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54 TITULO **JUNTA ROSCADA PARA CAÑOS**

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71 SOLICITANTE **TENARIS CONNECTIONS AG**

DOMICILIO **SCHAAN, LIECHTENSTEIN**

74 APODERADO **ERNESTO CAVELIER FRANCO**

22 BOGOTA, D.C., **4 de Febrero de 2005**

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①

## SOLICITUD DE:



Patente de Invención



Patente de Modelo de Utilidad



Capítulo I.



Capítulo II.

②

SOLICITANTE  
(71)

Nombre: TENARIS CONNECTIONS AG

Dirección: Bahnhofstrasse 7, Postfach  
48, FL 9494Nacionalidad o Domicilio: Schaan,  
Liechtenstein

Lugar de Constitución: Liechtenstein

Teléfono: Fax:

E-mail:

## IDENTIFICACION

C.C. ☐NIT ☐Otro ☐

Cual \_\_\_\_\_

Número \_\_\_\_\_

③

REPRESENTANTE  
O APODERADO

Nombre: ERNESTO CAVELIER FRANCO

Dirección: Carrera 9 No. 74-08 Of 504

Teléfono: 3764200 Fax: 3761707

E-mail: Ernesto.Cavelier@prc-laws.com

C.C. ☒NIT ☐C.E. ☐Otro ☐

Cual \_\_\_\_\_

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④

INVENTOR(ES)  
(72)

Nombre: VER ANEXO

Dirección:

Nacionalidad o Domicilio:

⑤

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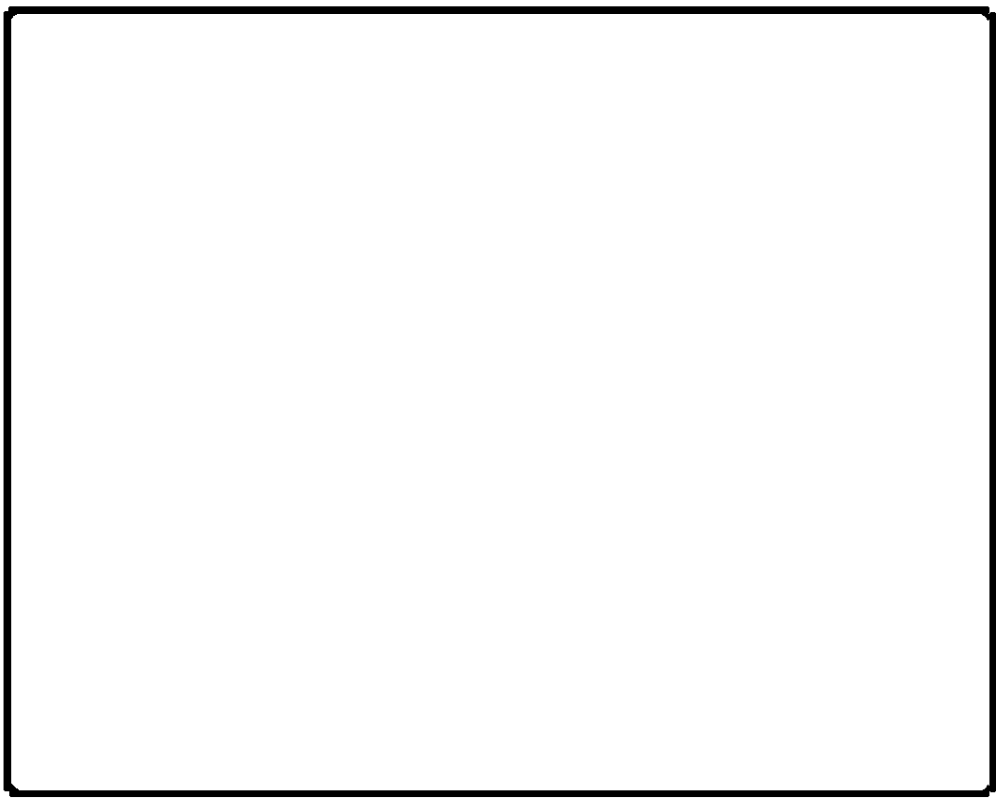
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ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud.
- X Documento que acredita la existencia y representación legal cuando el solicitante sea persona jurídica.
- X Poderes, si fuere el caso.
- ☐ Documento de cesión del inventor al solicitante o a su causante.
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- ☐ Otros

11

FIGURA CARACTERISTICA:



12

Solicito la concesión de la patente,

NOMBRE: ERNESTO CAVELIER FRANCO

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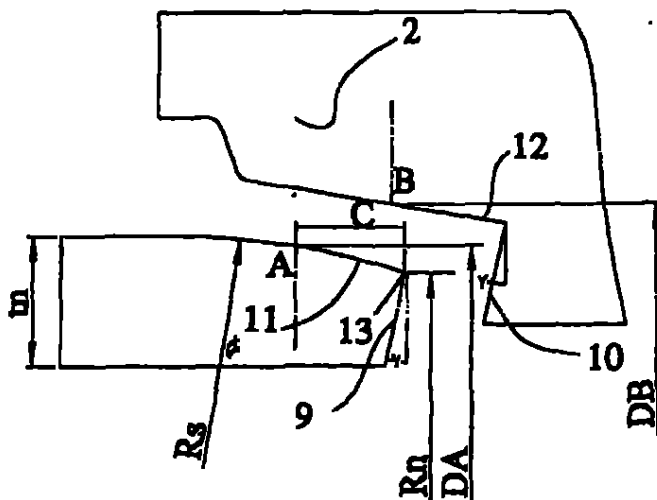
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(71) Applicant (for all designated States except US): TENARIS CONNECTIONS AG [LI/LI]; Poststrasse 409, FL-9491 Ruggel (LI)  
(72) Inventors; and  
(73) Inventors/Applicants (for US only): CARCAGNO, Gabriel, E. [AR/AR]; Berutti 495 Campana (B), Argentina (AR) TOSCANO, Rita, G. [AR/AR]; Goya 285, Buenos Aires, Argentina (AR) NAKAMURA, Hisao [JP/JP]; 2-15-37 Morigakoa, Isogo-Ku, Yokohama-City 225-0024 (JP) COPPOLA, Tommaso [IT/IT]; Via Domenico Parificato, 188, I-00125 Roma (IT) ONO, Tatsuo [JP/JP]; 229-7 Araiho Hodogayaku, Yokohamashi Kanagawa 240-0053 (JP)  
(74) Agent: GERVASI, Gemma; Notarbartolo & Gervasi S p A., Corso di Porta Vittoria, 9, I-20122 Milan (IT)  
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**[Continued on next page]**

(54) Title: THREADED TUBE JOINT



$$\frac{E}{2\nu_0} \left( \frac{b}{2.15} \right)^3 \leq R_3 \leq \frac{8E^2 \nu_0^2 OD^2}{240\pi \nu_0^2 \omega^2 (1-u^2)} \left[ \frac{3(1-u^2)}{R_1 \nu_0^2} \right]^{1/2} \quad (1)$$

**(57) Abstract:** A threaded tube joint for oil extraction industry has a trapezoidal thread and a toroidal sealing surface (11) placed at its end near the thread and engages, for sealing, a corresponding frusto-conical sealing surface (12) wherein the toroidal sealing surface (11) has a radius  $R_s$  value comprised within the range given by the formula (I)



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**THREADED TUBE JOINT****Technical field**

The present invention relates to a threaded tube joint, particularly for joining pipes used in the oil and gas extraction industry. Such pipes can be employed both as  
5 pipelines for pumping gas or oil and as linings of the wells themselves.

**State of the art**

The assembly of pipes or pipe segments to form strings used in the oil and gas industry is commonly performed using threaded joints. Most of the applications are covered by the standard connections described and specified by the American  
10 Petroleum Institute (API). These connections have limitations when subjected to extreme loading conditions that are increasingly common in oil and gas wells, especially those related with high gas internal or external pressure where the risk of leaks shall be eliminated, while resisting at the same time high mechanical loading conditions caused by tension, compression, bending or torque.

One solution provided to improve the seal resistance for oil and gas joints is the  
15 metal-to-metal seal placed at various points of the joint, depending on the joint design selected. This type of seal in a threaded joint provides a barrier to gas or liquid pressure while the thread provides mainly for the satisfaction of mechanical requirements and stabbing and running characteristics. Examples of these types  
20 of joints are the API Extreme-line. Several seal design alternatives on metal-to-metal seals have been proposed in the prior art. One of the metal-to-metal seal solutions is the one that comprises a frusto-conical annular outer seal surface located in the end of the male member of the joint, which is in contact with a  
25 corresponding frusto-conical annular inner seal surface located on the female member of the joint. Due to the tapered seal surface and the definite final assembling position, a radial interference between both surfaces is developed, which by promoting high contact stresses is a guarantee of the seal.

An important technical feature of frusto-conical sealing surfaces is the development of highly concentrated contact stresses on the edge formed by the  
30 intersection of the frusto-conical sealing surface of the male member and the cylindrical surface comprised between the seal surface and the threaded zone. The stress distribution along an axial section of a joint of the state of the art is

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shown in detail in Fig. 6.

The contact stress concentration can be calculated through numerical analysis, and is originated in the stiffness differences between male and female members of the joint that provoke the relative rotation of male member end. The distribution of contact stresses along the seal surface is also affected by the different loading conditions to which the joint is subjected: e.g. tension, compression, internal pressure, external pressure. The coming into existence of high contact stresses during make up, which are normally higher than nominal material yield strength, is a clear risk for galling occurrence in the joint.

- 10 When a torus-cone seal combination is used, the contact stresses on the seal surface present a distribution described by a Hertz-type function. The maximum contact stresses and the length of effective contact are related to the intensity of the contact force and the radius of the toroidal surface. The intensity of the contact force could be related to the geometrical interference between male and female sealing surfaces and the dimensions of the male member and female member of the joint.

- 20 The patent document US4623173 describes a threaded joint with a toroidal sealing surface of radius larger than 100 mm. Depending on the particular joint dimensions, i.e. its diameter and wall thickness, a sphere-cone seal with high sphere radius could present contact stresses at the seal not high enough to ensure sealing function in operation, increasing the risk of leaks under extreme conditions. On the other hand, if one wants to obviate to this drawback, the usual way to improve seal contact stresses is through the increase of the diametric interference, but this increases the level of mean stresses acting inside the joint, as well as the sliding distance travelled by the male and female members during the make up process, increasing the risk of galling.

- 25 On the other extreme, the use of a very small sphere radius is advantageous from a maximum seal contact pressure point of view, but it increases the risk of galling of the joint due to this particularly high contact stress generally higher than material yield strength. Another disadvantage of this alternative is the reduced area of the seal contact surface that could increase the risk of leaks. The non-perfect surface condition and the presence of roughness, lubricant, solid particles,
- 30

etc. require a minimum length of contact with contact pressure above a minimum value.

In these joints the preferred threads are with trapezoidal profile to increase thereby the load capacity of the joint itself in case of use in very deep wells, and of the

- 5 Extended Reach Wells type with very important horizontal displacements. To increase the structural resistance of the thread, several designs of joints are using a flank-to-flank contact concept, in which both the stab flank and the load flank of the threads of one of the two members are in contact with the corresponding flank of the other member during and at the end of the assembling.

- 10 One main drawback of using trapezoidal threads concept is that the contact on the stab flanks and load flanks during make up increases the risk of galling as well as the torque required, rendering the assembling operation unstable and reducing the re-utilization possibility of such joints.

#### Summary of the Invention

- 15 The main object of this invention is to eliminate the above mentioned drawbacks by means of a joint, allowing the production of strings with excellent sealing properties for the widest range of operational conditions common nowadays, assuring optimum performance even after several assembling and disassembling operations.

- 20 Another object of the invention is to provide a joint with high resistance to operation loads.

- The above mentioned objects and others which will be better clarified hereafter are achieved according to the present invention by means of a threaded tube joint comprising a tube with male member threaded end portion and a tube with female member threaded end portion with substantially cylindrical walls, the male member member having a toroidal sealing surface placed at its end portion near the respective threaded portion engaging for sealing purpose, when the male and female members are in the assembled position, a corresponding frusto-conical sealing surface of the female member placed in proximity of the respective threaded portion characterised by the fact that the toroidal sealing surface has a radius  $R_s$  value comprised in the range of formula
- 30



$$\frac{E}{2Y_0} \left( \frac{b}{2.15} \right)^2 \leq R_s \leq \frac{\delta \cdot E^2 t_n^3 OD^3}{240 \pi \sigma_{ad}^2 w t^2 (1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

wherein:

$\delta$  = radial seal interference;

E: Material young modulus;

5  $t_n$ : pin nose thickness

OD: Pipe external diameter

$\sigma_{ad}$  = Material yield stress

wt: pipe wall thickness

$R_n$ : pin nose radius

10  $\nu$ : Poisson's coefficient (=0.3)

b = active length of contact pressure

$$Y_0 = \frac{\delta \cdot E t_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

#### Brief description of the drawings

15 Further advantages and aspects of the invention will become apparent from the detailed description of a preferred embodiment thereof, hereafter shown by way of non-limitative example by means of the accompanying figures where

Fig. 1 shows a sectional view along a longitudinal plane of the joint according to the invention in an assembled position;

20 Fig. 2 shows an enlarged detail of the joint of Fig. 1;

Fig. 3 shows an enlarged detail, in a bigger scale, of the seal portion of the joint of Fig. 1 in an assembled position;

Fig. 4 shows an enlarged detail, in a bigger scale, of the seal portion of the joint of Fig. 1 in a disassembled position;

25 Fig. 5 shows a graph with the variation in seal contact pressure under different load conditions for a joint according to the invention.

Fig. 6 shows the stress distribution in the seal portion along an axial section of a state of the art joint.

#### Detailed description of a preferred embodiment

30 With reference to the Figures, a joint according to the present invention will be now

described as a non-limiting example. The joint comprises a male member 1 provided with an external frusto-conical threaded surface at the end thereof, and a female member 2, provided with an internal corresponding frusto-conical threaded surface, placed at the end portion of a pipe or of a pipe connection sleeve. The front end of the male member comprises a concave frusto-conical abutment surface 9 axially oriented, which is pressed against a convex frusto-conical bearing surface 10 forming a shoulder of the female member, at the end of the assembling operation. An external edge 13 is defined by the intersection between the pin nose frontal concave frusto-conical abutment surface 9 and the toroidal seal surface radially oriented 11. With the joint in assembled position, the toroidal sealing surface 11 of the male member 1 comes to bear against a corresponding concave frusto-conical sealing surface radially oriented 12 of the female member 2 which is connected to the corresponding convex frusto-conical bearing surface 10 of said member.

The relative positions of the abutment surface 9 and bearing surface 10 compared to those of the corresponding sealing surface 11 of the male member and of the female member 12 are so determined that, during the make up of the two members, the contact exerted by the abutment surface 9 and bearing surface 10 defines a diametric positive interference  $\delta$  defined by the difference between initial nominal diameters  $D_A$  of the male member and  $D_B$  of the female member in unloaded condition, between the male sealing surface 11 and the female sealing surface 12, measured in a plane orthogonal to the longitudinal axis  $X$  of the joint located at a distance  $C$  from the edge 13 of the male member. This point  $C$  coincides with the tangent point between the longitudinal sectional plane and the tangent circumferential line between the toroidal seal surface 11 of the male member 1 and the concave frusto-conical sealing surface 12 of the female member 2.

The diametric interference  $\delta$  between the toroidal sealing surface 11 of male member 1 and the frusto-conical sealing surface 12 of the female member 2 is compensated through the diametric expansion of the female member 2 and the simultaneous diametric compression of the male member 1. For a given diametric interference  $\delta$ , the contact pressure developed between the male and the female

members is related to the respective geometries. The higher the interference  $\delta$ , the higher the mean contact pressure originating between the male and the female members. Normally, the diametric seal interference ranges from 0,2 mm to 1,0 mm, depending on the diameter of the joint, i.e. the larger the diameter, the higher the diametric seal interference.

The particular stress distribution on the seal surface is defined by the particular geometry of the sealing surfaces themselves. The length "b", so-called contact length, is the length axially measured on the seal surfaces 11, 12 in which the contact pressure is developed. The value of "b" is directly related with the particular design of the sealing surfaces in contact and the level of interference  $\delta$ . If "b" is short, this will produce high concentrated seal contact pressure distributions, while if "b" is long, this will cause a wider distribution of lower contact stresses.

If a cylinder of radius  $R_s$  and a plane surface are in contact with a force  $F$  pressing the two members acting perpendicularly to the plane surface along the contact line, the contact pressure between both members is described by a Hertz' function, provided no plasticity occurs.

$$P_{\max} = \left[ \frac{E}{2\pi R_s} \frac{F}{L} \right]^{1/2}$$

where  $P_{\max}$  is the maximum contact pressure,  $E$  is the Young modulus,  $R_s$  is the cylinder radius,  $F$  is the contact force and  $L$  is the length of the contact line. As it can be seen, for a given material the  $P_{\max}$  is directly related with the cylinder radius and the contact force between the male and female members.

According to an important aspect of the invention, the maximum contact pressure developed between the sealing surfaces 11 and 12 is higher than a predefined number of times than the internal pressure of the media; e.g. gas or oil, to seal. In this manner, a minimum limit value for the maximum contact pressure developed on the seal is ensured, in order to control the seal behaviour under different loading conditions. As the contact force related to the diametric interference  $\delta$  is conditioned in turn by global stresses development and geometric conditions of the assembly, the maximum contact pressure is strongly related to the choice of

the maximum optimal toroidal sealing surface radius.

In accordance with the invention, the maximum radius  $R_s$  max of the male toroidal sealing surface is defined by the following relationship:

$$R_s \leq \frac{\delta E t_n^3 OD^2}{240\pi \sigma_{yd}^2 wt^2 (1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

wherein

$\delta$ = radial seal interference;

E: Material young modulus;

10  $t_n$ : pin nose thickness

OD: Pipe external diameter

$\sigma_{yd}$  = Material yield stress

wt: pipe wall thickness

$R_n$ : pin nose radius

15  $\nu$ : Poisson's coefficient (=0.3)

b = active length of contact pressure

The use of a toroidal seal surface with very small radius  $R_s$  is beneficial from a sealability point of view, provided the high contact pressure is critical to act as barrier for internal pressure. On the other hand, if  $R_s$  is too small the contact pressure is very high, as evident from Hertz's formula, and risky in terms of galling due to the high concentrated contact stresses, and sealability due to a very short contact length in which the contact pressures are developed.

20 In order to avoid the above-mentioned problems, the contact length "b" on the seal surfaces 11 and 12 in which the seal contact pressure is developed is chosen longer than a certain minimum value, which for common surface conditions and surface treatments is set at 0,5 mm. Then, according to the Hertz theory and as is shown by Finite Elements analysis, for determined conditions of the material, joint dimensions and geometrical seal interference, the male seal surface radius  $R_s$  affects directly the length along which the contact pressure between both seal surfaces is produced.

30 Also in accordance with the present invention, the minimum radius  $R_s$  min of the

male toroidal sealing surfaces is defined by the following relationship, from Hertz' theory function:

$$Rs \geq \frac{E}{2Vo} \left( \frac{b}{2.15} \right)^2$$

5    Where

b = active length of contact pressure, with a value of 0,5 mm, and Vo is given by the following formula

$$Vo = \frac{\delta \cdot Et_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

10    The following examples show values for maximum and minimum radius Rs for different typical oil pipes, using representative values for δ and t<sub>n</sub>/wt, calculated by using the above formulas:

| OD  | wt   | Rs min | Rs max |
|-----|------|--------|--------|
| 73  | 5,5  | 21     | 82     |
| 89  | 6,5  | 28     | 73     |
| 114 | 6,9  | 28     | 97     |
| 140 | 9,2  | 21     | 108    |
| 178 | 11,5 | 17     | 138    |
| 245 | 13,8 | 15     | 204    |
| 340 | 9,7  | 31     | 398    |

15    In case one needs to reduce the number of different seal radius for different pipe diameters, according to a preferred embodiment of the present invention two preferred radius ranges can be defined for two single pipe diameters ranges, by using the above formula.

| OD       | Rs            |
|----------|---------------|
| < 140 mm | 30 < Rs < 75  |
| > 140 mm | 30 < Rs < 100 |

20

An improvement of seal performance under different loading conditions is obtained through a advantageous embodiment of the joint where the advantages of the seal geometry described above is used in combination with a thread geometry as

described hereafter.

The optimum behaviour of the joint according to the invention under tensile or compressive loads is given by using trapezoidal thread profile for male and female members 1, 2 in which the possibilities of axial relative movements between the members are minimised. In that manner, both the movement and effects on the sealing surfaces are minimised.

The thread is thus provided with a gap or clearance with a dimension of 0,15 mm or less between the stab flank 8 of the male member 1 and the corresponding stab flank 5 of the female member 2, in the final assembling position. Such a combination of thread with the seal according to the invention offers a joint with good structural resistance to minimise seal movements and plastic strains in the vicinity of the seal region.

Figure 5 shows the variation in seal contact pressure for a joint according to the invention, where the axis X expresses the ratio between the seal contact pressure and the maximum pressure to seal, for extreme loading conditions to 100% of material Minimum Specified Yield Limit.

A further advantage of the invention is obtained by providing the angle  $\gamma$ , defined by the internal shoulder 10 and abutment surface 9 and a plane orthogonal to the axis X of the joint, with a value comprised in a range from  $-5^\circ$  to  $-15^\circ$ . In this manner the joint of the invention eliminates the danger of producing jump-in of the seal or high deformations of the seal.

Such a range of values further has the great advantage that it prevents galling or deformation problems from occurring during make up. On one hand an angle smaller than  $-5^\circ$  would make it likely the occurrence of a jump-in problem under high compression loads or high torques. On the other hand, angles bigger than  $-20^\circ$  would provoke large deformations under high compression loads or high torque conditions.

The joint of the present invention can be used either when the female member is provided in a pipe end, or when a connecting sleeve with two female members at both ends is used.

From what has been described it is apparent that the invention achieves all the objects set in the preamble.

## CLAIMS

1. A threaded tube joint, comprising a male threaded tube member (1) and a female threaded tube member (2) with substantially cylindrical walls, the male member (1) having a toroidal sealing surface (11) placed at its end portion near the threaded portion thereof engaging for sealing purpose, when the male and female members (1, 2) are in the assembled position, a corresponding frusto-conical sealing surface (12) of the female threaded tube member (2) placed near a threaded portion characterised by the fact that the toroidal sealing surface has a predetermined radius  $R_s$  value comprised in the range between 21 and 308 mm, whereby said value of  $R_s$  is determined in relation to the tube external diameter (OD) by means of the formula

$$\frac{E}{2V_0} \left( \frac{b}{2.15} \right)^2 \leq R_s \leq \frac{\delta E^2 t_n^3 OD^2}{240 \pi \sigma_{ad}^2 w t^2 (1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

where

- $\delta$  = radial seal interference;  
 E: Material young modulus;  
 $t_n$ : pin nose thickness  
 OD: tube external diameter  
 $\sigma_{ad}$  = Material yield stress  
 wt: tube wall thickness  
 $R_n$ : pin nose radius  
 $\nu$ : Poisson's coefficient (=0.3)  
 b = active length of contact pressure,

$$V_0 = \frac{\delta E t_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

25

2. The joint according to claim 1, wherein there is provided a thread with trapezoidal profile and with a clearance equal to or less than 0,15 mm between the stab flank (6) of the male member (1) and the corresponding stab flank (5) of the female member (2) in the assembled position.
3. The joint according to claim 2, wherein the male member (1) has a front end

30

frusto-conical abutment surface (9) forming an angle ( $\gamma$ ) comprised in a range between  $-15^\circ$  and  $-5^\circ$  with a plane orthogonal to a longitudinal axis (X) defined by the joint.

5 4.- The joint according to claim 3, wherein  $R_s$  has a value comprised in the range between 30 and 75 mm for a tube outer diameter (OD) of less than 140 mm.

5. The joint according to claim 3, wherein  $R_s$  has a value comprised in the range between 30 and 100 mm for a tube outer diameter (OD) of less than 140 mm.

6. The joint according to any of claims 4 or 5 wherein the male member (1) is provided in the end of a pipe segment and the female member (2) is provided in  
10 the end of a pipe connecting sleeve with two female ends.

7. The joint according to any of claims 4 or 5, wherein the male member (1) is provided in the end portion of a first pipe segment and the female member (2) is provided in the end of a second pipe segment.

8. A tube of definite length with a portion of at least an extremity provided with  
15 thread on the outer surface adapted to form the male member (1) of the joint having the characteristics of one or more claims 1 to 7.

9. A tube of definite length with a portion of at least an extremity provided with thread on the inner surface adapted to form the female member (2) of the joint having the characteristics of one or more claims 1 to 7



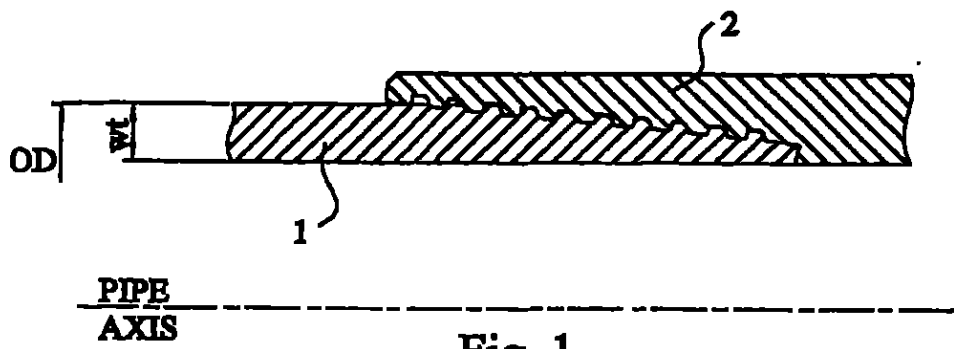


Fig. 1

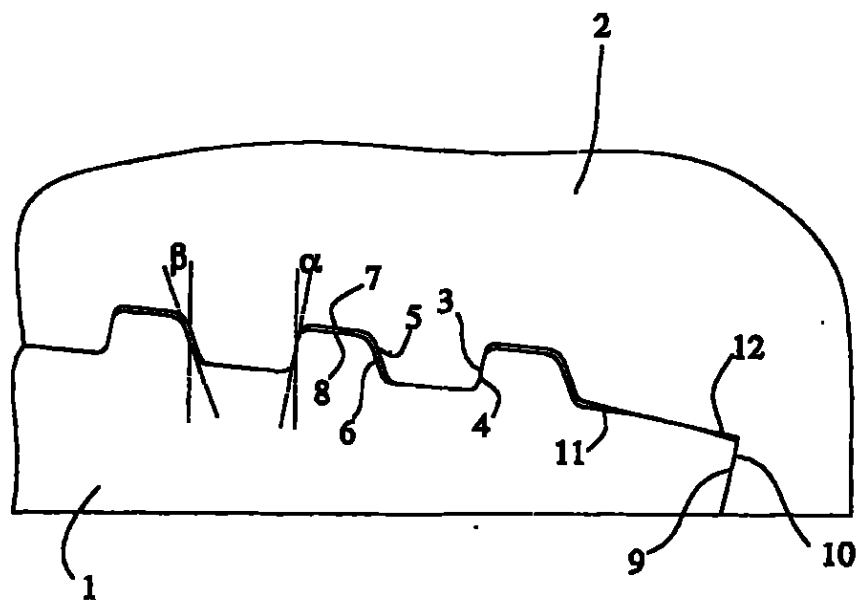
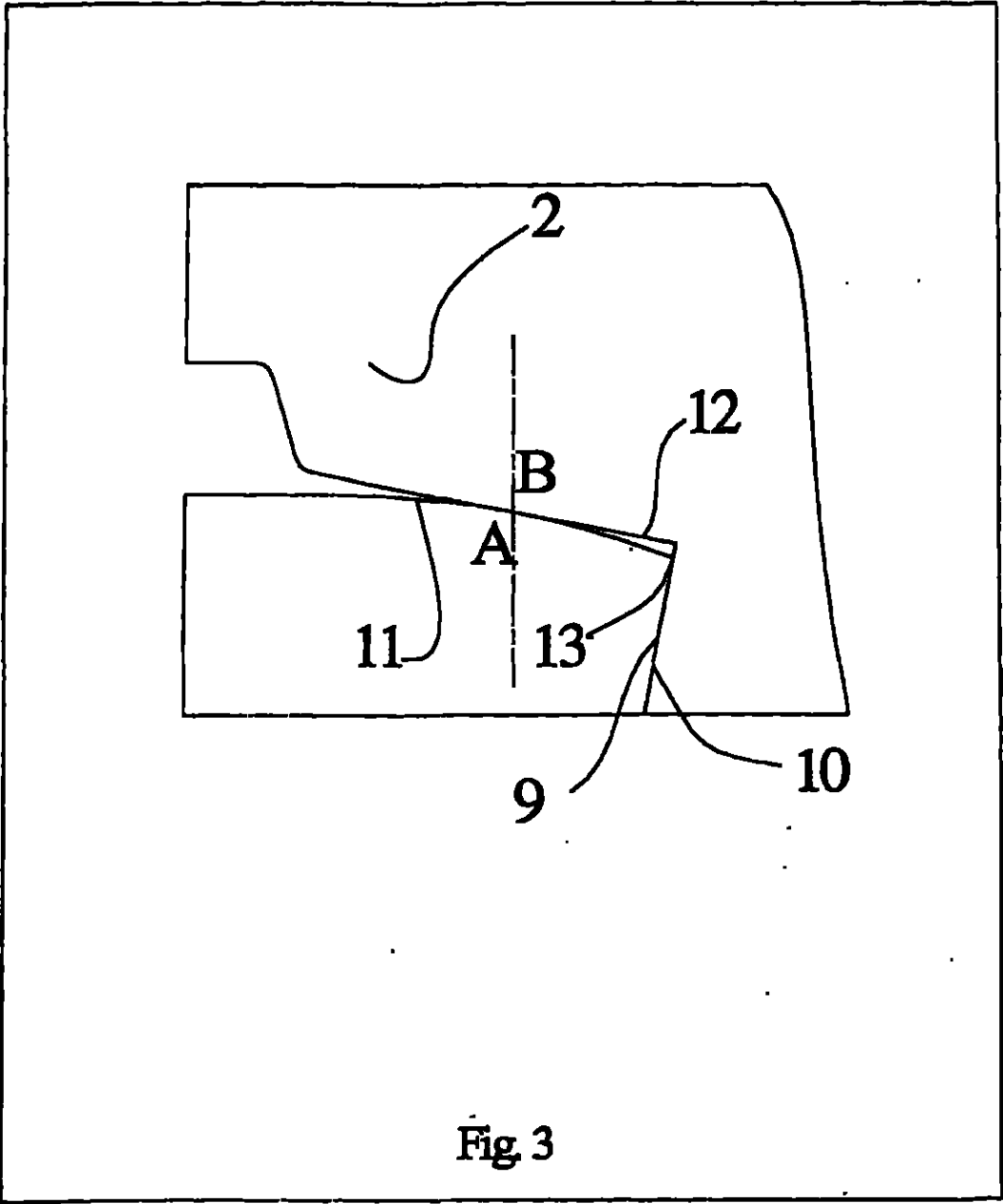
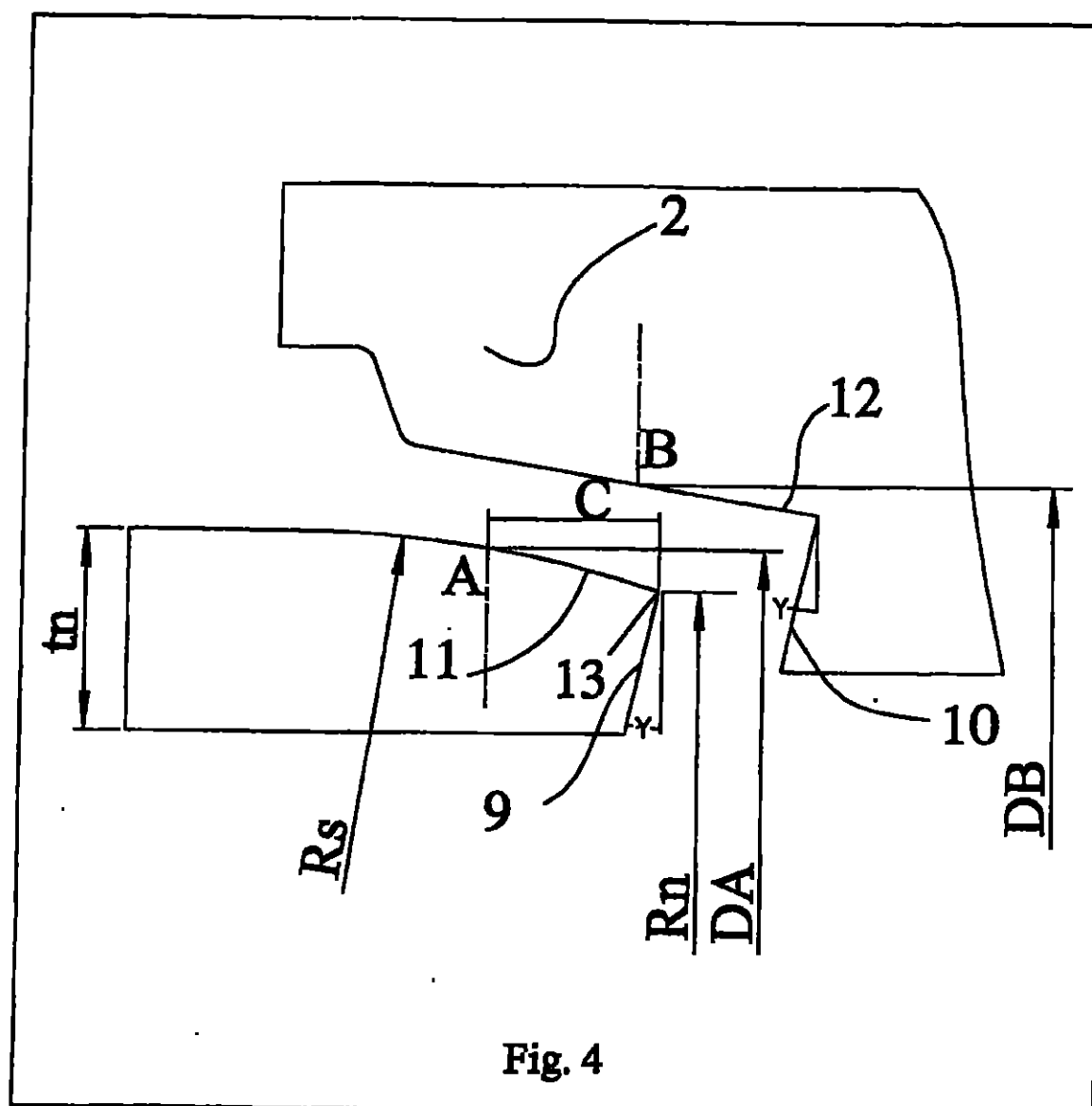
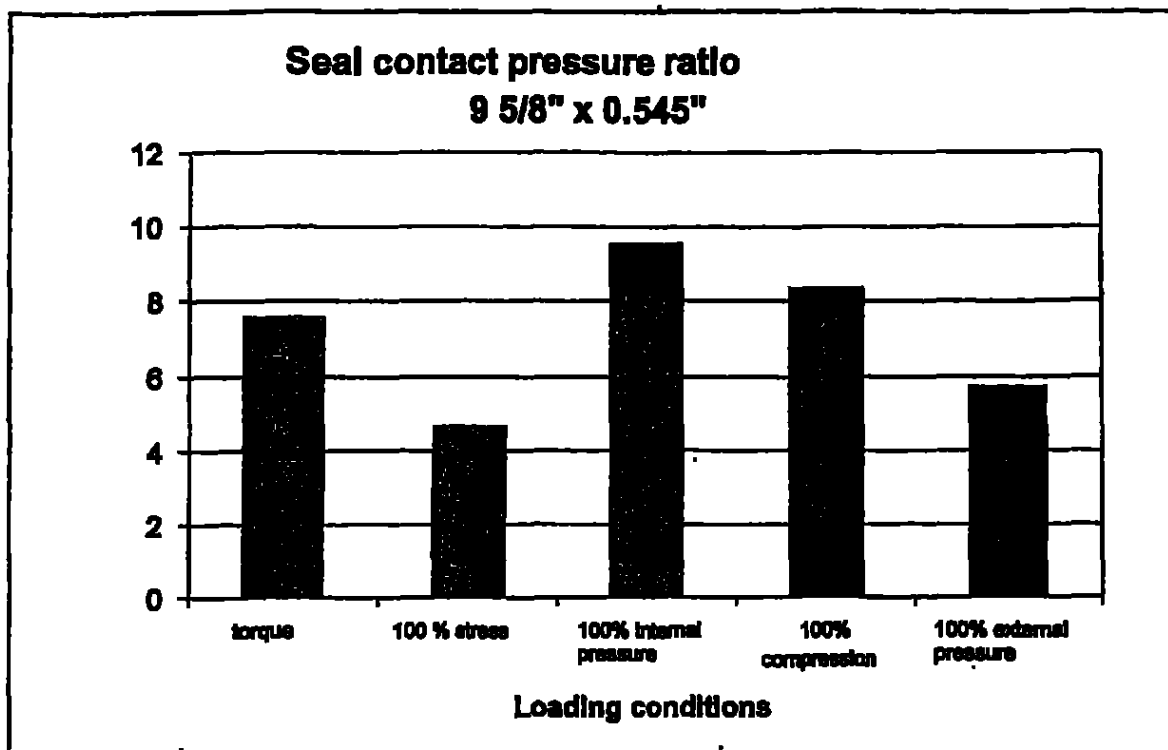


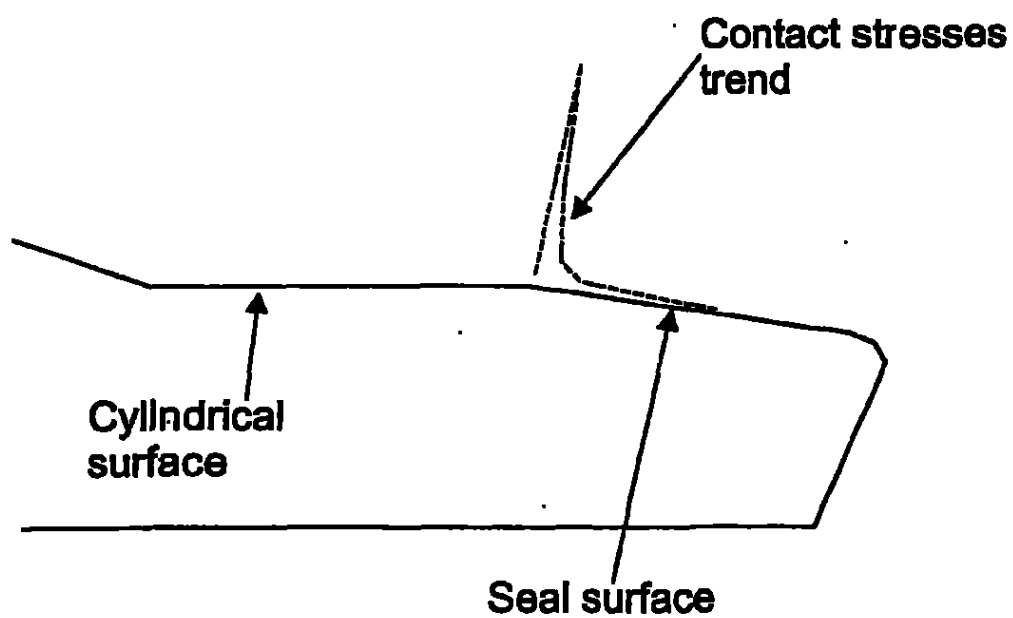
Fig. 2







**FIG. 5**



**FIG. 6**

## INTERNATIONAL SEARCH REPORT

In **Patent Application No**  
**PCT/EP 03/09870****A. CLASSIFICATION OF SUBJECT MATTER**  
**IPC 7 F16L15/06**

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 7 F16L**

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 practical, search terms used)

**EPO-Internal****C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                                                         | Relevant to claim No |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| A          | US 4 384 737 A (REUSSER HANS E)<br>24 May 1983 (1983-05-24)<br>column 8, line 20 - line 29; figures 4,5                                                    | 2-9                  |
| A          | EP 0 916 883 A (SUMITOMO METAL IND)<br>19 May 1999 (1999-05-19)<br>the whole document                                                                      | 2-9                  |
| A          | EP 1 203 909 A (HYDRIL CO)<br>8 May 2002 (2002-05-08)<br>column 3, line 27 - line 31; figure 2                                                             | 2-9                  |
| A          | WO 01/094831 A (SUMITANI KATSUTOSHI ;<br>MAEDA JUN (JP); NAGASAKU SHIGEO (JP);<br>SUMITOMO M) 13 December 2001 (2001-12-13)<br>abstract; figure 1; table 4 | 2-9                  |
|            | -/-                                                                                                                                                        |                      |

☒ Further documents are listed in the continuation of box C☒ Patent family members are listed in 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 document 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 (see 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
- 'Z' document member of the same patent family

Date of the actual completion of the international search

**30 January 2004**

Date of mailing of the international search report

**10/02/2004**

Name and mailing address of the ISA

European Patent Office, P B 8818 Patentkan 2  
NL - 8200 HV Rijswijk  
Tel (+31-70) 840-6040, Tx 31 851 apo nl,  
Fax (+31-70) 840-8018

Authorized officer

**Budtz-Olsen, A**

# INTERNATIONAL SEARCH REPORT

In **national Application No**  
**PCT/EP 03/09870**

## 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 4 153 283 A (HELLMUND WOLFGANG ET AL)<br>8 May 1979 (1979-05-08)<br>figures      | 2-9                  |
| A          | EP 0 713 952 A (SUMITOMO METAL IND)<br>29 May 1996 (1996-05-29)<br>figures 1a,2b,5c | 2-9                  |
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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 03/09870

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 1  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6 4(a)

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1

Present claim 1 relate to a product defined by the formula expressed in line 12 of the claim. The use of these parameters in the present context is considered to lead to a lack of clarity within the meaning of Article 6 PCT. It is impossible to compare the parameters the applicant has chosen to employ with what is set out in the prior art. The lack of clarity is such as to render a meaningful complete search impossible. Consequently, the search has been restricted to:

A threaded tube joint, comprising a male threaded tube member (1) and a female threaded tube member (2) with substantially cylindrical walls, the male member (1) having a toroidal sealing surface (11) placed at its end portion near the threaded portion thereof engaging for sealing purpose, when the male and female members (1, 2) are in the assembled position, a corresponding frustoconical sealing surface (12) of the female threaded tube member (2) placed near a threaded portion characterised by there is provided a thread with trapezoidal profile and with a clearance equal to or less than 0,15 mm between the stab flank (6) of the male member (1) and the corresponding stab flank (5) of the female member (2) in the assembled position.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. nat. Application No  
PCT/EP 03/09870

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date                                                                                                                                                                                                                                                                                                                                                                                                        |
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## **JUNTA ROSCADA PARA CAÑOS**

### **Campo técnico**

La presente invención se refiere a juntas roscadas para caños, particularmente para unir caños que se utilizan en la industria de la extracción de gas y petróleo. Estos caños se usan tanto como cañerías para el bombeo de gas o petróleo y también como tubería de revestimiento para los pozos propiamente dichos.

### **Estado del arte**

En general, el ensamblaje de caños o de segmentos de caños para formar columnas que se emplean en la industria del gas y del petróleo se realiza con el uso de juntas roscadas. La mayoría de las aplicaciones se encuentran cubiertas por las conexiones de tipo estándar que describe y especifica el American Petroleum Institute (API – *Instituto Americano del Petróleo*). Estas conexiones presentan limitaciones cuando se las somete a condiciones de cargas extremas que son cada vez más comunes en los pozos de petróleo y gas, especialmente los que se relacionan con alta presión del gas, tanto interna como externa, donde se eliminan los riesgos de que se produzcan fugas, a la vez que resisten exigentes condiciones de cargas mecánicas causadas por la tensión, la compresión, el torcimiento o el momento dinámico de torsión.

Una solución prevista para mejorar la resistencia de estanqueidad de las juntas para gas y petróleo es el sello metal a metal ubicado en diversos puntos de la junta, de acuerdo con el diseño que ésta tenga. Este tipo de sello en una junta roscada constituye una barrera para la presión del líquido o gas, mientras que la rosca satisface fundamentalmente los requisitos mecánicos y las características de esfuerzo y funcionamiento. Como ejemplo de estos tipos de juntas encontramos la línea Extreme del API. El arte previo propone varios diseños alternativos para los sellos metal a metal. Una de estas soluciones de cierre metal a metal es la que comprende una superficie de estanqueidad externa anular de forma frustocónica ubicada en el extremo del elemento macho de la junta, que se pone en contacto con una correspondiente superficie de estanqueidad interna anular de forma frustocónica ubicada en el elemento hembra de la junta. Debido a la superficie de estanqueidad cónica y la posición de ensamblaje final definida, se

forma una interferencia radial entre ambas superficies, que se convierte en garantía del sellado porque genera un gran esfuerzo de contacto.

Una característica técnica importante de las superficies de estanqueidad frustocónicas es el desarrollo de esfuerzos de contacto altamente concentrados sobre el borde formado por la intersección de la superficie de estanqueidad frustocónica del elemento macho y la superficie cilíndrica comprendida entre la superficie de estanqueidad y la zona roscada. En la Figura 8 se muestra detalladamente la distribución del esfuerzo a lo largo de una sección axial de una junta propia del estado del arte.

La concentración del esfuerzo de contacto puede calcularse a través del análisis numérico y se origina en las diferencias de rigidez entre los elementos macho y hembra de la junta que provocan la rotación relativa del extremo del elemento macho. La distribución de los esfuerzos de contacto a lo largo de la superficie de estanqueidad también se ve afectada por las diferentes condiciones de carga a la cual se somete la junta: tensión, compresión, presión interna y presión externa, por citar algunos ejemplos. El hecho de que se provoquen altos esfuerzos de contacto durante el montaje, que normalmente son mayores que el límite aparente de fluencia nominal del material, constituye un riesgo claro de que la junta sufra la acción del engrane.

Cuando se utiliza una combinación de sello toroide-cono, los esfuerzos de contacto sobre la superficie de estanqueidad presentan una distribución que se describe como una función del tipo Hertz. Los máximos esfuerzos de contacto y la longitud del contacto eficaz se relacionan con la intensidad de la fuerza de contacto y el radio de la superficie toroidal. La intensidad de la fuerza de contacto puede relacionarse con la interferencia geométrica entre las superficies de estanqueidad macho y hembra y las dimensiones del elemento macho y del elemento hembra de la junta.

La patente de Estados Unidos que lleva el número 4623173 describe una junta roscada con una superficie de estanqueidad toroidal cuyo radio es mayor que 100 mm. De acuerdo con las dimensiones específicas de la junta, como su diámetro y espesor de pared, un sello con forma de cuña esférica que tenga un radio grande puede presentar esfuerzos de contacto en el sello que no sean

suficientemente elevados como para garantizar el rendimiento del sello cuando se lo usa, lo que aumenta el riesgo de que se produzcan fugas bajo condiciones extremas. Por otro lado, si se desea obviar esta desventaja, usualmente los esfuerzos de contacto del sello se mejoran a través del aumento de la interferencia diametral, pero esto aumenta el nivel de los esfuerzos medios que actúan dentro de la junta, al igual que la distancia de desplazamiento que recorren los elementos macho y hembra durante el proceso de montaje, lo que aumenta el riesgo del engrane.

En el otro extremo, el uso de un radio esférico muy pequeño es ventajoso desde el punto de vista de la presión de contacto máxima del sello, pero profundiza el riesgo de engrane de la junta debido a este esfuerzo de contacto particularmente elevado, que en general es más alto que el límite aparente de fluencia del material. Otra desventaja que presenta esta alternativa es la reducida área de la superficie de contacto del sello que puede aumentar el riesgo de que se produzcan fugas. La condición de superficie imperfecta y la presencia de rugosidad, lubricante partículas sólidas, etc. requieren una mínima longitud de contacto, donde la presión de contacto se encuentre por encima de un valor mínimo.

En estas juntas, las roscas preferidas son las que tienen perfil trapezoidal, lo que lleva al aumento de la capacidad de carga de la junta propiamente dicha en caso de que se las utilice en pozos muy profundos y del tipo de alcance extendido con importantes desplazamientos horizontales. Para aumentar la resistencia estructural de la rosca, se utilizan varios diseños de juntas con el concepto de contacto flanco a flanco, donde tanto el flanco de carga como el flanco de emboque de las roscas de uno de los dos elementos se ponen en contacto con el flanco correspondiente del otro elemento durante y al finalizar el ensamblaje.

Una desventaja considerable que presenta el uso de roscas trapezoidales es que el contacto en los flancos de carga y flancos de emboque durante el montaje aumenta el riesgo de engrane y también el momento dinámico de torsión que se requiere, lo que hace que la operación de ensamblaje sea inestable y reduce la posibilidad de reutilización de dichas juntas.

#### Resumen de la invención

El principal objeto de la presente invención es eliminar las desventajas citadas previamente por medio de una junta que permita que se formen columnas con excelentes propiedades de estanqueidad que se adapten a la mayor cantidad de condiciones operativas que son frecuentes hoy en día y que se asegure un óptimo rendimiento aún después de varias operaciones de ensamblaje y desensamblaje.

Otro objeto de la invención es proporcionar una junta con gran resistencia a las cargas de operación.

Los objetos citados previamente y otros que se clarificarán más adelante, se logran de acuerdo con la presente invención por medio de una junta roscada para caños que comprende un caño en cuyo extremo tiene un elemento de rosca macho y un caño en cuyo extremo tiene un elemento de rosca hembra; el elemento macho tiene una superficie de estanqueidad toroidal ubicada en su parte terminal cerca de la respectiva porción roscada que presiona para dar estanqueidad; cuando los elementos macho y hembra están en posición ensamblada, existe una correspondiente superficie de estanqueidad frustocónica del elemento hembra ubicado cerca de la respectiva porción roscada caracterizada porque la superficie de estanqueidad toroidal tiene un radio, cuyo valor  $R_s$  se encuentra comprendido dentro de la escala de la siguiente fórmula:

$$\frac{E}{2V_o} \left( \frac{b}{2.15} \right)^2 \leq R_s \leq \frac{\delta \cdot E \cdot t_n^3 \cdot OD^2}{240\pi \cdot \sigma_{ad}^2 \cdot wt^2 (1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

donde:

$\delta$  = interferencia de sello radial;

$E$ : Módulo de Young del material;

$t_n$ : espesor del perno

$OD$ : Diámetro externo del caño

$\sigma_{ad}$  = límite elástico del material

$wt$ : espesor de la pared del caño

$R_n$ : radio del perno

$\nu$ : Coeficiente de Poisson (= 0,3)

$b$  = longitud activa de la presión de contacto

$$V_o = \frac{\delta \cdot E \cdot t_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

### **Breve descripción de las ilustraciones**

A partir de la descripción detallada de una forma de realización preferida de la invención, la cual se incluye a modo de ejemplo no limitativo, resultarán más evidentes otros aspectos y sus ventajas, por medio de las figuras adjuntas donde:

La Figura 1 muestra una vista en corte a lo largo de un plano longitudinal de la junta de acuerdo con la invención en una posición ensamblada;

La Figura 2 muestra una ampliación en detalle de la junta de la Figura 1;

La Figura 3 muestra una ampliación en detalle, a mayor escala, de la parte del sello de la junta de la Figura 1 en una posición ensamblada;

La Figura 4 muestra una ampliación en detalle, a mayor escala, de la parte del sello de la junta de la Figura 1 en una posición desensamblada;

La Figura 5 muestra un gráfico con la variación de la presión de contacto del sello bajo diferentes condiciones de carga para una junta de acuerdo con la invención.

La Figura 6 muestra la distribución del esfuerzo en la parte del sello a lo largo de una sección axial de una junta de acuerdo con el estado del arte.

### **Descripción detallada de una forma de realización preferida**

Con referencia a las Figuras, a continuación se describe una junta de acuerdo con la presente invención a modo de ejemplo no limitativo. La junta comprende un elemento macho 1 en cuyo extremo tiene una superficie roscada externa frustocónica; y un elemento hembra 2, que tiene una superficie roscada interna frustocónica que se corresponde, ubicada en el extremo de un caño o de un manguito de conexión del caño. El extremo frontal del elemento macho comprende una superficie de empalme frustocónica y cóncava 9 que está orientada axialmente, que se presiona contra una superficie de contacto frustocónica y convexa 10 que forman una pestaña del elemento hembra, cuando se termina la operación de ensamblaje. Se define un borde externo 13 por la intersección entre la superficie de empalme frustocónica, cóncava y frontal del perno 9 y la superficie de estanqueidad toroidal que tiene orientación radial 11. Cuando la junta está en posición ensamblada, la superficie de estanqueidad toroidal 11 del elemento macho 1 se pone en contacto con una correspondiente

superficie de estanqueidad frustocónica y cóncava que está radialmente orientada 12 del elemento hembra 2 que se conecta con la correspondiente superficie de contacto frustocónica y convexa 10 de dicho elemento.

Las posiciones relativas de la superficie de empalme 9 y la superficie de contacto 10 respecto de aquellas de la correspondiente superficie de estanqueidad 11 del elemento macho y del elemento hembra 12 se determinan de forma tal que, durante el montaje de los dos elementos, el contacto que ejerce la superficie de empalme 9 y la superficie de contacto 10 define una interferencia diametral positiva  $\delta$  definida por la diferencia entre los diámetros nominales iniciales  $D_A$  del elemento macho y  $D_B$  del elemento hembra en condición descargada, entre la superficie de estanqueidad macho 11 y la superficie de estanqueidad hembra 12, medida en un plano ortogonal respecto del eje longitudinal X de la junta ubicada a una distancia C del borde 13 del elemento macho. Este punto C coincide con el punto de tangencia entre el plano en sección longitudinal y la línea circunferencial de tangencia entre la superficie de estanqueidad toroidal 11 del elemento macho 1 y la superficie de estanqueidad frustocónica y cóncava 12 del elemento hembra 2.

La interferencia diametral  $\delta$  entre la superficie de estanqueidad toroidal 11 del elemento macho 1 y la superficie de estanqueidad frustocónica 12 del elemento hembra 2 se compensa mediante la expansión diametral del elemento hembra 2 y la compresión diametral simultánea del elemento macho 1. Para una interferencia diametral  $\delta$  determinada, la presión de contacto que se genera entre los elementos macho y hembra se relaciona con sus respectivas geometrías. Cuanto mayor sea la interferencia  $\delta$ , mayor será la presión de contacto media que se origina entre los elementos macho y hembra. Normalmente, la interferencia diametral del sello oscila entre 0,2 mm y 1 mm, de acuerdo con el diámetro de la junta, es decir que cuanto mayor sea el diámetro también mayor será la interferencia diametral del sello.

La distribución en particular del esfuerzo sobre la superficie de estanqueidad se define por la geometría particular de las propias superficies de estanqueidad. La longitud "b", denominada longitud de contacto, es la longitud medida axialmente sobre las superficies de estanqueidad 11, 12 donde se genera la presión de contacto. El valor de "b" se relaciona directamente con el diseño particular de las



superficies de estanqueidad en contacto y el nivel de interferencia  $\delta$ . Si "b" es corta, esto produce una distribución de las presiones de contacto del sello altamente concentradas, mientras que si "b" es larga, esto produce una distribución más amplia de los esfuerzos de contacto más bajos.

Si un cilindro de radio  $R_s$  y una superficie plana están en contacto con una fuerza  $F$  que presiona los dos miembros que actúan perpendicularmente respecto de la superficie plana a lo largo de la línea de contacto, la presión de contacto entre ambos elementos se describe por una función de Hertz, siempre que no se produzca ninguna plasticidad.

$$P_{\max} = \left[ \frac{E}{2\pi R_s} \frac{F}{L} \right]^{1/2}$$

donde  $P_{\max}$  es la máxima presión de contacto,  $E$  es el módulo de Young,  $R_s$  es el radio del cilindro,  $F$  es la fuerza de contacto y  $L$  es la longitud de la línea de contacto. Tal como puede verse, para un material dado,  $P_{\max}$  se relaciona directamente con el radio del cilindro y la fuerza de contacto entre los elementos macho y hembra.

De acuerdo con un importante aspecto de la invención, la máxima presión de contacto que se desarrolla entre las superficies de estanqueidad 11 y 12 es un número predefinido de veces mayor que la presión interna del medio que se debe sellar, por ejemplo gas o petróleo. De esta manera, se garantiza un valor límite mínimo para la máxima presión de contacto que se genera en el sello, a fin de controlar el comportamiento del sello bajo diferentes condiciones de carga. Como la fuerza de contacto que se refiere a la interferencia diametral  $\delta$  está condicionada, a su vez, por el desarrollo de esfuerzos globales y las condiciones geométricas del ensamblaje, la máxima presión de contacto se relaciona estrechamente con la elección del radio óptimo máximo de la superficie de estanqueidad toroidal.

De acuerdo con la invención, el radio máximo  $R_{s \max}$  de la superficie de estanqueidad toroidal macho se define a través de la siguiente relación:

$$R_s \leq \frac{\delta \cdot E^2 t_n^3 OD^2}{240 \pi \sigma_{ed}^2 w t^2 (1 - \nu^2)} \left[ \frac{3(1 - \nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

donde:

$\delta$ = interferencia de sello radial;

E: módulo de Young del material;

$t_n$ : espesor del perno

OD: diámetro externo del caño

$\sigma_{ed}$  = límite elástico del material

$w t$ : espesor de la pared del caño

$R_n$ : radio del perno

$\nu$ : coeficiente de Poisson (= 0,3)

$b$  = longitud activa de la presión de contacto

El uso de una superficie de estanqueidad toroidal con un muy reducido radio  $R_s$  resulta beneficioso desde el punto de vista de la estanqueidad, ya que la alta presión de contacto es crítica para actuar como barrera para la presión interna. Por otro lado, si  $R_s$  es demasiado reducido la presión de contacto es muy alta, según se hace evidente a partir de la fórmula de Hertz, y esto constituye un riesgo en términos de engrane, debido a los esfuerzos de contacto altamente concentrados, y de estanqueidad, debido a una pequeña longitud donde se generan las presiones de contacto.

A fin de evitar los problemas que se acaban de citar, se prefiere que la longitud de contacto " $b$ " sobre las superficies de estanqueidad 11 y 12 –donde se genera la presión de contacto del sello- sea mayor que un determinado valor mínimo, que en el caso de superficies y tratamientos de superficies comunes se establece en 0,5 mm. Luego, de acuerdo con la teoría de Hertz y tal como se muestra mediante el análisis por elementos finitos, para ciertas condiciones del material, dimensiones de la junta e interferencia geométrica del sello, el radio  $R_s$  de la superficie de estanqueidad macho afecta directamente la longitud a lo largo de la cual se genera la presión de contacto entre ambas superficies de estanqueidad.

También de acuerdo con la presente invención, el radio mínimo  $R_{s \text{ min}}$  de las superficies de estanqueidad toroidales macho se define a través de la relación que

se presenta seguidamente según la función de la teoría de Hertz:

$$Rs \geq \frac{E}{2Vo} \left( \frac{b}{2.15} \right)^2$$

donde

b = longitud activa de la presión de contacto, con un valor de 0,5 mm, y Vo está dado por la siguiente fórmula

$$Vo = \frac{\delta \cdot Et_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

Los ejemplos que se citan seguidamente muestran los valores para el radio máximo y mínimo Rs para diferentes caños para petróleo típicos, con el uso de los valores representativos para δ y t<sub>n</sub>/wt, calculado según las siguientes fórmulas:

| OD<br>: | wt:  | Rs<br>min | Rs<br>max |
|---------|------|-----------|-----------|
| 73      | 5,5  | 21        | 82        |
| 89      | 6,5  | 26        | 73        |
| 114     | 8,9  | 28        | 97        |
| 140     | 9,2  | 21        | 108       |
| 178     | 11,5 | 17        | 138       |
| 245     | 13,8 | 15        | 204       |
| 340     | 9,7  | 31        | 398       |

Si es necesario reducir la cantidad de radios de sello diferentes para los distintos diámetros de los caños, de acuerdo con una forma de realización preferida de la presente invención pueden definirse dos escalas de radios preferidas para dos escalas de diámetros de caños simples, para lo cual se puede emplear la fórmula precedente.

| OD:      | Rs           |
|----------|--------------|
| < 140 mm | 30 < Rs < 75 |
| > 140 mm | 30 < Rs <    |

|  |     |
|--|-----|
|  | 100 |
|--|-----|

Se puede mejorar el rendimiento del sello bajo diferentes condiciones de carga a través de una forma de realización propicia de la junta donde se aplican las ventajas de la geometría del sello descrito previamente en combinación con una geometría de rosca, según se explica a continuación.

El comportamiento óptimo de la junta de acuerdo con la invención bajo cargas de tensión o compresión se da con el uso del perfil de rosca trapezoidal para los elementos macho y hembra 1, 2 donde se minimizan las posibilidades de los movimientos relativos axiales entre los elementos. De esa manera, se minimizan tanto el movimiento como los efectos en las superficies de estanqueidad.

Asimismo la rosca tiene una separación u holgura con una dimensión de 0,15 mm o menos entre el flanco de emboque 6 del elemento macho 1 y el correspondiente flanco de emboque 5 del elemento hembra 2, en la posición de ensamblaje definitiva. Dicha combinación de rosca con sello de acuerdo con la presente invención ofrece una junta con buena resistencia estructural para minimizar los movimientos y las tensiones plásticas cerca de la región de sello.

La Figura 5 muestra la variación en la presión de contacto del sello para una junta de acuerdo con la invención, donde el eje X expresa la relación entre la presión de contacto del sello y la máxima presión a sellar, para condiciones de carga extremas respecto del 100 % del límite aparente de elasticidad mínimo especificado del material.

Otra ventaja de la invención se obtiene a través del ángulo  $\gamma$ , definido por la pestaña interna 10 y la superficie de empalme 9 y un plano ortogonal respecto del eje X de la junta, con un valor que se encuentra comprendido dentro de la escala de  $-5^\circ$  y  $-15^\circ$ . De esta manera, la junta de la invención elimina el peligro de producir el desacoplamiento del sello o mayores deformaciones de éste.

Dicho rango de valores también tiene la gran ventaja de que evita que durante el montaje se susciten problemas de engrane o deformación. Por un lado, un ángulo menor que  $-5^\circ$  haría probable que se produzca un problema de acoplamiento bajo elevadas cargas de compresión o elevados momentos

dinámicos de torsión. Por otro lado, los ángulos mayores que  $-20^\circ$  provocan grandes deformaciones bajo condiciones de altas cargas de comprensión o altos momentos dinámicos de torsión.

La junta de la presente invención puede emplearse cuando el elemento hembra se incluye en el extremo de un caño o cuando se utiliza un manguito de conexión con dos elementos hembra en ambos extremos.

A partir de la descripción precedente, puede apreciarse que la invención satisface todos los objetos establecidos en la memoria.

## REIVINDICACIONES

1. Una junta roscada para caños que comprende un elemento de caño con rosca macho (1) y un elemento de caño con rosca hembra (2) con paredes sustancialmente cilíndricas; el elemento macho (1) tiene una superficie de estanqueidad toroidal (11) ubicada en su parte terminal cerca de la respectiva porción roscada que se acopla para dar estanqueidad; cuando los elementos macho y hembra (1, 2) están en posición ensamblada, existe una correspondiente superficie de estanqueidad frustocónica (12) del elemento de caño con rosca hembra (2) que se encuentra cerca de una porción roscada, caracterizada porque la superficie de estanqueidad toroidal tiene un valor de radio Rs predeterminado comprendido dentro de la escala entre 21 y 398 mm, y dicho valor Rs se determina en relación con el diámetro externo del tubo (OD) por medio de la siguiente fórmula

$$\frac{E}{2V_o} \left( \frac{b}{2.15} \right)^2 \leq R_s \leq \frac{\delta \cdot E \cdot t_n^3 \cdot OD^2}{240\pi \cdot \sigma_{ed}^2 \cdot w t^2 (1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

donde

$\delta$ = interferencia de sello radial;

E: módulo de Young del material;

$t_n$ : espesor del perno

OD: diámetro externo del caño

$\sigma_{ed}$  = límite elástico del material

$w t$ : espesor de la pared del caño

$R_n$ : radio del perno

$\nu$ : coeficiente de Poisson (= 0,3)

$b$  = longitud activa de la presión de contacto

$$V_o = \frac{\delta \cdot E \cdot t_n^3}{6(1-\nu^2)} \left[ \frac{3(1-\nu^2)}{R_n^2 t_n^2} \right]^{3/4}$$

2. La junta de acuerdo con la reivindicación 1, donde se prevé una rosca que tiene perfil trapezoidal y con una holgura que es igual o menor que 0,15 mm entre el flanco de esfuerzo (6) del elemento macho (1) y el correspondiente flanco de esfuerzo (5) del elemento hembra (2) en la posición ensamblada.

3. La junta de acuerdo con la reivindicación 2, en la cual el elemento macho (1) tiene una superficie de empalme frustocónica en el extremo frontal (9) que forma un ángulo ( $\gamma$ ) comprendido dentro de la escala de entre  $-15^\circ$  y  $-5^\circ$  con un plano ortogonal respecto del eje longitudinal (X) definido por la junta.

4. La junta de acuerdo con la reivindicación 3, en la cual  $R_s$  tiene un valor que se encuentra comprendido dentro de la escala de 30 a 75 mm para un caño cuyo diámetro externo (OD) es menor que 140 mm.

5. La junta de acuerdo con la reivindicación 3, en la cual  $R_s$  tiene un valor que se encuentra comprendido dentro de la escala de 30 a 100 mm para un caño cuyo diámetro externo (OD) es mayor que 140 mm.

6. La junta de acuerdo con cualquiera de las reivindicaciones 4 o 5, en la cual el elemento macho (1) se encuentra en el extremo de un segmento del caño, y el elemento hembra (2) se encuentra provisto en el extremo de un manguito de conexión del caño con dos extremos hembra.

7. La junta de acuerdo con cualquiera de las reivindicaciones 4 o 5, en la cual el elemento macho (1) se encuentra en el extremo de un primer segmento del caño, y el elemento hembra (2) se encuentra provisto en el extremo de un segundo segmento del caño.

8. Un caño con una longitud establecida que tiene, por lo menos, una parte de su extremo provista con rosca sobre la superficie externa, adecuada para formar el elemento macho (1) de la junta, con las características descritas en una o más de las reivindicaciones 1 a 7.

9. Un caño con una longitud establecida que tiene, por lo menos, una parte de su extremo provista con rosca sobre la superficie interna, adecuada para formar el elemento hembra (2) de la junta, con las características descritas en una o más de las reivindicaciones 1 a 7.

## JUNTA ROSCADA PARA CAÑOS

### Resumen

Una junta roscada para caños para la industria de la extracción del petróleo que tiene una rosca trapezoidal y una superficie de estanqueidad toroidal (11) ubicada en su extremo cerca de la rosca, y que para el sellado se acopla con una correspondiente superficie de estanqueidad frustocónica (12), donde la superficie de estanqueidad toroidal (11) tiene un valor de radio  $R_s$  que se encuentra comprendido dentro de la escala que se determina en la siguiente fórmula (I):

$$\frac{E}{2V_o} \left( \frac{b}{2.15} \right)^2 \leq R_s \leq \frac{\delta \cdot E^2 m_n^3 OD^2}{240 \pi \cdot \sigma_w^2 w t^2 (1 - \nu^2)} \left[ \frac{3(1 - \nu^2)}{R_n^2 m^2} \right]^{3/4} \quad (I)$$

Fig. 4



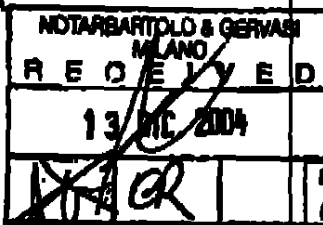
## PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

GERVASI, Gamma  
Notarbartolo & Gervasi S.p.A.  
Corso di Porta Vittoria 9  
I-20122 Milan  
ITALIE



NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

09.12.2004

Applicant's or agent's file reference  
3840PTWO/AG/a

## IMPORTANT NOTIFICATION

International application No.  
PCT/EP 0309870

International filing date (day/month/year)  
08.09.2003

Priority date (day/month/year)  
08.09.2002

Applicant  
TENARIS CONNECTIONS AG et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international  
preliminary examining authority:



European Patent Office  
D-60298 Munich  
Tel. +49 89 2369 - 0 Tlx: 623658 epmu d  
Fax +49 89 2369 - 4485

Authorized Officer

Hödl, S

Tel. +49 89 2369-8074



## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                               |                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Applicant's or agent's file reference<br><b>3840PTWQAG/a</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/10)                                                   |                                                     |
| International application No.<br><b>PCT/EP 03/08870</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | International filing date (day/month/year)<br><b>05.09.2003</b>                                                                                                               | Priority date (day/month/year)<br><b>06.09.2002</b> |
| International Patent Classification (IPC) or both national classification and IPC<br><b>F16L15/06</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                               |                                                     |
| Applicant<br><b>TENARIS CONNECTIONS AG et al.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                               |                                                     |
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 1 sheets.</p>                                                                                                                                                 |                                                                                                                                                                               |                                                     |
| <p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 68.2(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p> |                                                                                                                                                                               |                                                     |
| Date of submission of the demand<br><b>06.04.2004</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Date of completion of this report<br><b>09.12.2004</b>                                                                                                                        |                                                     |
| Name and mailing address of the international preliminary examining authority:<br> <b>European Patent Office<br/>D-80589 Munich<br/>Tel: +49 89 2369 - 0 Tx: 523656 apmu d<br/>Fax: +49 89 2369 - 4488</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Authorized Officer<br><b>Gortzalez Davila, J-C</b><br>Telephone No. +49 89 2369-2767<br> |                                                     |

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**International application No. **PCT/EP 03/09870****I. Basis of the report**

1. With regard to the elements of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)):

**Description, Pages**

1-9 as originally filed

**Claims, Numbers**

8, 9 as originally filed

1-7 received on 25.11.2004 with letter of 22.11.2004

**Drawings, Sheets**

1A-4A as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequences disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**International application No. **PCT/EP 03/09870**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |             |     |
|-------------------------------|-------------|-----|
| Novelty (N)                   | Yes: Claims | 1-7 |
|                               | No: Claims  |     |
| Inventive step (IS)           | Yes: Claims | 1-7 |
|                               | No: Claims  |     |
| Industrial applicability (IA) | Yes: Claims | 1-7 |
|                               | No: Claims  |     |

**2. Citations and explanations**

see separate sheet

**INTERNATIONAL PRELIMINARY**International application No. **PCT/EP 03/09870****EXAMINATION REPORT - SEPARATE SHEET****Reason V****Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. None of the prior art documents contained in the search report reveals a threaded tube joint as according to claim 1, in which the radius  $R_s$  of the toroidal sealing surface has a value comprised in the range 30 and 100 mm when OD is greater than 140 mm and in the range of 30 and 70 when OD is not greater than 140 mm.
2. The above features are neither known from, nor rendered obvious in respect of prior art so that claim 1 therefore meets the requirements of Articles 33(2) and 33(3) PCT.
3. Claims 2 to 7 contain advantageous modifications of the inventive ideas embodied in claim 1 and also meet the requirements of Articles 33(2) and 33(3) PCT.
4. The description is not in conformity with the claims as required by Rule 5.1(a)(ii) PCT.

**NEW CLAIMS**

1. A threaded tube joint, comprising a male threaded tube member (1) and a female threaded tube member (2) with substantially cylindrical walls, the male member (1) having a toroidal sealing surface (11) placed at its end portion near the threaded portion thereof engaging for sealing purpose, when the male and female members (1; 2) are in the assembled position, a corresponding frusto-conical sealing surface (12) of the female threaded tube member (2) placed near a threaded portion characterised by the fact that the radius  $R_s$  the toroidal sealing surface has a value comprised in the range 30 and 100 mm when OD is greater than 140mm and is comprised in the range of 30 and 70 when OD is not greater than 140mm.
2. The joint according to claim 1, wherein there is provided a thread with trapezoidal profile and with a clearance equal to or less than 0,15 mm between the stab flank (8) of the male member (1) and the corresponding stab flank (5) of the female member (2) in the assembled position.
3. The joint according to claim 2, wherein the male member (1) has a front end frusto-conical abutment surface (9) forming an angle (g) comprised in a range between  $-15^\circ$  and  $-5^\circ$  with a plane orthogonal to a longitudinal axis (X) defined by the joint.
4. The joint according to claim 3, wherein the male member (1) is provided in the end of a pipe segment and the female member (2) is provided in the end of a pipe connecting sleeve with two female ends.
5. The joint according to claim 3, wherein the male member (1) is provided in the end portion of a first pipe segment and the female member (2) is provided in the end of a second pipe segment.
6. A tube of definite length with a portion of at least an extremity provided with thread on the outer surface adapted to form the male member (1) of the joint having the characteristics of one or more claims 1 to 5.
7. A tube of definite length with a portion of at least an extremity provided with thread on the inner surface adapted to form the female member (2) of the joint having the characteristics of one or more claims 1 to 5.

**AMENDED SHEET**

## REIVINDICACIONES

1. Una junta roscada para caños que comprende un elemento de caño con rosca macho (1) y un elemento de caño con rosca hembra (2) con paredes sustancialmente cilíndricas; el elemento macho (1) tiene una superficie de estanqueidad toroidal (11) ubicada en su parte terminal cerca de la respectiva porción roscada que se acopla para dar estanqueidad; cuando los elementos macho y hembra (1,2) están en posición ensamblada, existe una correspondiente superficie de estanqueidad frustocónica (12) del elemento de caño con rosca hembra (2) que se encuentra cerca de una porción roscada, caracterizada porque el radio  $R_s$  de la superficie de estanqueidad toroidal tiene un valor comprendido dentro de la escala entre 30 y 100 mm, cuando el OD es mayor que 140mm y tiene un valor comprendido dentro de la escala entre 30 y 70 cuando el OD no es mayor que 140mm.
2. La junta de acuerdo con la reivindicación 1, donde se prevé una rosca que tiene perfil trapezoidal y con una holgura que es igual o menor que 0,15 mm entre el flanco de esfuerzo (6) del elemento macho (1) y el correspondiente flanco de esfuerzo (5) del elemento hembra (2) en la posición ensamblada.
3. La junta de acuerdo con la reivindicación 2, en la cual el elemento macho (1) tiene una superficie de empalme frustocónica en el extremo frontal (9) que forma un ángulo ( $\theta$ ) comprendido dentro de la escala de entre  $-15^\circ$  y  $-5^\circ$  con un plano ortogonal respecto del eje longitudinal (X) definido por la junta.
4. La junta de acuerdo con la reivindicación 3, en la cual el elemento macho (1) se encuentra en el extremo de un segmento del caño, y el elemento hembra (2) se encuentra provisto en el extremo de un manguito de conexión del caño con dos extremos hembra.
5. La junta de acuerdo con la reivindicación 3, en la cual el elemento macho (1) se encuentra en el extremo de un primer segmento del caño, y el elemento hembra (2) se encuentra provisto en el extremo de un segundo segmento del caño.
6. Un caño con una longitud establecida que tiene, por lo menos, una parte de su extremo provista con rosca sobre la superficie externa, adecuada para formar el elemento macho (1) de la junta, con las características descritas en una

o más de las reivindicaciones 1 a 5.

7. Un caño con una longitud establecida que tiene, por lo menos, una parte de su extremo provista con rosca sobre la superficie interna, adecuada para formar el elemento hembra (2) de la junta, con las características descritas en una o más de las reivindicaciones 1 a 5.





## NOTARBARTOLO & GERVASI

Dr. G. Gervasi  
Dr. D. Pallini Gervasi  
Dr. A. Pallini Gervasi

Dr. S. Lorenzi  
Dr. S. Merli  
Ing. B. Cinquanti  
Ing. M. Bonato  
Dr. E. Mauri  
Dr. M.L. Quadri

Dr. G. Glusto  
Dr. R. Appoloni  
Ing. C. Bossano  
Dr. R. Previtera  
Ing. A. Colona

Dr. G. Zucchini  
Dr. L. Piccolo  
Dr. G. Moretti  
Dr. R. Asensio  
Dr. M.V. Primiceri  
Dr. L. Brighenti  
Dr. G. Martini  
Dr. F. Orti  
Dr. P. Gerli  
Dr. C. Hewitt  
Dr. U. Pallini  
Dr. S. Brazzini  
Dr. S. Poncerini

Dipl.-Chem.S. Weisgerber  
Ing. G. Chialé  
Dr. R. Garzia  
Dr. E. Sani  
Dr. E. Gravina  
Dr. E. Fano  
Ing. P. De Anna  
Dr. M. Antonini  
Dr. P. Geronzi  
Dr. P. Cloni  
Ing. M. Savi

Dr. P. Foà

Dr. R. Marcinò

Dr. E. Vasco

Ing. D. Dall'Anese

Avv. E. Racco

Avv. F. Sardi Santori

Avv. M. Caramelli

Avv. L. S. Ghedini

Avv. P. Stefanelli

Dr. J. Grafier

The International Bureau of WIPO  
PCT Section  
34, chemin des Colombettes  
1211 GENEVA 20  
SWITZERLAND

Milan, 14 September 2004

Re: International Application No. PCT/EP03/04459  
filed on 29 April 2003  
in the name of TENARIS CONNECTIONS AG  
Our ref. 3378PTWO/er

International Application No. PCT/EP03/05165  
filed on 16 May 2003  
in the name of TENARIS CONNECTIONS AG  
Our ref. 3422PTWO/er

International Application No. PCT/EP03/09870  
filed on 6 September 2003  
in the name of TENARIS CONNECTIONS AG  
Our ref. 3640PTWO/er

International Application No. PCT/EP03/11238  
filed on 10 October 2003  
in the name of TENARIS CONNECTIONS AG  
Our ref. 3739PTWO/er

With reference to the above case, we inform you that the new address of the applicant is:

TENARIS CONNECTIONS AG.  
Bahnhofstrasse 7  
Postfach 48  
FL 9494 SCHAAN Liechtenstein.

20122 Milano Italy  
80336 Munich Germany  
6600 Lugano Switzerland  
50123 Firenze Italy  
00198 Roma Italy  
35137 Padova Italy  
10121 Torino Italy

Corso di Porta Vittoria, 9  
Bavariaring 21  
Via Besso, 9  
Lungarno A. Vespucci, 24  
Via Savola, 82  
Largo Europa, 16  
Corso Re Umberto, 8

Telephone  
+39 02 5417991  
+49 (0)89 5170163  
+41 091 9664230  
+39 055 264467-264468  
+39 06 8841696-85305418  
+39 049 8764447  
+39 011 4407733-8615545

Telex  
+39 02 54179920  
+49 (0)89 51701650  
+41 091 9664231  
+39 055 269662  
+39 06 8841697  
+39 049 8768013  
+39 011 5579080

Email  
notago@ngpatent.it  
ma@ngpatent.de  
ngpatent@icino.com  
notago@ngpatent.it  
notagern@ngpatent.it  
notagopd@ngpatent.it  
notagoto@ngpatent.it



NOTARBARTOLO & GERVASI S.p.A. - www.ngpatent.com

Capitale Sociale interamente versato € 500.000 - Codice Fiscale 02612760963 - Partita IVA 11060320151 - Reg. Imp. 1522518 Trib. di Milano

PATENTS, TRADE MARKS, DESIGNS, COPYRIGHT, PATENT AND TRADE MARK ATTORNEYS

IN 0000



Please notify the relevant Authorities and the elected offices in order to enter the national phases.

Respectfully submitted,

The Representative

  
GERVASI Gema

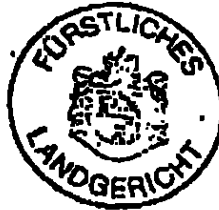
NOTARBARTOLO & GERVASI

c.c. EUROPEAN PATENT OFFICE  
Erhardtstrasse 27  
D-80298 MÜNCHEN  
GERMANY

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**Tenaris Connections B.V.**

**WTC Amsterdam Airport  
Schiphol Boulevard 271  
1118 BH Amsterdam  
The Netherlands**



Telephone +31 (0)20 635 07 04  
Telefax +31 (0)20 635 07 05

**-> PATENT ASSIGNMENT AGREEMENT**

This Patent Assignment Agreement (the "Agreement") is entered into as of September, 9<sup>th</sup> 2003, by and between **Tenaris Connections BV**, a corporation organized and existing under the laws of The Netherlands, having its principal place of business at Schiphol Boulevard 271, 1118 BH, Luchthaven Schiphol, Amsterdam, The Netherlands (hereinafter referred to as "**ASSIGNOR**"), and **Tenaris Connections AG**, a corporation organized and existing under the laws of the Principality of Liechtenstein, having its offices at Poststrasse 403, POBox 365 - FL 9491 Ruggell - Liechtenstein (hereinafter referred to as "**ASSIGNEE**").

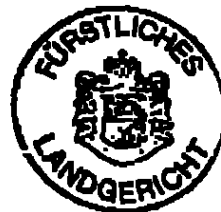
**Section 1:** The **ASSIGNOR** hereby assigns and transfers to the **ASSIGNEE**, and the **ASSIGNEE** hereby accepts, all its rights in and to the exclusive ownership of the technology, know how, trade secrets, plans and all intellectual property rights regarding the new development of threaded pipe joint technology known as "**Tenaris Blue**", including but not limited to the Patents/Patent applications listed in the Exhibit I ("**Patents**") and all continuations, divisions, extensions, renewals, substitutes, and renewals thereof. This assignment includes all renewals, reexaminations and extensions thereof, and all priority rights under all available International Agreements, Treaties and Conventions for the protection of the Patents in its various forms in every participating country, and all applications for patents (including related rights such as utility-model registrations, inventor's certificates, and the like) heretofore or hereafter filed in relation to the Patents in any foreign countries. Moreover, this assignment includes the rights in and to any opposition filed by the **ASSIGNOR** to the patent registration by third parties, based or purportedly based on the Patents.

**Section 2:** This assignment is made for the one-time and total amount of US\$ 307.750, payable within 12 months as of the execution date. The price of this Agreement is equivalent to all expenses incurred by the **ASSIGNOR** in promoting the technology as well as any other expense related thereto, and therefore the **ASSIGNOR** hereby waives any judicial or non-judicial claim against the **ASSIGNEE** for any reimbursement whatsoever.

**Section 3:** The **ASSIGNOR** hereby agrees to sign such documents that may be required by the administrative authorities for recording this assignment. The **ASSIGNOR** agrees to testify in any legal proceeding, sign all lawful papers, execute all divisional, continuation, substitute and reissue applications, make all rightful oaths and generally do everything possible to aid **ASSIGNEE** to obtain and enforce proper Patents protection in all countries. Any and all expenses and fees incurred in recording the assignment hereunder shall be exclusively borne by the **ASSIGNEE**.

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## Tenaris Connections B.V.



Amsterdam Airport  
Hol Boulevard 271  
1077 HJ Amsterdam  
Netherlands

Telephone +31 (0)20 635 07 04  
Telex +31 (0)20 635 07 05

Section 4: This Agreement has a retroactive effect to commence as from January 1, 2003. As from the effective date the ASSIGNER is considered the sole and exclusive owner of the Patent.

Section 5: This Agreement shall be deemed made pursuant to, and shall be governed by the laws of The Netherlands, except the conflict of laws provisions thereof.

Section 6: Any dispute, controversy or claim between the Parties arising out of, or relating to or in connection with this Agreement, including, without limitation, any dispute regarding its validity or termination, or the performance or breach thereof, to the extent not resolved by negotiations conducted during a period of 45 days, shall be finally resolved by three arbitrators appointed and acting in accordance with the arbitration rules of the International Chamber of Commerce. The arbitration shall be held in The Hague, The Netherlands. The arbitration proceedings shall be carried out in the English language.

Section 7: The parties hereto establish the domiciles set forth hereinabove; any and all notices delivered at said domiciles will be deemed valid, until a change thereof shall have been formally notified.

In witness whereof, the parties hereto sign two counterparts of the same tenor and purpose, as the date set forth above by their duly authorized representatives.

Tenaris Connections B.V.

Tenaris Connections A.G.

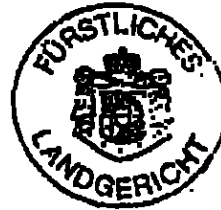
Mr. Dennis Day  
Managing Director

Mr. Esch Floop

ST  
52

# **Tenaris Connections B.V.**

**WTC Amsterdam Airport  
Schiphol Boulevard 271  
1118 BH Amsterdam  
The Netherlands**

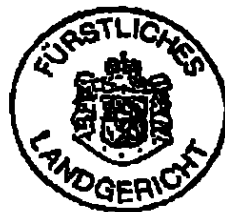


## **Exhibit I**

### **List of Patents in the name of TENARIS CONNECTIONS BV**

| <b>Country</b>   | <b>Filing number</b>  | <b>Filing date</b>       |
|------------------|-----------------------|--------------------------|
| <b>ITALY</b>     | <b>RM2002A000234</b>  | <b>April 30, 2002</b>    |
| <b>ITALY</b>     | <b>RM2002A000274</b>  | <b>May 16, 2002</b>      |
| <b>ITALY</b>     | <b>RM2002A000446</b>  | <b>September 6, 2002</b> |
| <b>ITALY</b>     | <b>RM2002A000512</b>  | <b>October 10, 2002</b>  |
| <b>PCT</b>       | <b>PCT/EP03/04459</b> | <b>April 29, 2003</b>    |
| <b>ARGENTINA</b> | <b>P030101518</b>     | <b>April 30, 2003</b>    |
| <b>BOLIVIA</b>   | <b>SP-230091</b>      | <b>April 28, 2003</b>    |
| <b>PERU</b>      | <b>000423-2003</b>    | <b>April 29, 2003</b>    |
| <b>U.S.A.</b>    | <b>10/424,857</b>     | <b>April 29, 2003</b>    |
| <b>VENEZUELA</b> | <b>2003-00696</b>     | <b>April 30, 2003</b>    |

Als die Urchrift gleichzeitend



### APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Land: Forstamt Leoben
2. Diese öffentliche Urkunde ist unterschrieben von: ...
3. in seiner Eigenschaft als ...
4. sie ist versehen mit dem ...

Bestand:

19. Sep. 2003

5. in 0480 Vaduz

7. durch Regierungskanzlei Vaduz

8. unter Nr. 0101



10. Unterschrift:

*C. Sant*  
Cornelia Sant  
Verwaltungs-Angestellte

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

## PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)

|                                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>To:</b><br>NOTARBARTOLO & GERVASI S.P.A.<br>Attn. Gervasi, Geoma<br>Corso di Porta Vittoria 2<br>20122 Milano<br>ITALY                                                                                            |  |
| <div style="border: 1px solid black; padding: 5px; text-align: center;">           NOTARBARTOLO &amp; GERVASI<br/>           MILANO<br/> <b>RECEIVED</b><br/>           10 FEB 2004<br/>           LA         </div> |  |

|                                     |            |
|-------------------------------------|------------|
| Date of mailing<br>(day/month/year) | 10/02/2004 |
|-------------------------------------|------------|

|                                                      |                                                        |
|------------------------------------------------------|--------------------------------------------------------|
| Applicant's or agent's file reference<br>3640PTWO/ez | <b>FOR FURTHER ACTION</b> See paragraphs 1 and 4 below |
|------------------------------------------------------|--------------------------------------------------------|

|                                                 |                                                               |
|-------------------------------------------------|---------------------------------------------------------------|
| International application No<br>PCT/EP 03/09870 | International filing date<br>(day/month/year)      06/09/2003 |
|-------------------------------------------------|---------------------------------------------------------------|

|                                                |
|------------------------------------------------|
| <b>Applicant</b><br><br>TENARIS CONNECTIONS AG |
|------------------------------------------------|

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith

**Filing of amendments and statement under Article 18:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland  
 Facsimile No : (41-22) 740 14.35

For more detailed instructions, see the notes on the accompanying sheet

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the International application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the International application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis 1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 18 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 18 months from the priority date or could not be elected because they are not bound by Chapter II

|                                                                                                                                                                                                                   |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Name and mailing address of the International Searching Authority<br>European Patent Office, P.O. 8818 Patentlaan 2<br>NL-2280 HV Rijswijk<br>Tel. (+31-70) 340-3040, Tx 31 851 epo nl,<br>Fax: (+31-70) 340-3016 | Authorized officer<br><br>Germaine Moet |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 18 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been filed, see below.

#### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

**Letter (Section 205(b)):**

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.



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## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 16 and 18 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### "Statement under article 19(1)" (Rule 48.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)".

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 18, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

### Consequences with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Office, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|                                                             |                                                                                                                                                        |                                                                |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Applicant's or agent's file reference<br><b>3640PTWO/ex</b> | <b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, Item 5 below |                                                                |
| International application No<br><b>PCT/EP 03/09870</b>      | International filing date (day/month/year)<br><b>06/09/2003</b>                                                                                        | (Earliest) Priority Date (day/month/year)<br><b>06/09/2002</b> |
| Applicant<br><b>TENARIS CONNECTIONS AG</b>                  |                                                                                                                                                        |                                                                |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets

☒ It is also accompanied by a copy of each prior art document cited in this report.

#### 1. Basis of the report

- a With regard to the language, the International search was carried out on the basis of the International application in the language in which it was filed unless otherwise indicated under this item

☐ the International search was carried out on the basis of a translation of the International application furnished to this Authority (Rule 23.1(b)).

- b With regard to any nucleotide and/or amino acid sequence disclosed in the International application, the International search was carried out on the basis of the sequence listing:

☐ contained in the International application in written form.

☐ filed together with the International application in computer readable form

☐ furnished subsequently to this Authority in written form

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the International application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☒ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II)

#### 4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

#### 5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International search report, submit comments to this Authority

#### 6. The figure of the drawings to be published with the abstract is Figure No.

☐ as suggested by the applicant

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention

☐ None of the figures

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/09870

A CLASSIFICATION OF SUBJECT MATTER  
IPC 7 F16L15/06

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 7 F16L

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 practical search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document with indication where appropriate of the relevant passages                                                                            | Relevant to claim No |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| A          | US 4 384 737 A (REUSSER HANS E)<br>24 May 1983 (1983-05-24)<br>column 8, line 20 - line 29; figures 4,5                                                    | 2-9                  |
| A          | EP 0 916 883 A (SUMITOMO METAL IND)<br>19 May 1999 (1999-05-19)<br>the whole document                                                                      | 2-9                  |
| A          | EP 1 203 909 A (HYDRIL CO)<br>8 May 2002 (2002-05-08)<br>column 3, line 27 - line 31; figure 2                                                             | 2-9                  |
| A          | WO 01/094831 A (SUMITANI KATSUTOSHI ;<br>MAEDA JUN (JP); NAGASAKU SHIGEO (JP);<br>SUMITOMO M) 13 December 2001 (2001-12-13)<br>abstract; figure 1; table 4 | 2-9                  |
|            | -/-                                                                                                                                                        |                      |

☒ Further documents are listed in the continuation of box C

☒ Patent family members are listed in 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 document 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

"Z" document member of the same patent family

Date of the actual completion of the international search

30 January 2004

Date of mailing of the international search report

10/02/2004

Name and mailing address of the ISA

European Patent Office P B. 6818 Patenkamp 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx 31 651 apo nl  
Fax (+31-70) 340-3018

Authorized officer

Budtz-Olsen, A

59

INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 03/09870

G (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No |
|------------|-------------------------------------------------------------------------------------|----------------------|
| A          | US 4 153 283 A (HELLMUND WOLFGANG ET AL)<br>8 May 1979 (1979-05-08)<br>figures      | 2-9                  |
| A          | EP 0 713 952 A (SUMITOMO METAL IND)<br>29 May 1996 (1996-05-29)<br>figures 1a,2b,5c | 2-9                  |
| A          | EP 1 020 674 A (KAWASAKI STEEL CO)<br>19 July 2000 (2000-07-19)<br>figures          | 2-9                  |

1

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1

Present claim 1 relate to a product defined by the formula expressed in line 12 of the claim. The use of these parameters in the present context is considered to lead to a lack of clarity within the meaning of Article 6 PCT. It is impossible to compare the parameters the applicant has chosen to employ with what is set out in the prior art. The lack of clarity is such as to render a meaningful complete search impossible. Consequently, the search has been restricted to:

A threaded tube joint, comprising a male threaded tube member (1) and a female threaded tube member (2) with substantially cylindrical walls, the male member (1) having a toroidal sealing surface (11) placed at its end portion near the threaded portion thereof engaging for sealing purpose, when the male and female members (1, 2) are in the assembled position, a corresponding frustoconical sealing surface (12) of the female threaded tube member (2) placed near a threaded portion characterised by there is provided a thread with trapezoidal profile and with a clearance equal to or less than 0,15 mm between the stab flank (6) of the male member (1) and the corresponding stab flank (5) of the female member (2) in the assembled position.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 03/09870

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

- 1 ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
- 2 ☒ Claims Nos.: 1  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
- 3 ☐ Claims Nos.:  
because they are dependant claims and are not drafted in accordance with the second and third sentences of Rule 8.4(a)

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

- 1 ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims
- 2 ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee
- 3 ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
- 4 ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest
- ☐ No protest accompanied the payment of additional search fees.

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62

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/09870

| Patent document cited in search report |   | Publication date | Patent family member(s)                                                                                                                                                                                                                            | Publication date                                                                                                                                                                                               |
|----------------------------------------|---|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| US 4384737                             | A | 24-05-1983       | NONE                                                                                                                                                                                                                                               |                                                                                                                                                                                                                |
| EP 0916883                             | A | 19-05-1999       | WO 9854501 A1<br>US 6045165 A<br>EP 0916883 A1                                                                                                                                                                                                     | 03-12-1998<br>04-04-2000<br>19-05-1999                                                                                                                                                                         |
| EP 1203909                             | A | 08-05-2002       | US 6530607 B1<br>CA 2361217 A1<br>EP 1203909 A2                                                                                                                                                                                                    | 11-03-2003<br>06-05-2002<br>08-05-2002                                                                                                                                                                         |
| WO 0194831                             | A | 13-12-2001       | AU 6421801 A<br>BR 0111528 A<br>CA 2411851 A1<br>CN 1433510 T<br>EP 1296088 A1<br>WO 0194831 A1<br>JP 2002061779 A<br>NO 20025872 A<br>US 2003132633 A1                                                                                            | 17-12-2001<br>22-07-2003<br>05-12-2002<br>30-07-2003<br>26-03-2003<br>13-12-2001<br>28-02-2002<br>29-01-2003<br>17-07-2003                                                                                     |
| US 4153283                             | A | 08-05-1979       | DE 2641767 A1<br>AR 222779 A1<br>BR 7704270 A<br>CA 1084553 A1<br>CS 214654 B2<br>FR 2364322 A1<br>GB 1589069 A<br>IT 1115293 B<br>JP 1314403 C<br>JP 53036024 A<br>JP 60030877 B<br>MX 143577 A<br>NO 772078 A, B,<br>RO 74789 A1<br>SU 993829 A3 | 16-03-1978<br>30-06-1981<br>25-04-1978<br>26-08-1980<br>28-05-1982<br>07-04-1978<br>07-05-1981<br>03-02-1986<br>28-04-1986<br>04-04-1978<br>18-07-1985<br>03-06-1981<br>15-03-1978<br>30-10-1980<br>30-01-1983 |
| EP 0713952                             | A | 29-05-1996       | CA 2163282 A1<br>DE 69522177 D1<br>DE 69522177 T2<br>EP 0713952 A1<br>JP 9119564 A<br>US 5829797 A                                                                                                                                                 | 23-05-1996<br>20-09-2001<br>02-05-2002<br>29-05-1996<br>06-05-1997<br>03-11-1998                                                                                                                               |
| EP 1020674                             | A | 19-07-2000       | EP 1020674 A1<br>US 6454315 B1<br>CN 1133842 B<br>WO 0006937 A1                                                                                                                                                                                    | 19-07-2000<br>24-09-2002<br>07-01-2004<br>10-02-2000                                                                                                                                                           |

## PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

GERVASI, Gemma  
Notarbartolo & Gervasi S.p.A.  
Corso di Porta Vittoria, 1  
I-20122 Milan  
Italy

R E C

14/01

IMPORTANT NOTIFICATION

|                                                                      |                                                                              |
|----------------------------------------------------------------------|------------------------------------------------------------------------------|
| Date of mailing (day/month/year)<br>06 January 2004 (06.01.2004)     |                                                                              |
| Applicant's or agent's file reference<br>3640PTWO/er                 |                                                                              |
| International application No.<br>PCT/EP2003/009870                   | International filing date (day/month/year)<br>06 September 2003 (06.09.2003) |
| International publication date (day/month/year)<br>Not yet published | Priority date (day/month/year)<br>06 September 2002 (06.09.2002)             |
| Applicant<br>TENARIS CONNECTIONS AG et al                            |                                                                              |

- By means of this Form, which replaces any previously issued notification concerning submission or transmittal of priority documents, the applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to all earlier application(s) whose priority is claimed. Unless otherwise indicated by the letters "NR", in the right-hand column or by an asterisk appearing next to a date of receipt, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- (If applicable) The letters "NR" appearing in the right-hand column denote a priority document which, on the date of mailing of this Form, had not yet been received by the International Bureau under Rule 17.1(a) or (b). Where, under Rule 17.1(a), the priority document must be submitted by the applicant to the receiving Office or the International Bureau, but the applicant fails to submit the priority document within the applicable time limit under that Rule, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- (If applicable) An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b) (the priority document was received after the time limit prescribed in Rule 17.1(a) or the request to prepare and transmit the priority document was submitted to the receiving Office after the applicable time limit under Rule 17.1(b)). Even though the priority document was not furnished in compliance with Rule 17.1(a) or (b), the International Bureau will nevertheless transmit a copy of the document to the designated Offices, for their consideration. In case such a copy is not accepted by the designated Office as priority document, Rule 17.1(a) provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

| Priority date             | Priority application No. | Country or regional Office<br>or PCT receiving Office | Date of receipt<br>of priority document |
|---------------------------|--------------------------|-------------------------------------------------------|-----------------------------------------|
| 06 Sept 2002 (06.09.2002) | RM2002A000445            | IT                                                    | 12 Dec 2003 (12.12.2003)                |

|                                                                                                                                 |                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No. (41-22) 338-7080 | Authorized officer<br>Véronique Bellour<br>Telephone No. (41-22) 338 8802 |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|



## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

GERVASI, Gemma  
Notarbartolo & Gervasi S.p.A.  
Corso di Porta Vittoria, 9  
I-20122 Milan  
Italy

Date of mailing (day/month/year)

09 November 2004 (09.11.2004)

Applicant's or agent's file reference

3840PTWO/er

## IMPORTANT NOTIFICATION

International application No.

PCT/EP2003/009870

International filing date (day/month/year)

06 September 2003 (06.09.2003)

## 1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address

TENARIS CONNECTIONS AG  
Poststrasse 409  
FL-9491 Ruggel  
Liechtenstein

State of Nationality

LI

State of Residence

LI

Telephone No.

Facsimile No.

Teleprinter No.

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

TENARIS CONNECTIONS AG  
Bahnhofstrasse 7  
Postfach 48  
FL-9494 Schaan  
Liechtenstein

State of Nationality

LI

State of Residence

LI

Telephone No.

Facsimile No.

Teleprinter No.

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

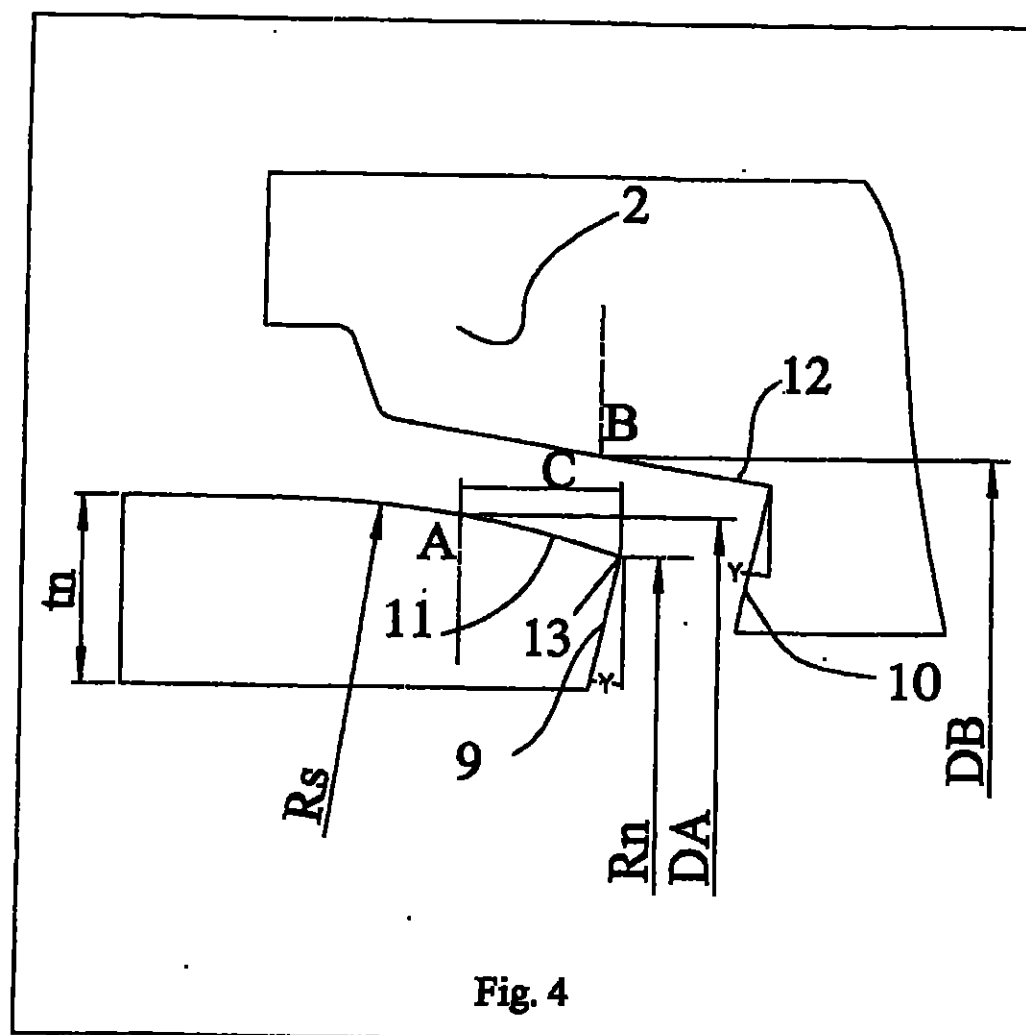
☒ the receiving Office ☐ the designated Offices concerned  
☐ the International Searching Authority ☒ the elected Offices concerned  
☒ the International Preliminary Examining Authority ☐ other:The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 338.70.80

Authorized officer

Peggy Steunenberg

Telephone No. (41-22) 336 9482

**ARTE**

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66

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

SUPERINDUSTRIA Y COMERCIO  
Radicacion : 05020356 00000000 Folios: 65  
Fecha (AMD): 2005-03-04 17:43:28  
Tramite : 011 PCT-PATENT 379 FASE NACI 411 PRESENTAC  
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES  
NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 05 - 15,517  
FECHA : MARZO 1 DE 2005

##### CONSIGNACION #####

| DEPOSITANTE            | TIPO PAGO    | BANCO         | CUENTA      | No. PAGO | FECHA PGO  | Vr. PAGO     |
|------------------------|--------------|---------------|-------------|----------|------------|--------------|
| PARRA RODRIGUEZ & CAVE | CONSIGNACION | BANCO POPULAR | 050-00110-6 | 34448819 | 28/02/2005 | 2,938,000.00 |

##### CONCEPTO #####

| CANT. RENTISTICO          | CONCEPTO                            | TOTAL CONCEPTO |
|---------------------------|-------------------------------------|----------------|
| 1 50005-01-01 SOLICITUDES | 1 TRAMITES DE SOL. DE PATENTE DE IN | 443,000.00     |
|                           | TOTAL :                             | 443,000.00     |

SON: CUATROCIENTOS CUARENTA Y TRES MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. \_\_\_\_\_

## REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL TRAMITE

|                                                                                                              |                           | USUARIO | RADICADOR                               |
|--------------------------------------------------------------------------------------------------------------|---------------------------|---------|-----------------------------------------|
| <b>PATENTE DE INVENCION</b> <input checked="" type="checkbox"/>                                              | <b>MODELO DE UTILIDAD</b> | ( )     | ( ) <input checked="" type="checkbox"/> |
| - Indicación de que se solicita la concesión de una patente.                                                 |                           | ( )     | ( ) <input checked="" type="checkbox"/> |
| - Datos de identificación del solicitante o de la persona que se presenta la solicitud.                      |                           | ( )     | ( ) <input checked="" type="checkbox"/> |
| - Descripción de la invención.                                                                               |                           | ( )     | ( ) <input checked="" type="checkbox"/> |
| - Dibujos de ser estos pertinentes.                                                                          |                           | ( )     | ( ) <input checked="" type="checkbox"/> |
| - Comprobante de Pago de las tasas establecidas.                                                             |                           | ( )     | ( ) <input checked="" type="checkbox"/> |
| <b>COMPLETA</b> <input checked="" type="checkbox"/>                                                          | <b>INCOMPLETA</b>         | ( )     | ( )                                     |
| <b>DISEÑO INDUSTRIAL</b> ( )                                                                                 |                           |         |                                         |
| - Indicación de que se solicita el registro de Diseño industrial                                             |                           | ( )     | ( )                                     |
| - Datos de identificación del solicitante o de la persona que presenta la solicitud.                         |                           | ( )     | ( )                                     |
| - Representación gráfica o fotográfica del Diseño Industrial o muestra del Material que incorpora el diseño. |                           | ( )     | ( )                                     |
| - Comprobante de pago de las tasas establecidas                                                              |                           | ( )     | ( )                                     |
| <b>COMPLETA</b> ( )                                                                                          | <b>INCOMPLETA</b>         | ( )     | ( )                                     |
| <b>ESQUEMA DE TRAZADO</b> ( )                                                                                |                           |         |                                         |
| - Indicación de que solicita el registro de un Esquema de trazado.                                           |                           | ( )     | ( )                                     |
| - Datos de identificación del solicitante o de la persona que presenta La solicitud.                         |                           | ( )     | ( )                                     |
| - Representación gráfica del esquema de trazado                                                              |                           | ( )     | ( )                                     |
| - Comprobante de pago de las tasas establecidas.                                                             |                           | ( )     | ( )                                     |
| <b>COMPLETA</b> ( )                                                                                          | <b>INCOMPLETA</b>         | ( )     | ( )                                     |

Firma Responsable:



Fecha:

2020  
Bogotá, D.C.,

**Doctor:**  
**ERNESTO CAVELIER FRANCO**  
**Apoderado**  
**TENARIS CONNECTIONS AG**

**Oficio N°** 12491

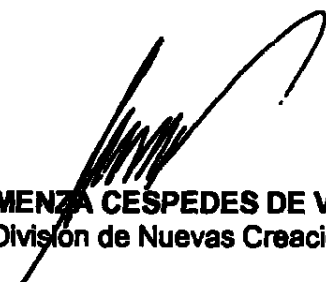
|                |                                   |                          |
|----------------|-----------------------------------|--------------------------|
| <b>ASUNTO:</b> | <b>Radicación N°</b>              | <b>05-20558</b>          |
|                | <b>Solicitud internacional</b>    | <b>PCT/EP2003/009870</b> |
|                | <b>Fecha inicio fase nacional</b> | <b>06/04/2005</b>        |
|                | <b>Trámite</b>                    | <b>011</b>               |
|                | <b>Evento</b>                     | <b>379</b>               |
|                | <b>Actuación</b>                  | <b>430</b>               |
|                | <b>Folios</b>                     | <b>001</b>               |

Como resultado del examen de forma, realizado con fundamento en el artículo 38 de la Decisión 486 de la Comisión de la Comunidad Andina, artículo 27 del Tratado de Cooperación en Materia de Patentes (PCT), regla 51 bis del Reglamento y Circular Única de la Superintendencia de Industria y Comercio, se le comunica que:

- Debera presentar la correspondiente traducción de los dibujos 5 y 6.
- El solicitante deberá presentar el anexo relativo a los Inventores para complementar los datos solicitados en el petitorio fase nacional.
- El solicitante deberá precisar el numero de solicitud internacional, por cuanto no corresponde en su totalidad al consignado en el petitorio fase nacional.
- La solicitud no contiene la copia del documento en que consta la cesión del derecho a la patente del inventor al solicitante o a su causante. (Art. 26-k) Decisión 486).
- La solicitud no contiene el poder debidamente otorgado, con el lleno de los requisitos exigidos por los artículos 63 y subsiguientes del Código de Procedimiento Civil. Adicionalmente, deberá presentar el documento que acredita la existencia y representación legal de la sociedad solicitante, cuando ésta fuere persona jurídica.

En cumplimiento de lo dispuesto por el artículo 39 de la Decisión 486, se le requiere para que dentro del término de dos meses siguientes a la fecha de notificación del presente oficio, complete los requisitos anteriormente enunciados. En caso de no dar cumplimiento al presente requerimiento, la solicitud se considerará abandonada y perderá su prelación.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.

  
**ALIX CARMENZA CESPEDES DE VERGEL**  
Jefe de la División de Nuevas Creaciones.

El anterior requerimiento fue notificado por fijación en lista de fecha 01 ABR 2005

202030

Carrera 13 No. 27-00 Piso 5 y 10  
C.S. notador 334 12 21-2-3-4  
Fax 281 31 25 e-mail: info@sic.gov.co  
SIC de Bogotá D.C. - Colombia

copie oficio  
H. Prieto 16/05