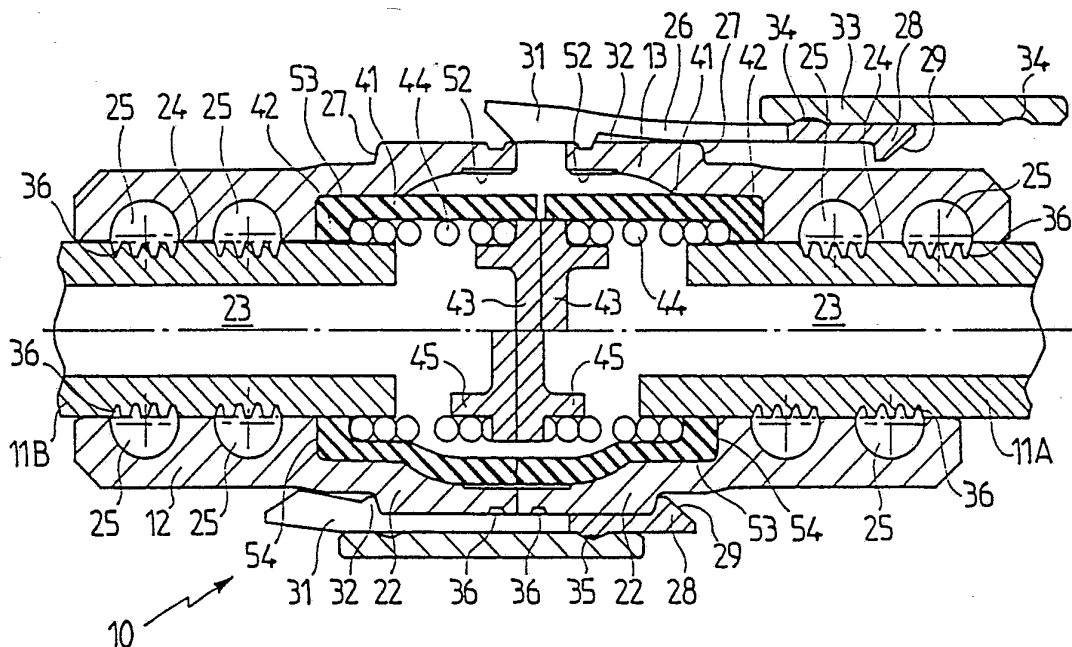




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(54) Title: CONNECTOR FOR A FLUID CONDUIT



(57) Abstract

A fluid conduit connector (10) comprising two half connectors (12, 13) each having a cylindrical body (22) that receives the conduit (11A, 11B), an elastomeric sleeve (41) within the body (22) having one end portion sealed to the body and in an uncoupled condition its other end portion spaced radially from the body and sealed by an end cap (43). Each elastomeric sleeve (41) holds the respective end cap (43) in position forward of the cylindrical body (22) and when the two half connectors (12, 13) are coupled together the two end caps (43) and the two said other ends of the sleeves (41) are pushed together in abutment causing the sleeve to deflect to lie against the respective cylindrical body (22) and allow fluid to flow around the respective end cap from one half connector to the other half connector.

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CONNECTOR FOR A FLUID CONDUIT

This invention relates to connectors for the inter-connection of two parts of a fluid conduit.

A typical motor vehicle clutch hydraulic control apparatus comprises a master cylinder, a fluid reservoir, a slave cylinder and conduit interconnecting the master cylinder and slave cylinder. In some instances, these apparatus are prefilled with hydraulic fluid prior to installation on a vehicle.

It is known from EP-A-146283 that the hydraulic control apparatus can be split at some point in the conduit and the two parts of the conduit equipped with quick connectors, to allow two halves of a prefilled hydraulic control apparatus to be supplied separately, each half of the apparatus being sealed by a half connector, and then after installation on a vehicle joining the two half connectors together to complete assembly of the clutch hydraulic control apparatus.

However quick connect couplings are expensive, as compared to the cost of manufacture of the other

parts of the apparatus.

The present invention provides a connector for a hydraulic conduit which is of a relatively cheap and simple construction .

Accordingly there is provided a connector for inter-connection of a fluid carrying conduit, the connector comprising two half connectors, each half connector comprising a cylindrical body that receives the conduit, an elastomeric sleeve arranged coaxially within the body and having one end portion sealed to the body and in an uncoupled condition its other end portion spaced radially from the body and having an end cap sealingly held therein, the elastomeric sleeve extending axially beyond the body to hold the respective end cap in position forward of the cylindrical body, and when the two half connectors are coupled together the two end caps, and the two said other ends of the sleeves are compressively loaded in abutment and said other end portions of the sleeve each lie against the respective cylindrical body and are spaced from the respective end cap to allow fluid to flow around the respective end cap from one half connector to the other half connector.

Also there is further provided a connector for the interconnection of two parts of a fluid carrying conduit, the connector comprising two half connectors, each of which comprises a cylindrical body that receives a portion of the conduit, wherein the cylindrical bodies of the two half connectors are held together by a surrounding resilient coupling which is a snap fit with at least one of said half connectors and which engages external surfaces on the two cylindrical bodies to limit the axial separation there between.

Yet another aspect of the invention provides a connector for the inter connection of the two parts of a fluid carrying conduit, the connector comprising two half connectors each of which comprise a cylindrical body that receives a portion of the conduit, wherein the conduit is secured to each half connector body by chordal pins that pass through corresponding aperture in the body and project into external surface of the conduit.

The invention will be described by way of example and with reference to the accompanying drawings in which:-

Fig 1 is an elevation of connector according to

this invention .

Fig 2 is a longitudinal cross-section through the connector shown in Fig 1 and shows the connector is an uncoupled condition above the centre line and a coupled condition below the centre line.

Fig 3 is a section on the line III-III of Fig 1 showing the securing pins in the "as moulded" condition.

Fig 4 is a longitudinal cross-section through a second connector also according to the invention, shown in a similar manner to that of Fig 2.

With reference to Figures 1-3 there is illustrated a connector 10 the inter-connection of two parts 11a and 11b of a fluid conduit 11. The fluid conduit is for example a flexible plastic tube, preferably a nylon 12 tube, utilised in a motor vehicle hydraulic clutch actuator system.

The connector 10 comprises two half connectors 12, 13 which are identical one with the other. The two half connectors 12 and 13 each comprise a substantially cylindrical body 22 having a coaxial bore 23 therein with a smaller diameter portion 24

at the outermost end thereof 16 to receive the conduit 11. The conduit 11 extends into the body 22 axially beyond the smaller diameter portion 24 of the bore 23 and the end portion of the conduit is secured in the body by chordal pins 25 that pass through apertures 37 in the body. The pins 25 are each fluted on their radially inner side thereof, and the flutes 36 can cut into the radially outer surfaces of the plastic conduit 11 to secure the conduit in position. The half connector body 22 is preferably a plastic moulding with the pins 25 and apertures 37 formed with the body 22, the pins 25 being connected thereto by webs in the condition shown in Fig 3.

To secure the tube 11 in position the pins 25 are pushed into their respective apertures 37 by use of a special tool and cut into the outer surface of the tube 11. A suitable material for moulding the half connector bodies and pins in a phenolic moulding compound, or a polyamide material.

The cylindrical bodies 22 of the two half connectors 12 and 13 are held together by a surrounding resilient coupling 26. Each half connector body 22 has an axially directed abutment surface 27 thereon in the form of a shoulder 27,

which is facing away from the other connector body. The resilient coupling 26 is an annular coupling having a annular continuous base portion 28 having a radially inward projection 29 to engage a shoulder 27 on one half connector 13, with a plurality of circumferentially spaced axially projecting resilient fingers 31 extending towards the other half connector 12. The fingers 31 each have a detent 32 thereon for engaging the shoulder 27 on the other half connector 12. When the resilient coupling is pushed into position the fingers 31 make a snap fit connection with their cooperating shoulder 27, and the coupling 26 engages against the shoulder 27 on both half connectors 12 and 13 to prevent axial separation of the half connectors.

This is the condition shown below the counter line in Fig 2.

The resilient coupling is surrounded by a locking collar 33. The locking collar 33 is cylindrical and has a pair of axially spaced grooves 34 on the internal surface thereof. The grooves 34 can engage a raised annular rib 35 on the external surface of the base portion 28 of the coupling 26 to hold the collar 33 in an inoperative condition

(as shown above the centre line), or an operative condition (as shown below centre line).

Each cylindrical body 22 has a groove 36 in its external surface adjacent the innermost end of the respective half connector 12 or 13. This groove 36 is engagable with the detents 32 on the ends of the resilient fingers 31 to retain the coupling 26 when the connector 10 is in an uncoupled condition. The coupling 26 and collar 30 are manufactured from a plastic material preferably acetal resin.

The coaxial bore 23 in each cylindrical body 22 has a larger diameter portion 52 adjacent the innermost end of the body, and an intermediate diameter portion 53 adjacent the smaller diameter portion 24 at the outermost end of the body.

An elastomeric sleeve 41 preferably formed from a ethylene propylene rubber (EPDM) and is arranged coaxially within the bore 23 of each half connector 12 and 13, and the outer end portion of each sleeve 41 seals against the respective intermediate diameter portion 53 of the bore.

The outer end of each sleeve 41 has a radially inwardly projecting annular rib 42 which seats

against the shoulder 54 between the smaller and intermediate diameter portions 24 and 53 of the bore, respectively. This annular rib 42 also seals against the respective end portion of the conduits 11a and 11b which projects into the intermediate diameter portions 53 of the bore.

The inner end portion of each sleeve 41 is spaced radially away from the respective radially inner surface of the larger diameter portion 52 of the bore, in the uncoupled condition as shown above the centre line of Fig 2.

The inner end of each sleeve 41 is sealed by an end cap 43 retained in the inner end portion of the respective sleeve by the resilience of the sleeve and by a coil spring 44. Each coil spring 44 has its outer end abutting the annular rib 42 and is secured between the respective conduit 11a and 11b and the outer end portion of the sleeve 41, and has its inner end gripping an annular boss 45 on the back face of the end cap 43.

Each elastomeric sleeve 41 extends axially beyond the respective cylindrical body 22 so that each end cap is held in a position forward of the body 22 as is shown in Fig 2 above the centre line. For

example the end cap may be held a distance of about $L/4 - L/5$ in front of the body, where L is length of the larger diameter portion of the bore.

When the two half connectors 12 and 13 are coupled together the two end caps 43 first come into abutment as shown above the centre in Fig 2. Further inwards movement against the load in the springs 44 brings the two inner ends of the sleeve 41 into sealing abutment under the resilient loads in the elastomeric sleeve. Then the further first inward movement causes the compressive loads on the sleeves 41 to build up and eventually cause the inner end portions of the sleeve to move radially outwards against the inner surface of the larger diameter portion 53 of the bore, and therefore spaced from the end cap.

It is the Poisson's ratio of the elastomer under compression that causes the radially outward movement of the unsupported inner end portion of the sleeve.

In this coupled condition, shown below the centre line in Fig 2, the fluid can now flow through the connector, and is free to flow through the coil of the spring 44 and through the radial gap between

the end cap 43 and the sleeve 41.

When the two half connectors 12 and 13 are pushed together, the resilient coupling 26 can slide over the two bodies 22 until the projection 29 abuts a shoulder 27 on one body 12 and detents 32 snap into engagement against the shoulder 27 on the other body 22.

The locking collar 33 can slide over the coupling 26 so that the rib 35 on the coupling engages the other groove 33 on the inner surface of the collar 33.

The second embodiment of the invention shown in Fig 4 differs from the embodiment described with reference to Fig 1 - 3 only in the internal parts of the half connectors and only these differences will be described. Where the parts are the same as for the embodiment of Figs 1 - 3 the same part reference numbers will be used. The cylindrical bodies 22 are formed with a series of circumferential ribs 124 adjacent the inner end of the small diameter portion 24 of the bore 23.

These ribs 124 help grip the inner end portion of the conduit 11a which extends into the ribbed

portion 124 of the smaller diameter portion of the bore.

The sleeve 141 is formed at its outer end portion with a radially inwardly projecting bead 142 which engages in an annular undercut groove 143 formed in the shoulder 54 between the smaller and intermediate portions 24 and 53 of the bore 23. This firmly secures the sleeve 141 to the cylinder body 22.

The other inner end portion of the sleeve 141 engages an end cap 148 and seals against the outer periphery of the end cap. The end cap has three circumferentially spaced axially extending legs 144 which are resiliently hinged to the end cap and are biased radially outwardly at their ends. The legs 144 each have a circumferential groove 145 therein that engages an annular rib 146 the midway along the radially inner surface of the sleeve 141 to secure the end cap in position in the inner end of the sleeve.

The operating mechanism of the connector is as previously described excepting that the fluid flow passes between the legs 144 on the end cap when the connection is made, and then around the end cap.

CLAIMS

1. A connector (10) for inter-connection of a fluid carrying conduit (11), the connector (10) comprising two half connectors (12,13), each half connector (12,13) comprising a cylindrical body (22) that receives the conduit (11A,11B), an elastomeric sleeve (41, 141) arranged coaxially within the body (22) and having one end portion sealed to the body and in an uncoupled condition its other end portion spaced radially from the body and having an end cap (43, 143) sealingly held therein, the elastomeric sleeve (41, 141) extending axially beyond the body (22) to hold the respective end cap (43,143) in position forward of the cylindrical body (22), and when the two half connectors (12,13) are coupled together the two end caps (43, 143), and the two said other ends of the sleeves (41, 141) are compressively loaded in abutment and said other end portions of the sleeve lie against the respective cylindrical body (22) and are spaced from the respective end cap (43, 143) to allow fluid to flow around the respective

end cap from one half connector to the other half connector.

2. A Connector as claimed in Claim 1 wherein when in the coupled condition the two sleeves (41, 141) are compressively loaded together by the inherent resilience of the elastomeric material from which they are formed.
3. A connector as claimed in Claim 1 and Claim 2 wherein each end cap (143) has axially extending portions (144) and the sleeve holds said portions of the cap so that in the coupled condition the two end caps (143) are biased together by the inherent resilience of the elastomeric sleeves.
4. A connector as described in Claim 3 wherein each end cap (143) has fluid passageways between said axially extending portions (144) which in an uncoupled condition are closed by said other end portion of the sleeve (141), and which are opened on coupling together of the half connectors (12,13)
5. A connector as claimed in Claim 1 or Claim 2,

wherein in each half connector (12,13) the end cap (43) is retained in the sleeve by a spring (44) secured to the cylinder body (22).

6. A connector as claimed in Claim 5 in each half connector (12,13) the end cap (43) comprises a disc-like member which is gripped by within the coils of a compression spring (44) whose other end is held within the sleeve (41), and in the coupled condition fluid flows through the coils of the spring.
7. A connector as claimed in any one of claims 1 to 6 wherein in the coupled condition the cylindrical bodies (22) of the two half connectors (12,13) are held together by a surrounding resilient coupling (26) which is a snap fit with at least one of said half connectors (12) and which engages external surfaces (27) on the two cylindrical bodies (22) to limit the axial separation therebetween.
8. A connector as claimed in Claim 7 wherein the resilient coupling (26) is an annular coupling comprising an annular base portion (28) with a

lip (29) thereon to engage an axially directed abutment surface (27) on one half connector (13), and a plurality of circumferentially spaced axially extending resilient fingers (31) each having a detent (32) thereon for engaging an axially directed abutment surface (27) on the other half connector (12).

9. A connector as claimed in Claim 7 or Claim 8 wherein the annular coupling (26) is surrounded by a locking collar (33) which holds the resilient coupling in an engaged position, and must be removed to allow the connector (10) to be uncoupled.

10. A connector as claimed in Claim 9 wherein the locking collar (33) has a pair of spaced engaging means (34) thereon located at each end portion of the collar, which engaging means (34) are engageable with a co-operating engaging means (35) on the resilient coupling (26) to secure the collar (33) in a operative or inoperative position relative to the collar (33).

11. A connector as claimed in any one of claims 1

to 10 the connector being for use in connecting together two flexible plastic conduits (11A,11B) and wherein the plastic conduit (11) is secured to each half connector body (22) by chordal pins (25) that pass through co-operating apertures (37) in the body (22) and project into the external surface of the conduit (11).

12. A connector as claimed in Claim 11 wherein the pins (25) have flutes (36) thereon, and on insertion into the apertures (37), the flutes (36) cut into the external surface of the conduit to lock the conduit in position.

13. A connector as claimed in Claim 11 or Claim 12, wherein the axially inner end portion of the two conduits (11A,11B) each seal against a portion (42) of the respective sleeve.

14. A connector (10) for the interconnection of two parts (11A,11B) of a fluid carrying conduit (11), the connector (10) comprising two half connectors (12,13), each of which comprises a cylindrical body (22) that receives a portion of the conduit, wherein the cylindrical bodies (22) of the two half

connectors (12,13) are held together by a surrounding resilient coupling (24) which is a snap fit with at least one of said half connectors (12) and which engages external surfaces (27) on the two cylindrical bodies (22) to limit the axial separation there between.

15. A connector as claimed in Claim 14 wherein the resilient coupling (26) is an annular coupling comprising an annular base portion (28) which has an inward projection (29) thereon to engage an axially directed abutment surface (27) on one half connector (13), and a plurality of circumferentially spaced axially extending resilient fingers (31) each having a detent (32) thereon for engaging an axially directed abutment (27) surface on the other half connector (12).
16. A connector (10) for the interconnection of two parts (11A,11B) of a fluid carrying conduit (11), the connector comprising two half connectors (12,13) each of which comprises a cylindrical body (22) that receives a portion of the conduit (11) wherein the conduit (11) is secured to each

half connector body (22) by chordal pins (25) that pass through co-operating aperture (37) in the body and project into external surface of the conduit.

17. A connector as claimed in Claim 16 wherein the connector is for conduit the interconnection of two parts of plastic conduit, and the pins (25) have flutes (36) thereon, and on insertion into the apertures (36), the flutes cut into the external surface of the plastic conduit (11) to lock the conduit in position.
18. A connector as claimed in Claim 16 or Claim 17 wherein the pins (25) are formed integrally with the body (22) of each half connector (12 and 13) and are connected to said body by a membrane which can be broken on insertion of the pins (25) into their respective apertures (37).

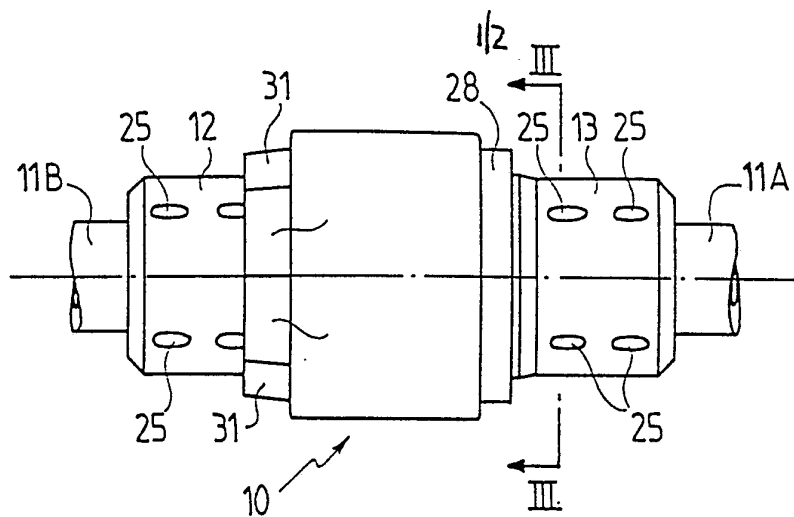


FIG. 1

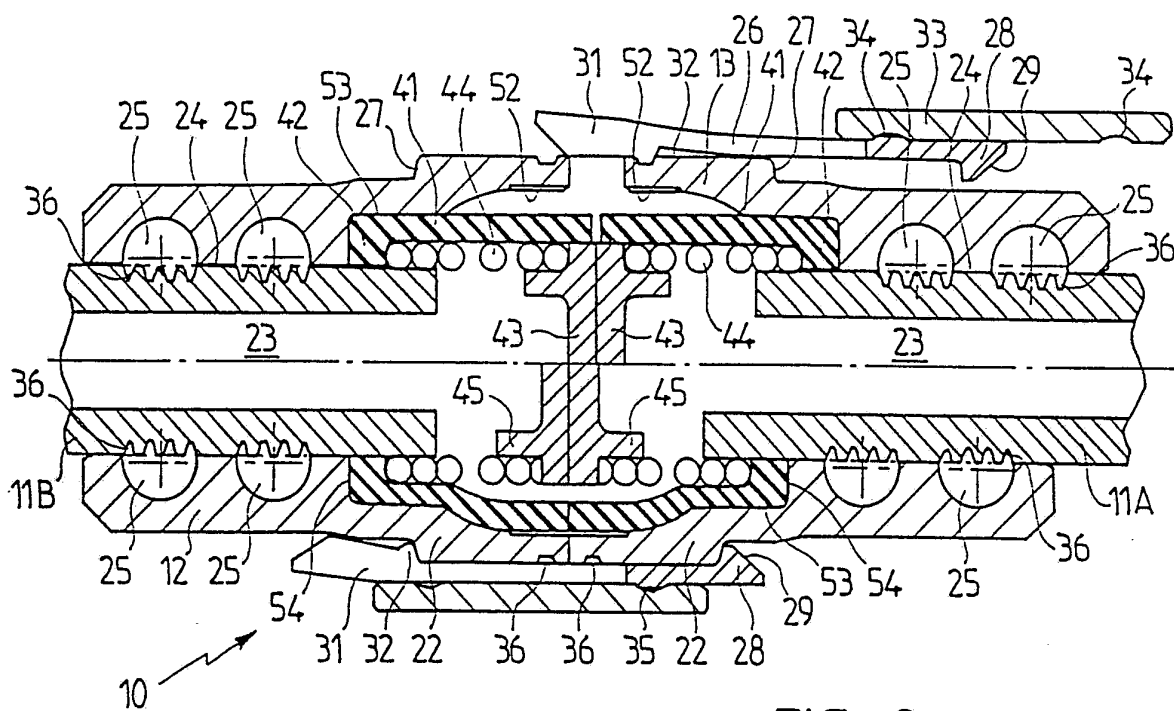


FIG. 2

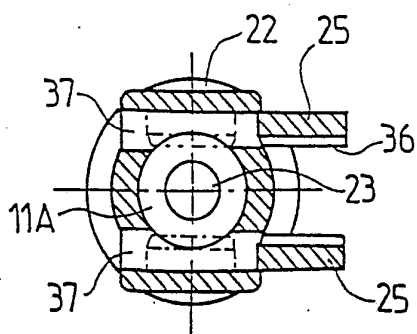


FIG. 3

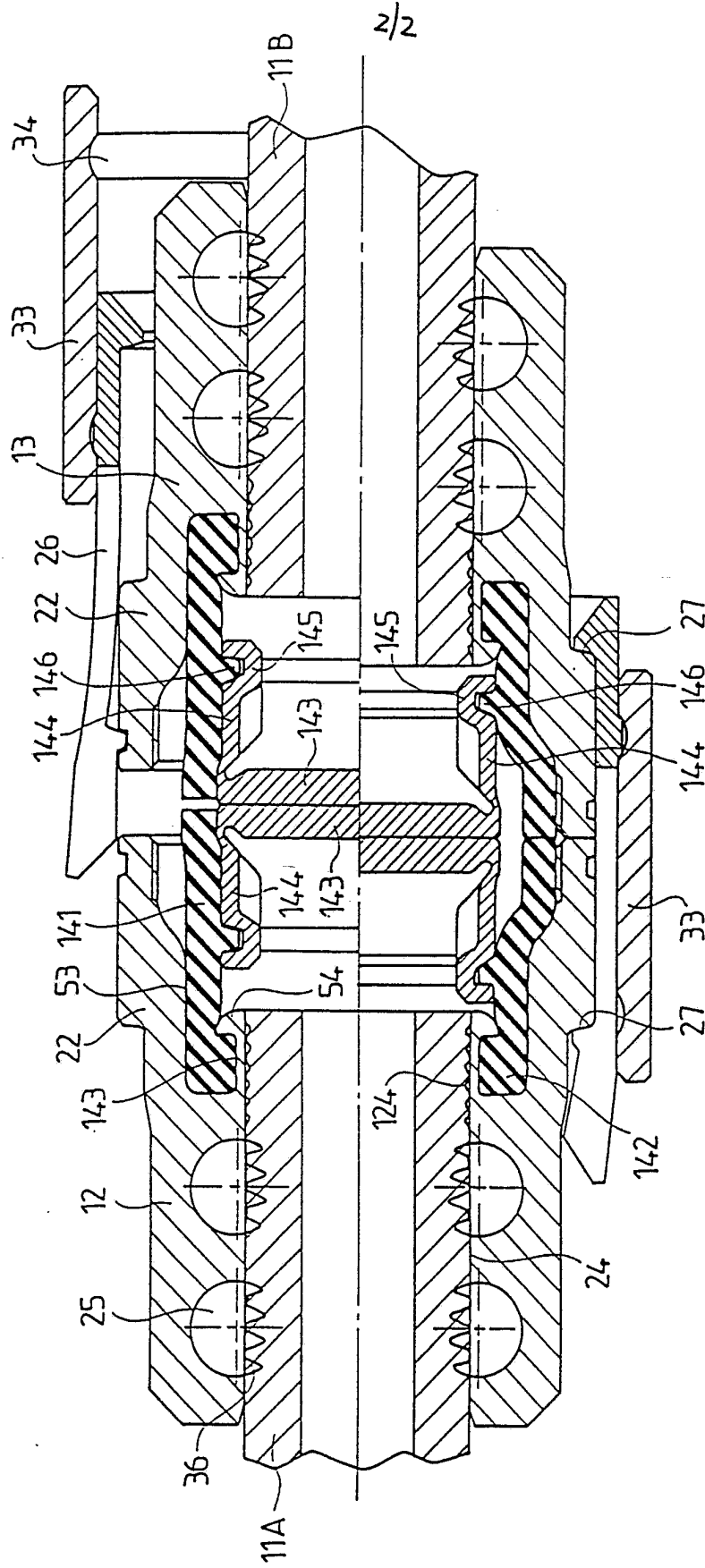


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 93/00388

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 F16L 37/28

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System	Classification Symbols
Int.Cl. 5	F16L ; F16K

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US,A,3 838 843 (BERNHARD) 1 October 1974 see figures 1-3 ---	1
A	DE,C,732 316 (SCHON) 4 February 1943 see figures 1,2 ---	1
A	FR,A,1 240 323 (RALET ET AL) 25 July 1960 see figures 9-12 ---	1
A	FR,A,2 034 123 (QUERCIA) 11 December 1970 see the whole document ---	1
A	EP,A,0 146 283 (AUTOMOTIVE PRODUCTS) 26 June 1985 cited in the application -----	

¹⁰ Special categories of cited documents:

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

07 APRIL 1993

Date of Mailing of this International Search Report

04.05.93

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

SCHLABBACH M.

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

EP 9300388
SA 70468

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07/04/93

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