claim in proper dependent form, rewrite the claim in independent form, or present a sufficient showing that the dependent claim complies with the statutory requirements.

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 1-7, 9-12, 14-16, and 18-20 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Kofuji (US 2009/0233723 A1).

With respect to **Claim 1**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having a first engagement means (86, a spline hole);

a second member (45) having a second engagement means (84, a spline section), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining means (95) accessible through the window (93).

With respect to **Claim 2**, Kofuji (Fig. 4) discloses the limitations set forth in Claim 1 and that the first member (43) includes an open end and the first engagement means (86) of the first member (43) is formed within the open end.

With respect to **Claim 3**, Kofuji (Fig. 4) discloses the limitations set forth in Claim 2 and that the portion (45b) of the second member (45) disposed within the first member (43) is disposed within the open end and includes the second engagement means (84).

With respect to **Claim 4**, Kofuji (Fig. 4) discloses the limitations set forth in Claim 2 and that the window (93) is continuous with the open end. See Paragraph 0051, wherein the window (93) has a section opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43).

With respect to **Claim 5**, Kofuji (Fig. 4) discloses the limitations set forth in Claim 1 and that the first engagement means (86) includes a first plurality of splines (spline hole) and the second engagement means (84) includes a second plurality of splines (spline section).

With respect to **Claim 6**, Kofuji (Fig. 4) discloses the limitations set forth in Claim 1 and that the first member (43) includes an interior surface recess (91) receiving a portion of the retaining means and the second member (45) includes an exterior surface recess (92) receiving another portion of the retaining means (95). See Paragraph 0053, wherein the retaining means (95) is disposed spanning the interior surface recess (91) and the exterior surface recess (92).

With respect to **Claim 7**, Kofuji (Figs. 5a-5b) discloses the limitations set forth in Claim 1 and that the retaining means (95) is configured as a retaining ring (circular clip).

With respect to **Claim 9**, Kofuji (Fig. 3) discloses the limitations set forth in Claim 1 and further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 10**, Kofuji (Figs. 2-3) discloses a vehicle driveline (41) comprising the joint assembly of Claim 1.

With respect to **Claim 11**, Kofuji (Figs. 1-3) discloses a vehicle (10) comprising the joint assembly of Claim 1.

With respect to **Claim 12**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having an open end and a first plurality of splines (86, a spline hole) formed within the open end;

a second member (45) having a second plurality of splines (84, a spline section) formed thereon, a portion (45b) of the second member (45) disposed within the first member (43), the second plurality of splines (84) engaging the first plurality of splines (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining ring (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining ring (95) accessible through the window (93), the first member (43) including an interior surface annular recess (91) receiving a portion of the retaining ring and the second member (45) including an exterior surface annular recess (92) receiving another portion of the retaining ring (see Paragraph 0053, wherein the retaining means (95) is disposed spanning the interior surface annular recess (91) and the exterior surface annular recess (92).

With respect to **Claim 14**, Kofuji (Fig. 3) discloses the limitations set forth in Claim 12 and further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 15**, 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 211.02.

Therefore, Kofuji (Figs. 1-6c) discloses a method of servicing a joint assembly comprising:

providing (Fig. 4) the joint assembly, the joint assembly (Figs. 4) including:

a first member (43) having a first engagement means (86, spline hole);

a second member (45) having a second engagement means (84, a spline section), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining means (95) accessible through the window (93).

manipulating (Figs. 5a-5b) the retaining means (95) through the window (93) to release the coupling of the second member (45) to the first member (43); and

separating (Figs. 6a-6c) the first member (43) and the second member (45) by disengaging the second engagement means from the first engagement means.

With respect to **Claim 16**, Kofuji (Fig. 3) discloses the limitations set forth in Claim 15 and that the joint assembly further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 18**, Kofuji (Figs. 2-3) discloses the limitations set forth in Claim 15 and further comprising coupling the separated first member (43) with another second member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated first member (43) to be capable of coupling with another second member to form another joint assembly.

With respect to **Claim 19**, Kofuji (Figs. 2-3) discloses the limitations set forth in Claim 15 and further comprising coupling the separated second member (45) with another first member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated second member (45) to be capable of coupling with another first member to form another joint assembly.

With respect to **Claim 20**, Kofuji discloses the limitations set forth in Claim 15 and further comprising replacing the retaining means (95) with another retaining means and coupling the separated first member with the separated second member to reform the joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing another retaining means to be used to couple the separated first member and the separated second member to reform the joint assembly.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8, 13, and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Sugiyama et al. (US 2018/0003240 A1).

With respect to **Claims 8 and 13**, Kofuji discloses the limitations set forth in Claims 1 and 12 respectively but fails to disclose that the joint assembly further comprises a seal configured to cover the window.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (12). Sugiyama et al. (Fig. 7) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 17**, Kofuji discloses the limitations set forth in Claim 15 but fails to discloses that the joint assembly further comprises a seal configured to cover the window and the method further comprises 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.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (12). Sugiyama et al. (Fig. 7) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32), wherein the seal (35) can be removed from the joint assembly to uncover the through holes (31, 32).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

Conclusion

The prior art set forth in the attached Notice of Reference Cited (PTO-892) 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 ALEXUS CAMERO whose telephone number is (571)272-8629. The examiner can normally be reached on M-F 9:00 am to 5:00 pm EST.

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 an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEXUS CAMERO/
Examiner, Art Unit 3678

/AMBER R ANDERSON/
Supervisory Patent Examiner, Art Unit 3678

Notice of References Cited	Application/Control No. 15/966,085	Applicant(s)/Patent Under Reexamination Hopson et al.	
	Examiner ALEXUS CAMERO	Art Unit 3678	Page 1 of 2

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Notice of References Cited	Application/Control No. 15/966,085	Applicant(s)/Patent Under Reexamination Hopson et al.	
	Examiner ALEXUS CAMERO	Art Unit 3678	Page 2 of 2

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FOREIGN PATENT DOCUMENTS

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	S					
	T					

NON-PATENT DOCUMENTS

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

CPC - Searched*		
Symbol	**Date**	**Examiner**
F16D 1/108, 112, 116	01/12/2021	AC
F16D 2001/103	01/12/2021	AC
F16B 21/18, 183, 186	01/12/2021	AC
Y10T 403/7033	01/12/2021	AC

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**
EAST, PALM search of inventor and assignee	01/11/2021	AC
Search Help from Josh Skroupa (Class 403)	01/12/2021	AC
Forward and Backward Citation Search	01/13/2021	AC
See attached EAST search history	01/14/2021	AC

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

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

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PET_AAM_1004-0065

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/14/2021								
	1	✓								
	2	✓								
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	18	✓								
	19	✓								
	20	✓								

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(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

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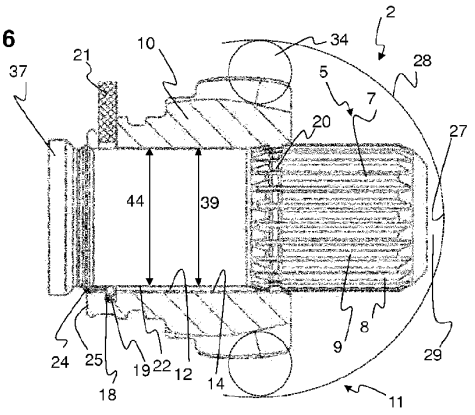
Veröffentlicht:

— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

(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

FIG. 6



(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 Verschiebeinheit (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).

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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

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Verschwenkbereich der Längswellenanordnung sind entsprechend ausgelegt und beschränkt.

Es sind auch Ausgestaltungen von Längswellenanordnungen möglich, bei denen 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 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.

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 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.

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.

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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 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 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 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 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 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).

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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-

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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:

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;
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.

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

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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 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 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.

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 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 Zapfen und Aufnahme ausgebildet sind, ineinandergeschoben werden können.

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

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 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).

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.

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 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.

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

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 das der 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, der mindestens dem zweiten Innendurchmesser des gespreizten Sicherungsrings 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 ersten Ringnut angeordnet. Insbesondere erfolgt die Spreizung durch das Distanzstück so, dass der kleinste erste Innendurchmesser des gespreizten Sicherungsrings 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 dass durch den Sicherungsring weitere Reibkräfte hervorgerufen werden.

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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 Einschiebens 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 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 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 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.

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

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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.

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.

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.

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-

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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.

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

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 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.;

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

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Fig. 4: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt ii.;

Fig. 5: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt ii.;

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.;

Fig. 8: Verbindung zwischen einem Zapfen und einem Gelenkinnenteil an einem ersten Ende einer Längswellenanordnung während Schritt iv.;

Fig. 9: Verbindung zwischen einem ersten Ende und einem ersten Anbindungspunkt nach Schritt iv.;

Fig. 10: Distanzstück in einer frontalen Ansicht;

Fig. 11: Distanzstück in einer Seitenansicht;

Fig. 12: Distanzstück in perspektivischer Ansicht;

Fig. 13: Sicherungsring mit Distanzstück in einer frontalen Ansicht; und

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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.

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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

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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-

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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

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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.

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.

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

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.

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.

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

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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

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

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Bezugszeichenliste

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

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

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Patentansprüche

1. Verfahren zur Montage einer Längswellenanordnung (1), umfassend zumindest eine erste Welle (37) und eine Verschiebeinheit (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 einer 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 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:

   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 einer 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

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v. Verbinden des zweiten Endes (6) mit dem zweiten Anbindungspunkt (3).

2. Verfahren nach Patentanspruch 1, wobei der Zapfen (7) und das Gelenkinnenteil (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) angeordnet wird und zumindest während Schritt ii. gespreizt ist, so dass der Sicherungsring (18) während Schritt ii. über die zweite Ringnut (20) hinaus verschoben werden kann.

3. Verfahren nach Patentanspruch 2, wobei der Sicherungsring (18) durch ein Distanzstück (21) gespreizt wird.

4. Verfahren nach Patentanspruch 3, wobei der Sicherungsring (18) in der ersten Ringnut (19) bereits vor Schritt i. durch das Distanzstück (21) gespreizt wird und damit unverlierbar in der ersten Ringnut (19) angeordnet ist.

5. Verfahren nach Patentanspruch 3 oder 4, wobei das Distanzstück (21) nach Schritt ii. und vor Schritt iv. entfernt wird und der Sicherungsring (18) danach auf einer äußeren Zapfenumfangsfläche (22) aufliegt.

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.

7. Verfahren nach einem der vorhergehenden Patentansprüche, wobei zumindest während der Schritte ii., iii. und iv. die erste und zweite Keilverzahnung (9, 13) ständig miteinander in Eingriff stehen.

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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.

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 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 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 zweites Ende (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 Verschiebeinheit (35), die miteinander verbunden sind, wobei die Längswellenanordnung (1) über ein erstes Ende (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 aus der Gruppe erstes Ende (5) und erster Anbindungspunkt (2) als ein Zapfen (7) ausgebildet ist, der an einer Außenumfangsfläche (8) zumindest

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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 Zapfen (7) und Aufnahme (12) in einer Betriebsposition (15) zueinander angeordnet sind; wobei ein Gelenkaußenteil (28) des Gleichlaufdrehgelenks (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 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 Verschiebeeinheit (35) mit der ersten Welle (37) verbunden ist, wobei die Längswellenanordnung (1) über das zweites Ende (6) an der zweiten Welle (38) mit einem zweiten Anbindungspunkt (3) am Kraftfahrzeug (4) verbindbar ist

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.

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FIG. 1

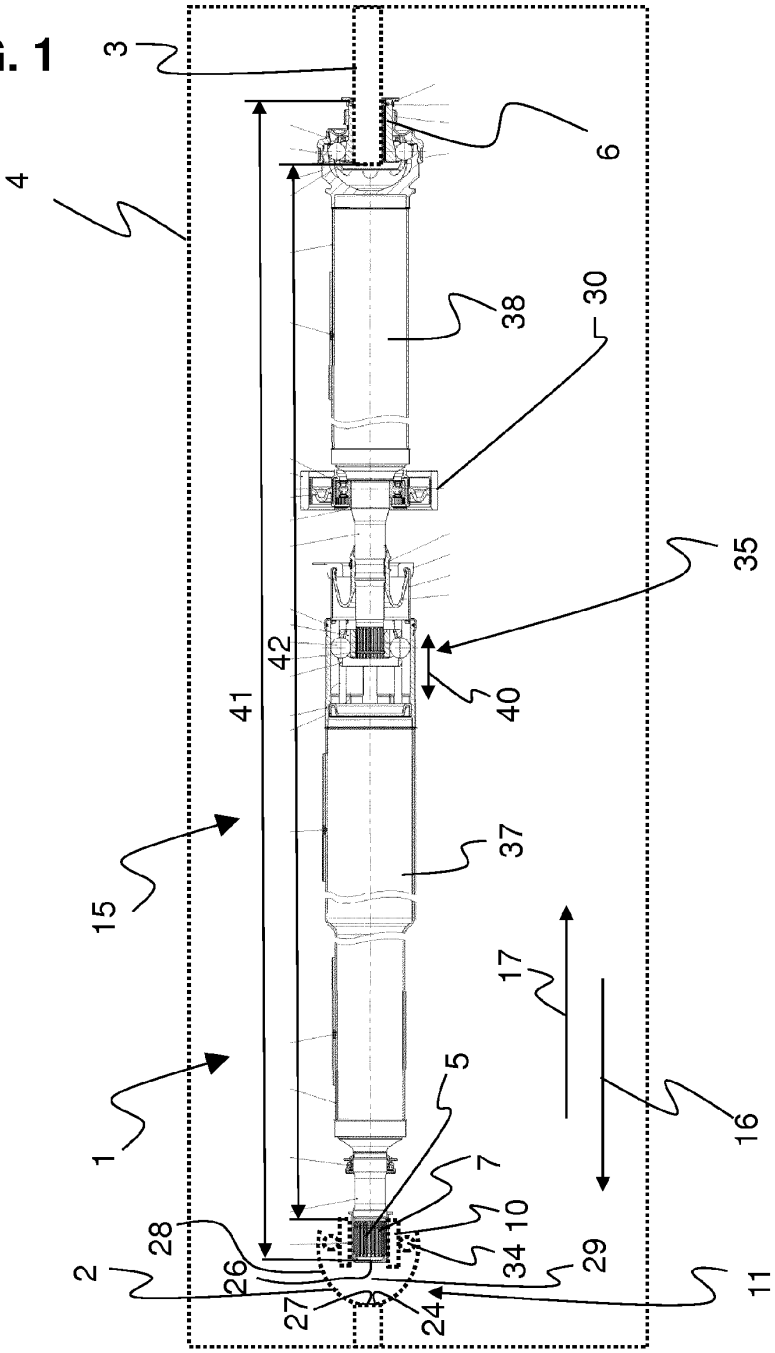
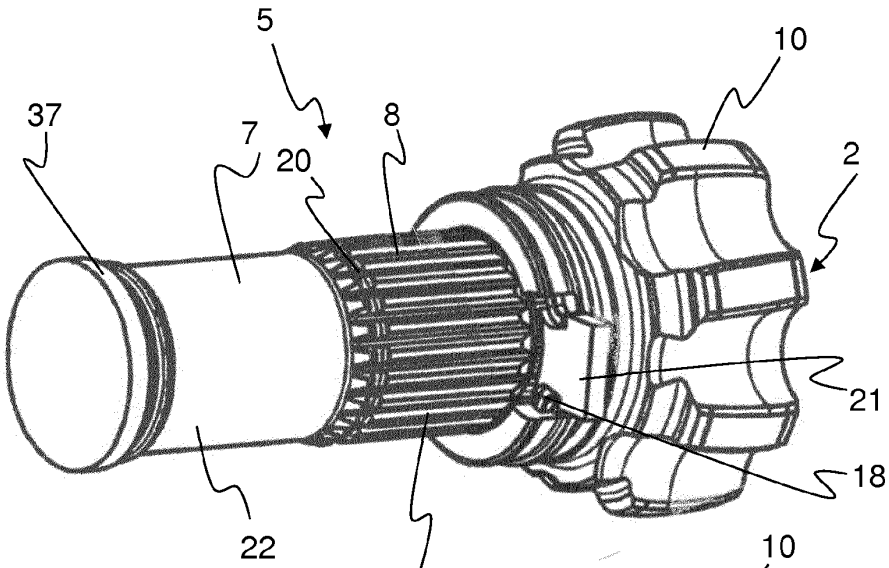


FIG. 2


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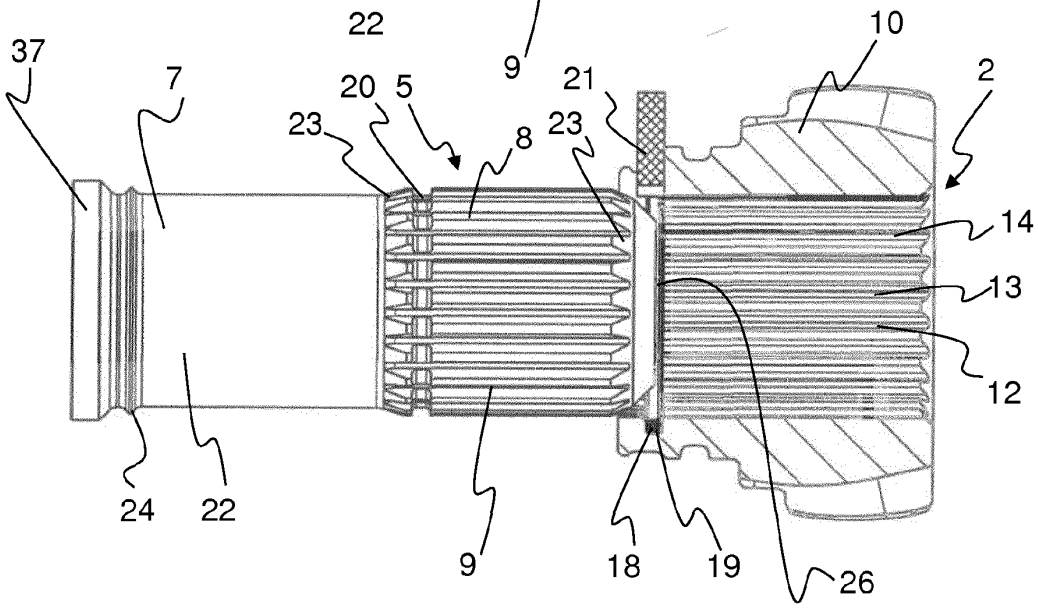

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FIG. 3

FIG. 4

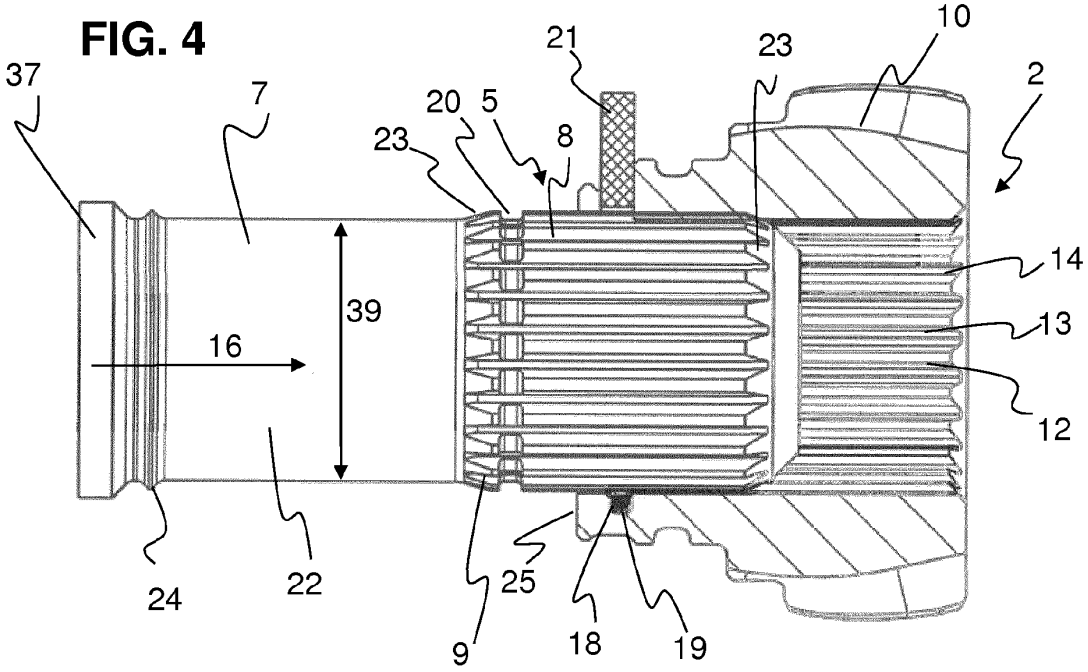

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FIG. 5

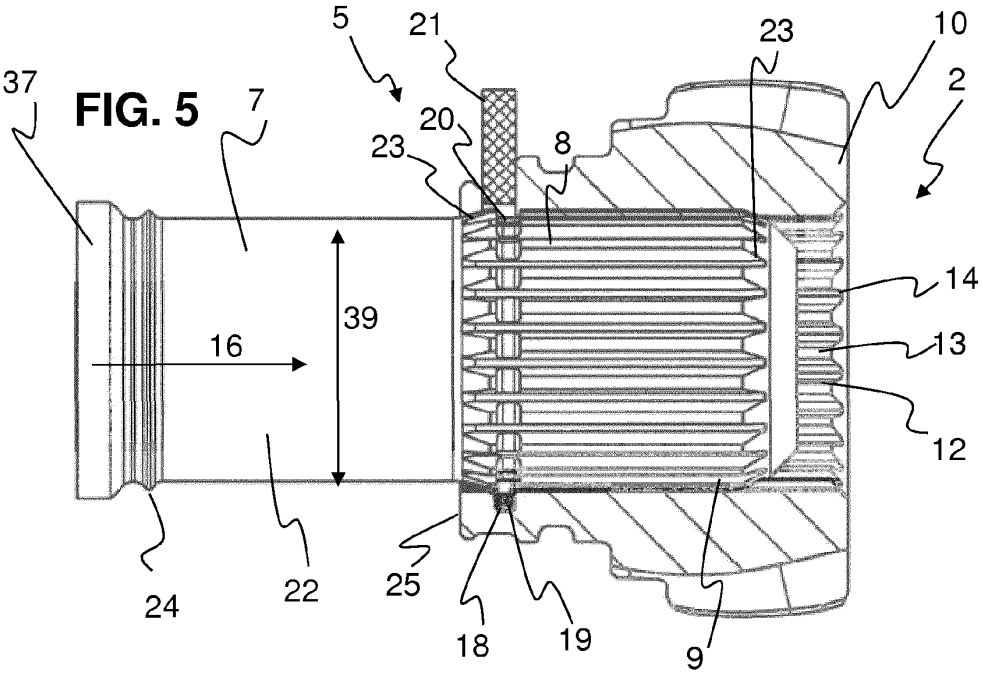
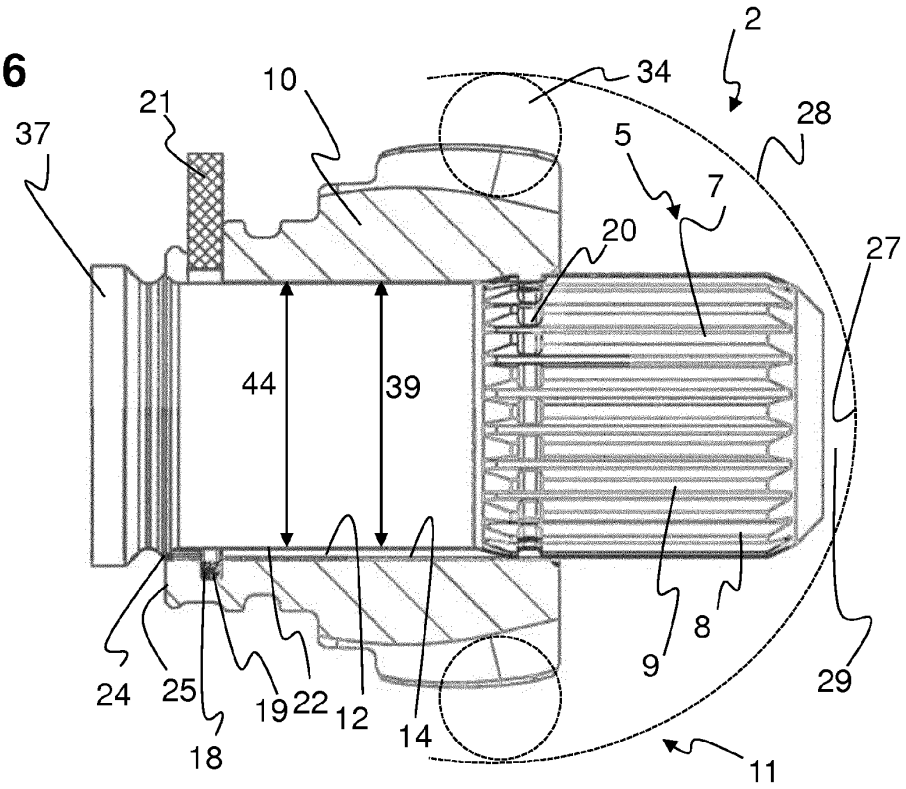

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FIG. 6


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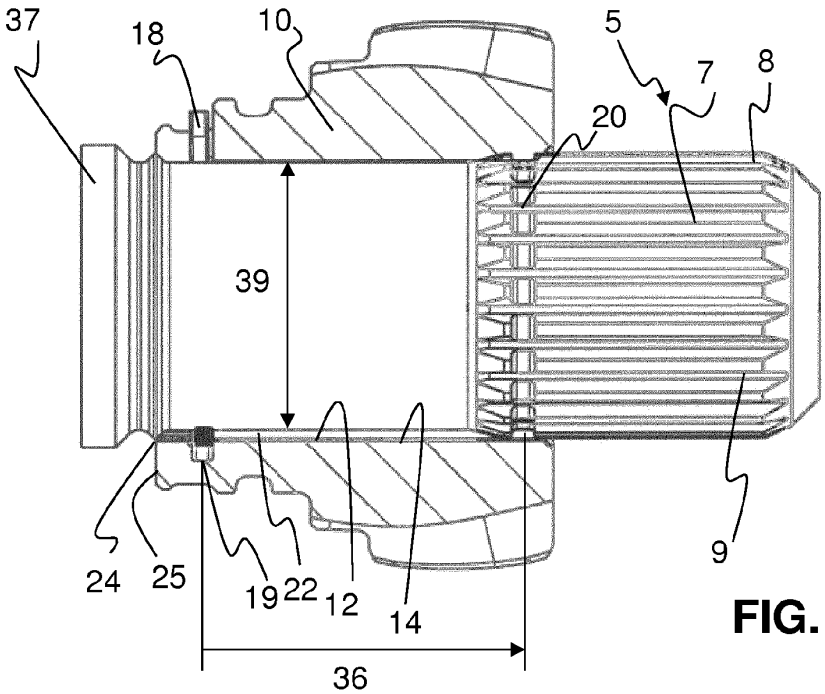
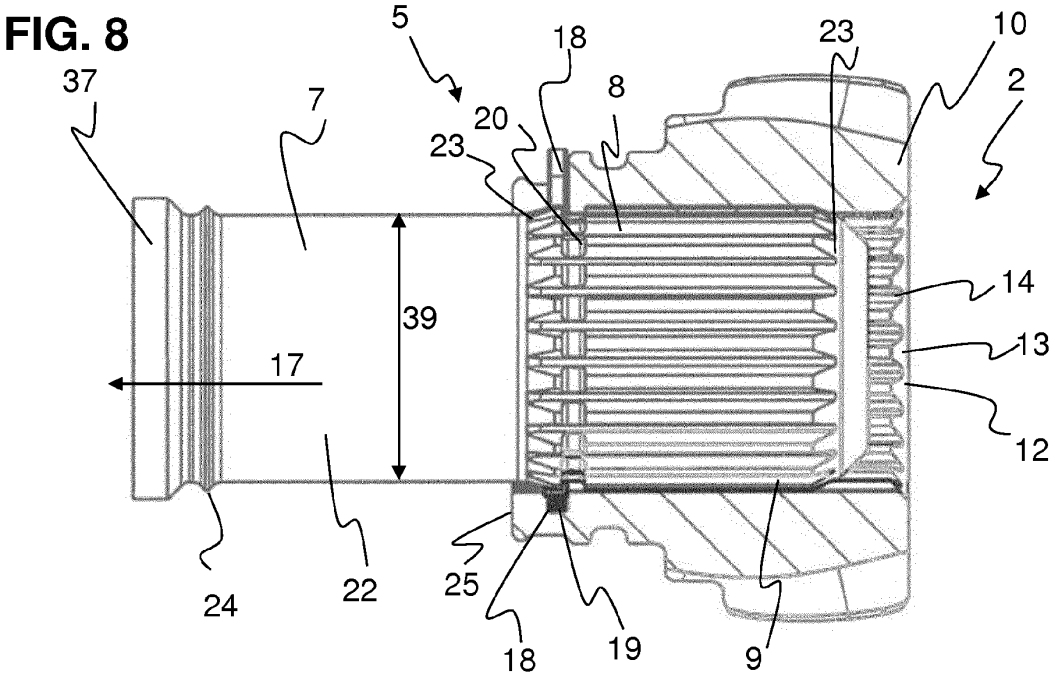

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FIG. 7

FIG. 8


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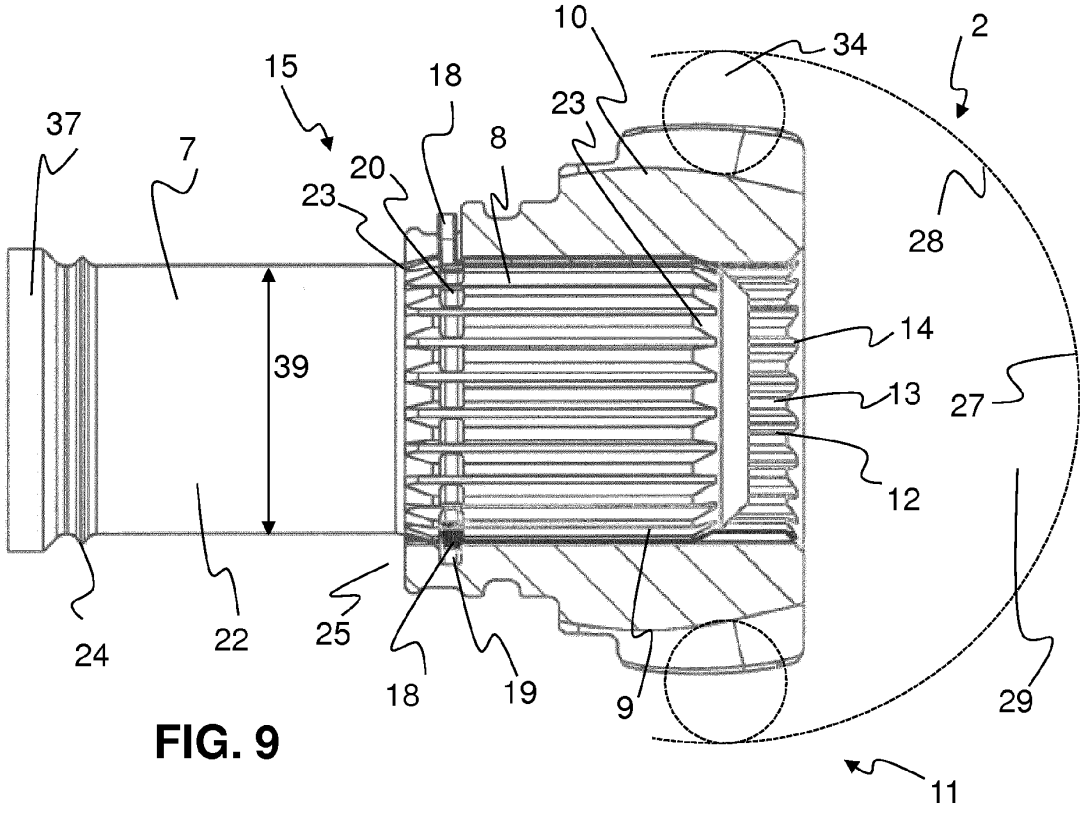

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FIG. 9

FIG. 10

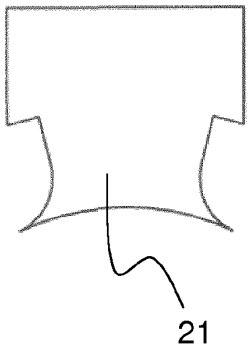


FIG. 11

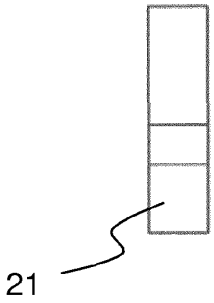


FIG. 12

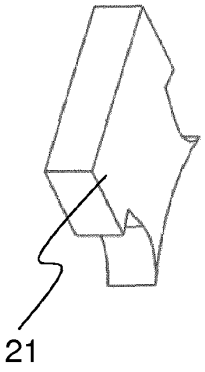


FIG. 13

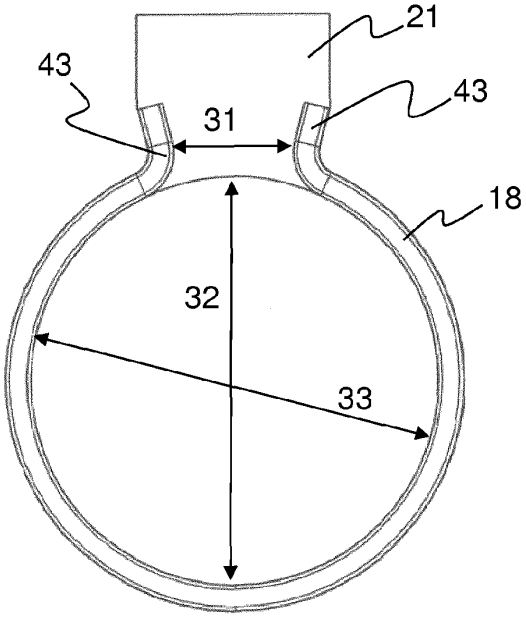
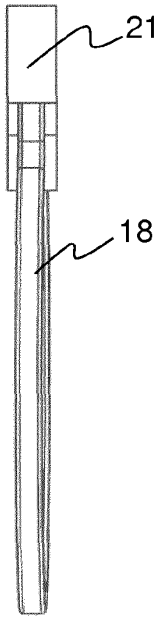


FIG. 14



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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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 :

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

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

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

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"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	Date of mailing of the international search report
10 June 2015	14/07/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Arboreanu, Antoniu

Form PCT/ISA/210 (second sheet) (April 2005)

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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

Form PCT/ISA/210 (patent family annex) (April 2005)

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

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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
WO 2014121832 A1	14-08-2014	KEINE	
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TITLE: METHOD FOR MOUNTING A DRIVE SHAFT ASSEMBLY IN A MOTOR VEHICLE, AND CORRESPONDING MOTOR VEHICLE

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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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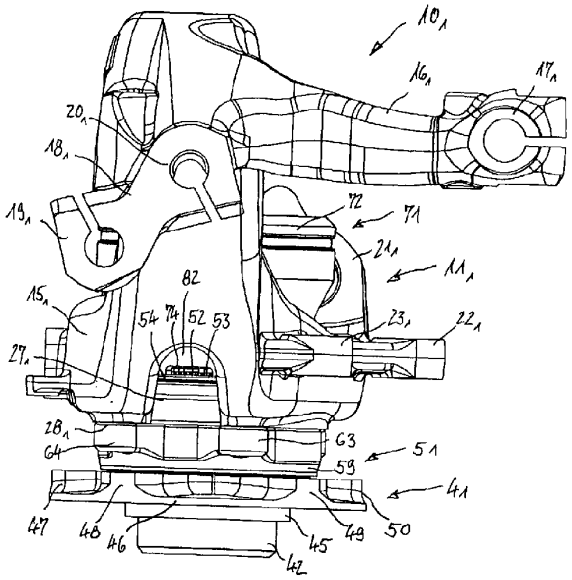
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DE 197 51 855 C1
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Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

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_1 im Ringteil 15_1 in zumindest einer Umfangsposition eine Ausbrechung 27_1 ausgebildet ist, so daß ein Sicherungsring mittels eines Zangenwerkzeuges durch die Ausbrechung 27_1 hindurch handhabbar ist.



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Beschreibung

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 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 Gelenkaußentiel 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 Sicherungsrings aufnimmt. Zum Darstellen der Manipulierbarkeit des Sicherungsrings 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 abgeschlossenen, ist eine Demontage nur noch unter Zerstörung des Sicherungsrings 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 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 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 Zangenwerkzeuges 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 Sicherungsrings 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-

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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 Sicherungsrings eingreifen und sich an dieser in Umfangsrichtung abstützen. Die über die Ausklinkung nach außen vorstehenden Enden des Sicherungsrings 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 Radnabeneinheit 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 Gleichlaufdrehgelenks 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 $\mathbf{10}_1$ umfaßt einen Radträger $\mathbf{11}_1$, eine Radnabe **41** und ein Gleichlaufgelenk **71**. Am Radträger $\mathbf{11}_1$ ist ein zentrales Ringteil $\mathbf{15}_1$ erkennbar, an dem ein erster Lenker arm 16_1, mit einem Befestigungsauge $\mathbf{17}_1$, und ein zweiter Lenkerarm $\mathbf{18}_1$, mit zwei Befestigungsaugen $\mathbf{19}_1$, $\mathbf{20}_1$ erkennbar sind. Weitere Befestigungsaugen $\mathbf{21}_1$, $\mathbf{22}_1$, $\mathbf{23}_1$ sind mit unterschiedlicher Bohrungsrichtung unmittelbar am Ringteil $\mathbf{15}_1$ angeformt. Im Ringteil $\mathbf{15}_1$ ist eine zur Radnabeneinheit **41** hin offene Ausbrechung $\mathbf{27}_1$, die sich parallel zur Achse des Ringteils bis zu einer Flanschfläche $\mathbf{28}_1$ des Ringteils $\mathbf{15}_1$ erstreckt und in dieser mündet. Die Radnabeneinheit **41** umfaßt ein Radlager **51** mit einem Lageraußenring **59**, an dem Anschraubaugen **63**, **64** zur Anschraubung an der Flanschfläche $\mathbf{28}_1$ des Ringteils $\mathbf{15}_1$ erkennbar sind, die unmittelbar zu beiden Seiten der Ausbrechung $\mathbf{27}_1$ 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 $\mathbf{27}_1$ im Ringteil $\mathbf{15}_1$ des Radträgers $\mathbf{11}_1$ 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 $\mathbf{27}_1$ sichtbar.

In **Fig.** 2 sind die gleichen Einzelheiten wie in **Fig.** 1 mit gleichen Bezugszeichen beziffert. Auf die entsprechende Beschreibung wird Bezug genommen. Radnabeneinheit **41**, Radträger $\mathbf{11}_1$ und Gleichlaufgelenkeinheit **71** sind längs an der Drehachse in Explosionsdarstellung gespreizt gezeigt. Am Radträger $\mathbf{11}_1$ sind über die bereits in **Fig.** 1 bezeichneten Einzelheiten hinaus keine weiteren erkennbar. An der Radnabeneinheit **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 $\mathbf{15}_1$ des Radträgers $\mathbf{11}_1$ von der Flanschfläche $\mathbf{28}_1$ her in Ansicht gezeigt, wobei die radiale Erstreckung der Ausbrechung $\mathbf{27}_1$ sehr deutlich wird. Am Ringteil $\mathbf{15}_1$ sind weitere Augen $\mathbf{24}_1$, $\mathbf{25}_1$, $\mathbf{26}_1$ mit parallel zur Achse verlaufenden Bohrungen sichtbar sowie weitere größere Augen $\mathbf{29}_1$, $\mathbf{30}_1$ für Drehzapfen bzw. Lenker. In der Flanschfläche $\mathbf{28}_1$ sind Gewindebohrungen $\mathbf{31}_1$, $\mathbf{32}_1$, $\mathbf{33}_1$, $\mathbf{34}_1$ zur Anschraubung des Lageraußenrings **59** ausgeführt. Weiter ist eine Ringnut $\mathbf{36}_1$ zur Aufnahme des bereits angesprochenen Dichtungsrings $\mathbf{54}_1$ im Durchgangsloch $\mathbf{35}_1$ des Ringteils $\mathbf{15}_1$ 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 $\mathbf{11}_2$, dessen Lenkerarm $\mathbf{16}_2$ abgebrochen dargestellt, und von dem weiterhin das Lagerauge $\mathbf{29}_2$ geschnitten dargestellt ist, ist eine Ausbrechung $\mathbf{27}_2$ ausgebildet, die sich im wesentlichen parallel zur Drehachse der Baueinheit $\mathbf{10}_2$ erstreckt und zugleich von dieser aus radial in den Lenkerarm $\mathbf{16}_2$ hineinreicht. Von der Radnabeneinheit **41** sind der Nabenkörper **45** und der Radflansch **46** erkennbar. Vom Radlager **51** sind über den Lage-

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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 Kugelkäfig **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 $\mathbf{10}_2$ Radträger $\mathbf{11}_2$, 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 Verdrehsicherung 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 $\mathbf{11}_2$ mit den bereits erläuterten Einzelheiten erkennbar, die hier in gleicher Weise beziffert sind. Es ist besonders deutlich die radseitige Ausbrechung $\mathbf{27}_2$ erkennbar, die sich symmetrisch zur Längsachse der Bohrung $\mathbf{35}_2$ und radial in den Lenkerarm $\mathbf{16}_2$ hinein erstreckt. Es ist nachvollziehbar, daß unter Nutzung der Ausbrechung $\mathbf{27}_2$ ein freier Zugriff auf den die Radnabeneinheit **41** und das Gleichlaufgelenk **71** verbindenden Sicherungsring **57** gegeben ist.

Bezugszeichliste

10 Baueinheit
11 Radträger
12
13
14
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
69
70
71 Gleichlaufgelenk
72 Gelenkaußenteil
73 Stirnfläche
74 Ausklinkung
75 Innenverzahnung
76 Ringnut
77 Gelenkinnenteil
78 Kugelkäfig
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

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Hülsenansatz (**82**) im Bereich der zweiten Verzahnung (**75**) ausgebildet ist, **dadurch gekennzeichnet**, daß am Radträger (11_1) im Ringteil (15_1) in zumindest einer Umfangsposition eine Ausbrechung (27_1) ausgebildet ist, die von der Radseite in das Ringteil (15_1) axial einschneidet und daß bei im Radträger (11_1) festgelegtem Wälzlager (**51**) und bei mit der Radnabe (**41**) verbundenem Gelenkaußenteil die beiden Ringnuten (**53**, **76**) axial korrespondierend zur Ausbrechung (27_1) liegen, so daß der Sicherungsring (**57**) mittels eines Zangenwerkzeuges durch die Ausbrechung (27_1) 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 (11_2) im Ringteil (15_2) in zumindest einer Umfangsposition eine Ausbrechung (27_2) ausgebildet ist, die von der Gelenkseite in das Ringteil (15_2) axial einschneidet und bei im Radträger (11_2) festgelegtem Wälzlager (**51**) und daß bei mit der Radnabe (**41**) verbundenem Gelenkaußenteil die beiden Ringnuten (**53**, **76**) axial korrespondierend zur Ausbrechung (27_2) liegen, so daß der Sicherungsring (**57**) mittels eines Zangenwerkzeuges durch die Ausbrechung (27_2) 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 (27_2) im Bereich eines Lenkerarms (16_2) 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 (27_2) 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**) verspannt ist.

Hierzu 7 Seite(n) Zeichnungen

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PET_AAM_1004-0110

Nummer: DE 100 08 182 A1
Int. Cl.[7]: B 60 B 27/04
Offenlegungstag: 13. September 2001

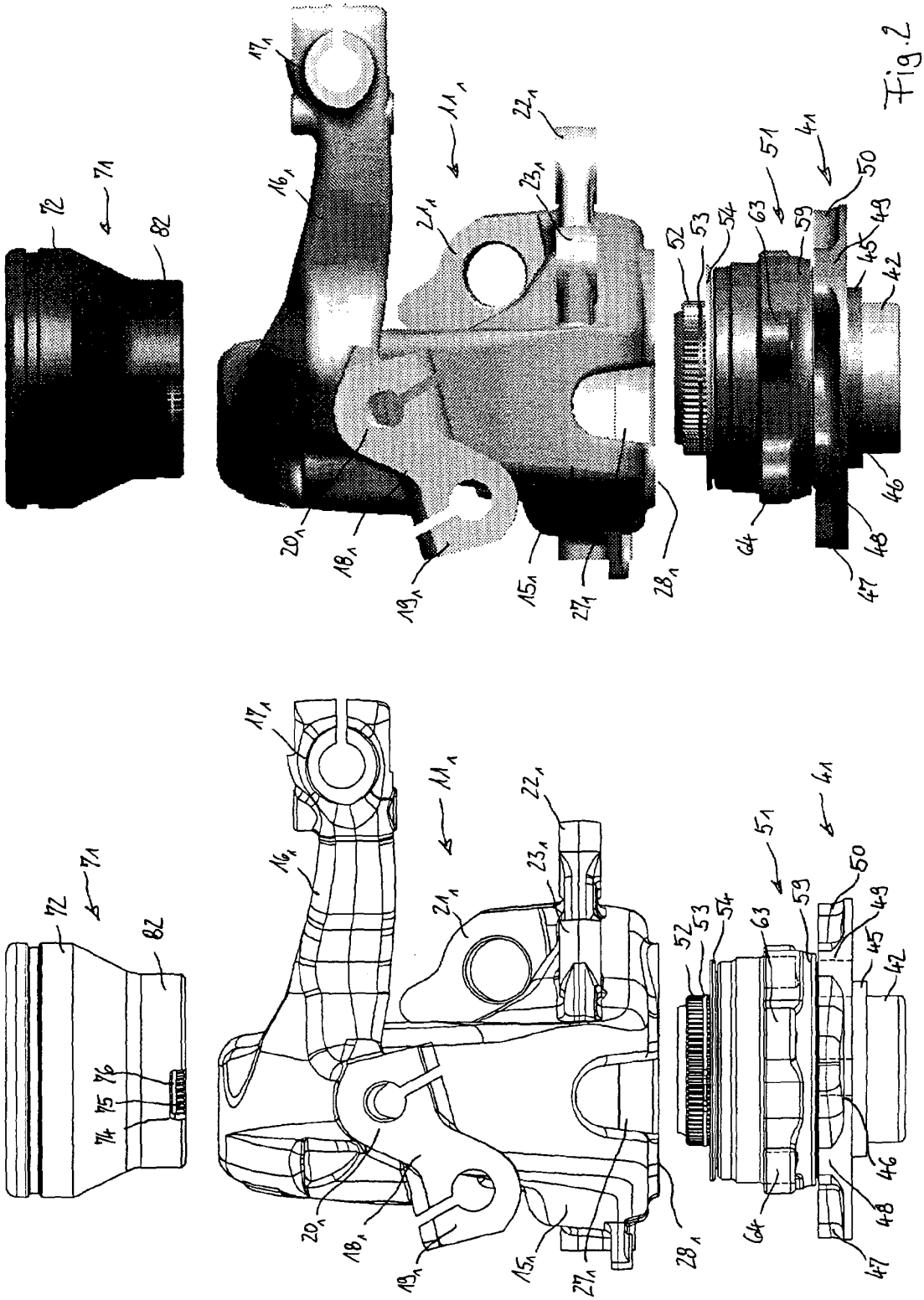


Fig. 2

101 370/69

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PET_AAM_1004-0111

Nummer: DE 100 08 182 A1
Int. Cl.[7]: B 60 B 27/04
Offenlegungstag: 13. September 2001

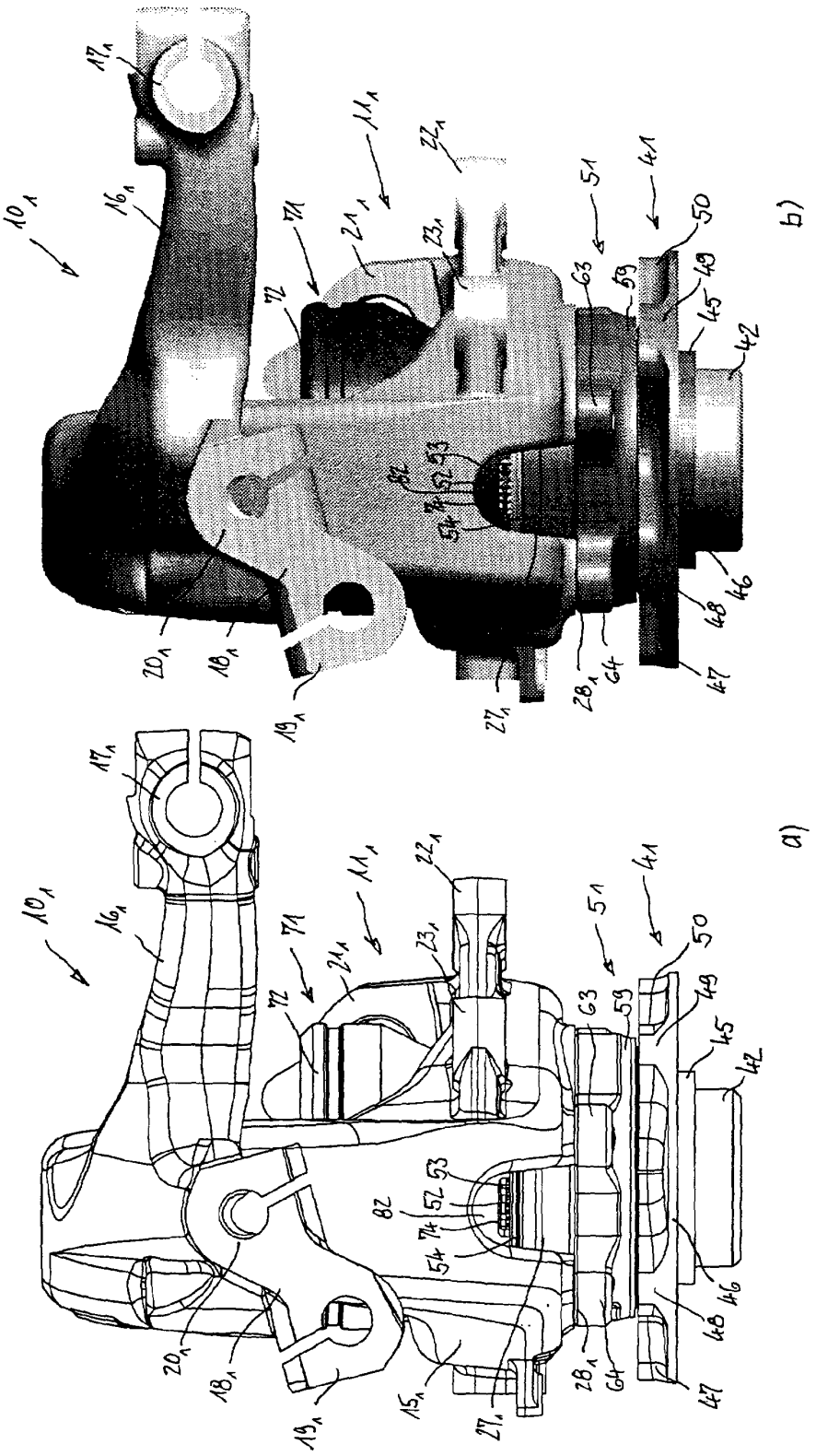


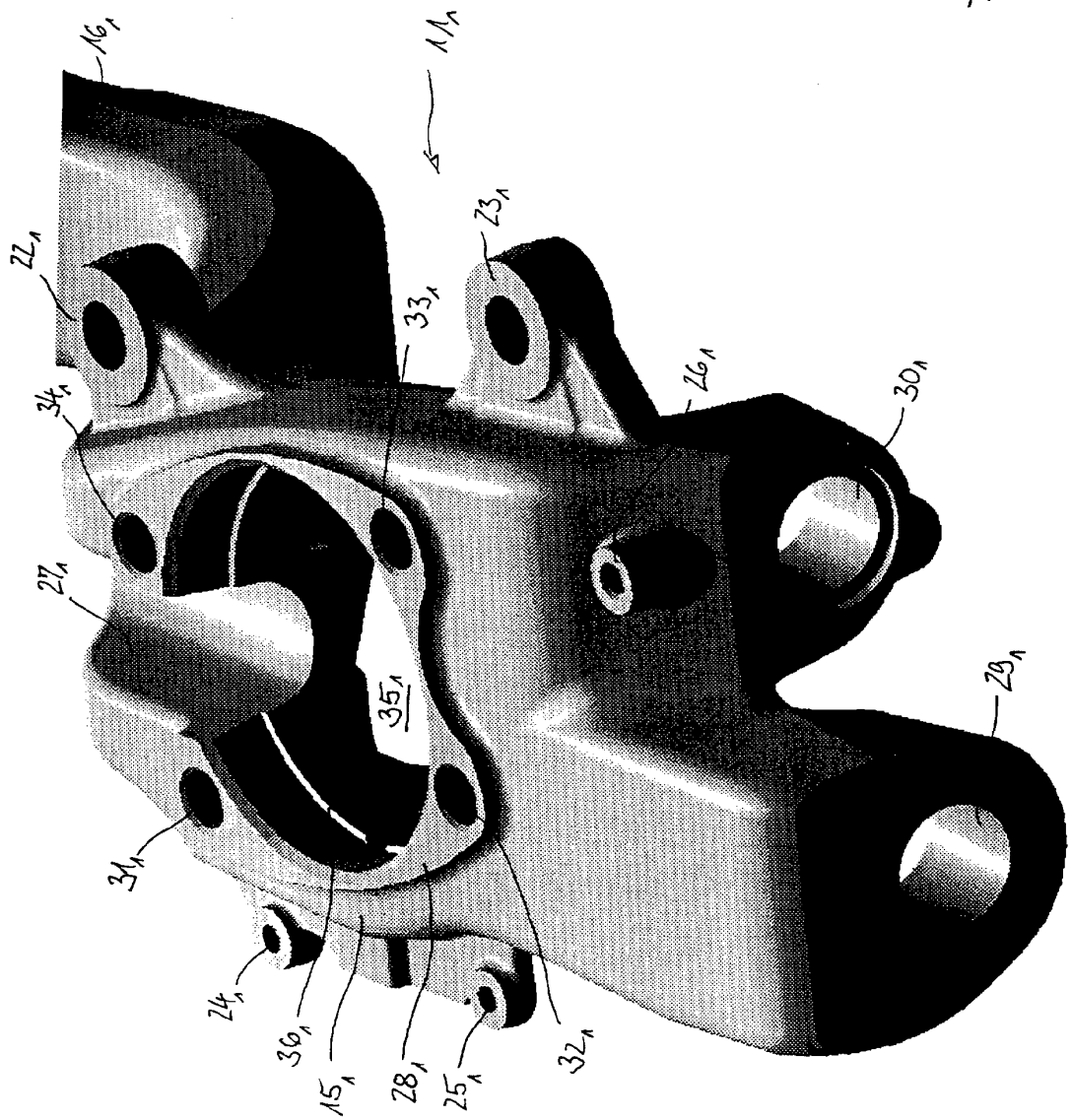
Fig. 1

101 370/69

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PET_AAM_1004-0112

Nummer: DE 100 08 182 A1
Int. Cl.[7]: B 60 B 27/04
Offenlegungstag: 13. September 2001

Fig. 3

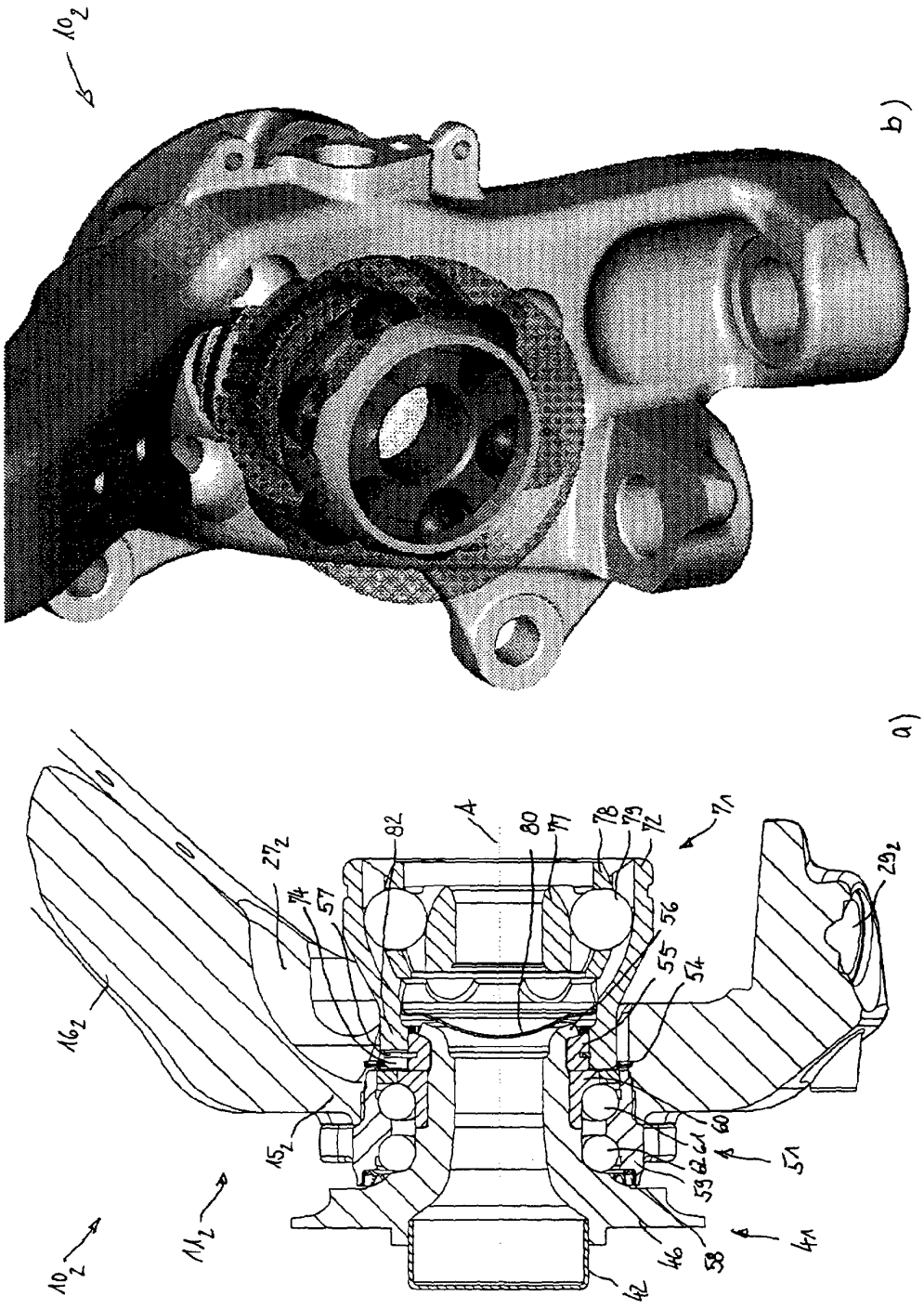


101 370/69

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PET_AAM_1004-0113

Nummer: DE 100 08 182 A1
Int. Cl.[7]: B 60 B 27/04
Offenlegungstag: 13. September 2001

Fig. 4

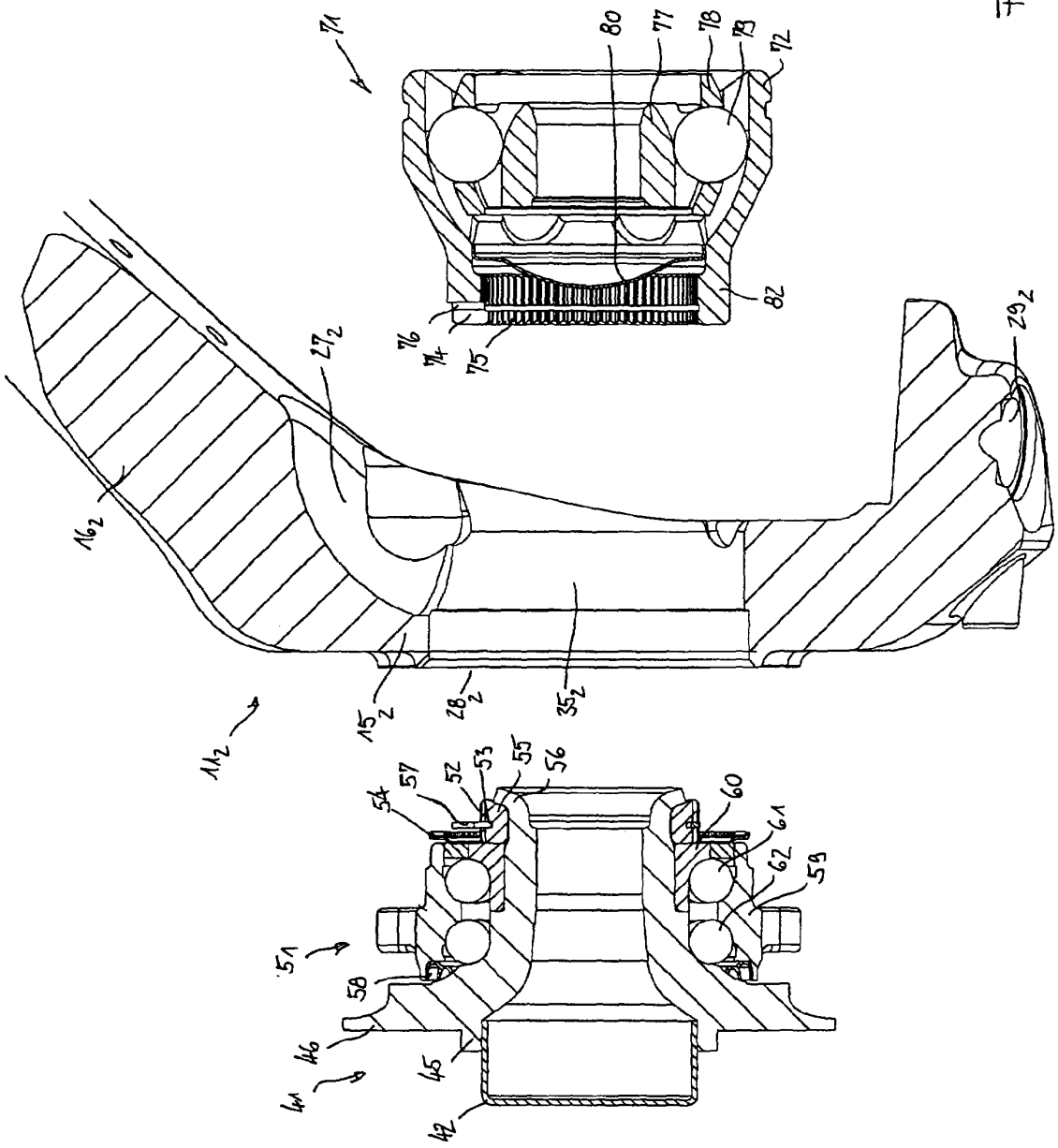


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Int. Cl.[7]: B 60 B 27/04
Offenlegungstag: 13. September 2001

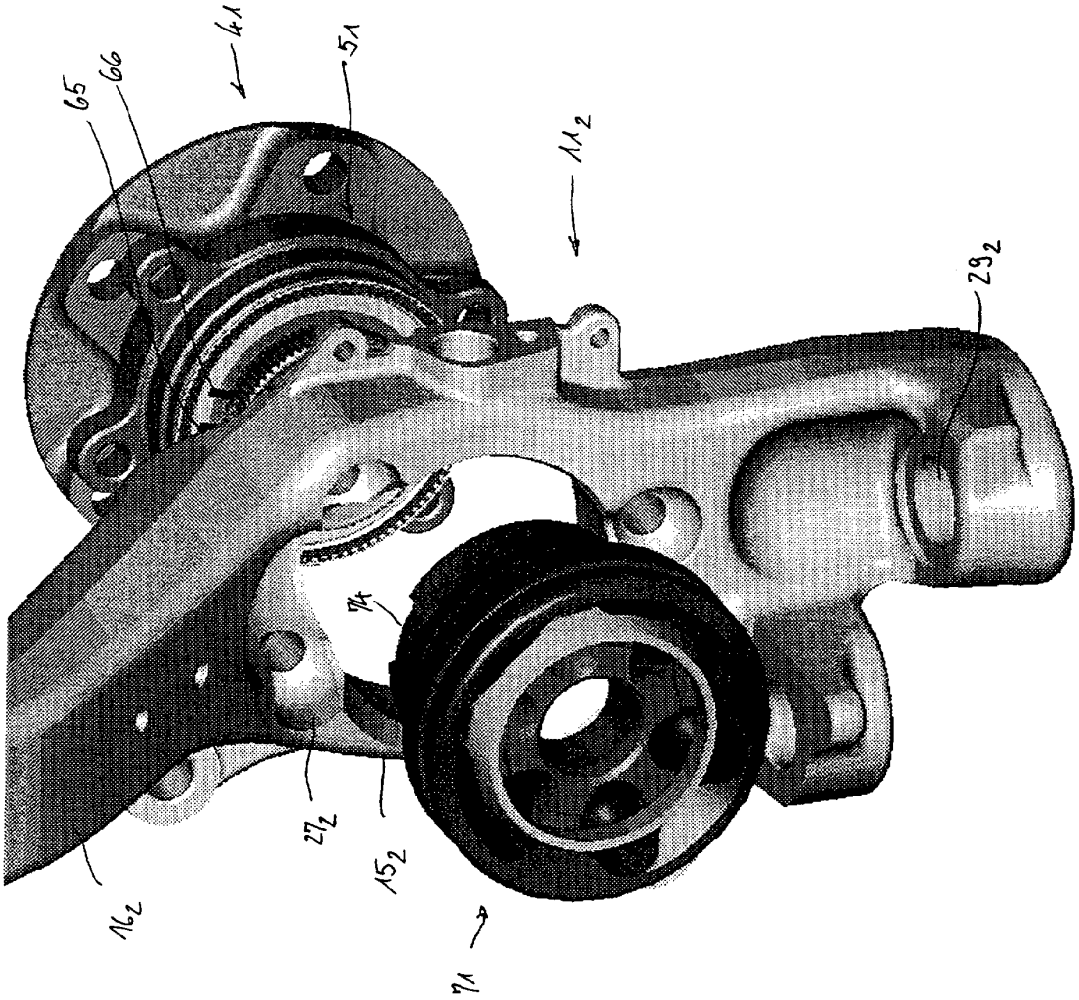
Fig. 5a



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Fig. 5b



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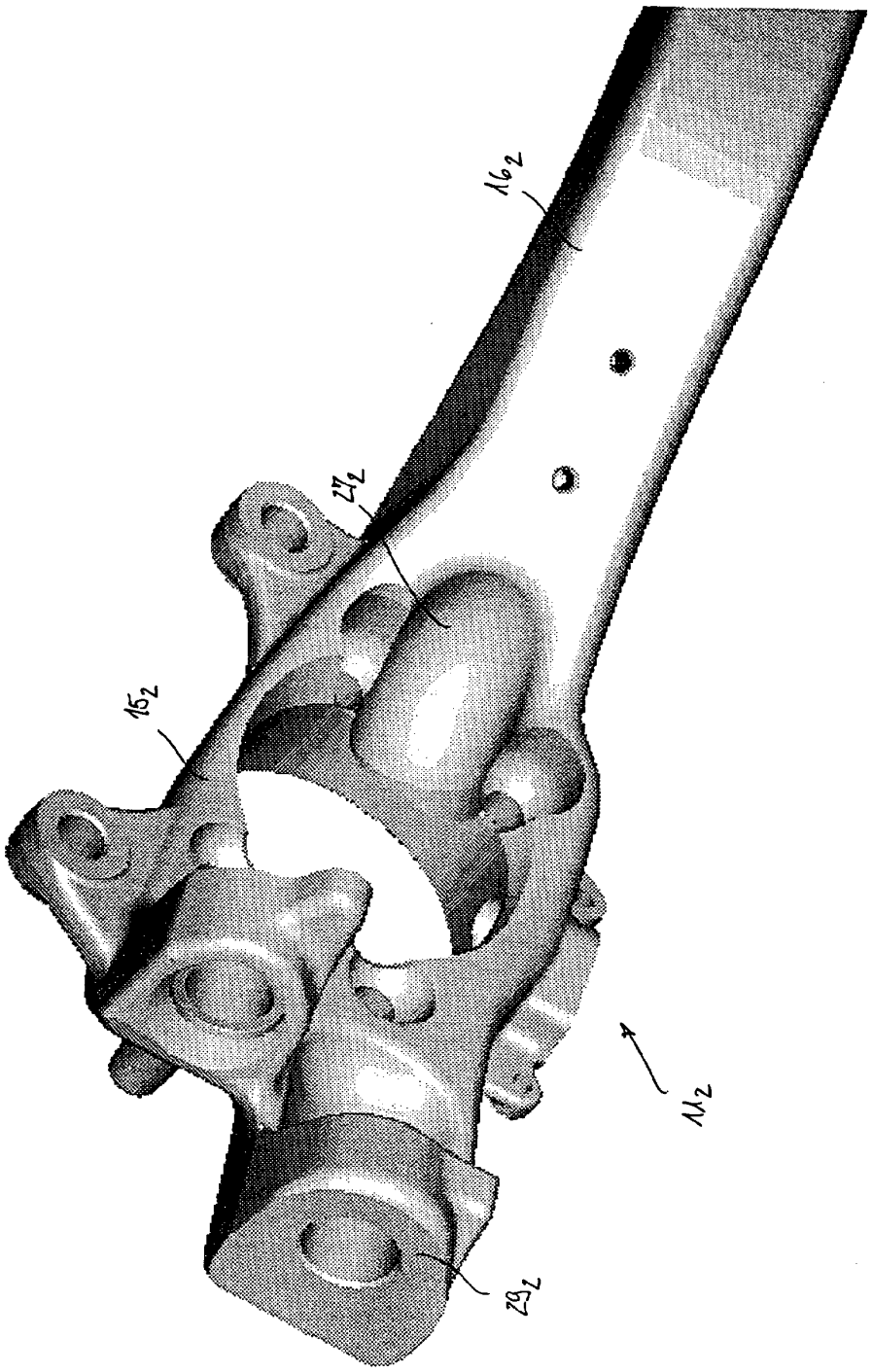


Fig. 6

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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.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
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(Not for submission under 37 CFR 1.99)

Application Number	15966085
Filing Date	2018-04-30
First Named Inventor	Michael Walter Hopson
Art Unit	~~2833~~ 3678
Examiner Name	/ALEXUS CAMERO/
Attorney Docket Number	206898/58974-1

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	2	6251019	B1	2001-06-26	Hofmann et al.	
	3	7922590	B2	2011-04-12	Pallante	
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	Filing Date	2018-04-30
	First Named Inventor	Michael Walter Hopson
	Art Unit	~~2833~~ 3678
	Examiner Name	/ALEXUS CAMERO/
	Attorney Docket Number	206898/58974-1

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	Application Number	15966085
	Filing Date	2018-04-30
	First Named Inventor	Michael Walter Hopson
	Art Unit	~~2833~~ 3678
	Examiner Name	/ALEXUS CAMERO/
	Attorney Docket Number	206898/58974-1

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See attached certification statement.

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

☒ A certification statement is not submitted herewith.

SIGNATURE

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)	2018-05-22
Name/Print	James D. Miller	Registration Number	46932

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	8	US-6739422-$ | US-6251019-$ | US-7922590-$ | US-8231475-$	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 15:39
S3	78	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY") near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/01/11 16:02
S5	346	((("HOPSON") near3 ("Michael")) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 16:07
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S10	3,350	F16D1/112,116.cpc. NOT S7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:14
S12	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:53
S17	5,135	F16B21/18,186.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:50
S18	1,981	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:51
S19	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO;	OR	ON	2021/01/12 18:51

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S24	3,919	F16D2001/103.cpc. NOT (S17 S18 S19 S21)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S25	1,581	Y10T403/7033.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S26	936	Y10T403/7033.cpc. NOT (S17 S18 S19 S21 S23)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:18
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S56	448	joint near3 (seal) near3 (cutout notch window)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 15:49
S57	3,197	(joint near2 shaft) with seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:22
S59	597	(joint near2 shaft) near2 seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:22

S60	8,143	joint and (retaining adj ring) and seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:39
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S62	193	joint and ((retaining adj ring) with seal) and spline	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:39
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EAST Search History (Interference)

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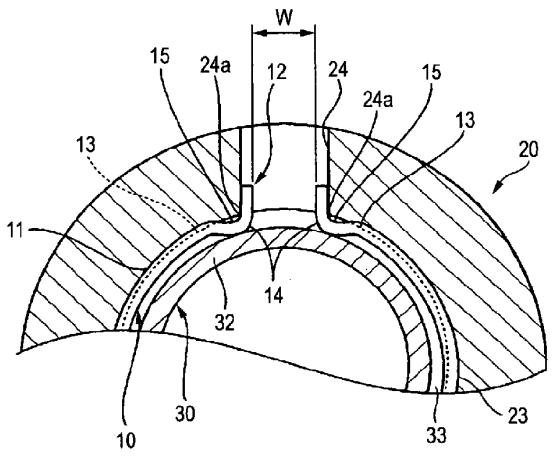
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(54) Snap ring

(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 rove 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

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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 sufficiently 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

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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-

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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:

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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.

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:

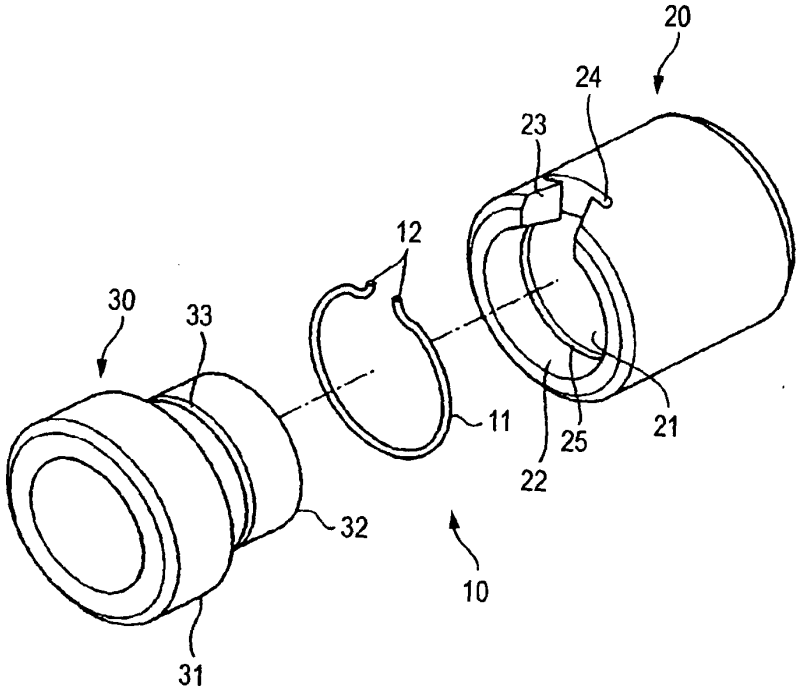
a circumferential portion, which is curved in a circular shape fitting an outer periphery of the shaft or an inner periphery of the hole of the holding member; and
a pair of projecting end portions, which extend substantially in parallel to each other from both ends of the circumferential portion with being bent radially 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:

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.

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.

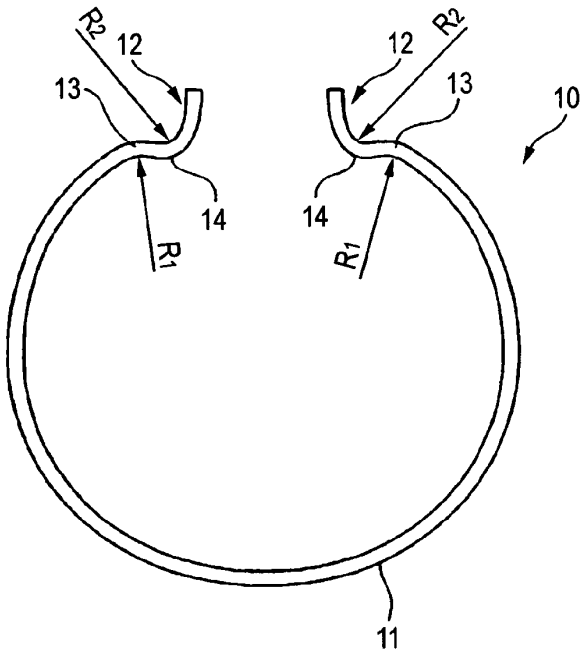
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FIG. 1



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FIG. 2



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FIG. 3A

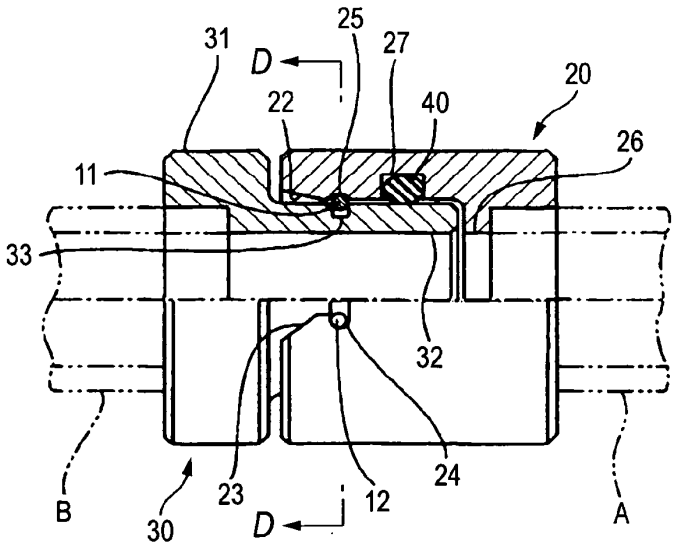
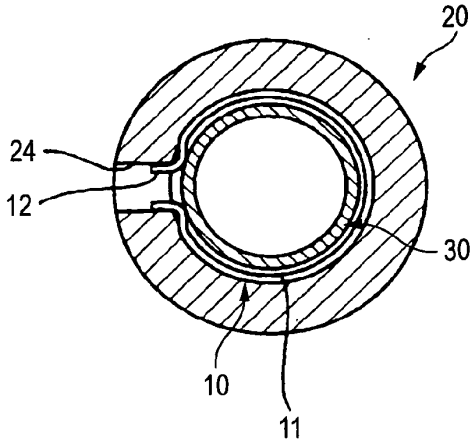
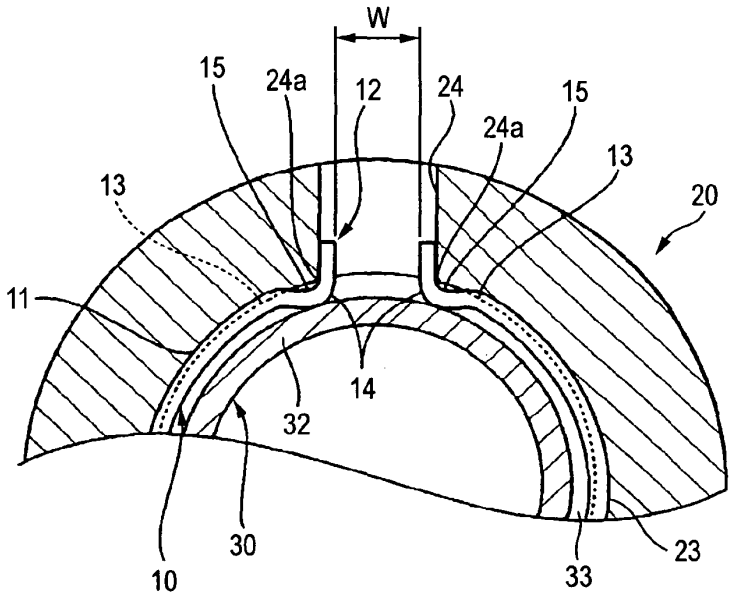


FIG. 3B



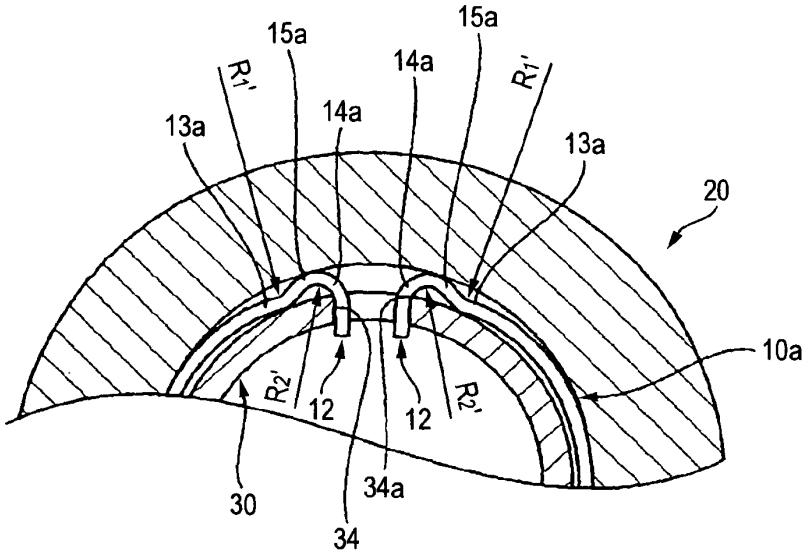
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FIG. 4



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FIG. 5



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FIG. 6A

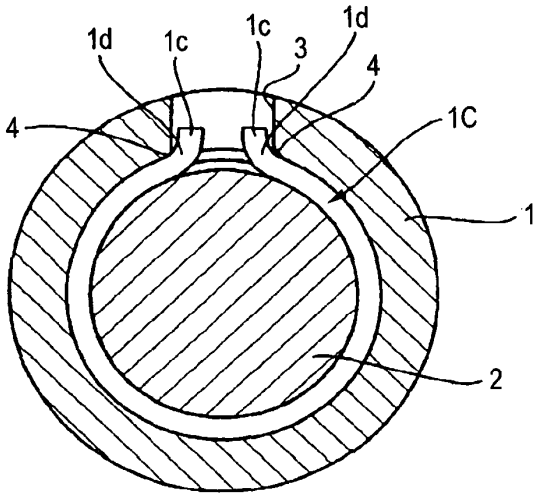
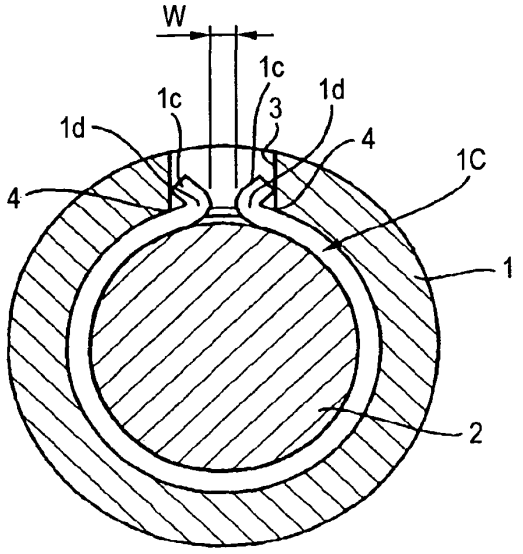


FIG. 6B



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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
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A : technological background
O : non-written disclosure
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D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 02 8745

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20-03-2006

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EPO FORM P0459

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

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PET_AAM_1004-0143

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

APPL-NO: EP 05028745 A

APPL-DATE: December 30, 2005

PRIORITY-DATA:

PRIORITY-NO	PRIORITY-APPL-DATE
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

APC JP 63142413 U 19880920

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).

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENT- UND MARKENAMT

(12) **Patentschrift**

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(51) Int. Cl.[7]:
B 60 B 27/04
B 60 K 17/22

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DE 100 08 183 C 1

Innerhalb von 3 Monaten nach Veröffentlichung der Erteilung kann Einspruch erhoben werden

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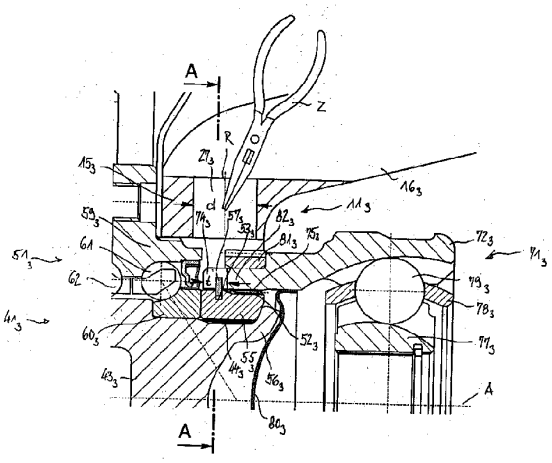
(72) Erfinder:
Krude, Werner, Dipl.-Ing., 53819 Neunkirchen-Seelscheid, DE; Fuchs, Heinzwilli, 53783 Eitorf, DE

(56) Für die Beurteilung der Patentfähigkeit in Betracht gezogene Druckschriften:

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_3, 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_3 liegen.



DE 100 08 183 C 1

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Beschreibung

[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 Sicherungsrings aufnimmt. Zur Manipulierbarkeit des Sicherungsrings 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 abgeschlossenen, ist eine Demontage nur noch unter Zerstörung des Sicherungsrings 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 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.

[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 Sicherungsrings 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 Sicherungsrings 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

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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 $\mathbf{10}_3$ gezeigt, die eine Nabenanordnung $\mathbf{41}_3$ und ein Gleichlaufgelenk $\mathbf{71}_3$ umfaßt. Am Nabenkörper $\mathbf{45}_3$ ist ein Zwischenboden $\mathbf{43}_3$ vorgesehen. Eine Umbördelung $\mathbf{56}_3$ am Nabenkörper $\mathbf{45}_3$ hält einen Treibring $\mathbf{55}_3$, der mit dem Nabenkörper $\mathbf{45}_3$ über Längsverzahnungen $\mathbf{44}_3$ ineinandergreift. Der Treibring $\mathbf{55}_3$ hält seinerseits einen Lagerinnenring $\mathbf{60}_3$ eines Radlagers $\mathbf{51}_3$. Eine Dichtung $\mathbf{59}_3$ dichtet das Radlager ab. Zwei Wälzkörperreihen $\mathbf{61}_3$, $\mathbf{62}_3$ und der Lageraußenring $\mathbf{59}_3$ des Radlagers $\mathbf{51}_3$ sind ebenfalls dargestellt. Am Treibring $\mathbf{55}_3$ ist eine Außenverzahnung $\mathbf{52}_3$ und eine Ringnut $\mathbf{53}_3$ erkennbar. Das Gleichlaufgelenk $\mathbf{71}_3$ umfaßt ein Gelenkaußenteil $\mathbf{72}_3$ mit einem Hülsenansatz $\mathbf{82}_3$, ein Gelenkinnenteil $\mathbf{77}_3$, einen Käfig $\mathbf{78}_3$ und Kugeln $\mathbf{79}_3$. An der Stirnseite $\mathbf{73}_3$ des Hülsenansatzes $\mathbf{82}_3$ ist eine Ausklinkung $\mathbf{74}_3$ erkennbar. Eine Innenverzahnung $\mathbf{75}_3$ am Hülsenansatz $\mathbf{82}_3$ wirkt mit einer Außenverzahnung $\mathbf{52}_3$ am Treibring $\mathbf{55}_3$ zusammen. Am Umfang trägt das Gelenkaußenteil $\mathbf{72}_3$ einen Geberring $\mathbf{81}_3$, für einen ABS-Sensor.

[0015] Von einem Radträger $\mathbf{11}_3$ ist nur ein Ringteil $\mathbf{15}_3$ im Schnitt dargestellt, an dem ein henkerarm 16_3 abgebrochen gezeichnet ist. In axialer Zuordnung zur Ringnut $\mathbf{53}_3$ ist im Ringteil $\mathbf{15}_3$ eine radiale Bohrung $\mathbf{27}_3$ mit zur Achse A der Baueinheit $\mathbf{10}_3$ etwa radialer Mittelachse R ausgeführt. Ein Zangenkörper Z soll andeuten, daß über diese Bohrung $\mathbf{27}_3$ und die Ausklinkung $\mathbf{74}_3$ freier Zugriff zum Sicherungsring $\mathbf{57}_3$ gegeben ist. Der Durchmesser d der Bohrung $\mathbf{27}_3$ ist größer als die axiale Tiefe t der Ausklinkung $\mathbf{74}_3$. In die Bohrung $\mathbf{27}_3$ 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 $\mathbf{45}_3$, Verzahnung $\mathbf{44}_3$, Treibring $\mathbf{55}_3$, Sicherungsring $\mathbf{57}_3$ in Ringnut $\mathbf{53}_3$ und in Ringnut $\mathbf{76}_3$, Hülsenansatz $\mathbf{82}_3$ am Gelenkaußenteil, alle jeweils im Querschnitt, Ausklinkung $\mathbf{74}_3$ im Hülsenansatz $\mathbf{82}_3$ und Geberring $\mathbf{81}_3$ jeweils in Ansicht, Gelenkaußenteil $\mathbf{72}_3$ in Ansicht, Ringteil $\mathbf{15}_3$ des Radträgers mit radialer Bohrung **273** im teilweise weggebrochenen Querschnitt. Am Sicherungsring sind die Enden $\mathbf{65}_3$ und $\mathbf{66}_3$ bezeichnet, die von der Zange Z durch die Bohrung $\mathbf{27}_3$ hindurch ergriffen und zusammengeführt werden, so daß der Sicherungsring $\mathbf{57}_3$ aus der Innennut $\mathbf{76}_3$ im Hülsenansatz $\mathbf{82}_3$ am Gelenkaußenteil austritt und das Gelenkaußenteil von der Radnabe zerstörungsfrei demontiert werden kann. Der Durchmesser d der Bohrung $\mathbf{27}_3$ ist kleiner als die Umfangserstreckung b der Ausklinkung $\mathbf{74}_3$.

[0017] In **Fig.** 3 sind der Radträger $\mathbf{11}_3$, die Radnabeneinheit $\mathbf{41}_3$ und das Gleichlaufgelenk $\mathbf{71}_3$ bezeichnet, wobei Einzelheiten in gleicher Weise beziffert sind, wie in den vorherigen Figuren. An der Radnabeneinheit ist weiter ein Radflansch $\mathbf{46}_3$ bezeichnet. Im Ringteil $\mathbf{15}_3$ ist die radiale Bohrung $\mathbf{27}_3$ gezeigt, die einen durchgehenden Dichtungsring $\mathbf{54}_3$ sowie die freien, nach radial außen umgebogenen Enden **65**, **66** des Sicherungsrings $\mathbf{57}_3$ erkennen läßt. Hiermit kann über den Zugriff mittels der Zange Z und Zusammendrükken der Enden **65**, **66** der Sicherungsring $\mathbf{57}_3$ so reduziert werden, daß er tiefer in die Ringnut $\mathbf{53}_3$ im Treibring $\mathbf{55}_3$ eintritt und dabei gleichzeitig aus der Innenringnut $\mathbf{76}_3$ im Gelenkaußenteil $\mathbf{72}_3$ herausgleitet, so daß das Gleichlaufgelenk $\mathbf{71}_3$ zerstörungsfrei axial von der Nabeneinheit $\mathbf{41}_3$, d. h. speziell vom Treibring $\mathbf{53}_3$ gelöst werden kann.

[0018] In **Fig.** 4 ist die Baueinheit $\mathbf{10}_3$ nach dem Entfernen des Gleichlaufdrehgelenks $\mathbf{71}_3$ gezeigt. Durch die radiale Bohrung $\mathbf{27}_3$ wird hierbei die Außenverzahnung $\mathbf{52}_3$ der Nabenanordnung $\mathbf{41}_3$ mit der eingedrehten Ringnut $\mathbf{53}_3$ und dem Sicherungsring $\mathbf{57}_3$ erkennbar. Die Radnabe $\mathbf{41}_3$ ist im Radlager $\mathbf{51}_3$ so gedreht, daß wieder die Enden $\mathbf{65}_3$, $\mathbf{66}_3$ des Sicherungsrings $\mathbf{57}_3$ 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-

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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 ($\mathbf{27}_3$) 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 ($\mathbf{27}_3$) und zur Ausklinkung (**74**) liegen, **dadurch gekennzeichnet**, daß der Durchmesser d der Bohrung ($\mathbf{27}_3$) kleiner ist, als die Umfangserstreckung b der Ausklinkung (**74**) und der Sicherungsring (**57**) mittels eines Zangenwerkzeuges durch die Bohrung ($\mathbf{27}_3$) 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 ($\mathbf{27}_3$).

3. Baueinheit nach einem der Ansprüche 1 und 2, dadurch gekennzeichnet, daß nach außen aufgebogene Enden (**65**, **66**) des Sicherungsrings (**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**) verspannt ist.

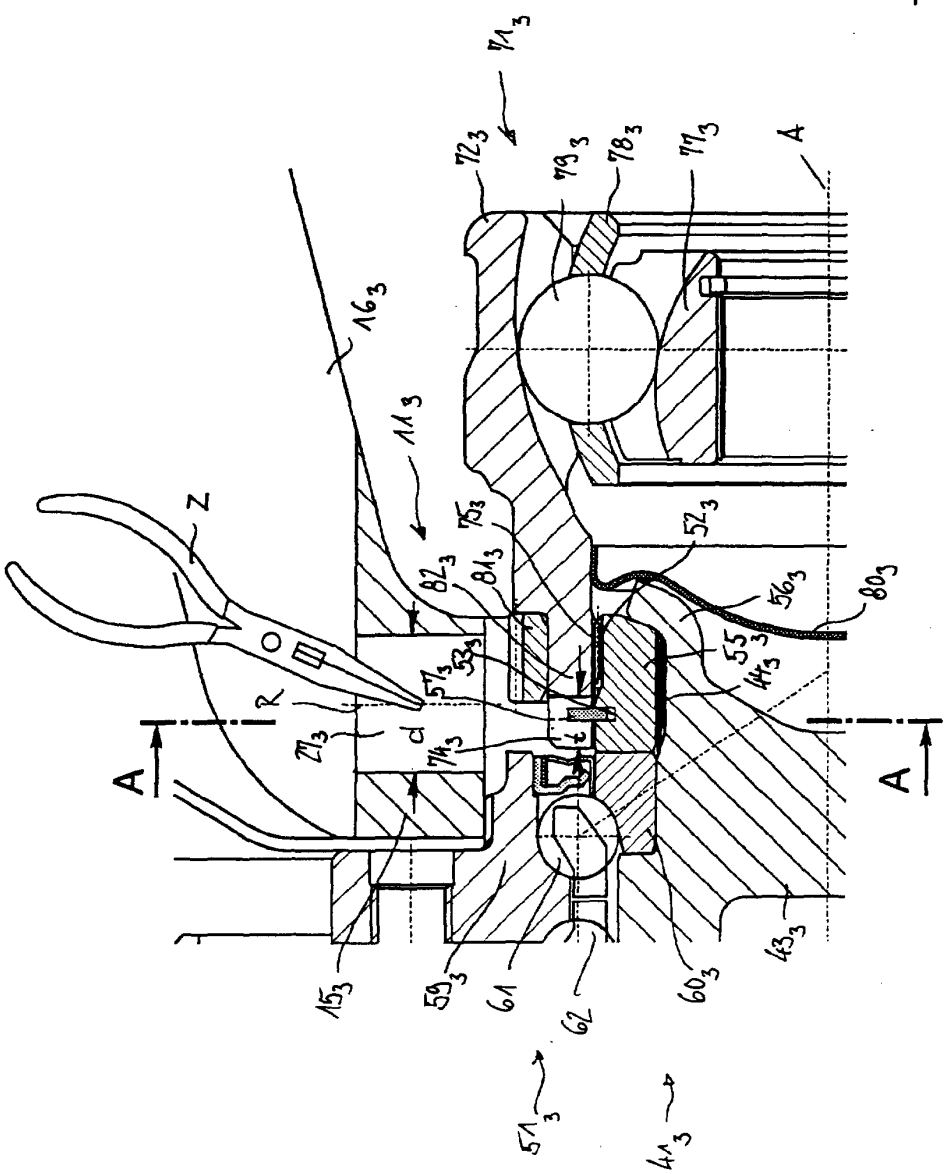
6. Baueinheit nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Bohrung ($\mathbf{27}_3$) zur Aufnahme eines ABS-Sensors dient.

Hierzu 4 Seite(n) Zeichnungen

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PET_AAM_1004-0149

Nummer: DE 100 08 183 C1
Int. Cl.[7]: B 60 B 27/04
Veröffentlichungstag: 13. Dezember 2001

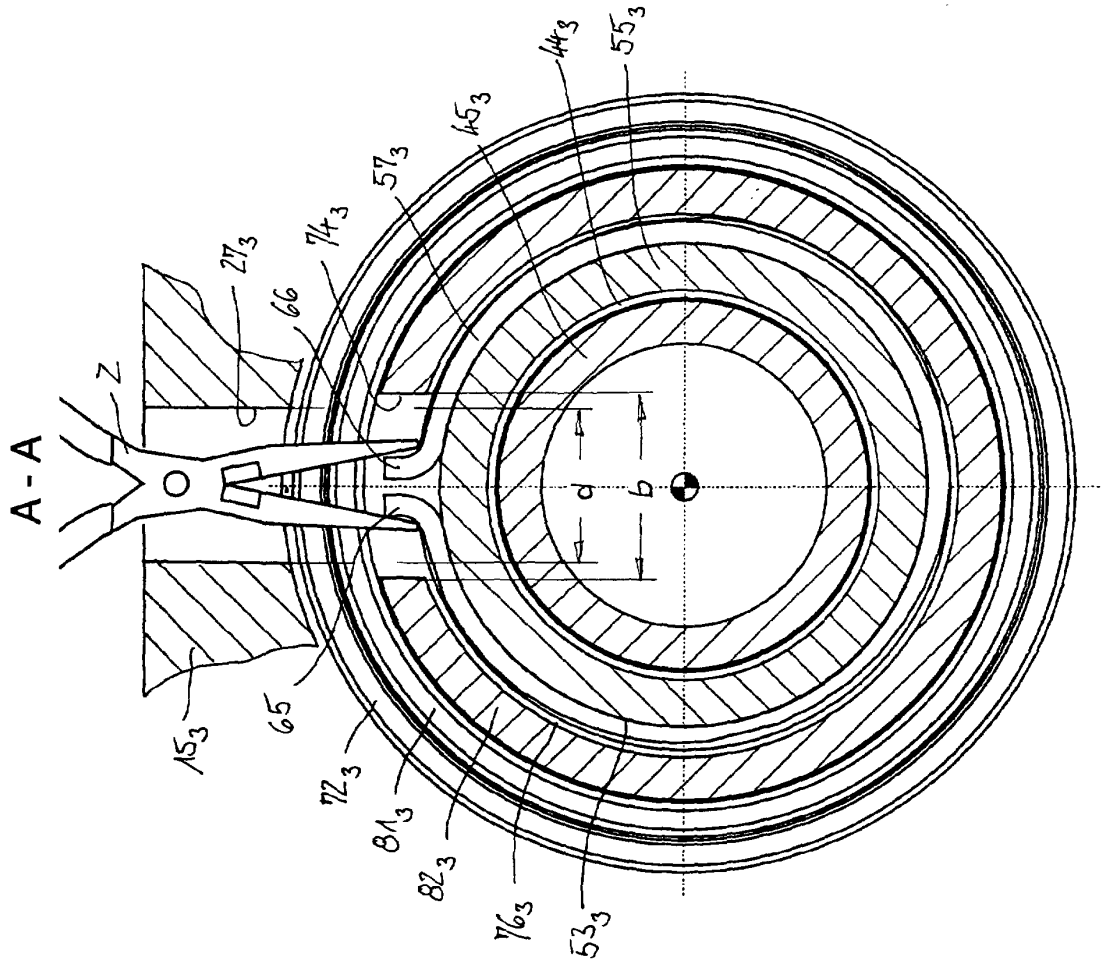
Fig. 1



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Nummer: DE 100 08 183 C1
Int. Cl.[7]: B 60 B 27/04
Veröffentlichungstag: 13. Dezember 2001

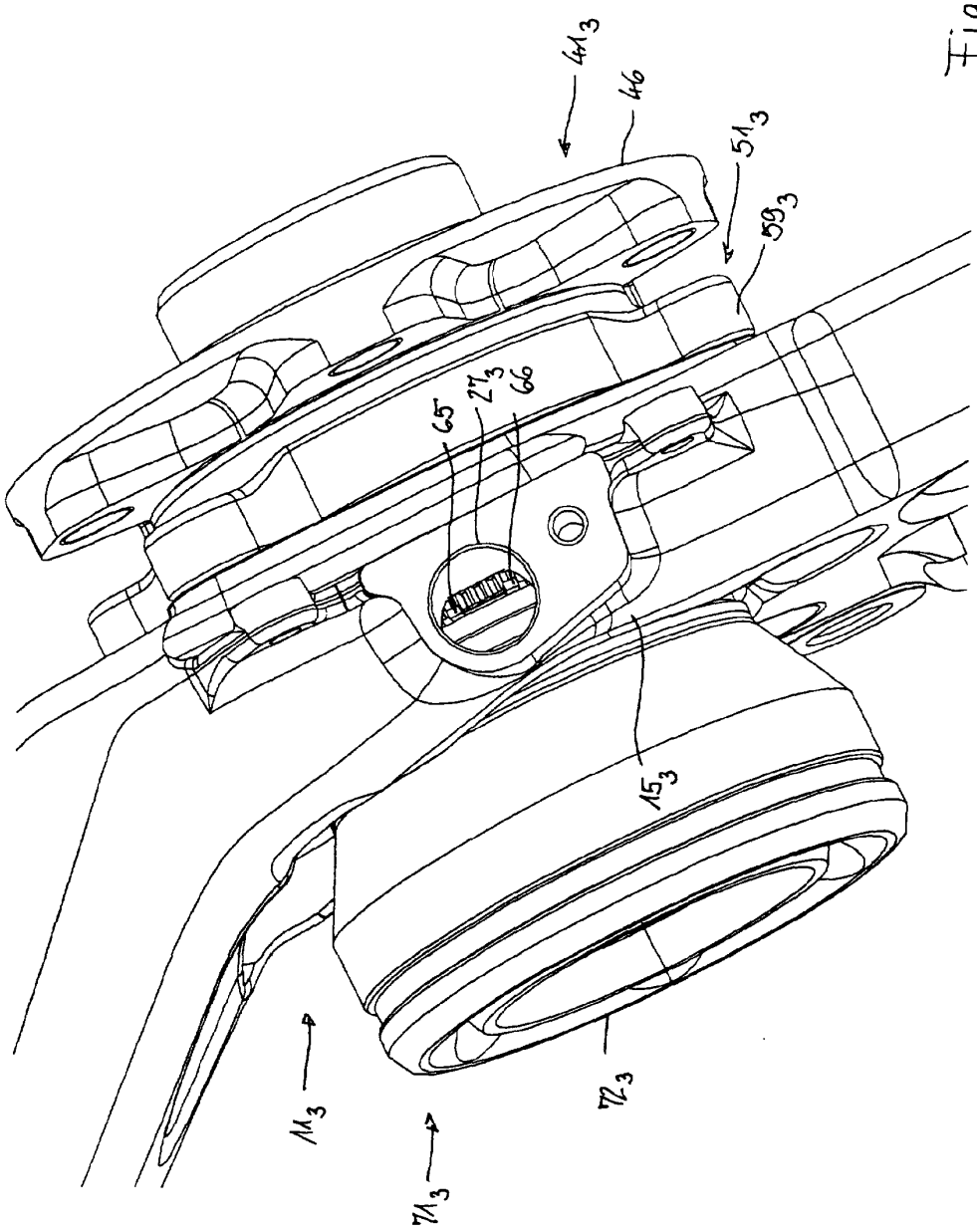
Fig. 2



American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0151

Nummer: **DE 100 08 183 C1**
Int. Cl.[7]: **B 60 B 27/04**
Veröffentlichungstag: 13. Dezember 2001

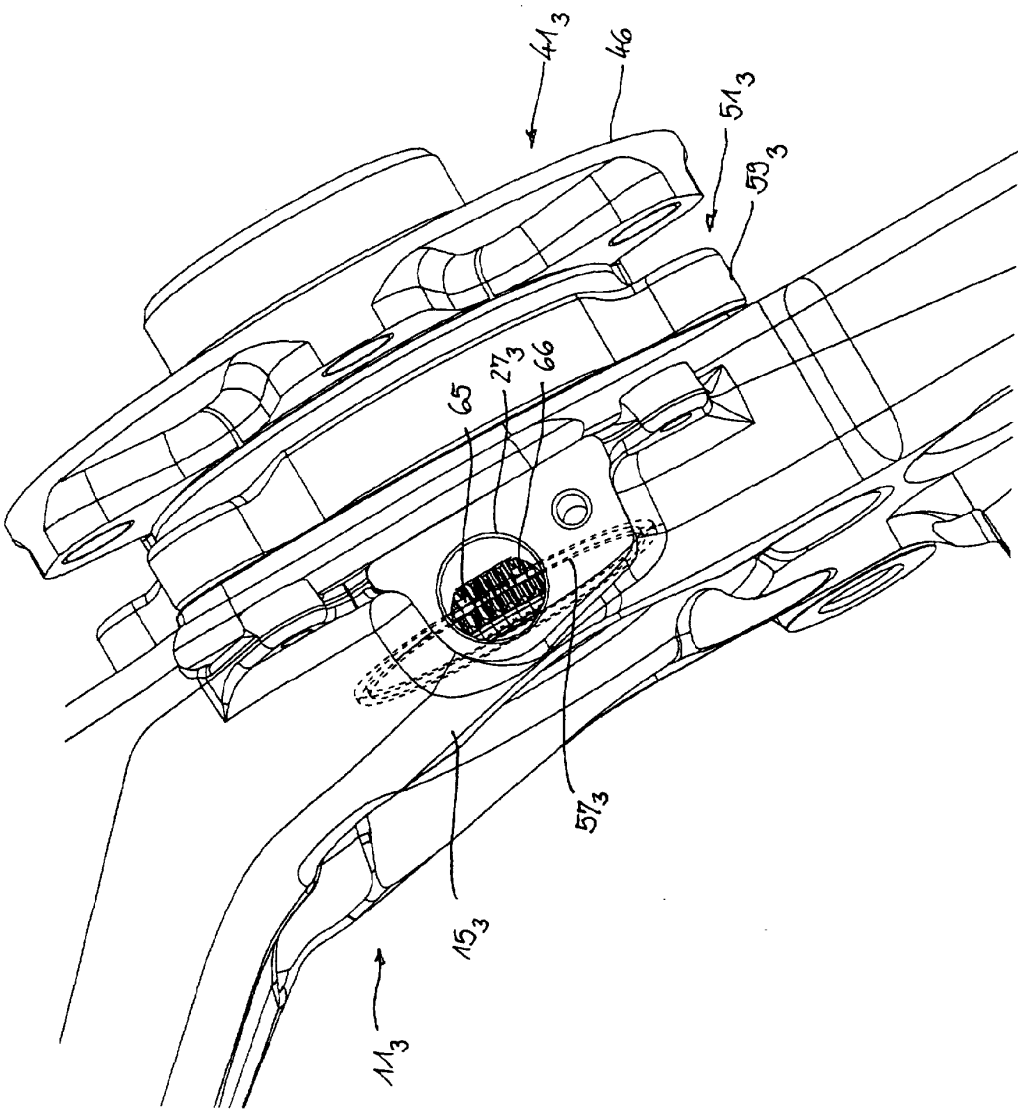
Fig. 3



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PET_AAM_1004-0152

Nummer: **DE 100 08 183 C1**
Int. Cl.[7]: **B 60 B 27/04**
Veröffentlichungstag: 13. Dezember 2001

Fig. 4



American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0153

PUB-NO: DE010008183C1

DOCUMENT-IDENTIFIER: DE 10008183 C1

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: December 13, 2001

PATENT-FAMILY-ID: 7631920

INVENTOR-INFORMATION:

NAME	COUNTRY
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APPLICANT:

NAME	COUNTRY
GKN AUTOMOTIVE GMBH	DE

APPL-NO: DE 10008183 A

APPL-DATE: February 23, 2000

PRIORITY-DATA:

PRIORITY-NO	PRIORITY-APPL-DATE
DE 10008183 A	20000223

CPC-CURRENT:

TYPE	CPC	DATE
CPCI	B60B27/00	20130101
CPCI	F16D3/223	20130101
CPCI	F16D1/116	20130101
CPCI	F16D1/108	20130101
CPCA	F16D2003/22326	20130101
CPCA	F16D2300/12	20130101

INT-CL-CURRENT:

TYPE	IPC	DATE
IPCP	B60B27/00	20060101
IPCS	F16D3/223	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.

To: tlopez@shumaker.com,dmiller@shumaker.com,cgolupski@shumaker.com
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	892	01/22/2021	206898/58974-1
	1449	01/22/2021	206898/58974-1

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PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

Electronic Patent Application Fee Transmittal

Application Number:	15966085
Filing Date:	30-Apr-2018
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Filer:	James D. Miller/Christine Golupski
Attorney Docket Number:	206898/58974-1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	480	480
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt	
EFS ID:	42023245
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	25-FEB-2021
Filing Date:	30-APR-2018
Time Stamp:	14:30:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$480
RAM confirmation Number	E20212OE30310692
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	206898_Amendment_Filed_02252021.pdf	179804 cf179d3324c02f96cffe22382e2fc75f7c0384e2	no	12
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31065 15336640d0f2bf428f827ba9db7272ccb8cd053f	no	2
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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
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(signature)

Date of signature and deposit - February 25, 2021

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Confirmation No.:	9702
Filing Date:	April 30, 2018
Applicants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Frank D. Lopez
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

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

AMENDMENT

Honorable Commissioner:

In response to the Office Action mailed January 22, 2021, please amend the application as follows and consider the remarks set forth below.

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph [0031] as follows:

[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 ~~bias~~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.

Please amend paragraph [0032] as follows:

[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 ~~140~~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 ~~expansion~~contraction of the retaining ring 140 to release the coupling of the ~~second~~first member ~~120~~110 to the ~~first~~second member ~~110~~120 and 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.

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Please amend paragraph [0034] as follows:

[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 slidingly 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 ~~200~~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 ~~200~~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.

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AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of claims in the application.

1. (Currently Amended) A joint assembly comprising:

a first member having a first engagement means;

a second member having a second engagement means, 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; and

a retaining means configured to retain the coupling of the second member to the first member, a portion of the retaining means accessible through the window, wherein 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 wall of the first member.

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 1, wherein the first engagement means includes a first plurality of splines and the second engagement means includes a second plurality of splines.

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6. (Original) The joint assembly of Claim 1, wherein the first member includes an interior surface recess receiving a portion of the retaining means and the second member includes an exterior surface recess receiving another portion of the retaining means.

7. (Original) The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. (Original) The joint assembly of Claim 1, further comprising a seal configured to cover the window.

9. (Original) The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. (Original) A vehicle driveline comprising the joint assembly of Claim 1.

11. (Original) A vehicle comprising the joint assembly of Claim 1.

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12. (Currently Amended) A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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; and

a retaining ring configured to retain the coupling of the second member to the first member, a portion of the retaining ring accessible through the window, the first member including an interior surface annular recess receiving a portion of the retaining ring and the second member including an exterior surface annular recess receiving another portion of the retaining ring, wherein distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member.

13. (Original) The joint assembly of Claim 12, further comprising a seal configured to cover the window.

14. (Original) The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

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

providing [[a]]the joint assembly, the joint assembly including:

a first member having a first engagement means;

a second member having a second engagement means, 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; and

a retaining means configured to retain the coupling of the second member to the first member, a portion of the retaining means accessible through the window, wherein 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 wall of the first member;

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.

16. (Currently Amended) The method of servicing the joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. (Currently Amended) The method of servicing the joint assembly of Claim [[1]]15, wherein the joint assembly further comprises a seal configured to cover the window and the method further comprises 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.

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18. (Currently Amended) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. (Currently Amended) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. (Canceled)

21. (New) A joint assembly comprising:

a first member having a first engagement means;

a second member having a second engagement means, 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, a portion of the retaining means accessible through the window; and

a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window.

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REMARKS

Claims 1-19 and 21 are pending in the patent application.

Claim 20 is currently cancelled.

Claims 1, 12, and 15-19 are amended. Claim 21 is new.

No new matter is added.

Support for the amendments is found in the patent application as originally filed, including in Fig. 3.

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

OBJECTIONS TO THE SPECIFICATION

The Examiner made the following objection to the specification:

> The disclosure is objected to because "window 140" in line 3 of Paragraph 0032 should read --window 130--. Appropriate correction is required.

The specification is amended to change the reference numeral as suggested by the Examiner.

Withdrawal of the objections is respectfully requested.

OBJECTIONS TO THE CLAIMS

The Examiner made the following objections to the claims:

> Claims 15-20 are objected to because of the following informalities:
>
> - With respect to Claim 15, "providing a joint assembly" in line 2 should read --providing the joint assembly--.
> - With respect to Claims 16 and 18-19, "The joint assembly of Claim 15" should read --The method of servicing the joint assembly of Claim 15--.
> - With respect to Claim 17 and 20, "The joint assembly of Claim 1" should read --The method of servicing the joint assembly of Claim 15--.

The claims are amended as suggested by the Examiner.

Withdrawal of the objections is respectfully requested.

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REJECTIONS UNDER 35 U.S.C. § 112

The Examiner made the following rejections under 35 U.S.C. § 112:

> Claim 20 is rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends.
>
> Claim 20 recites the limitation "replacing the retaining means with another retaining means". Therefore, Claim 20 fails to include all the limitations of the claim upon which it depends, particularly the "retaining means" of Claim 15.

Claim 20 is canceled, thereby rendering the rejection moot.

Withdrawal of the rejection under 35 U.S.C. § 112 is respectfully requested.

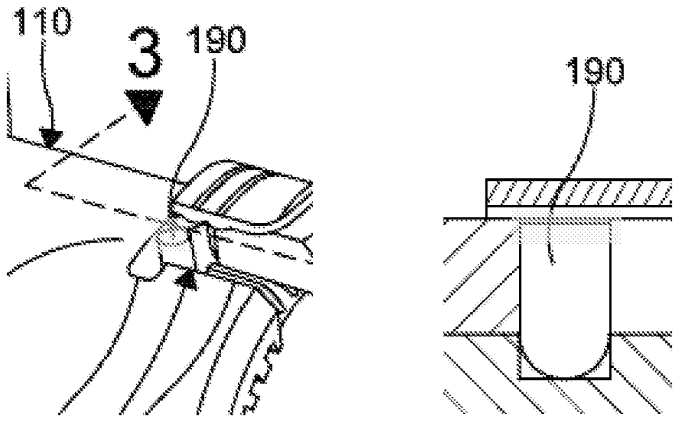
REJECTIONS UNDER 35 U.S.C. §§ 102 AND 103

The Examiner made the following art based rejections:

> **Claims 1-7, 9-12, 14-16, and 18-20 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Kofuji (US 2009/0233723 A1).**
>
> **Claims 8, 13, and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Sugiyama et al. (US 2018/0003240 A1).**

The rejections are respectfully traversed.

Claim 1 is amended to recite in part "wherein 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 wall of the first member". The distal ends are highlighted in the annotated portions of Figs. 2 and 3 of the instant patent application included hereinbelow.



As shown, the distal ends of the retaining means extend in a linear direction radially

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outwardly into the window to a point at or radially inwardly from the outer wall of the first member.

In Kofuji, distal ends of the retainer extend beyond an outer wall, and do not extend in a direction radially outwardly into the window to a point at or radially inwardly from the outer wall of the first member, as shown in the highlighted portion of annotated Fig. 5(a) included hereinbelow.

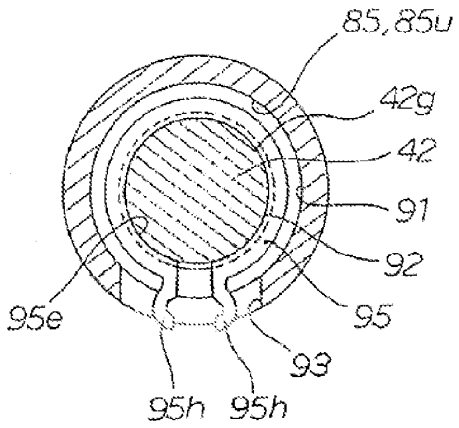
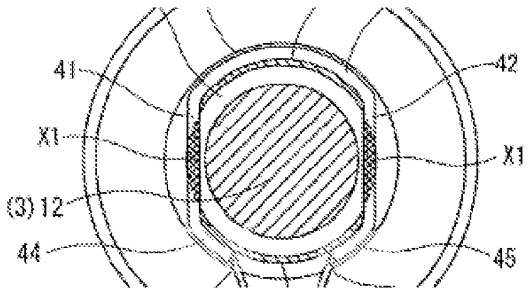


FIG. 5(a)

By extending in a direction radially outwardly into the window to a point at or radially inwardly from the outer wall of the first member as recited in Claim 1 of the instant patent application, the ends do not protrude from a wall of the rotating first member.

In Sugiyama, the ends of the retainer extend in a circumferential direction as shown in the highlighted portions of annotated Fig. 10a included hereinbelow, and are not radially outwardly extending.



Having the ends extend radially outwardly as recited in Claim 1 of the instant patent application facilitates interaction between extended portions of the ends with a tool. In

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Sugiyama, only the tips of the ends interact with the tool which can result in slippage.

It is submitted that amended Claim 1 is allowable over the cited references. Thus, Claims 2-11 depending therefrom are also allowable for at least the same reasons. Independent Claims 12 and 15 include at least the same limitations and are likewise patentable. Claims 13-14 and 16-19 respectively depending therefrom are also patentable.

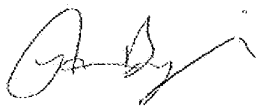
Withdrawal of the rejections Under 35 U.S.C. §§ 102 and 103 is respectfully requested.

New independent Claim 21 recites in part "a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window". None of the cited references discloses a seal coupled to a second member adjacent the end of a second member and coupled to a first member adjacent a window formed in the first member. Specifically, in Sugiyama, a boot is connected to a shaft at a point distal from an end of a cylindrical section. Thus, Claim 21 is also patentable for at least these reasons.

CONCLUSION

It is believed that the remaining 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,



By: _____

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/966,085	Filing Date 04/30/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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), (i), 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(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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	02/25/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	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.	Team Leader
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/JASMINE C GLENN/
*** 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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

43935 7590 03/16/2021

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

EXAMINER
CAMERO, ALEXUS

ART UNIT	PAPER NUMBER
3678	

NOTIFICATION DATE	DELIVERY MODE
03/16/2021	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

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Office Action Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.	
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 25 February 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-21 is/are pending in the application.

5a) Of the above claim(s) 20 is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-19 and 21 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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DETAILED ACTION

Response to Amendment

The amendment filed on 25 February 2021 has been entered. Claims 1, 12, and 15-19 have been amended and are hereby entered. Claim 20 has been cancelled. Claim 21 has been added. Applicant's amendment to the Specification and Claims have overcome the objection previously set forth in the Non-Final Action mailed on 22 January 2021.

Claims 1-19 and 21 are currently pending and have been examined.

Response to Arguments

Applicant's arguments with respect to Claims 1-19 and 21 have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.

Regarding Applicant's argument that Kofuji fails to disclose that 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 wall of the first member, the Examiner presents a prior art, Krude et al. (US, 6,739,422 B2), wherein Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising a first member (72) having a first engagement means (75), a second member (41) having a second engagement means (52) to couple with the first engagement means (75) forming a coupling between the first and second members (72, 41), a window (74) formed within the first member (72), and a retaining means (57) configured to retain the coupling of the first and second members (72, 41), wherein the retaining means (57) include distal ends (65, 66) extending in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member (72).

Further, Krude et al. has also been used as a teaching reference to modify the retaining means of previously applied prior art Kofuji such that distal ends of the retaining means do not extend outside the window in order to prevent any interference with external parts located outside the window.

Regarding Applicant's argument that none of the cited references discloses a seal coupled to a second member adjacent the end of the first member and coupled to a first member adjacent a window formed in the first member and that the boot of Sugiyama et al. is connected to a shaft at a point distal from an end of a cylindrical section, the Examiner's respectfully disagrees and

would like to point out that Sugiyama is merely being used to teach the use of a boot as a seal to prevent an invasion of water or dust from the window or openings and that, when added to the joint assembly of Kofuji, the boot of Sugiyama et al. is capable of being coupled to the second member adjacent the end of the first member and to the first member adjacent the window formed in the first member, such that the boot covers the window.

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 1-7, 9-12, 14-16, and 18-19 are rejected under 35 U.S.C. 102(a) (1) as being anticipated by Krude et al. (US 6,739,422 B2).

With respect to **Claim 1**, Krude et al. (Figs. 1-10) discloses a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining means (57) accessible through the window (74), wherein distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

With respect to **Claim 2**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 1 and that the first member (72) includes an open end (82) and the first engagement means (75) of the first member (72) is formed within the open end (82).

With respect to **Claim 3**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 2 and that wherein the portion (55) of the second member (41) disposed within the first member (72) is disposed within the open end (82) and includes the second engagement means (52).

With respect to **Claim 4**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 2 and that the window (74) is continuous with the open end (82) as best shown in Fig. 2.

With respect to **Claim 5**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 1 and that the first engagement means (75) includes a first plurality of splines (inner toothing) and the second engagement means (52) includes a second plurality of splines (outer toothing).

With respect to **Claim 6**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 1 and that the first member (72) includes an interior surface recess (76) receiving a portion of the retaining means (57) and the second member (41) includes an exterior surface recess (53) receiving another portion of the retaining means (57), wherein the retaining means (57) being received in the interior surface recess (76) and exterior surface recess (53) is best shown in Fig. 7.

With respect to **Claim 7**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 1 and that the retaining means (57) is configured as a retaining ring (a securing ring).

With respect to **Claim 9**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 1 and further comprising a constant velocity joint (71) coupled to the first member (72).

With respect to **Claim 10**, Krude et al. (Figs. 1-10) discloses a vehicle driveline comprising the joint assembly (10) of Claim 1, wherein the joint assembly (10) of Claim 1 is used for supporting a wheel of a motor vehicle and for drivingly connecting the wheel to a driveshaft. See Abstract.

With respect to **Claim 11**, Krude et al. (Figs. 1-10) discloses a vehicle comprising the joint assembly (10) of Claim 1, wherein the joint assembly (10) of Claim 1 is used for supporting a wheel of a motor vehicle and for drivingly connecting the wheel to a driveshaft. See Abstract.

With respect to **Claim 12**, Krude et al. (Figs. 1-10) discloses a joint assembly (10) comprising:

a first member (72) having an open end (82) and a first plurality of splines (75, an inner toothing) formed within the open end (82);

a second member (41) having a second plurality of splines (52, an outer toothing) formed thereon, a portion (55) of the second member (41) disposed within the first member (72), the second plurality of splines (52) engaging the first plurality of splines (75) to provide a coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion (55) of the second member (41) is disposed within the first member (72); and

a retaining ring (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining ring accessible through the window (74), the first member (72) including an interior surface annular recess (76) receiving a portion of the retaining ring (57) and the second member (41) including an exterior surface annular recess (53) receiving another portion of the retaining ring (57) (best shown in Fig. 7), wherein distal ends (65, 66) of the retaining ring (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

With respect to **Claim 14**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 12 and further comprising a constant velocity joint (71) coupled to the first member (72).

With respect to **Claim 15**, 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 211.02.

Therefore, Krude et al. (Figs. 1-10) discloses a method of servicing a joint assembly (10) comprising:

providing the joint assembly (10), the joint assembly (10) including:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing),

a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide a coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion (55) of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining means (57) accessible through the window (74), wherein distal ends (65. 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72);

manipulating the retaining means (57) through the window (74) to release the coupling of the second member (41) to the first member (72); and

separating the first member (72) and the second member (41) by disengaging the second engagement means (52) from the first engagement means (75).

With respect to **Claim 16**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 15 and that the joint assembly further comprises a constant velocity joint (71) coupled to the first member (72).

With respect to **Claim 18**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 15 and further comprising coupling the separated first member (72) with another second member to form another joint assembly, wherein the retaining means (57) can be simply attached and detached from the joint assembly, thereby allowing the separated first member (72) to be capable of coupling with another second member to form another joint assembly.

With respect to **Claim 19**, Krude et al. (Figs. 1-10) discloses the limitations set forth in Claim 15 and further comprising coupling the separated second member (41) with another first member to form another joint assembly, wherein the retaining means (57) can be simply attached and detached from the joint assembly, thereby allowing the separated second member (41) to be capable of coupling with another first member to form another joint assembly.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective

filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 9-12, 14-16, and 18-19 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Krude et al. (US 6,739,422 B2).

With respect to **Claim 1**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having a first engagement means (86, a spline hole);

a second member (45) having a second engagement means (84, a spline section), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining means (95) accessible through the window (93).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining means (57) accessible through the window (74), wherein distal ends (65, 66) of the retaining means (57) extend in a

direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

With respect to **Claim 2**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first member (43) includes an open end and the first engagement means (86) of the first member (43) is formed within the open end.

With respect to **Claim 3**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the portion (45b) of the second member (45) disposed within the first member (43) is disposed within the open end and includes the second engagement means (84).

With respect to **Claim 4**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the window (93) is continuous with the open end. See Paragraph 0051, wherein the window (93) has a section opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43).

With respect to **Claim 5**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first engagement means (86) includes a first plurality of splines (spline hole) and the second engagement means(84) includes a second plurality of splines (spline section).

With respect to **Claim 6**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first member (43) includes an interior surface recess (91) receiving a portion of the retaining means and the second member (45) includes an exterior surface recess (92) receiving another portion of the retaining means (95). See Paragraph 0053, wherein the retaining means (95) is disposed spanning the interior surface recess (91) and the exterior surface recess (92).

With respect to **Claim 7**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the retaining means (95) is configured as a retaining ring (circular clip).

With respect to **Claim 9**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 3) further discloses further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 10**, Kofuji in view of Krude et al. discloses a vehicle driveline (41; Figs. 2-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 11**, Kofuji in view of Krude et al. discloses a vehicle (10; Figs. 1-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 12**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having an open end and a first plurality of splines (86, a spline hole) formed within the open end;

a second member (45) having a second plurality of splines (84, a spline section) formed thereon, a portion (45b) of the second member (45) disposed within the first member (43), the second plurality of splines (84) engaging the first plurality of splines (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining ring (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining ring (95) accessible through the window (93), the first member (43) including an interior surface annular recess (91) receiving a portion of the retaining ring and the second member (45) including an exterior surface annular recess (92) receiving another portion of the retaining ring (see Paragraph 0053, wherein the retaining means (95) is disposed spanning the interior surface annular recess (91) and the exterior surface annular recess (92)).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second

engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining means (57) accessible through the window (74), wherein distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

With respect to **Claim 14**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 12 and Kofuji (Fig. 3) further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 15**, 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 211.02.

Therefore, Kofuji (Figs. 1-6c) discloses a method of servicing a joint assembly comprising:

providing (Fig. 4) the joint assembly, the joint assembly (Figs. 4) including:

a first member (43) having a first engagement means (86, spline hole);

a second member (45) having a second engagement means(84, a spline section), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means(84) engaging the first engagement means

(86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining means (95) accessible through the window (93);

manipulating (Figs. 5a-5b) the retaining means (95) through the window (93) to release the coupling of the second member (45) to the first member (43); and

separating (Figs. 6a-6c) the first member (43) and the second member (45) by disengaging the second engagement means from the first engagement means.

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), a portion (65, 66) of the retaining means (57) accessible through the window (74), wherein distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude

et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

With respect to **Claim 16**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 15 and Kofuji (Fig. 3) further discloses that the joint assembly further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 18**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated first member (43) with another second member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated first member (43) to be capable of coupling with another second member to form another joint assembly.

With respect to **Claim 19**, Kofuji in view of Krude et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated second member (45) with another first member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated second member (45) to be capable of coupling with another first member to form another joint assembly.

Claims 8, 13, and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Krude et al. (US 6,739,422 B2), as applied to Claims 1-7, 9-12, 14-16, and 18-19, and further in view of Sugiyama et al. (US 2018/0003240 A1).

With respect to **Claims 8 and 13**, Kofuji in view of Krude et al. discloses the limitations set forth in Claims 1 and 12 respectively but fails to disclose that the joint assembly further comprises a seal configured to cover the window.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means(8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes(31, 32) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second

member (11, 12). Sugiyama et al. (Fig. 7) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji in view of Krude et al. with a seal or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 17**, Kofuji discloses the limitations set forth in Claim 15 but fails to discloses that the joint assembly further comprises a seal configured to cover the window and the method further comprises 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.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means(8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12). Sugiyama et al. (Fig. 7) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32), wherein the seal (35) can be removed from the joint assembly to uncover the through holes (31, 32).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

Claim 21 is rejected under 35 U.S.C. 103 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Sugiyama et al. (US 2018/0003240 A1).

With respect to **Claim 21**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having a first engagement means (86, a spline hole);

a second member (45) having a second engagement means (84, a spline section), a portion (45b) of the second member (45) disposed within the first member (43), the second

engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notch section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), a portion (95h) of the retaining means (95) accessible through the window (93).

Kofuji fails to disclose a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window.

However, Sugiyama et al. (Figs. 4-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means(8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (12).

Sugiyama et al. (Fig. 7) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32), the seal coupled to the second member (12) adjacent an end (36) of the first member (30), the seal coupled to the first member (11, 12), wherein the seal (35), as stated on Paragraph 0058, is mounted on the first member (30) and on the first member (11, 12) of the output shaft (3).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. such that it is coupled to the second member adjacent the end of the first member and to the first member adjacent the window for the purpose of preventing an invasion of water or dust from the window or openings.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXUS CAMERO whose telephone number is (571)272-8629. The examiner can normally be reached on M-F 9:00 am to 5:00 pm EST.

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 an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEXUS CAMERO/
Examiner, Art Unit 3678

/AMBER R ANDERSON/
Supervisory Patent Examiner, Art Unit 3678

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	ALEXUS CAMERO	3678

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/14/2021	03/01/2021							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	-							
	21		✓							

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PET_AAM_1004-0191

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

CPC - Searched*		
Symbol	**Date**	**Examiner**
F16D 1/108, 112, 116	01/12/2021	AC
F16D 2001/103	01/12/2021	AC
F16B 21/18, 183, 186	01/12/2021	AC
Y10T 403/7033	01/12/2021	AC
Updated Search Above	03/01/2021	AC

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**
EAST, PALM search of inventor and assignee	01/11/2021	AC
Search Help from Josh Skroupa (Class 403)	01/12/2021	AC
Forward and Backward Citation Search	01/13/2021	AC
See attached EAST search history	01/14/2021	AC
See attached updated EAST search history	03/06/2021	AC

/ALEXUS CAMERO/ Examiner, Art Unit 3678	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

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

/ALEXUS CAMERO/ Examiner, Art Unit 3678	

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PET_AAM_1004-0193

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	8	US-6739422-$ | US-6251019-$ | US-7922590-$ | US-8231475-$	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 15:39
S3	78	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY") near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/01/11 16:02
S5	346	((("HOPSON") near3 ("Michael")) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 16:07
S7	1,981	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 09:31
S10	3,350	F16D1/112,116.cpc. NOT S7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:14
S12	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:53
S17	5,135	F16B21/18,186.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:50
S18	1,981	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:51
S19	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO;	OR	ON	2021/01/12 18:51

			JPO; DERWENT			
S20	4,858	F16B21/18,186.cpc. NOT (S18 S19)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:51
S21	1,252	F16B21/183.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:14
S22	994	F16B21/183.cpc. NOT (S17 S18 S19)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:15
S23	5,417	F16D2001/103.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:15
S24	3,919	F16D2001/103.cpc. NOT (S17 S18 S19 S21)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S25	1,581	Y10T403/7033.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S26	936	Y10T403/7033.cpc. NOT (S17 S18 S19 S21 S23)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:18
S27	1	(13/170547).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:28
S28	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:28
S29	1	(10/755805).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:30

S30	6	("20060009298" | "5363601" | "5647800" | "5803993" | "6672965" | "6736729").PN. OR ("7222426").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:30
S31	1	(10/690146).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:34
S32	27	("1966826" | "20020044706" | "20020106140" | "20030044099" | "4004838" | "4340317" | "4493388" | "4629028" | "5486053" | "5536075" | "5549514" | "5603554" | "5782565" | "5921633" | "6022275" | "6152825" | "6170628" | "6193419" | "6196639" | "6203441" | "6354952" | "6413008" | "6450585" | "6668888").PN. OR ("6969125").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:35
S33	1	(09/758767).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:45
S34	26	("1631236" | "4136982" | "4225263" | "4261668" | "5492417" | "5499884" | "5611733" | "5643092" | "5667332" | "5853250" | "5957615").PN. OR ("6582151").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:46
S35	29	("2170970" | "2349903" | "3832076" | "3865499" | "3992117").PN. OR ("4136982").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:46
S36	21	("1391012" | "2453391" | "2611632" | "2775037" | "3374015" | "4077232").PN. OR ("4225263").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:56
S37	13	("20070199756" | "20090057046" | "4523871" | "6009609" | "6467565" | "6582151" | "7533751" | "7644797" | "7665562").PN. OR ("7946374").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:25
S38	19	("3357206").URPN.	USPAT	OR	ON	2021/01/13 12:34
S39	22	("2457942" | "2857777" | "3191453").PN. OR ("3750489").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:36
S40	28	("0684594" | "1740377" | "2361827" | "3351359" | "3480310").PN. OR ("3926532").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:38
S41	46	("3531144" | "3718350" | "3832076" | "3992117").PN. OR ("4124318").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:42
S42	1	(12/393461).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:52
S43	1	(12/502928).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:53

S44	4	("3625548" | "3966239" | "4157019" | "4169686").PN. OR ("8187107").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:55
S45	1	(12/361795).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:57
S46	21	("1541007" | "2952999" | "3999786" | "4127741" | "4136982" | "4915536" | "5647683" | "5735747" | "6348002" | "6367680" | "7029398" | "7140969" | "7228787" | "7314416").PN. OR ("8092312").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:57
S47	2	US-20180003240-$	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:03
S48	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:06
S49	70	(US-20120004044-$ or US-20050150111-$ or US-20050082903-$ or US-20020090257-$ or US-20140161509-$ or US-20090208278-$ or US-20090233723-$ or US-20100120545-$ or US-20100190559-$).did. or (US-3357206-$ or US-3750489-$ or US-3926532-$ or US-3992117-$ or US-4124318-$ or US-4645372-$ or US-4859110-$ or US-5601380-$ or US-6234907-$ or US-6739422-$ or US-4136982-$ or US-5098241-$ or US-4966488-$ or US-8690690-$ or US-7222426-$ or US-6969125-$ or US-6582151-$ or US-7946374-$ or US-10883545-$ or US-8870489-$ or US-8187107-$ or US-8092312-$).did. or (DE-1813395-$ or DE-10008182-$ or DE-10008182-$ or DE-10008183-$ or EP-1302684-$ or WO-2008148373-$ or DE-2342940-$ or EP-0225554-$ or EP-0645548-$ or DE-29501158-$ or WO-0163135-$ or WO-2005024258-$ or WO-2008029017-$ or WO-2008031738-$ or DE-102009020981-$ or WO-2011058000-$ or WO-2016034228-$ or DE-102016121785-$ or DE-2820380-$ or EP-1681477-$ or DE-202012008999-$ or DE-102012013243-$).did. or (JP-61041017-$ or JP-02089816-$).did. or (DE-2919214-$ or DE-3320444-$ or GB-	US-PGPUB; USPAT; FPRS; JPO; DERWENT	OR	ON	2021/01/13 13:18

		2173572-$ or GB-2219372-$ or DE-102009017007-$ or DE-102016000530-$ or US-20180003240-$ or DE-102013012749-$).did.				
S50	17	S49 and (seal cover)	US-PGPUB; USPAT; FPRS; JPO; DERWENT	OR	ON	2021/01/13 13:19
S51	22	("10151352" | "1114123" | "20120308293" | "20160017929" | "3367692" | "3450424" | "4635974" | "5518332" | "7048972" | "7104893" | "7195399" | "7595095" | "7722089" | "7946374" | "8477386" | "8864591" | "9528389" | "9587669" | "9926967").PN. OR ("10883545").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:46
S52	9	("4629028" | "5549514").PN. OR ("6739422").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:52
S53	6	S49 and (exchang$4 replace$4)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 14:26
S54	19	S49 and (exchang$4 replace$4 chang$4)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 14:34
S55	837	joint near3 (seal cover) near3 (cutout notch window)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 15:34
S56	448	joint near3 (seal) near3 (cutout notch window)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 15:49
S57	3,197	(joint near2 shaft) with seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:22
S59	597	(joint near2 shaft) near2 seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:22

S60	8,143	joint and (retaining adj ring) and seal	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:39
S61	1,947	joint and ((retaining adj ring) with seal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:39
S62	193	joint and ((retaining adj ring) with seal) and spline	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 17:39
S63	9	("4629028" | "5549514").PN. OR ("6739422").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 18:35
S64	9	("4629028" | "5549514").PN. OR ("6739422").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/14 09:40
S65	2,035	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 17:30
S66	3,425	F16D1/112,116.cpc. NOT S65	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 17:49
S67	2,035	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:18
S68	3,656	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:18
S69	4,925	F16B21/18,186.cpc. NOT (S67 S68)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:18
S70	1,265	F16B21/183.cpc.	US-PGPUB; USPAT;	OR	ON	2021/03/01 18:40

			FPRS; EPO; JPO; DERWENT			
S71	5,213	F16B21/18,186.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:40
S72	1,001	F16B21/183.cpc. NOT (S71 S67 S68)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:40
S73	5,645	F16D2001/103.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:42
S74	4,018	F16D2001/103.cpc. NOT (S71 S67 S68 S70)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:42
S75	1,602	Y10T403/7033.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:49
S76	946	Y10T403/7033.cpc. NOT (S71 S67 S68 S70 S73)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/03/01 18:49
S77	24	("20020018719" | "20110283491" | "20120051918" | "2650484" | "2895754" | "2897022" | "3214204" | "3535977" | "3924957" | "3992117" | "4138168" | "5127764" | "5462369" | "5484242" | "5607192" | "5788399" | "6116809" | "6884196").PN. OR ("9933005").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/01 18:53
S78	7	("20120004044" | "20170130777" | "20190128333" | "7867099" | "8647210" | "8784220" | "8864591").PN. OR ("10533612").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/01 18:54
S79	1	(13/170547).APP.	USPAT; USOCR	OR	ON	2021/03/01 18:54

S80	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/01 18:54

EAST Search History (Interference)

<This search history is empty>

3/6/2021 7:41:43 PM
C:\Users\acamero1\Documents\EAST\Workspaces\15966085 - High Retention Force S Plug On Joint Assembly.wsp

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

Mar 16, 2021 04:11:28 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.
15966085	CTFR	03/16/2021	206898/58974-1

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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

506652066 05/07/2021

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT6698877

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	SECURITY INTEREST

CONVEYING PARTY DATA

Name	Execution Date
NEAPCO HOLDINGS, LLC	05/07/2021

RECEIVING PARTY DATA

Name:	PNC BANK, NATIONAL ASSOCIATION
Street Address:	755 W. BIG BEAVER RD, STE 2400
Internal Address:	MAIL CODE: R1-YB94-24-1
City:	TROY
State/Country:	MICHIGAN
Postal Code:	48084

PROPERTY NUMBERS Total: 63

Property Type	Number
Patent Number:	6682429
Patent Number:	6705949
Patent Number:	7025167
Patent Number:	8382595
Patent Number:	10309463
Patent Number:	10955005
Patent Number:	10680549
Patent Number:	10734940
Patent Number:	6702508
Patent Number:	7047622
Patent Number:	8075218
Patent Number:	8544591
Patent Number:	8038540
Patent Number:	8231475
Patent Number:	9631676
Patent Number:	9709100
Application Number:	15914486
Application Number:	15966085
Application Number:	16149361

Property Type	Number
Application Number:	16154318
Application Number:	16211484
Application Number:	16211608
Application Number:	16212840
Application Number:	16211452
Application Number:	16449773
Application Number:	16449690
Application Number:	16663418
Application Number:	16590596
Application Number:	16591803
Application Number:	16710596
Application Number:	16783649
Application Number:	16924505
Application Number:	17025085
Application Number:	16630471
Application Number:	16664962
Application Number:	63071741
Patent Number:	10800254
Patent Number:	10857878
Application Number:	16160018
Application Number:	16144002
Application Number:	16159958
Application Number:	16160102
Patent Number:	10882527
Patent Number:	10833512
Application Number:	16135722
Application Number:	16135713
Application Number:	16522838
Application Number:	16529253
Application Number:	17030847
Application Number:	62905481
Application Number:	62912130
Application Number:	62912138
Application Number:	62916820
Application Number:	62931283
Application Number:	16160034
Application Number:	17084722
Application Number:	16668390

Property Type	Number
Application Number:	62905487
Application Number:	62912122
Application Number:	62931294
Application Number:	17091137
Application Number:	63134654
Application Number:	63135682

CORRESPONDENCE DATA

Fax Number:

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 2164798005
Email: ariana.rainbow@squirepb.com
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Address Line 4: CLEVELAND, OHIO 44115

ATTORNEY DOCKET NUMBER:	034397.00083
NAME OF SUBMITTER:	ARIANA RAINBOW
SIGNATURE:	/Ariana Rainbow/
DATE SIGNED:	05/07/2021
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 14
source=PNC - Neapc - Patent Trademark and Copyright Security Agreement EXECUTED#page1.tif
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EXECUTION VERSION

PATENT, TRADEMARK AND COPYRIGHT SECURITY AGREEMENT

This PATENT, TRADEMARK AND COPYRIGHT SECURITY AGREEMENT (as amended, restated, supplemented, replaced and otherwise modified from time to time, this "IP Security Agreement") is made and entered into as of this 7th day of May, 2021, by and among EACH OF THE GRANTORS LISTED ON THE SIGNATURE PAGES HERETO and each of the other persons and entities that become bound hereby from time to time by joinder, assumption or otherwise (each a "Grantor" and collectively, the "Grantors") and PNC BANK, NATIONAL ASSOCIATION, a national banking association, in its capacity as Administrative Agent under and pursuant to the Credit Agreement, hereinafter defined (the "Secured Party"). Capitalized terms used herein but not otherwise defined herein shall have the meanings ascribed to such terms in the Credit Agreement or the Security Agreement, as applicable.

Recitals:

A. NEAPCO HOLDINGS, LLC, a Delaware limited liability company, as Borrower, (the "Borrower"), the Guarantors party thereto, as the "Guarantors", including, without limitation, the Grantors, the Lenders party thereto, as the "Lenders", PNC Bank, National Association, as the "Administrative Agent", and PNC Bank, National Association, as the "Swingline Loan Lender" and the "Issuing Lender", are the parties to that certain Credit Agreement of even date herewith (as amended, restated, supplemented, replaced and otherwise modified from time to time, the "Credit Agreement").

B. It is a condition precedent to the effectiveness of the Credit Agreement that the Grantors deliver this IP Security Agreement.

C. The Grantors are party to that certain Security and Pledge Agreement dated as of May 7, 2021 (as amended, amended and restated, restated, supplemented or otherwise modified from time to time, the "Security Agreement") in favor of the Secured Party.

Agreements:

NOW THEREFORE, in consideration of the foregoing Recitals, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, each Grantor and the Secured Party hereby agree as follows:

1. INCORPORATION OF CREDIT AGREEMENT AND SECURITY AGREEMENT. The Credit Agreement and the Security Agreement and the terms and provisions thereof are hereby incorporated herein in their entirety by this reference.

2. SECURITY INTEREST IN U.S. PATENTS, TRADEMARKS, COPYRIGHTS, ETC. Each Grantor hereby pledges and grants to the Secured Party for the benefit of the Secured Parties a lien on and security interest in and to all of its right, title and interest in, to and under all the following Proprietary Collateral of such Grantor (collectively, the "IP Collateral") to secure,

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PET_AAM_1004-0206

among other things, the prompt and complete payment and performance in full when due of the Secured Obligations.

(a) the Intellectual Property of such Grantor listed on Schedule I attached hereto which is incorporated herein by reference; and

(b) all Proceeds of any and all of the foregoing.

3. SECURITY AGREEMENT. The security interest granted pursuant to this IP Security Agreement is granted in conjunction with the security interest granted to the Secured Party pursuant to the Security Agreement and the Grantors hereby acknowledge and affirm that the rights and remedies of the Secured Party with respect to the security interest in the IP Collateral made and granted hereby are more fully set forth in the Security Agreement. In the event that any provision of this IP Security Agreement is deemed to conflict with the Security Agreement, the provisions of the Security Agreement shall control unless the Secured Party shall otherwise determine.

4. TERMINATION. Upon the termination of the security interests granted to the Secured Party under the Security Agreement in accordance with Section 21 thereof, the liens on the IP Collateral granted hereunder shall terminate and the Secured Party shall execute, acknowledge, and deliver to the Grantors an instrument in writing in recordable form releasing the IP Collateral.

5. COUNTERPARTS. This IP Security Agreement may be executed in any number of counterparts, all of which shall constitute one and the same instrument, and any party hereto may execute this IP Security Agreement by signing and delivering one or more counterparts.

6. GOVERNING LAW. Section 12.11 of the Credit Agreement is incorporated herein, mutatis mutandis, as if a part hereof.

[Signatures Follow on Next Page]

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PET_AAM_1004-0207

IN WITNESS WHEREOF, the parties hereto have executed this Patent, Trademark and Copyright Security Agreement as of the date first above written.

GRANTORS:

NEAPCO HOLDINGS, LLC
NEAPCO REAL ESTATE, LLC
NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC
ELECTRIC PROPULSION TECHNOLOGIES, LLC
NEAPCO COMPONENTS, LLC
NEAPCO DRIVELINES, LLC

Robert P. Lenard

Name: Robert P. Lenard
Title: Chief Financial Officer

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0208

Accepted and Agreed:

PNC BANK, NATIONAL ASSOCIATION,
as Secured Party

By: _____
Name: Scott Neiderheide
Title: Senior Vice President

[Signature Page to IP Security Agreement]

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PET_AAM_1004-0209

SCHEDULE I
To

PATENT, TRADEMARK AND COPYRIGHT SECURITY AGREMENT

Patents

Name	Acquired Date	Patent No. or Appl. No.	Grant Date or Appl. Date	Patent Status	Patent Expiration
Shaft with a venting system	2008 ACH asset acquisition	US6682429	2004/01/27	Granted	2022/06/13
Shaft spline having a straight side tooth profile	2008 ACH asset acquisition	US6705949	2004/03/16	Granted	2022/06/26
A shaft to transfer torque in a vehicle	2008 ACH asset acquisition	US7025167	2006/04/11	Granted	2023/03/06
Torque limiting driveline	2006 Neapco acquisition	US8382595	2013/02/26	Granted	2030/11/07
Joint member with extension travel restriction feature	2019/02/25	US10309463	2016/08/26	Granted	2037/03/23
Cardan universal joint seal with optimized lip orientations	2021/03/23	US10955005B2	2017/06/19	Granted	2039/07/03
Solar panel drive shaft	2020/06/09	US10680549B2	2016/09/27	Granted	2038/04/13
	2020/08/04	US10734940B2	2016/09/27	Granted	2038/01/25
Mechanical Connection using non-circular inter-fitting components	2010 TeDrive acquisition	US6702508	2004/03/09	Granted	2022/01/22
Method for manufacturing a shaft-hub connection	2010 TeDrive acquisition	US7047622	2006/05/23	Granted	2024/05/12
Prestressed shaft and hub connection having a perfect cone shape	2011/12/13	US8075218	2006/07/06	Granted	2027/12/07
Bearing device for the vibration-decoupled rotatable support	2013/10/01	US8544591	2009/09/14	Granted	2028/02/26
Improved Tuned Mass Damper for Rotating Shafts	2011/10/18	US8038540	2010/06/21	Granted	2028/12/18
CV joint with mechanically efficient assembly properties	2012/07/31	US8231475	2011/08/02	Granted	2030/02/01

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Tripod joint having low vibration inducing forces	2017/04/25	US9631676	2012/06/29	Granted	2032/06/29
Serration having an offset construction point	2017/07/18	US9709100	2013/07/16	Granted	2034/04/24
Integrated post-weld knurling process and device for performing the same	N/A	US20180258980A1	2017/03/07	Pending	N/A
High retention force serviceable plug-on joint assembly	N/A	US20180320742A1	2017/05/30	Pending	N/A
Driveline assembly with variable thickness tube wall	N/A	US20190162227A1	2017/11/27	Pending	N/A
Propeller shaft tube yoke optimized for improved weld fatigue reliability	N/A	US20190113083A1	2017/10/16	Pending	N/A
Semi-cylindrical/semi-spherical inner surface of an outer race and a ball cage for a fixed constant velocity joint	N/A	US20190178297A1	2017/12/08	Pending	N/A
Constant velocity joint with cooperating boot and shaft vent channels	N/A	US20190178300A1	2017/12/07	Pending	N/A
Propeller shaft with crash feature	N/A	US20190178302A1	2017/12/08	Pending	N/A
Constant velocity joint with vent sleeve	N/A	US20190178299A1	2017/07/12	Pending	N/A
Solid body umbrella vent for a constant velocity joint	N/A	US20200003263A1	2018/06/27	Pending	N/A
Center bearing assembly including a rotatable weld collar with a tuned damper	N/A	US20200001708A1	2018/06/27	Pending	N/A
Center bearing assembly including a rotatable weld collar with a tuned damper	N/A	US20200055392A1	2018/06/27	Pending	N/A
Joint assembly having a piloting cover for centering a mating flange relative to an outer race of a constant velocity joint	N/A	16/590,596	2019/10/02	Pending	N/A
Propeller shaft yoke with improved tool clearance	N/A	US20200108715A1	2018/10/03	Pending	N/A
Vehicle driveline joint having a venting and sealing cavity	N/A	US20200182305A1	2018/12/11	Pending	N/A
Slip-between-center propeller shaft assembly with radial thrust rings	N/A	US20200263737A1	2019/02/15	Pending	N/A
Slip-between-center propshaft assembly	N/A	US20210010529A1	2019/07/10	Pending	N/A

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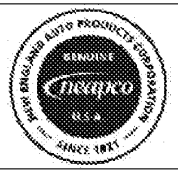
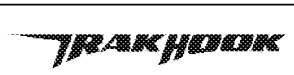
Propeller shaft yoke with protective shoulder for damper	N/A	US20210088082A1	2019/09/20	Pending	N/A
Constant-velocity joint	N/A	US20210088083A1	2018/08/14	Pending	N/A
Ball constant velocity swivel with multi-cage window	N/A	US20200132128A1	2019/10/29	Pending	N/A
Tapered Polygonal Connection for Automotive Drivelines	N/A	63/071,741	2020/08/28	Pending	N/A
Driveline Assembly for an Electric Vehicle	2020/10/13	US10800254B2	2017/10/16	Granted	2038/10/15
Driveline Including a Variable End Reducer Assembly	2020/12/08	US10857878	2020/12/18	Granted	2038/10/16
Driveline Assembly Including Torque Vectoring System	N/A	US20190111802A1	2017/10/16	Pending	N/A
Luburicant-Supported Electric Motor	N/A	US20190093757A1	2017/10/16	Pending	N/A
Battery Cell Monitoring System	N/A	US20190115635A1	2017/10/16	Pending	N/A
High Coverage Battery Usage Monitor	N/A	US20190111800A1	2017/10/16	Pending	N/A
Torque Modulation to Linearize Tire Slip Characteristics	2021/01/05	US10882527B2	2017/11/14	Granted	2039/05/10
Disposable Filter With An Accessory Port	N/A	US20190083908A1	2017/09/20	Pending	N/A
Disposable Filter Including An Integrated Sensor Assembly	N/A	US20190083912A1	2017/09/20	Pending	N/A
Cell Balancing With Local Sensing and Switching	2020/11/10	US10833512B2	2017/11/14	Granted	2039/01/30
System and Method for Rotor Positioning within an Electric Motor	N/A	US20200036312A1	2018/07/27	Pending	N/A
Lubricant Supported Electric Motor with Bearing Support	N/A	US16529253	2019/08/01	Pending	N/A
Lubricant Supply Methods for Lubricant Supported Motor	N/A	US20210088124A1	2019/09/25	Pending	N/A
Lubricant Supported Electric Motor with Profiled Raceways	N/A	62/905481	2019 P	Pending	N/A
Laminated Magnetic Structures for Lubricant Supported Motors	N/A	62/912130	2019 P	Pending	N/A

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Lubricant Supported Motor with 2-Sided Radial Flux Configuration	N/A	62/912138	2019 P	Pending	N/A
Magnetic Rotor Centering Orig: Internal Motor DC Bus with Per-Coil Current Switching)	N/A	62/916820	2019 P	Pending	N/A
Hydrostatic Bearing Oil Film Design for Lubricant Supported Motor	N/A	62/931283	2019 P	Pending	N/A
Lubricant-Supported Electric Motor	N/A	US20190093757A1	2017/10/16	Pending	N/A
Battery Cell Monitoring System	N/A	US20190115636A1	2017/10/16	Pending	N/A
Lubricant supported electric motor with bearing support	N/A	US20200044511A1	2018/08/02	Pending	N/A
Driveline Including a Variable End Reducer Assembly (Continuation of #32)	N/A	US20210046818A1	2020/10/30	Pending	N/A
Lubricant supported electric motor with wheel support	N/A	US20200130408A1	2018/10/30	Pending	N/A
LUBRICANT SUPPORTED ELECTRIC MOTOR WITH A MOVABLE RACEWAY AND AN OPTIMIZED METHOD OF OPERATING SAME	N/A	62/905487	2019 P	Pending	N/A
LUBRICANT SUPPORTED ELECTRIC MOTOR WITH A MONITORING PORT	N/A	62/912122	2019 P	Pending	N/A
Lubricant Supported External Rotor Architectures	N/A	62/931294	2019 P	Pending	N/A
System and Method for Providing Vehicle Alerts	N/A	17/091137	2020/11/06	Pending	N/A
Sealed and Unsealed Electronic Assemblies Using Common Design	N/A	63/134654	2021/01/07	Pending	N/A
System and Method for Optimizing Signal Processing and Storage using Frequency-Time Domain Conversion	N/A	63/135682	2021/01/11	Pending	N/A

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Trademarks

Country	Mark	Class	Status	Application Number	Filing Date	Registration Number	Registration Date	Next Action Due Date
United States	MANUFACTURING DRIVELINE SOLUTIONS	7, 12, 40	Allowed	88171375	26-Oct-2018			
United States	4EVER	7, 12, 40	Pending	90277923	26-Oct-2020			
United States	INNOVATIVE DRIVETRAIN SOLUTIONS	7, 12	Registered	77604091	30-Oct-2008	3886900	07-Dec-2010	07-Dec-2030
United States	NEAPCO	7, 12	Registered	71530113	31-Jul-1947	519167	27-Dec-1949	27-Dec-2029
United States		7, 12	Registered	77542345	08-Aug-2008	3751150	23-Feb-2010	23-Feb-2030
United States	NEAPCO	12	Registered	87467900	30-May-2017	5442194	10-Apr-2018	10-Apr-2024
United States	NEW ENGLAND AUTO PRODUCTS CORPORATION	7, 12	Registered	88433819	16-May-2019	6257740	26-Jan-2021	26-Jan-2027
United States		7, 12	Registered	88434011	16-May-2019	6257741	26-Jan-2021	26-Jan-2027
United States	TRAKHOOK	7, 12, 40	Registered	88668629	25-Oct-2019	6252448	19-Jan-2021	19-Jan-2027
United States		7, 12, 40	Registered	88700903	21-Nov-2019	6252606	19-Jan-2021	19-Jan-2027

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Copyrights

Country	Title	Status	Registration No.	Registration Date
United States	2001 boot kit catalog no. FWD 2001	Registered	TX5419597	31-Jul-2001
United States	2001 power-take off driveline catalog, no. 637	Registered	TX5361340	26-Mar-2001
United States	2002 axle/ring & pinion catalog	Registered	TX5638458	02-Aug-2002
United States	2002 universal joint catalog	Registered	TX5656469	02-Aug-2002
United States	2005 UNIVERSAL JOINT CATALOG	Registered	TX6181573	20-Jun-2005
United States	2007 UNIVERSAL JOINT CATALOG	Registered	TX6831202	10-Oct-2007
United States	85-0880 Ford outboard CV tool : no. NCV-29, Instruction Sheet	Registered	TX2267479	16-Feb-1988
United States	Carquest universal joints	Registered	TX6189707	20-Jun-2005
United States	CARQUEST UNIVERSAL JOINTS 2007	Registered	TX6831203	10-Oct-2007
United States	Driveline specialist master catalog DS 245	Registered	TX6021527	17-Aug-2004
United States	Driveline specialist master catalog, DS 245	Registered	TX5537053	14-Feb-2002
United States	Fiat X1/9 and 128 : constant velocity driveshaft replacement instructions	Registered	TX2293732	16-Feb-1988
United States	Fleetrite cross reference list	Registered	TX256370	29-May-1979
United States	Fleetrite universal joint repair kits catalog.	Registered	TX1470426	10-Sep-1984
United States	Fleetrite universal joint repair kits for all makes.	Registered	TX172284	08-Jan-1979
United States	Ford domestic models constant velocity (CV) driveshaft/joint/boot repair : no. NCV-102	Registered	TX2267478	16-Feb-1988

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Country	Title	Status	Registration No.	Registration Date
United States	Front wheel drive products	Registered	TX2278630	09-Mar-1988
United States	Front wheel drive products: catalog	Registered	TX1771358	24-Feb-1986
United States	Front wheel drive products: catalog	Registered	TX1256719	27-Dec-1983
United States	Front wheel drive products: catalog	Registered	TX1226382	14-Nov-1983
United States	GM A-, C-, H-, J-, N-, and X-series cars	Registered	TX2293733	16-Feb-1988
United States	GME-& K-cars and S-series 4x4 trucks constant velocity (CV) driveshaft/joint/boot repair : no. NCV-100	Registered	TX2267477	16-Feb-1988
United States	NAPA UNIVERSAL JOINT 2005	Registered	TX6181816	20-Jun-2005
United States	NAPA UNIVERSAL JOINTS 2007	Registered	TX6831200	10-Oct-2007
United States	Neapco 4-wheel drive universal joint repair kits: catalog	Registered	TX323171	04-Sep-1979
United States	Neapco part number interchange : [no.] IL-830.	Registered	TX171880	05-Jan-1979
United States	Neapco Power take-off catalog ...: argricultural, heavy-duty truck, industrial.	Registered	TX1068924	22-Feb-1983
United States	Neapco power take-off products: catalog	Registered	TX1903441	14-Jul-1986
United States	Neapco power train components: catalog	Registered	TX2552019	21-Apr-1989
United States	Neapco power train components: catalog	Registered	TX1903440	14-Jul-1986
United States	Neapco presents The catalog on remanufactured front wheel drive axle assemblies	Registered	TX5827284	07-Jun-2002
United States	Neapco universal joint catalog ...: passenger car, foreign car, light, medium, heavy-duty trucks, industrial, marine construction	Registered	TX662056	30-Mar-1981

Country	Title	Status	Registration No.	Registration Date
United States	Neapco universal joint catalog : passenger car, heavy duty truck, foreign car, light and medium duty truck : catalog 130	Registered	TX172283	08-Jan-1979
United States	Neapco: catalog	Registered	TX1880825	04-Aug-1986
United States	Neapco: catalog	Registered	TX1420742	04-Sep-1984
United States	Neapco's N1000 series u-joints and yokes: for heavy duty mashing, mixing and dumping : catalog	Registered	TX323170	04-Sep-1979
United States	P D Q diagnostic guide for front wheel drive.	Registered	TX1645421	26-Aug-1985
United States	P D Q: proven drive-train quality : passenger car, foreign car, light, medium & heavy duty trucks, marine, industrial, constructions : the hot line in power train components	Registered	TX2552020	21-Apr-1989
United States	P D Q: proven drive-train quality : catalog 2-88FWD, Front wheel drive products.	Registered	TX2313258	11-Apr-1988
United States	P V power take-off products	Registered	TX1903439	14-Jul-1986
United States	P V power train components.	Registered	TX1903434	02-Sep-1986
United States	P. T. O. drive shafts & components/ Republic Parts, Inc.	Registered	TX1903437	14-Jul-1986
United States	Power take-off catalog: universal joints & driveshafts / Neapco	Registered	TX323264	04-Sep-1979
United States	Proven Valu power take-off catalog: agricultural, heavy-duty truck, industrial.	Registered	TX1104807	24-Jan-1983
United States	Proven Valu power train components: passenger car, foreign car, light, medium and heavy duty trucks, marine, industrial, construction. - - Catalog no. PV84-4	Registered	TX1452038	30-Aug-2001
United States	Proven Valu universal joint catalog: passenger car, frontwheel drive components, foreign car, light, medium, heavy duty trucks, industrial, marine construction	Registered	TX1104805	24-Jan-1983
United States	Proven Valu universal joint part number interchange: competitors, o. e. manufacturers.	Registered	TX1104806	24-Jan-1983

Country	Title	Status	Registration No.	Registration Date
United States	PV power train components : catalog no. PV-89-4, 1989	Registered	TX2552023	21-Apr-1989
United States	Universal joint & driveline component booklet no. DLI-1055	Registered	TX5398441	07-Jun-2001
United States	Universal joint catalog : UJ9900	Registered	TX5222108	02-Feb-2001
United States	Universal joints: front wheel drive replacement parts and drive shaft supports / Republic Parts, Inc.	Registered	TX1903438	14-Jul-1986
United States	NEAPCO 2008 Boot Kit Catalog	Registered	TX 7-216-002	22-May-2008
United States	CARQUEST Boot Kit 2008	Registered	TX 7-216-008	22-May-2008
United States	2009 Driveline Catalog DS245	Registered	TX 7-243-430	02-Jun2009
United States	Neapco's N1000 series u-joints and yokes: for heavy duty mashing, mixing and dumping: catalog	Registered	CSN0022133	
United States	Neapco 4-wheel drive universal joint repair kits: catalog	Registered	CSN0022134	
United States	Power take-off catalog: universal joints & driveshafts / Neapco	Registered	CSN0022565	
United States	Universal joint catalog	Registered	CSN0034405	
United States	Neapco Power take-off catalog: agricultural, heavy-duty truck, industrial	Registered	CSN0047593	
United States	Proven Valu power take-off catalog: agricultural, heavy-duty truck, industrial	Registered	CSN0047895	
United States	Proven Valu universal joint catalog: passenger car, frontwheel drive components, foreign car, light, medium, heavy duty trucks, industrial, marine construction	Registered	CSN0047896	
United States	Proven Valu universal joint part number interchange: competitors, o. e. manufacturers	Registered	CSN0047897	
United States	Front wheel drive products : catalog	Registered	CSN0049879	

Country	Title	Status	Registration No.	Registration Date
United States	Neapco: catalog	Registered	CSN0056698	
United States	Proven Valu power train components: passenger car, foreign car, light, medium and heavy duty trucks, marine, industrial, construction	Registered	CSN0057068	
United States	Power train components catalog	Registered	CSN0068560	
United States	Power take-off products catalog	Registered	CSN0068561	
United States	P.T.O. drive shafts & components / Republic Parts, Inc.	Registered	CSN0068696	
United States	PV power take-off products	Registered	CSN0068702	
United States	PV power train components	Registered	CSN0068703	
United States	Universal joints: front wheel drive replacement parts and drive shaft supports 2005/ Republic Parts, Inc.	Registered	CSN0069399	
United States	PDQ : proven drive-train quality: passenger car, foreign car, light, medium & heavy duty trucks, marine, industrial, construction: the hot line in power train components	Registered	CSN0082936	

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (12-20)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
206898	15/966,085	04-30-2018
First Named Inventor:	**Title:**	
Michael Walter Hopson	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:
    - Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
    - The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
        - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
        - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
            - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
            - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date	Practitioner Registration No.
/James D. Miller/	May 13, 2021	46,932
Name (Print/Typed)	**Telephone Number**	
James D. Miller	419-241-9000	

***Note**: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

☐ * Total of _____ forms are submitted.

Privacy Act Statement

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.

Electronic Acknowledgement Receipt

EFS ID:	42717016
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	13-MAY-2021
Filing Date:	30-APR-2018
Time Stamp:	15:30:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response After Final Action	206898_Amendment_AF_Filed_05132021.pdf	142030 ce4575df7b5d00de5c4e4eed46b67e440cf9fd4d	no	12

Warnings:

Information:					
2	After Final Consideration Program Request	206898_AFCPPR_Filed_05132021.pdf	217392 9c5dbd2c11f07a9460546e522a0b9aa7ddb2ee24	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	359422	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Confirmation No.:	9702
Filing Date:	April 30, 2018
Applicants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Alexus Camero
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AFTER FINAL

Honorable Commissioner:

In response to the final Office Action mailed March 16, 2021, please amend the patent application as follows and consider the remarks set forth below.

Additionally, Applicants submit herewith a Certification and Request for Consideration under the After Final Consideration Pilot Program 2.0.

AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of claims in the application.

1. (Currently Amended) 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; ~~and~~

a retaining means configured to retain the coupling of the second member to the first member, ~~a portion~~ 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window.

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.

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4. (Original) The joint assembly of Claim 2, wherein the window is continuous with the open end.

5. (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.

6. (Cancelled)

7. (Original) The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. (Cancelled)

9. (Original) The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. (Original) A vehicle driveline comprising the joint assembly of Claim 1.

11. (Original) A vehicle comprising the joint assembly of Claim 1.

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12. (Currently Amended) A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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; ~~and~~

a retaining ring configured to retain the coupling of the second member to the first member, wherein distal ends ~~a portion~~ of the retaining ring are accessible through the window, the first member including an interior surface annular recess ~~receiving a portion of the retaining ring~~ and the second member including an exterior surface annular recess ~~receiving another portion of the retaining ring~~, 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 wherein the distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member; and

a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window.

13. (Cancelled)

14. (Original) The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

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

providing the 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; ~~and~~

a retaining means configured to retain the coupling of the second member to the first member, ~~a portion~~ 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window;

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

manipulating the distal ends of 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.

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16. (Previously Presented) The method of servicing the joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. (Cancelled)

18. (Previously Presented) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. (Previously Presented) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. (Canceled)

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21. (Cancelled)

22. (New) The joint assembly of Claim 1, wherein the window is covered by a cylindrical portion of the seal having an inner surface corresponding in shape to the outer wall of the first member.

23. (New) The joint assembly of Claim 22, wherein the cylindrical portion of the seal engages the outer wall of the first member about at least a portion of a perimeter of the window.

24. (New) The joint assembly of Claim 22, wherein the cylindrical portion of the seal is disposed at an end of the seal.

25. (New) The joint assembly of Claim 24, wherein the cylindrical portion of the seal is disposed adjacent a portion of the seal spaced radially outwardly from each of the first member and the second member.

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REMARKS

Applicants submit herewith a Certification and Request for Consideration under the After Final Consideration Pilot Program 2.0 using form PTO/SB/434. The Amendment after final Office Action should accordingly be entered because the amendments to the independent claims can be determined to place the application in a condition for allowance without conducting additional search and consideration.

Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 are pending in the patent application.

Claim 20 was previously cancelled.

Claims 6, 8, 13, 17, and 21 are currently cancelled.

Claims 1, 12, and 15 are currently amended. Support for the amendments is found in the patent application as originally filed, including in the figures.

Claims 22-25 are added as new. Support for the new claims is found in the patent application as originally filed, including in the figures.

No new matter is added.

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

REJECTIONS UNDER 35 U.S.C. §§ 102 AND 103

Claims 1-7, 9-12, 14-16, 18, and 19 stand rejected under 35 U.S.C. § 102(a)(1) as anticipated by Krude et al. (U.S. Pat. No. 6,739,422).

Claims 1-7, 9-12, 14-16, 18, and 19 alternatively stand rejected under 35 U.S.C. § 103 as unpatentable over Kofuji (U.S. Pat. Appl. Pub. No. 2009/0233723) in view of Krude.

Claims 8, 13, and 17 stand rejected under 35 U.S.C. § 103 as unpatentable over Kofuji in view of Krude and further in view of Sugiyama et al. (U.S. Pat. Appl. Pub. No. 2018/0003240).

Claim 21 stands rejected under 35 U.S.C. § 103 as unpatentable over Kofuji in view of Sugiyama.

The rejections are respectfully traversed.

Claims 1, 12, and 15

Each of Claims 1, 12, and 15 now recites some form of the limitations “a window formed within the first member where the portion of the second member is disposed within the first

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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 wall of the first member," "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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window."

The amendments to each of Claims 1, 12, and 15 establish a different scope of the invention. Specifically, each of Claims 1, 12, and 15 now requires that the window is an opening provided specifically for accessing the distal ends of the retaining means, which extend radially outwardly into the window, while a remaining portion of the retaining means is at least partially received within each of the interior surface recess of the first member and the exterior surface recess of the second member. Claims 1, 12, and 15 therefore each relate to a joint assembly that has a retaining means disposed between and partially received within two components with respect to a radial direction of the joint assembly, hence such a window is utilized to access this position of the retaining means that is disposed radially inwardly of the outer wall of the first member.

Claims 1, 12, and 15 further require that this window is covered by a seal spanning the first member and the second member. Such a seal is utilized to prevent ingress of debris or other materials that could enter through the window, and especially in view of the manner in which the window leads to the connection formed between the recited retaining means as indicated by the limitation that the window be formed "within the first member where the portion of the second member is disposed within the first member." The seal being coupled to the first member to cover the window and to the second member also indicates that seal covers both the window and the location where the second member is inserted into the first member, hence the seal covers two independent points of ingress of materials into the joint present between the first member and the second member.

On page 12 of the Office Action the Examiner admits that Kofuji in view of Krude fails to disclose the limitations relating to the seal configured to cover the window, and for this reason the Examiner relies upon the Sugiyama reference.

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However, the Sugiyama reference does not disclose a window for accessing the distal ends of a retaining means disposed between a first member and a second member. Instead, Sugiyama discloses a pair of through holes (31, 32) formed to diametrically opposing sides of an output shaft (3) having an input shaft (2) received therein. The through holes (31, 32) are provided to allow for lateral portions of a retaining ring (8) to be passed through the through holes (31, 32) from an exterior of the output shaft (3) in such a manner that the lateral portions of the retaining ring (8) bear against radially extending surfaces of each of the shafts (2, 3) exposed by the through holes (31, 32). The lateral portions of the retaining ring (8) accordingly form an interference pattern within each of the through holes (31, 32) for preventing axial motion of the shafts (2, 3) relative to each other. As shown in Figs. 10(a) and (b) of Sugiyama, the distal ends of the retaining ring (8) are always exposed at a position exterior to and spaced from the through holes (31, 32), and are manipulated without having to access any portion of the retaining ring (8) via the through holes (31, 32).

In view of the above, the Sugiyama reference is devoid of what could reasonably be construed as the "window" as recited in each of Claims 1, 12, and 15. The through holes (31, 32) do not provide access to the distal ends of the retaining means (8), and the retaining means (8) is not received partially into opposing grooves between the different shafts (2, 3). There is accordingly no motivation for one skilled in the art to look to the Sugiyama reference for guidance in creating a joint assembly having a seal for covering a window used to access such a retaining means, as the through holes (31, 32) are unrelated structures that play an entirely different structural role than the window of the present invention.

As such, each of Claims 1, 12, and 15 is patentable over the cited combination of references.

Withdrawal of the rejections is respectfully requested.

New Claims 22-25

New Claims 22-25 further narrow the scope of the recited seal to differentiate the recited joint assembly from the cited combination of references including the Sugiyama reference.

New Claim 22 recites "wherein the window is covered by a cylindrical portion of the seal having an inner surface corresponding in shape to the outer wall of the first member." Claim 22 accordingly establishes that the cylindrical portion has a close fit around the first member around the window as opposed to being spaced apart therefrom, thereby ensuring proper overage of the window. In contrast, the seal (35) of Sugiyama is spaced radially outwardly from the position of

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each of the through holes (31, 32). Claim 22 is accordingly patentable over the cited combination of references for at least this additional reason.

New Claim 23, which depends from 22, further recites "wherein the cylindrical portion of the seal engages the outer wall of the first member about at least a portion of a perimeter of the window." Once again, this limitation further establishes the close contact and prevention of entry into the window, whereas the perimeter of the through holes (31, 32) are in all cases spaced from the seal (35). Claim 23 is accordingly patentable over the cited combination of references for at least this additional reason.

New Claim 24, which also depends from Claim 22, recites "wherein the cylindrical portion of the seal is disposed at an end of the seal." Claim 24 establishes that the window can be accessed by merely uncovering an end portion of the seal, as opposed to having to access an open space formed inwardly of an end of the seal. In contrast, a central portion of the seal (35) of Sugiyama must be accessed to reach the retaining ring (8). Claim 24 is accordingly patentable over the cited combination of references for at least this additional reason.

Lastly, new Claims 25, which depends from Claim 24, further recites "wherein the cylindrical portion of the seal is disposed adjacent a portion of the seal spaced radially outwardly from each of the first member and the second member." Once again, this configuration is clearly contrary to that of Sugiyama, hence Claim 25 is patentable over the cited combination of references for at least this additional reason.

Careful consideration of new Claims 22-25 is respectfully requested.

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CONCLUSION

It is believed that the remaining 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,



By: _____

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/966,085	Filing Date 04/30/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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), (i), 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(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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	05/13/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	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".	/VENICE M WILLIAMS/
*** 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.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

43935 7590 06/03/2021

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

EXAMINER
CAMERO, ALEXUS

ART UNIT	PAPER NUMBER
3678	

NOTIFICATION DATE	DELIVERY MODE
06/03/2021	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

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0237

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.	
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (FITF) Status** Yes

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

THE REPLY FILED 13 May 2021 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires ____ months from the mailing date of the final rejection.
   b) ☑ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☑ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: _____ (See 37CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☑ Applicants reply has overcome the following rejection(s): See Continuation Sheet
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☑ For purposes of appeal, the proposed amendment(s):(a) ☑ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☑ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☑ Other: PTO-2323.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:_____.
    Claim(s) objected to:_____.
    Claim(s) rejected:1-5,7,9-12,14-16,18-19 and 22-25.
    Claim(s) withdrawn from consideration:6,8,13,17 and 20-21.

/ALEXUS CAMERO/ Examiner, Art Unit 3678	/AMBER R ANDERSON/ Supervisory Patent Examiner, Art Unit 3678

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PET_AAM_1004-0238

NOTE: Continuation of (5), (7), (12):

For the purposes of appeal, the proposed amendments will not be entered. The request for reconsideration has been considered but does NOT place the application in condition for allowance.

Claim 1, upon being entered, would be rejected over the combination Kofuji in view of Krude et al. and Sugiyama et al. as stated in the Final Office Action mailed on 16 March 2021 (see rejections of Claims 1, 6, 8, 12, 13, 15, and 17 on pages 7-13).

Claims 22-25 would also be rejected over the combination Kofuji in view of Krude et al. and Sugiyama et al. Sugiyama et al. (Fig. 7) teaches a seal (35) having a cylindrical portion (36) having an inner surface corresponding in shape to the outer wall of the first member (30) and being disposed at an end of the seal (35). The seal (35) also includes a portion adjacent said cylindrical portion (36), and that is spaced radially outwardly from the first and second members (30, 11). See Paragraph 0058, wherein the portion adjacent said cylindrical portion (36) is "the middle section structured in a substantially bellows shape". The seal (35) of Sugiyama et al., when combined to Kofuji in view of Krude et al., is capable of engaging the outer wall of the first member about at least a portion of a perimeter of the window of Kofuji, and is also capable of covering the window of Kofuji.

The Examiner, however, further notes that Applicant's amendments, upon being entered, would overcome the outstanding 102 rejection over Krude et al.

Examiner-Initiated Interview Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.		
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
ALEXUS CAMERO	Examiner	Telephonic
Amber Anderson	SPE	
Scott L. Seaman	Attorney	

Date of Interview: 26 May 2021

Issues Discussed:

Proposed Amendment(s)

Applicant's proposed amendments to Claim 1 and newly added Claims 22-25 have been discussed. The Examiner noted that Claims 22-25 are broadly written and that previously applied references, i.e. the combination of Kofuji in view of Krude et al. and Sugiyama et al., would be able to reject the amended Claim 1 and newly added Claims 22-25.

The reference Sugiyama et al. and how it would be used to reject Claims 22-25 have been discussed. The Examiner has noted that, under broadest reasonable interpretation, Sugiyama et al. discloses each limitations recited in Claims 22-25.

Moreover, possible incorporation of Claims 22-25 into Claim 1 has been discussed. It is suggested that limitations with regard to the seal upon adding to Claim 1 would need to be further specified/clarified, which will then require further search and consideration.

/ALEXUS CAMERO/ Examiner, Art Unit 3678	/AMBER R ANDERSON/ Supervisory Patent Examiner, Art Unit 3678

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0240

AFCP 2.0 Decision	Application No.	Applicant(s)	
	15/966,085	Hopson et al.	
	Examiner	Art Unit	AIA (FITF) Status
	ALEXUS CAMERO	3678	Yes

This is in response to the After Final Consideration Pilot request filed 13 May 2021.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

   ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.

   ☐ A non-broadening amendment to at least one independent claim was not submitted.

   ☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.

   ☐ Other: _____

2. **Proper Request**

   A. After final amendment submitted with the request will not be treated under AFCP 2.0.
   The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

   ☐ The after final amendment will be treated under pre-pilot procedure.

   B. Updated search and/or completed additional consideration.
   The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

   ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.

   ☑ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action . See attached interview summary for further details.

   ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.

   ☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.

   ☐ 5. Other: _____

   Examiner Note: Please attach an interview summary when necessary as described above.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0241

DO NOT ENTER: /A.C./

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Confirmation No.:	9702
Filing Date:	April 30, 2018
Applicants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Alexus Camero
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AFTER FINAL

Honorable Commissioner:

In response to the final Office Action mailed March 16, 2021, please amend the patent application as follows and consider the remarks set forth below.

Additionally, Applicants submit herewith a Certification and Request for Consideration under the After Final Consideration Pilot Program 2.0.

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

Jun 03, 2021 04:21:42 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.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

Disclaimer:
The list of documents shown below is provided as a courtesy and is not part of the official file wrapper. The content of the images shown in PAIR is the official record.

Application	Document	Mailroom Date	Attorney Docket No.
15966085	CTAV	06/03/2021	206898/58974-1
	EXIN	06/03/2021	206898/58974-1
	A.NE.AFCP.D	06/03/2021	206898/58974-1

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If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

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

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15966085	Filing Date	2018-04-03	Docket Number (if applicable)	206898/58974-1	Art Unit	3678
First Named Inventor	Michael Walter Hopson			Examiner Name	CAMERO, ALEXUS		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 505605

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

American Axle v. Neapco - IPR2025-00090
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PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/James D. Miller/	Date (YYYY-MM-DD)	2021-06-08
Name	James D. Miller	Registration Number	46932

This collection of information is required by 37 CFR 1.114. 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 1.11 and 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.

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

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0245

Privacy Act Statement

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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0246

Electronic Patent Application Fee Transmittal	
Application Number:	15966085
Filing Date:	30-Apr-2018
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Filer:	James D. Miller/Christine Golupski
Attorney Docket Number:	206898/58974-1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
		Total in USD ($)		**1360**

Electronic Acknowledgement Receipt	
EFS ID:	42923201
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	08-JUN-2021
Filing Date:	30-APR-2018
Time Stamp:	09:02:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1360
RAM confirmation Number	E202168003144395
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	206898_RCE_Filed_06082021.pdf	1388467 a91583fd87c8453149a4eb29997b7c5a2d924334	no	3
Warnings:					
Information:					
2	Amendment Submitted/Entered with Filing of CPA/RCE	206898_Response_Filed_06082021.pdf	148092 9c36e31dfaff2a8e9d4d315a1e89ecc0f745d2f8	no	12
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30968 71d73242452e4de22f5c5cae38bb3c3880352d82	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1567527		

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 a 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Confirmation No.:	9702
Filing Date:	April 30, 2018
Applicants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Alexus Camero
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AFTER FINAL ACCOMPANYING A REQUEST FOR CONTINUED EXAMINATION

Honorable Commissioner:

In response to the final Office Action mailed March 16, 2021, please amend the patent application as follows and consider the remarks set forth below.

The present Amendment is also filed in conjunction with a Request for Continued Examination in accordance with 37 C.F.R. § 1.114.

AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of claims in the application.

1. (Currently Amended) 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; ~~and~~

a retaining means configured to retain the coupling of the second member to the first member, ~~a portion~~ 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

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.

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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 1, wherein the first engagement means includes a first plurality of splines and the second engagement means includes a second plurality of splines.

6. (Cancelled)

7. (Original) The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. (Cancelled)

9. (Original) The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. (Original) A vehicle driveline comprising the joint assembly of Claim 1.

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11. (Original) A vehicle comprising the joint assembly of Claim 1.

12. (Currently Amended) A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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; ~~and~~

a retaining ring configured to retain the coupling of the second member to the first member, wherein distal ends ~~a portion~~ of the retaining ring are accessible through the window, the first member including an interior surface annular recess ~~receiving a portion of the retaining ring~~ and the second member including an exterior surface annular recess ~~receiving another portion of the retaining ring~~, 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 wherein the distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member; and

a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

13. (Cancelled)

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14. (Original) The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

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

providing the 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; ~~and~~

a retaining means configured to retain the coupling of the second member to the first member, ~~a portion~~ 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window;

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uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means;

manipulating the distal ends of 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.

16. (Previously Presented) The method of servicing the joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. (Cancelled)

18. (Previously Presented) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. (Previously Presented) The method of servicing the joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. (Cancelled)

21. (Cancelled)

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22. (New) The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member.

23. (New) The joint assembly of Claim 22, wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, wherein the corrugated portion is spaced radially from each of the first member and the second member.

24. (New) The joint assembly of Claim 23, wherein the window is continuous with an open end of the first member, and wherein the corrugated portion of the seal is disposed directly radially outwardly of the open end of the first member.

25. (New) The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed at an end of the seal.

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PET_AAM_1004-0257

REMARKS

Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 are pending in the patent application.

Claim 20 was previously cancelled.

Claims 6, 8, 13, 17, and 21 are currently cancelled.

Claims 1, 12, and 15 are currently amended. Support for the amendments is found in the patent application as originally filed, including in the figures.

Claims 22-25 are added as new. Support for the new claims is found in the patent application as originally filed, including in the figures.

No new matter is added.

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

REJECTIONS UNDER 35 U.S.C. §§ 102 AND 103

Claims 1-7, 9-12, 14-16, 18, and 19 stand rejected under 35 U.S.C. § 102(a)(1) as anticipated by Krude et al. (U.S. Pat. No. 6,739,422).

Claims 1-7, 9-12, 14-16, 18, and 19 alternatively stand rejected under 35 U.S.C. § 103 as unpatentable over Kofuji (U.S. Pat. Appl. Pub. No. 2009/0233723) in view of Krude.

Claims 8, 13, and 17 stand rejected under 35 U.S.C. § 103 as unpatentable over Kofuji in view of Krude and further in view of Sugiyama et al. (U.S. Pat. Appl. Pub. No. 2018/0003240).

Claim 21 stands rejected under 35 U.S.C. § 103 as unpatentable over Kofuji in view of Sugiyama.

The rejections are respectfully traversed.

Claims 1, 12, and 15

Each of Claims 1, 12, and 15 now recites some form of the limitations "a window formed within the first member where the portion of the second member is disposed within 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 wall of the first member," "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

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coupling of the second member to the first member," and "a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window."

The amendments to each of Claims 1, 12, and 15 establish a different scope of the invention. Specifically, each of Claims 1, 12, and 15 now requires that the window is an opening provided specifically for accessing the distal ends of the retaining means, which extend radially outwardly into the window, while a remaining portion of the retaining means is at least partially received within each of the interior surface recess of the first member and the exterior surface recess of the second member. Claims 1, 12, and 15 therefore each relate to a joint assembly that has a retaining means disposed between and partially received within two components with respect to a radial direction of the joint assembly, hence such a window is utilized to access this position of the retaining means that is disposed radially inwardly of the outer wall of the first member.

Claims 1, 12, and 15 further require that this window is covered by a seal spanning the first member and the second member. Such a seal is utilized to prevent ingress of debris or other materials that could enter through the window, and especially in view of the manner in which the window leads to the connection formed between the recited retaining means as indicated by the limitation that the window be formed "within the first member where the portion of the second member is disposed within the first member." The seal being coupled to the first member to cover the window and to the second member also indicates that seal covers both the window and the location where the second member is inserted into the first member, hence the seal covers two independent points of ingress of materials into the joint present between the first member and the second member.

On page 12 of the Office Action the Examiner admits that Kofuji in view of Krude fails to disclose the limitations relating to the seal configured to cover the window, and for this reason the Examiner relies upon the Sugiyama reference.

However, the Sugiyama reference does not disclose a window for accessing the distal ends of a retaining means disposed between a first member and a second member. Instead, Sugiyama

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discloses a pair of through holes (31, 32) formed to diametrically opposing sides of an output shaft (3) having an input shaft (2) received therein. The through holes (31, 32) are provided to allow for lateral portions of a retaining ring (8) to be passed through the through holes (31, 32) from an exterior of the output shaft (3) in such a manner that the lateral portions of the retaining ring (8) bear against radially extending surfaces of each of the shafts (2, 3) exposed by the through holes (31, 32). The lateral portions of the retaining ring (8) accordingly form an interference pattern within each of the through holes (31, 32) for preventing axial motion of the shafts (2, 3) relative to each other. As shown in Figs. 10(a) and (b) of Sugiyama, the distal ends of the retaining ring (8) are always exposed at a position exterior to and spaced from the through holes (31, 32), and are manipulated without having to access any portion of the retaining ring (8) via the through holes (31, 32).

In view of the above, the Sugiyama reference is devoid of what could reasonably be construed as the "window" as recited in each of Claims 1, 12, and 15. The through holes (31, 32) do not provide access to the distal ends of the retaining means (8), and the retaining means (8) is not received partially into opposing grooves between the different shafts (2, 3). There is accordingly no motivation for one skilled in the art to look to the Sugiyama reference for guidance in creating a joint assembly having a seal for covering a window used to access such a retaining means, as the through holes (31, 32) are unrelated structures that play an entirely different structural role than the window of the present invention.

As such, each of Claims 1, 12, and 15 is patentable over the cited combination of references for at least this reason.

Furthermore, Claims 1, 12, and 15 also recite "wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window." These limitations establish that the cylindrical portion of the seal does not merely surround the first member, but actually engages the outer wall of the first member where the opening defining the window is formed therein. This direct engagement ensures that a fluid tight seal is established where the cylindrical portion contacts the first member along a boundary into the window, which ensures that debris cannot enter the seal between the cylindrical portion and the first member with respect to the axial direction before eventually reaching the perimeter of the window.

In contrast, the seal (35) of Sugiyama is spaced radially outwardly from the position of each

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of the through holes (31, 32) formed through the shaft (3). As such, the seal (35) cannot be said to be engaging the shaft (3) "along at least a portion of a perimeter of the window" as required by Claims 1, 12, and 15. The Sugiyama reference accordingly fails to disclose the seal as recited in Claims 1, 12, and 15.

Claims 1, 12, and 15 are accordingly patentable over any combination of the cited art of record for at least this additional reason.

Withdrawal of the rejections is respectfully requested.

New Claims 22-25

New Claim 22, which depends from Claim 1, further recites "wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member." This limitation further establishes that the close contact between the cylindrical portion and the first member occurs at the axial position of the retaining means, whereas the perimeter of the through holes (31, 32) of Sugiyama are in all cases spaced from the seal (35) in the radial direction at the position of the circlip (8). Claim 22 is accordingly patentable over the cited combination of references for at least this additional reason.

New Claim 23, which depends from Claim 22, recites "wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, wherein the corrugated portion is spaced radially from each of the first member and the second member." Claim 23 accordingly further establishes the contrary structure of the recited seal in comparison to the axially shifted seal (35) of Sugiyama, which instead includes a corrugated portion thereof directly surrounding the circlip (8) and the through holes (31, 32). Claim 23 is accordingly patentable over the cited combination of references for at least this additional reason.

New Claim 24, which depends from Claim 23, further recites "wherein the window is continuous with an open end of the first member, and wherein the corrugated portion of the seal is disposed directly radially outwardly of the open end of the first member." Once again, Claim 24 recites a configuration that is entirely contrary to the configuration disclosed in Sugiyama. Claim 24 is accordingly patentable over the cited combination of references for at least this additional reason.

New Claim 25, which depends from Claim 1, recites "wherein the cylindrical portion of the

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seal is disposed at an end of the seal." Claim 25 establishes that the window can be accessed by merely uncovering an end portion of the seal, as opposed to having to access an open space formed inwardly of an end of the seal. In contrast, a central portion of the seal (35) of Sugiyama must be accessed to reach the retaining ring (8). Claim 25 is accordingly patentable over the cited combination of references for at least this additional reason.

Careful consideration of new Claims 22-25 is respectfully requested.

CONCLUSION

It is believed that the remaining 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,



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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/966,085	Filing Date 04/30/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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), (i), 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(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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	06/08/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	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".	/SHARAIN E MORELAND/
*** 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.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

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EXAMINER
CAMERO, ALEXUS

ART UNIT	PAPER NUMBER
3678	

NOTIFICATION DATE	DELIVERY MODE
06/23/2021	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

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Office Action Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.	
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 08 June 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-5,7,9-12,14-16,18-19 and 22-25 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-5,7,9-12,14-16,18-19 and 22-25 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8 June 2021 has been entered.

Response to Amendment

The amendment filed on 8 June 2021 has been entered. Claims 1, 12, and 15 have been amended and are hereby entered. Claims 6, 8, 13, 17, and 20-21 have been cancelled. Claims 22-25 have been added. Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 are currently pending and have been examined.

Response to Arguments

Applicant's arguments filed 8 June 2021 have been fully considered but they are not persuasive.

Regarding Applicant's argument, see pages 9-10, that Sugiyama et al. fails to disclose a window for accessing distal ends of a retaining means disposed between first and second members, the Examiner would like to point out that Sugiyama et al. is not being relied on to teach a window for access distal ends of a retaining means and that it is merely being used to teach the use of a seal or a water-proof boot in a joint assembly to cover through holes or a window. Kofuji (Figs. 4-6c) already discloses a window (93, a notched section) for accessing distal ends (95h) of a retaining means (95) disposed between a first member (43) and a second member (45). When combined with the joint assembly of Kofuji, the seal of Sugiyama et al. is therefore capable of covering the window formed within the first member of Kofuji.

Regarding Applicant's argument, see pages 10-11, that Sugiyama et al. fails to disclose that the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member and that the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window, the Examiner respectfully disagrees and would like to point out that Sugiyama et al. (see

annotated Fig. 7 on Page 6) teaches that a cylindrical portion (36a) being disposed at an end of a seal (35) includes an inner surface engaging the outer wall of a first member (30) and that the cylindrical portion (36a) engages the outer wall of the first member (30) **along at least a portion** of a perimeter of through holes (31, 31, 26a, 26b) of the first member (30). Since the Applicant has not recited that the cylindrical portion engages the outer wall of the first member along the entire perimeter of the window, Sugiyama et al. reads on said limitation of the claim.

Regarding Applicant's argument, see pages 11-12, that Sugiyama et al. fails to disclose that the seal is disposed radially outwardly of the retaining means, that the seal further includes a corrugated portion disposed adjacent the cylindrical portion and disposed directly radially outwardly of the open end of the first member, and that the cylindrical portion is disposed at an end of the seal, the Examiner respectfully disagrees for the following reasons. Sugiyama et al. (see annotated Fig. 7 on Page 6) teaches that the entirety of the seal (35) extends radially surrounding both first member (30) and second member (11, 12) and that a cylindrical portion (36a) being disposed at an end of the seal (35) being in a form of a cylinder, when combined with the joint assembly of Kofuji, is disposed directly radially outwardly of the retaining means (95, of Kofuji) when the retaining means (95) retains the coupling of the second member to the first member. The seal (35) further includes a corrugated portion (36b) disposed adjacent the cylindrical portion (36a) and, when combined with the joint assembly of Kofuji, the corrugated portion (36b) of the seal (35) is disposed directly radially outwardly of the open end of the first member (30, of Kofuji).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Krude et al. (US 6,739,422 B2) and of Sugiyama et al. (US 2018/0003240 A1).

With respect to **Claim 1**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having a first engagement means (86, a spline hole) and an interior surface recess (91);

a second member (45) having a second engagement means (84, a spline section) and an exterior surface recess (92), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43),

wherein distal ends (95h) of the retaining means (95) are accessible through the window (93),

wherein the retaining means (95) is received partially into each of the interior surface recess (91) of the first member (43) and the exterior surface recess (92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57)

are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window

Kofuji fails to disclose a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

However, Sugiyama et al. (Fig. 3-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 6) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b);

the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2 and 21);

the seal (35) coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b), wherein the through holes (31, 32, 26a, 26b) are at least partially covered by a cylindrical portion (36a) of the seal (35) having an inner surface engaging an outer wall of the first member (30), and wherein the cylindrical portion (36a) of the seal (35) engages the outer wall of the first member (30) along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal

or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

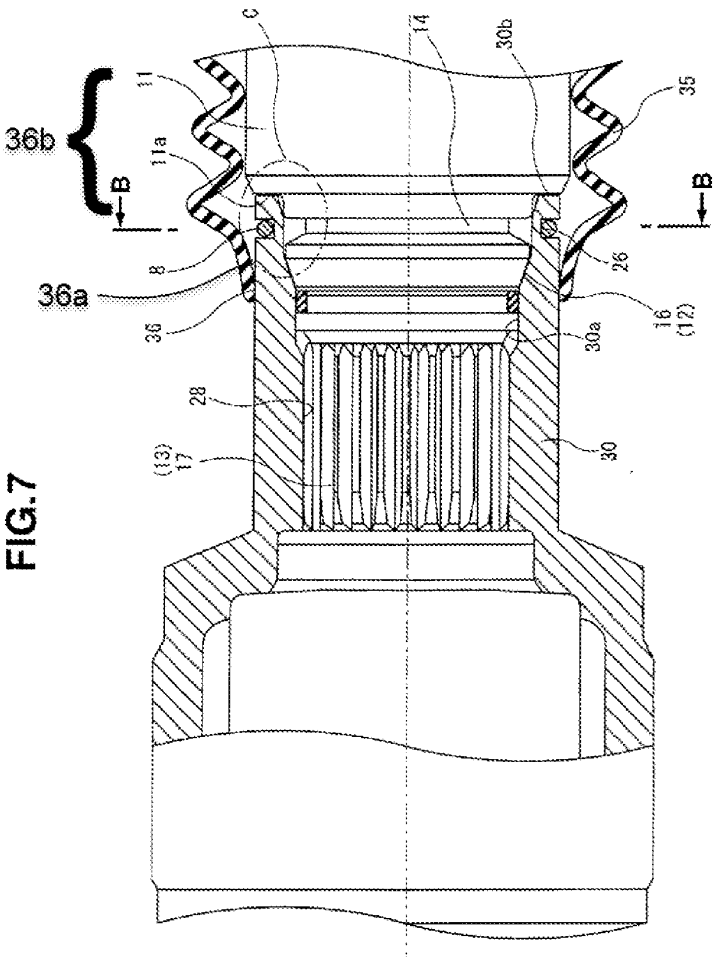


FIG.7

With respect to **Claim 2**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first member (43) includes an open end and the first engagement means (86) of the first member (43) is formed within the open end.

With respect to **Claim 3**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the portion (45b) of the second member (45) disposed within the first member (43) is disposed within the open end and includes the second engagement means (84).

With respect to **Claim 4**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the window (93) is

continuous with the open end. See Paragraph 0051, wherein the window (93) has a section opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43).

With respect to **Claim 5**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first engagement means (86) includes a first plurality of splines (spline hole) and the second engagement means (84) includes a second plurality of splines (spline section).

With respect to **Claim 7**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the retaining means (95) is configured as a retaining ring (circular clip).

With respect to **Claim 9**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 3) further discloses further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 10**, Kofuji in view of Krude et al. and Sugiyama et al. discloses a vehicle driveline (41; Figs. 2-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 11**, Kofuji in view of Krude et al. and Sugiyama et al. discloses a vehicle (10; Figs. 1-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 12**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having an open end and a first plurality of splines (86, a spline hole) formed within the open end;

a second member (45) having a second plurality of splines (84, a spline section) formed thereon, a portion (45b) of the second member (45) disposed within the first member (43), the second plurality of splines (84) engaging the first plurality of splines (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining ring (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), wherein distal ends (95h) of the retaining ring (95) are accessible through the window (93), the first member (43) including an interior surface annular

recess (91) and the second member (45) including an exterior surface annular recess (92),

wherein the retaining means (95) is received partially into each of the interior surface recess (91) of the first member (43) and the exterior surface recess(92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57) are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

Kofuji fails to disclose a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion

of a perimeter of the window.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 6) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b);

the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2 and 21);

the seal (35) coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b), wherein the through holes (31, 32, 26a, 26b) are at least partially covered by a cylindrical portion (36a) of the seal (35) having an inner surface engaging an outer wall of the first member (30), and wherein the cylindrical portion (36a) of the seal (35) engages the outer wall of the first member (30) along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 14**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 12 and Kofuji (Fig. 3) further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 15**, 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 211.02.

Therefore, Kofuji (Figs. 1-6c) discloses a method of servicing a joint assembly comprising:

providing (Fig. 4) the joint assembly, the joint assembly (Figs. 4) including:

a first member (43) having a first engagement means (86, a spline hole) and an interior surface recess (91);

a second member (45) having a second engagement means (84, a spline section) and an exterior surface recess (92), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means(84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43); a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), wherein distal ends (95h) of the retaining means (95) are accessible through the window (93), and wherein the retaining means (95) is received partially into each of the interior surface recess (91) of the first member (43) and the exterior surface recess (92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4);

manipulating (Figs. 5a-5b) the distal ends (95h) of the retaining means (95) through the window (93) to release the coupling of the second member (45) to the first member (43); and

separating (Figs. 6a-6c) the first member (43) and the second member (45) by disengaging the second engagement means from the first engagement means.

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second

engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57) are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

Kofuji fails to disclose that the joint assembly includes a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window and that the method comprises uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means.

However, Sugiyama et al. (Fig. 4-7) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 6) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b);

the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2, 21);

the seal (35) coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b), wherein the through holes (31, 32, 26a, 26b) are at least partially covered by a cylindrical portion (36a) of the seal (35) having an inner surface engaging an outer wall of the first member (30), wherein the cylindrical portion (36a) of the seal (35) engages the outer wall of the first member along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. such that the combination of Kofuji and Sugiyama et al. allows the window to be uncovered from the cylindrical portion of the seal to provide access to the distal ends of the retaining means. One of ordinary skill in the art would have been motivated to make such combination for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 16**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Fig. 3) further discloses that the joint assembly further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 18**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated first member (43) with another second member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated first member (43) to be capable of coupling with another second member to form another joint assembly.

With respect to **Claim 19**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated second member (45) with another first member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated second member (45) to be capable of coupling with another first member to form another joint assembly.

With respect to **Claim 22**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Sugiyama et al. (annotated Fig. 7 on Page 6) further discloses that, when combined with the joint assembly of Kofuji, the cylindrical portion (36a) of the seal (35) is disposed directly radially outwardly of the retaining means (95, of Kofuji) when the retaining means (95) retains the coupling of the second member (45) to the first member (43).

With respect to **Claim 23**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 22 and Sugiyama et al. (annotated Fig. 7 on Page 6) further discloses that the seal (35) further includes a corrugated portion (36b) adjacent the cylindrical portion (36a), wherein the corrugated portion (36b) is spaced radially outwardly from each of the first member (30) and the second member (11, 12) (or from each of the first member (43) and the second member (45) of Kofuji when combined).

With respect to **Claim 24**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 23, Kofuji (Fig. 4) further discloses that the window (93) is continuous with an open end of the first member (43) (see Paragraph 0051, wherein the window (93) has a section opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43), and Sugiyama et al. (annotated Fig. 7 on Page 6) further discloses that, when combined with the joint assembly of Kofuji, the corrugated portion (36b) of the seal (35) is disposed directly radially outwardly of the open end of the first member (30, of Kofuji).

With respect to **Claim 25**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Sugiyama et al. (annotated Fig. 7 on Page 6) further discloses that the cylindrical portion (36a) of the seal (35) is disposed at an end of the seal (35).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXUS CAMERO whose telephone number is (571)272-8629. The examiner can normally be reached on M-F 9:00 am to 5:00 pm EST.

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 an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEXUS CAMERO/
Examiner, Art Unit 3678

/AMBER R ANDERSON/
Supervisory Patent Examiner, Art Unit 3678

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

CPC - Searched*		
Symbol	**Date**	**Examiner**
F16D 1/108, 112, 116	01/12/2021	AC
F16D 2001/103	01/12/2021	AC
F16B 21/18, 183, 186	01/12/2021	AC
Y10T 403/7033	01/12/2021	AC
Updated Search Above	03/01/2021	AC
Updated Search Above	06/16/2021	AC

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**
EAST, PALM search of inventor and assignee	01/11/2021	AC
Search Help from Josh Skroupa (Class 403)	01/12/2021	AC
Forward and Backward Citation Search	01/13/2021	AC
See attached EAST search history	01/14/2021	AC
See attached updated EAST search history	03/06/2021	AC
See attached updated EAST search history	06/17/2021	AC

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PET_AAM_1004-0279

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	ALEXUS CAMERO	3678

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

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	ALEXUS CAMERO	3678

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/14/2021	03/01/2021	06/17/2021						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	-						
	7	✓	✓	✓						
	8	✓	✓	-						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	-						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	-						
	18	✓	✓	✓						
	19	✓	✓	✓						
	20	✓	-	-						
	21		✓	-						
	22			✓						
	23			✓						
	24			✓						
	25			✓						

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	8	US-6739422-$ | US-6251019-$ | US-7922590-$ | US-8231475-$	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 15:39
S3	78	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY") near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2021/01/11 16:02
S5	346	((("HOPSON") near3 ("Michael")) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/11 16:07
S7	1,981	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 09:31
S10	3,350	F16D1/112,116.cpc. NOT S7	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:14
S12	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 12:53
S17	5,135	F16B21/18,186.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:50
S18	1,981	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:51
S19	3,577	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO;	OR	ON	2021/01/12 18:51

			JPO; DERWENT			
S20	4,858	F16B21/18,186.cpc. NOT (S18 S19)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 18:51
S21	1,252	F16B21/183.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:14
S22	994	F16B21/183.cpc. NOT (S17 S18 S19)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:15
S23	5,417	F16D2001/103.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:15
S24	3,919	F16D2001/103.cpc. NOT (S17 S18 S19 S21)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S25	1,581	Y10T403/7033.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:16
S26	936	Y10T403/7033.cpc. NOT (S17 S18 S19 S21 S23)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/12 20:18
S27	1	(13/170547).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:28
S28	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:28
S29	1	(10/755805).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:30

S30	6	("20060009298" | "5363601" | "5647800" | "5803993" | "6672965" | "6736729").PN. OR ("7222426").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:30
S31	1	(10/690146).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:34
S32	27	("1966826" | "20020044706" | "20020106140" | "20030044099" | "4004838" | "4340317" | "4493388" | "4629028" | "5486053" | "5536075" | "5549514" | "5603554" | "5782565" | "5921633" | "6022275" | "6152825" | "6170628" | "6193419" | "6196639" | "6203441" | "6354952" | "6413008" | "6450585" | "6668888").PN. OR ("6969125").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:35
S33	1	(09/758767).APP.	USPAT; USOCR	OR	ON	2021/01/13 11:45
S34	26	("1631236" | "4136982" | "4225263" | "4261668" | "5492417" | "5499884" | "5611733" | "5643092" | "5667332" | "5853250" | "5957615").PN. OR ("6582151").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:46
S35	29	("2170970" | "2349903" | "3832076" | "3865499" | "3992117").PN. OR ("4136982").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:46
S36	21	("1391012" | "2453391" | "2611632" | "2775037" | "3374015" | "4077232").PN. OR ("4225263").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 11:56
S37	13	("20070199756" | "20090057046" | "4523871" | "6009609" | "6467565" | "6582151" | "7533751" | "7644797" | "7665562").PN. OR ("7946374").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:25
S38	19	("3357206").URPN.	USPAT	OR	ON	2021/01/13 12:34
S39	22	("2457942" | "2857777" | "3191453").PN. OR ("3750489").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:36
S40	28	("0684594" | "1740377" | "2361827" | "3351359" | "3480310").PN. OR ("3926532").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:38
S41	46	("3531144" | "3718350" | "3832076" | "3992117").PN. OR ("4124318").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:42
S42	1	(12/393461).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:52
S43	1	(12/502928).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:53

S44	4	("3625548" | "3966239" | "4157019" | "4169686").PN. OR ("8187107").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:55
S45	1	(12/361795).APP.	USPAT; USOCR	OR	ON	2021/01/13 12:57
S46	21	("1541007" | "2952999" | "3999786" | "4127741" | "4136982" | "4915536" | "5647683" | "5735747" | "6348002" | "6367680" | "7029398" | "7140969" | "7228787" | "7314416").PN. OR ("8092312").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 12:57
S47	2	US-20180003240-$	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:03
S48	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/01/13 13:06
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		2173572-$ or GB-2219372-$ or DE-102009017007-$ or DE-102016000530-$ or US-20180003240-$ or DE-102013012749-$).did.				
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S54	19	S49 and (exchang$4 replace$4 chang$4)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/01/13 14:34
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S79	1	(13/170547).APP.	USPAT; USOCR	OR	ON	2021/03/01 18:54

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S83	2,125	F16D1/108.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/06/16 21:06
S84	3,929	F16D1/112,116.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2021/06/16 21:06
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S89	1,296	F16B21/183.cpc.	US-PGPUB; USPAT;	OR	ON	2021/06/16 21:10

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EAST Search History (Interference)

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6/17/2021 11:20:50 AM
C:\Users\acamero1\Documents\EAST\Workspaces\15966085 - High Retention Force S Plug On Joint Assembly.wsp

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PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Filing Date:	April 30, 2018
Appellants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Alexus Camero
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Commissioner:

This is Appellants' Appeal Brief filed in accordance with 37 CFR §41.37 appealing the Examiner's Non-final Office Action dated June 23, 2021 (hereinafter "the Office Action"). A Notice of Appeal is filed concurrently herewith and is accompanied by the fee required under 37 C.F.R § 41.20(b)(1).

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I. REAL PARTY IN INTEREST

The inventors Michael Walter Hopson, Arvind Srinivasan, and Michael Peter Kinsella originally assigned all rights in the invention to NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals, interferences, or judicial proceedings known to the Appellants that will directly affect, or be directly affected by, the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 are pending, wherein a copy of the claim set appears in the Appendix of this Brief. Claims 6, 8, 13, 17, 20, and 21 are cancelled. Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 are rejected and are currently on appeal. No claims are allowed. No claims are objected to as improper.

IV. STATUS OF AMENDMENTS

All claim amendments have been entered in the application. No amendments are filed concurrently with the present Appeal Brief.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter involved in the appeal, as required by 37 CFR §41.37(c)(1)(v). The following explanation is not intended to be used to construe the claims, which speak for themselves, nor does Appellant intend the following explanation to modify or add any claim elements, or to constitute a disclaimer of any equivalents to which the claims would otherwise be entitled, nor is any reference to certain preferred embodiments herein intended to disclaim other possible embodiments.

The following summary indicates certain portions of the specification (including the drawings) that provide examples of embodiments of elements of the claimed subject matter. It is to be understood that other portions of the specification not cited herein may also provide examples of embodiments of elements of the claimed subject matter. It is also to be understood

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that the indicated examples are merely examples, and the scope of the claimed subject matter includes alternative embodiments and equivalents thereof. References herein to the specification are thus intended to be exemplary and not limiting.

Appellants' independent Claim 1 recites a joint assembly 100. See paragraph [0029]. The joint assembly 100 comprises a first member 110 having a first engagement means 160 and an interior surface recess 200 and a second member 120 having a second engagement means 170 and an exterior surface recess 220. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the second member 120 is disposed within the first member 110. See paragraph [0030] and Fig. 3. The second engagement means 170 engages the first engagement means 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs. 1-3. A retaining means 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining means 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. The retaining means 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2.

Appellants' independent Claim 12 recites a joint assembly 100. See paragraph [0029]. The joint assembly 100 comprises a first member 110 having an open end 150 and a first plurality of splines 160 formed within the open end 150 and a second member 120 having a second plurality of splines 170 formed thereon. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the

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second member 120 disposed within the first member 110. See paragraph [0030] and Fig. 3. The second plurality of splines 170 engage the first plurality of splines 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs. 1-3. A retaining ring 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining ring 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The first member 110 includes an interior surface recess 200 and the second member 120 includes an exterior surface recess 220, wherein the retaining ring 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining ring 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2.

Appellants' independent Claim 15 recites a method of servicing a joint assembly 100. See paragraph [0035]. The joint assembly 100 includes a first member 110 having a first engagement means 160 and an interior surface recess 200 and a second member 120 having a second engagement means 170 and an exterior surface recess 220. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the second member 120 is disposed within the first member 110. See paragraph [0030] and Fig. 3. The second engagement means 170 engages the first engagement means 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs.

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1-3. A retaining means 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining means 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. The retaining means 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2. The method includes a step of uncovering the window 130 from the cylindrical portion of the seal 240 to provide access to the distal ends 260 of the retaining means 140. See paragraphs [0024] and [0026] and Figs. 2 and 3. The method also includes a step of manipulating the distal ends 260 of the retaining means 140 through the window 130 to release the coupling of the second member 120 to the first member 110. See paragraphs [0026], [0032], and [0034]. Lastly, the method includes a step of separating the first member 110 and the second member 120 by disengaging the second engagement means 170 from the first engagement means 160. See paragraphs [0026], [0032], and [0035].

Appellants' dependent Claim 22 recites the joint assembly 100 according to Claim 1, wherein the cylindrical portion of the seal 240 is disposed directly radially outwardly of the retaining means 140 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See Figs. 2 and 3.

Appellants' dependent Claim 25 recites the joint assembly 100 according to Claim 1, wherein the cylindrical portion of the seal 240 is disposed at an end of the seal 240. See Figs. 2 and 3.

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VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

With regards to the rejections set forth in the outstanding Office Action, the present Appeal addresses whether the Examiner erred in rejecting Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 under 35 U.S.C. § 103 as unpatentable over Kofuji (U.S. Pat. Appl. Pub. No. 2009/0233723) in view of Krude et al. (U.S. Pat. No. 6,739,422) and Sugiyama et al. (U.S. Pat. Appl. Pub. No. 2018/0003240).

VII. ARGUMENT

i. Independent Claims 1, 12, and 15 were improperly rejected under 35 U.S.C. § 103 as obvious in view of the cited combination of references.

Appellants' independent Claims 1, 12, and 15 each recite a joint assembly having a first member, a second member having a portion disposed within the first member, a window formed within the first member where the portion of the second member is disposed in the first member, a retaining means/ring configured to retain a coupling of the first member to the second member, and a seal configured to cover the window. The retaining means/ring is recited in each instance as including distal ends that are accessible through the window when the retaining means/ring is received into an interior surface recess of the first member and an exterior surface recess of the second member. The recited window is accordingly provided in order to access the distal ends of the retaining means/ring when it is desirable to decouple the first member from the second member.

When considered in the context of the present patent application, a "window" as used in Claims 1, 12, and 15 is defined by the Merriam-Webster Dictionary as "a means of entrance or access" or "an opening (such as a shutter, slot, or valve) that resembles or suggests a window." When considered in view of remaining limitations of Claims 1, 12, and 15 highlighted above, it is clear that the recited window refers to an opening formed within the first member that leads radially inwardly to a position of the retaining means/ring, which is itself positioned at a junction of the first member and the second member where the portion of the second member is received within the first member. For example, the distal ends of retaining means/ring are recited as being "accessible through the window" while also "extend[ing] in a direction radially outwardly into the

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window to a point at or radially inwardly from an outer wall of the first member." When considering these limitations in combination, the distal ends of the retaining means/ring are accordingly recited as being accessible from an exterior of the first member, thereby indicating that the window is an opening extending radially inwardly through the first member from an outer surface thereof to at least a position of the distal ends of the retaining means.

Each of Claims 1, 12, and 15 further recites "wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member." The term "cylindrical" is defined by the Merriam-Webster Dictionary as "relating to or having the form or properties of a cylinder," wherein the term "cylinder" is further defined as "the surface traced by a straight line moving parallel to a fixed straight line and intersecting a fixed planar closed curve." The recited "cylindrical portion of the seal" accordingly refers to a closed annular portion of the seal that is extended in an axial direction thereof, and not to a conical, frustoconical, or otherwise tapered shape that is formed by the seal. The "inner surface" of the "cylindrical portion of the seal" being recited as "engaging the outer wall of the first member" accordingly indicates that a surface of the seal formed along an axially extending portion thereof (the cylindrical portion) is in direct contact with an exposed outer surface of the first member as formed by the outer wall thereof.

Additionally, each of Claims 1, 12, and 15 also recites "wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window." As established above, the window is formed within the outer wall of the first member with the window penetrating the first member in a radially inward direction. As used in the context of Claims 1, 12, and 15, the term "perimeter" is defined as "the boundary of a closed plane figure" or "a line or strip bounding or protecting an area." The boundary of the window as recited in Claims 1, 12, and 15 therefore refers to those positions around the window where an outer surface of the first member deviates radially inwardly to define the opening corresponding to the window. Such a deviation in the outer surface of the first member may, as one non-limiting example, correspond to an edge of the window formed at the outer surface of the first member where the outer surface first curves or turns radially inwardly from the otherwise cylindrical shape thereof.

Considering each of the limitations discussed hereinabove in combination, each of Claims 1, 12, and 15 recites a configuration wherein the inner surface of the cylindrical portion

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of the seal must be contacting the outer wall of the first member along at least one position where the outer surface of the outer wall deviates radially inwardly to define the perimeter of the window. For example, if an edge is formed at the outer surface of the first member to define a boundary of the window, the inner surface of the cylindrical portion of the seal must engage the first member along such an edge at one or more positions to disclose the described relationship as recited in any of Claims 1, 12, and 15.

In rejecting Claims 1, 12, and 15, the Examiner admits that Kofuji in view of Krude fails to disclose the limitations relating to the seal configured to cover the window, and for this reason the Examiner relies upon the Sugiyama reference. However, as explained hereinafter, the Sugiyama reference does not disclose a seal covering a window in the manner recited in Claims 1, 12, and 15, hence the cited combination of references cannot establish a *prima facie* case of obviousness.

Specifically, Sugiyama discloses an output shaft (3) having an annular retaining groove (26) formed therein, wherein through holes (31, 32) are formed to diametrically opposing sides of retaining groove (26). The output shaft (3) is configured to receive an input shaft (2) therein. The through holes (31, 32) are provided to allow for lateral portions of a retaining ring (8) to be passed through the through holes (31, 32) from an exterior of the output shaft (3) in such a manner that the lateral portions of the retaining ring (8) bear against radially extending surfaces of each of the shafts (2, 3) exposed by the through holes (31, 32), thereby forming an interference fit. See Sugiyama at paragraph [0046] and Figs. 4-7. A boot (35) is coupled to each of the shafts (2, 3) to span the joint therebetween. The boot (35) includes a boot attachment section (36) which directly engages a cylindrical section (30) of the outer surface of the output shaft (3). The boot attachment section (36) is formed by an annularly shaped end of the boot (35) that is tapered radially inwardly to make the contact with the cylindrical section (30) of the output shaft (3).

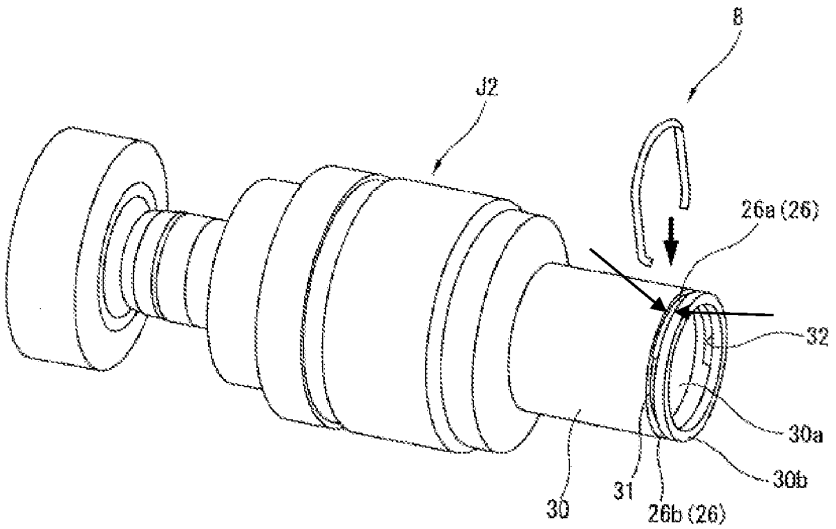
As can be seen clearly in Fig. 7 of Sugiyama, the boot attachment section (36) engages the output shaft (3) at a position that is spaced axially from the position of the retaining groove (26), which also corresponds to the axial position of each of the through holes (31, 32). The remainder of the boot (35) extending away from the boot attachment section (36) is spaced radially outwardly from the outer surface of each of the shafts (2, 3), which includes the portion of the output shaft (3) having the retaining groove (26) and the corresponding through holes (31, 32).

In citing the Sugiyama reference, the Examiner equates the retaining groove (26) and/or the through holes (31, 32) to the recited window while the boot (35) is equated to the recited seal. As is

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best seen in Fig. 4 of Sugiyama, the "perimeter" of the retaining groove (26) (or either of the through holes (31, 32)) must refer to the positions at which the retaining groove (26) deviates radially inwardly from the surrounding cylindrical section (30) based on the above provided definitions and the remainder of the language of each of Claims 1, 12, and 15. It is clear from a review of Fig. 4 that the perimeter of the retaining groove (26) refers to one of two axially spaced apart annular edges formed in the cylindrical section (30), which accordingly corresponds to the perimeter of the retaining groove (26) being restricted to those axial positions immediately adjacent an end of the output shaft (3). The annular edges defining the perimeter of the retaining groove (26) are identified by arrows hereinbelow with respect to Fig. 4 of Sugiyama. The through holes (31, 32) similarly include perimeters that are restricted to being present at some position between these two annular edges.

FIG.4



As is shown in Fig. 7 of the Sugiyama reference, the boot attachment section (36), which forms the only portion of the boot (35) contacting or engaging the output shaft (3) adjacent the retaining groove (26) and the through holes (31, 32), is unambiguously spaced axially from a perimeter of any of the retaining groove (26), the through hole (31), or the through hole (32). An inner surface of the boot (35) is also spaced apart from the output shaft (3) along the cylindrical

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section (30) having the retaining groove (36) formed therein, hence the boot (35) cannot contact or otherwise engage the retaining groove (26) or the through holes (31, 32) at any position where these features otherwise deviate from the parallel arrangement of the output shaft (3) along the cylindrical section (30).

The Sugiyama reference accordingly fails to disclose or otherwise render obvious the limitations "wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member" or "wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window."

The remaining references of record fail to cure the deficiencies of the Sugiyama reference. As such, Claims 1, 12, and 15 are patentable over any combination of the cited art of record.

ii. Dependent Claim 22 was improperly rejected under 35 U.S.C. § 103 as obvious in view of the cited combination of references.

Appellants' Claim 22 depends from independent Claim 1 and recites "wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member."

As shown in Fig. 7 of Sugiyama, the retaining groove (26) includes a circlip (8) therein, which is considered analogous to the recited retaining means. The retaining groove (26) and the corresponding circlip (8) are formed at an axial position corresponding to an axial position where a frustoconical portion of the boot (35) transitions to a corrugated portion of the boot (35) (which is also frustoconical in shape) immediately radially outwardly of the retaining groove (26) and the circlip (8).

The Sugiyama reference accordingly fails to disclose or otherwise suggest a seal having a cylindrical portion disposed radially outwardly of a retaining means. Once again referring to Fig. 7, the only portion of the boot (35) contacting the output shaft (3), the boot attachment section (36), is clearly not disposed directly radially outwardly of the circlip (8).

Dependent Claim 22 is accordingly patentable over any combination of the cited art of record for at least this additional reason.

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iii. Dependent Claim 25 was improperly rejected under 35 U.S.C. § 103 as obvious in view of the cited combination of references.

Appellants' Claim 25 depends from independent Claim 1 and recites "wherein the cylindrical portion of the seal is disposed at an end of the seal."

As explained in the preceding sections, the boot attachment section (36) forms one end of the boot (35) and forms the only portion of the boot (35) directly engaging the output shaft (3). Assuming that the boot attachment section (36) is considered analogous to the recited cylindrical portion of the seal, the Sugiyama reference clearly fails to disclose or suggest the limitations of Claim 1 regarding the relationships present between the first member and the seal. Specifically, as explained in detail in the preceding sections, the boot attachment section (36) cannot provide guidance regarding each and every limitation of Claim 1 drawn towards the manner in which the recited cylindrical portion engages at least a portion of a perimeter of the recited window. Instead, Sugiyama discloses the outward tapering of the boot (35) before reaching the axial position of the circlip (8) and the retaining groove (26).

Dependent Claim 25 is accordingly patentable over any combination of the cited art of record for at least this additional reason.

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iv. Conclusion

In sum, each of independent Claims 1, 12, and 25 are patentable over each of the cited references of record and all combinations thereof. For the same reasons, each of the dependent claims depending from independent Claims 1, 12, and 25 are similarly patentable over the cited references and combinations thereof. For these and the other reasons discussed above, Appellants respectfully request that the rejections of Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 be REVERSED.

Respectfully submitted,

Dated: August 4, 2021

By: _____

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VIII. Claims Appendix

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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of 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.

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4. The joint assembly of Claim 2, wherein the window is continuous with the open end.

5. 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.

6. (Cancelled)

7. The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. (Cancelled)

9. The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. A vehicle driveline comprising the joint assembly of Claim 1.

11. A vehicle comprising the joint assembly of Claim 1.

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12. A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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 ring configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining ring are accessible through the window, the first member including an interior surface annular recess and the second member including an exterior surface annular recess, 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 wherein the distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member; and

a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

13. (Cancelled)

14. The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

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15. A method of servicing a joint assembly comprising:

providing the 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window;

uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means;

manipulating the distal ends of 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.

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16. The method of servicing the joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. (Cancelled)

18. The method of servicing the joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. The method of servicing the joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. (Cancelled)

21. (Cancelled)

22. The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member.

23. The joint assembly of Claim 22, wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, wherein the corrugated portion is spaced radially from each of the first member and the second member.

24. The joint assembly of Claim 23, wherein the window is continuous with an open end of the first member, and wherein the corrugated portion of the seal is disposed directly radially outwardly of the open end of the first member.

25. The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed at an end of the seal.

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IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.

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Electronic Patent Application Fee Transmittal

Application Number:	15966085
Filing Date:	30-Apr-2018
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Filer:	James D. Miller/Christine Golupski
Attorney Docket Number:	206898/58974-1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
NOTICE OF APPEAL	1401	1	840	840
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**840**

Electronic Acknowledgement Receipt	
EFS ID:	43428004
Application Number:	15966085
International Application Number:	
Confirmation Number:	9702
Title of Invention:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
First Named Inventor/Applicant Name:	Michael Walter Hopson
Customer Number:	43935
Filer:	James D. Miller/Christine Golupski
Filer Authorized By:	James D. Miller
Attorney Docket Number:	206898/58974-1
Receipt Date:	04-AUG-2021
Filing Date:	30-APR-2018
Time Stamp:	16:56:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$840
RAM confirmation Number	E202184G56210174
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of Appeal Filed	206898_Notice_of_Appeal_Filed_08042021.pdf	251561 f30d4515c27bc4b91388b8ce1b7f935c706b3f00	no	2
Warnings:					
Information:					
2	Appeal Brief Filed	206898_Appeal_Brief_Filed_08042021.pdf	150981 98a732906d6deefad68df1458476f81900eaa25d	no	19
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	38506 c5966684f5b0aed66a6a4b57cd683d80b9f0192b	no	2
Warnings:					
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		Total Files Size (in bytes):	441048		

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If a new application is being filed and the application includes the necessary components for a 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.

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NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 206898/58974-1

I hereby certify that this correspondence is being facsimile transmitted to the USPTO, EFS-Web transmitted to the USPTO, or deposited with the United States Postal Service with sufficient postage in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, on Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on August 4, 2021.

Signature /James D. Miller/

Typed or printed name James D. Miller

In re Application of: Michael Walter Hopson et al.

Application Number	Filed
15/966,085	04-30-2018

For: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Art Unit	Examiner
3678	CAMERO, ALEXUS

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 840

☐ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ _____

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Therefore, the fee shown above is reduced by 75%, and the resulting fee is: $ _____
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 505605.

☑ Payment made via EFS-Web.

☐ A petition for an extension of time under 37 CFR 1.136(a) (PTO/AIA/22 or equivalent) is enclosed.
For extensions of time in reexamination proceedings, see 37 CFR 1.550.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant

☑ attorney or agent of record
Registration number 46,932

☐ attorney or agent acting under 37 CFR 1.34
Registration number _____

Signature /James D. Miller/

Typed or printed name James D. Miller

Telephone Number 419-241-9000

Date August 4, 2021

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 41.20(b)(1) and 41.31. 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 1.11, 1.14 and 41.6. 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.**

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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.
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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.
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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

43935 7590 11/16/2021

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

EXAMINER	
CAMERO, ALEXUS	

ART UNIT	PAPER NUMBER
3678	

NOTIFICATION DATE	DELIVERY MODE
11/16/2021	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

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0317

Office Action Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.	
	Examiner ALEXUS CAMERO	**Art Unit** 3678	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 04 August 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-5,7,9-12,14-16,18-19 and 22-25 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-5,7,9-12,14-16,18-19 and 22-25 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0318

DETAILED ACTION

In view of the appeal brief filed on 4 August 2021, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/AMBER R ANDERSON/
Supervisory Patent Examiner, Art Unit 3678

Status of Claims

The office action is being examined in response to the application filed by the applicant on 4 August 2021. Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 are currently pending and have been examined.

This action is made SECOND NON-FINAL.

Response to Arguments

Applicant's arguments, see pages 5-10, filed on 4 August 2021, with respect to the rejections of Claims 1, 12, 15, 22, and 25 under 35 USC § 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of a different interpretation of the previously applied reference.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 as being unpatentable over Kofuji (US 2009/0233723 A1) in view of Krude et al. (US 6,739,422 B2) and of Sugiyama et al. (US 2018/0003240 A1).

With respect to **Claim 1**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having a first engagement means (86, a spline hole) and an interior surface recess (91);

a second member (45) having a second engagement means (84, a spline section) and an exterior surface recess (92), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means (84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43),

wherein distal ends (95h) of the retaining means (95) are accessible through the window (93),

wherein the retaining means (95) is received partially into each of the interior surface recess (91) of the first member (43) and the exterior surface recess (92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57) are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

Kofuji fails to disclose a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

However, Sugiyama et al. (Fig. 3-7; annotated Fig. 7 on Page 5) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b)

from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 5) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b), wherein the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2 and 21), and wherein the seal (35) is coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b) via an attachment section (36).

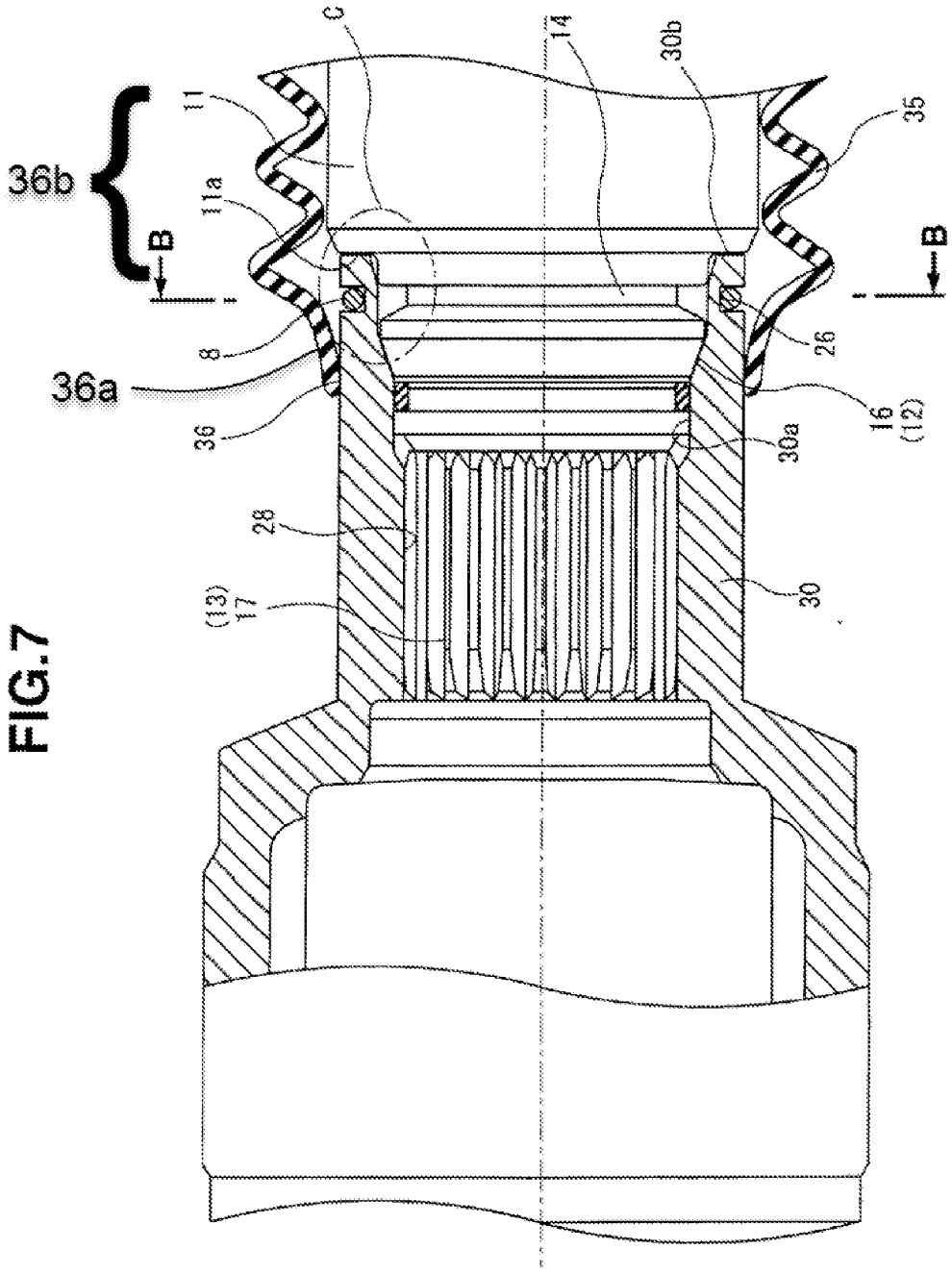


FIG.7

Sugiyama et al. (annotated Fig. 7 on Page 5) does not explicitly teach that an inner surface of a cylindrical portion (36a) of the seal (35) engages an outer wall of the first member (30) such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) of the seal (35) and that the cylindrical portion (36a) of the seal engages the outer

wall of the first member along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

However, the seal (35) of Sugiyama et al. being formed to enable expansion and contraction in the axial direction (Paragraph 0058) suggests its capability of moving in an axial direction with respect to the first member (30) and to the second member (11, 12). Thus, the cylindrical portion (36a) of the seal (35) is capable of engaging and contacting the outer wall of the first member to an extent, i.e. in parallel arrangement with respect to the outer wall of the first member, such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) and such that the cylindrical portion (36a) engages and contact the outer wall of the first member along at least a portion of the perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. such that the cylindrical portion of the seal, having the capability of moving in an axial direction, is in parallel arrangement with respect to the outer wall of the first member, the cylindrical portion thereby engaging and contacting the outer wall of the first member along at least a portion of the perimeter of the window and at least partially covering the window of the first member, for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 2**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first member (43) includes an open end and the first engagement means (86) of the first member (43) is formed within the open end.

With respect to **Claim 3**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the portion (45b) of the second member (45) disposed within the first member (43) is disposed within the open end and includes the second engagement means (84).

With respect to **Claim 4**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 2 and Kofuji (Fig. 4) further discloses that the window (93) is continuous with the open end. See Paragraph 0051, wherein the window (93) has a section

opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43).

With respect to **Claim 5**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the first engagement means (86) includes a first plurality of splines (spline hole) and the second engagement means (84) includes a second plurality of splines (spline section).

With respect to **Claim 7**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 4) further discloses that the retaining means (95) is configured as a retaining ring (circular clip).

With respect to **Claim 9**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Kofuji (Fig. 3) further discloses further comprising a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 10**, Kofuji in view of Krude et al. and Sugiyama et al. discloses a vehicle driveline (41; Figs. 2-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 11**, Kofuji in view of Krude et al. and Sugiyama et al. discloses a vehicle (10; Figs. 1-3 of Kofuji) comprising the joint assembly of Claim 1.

With respect to **Claim 12**, Kofuji (Figs. 1-6c) discloses a joint assembly (Figs. 4-6c) comprising:

a first member (43) having an open end and a first plurality of splines (86, a spline hole) formed within the open end;

a second member (45) having a second plurality of splines (84, a spline section) formed thereon, a portion (45b) of the second member (45) disposed within the first member (43), the second plurality of splines (84) engaging the first plurality of splines (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining ring (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), wherein distal ends (95h) of the retaining ring (95) are accessible through the window (93), the first member (43) including an interior surface annular recess (91) and the second member (45) including an exterior surface annular recess (92),

wherein the retaining means (95) is received partially into each of the interior surface recess (91) of the first member (43) and the exterior surface recess (92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4).

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57) are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

Kofuji fails to disclose a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

However, Sugiyama et al. (Fig. 3-7; annotated Fig. 7 on Page 5) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 5) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b), wherein the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2 and 21), and wherein the seal (35) is coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b) via an attachment section (36).

Sugiyama et al. (annotated Fig. 7 on Page 5) does not explicitly teach that an inner surface of a cylindrical portion (36a) of the seal (35) engages an outer wall of the first member (30) such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) of the seal (35) and that the cylindrical portion (36a) of the seal engages the outer wall of the first member along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

However, the seal (35) of Sugiyama et al. being formed to enable expansion and contraction in the axial direction (Paragraph 0058) suggests its capability of moving in an axial direction with respect to the first member (30) and to the second member (11, 12). Thus, the cylindrical portion (36a) of the seal (35) is capable of engaging and contacting the outer wall of the first member to an extent, i.e. in parallel arrangement with respect to the outer wall of the first member, such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) and such that the cylindrical portion (36a) engages and contact the outer wall of the first member along at least a portion of the perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. such that the cylindrical portion of the seal, having the capability of moving in an axial direction, is in parallel arrangement with respect to

the outer wall of the first member, the cylindrical portion thereby engaging and contacting the outer wall of the first member along at least a portion of the perimeter of the window and at least partially covering the window of the first member, for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 14**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 12 and Kofuji (Fig. 3) further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 15**, 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 211.02.

Therefore, Kofuji (Figs. 1-6c) discloses a method of servicing a joint assembly comprising:

providing (Fig. 4) the joint assembly, the joint assembly (Figs. 4) including:

a first member (43) having a first engagement means (86, a spline hole) and an interior surface recess (91);

a second member (45) having a second engagement means (84, a spline section) and an exterior surface recess (92), a portion (45b) of the second member (45) disposed within the first member (43), the second engagement means(84) engaging the first engagement means (86) to provide a coupling of the second member (45) to the first member (43);

a window (93, a notched section) formed within the first member (43) where the portion (45b) of the second member (45) is disposed within the first member (43); and

a retaining means (95, a circular clip) configured to retain the coupling of the second member (45) to the first member (43), wherein distal ends (95h) of the retaining means (95) are accessible through the window (93), and wherein the retaining means (95) is received partially into each of the interior surface

recess (91) of the first member (43) and the exterior surface recess (92) of the second member (45) when the retaining means (95) retains the coupling of the second member (45) to the first member (43) (see Paragraph 0053 and Fig. 4);

manipulating (Figs. 5a-5b) the distal ends (95h) of the retaining means (95) through the window (93) to release the coupling of the second member (45) to the first member (43); and

separating (Figs. 6a-6c) the first member (43) and the second member (45) by disengaging the second engagement means from the first engagement means.

Kofuji fails to disclose that 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 wall of the first member.

However, Krude et al. (Figs. 1-10) teaches a joint assembly (10) comprising:

a first member (72) having a first engagement means (75, an inner toothing);

a second member (41) having a second engagement means (52, an outer toothing), a portion (55) of the second member (41) disposed within the first member (72), the second engagement means (52) engaging the first engagement means (75) to provide coupling of the second member (41) to the first member (72);

a window (74) formed within the first member (72) where the portion of the second member (41) is disposed within the first member (72); and

a retaining means (57, a securing ring) configured to retain the coupling of the second member (41) to the first member (72), wherein distal ends (65, 66) of the retaining means (57) are accessible through the window (74), wherein the distal ends (65, 66) of the retaining means (57) extend in a direction radially outwardly into the window (74) to a point at or radially inwardly from an outer wall of the first member (72).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to modify the retaining ring of Kofuji such that the distal ends extend in a direction radially outwardly into the window to a point as taught by Krude et al. for the purpose of providing a discreet means of uncoupling the first and second members and of preventing the distal ends to interfere with external parts located outside the window.

Kofuji fails to disclose that the joint assembly includes a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially

covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window and that the method comprises uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means.

However, Sugiyama et al. (Fig. 3-7; annotated Fig. 7 on Page 5) teaches a joint assembly comprising a first member (30), a second member (11, 12) coupled to the first member (30), and a retaining means (8) configured to retain the coupling of the second member (11, 12) to the first member (30), wherein the retaining means (8) is inserted into through holes (31, 32, 26a, 26b) from an outer peripheral side of the first member (30) and being engaged with an engagement groove of the second member (11, 12).

Sugiyama et al. (annotated Fig. 7 on Page 5) further teaches a seal (35, a water-proof boot) configured to cover the through holes (31, 32, 26a, 26b), wherein the seal (35) can be coupled to the second member (11, 12) adjacent an end of the first member (30) such as how another seal (27) in Fig. 3 is coupled to two members (2 and 21), and wherein the seal (35) is coupled to the first member (30) adjacent the through holes (31, 32, 26a, 26b) via an attachment section (36).

Sugiyama et al. (annotated Fig. 7 on Page 5) does not explicitly teach that an inner surface of a cylindrical portion (36a) of the seal (35) engages an outer wall of the first member (30) such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) of the seal (35) and that the cylindrical portion (36a) of the seal engages the outer wall of the first member along at least a portion of a perimeter of the through holes (31, 32, 26a, 26b).

However, the seal (35) of Sugiyama et al. being formed to enable expansion and contraction in the axial direction (Paragraph 0058) suggests its capability of moving in an axial direction with respect to the first member (30) and to the second members (11, 12). Thus, the cylindrical portion (36a) of the seal (35) is capable of engaging and contacting the outer wall of the first member to an extent, i.e. in parallel arrangement with respect to the outer wall of the first member, such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) and such that the cylindrical portion (36a) engages and contact the outer

wall of the first member along at least a portion of the perimeter of the through holes (31, 32, 26a, 26b).

Therefore, it would have been obvious to one in ordinary skill in the art at the time of the effective filing date of the claimed invention to include the joint assembly of Kofuji with a seal or a water-proof boot as taught by Sugiyama et al. such that the cylindrical portion of the seal, having the capability of moving in an axial direction, is in parallel arrangement with respect to the outer wall of the first member, the cylindrical portion thereby engaging and contacting the outer wall of the first member along at least a portion of the perimeter of the window and at least partially covering the window of the first member, and such that the combination of Kofuji and Sugiyama et al. allows the window to be uncovered from the cylindrical portion of the seal to provide access to the distal ends of the retaining means. One of ordinary skill in the art would have been motivated to make such combination for the purpose of preventing an invasion of water or dust from the window or openings.

With respect to **Claim 16**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Fig. 3) further discloses that the joint assembly further comprises a constant velocity joint (47, a shaft length variation mechanism; see Paragraph 0036) coupled to the first member (43).

With respect to **Claim 18**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated first member (43) with another second member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated first member (43) to be capable of coupling with another second member to form another joint assembly.

With respect to **Claim 19**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 15 and Kofuji (Figs. 2-3) further comprising coupling the separated second member (45) with another first member to form another joint assembly, wherein the retaining means (95) can be simply attached and detached from the joint assembly, thereby allowing the separated second member (45) to be capable of coupling with another first member to form another joint assembly.

With respect to **Claim 22**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Sugiyama et al. (annotated Fig. 7 on Page 5) further

discloses that, when combined with the joint assembly of Kofuji, the cylindrical portion (36a) of the seal (35) (being in a parallel arrangement with respect to the outer wall of the first member and having the inner surface thereof engage and contact the outer wall of the first member along at least a portion of the perimeter of the window as discussed in the rejection of Claim 1 above) is disposed directly radially outwardly of the retaining means (95, of Kofuji) when the retaining means (95) retains the coupling of the second member (45) to the first member (43).

With respect to **Claim 23**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 22 and Sugiyama et al. (annotated Fig. 7 on Page 5) further discloses that the seal (35) further includes a corrugated portion (36b) adjacent the cylindrical portion (36a), wherein the corrugated portion (36b) is spaced radially outwardly from each of the first member (30) and the second member (11, 12) (or from each of the first member (43) and the second member (45) of Kofuji when combined).

With respect to **Claim 24**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 23, Kofuji (Fig. 4) further discloses that the window (93) is continuous with an open end of the first member (43) (see Paragraph 0051, wherein the window (93) has a section opening towards the tip of the tubular engaging section (85) from a first annular groove (91) of the first member (43), and Sugiyama et al. (annotated Fig. 7 on Page 5) further discloses that, when combined with the joint assembly of Kofuji, the corrugated portion (36b) of the seal (35) is disposed directly radially outwardly of the open end of the first member (30, of Kofuji).

With respect to **Claim 25**, Kofuji in view of Krude et al. and Sugiyama et al. discloses the limitations set forth in Claim 1 and Sugiyama et al. (annotated Fig. 7 on Page 5) further discloses that the cylindrical portion (36a) of the seal (35) is disposed at an end of the seal (35).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXUS CAMERO whose telephone number is (571)272-8629. The examiner can normally be reached on M-F 9:00 am to 5:00 pm EST.

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 an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEXUS CAMERO/
Examiner, Art Unit 3678

/AMBER R ANDERSON/
Supervisory Patent Examiner, Art Unit 3678

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	ALEXUS CAMERO	3678

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/14/2021	03/01/2021	06/17/2021	11/09/2021					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	-	-					
	7	✓	✓	✓	✓					
	8	✓	✓	-	-					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	-	-					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
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	18	✓	✓	✓	✓					
	19	✓	✓	✓	✓					
	20	✓	-	-	-					
	21		✓	-	-					
	22			✓	✓					
	23			✓	✓					
	24			✓	✓					
	25			✓	✓					

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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CPC - Searched*		
Symbol	**Date**	**Examiner**
F16D 1/108, 112, 116	01/12/2021	AC
F16D 2001/103	01/12/2021	AC
F16B 21/18, 183, 186	01/12/2021	AC
Y10T 403/7033	01/12/2021	AC
Updated Search Above	03/01/2021	AC
Updated Search Above	06/16/2021	AC
Updated Search Above	11/08/2021	AC
Y10T 403/7026, 31	11/08/2021	AC

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.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	ALEXUS CAMERO	3678

Search Notes		
Search Notes	**Date**	**Examiner**
EAST, PALM search of inventor and assignee	01/11/2021	AC
Search Help from Josh Skroupa (Class 403)	01/12/2021	AC
Forward and Backward Citation Search	01/13/2021	AC
See attached EAST search history	01/14/2021	AC
See attached updated EAST search history	03/06/2021	AC
See attached updated EAST search history	06/17/2021	AC
Search Help from Michael Ferguson (Class 403)	11/08/2021	AC
See attached PE2E SEARCH summary	11/09/2021	AC

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

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	8	US-6739422-$ | US-6251019-$ | US-7922590-$ | US-8231475-$	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/11 03:39 PM
L2	7	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY") near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.	(USPAT)	OR	ON	ON	2021/01/11 04:01 PM
L3	78	((("NEAPCO") near3 ("INTELLECTUAL") near3 ("PROPERTY") near3 ("HOLDINGS") near3 ("LLC"))).AS,AANM.	(US-PGPUB; USPAT; FPRS; EPO; JPO)	OR	ON	ON	2021/01/11 04:02 PM
L4	245	((("HOPSON") near3 ("Michael")) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/11 04:07 PM
L5	346	((("HOPSON") near3 ("Michael")) OR (("SRINIVASAN") near3 ("Arvind")) OR (("KINSELLA") near3 ("Michael"))).INV.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/11 04:07 PM
L6	1981	F16D1/108.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 09:24 AM
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L11	5135	F16B21/18,186.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 12:53 PM
L12	3577	F16D1/112,116.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 12:53 PM

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L15	4858	F16B21/18,186.cpc. NOT (L7 L12)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 12:54 PM
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L18	1981	F16D1/108.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 06:51 PM
L19	3577	F16D1/112,116.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 06:51 PM
L20	4858	F16B21/18,186.cpc. NOT (L18 L19)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 06:51 PM
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L22	994	F16B21/183.cpc. NOT (L17 L18 L19)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 08:15 PM
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L25	1581	Y10T403/7033.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 08:16 PM
L26	936	Y10T403/7033.cpc. NOT (L17 L18 L19 L21 L23)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/12 08:18 PM
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		"7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.					
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L31	1	(10/690146).APP.	(USPAT; USOCR)	OR	ON	ON	2021/01/13 11:34 AM
L32	27	("1966826" | "20020044706" | "20020106140" | "20030044099" | "4004838" | "4340317" | "4493388" | "4629028" | "5486053" | "5536075" | "5549514" | "5603554" | "5782565" | "5921633" | "6022275" | "6152825" | "6170628" | "6193419" | "6196639" | "6203441" | "6354952" | "6413008" | "6450585" | "6668888").PN. OR ("6969125").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 11:35 AM
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L34	26	("1631236" | "4136982" | "4225263" | "4261668" | "5492417" | "5499884" | "5611733" | "5643092" | "5667332" | "5853250" | "5957615").PN. OR ("6582151").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 11:46 AM
L35	29	("2170970" | "2349903" | "3832076" | "3865499" | "3992117").PN. OR ("4136982").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 11:46 AM
L36	21	("1391012" | "2453391" | "2611632" | "2775037" | "3374015" | "4077232").PN. OR ("4225263").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 11:56 AM
L37	13	("20070199756" | "20090057046" | "4523871" | "6009609" | "6467565" | "6582151" | "7533751" | "7644797" | "7665562").PN. OR ("7946374").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:25 PM
L38	19	("3357206").URPN.	(USPAT)	OR	ON	ON	2021/01/13 12:34 PM

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L39	22	("2457942" | "2857777" | "3191453").PN. OR ("3750489").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:36 PM
L40	28	("0684594" | "1740377" | "2361827" | "3351359" | "3480310").PN. OR ("3926532").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:38 PM
L41	46	("3531144" | "3718350" | "3832076" | "3992117").PN. OR ("4124318").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:42 PM
L42	1	(12/393461).APP.	(USPAT; USOCR)	OR	ON	ON	2021/01/13 12:52 PM
L43	1	(12/502928).APP.	(USPAT; USOCR)	OR	ON	ON	2021/01/13 12:53 PM
L44	4	("3625548" | "3966239" | "4157019" | "4169686").PN. OR ("8187107").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:55 PM
L45	1	(12/361795).APP.	(USPAT; USOCR)	OR	ON	ON	2021/01/13 12:57 PM
L46	21	("1541007" | "2952999" | "3999786" | "4127741" | "4136982" | "4915536" | "5647683" | "5735747" | "6348002" | "6367680" | "7029398" | "7140969" | "7228787" | "7314416").PN. OR ("8092312").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 12:57 PM
L47	2	US-20180003240-$	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 01:03 PM
L48	18	("20080104844" | "20080318693" | "20090208276" | "20090317182" | "20100105488" | "20100275429" | "4325232" | "5221233" | "6152825" | "7396284" | "7604545" | "7621816" | "7632189" | "7806773" | "7854658").PN. OR ("8690690").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 01:06 PM
L49	70	(US-20120004044-$ or US-20050150111-$ or US-20050082903-$ or US-20020090257-$ or US-20140161509-$ or US-20090208278-$ or US-20090233723-$ or US-20100120545-$ or US-20100190559-$).did. or (US-3357206-$ or US-3750489-$ or	(US-PGPUB; USPAT; FPRS; JPO; DERWENT)	OR	ON	ON	2021/01/13 01:18 PM

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		US-3926532-$ or US-3992117-$ or US-4124318-$ or US-4645372-$ or US-4859110-$ or US-5601380-$ or US-6234907-$ or US-6739422-$ or US-4136982-$ or US-5098241-$ or US-4966488-$ or US-8690690-$ or US-7222426-$ or US-6969125-$ or US-6582151-$ or US-7946374-$ or US-10883545-$ or US-8870489-$ or US-8187107-$ or US-8092312-$).did. or (DE-1813395-$ or DE-10008182-$ or DE-10008182-$ or DE-10008183-$ or EP-1302684-$ or WO-2008148373-$ or DE-2342940-$ or EP-0225554-$ or EP-0645548-$ or DE-29501158-$ or WO-0163135-$ or WO-2005024258-$ or WO-2008029017-$ or WO-2008031738-$ or DE-102009020981-$ or WO-2011058000-$ or WO-2016034228-$ or DE-102016121785-$ or DE-2820380-$ or EP-1681477-$ or DE-202012008999-$ or DE-102012013243-$).did. or (JP-61041017-$ or JP-02089816-$).did. or (DE-2919214-$ or DE-3320444-$ or GB-2173572-$ or GB-2219372-$ or DE-102009017007-$ or DE-102016000530-$ or US-20180003240-$ or DE-102013012749-$).did.				
L50	17	L49 and (seal cover)	(US-PGPUB; USPAT; FPRS; JPO; DERWENT)	OR	ON	ON	2021/01/13 01:19 PM
L51	22	("10151352" | "1114123" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 01:46 PM

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		"20120308293" | "20160017929" | "3367692" | "3450424" | "4635974" | "5518332" | "7048972" | "7104893" | "7195399" | "7595095" | "7722089" | "7946374" | "8477386" | "8864591" | "9528389" | "9587669" | "9926967").PN. OR ("10883545").URPN.					
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L53	6	L49 and (exchang$4 replace$4)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 02:26 PM
L54	19	L49 and (exchang$4 replace$4 chang$4)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 02:34 PM
L55	837	joint near3 (seal cover) near3 (cutout notch window)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 03:34 PM
L56	448	joint near3 (seal) near3 (cutout notch window)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 03:49 PM
L57	3197	(joint near2 shaft) with seal	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:22 PM
L58	128490	(joint near2 shaft) near2seal	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:22 PM
L59	597	(joint near2 shaft) near2 seal	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:22 PM
L60	8143	joint and (retaining adj ring) and seal	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:39 PM
L61	1947	joint and ((retaining adj ring) with seal)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:39 PM
L62	193	joint and ((retaining adj ring) with seal) and spline	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/01/13 05:39 PM
L63	9	("4629028" | "5549514").PN. OR ("6739422").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/01/13 06:35 PM
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L66	3425	F16D1/112,116.cpc. NOT L65	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 05:49 PM
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L68	3656	F16D1/112,116.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:18 PM
L69	4925	F16B21/18,186.cpc. NOT (L67 L68)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:18 PM
L70	1265	F16B21/183.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:40 PM
L71	5213	F16B21/18,186.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:40 PM
L72	1001	F16B21/183.cpc. NOT (L71 L67 L68)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:40 PM
L73	5645	F16D2001/103.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:42 PM
L74	4018	F16D2001/103.cpc. NOT (L71 L67 L68 L70)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:42 PM
L75	1602	Y10T403/7033.cpc.	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:49 PM
L76	946	Y10T403/7033.cpc. NOT (L71 L67 L68 L70 L73)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT)	OR	ON	ON	2021/03/01 06:49 PM
L77	24	("20020018719" | "20110283491" | "20120051918" | "2650484" | "2895754" | "2897022" | "3214204" | "3535977" | "3924957" | "3992117" | "4138168" | "5127764" | "5462369" | "5484242" | "5607192" | "5788399" | "6116809" | "6884196").PN. OR ("9933005").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/03/01 06:53 PM
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L79	1	(13/170547).APP.	(USPAT; USOCR)	OR	ON	ON	2021/03/01 06:54 PM

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L94	56	F16D1/112,116.cpc. AND	(US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	ON	ON	2021/11/08 04:23 PM

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PET_AAM_1004-0344

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L103	1474	Y10T403/31.cpc.	(US-PGPUB; USPAT; FIT (AP, AT, AU, 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, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH,	OR	ON	ON	2021/11/08 06:07 PM

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			TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT)				
L104	14	("3208779" | "3343855" | "3343857" | "3357728" | "3472540" | "5100254" | "5601378" | "6357956").pn. OR ("6857811").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/11/08 06:34 PM
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/966,085
Filing Date:	April 30, 2018
Appellants:	Michael Walter Hopson et al.
Group Art Unit:	3678
Examiner:	Alexus Camero
Title:	HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY
Attorney Docket:	206898

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Commissioner:

This is Appellants' Appeal Brief filed in accordance with 37 CFR §41.37 appealing the Examiner's Non-final Office Action dated November 16, 2021 (hereinafter "the Office Action").

A Notice of Appeal is filed concurrently herewith. A Notice of Appeal was previously filed on August 4, 2021 with respect to the Appeal Brief filed therewith and was accompanied by the fee required under 37 C.F.R § 41.20(b)(1). In accordance with MPEP § 1204.01 regarding the reinstatement of an Appeal, the current Notice of Appeal is not accompanied by additional fees.

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I. REAL PARTY IN INTEREST

The inventors Michael Walter Hopson, Arvind Srinivasan, and Michael Peter Kinsella originally assigned all rights in the invention to NEAPCO INTELLECTUAL PROPERTY HOLDINGS, LLC, the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals, interferences, or judicial proceedings known to the Appellants that will directly affect, or be directly affected by, the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 are pending, wherein a copy of the claim set appears in the Appendix of this Brief. Claims 6, 8, 13, 17, 20, and 21 are cancelled. Claims 1-5, 7, 9-12, 14-16, 18-19, and 22-25 are rejected and are currently on appeal. No claims are allowed. No claims are objected to as improper.

IV. STATUS OF AMENDMENTS

All claim amendments have been entered in the application. No amendments are filed concurrently with the present Appeal Brief.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter involved in the appeal, as required by 37 CFR §41.37(c)(1)(v). The following explanation is not intended to be used to construe the claims, which speak for themselves, nor does Appellant intend the following explanation to modify or add any claim elements, or to constitute a disclaimer of any equivalents to which the claims would otherwise be entitled, nor is any reference to certain preferred embodiments herein intended to disclaim other possible embodiments.

The following summary indicates certain portions of the specification (including the drawings) that provide examples of embodiments of elements of the claimed subject matter. It is to be understood that other portions of the specification not cited herein may also provide examples of embodiments of elements of the claimed subject matter. It is also to be understood

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that the indicated examples are merely examples, and the scope of the claimed subject matter includes alternative embodiments and equivalents thereof. References herein to the specification are thus intended to be exemplary and not limiting.

Appellants' independent Claim 1 recites a joint assembly 100. See paragraph [0029]. The joint assembly 100 comprises a first member 110 having a first engagement means 160 and an interior surface recess 200 and a second member 120 having a second engagement means 170 and an exterior surface recess 220. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the second member 120 is disposed within the first member 110. See paragraph [0030] and Fig. 3. The second engagement means 170 engages the first engagement means 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs. 1-3. A retaining means 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining means 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. The retaining means 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2.

Appellants' independent Claim 12 recites a joint assembly 100. See paragraph [0029]. The joint assembly 100 comprises a first member 110 having an open end 150 and a first plurality of splines 160 formed within the open end 150 and a second member 120 having a second plurality of splines 170 formed thereon. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the

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second member 120 disposed within the first member 110. See paragraph [0030] and Fig. 3. The second plurality of splines 170 engage the first plurality of splines 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs. 1-3. A retaining ring 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining ring 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The first member 110 includes an interior surface recess 200 and the second member 120 includes an exterior surface recess 220, wherein the retaining ring 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining ring 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2.

Appellants' independent Claim 15 recites a method of servicing a joint assembly 100. See paragraph [0035]. The joint assembly 100 includes a first member 110 having a first engagement means 160 and an interior surface recess 200 and a second member 120 having a second engagement means 170 and an exterior surface recess 220. See paragraphs [0030] and [0031] and Fig. 3. A portion 180 of the second member 120 is disposed within the first member 110. See paragraph [0030] and Fig. 3. The second engagement means 170 engages the first engagement means 160 to provide a coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. A 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. See paragraph [0030] and Figs.

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1-3. A retaining means 140 is configured to retain the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 1-3. Distal ends 260 of the retaining means 140 are accessible through the window 130. See paragraph [0031] and Figs. 1-3. The distal ends 260 of the retaining means 140 extend in a direction radially outwardly into the window 130 to a point at or radially inwardly from an outer wall 270 of the first member 110. See paragraph [0032] and Fig. 2. The retaining means 140 is received partially into each of the interior surface recess 200 of the first member 110 and the exterior surface recess 220 of the second member 120 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See paragraph [0030] and Figs. 2 and 3. A seal 240 is configured to cover the window 130. See paragraph [0033] and Figs. 1-3. The seal 240 is coupled to the second member 120 adjacent an end of the first member 110. See paragraphs [0030] and [0033] and Figs. 2 and 3. The seal 240 is coupled to the first member 110 adjacent the window 130. See paragraph [0030] and Figs. 2 and 3. The window 130 is at least partially covered by a cylindrical portion of the seal 240 having an inner surface engaging the outer wall 270 of the first member 110, wherein the cylindrical portion of the seal 240 engages the outer wall 270 of the first member 110 along at least a portion of a perimeter of the window 130. See Fig. 2. The method includes a step of uncovering the window 130 from the cylindrical portion of the seal 240 to provide access to the distal ends 260 of the retaining means 140. See paragraphs [0024] and [0026] and Figs. 2 and 3. The method also includes a step of manipulating the distal ends 260 of the retaining means 140 through the window 130 to release the coupling of the second member 120 to the first member 110. See paragraphs [0026], [0032], and [0034]. Lastly, the method includes a step of separating the first member 110 and the second member 120 by disengaging the second engagement means 170 from the first engagement means 160. See paragraphs [0026], [0032], and [0035].

Appellants' dependent Claim 22 recites the joint assembly 100 according to Claim 1, wherein the cylindrical portion of the seal 240 is disposed directly radially outwardly of the retaining means 140 when the retaining means 140 retains the coupling of the second member 120 to the first member 110. See Figs. 2 and 3.

Appellants' dependent Claim 25 recites the joint assembly 100 according to Claim 1, wherein the cylindrical portion of the seal 240 is disposed at an end of the seal 240. See Figs. 2 and 3.

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VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

With regards to the rejections set forth in the outstanding Office Action, the present Appeal addresses whether the Examiner erred in rejecting Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 under 35 U.S.C. § 103 as unpatentable over Kofuji (U.S. Pat. Appl. Pub. No. 2009/0233723) in view of Krude et al. (U.S. Pat. No. 6,739,422) and Sugiyama et al. (U.S. Pat. Appl. Pub. No. 2018/0003240).

VII. ARGUMENT

i. The Examiner has failed to establish a *prima facie* case of obvious with respect to each of independent Claims 1, 12, and 15 in view of the cited combination of references.

Appellants' independent Claims 1, 12, and 15 each recite a joint assembly having a first member, a second member having a portion disposed within the first member, a window formed within the first member where the portion of the second member is disposed in the first member, a retaining means/ring configured to retain a coupling of the first member to the second member, and a seal configured to cover the window. The retaining means/ring is recited in each instance as including distal ends that are accessible through the window when the retaining means/ring is received into an interior surface recess of the first member and an exterior surface recess of the second member. The recited window is accordingly provided in order to access the distal ends of the retaining means/ring when it is desirable to decouple the first member from the second member.

When considered in the context of the present patent application, a "window" as used in Claims 1, 12, and 15 is defined by the Merriam-Webster Dictionary as "a means of entrance or access" or "an opening (such as a shutter, slot, or valve) that resembles or suggests a window." When considered in view of remaining limitations of Claims 1, 12, and 15 highlighted above, it is clear that the recited window refers to an opening formed within the first member that leads radially inwardly to a position of the retaining means/ring, which is itself positioned at a junction of the first member and the second member where the portion of the second member is received within the first member. For example, the distal ends of retaining means/ring are recited as being

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"accessible through the window" while also "extend[ing] in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member." When considering these limitations in combination, the distal ends of the retaining means/ring are accordingly recited as being accessible from an exterior of the first member, thereby indicating that the window is an opening extending radially inwardly through the first member from an outer surface thereof to at least a position of the distal ends of the retaining means.

Each of Claims 1, 12, and 15 further recites "wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member." The term "cylindrical" is defined by the Merriam-Webster Dictionary as "relating to or having the form or properties of a cylinder," wherein the term "cylinder" is further defined as "the surface traced by a straight line moving parallel to a fixed straight line and intersecting a fixed planar closed curve." The recited "cylindrical portion of the seal" accordingly refers to a closed annular portion of the seal that is extended in an axial direction thereof, and not to a conical, frustoconical, or otherwise tapered shape that is formed by the seal. The "inner surface" of the "cylindrical portion of the seal" being recited as "engaging the outer wall of the first member" accordingly indicates that a surface of the seal formed along an axially extending portion thereof (the cylindrical portion) is in direct contact with an exposed outer surface of the first member as formed by the outer wall thereof.

Additionally, each of Claims 1, 12, and 15 also recites "wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window." As established above, the window is formed within the outer wall of the first member with the window penetrating the first member in a radially inward direction. As used in the context of Claims 1, 12, and 15, the term "perimeter" is defined as "the boundary of a closed plane figure" or "a line or strip bounding or protecting an area." The boundary of the window as recited in Claims 1, 12, and 15 therefore refers to those positions around the window where an outer surface of the first member deviates radially inwardly to define the opening corresponding to the window. Such a deviation in the outer surface of the first member may, as one non-limiting example, correspond to an edge of the window formed at the outer surface of the first member where the outer surface first curves or turns radially inwardly from the otherwise cylindrical shape thereof.

Considering each of the limitations discussed hereinabove in combination, each of

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Claims 1, 12, and 15 recites a configuration wherein the inner surface of the cylindrical portion of the seal must be contacting the outer wall of the first member along at least one position where the outer surface of the outer wall deviates radially inwardly to define the perimeter of the window. For example, if an edge is formed at the outer surface of the first member to define a boundary of the window, the inner surface of the cylindrical portion of the seal must engage the first member along such an edge at one or more positions to disclose the described relationship as recited in any of Claims 1, 12, and 15.

In rejecting Claims 1, 12, and 15, the Examiner admits that Kofuji in view of Krude fails to disclose the limitations relating to the seal configured to cover the window, and for this reason the Examiner relies upon the Sugiyama reference. However, as explained hereinafter, the Sugiyama reference does not disclose a seal covering a window in the manner recited in Claims 1, 12, and 15, hence the cited combination of references cannot establish a *prima facie* case of obviousness.

Specifically, Sugiyama discloses an output shaft (3) having an annular retaining groove (26) formed therein, wherein through holes (31, 32) are formed to diametrically opposing sides of the retaining groove (26). The output shaft (3) is configured to receive an input shaft (2) therein. The through holes (31, 32) are provided to allow for lateral portions of a retaining ring (8) to be passed through the through holes (31, 32) from an exterior of the output shaft (3) in such a manner that the lateral portions of the retaining ring (8) bear against radially extending surfaces of each of the shafts (2, 3) exposed by the through holes (31, 32), thereby forming an interference fit. See Sugiyama at paragraph [0046] and Figs. 4-7. A boot (35) is coupled to each of the shafts (2, 3) to span the joint therebetween. The boot (35) includes a boot attachment section (36) which directly engages a cylindrical section (30) of the outer surface of the output shaft (3). The boot attachment section (36) is formed by an annularly shaped axial end of the boot (35) that is tapered radially inwardly to make the contact with the cylindrical section (30) of the output shaft (3).

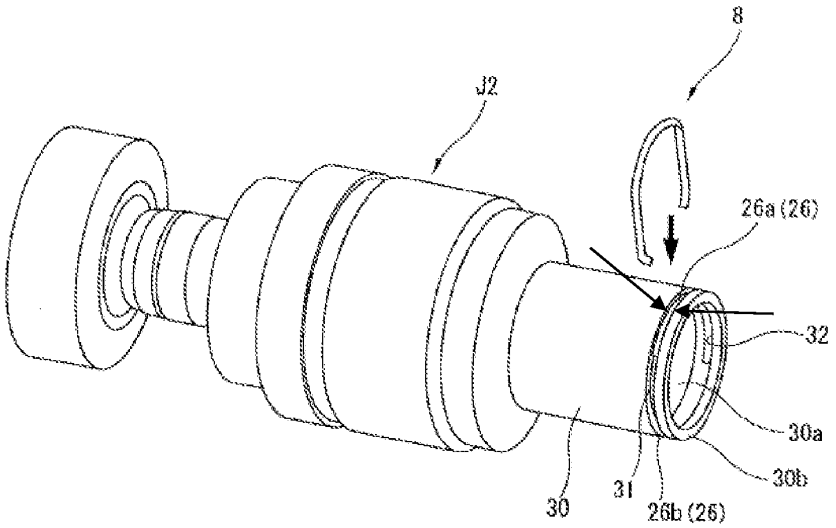
As can be seen clearly in Fig. 7 of Sugiyama, the boot attachment section (36) engages the output shaft (3) at a position that is spaced axially from the position of the retaining groove (26), which also corresponds to the axial position of each of the through holes (31, 32). The remainder of the boot (35) extending away from the boot attachment section (36) is spaced radially outwardly from the outer surface of each of the shafts (2, 3), which includes the portion of the output shaft (3) having the retaining groove (26) and the corresponding through holes (31, 32).

In citing the Sugiyama reference, the Examiner equates the retaining groove (26) and/or the

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through holes (31, 32) to the recited window while the boot (35) is equated to the recited seal. As is best seen in Fig. 4 of Sugiyama, the "perimeter" of the retaining groove (26) (or either of the through holes (31, 32)) must refer to the positions at which the retaining groove (26) deviates radially inwardly from the surrounding cylindrical section (30) based on the above provided definitions and the remainder of the language of each of Claims 1, 12, and 15. It is clear from a review of Fig. 4 that the perimeter of the retaining groove (26) refers to one of two axially spaced apart annular edges formed in the cylindrical section (30), which accordingly corresponds to the perimeter of the retaining groove (26) being restricted to those axial positions immediately adjacent an end of the output shaft (3). The annular edges defining the perimeter of the retaining groove (26) are identified by arrows hereinbelow with respect to Fig. 4 of Sugiyama. The through holes (31, 32) similarly include perimeters that are restricted to being present at some position between these two annular edges.

FIG.4



As is shown in Fig. 7 of the Sugiyama reference, the boot attachment section (36), which forms the only portion of the boot (35) contacting or engaging the output shaft (3) adjacent the retaining groove (26) and the through holes (31, 32), is unambiguously spaced axially from a perimeter of any of the retaining groove (26), the through hole (31), or the through hole (32). An

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inner surface of the boot (35) is also spaced apart from the output shaft (3) along the cylindrical section (30) having the retaining groove (26) formed therein, hence the boot (35) cannot contact or otherwise engage the retaining groove (26) or the through holes (31, 32) at any position where these features otherwise deviate from the parallel arrangement of the output shaft (3) along the cylindrical section (30).

The Sugiyama reference accordingly fails to disclose the limitations "wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member" or "wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window."

The remaining references of record fail to cure the deficiencies of the Sugiyama reference. As such, Claims 1, 12, and 15 are patentable over any combination of the cited art of record.

ii. The Examiner improperly cited all possible configurations of the boot seal of the Sugiyama reference by citing an arbitrary adjustment thereto in view of the recitation of each of Claims 1, 12, and 15.

The Examiner cited the Sugiyama reference as disclosing all limitations relating to the claimed seal despite the lack of explicit disclosure of various claimed features and relationships as found in Claims 1, 12, and 15. The Examiner provides an explanation regarding the citation to the Sugiyama reference despite these deficiencies on page 7 of the Office Action as follows:

> However, the seal (35) of Sugiyama et al. being formed to enable expansion and contraction in the axial direction (Paragraph 0058) suggests its capability of moving in an axial direction with respect to the first member (30) and to the second member (11, 12). Thus, the cylindrical portion (36a) of the seal (35) is capable of engaging and contacting the outer wall of the first member to an extent, i.e. in parallel arrangement with respect to the outer wall of the first member, such that the through holes (31, 32, 26a, 26b) are at least partially covered by the cylindrical portion (36a) and such that the cylindrical portion (36a) engages and contact the outer wall of the first member along at least a portion of the perimeter of the through holes (31, 32, 26a, 26b).

As is apparent from a review of the above paragraph, the Examiner is not utilizing an embodiment of Sugiyama as shown or described within the Sugiyama patent disclosure, but is

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instead citing an embodiment of Sugiyama that the Examiner believes is "capable" of being reconstructed using the components disclosed in Sugiyama. That is, the Examiner has cited Sugiyama as disclosing a structural configuration that only exists by arbitrarily adjusting the configuration of the boot seal (35) as shown and described within Sugiyama via an axial adjustment of the position of the boot attachment section (36). This adjustment has been made absent the citation to any specific reasoning other than directly recreating Appellant's independent Claims 1, 12, and 15. The Appellant respectfully submits that such an adjustment is therefore indicative of impermissible hindsight bias.

The use of the term "capable" by the Examiner in describing the adjusted configuration of Sugiyama appears to indicate that the Examiner is not giving proper weight to the claimed relationships in each of Claims 1, 12, and 15. Specifically, the Examiner appears to be treating certain limitations in similar fashion to limitations reciting that a component is "configured to" operate in a certain manner absent more definitive recitations of structure for achieving the desired relationship. It is acknowledged by the Appellant that a relationship recited as being "configured to" occur in a specific manner may in some circumstances be anticipated by a prior art apparatus that is clearly capable of structurally achieving the recited relationship, even in the absence of explicit disclosure of the relationship in question, as the prior art apparatus may be said to inherently include a state of configuration that meets the claimed relationship.

However, in the present case, the only limitation present within any of Claims 1, 12, and 15 allowing for such a broad interpretation is "a seal configured to cover the window." All limitations following this limitation are definitive in nature and devoid of any suggestion that the recited structures are merely capable of reaching the recited configuration in forming the claimed invention. Claims 1 and 12 recite one specific configuration of the seal relative to each of the members while Claim 15 specifically recites the location at which each coupling and engagement takes place between the seal and each of the members, wherein such recitations are absent any form of ambiguity.

There is accordingly no justification for the adjustment of the disclosed structure of Sugiyama as proposed by the Examiner in view of the language utilized in each of Claims 1, 12, and 15.

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iii. The adjustment of the configuration of the Sugiyama reference as proposed by the Examiner is unreasonable because the resulting structure would be unsatisfactory for carrying out the intended purpose thereof.

The arbitrary axial repositioning of the boot attachment section (36) relative to the cylindrical section (30) as described in the preceding sections also leads to the boot (35) of Sugiyama being incapable of providing a satisfactory seal at the corresponding joint. As a result, there is no suggestion or motivation to make the proposed modification to the Sugiyama reference in arriving at the seal as recited in Claims 1, 12, and 15. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

The boot (35) is described exclusively in paragraph [0058] of Sugiyama, which is reproduced hereinbelow in its entirety:

> [0058] A water-proof boot 35 which serves to prevent an invasion of water or dust from first and second through holes 31, 32 is mounted on cylindrical section 30 in a form of extending on and over cylindrical section 30 and output shaft 3 so as to enclose first and second through holes 31, 32. This water-proof boot 35 has a middle section structured in a substantially bellows shape so that water-proof boot 35 is formed to enable expansion and contraction (telescopically) in the axial direction. This water-proof boot 35 is attached and fixed to cylindrical section 30 via a boot attachment section 36 disposed at a basic end side of cylindrical section 30 which is opposite to an insertion inlet of output shaft 3. One end side of water-proof boot 35 in the axial direction is located at the outer peripheral side of cylindrical section 30.

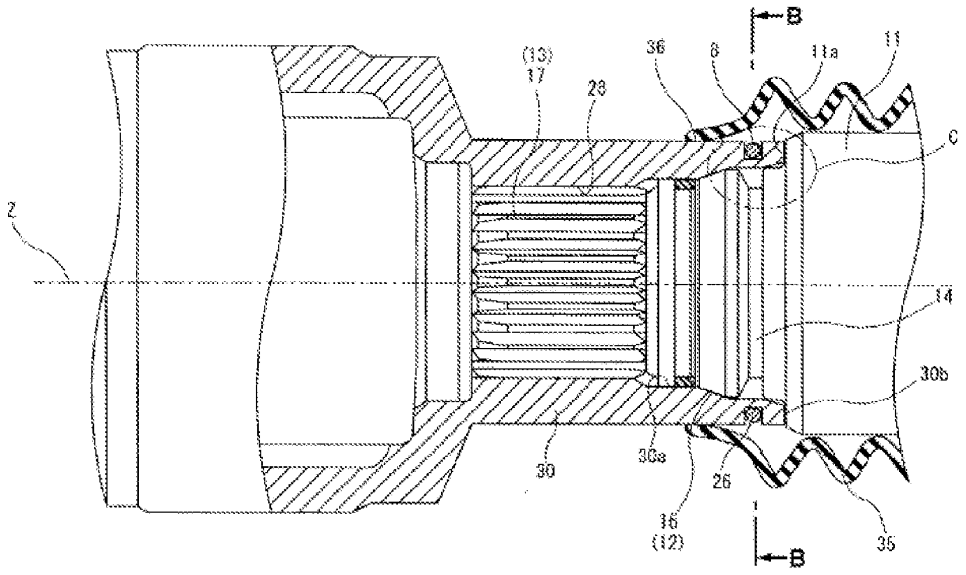
As can be seen in Fig. 7 of Sugiyama, which is reproduced hereinbelow, the boot attachment section (36) is formed by a tapered and axially symmetric portion of the boot (35) having a frustoconical shape. The frustoconical shape terminates at an axial end of the boot (35) contacting the cylindrical section (30) as confirmed by the statement "[o]ne end side of water-proof boot 35 in the axial direction is located at the outer peripheral side of cylindrical section 30." The manner in which this frustoconical shape terminates at an axial end surface contacting the cylindrical section (30) results in only an annular end portion of the boot (35) making contact with the cylindrical section (30), which results in a minimal sealing surface with respect to the axial direction of the cylindrical section (30).

The proposed adjustment including the axial repositioning of the boot attachment section

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(36) towards the retaining groove (26) would accordingly not create a suitable seal when considering the limitation "wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window" as recited in each of Claims 1, 12, and 15. That is, the proposed adjustment of the axial position of the boot attachment section (36) would result in an annular sealing surface as formed by the axial end of the boot (35) being axially aligned with and overlaying an edge forming the perimeter of the groove (26) such that there would be no sealing effect at the location of the annular sealing surface. In other words, the use of an axial end surface as the sealing surface of the boot (35) results in a minimized axial sealing surface being produced by the boot (35), and the movement of this minimized axial sealing surface to the position of the edge of the groove (26) would maximize the likelihood that the seal would fail or be bypassed. There is simply no motivation for one skilled in the art to move the boot attachment section (36) axially to a position maximizing the likelihood that the boot (35) would not provide an adequate seal absent impermissible hindsight bias in view of the recitation of any of Claims 1, 12, or 15.

FIG.7



The Examiner's reasoning for citing the boot (35) of Sugiyama also appears to potentially

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include a reconfiguration of the boot attachment section (36) to include the walls thereof extending in parallel to form a substantially cylindrical shape (as opposed to the disclosed frustoconical shape) as evidenced by the Examiner mentioning a parallel arrangement of the boot attachment section (36) as being suggestive of the relationships recited in Claims 1, 12, and 15.

However, once again, such a reconfiguration of the boot (35) of Sugiyama would not be reasonable when considered in the context of operation of the boot (35) as such a condition is not actually encountered by the boot (35) when operationally installed relative to the corresponding shafts. Specifically, there does not appear to be any suggestion that such a boot (35) would ever be stretched axially to such a parallel arrangement at any time other than during installation or removal of the boot (35) from the adjoining shafts or during a crash scenario causing an axial disassembly of the shafts (2, 3) joined by the boot (35), as such a parallel arrangement would correspond to a maximized axial stretching and tensioning of the boot (35) not indicative of normal operating conditions or normal axial displacements of adjacent shaft components associated with the stretching/contraction of the boot (35). For example, assuming the boot (35) is affixed to each shaft at each axial end thereof, such a parallel arrangement of the boot attachment section (36) would never occur unless the boot (35) is stretched axially when not affixed to at least one of the shafts or unless the shafts are separating axially during a crash scenario or disassembly leading to the failure or disengagement of the boot (35) from the shafts.

The Sugiyama reference is accordingly devoid of any suggestion that such a parallel arrangement of the boot attachment section (36) would ever occur when the boot (35) is installed and in operation relative to the corresponding shafts (2, 3), nor is any apparent benefit disclosed as being derived from such an adjustment. Additionally, the stretching of the boot attachment section (36) to such a configuration would also result in the flexibility of the boot (35) being compromised due to the introduction of tension within the boot (35), which would frustrate the stated purpose for the boot (35) to "enable expansion and contraction (telescopically) in the axial direction." In other words, the axial stretching of the boot (35) to achieve the adjusted configuration proposed by the Examiner would result in a boot (35) that is then incapable of providing the desired telescopic flexibility because the boot (35) would already be subjected to a state of unnecessary axial tension.

For each of the reasons outlined hereinabove, the proposed modification of Sugiyama to include a boot attachment section (36) that is parallel arranged (cylindrical) and contacting the perimeter of the groove (26) is unreasonable due to such modifications frustrating the operation of

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the boot (35) as disclosed in Sugiyama, thereby rendering the modified boot (35) as unsatisfactory in carrying out its intended function.

iv. Dependent Claim 22 was improperly rejected under 35 U.S.C. § 103 as obvious in view of the cited combination of references.

Appellants' Claim 22 depends from independent Claim 1 and recites "wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member."

As shown in Fig. 7 of Sugiyama, the retaining groove (26) includes a circlip (8) therein, which is considered analogous to the recited retaining means. The retaining groove (26) and the corresponding circlip (8) are formed at an axial position corresponding to an axial position where a frustoconical portion of the boot (35) transitions to a corrugated portion of the boot (35) (which is also frustoconical in shape) immediately radially outwardly of the retaining groove (26) and the circlip (8).

The Sugiyama reference accordingly fails to disclose or otherwise suggest a seal having a cylindrical portion disposed radially outwardly of a retaining means. Once again referring to Fig. 7, the only portion of the boot (35) contacting the output shaft (3), the boot attachment section (36), is clearly not disposed directly radially outwardly of the circlip (8).

Dependent Claim 22 is accordingly patentable over any combination of the cited art of record for at least this additional reason.

v. Dependent Claim 25 was improperly rejected under 35 U.S.C. § 103 as obvious in view of the cited combination of references.

Appellants' Claim 25 depends from independent Claim 1 and recites "wherein the cylindrical portion of the seal is disposed at an end of the seal."

As explained in the preceding sections, the boot attachment section (36) forms one end of the boot (35) and forms the only portion of the boot (35) directly engaging the output shaft (3). Assuming that the boot attachment section (36) is considered analogous to the recited cylindrical portion of the seal, the Sugiyama reference clearly fails to disclose or suggest the limitations of

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Claim 1 regarding the relationships present between the first member and the seal. Specifically, as explained in detail in the preceding sections, the boot attachment section (36) cannot provide guidance regarding each and every limitation of Claim 1 drawn towards the manner in which the recited cylindrical portion engages at least a portion of a perimeter of the recited window. Instead, Sugiyama discloses the outward tapering of the boot (35) before reaching the axial position of the circlip (8) and the retaining groove (26).

Dependent Claim 25 is accordingly patentable over any combination of the cited art of record for at least this additional reason.

vi. Conclusion

In sum, each of independent Claims 1, 12, and 25 are patentable over each of the cited references of record and all combinations thereof. For the same reasons, each of the dependent claims depending from independent Claims 1, 12, and 25 are similarly patentable over the cited references and combinations thereof. For these and the other reasons discussed above, Appellants respectfully request that the rejections of Claims 1-5, 7, 9-12, 14-16, 18, 19, and 22-25 be REVERSED.

Respectfully submitted,

Dated: February 16, 2022

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VIII. Claims Appendix

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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of 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.

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4. The joint assembly of Claim 2, wherein the window is continuous with the open end.

5. 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.

6. (Cancelled)

7. The joint assembly of Claim 1, wherein the retaining means is configured as a retaining ring.

8. (Cancelled)

9. The joint assembly of Claim 1, further comprising a constant velocity joint coupled to one of the first member and the second member.

10. A vehicle driveline comprising the joint assembly of Claim 1.

11. A vehicle comprising the joint assembly of Claim 1.

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12. A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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 ring configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining ring are accessible through the window, the first member including an interior surface annular recess and the second member including an exterior surface annular recess, 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 wherein the distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member; and

a seal configured to cover the window, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window.

13. (Cancelled)

14. The joint assembly of Claim 12, further comprising a constant velocity joint coupled to one of the first member and the second member.

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15. A method of servicing a joint assembly comprising:

providing the 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, wherein the cylindrical portion of the seal engages the outer wall of the first member along at least a portion of a perimeter of the window;

uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means;

manipulating the distal ends of 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.

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16. The method of servicing the joint assembly of Claim 15, wherein the joint assembly further comprises a constant velocity joint coupled to one of the first member and the second member.

17. (Cancelled)

18. The method of servicing the joint assembly of Claim 15, further comprising coupling the separated first member with another second member to form another joint assembly.

19. The method of servicing the joint assembly of Claim 15, further comprising coupling the separated second member with another first member to form another joint assembly.

20. (Cancelled)

21. (Cancelled)

22. The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed directly radially outwardly of the retaining means when the retaining means retains the coupling of the second member to the first member.

23. The joint assembly of Claim 22, wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, wherein the corrugated portion is spaced radially from each of the first member and the second member.

24. The joint assembly of Claim 23, wherein the window is continuous with an open end of the first member, and wherein the corrugated portion of the seal is disposed directly radially outwardly of the open end of the first member.

25. The joint assembly of Claim 1, wherein the cylindrical portion of the seal is disposed at an end of the seal.

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IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.

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PTO/AIA/31 (03-14)
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NOTICE OF APPEAL FROM THE EXAMINER TO THE PATENT TRIAL AND APPEAL BOARD

Docket Number (Optional): 206898/58974-1

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Signature /James D. Miller/

Typed or printed name James D. Miller

In re Application of: Michael Walter Hopson et al.

Application Number	Filed
15/966,085	04-30-2018

For: HIGH RETENTION FORCE SERVICEABLE PLUG-ON JOINT ASSEMBLY

Art Unit	Examiner
3678	CAMERO, ALEXUS

Applicant hereby **appeals** to the Patent Trial and Appeal Board from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 41.20(b)(1)) $ 0

☐ Applicant asserts small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by 50%, and the resulting fee is: $ _____

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Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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I am the

☐ applicant

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Registration number _____

Signature /James D. Miller/

Typed or printed name James D. Miller

Telephone Number 419-241-9000

Date February 16, 2022

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
15/966,085	**02/16/2022 01:36:15 PM ET**	**206898/58974-1**

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 #	9702	FILED BY	Heather Peppard
PATENT CENTER #	60534373	FILING DATE	04/30/2018
CUSTOMER #	43935	FIRST NAMED INVENTOR	Michael Walter Hopson
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	James Miller

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
206898_Appeal_Brief_021622.pdf	24	Appeal Brief Filed	278 KB
206898_Notice_of_Appeal_Filed_02162022.pdf	2	Notice of Appeal Filed	245 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
206898_Appeal_Brief_021622.pdf	D377EF1BD0586332CBD128018D565E353E85910717CB1EDC64FF0347420A5F1E4D26D397854E13455F35444C131C0A9A1E9

	E5D58B2D77CF916E7A7CB2FB6DC36
206898_Notice_of_Appeal_Filed_02162022.pdf	7EC4A612E0B945AFCC504F9B76FE11FC320C2FB38E434F5C5C311A549A2582FB2509DC872FB3CAB6D47CC67CFB8CC1F216A33495D04CAADDAB3A476A50FDDB5A

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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

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

43935 7590 05/03/2022

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

EXAMINER	
MCMAHON, MATTHEW R	
ART UNIT	PAPER NUMBER
3678	

DATE MAILED: 05/03/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

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	08/03/2022

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 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity 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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0376

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 05/03/2022
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.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

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	08/03/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCMAHON, 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 _____
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 _____

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. _____

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 _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0377

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

43935 7590 05/03/2022

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

EXAMINER	
MCMAHON, MATTHEW R	
ART UNIT	**PAPER NUMBER**
3678	

DATE MAILED: 05/03/2022

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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0378

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.

Privacy Act Statement

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. 15/966,085	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 the Appeal Brief filed 16 February 2022 and the Interview 22 April 2022.
   ☐ 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 See Continuation Sheet . 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 _____.

/MATTHEW R MCMAHON/
Primary Examiner, Art Unit 3678

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0380

Continuation of 3. The allowed claim(s) is/are: 1-5,7,9-12,14-16,18-19,22 and 24-25

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.

Authorization for this examiner's amendment was given in an interview with J. Douglas Miller (Reg. No. 46,932) on 22 April 2022.

The application has been amended as follows:

Claim 1 was amended as follows:

--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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, ~~wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member, and~~ wherein ~~the~~ a cylindrical portion of the seal ~~engages~~ covers the outer wall of the first member along at least a portion of a perimeter of the window, **wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, and wherein the corrugated portion is spaced radially from each of the first member and the second member**.–

Claim 12 was amended as follows:

--12. A joint assembly comprising:

a first member having an open end and a first plurality of splines formed within the open end;

a second member having a second plurality of splines formed thereon, a portion of the second member disposed within the first member, the second plurality of splines engaging the first plurality of splines 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 ring configured to retain the coupling of the second member to the first member, wherein distal ends of the retaining ring are accessible through the window, the first member including an interior surface annular recess and the second member including an exterior surface annular recess, wherein the retaining ~~means~~ ring 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~~ ring retains the coupling of the second member to the first member, and wherein the distal ends of the retaining ring extend in a direction radially outwardly into the window to a point at or radially inwardly from an outer wall of the first member; and

a seal configured to cover the window, the seal coupled to the second member adjacent [[an]] the open end of the first member, the seal coupled to the first member adjacent the window, ~~wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member,~~ wherein ~~the~~ a cylindrical portion of the seal ~~engages~~ covers the outer wall of the first member along at least a portion of a perimeter of the window, **wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, and wherein the corrugated portion is spaced radially from each of the first member and the second member**.--

Claim 15 was amended as follows:

--15. A method of servicing a joint assembly comprising:

providing the 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 wall 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, the seal coupled to the second member adjacent an end of the first member, the seal coupled to the first member adjacent the window, ~~wherein the window is at least partially covered by a cylindrical portion of the seal having an inner surface engaging the outer wall of the first member,~~ wherein ~~the~~ a cylindrical portion of the seal ~~engages~~ covers the outer wall of the first member along at least a portion of a perimeter of the window, **wherein the seal further includes a corrugated portion disposed adjacent the cylindrical portion, and wherein the corrugated portion is spaced radially from each of the first member and the second member**;

uncovering the window from the cylindrical portion of the seal to provide access to the distal ends of the retaining means,

manipulating the distal ends of 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.--

Claim 23 was cancelled.

Claim 24 was amended as follows:

--24. The joint assembly of ~~Claim 23~~**Claim 1**, wherein the window is continuous with an open end of the first member, and wherein the corrugated portion of the seal is disposed directly radially outwardly of the open end of the first member.--

Reasons for Allowance

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

Regarding the previous prior art rejections set forth in the Office Action mailed 16 November 2021, Examiner notes that the arguments in Applicant's Appeal Brief filed 16 February 2022 are persuasive.

However, a new prior art reference (US Patent 7,722,089 to *Nauer*) was discovered by the Examiner that discloses a joint assembly with a seal (40) similar to that required in previous independent claims 1, 12, and 15. Accordingly, to overcome this prior art reference, the subject matter of previous claim 23 related to the "corrugated portion" of the seal has incorporated into independent claims 1, 12, and 15 in the Examiner's Amendment above. *Nauer* does not disclose such a corrugated portion, nor would it have been obvious to modify the seal of *Nauer* to have such a corrugated portion since there would have been no motivation to do so in the fluid coupling of Nauer. In addition, none of the other prior art references of record teach, disclose, or render obvious the joint assembly/method according to claims 1, 12, and 15.

Accordingly, independent claims 1, 12, and 15 are considered to be allowable over the prior art of record.

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

Examiner-Initiated Interview Summary	**Application No.** 15/966,085	**Applicant(s)** Hopson et al.		
	Examiner MATTHEW R MCMAHON	**Art Unit** 3678	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MATTHEW R MCMAHON	Primary Examiner	Telephonic
J. Douglas Miller (Reg. No. 46,932)	Attorney of Record	

Date of Interview: 22 April 2022

Issues Discussed:

Proposed Amendment(s)

Discussed and agreed to the attached Examiner's Amendments to place the application in condition for allowance

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0388

Notice of References Cited	Application/Control No. 15/966,085	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-7722089-B2	05-2010	Nauer; Gary	F16L37/0885	285/308
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		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.

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0389

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	MATTHEW R MCMAHON	3678

CPC - Searched*		
Symbol	**Date**	**Examiner**
F16D 1/108, 112, 116	01/12/2021	AC
F16D 2001/103	01/12/2021	AC
F16B 21/18, 183, 186	01/12/2021	AC
Y10T 403/7033	01/12/2021	AC
Updated Search Above	03/01/2021	AC
Updated Search Above	06/16/2021	AC
Updated Search Above	11/08/2021	AC
Y10T 403/7026, 31	11/08/2021	AC
Updated Search Above	04/19/2022	MRM
F16J 15/52, 525	04/19/2022	MRM
F16D 2003/22326	04/19/2022	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.

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0390

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	Art Unit
	MATTHEW R MCMAHON	3678

Search Notes		
Search Notes	**Date**	**Examiner**
EAST, PALM search of inventor and assignee	01/11/2021	AC
Search Help from Josh Skroupa (Class 403)	01/12/2021	AC
Forward and Backward Citation Search	01/13/2021	AC
See attached EAST search history	01/14/2021	AC
See attached updated EAST search history	03/06/2021	AC
See attached updated EAST search history	06/17/2021	AC
Search Help from Michael Ferguson (Class 403)	11/08/2021	AC
See attached PE2E SEARCH summary	11/09/2021	AC
Search help frm Vishal Patel (F16J)	04/19/2022	MRM
F16D 2003/22326 (limited by text search - see attached search history)	04/19/2022	MRM
F16J 15/52 (limited by text search - see attached search history)	04/19/2022	MRM
See attached PE2E SEARCH summary	04/22/2022	MRM

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	USPGpub database text search (see attached search history)	04/22/2022	MRM
F16D	1/116	04/22/2022	MRM
F16D	2001/103	04/22/2022	MRM
F16D	2003/22326	04/22/2022	MRM
F16B	21/18, 186	04/22/2022	MRM

/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0391

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	MATTHEW R MCMAHON	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**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	18	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	22 April 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20220419

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0392

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	MATTHEW R MCMAHON	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)	18	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	22 April 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20220419

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0393

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/966,085	Hopson et al.
	Examiner	**Art Unit**
	MATTHEW R MCMAHON	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
1	1	11	10	18	19										
2	2	12	11		20										
3	3	13	12		21										
4	4		13	8	22										
5	5	14	14		23										
	6	15	15	9	24										
6	7	16	16	10	25										
	8		17												
7	9	17	18												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	18	
/MATTHEW R MCMAHON/ Primary Examiner, Art Unit 3678	22 April 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20220419

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0394

Bibliographic Data

Application No: 15/966,085

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.
04/30/2018	403	3678	206898/58974-1
RULE			

APPLICANTS

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Arvind Srinivasan, Troy, MI, UNITED STATES

Michael Peter Kinsella, White Lake, MI, UNITED STATES

CONTINUING DATA

This application has PRO of 62500821 05/03/2017 /M.R.M/ (04/22/2022)

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

05/22/2018

STATE OR COUNTRY

UNITED STATES

ADDRESS

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1000 Jackson Street
Toledo, OH 43604-5573
UNITED STATES

FILING FEE RECEIVED

$1,720

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
L2	20	("8231475"|"4859110"|"7922590"|"20090233723"|"20180003240"|"7722089"|"10883545"|"4136982"|"8870489"|"6739422"|"6582151"|"6739422"|"7946374"|"6251019"|"8690690"|"8864591"|"3992117"|"8092312"|"4124318"|"3357206").PN.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/08 09:37 AM
L3	24	"1681477"	(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 09:38 AM
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L7	10	("4629028" | "5549514").pn. OR ("6739422").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2022/04/08 11:16 AM
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		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.)	BR, CA, CN, ES, HU, IT, KR, LU, RU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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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PET_AAM_1004-0397

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American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0398

L15	34	(Artificial Intelligence) More Like: US-7722089-B2 Text: (US-20180100609-A1 OR US-20160076681-A1 OR US-6921115-B2 OR US-20040239117-A1 OR CA-2497126-A1 OR US-9958095-B2 OR RU-2008102977-A OR RU-2404390-C2 OR WO-2007000023-A1 OR EP-1896760-A1 OR US-4884829-A OR EP-3458761-B1 OR US-20080111377-A1 OR US-20180180203-A1 OR CA-2988929-A1 OR US-6595559-B1 OR US-5671955-A OR ZA-200711031-B OR EP-1896760-A4 OR US-11131408-B2).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	2022/04/08 01:29 PM
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L22	6	Y10T403/7026,31.cpc.	(US-PGPUB; USPAT;	ADJ	ON	ON	2022/04/19

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0399

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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
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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
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American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0400

		"4565392" | "5172941" | "5498042" | "5681060" | "5794988" | "5876071" | "5882044" | "6102447" | "6186560" | "6386596" | "6932391").pn. OR ("7722089").urpn. AND (PGPB | USPT | USOC).dbnm.					

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 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	2022/04/22 01:21 PM

American Axle v. Neapco - IPR2025-00090
PET_AAM_1004-0401

To: tlopez@shumaker.com,dmiller@shumaker.com,cgolupski@shumaker.com
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Cc: PAIR_eOfficeAction@uspto.gov
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Dear PAIR Customer:

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1000 Jackson Street
Toledo, OH 43604-5573
UNITED STATES

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Application	Document	Mailroom Date	Attorney Docket No.
15966085	NOA	05/03/2022	206898/58974-1
	EXIN	05/03/2022	206898/58974-1
	892	05/03/2022	206898/58974-1

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
15/966,085	**07/29/2022 11:33:46 AM ET**	**206898/58974-1**

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 #	9702	FILED BY	Christine Golupski
PATENT CENTER #	60824009	FILING DATE	04/30/2018
CUSTOMER #	43935	FIRST NAMED INVENTOR	Michael Walter Hopson
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	James Miller

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
206898_Issue_Fee_Filed.pdf	1	Issue Fee Payment (PTO-85B)	118 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
206898_Issue_Fee_Filed.pdf	DB1F25F9D7E8A436C720131FE34726AEEF1A0349F63E66469E392DE973482065EC3C9D220A58A4D2FA1CE9348EA4A9B999FE72DFE030E808B93E8580AF7B32CA

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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

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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

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
15/966,085	07/29/2022 11:33:46 AM ET	206898/58974-1

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PATENT CENTER #	60824009	AUTHORIZED BY	James Miller
CUSTOMER #	43935	FILING DATE	04/30/2018
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Michael Walter Hopson

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 505605	E20227SB34072340	Christine Golupski

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

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

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43935 7590 05/03/2022
Shumaker, Loop & Kendrick, LLP
1000 Jackson Street
Toledo, OH 43604-5573

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(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	04/30/2018	Michael Walter Hopson	206898/58974-1	9702

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	08/03/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCMAHON, 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,
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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 _____

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☐ 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.

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Authorized Signature /James D. Miller/ Date July 29, 2022

Typed or printed name James D. Miller Registration No. 46932

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/966,085	09/06/2022	11434958	206898/58974-1	9702

43935 7590 08/17/2022

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 736 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, Troy, 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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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

Aug 18, 2022 05:14:54 AM

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Application	Document	Mailroom Date	Attorney Docket No.
15966085	ISSUE.NTF	08/17/2022	206898/58974-1

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