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(54) CYLINDRICAL PILE AND CYLINDRICAL PILE EXTENSION ELEMENT

ZYLINDRISCHER PFAHL UND AUSWEITUNGSELEMENT DES ZYLINDRISCHEN PFAHLS

PIEU CYLINDRIQUE ET UN ÉLÉMENT D'EXTENSION DE PIEU CYLINDRIQUE

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Description

[0001] The present invention relates to cylindrical construction piles. Specifically, the present invention relates to such piles to be used as reinforcing or supporting construction elements in large and/or heavy structures, such as buildings, bridges and the like. In particular, the present invention relates to threaded such piles, which threads have certain characteristics.

[0002] Such piles are for instance used to transfer gravitational forces from the weight of heavy structures down into the ground, to stable bedrock. Normally, piles are arranged in bore holes in the ground, which holes may be quite long, such as at least tens of meters. As a result, corresponding piles also need to be long, which is typically achieved by providing a number of pile elements that may be attached one to the other to provide a single, long pile. One conventional way of achieving this is by using weld joints. Another is to use threaded screw joints. Both these methods achieve a connected, long pile, formed by several pile elements arranged one after the other in a permanently stable way. Screw joints allow for a quicker installation than weld joints.

[0003] However, high demands are placed on such joints. They must be able to support the intended load for long periods of time, such as at least 100 years, despite corrosion and ground movements. This applies both to axial compression and bending forces, but also to axial pulling forces. Typically, the joints need to be at least as strong as a pile section of corresponding length. In typical installation projects, it is very important to keep pile installation time to a minimum, at the same time as high reliability requirements must be met. The installation environment is often very dirty and exposed to the elements.

[0004] Many screw joint pile designs have been proposed to solve these problems. Examples comprise EP1010815 B1, and also EP2256251 A2, US 4444421 B and SE523782 B.

[0005] In a tubular screw joint, a "pin end" is an externally threaded male member, arranged to engage and cooperate with a "box end", which is an internally threaded, female member. Typically, each pile element comprises two opposite pin ends, and individual pile elements are attached one to the other, in their longitudinal direction, using a "sleeve", to form a connected, long pile. A "sleeve" is a cylindrical part comprising two opposite box ends, each arranged to engage with a corresponding pin end of a respective pile element.

[0006] It would be desirable to achieve a screw joint pile element which is better than prior art such pile elements in terms of installation quickness and reliability. Specifically, a pile element is desired that can offer such qualities in dirty environments and using manual installation methods.

[0007] The present invention solves this and other problems. In particular, it solves the problem by proposing a thread of particular configuration in a cone-shaped thread joint for such pile- and sleeve elements.

[0008] Hence, the invention relates to a cylindrical pile element with a longitudinal axis, which pile element is arranged for use as a reinforcing or supporting construction element, which pile element has a cross-sectional cylinder diameter of at least 70 mm, which pile element is arranged to be lengthwise extendable using a cylindrical sleeve element, using a male pile element thread comprised in a pin end of the said pile element and arranged to engage with a corresponding female sleeve element thread comprised in the said sleeve element at a respective box end of the sleeve element, which pile element thread is generally tapered from a relatively wider part towards a relatively narrower part closer to the said pin end, which pile element is characterised in that the side flank of the pile element thread facing towards the pin end is inclined between 15° and 25° in relation to a plane which is perpendicular to the longitudinal axis of the pile element, and in that the side flank of the pile element thread facing away from the pin end is inclined between 6° and 8° in relation to a plane which is perpendicular to the longitudinal axis of the pile element.

[0009] Furthermore, the invention relates to a cylindrical pile sleeve element with a longitudinal axis, which sleeve element is arranged for use as a reinforcing or supporting construction element, which sleeve element has a cross-sectional cylinder diameter of at least 80 mm, which sleeve element is arranged for extending lengthwise a cylindrical pile element according to any one of the preceding claims, using a female sleeve element thread comprised in the sleeve element at a respective box end of the sleeve element, and arranged to engage with the male pile element thread of said pile element, which sleeve element thread is generally tapered from a relatively narrower part towards a relatively wider part closer to the said box end, which sleeve element is characterised in that the side flank of the sleeve element thread facing away from the box end is inclined between 15° and 25° in relation to a plane which is perpendicular to the longitudinal axis of the sleeve element, and in that the side flank of the sleeve element thread facing towards the box end is inclined between 6° and 8° in relation to a plane which is perpendicular to the longitudinal axis of the sleeve element.

[0010] In the following, the invention will be described in detail, with reference to three embodiments of the invention as shown in the enclosed drawings, wherein

Figure 1a is a cross-section of a pin end of a pile element according to a first exemplifying embodiment of the present invention;

Figure 1b is a magnification of the detail "A" of figure 1a;

Figure 2a is a cross-section of a sleeve according to said first embodiment;

Figures 2b and 2c are respective magnifications of details "A" and "B", respectively, of figure 2a;

Figure 3a is a cross-section of a made-up aggregate comprising a first and a second pile element and a

sleeve according to said first embodiment;
Figure 3b is a magnification of the detail "A" of figure 3a;
Figure 4a is a cross-section of a pin end of a pile element according to a second exemplifying embodiment of the present invention;
Figure 4b is a magnification of the detail "A" of figure 4a;
Figure 5a is a cross-section of a sleeve according to said second embodiment;
Figures 5b and 5c are respective magnifications of details "A" and "B", respectively, of figure 5a;
Figure 6a is a cross-section of a made-up aggregate comprising a first and a second pile element and a sleeve according to said second embodiment;
Figures 6b and 6c are respective magnifications of the details "A" and "B", respectively, of figure 6a;
Figure 7a is a cross-section of a pin end of a pile element according to a third exemplifying embodiment of the present invention;
Figure 7b is a magnification of the detail "A" of figure 7a;
Figure 8a is a cross-section of a sleeve according to said third embodiment;
Figure 8b is a magnification of detail "A" of figure 8a;
Figure 9 is a simplified view of a part of a pile element and a part of a sleeve, illustrating the terminology used herein; and
Figure 10 is a simplified view of a pile aggregate comprising three pile elements and three sleeve elements according to the invention.

[0011] The figures also show measures, given in mm and degrees, as applicable. An "R" followed by a number indicates the curvature radius of a corner. For instance, "R0,25" means a curvature radius of an indicated corner of 0.25 mm.

[0012] Some figures comprise a "1" or "2" inside a circle. This denotes a pile element "1" or a sleeve element "2", respectively.

[0013] Figure 9 illustrates the terminology used herein. A simplified and not-to-scale detail section view of the respective wall of a cylindrical pile element 10 and a cylindrical sleeve element 20 are shown. It is understood that the sleeve element 20 is arranged to fit snugly and concentrically around the pile element 10 when engaged in a made-up threaded relationship.

[0014] The pile element 10 comprises a pin end 11. As used herein, the term "pin end" may refer to either the end itself or to the part of the pile 10 near the end itself, depending on the circumstances. The corresponding is true regarding the term "box end". The pile element 10 also comprises external threads 12. "V" denotes a longitudinal direction of the pile element 10 and the sleeve element 20 (the same in figure 10).

[0015] The sleeve element 20 comprises a box end 21, and a second box end 27 (not shown), as well as internal threads 22. In general, threads 12, 22 comprise side flanks 24, 25 separated by crests 23 and roots 26.

[0016] In the following, the present invention will be explained in relation to the three embodiments shown in figures 1a-3b; 4a-6b; and 7a-8b, respectively.

[0017] Hence, the present invention relates to a cylindrical pile element with a longitudinal axis, which pile element is arranged for use as a reinforcing or supporting construction element, for instance in the construction of buildings and/or traffic infrastructure. The pile has a cross-sectional cylinder diameter of at least 70 mm. As shown in the figures, the thread of the pile element is conical in the sense that the pile element thread is generally tapered from a relatively wider part, extending along a longer section, such as covering the majority of the pile element length, towards a relatively narrower part closer to the pin end of the pile element. This implies that the thickness of the cylinder wall of the pile element is also tapered towards a thinner part near the pin end.

[0018] In the opposite end of the pile element, a corresponding narrowing exists. The cylinder diameter referred to above pertains to the maximum diameter away from the conical section of the pile.

[0019] Moreover, the pile element is arranged to be lengthwise extendable using a cylindrical sleeve element, using a male pile element thread comprised in a pin end of the said pile element, which male thread is arranged to engage with a corresponding female sleeve element thread comprised in the said sleeve element at a respective box end of the sleeve element. Hence, using sleeves 20a, 20b of the type illustrated, in a simplified fashion, in figure 9, several pile elements 10a, 10b, 10c may be joined together to form a single, connected and longer pile 30. This is illustrated in figure 10, in a simplified and not-to-scale manner.

[0020] According to the invention, the side flank of the pile element thread facing towards the pin end of the pile element is inclined between 15° and 25°, preferably about 20°, most preferably 20°, in relation to a plane which is perpendicular to the longitudinal axis V of the pile element. When the pile element 10, and the pile 30, is installed vertically, this axis V is thus also vertical. Furthermore, the opposite side flank, that is the side flank of the pile element thread facing away from the pin end of the pile element, is inclined between 6° and 8°, preferably about 6°, most preferably 6°, in relation to a plane which is perpendicular to the longitudinal axis V of the pile element. This is illustrated in figures 1b (110° and 96° angle to longitudinal direction); 4b (110° and 84° angle to longitudinal direction); and 7b, respectively.

[0021] As stated above, the threads are in general conical, preferably at a general angle of 3-4° to the longitudinal direction V - see figures 1b (3°); 4b (3°) and 7a (4°). The combination of generally conical threads and the type of angled side flanks discussed above has been found, by the present inventors, to be superior for the specific application of construction piles. Namely, they offer a very strong joint between pile and sleeve once fastened with appropriate torque, at the same time as

their installation can be made fast and in a highly reliable way. A next pile element can simply be put, tipped or tilted down into the hole of the sleeve, which is mounted on the previous pile element (which is then arranged in a bore hole in the ground), and rotated into threaded engagement with the sleeve, with a low risk of the threads becoming intertangled due to rotational or angular mismatch between pile element and sleeve element. This is the case even when used in uncontrolled, heavily dirty environments, such as at a construction site with presence of moist, dirt, sand, gravel and so forth.

[0022] In particular, the above specified flank angles have proven to be advantageous in the case shown in the figures, in which the crest of the pile element thread comprises a flat surface which is substantially parallel to the longitudinal axis V of the pile element along substantially the whole length of the male thread. Hence, as seen in the cross-section shown in the figures, the respective flat surfaces of consecutive crests are parallel displaced one the next, so that all such surfaces are essentially parallel to the longitudinal direction V of the pile element. This provides a very high chance that a coarsely inserted pile element can engage directly, in a problem-free way, with its sleeve element, in particular in combination with the above-discussed flank angles.

[0023] It is preferred that the pile element thread has a constant pitch, preferably throughout the whole or substantially the whole length of the pile element thread. The corresponding is preferably also true regarding the present sleeve element.

[0024] As seen in the figures, inner and outer corners of the threaded parts are in general rounded. In particular, it is preferred that all external and internal corners of the pile element thread are rounded using a respective curvature radius of between 0.1 and 0.5 mm. The corresponding is preferably also true regarding the present sleeve element.

[0025] Preferably, the pile element, and also correspondingly the sleeve element, is made of steel material as one integrated material body. Preferably, the steel material is a high strength structural steel such as S460 or comparable qualities.

[0026] Each pile element is preferably at least about 1 meter long, in a more preferred embodiment and primarily intended for heavy installations at least about 3 meters long, from pin end to pin end. Preferably, the pile element comprises two opposed pin ends, each comprising a respectively substantially identical male pile element thread according to the above.

[0027] The present invention further relates to a cylindrical pile sleeve element according to the above and as shown in the figures. Such a sleeve element is, like the pile element, arranged for use as a reinforcing or supporting construction element, and has a cross-sectional cylinder diameter of at least 80 mm. Furthermore, the sleeve element is arranged for extending lengthwise a cylindrical pile element of the above described type, using a female sleeve element thread comprised in the sleeve element at a respective box end of the sleeve element, and is arranged to engage with the male pile element thread of the said pile element. The sleeve element thread is generally tapered from a relatively narrower part towards a relatively wider part closer to the said box end.

[0028] As is the case with the pile element, the side flank of the sleeve element thread facing away from the box end is inclined between 15° and 25° in relation to a plane which is perpendicular to the longitudinal axis V of the sleeve element, and in that the side flank of the sleeve element thread facing towards the box end is inclined between 6° and 8° in relation to a plane which is perpendicular to the longitudinal axis V of the sleeve element.

[0029] It is preferred that the sleeve element thread corresponds or at least substantially corresponds to the pile element thread in terms of side flank-, crest- and root angles and dimensions. However, it is preferred, as illustrated in figures 3b and 6b, that a certain play of preferably less than 1 mm, more preferably less than 0,5 mm, most preferably 0,39 mm, is present along the V direction at the less angled side flanks during fully made-up engagement between pile element and sleeve element.

[0030] According to one preferred embodiment, the sleeve element comprises an additional female thread arranged at an additional box end of the sleeve element, which additional female thread is substantially identical to the said sleeve element thread. Hence, each sleeve element is arranged to interconnect two pile elements, one at each side of the sleeve element, forming a pile aggregate according to the present invention.

[0031] In such a pile aggregate, each respective pile element thread is preferably screwed fully into the corresponding sleeve element thread so that a fully made-up thread engagement is achieved between the pile element and the sleeve element.

[0032] In a pile aggregate according to the present invention in which two pile elements are interconnected by fully made-up thread engagements at opposite respective ends of the sleeve element, the respective sleeve element threads are preferably arranged on the sleeve element so that the distance between the first and second pile elements is between 3 and 15 mm. This is illustrated in figures 3b (9.5 mm) and 6b (5 mm).

[0033] Furthermore, the shape of the sleeve element is preferably such that, in fully made-up engagement with the pile element, there is a play of at least 0.3 mm (see figure 6c) between the inner surface of the sleeve element and the outer surface of the pile element along a distance of at least 3 mm from the box end of the sleeve element.

[0034] Above, preferred embodiments have been described. However, it is apparent to the skilled person that many modifications may be made to the disclosed embodiments without departing from the basic idea of the invention.

[0035] There are many measures given in the drawings, which are all part of the disclosed exemplifying em-

bodiments. At the same time, it is realized that these detailed examples merely show three different possible pile- and sleeve element designs falling under the protective scope of the enclosed claims.

[0036] Hence, the invention is not to be limited to the described embodiments, but may be varied within the scope of the enclosed claims.

Claims

1. Cylindrical pile element (10) with a longitudinal axis (V), which pile element (10) is arranged for use as a reinforcing or supporting construction element, which pile element (10) has a cross-sectional cylinder diameter of at least 70 mm, which pile element (10) is arranged to be lengthwise extendable using a cylindrical sleeve element (20), using a male pile element thread comprised in a pin end (11) of the said pile element (10) and arranged to engage with a corresponding female sleeve element thread comprised in the said sleeve element (20) at a respective box end (21) of the sleeve element (20), which pile element thread is generally tapered from a relatively wider part towards a relatively narrower part closer to the said pin end (11), **characterised in that** the side flank of the pile element thread facing towards the pin end (11) is inclined between 15° and 25° in relation to a plane which is perpendicular to the longitudinal axis (V) of the pile element (10), and **in that** the side flank of the pile element thread facing away from the pin end (11) is inclined between 6° and 8° in relation to a plane which is perpendicular to the longitudinal axis (V) of the pile element (10).

2. Cylindrical pile element (10) according to claim 1, **characterised in that** the side flank of the pile element thread facing towards the pin end (11) is inclined 20° in relation to a plane which is perpendicular to the longitudinal axis (V) of the pile element (10) along substantially the whole length of the male thread.

3. Cylindrical pile element (10) according to claim 1 or 2, **characterised in that** the side flank of the pile element thread facing away from the pin end (11) is inclined 6° in relation to a plane which is perpendicular to the longitudinal axis (V) of the pile element (10) along substantially the whole length of the male thread.

4. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** the crest of the pile element thread comprises a flat surface which is substantially parallel to the longitudinal axis (V) of the pile element (10) along substantially the whole length of the male thread.

5. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** the pile element thread has constant pitch.

6. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** all external and internal corners of the pile element thread are rounded using a respective curvature radius of between 0.1 and 0.5 mm.

7. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** the pile element (10) is made of steel material as one integrated material body.

8. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** the pile element (10) is at least 1 meter long.

9. Cylindrical pile element (10) according to any one of the preceding claims, **characterised in that** the pile element (10) comprises an additional male thread arranged at a second, opposed, pin end of the pile element (10), which additional male thread is substantially identical to the said pile element thread.

10. Cylindrical pile sleeve element (20) with a longitudinal axis (V), which sleeve element (20) is arranged for use as a reinforcing or supporting construction element, which sleeve element (20) has a cross-sectional cylinder diameter of at least 80 mm, which sleeve element (20) is arranged for extending lengthwise a cylindrical pile element (10) according to any one of the preceding claims, using a female sleeve element thread comprised in the sleeve element (20) at a respective box end (21) of the sleeve element (20), and arranged to engage with the male pile element thread of said pile element (10), which sleeve element thread is generally tapered from a relatively narrower part towards a relatively wider part closer to the said box end (21), **characterised in that** the side flank (25) of the sleeve element thread facing away from the box end (21) is inclined between 15° and 25° in relation to a plane which is perpendicular to the longitudinal axis (V) of the sleeve element (20), and **in that** the side flank (24) of the sleeve element thread facing towards the box end (21) is inclined between 6° and 8° in relation to a plane which is perpendicular to the longitudinal axis (V) of the sleeve element (20).

11. Cylindrical pile sleeve element (20) according to claim 10, **characterised in that** the sleeve element (20) comprises an additional female thread arranged at an additional box end of the sleeve element (20), which additional female thread is substantially identical to the said sleeve element thread.

12. Pile aggregate (30) comprising a cylindrical pile element (10) according to any one of claims 1-9 and a cylindrical pile sleeve element (20) according to claim 10 or 11, wherein the pile element thread is screwed fully into the sleeve element thread so that a made-up thread engagement is achieved between the pile element (10) and the sleeve element (20).

13. Pile aggregate (30) comprising first and second cylindrical pile elements (10a,10b, 10c) according to claim 9 and a cylindrical pile sleeve element (20a,20b) according to claim 11, wherein the pile element thread of the first pile element (10a) is screwed fully into the sleeve element thread so that a made-up thread engagement is achieved between the first pile element (10a) and the sleeve element (20a), wherein the additional pile element thread of the second pile element (10b) is screwed fully into the additional sleeve element thread so that a made-up thread engagement is achieved between the second pile element (10b) and the sleeve element (20a), **characterised in that** the respective sleeve element threads are arranged on the sleeve element (20a) so that the distance between the first and second pile elements (10a,10b) is between 3 and 15 mm.

Patentansprüche

1. Zylindrisches Dielenkammerelement (10) mit einer Längsachse (V), das Dielenkammerelement (10) für die Verwendung als verstärkendes oder unterstützendes Bauelement, das Dielenkammerelement (10) hat einen Querschnittszylinderdurchmesser von mindestens 70 mm, das Dielenkammerelement (10) ist angeordnet, um längsweise ausfahrbar zu sein unter Verwendung eines zylindrischen Hülsenelements (20), unter Verwendung eines männlichen Dielenkammerelementgewindes, bestehend aus einem Zapfenende (11) des besagten Dielenkammerelements (10) und so angeordnet, um in ein korrespondierendes weibliches Hülsenelementgewinde einzugreifen, der aus besagtem Hülsenelement (20) besteht an einem jeweiligen Steckende (21) des Hülsenelements (20), das Dielenkammerelementgewinde wird generell verjüngt von einem relativ breiteren Teil zu einem relativ schmäleren Teil näher am besagten Zapfenende (11), **dadurch gekennzeichnet, dass** die Seitenflanke des Dielenkammerelementgewindes , welche in Richtung des Zapfenendes (11) zeigt, zwischen 15° und 25° abgeschrägt ist in Bezug auf eine Ebene, die senkrecht zur Längsachse (V) des Dielenkammerelements (10) ist, und dadurch dass die Seitenflanke des Dielenkammerelementgewindes, welche vom Zapfenende (11) weg zeigt, zwischen 6° und 8° abgeschrägt ist in Bezug auf eine Ebene, die senkrecht zur Längsachse (V) des Dielenkammerelements (10) ist.

2. Zylindrisches Dielenkammerelement (10) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Seitenflanke des Dielenkammerelements, welche in Richtung des Zapfenendes (11) zeigt, 20° in Bezug auf eine Ebene abgeschrägt ist, die senkrecht zur Längsachse (V) des Dielenkammerelements (10) entlang weitgehend der gesamten Länge des männlichen Gewindes ist.

3. Zylindrisches Dielenkammerelement (10) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Seitenflanke des Dielenkammerelementgewindes, welche vom Zapfenende (11) weg zeigt 6° abgeschrägt ist in Bezug auf eine Ebene, die senkrecht zur Längsachse (V) des Dielenkammerelements (10) entlang weitgehend der gesamten Länge des männlichen Gewindes ist.

4. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Gewindespitze des Dielenkammerelementgewindes eine ebene Fläche umfasst, die weitgehend parallel zur Längsachse (V) des Dielenkammerelements (10) ist entlang weitgehend der gesamten Länge des männlichen Gewindes.

5. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Dielenkammerelementgewinde eine konstante Steigung aufweist.

6. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** alle externen und internen Ecken des Dielenkammerelementgewindes abgerundet sind unter Verwendung eines jeweiligen Wölbungsradius von zwischen 0,1 und 0,5 mm.

7. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Dielenkammerelement (10) aus Stahlmaterial als ein integrierter Materialkörper hergestellt ist.

8. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Dielenkammerelement (10) mindestens 1 Meter lang ist.

9. Zylindrisches Dielenkammerelement (10) gemäß einer beliebigen der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Dielenkammerelement (10) ein zusätzliches männliches Gewinde umfasst, das an einem zweiten, gegenüberliegenden Zapfenende des Dielenkammerelements (10)

angeordnet ist, dieses zusätzliche männliche Gewinde ist weitgehend identisch mit dem besagten Dielenkammerelementgewinde.

10. Zylindrisches Dielenkammerhülsenelement (20) mit einer Längsachse (V), dieses Hülsenelement (20) ist angeordnet zur Verwendung als verstärkendes oder unterstützendes Bauelement, das Hülsenelement (20) hat einen Querschnittszylinderdurchmesser von mindestens 80 mm, das Hülsenelement (20) ist angeordnet, um längsweise ein zylindrisches Dielenkammerelement (10) auszustrecken gemäß eines beliebigen der vorangehenden Ansprüche, unter Verwendung eines weiblichen Hülsenelementgewindes, das aus einem Hülsenelement (20) an einem jeweiligen Steckende (21) des Hülsenelements (20) besteht und angeordnet ist, um in das männliche Dielenkammerelementgewinde des besagten Dielenkammerelements (10) eingreifen, dieses Dielenkammerelementgewinde wird generell verjüngt von einem relativ schmäleren Teil zu einem relativ breiteren Teil näher an besagtem Steckende (21), **dadurch gekennzeichnet, dass** die Seitenflanke (25) des Hülsenelementgewindes, das vom Steckende (21) weg zeigt, zwischen 15° und 25° abgeschrägt ist in Bezug auf eine Ebene, die senkrecht zur Längsachse (V) des Hülsenelements (20) ist, und dadurch, dass die Seitenflanke (24) des Hülsenelementgewindes, welche in Richtung des Steckendes (21) zeigt, zwischen 6° und 8° abgeschrägt ist in Bezug auf eine Ebene, die senkrecht zur Längsachse (V) des Hülsenelements (20) ist.

11. Zylindrisches Dielenkammerhülsenelement (20) gemäß Anspruch 10, **dadurch gekennzeichnet, dass** das Hülsenelement (20) ein zusätzliches weibliches Gewinde umfasst, welches an einem zusätzlichen Steckende des Hülsenelements (20) angeordnet ist, dieses zusätzliche weibliche Gewinde ist weitgehend identisch mit dem besagten Hülsenelementgewinde.

12. Dielenkammeraggregat (30) umfassend ein zylindrisches Dielenkammerelement (10) gemäß einem beliebigen der Ansprüche 1-9 und ein zylindrisches Dielenkammerhülsenelement (20) gemäß Anspruch 10 oder 11, wobei das Dielenkammerelementgewinde vollständig in das Hülsenelementgewinde eingeschraubt ist, so dass ein fingierter Gewindeeingriff zwischen dem Dielenkammerelement (10) und dem Hülsenelement (20) erzielt wird.

13. Dielenkammeraggregat (30) umfassend erste und zweite zylindrische Dielenkammerelement (10a, 10b, 10c) gemäß Anspruch 9 und ein zylindrisches Dielenkammerhülsenelement (20a, 20b) gemäß Anspruch 11, wobei das Dielenkammerelementgewinde des ersten Dielenkammerelements (10a) vollständig in das Hülsenelementgewinde eingeschraubt ist, so dass der fingierte Gewindeeingriff zwischen dem ersten Dielenkammerelement (10a) und dem Hülsenelement (20a) erzielt wird, wobei das zusätzliche Dielenkammerelementgewinde des zweiten Dielenkammerelements (10b) vollständig in das zusätzliche Hülsenelementgewinde eingeschraubt ist, so dass ein fingierter Gewindeeingriff zwischen dem zweiten Dielenkammerelement (10b) und dem Hülsenelement (20a) erzielt wird, **dadurch gekennzeichnet, dass** die jeweiligen Hülsenelementgewinde auf dem Hülsenelement (20a) angeordnet sind, so dass der Abstand zwischen den ersten und zweiten Dielenkammerelementen (10a, 10b) zwischen 3 und 15 mm beträgt.

Revendications

1. Élément de pieu cylindrique (10) ayant un axe longitudinal (V), lequel l'élément de pieu (10) est agencé pour une utilisation comme élément de construction de renforcement ou de support, lequel élément de pieu (10) a un diamètre de cylindre en section transversale d'au moins 70 mm, lequel élément de pieu (10) est agencé pour être extensible longitudinalement à l'aide d'un élément de manchon cylindrique (20), à l'aide d'un filetage d'élément de pieu mâle inclus dans une extrémité mâle (11) dudit élément de pieu (10) et agencé pour s'engager avec un filetage d'élément de manchon femelle correspondant inclus dans ledit élément de manchon (20) à une extrémité femelle respective (21) de l'élément de manchon (20), lequel filetage d'élément de pieu est généralement effilé à partir d'une partie relativement plus large en direction d'une partie relativement plus étroite plus proche de ladite extrémité mâle (11), **caractérisé par le fait que** le flanc latéral du filetage d'élément de pieu tourné vers l'extrémité mâle (11) est incliné entre 15° et 25° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de pieu (10), et **par le fait que** le flanc latéral du filetage d'élément de pieu tourné à l'opposé de l'extrémité mâle (11) est incliné entre 6° et 8° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de pieu (10).

2. Élément de pieu cylindrique (10) selon la revendication 1, **caractérisé par le fait que** le flanc latéral du filetage d'élément de pieu tourné vers l'extrémité mâle (11) est incliné de 20° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de pieu (10) sensiblement sur toute la longueur du filetage mâle.

3. Élément de pieu cylindrique (10) selon la revendication 1 ou 2, **caractérisé par le fait que** le flanc latéral du filetage d'élément de pieu tourné à l'opposé de

l'extrémité mâle (11) est incliné de 6° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de pieu (10) sensiblement sur toute la longueur du filetage mâle.

4. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'arête du filetage d'élément de pieu comprend une surface plate qui est sensiblement parallèle à l'axe longitudinal (V) de l'élément de pieu (10) sensiblement sur toute la longueur du filetage mâle.

5. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** le filetage d'élément de pieu a un pas constant.

6. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** tous les coins externes et internes du filetage d'élément de pieu sont arrondis avec un rayon de courbure respectif compris entre 0,1 et 0,5 mm.

7. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de pieu (10) est fait de matériau d'acier sous forme d'un seul corps de matériau intégré.

8. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de pieu (10) a une longueur d'au moins 1 mètre.

9. Élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de pieu (10) comprend un filetage mâle supplémentaire disposé à une seconde extrémité mâle, opposée, de l'élément de pieu (10), lequel filetage mâle supplémentaire est sensiblement identique audit filetage d'élément de pieu.

10. Élément de manchon de pieu cylindrique (20) ayant un axe longitudinal (V), lequel élément de manchon (20) est agencé pour une utilisation comme élément de construction de renforcement ou de support, lequel élément de manchon (20) a un diamètre de cylindre en section transversale d'au moins 80 mm, lequel élément de manchon (20) est agencé pour étendre longitudinalement un élément de pieu cylindrique (10) selon l'une quelconque des revendications précédentes, à l'aide d'un filetage d'élément de manchon femelle inclus dans l'élément de manchon (20) à une extrémité femelle respective (21) de l'élément de manchon (20), et agencé pour s'engager avec le filetage d'élément de pieu mâle dudit élément de pieu (10), lequel filetage d'élément de manchon est généralement effilé à partir d'une partie relativement plus étroite en direction d'une partie relativement plus large plus proche de ladite extrémité femelle (21), **caractérisé par le fait que** le flanc latéral (25) du filetage d'élément de manchon tourné à l'opposé de l'extrémité femelle (21) est incliné entre 15° et 25° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de manchon (20), et **par le fait que** le flanc latéral (24) du filetage d'élément de manchon tourné vers l'extrémité femelle (21) est incliné entre 6° et 8° par rapport à un plan qui est perpendiculaire à l'axe longitudinal (V) de l'élément de manchon (20).

11. Élément de manchon de pieu cylindrique (20) selon la revendication 10, **caractérisé par le fait que** l'élément de manchon (20) comprend un filetage femelle supplémentaire disposé à une extrémité femelle supplémentaire de l'élément de manchon (20), lequel filetage femelle supplémentaire est sensiblement identique audit filetage d'élément de manchon.

12. Ensemble pieu (30) comprenant un élément de pieu cylindrique (10) selon l'une quelconque des revendications 1 à 9 et un élément de manchon de pieu cylindrique (20) selon la revendication 10 ou 11, dans lequel le filetage d'élément de pieu est vissé entièrement dans le filetage d'élément de manchon de telle sorte qu'un engagement de filetage composé est obtenu entre l'élément de pieu (10) et l'élément de manchon (20).

13. Ensemble pieu (30) comprenant des premier et second éléments de pieu cylindriques (10a, 10b, 10c) selon la revendication 9 et un élément de manchon de pieu cylindrique (20a, 20b) selon la revendication 11, dans lequel le filetage d'élément de pieu du premier élément de pieu (10a) est vissé entièrement dans le filetage d'élément de manchon de telle sorte qu'un engagement de filetage composé est obtenu entre le premier élément de pieu (10a) et l'élément de manchon (20a), le filetage d'élément de pieu supplémentaire du second élément de pieu (10b) est vissé entièrement dans le filetage d'élément de manchon supplémentaire de telle sorte qu'un engagement de filetage composé est obtenu entre le second élément de pieu (10b) et l'élément de manchon (20a), **caractérisé par le fait que** les filetages d'élément de manchon respectifs sont disposés sur l'élément de manchon (20a) de telle sorte que la distance entre les premier et second éléments de pieu (10a, 10b) est comprise entre 3 et 15 mm.

Fig. 1a

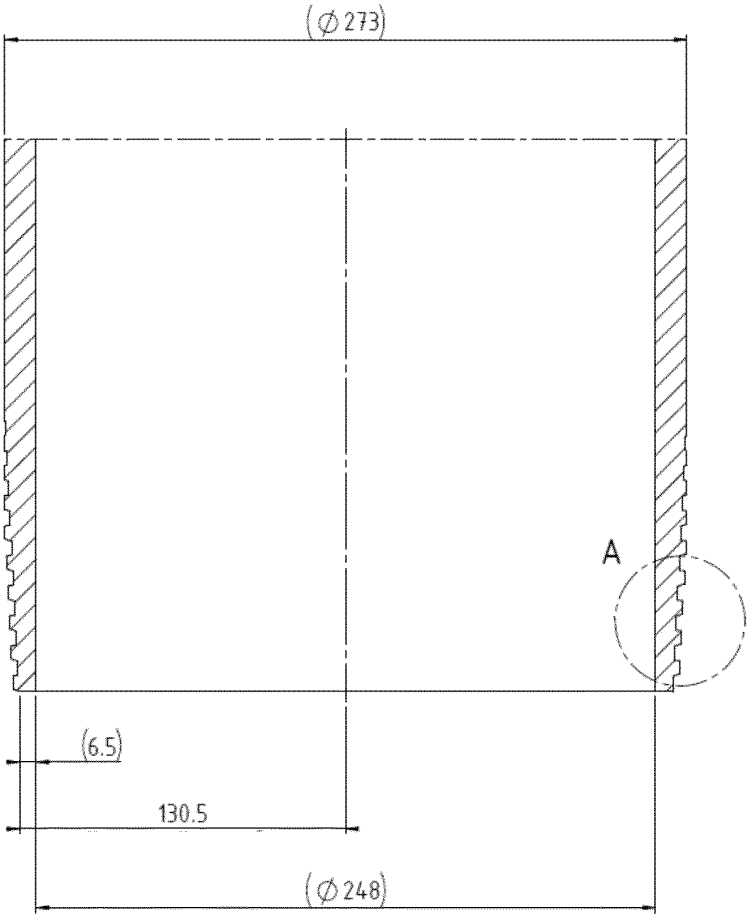


Fig. 1b

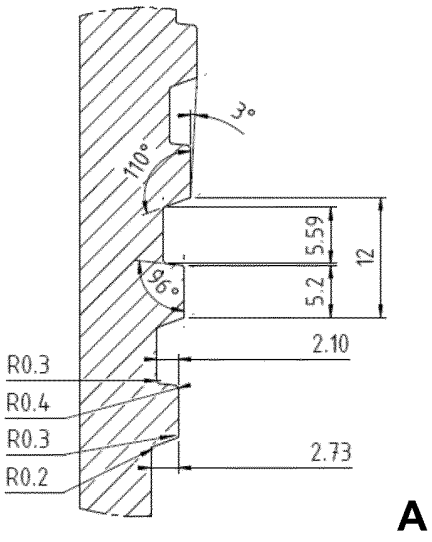


Fig. 2a

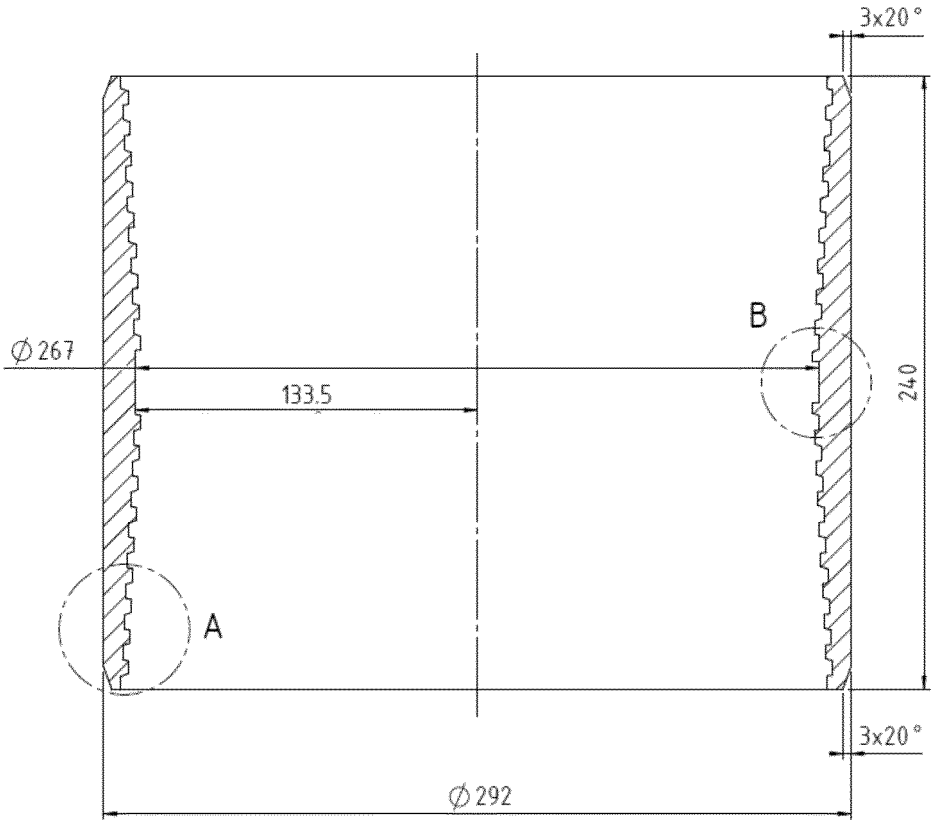


Fig. 2b

A

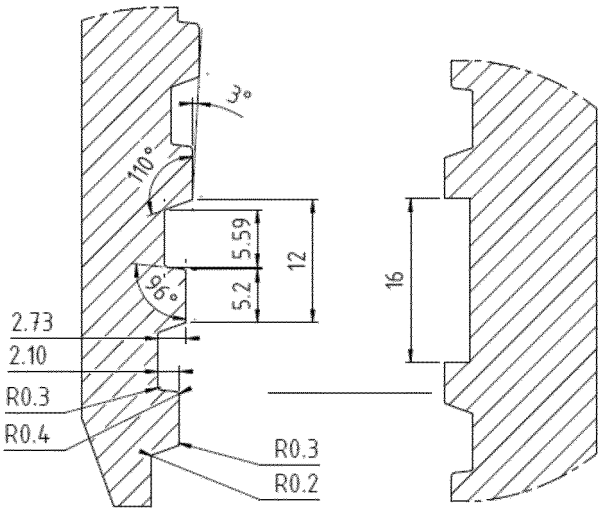


Fig. 2c

B

Fig. 3a

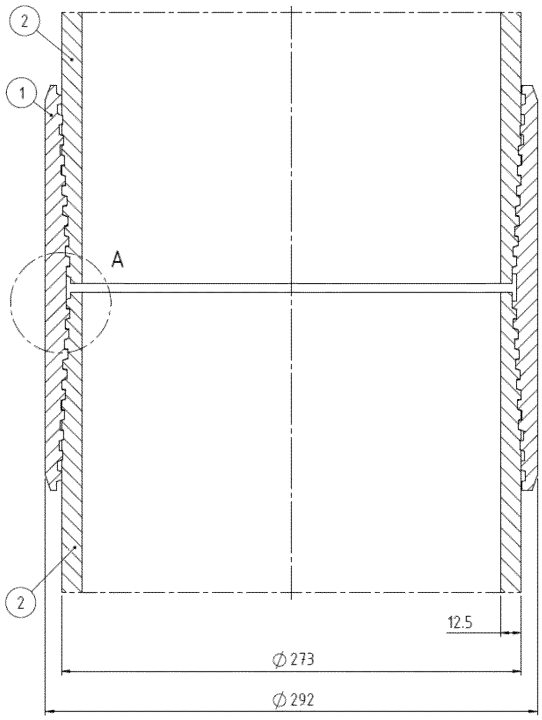


Fig. 3b

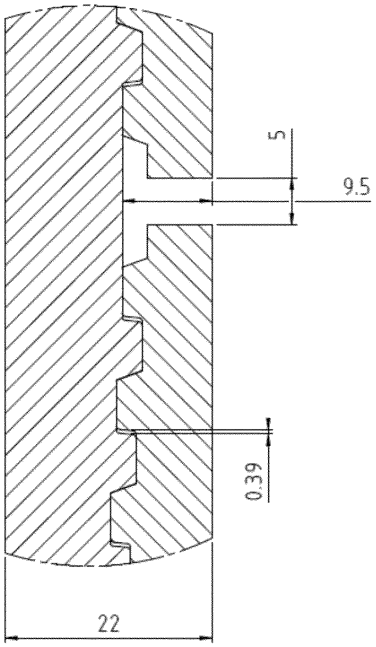


Fig. 4a

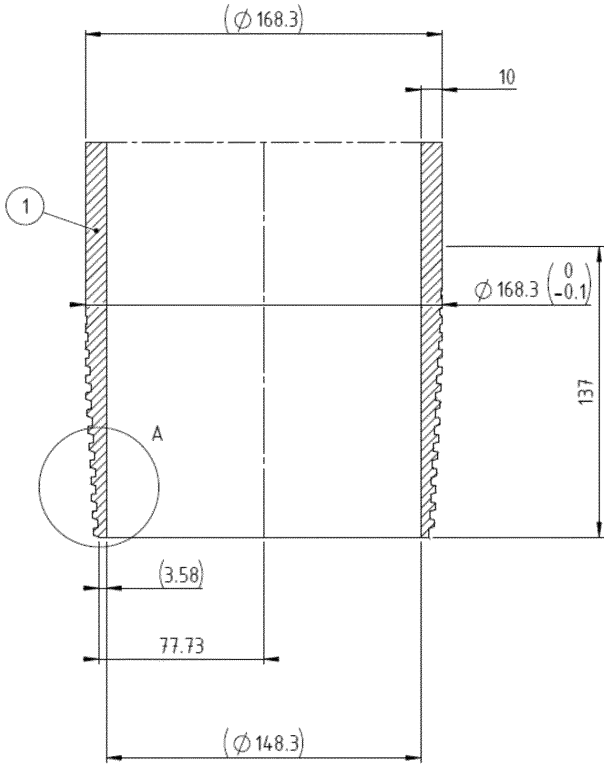
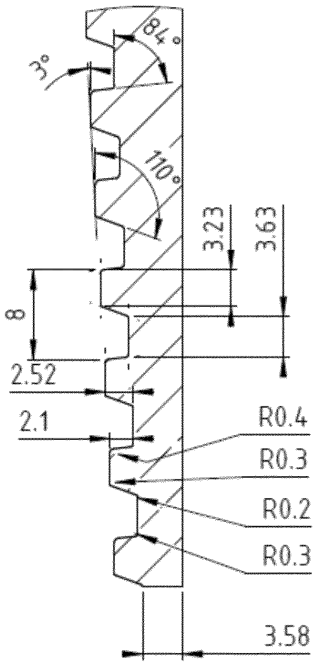


Fig. 4b



A

Fig. 5a

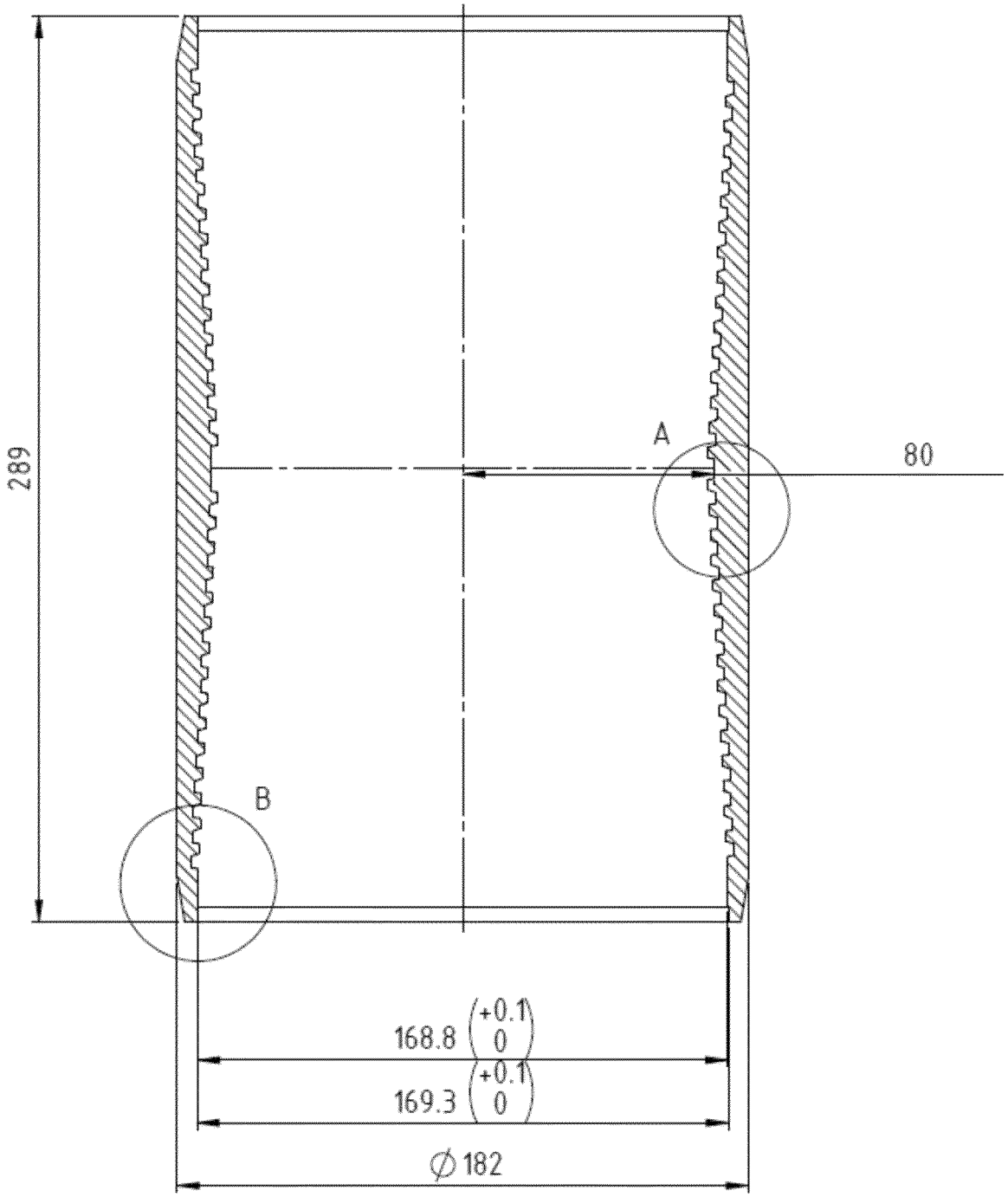
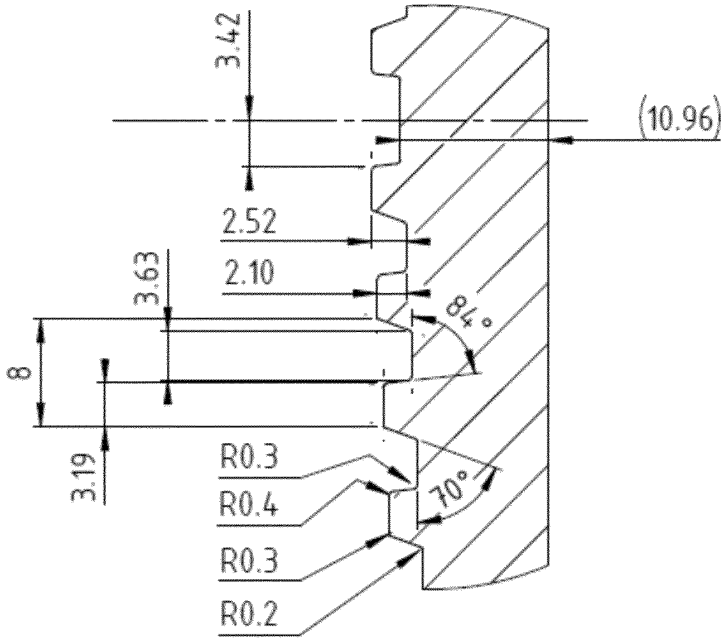
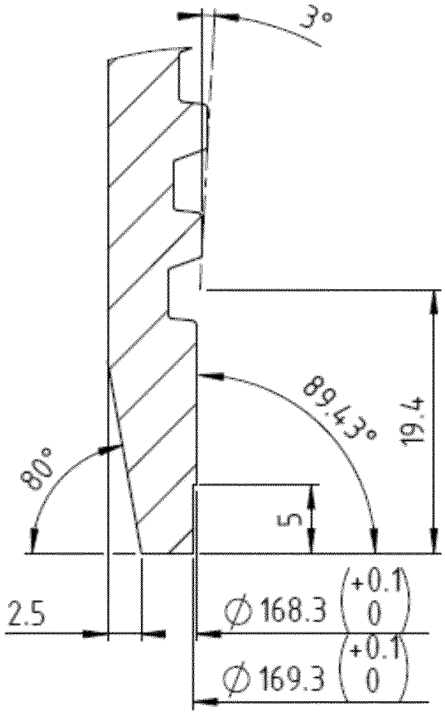


Fig. 5b



A

Fig. 5c



B

Fig. 6a

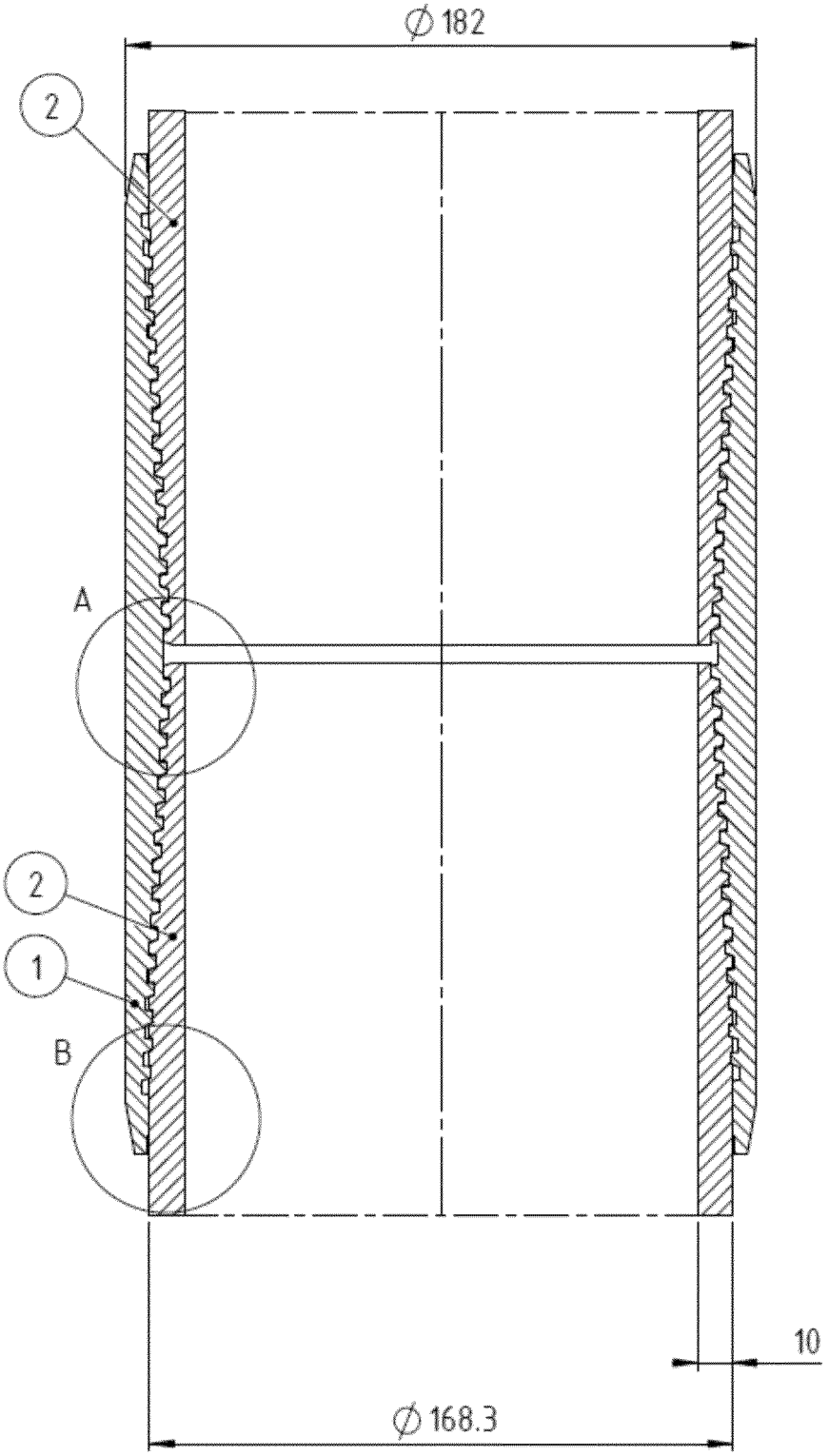


Fig. 6b

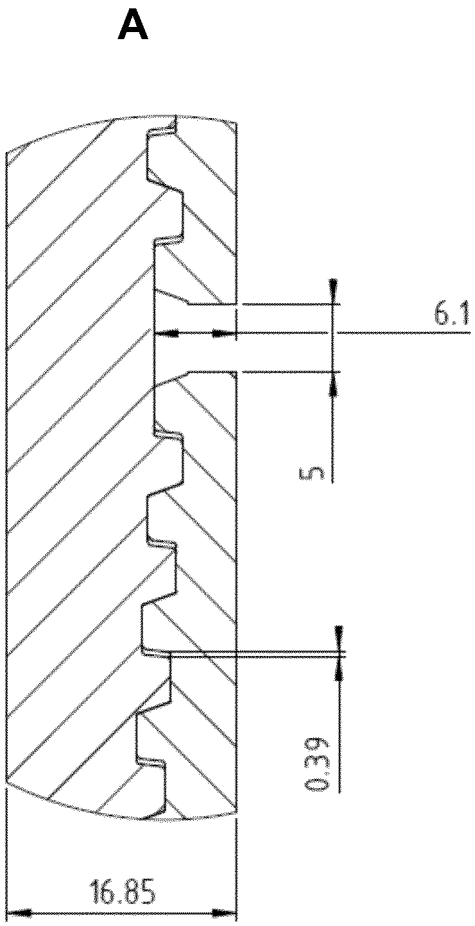


Fig. 6c

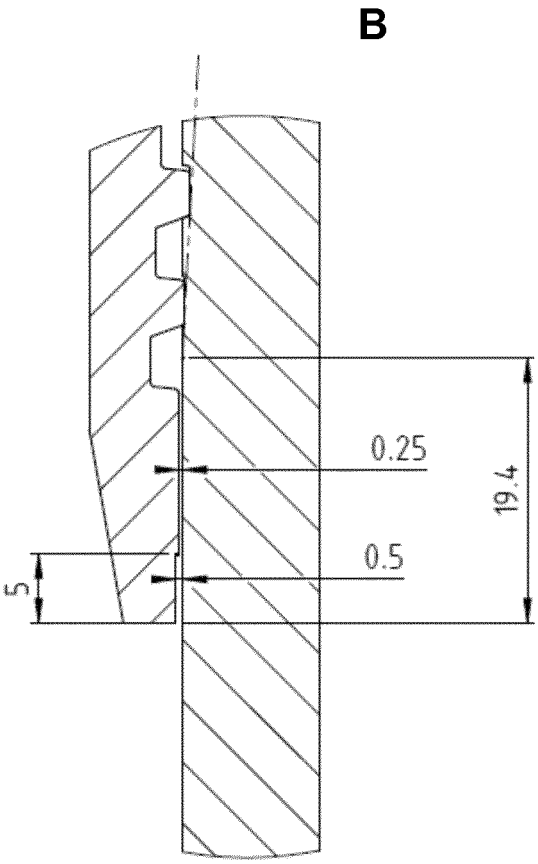


Fig. 7a

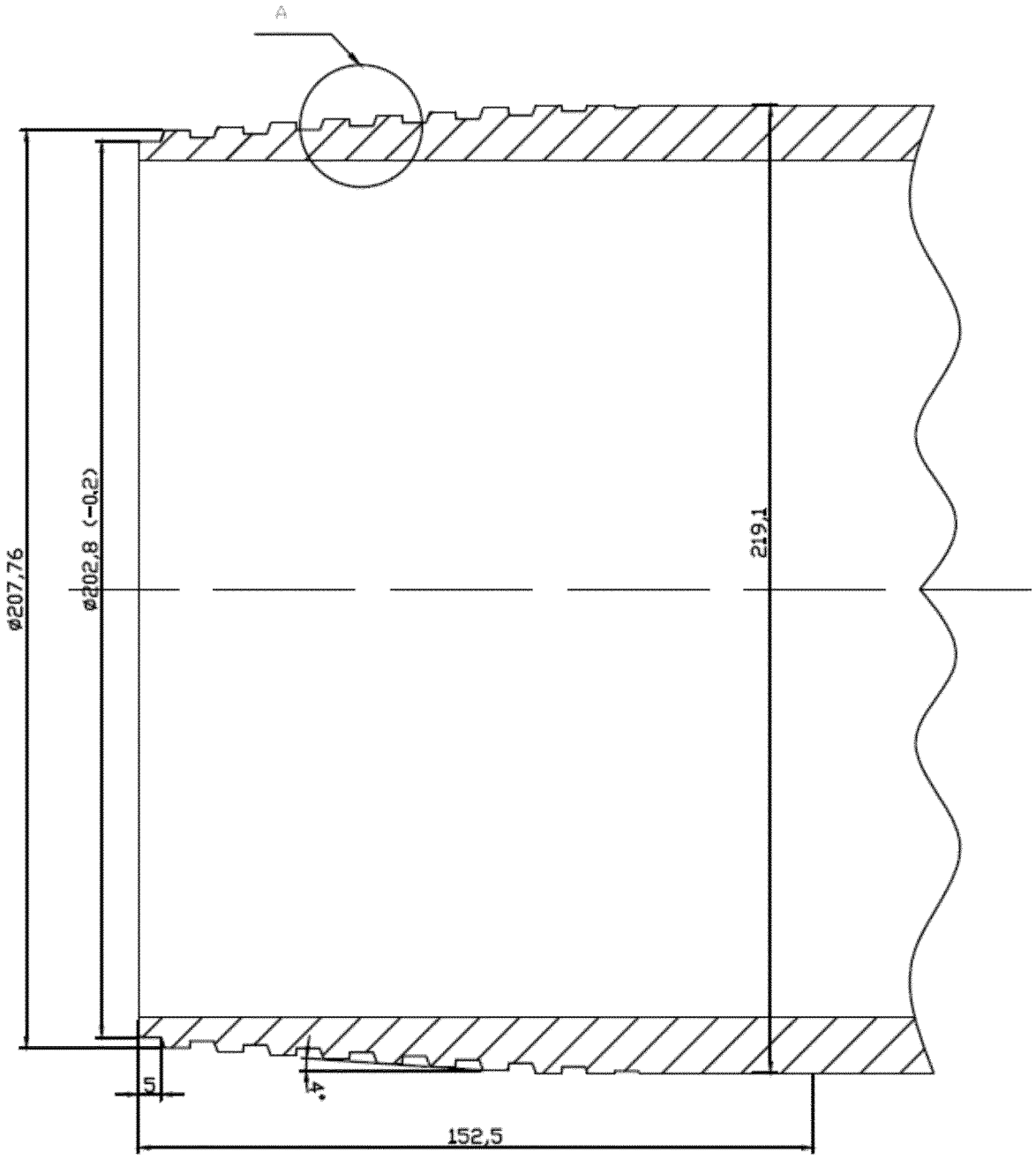


Fig. 7b

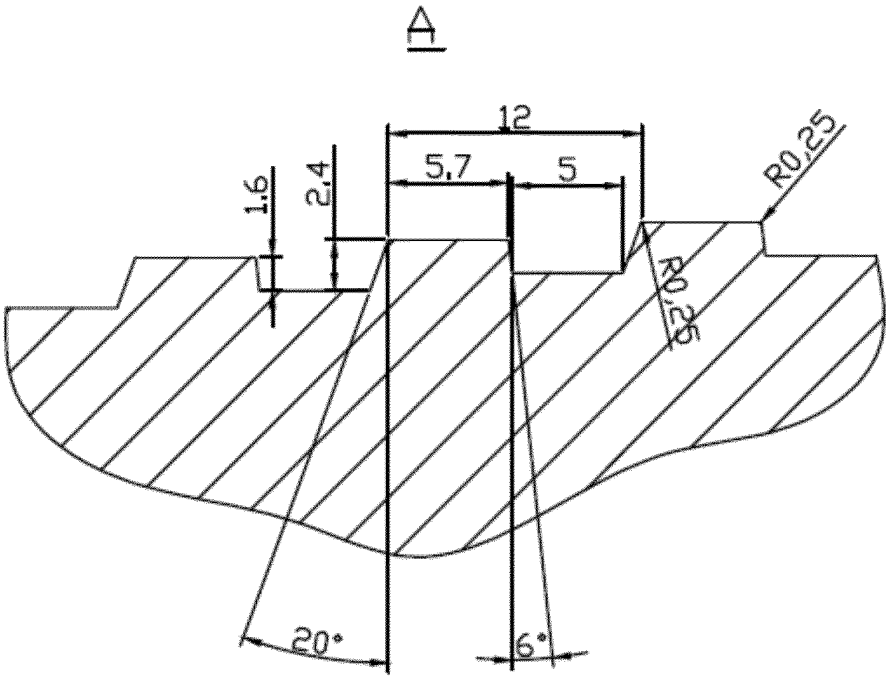


Fig. 8b

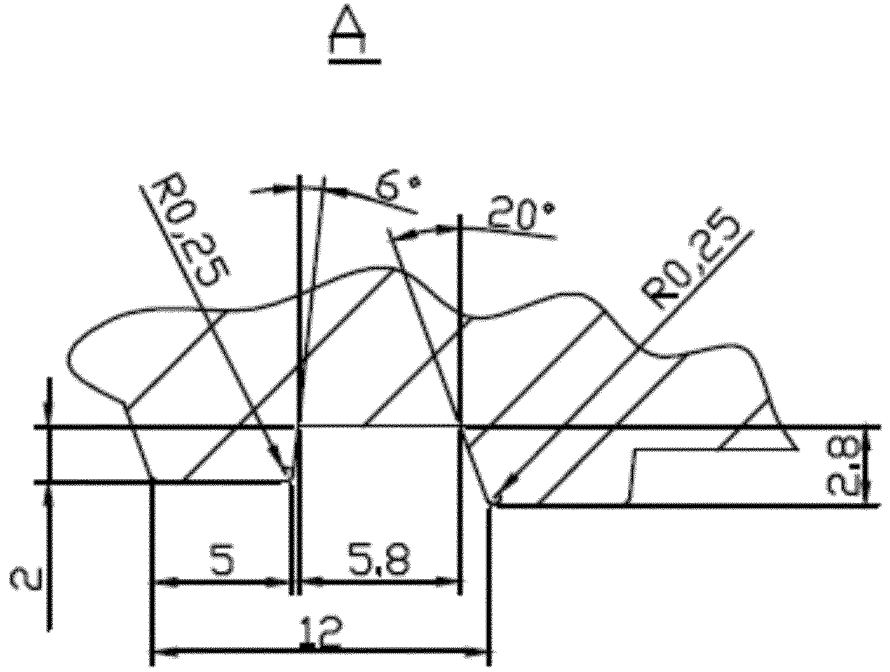


Fig. 8a

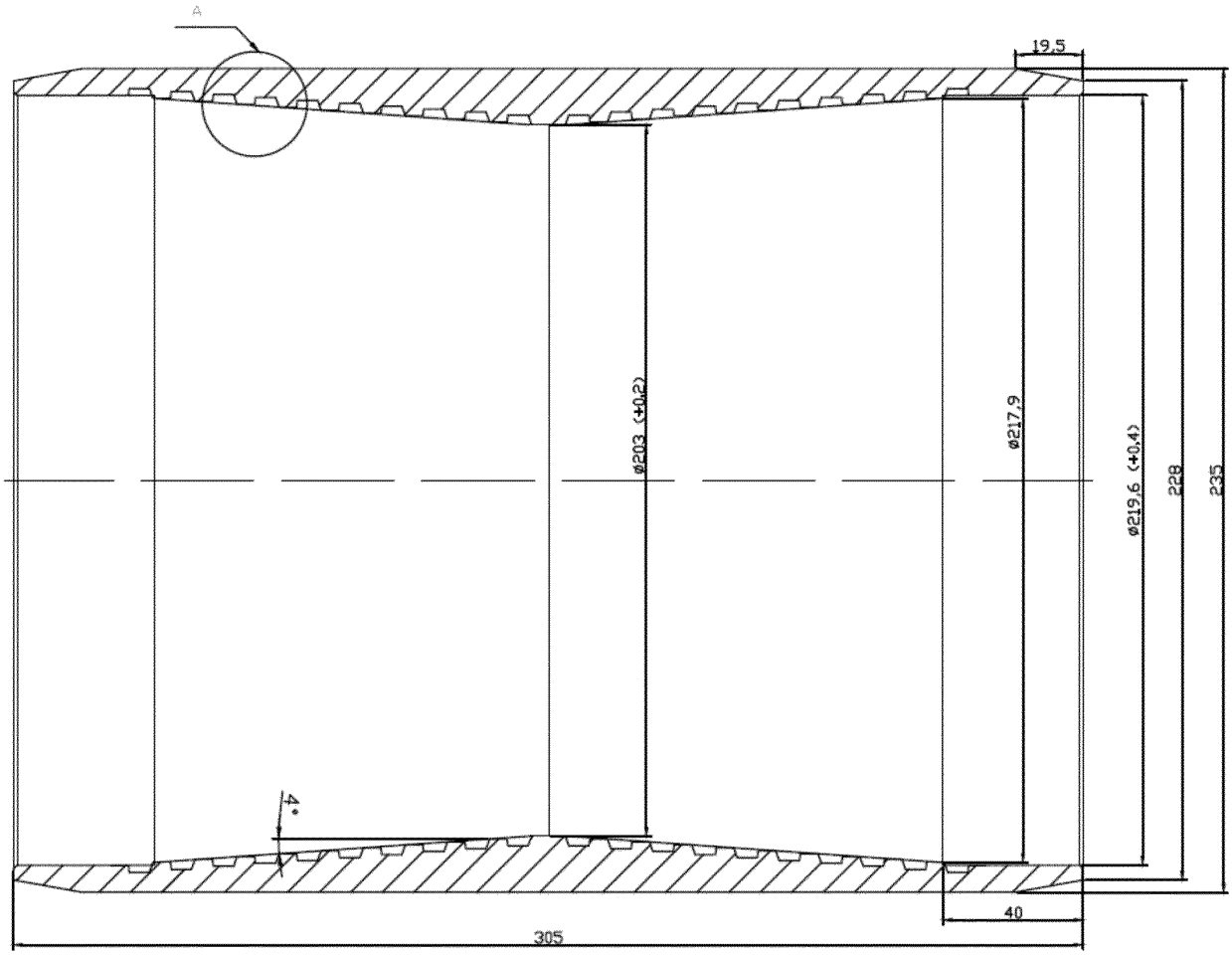


Fig. 9

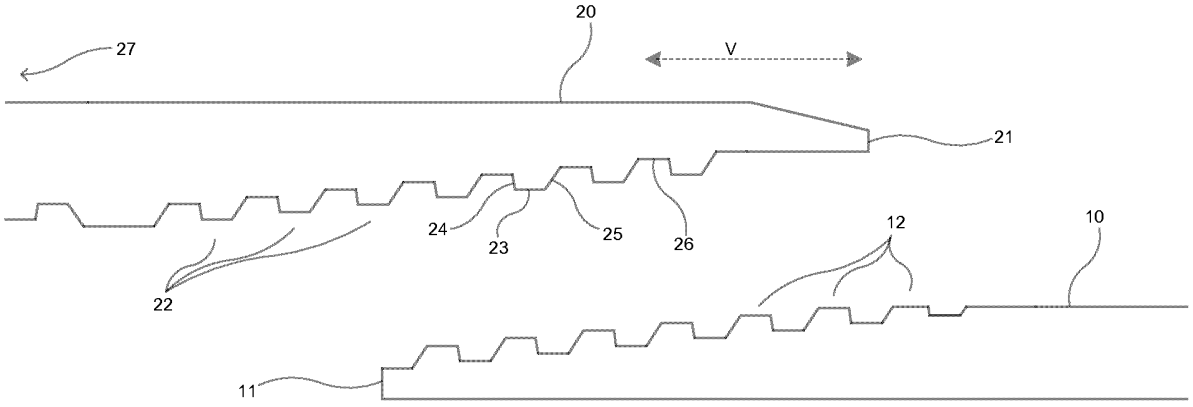
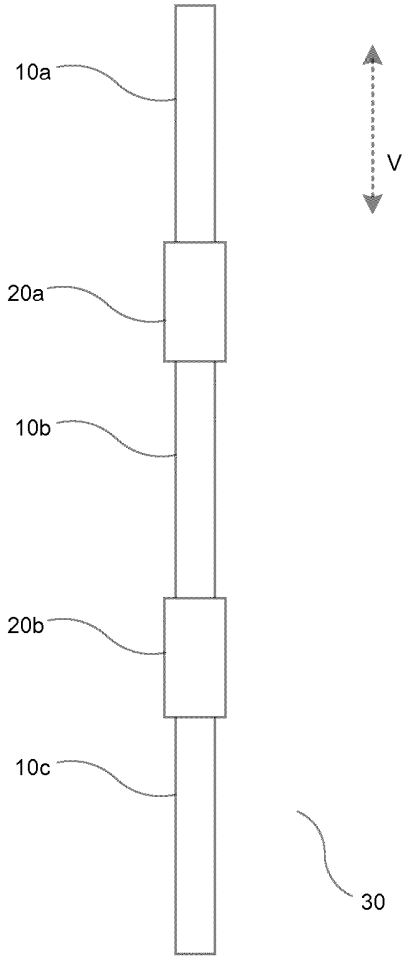


Fig. 10



REFERENCES CITED IN THE DESCRIPTION

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- EP 2256251 A2 **[0004]**
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- SE 523782 B **[0004]**