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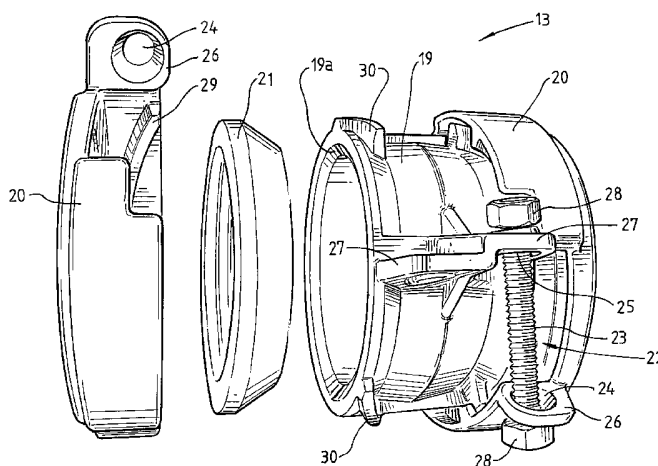
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(54) Title: PIPE COUPLING



(57) Abstract: There is disclosed a pipe coupling (13) for coupling the ends of pipe sections (10 and 11) together end to end. The coupling includes a barrel member (19) adapted to bridge and surround the ends of the pipe sections to be coupled, and, together with coupling members (20), adapted to engage the ends of the barrel sections, and elastomeric sealing rings (21) adapted to be forced by the coupling members into the ends of the barrel member and expanded radially outwardly and inwardly into tight sealing engagement within the end of the barrel member and around the circumferences of the pipe sections being coupled. Substantially tangentially extending bolts (22) are utilised to couple the respective coupling members to the barrel member, and means (29, 30) on the inside of the coupling members, and on the outside of the barrel member, to interact and progressively twist the coupling members along the barrel member to force the sealing rings into tight sealing engagement with the inside of the barrel member and around the circumference of the pipe sections being coupled. There is also disclosed a coupling which has a barrel member which forms part of one of the pipe sections to be joined and only one coupling member and sealing ring is used to couple the barrel member to the other pipe section.



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PIPE COUPLING

Technical Field

5 This invention relates to pipe couplings for
joining the ends of pipe sections end to end in pipelines,
and more particularly, but not exclusively, for use in
replacing burst pipeline sections in water pipelines. The
pipe coupling may be for the purpose of joining directly
10 abutting pipe ends, although the coupling is also
applicable to the joining of pipe ends of various
configurations such as socket and spigot joints.

 The invention has been particularly developed for
15 coupling the ends of a replacement pipe section to the
ends of an existing pipe after a burst section of pipe has
been removed, such as in a water main pipeline extending
beneath or adjacent roadways in commercial and/or
residential locations.

20

Background Art

 In order to replace burst sections of such water
supply pipelines, a trench or hole is dug down to and
25 along the burst section of the pipeline. The burst
section is then cut out from the pipeline and replaced
with a new pipe section which is to be coupled at both
ends to the ends of the existing pipeline by couplings.

 Known, but not necessarily commonly known,
30 couplings have a barrel section bridging and surrounding
the ends of the old and new pipeline sections, with the
barrel receiving at both ends elastomeric sealing rings to
form a seal between the inside of the barrel and the
circumferences of the existing and new pipe sections. The
35 sealing rings are of an axially tapered configuration and
are forced into matingly internally tapered ends of the
barrel by annular cylindrical coupling members surrounding

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the respective pipe sections and axially connected by bolts extending through lugs in the coupling members at each end of the coupling and along the length of the barrel. The bolts when tightened progressively force the sealing rings into the opposite ends of the barrel whilst compressing the sealing rings to expand them radially outwardly into tight sealing engagement within the ends of the barrel and radially inwardly into tight sealing engagement around the circumferences of the pipe sections being joined. A similar coupling is used to couple the opposite end of the new pipe section to the adjacent end of the existing pipe section. Multiple axially extending bolts are utilised equally spaced around the coupling to provide an even distribution of force on the sealing rings. There may be up to sixteen, or even more, axially extending bolts.

However, because of the location of the connecting bolts with such known couplings, access to beneath the pipe sections is required when tightening the bolts, thus producing back strain, whilst, because of the number of bolts to be tightened, the task of installing the coupling can be time consuming.

It is therefore an object of the present invention to provide a coupling which overcomes, or at least minimises, the above disadvantages with known couplings, whilst also accommodating different diameters of pipe sections to be coupled and also differences between the diameters of the existing pipe and the diameter of the new pipe section. For example the existing pipe may be a metal pipe and the new replacement pipe section may be PVC having a thinner wall thickness, but providing an internal diameter the same as that of the existing pipe but with a smaller external diameter.

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Disclosure of the Invention

In accordance with the present invention there is provided a pipe coupling for coupling the ends of pipe sections together end to end, said coupling including a barrel member forming part of the end of one of the pipe sections, or adapted to bridge and surround the ends of the pipe sections to be coupled, at least one coupling member, adapted to engage at least one end of the barrel section, and at least one elastomeric sealing ring adapted to be forced by the or each coupling member into at least one end of the barrel member and expanded radially outwardly and inwardly into tight sealing engagement within the end of the barrel member and around the circumference of the pipe section being coupled, wherein a substantially tangentially extending bolt is utilised to couple the or each respective coupling member to the barrel member, and means on the inside of the or each coupling member, and on the outside of the barrel member, to interact and progressively twist the or each coupling member along the barrel member to force the or each sealing ring into tight sealing engagement with the inside of the barrel member and around the circumference of the or each pipe section being coupled.

With the above defined coupling, only one or two bolts have to be tightened and by positioning them appropriately on top of the pipeline access to beneath the pipeline is not required, whilst an even force is applied to the or each sealing ring.

Brief Description of the Drawings

One preferred embodiment of the invention will now be described with reference to the accompanying illustrations, in which:

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Figure 1 is a view from above of a replacement pipe section coupled to the ends of an existing pipeline utilising the known prior art pipe coupling at one end and the pipe coupling of the preferred embodiment of the present invention at the other end,

Figure 2 is a perspective exploded view of the preferred pipe coupling of the present invention, and

Figure 3 is a perspective view of the pipe coupling of Figure 2 in an assembled condition with the pipeline sections omitted.

Best Modes of Carrying out the Invention

Turning to the illustrations, and in particular Figure 1, there is shown an existing pipeline 10 from which a burst pipe section has been removed and replaced by a new pipe section 11. The existing pipeline may be metallic and the new replacement pipe section may be PVC having an internal diameter the same as that for the existing pipeline, but having a smaller external diameter.

The pipe coupling 12 at the left hand end of the illustration is a known form of a coupling, whilst the coupling 13 at the right hand end is a pipe coupling in accordance with the preferred embodiment of the present invention.

The known pipe coupling 12, as described previously, has a barrel member 14 adapted to bridge and surround the ends of the new and old pipe sections 11 and 10 respectively. The barrel member receives elastomeric sealing rings (not shown) within both ends to form seals between the inside of the barrel and the circumferences of the existing pipe section 10 and the new pipe section 11. The sealing rings are of an axially tapering

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configuration, and are forced into matingly internal tapered ends of the barrel member 14 by annular cylindrical coupling members 15 surrounding the pipe sections 10 and 11. The coupling members 15 are coupled
5 together by axially extending bolts 16 passing through axially aligned holes 17 in outwardly extending lugs 18 carried by the coupling members. As the bolts 16 are progressively tightened, little by little, and in turn, to maintain an even force around the sealing rings, the
10 sealing rings are forced into the ends of the barrel member, whilst axially compressing the sealing rings to expand then radially outwardly into tight sealing engagement within the ends of the barrel member and radially inwardly into tight sealing engagement around the
15 circumferences of the pipe sections 10 and 11. As shown the axially extending bolts 16 are equally spaced (120°) around the coupling.

In contrast, the pipe coupling 13 of this
20 preferred embodiment of the present invention, although also comprising a barrel member 19 adapted to bridge and surround the ends of the pipe sections 10 and 11, and a pair of coupling members 20, one at each end of the barrel member, and engaging and axially forcing and compressing a
25 pair of axially tapered elastomeric sealing rings 21 into matingly axially tapered ends 19a of the barrel member, and whereby to compress the sealing rings 21 so as to expand radially outwardly and inwardly into tight engagement ends 19a of the barrel member 19, and the
30 circumferences of the pipe sections 10 and 11, the coupling is structurally otherwise different. In order to move the coupling members 20 along the ends of the barrel member 19, and compress the sealing rings 21 therebetween, a single substantially tangentially extending bolt system
35 22 is used for each coupling member, and comprises a threaded shaft 23 extending through aligned holes 24 and 25 in radially outwardly extending lugs 26 and 27 on the

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coupling members 20 and the barrel member 19 respectively. Nuts 28 at either end of the threaded shaft 23, when tightened, served to twist the coupling members, by means of radially inwardly directed lugs 29 on the inside of the
5 respective coupling members engaging radially outwardly directed and helically extending lugs 30 on the outside of the barrel member, whereby the coupling members move along the barrel member and compress the sealing rings whereby to expand them radially outwardly and inwardly into tight
10 sealing engagement with the barrel member and circumferentially around the respective pipe sections 10 and 11. The bolts alternatively may be conventional bolts of the type having a head on a threaded shaft and nuts at only one end.

15

Reverting to Figure 1 of the drawings, as the coupling member 20 surrounding the new pipe section 11 which is of a smaller diameter than in the existing pipeline 10, that coupling member twists further onto the
20 end of the barrel section before the associated sealing ring radially expands sufficiently to engage in tight sealing engagement around the new pipe section 11. By providing sufficient spacing between the lugs 26 and 27 various external pipe diameters can be accommodated within
25 the same installation, although the external diameter of the pipes in one installation may be different from those of another installation, whilst, as referred to above, the material of the new pipe section may be different from the existing pipe section.

30

The barrel and coupling member components 19 and 20 of the coupling 13 may be formed from ductile iron castings, whilst the elastomeric sealing rings 21 may be
35 formed from conventional materials to achieve the sealing functions required.

It should be noted that the tightening of the

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bolt 16 required in the known pipe coupling requires a spanner to be swung in a substantially vertical plane (transversely of the pipeline axis), including down towards the bottom of the trench or hole which thus
5 inhibits movement downwardly unless there is sufficient space beneath the pipeline. With the present invention the spanner or spanners are swung in the axial direction (longitudinally of the pipeline), and if the bolts are above the pipeline as in the case of the present
10 invention, access (trench or hole depth) to beneath the pipeline does not inhibit spanner operation.

Although in the preferred embodiment described above the pipe coupling utilises two coupling members 20
15 and two elastomeric sealing rings 21, the barrel member in a new pipeline installation could alternatively be formed integrally with the end of one of the pipe sections (which may be a socket type configuration to receive spigot and configuration of the pipe section to be joined thereto)
20 whereby only one coupling member and one elastomeric sealing ring are required to complete the coupling.

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CLAIMS:

1. A pipe coupling for coupling the ends of pipe sections together end to end, said coupling including a barrel member forming part of the end of one of the pipe sections, or adapted to bridge and surround the ends of the pipe sections to be coupled, at least one coupling member, adapted to engage at least one end of the barrel section, and at least one elastomeric sealing ring adapted to be forced by the or each coupling member into at least one end of the barrel member and expanded radially outwardly and inwardly into tight sealing engagement within the end of the barrel member and around the circumference of the pipe section being coupled, wherein a substantially tangentially extending bolt is utilised to couple the or each respective coupling member to the barrel member, and means on the inside of the or each coupling member, and on the outside of the barrel member, to interact and progressively twist the or each coupling member along the barrel member to force the or each sealing ring into tight sealing engagement with the inside of the barrel member and around the circumference of the or each pipe section being coupled.
2. A pipe coupling as claimed in Claim 1, wherein the barrel member is adapted to bridge and surround the ends of the pipe sections to be coupled, and two coupling members are provided, one for each end of the barrel member and for the end of each pipe section, and two sealing rings are provided for positioning between each coupling member and an adjacent end of the barrel member whereby when the pipe coupling is assembled between the ends of the pipe sections and each coupling member is coupled to its adjacent end of the barrel member, by a said tangentially extending bolt for each coupling member, each sealing ring will be expanded radially outwardly and inwardly into tight sealing engagement within the barrel

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member and around the circumferences of the pipe sections being coupled.

3. A pipe coupling as claimed in Claim 1 or 2,
5 wherein the means on the inside of the or each coupling member, and on the outside of the barrel member, to interact and progressively twist the or each coupling member along the barrel member, are one or more radially outwardly directed and helically extending lugs on the
10 outside of the barrel member engaged by one or more radially inwardly directed lugs on the inside of the coupling member.

4. A pipe coupling as claimed in any one of Claims 1
15 to 3, wherein the or each substantially tangentially extending bolt coupling the or each coupling member to the barrel member extends between radially outwardly directed lugs on the coupling member and the barrel member.

20 5. A pipe coupling as claimed in any one of the preceding claims, wherein the or each elastomeric sealing ring are of axially tapering configuration and the adjacent end of the barrel member is matingly internally tapered.

25 6. A pipe coupling, substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 24th day of April 2003

30 TYCO WATER PTY LTD

By their Patent Attorneys

GRIFFITH HACK

Fellows Institute of Patent and

Trade Mark Attorneys of Australia

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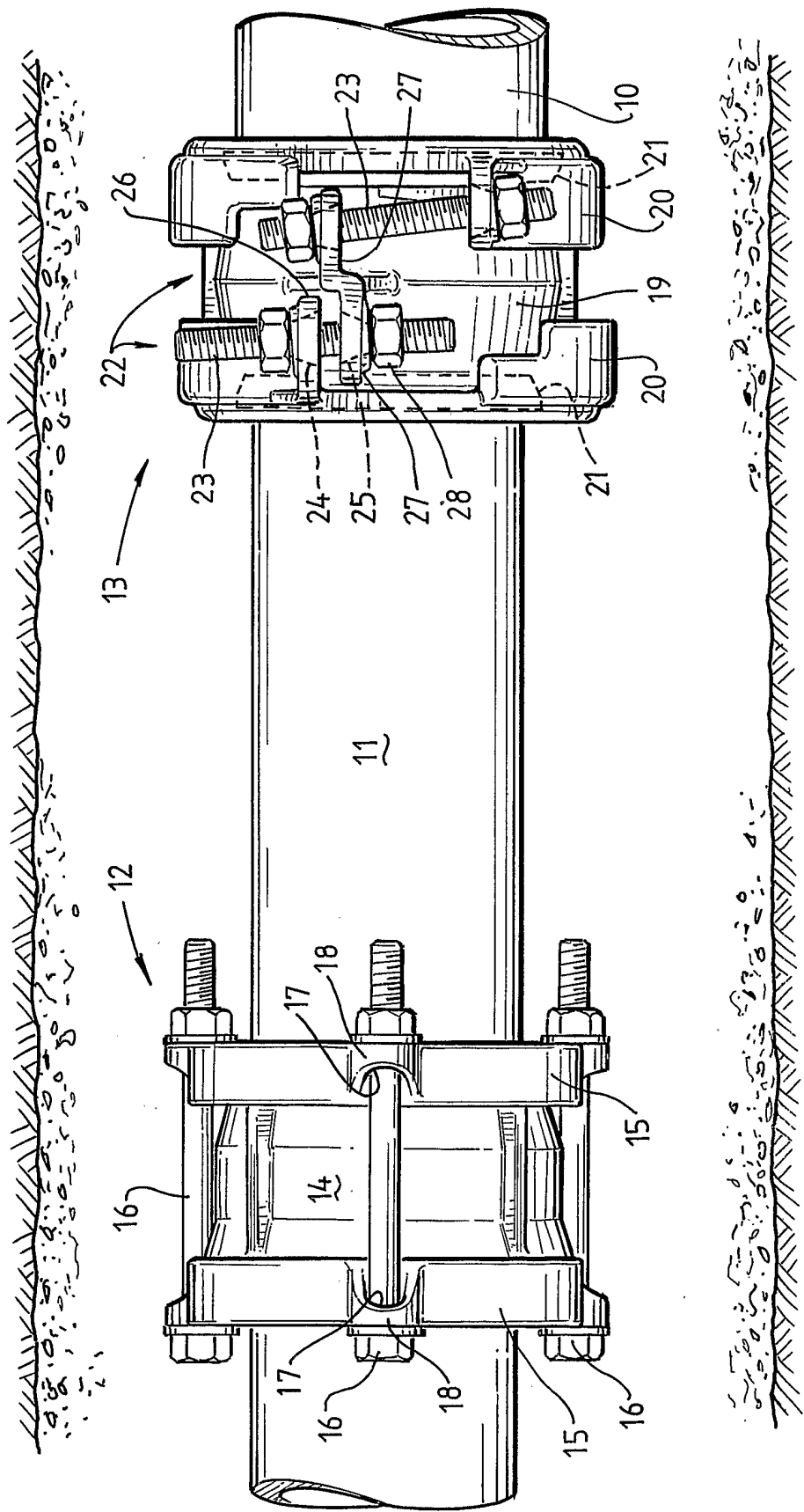


Fig. 1

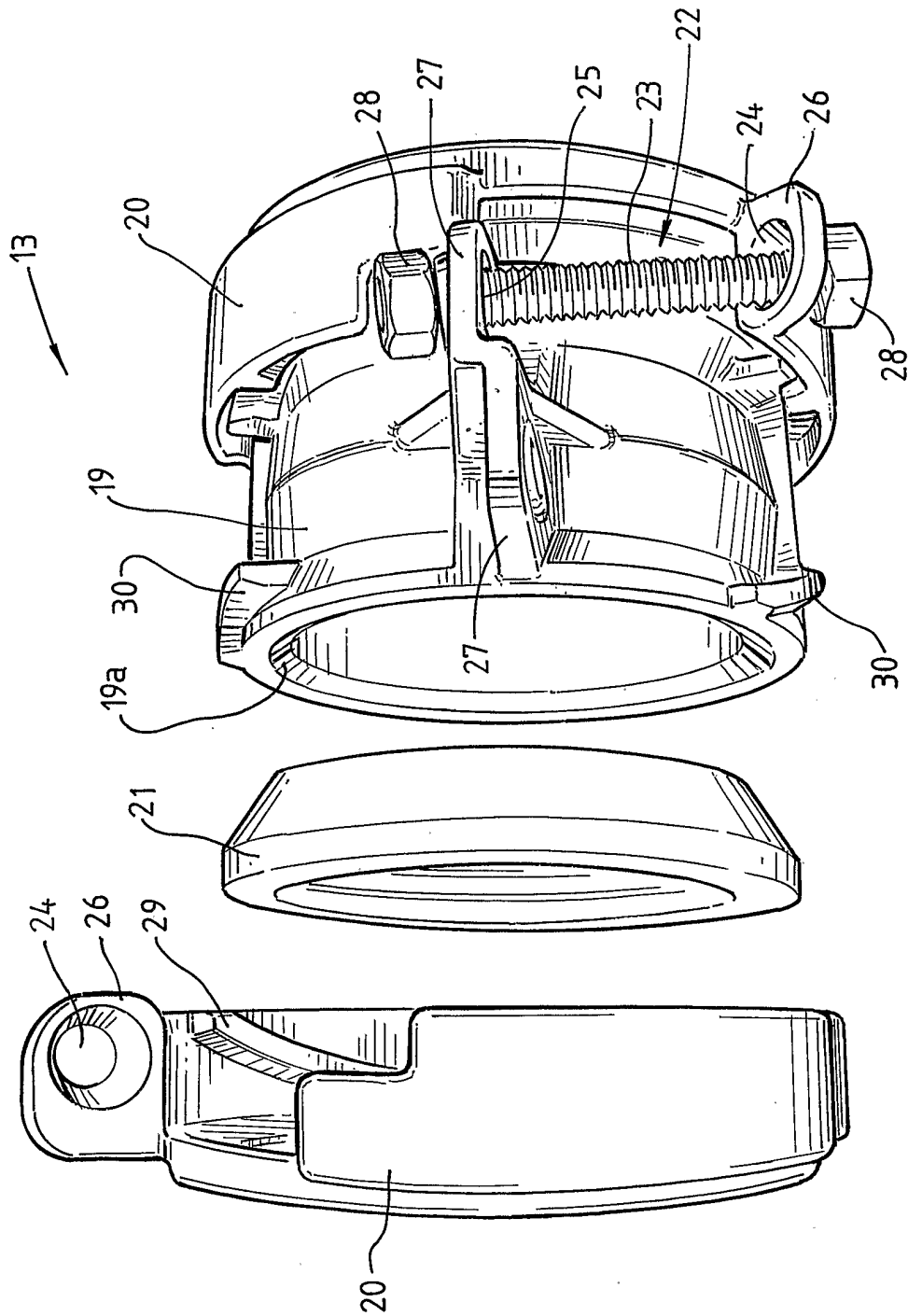


Fig. 2

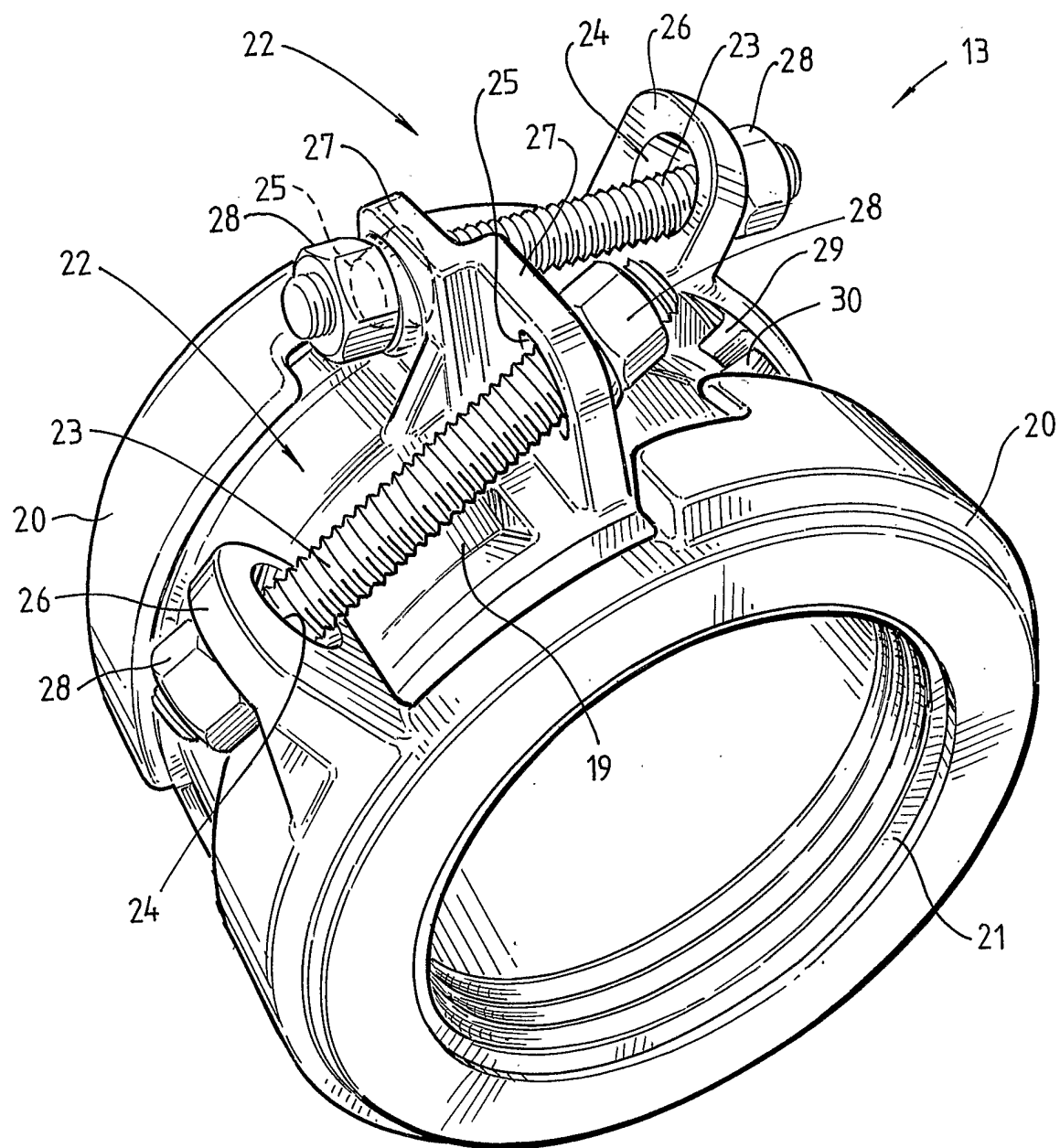


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00492

A. CLASSIFICATION OF SUBJECT MATTER												
Int. Cl. 7: F16L 25/04, 19/02.												
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) IPC F16L 25/04, 19/02.												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU IPC F16L 25/04, 19/02.												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI F16L/IC and (join+ or coup1+ or connect+ or attach+) and (tangent+)												
C. DOCUMENTS CONSIDERED TO BE RELEVANT												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
A	US 4083588 A (BERGER) 11 April 1978. See entire document.											
A	US 4397486 A (OHYA) 9 August 1983. See entire document.											
A	US 4640536 A (PRINTISS SR. ET AL) 3 February 1987. See entire document.											
☒ Further documents are listed in the continuation of Box C ☒ See patent family annex												
* Special categories of cited documents: <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"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</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"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</td> </tr> <tr> <td>"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)</td> <td>"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</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"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	"E" earlier application or patent but published on or after the international filing date	"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	"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)	"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	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
"A" document defining the general state of the art which is not considered to be of particular relevance	"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											
"E" earlier application or patent but published on or after the international filing date	"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											
"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)	"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											
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family											
"P" document published prior to the international filing date but later than the priority date claimed												
Date of the actual completion of the international search 26 May 2003		Date of mailing of the international search report 29 MAY 2003										
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer R. WEBER Telephone No : (02) 6283 2546										

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00492

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4848808 A (PANNELL ET AL) 18 July 1989. See entire document.	
A	US 4896902 A (WESTON) 30 January 1990. See entire document.	
A	DE 29811369 U (HERMANN MUCHER GMBH) 19 November 1998. See entire document.	
A	EP 926414 A (THE VICTAULIC CO OF JAPAN LTD.) 30 June 1999. See entire document.	
A	US 6123317 A (DENSEL ET AL) 26 September 2000. See entire document.	
A	FR 2810716 A (PEUGEOT CITROEN AUTOMOBILES SA) 28 December 2001. See entire document.	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU03/00492

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member			
US	4083588	NIL				
US	4397486	JP	56129560			
US	4640536	CA	1292259	EP	235982	
US	4848808	NIL				
US	4896902	AU	41518/89	CA	1318930	EP 361765
DE	29811369	NIL				
EP	926414	CN	1221088	CN	1221089	SG 71184
		JP	11241793	JP	11241794	TW 460667
		US	6076861			
US	6123317	CN	1283761	EP	1076198	
FR	2810716	NIL				END OF ANNEX