

(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. AU 199918572 B2
(10) Patent No. 743533

(54) Title
Clampable pipe coupling

(51)⁷ International Patent Classification(s)
F16L 037/08

(21) Application No: **199918572**

(22) Application Date: **1999.03.03**

(30) Priority Data

(31) Number	(32) Date	(33) Country
29803713	1998.03.04	DE

(43) Publication Date : **1999.09.16**

(43) Publication Journal Date : **1999.09.16**

(44) Accepted Journal Date : **2002.01.31**

(71) Applicant(s)
Rasmussen GmbH

(72) Inventor(s)
Reiner Schreiter

(74) Agent/Attorney
SPRUSON and FERGUSON,GPO Box 3898,SYDNEY NSW 2001

(56) Related Art
US 4842306
US 4898407
DE 411952

Clampable Pipe Coupling

Abstract

A pipe coupling axially connects two pipes [3] having a smooth outer surface. The pipe coupling includes a first split circular ring [12] and a second split circular ring [12]. The first and the
5 second split circular rings are each made from a metal strip. Each of the strips have a radial inner edge surrounding the ends of the pipes. A plurality of teeth [13] are disposed at the radial inner edge of the strips. The teeth are disposed in the plane of the respective rings. A free end of the tooth penetrates into the pipe when the coupling is in the clamped position. The teeth of the first ring extend at an angle relative to the teeth of the second ring. A side [19] of each tooth facing toward the pipe
10 inserted in the coupling encloses an acute angle $[\beta]$ with an end surface [2] of the free end of the tooth.

AUSTRALIA
PATENTS ACT 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name and Address
of Applicant:

Rasmussen GmbH
Edisonstrasse 4
D-63477 Maintal
GERMANY

Actual Inventor(s): Reiner Schreiter

Address for Service: Spruson & Ferguson, Patent Attorneys
Level 33 St Martins Tower, 31 Market Street
Sydney, New South Wales, 2000, Australia

Invention Title: Clampable Pipe Coupling

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

Clampable Pipe Coupling

Background of the Invention

1. Field of the Invention

The present invention relates to a clampable pipe coupling to axially connect two pipes having
 5 a smooth outer surface. The coupling includes split annular or ring-shaped elements that are made from a metal strip. The rings have a radially inner edge that, in the clamped position, surrounds the pipe ends. The radially inner edge of the rings have teeth that extend in the plane of the ring. The free ends of the teeth penetrate into the pipe material when the pipe coupling is in the clamped position. The teeth penetrating into one pipe extend at an angle relative to the longitudinal axis of the pipe and
 10 also extend at an angle relative to the teeth that engage in the other pipe. A side of each tooth facing toward the pipe inserted in the coupling encloses an acute angle with an end surface of the free end of the tooth.

2. Discussion of the Related Arts

Conventional pipe couplings have teeth (which are also referred to as "claws") that are
 15 configured like pointed sawteeth. Circumferentially neighboring edges of the sawteeth are V-shaped. A radial inner front face of the sawteeth is inclined relative to the longitudinal axis of the pipes that are joined by the coupling. The pointed tips of these teeth penetrate deeply into the pipe material, even metal pipes, thereby preventing the pipe ends from slipping out of the coupling when the pipes are subject to a high internal pressure. If the teeth are made of a sufficiently rigid material, with increasing
 20 internal pressure, the pipes will try to separate, which causes the teeth to move from their radially inclined position relative to the longitudinal axis toward a position where the teeth are normal to the longitudinal axis. In other words, the teeth tend to stand up radially as the pipes attempt to move apart due to internal pressure. As the teeth stand up, their grip and depth of penetration into the pipe around the perimeter of the pipe intensifies, thereby ensuring the axial integrity of the pipe connection
 25 in spite of rising internal pressure. But in the case of very high internal pressures, the teeth bend because they are not strong enough. The bending of the teeth is mostly due to their tapered, pointed ends. If the pipes are made from a softer material (e.g., plastic), under very high internal pressures, the pipes can be pressed apart axially because the teeth's pointed tips do not remain penetrated within the pipes, but form V-shaped axial grooves in the outer surface of the pipes.

Summary of the Invention

30 It is an object of the present invention to provide a pipe coupling that has teeth which have greater strength and flexural stiffness, and substantially prevent the formation of axial grooves in the outer surface of the pipes even if the pipes are made of a relatively soft material.

According to an exemplary embodiment of a pipe coupling according to the present invention,
 35 this and other objects are achieved with a split circular ring, which has a radial inner edge surrounding the end of the pipe to be clamped. The radial inner edge extends transversely with respect to the longitudinal axis of the pipe coupling. Teeth are disposed at the radial inner edge of the split circular ring. A side of each tooth faces the outside surface of the pipe inserted in this side of the coupling. This side of the tooth encloses an acute angle (β) with an end surface of the tooth that adjoins this

side. The free end of the teeth on one side of the pipe coupling are level with the free end of the teeth on the other side of the pipe coupling.

In this exemplary embodiment of a pipe coupling the teeth, when viewed in the axial direction, do not form V-shaped points. Therefore, the teeth are unable to tear grooves into the pipe material. Additionally, the teeth have an increased flexural stiffness in the vicinity of their free ends. Nevertheless, the free ends of the teeth penetrate sufficiently into the pipe material so that the pipe connection prevents the pipe ends from slipping out of the coupling even when the pipes are subject to a very high internal pressure.

Thus, the present invention provides a pipe coupling for axially connecting two pipes having a smooth outer surface, said pipe coupling comprising: a split casing adapted to be tensioned around end portions of said pipes and having radially bent in front faces at its axial ends; a first frustum-shaped split circular ring; and a second frustum-shaped split circular ring, wherein said first and said second split circular rings are each made from a metal strip, each of said strips having a radially outer edge abutting against the inner surface of each radially bent in front face and a radially inner edge surrounding the ends of the pipes in the clamped position, a plurality of teeth being disposed at said radially inner edge of said strips, said teeth being disposed in the plane of said respective rings, a free end of each of said teeth penetrating into said pipe when the coupling is in the clamped position, said free end of each of said teeth having an edge that extends tangentially with respect to a circle surrounding the central axis of said pipe coupling, said teeth of said first split circular ring extending at an angle relative to said teeth of said second split circular ring, such that side of each of said teeth which faces toward the pipe inserted in the coupling encloses an acute angle with an end surface of said free end of said tooth.

In accordance with a currently preferred exemplary embodiment of a pipe coupling according to the present invention, the acute angle (β) ranges from approximately 50° to approximately 80° , preferably approximately 70° . The side of the tooth facing the outside of the pipe that is introduced into the tooth's side of the pipe coupling encloses an angle (α) with respect to the longitudinal axis of the pipe coupling, in the range from approximately 35° to approximately 55° , preferably approximately 45° .

Brief Description of the Drawing Figures

The above and still further objects, features and advantages of the present invention will become apparent upon consideration of the following detailed description of a specific embodiment thereof, especially when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a front view, in partial cross-section, of the pipe coupling according to the present invention;

Fig. 2 is an axial side view of the pipe coupling of Fig. 1;

Fig. 3 is an axial sectional view of the pipe coupling of Fig. 1 shown in the clamped position, axially connecting two smooth surfaced pipes;

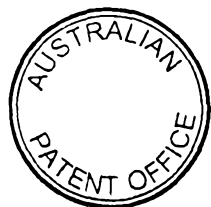
Fig. 4 is an enlarged detail of Fig. 3; and



Fig. 5 is a cross sectional view, in the proximity of a tooth, of the ring illustrated on the left in Figs. 1, 3 and 4.

Detailed Description of a Preferred Embodiment

Referring now to Figures 1-5, a pipe coupling according to the present invention is
 5 illustrated. The pipe coupling includes an outer sheet steel casing 1 that is bent into less than a complete ring (see Fig. 2). Radially bent in front faces 2 are provided at each axial end of casing 1. The inner diameter of each front face 2 is larger than the outer diameter of the pipes 3 to be connected by the pipe coupling (see Fig. 3). Casing 1 is split or open in the circumferential direction, thereby forming the incomplete ring. The free ends of casing 1 are
 10 bent radially outwardly and back, thereby forming a loop 4 at each free circumferential end of the incomplete ring (see Figs. 1 and 2). The free ends of casing 1 are attached, via buckle weldments 7, to the outer surface of casing 1 (see Fig. 1). A bolt 5, 6 is inserted in each loop 4. Each loop 4 has a slot 8 that extends around a major portion of each bolt 5, 6 (see Fig. 1). Each bolt 5,6 has a through bore that is located in an area corresponding to the location of
 15 slot 8 in the assembled position. The through bore in bolt 6 is threadless, whereas the through bore in bolt 5 is threaded. A headed clamping screw 9 extends through each slot 8 and the



through bore in bolts 5,6. A threaded shaft of clamping screw 9 mates with the internally threaded through bore in bolt 5. Each clamping screw 9 has a socket head 10 with a shoulder that abuts against a flared pocket 11 at the end of the through bore in bolt 6 that faces head 10 in the clamped position.

5 A radially outer edge of a frustum-shaped, circumferentially discontinuous ring 12 abuts against the inner surface of each radially bent in front face 2 of casing 1. The free ends 14 of each ring 12 overlap in the circumferential direction (see Fig. 2). Rings 12 are shaped from a metal strip. Teeth 13 are disposed at the radially inner edge of rings 12. Teeth 13 are disposed in the plane of the metal strip forming rings 12.

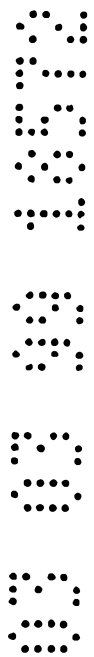
10 An elastomer gasket 15 is disposed radially inside of casing 1 (see Figs. 3 and 4). The axial ends of gaskets 15 form sealing lips 16 and 17 that protrude radially inwardly. In the clamped position, sealing lips 16, 17 press against the outside of pipes 3. A sheet-metal ring 18 is located between lip seals 16. Ring 18 is disposed radially inside of a middle portion of gasket 15. Ring 18 is a split ring in the circumferential direction and has free end sections that overlap each other in the circumferential
15 direction. Ring 18 ensures, in the clamped position, that the material of elastomer gasket 15 will not squeeze between the ends of the pipes 3. The gap between the two ends of the circular casing 1 is spanned by a bridge which abuts against the outer circumference of gasket 15 and is overlapped by the end sections of the casing 1.

As illustrated in Figs. 3-5, ring 12, including its teeth 13, are inclined relative to the pipe by an
20 angle α between about 35° and about 55° , preferably about 45° . The side 19 of each tooth 13 that faces toward the pipe 3 that is inserted in the side of the pipe coupling having this ring 12 encloses an angle β with an end surface 20 of the free end of the tooth 13. Angle β ranges from approximately 50° to approximately 80° , preferably approximately 70° . The free end of each tooth has a sharp edge tip 21 formed by the intersection of side 19 and end surface 20. Sharp edge tip 21 is a circumferential
25 edge that extends transversely with respect to an axis of the pipe coupling. Sharp edge tip 21 is arcuate in shape, but because the circumferential length of the edge 21 is relatively small, edge 21 is substantially straight.

When the coupling is in the clamped position, teeth 13 with their tips 21 disposed at their free ends, penetrate into the pipe material as shown in Figs. 3 and 4. Thus, teeth 13 prevent pipes 3 from
30 pulling apart when there is high internal pressure in the pipes 3. Moreover, rings 12 along with teeth 13 have a tendency to stand up radially as the pipes 3 attempt to move apart due to the internal pressure. Thus, as a result of increasing internal pressure, teeth 13 will penetrate even more deeply into the pipe material, thereby increasing the axial load capacity of the pipe connection provided by the coupling as the internal pressure increases. Because teeth 13 penetrate into the pipe material, the
35 formation of axial grooves in pipes 3 due to teeth 13 moving axially is avoided.

Having described the presently preferred exemplary embodiment of a clampable pipe coupling in accordance with the present invention, it is believed that other modifications, variations and changes will be suggested to those skilled in the art in view of the teachings set forth herein. For example, the front faces 2 may not extend precisely radially, but may be bent in an axial relation with
40 respect to one another. Rings 12 are preferably provided with teeth 13 that are configured to bite into

the pipe material. Additional rings 12 may also be used. In certain instances, rings 12 may not be needed, with the front faces 2 alone constituting appropriate rings. Alternatively, the inside of casing 1 may be equipped with a dual row of serrated rings, with the teeth of each ring angled either in the same direction or in opposite directions relative to the longitudinal axis. It is, therefore, to be understood that all such modifications, variations, and changes are believed to fall within the scope of the present invention as defined by the appended claims.



The claims defining the invention are as follows:

1. A pipe coupling for axially connecting two pipes having a smooth outer surface, said pipe coupling comprising: a split casing adapted to be tensioned around end portions of said pipes and having radially bent in front faces at its axial ends; a first frustum-shaped split circular ring; and a second frustum-shaped split circular ring, wherein said first and said second split circular rings are each made from a metal strip, each of said strips having a radially outer edge abutting against the inner surface of each radially bent in front face and a radially inner edge surrounding the ends of the pipes in the clamped position, a plurality of teeth being disposed at said radially inner edge of said strips, said teeth being disposed in the plane of said respective rings, a free end of each of said teeth penetrating into said pipe when the coupling is in the clamped position, said free end of each of said teeth having an edge that extends tangentially with respect to a circle surrounding the central axis of said pipe coupling, said teeth of said first split circular ring extending at an angle relative to said teeth of said second split circular ring, wherein that side of each of said teeth which faces toward the pipe inserted in the coupling encloses an acute angle with an end surface of said free end of said tooth.
2. The pipe coupling according to claim 1, wherein said acute angle ranges from approximately 50° to approximately 80°.
3. The pipe coupling according to claim 2, wherein said acute angle is approximately 70°.
4. The pipe coupling according to claim 1, wherein said side of each of said teeth encloses a second acute angle with respect to a longitudinal axis of the pipes.
5. The pipe coupling according to claim 4, wherein said second acute angle ranges from approximately 35° to approximately 55°.
6. The pipe coupling according to claim 5, wherein said second acute angle is approximately 45°.
7. The pipe coupling according to claim 2, wherein said side of each of said teeth encloses a second acute angle with respect to a longitudinal axis of the pipes.
8. The pipe coupling according to claim 7, wherein said second acute angle ranges from approximately 35° to approximately 55°.
9. The pipe coupling according to claim 8, wherein said second acute angle is approximately 45°.
10. A pipe coupling for axially connecting two pipes having a smooth outer surface, substantially as hereinbefore described with reference to the accompanying drawings.

35

Dated 30 November 2001

RASMUSSEN GMBH

Patent Attorneys for the Applicant/Nominated Person

SPRUSON&FERGUSON

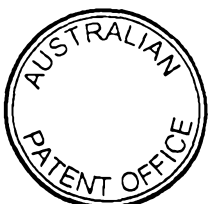


Fig. 1

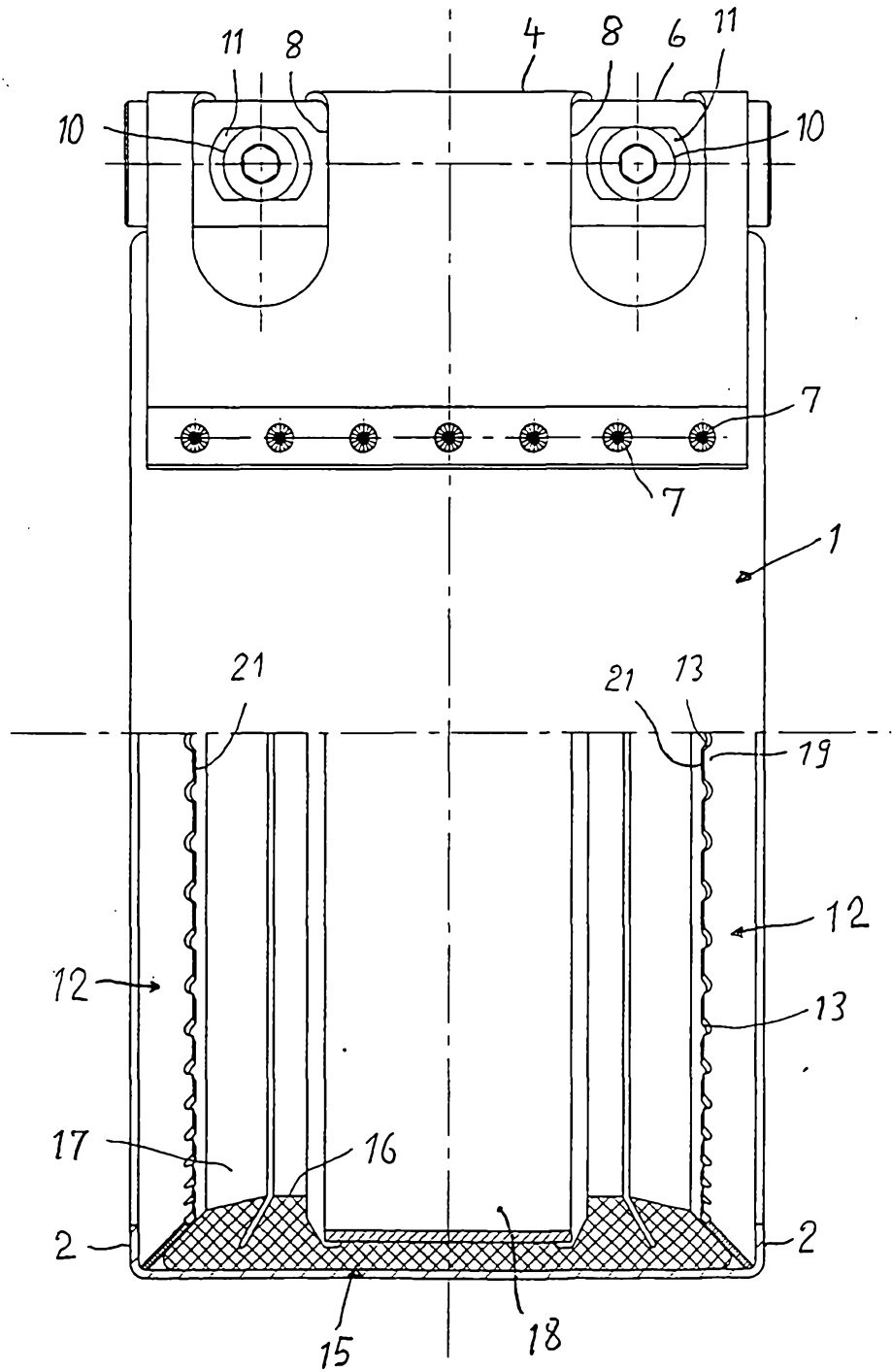


Fig.2

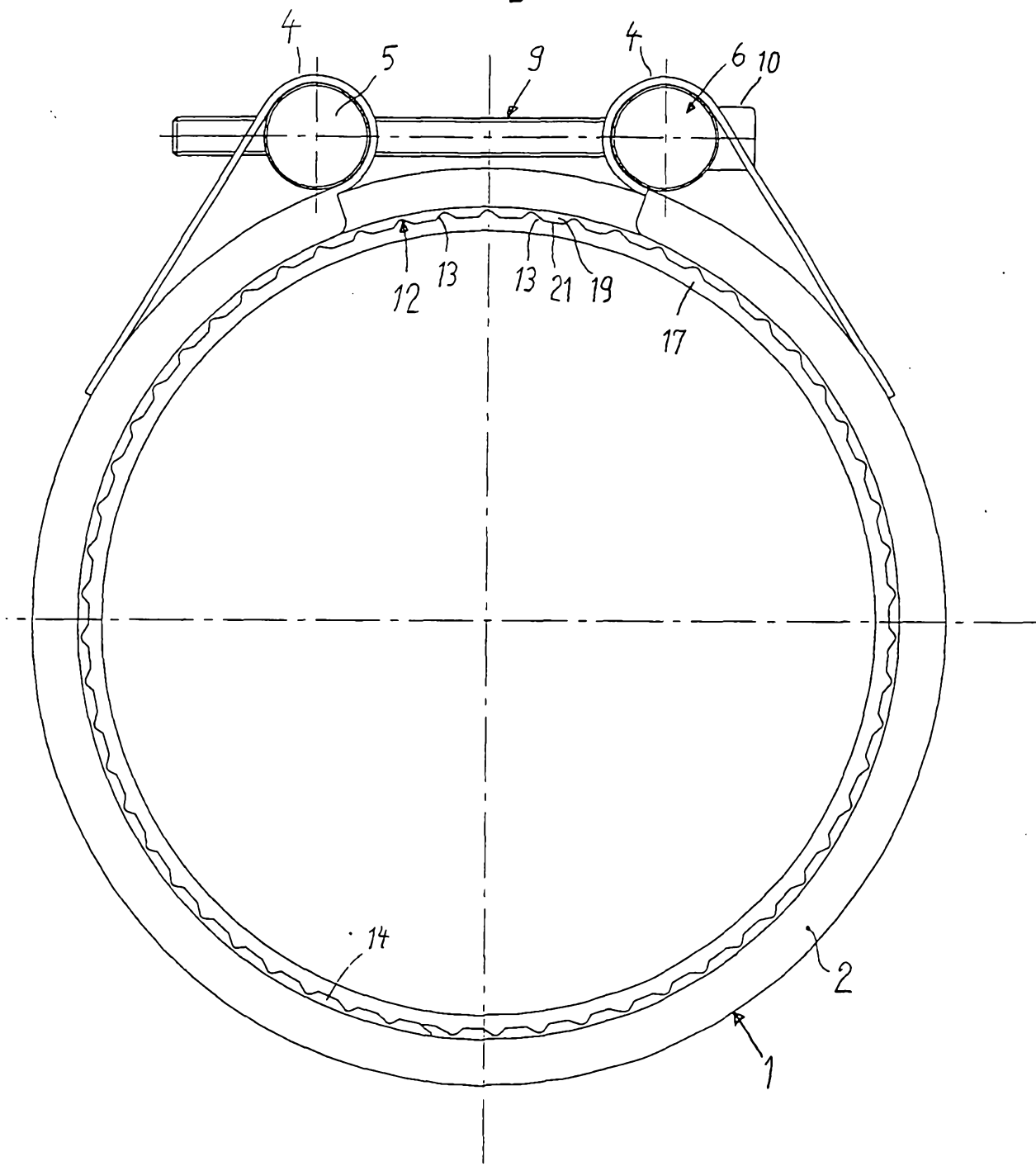


Fig.3

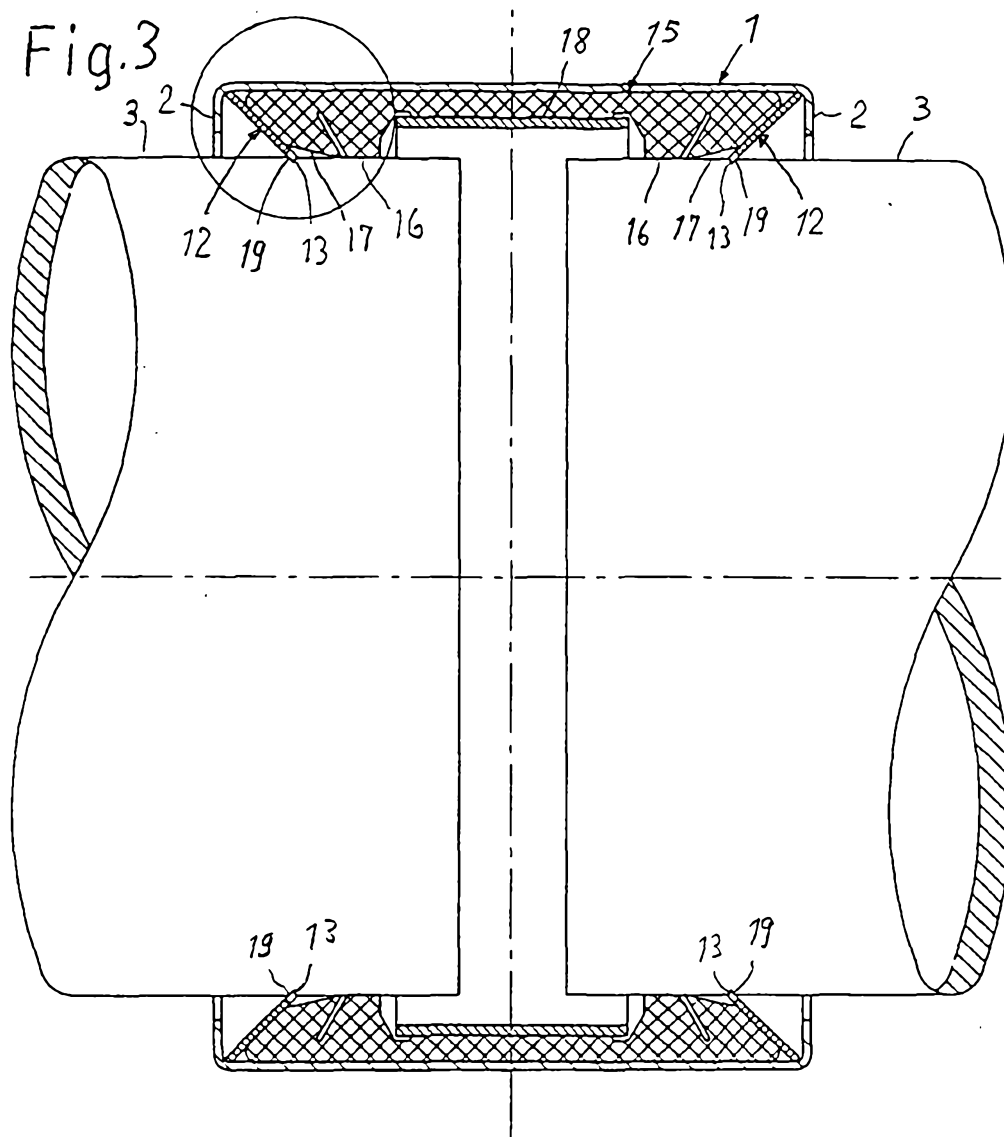
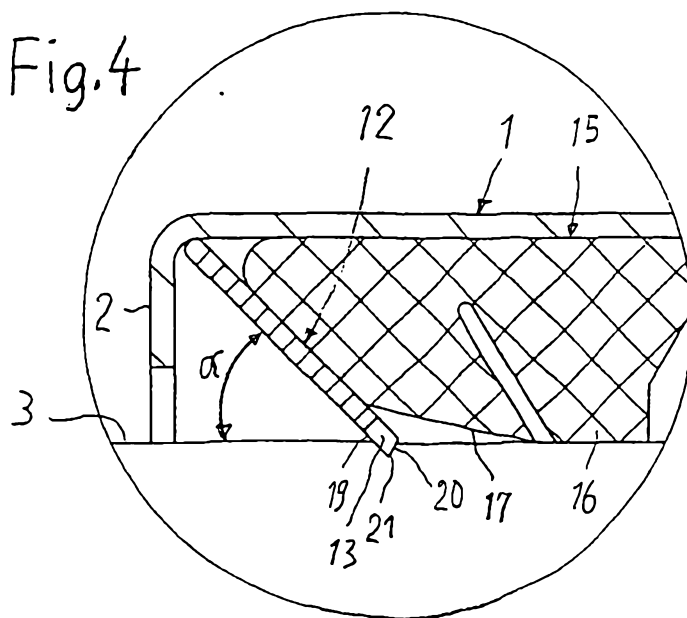


Fig.4



Radial

Fig. 5

