

Señor

SUPERINTENDENTE DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES

E. _____ S. _____

SUPERINDUSTRIA Y COMERCIO
Radicación : 00059535 00000002 Folios: 40
Fecha (MD): 2000-10-25 15:54:06
Trámite : 002 PATENTES D 1 REGISTRO/ 329 COMPLEMEN
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

Re: P1.-STANTON PLC.-Solicitud de Patente de Invención para "UNA EMPAQUETADURA PARA ASEGURAR TUBERIAS Y COMPONENTES DE TUBERIA".-Clase F.16L.-Expediente número 00-059.535.-

1. Me refiero a mi solicitud arriba mencionada de fecha 9 de Agosto de 2000.
2. Anexos me permito presentar a usted:
 - (1) Copia autentica de la primera solicitud de patente presentada para el invento arriba nombrado respecto de la cual reclamo prioridad, a saber la solicitud británica número 9918806.2 de 11 de Agosto de 1999, junto con su traducción oficial, correspondiente a las legalizaciones y reivindicaciones de dicho documento;
 - (2) Copias debidamente autenticadas por el Notario Sexto del Circulo de Bogotá, de los documentos que acreditan la calidad de Traductor Oficial de la señora María Mercedes Uricoechea Torres quien elaboró la traducción de la solicitud británica número 9918806.2, respecto de la cual se reivindica prioridad en el presente caso.
 - (3) Documento que acredita el traspaso que los autores del invento de la referencia hacen a favor de mi poderdante, de sus derechos sobre el mismo, debidamente legalizado hasta por el Ministerio de Relaciones Exteriores de Colombia bajo el número 331061 de 6 de Septiembre de 2000.
 - (4) Traducción Oficial No. 8135, debidamente legalizada hasta por el Ministerio de Relaciones Exteriores de Colombia bajo el número 529812 de 11 de Septiembre de 2000, correspondiente a las legalizaciones de dicho documento de traspaso.

A2
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3. Ruego a usted tomar atenta nota de lo anterior y proceder de conformidad.

Señor Superintendente,



JOSE ANTONIO LLOREDA
V.P. 10.784
Código 231

43
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REPUBLICA DE COLOMBIA
MINISTERIO DE RELACIONES EXTERIORES

CERTIFICACION

Se hace constar que el Señor(a) MARIA MERCEDES URICOECHEA TORRES

se encuentra debidamente registrado(a) ante el Ministerio de Relaciones

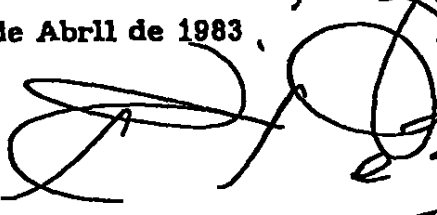
Exteriores, como traductor e interprete oficial para los idiomas _____

Ingles - Español - Ingles según resolución N° 10607

de fecha 31 de Diciembre de 1981 del Ministerio de Justicia

Se expide a los 6 días del mes de Abril de 1983

Atentamente,


RAFAEL HUMBERTO PEÑA
JEFE DE NEGOCIOS GENERALES

COMO NOTARIO SEXTO ENCARGADO
DE SANTAFE DE BOGOTA
HAGO CONSTAR
QUE LA FOTOCOPIA CONCIDE CON LA FOTOCOPIA
AUTENTICA QUE HE TENIDO A LA VISTA
SANTAFE DE BOGOTA 21-ABR-1998

COMO NOTARIO SEXTO ENCARGADO
DE SANTAFE DE BOGOTA
HAGO CONSTAR
QUE LA FOTOCOPIA CONCIDE CON LA FOTOCOPIA
AUTENTICA QUE HE TENIDO A LA VISTA
SANTAFE DE BOGOTA 25-ABR-2000
PABLO MENDOZA BARAJAS

COMO NOTARIO SEXTO DE
SANTAFE DE BOGOTA
HAGO CONSTAR
QUE LA FOTOCOPIA CONCIDE CON LA FOTOCOPIA
AUTENTICA QUE HE TENIDO A LA VISTA
SANTAFE DE BOGOTA 29-III-1989
JUAN RAMON BOTERO MEDINA
NOTARIO

COMO NOTARIO SEXTO ENCARGADO
DE SANTAFE DE BOGOTA
HAGO CONSTAR
QUE LA FOTOCOPIA CONCIDE CON LA FOTOCOPIA
AUTENTICA QUE HE TENIDO A LA VISTA
SANTAFE DE BOGOTA 24-NOV-1998

OFICINA DE PATENTES

Concept House
Cardiff Road
Newport
South Wales
NP9 1RH

El suscrito, un funcionario debidamente autorizado conforme a los Artículos 74(1) y (4) de la Ley de Desreglamentación y Contratación de 1994 para firmar y expedir certificados en nombre del Contralor General, certifico que la copia adjunta es una copia correcta de los documentos archivados originalmente con respecto a la solicitud de patente que allí se identifica.

De acuerdo con las Reglamentaciones de Patentes de 1982 (Re-registro de Compañías), si una compañía nombrada en este certificado y en los documentos adjuntos se ha vuelto a registrar según la Ley de Compañías de 1980 con el mismo nombre con el que fue registrada inmediatamente antes del re-registro, salvo la sustitución o inclusión como la última parte del nombre de las palabras "sociedad anónima" o su equivalente en galés, las referencias al nombre de la compañía y sus documentos adjuntos serán tratadas como referencias al nombre con el cual fue re-registrada.

De acuerdo con las reglas, las palabras "sociedad anónima" (o en inglés *public limited company*) pueden ser reemplazadas por las letras p.l.c, plc. P.L.C ó PLC.

El re-registro bajo la Ley de Compañías no constituye una nueva entidad legal sino simplemente somete a la compañía a ciertas normas de ley adicionales.

(FIRMA) A. CRESSEY

FECHA: 1 de agosto de 2000

(SELLO DE LACRE)

María Mercedes Liriochea

María Mercedes Liriochea

OFICINA DE PATENTES

SOLICITUD DE PATENTE

1. Su referencia: **STAG/P20923GB**

2. Solicitud No. 9918806.2 **11 de agosto de 1999**

3. Nombre completo y código postal de cada solicitante:

Dirección: STANTON PLC
LOWS LANE
Stanton-by-Dale
Ilkeston
Derbyshire DE7 4QU
REINO UNIDO

ADP 739771003

Si el solicitante es una entidad, indique el país/estado de constitución:
REINO UNIDO

TITULO DEL INVENTO:

OBTURADOR PARA ASEGURAR TUBERIAS O COMPONENTES DE TUBERIA

5. NOMBRE DE SU AGENTE:

Nombre del Agente: **ERIC POTTER CLARKSON**

Dirección para notificaciones: **ERIC POTTER CLARKSON**
PARK VIEW HOUSE
58 THE ROPEWALK
NOTTINGHAM

NG1 5DD

NO. ADP Patentes **1305010**

María Mercedes Urcochea
Res. No. 10607 Mirajurcla
Traductora Juramentada

María Mercedes Urcochea

OBTURADOR PARA ASEGURAR TUBERIAS O COMPONENTES DE TUBERIA

REIVINDICACIONES:

1. Un obturador para asegurar primero y segundo componentes de tubería que tienen, respectivamente, un extremo de espigo y un obturador mediante el cual el extremo de espigo de dicho primer componente de tubería es recibido en el obturador de dicho segundo componente de tubería para definir una unión de tubería; el obturador incluye:

(i) un par de pared anulares mutuamente en juxtaposición espaciadas longitudinalmente la una de la otra y del extremo libre del obturador para definir un canal en el extremo inferior del obturador en la superficie interior del obturador; y

(ii) un borde reforzado anular, localizado longitudinalmente hacia adentro del canal en el extremo inferior del obturador y que sobresale desde la superficie interior del obturador, en donde el obturador comprende:

(a) un elemento elastomérico anular; y

(b) uno o más segmentos metálicos fijos al elemento elastomérico, y cada segmento tiene:

Maria Mercedes Urcochea
Res. No. 10007 Ampuero
Traductora Juramentada, 1

Uriel Urcochea

- (i) una pluralidad de dientes que se extienden hacia el eje central del obturador, para engranaje con el extremo del espigo de dicho primer componente de tubería; y
- (ii) un extremo inferior, apartado de dichos dientes, para engranaje con el canal del extremo inferior del obturador, una porción de engranaje de cada segmento metálico cuya forma es tal que se engrana con dicho borde reforzado cuando el elemento elastomérico está alojado en dicho extremo del obturador, de manera que el borde reforzado actúa como punto de apoyo de cada segmento metálico, permitiendo de este modo que el segmento metálico se incline alrededor de la periferia expuesta de borde reforzado cuando ocurre un movimiento relativo transversal entre el par de componentes de tubería, caracterizado en que la porción de engranaje del segmento metálico incluye un receso que termina en un punto de contacto que puede girar en pivote con el borde reforzado; la distancia entre el punto de contacto y la parte más profunda del receso adyacente, medida en dirección perpendicular a una línea tangente al receso es tal que la parte inferior del

María Uncochea

segmento metálico se engrana con una pared del canal del extremo inferior del obturador para todos los grados de inclinación del segmento metálico a un grado mayor o igual de inclinación correspondiente al espacio anular medio entre el extremo del espigo y el obturador.

2. Un obturador según la Reivindicación 1, en donde el punto de contacto es el ápice de una cúspide.
3. Un obturador según la Reivindicación 1, en donde el punto de contacto es en una porción plana del segmento metálico.
4. Un obturador según cualquiera de las reivindicaciones anteriores, en donde dicha distancia entre el punto de contacto y la parte más profunda del receso adyacente, es lo suficientemente pequeña para permitir que todo el segmento se mueva, con el obturador en uso, entre el borde reforzado anula y el extremo del espigo.
5. Un obturador según cualquiera de las reivindicaciones anteriores, en donde dicha distancia, entre el punto de contacto y la parte más profunda del receso adyacente, es lo suficientemente grande como para garantizar engranaje entre el segmento y el borde reforzado cuando el segmento es soportado por el extremo del espigo.

Maria Mercedes Vincenza
Rte. No. 147, Montecarlo
Traductora Juramentada

Used Microbes

6. Un obturador según cualquiera de las reivindicaciones anteriores, en donde el extremo inferior del segmento incluye una porción cuyo tamaño permite el movimiento relativo entre el extremo inferior y el canal del extremo inferior del obturador mientras que el extremo inferior se engrana con dicha pared del canal del extremo inferior del obturador.
7. Un obturador según la Reivindicación 6, en donde la porción perfilada del extremo inferior es de radios convexos y su engranaje no es fijo con el canal del extremo inferior del obturador.
8. Un obturador según cualquiera de las reivindicaciones anteriores, en donde la distancia entre el punto de contacto y la punta del extremo inferior lejos del punto de contacto es tal que permite la deflexión del segmento hacia dicha pared del canal del extremo inferior del obturador hasta que el punto de contacto esté en o cerca de la punta del borde reforzado del obturador.
9. Un obturador según cualquiera de las reivindicaciones anteriores, en donde el elemento elastomérico incluye una porción de bulbo transversal sustancialmente circular; y en donde cada segmento metálico incluye un diente delantero localizado a un extremo del segmento lejos del canal del extremo inferior del obturador cuando el obturador esté en uso, colocado de tal modo que la

María Mercedes

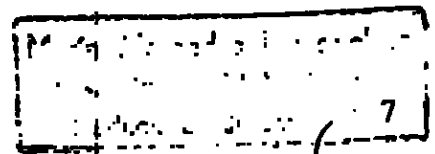
distancia media L desde el punto de contacto hasta la punta de engranaje del diente se define por la relación $L=0.75D$, donde D es el diámetro de la porción de bulbo, con lo cual se provee un brazo de palanca grande entre el borde reforzado del obturador y la punta del diente delantero cuando el espacio anular entre el extremo del espigo y el obturador es máxima.

10. Un obturador según cualquiera de las reivindicaciones anteriores, en donde el extremo inferior del segmento incluye una porción perfilada para permitir que el extremo inferior se engraneje con el canal del extremo inferior del obturador a un nivel radialmente hacia adentro del nivel de la punta del borde reforzado del obturador.
11. Un obturador según cualquiera de las reivindicaciones anteriores, en donde el elemento elastomérico es de dureza única y uniforme
12. Un obturador tal como se describe en términos generales aquí, con referencia o según se ilustra en los dibujos adjuntos.
13. Un segmento metálico para un obturador según cualquiera de las reivindicaciones anteriores.
14. Un segmento metálico que comprende:

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todos los grados de inclinación del segmento metálico a un grado mayor o igual de inclinación correspondiente al espacio anular medio entre el extremo del espigo y el obturador.

15. Un segmento metálico tal como se describe en términos generales aquí, con referencia o tal como se ilustra en los dibujos adjuntos.



Handwritten signature or initials.



The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

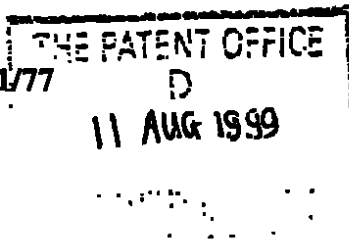
Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Andrew Gray

Dated

1 August 2000



The
Patent
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1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference	11 AUG 1999			STAG / P20923GB		
2. Patent application number (The Patent Office will fill in this part)	9918806.2			11AUG99 E468444-5 002866 P01/7700 0.00 - 9918806.2		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	Stanton Plc Lows Lane Stanton-by-Dale Ilkeston Derbyshire DE7 4QU United Kingdom 73971003 United Kingdom					
Patents ADP number (if you know it)						
If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom					
4. Title of the invention	A GASKET FOR SECURING PIPES OR PIPE COMPONENTS					
5. Name of your agent (if you have one)	ERIC POTTER CLARKSON					
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	PARK VIEW HOUSE 58 THE ROPEWALK NOTTINGHAM NG1 5DD					
Patents ADP number (if you know it)	1305010 ✓ haste aquir.					
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)		Date of filing (day / month / year)		
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day / month / year)			
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:	YES					
a) any applicant named in part 3 is not an inventor; or						
b) there is an inventor who is not named as an applicant, or						
c) any named applicant is a corporate body. See note (d))						

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description 14
Claims(s) 4
Abstract 1
Drawing(s) 4 *att*

10. If you are also filing in any of the following, state how many against each item.

Priority Documents 0
Translations of priority documents 0
Statement of inventorship and right to grant of a patent (Patents Form 7/77) NO
Request for preliminary examination and search (Patents Form 9/77) YES
Request for substantive examination (Patents Form 10/77) NO
Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Eric Potter Clarkson

Signature
ERIC POTTER CLARKSON

Date
10 August 1999

12. Name and daytime telephone number of person to contact in the United Kingdom 0115 9552211

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

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- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

A GASKET FOR SECURING PIPES OR PIPE COMPONENTS

- 5 This invention relates to a gasket for securing pipes or pipe components to one another.

It is known to provide pipes, such as metal pipes for conveying liquids, with respective spigot and socket ends. The pipes are designed such that
10 the spigot end of one pipe may be received in the socket end of an adjacent pipe to connect the pipes together. It is very common to connect a series of pipes and for pipe components in this way to create a desired pipe run.

- 15 It is necessary to seal the joint defined by each spigot end and socket end combination, against the pressure of fluid such as water conveyed in the pipes. It is known for the pressure in metal water pipes to reach 16 bar in use. The pipes typically have to pass tests in which they are pressurised to 21 bar.

20

Sealing of the joints is complicated by two factors:

- There is a manufacturing tolerance inherent in the diameters of the spigot and socket ends. Consequently the annular gap between the spigot and
25 socket ends varies from one combination of spigot and socket to another. The joints are designed to flex for ease of installation (i.e. they do not have to be laid in a perfectly straight line) and to reduce stresses in the pipeline arising from any ground movements/loads. Joint flexibility also allows the passive resistance of the soil to be mobilised for restraint when
30 anchorage is required at changes in pipeline direction.

It is usual to form the free end of each socket end with a radially inwardly extending flange defining an inwardly facing annular shoulder spaced a short distance axially inwardly of the free end of the socket. An annular bead, e.g. of semi-circular profile, is formed a short axial distance further inward of the shoulder. The axial space between the shoulder and bead defines a groove known as a socket heel groove.

It is known to provide a seal that seats in or adjacent the socket heel groove to seal the joint between the pipes.

10

One form of seal, that performs dual functions of sealing the joint and preventing axial separation of the pipes, is known as a Tyton anchor gasket. A known Tyton anchor gasket 10 is shown in cross section in Figure 1.

15

In Figure 1 there is shown an annular elastomeric member 15 that is designed to seat about the socket heel groove and bead of a pipe socket end.

20 Elastomeric member 15 has a portion 15a of substantially circular cross section that blends into a heel portion 15b of substantially rectangular cross section. The transition between portions 15a and 15b is a concave curvature 15c that is substantially congruent with the profile of the annular bead. In use the heel portion of the elastomeric member 15 is received in the socket heel groove, while the annular bead seats in concave portion 15c and the substantially circular cross section portion seals the gap between the spigot and socket pipe ends.

30 A series of metal anchor segments 11 is secured in the elastomeric member about the annulus defined thereby. Each anchor segment 11 has

a series of radially inwardly directed teeth 12a, 12b that protrude inwardly of the elastomeric member 15 for engagement with the spigot end. The tips of the teeth are angled towards the free end of the spigot end. Thus in use of the Tyton anchor gasket 10 the teeth 12 engage the spigot end
 5 and resist any tendency for the spigot end and the socket end to separate from one another in the axial direction.

Radially outwardly of the teeth 12a, 12b the upper edge of each metal segment 11 is concave in a profile 11a similar to that of portion 15c of
 10 elastomeric member 15. Concave portion 11a terminates in a cusp 13 near the axially inner end of segment 11.

Cusp 13 is engageable with the annular bead. Since there is an annular gap between the inner diameter of the socket end and the outer diameter
 15 of the spigot end, the metal segment is moveable relative to the bead. Such movement occurs by deflection of the metal segment with the cusp in engagement with and moving around the bead.

Each segment 11 includes a heel portion 11b that is of similar shape to the
 20 shape of heel portion 15b of elastomeric member 15.

By virtue of the shape of the segments 11 and the elastomeric member 15, the known Tyton anchor gasket 10 can accommodate some variations in the annular gap as outlined above. Segment 11 moves in the direction of
 25 arrow A in Figure 1 on insertion of the spigot into the socket. This causes the segment to seat more fully onto the bead and socket heel groove and thereby present a low profile. On pressurisation of the pipe (which tends to withdraw the spigot from the socket) segment 11 moves in the direction of arrow B in Figure 1 to present a higher profile and thus
 30 perform its sealing and anchoring functions. The larger the annular gap

between the spigot and socket, the greater will be the movement in the direction of arrow B on pressurisation of the pipe.

Although the known Tyton anchor gasket has been successful, it nonetheless suffers some disadvantages. Principal among these is the tendency for the Tyton anchor segments to over-stress the spigot end when the fluid pressure in the pipe increases.

This arises because once the segments have engaged the socket bead, on assembly of the pipe joint, fluid pressure rotates the segments around the socket bead. This rotation increases the radial component of the restraining force and leads to the teeth 12a, 12b corrugating or fracturing the spigot.

The Tyton anchor has a limited pressure thrust capability. At small pipe diameters the pressure ratings are more than adequate to accommodate the working pressure but as the diameter increases the pressure rating decreases. At the pipe diameter known as 'DN400' the working pressure limit is only 10 bar. This is because the number of teeth in the metal segments can only increase in proportion to the pipe diameter whereas the pressure thrust increases in proportion to the square of the pipe diameter.

EP-A-0596394 discloses a segment having a rear tooth that prevents segment rotation by engaging the upstanding wall 18 of the socket heel groove 17 of the socket end 14.

This design of segment is shown in Figure 2, in which the heel portion 11b of the metal segment terminates in a sharp tooth 22 that points towards the upstanding wall 18.

Engagement of tooth 22 with the upstanding wall 18 prevents rotation of the segment beyond a predetermined point. However it is believed that once such engagement of the tooth 22 occurs the segment cannot further adjust its position if the spigot 16 deflects under pressure, e.g. due to ground movement after installation of the pipes underground.

GB-A-2018924 discloses a segment design, similar to that of EP-A-0596394, in which the heel portion of the segment is radiused to prevent the jamming of the segment that may arise in the EP-A-0596394 arrangement. However it is clear that the heel portion of the segment in GB-A-2018924 only engages the socket heel groove when there is a maximum annular gap between the spigot and socket ends.

DE-A-2606643 discloses an arrangement that attempts to reduce the radial force acting between the segments and the pipe members. However, this design seems to suffer from the same disadvantage as the arrangement of GB-A-2018924 in that prevention of rotation apparently only occurs at a maximum annular gap.

Also the DE-A-2606643 segment only seems to function over a limited range of annular gaps. This is because the engaging parts of the metal segment and the heel groove are defined by perpendicular surfaces in each case, thereby limiting the possible range of effective movements.

Thus there is a need for a gasket, that functions both to seal a pipe joint and to prevent axial separation of the joint parts; and that exerts a reduced force on the spigot end at least for large annular gaps, while simultaneously permitting adjustment of the position of the segments over a large range of annular gaps.

According to a first aspect of the invention there is provided a gasket as defined in Claim 1.

5 The use of a low cusp height as defined in Claim 1 ensures that when the gasket is designed as a Tyton anchor gasket (in which manufacturing tolerances are small) the heel portion of the metal segment engages the upstanding wall of the socket heel groove for all annular gaps greater than or equal to the mean. The gasket of the invention can equally well be employed in anchors other than the Tyton type, and which may be
10 associated with greater manufacturing tolerances. In such applications the heel may engage the wall, e.g. when the annular gap is at or close to its minimum. In other words the cusp height is low enough to allow the segment to deflect under the socket bead, but large enough to ensure positive engagement of the spigot before and after such before deflection.

15

Preferably the said distance, between the apex of the cusp and the most recessed part of the adjacent recess, is sufficiently small as to permit the entire segment to move, in use of the gasket, between the annular bead and the spigot end. This allows effective minimisation of the radial force.

20

Conveniently the said distance, between the apex of the cusp and the most recessed part of the adjacent recess, is sufficiently large as to ensure engagement between the segment and the bead when the segment is supported by the spigot end.

25

Thus the segment may remain in contact with the bead throughout any movement.

In preferred embodiments the heel of the segment includes a portion
30 shaped to permit relative movement between the heel and the socket heel

groove while the heel engages the said wall of the socket heel groove. In particularly preferred embodiments the shaped portion is convexly radiused and is engageable with the said wall.

- 5 These features advantageously avoid the problem, inherent in the arrangement of EP-A-0596394, of the rear tooth of the segment jamming in the upstanding wall.

Conveniently the distance between the apex of the cusp and the extremity
10 of the heel remote from the cusp is such as to permit deflection of the segment towards the said wall of the socket heel groove until the cusp is at or near the tip of the socket bead.

This advantageously minimises the reaction angle and hence the radial
15 force exerted on the spigot end.

Preferably the elastomeric member includes a bulb portion of substantially circular cross-section; and the or each metal segment includes a forward tooth, located at an end of the segment remote from the socket heel
20 groove in use of the gasket, positioned such that the mean distance L from the contact point to the engaging tip of the tooth is defined by the relation $L=0.75D$, where D is the diameter of the bulb portion, whereby to provide a large lever arm between the socket bead and the tip of the forward tooth when the annular gap between the spigot end and the socket
25 is maximal.

This has the beneficial effect, when the annular gap is a maximum, of maximising the lever arm constituted by the segment and hence reducing further the radial force.

30

In preferred embodiments the heel of the segment includes a portion shaped to permit the heel to engage the socket heel groove at a level radially inward of the level of the tip of the socket bead. This has also been found to reduce the radial force.

5

Preferably the elastomeric member is of a single, uniform hardness.

This advantageous feature arises because the metal segments are effective at preventing the gasket from becoming dislodged from the socket bead on
10 insertion of the spigot. The metal segments are also effective at preventing the gasket extruding between the socket mouth and the spigot.

The invention also resides in a metal segment for a gasket as defined herein.

15

There now follows a description of preferred embodiments of the invention, by way of non-limiting example, with reference being made to the accompanying drawings in which:

20 Figure 1 is a cross sectional view of a conventional, prior art Tyton anchor gasket;

Figure 2 is a cross sectional view, showing the metal segment of EP-A-0596394 in position in a socket heel groove but omitting the elastomeric
25 member;

Figure 3 is a cross sectional view of a gasket according to the invention;

Figures 4A - 4C show the position of a metal segment of the gasket of
30 Figure 3 when in use when there is respectively a minimum annular gap,

a mean annular gap and a maximum annular gap between a chosen spigot and socket end;

Figures 5A – 5C show views, similar to Figures 4, for an alternative
5 embodiment of the segment; and

Figure 6 is a cross-sectional view of a further embodiment of the invention.

10 Referring to Figure 3 there is shown an annular gasket 10, according to the invention, for use in sealing and securing together two pipes respectively having a spigot end insertable into a socket end. The gasket 10 includes an annular elastomeric member 15.

15 Elastomeric member 15 includes a substantially circular cross section sealing portion 15a that blends into a heel portion 15b whose cross section is a chamfered rectangle as shown.

Intermediate the circular and rectangular parts the transition zone 15c of
20 the member 15 is concavely curved to a profile corresponding to that of the bead 19 (Figures 4 & 5) of the socket end 14 into which the gasket 10 is insertable.

The gasket 10 also includes a series of metal segments 11 secured within
25 and distributed round the annular member 15.

Each segment 11 has a plurality of teeth 12a, 12b, 12c that extend towards the centre axis of the socket end, for engagement with the spigot 16. In the embodiment shown the teeth 12a, 12b, 12c protrude through the
30 elastomeric member 15.

Each metal segment 11 includes a heel 20 that is remote from the teeth 12a, 12b, 12c. Heel 20 is engageable with the wall 18 of the socket heel groove 17.

5

Intermediate the heel 20 and the teeth 12 the segment 11 is formed as a concave portion 11a that terminates at its forward end in a cusp 13. Cusp 13 defines the transition in the segment 11 from a curved profile to a substantially flat profile in the region 11c visible in Figure 3.

10

The bead 19 acts as a fulcrum about which cusp 13 pivots when the gasket 10 is in use.

15

The distance h between the apex of cusp 13 and the most recessed part of concave portion 11a, measured in the direction perpendicular to a tangent to the said most recessed part, is sufficiently small that the heel 20 engages the wall 18 for all degrees of tilt of the segment 11 greater than or equal to the tilt corresponding to the mean annular gap between the spigot and socket ends that the gasket 10 is in use to seal.

20

In other embodiments the distance h and other dimensions of the metal segment may be chosen so that the heel 20 engages the wall 18 for degrees of tilt corresponding to less than the mean annular gap.

25 Figure 4 shows the action of segment 11 of Figure 3 when the gasket 10 is in use to seal and retain a pipe joint.

Figure 4A shows the segment 11 in use when the annular gap G is less than the mean annular gap between the spigot 16 and socket 14.

30

In this situation the flange 23 of the socket end is in contact with the spigot 16, signifying that the socket 14 and spigot 16 are as close together as possible.

- 5 In Figure 4A the segment bead 19 of the socket 14 is received in the concave portion 11a, which seats snugly about the bead 19. The teeth 12a and 12b are in engagement with the outer surface of the spigot 16. Thus if the pipe portions tend to separate from one another in the direction of the arrows C the teeth 12a, 12b prevent actual separation from occurring.

10

Although not visible in Figure 4A, the circular section part (known as the "bulb") of the elastomeric member 15 is received in the gallery 24 that lies axially inwardly of the bead 19. In this position the elastomeric member seals the joint.

15

In Figure 4B the annular gap G has increased to the mean, primarily as a result of manufacturing tolerances. The increase can also arise by virtue of e.g. deflection of the pipes under a load caused by ground movement.

- 20 As is clear from Figure 4B the cusp 13 has pivoted around the bead 19 while the tooth 12b remains in contact with the spigot outer surface. The bead 19 is no longer seated in the concave portion 11a.

- Thus it is clear from Figures 4A and 4B that the cusp height is sufficiently
25 low as to permit the segment 11 to deflect under the bead 19. The cusp height h is on the other hand sufficiently high that the segment positively engages the spigot 16.

- When the annular gap G is at the mean level, the heel 20 engages the wall
30 18. This is preferably achieved through judicious choice of the

dimensions of the segment and socket portions. The correct dimensions may be determined by the Tyton gasket (i.e. without inserts). Dimensions of the inserts can be determined by striking a radius of length 'r' from the cusp 13 of the insert when the dimension 'r' of the socket is on the mean.

- 5 In contrast, in Figure 5 (described below) the radius has been struck from a point below the cusp.

The heel 20 is radiused over a part of its outer surface. In other words the heel 20 includes a radiused portion that terminates in a substantially
10 planar portion as shown. This permits the heel to move relative to the wall 18 even after the heel 20 has engaged the wall.

Thus the detrimental effect evident in the segment of EP-A-0596394 does not arise.

15

Figure 4C shows that with a further increase in the gap G the segment deflects further around the bead 19, until the cusp 13 is at or near the tip of the bead 19.

- 20 This is achieved through the choice of the dimension r, that is the distance from the heel 20 to the cusp 13 measured in a direction parallel to the spigot 16. If dimension r is long enough, cusp 13 will reach its maximum extent of travel around the bead 19 at the tip or most protruding part thereof.

25

The dimension r may be similarly determined in all embodiments of the invention, if desired.

- This has been found to minimise the reaction angle and hence the radial
30 force.

Figure 4C demonstrates that the heel 20 is able to continue to move relative to the wall 18 after these components have engaged one another. Thus the segment 11 can accommodate further increases in annular gap arising from deflection or eccentricity of the spigot relative to the socket.

In the Figure 4C position the teeth 12b, 12c are in engagement with the spigot 16. Tooth 12a is out of engagement with the spigot.

The tooth 12c is positioned as far forward as possible in order to maximise the length of lever arm L indicated in Figure 4C. This also reduces the radial force.

As illustrated in Figure 3, the cusp angle A, that defines the cusp height h, is in preferred embodiments 6° . The bulb of the elastomeric member has a diameter D. In preferred embodiments the mean length L (shown in Figure 4C) is given by $L=0.75D$

It is believed possible to seal and anchor e.g. 600mm ductile iron pipes experiencing internal working pressures up to 16 bar and test pressures of up to 21 bar using the apparatus of Figure 4.

The Figures 5 show a second embodiment of segment for use in a gasket according to the invention.

25

The Figure 5 segment is similar to the Figure 4 segment, except that the heel 20 is radiused over the whole of its end surface that may contact the wall 18. The curved heel surface extends to a lower point in this embodiment, to ensure that there is a sufficient curved surface for all possible engagement angles with the wall of the socket heel groove. Also

in this embodiment the radius 'r' is struck from a point slightly below the cusp 13, to ensure that the heel engages the wall at a level below the cusp.

This allows the heel 20 to engage the wall 18 at a lower position (i.e. at a position closer to the centre axis of the socket pipe) than is the case in the Figure 4 arrangement. This has been found further to reduce the radial force.

Referring now to Figure 6 there is shown another embodiment of the invention, including two further, optional features that may be included separately or together in the same segment 11.

In Figure 6 the cusp 13 of Figures 3 to 5 is replaced by a flat 13a. Flat 13a makes a tangential (point) contact with the bead of the socket heel groove, that is similar to the point contact of the cusp in Figures 3 to 5. However, the flat 13a provides such point contact (i.e. it sits "on top" of the bead) over a wide range of annular gaps. Thus the flat 13a is useful in e.g. non-Tyton anchors, that suffer greater tolerances than the Tyton design.

20

Figure 6 also shows a recess 11a' that is of generally trapezoidal profile, instead of the arcuate profile of Figures 3-5. Other recess shapes/profiles are also possible.

25 In all embodiments the elastomeric member can be manufactured entirely from a single hardness material. Thus there is no need for a high stiffness portion as is sometimes called for in the prior art.

30 In its simple form the invention resides in a segment having the characteristics defined in the claims and/or described herein.

CLAIMS

1. A gasket for securing together first and second pipe components having, respectively, a spigot end and a socket whereby the spigot end of the first said pipe component is receivable in the socket of the second said pipe component to define a pipe joint, the socket including:
 - (i) a pair of mutually juxtaposed annular walls longitudinally spaced from one another and from the free end of the socket to define an annular socket heel groove on the interior surface of the socket; and
 - (ii) an annular bead, located longitudinally inwardly of the socket heel groove and protruding from the interior surface of the socket, wherein the gasket comprises
 - (a) an annular, elastomeric member; and
 - (b) one or more metal segments secured to the elastomeric member and each having:
 - (i) a plurality of teeth, that extend towards the centre axis of the socket, for engagement with the spigot end of the first said pipe component; and
 - (ii) a heel, remote from the said teeth, for engagement with the socket heel groove, an engaging portion of the or each metal segment being shaped to engage the said bead when the elastomeric member is seated in the said socket end, such that the bead acts as a fulcrum for the or each metal segment, thereby permitting tilting of the metal segment around the exposed periphery of the bead when transverse relative movement occurs between the pair of pipe components, characterised in that the engaging portion of the metal segment includes a recess terminating in a contact point that is pivotably engageable with the bead, the distance between the contact point and the most recessed part of the adjacent recess, measured in a direction perpendicular to a tangent to the recess, is such that the heel of the metal segment engages a wall of the

socket heel groove for all degrees of tilt of the metal segment greater than or equal to the degree of tilt corresponding to the mean annular gap between the spigot end and the socket.

5 2. A gasket according to Claim 1 wherein the contact point is the apex of a cusp.

3. A gasket according to Claim 1 wherein the contact point is on a flat portion of the metal segment.

10

4. A gasket according to any preceding claim wherein the said distance, between contact point and the most recessed part of the adjacent recess, is sufficiently small as to permit the entire segment to move, in use of the gasket, between the annular bead and the spigot end.

15

5. A gasket according to any preceding claim wherein the said distance, between the contact point and the most recessed part of the adjacent recess, is sufficiently large as to ensure engagement between the segment and the bead when the segment is supported by the spigot end.

20

6. A gasket according to any preceding claim, wherein the heel of the segment includes a portion shaped to permit relative movement between the heel and the socket heel groove while the heel engages the said wall of the socket heel groove.

25

7. A gasket according to Claim 6 wherein the shaped portion of the heel is convexly radiused and is non-lockingly engageable with the socket heel groove.

8. A gasket according to any preceding claim wherein the distance between contact point and the extremity of the heel remote from the contact point is such as to permit deflection of the segment towards the said wall of the socket heel groove until the contact point is at or near the tip of the socket bead.

9. A gasket according to any preceding claim wherein the elastomeric member includes a bulb portion of substantially circular cross-section; and wherein the or each metal segment includes a forward tooth, located at an end of the segment remote from the socket heel groove in use of the gasket, positioned such that the mean distance L from the contact point to the engaging tip of the tooth is defined by the relation $L=0.75D$, where D is the diameter of the bulb portion, whereby to provide a large lever arm between the socket bead and the tip of the forward tooth when the annular gap between the spigot end and the socket is maximal.

10. A gasket according to any preceding claim wherein the heel of the segment includes a portion shaped to permit the heel to engage the socket heel groove at a level radially inward of the level of the tip of the socket bead.

11. A gasket according to any preceding claim wherein the elastomeric member is of a single, uniform hardness.

12. A gasket generally as herein described, with reference to or as illustrated in the accompanying drawings.

13. A metal segment for a gasket according to any preceding claim.

14. A metal segment comprising :

(i) a plurality of teeth, that extend towards the centre axis of the socket, for engagement with the spigot end of the first said pipe component; and

5 (ii) a heel, remote from the said teeth, for engagement with a socket heel groove, an engaging portion of the or each metal segment being shaped to engage a bead when an elastomeric member supporting the segment is seated in the a socket, such that the bead acts as a fulcrum for the or each metal segment, thereby permitting tilting of the metal segment around the exposed periphery of the bead when transverse
10 relative movement occurs between a pair of pipe components, characterised in that the engaging portion of the metal segment includes a recess terminating in a contact point that is pivotably engageable with the bead, the distance between the contact point of the cusp and the most recessed part of the adjacent recess, measured in a direction perpendicular
15 to a tangent to the recess, is such that the heel of the metal segment engages a wall of the socket heel groove for all degrees of tilt of the metal segment greater than or equal to the degree of tilt corresponding to the mean annular gap between the spigot end and the socket.

20 15. A metal segment generally as herein described, with reference to or as illustrated in the accompanying drawings.

A GASKET FOR SECURING PIPES OR PIPE COMPONENTS

ABSTRACT

5

There is a need for a fluid pipe anchor gasket that exerts a reduced radial force on a spigot end inserted into a pipe socket.

10 An anchor gasket (10) according to the invention includes an annular, elastomeric member (15) having secured therein a series a metal segments (11). The segments each have a concave portion (11a) on their upper sides. Each concave portion terminates in a contact point such as a cusp (13) that is of low height. This allows the metal segments (11) to pass under a bead (19) formed in the socket member, whilst maintaining
15 positive engagement of the teeth (12) of the metal segment with the spigot end.

This reduces the radial force, applied to the spigot by the teeth, whilst retaining an adequate axial force sufficient to prevent the pipes from
20 separating in use.

(Figure 3.)

FIGURE 1 (PRIOR ART).

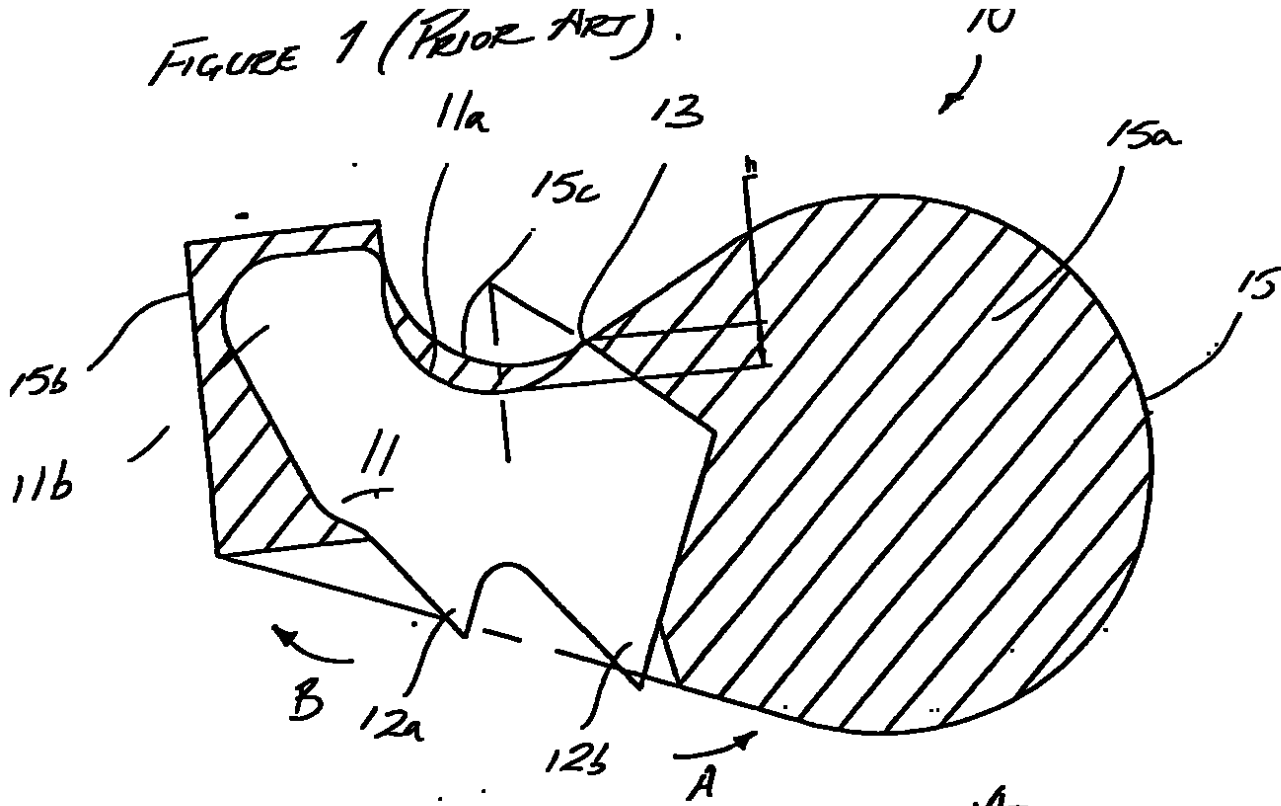
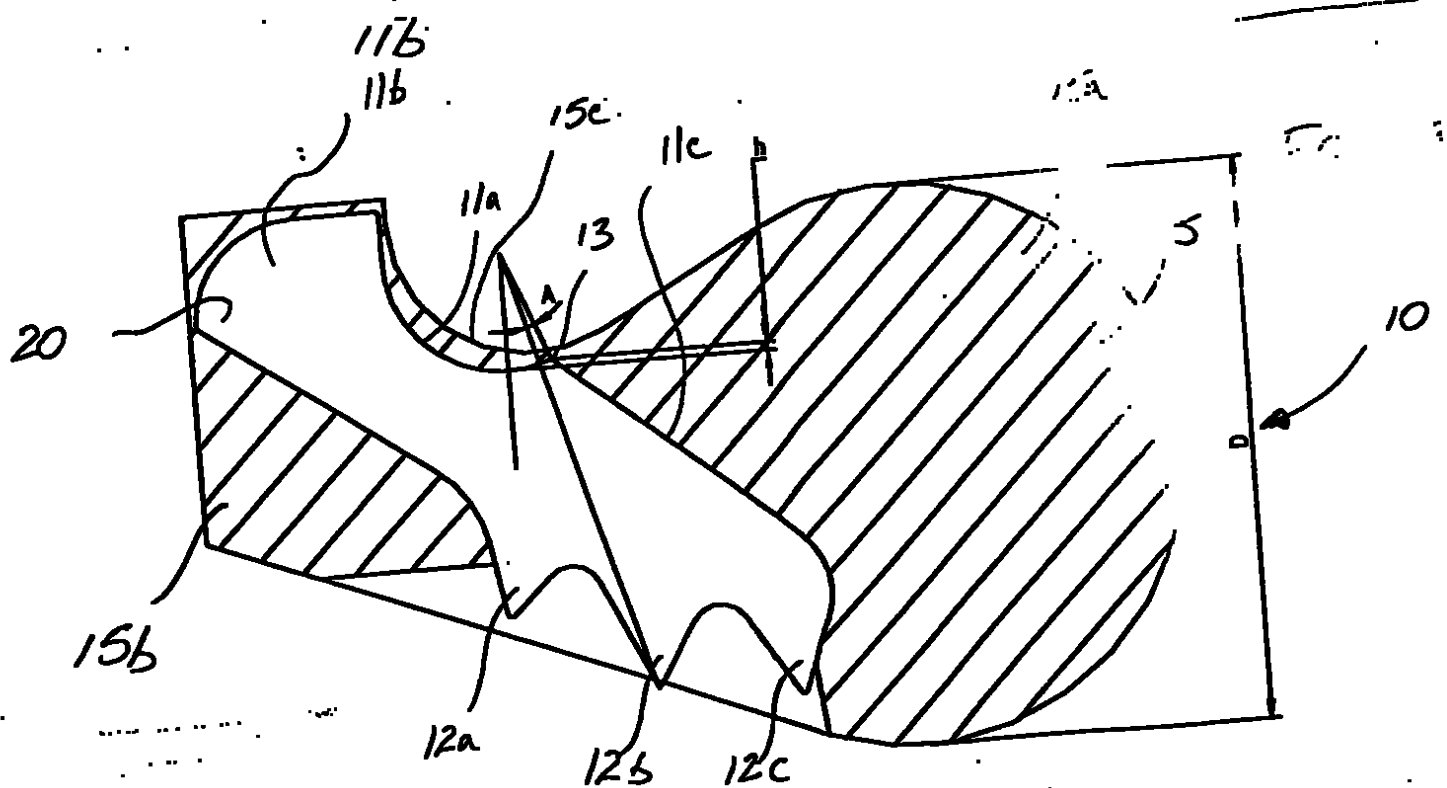
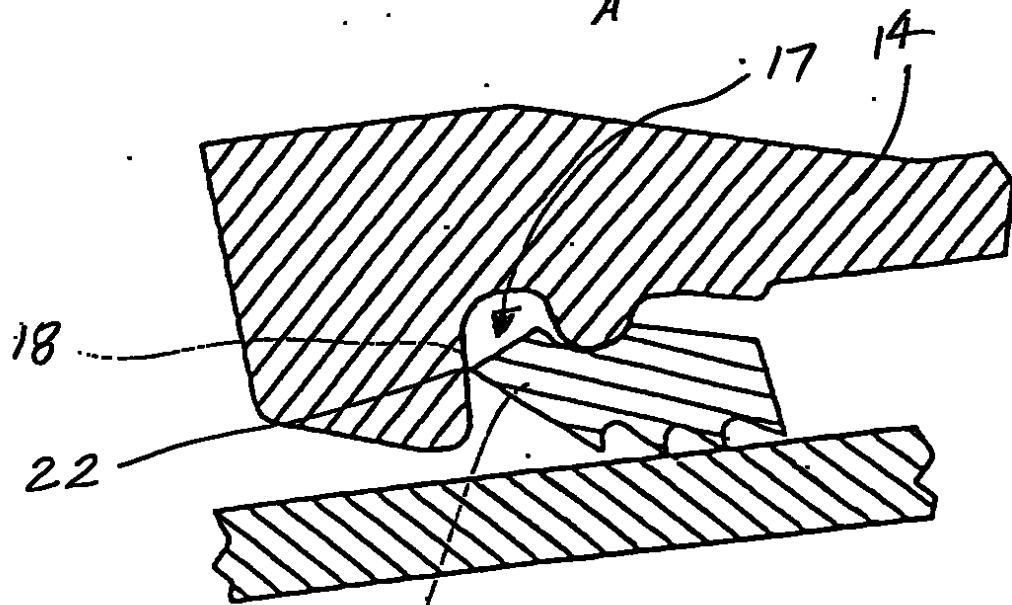


FIGURE 2 (PRIOR ART)



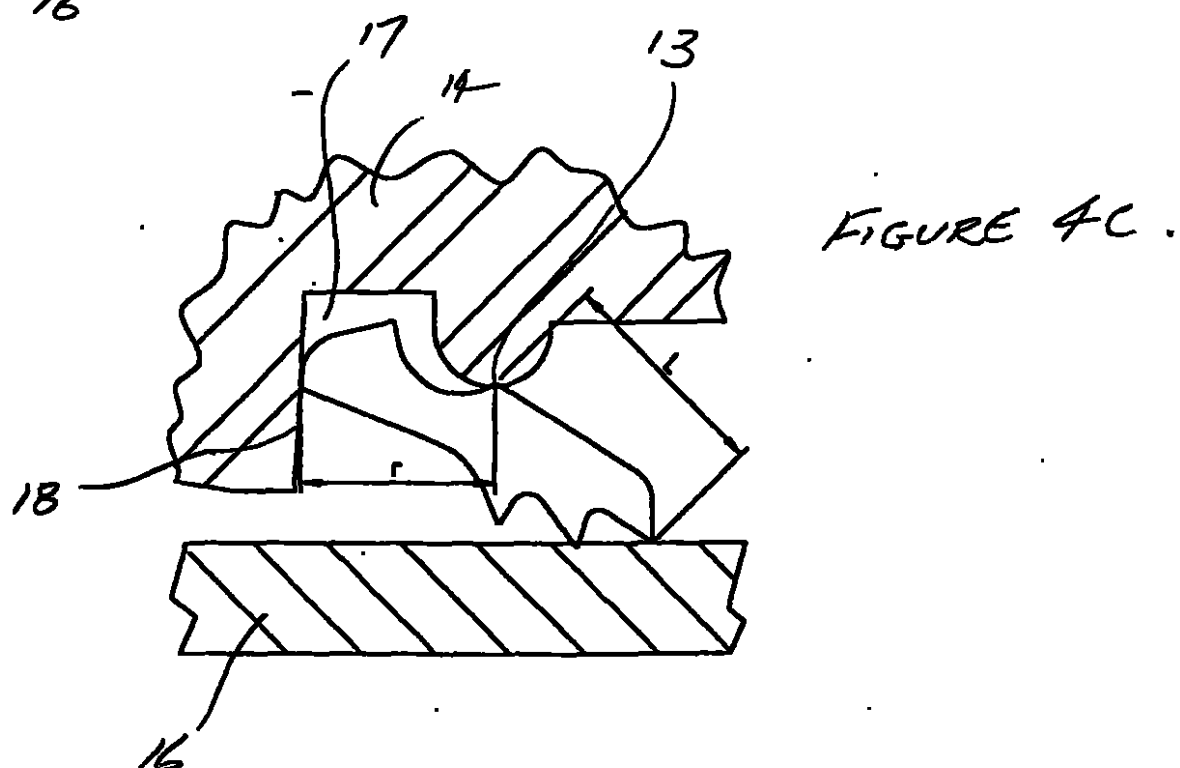
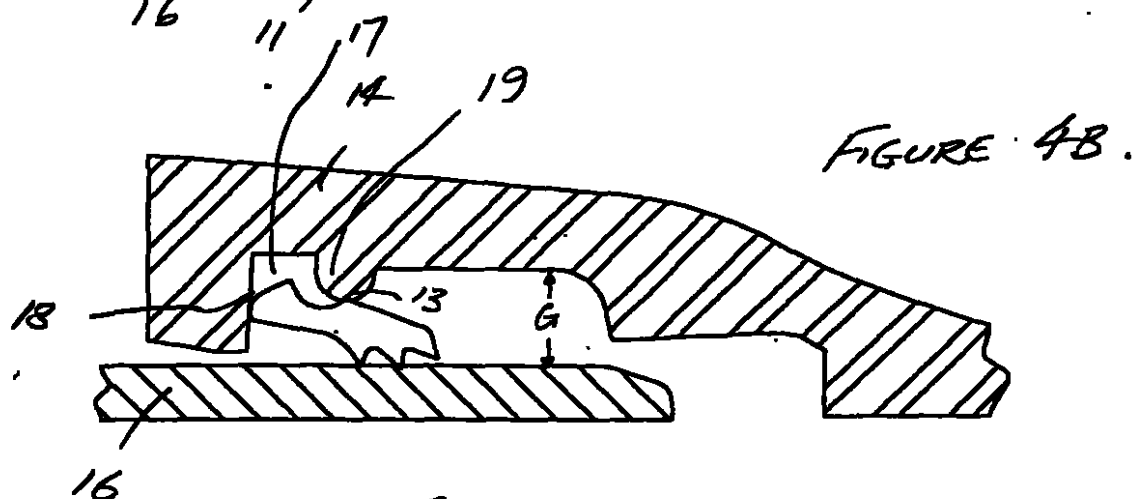
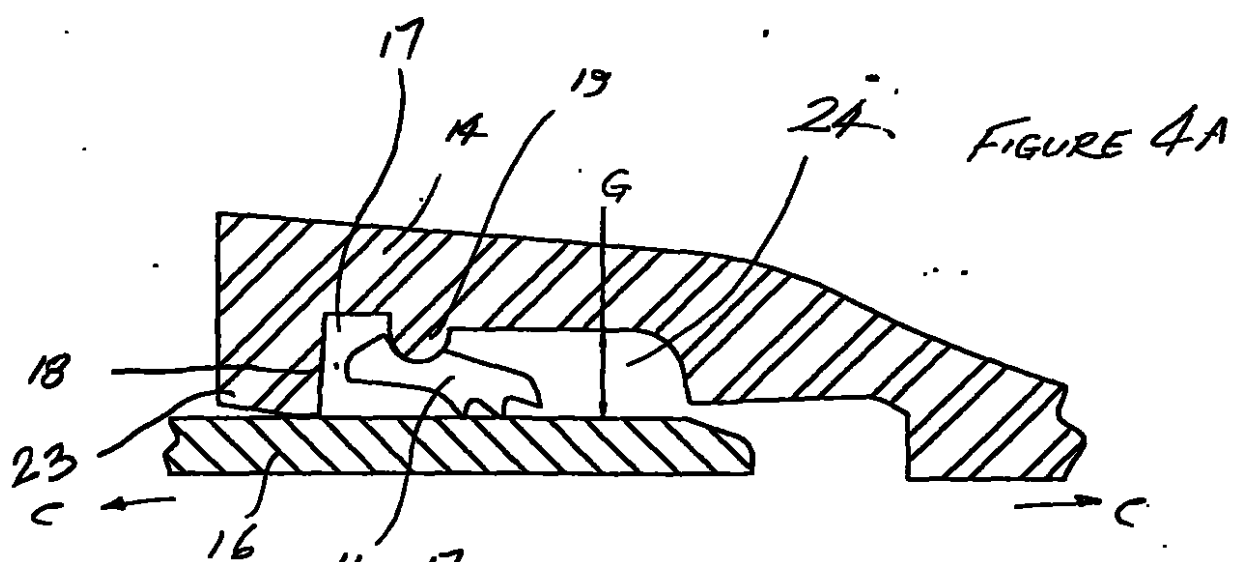


FIGURE 5A

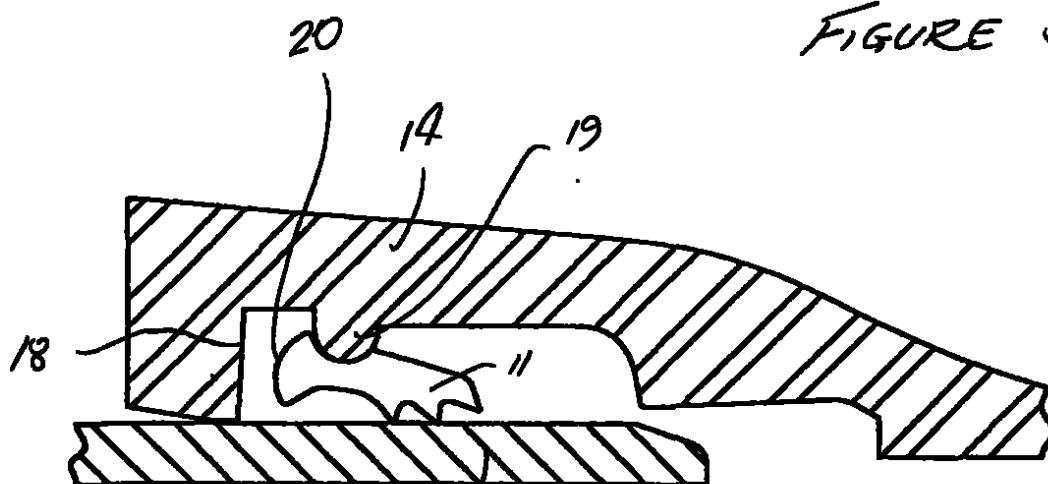


FIGURE 5B

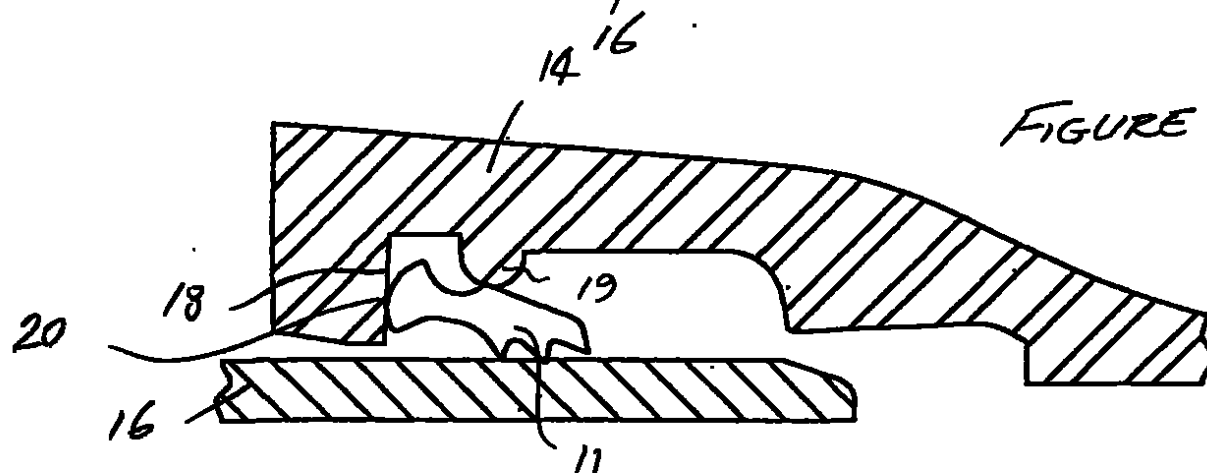


FIGURE 5C

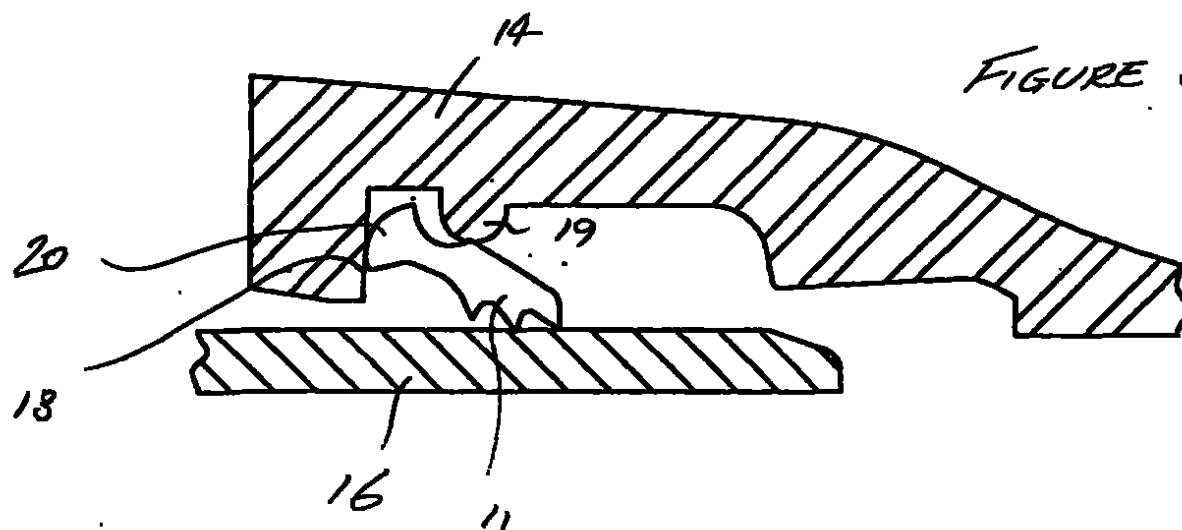
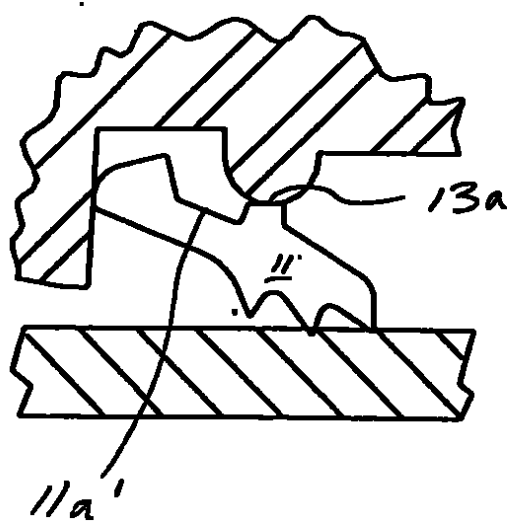


Fig 6

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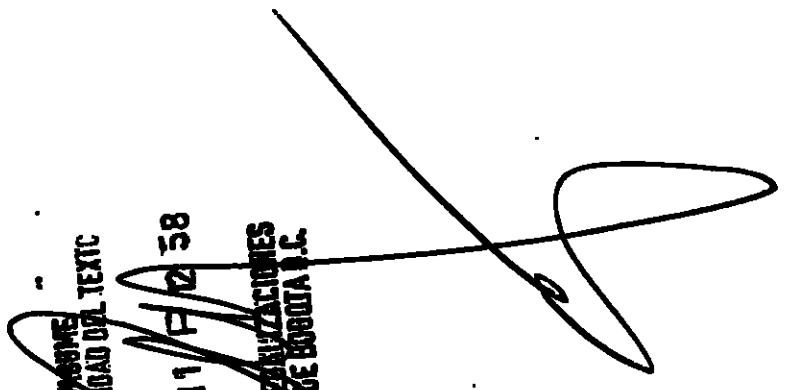
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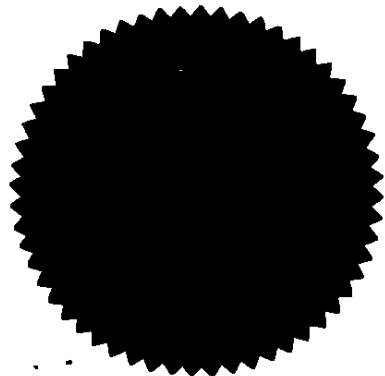
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PAUL ANTHONY COWAN
OF 14 VINE FARM CLOSE
ILKESTON, DERBYSHIRE,
DE7 4NG,
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On this sixteenth day of August 2000 personally appeared before me, a Notary Public,
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OF 14 VINE FARM CLOSE,
ILKESTON, DERBYSHIRE,
DE7 4NG,
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to me known and known to me to be the person described in and who executed the foregoing document, and he duly acknowledged to me that he executed the same for the uses and purposes therein expressed.

NOTARY PUBLIC (Notario Público) M. S. Cobbett
MICHAEL STUART COBBETT
35 Dairy Road, Long Eaton,
Derbyshire, England,
United Kingdom

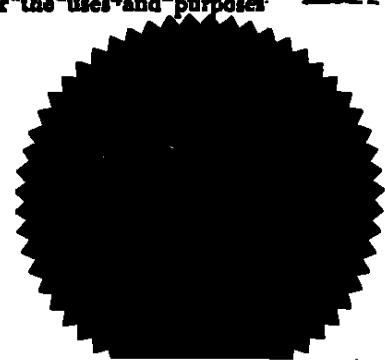


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A los ^{dieciseis} días del mes de agosto de 2000 , compareci personalmente ante mi, Notario Público,
WILLIAM WALTER STEVENS
OF 11 GORDON ROAD,
BORROWASH
DERBY, DE72 3JX,
UNITED KINGDOM
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On this sixteenth day of August 2000 personally appeared before me, a Notary Public,
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DERBY, DE72 3JX,
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to me known, and known to me to be the person described in and who executed the foregoing document, and he duly acknowledged to me that he executed the same for the uses and purposes therein expressed.

NOTARY PUBLIC (Notario Público) M. S. Cobbett
MICHAEL STUART COBBETT
35 Dairy Road, Long Eaton,
Derbyshire, England,
United Kingdom



ASSIGNMENT

The undersigned,

Paul Anthony COWAN

William Walter STEVENS



domiciled in

14 Vine Farm Close, Ilkeston
Derbyshire, DE7 4NG, United Kingdom

11 Gordon Road, Borrowash
Derby, DE72 3JX, United Kingdom

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A GASKET FOR SECURING PIPES OR PIPE
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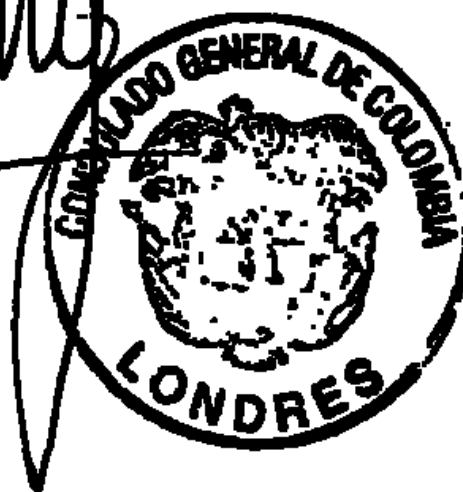
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