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Description

The invention relates to a pipe sleeve with an elastic sealing means. The pipe sleeve is in particular part of a pressureless pipe system, for example a drain pipe system.

DE 10 2004 038 811 B3 shows a previously known pipe sleeve. The pipe sleeve disclosed here comprises two rigid rings which are connected via an elastic sealing ring (intermediate ring) with an inwardly projecting sealing lip. A pipe can be inserted into this pipe sleeve. The state of the art also includes conventional pipe sleeves with grooves, wherein the sealing means is inserted into the groove.

DE 31 20 266 A1 discloses a sealing ring with an annular groove in which dirt can collect.

In the recent past, sealing means have increasingly been provided with self-lubricating systems. This can be achieved by means of diffusion of a lubricant layer from the sealing material or by means of dry sliding coatings on the sealing means surface. As a result, it is no longer necessary to apply a lubricant to the pipe end to be inserted, wherein the pipe end is cleaned at the same time as the lubricant is applied. Due to possible contamination of the pipe end, this increases the risk of the pipe system leaking.

It is the object of the present invention to provide a pipe sleeve which ensures a tight connection with simple manufacture and simple assembly without cleaning of the pipe end.

The object is achieved by means of the features of the independent claims. The dependent claims have, as their object, further embodiments of the invention.

The invention shows a pipe sleeve which is used in particular for a pressureless pipe system, for example a drainage pipe system. The pipe sleeve can merge into a pipe extension via a taper, thus forming one end of a pipe. The opposite end of the pipe, which is not fitted with the sleeve, is usually referred to as the tip end and is designed to be pushed into a pipe sleeve. Furthermore, the pipe sleeve can also be an integral part of a fitting or a double sleeve, for example.

The pipe sleeve has a cylindrical base body with an opening at the front side for inserting a tip end. There is an elastic sealing means in the pipe sleeve. This sealing means in turn consists of a sealing ring and an annular sealing lip. The sealing lip is directed inwards from the sealing ring. The sealing ring is made in one piece with the sealing lip.

The entire sealing means, i.e. in particular the sealing ring and the sealing lip, are preferably of a closed annular design. The sealing means is made from a thermoplastic elastomer, for example.

The terms “elastic” and “rigid” chosen in the context of the invention refer to the elasticity and elastic deformation that occur when using the pipe sleeve, but not to the fact that a rigid element should not have any elasticity in the sense of classical mechanics.

There are essentially two embodiments for arranging this sealing means in the pipe sleeve:

According to the first embodiment, the base body of the sleeve comprises two rigid rings, which are connected via the sealing ring. The sealing means is therefore an integral part of the pipe sleeve. The sealing ring is arranged between the two rings, wherein the first ring and the second ring are connected to each other exclusively via the sealing ring. The sealing ring is preferably connected to the first ring at one end face and to the second ring at the opposite end face. The sealing ring and thus the entire sealing means is formed directly and in one piece with the first ring and the second ring. In particular, a one-piece manufacturing process is used here, in which the two rigid rings and the elastic sealing ring are moulded one behind the other in a 2-component process. Alternatively, it is also possible to bond the sealing ring to the two rigid rings or to injection-mould the sealing ring with only one of the two rigid rings in a 2-component process and bond it to the other rigid ring. The elastic sealing means, in particular the sealing ring, is preferably not limited on its radially outer side by any rigid element. This allows the sealing ring to expand radially outwards, for example when a pipe is inserted, causing the seal to deform and pre-stress.

According to the second embodiment, the sealing means is not an integral part of the base body. Instead, the base body comprises an inwardly open groove. The sealing means is inserted into this groove. The advantage of this design is that the sealing means can be replaced.

In both embodiments, both in the integral arrangement of the sealing means between the two rigid rings and in the arrangement in the groove, the sealing ring is primarily responsible for connecting the sealing means to the base body of the pipe sleeve. The annular sealing lip is directed inwards from the sealing ring. This sealing lip is folded over by the pipe to be inserted and deformed radially outwards. This causes the sealing surface of the sealing lip to come into contact with the inner pipe, thereby sealing the pipe connection.

The sealing means comprises an inserting side which is to face the opening at the front side of the pipe sleeve.

The sealing means has a plurality of dirt pockets on its inserting side, which are distributed along the circumference of the sealing means. The dirt pockets are therefore open towards the inserting side. The dirt pockets are in particular bag-shaped or pocket-shaped dirt pockets and therefore not through recesses or through holes. In particular, the dirt pockets form hollow spaces within the sealing means.

The dirt pockets open towards the inserting side have the advantage that any dirt on the tip end to be inserted can be wiped off and collected in the dirt pockets.

When assembling the pipe connection, i.e. when the dirt pockets are not yet filled, the dirt pockets have the following additional advantage: due to the dirt pockets, the sealing lip has differing thicknesses along the circumference. This creates a space for the material of the sealing means to escape during the insertion process and makes it easier to bend/fold over the sealing lip.

The dirt pockets are not located on the radially outer edge of the sealing means. The dirt pockets are located entirely in the sealing lip and not in the sealing ring. The dirt pockets are open towards the inserting side, but closed radially outwards and possibly radially inwards. The resulting edge between dirt pocket and sealing ring is pressed against the pipe surface by the contact pressure and acts like a scraper that scrapes off the dirt particles and transports them into the dirt pockets.

Most preferably, the sealing means as described herein has only the one annular sealing lip. In particular, it is provided that the complete sealing means is made in one piece and that no additional parts, such as inlaid metal parts or other parts, are provided in the sealing means. In addition, it is preferably a sealing means that is only deformed by the pipe to be inserted and acquires its elastic restoring force for the seal in this way. In particular, no other means for axial and/or radial deformation or tensioning of the sealing means is provided on the pipe sleeve. Such a simply designed sealing means is particularly suitable for use with a pressureless, plug-in pipe system.

In the following, upper and lower limits of value ranges are defined for different designs of the pipe sleeve or sealing means. It should always be understood that the upper and lower limits can be freely combined with each other.

The sealing lip has a chamfer slope on the inserting side that merges into a sealing surface. When inserting the pipe, the chamfer slope comes into contact in particular with the front side of the pipe to be inserted. This contact causes the sealing lip to fold over and the sealing lip or the entire sealing means to deform radially outwards.

The sealing surface of the sealing lip is formed radially within the chamfer slope. This sealing surface comes to rest on the outer circumference of the pipe to be inserted and provides the seal. The sealing lip supports tightness in the event of increased overpressure in that the sealing lip is additionally pressed against the pipe surface to be sealed by the applied fluid pressure.

When the sealing means is not deformed, the chamfer slope can merge radially inwards directly into the sealing surface. The dirt pockets are only positioned in the chamfer slope, but not in the sealing surface. In particular, the dirt pockets are positioned in such a way that a continuous annular sealing surface remains radially inside the dirt pockets on the sealing lip, in which no dirt pockets are formed. This means that the dirt pockets do not impair the seal.

What is more, the tip end of the pipe to be inserted is sufficiently well pre-centred and guided at the portions of the chamfer slope without dirt pockets. For example, it is particularly advantageous if the dirt pockets do not cover the entire chamfer slope, but portions of the chamfer slope remain between the dirt pockets. This has two effects that facilitate or reduce the insertion force: on the one hand, the chamfer slope improves the force transmission from the pipe to be inserted to the sealing lip and the sealing lip can be bent more easily; on the other hand, the dirt pockets allow the material of the sealing means to deflect or deform in the circumferential and radial directions, so that the sealing lip can be easily bent and deformed.

Preferably, the sealing surface is inclined with a sealing surface angle relative to the centre axis. The chamfer slope is preferably inclined at an angle to the centre axis, at least outside the dirt pockets. As the chamfer slope can merge directly into the sealing surface, the two angles (sealing surface angle and chamfer angle) can also be the same. However, the sealing lip can also be designed in such a way that these two angles differ. Both the sealing surface angle and the chamfer angle are preferably selected so that the sealing lip is inclined away from the inserting side; wherein preferably a right angle or an acute angle is provided between the sealing ring and the sealing lip on the side opposite the inserting side.

In particular, it is provided that the sealing surface angle is 10 to 80°, preferably 20 to 70°, taking into account the direction of inclination just described. Additionally or alternatively, it is provided that the chamfer angle is 10° to 80°, preferably 20° to 70°, taking into account the direction of inclination just described.

When looking at the cross-sectional area of the sealing means, it comprises portions with the largest cross-sectional area and portions with the smallest cross-sectional area. The portions with the smallest cross-sectional area run through the dirt pockets. The largest cross-sectional area of the sealing means is between the dirt pockets or at points where two adjacent dirt pockets merge.

The upper limit of the smallest cross-sectional area is in particular 98 %, preferably 95 %, particularly preferably 90 %, of the largest cross-sectional area. Additionally or alternatively, it is provided that the lower limit of the smallest cross-sectional area is 50%, preferably 60%, particularly preferably 70%, of the largest cross-sectional area.

In addition, a dirt pocket depth of the individual dirt pockets is defined as follows: the sealing means comprises a sealing means thickness in the axial direction at the thickest point. The axial direction is defined by the centre axis of the pipe sleeve, which is identical to the centre axis of the sealing means. The respective dirt pocket comprises a dirt pocket depth in axial direction at the deepest position. In particular, it is provided that the upper limit of the dirt pocket depth is 50%, preferably 40%, of the sealing means thickness. Additionally or alternatively, it is preferably provided that the lower limit of the dirt pocket depth is 5%, preferably 10%, of the sealing means thickness.

The extension of the respective dirt pocket in the circumferential direction is referred to as the “dirt pocket arc length”. The respective dirt pocket preferably has its largest recess arc length at its radially inner end. This dirt pocket arc length tapers radially outwards. The radially outwardly directed taper takes into account that the greatest effect to facilitate bending and deformation of the sealing lip can be achieved in the radially inner portion of the sealing means.

To further define the number and position of the dirt pockets, the sealing means is divided into imaginary segments along its circumference. There is at most one dirt pocket in each segment, i.e. either one dirt pocket or no dirt pocket. The segments are preferably evenly distributed. In particular, an upper limit of the respective segment angle is 45°, preferably 30°, particularly preferably 20°. For example, eight segments are provided for the segment angle of 45°. Additionally or alternatively, a lower limit of the segment angle of 3°, preferably 5°, particularly preferably 10°, is provided in particular.

The respective dirt pocket comprises a dirt pocket width. The dirt pocket width is defined by the portion of the dirt pocket with its largest dirt pocket arc length, i.e. in particular at the radially inner end of the dirt pocket. The segment arc length of the corresponding segment is also defined on the circle of the dirt pocket width. For example, if the dirt pocket width is 100% of the segment arc length, the corresponding dirt pocket extends over the entire segment at its widest point (in relation to the circumference).

In particular, the upper limit of the dirt pocket width is 100%, preferably 99%, particularly preferably 95%, of the segment arc length. Additionally or alternatively, the lower limit is in particular 20%, preferably 50%, of the segment arc length.

If the dirt pocket is designed with a dirt pocket width of 100% of the segment arc length, the adjacent dirt pockets can be directly adjacent to each other. The contact of the individual dirt pockets allows the entire circumference of the tip end to be cleaned. However, the fact that the dirt pocket arc length decreases radially outwards means that there is sufficient surface area of the sealing lip between the dirt pockets without dirt pockets and thus to provide the desired chamfer slope.

Furthermore, it is preferable that exactly one dirt pocket is arranged in each segment.

Also disclosed is a pipe system. The pipe system comprises at least the pipe sleeve described above and an associated pipe, the tip end of which can be inserted into the pipe sleeve so that the end at the front side of the pipe meets the chamfer slope when it is inserted and, after insertion, the sealing surface of the sealing lip rests in a sealing manner on the outer circumference of the inserted pipe.

Further details, advantages and features of the present invention will be apparent from the following description of embodiments based on the drawing. The following are shown:

Fig. 1 a pipe sleeve according to the invention according to an embodiment of the invention,

Fig. 2 a first view of the sealing means from Fig. 1,

Fig. 3 a detailed view of Fig. 2,

Fig. 4 the section A-A marked in Fig. 2,

Fig. 5 the section B-B marked in Fig. 2, and.

Fig. 6 an alternative embodiment of the pipe sleeve according to the invention with the sealing means.

Fig. 1 shows a pipe sleeve 100 with a rigid base body 101. In the example shown, the pipe sleeve 100 merges into a pipe extension 102 via a taper. The pipe sleeve 100 has an opening 103 at the front for inserting a further pipe. The pipe sleeve 100 shown is part of a pressureless, plug-in pipe system, for example for drainage pipes.

An inwardly open groove 104 is formed in the pipe sleeve 100. A sealing means 1 is inserted into this groove 104. The sealing means 1 is described in detail based on Figs. 2 to 5.

Both the sealing means 1 and the pipe sleeve 100 extend in closed annular fashion around a centre axis 50. The centre axis 50 also defines the directions such as axial direction, radial direction or circumferential direction.

The sealing means 1 comprises a sealing ring 2 and a sealing lip 3 in single-piece design. Both the sealing ring 2 and the sealing lip 3 are made of an elastic material and form a closed ring. The sealing ring 2 serves to hold the sealing means 1 in the groove 104 of the pipe sleeve 100. The sealing lip 3 extends radially inwards from this sealing ring 2. The side of the sealing means 1 facing the opening 103 at the front side is referred to as the inserting side 7. The sealing lip 3 is inclined away from this inserting side 7, so that an acute angle is formed between the sealing lip 3 and the sealing ring 2 on the opposite side of the sealing means. This acute angle also forms a rear cavity 6 of the sealing means 1. When a pipe is inserted and thus when the sealing lip 3 is folded over, this rear cavity 6 is reduced in size or the rear cavity 6 disappears.

As shown for example in Fig. 2 or in the detailed view in Fig. 3, the sealing means 1 can be divided into imaginary segments 15 with a respective segment angle γ. In each segment 15, there is a dirt pocket 8 on the inserting side 7, which is pocket-shaped here and is essentially located in the sealing lip 3.

The detailed illustration in Fig. 3 shows that the individual dirt pocket 8 has a dirt pocket arc length 12. The dirt pocket arc length 12 is radially inwards at its largest; the dirt pocket width 13 is defined in this portion. The dirt pocket arc length 12 of the dirt pocket 8 decreases radially outwards.

The segment arc length 14 is also defined on the circular section of the dirt pocket width 13. As explained in the general part of the description, the dirt pocket width 13 can extend for up to 100% of the segment arc length 14.

Fig. 2 shows the two sections A-A and B-B. The associated sectional views and thus the associated cross-sections of the sealing means 1 are shown in Figs. 4 and 5.

Fig. 4 shows section A-A, the portion between two recesses 8 and therefore a portion with the largest cross-sectional area. Fig. 5 shows section B-B, the cross-section through a dirt pocket 8 and therefore a portion of the sealing means 1 with the smallest cross-sectional area. The proportions of these two cross-sectional areas were defined in the general part of the description.

A combined view of Figs. 4 and 5 shows that the sealing lip 3 has a chamfer slope 4 on its inserting side 7, which merges into a sealing surface 5. The chamfer slope 4 and the sealing surface 5 are conical, annular surfaces when the sealing means 1 is not deformed.

The chamfer slope 4 has a chamfer angle β relative to the centre axis 50. The sealing surface 5 has a sealing surface angle α in relation to the centre axis 50. In the embodiment shown, as can be seen in Fig. 4, the two angles α, β are the same, as here the chamfer slope 4 merges into the sealing surface 5.

Fig. 5 shows that the dirt pocket 8 is only formed in the portion of the chamfer slope 4, but not in the portion of the sealing surface 5.

A dirt pocket depth 11 of the dirt pocket 8 is defined parallel to the centre axis 50 and extends at the deepest point of the dirt pocket 8 from the chamfer slope 4 or the imaginary extension of the chamfer slope 4 to the bottom of the dirt pocket 8. By contrast, the entire sealing means 1, also measured parallel to the centre axis 50, has a sealing means thickness of 10. The relationship between sealing means thickness 10 and dirt pocket depth 11 was previously defined in the general part of the description.

Fig. 6 shows an alternative embodiment of the pipe sleeve 100. Here, the base body 101 comprises two rigid rings 110, 111. The two rigid rings 110, 111 are connected to each other via the sealing ring 2, also known as the intermediate ring. In particular, the two rigid rings 110, 111 and the sealing means 1 are manufactured together in a 2-component injection moulding process. As Figs. 4 and 5 show, the sealing ring 2 can be designed on its radially outer circumference in such a way that it can be inserted into the groove 104. Otherwise, however, the sealing means 1 differ insignificantly for use in the pipe sleeve 100 according to Fig. 1 or the pipe sleeve 100 according to Fig. 6.

List of reference numerals

1	Sealing means
2	Sealing ring
3	Sealing lip
4	Chamfer slope
5	Sealing surface
6	Rear cavity
7	Inserting side
8	Dirt pockets
10	Sealing means thickness
11	Dirt pocket depth
12	Dirt pocket arc length
13	Dirt pocket width
14	Segment arc length
15	Segments
50	Centre axis
100	Pipe sleeve
101	Base body
102	Pipe extension
103	Opening at the front side
104	Groove
110	First rigid ring
111	Second rigid ring
α	Sealing surface angle
β	Chamfer angle
γ	Segment angle

Patentkrav

1. Rørmuffe (100), især til et trykløst rørsystem, omfattende

- en cylindrisk basisdel (101) med en åbning (103) i enden til indstikning af et rør,
- og et elastisk tætningsmiddel (1),
- hvor tætningsmidlet (1) har en i basisdelen (101) anbragt tætningsring (2) og en fra tætningsringen (2) indadrettet, ringformig tætningslæbe (3), idet tætningsringen (2) er fremstillet i et stykke sammen med tætningslæben (3),
- hvor den mod åbningen (103) i basisdelen (101) vendende side af tætningsmidlet (1) er defineret som indstikningsside (7), **kendetegnet ved, at** tætningsmidlet (1) på sin indstikningsside (7) har et stort antal smudslommer (8), der er fordelt langs tætningsmidlets (1) omkreds,
- og at tætningslæben (3) på indstikningssiden (7) har en anløbsskråkant (4), der går over i en tætningsflade (5) på tætningslæben (3), hvor smudslommerne (8) er placerede i anløbsskråkanten (4), men ikke i tætningsfladen (5).

2. Rørmuffe ifølge krav 1, hvori

- rørmuffens (100) basisdel (101) omfatter to stive ringe (110, 111), der er forbundet via tætningsringen (2),
- eller basisdelen (101) omfatter en indadtil åben rille (104), i hvilken tætningsringen (2) er indlagt.

3. Rørmuffe ifølge krav 1 eller 2, hvori

- tætningsfladen (5) hælder med en tætningsfladevinkel (α) fra 10° til 80°, især 20° til 70°, i forhold til midteraksen (50),
- og/eller hvori anløbsskråkanten (4) uden for smudslommerne (8) hælder med en anløbsvinkel (β) fra 10° til 80°, især 20° til 70°, i forhold til midteraksen (50).

4. Rørmuffe ifølge et af de foregående krav, hvori tætningsmidlet (1) har områder med største tværsnitsareal og områder med mindste tværsnitsareal,

- idet en overgrænse for det mindste tværsnitsareal udgør 98%, fortrinsvis 95%, særlig foretrukket 90%, af det største tværsnitsareal,
- og/eller idet en undergrænse for det mindste tværsnitsareal udgør 50%, fortrinsvis 60%, særlig foretrukket 70%, af det største tværsnitsareal.

5. Rørmuffe ifølge et af de foregående krav, hvori tætningsmidlet (1) har en tætningsmiddeltykkelse (10) i aksial retning på det tykkeste sted, og den enkelte smudslomme (8) har en smudslommedybde (11) i aksial retning på det dybeste sted,

- idet en overgrænse for smudslommedybden (11) udgør 50%, fortrinsvis 40%, af tætningsmiddeltykkelsen (10),
- og/eller idet en undergrænse for smudslommedybden (11) udgør 5%, fortrinsvis 10%, af tætningsmiddeltykkelsen (10).

6. Rørmuffe ifølge et af de foregående krav, hvori udstrækningen af den enkelte smudslomme (8) i omkredsretningen er defineret som smudslomme-buelængde (12), og smudslommen (8) på sin radialt indre ende har sin største smudslomme-buelængde (12), og smudslommerne-buelængden (12) aftager radialt udad.

7. Rørmuffe ifølge et af de foregående krav, hvori der på tætningsmiddel (1) langs omkredsen er defineret segmenter (15) med hver især en segmentvinkel (γ), hvor der i hvert segment (15) er anbragt højst en smudslomme (8),

- idet en overgrænse for segmentvinklen (γ) udgør 45°, fortrinsvis 30°, særlig foretrukket 20°,
- og/eller idet en undergrænse for segmentvinklen (γ) udgør 3°, fortrinsvis 5°, særlig foretrukket 10°.

8. Rørmuffe ifølge krav 7, hvori den største smudslomme-buelængde (12) af den enkelte smudslomme (8) er defineret som smudslommebredde (13),

- idet en overgrænse for smudslommebredden (13) udgør 100%, fortrinsvis 99%, særlig foretrukket 95%, af segmentets (15) segment-buelængde (14).

Fig. 1

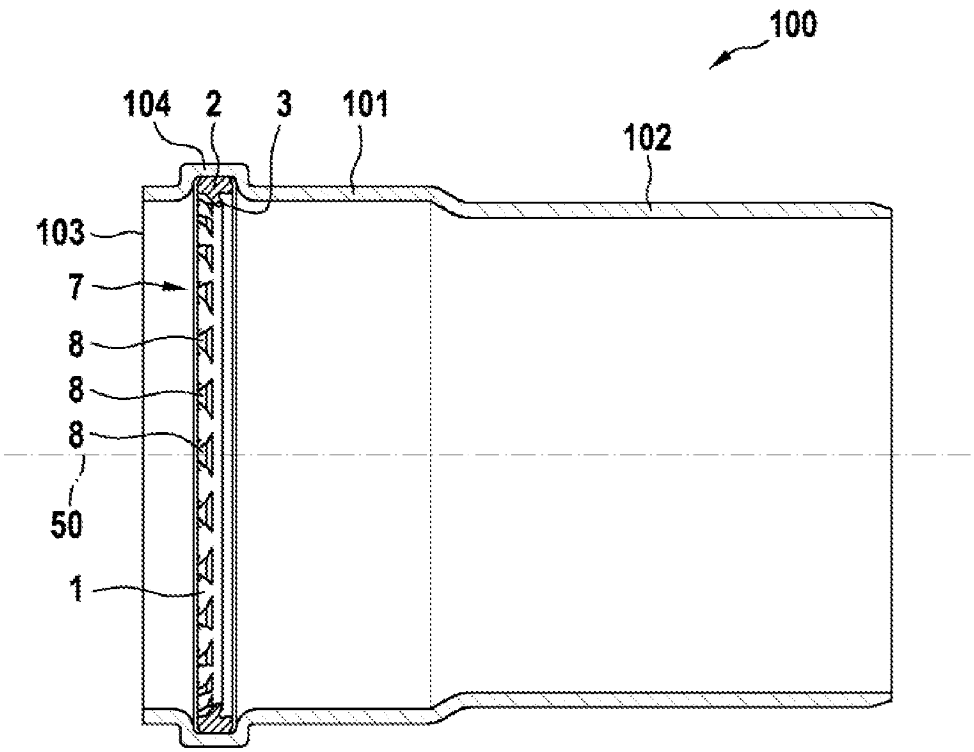

Fig. 2

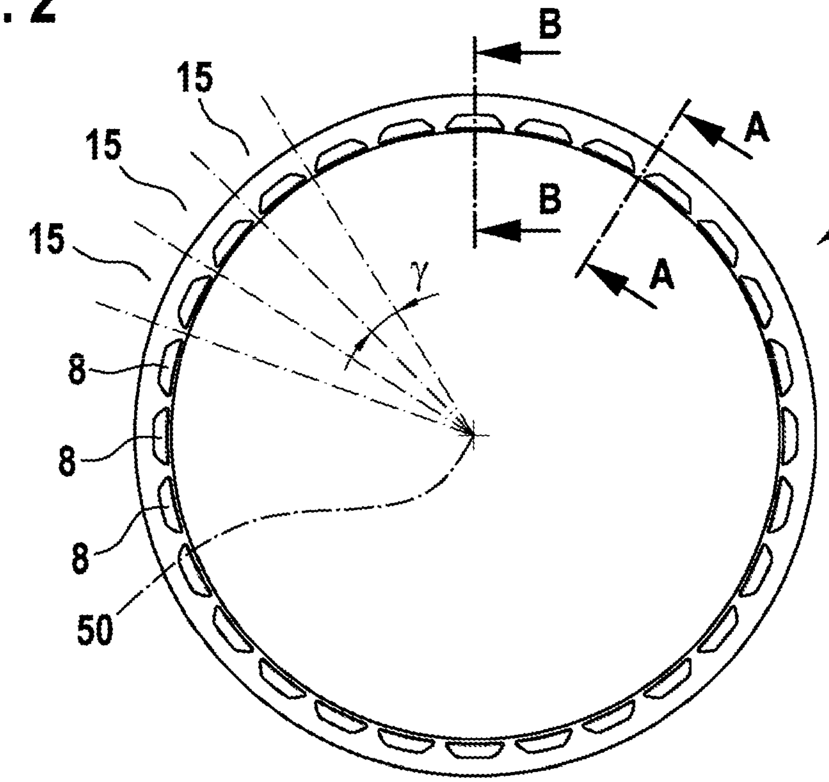

Fig. 3

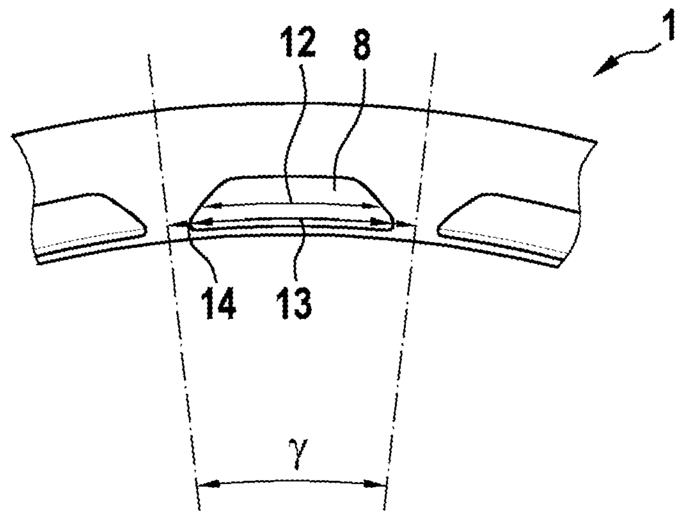

Fig. 4

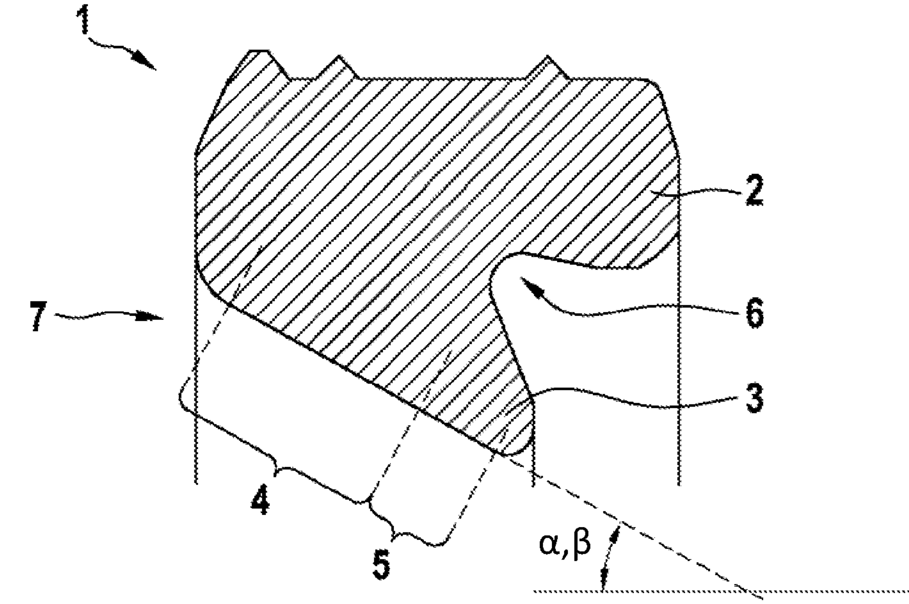

Fig. 5

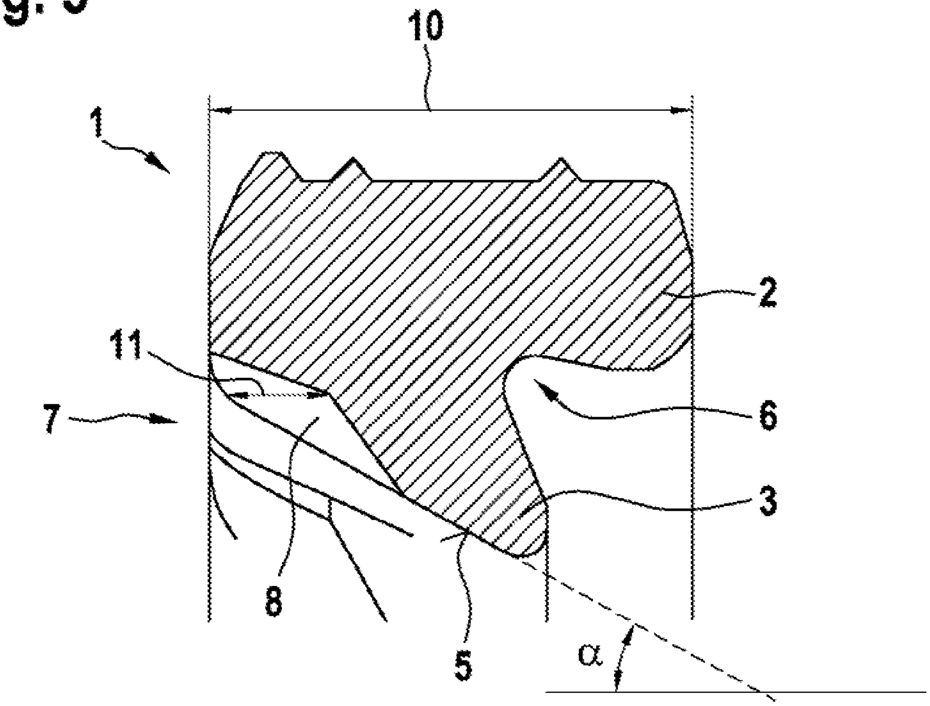

Fig. 6