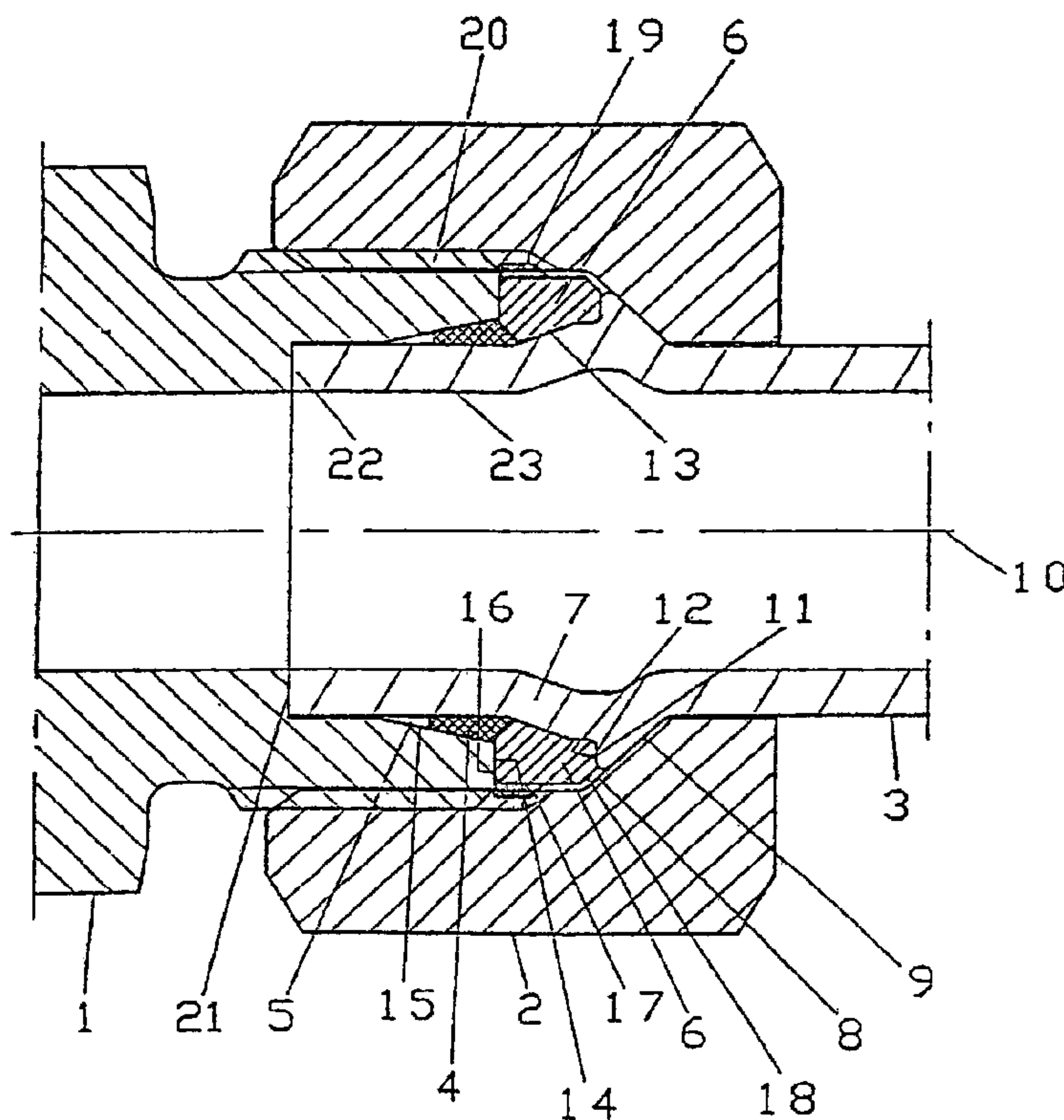




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(54) Titre : RACCORD DE TUYAU ET SON PROCEDE DE REALISATION  
 (54) Title: PIPE CONNECTOR AND METHOD FOR PRODUCTION THEREOF



(57) Abrégé/Abstract:

The invention relates to a pipe connector for a pressure-resistant, positive-fit, high pressure screwed joint, comprising a formed tube, a screw body or connector branch with a cone, which connects to a parallel axis drilling, with a radial end surface, a union nut, a sealing ring and a retaining ring, whereby the formed tube has a parallel axis end-piece with the same tube diameter and which corresponds to the depth of the tube seat base. The formed tube (3), with a pronounced bead (7), forms a mating face (9), with the cone surface (8) of the union nut (2), which leads to an abutment face (11), for a front face (12) of the retaining ring (6), essentially aligned with the tube axis (10). The retaining ring (6) has a radial ring surface (14), which, in the assembled state, contacts with the front face (16) of the cone of the connector branch (1) or screw body and thus permits a block assembly.

**ABSTRACT**

The invention relates to a pipe connector for a pressure-resistant, positive-fit, high pressure screwed joint, comprising a formed tube, a screw body or connector branch with a cone, which connects to a parallel axis drilling, with a radial end surface, a union nut, a sealing ring and a retaining ring, whereby the formed tube has a parallel axis end-piece with the same tube diameter and which corresponds to the depth of the tube seat base. The formed tube (3), with a pronounced bead (7), forms a mating face (9), with the cone surface (8) of the union nut (2), which leads to an abutment face (11), for a front face (12) of the retaining ring (6), essentially aligned with the tube axis (10). The retaining ring (6) has a radial ring surface (14), which, in the assembled state, contacts with the front face (16) of the cone of the connector branch (1) or screw body and thus permits a block assembly.

PIPE CONNECTOR AND METHOD FOR PRODUCTION THEREOF

The invention concerns a pipe connection for a pressure-resistant and tearout-resistant and positively locking high-pressure screw joint comprising a deformed pipe, a screw body or a connecting portion having a cone adjoined by an axis-parallel bore having a radial end face as a pipe seat bottom for the pipe which is inserted into the screw body, a sealing ring, and a union nut which engages over the deformed pipe formed with a bead and which in the assembled condition is screwed on to the screw body and which at its inner cone, with the bead of the deformed pipe, forms a contact surface which is inclined with respect to the axis of the pipe, wherein on its side that is towards the screw body the bead has an abutment surface which is oriented radially with respect to the axis of the pipe.

A pipe connection of that kind is described in DE 19520099 A1 on which the classifying portion of the main claim is based. In the known pipe connection the end face on the cone of the screw body bears directly against the abutment surface of the bead, which is oriented radially with respect to the axis of the pipe and which is provided on the bead-like outwardly bulged portion produced by deformation of the pipe. If in the assembled condition of the pipe connection the union nut which is screwed onto the screw body presses with the contact surface provided on its inner cone against the side or surface of the bead which is remote from the screw body, and thereby draws the deformed pipe into the screw body, that involves the disadvantage that, if the union nut is tightened excessively, particularly when dealing with thin-gauge pipes, the bead with the contact surfaces which bear on the one hand against the cone of the union nut and on the other hand against the screw body becomes unstable and compressed, with the consequence that the hollow space between the contact surfaces of the pipe bead



collapses. That can entail deformation of the pipe with component damage for example due to tearing of the pipe wall.

5 A pipe connection of a different structure is described in DE  
19742917 Cl. In that case the bead on the deformed pipe is in  
the form of a substantially symmetrical bulge with contact  
surfaces which are inclined uniformly with respect to the axis  
of the pipe towards both sides in the direction of that axis.  
Arranged between the bulge-like bead and the screw body is a  
10 retaining ring which with its radial end face towards the screw  
body bears directly against the end face of the cone of the  
screw body. The union nut which engages over the retaining ring  
bears in turn with a portion of its inner contact surface of  
the cone against the associated contact surface of the  
15 bulge-shaped bead and with a further portion directly against  
a surface correspondingly arranged on the retaining ring, so  
that the retaining ring transmits the force exerted by the  
union nut in the assembled condition directly from the union  
nut to the screw body. In that way, the bead of the deformed  
20 pipe is scarcely involved in the transmission of force. That  
design configuration suffers from the disadvantage that the  
bulge-like bead has to be produced on the deformed pipe with  
a high degree of accuracy because otherwise the immediate  
transmission of force between the union nut and the screw body,  
25 by way of the retaining ring, is interrupted for example by the  
retaining ring and/or the union nut previously bearing against  
an imprecisely worked bulge-like bead. That situation also  
involves either unwanted deformation of the bead or  
disadvantageous play in the region of the pipe connection.

30

Therefore the invention is based on the problem of developing  
a pipe connection of the general kind set forth in such a way  
that a secure pipe connection is afforded in any assembly  
condition.

35

The solution to that problem is set forth in claim 1; advantageous configurations and developments of the invention are set forth in the appendant claims.

5 The invention provides more specifically that arranged between an end face of the cone of the screw body and the bead of the deformed pipe is a retaining ring which has the union nut engaging thereover and which in the assembled pipe connection bears with a first end face directly against the abutment  
10 surface of the bead and with a second end face directly against the end face of the cone, and that the cone of the union nut extends as far as the screw-threaded bore of the union nut and in the assembled condition, with its ring surface extending parallel to the cone of the union nut, the retaining ring forms  
15 an annular gap relative to the cone of the union nut. In the context of the pipe connection according to the invention the bead-like deformation of the pipe is again incorporated into the transmission of force, insofar as now, by way of the radially oriented abutment surface of the bead, the force is  
20 transmitted to the retaining ring and from there directly to the screw body. The annular gap which in that case is formed at the same time between the union nut and the retaining ring prevents the union nut from coming to bear prematurely against the retaining ring and ensures that the force exerted by the  
25 union nut is transmitted to the retaining ring exclusively by way of the bead formed in the pipe.

An embodiment of the invention provides that the abutment surface of the bead runs into the outside wall of an  
30 axis-parallel end portion of the pipe, that adjoins the bead, providing a surface which is inclined with respect to the axis of the pipe, and that the inside contour of the retaining ring, that is towards the pipe bead and adjoins the first end face, bears over the full area against the surface forming the  
35 transition from the abutment surface into the pipe wall. That



entails the advantage that, in contrast to the arrangement, known from DE 19520099 A1, of an abutment surface which extends radially to the pipe wall, on the pipe bead, in accordance with the invention the corresponding abutment surface now runs into  
5 the pipe wall, providing a surface which is inclined with respect to the axis of the pipe, wherein the retaining ring bears over the full area also against that surface of the pipe wall. This means that surface is additionally also incorporated into the transmission of force between the pipe bead and the  
10 retaining ring. In addition the particular configuration of that surface on the pipe bead means that no hollow space is formed in the region of the radial abutment surface in the pipe bead so that the path involving the transmission of force between the union nut and the screw body is afforded in each  
15 case by way of solid-material components.

In accordance with an embodiment of the invention the annular gap between the union nut and the retaining ring advantageously extends to over a partial region of the cylindrical outside  
20 surface of the retaining ring.

In an advantageous development over a part of its cylindrical outside surface the retaining ring has a plastic or elastomer coating which is in the form of a carrier substance for knobs  
25 which in the assembled condition are in the region of the female screw-thread of the union nut. The knobs engage in the end region of the screw-thread of the union nut, thereby ensuring that the retaining ring captively holds the union nut together on the end of the pipe during transport of those parts  
30 to the assembly location until final assembly can begin by introducing the end of the pipe into the screw body.

An embodiment of the invention provides that in the assembled condition of the pipe connection a sealing chamber is formed  
35 between the cone of the screw body or connecting portion, the

axis-parallel end portion of the pipe and a ring surface of the retaining ring, the sealing ring in the form of an elastomer seal with pressure-supporting sealing effect being arranged in the sealing chamber, wherein it can desirably be provided that  
5 the elastomer sealing ring is fixedly connected to the retaining ring.

The excellent effect of the pipe connection according to the invention can be improved by the retaining ring being of  
10 greater strength than the pipe portion, the screw body and the union nut, wherein that greater strength can preferably be produced by a heat treatment.

An embodiment of the invention provides that an end face of the  
15 axis-parallel end portion of the deformed pipe forms a contact face with the pipe seat bottom of the screw body in the assembled condition of the connection.

In accordance with a further embodiment of the invention the  
20 metallic seal can be produced by an end face of the axis-parallel end portion of the deformed pipe having a closed annular ridge which occupies a fraction of the end face and which forms a metallic seal with the pipe seat bottom of the screw body in the assembled condition of the pipe connection.

25  
The pipe connection according to the invention permits the use of standardized components such as the union nut, wherein, with the bead of the deformed pipe, a contact surface with an inclination of  $45^\circ$  is formed with respect to the axis of the  
30 pipe.

In a further embodiment of the invention to provide a safeguard against mechanical vibration which can go by way of the pipe system and thus also by way of the pipe connection, directly  
35 adjoining the pipe deformation is a support sleeve which is



clamped to the pipe in the assembled condition by the union nut.

In a broad aspect, then, the present invention relates to a  
5 pipe connection for a pressure-resistant and tearout-resistant  
and positively locking high-pressure screw joint comprising  
a deformed pipe (3), a screw body (1) or a connecting portion  
having a cone (15) adjoined by an axis-parallel bore having a  
radial end face as a pipe seat bottom (21) for the pipe (3)  
10 which is inserted into the screw body (1), a sealing ring (4),  
and a union nut (2) which engages over the deformed pipe (3)  
formed with a bead (7) and which in the assembled condition is  
screwed on to the screw body (1) and which at its inner cone  
(8), with the bead (7) of the deformed pipe (3), forms a  
15 contact surface (9) which is inclined with respect to the axis  
(10) of the pipe (3), wherein on its side that is towards the  
screw body (1) the bead has an abutment surface (11) which is  
oriented radially with respect to the axis (10) of the pipe  
(3), characterized in that arranged between an end face (16)  
20 of the cone (15) of the screw body (1) and the bead (7) of the  
deformed pipe (3) is a retaining ring (6) which has the union  
nut (2) engaging thereover and which in the assembled pipe  
connection bears with a first end face (12) directly against  
the abutment surface (11) of the bead (7) and with a second end  
25 face (14) directly against the end face (16) of the cone (15),  
and that the cone (8) of the union nut (2) extends as far  
as the screw-threaded bore (17) of the union nut and in the  
assembled condition, with its ring surface extending parallel  
to the cone (8) of the union nut (2), the retaining ring (6)  
30 forms an annular gap (18) relative to the cone (8) of the union  
nut (2).

An embodiment of the invention which is described hereinafter  
is illustrated in the drawings in which:

35



Figure 1 shows a view in longitudinal section through an assembled pipe screw joint of an embodiment according to the invention, and

5 Figure 2 shows a side view in longitudinal section through an assembled pipe screw connection of a further embodiment with an annular ridge on the end face of the pipe end.

10 The connecting system shown in Figure 1 comprises a screw body 1 with a cone 15 which in the illustrated embodiment is in the form of a standardized  $24^\circ$  cone, a standardized union nut 2, a deformed pipe 3 and a sealing ring 4. The sealing ring preferably involves an elastomer, that is to say a polymer with  
15 rubber-elastic properties, of a profile which is adapted to the sealing chamber 5. The sealing chamber 5 is delimited by a part of the pipe 3, a retaining ring 6 and the cone 15 of the screw body 1. The pipe bead 7 which is produced by deformation is of a specific configuration, wherein the pipe bead 7, with the  
20 cone 8 of the union nut 2, forms a contact surface 9 which goes into an abutment surface 11 which is oriented substantially radially with respect to the axis 10 of the pipe, for an end face 12 of the retaining ring 6.

25 The abutment surface 11 of the pipe bead 7 with respect to the axis 10 of the pipe preferably forms a right angle as such an angle is particularly advantageous for the transmission of the forces applied. In the context of manufacturing accuracy slight deviations from such a right angle can also occur without  
30 thereby departing from the basic concept of the invention.

The inside contour 13 of the retaining ring 6, which is towards the pipe bead 7 and which extends from the abutment surface 11 of the pipe bead 7 or the end face of the retaining ring 6,  
35 directly adjoins the end face 12 and is formed on the pipe

bead.

5 The retaining ring 6 further has a radially extending ring surface 14 which in the assembled condition contacts the end face of the cone 15 of the screw body 1 and thus permits locking assembly.

10 The union nut 2 can be in compliance with a DIN standard and, with the bead 7 of the deformed pipe 3, can form a contact surface 9 at an inclination of  $45^\circ$  relative to the axis 10 of the pipe 3.

15 The cone 8 or the associated cone surface of the union nut 2 extends as far as its screw-threaded bore, wherein in the assembled condition the retaining ring 6, with its ring surface extending parallel to the cone 8 of the union nut 2, forms an annular gap 18 with the cone 8 of the union nut. The annular gap 18 between the union nut 2 and the retaining ring 6 extends over a partial region of its cylindrical outside surface.

20

Advantageously, over a part of its cylindrical outside surface, the retaining ring 6 has a plastic or elastomer coating 19 which is in the form of a carrier substance for knobs which in the assembled condition are in the region of the female screw-thread 20 of the union nut 2. With that knob coating the retaining ring 6 clings to the nut 2 during the assembly operation so that the two components are held together and cannot be removed from the pipe bead 7.

30 In a particular embodiment the elastomer sealing ring 4 is fixedly connected, for example glued, to the retaining ring 6 so that this also facilitates assembly.

35 In a further embodiment the end face 22 of the axis-parallel end portion 23 of the deformed pipe 3 forms a contact face with



the pipe seat bottom 21 of the screw body 1 in the assembled condition of the pipe connection.

5 In another embodiment of the invention the end face 22 of the pipe end portion 23 or a radial part thereof is rolled so that in special cases it is possible to achieve a metal seal with the pipe seat bottom 21.

10 The pipe connection is further improved by the retaining ring 6 being of greater strength than the pipe portion 23 including the pipe bead 7, than the screw body 1 and than the union nut 2. The proposed greater strength of the retaining ring 6 is preferably achieved by heat treatment of the retaining ring.

15 In a further embodiment of the invention there is provided a support sleeve (not shown in the drawing) which directly adjoins the pipe deformation and which is clamped to the pipe 3 by the union nut 2. In that way vibration which passes into the pipe system can be considerably damped so that such  
20 vibration can no longer exert any damaging effect in the pipe screw joint.

Figure 2 shows the same view of a pipe connection as Figure 1 but in a modified embodiment. The end face 22 of the  
25 axis-parallel end portion 23 of the deformed pipe 3 has a closed annular ridge 24 which occupies a fraction of the end face 22 and which forms a metallic seal with the pipe seat bottom 21 of the screw body 1 in the assembled condition of the pipe connection. The annular ridge 24 is subjected to a  
30 pressing effect in the assembly operation so that the arrangement here has a metallic seal.

## WE CLAIM

1. A pipe connection for a pressure-resistant and tearout-resistant and positively locking high-pressure screw joint comprising a deformed pipe (3), a screw body (1) or a  
5 connecting portion having a cone (15) adjoined by an axis-parallel bore having a radial end face as a pipe seat bottom (21) for the pipe (3) which is inserted into the screw body (1), a sealing ring (4), and a union nut (2) which engages  
10 over the deformed pipe (3) formed with a bead (7) and which in the assembled condition is screwed on to the screw body (1) and which at its inner cone (8), with the bead (7) of the deformed pipe (3), forms a contact surface (9) which is inclined with respect to the axis (10) of the pipe (3), wherein on its side  
15 that is towards the screw body (1) the bead has an abutment surface (11) which is oriented radially with respect to the axis (10) of the pipe (3), characterized in that arranged between an end face (16) of the cone (15) of the screw body (1) and the bead (7) of the deformed pipe (3) is a retaining ring  
20 (6) which has the union nut (2) engaging thereover and which in the assembled pipe connection bears with a first end face (12) directly against the abutment surface (11) of the bead (7) and with a second end face (14) directly against the end face (16) of the cone (15), and that the cone (8) of the union nut  
25 (2) extends as far as the screw-threaded bore (17) of the union nut and in the assembled condition, with its ring surface extending parallel to the cone (8) of the union nut (2), the retaining ring (6) forms an annular gap (18) relative to the cone (8) of the union nut (2).

30

2. A pipe connection according to claim 1 characterized in that the abutment surface (11) of the bead (7) runs into the outside wall of an axis-parallel end portion (23) of the pipe  
35 (3), that adjoins the bead (7), providing a surface which is inclined with respect to the axis (10) of the pipe (3), and



that the inside contour (13) of the retaining ring (6), that is towards the pipe bead (7) and adjoins the first end face (12), bears over the full area against the surface forming the transition from the abutment surface (11) into the pipe wall.

5

3. A pipe connection according to claim 1 or claim 2 characterized in that the annular gap (18) between the union nut (2) and the retaining ring (6) extends to over a partial region of the cylindrical outside surface of the retaining ring (6).

10

4. A pipe connection according to any one of claims 1 to 3 characterized in that over a part of its cylindrical outside surface the retaining ring (6) has a plastic or elastomer coating (19) which is in the form of a carrier substance for knobs which in the assembled condition are in the region of the female screw-thread of the union nut (2).

15

5. A pipe connection according to any one of claims 1 to 4 characterized in that in the assembled condition of the pipe connection a sealing chamber (5) is formed between the cone (15) of the screw body (1) or connecting portion, the axis-parallel end portion (23) of the pipe (3) and a ring surface of the retaining ring (6), the sealing ring (4) which is in the form of an elastomer seal with pressure-supporting sealing effect being arranged in the sealing chamber.

20

25

6. A pipe connection according to claim 5 characterized in that the elastomer sealing ring (4) is fixedly connected to the retaining ring (6).

30

7. A pipe connection according to any one of claims 1 to 6 characterized in that the retaining ring (6) is of greater strength than the pipe portion, the screw body (1) and the union nut (2).

35

8. A pipe connection according to claim 7 characterized in that the greater strength of the retaining ring (6) is produced by heat treatment.

5 9. A pipe connection according to any one of claims 1 to 8 characterized in that an end face (22) of the axis-parallel end portion (23) of the deformed pipe (3) forms a contact face with the pipe seat bottom (21) of the screw body (1) in the assembled condition of the connection.

10

10. A pipe connection according to any one of claims 1 to 8 characterized in that an end face (22) of the axis-parallel end portion (23) of the deformed pipe (3) has a closed annular ridge (24) which occupies a fraction of the end face (22) and  
15 which forms a metallic seal with the pipe seat bottom (21) of the screw body (1) in the assembled condition of the pipe connection.

11. A pipe connection according to any one of claims 1 to 10  
20 characterized in that adjoining the bead (7) of the deformed pipe (3) is a support sleeve which is clamped to the pipe (3) by the union nut (2).

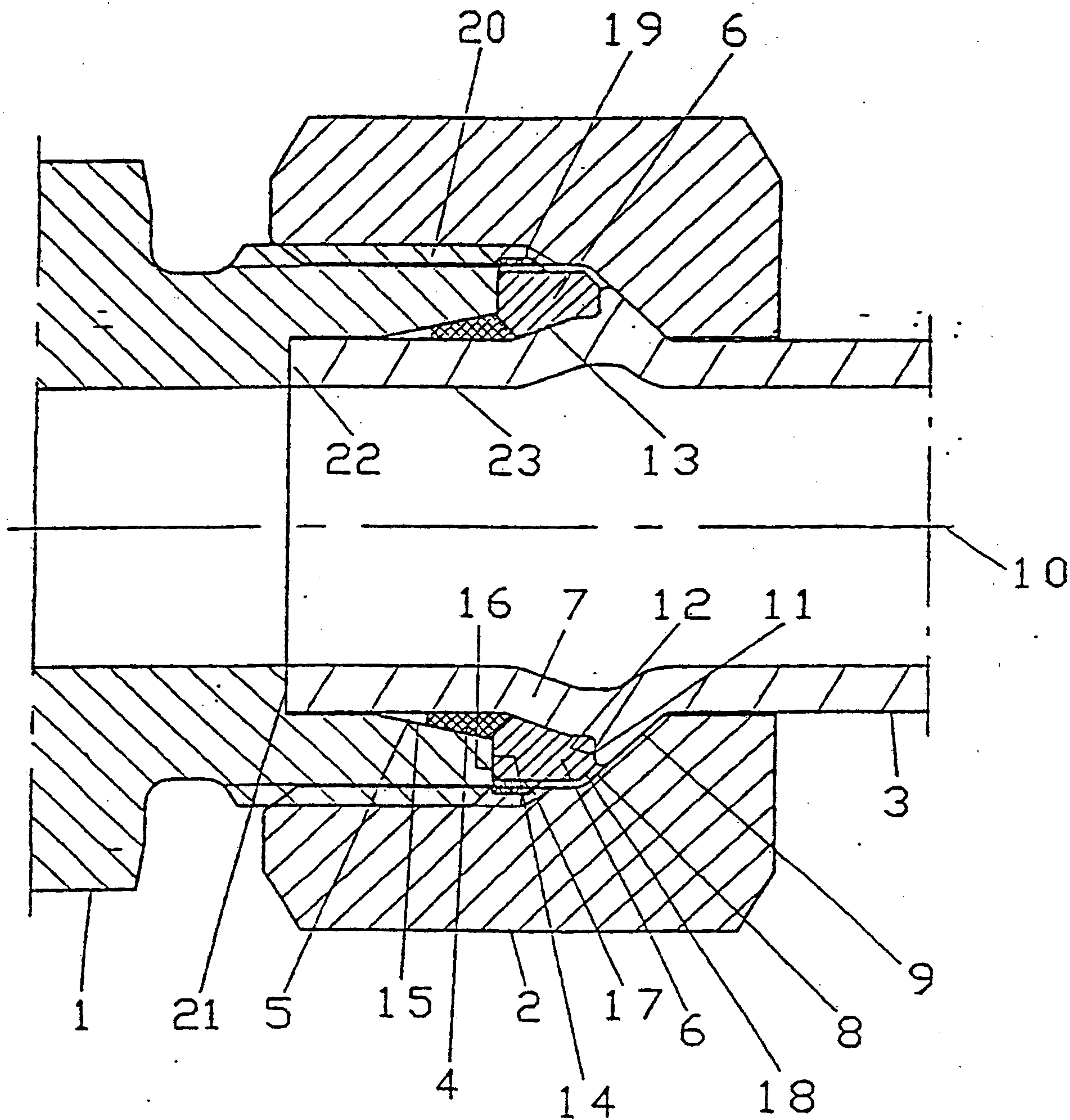


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Fig. 1



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Fig. 2

