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A combination of a first pipe section and a second pipe section, a pipe, a method to construct a pipe, and a pipe section.

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The present invention provides a combination of a thin-walled first pipe section and a thin-walled second pipe section configured to be connected to each other to form a pipe using a conical screw thread connection, wherein the screw thread connection is formed by an inner screw thread arranged at an inner surface provided at a first end of the first pipe section, and an outer screw thread arranged at an outer surface provided at a second end of the second pipe section.

The invention is characterized in that the inner screw thread and the outer screw thread are designed to have a negative play with respect to each other, such that screwing the inner screw thread and the outer screw thread in each other results in an increased wall thickness at the screw thread connection, for example at least 5 %, with respect to the wall thickness in a middle part of the first pipe section and the second pipe section.

A combination of a first pipe section and a second pipe section, a pipe, a method to construct a pipe, and a pipe section.

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The invention relates to a combination of a thin-walled first pipe section and a thin-walled second pipe section configured to be connected to each other to form a pipe. Such pipe may for example be used as a foundation pile for supporting a building structure such as a house. The invention further relates to a pipe constructed from a combination of a first and

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second pipe section, a method to construct a pipe, and a pipe section. In a known embodiment of a foundation pile, a connection between a first pipe section and a second pipe section is formed by a conical screw thread connection. In this conical screw thread connection a first end of the first pipe section comprises an inner screw thread arranged at a conical inner surface provided at the first end of the first pipe section, and the second pipe

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section comprises an outer screw thread arranged at a conical outer surface provided at a second end of the second pipe section. By screwing the outer screw thread into the inner screw thread the first pipe section and the second pipe section are connected to each other. Usually, the pipe is constructed by multiple pipe sections, wherein each pipe section comprises an inner screw thread at the first

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end and an outer screw thread at the second end. Usually, the first end of the first pipe section and the second end of the second pipe section each comprise a stop surface. The first stop surface and the second stop surface are arranged such that the inner screw thread and the outer screw thread are completely screwed into each other when the first stop surface abuts the second stop surface.

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The first and second pipe sections normally have at least over the middle part a constant outer diameter and a constant inner diameter, and the conical inner and outer surfaces extend between this inner diameter and the outer diameter.

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A drawback of the known combination of pipe section is that the screw thread connection introduces a relatively weak location in the pipe constructed from the first and second pipe sections.

It is an aim of the invention to provide an improved combination of pipe sections that provides increased strength to the pipe constructed from the pipe sections.

The invention provides combination of a thin-walled first pipe section and a thin-walled second pipe section configured to be connected to each other to form a pipe using a screw thread connection, wherein the screw thread connection is formed by:

5 an inner screw thread arranged at an inner surface provided at a first end of the first pipe section, and

an outer screw thread arranged at an outer surface provided at a second end of the second pipe section,

10 characterized in that the inner screw thread and the outer screw thread are designed to have a negative play with respect to each other, such that screwing the inner screw thread and the outer screw thread in each other results in an increased wall thickness at at least a part of the screw thread connection, for example at least 5 %, with respect to the wall thickness in a middle part of the first pipe section and the second pipe section.

15 According to the invention, the screw thread connection is designed with substantial negative play. Due to this negative play, screwing the outer screw thread into the inner screw thread to the desired depth will result in an increased wall thickness of the screw thread connection compared with a middle part of the first and second pipe section. The increased wall thickness of a combination according to the invention is for example, on average, at least 5% with respect to the wall thickness of a middle part of the first and second pipe section.

20 It has been found that an increase of wall thickness of at least 5% substantially improves the strength of the screw thread connection and therewith the pipe constructed with the first and second pipe sections.

25 Screwing of the outer screw thread into the inner screw thread until the desired depth has been reached will, due to the negative play, lead to stresses above the yield point of the material and, as a result, in plastic deformation of the inner screw thread, the outer screw thread and the inner surface and/or the outer surface. Since the first and second pipe sections are thin-walled, the deformation may be absorbed in the first and/or second end of the first and second pipe section, respectively. It is remarked that the deformation of the screw threads also results in a better engaging of the screw threads into each other which also increases the strength of the screw thread connection.

30 Due to the deformation of the inner screw thread and the outer screw thread of the screw thread connection is that a permanent connection may be obtained between the inner screw thread and the outer screw thread. This has the advantage that a drilling pipe can be rotated clockwise and anti-clockwise once the outer screw thread has been screwed into the inner screw thread. The combination of the invention is typically suitable for single use.

The increase in wall thickness may occur over a substantial part of the length of the first and second parts, for example at least half of the length of the first part.

5 A further advantage of the combination according to the invention is that, since the strength of the screw thread connections may be increased by the increased wall thickness of the screw thread connection, pipe sections with a smaller wall thickness can be used to obtain a pipe with a corresponding strength when compared with conventional screw thread connections.

This results in a decrease in the volume of steel to be used which represents a decrease in costs, weight etc.

10 The first pipe section and second pipe section can be made of steel, preferably high strength steel. The first pipe section and second pipe section are preferably fabricated by forming steel plate into a tube like form and welding the longitudinal or spiral shaped seams to form a pipe section having a constant outer diameter and inner diameter over its entire length. Subsequently, the inner surface and inner screw thread and the outer surface and the outer
15 screw thread can be machined into the respective pipe section.

In an embodiment, the outer surface at the outer end of the outer screw thread has a smaller diameter than the inner surface at the outer end of the inner screw thread. The outer end of the outer screw thread is the end of the screw thread closest to an end of the pipe section; similarly, the outer end of the inner screw thread is the end of the screw thread closest
20 to an end of the pipe section.

The inner screw tread and the outer screw thread have a negative play with respect to each other. By making the diameter of the outer surface at the outer end of the outer screw thread smaller than the diameter of the inner surface at the outer end of the inner screw thread, the beginning of the outer screw thread can be screwed more easily in the beginning of the
25 inner screw thread.

In an embodiment, screwing the inner screw thread and the outer screw thread in each other results in an increased wall thickness at the screw thread connection of at least 10 %, preferably 15% - 50%, with respect to the wall thickness of a middle part of the first pipe section and a middle part of the second pipe section.

30 In an embodiment, the inner surface is a conical inner surface and the outer surface is a conical outer surface. By providing a conical inner surface and a conical outer surface provided with an inner screw thread and an outer screw thread, respectively, the increase in wall thickness over the length of the screw thread connection can be made substantially constant.

In alternative embodiments, one of the inner surface and the outer surface may be conical while the other is mainly cylindrical.

In an embodiment, the inner screw thread and the outer screw thread have a screw thread height extending from the conical inner surface and conical outer surface, respectively, wherein the inner screw thread runs from a first inner diameter of the conical inner surface to a second inner diameter of the conical inner surface, wherein the first inner diameter is larger than the second inner diameter, wherein the outer screw thread runs from a first outer diameter of the conical outer surface to a second outer diameter of the conical outer surface, wherein the first outer diameter is larger than the second outer diameter, and wherein a difference between the first inner diameter and the first outer diameter or a difference between the second inner diameter and the second outer diameter is smaller than the screw thread height.

In an embodiment, the middle part of the first tube section has an inner diameter and an outer diameter, wherein the conical inner surface of the inner screw thread has a minimum diameter larger than or equal to the inner diameter and a maximum diameter smaller than or equal to the outer diameter, and wherein the conical outer surface of the outer screw thread has a minimum diameter larger than or equal to the inner diameter and a maximum diameter smaller than or equal to the outer diameter. In other words the conical inner surface extends between the inner diameter and the outer diameter of the middle part of the first pipe section and In other words the conical outer surface extends between the inner diameter and the outer diameter of the middle part of the second pipe section.

In an embodiment, a wall thickness of the first pipe section and the second pipe section is maximally 10% of the diameter of the first pipe section and the second pipe section, respectively. The first and second pipe sections are thin walled pipe sections to allow plastic deformation of the conical inner and/or outer surfaces while the outer screw thread is screwed into the inner screw thread.

The outer diameter of the first and second pipe section may for example be in the range of 50 mm - 150 mm, while the wall thickness of the pipe sections is 4 mm – 15 mm. The thin wall of the pipe sections is advantageous in order to allow the first end and/or the second end to plastically deform when the outer screw thread is screwed into the inner screw thread.

In an embodiment, screwing the inner screw thread and the outer screw thread in each other comprises screwing until a stop surface at a first end of the first pipe section abuts an associated stop surface on the second end of the second pipe section.

By using stop surfaces arranged at the first end of the first pipe section and the second end of the pipe, the user can easily determine whether the outer screw thread has been

screwed into the inner screw thread to the desired depth. The stop surfaces may for example be arranged at the inner side of the screw thread connection or the outer side of the screw thread connection or both.

5 Other indicators to indicate the desired screwing depth may also be used such as indicator lines. In another embodiment, the number of revolutions or a minimal number of revolutions of the outer screw thread with respect to the inner screw thread may be prescribed to the user, in order to assure that the outer screw thread has been screwed into the inner screw thread to the desired depth.

10 In an embodiment, the combination comprises a sealing ring to be arranged between the first end of the first pipe section and the second end of the second pipe section. A sealing ring may be provided between the first end and the second end to seal the transition between the first pipe section and the second pipe section. This sealing ring may in particular prevent that moisture reaches the inner and/or outer screw thread. The sealing ring may for example be provided near the outer surface of the first and second pipe sections to prevent moisture to
15 enter the screw thread connection from the outer surface of the pipe sections. As an alternative, or in addition, a sealing ring may be provided near the inner surface of the first and second pipe sections to prevent moisture to enter the screw thread connection from the inner surface of the pipe sections.

20 The first pipe section and/or the second pipe section, in particular the first end and/or the second end, respectively, may comprise a circumferential groove to at least partially receive the sealing ring.

In an embodiment, the screw thread connection is intended to be plastically deformed during screwing the inner screw thread and the outer screw thread in each other results to obtain the increased wall thickness at the screw thread connection of at least 5 % with respect
25 to the wall thickness in a middle part of the first pipe section and the second pipe section.

In an embodiment, the combination comprises multiple pipe sections, wherein each pipe section comprises a first end and a second end opposed to the first end, wherein each pipe section comprises an inner screw thread arranged at an inner surface provided at the first end of the pipe section, and an outer screw thread arranged at an outer surface provided at the
30 second end of the pipe section, wherein the multiple pipe sections can be connected to each other using the inner and outer screw threads to form a pipe.

In an embodiment, the inner screw thread and the outer screw thread are double or triple screw threads. The screw thread connection according to the invention requires a relatively large torque in order to screw the outer screw thread into the inner screw thread. To

prevent that the required forces on the threads become too high, it may be advantageous to use double or triple screw threads as inner and outer screw threads. Since the pitch of the double or triple screw threads may be larger compared to a single screw thread, the forces on the threads may be lower.

5 The invention further provides a pipe constructed by screwing the first pipe section and the second pipe section of any of the preceding claims to each other, wherein the screw thread connection has a wall thickness larger, for example at least 5 % larger, than a wall thickness in a middle part of the first pipe section and the second pipe section.

10 In an embodiment, the pipe may be a foundation pile. Such foundation pile may be rammed, vibrated, drilled and/or pushed into the ground to create a foundation pile to support an object, such as a building. The foundation pile may be filled, before, during and/or after being arranged in the ground, with a suitable filling material, such as cement grout, grout, concrete, and/or mortar.

15 The presence of such filling material will increase the strength of the screw thread connection since the filling material will provide radial support at the inner side of the screw thread connection. This radial support may prevent that the outer surface 7 is pressed inwards into the foundation pile 1.

20 The invention also provides a method to provide a pipe using a combination as claimed in any of the claims 1-17, comprising the step of connecting the first pipe section and the second pipe section, wherein the step of connecting comprises screwing the inner screw thread and the outer screw thread in each other, wherein screwing involves introducing stresses into the screw thread connection above the yield point of the material of the first pipe section and the second pipe section.

25 The method of the invention may require a relatively large torque during the screwing of the outer screw thread into the inner screw thread to obtain the desired plastic deformation in the screw thread connection. For example, a torque used for screwing the outer screw thread into the inner screw thread may be at least 20% of a torque required to reach a yielding point in the middle part of the first pipe section and/or second pipe section.

30 Screw driving machines used for rotating, e.g. drilling drill pipes or foundation piles into the ground are often capable of delivering such torque for pipe sections used for these applications. Therefore, the method according to the invention may be carried out using a screw driving machine for drilling pipes into the ground for foundation purposes.

 The invention also provide a thin-walled pipe section comprising a middle part, a first end and a second end, wherein an inner screw thread is arranged at an inner surface provided

at the first end of the pipe section, and an outer screw thread is arranged at an outer surface provided at the second end of the pipe section,

characterized in that the inner screw thread and the outer screw thread have a negative play with respect to each other, such that screwing the outer screw thread in a corresponding inner screw thread of a corresponding pipe section results in an increased wall thickness at the screw thread connection, for example at least 5 %, with respect to the wall thickness in a middle part of the pipe section.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings in which:

Figure 1 shows a longitudinal cross section of a pipe section according to a first embodiment of the invention;

Figure 2 shows a longitudinal cross section of the screw thread connection between two pipe sections as shown in Figure 1;

Figure 3 shows a longitudinal cross section of an alternative embodiment of a screw thread connection between two pipe sections;

Figure 4 shows the first end of an embodiment of a pipe section in more detail;

Figure 5 shows the second end of the pipe section of Figure 4 in more detail;

Figure 6 shows a longitudinal cross section of a pipe section according to a second embodiment of the invention; and

Figure 7 shows a longitudinal cross section of the screw thread connection between two pipe sections as shown in Figure 6.

Figure 1 shows a longitudinal cross section of an embodiment of a pipe section, generally denoted by reference numeral 1. The pipe section 1 comprises a middle part 2, a first end 3 and a second end 4.

The pipe section 1 is thin-walled, in particular the wall thickness of the pipe section 1 is maximally 10% of the diameter of the pipe section 1. The outer diameter of the pipe section 1 is at least 50 mm.

The first end 3 comprises a conical inner surface 5 having an inner screw thread 6 and the second end 4 comprises a conical outer surface 7 having an outer screw thread 8. The first end 3 further comprises a stop surface 9 and the second end 4 comprises a stop surface 10.

The pipe section 1 is fabricated by welding a steel plate in a pipe-shaped form. The welded pipe section has a constant inner diameter and a constant outer diameter over its entire length.

5 Thereafter, the conical inner surface 5 and the conical outer surface 7, including the inner screw thread 6 and the outer screw thread 8 are machined into the pipe section, resulting in the pipe section 1 shown in Figure 1. The outer diameter of the pipe section 1 is constant over the middle part 2 and the first end 3, while the inner diameter of the pipe section 1 is constant over the middle part and the second end 4.

10 The pipe section 1 is intended to be used in combination with other pipe sections to construct a pipe, for example a pipe used as a drilling pipe or foundation pile. Such foundation pile may be rammed, vibrated, drilled and/or pushed into the ground to create a foundation pile to support an object, such as a building. A drilling pipe is intended to be drilled into the ground.

15 After the foundation pile is formed in the ground connecting multiple pipe sections 1 on top of each other, the foundation pile may be filled with a filling material such as cement grout, grout, concrete or mortar. The presence of such filling material may increase the strength of the foundation pile.

20 The pipe section 1 and other pipe sections may be substantially identical. Typically, the other pipe sections will have the same inner and outer diameter, and the same of different lengths. In each of these pipe sections, the first end comprises a conical inner surface having an inner screw thread and the second end comprises a conical outer surface having an outer screw thread, substantially identical to the pipe section 1 shown in Figure 1.

It is remarked that hereinafter the reference numerals used with respect to the pipe section 1 of Figure 1 will also be used for corresponding parts of other pipe sections.

25 A pipe can be constructed using the pipe sections 1 by screwing the outer screw thread 8 of one pipe section 1 into the inner screw thread 6 of the other pipe section 1. During connection of two pipe sections 1, the outer screw thread 8 is completely screwed into the inner screw thread 6 until the stop surface 9 of the first end 3 abuts the stop surface 10 of the second end 4.

30 Instead of stop surfaces 9 and 10 to indicate that the inner screw thread 6 and the outer screw thread 8 are screwed into each other to the desired depth also other indicators such as indicator stripes can be used. Also a certain number of revolutions may be prescribed in order to assure that the outer screw thread 8 is screwed to the desired depth into the inner screw thread 6.

A known screw driving machine used in drilling pipes into the ground for foundation purposes may be used to screw the outer screw thread 8 into the inner screw thread.

In the pipe section of Figure 1, the inner screw thread 6 and the outer screw thread 8 have a screw thread height extending from the conical inner surface 6 and conical outer surface 8, respectively. The inner screw thread 6 runs from a first inner diameter of the conical inner surface 5 to a second inner diameter of the conical inner surface 5, wherein the first inner diameter is larger than the second inner diameter. Similarly, the outer screw thread 8 runs from a first outer diameter of the conical outer surface 7 to a second outer diameter of the conical outer surface 7, wherein the first outer diameter is larger than the second outer diameter.

The difference between the first inner diameter and the first outer diameter and the difference between the second inner diameter and the second outer diameter is smaller than the screw thread height.

As a result, the inner screw thread 6 and the outer screw thread 8 have negative play with respect to each other. Screwing of the outer screw thread 8 into the inner screw thread 6 until the stop surfaces 9 and 10 abut against each other, can only be accomplished by introducing stresses that exceed the yield point of the material of the pipe sections 1. This results in plastic deformation of the first end 3 and/or the second end 4 of the respective pipe sections of the conical screw thread connection.

A longitudinal cross section of the screw thread connection obtained by screwing the outer screw thread 8 of a second pipe section 1b into the inner screw thread 6 of a first pipe section 1a until the stop surfaces 9 and 10 abut against each other is shown in Figure 2. It can be seen that the wall thickness of the screw thread connection, for example at cross section B-B is increased with respect to the wall thickness of the middle part 2 of the pipe section, i.e. cross section A-A, due to the negative play of the inner screw thread 6 and the outer screw thread 8 and the associated increase in material.

This increase in wall thickness of the screw thread connection is at least 5% with respect to the wall thickness of the middle part 2 of the pipe section. Preferably, the increase in wall thickness is at least 10% with respect to the wall thickness of the middle part 2 of the pipe sections 1.

The increase in wall thickness at the location of the conical screw thread connection improves the strength of screw thread connection and therewith the overall strength of the pipe constructed with the pipe sections 1.

Figure 2 shows only one screw thread connection of a first pipe section 1a to a second pipe section 1b. Further pipe sections 1 may be connected to combination to increase the length of the pipe. Each of the

Figure 3 shows an alternative embodiment of a first pipe section 1a and a second pipe section 1b. In this embodiment, a sealing ring 11 is provided between the first end 3 and the second end 4 to seal the transition between the first pipe section 1a and the second pipe section 1b at the outer surface of the pipe. This sealing ring 11 protects the screw thread connection from environmental influences from the outside such as moisture in order to prevent corrosion of the screw thread connection.

Correspondingly, a sealing ring may be provided at the transition between the first pipe section 1a and the second pipe section 1b at the inner surface of the pipe.

The first end 3 and/or the second end 4 may be provided with a circumferential groove to at least partially receive the sealing ring 11.

It is remarked that instead of providing a sealing ring, the part of the inner surface closest to the end of the pipe section 1 and the part of the outer surface 7 abutting against this part after screwing the inner and outer screw thread in to each other may be flat surfaces, i.e. without inner and outer screw thread, to form a sealing engagement at the outer side of the screw thread connection. Similarly, a sealing engagement can be created by two flat surfaces at the inner end of the screw thread connection.

Figures 4 and 5 show an embodiment of a pipe section 1 as depicted in Figure 1 in more detail. Figure 4 shows the first end 3 of the pipe section 1, while Figure 5 shows the second end 4 of the pipe section 1 in more detail.

Figures 4 and 5 show a pipe section having a middle part 2 with an outer diameter D_o of about 88.9 mm and an inner diameter D_i of about 76.3 mm. The wall thickness w of the middle part 2 is therewith about 6.3 mm which is about 7 % of the outer diameter D_o .

At the first end 3, an inner screw thread 6 is provided on the conical inner surface 5. The conical inner surface 5 with the inner screw thread 6 is machined in the pipe section 1. The length L_1 of the first end is about 50 mm and the angle α of the conical inner surface 5 with respect to the longitudinal axis of the pipe section 1 is about 1.95 degrees.

The first end comprises two surfaces extending in a plane perpendicular to the longitudinal axis of the pipe section 1, i.e. the stop surface 9 and a second stop surface 12. The width a of the stop surface 9 is about 0.6 mm and width b of the second stop surface 12 is about 2.5 mm.

Detail A of Figure 4 is depicted in Figure 4a and shows the inner screw thread 6 in more detail. The inner screw thread 6 has a screw thread height h of about 1.5 mm.

The inner screw thread 6 comprises a root, a flank and a crest. The root of the inner screw thread 5 has a dimension i of about 1.9 mm, the flank has a dimension j of about 0.75 mm and the crest has a dimension k of about 1.6 mm.

At the second end 4, as shown in Figure 5, an outer screw thread 8 is provided on the conical outer surface 7. The conical outer surface 7 with outer screw thread 8 is machined in the pipe section 1. The length L_2 of the second end 4 is, corresponding to the length L_1 of the first end 3, about 50 mm. The angle β of the conical outer surface 7 with respect to the longitudinal axis of the pipe section 1 is about 1.72 degrees, and therefore differs from the angle α of the conical inner surface 5 at the first end 3.

The second end 4 comprises two surfaces extending in a plane perpendicular to the longitudinal axis of the pipe section 1, i.e. the stop surface 10 and a second stop surface 13. The width c of the stop surface 10 is about 1.5 mm and width d of the second stop surface 13 is about 1.8 mm.

When the inner screw thread 6 and the outer screw thread 8 are completely screwed into each other, the stop surface 9 will abut against the stop surface 10 and the stop surface 12 will abut against the stop surface 13. In alternative embodiments, the dimensions of the stop surfaces may be different or there may be only one stop surface on each of the first end 3 and the second end 4. It is also possible that no stop surfaces are provided.

Detail B of Figure 5 is depicted in Figure 5a and shows the outer screw thread 8 in more detail. The outer screw thread 8 has a screw thread height h of about 1.5 mm.

The outer screw thread 8 comprises a root, a flank and a crest corresponding to the root, flank and crest of the inner screw thread 6. The root of the outer screw thread 8 has a dimension p of about 1.9 mm, the flank has a dimension q of about 0.75 mm and the crest has a dimension of about 1.6 mm.

The pitch of the inner screw thread 6 and the outer screw thread 8 is about 5 mm.

It is remarked that Figures 4 and 5 only show an example of a combination of an inner screw thread 6 and an outer screw thread 8 that have negative play with respect to each other. The dimensions of the conical inner surface 5 and the conical outer surface 7 and the inner screw thread 6 and the outer screw thread 8 provided thereon may differ as long as the inner screw thread 6 and the associated outer screw thread 8 have negative play with respect to each other, and the pipe section is a thin walled pipe section that allows plastic deformation of

the first end 3 and the second end 4 when the outer screw thread 8 is screwed into the inner screw thread 6.

Figure 6 shows a second embodiment of a pipe section 1 according to the invention. The pipe section comprises a middle part 2, a first end 3 and a second end 4. The second end 4 corresponds to the second end of the pipe section 1 of Figure 1, having a conical outer surface 7 with an outer screw thread 8. The first end 3 comprises an inner surface having a cylindrical main part 15 and a conical end part 16 at the outer end of the second end 3. The inner screw thread 6 runs over the cylindrical main part 15 and the conical end part 16.

The conical end part 16 is provided to allow at least the outer end of the outer surface 7 to be arranged in the interior space of the pipe section 1 at the outer end of the first end 3, such that the beginning of the outer screw thread 8 can be engaged with the beginning of the inner screw thread 6.

By screwing the inner screw thread 6 further into the outer screw thread, plastic deformation of the first end 3 and the second end 4 will occur. The resulting screw thread connection is shown in Figure 7. It can be seen that at the upper side of the screw thread connection the wall thickness has increased with a relatively low amount, i.e. the material of the stop surface 10, while at the other lower end of the screw thread connection, the wall thickness has been increased with at least 50% of the wall thickness of the middle part 2 of the pipe sections. This increase in wall thickness substantially increases the strength of the screw thread connection. In practice, an increase in wall thickness of almost 100 % can be created.

It is remarked that although the embodiment of Figure 6 shows an inner surface 5 with a cylindrical main part 15 and the conical end part 16, also other inner surfaces may be used, such as for example two or more adjacent conical inner surfaces with different angles, or other combinations of adjacent inner surfaces.

CONCLUSIES

1. Combinatie van een dunwandig eerste buisdeel en een dunwandig tweede buisdeel die zijn ingericht om door middel van een schroefdraadverbinding met elkaar te worden
5 verbonden om een buis te vormen, waarbij de schroefdraadverbinding wordt gevormd door:
een binnenschroefdraad aangebracht op een binnenoppervlak voorzien aan een
eerste einde van het eerste buisdeel, en
een buitenschroefdraad aangebracht op een buitenoppervlak voorzien aan een
tweede einde van het tweede buisdeel,
10 met het kenmerk, dat de binnenschroefdraad en de buitenschroefdraad zijn ontworpen
om een negatieve speling ten opzichte van elkaar te hebben, zodat het in elkaar schroeven
van de binnenschroefdraad en de buitenschroefdraad resulteert in een verhoogde wanddikte
van tenminste een deel van de schroefdraadverbinding, bijvoorbeeld ten minste 5%, ten
opzichte van de wanddikte in een middengedeelte van het eerste buisdeel en het tweede
15 buisdeel.
2. Combinatie volgens conclusie 1, waarbij het buitenoppervlak aan het uiteinde van de
buitenschroefdraad een kleinere diameter heeft dan het binnenoppervlak aan het uiteinde van
de binnenschroefdraad.
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3. Combinatie volgens conclusie 1 of 2, waarbij het in elkaar schroeven van de
binnenschroefdraad en de buitenschroefdraad resulteert in een verhoogde wanddikte van de
schroefdraadverbinding van ten minste 10% ten opzichte van de wanddikte van een
middengedeelte van het eerste buisdeel en een middengedeelte van het tweede buisdeel.
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4. Combinatie volgens een van de conclusies 1-3, waarbij het binnenoppervlak een
conisch binnenoppervlak is en het buitenoppervlak een conisch buitenoppervlak.
5. Combinatie volgens conclusie 4, waarbij de binnenschroefdraad en de
30 buitenschroefdraad een schroefdraadhoogte hebben die zich uitstrekt vanaf het conische
binnenoppervlak respectievelijk het conische buitenoppervlak,
waarbij de binnenschroefdraad van een eerste binnendiameter van het conische
binnenoppervlak naar een tweede binnendiameter van het conische binnenoppervlak loopt,
waarbij de eerste binnendiameter groter is dan de tweede binnendiameter,
35 waarbij de buitenschroefdraad van een eerste buitendiameter van het conische
buitenoppervlak naar een tweede buitendiameter van het conische buitenoppervlak loopt,
waarbij de eerste buitendiameter groter is dan de tweede buitendiameter

waarbij een verschil tussen de eerste binnendiameter en de eerste buitendiameter of een verschil tussen de tweede binnendiameter en de tweede buitendiameter kleiner is dan de schroefdraadhoogte.

5 6. Combinatie volgens conclusie 5, waarbij het verschil tussen de eerste binnendiameter en de eerste buitendiameter en het verschil tussen de tweede binnendiameter en de tweede buitendiameter kleiner is dan de schroefdraadhoogte.

7. Combinatie volgens een van de conclusies 4-6,
10 waarbij het middengedeelte van het eerste buisdeel een binnendiameter en een buitendiameter heeft,
waarbij het conische binnenoppervlak van de binnenschroefdraad een minimumdiameter heeft die groter is dan of gelijk is aan de binnendiameter en een maximumdiameter die kleiner is dan of gelijk is aan de buitendiameter, en waarbij het
15 conische buitenoppervlak van de buitenschroefdraad een minimumdiameter heeft die groter is dan of gelijk is aan de binnendiameter en een maximum diameter die kleiner is dan of gelijk is aan de buitendiameter.

8. Combinatie volgens een van de voorgaande conclusies, waarbij de buitendiameters
20 en binnendiameters van de eerste en tweede buisdelen tenminste constant en hetzelfde zijn voor de middengedeelten van het eerste buisdeel en het tweede buisdeel, waarbij de buitendiameter van het eerste einde van het eerste buisdeel gelijk is aan de buitendiameter van het middengedeelte van het eerste buisdeel en waarbij de binnendiameter van het tweede einde van het tweede buisdeel gelijk is aan de binnendiameter van het
25 middengedeelte van het tweede buisdeel.

9. Combinatie volgens een van de voorgaande conclusies, waarbij een wanddikte van het eerste buisdeel en de tweede buisdeel maximaal 10% is van de diameter van het eerste buisdeel respectievelijk het tweede buisdeel.

30

10. Combinatie volgens een van de voorgaande conclusies, waarbij een buitendiameter van het eerste buisdeel en een buitendiameter van de tweede buisdeel ten minste 50 mm is.

11. Combinatie volgens een van de voorgaande conclusies, waarbij het in elkaar
35 schroeven van de binnenschroefdraad en de buitenschroefdraad omvat het in elkaar schroeven totdat een aanslagvlak bij een eerste einde van het eerste buisdeel aanligt tegen een bijbehorend aanslagvlak bij het tweede einde van het tweede buisdeel.

12. Combinatie volgens een van de voorgaande conclusies, waarbij de combinatie een afdichtring omvat om te worden aangebracht tussen het eerste einde van het eerste buisdeel en het tweede einde van het tweede buisdeel.

5 13. Combinatie volgens een van de voorgaande conclusies, waarbij de buis een funderingspaal of boorbuis is.

10 14. Combinatie volgens een van de voorgaande conclusies, waarbij de schroefdraadverbinding is bedoeld om plastisch te worden vervormd tijdens het in elkaar schroeven van de binnenschroefdraad en de buitenschroefdraad om de verhoogde wanddikte bij de schroefdraadverbinding van ten minste 5% ten opzichte van de wanddikte in een middengedeelte van het eerste buisdeel en het tweede buisdeel te verkrijgen.

15 15. Combinatie volgens een van de voorgaande conclusies, waarbij de combinatie meerdere buisdelen omvat, waarbij elk buisdeel een eerste einde en een tegenover het eerste einde liggende tweede einde omvat, waarbij elk buisdeel een binnenschroefdraad aangebracht op een binnenoppervlak voorzien aan het eerste einde van het buisdeel en een buitenschroefdraad aangebracht op een buitenoppervlak voorzien aan het tweede einde van het buisdeel, waarbij de meerdere buisdelen met elkaar kunnen worden verbonden door
20 middel van de binnenschroefdraad en de buitenschroefdraad om een buis te vormen.

16. Combinatie volgens een van de voorgaande conclusies, waarbij de binnenschroefdraad en de buitenschroefdraad dubbel of driedubbel schroefdraad zijn.

25 17. Buis geconstrueerd door het aan elkaar schroeven van het eerste buisdeel en het tweede buisdeel volgens een van de voorgaande conclusies, waarbij de schroefdraadverbinding een wanddikte heeft die groter, bijvoorbeeld ten minste 5% groter, is dan een wanddikte van een middengedeelte van het eerste buisdeel en het tweede buisdeel.

30 18. Buis volgens conclusie 17, waarbij de buis een funderingspaal is, waarbij de funderingspaal bij voorkeur gevuld is met een vulmateriaal, zoals cementspecie, grout, beton en/of mortel.

35 19. Werkwijze om een buis te verschaffen met een combinatie volgens een van de conclusies 1-16, omvattende de stap van het verbinden van het eerste buisdeel en het tweede buisdeel, waarbij de stap van het verbinden omvat het in elkaar schroeven van de binnenschroefdraad en de buitenschroefdraad, waarbij het schroeven omvat het introduceren

van spanningen in de schroefdraadverbinding boven de rekgrens van het materiaal van het eerste buisdeel en het tweede buisdeel.

20. Werkwijze volgens conclusie 19, waarbij een draaimoment gebruikt voor het
5 schroeven van de buitenschroefdraad in de binnenschroefdraad ten minste 20% is van een
koppel dat vereist is om een rekgrens te bereiken in het middengedeelte van het eerste
buisdeel en/of het tweede buisdeel.

21. Dunwandige buisdeel omvattende een middengedeelte, een eerste einde en een
10 tweede einde, waarbij een binnenschroefdraad is aangebracht op een binnenoppervlak
voorzien aan het eerste einde van het buisdeel en een buitenschroefdraad is aangebracht op
een buitenoppervlak voorzien aan het tweede einde van het buisdeel,
met het kenmerk, dat de binnenschroefdraad en de buitenschroefdraad een negatieve
speling ten opzichte van elkaar hebben, zodanig dat het schroeven van de
15 buitenschroefdraad in een overeenkomstige binnenschroefdraad van een overeenkomstig
buisdeel resulteert in een verhoogde wanddikte bij de schroefdraadverbinding, bijvoorbeeld
ten minste 5%, ten opzichte van de wanddikte in een middengedeelte van het buisdeel.

Figure 1

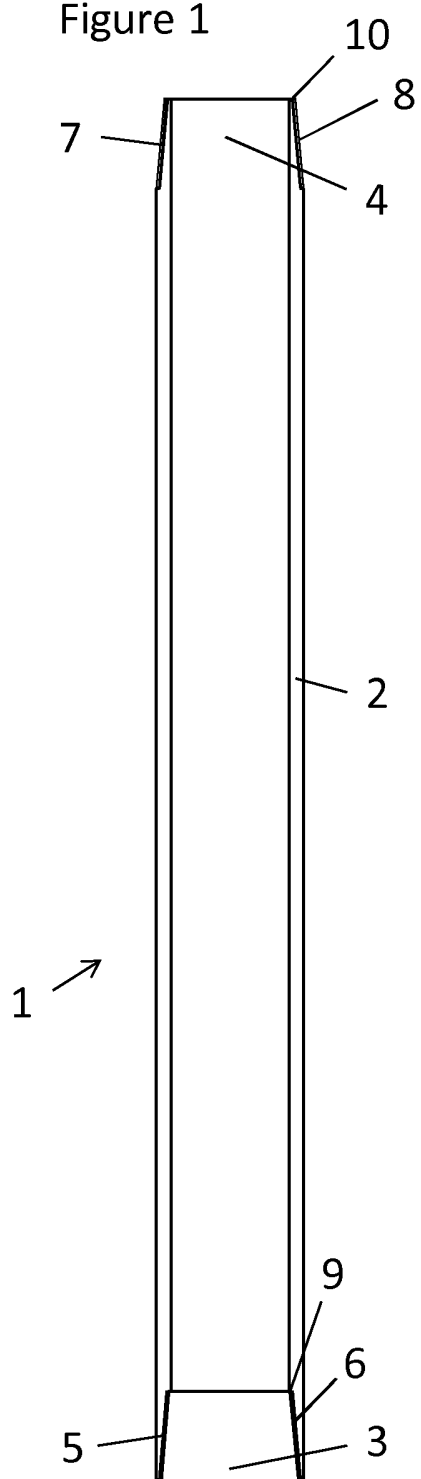


Figure 2

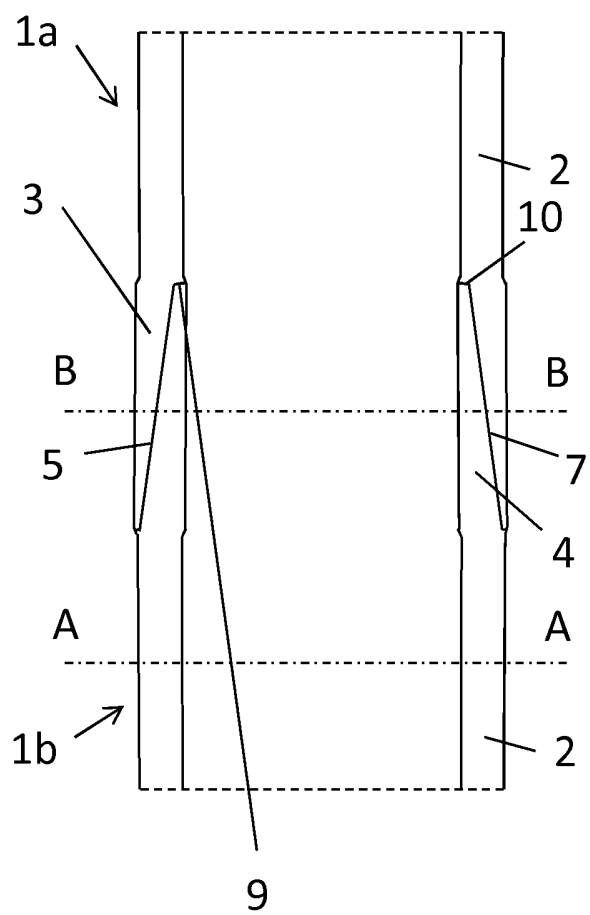


Figure 3

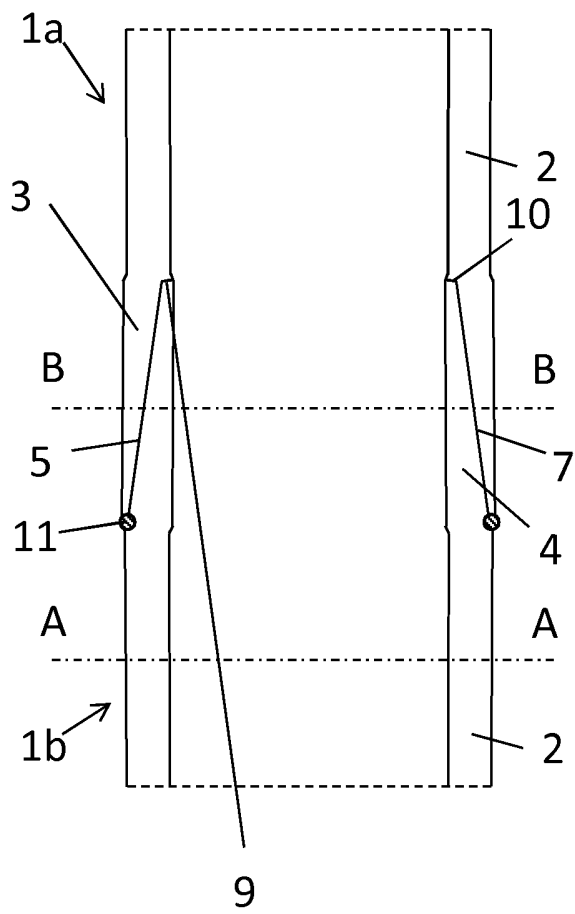


Figure 4

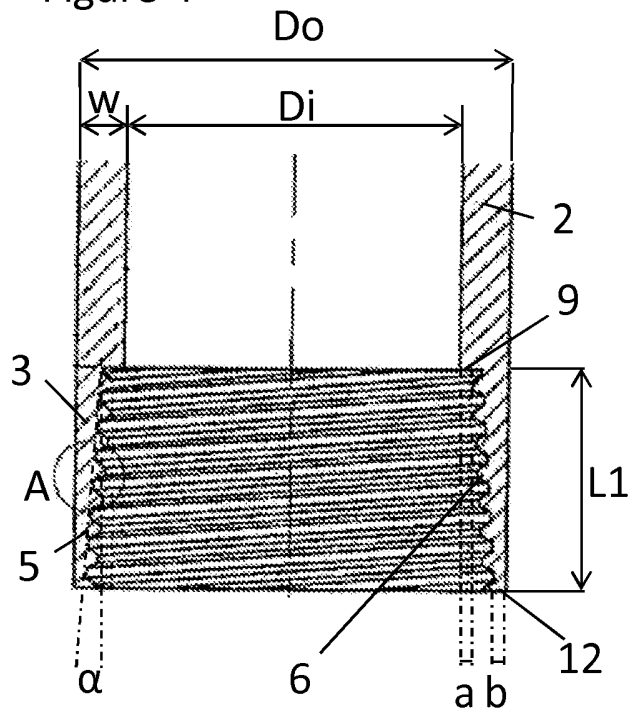


Figure 5a (A)

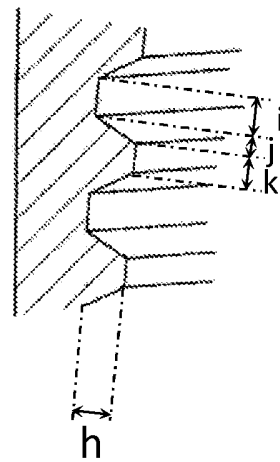


Figure 5

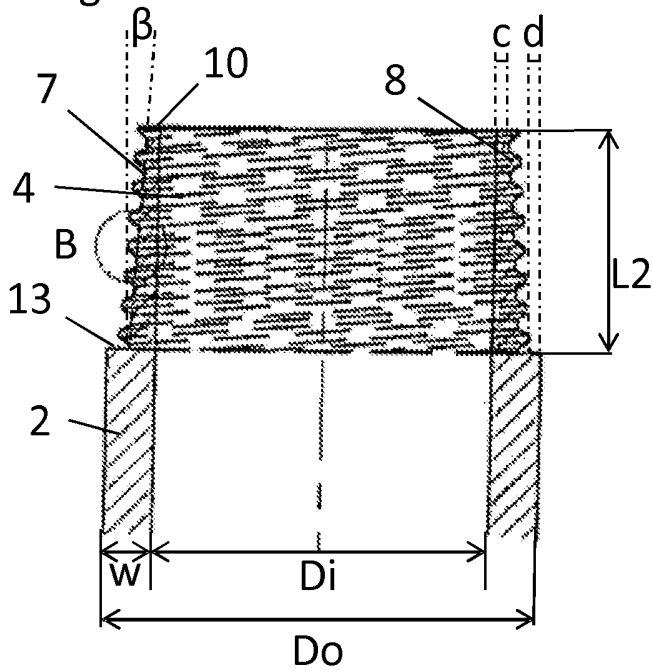


Figure 5a (B)

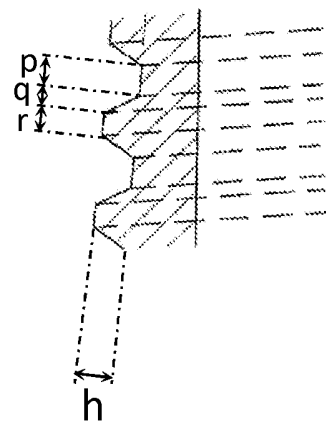


Figure 6

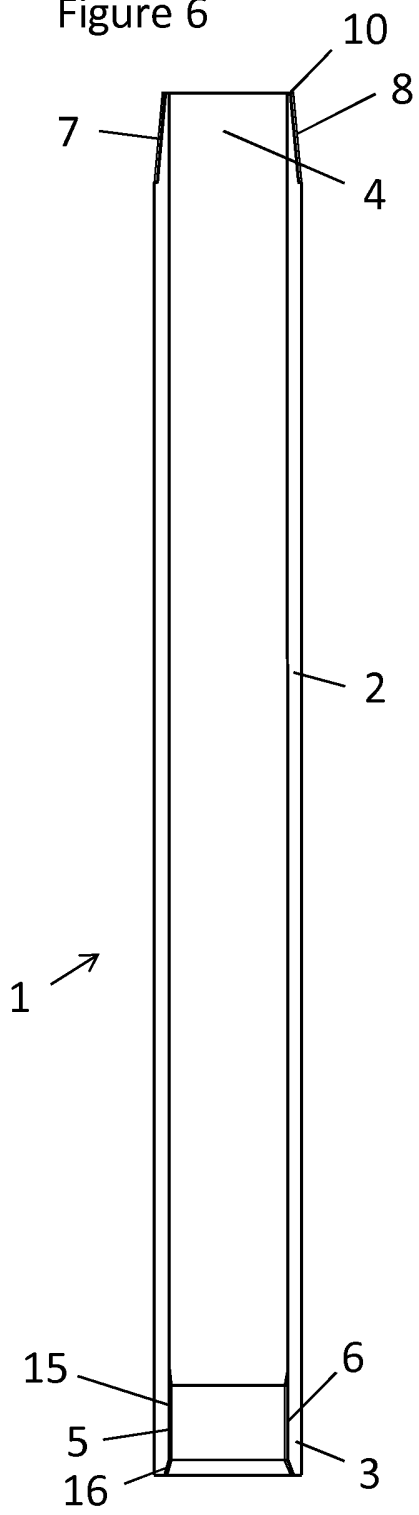
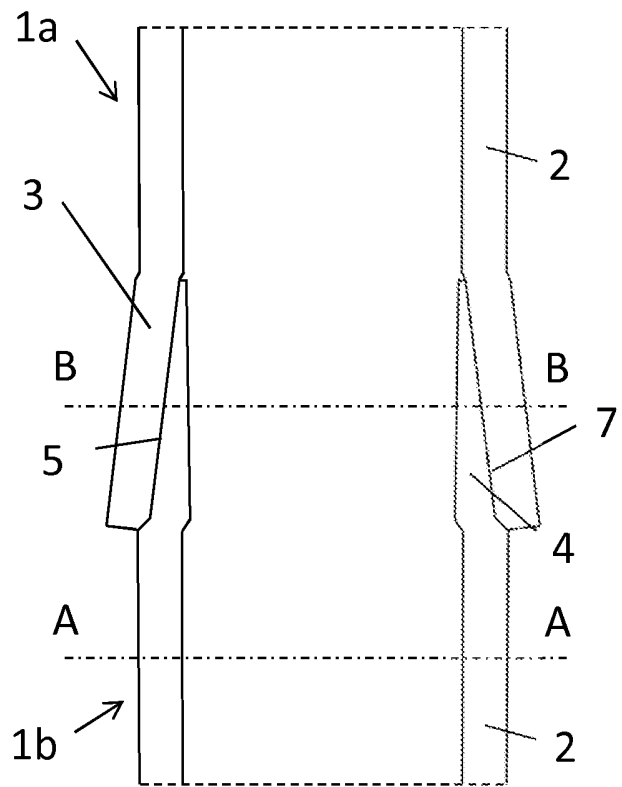


Figure 7



ABSTRACT

5 The present invention provides a combination of a thin-walled first pipe section and a thin-walled second pipe section configured to be connected to each other to form a pipe using a conical screw thread connection, wherein the screw thread connection is formed by an inner screw thread arranged at an inner surface provided at a first end of the first pipe section, and an outer screw thread arranged at an outer surface provided at a second end of the second pipe section.

10 The invention is characterized in that the inner screw thread and the outer screw thread are designed to have a negative play with respect to each other, such that screwing the inner screw thread and the outer screw thread in each other results in an increased wall thickness at the screw thread connection, for example at least 5 %, with respect to the wall thickness in a middle part of the first pipe section and the second pipe section.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

| | |
|---|--|
| IDENTIFICATIE VAN DE NATIONALE AANVRAGE | KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE P32501NL00/MVM |
| Nederlands aanvraag nr. 2015529 | Indieningsdatum 30-09-2015 |
| | Ingeroepen voorrangsdatum |
| Aanvrager (Naam) Victor Jan de Waal | |
| Datum van het verzoek voor een onderzoek van internationaal type 02-02-2016 | Door de instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van Internationaal type toegekend nr. SN65577 |
| I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven) | |
| Volgens de internationale classificatie (IPC) E02D5/10;E02D5/24;E02D5/52 | |
| II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK | |
| Onderzochte minimumdocumentatie | |
| Classificatiesysteem | Classificatiesymbolen |
| IPC | E02D |
| Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen | |
| | |
| III. | GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad) |
| IV. | GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad) |

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2015529

A. CLASSIFICATIE VAN HET ONDERWERP
INV. E02D5/10 E02D5/24 E02D5/52
ADD.

Volgens de internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
E02D

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

| Categorie * | Geleete documenten, eventueel met aanduiding van speciaal van belang zijnde passages | Van belang voor conclusie nr. |
|-------------|--|-------------------------------|
| X | FR 3 011 309 A1 (VALLOUREC OIL & GAS FRANCE [FR]) 3 april 2015 (2015-04-03) * het gehele document * ----- | 1-21 |

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvraag vermeld

"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geleete literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"Z" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

30 mei 2016

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Geiger, Harald

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octroofamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2015529

| In het rapport genoemd octrooigescrift | Datum van publicatie | Overeenkomend(e) geschrift(en) | Datum van publicatie | |
|---|-------------------------|-----------------------------------|-------------------------|------------|
| FR 3011309 | A1 | 03-04-2015 | AU 2014331298 A1 | 24-03-2016 |
| | | | CA 2923343 A1 | 09-04-2015 |
| | | | FR 3011309 A1 | 03-04-2015 |
| | | | WO 2015049098 A1 | 09-04-2015 |
| ----- | | | | |

WRITTEN OPINION

| | | | |
|---------------------|--|--------------------------------|------------------------------|
| File No. SN65577 | Filing date (day/month/year) 30.09.2015 | Priority date (day/month/year) | Application No. NL2015529 |
|---------------------|--|--------------------------------|------------------------------|

International Patent Classification (IPC)
INV. E02D5/10 E02D5/24 E02D5/52

Applicant
Victor Jan de Waal

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

Examiner

Geiger, Harald

WRITTEN OPINION

Application number
NL2015529

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|--------------------------|-------------|------|
| Novelty | Yes: Claims | |
| | No: Claims | 1-21 |
| Inventive step | Yes: Claims | |
| | No: Claims | 1-21 |
| Industrial applicability | Yes: Claims | 1-21 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Item V

The subject matter of the claims **1-21** is not new.

re independent claims 1, 17, 19 & 21

The document **D1** (= FR 3 011 309 A1) discloses:

" Combinatie (Fig. 1 & 2) van een dunwandig eerste 1 buisdeel en een dunwandig tweede 2 buisdeel die zijn ingericht om door middel van een schroefdraadverbinding met elkaar te worden verbonden om een buis te vormen, waarbij de schroefdraadverbinding wordt gevormd door:
een binnenschroefdraad aangebracht op een binnenoppervlak voorzien aan een eerste einde van het eerste buisdeel, en
een buitenschroefdraad aangebracht op een buitenoppervlak voorzien aan een tweede einde van het tweede buisdeel,
met het kenmerk, dat de binnenschroefdraad en de buitenschroefdraad zijn ontworpen om een negatieve speling ten opzichte van elkaar te hebben, zodat het in elkaar schroeven van de binnenschroefdraad en de buitenschroefdraad resulteert in een verhoogde wanddikte van tenminste een deel van de schroefdraadverbinding, bijvoorbeeld ten minste 5%, ten opzichte van de wanddikte in een middengedeelte van het eerste buisdeel en het tweede buisdeel."

Hence, the subject matter of this claim is not new.

The same objection applies for the subject matter of claims **17, 19, & 21** which are not new following the reasoning detailed for claim **1**.

re dependent claims

The dependent claims do not contribute any features which would make a difference or an invention with respect to the prior art.

Remarks.

There are no reference signs in the claims.