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Coupling device

(57)

Coupling device (1) for a pipe (2), comprising a sleeve (13) for receiving the pipe (2) and at least one sealing member (5) to provide a seal between the sleeve (13) and the pipe (2), a pressure member (6) for applying a pressure to the sleeve (13) and to the pipe (2), and a grip element (4) extending along at least a part of the perimeter of the pipe (2), wherein the grip element (4) is provided with dents (9) pressed out of the plane of the grip element (4) adjacent to slit like openings (8) punched out of the grip element (4), wherein edges (8') of the slit like openings (8) are cold forced.

Coupling device

The invention relates to a coupling device for a pipe, comprising a sleeve for receiving the pipe and at least one sealing member to provide a seal between the sleeve and the pipe, and a pressure member for applying a pressure to the sleeve and to the pipe.

A relatively recent example of such a coupling device is disclosed in the international patent application WO2015/177259 assigned to the present applicant. Other examples are WO2007/055576, WO2010/114366 and WO2014/090667, all in the name of the applicant.

The applicant is a leading firm in this field which is exemplified by the closest prior art for the instant invention which is embodied in the 1998 invention of EP 0 974 780, which discloses a coupling device for a pipe according to the preamble, wherein a grip element is provided with dents pressed out of the plane of the grip element adjacent to slit like openings that are punched out of the grip element. The instant invention also relates to a method for fabricating a grip element to be used in such a coupling device, and relates to said grip element.

With the previous century technology of EP 0 974 780 it was found that improved tensile strain resistance was possible with a diversity of pipes, to note hard pipes like pipes of cast iron, steel, and stainless steel. At the same time the prior art coupling device was suitably used with more softer pipes as well, such as pipes of PVC, polyethylene and asbestos cement.

Over time practice showed however that although the results of applying the device of EP 0 974 780 were quite satisfactory, problems could occur when the coupling device was used on hard pipes that were provided with a covering layer, such as cast iron pipes provided with a protective epoxy layer or a zinc layer. With such pipes the tensile strain resistance could be less than desirable.

Another tensile strain resistance problem with the coupling device of the prior art could occur when the coupling device was applied with softer pipes. The dents of the device

according to EP 0 974 780 could bite in such softer type of pipes in a way that the grip element of the coupling device would act as a cheese slicer on the surface of the pipe, due to which process the coupling device would gradually lose grip on the pipe. The applicant has earlier tried a solution for this problem as disclosed in EP 1 138 999, but there is still room for improvement.

The instant invention aims to provide a solution or at least alleviate one or more of the above-mentioned problems, and to this end a coupling device, a method of manufacturing a grip element, and such a grip element are proposed according to the features of one or more of the appended claims.

In a first aspect of the invention a coupling device according to the preamble is proposed which comprises a grip element extending along at least a part of the perimeter of the pipe, wherein the grip element is provided with dents pressed out of the plane of the grip element adjacent to slit like openings punched out of the grip element, and which comprises the novel feature that edges of the slit like openings are cold forced. This brings about the advantage to modify the crystal structure of the metal that is used for the grip element, including the structure of the dents that are pressed out of the plane of the grip element. The dents will accordingly be harder which improves their effectiveness. Alternatively it is possible to reduce costs by applying cheaper base material from which the grip element is manufactured, without sacrificing the hardness of the dents. Another advantage is that with cheaper base material the coupling device of the invention endures for a longer time without maintenance or replacement.

A suitable and preferable way to cold force the edges of the slit like openings is to execute the cold forcing prior to pressing the dents out of the plane of the grip element. This forcing can be done with an appropriate peening tool.

A feature that contributes to improving the effectiveness of the dents is that a frontal surface of a top of each dent is at an angle of approximately 90° with reference to the plane of the grip element.

The invention is also embodied in a method for fabricating the grip element to be used in a coupling device according to the invention, wherein slit like openings are punched in a plate, and wherein in a forming process dents are pressed out of the plane of the plate adjacent to the openings.

According to the invention prior to pressing the dents out of the plane of the plate, edges of the slit like openings are first cold forced.

Preferably cold forcing of the edges of the slit like openings is executed with a peening operation on said edges.

Correspondingly the invention is also embodied in a grip element provided with dents pressed out of the plane of the grip element adjacent to slit like openings punched out of the grip element, wherein the slit like openings are subjected to a cold forcing treatment. In an advantageous embodiment cold forcing of the edges of the slit like openings is executed prior to pressing the dents out of the plane of the grip element.

In another aspect of the invention which can be applied independent from the aforesaid features or in combination therewith, each grip element is supported by at least one pressure member, which pressure member is provided with protrusions that mate with the back of the dents that are pressed out of the plane of the corresponding grip element that is mounted on such pressure member.

The protrusions mating with the back of the dents that are pressed out of the plane of the grip element is an effective means to counteract the earlier mentioned cheese slicer effect when the coupling device is used on softer pipes. This counteracting effect is particularly promoted in an embodiment wherein the protrusions of the pressure member block openings in the grip element that are present next to the dents. The construction of the protrusions that mate with the back of the dents also provides that forces acting on the grip element elements due to strains exerted by the pipe on the coupling device, will effectively be transferred to the pressure members and absorbed by the construction of the coupling device.

The invention will hereinafter be further elucidated with reference to the drawing of an exemplary embodiment of a coupling device, a grip element and a method of manufacturing a grip element according to the invention that is not limiting as to the appended claims.

In the drawing:

-figure 1 shows a cross-sectional side view of the coupling device according to the invention;

-figures 2A and 2B show respectively and schematically two process steps according to the prior art for manufacturing a dent in a grip element, and figure 2C shows a cross-sectional side view of a part of a grip element near the dent manufactured according to the prior art;

- figures 3A, 3B, and 3C show respectively and schematically three process steps according to the invention for manufacturing a dent in a grip element, and figure 3D shows a cross-sectional side view of a part of a grip element near the dent manufactured according to the invention;

-figures 4A and 4B show in cross-sectional side view and exploded view, respectively a grip element together with a pressure member of the coupling device of the invention.

Whenever in the figures the same reference numerals are applied, these numerals refer to the same parts.

Figure 1 shows a coupling device 1 of the invention in a cross-sectional side view. The coupling device 1 comprises a sleeve 13 for receiving a pipe 2 and at least one sealing member 5 to provide a seal between the sleeve 13 and the pipe 2. The sealing member 5 may be attached to the sleeve 13 with a clip 14. Further the coupling device 1 comprises a pressure member 6 for applying a pressure to the sleeve 13 and to the pipe 2. Actuation means 3, 3' are provided to arrange that a pressure is applied to the pressure member 6, wherein a grip element 4 which extends along at least a part of the perimeter of the pipe 2 is supported by the pressure member 6. In this manner the grip element 4 is arranged to press on the pipe 2. As will be elucidated further hereinafter the grip element 4 is formed with dents pressed out of the plane of the grip element.

In figures 2A and 2B a prior art method is elucidated for fabricating a grip element to be used in a coupling device as shown in figure 1. In this method a punching tool 10 is used to provide slit like openings 8 in a plate 7. This is shown in figure 2A from top to bottom in an isometric view, in a side view, and in a cross-sectional view. Similarly figure 2B shows that in a subsequent step a pressing tool 11 is used to press dents 9 out of the plane of the plate 7 adjacent to the openings 8.

Figure 2C shows on larger scale one of the resulting dents 9 which is pressed out of the plane of the plate 7. In this prior art process a frontal surface 9' of the top of the dent 9 is at an angle of between 50° and 70° with reference to the plane of the plate 7 that eventually forms the grip element.

Correspondingly figures 3A - 3C show the method of the invention for fabricating a grip element 4 to be used in a coupling device as shown in figure 1.

In the method of the invention first a punching tool 10 is used to provide slit like openings 8 in a plate 7 as shown in figure 3A from top to bottom in an isometric view, in a side view, and in a cross-sectional view. Similarly figure 2B shows that in a subsequent step edges 8' of the slit like openings 8 are cold forced with a peening tool 12. Figure 2C shows that thereafter in a further process when the cold forcing of the edges 8' of the slit like openings 8 is complete, a pressing tool 11 is used to press dents 9 out of the plane of the plate 7 adjacent to the openings 8 to form the eventual grip element 4.

Figure 2D provides a detailed view on one of the resulting dents 9 which is pressed out of the plane of the plate 7. A frontal surface 9' of the top of the dent 9 is at an angle of approximately 90° with reference to the plane of the plate 7 of the grip element 4.

Turning now to figure 4A and figure 4B another aspect of the invention is elucidated. Figure 4B shows separately in an isometric view a grip element 4 manufactured from a plate 7 as elucidated with reference to figures 3A - 3D, and a single pressure member 6. A multitude of such pressure members 6 to-

gether form a ring around the perimeter of the pipe 2 in the coupling device 1 which is referred to in figure 1. In figure 4A a single pressure member 6 is shown in a cross-sectional view, wherein a single grip element 4 is mounted on the pressure member 6. It is however also possible that the pressure member 6 supports a number of grip elements, or that a number of pressure members support a single grip element.

In the complete coupling device as shown in figure 1 preferably each single pressure member 6 supports a single grip element 4. Accordingly the pressure members 6 together support all grip elements 4 that collectively surround the pipe 2 shown in figure 1. In the mounted condition the grip elements 4 thus extend along the entire perimeter of the pipe 2 which is connected to the coupling device 1.

It is clearly shown in both figure 4A and figure 4B that the shown pressure member 6 is provided with multiple protrusions 15 at the side facing the grip element 4. These protrusions 15 are designed to mate with the back of the dents 9 that are pressed out of the plane of the grip element 4, preferably in a manner that when the grip element 4 is mounted on the pressure member 6 as shown in figure 4A, the protrusions 15 of the pressure member 6 block openings 8 in the grip element 4 that are present next to the dents 9. This construction also provides that forces acting on the grip element 4 due to strains exerted by the pipe 2 on the coupling device 1, will effectively be transferred to the pressure member 6 and absorbed by the construction of the coupling device.

Although the invention has been discussed in the foregoing with reference to an exemplary embodiment of the invention, the invention is not restricted to this particular embodiment which can be varied in many ways without departing from the invention. The discussed exemplary embodiment shall therefore not be used to construe the appended claims strictly in accordance therewith. On the contrary the embodiment is merely intended to explain the wording of the appended claims without intent to limit the claims to this exemplary embodiment. The scope of protection of the invention shall therefore be construed in accordance with the appended claims only,

wherein a possible ambiguity in the wording of the claims shall be resolved using this exemplary embodiment.

CONCLUSIES

1. Koppelinrichting (1) voor een pijp (2), omvattende een huls (13) voor het opnemen van de pijp (2) en ten minste één afdichtorgaan (5) voor het verschaffen van een afdichting tussen de huls (13) en de pijp (2), een drukorgaan (6) voor
5 het uitoefenen van een druk op de huls (13) en op de pijp (2), en een gripelement (4) dat verloopt langs tenminste een deel van de omtrek van de pijp (2), waarbij het gripelement (4) voorzien is van uitdeukingen (9) die uit het vlak van het gripelement (4) gedrukt zijn naast sleufvormige openingen (8) die
10 geponst zijn uit het gripelement (4), **met het kenmerk**, dat randen (8') van de sleufvormige openingen (8) koud geforceerd zijn.

2. Koppelinrichting volgens conclusie 1, **met het kenmerk**, dat koud forceren van de randen (8') van de sleufvormige openingen (8) uitgevoerd wordt voorafgaand aan het drukken van
15 de uitdeukingen (9) uit het vlak van het gripelement (4).

3. Koppelinrichting volgens conclusie 1 of 2, **met het kenmerk**, dat een frontaal oppervlak (9') van een top van iedere uitdeuking (9) onder een hoek ligt van ongeveer 90° ten opzichte van het vlak van het gripelement (4).
20

4. Koppelinrichting volgens één der conclusies 1 - 3 of de aanhef van conclusie 1, **met het kenmerk**, dat de inrichting meerdere gripelementen (4) omvat, waarbij ieder gripelement (4) gesteund wordt door ten minste één drukorgaan (6),
25 welk drukorgaan (6) voorzien is van uitsteeksels (15) die samenwerken met de achterkant van de uitdeukingen (9) die gedrukt zijn uit het vlak van het gripelement (4).

5. Koppelinrichting volgens conclusie 4, **met het kenmerk**, dat de uitsteeksels (15) van het drukorgaan (6) openingen (8) in het gripelement (4) blokkeren die aanwezig zijn
30 naast de uitdeukingen (9).

6. Werkwijze voor het produceren van een gripelement (4) voor gebruik in een koppelinrichting (1) voor een pijp (2), waarbij sleufvormige openingen (8) geponst zijn in een
35 plaat (7) en dat in een vormproces uitdeukingen (9) gedrukt zijn uit het vlak van de plaat (7) naast de openingen (8), **met het kenmerk**, dat voorafgaand aan het drukken van de uitdeukin-

gen (9) uit het vlak van de plaat (7) randen (8') van de sleufvormige openingen (8) koud geforceerd zijn.

5 7. Werkwijze volgens conclusie 6, **met het kenmerk**, dat het koud forceren van de randen (8') van de sleufvormige openingen (8) uitgevoerd wordt met een hamerbewerking op genoemde randen (8').

10 8. Gripelement (4) voorzien van uitdeukingen (9) die gedrukt zijn uit het vlak van het gripelement (4) naast sleufvormige openingen (8) die geponst zijn uit het gripelement (4), **met het kenmerk**, dat randen (8') van de sleufvormige openingen (8) koud geforceerd zijn.

15 9. Gripelement (4) volgens conclusie 8, **met het kenmerk**, dat koud forceren van de randen (8') van de sleufvormige openingen (8) uitgevoerd wordt voorafgaand aan het drukken van de uitdeukingen (9) uit het vlak van het gripelement (4).

10. Gripelement (4) volgens conclusie 8 of 9, **met het kenmerk**, dat een frontaal oppervlak (9') van een top van de uitdeuking (9) onder een hoek ligt van ongeveer 90° ten opzichte van het vlak van het gripelement (4).

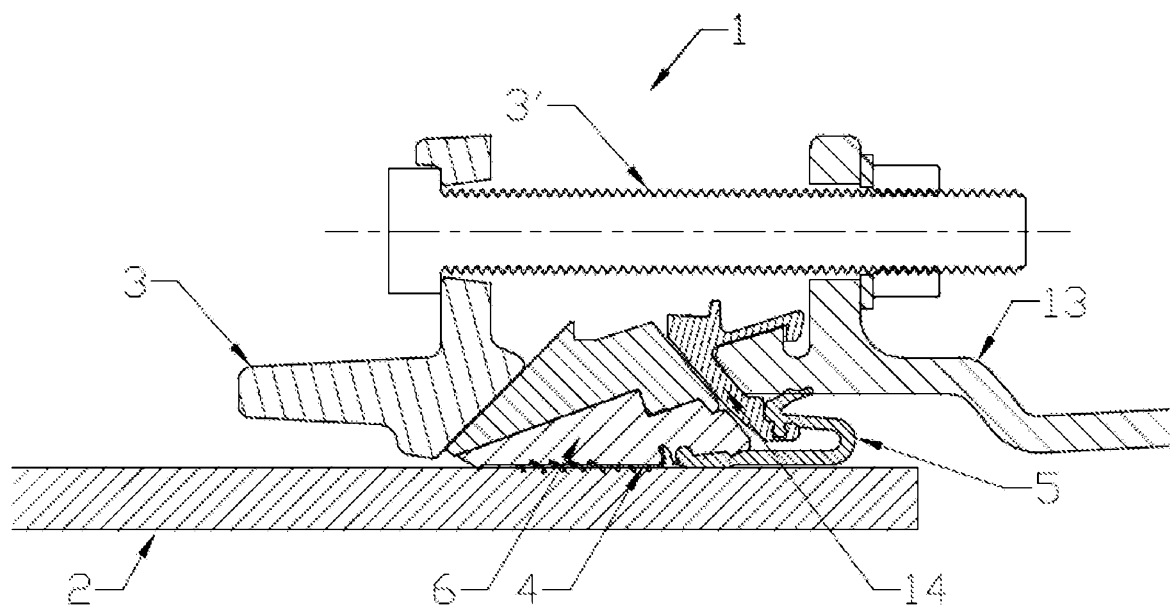
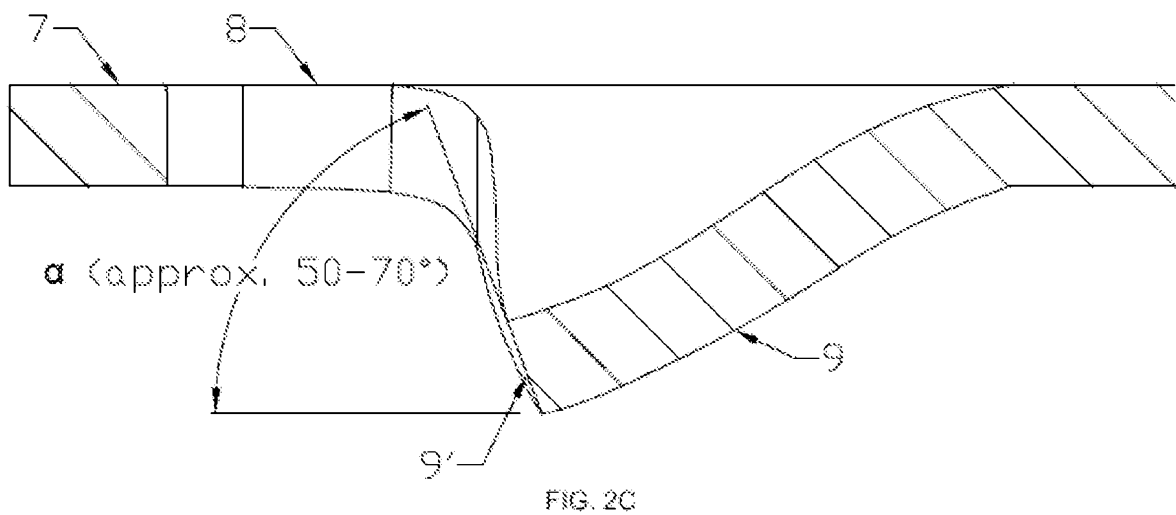
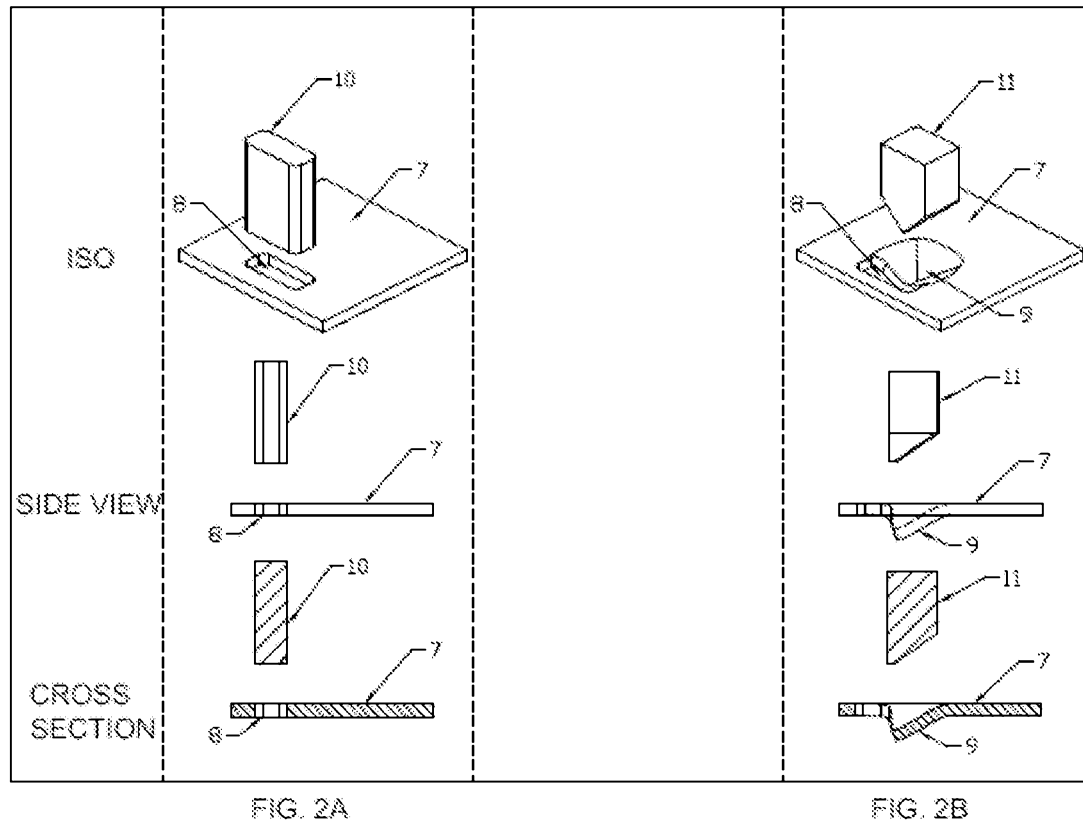
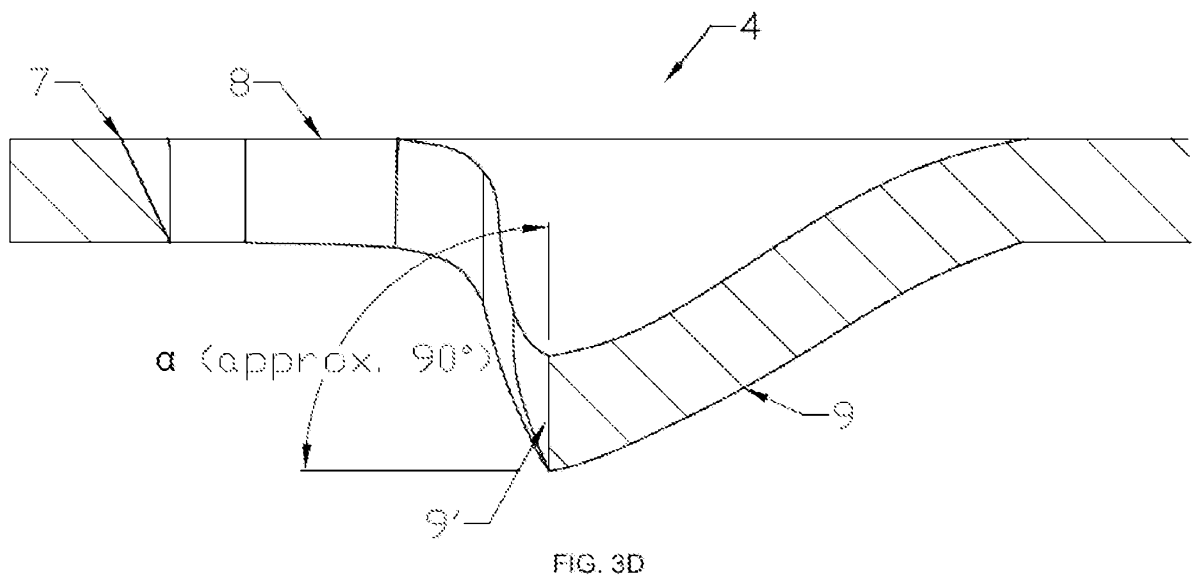
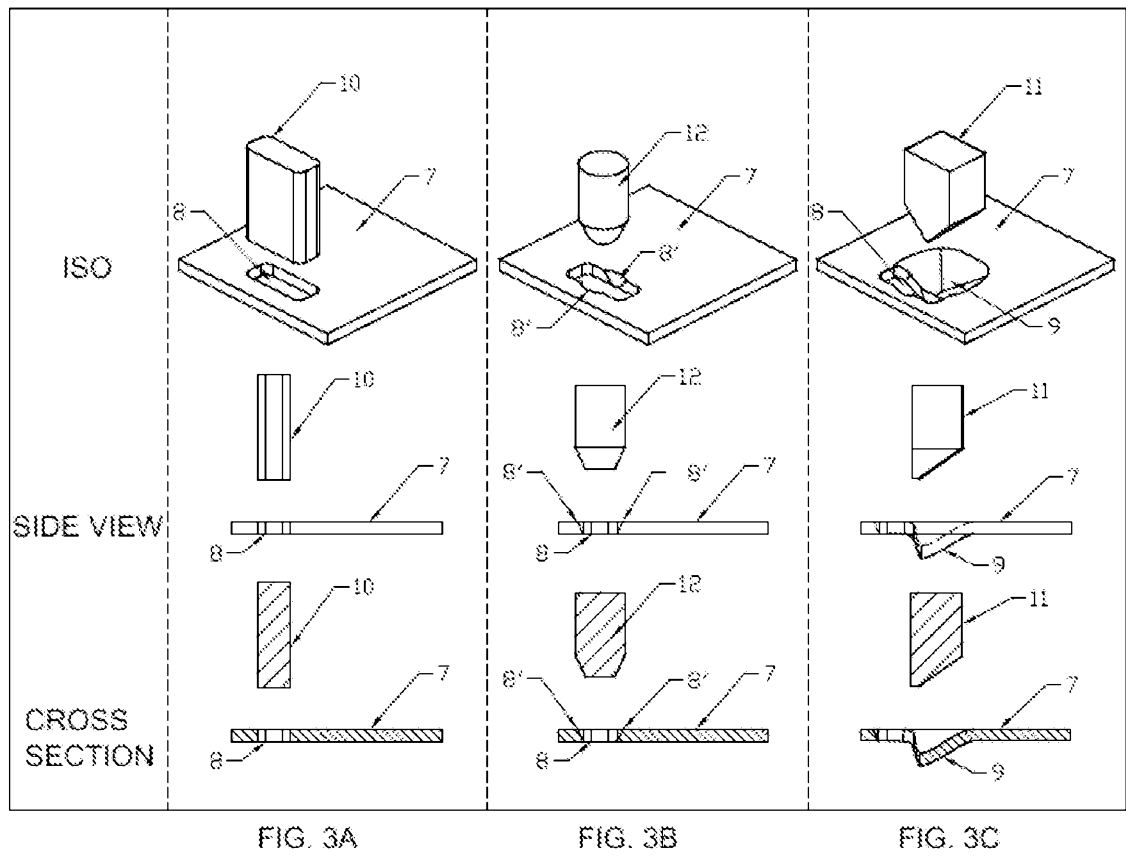
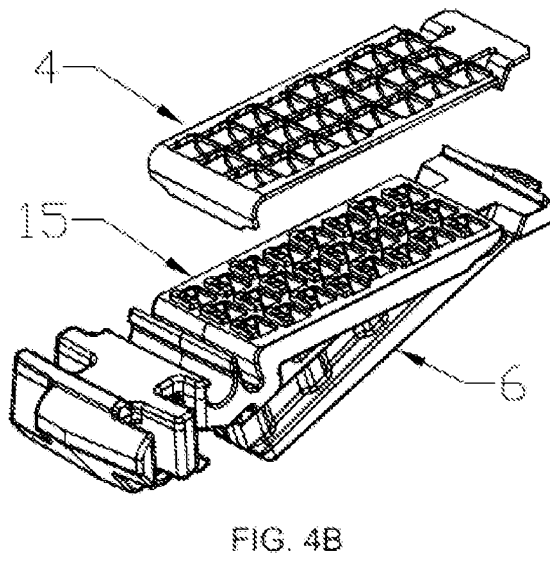
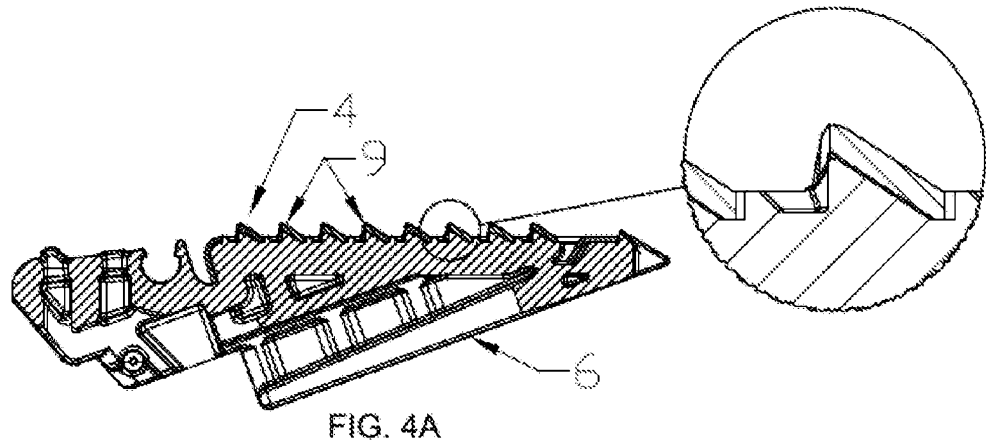


FIG. 1







ABSTRACT

Coupling device (1) for a pipe (2), comprising a sleeve (13) for receiving the pipe (2) and at least one sealing member (5) to provide a seal between the sleeve (13) and the pipe (2), a pressure member (6) for applying a pressure to the sleeve (13) and to the pipe (2), and a grip element (4) extending along at least a part of the perimeter of the pipe (2), wherein the grip element (4) is provided with dents (9) pressed out of the plane of the grip element (4) adjacent to slit like openings (8) punched out of the grip element (4), wherein edges (8') of the slit like openings (8) are cold forced.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE 	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE 017769NL-PD		
Nederlands aanvraag nr. 2019920	Indieningsdatum 16-11-2017		
	Ingeroepen voorrangsdatum 		
Aanvrager (Naam) Georg Fischer Waga N.V.			
Datum van het verzoek voor een onderzoek van internationaal type 06-01-2018	Door de instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN70347		
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven) Volgens de internationale classificatie (IPC) F16L21/04;F16L21/08			
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK			
Onderzochte minimumdocumentatie			
Classificatiesysteem	Classificatiesymbolen		
IPC	F16L		
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen 			
III.	☐	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES	(opmerkingen op aanvullingsblad)
IV.	☒	GEBREK AAN EENHEID VAN UITVINDING	(opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2019920

A. CLASSIFICATIE VAN HET ONDERWERP
INV. F16L21/04 F16L21/08
ADD.

Volgens de internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)

F16L

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie	Gepiteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	EENHEID VAN UITVINDING ONTBREEKT zie aanvullingsblad B ----- WO 2009/157766 A1 (FISCHER GEORG WAGA NV [NL]; NIJSEN ANDREAS JACOBUS LOUIS [NL]) 30 december 2009 (2009-12-30) * samenvatting; figuren * * bladzijde 2, regel 37 - bladzijde 3, regel 21 * * bladzijde 4, regel 35 - bladzijde 5, regel 20 *	1-3,6-10 4,5
X,D	EP 0 974 780 A1 (FISCHER GEORG WAGA NV [NL]) 26 januari 2000 (2000-01-26) in de aanvraag genoemd * samenvatting; figuren * * alinea's [0012], [0013] *	1-3,8-10 4,5
A	----- -/-	



Verdere documenten worden vermeld in het vervolg van vak C.



Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

* "A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

* "D" in de octrooiaanvraag vermeld

* "E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

* "L" om andere redenen vermelde literatuur

* "O" niet-schriftelijke stand van de techniek

* "P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

* "T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

* "X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

* "Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere gepiteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

* "&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

5 juli 2018

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

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Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Untermann, Nils

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2019920

C. (Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	DE 26 46 939 A1 (HAWLE & CO E) 2 juni 1977 (1977-06-02)	1-3,8-10
A	* samenvatting; figuren * * bladzijden 5,6 *	4,5
X	----- NL 2 013 426 A (DYKA B V [NL]) 18 augustus 2016 (2016-08-18)	1-3,8-10
A	* samenvatting; figuren * * bladzijde 21, regel 34 - bladzijde 22, regel 15; figuren 3A-3C *	4,5
A,D	----- EP 1 138 999 A1 (FISCHER GEORG WAGA NV [NL]) 4 oktober 2001 (2001-10-04) in de aanvraag genoemd * samenvatting; figuren * * alinea [0012] *	1-10
A,D	----- WO 2015/177259 A1 (FISCHER GEORG WAGA NV [NL]) 26 november 2015 (2015-11-26) in de aanvraag genoemd * samenvatting; figuren *	1-10

GEBREK AAN EENHEID VAN UITVINDING

Octrooiaanvraag Nr.:

SN 70347

NL 2019920

AANVULLINGSBLAD B

De instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvraag meerdere uitvindingen bevat, te weten:

1. conclusies: 1-3, 6-10(compleet); 4, 5(gedeeltelijk)

coupling device with a grip element wherein edges of a slit-like opening are cold forged, claims 4 and 5 in the variant according to any one of claims 1-3

2. conclusies: 4, 5(gedeeltelijk)

coupling device in the variant according to the preamble of claim 1, wherein each grip element is supported by at least one pressure member, which pressure member is provided with protrusions that mate with the back of the dents that are pressed out of the plane of the corresponding grip element that is mounted on such pressure member

Het vooronderzoek werd tot het eerste onderwerp beperkt.

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummers van het verzoek om een onderzoek naar
de stand van de techniek

NL 2019920

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
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WRITTEN OPINION

File No. SN70347	Filing date (day/month/year) 16.11.2017	Priority date (day/month/year)	Application No. NL2019920
International Patent Classification (IPC) INV. F16L21/04 F16L21/08			
Applicant Georg Fischer Waga N.V.			

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☒ Box No. VIII Certain observations on the application

Examiner Untermann, Nils

WRITTEN OPINION

Application number

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Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step, or to be industrially applicable have not been examined in respect of

- ☐ the entire application
- ☒ claims Nos. 4, 5(gedeeltelijk)

because:

- ☐ the said application, or the said claims Nos. relate to the following subject matter which does not require a search (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):
- ☒ no search report has been established for the whole application or for said claims Nos. 4, 5(gedeeltelijk)
- ☐ a meaningful opinion could not be formed as the sequence listing was either not available, or was not furnished in the international format (WIPO ST25).
- ☐ a meaningful opinion could not be formed without the tables related to the sequence listings; or such tables were not available in electronic form.
- ☐ See Supplemental Box for further details.

Box No. IV Lack of unity of invention

1. The requirement of unity of invention is not complied with for the following reasons:

see separate sheet

2. This report has been established in respect of the following parts of the application:

- ☐ all parts.
- ☒ the parts relating to claims Nos. (see Search Report)

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Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	7(compleet); 4, 5(gedeeltelijk)
	No: Claims	1-3, 6, 8-10
Inventive step	Yes: Claims	4, 5(gedeeltelijk)
	No: Claims	1-3, 6-10
Industrial applicability	Yes: Claims	1-3, 6-10(compleet); 4, 5(gedeeltelijk)
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Re Item IV

Lack of unity of invention

- 1 It is considered that there are two inventions covered by the claims.
 1. conclusies: 1-3, 6-10(compleet); 4, 5(gedeeltelijk)
coupling device with a grip element wherein edges of a slit-like opening are cold forged, claims 4 and 5 in the variant according to any one of claims 1-3
 2. conclusies: 4, 5(gedeeltelijk)
coupling device in the variant according to the preamble of claim 1, wherein each grip element is supported by at least one pressure member, which pressure member is provided with protrusions that mate with the back of the dents that are pressed out of the plane of the corresponding grip element that is mounted on such pressure member
- 2 The reasons for which the inventions are not so linked as to form a single general inventive concept are as follows:
- 3 The present application comprises independent product claims 1 and 4. Claim 4 contains a variant according to which the coupling device is defined according to the preamble of claim 1 ("volgens de aanhef van conclusie 1"). In this variant, claim 4 is an independent claim. Unity is first considered in view of the independent claims.
- 4 The common general concept linking together independent claims 1 and 4 is the preamble of claim 1:
 - a coupling device for a pipe, comprising a sleeve for receiving a pipe and at least one sealing member to provide a seal between the sleeve and the pipe,
 - a pressure member for applying a pressure to the sleeve and to the pipe,
 - and a grip element which extends along at least a part of the perimeter of the pipe,

- wherein the grip element is formed with dents pressed out of the plane of the grip element adjacent to slit-like openings punched out of the grip element.

5 The remaining features of claim 1 are the following:

- edges of the slit-like openings are cold forged.

This feature solve the technical problem of providing a coupling device with a grip element having dents which are harder and have improved effectiveness, see page 2, lines 19-25 of the present application.

6 The remaining feature of claim 4 are the following:

- the coupling device comprises a plurality of grip elements,
- wherein each grip element is supported by at least one pressure member, which pressure member is provided with protrusions that mate with the back of the dents that are pressed out of the plane of the corresponding grip element that is mounted on such pressure member.

These features solve the technical problem of providing a coupling device which effectively counteracts a so-called "cheese slicer effect" when the coupling device is used on softer pipes, see page 3, lines 27-31 of the present application.

7 Hence, the remaining features of claims 1 and 4 are constructively different, they can therefore not be seen as identical. Likewise, the remaining features of claims 1 and 4 solve distinct technical problems, they are thus not corresponding.

Consequently, these remaining features are not part of the single general concept linking claim 1 and 4, which is limited to the above mentioned common concept.

8 The single general concept as defined in the preamble of claim 1 is not novel over document EP 0 974 780 A1 (D2), which clearly discloses the features according to the preamble of claim 1. This has been acknowledged by the applicant himself on page 1, lines 15-17 of the present application.

9 In conclusion, claim 1 and claim 4 in the variant according to the preamble of claim 1 are not linked by a single general inventive concept.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 WO 2009/157766 A1 (FISCHER GEORG WAGA NV [NL]; NIJSEN ANDREAS JACOBUS LOUIS [NL]) 30 december 2009 (2009-12-30)
- D2 EP 0 974 780 A1 (FISCHER GEORG WAGA NV [NL]) 26 januari 2000 (2000-01-26)in de aanvraag genoemd
- D3 DE 26 46 939 A1 (HAWLE & CO E) 2 juni 1977 (1977-06-02)
- D4 NL 2 013 426 A (DYKA B V [NL]) 18 augustus 2016 (2016-08-18)
- D5 EP 1 138 999 A1 (FISCHER GEORG WAGA NV [NL]) 4 oktober 2001 (2001-10-04)in de aanvraag genoemd
- D6 WO 2015/177259 A1 (FISCHER GEORG WAGA NV [NL]) 26 november 2015 (2015-11-26)in de aanvraag genoemd

10 Claim 1

The present application does not meet the criteria of patentability, because the subject-matter of claim 1 is not new.

Although claim 1 in Dutch is the legally binding version, for the sake of convenience, the English translation based on page 4, lines 24-38 and page 2, lines 14-21 is preferred.

10.1 Document D1 discloses (the references in brackets applying to this document):

- a coupling device for a pipe (figure 1), comprising a sleeve (1) for receiving a pipe and at least one sealing member (5) to provide a seal between the sleeve (1) and the pipe (figures 2, 3),
- a pressure member (4') for applying a pressure to the sleeve (1) and to the pipe,
- and a grip element (3', 3'') which extends along at least a part of the perimeter of the pipe,

- wherein the grip element (3', 3'') is formed with dents (16, figures 4A-4D, page 6, lines 3-10) pressed out of the plane of the grip element (3', 3'') adjacent to slit-like openings (7) punched out of the grip element (figures 4A-4D, page 4, line 35 - page 5, line 20),
- edges of the slit-like openings (7) are cold forged (figure 4B, page 5, lines 3-6).

In D1, figure 4B, page 5, lines 3-6, a bulge 10 is formed and the material-connection 8 is torn loose. This method step can certainly be read on the feature that edges of the slit-like openings are cold forged. D1 even mentions explicitly on page 3, lines 13-15:

"By deforming the metal as a result of pressing out of the plane of the plate, the material which is located adjacent to the cut-aways is strengthened [...]".

This mechanism is identical to the technical effect mentioned on page 2, lines 21-25 of the present application.

Furthermore, claim 1 is silent about any details of how the cold-forging of the edges of the slit-like openings is carried out. Claim 1 is also silent that the cold forging is a separate method step performed prior to the method step of pressing out the dents. This is also difficult to express in claim 1 when bearing in mind that claim 1 is related to a product rather than a method.

Therefore, the subject matter of claim 1 is not new.

10.2 Furthermore, the subject matter of claim 1 also lacks novelty in view of the following documents:

- D2, figures 1-4, paragraphs [0012], [0013]. When the dents 7 are pressed out of the plane of the grip ring 4 adjacent to the slit-like openings 8, edges of the slit-like opening are also cold forged, at least in the region which forms the peaks of the dents.
- D3, figures 1-11, pages 5, 6: sleeve 4, sealing member 5, pressure member 6, 7, grip element 8 with dents 9. When the dents 9 are pressed out of the plane of the grip ring 8 adjacent to the slit-like openings 11a-11e, edges of the slit-like opening 11a-11e are also cold forged, at least in the region which forms the peaks of the dents 9.
- D4, figures 1A, 1B, 3A-3C, page 21, line 34 - page 22, line 15: sleeve 10, sealing member 14, pressure member 40, grip element 60 with dents 67. When the dents 67 are pressed out of the plane of the grip

ring 60 adjacent to the slit-like openings 63, edges of the slit-like opening 63 are also cold forged, at least in the region which forms the peaks of the dents 67.

11 **Claim 6**

Claim 6 is directed to a method for fabricating a grip element to be used in a coupling device for a pipe. The method steps in claim 6 correspond to those according to claim 1.

Compared to claim 1, claim 6 further defines that prior to pressing the dents out of the plane of the plate, edges of the slit like openings are first cold forged.

This additional method step is known from D1, figure 4B. The method step shown in figure 4B is considered as the claimed cold forging step, which is performed before the method step shown in figure 4C, i.e. before the projections 11 are forced back until they are located on in the opposite side of the plate 6, see page 5, lines 3-14 of D1.

12 **Claim 8**

Claim 8 is directed to a grip element as such corresponding to the grip element defined in claim 1. Therefore, the reasoning of claim 1 applies *a fortiori* to claim 8, which is considered to be not new.

13 **Dependent Claims**

13.1 Dependent claims 2, 3, 7, 9 and 10 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step:

- Claims 2 and 9 are not clear, see item VIII
- Claims 3, 10: D1, figures 4D, 5D; D2, figure 3; D3, figures 2, 4, 6, 8, 10; D4, figures 3A-3C
- Claim 7: a slight constructional change which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen

- 13.2 Claim 4 in the variant according to claim 1, i.e. not according to the preamble of claim 1, is neither known from, nor rendered obvious by, the available prior art. It has the technical effect as mentioned on page 3, lines 27-31 of the present application.

Claim 5 is dependent on claim 4 and hence considered to be new and inventive as well.

Re Item VII

Certain defects in the international application

- 14 Documents D1, D3 and D4 are not identified in the description and the relevant background art therein is not indicated.

Re Item VIII

Certain observations on the application

- 15 Claim 1 is not clear. In the characterising portion of claim 1, the following feature is defined, the translation into English being found on page 2, lines 20, 21:

"edges of the slit-like openings are cold forced".

However, the term "cold forced" has no well-recognised meaning in the art of sheet metal forming. In view of figure 3B and page 5, lines 22-24, the term "cold forged" seems to be meant. Cold forging is well known in the art of sheet metal forming, see for instance

<https://en.wikipedia.org/wiki/Forging>

In the analysis of novelty and inventive step, it is assumed that the term "cold forging" is meant. The description is also unclear in this respect and should be corrected accordingly, in particular on pages 2, 3 and 5.

- 16 Claims 2 and 9 are not clear. Claims 2 and 9 define that the cold forging is executed prior to pressing the dents of of the plane of the grip element, respectively. This feature is a method step although claims 2 and 9 are directed to a product. Hence, the category of claims 2 and 9 is not clear. Claims 2 and 9 are to be deleted.
- 17 Claim 8 is directed to a grip element as such without defined the intended use of the grip element. For reasons of clarity and consistency with method claim 6, claim 8 should rather be directed to a

"grip element for use in a coupling device for a pipe".