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(54) **Zero-moment fitting**

Nullmoment-Anschlussstück

Raccord à moment nul

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US-A- 3 018 078 US-A- 6 070 835
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Description

Background

[0001] Aircraft and other vehicles commonly have various fluid conduits (e.g., fuel lines, hydraulic lines, air lines, etc) extending throughout the vehicle. These conduits may traverse bulkheads and other structures as they route fluid between source and destination locations. The conduits are typically routed through openings in the bulkheads and secured to the bulkheads at these locations with fittings to prevent abrasion and other damage to the fluid conduits that could occur due to contact between the conduit and the bulkhead.

[0002] Fuel lines and other fluid conduits are often pressurized. As pressurized fluids travel through the conduits, the geometry or configuration of the lines and the various couplings associated with the fluid conduits creates various loads and moments that may be transferred to the bulkheads or to the fittings that attach the fluid conduits to the bulkheads. Pulse loads or shear loads that align with a central axis of the fluid conduit may not be problematic. However, loads that create a twisting of the fluid conduit around the central axis or at a non-zero angle with respect to the central axis provide a moment on the fitting and/or bulkhead. These moments may lead to fatigue or failure of the fitting over time.

[0003] It is with respect to these considerations and others that the disclosure made herein is presented.

[0004] US 3 018 078 A discloses a device for mounting a conduit to a tank. This device or tube mount includes a partially spherical resilient bushing having a hole that is adapted to receive and engage the outer surface of a spray inlet tube which extends through an upper wall of a dairy tank. A resilient outer body portion and a resilient inner body portion form inner surfaces that conform in curvature with the spherical outer surface of the resilient bushing. The body portions are provided with spaced surfaces that engage the outer and inner surfaces of the tank wall.

[0005] US 2007/274618 A1 discloses a split bearing which generally includes first and second bearing halves each having complementary partial shaft receiving portions, wherein the first and second bearing halves are substantially identically configured. The split bearing further includes means for releasably coupling the first and second bearing halves together, such that when coupled, the complementary partial shaft receiving portions of the first and second bearing halves define a center bearing thru-hole for receiving a shaft, and when decoupled, the first and second bearing halves can be removed from the shaft.

[0006] In US 6 070 835 A a ball-compression grommet is disclosed which is used for mounting an object, such as an electrical or fiber optic cable, through a panel access hole. The ball-compression grommet allows the object to rotate to a wide variety of desired angles with respect to the panel surface, while maintaining an environ-

mental seal against moisture and other contaminants found in outdoor environments. The ball-compression grommet comprises a spherical object having a passage formed substantially through its center. A threaded sleeve and nut are then used to capture the spherical object therebetween, while allowing rotation in relation to the nut and threaded sleeve. Both the threaded sleeve and the nut have an inside portion which is shaped to fit the contour of the spherical object. The spherical object is free to rotate in relation to the threaded sleeve/nut assembly, while at the same time forming an environmental seal from a compression fitting that results between the spherical object and the threaded sleeve. The sleeve/nut assembly may be mounted to an access hole using a retaining nut, securing the ball-compression grommet to the mounting surface.

Summary

[0007] It should be appreciated that this Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to be used to limit the scope of the claimed subject matter.

[0008] Apparatus, systems, and methods provide for a zero-moment fitting, or a fitting that allows for the rotation of a fluid conduit around a central axis without applying an undesirable moment on the corresponding fitting and structure to which the fitting is attached.

[0009] According to one aspect of the disclosure provided herein, a structural fitting may comprise the features defined in claim 1. Further embodiments of this structural fitting are defined in dependent claims 2-10.

[0010] According to another aspect, a method for securing a fluid conduit to a structure comprises the features defined in claim 11. Further embodiments of this method form the subject-matter of dependent claims 12-15.

[0011] The features, functions, and advantages that have been discussed can be achieved independently in various embodiments of the present disclosure or may be combined in yet other embodiments, further details of which can be seen with reference to the following description and drawings.

Brief Description Of The Drawings

[0012]

FIGURE 1 is a top perspective exploded view of an example of a zero-moment fitting with a fluid conduit and the structure to which the fluid conduit is to be attached according to various embodiments presented herein;

FIGURE 2 is a front view of a zero-moment fitting securing a fluid conduit to a structure according to various embodiments presented herein;

FIGURE 3 is a cross-sectional view taken along line A-A of the zero-moment fitting of FIGURE 2 accord-

ing to various embodiments presented herein; and FIGURE 4 is a process flow diagram illustrating a method for securing a fluid conduit to a structure according to various embodiments presented herein.

Detailed Description

[0013] The following detailed description is directed to a zero-moment fitting, system, and methods for securing a fluid conduit to a structure. As discussed briefly above, fluid conduits are often routed through bulkheads and other structures. In doing so, fittings are typically used to secure the fluid conduit to the structure as the conduit passes through. However, as pressurized fluids travel through the fluid conduit, due to the geometry of some conventional fluid conduits and associated couplings, a load or moment may be created on the traditional fitting used to secure the fluid conduit to the structure. This undesirable moment may result in premature fatigue or failure of the fitting or fluid conduit at that location.

[0014] Utilizing the concepts described herein, a zero-moment fitting may be used to allow for rotational movement of the fluid conduit around a longitudinal axis of the conduit without imposing a corresponding load and moment on the fitting. As will be described in detail below, a fitting according to various embodiments may include a housing that is coupled to the structure. A spherical bearing encompasses the fluid conduit and rests within the housing without being fixedly attached to the housing. Any rotational movement of the fluid conduit creates a corresponding rotational movement of the spherical bearing. However, because the spherical bearing is allowed to rotate freely within the housing, there is no associated load or moment imposed on the fitting as a result of the rotational movement of the fluid conduit and spherical bearing.

[0015] In the following detailed description, references are made to the accompanying drawings that form a part hereof, and which are shown by way of illustration, specific embodiments, or examples. Referring now to the drawings, in which like numerals represent like elements through the several figures, the zero-moment fitting will be described. Turning to FIGURE 1, an exploded view of an example of a zero-moment fitting 100 with a fluid conduit 102 and the structure 140 to which the fluid conduit 102 is to be attached are shown. The fluid conduit 102 may include a first portion 102A and a second portion 102B being joined together at or near the structure 140. According to one illustrative embodiment, the fluid conduit 102 may be a pressurized fuel line passing through the structure 140, which may be an aircraft bulkhead or wing spar.

[0016] The first portion 102A and the second portion 102B of the fluid conduit 102 may each include a coupling flange 104. Each coupling flange may have any number of fastener apertures 106 for receiving fasteners for coupling the two portions together. A coupling gasket 108 having corresponding apertures may be used between

the coupling flanges 104 of the first portion 102A and the second portion 102B to prevent fluid leakage from the fluid conduit 102 when assembled.

[0017] A spherical bearing 110 may include two sections for ease of assembly, specifically a front bearing 110A and a rear bearing 110B. The front bearing 110A and the rear bearing 110B each include a bearing inner face 114 that will abut the corresponding opposing bearing inner face 114 to mate the front bearing 110A and the rear bearing 110B and create an assembled configuration of the spherical bearing 110. The exterior bearing surface 118 is shaped such that the spherical bearing 110 is approximately spherical when assembled. The material of the spherical bearing, and of the bearing housing 120 described below, may be any suitable material according to the operational loads for which the zero-moment fitting 100 will experience while minimizing weight and wear that may occur due to the friction between the spherical bearing 110 and the bearing housing 120. Example materials include but are not limited to Cu-NiSn or AlNiBr compounds or other suitable materials for the spherical bearing 110 and 15Cr-5Ni stainless steel or other suitable materials for the bearing housing 120.

[0018] The spherical bearing 110 additionally includes a conduit aperture 112 sized to receive the fluid conduit 102 within. The fluid conduit 102 passes through the approximate center of the spherical bearing 110 parallel with a longitudinal axis 150 extending through the zero-moment fitting 100. To secure the fluid conduit 102 within the spherical bearing 110, the front bearing 110A and/or the rear bearing 110B may include a number of fastener cavities 116 for receiving a front or rear portion of a fastener extending through the coupling flange 104 of the first or second portion of the fluid conduit 102. One or both of the front bearing 110A and the rear bearing 110B may additionally include a flange cavity (not shown in FIGURE 1) configured to receive all or a portion of the coupling flange 104. In doing so, rotational movement of the fluid conduit 102 around the longitudinal axis 150, or angular rotation with respect to the longitudinal axis 150, will allow for the spherical bearing 110 to rotate with the fluid conduit 102 within the bearing housing 120.

[0019] The bearing housing 120 may include two sections for assembly purposes, specifically the front housing 120A and the rear housing 120B. These two sections may be identical components arranged to face one another such that an inside face 122 of the front housing 120A (not shown) will abut an inside face 122 of the rear housing 120B when assembled. Each of the front housing 120A and the rear housing 120B may have an inside face 122 and an outside face 128 opposite the inside face. The inside face may include an annular inner bearing edge 130, while the outside face may include an annular outer bearing edge 132. The surface defined between the annular inner bearing edge 130 and the annular outer bearing edge 132 may be referred to as the bearing retention surface 134, as this surface abuts the exterior bearing surface 118 and retains the spherical

bearing 110 within the bearing housing 120.

[0020] According to various embodiments, the diameter of the annular outer bearing edge 132 may be smaller than the diameter of the annular inner bearing edge 130. According to one embodiment, the diameter of the annular inner bearing edge 130 may be approximately equivalent to, or slightly larger than, the diameter of the spherical bearing 110. In this manner, the front housing 120A and the rear housing 120B may be mated together with the spherical bearing 110 in between. The smaller diameters of the annular outer bearing edges 132 of the front and rear housings prevent the spherical bearing 110 from exiting either the front housing 120A or the rear housing 120B, effectively retaining the spherical bearing 110 within the zero-moment fitting 100.

[0021] As previously stated, the bearing retention surface 134 of the front housing 120A and of the rear housing 120B about the exterior bearing surface 118 of the spherical bearing 110 when the zero-moment fitting 100 is in the assembled configuration. It should be appreciated that the bearing retention surface 134 between the annular inner bearing edge 130 and the annular outer bearing edge 132 of each of the front housing 120A and the rear housing 120B may be shaped such that the slope between the inner and the outer edge is linear or straight, or may be shaped such that the slope is arcuate or curved. An arcuate shape of the bearing retention surface 134 may substantially correspond to the external shape of the spherical bearing 118.

[0022] The bearing housing 120 may additionally include a fitting flange 124 for securing the zero-moment fitting 100 to a structure 140. The fitting flange 124 may be configured as an annular flange as shown in FIGURE 1, or may alternatively be configured as any number of tabs (not shown) extending from the inside face 122. The fitting flange 124 may include any number of fastener apertures 126 for receiving fasteners to secure the bearing housing 120 to the vehicle bulkhead or other structure 140. Moreover, the fitting flange 124 may have a recessed groove (not shown) for receiving an o-ring for preventing fluid from escaping through the structure 140 when the zero-moment fitting 100 is used in a wet environment such as within a tank of fluid.

[0023] Turning now to FIGURES 2 and 3, a zero-moment fitting 100 in an assembled configuration and attached to a structure 140 will now be discussed. FIGURE 2 shows a front view of the zero-moment fitting 100. The spherical bearing 110 has been hatched to distinguish the bearing from the bearing housing 120 for clarity purposes. From this view, the fluid conduit 102 can be seen traversing the center of the spherical bearing 110.

[0024] FIGURE 3 shows a cross-sectional view of one embodiment of the zero-moment fitting 100 taken along line A-A of FIGURE 2. As indicated by the open arrow, fluid flows through the fluid conduit 102 from one side of the structure 140 to the opposite side of the structure 140. The first portion 102A of the fluid conduit 102 is coupled to the second portion 102B via fasteners 302.

The fasteners 302 may include any suitable conventional type of fastener. A bearing gasket 108 may be used between the coupling flanges 104 of the first portion 102A and the second portion 102B.

[0025] As discussed above, the front bearing 110A and the rear bearing 110B encompass the fluid conduit 102 and abut one another to create the spherical bearing 110. The front bearing 110A and the rear bearing 110B may include fastener cavities 116 for receiving a portion of the fasteners 302 that secure the two portions of the fluid conduit 102. One or both of the front bearing 110A and the rear bearing 110B may additionally include a flange cavity 304 for receiving the coupling flange 104 while allowing the bearing inner faces 114 of the front bearing 110A and rear bearing 110B to abut one another.

[0026] The bearing housing 120 is shown in FIGURE 3 in the assembled configuration in which the front housing 120A is coupled to the rear housing 120B with the spherical bearing 110 retained within. As shown, the bearing housing 120 includes a bearing retention surface 134 that is shaped according to the exterior bearing surface 118. When the fluid conduit 102 moves and rotates in a manner that would traditionally create an undesirable load on the fitting secured to the structure 140, the spherical bearing 110 according to the disclosure herein is allowed to rotate within the bearing housing 120. In doing so, the bearing housing 120 remains free from rotational loads and corresponding moments that may damage or destroy a traditional fitting. The bearing housing 120 is fixedly attached to the structure 140 via the fitting flange 124 and corresponding fasteners 302.

[0027] Turning now to FIGURE 4, an illustrative routine 400 for securing a fluid conduit 102 to a structure 140 will now be described in detail. It should be appreciated that more or fewer operations may be performed than shown in the figures and described herein. These operations may also be performed in a different order than those described herein.

[0028] The routine 400 begins at operation 402, where the first portion 102A of the fluid conduit 102 is coupled to the second portion 102B via fasteners 302. The coupling may include sandwiching a bearing gasket 108 between coupling flanges 104 of the first portion 102A and the second portion 102A of the fluid conduit 102. Fasteners 302 may be threaded or otherwise positioned within fastener apertures 106 of the coupling flanges 104 and bearing gasket 108.

[0029] From operation 402, the routine 400 continues to operation 404, where the fluid conduit 102 is encompassed by the spherical bearing. To do so, the front bearing 110A is threaded onto the first portion 102A of the fluid conduit 102, while the rear bearing 110B is threaded onto the second portion 102B of the fluid conduit 102. The coupling flange 104 and corresponding fasteners 302 associated with the fluid conduit 102 may be positioned within the flange cavity 304 and fastener cavities 116 of one or both of the front bearing 110A and the rear bearing 110B. The bearing inner faces 114 of the front

bearing 110A and the rear bearing 110B are positioned against one another to assemble the spherical bearing 110.

[0030] At operation 406, the front housing 120A is positioned on one side of the spherical bearing 110 with the fluid conduit 102 traversing through the housing and the rear housing 120B is similarly positioned on the opposing side of the spherical bearing 110. The front housing 120A and the rear housing 120B are moved inward until the inside faces 122 of the front housing 120A and the rear housing 120B abut one another with the spherical bearing 110 positioned within the bearing housing 120 against the bearing retention surface 134.

[0031] The routine 400 continues from operation 406 to operation 408, where the assembled housing is placed against the structure 140 and secured to the structure utilizing the fitting flange 124 of the bearing housing 120 and corresponding fasteners 302. After operation 408, the zero-moment fitting 100 is assembled and installed, securing the fluid conduit 102 to the structure 140 while allowing for rotational movement of the fluid conduit 102. The routine 400 ends.

[0032] Based on the foregoing, it should be appreciated that technologies for securing a fluid conduit to a structure in a manner that eliminates the undesirable moment on a traditional fitting created at least in part as a result of pressurized fluid travelling through various conduit geometries through a vehicle. The subject matter described above is provided by way of illustration only and should not be construed as limiting. Various modifications and changes may be made to the subject matter described herein without following the example embodiments and applications illustrated and described, and without departing from the scope of the present disclosure, which is set forth in the following claims.

Claims

1. A structural fitting (100), comprising:

a spherical bearing (110) comprising a conduit aperture (112) configured to receive a fluid conduit (102) traversing the spherical bearing (110); and
 a bearing housing (120) configured to retain the spherical bearing (110) within the bearing housing (120), to allow for rotation of the spherical bearing (110) within the bearing housing (120), and to be fixedly coupled to a structure (140), wherein the spherical bearing (110) further comprises a front bearing (110A) and a rear bearing (110B), wherein the front bearing (110A) and the rear bearing (110B) are configured to:

abut one another to create an assembled bearing configuration having the conduit aperture (112),

wherein at least one of the front bearing (110A) and the rear bearing (110B) is configured to engage an assembled coupling flange, which couples front (102A) and rear portions (102B) of the fluid conduit (102) within the conduit aperture (112) such that the assembled bearing configuration secures the fluid conduit (102) within the spherical bearing (110).

2. The structural fitting (100) of claim 1, wherein the bearing housing (120) comprises a front housing (120A) and a rear housing (120B) configured to abut one another to create an assembled housing configuration, the assembled housing configuration comprising an inside face (122) shaped to maintain the assembled bearing configuration of the spherical bearing (110) while allowing rotation of the spherical bearing (110) within the bearing housing (120).

3. The structural fitting (100) of claim 2, wherein each of the front housing (120A) and the rear housing (120B) comprises:

an inside face (122) configured to mate with the inside face (122) of a corresponding front housing (120A) or rear housing (120B), the inside face (122) comprising an annular inner bearing edge (130);

an outside face (128) opposite the inside face (122) and external to the bearing housing (120) in the assembled housing configuration, the outside face (128) comprising an annular outer bearing edge (132) having a smaller diameter than a diameter of the annular inner bearing edge (130); and

a bearing retention surface (134) defined between the annular inner bearing edge (130) and the annular outer bearing edge (132).

4. The structural fitting (100) of claim 3, wherein the bearing retention surface (134) comprises an arcuate shape between the annular inner bearing edge (130) and the annular outer bearing edge (132) that substantially corresponds to an external shape of the spherical bearing (110).

5. The structural fitting (100) of any of the preceding claims, wherein the front bearing (110A) and the rear bearing (110B) comprise a plurality of fastener cavities (116), each of the fastener cavities (116) configured for receiving a portion of a fastener from the assembled coupling flange coupling the front (102A) and rear (102B) portions of the fluid conduit (102).

6. The structural fitting (100) of any of the preceding claims, wherein the bearing housing (120) comprises a fitting flange (124) comprising a fastener aper-

ture (126) configured to receive a fastener (302) for coupling the bearing housing (120) to the structure (140).

7. The structural fitting (100) of any of the preceding claims, wherein the fluid conduit (102) comprises a fluid line and wherein the structure (140) comprises a bulkhead of a vehicle.

8. The structural fitting (100) of any of the preceding claims, wherein the fluid conduit (102) comprises:

a first portion (102A) of the fluid conduit (102) comprising a first coupling flange (104) having a plurality of first fastener apertures (106); and a second portion (102B) of the fluid conduit (102) comprising a second coupling flange (104) having a plurality of second fastener apertures (106), wherein the second coupling flange (104) is configured to abut the first coupling flange (104) such that the plurality of first fastener apertures (106) aligns with the plurality of second fastener apertures (106),

wherein the front bearing (110A) is configured to encompass the first portion (102A) of the fluid conduit (102) and to secure a plurality of fasteners projecting through the plurality of first fastener apertures (106), and

wherein the rear bearing (110B) is configured to encompass the second portion (102B) of the fluid conduit (102), to secure the plurality of fasteners projecting through the plurality of second fastener apertures (106), and to abut the front bearing (110A) to create an assembled bearing configuration having the fluid conduit (102) traversing through the spherical bearing (110).

9. The structural fitting (100) of claim 8, wherein:

the bearing housing (120) comprises a front housing (120A) and a rear housing (120B) configured to abut one another to create an assembled housing configuration and configured to retain the spherical bearing (110) within the bearing housing (120), to allow for rotation of the spherical bearing (110) within the bearing housing (120), and to fixedly couple the bearing housing (120) to the structure (140); and

the fluid conduit (102) comprises a coupling gasket (108) sized according to the first coupling flange (104) and the second coupling flange (104), and configured for positioning between the first coupling flange (104) and the second coupling flange (104) when assembled to prevent fluid from escaping the fluid conduit (102).

10. The structural fitting (100) according to claim 9, wherein each of the front housing (120A) and the

rear housing (120B) comprises:

an inside face (122) configured to mate with the inside face (122) of a corresponding front housing (120A) or rear housing (120B), the inside face (122) comprising an annular inner bearing edge (130);

an outside face (128) opposite the inside face (122) and external to the bearing housing (120) in the assembled housing configuration, the outside face (128) comprising an annular outer bearing edge (132) having a smaller diameter than a diameter of the annular inner bearing edge (128); and

a bearing retention surface (134) defined between the annular inner bearing edge (128) and the annular outer bearing edge (132).

11. A method for securing a fluid conduit (102) to a structure (140), comprising:

encompassing the fluid conduit (102) with a spherical bearing (110);

securing the spherical bearing (110) within a bearing housing (120) such that the spherical bearing (110) is retained within the bearing housing (120) while allowing for rotation of the spherical bearing (110) within the bearing housing (120); and

securing the bearing housing (120) to the structure (140),

wherein the spherical bearing (110) comprises a front bearing (110A) and a rear bearing (110B), wherein the front bearing (110A) and the rear bearing (110B) are configured to:

abut one another to create an assembled bearing configuration encompassing the fluid conduit (102),

wherein at least one of the front bearing (110A) and the rear bearing (110B) is configured to engage an assembled coupling flange, which couples front (102A) and rear portions (102B) of the fluid conduit (102) within the conduit aperture (112) such that the assembled bearing configuration secures the fluid conduit (102) within the spherical bearing (110).

12. The method of claim 11, further comprising:

coupling a first portion (102A) of the fluid conduit (102) to a second portion (102B) of the fluid conduit (102) via a first coupling flange (104) of the first portion (102A) and a second coupling flange (104) of the second portion (102B) and a plurality of fasteners to create an assembled coupling flange of the fluid conduit (102), wherein encompassing the fluid conduit (102) with the spherical bearing (110) comprises

positioning the assembled coupling flange within corresponding flange and fastener cavities (116) of the spherical bearing (110).

13. The method of claim 11 or 12, wherein the bearing housing (120) comprises a front housing (120A) and a rear housing (120B), and wherein securing the spherical bearing (110) within the bearing housing (120) such that the spherical bearing (110) is retained within the bearing housing (120) while allowing for rotation of the spherical bearing (110) within the bearing housing (120) comprises:

positioning the spherical bearing (110) within the front housing (120A); and
 positioning the spherical bearing (110) within the rear housing (120B) such that an inside face (122) of the front housing (120A) abuts an inside face (122) of the rear housing (120B), encompassing the spherical bearing (110) such that an exterior bearing surface (118) of the spherical bearing (110) abuts a bearing retention surface (134) defined by the front housing (120A) and the rear housing (120B) and configured to allow for rotational movement of the spherical bearing (110) with respect to the bearing retention surface (134).

14. The method of any of claims 11 to 13, further comprising securing the front housing (120A) to the rear housing (120B).
15. The method of any of claims 11 to 14, wherein securing the front housing (120A) to the rear housing (120B) and securing the bearing housing (120) to the structure (140) comprises installing a plurality of fasteners (302) through a plurality of fastener apertures (126) such that each fastener aperture (126) and corresponding fastener traverses the front housing (120A), the rear housing (120B), and the structure (140).

Patentansprüche

1. Strukturanschlussstück (100), das Folgendes umfasst:

ein Gelenklager (110), das eine Leitungsöffnung (112) umfasst, die zur Aufnahme einer das Gelenklager (110) durchquerenden Fluidleitung (102) konfiguriert ist; und
 ein Lagergehäuse (120), das dazu konfiguriert ist, das Gelenklager (110) innerhalb des Lagergehäuses (120) zu halten, um eine Drehung des Gelenklagers (110) innerhalb des Lagergehäuses (120) zu ermöglichen, und dazu, fest mit einer Struktur (140) gekoppelt zu werden,

wobei das Gelenklager (110) weiterhin ein vorderes Lager (110A) und ein hinteres Lager (110B) umfasst, wobei das vordere Lager (110A) und das hintere Lager (110B) so konfiguriert sind, dass

sie aneinander anliegen, um eine zusammengebaute Lagerkonfiguration mit der Leitungsöffnung (112) zu schaffen,

wobei das vordere Lager (110A) und/oder das hintere Lager (110B) dazu konfiguriert sind, mit einem zusammengebauten Kupplungsflansch in Eingriff zu stehen, welcher vordere (102A) und hintere Abschnitte (102B) der Fluidleitung (102) innerhalb der Leitungsöffnung (112) koppelt, so dass die zusammengebaute Lagerkonfiguration die Fluidleitung (102) innerhalb des Gelenklagers (110) sichert.

2. Strukturanschlussstück (100) nach Anspruch 1, wobei das Lagergehäuse (120) ein vorderes Gehäuse (120A) und ein hinteres Gehäuse (120B) umfasst, die so konfiguriert sind, dass sie aneinander anliegen, um eine zusammengebaute Gehäusekonfiguration zu schaffen, wobei die zusammengebaute Gehäusekonfiguration eine Innenseite (122) umfasst, die so geformt ist, dass sie die zusammengebaute Lagerkonfiguration des Gelenklagers (110) beibehält, während eine Drehung des Gelenklagers (110) innerhalb des Lagergehäuses (120) ermöglicht wird.
3. Strukturanschlussstück (100) nach Anspruch 2, wobei das vordere Gehäuse (120A) und das hintere Gehäuse (120B) jeweils Folgendes umfassen:

eine Innenseite (122), die dazu konfiguriert ist, mit der Innenseite (122) eines entsprechenden vorderen Gehäuses (120A) oder hinteren Gehäuses (120B) zusammengekoppelt zu werden, wobei die Innenseite (122) eine ringförmige innere Lagerkante (130) aufweist;

eine Außenseite (128), die in der zusammengebauten Gehäusekonfiguration gegenüber der Innenseite (122) liegt und außerhalb des Lagergehäuses (120) angeordnet ist, wobei die Außenseite (128) eine ringförmige äußere Lagerkante (132) mit einem kleineren Durchmesser als dem Durchmesser der ringförmigen inneren Lagerkante (130) aufweist; und

eine Lagerhaltefläche (134), die zwischen der ringförmigen inneren Lagerkante (130) und der ringförmigen äußeren Lagerkante (132) definiert ist.

4. Strukturanschlussstück (100) nach Anspruch 3, wobei die Lagerrückhaltefläche (134) zwischen der ringförmigen inneren Lagerkante (130) und der ringförmigen äußeren Lagerkante (132) eine Bogenform

aufweist, die im Wesentlichen einer äußeren Form des Gelenklagers (110) entspricht.

5. Strukturanschlussstück (100) nach einem der vorhergehenden Ansprüche, wobei das vordere Lager (110A) und das hintere Lager (110B) eine Mehrzahl von Befestigungshohlräumen (116) aufweisen, wobei jeder der Befestigungshohlräume (116) dazu konfiguriert ist, einen Abschnitt eines Befestigungselements aus dem zusammengebauten Kupplungsflansch, der die vorderen (102A) und hinteren (102B) Abschnitte der Fluidleitung (102) miteinander koppelt, aufzunehmen.
6. Strukturanschlussstück (100) nach einem der vorhergehenden Ansprüche, wobei das Lagergehäuse (120) einen Anschlussflansch (124) umfasst, der eine Befestigungselementöffnung (126) umfasst, die zur Aufnahme eines Befestigungselements (302) zum Koppeln des Lagergehäuses (120) mit der Struktur (140) konfiguriert ist.
7. Strukturanschlussstück (100) nach einem der vorhergehenden Ansprüche, wobei die Fluidleitung (102) einen Fluidkanal umfasst und wobei die Struktur (140) eine Trennwand eines Fahrzeugs umfasst.
8. Strukturanschlussstück (100) nach einem der vorhergehenden Ansprüche, wobei die Fluidleitung (102) Folgendes umfasst:

einen ersten Abschnitt (102A) der Fluidleitung (102), der einen ersten Kupplungsflansch (104) mit einer Mehrzahl von ersten Befestigungselementöffnungen (106) umfasst; und

einen zweiten Abschnitt (102B) der Fluidleitung (102), der einen zweiten Kupplungsflansch (104) mit einer Mehrzahl von zweiten Befestigungselementöffnungen (106) aufweist, wobei der zweite Kupplungsflansch (104) so konfiguriert ist, dass er an dem ersten Kupplungsflansch (104) anliegt, so dass die Mehrzahl von ersten Befestigungselementöffnungen (106) mit der Mehrzahl von zweiten Befestigungselementöffnungen (106) ausgerichtet ist,

wobei das vordere Lager (110A) so konfiguriert ist, dass es den ersten Abschnitt (102A) der Fluidleitung (102) umgibt und eine Mehrzahl von Befestigungselementen sichert, die durch die Mehrzahl von ersten Befestigungselementöffnungen (106) vorstehen, und

wobei das hintere Lager (110B) so konfiguriert ist, dass es den zweiten Abschnitt (102B) der Fluidleitung (102) umgibt, um die Mehrzahl von Befestigungselementen zu sichern, die durch die Mehrzahl von zweiten Befestigungselementöffnungen (106) vorstehen, und um an das vordere Lager (110A) anzuliegen, um eine zusam-

mengebaute Lagerkonfiguration zu schaffen, bei der die Fluidleitung (102) das Gelenklager (110) durchquert.

9. Strukturanschlussstück (100) nach Anspruch 8, wobei:
- das Lagergehäuse (120) ein vorderes Gehäuse (120A) und ein hinteres Gehäuse (120B) umfasst, die dazu konfiguriert sind, aneinander anzuliegen, um eine zusammengebaute Gehäusekonfiguration zu schaffen, und dazu konfiguriert sind, das Gelenklager (110) in dem Lagergehäuse (120) zu halten, eine Drehung des Gelenklagers (110) innerhalb des Lagergehäuses (120) zu ermöglichen und das Lagergehäuse (120) fest mit der Struktur (140) zu koppeln; und die Fluidleitung (102) eine Kupplungsdichtung (108) umfasst, die entsprechend dem ersten Kupplungsflansch (104) und dem zweiten Kupplungsflansch (104) bemessen ist und in zusammengebautem Zustand für eine Positionierung zwischen dem ersten Kupplungsflansch (104) und dem zweiten Kupplungsflansch (104) konfiguriert ist, um zu verhindern, dass Fluid aus der Fluidleitung (102) austritt.
10. Strukturanschlussstück (100) nach Anspruch 9, wobei das vordere Gehäuse (120A) und das hintere Gehäuse (120B) jeweils Folgendes umfassen:
- eine Innenseite (122), die dazu konfiguriert ist, mit der Innenseite (122) eines entsprechenden vorderen Gehäuses (120A) oder hinteren Gehäuses (120B) zusammengekoppelt zu werden, wobei die Innenseite (122) eine ringförmige innere Lagerkante (130) aufweist;
- eine Außenseite (128), die in der zusammengebauten Gehäusekonfiguration gegenüber der Innenseite (122) liegt und außerhalb des Lagergehäuses (120) angeordnet ist, wobei die Außenseite (128) eine ringförmige äußere Lagerkante (132) mit einem kleineren Durchmesser als dem Durchmesser der ringförmigen inneren Lagerkante (128) aufweist; und
- eine Lagerhaltefläche (134), die zwischen der ringförmigen inneren Lagerkante (128) und der ringförmigen äußeren Lagerkante (132) definiert ist.
11. Verfahren zur Sicherung einer Fluidleitung (102) an einer Struktur, (140) wobei das Verfahren Folgendes umfasst:
- Umgeben der Fluidleitung (102) mit einem Gelenklager (110);
- Sichern des Gelenklagers (110) innerhalb eines Lagergehäuses (120), so dass das Gelenklager

(110) innerhalb des Lagergehäuses (120) gehalten wird, während eine Drehung des Gelenklagers (110) innerhalb des Lagergehäuses (120) ermöglicht wird; und

Sichern des Lagergehäuses (120) an der Struktur (140),

wobei das Gelenklager (110) ein vorderes Lager (110A) und ein hinteres Lager (110B) umfasst, wobei das vordere Lager (110A) und das hintere Lager (110B) so konfiguriert sind, dass sie aneinander anliegen, um eine zusammengebaute Gehäusekonfiguration zu schaffen, die die Fluidleitung (102) umgibt,

wobei das vordere Lager (110A) und/oder das hintere Lager (110B) dazu konfiguriert sind, mit einem zusammengebauten Kupplungsflansch in Eingriff zu stehen, welcher vordere (102A) und hintere Abschnitte (102B) der Fluidleitung (102) innerhalb der Leitungsöffnung (112) koppelt, so dass die zusammengebaute Lagerkonfiguration die Fluidleitung (102) innerhalb des Gelenklagers (110) sichert.

12. Verfahren nach Anspruch 11, das weiterhin Folgendes umfasst:

Koppeln eines ersten Abschnitts (102A) der Fluidleitung (102) mit einem zweiten Abschnitt (102B) der Fluidleitung (102) über einen ersten Kupplungsflansch (104) des ersten Abschnitts (102A) und einen zweiten Kupplungsflansch (104) des zweiten Abschnitts (102B) und eine Mehrzahl von Befestigungselementen, um einen zusammengebauten Kupplungsflansch der Fluidleitung (102) zu schaffen, wobei das Umgeben der Fluidleitung (102) mit dem Gelenklager (110) eine Positionierung des zusammengebauten Kupplungsflanschs innerhalb entsprechender Flansch- und Befestigungshohlräume (116) des Gelenklagers (110) umfasst.

13. Verfahren nach Anspruch 11 oder 12, wobei das Lagergehäuse (120) ein vorderes Gehäuse (120A) und ein hinteres Gehäuse (120B) umfasst, und wobei das Sichern des Gelenklagers (110) innerhalb des Lagergehäuses (120), so dass das Gelenklager (110) innerhalb des Lagergehäuses (120) gehalten wird, während eine Drehung des Gelenklagers (110) innerhalb des Lagergehäuses (120) ermöglicht wird, Folgendes umfasst:

Positionieren des Gelenklagers (110) innerhalb des vorderen Gehäuses (120A); und

Positionieren des Gelenklagers (110) innerhalb des hinteren Gehäuses (120B), so dass eine Innenseite (122) des vorderen Gehäuses (120A) an eine Innenseite (122) des hinteren Gehäuses (120B) anliegt, wobei das Gelenklager (110) derart umgeben wird, dass eine äußere Lagerfläche (118) des Gelenklagers (110) an eine La-

gerrückhaltefläche (134) anliegt, die durch das vordere Gehäuse (120A) und das hintere Gehäuse (120B) definiert wird und dazu konfiguriert ist, eine Drehbewegung des Gelenklagers (110) in Bezug auf die Lagerrückhaltefläche (134) zu ermöglichen.

14. Verfahren nach einem der Ansprüche 11 bis 13, weiterhin umfassend ein Sichern des vorderen Gehäuses (120A) an dem hinteren Gehäuse (120B).

15. Verfahren nach einem der Ansprüche 11 bis 14, wobei das Sichern des vorderen Gehäuses (120A) an dem hinteren Gehäuse (120B) und das Sichern des Lagergehäuses (120) an der Struktur (140) das Installieren einer Mehrzahl von Befestigungselementen (302) durch eine Mehrzahl von Befestigungselementöffnungen (126), so dass jede Befestigungselementöffnung (126) mit dem entsprechenden Befestigungselement das vordere Gehäuse (120A), das hintere Gehäuse (120B) und die Struktur (140) durchqueren, umfasst.

25 Revendications

1. Raccord structurel (100), comprenant :

un coussinet sphérique (110) comprenant une percée pour conduite (112) conçue pour recevoir une conduite de fluide (102) traversant le coussinet sphérique (110), et

un corps de palier (120) conçu pour retenir le coussinet sphérique (110) à l'intérieur du corps de palier (120), pour permettre la rotation du coussinet sphérique (110) à l'intérieur du corps de palier (120), et pour être couplé à demeure sur une structure (140) ;

ledit coussinet sphérique (110) comprenant en outre un coussinet avant (110A) et un coussinet arrière (110B), lesdits coussinet avant (110A) et coussinet arrière (110B) étant conçus pour :

être montés l'un contre l'autre pour créer une configuration de coussinet assemblé présentant la percée pour conduite (112) ; le coussinet avant (110A) et/ou le coussinet arrière (110B) étant conçus pour coopérer avec une bride de couplage assemblée, qui couple des parties avant (102A) et arrière (102B) de la conduite de fluide (102) dans la percée pour conduite (112) de manière que la configuration de coussinet assemblé assujettisse la conduite de fluide (102) à l'intérieur du coussinet sphérique (110).

2. Raccord structurel (100) selon la revendication 1, dans lequel le corps de palier (120) comprend un

- corps avant (120A) et un corps arrière (120B) conçus pour être montés l'un contre l'autre pour créer une configuration de corps assemblé, la configuration de corps assemblé comprenant une face intérieure (122) dont la forme permet de maintenir la configuration de coussinet assemblé du coussinet sphérique (110) tout en permettant la rotation du coussinet sphérique (110) à l'intérieur du corps de palier (120).
3. Raccord structurel (100) selon la revendication 2, dans lequel le corps avant (120A) et le corps arrière (120B) comprennent chacun :
- une face intérieure (122) conçue pour être accouplée avec la face intérieure (122) d'un corps avant (120A) ou corps arrière (120B) correspondant, la face intérieure (122) comprenant un bord annulaire intérieur de coussinet (130), une face extérieure (128) opposée à la face intérieure (122) et extérieure au corps de palier (120) dans la configuration de corps assemblé, la face extérieure (128) comprenant un bord annulaire extérieur de coussinet (132) dont le diamètre est inférieur au diamètre du bord annulaire intérieur de coussinet (130), et une surface de retenue de coussinet (134) définie entre le bord annulaire intérieur de coussinet (130) et le bord annulaire extérieur de coussinet (132).
4. Raccord structurel (100) selon la revendication 3, dans lequel la surface de retenue de coussinet (134) présente une forme arquée entre le bord annulaire intérieur de coussinet (130) et le bord annulaire extérieur de coussinet (132), laquelle correspond sensiblement à la forme extérieure du coussinet sphérique (110).
5. Raccord structurel (100) selon l'une quelconque des revendications précédentes, dans lequel le coussinet avant (110A) et le coussinet arrière (110B) comprennent une pluralité de cavités de fixation (116), chacune des cavités de fixation (116) étant conçue pour recevoir une partie d'une fixation, depuis la bride de couplage assemblée, couplant les parties avant (102A) et arrière (102B) de la conduite de fluide (102).
6. Raccord structurel (100) selon l'une quelconque des revendications précédentes, dans lequel le corps de palier (120) comprend une bride de raccord (124) comprenant une ouverture pour fixation (126) conçue pour recevoir une fixation (302) destinée à coupler le corps de palier (120) à la structure (140).
7. Raccord structurel (100) selon l'une quelconque des revendications précédentes, dans lequel la conduite de fluide (102) comprend un tuyau pour fluide et dans lequel la structure (140) comprend une cloison d'un véhicule.
8. Raccord structurel (100) selon l'une quelconque des revendications précédentes, dans lequel la conduite de fluide (102) comprend :
- une première partie (102A) de la conduite de fluide (102) comprenant une première bride de couplage (104) présentant une pluralité de premières ouvertures pour fixation (106), et une deuxième partie (102B) de la conduite de fluide (102) comprenant une deuxième bride de couplage (104) présentant une pluralité de deuxièmes ouvertures pour fixation (106), ladite deuxième bride de couplage (104) étant conçue pour être montée contre la première bride de couplage (104) de manière que la pluralité de premières ouvertures pour fixation (106) soit alignée avec la pluralité de deuxième ouvertures pour fixation (106) ; ledit coussinet avant (110A) étant conçu pour enserrer la première partie (102A) de la conduite de fluide (102) et pour assujettir une pluralité de fixations ressortant de la pluralité de premières ouvertures pour fixation (106), et ledit coussinet arrière (110B) étant conçu pour enserrer la deuxième partie (102B) de la conduite de fluide (102), pour assujettir la pluralité de fixations ressortant de la pluralité de deuxièmes ouvertures pour fixation (106), et pour être monté contre le coussinet avant (110A) pour créer une configuration de coussinet assemblé dans laquelle la conduite de fluide (102) traverse le coussinet sphérique (110).
9. Raccord structurel (100) selon la revendication 8, dans lequel :
- le corps de palier (120) comprend un corps avant (120A) et un corps arrière (120B) conçus pour être montés l'un contre l'autre pour créer une configuration de corps assemblé et conçus pour retenir le coussinet sphérique (110) à l'intérieur du corps de palier (120), pour permettre la rotation du coussinet sphérique (110) à l'intérieur du corps de palier (120) et pour coupler le corps de palier (120) à demeure sur la structure (140), et la conduite de fluide (102) comprend un joint de couplage (108) dimensionné conformément à la première bride de couplage (104) et à la deuxième bride de couplage (104) et conçu pour être disposé entre la première bride de couplage (104) et la deuxième bride de couplage (104) lorsqu'elles sont assemblées afin d'empêcher le fluide de s'échapper de la conduite de fluide (102).

- 10.** Raccord structurel (100) selon la revendication 9, dans lequel le corps avant (120A) et le corps arrière (120B) comprennent chacun :

une face intérieure (122) conçue pour être accouplée avec la face intérieure (122) d'un corps avant (120A) ou d'un corps arrière (120B) correspondant, la face intérieure (122) comprenant un bord annulaire intérieur de coussinet (130), une face extérieure (128) opposée à la face intérieure (122) et extérieure au corps de palier (120) dans la configuration de corps assemblé, la face extérieure (128) comprenant un bord annulaire extérieur de coussinet (132) dont le diamètre est inférieur au diamètre du bord annulaire intérieur de coussinet (128), et une surface de retenue de coussinet (134) définie entre le bord annulaire intérieur de coussinet (128) et le bord annulaire extérieur de coussinet (132).

- 11.** Procédé d'assujettissement d'une conduite de fluide (102) sur une structure (140), comprenant les opérations consistant à :

enserrer la conduite de fluide (102) dans un coussinet sphérique (110), assujettir le coussinet sphérique (110) à l'intérieur d'un corps de palier (120) de manière que le coussinet sphérique (110) soit retenu à l'intérieur du corps de palier (120) tout en permettant la rotation du coussinet sphérique (110) à l'intérieur du corps de palier (120), et assujettir le corps de palier (120) sur la structure (140) ; ledit coussinet sphérique (110) comprenant un coussinet avant (110A) et un coussinet arrière (110B), lesdits coussinet avant (110A) et coussinet arrière (110B) étant conçus pour :

être montés l'un contre l'autre pour créer une configuration de corps assemblé enserrant la conduite de fluide (102) ; le coussinet avant (110A) et/ou le coussinet arrière (110B) étant conçus pour coopérer avec une bride de couplage assemblée qui couple des parties avant (102A) et arrière (102B) de la conduite de fluide (102) dans la percée pour conduite (112) de manière que la configuration de coussinet assemblé assujettisse la conduite de fluide (102) à l'intérieur du coussinet sphérique (110).

- 12.** Procédé selon la revendication 11, comprenant en outre :

le couplage d'une première partie (102A) de la conduite de fluide (102) sur une deuxième partie (102B) de la conduite de fluide (102) par le biais d'une pre-

mière bride de couplage (104) de la première partie (102A) et d'une deuxième bride de couplage (104) de la deuxième partie (102B) ainsi que d'une pluralité de fixations pour créer une bride de couplage assemblée de la conduite de fluide (102), l'enserrage de la conduite de fluide (102) par le coussinet sphérique (110) comprenant la disposition de la bride de couplage assemblée à l'intérieur de cavités pour bride et pour fixations (116) du coussinet sphérique (110).

- 13.** Procédé selon la revendication 11 ou 12, dans lequel le corps de palier (120) comprend un corps avant (120A) et un corps arrière (120B), et dans lequel l'assujettissement du coussinet sphérique (110) à l'intérieur du corps de palier (120) de manière que le coussinet sphérique (110) soit retenu à l'intérieur du corps de palier (120) tout en permettant la rotation du coussinet sphérique (110) à l'intérieur du corps de palier (120) comprend :

la disposition du coussinet sphérique (110) à l'intérieur du corps avant (120A), et la disposition du coussinet sphérique (110) à l'intérieur du corps arrière (120B) de manière qu'une face intérieure (122) du corps avant (120A) soit contre une face intérieure (122) du corps arrière (120B), en enserrant le coussinet sphérique (110) de manière qu'une surface extérieure (118) du coussinet sphérique (110) soit contre une surface de retenue de coussinet (134) qui est définie par le corps avant (120A) et le corps arrière (120B) et conçue pour permettre un mouvement de rotation du coussinet sphérique (110) par rapport à la surface de retenue de coussinet (134).

- 14.** Procédé selon l'une quelconque des revendications 11 à 13, comprenant en outre l'assujettissement du corps avant (120A) sur le corps arrière (120B).

- 15.** Procédé selon l'une quelconque des revendications 11 à 14, dans lequel l'assujettissement du corps avant (120A) sur le corps arrière (120B) et l'assujettissement du corps de palier (120) sur la structure (140) comprend l'installation d'une pluralité de fixations (302) à travers une pluralité d'ouvertures pour fixation (126) telles que chaque ouverture pour fixation (126), pourvue de sa fixation correspondante, traverse le corps avant (120A), le corps arrière (120B) et la structure (140).

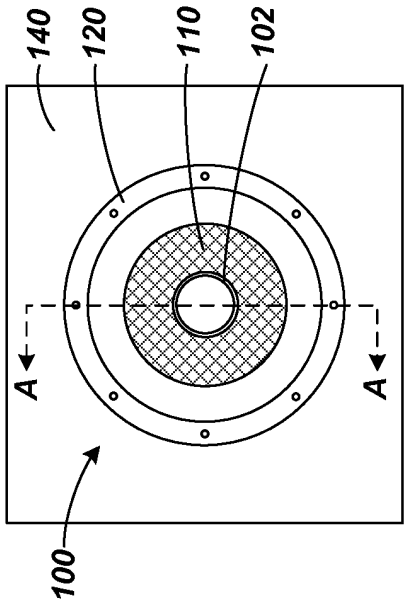


FIG. 2

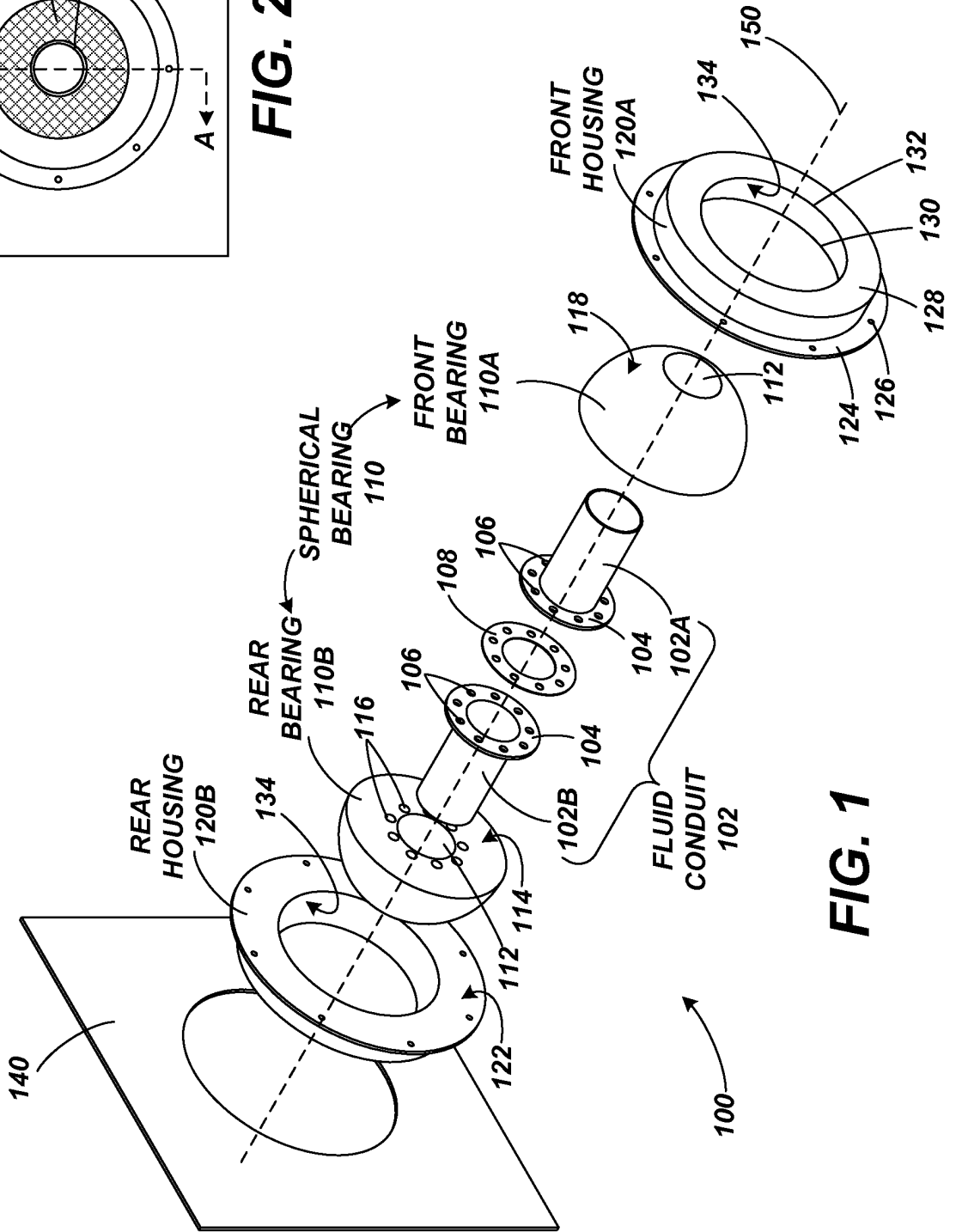


FIG. 1

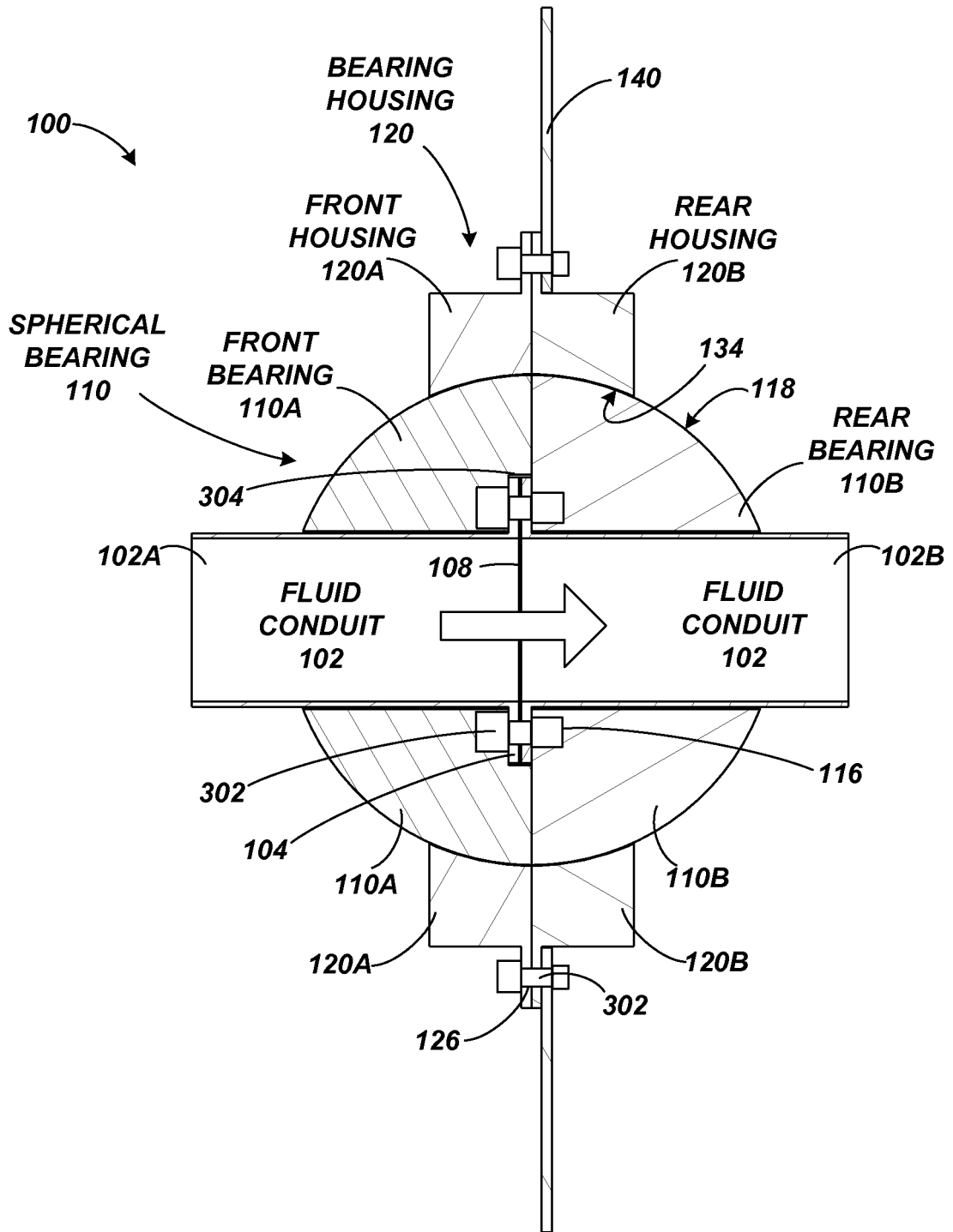


FIG. 3

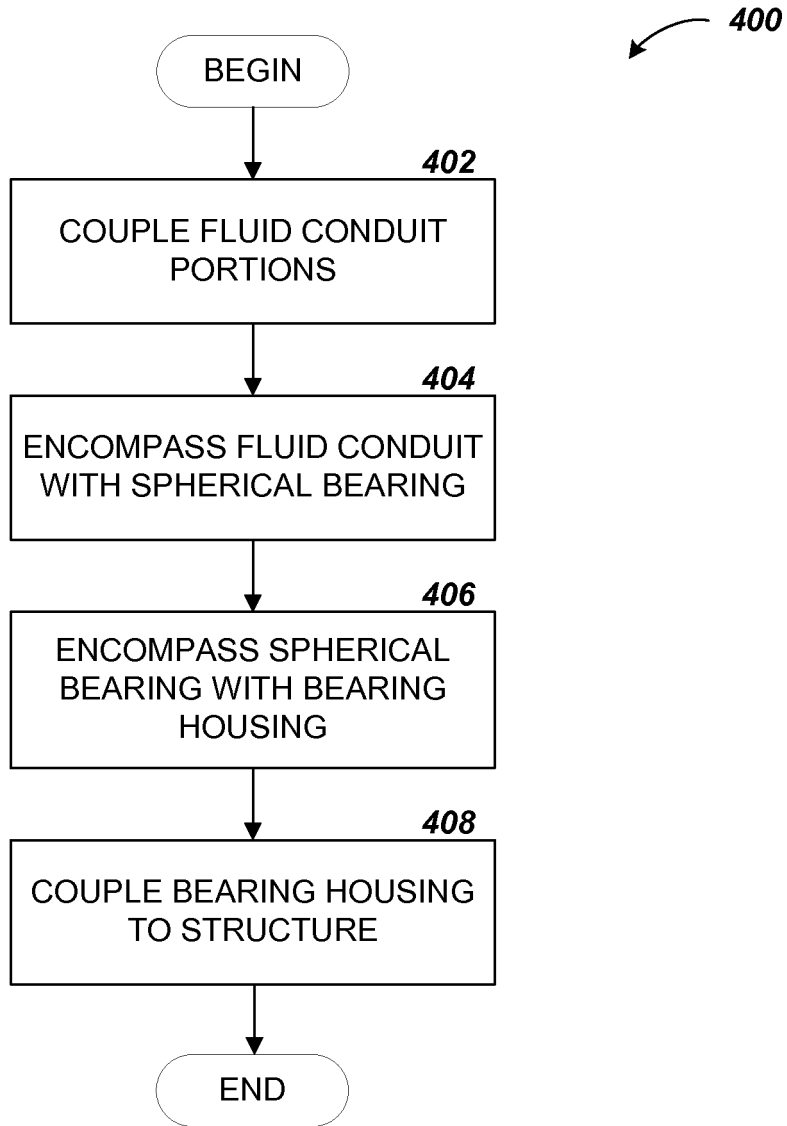


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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