



(51) International Patent Classification:

F16L 15/00 (2006.01) B60T 17/04 (2006.01)
F16L 41/08 (2006.01)

(21) International Application Number:

PCT/EP2018/050079

(22) International Filing Date:

02 January 2018 (02.01.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1700231.2 06 January 2017 (06.01.2017) GB

(71) Applicant: **HALDEX BRAKE PRODUCTS AB**
[SE/SE]; 507, Instrumentgatan 15, 26124 Landskrona (SE).

(74) Agent: **JOHNSON, Emma**; Forresters IP LLP, Rutland
House, 148 Edmund Street, Birmingham, West Midlands
B32JA (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: FLUID DELIVERY ASSEMBLY

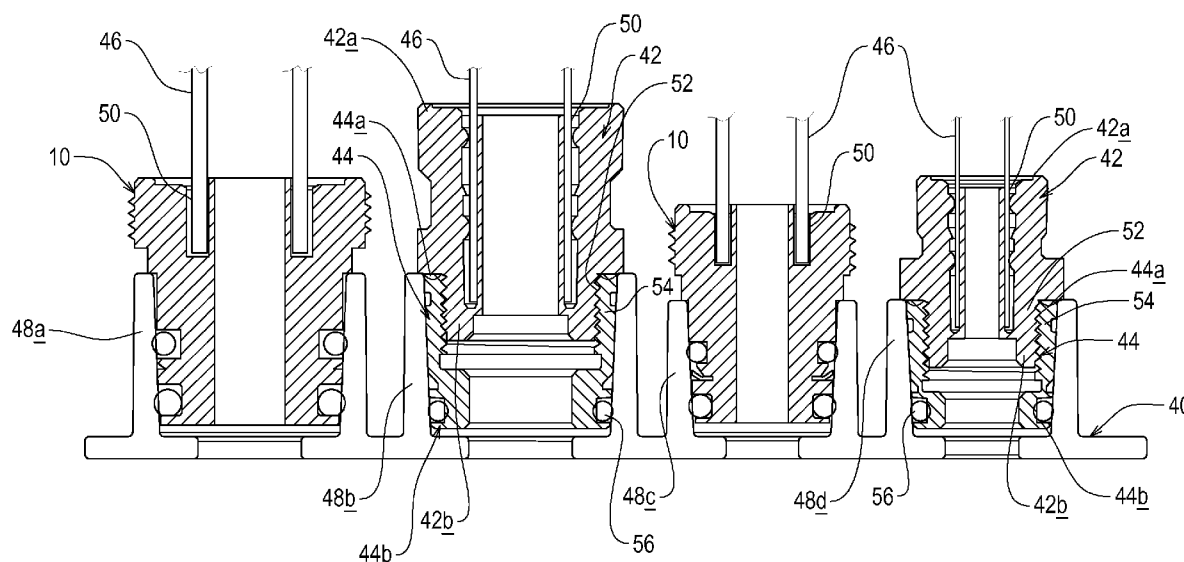


Figure 2

(57) Abstract: A brake valve assembly comprising a valve housing (40) containing a port (12), a connector (42) and an adapter (44), the connector (42) and adapter (44) together being configured to connect a tube (46) to the port, the connector (42) having a first sealing arrangement which is configured to provide a substantially fluid tight seal between the connector (42) and the tube (46), and a connector screw thread (52) which is releasably connected to a corresponding adapter screw thread (54) provided on the adapter (44), the adapter (44) having a second sealing arrangement (56) which is configured to provide a substantially fluid tight seal between the adapter (44) and the housing (40) surrounding the port.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

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

Title: Fluid Delivery Assembly

Description of Invention

The present invention relates to a fluid delivery assembly comprising a tube, a
5 port and a fitting for securing a tube to a port, particularly, but not exclusively a
port of a valve such as a pneumatic braking valve. The tube may be a flexible
hose, pipeline or other conduit, through which fluid such as compressed air is
supplied to or flows from the port.

In pneumatic braking systems, such as those used in heavy goods vehicles,
10 the conduits (hoses or pipelines) which convey compressed air around the
braking system (for example, from the compressed air reservoir or to the brake
actuators) are commonly connected to ports in fluid control valves by means of
a fitting with screw thread which is connected to a corresponding screw thread
provided on the housing around the port. Having said that, push to connect
15 fittings, such as those made by Kongsberg Automotive and sold under the
trade mark Raufoss Couplings[®], which are pushed directly into the valve
housing, are becoming increasingly popular. An example of a prior art
Raufoss Couplings[®] fitting 10 is illustrated in Figures 1a, 1b and 1c. An
exploded view of the fitting 10 is illustrated in Figure 1a, whilst Figure 1b
20 shows the fitting in its assembled state, and Figure 1c shows the fitting
inserted in port 12 of a valve housing, and connecting a tube 13 to the port 12.

The prior art fitting 10 comprises a main cartridge body 14, having a first end
14a and a second end 14b, around which, towards the second end 14b, are
mounted two exterior O-ring seals 16, 18 which, when the fitting is inserted
25 into the port 12 provide a substantially fluid tight seal between the fitting 10
and the housing around the port 12. In between the two exterior O-ring seals
16, 18, there is a locking ring 20 and star washer 22, and a locking element 24

is provided at the second end 14b of the main cartridge body 14 adjacent to the second one of the exterior O-ring seals 18.

The main cartridge body 14 is tubular, and, as such, has a longitudinally extending main passage which extends from the first end 14a to the second end 14b thereof. Two interior O-ring seals 26, 28 are mounted in the main passage adjacent the first end 14a of the main cartridge body 14, spaced by a grip ring 30 and cone element 32. The interior O-ring seals 26, 28 are adapted to engage with the exterior surface of a tube 13 inserted into the fitting 10 so as to provide a substantially fluid tight seal between the fitting 10 and the tube 13.

The locking element 24 has a tubular portion 24a with a radially extending annular flange portion 24b which is located at an end of the tubular portion 24a. The tubular portion 24a has a generally circular transverse cross-section, and extends along the main passage of the main cartridge body 14 to the second end 14b thereof, the tube 13 being located in the annular space around the exterior of the tubular portion 24a. The tubular portion 24a thus acts to locate the tube 13 in sealing engagement with the interior O-ring seals 26, 28.

The first exterior O-ring seal 16 is located in a circumferential groove provided in the radially outward surface of the main cartridge body 14, whilst the second exterior O-ring seal 18 is trapped between the flange portion 24b of the locking element 24 and the locking ring 20.

The cone element 32 is also tubular and, when the fitting 10 is assembled, the first interior O-ring seal 26 is retained in a groove provided in the interior face of the cone element 32. The second interior O-ring seal 28 is captured between the grip ring 30 and a shoulder provided in the interior surface of the main cartridge body 14. The cone element 32 has a radially outwardly extending circumferential ridge 32a which is located in a corresponding

circumferential groove in the interior surface of the main cartridge body 14, so as to retain the cone element 32, interior O-ring seals 26, 28 and grip ring 30 in place in the main cartridge body 14.

5 The star washer 22 is located around the main cartridge body 14 between a shoulder in the exterior surface of the main cartridge body 14 and the locking ring 20. It is annular and has a plurality of radially outwardly extending protuberance which are inclined towards the first end 14a. This ensures that the fitting 10 can be readily pushed, locking element 24 first, into the port 12 of a valve housing, as illustrated in Figure 1c. The protuberances engage with
10 the housing around the port 12, and as a result of this and their angle of inclination, ensure that the fitting 10 is retained in the port 12.

As mentioned on page 1, this is not the only sort of coupling in use at present, and threaded connectors are also used. In order to accommodate this variation in connector, it is common practice for different housings to be used
15 for valves which will use push to fit connectors and valves which will use threaded connectors. It will appreciate that the production of different types of housing is not ideal as it increases the complexity and cost of manufacturing the valves using these housings.

According to a first aspect of the invention we provide a brake valve assembly
20 comprising a valve housing containing a port, a connector and an adapter, the connector and adapter together being configured to connect a tube to the port, the connector having a first sealing arrangement which is configured to provide a substantially fluid tight seal between the connector and the tube, and a connector screw thread which is releasably connected to a corresponding
25 adapter screw thread provided on the adapter, the adapter having a second sealing arrangement which is configured to provide a substantially fluid tight seal between the adapter and the housing surrounding the port.

The adapter may be metallic, for example, made from brass.

The housing may be made from a polymeric material.

.

The adapter may be tubular, having a first end and a second end, and main passage extending from the first end to the second end. In this case, the
5 adapter screw thread may be provided at the first end and the second sealing arrangement provided at the second end.

The second sealing arrangement may comprise an elastomeric O-ring which is located in a circumferential groove provided around the exterior of the second end of the adapter.

10 The connector may be tubular, having a first end and a second end, and main passage extending from the first end to the second end. In this case, the first sealing arrangement may be provided at the first end and the connector screw thread provided at the second end.

The first sealing arrangement may comprise an elastomeric O-ring which is
15 located in a circumferential groove provided around the interior of the first end of the connector.

The adapter screw thread may be provided around the circumference of the interior surface of the first end of the adapter. The connector screw thread may be provided around the circumference of the exterior surface of the
20 second end of the connector.

The housing may have a tubular portion having a wall which surrounds a central passage which forms the port.

According to a second aspect of the invention we provide a vehicle braking system comprising a brake valve assembly according to the first aspect of the
25 invention.

Embodiments of the invention will now be described with reference to figure 2 which illustrates a cross-section through portion of a brake valve assembly according to the first aspect of the invention comprising a port of the valve housing, the adapter and connector.

- 5 Referring now to Figure 2, there is shown a portion of a brake valve assembly suitable for use in the braking system of a vehicle such as a heavy goods vehicle. The brake valve assembly comprises a valve housing 40, which, in the portion illustrated in Figure 2, includes four ports. For each port, the housing 40 has a tubular portion having a wall 48a, 48b, 48c, 48d which
10 surrounds a central passage which forms the port. The valve housing 40 encloses a plurality of moving valve parts which are operable to control flow of fluid between the ports in the housing 40.

Mounted in two of the tubular portions 48a, 48c is a standard prior art push to fit connector 10 of the type illustrated in Figures 1a, 1b and 1c. In each of the
15 other two tubular portions 48b, 48d there is a connector 42 and an adapter 44, the connector 42 and adapter 44 together being configured to connect a tube 46 to the port so that the tube 46, connector 42 and adapter 44 form a conduit for flow of fluid along the tube, thorough port and into the valve housing 40. The housing 40 may be used as the housing for a brake modulator valve.

- 20 The connector 42 has a first sealing arrangement 50 which is configured to provide a substantially fluid tight seal between the connector 42 and the tube 46, and a connector screw thread 52 which is releasably connected to a corresponding adapter screw thread 54 provided on the adapter 44.

The connector 42 is tubular, having a first end 42a and a second end 42b, and
25 main passage extending from the first end 42a to the second end 42b. In this case, the first sealing arrangement 50 is provided at the first end 42a and the connector screw thread 52 is provided at the second end 42b. In this embodiment, the connector 42 forms the male part of the connection between

the connector 42 and the adapter 44, in that the connector screw thread 52 is provided around the circumference of the exterior surface of the second end 42b of the connector 42.

5 The first sealing arrangement 50 comprises an elastomeric O-ring which is located in a circumferential groove provided around the interior of the second end of the connector. Preferably, the first sealing arrangement 50 is the same as that provided in the prior art connector 10 illustrated in Figures 1a, 1b and 1c.

10 The adapter 44 is also tubular, having a first end 44a and a second end 44b, and main passage extending from the first end 44a to the second end 44b. In this case, the adapter screw thread 54 is provided at the first end 44a and a second sealing arrangement 56 provided at the second end 44b. The adapter screw thread 54 is provided around the circumference of the interior surface of the second end 44b of the adapter 44.

15 The second sealing arrangement 56 is configured to provide a substantially fluid tight seal between the adapter 44 and the housing 48b, 48d surrounding the port in which the adapter 44 is inserted. In this example, the second sealing arrangement 56 comprises an elastomeric O-ring which is located in a circumferential groove provided around the exterior of the second end 44b of
20 the adapter 44, and which is in sealing engagement with the interior surface of the tubular portion 48b, 48d of the housing 40 around the port.

Preferably the valve housing 40 is made from a polymeric material, whilst the adapter 44 is made from a metal such as brass. The connector 42, or at least its main body, may also be substantially polymeric.

25 Each adapter 44 is designed to be a push fit, so it is installed in the housing 40 by pushing it into the tubular portion 48b, 48d of the housing surrounding the port. This means that any of the tubular portions 48a, 48b, 48c, 48d of the housing 40 can be fitted with either a prior art push to fit connector 10, or an

adapter 44. As a result, it is necessary to produce only one configuration of valve housing 40, as a user can make any of the ports therein suitable for connecting to a tube 46 (hose or other pipeline) via a screw thread connector 42, by inserting an adapter 44 in the tubular portion 48a, 48b, 48d, 48d of the
5 housing 40 surrounding the port in question.

Securing means may be provided to ensure that the adapter 44 does not, in use, come away from the housing 40. For example, for this purpose. the adapter 44 may be provided with a star washer as in the prior art connector 10 described above and illustrated in Figures 1a, 1b and 1c. Alternatively, the
10 adapter may be provided with a retaining part as described in our co-pending patent application entitled "Fluid Delivery Assembly".

When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the
15 presence of other features, steps or components.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any
20 combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A brake valve assembly comprising a valve housing containing a port, a connector and an adapter, the connector and adapter together being configured to connect a tube to the port, the connector having a first
5 sealing arrangement which is configured to provide a substantially fluid tight seal between the connector and the tube, and a connector screw thread which is releasably connected to a corresponding adapter screw thread provided on the adapter, the adapter having a second sealing arrangement which is configured to provide a substantially fluid tight
10 seal between the adapter and the housing surrounding the port.
2. A brake valve assembly according to claim 1 wherein the adapter is metallic.
3. A brake valve assembly according to any preceding claim wherein the housing is made from a polymeric material.
- 15 4. A brake valve assembly according to any preceding claim wherein the adapter is tubular, having a first end and a second end, and main passage extending from the first end to the second end.
5. A brake valve assembly according to claim 4 wherein the adapter screw thread is provided at the first end and the second sealing
20 arrangement provided at the second end.
6. A brake valve arrangement according to claim 5 wherein the second sealing arrangement comprise an elastomeric O-ring which is located in a circumferential groove provided around the exterior of the second end of the adapter.
- 25 7. A brake valve assembly according to any preceding claim wherein the connector is tubular, having a first end and a second end, and main passage extending from the first end to the second end.

8. A brake valve assembly according to claim 7 wherein the first sealing arrangement is provided at the first end of the connector and the connector screw thread provided at the second end of the connector.
- 5 9. A brake valve assembly according to claim 8 wherein the first sealing arrangement comprises an elastomeric O-ring which is located in a circumferential groove provided around the interior of the first end of the connector.
- 10 10. A brake valve assembly according to claims 5 and 8 wherein the adapter screw thread is provided around the circumference of the interior surface of the first end of the adapter, and the connector screw thread is provided around the circumference of the exterior surface of the second end of the connector.
- 15 11. A brake valve assembly according to any preceding claim wherein the housing has a tubular portion having a wall which surrounds a central passage which forms the port.
12. A vehicle braking system comprising a brake valve assembly according to any one of claims 1 to 11.

1 / 2

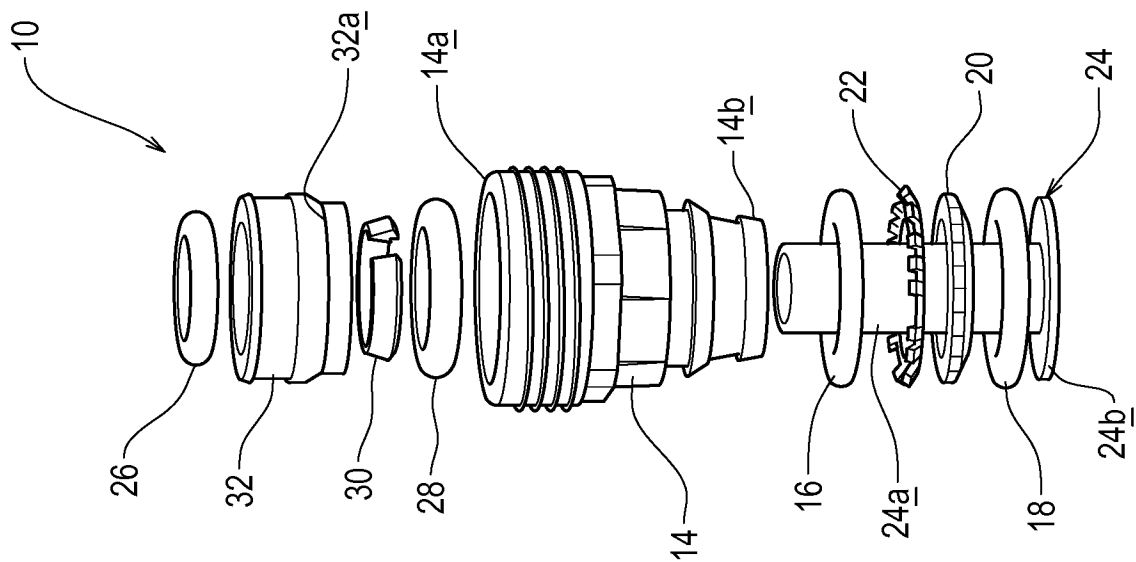


Figure 1a
(Prior Art)

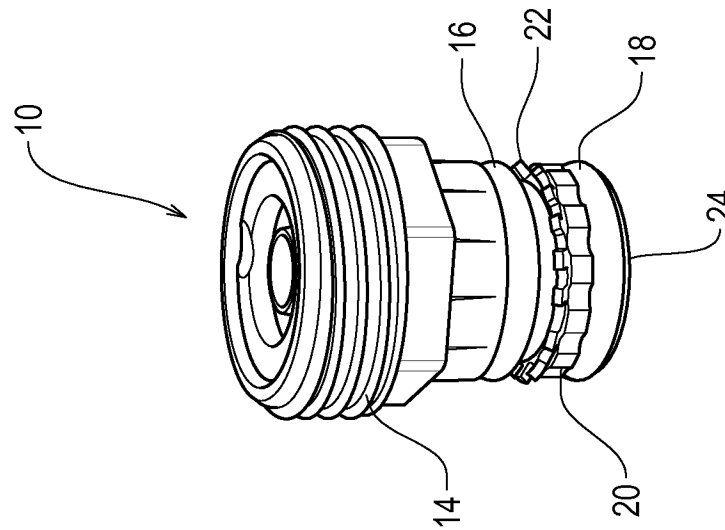


Figure 1b

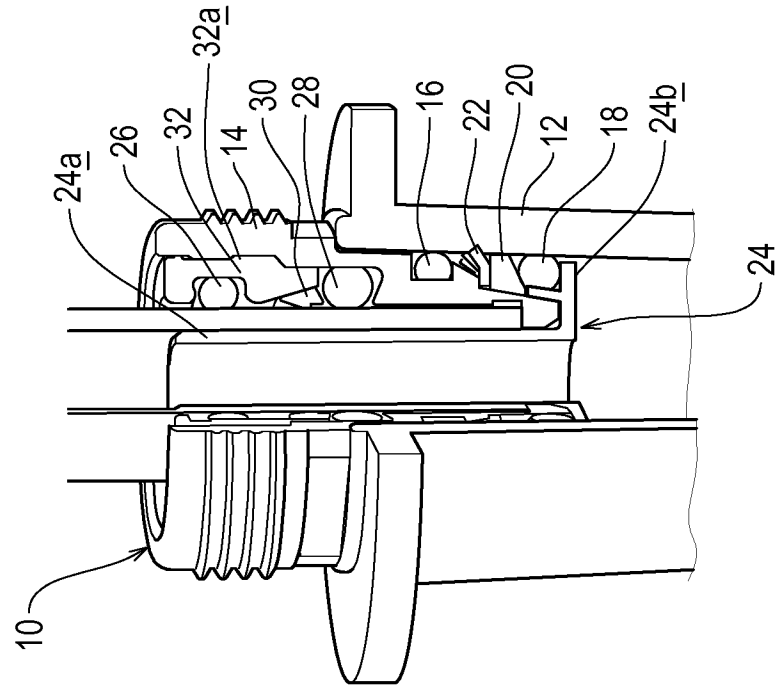


Figure 1c

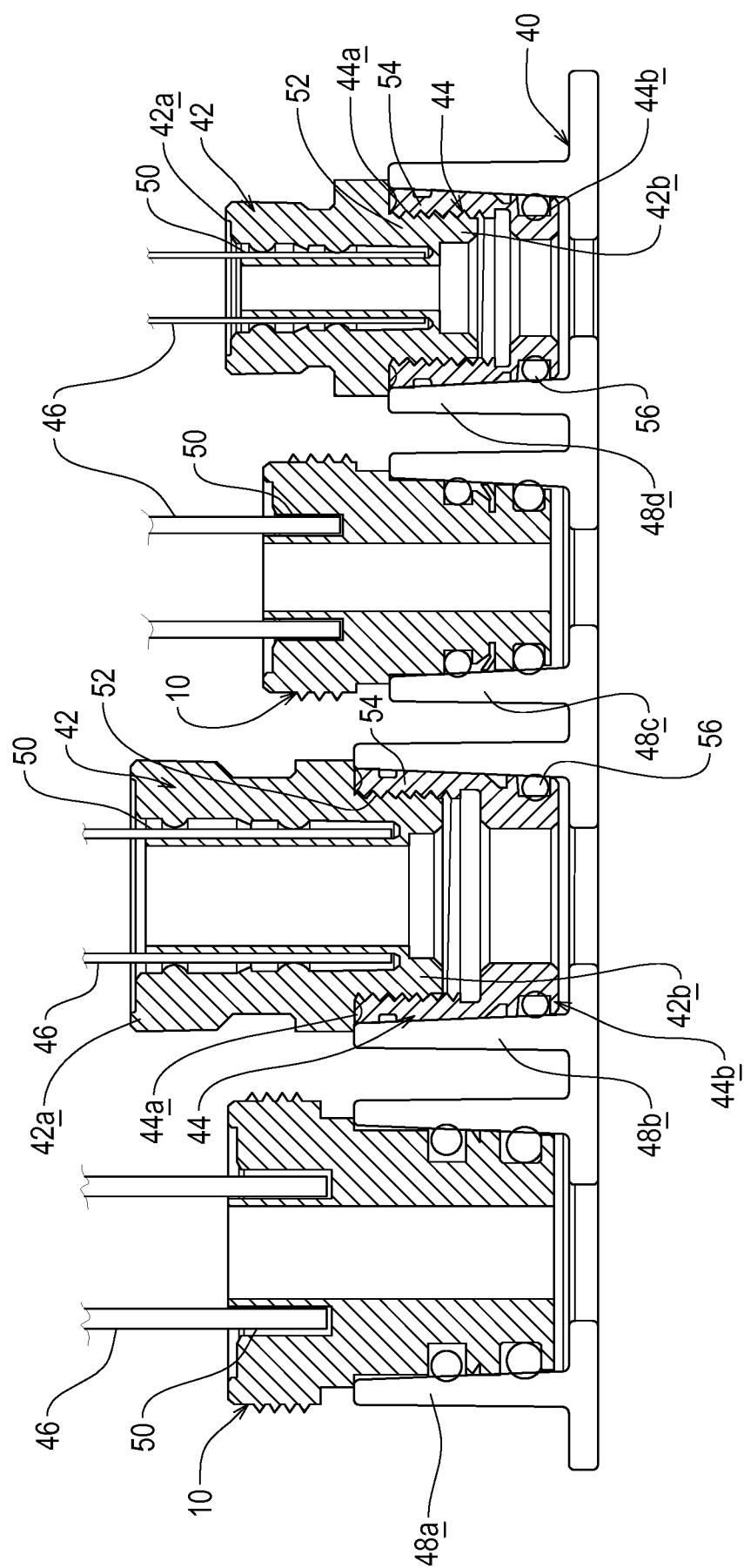


Figure 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/050079

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16L15/00 F16L41/08
ADD. B60T17/04

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)
F16L B60T

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/049969 A1 (KONGSBERG AUTOMOTIVE AS [NO]; DALE KRISTOFFER [NO]) 3 May 2007 (2007-05-03) page 8, line 11 - line 17; figures 4, 12 page 1, line 12 - line 16 -----	1-3, 11, 12
X	DE 29 53 463 A1 (VOSS ARMATUREN) 11 December 1980 (1980-12-11) page 9 - page 11; figures 2, 1 page 6, paragraph 1 page 8, last paragraph -----	1-3, 7-10, 12
X	US 4 471 978 A (KRAMER DIETER [DE]) 18 September 1984 (1984-09-18) column 7, line 61 - column 8, line 51; figure 12B column 1, line 8 - line 10 column 1, line 63 - column 2, line 2 -----	1-7, 9, 10, 12

☐

Further documents are listed in the continuation of Box C.

☒

See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

7 March 2018

Date of mailing of the international search report

20/03/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

dall'Amico, Mauro

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/050079

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007049969 A1	03-05-2007	CN 101296828 A ES 2335180 A1 GB 2445124 A WO 2007049969 A1	29-10-2008 22-03-2010 25-06-2008 03-05-2007
DE 2953463 A1	11-12-1980	DE 2824943 A1 DE 2856064 A1 DE 2856069 A1 DE 2912160 A1 DE 2953463 A1 EP 0005865 A2 US 4471978 A	20-12-1979 10-07-1980 10-07-1980 09-10-1980 11-12-1980 12-12-1979 18-09-1984
US 4471978 A	18-09-1984	DE 2824943 A1 DE 2856064 A1 DE 2856069 A1 DE 2912160 A1 DE 2953463 A1 EP 0005865 A2 US 4471978 A	20-12-1979 10-07-1980 10-07-1980 09-10-1980 11-12-1980 12-12-1979 18-09-1984