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PATENT SPECIFICATION

DRAWINGS ATTACHED

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The Inventor of this invention in the sense of being the actual deviser thereof within the meaning of Section 16 of the Patents Act 1949 is:—JEAN LOUIS ALBERT DURET, a French citizen of 104, Rue Mirabeau, Aulnoye Aymeres (Nord) France.

COMPLETE SPECIFICATION

Joint Connection for Metal Pipes

We, VALLOUREC a Societe anonyme organised under the laws of France of 6 Rue Daru, Paris 8eme, France, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The invention relates to joints for the tight connection of metal tubes in which the male extremity of one element and the female extremity of the other element are each fitted with corresponding screw threads, arranged according to a truncated cone in such a way that in closing the joint by screwing one element on the other locking of said threads is obtained. Such jointed metal tubing is more especially designed for use in the petroleum industry.

The present invention concerns a joint which pertains to the aforementioned category and which constitutes an improvement with respect to the joints presently on the market.

The present invention has for an object a new industrial product which constitutes a joint to join two elements of metallic pipes in a tight manner characterised by the fact that the male element is supplied with a screw thread in the form of a truncated cone while the female element is provided with a corresponding truncated cone screw thread and that at the completion of tightening the extremity of the male element which has a concave conic shape comes to seat against a convex conic shoulder of corresponding shape, formed at the base of the threading of the female element.

According to the invention there is provided a pipe joint for disengageably connecting pipe sections, comprising a screw threaded male portion, and a correspondingly screw threaded female portion, said threaded portions each tapering inwardly and having the overall contour of the surface of a truncated cone, said female portion being provided with a peripheral shoulder adjacent the inner end of said joint, the periphery of the inner end of said threaded male portion having a concave conic surface, said peripheral shoulder having a convex conic surface the shape of said convex conic surface corresponding to the shape of said concave conic surface, said conic surfaces abutting each other when said portions are connected and tightened.

According to the invention the generatrices of a conic shoulder forming the abutment, makes an angle with the axis of the pipe which angle generally is between 10° and 30° and which is preferably between 15° and 20°. In any case, it is desirable that the size of this angle permits a disengageable connection in spite of the frictions which intervene at the zone of abutment.

Preferably, the convex shoulder of the female element is extended over its outer circumference by a concave truncated cone surface against which the outer front edge of the male element can advantageously bear, so that even before final tightening, a slight concave conic chamfer on the male element comes to be slightly crushed and flattened.

In the case of pipes of larger diameter, the abovesaid chamfer can assume a special importance and constitute a convex tapered bearing surface which comes to be applied very forcefully against the female element.

Due to the tapered shape of the shoulder

[Price 4s. 6d.]

which limits the tightness of the joint according to the invention, the extremity of the male element is in every case forced back toward the outside, which assures an excellent metal-on-metal tightness, even after several operations of the elements of the pipes according to the invention, that is after a given female element has been assembled with different male elements, or inversely.

In this manner, according to the invention, the machining tolerances which are capable of acting in an inverse direction can be used so as to have no bad effect on the tightness of the joint, even after repeated assemblies and disassemblies of the latter.

The inclined shoulder abutment according to the invention also has important advantages in the avoidance of excessive jamming of the joint, that is, the screwing of the male element in the female element in excess of the normal tightening couple.

Due to the characteristic of the shoulder according to the invention, the extremity of the male element cannot form a flange inside the pipe line connection because the conic surface of the joint diverts this extremity toward the exterior.

According to a preferred variant of the invention an increase of the elastic limit of the shoulder surface of the female element or of the front end surface of the male element or of both these surfaces, can be achieved by a treatment such as cold-hardening or heat treatment.

The result of this is that there is thus increased the maximum tolerable couple of tightening by the joint while permitting the metal which constitutes the extremity of the male part in front of the part which has undergone the increase of elastic limit to deform it toward the outside in order to apply it against the female element while assuring metal-on-metal tightness under very satisfactory conditions.

According to another variant, there can be placed for the same purpose as the one just indicated, a hard steel washer or ring on the shoulder of the female element.

According to another characteristic of the invention, it may be advantageous, with the purpose of increasing still more the fluid tightness of the joint, to place a sealing ring, for example a plastics ring on the inner surface of the pipe, near the line of contact of the extremity of the male element and the shoulder of the female element.

This sealing ring can, in particular, be constituted by a certain thickness of plastics coating which is realised in continuity with the plastics coating which assures the internal protection of the pipe.

In forming the screw threading according to the invention, the base of the screw threading of the female part (that is, the end of the threading which is on the female part

near the shoulder), is achieved in such a way as to have the grooves of the threads of a depth increasing progressively over a certain length of threading. Inversely, the corresponding threading at the extremity of the male part is formed so as to provide threads which increase in height progressively over the same length.

These characteristics of the invention have several advantages. In the first place, the progressive depth of the female threads renders more progressive the variation of the section of the female elements and reduces the cutting and grooving effect, which in turn notably increases the resistance to alternate or repeated stresses (vibratory fatigue or rotating bending fatigue).

On the other hand, this particular form of the extremity of threading favours, by reason of the reduction of the bearing surface of the end threads, the plastic adaptation of the male and female threads, an adaptation which is in fact always necessary, principally at the extremity of the male threading, because of thread tolerances deemed permissible during manufacture.

Finally, the substantially conic shape which is provided at the extremity of the male threading allows easier introduction and reduces the risks of having the tops of the female threads damaged by the male threads while the two elements of pipes are assembled before tightening.

With the purpose of making the invention better understood, there will now be described by way of illustration and without any limiting character, several embodiments given by way of example and shown on the attached drawing.

In the drawings:

Figure 1 shows a partial cross-section of one method of formation of a male element and female element before assembly;

Figure 2 is a partial cross-section of the elements represented in Figure 1, after being assembled;

Figure 3 is a view in larger scale of the part of Figure 2 surrounded by a circle III;

Figure 4 is a cross-section of the part of the threadings tapered according to a further embodiment of the invention;

Figures 5, 6 and 7 show in section different embodiments or variants of the arrangement according to Figure 3.

Referring now to the drawings in detail, male element 1 fitted with conic screw threading 2 and whose extremity presents a concave conic shape 3 whose outer edge 4 is slightly chamfered is seen on the drawing.

There is also shown on the drawings the female element 5 fitted with a conic screw threading 6, corresponding to threading 2 of male element 1, at the base of which is found a convex conic shoulder 7.

In the embodiments illustrated in the draw-

ings, the convex conic shoulder 7 is lengthened over its outer periphery by a concave truncated conic part 8.

5 Conforming to one preferred method of practicing the invention, the metal located near the extremity 3 of the male element and situated near shoulder 7 of the female element have undergone a treatment such as thermal or cold-hardening treatment, in order
10 to increase their elastic limit.

As can be seen clearly on Figure 3, the chamfered edge 4 of the extremity of male pipe 3 comes, during connecting, to flatten
15 against surface 8 of the female element and is thus pushed back against inner wall 9 of the female element as is shown by 4a.

This compressing or flattening (which is produced all the more easily as the elastic limit of the metal near the surfaces 3 and 7
20 has been increased) assures an excellent tightness even during successive operations of the elements constituting the joints.

It is also noted that this flattening action is greatly favoured by the conic shoulder according to the invention, a shoulder which has
25 the effect of displacing the extremity of the male element toward the exterior.

Figure 4 shows how according to one particular characteristic of the invention, the
30 threading 2 of the male part 1 is limited at its extremity by a surface 2a presenting a perceptible conic decrease in helix, while threading 6 of female part 5 is limited by a similar surface 6a, which allows for obtaining
35 advantages which have been indicated above.

Of course, it is preferable for surfaces 2a and 6a not to come in contact with one
40 another during process of connection of the joint.

In one variant, the threading of the male and female parts may decrease by stages.

45 Female element 5 and its threading 6 as well as male element 1 and its threading 2 are shown on Figures 5, 6 and 7 which represent variants of the embodiment shown in Figure 3.

In these embodiments are also found the characteristics of shoulder 7 of the joint
50 according to the invention.

In the three embodiments shown in Figures 5, 6 and 7 there has been added a supplementary fluid tightness device which increases still more the secureness of the joint
55 according to the invention.

In the variant represented in Figure 5, there is placed in a groove made on shoulder 7, a washer 10 of hard steel, which is preferably removable and at the inside of which
60 is attached a plastics ring 11 which also has the advantage of protecting the enamelled or coated surfaces 12a which might run the risk of damage during tightening.

65 The lips of ring 11 are applied against enamelled surfaces 12 which cover the inner

wall of the elements of the pipe and which extend slightly toward the interior at 12a near the plane of the joint.

This protective enamel or coating which can be of a conventional type, is for example
70 formed from epoxy resin.

It will be noticed that in this embodiment, the washer 10 performs the functions of surfaces 3 and 7 illustrated in Figure 3 the elastic limits whereof have been increased
75 by suitable treatments, whereas on the other hand ring 11 assures supplementary fluid tightness.

In the embodiment according to Figure 6, contact is effected, according to the invention, of the extremity 3 of male element 1 on the conic shoulder 7 of the female element, a fluid tightness ring 13 being mounted in a groove on the inner edge of the male extremity. The layer of enamel 12 covering
80 the inner surface of the pipe 1 is also, in this particular case, extended to 12a over the edges of ring 13.

In the embodiment shown in Figure 7, the supplementary fluid tightness is realised by the fact that there has been provided a greater thickness of plastics coating 12b in the vicinity of shoulder 7 and surface 3, fluid tightness being assured by elastic contact
90 of the plastics coating at the joint.

It is within the scope of the invention to omit the chamfer made on the outer edge of the male element or to omit the concave tapered part around the periphery of the convex conic shoulder according to the invention.
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Sufficient fluid tightness can be obtained by reason of plastic deformations of metal during tightening.

The invention may be applied as well to
105 the joining of two male elements by means of a double female sleeve as to other joinings presenting similar characteristics.

WHAT WE CLAIM IS:—

1. A pipe joint for disengageably connecting pipe sections, comprising a screw threaded male portion, and a correspondingly screw threaded female portion, said threaded portions each tapering inwardly and having the overall contour of the surface of a truncated cone, said female portion being provided with a peripheral shoulder adjacent the inner end of said joint, the periphery of the inner end of said threaded male portion having a concave conic surface, said peripheral shoulder having a convex conic surface the shape of said convex conic surface corresponding to the shape of said concave conic surface, said conic surfaces abutting each other when said portions are connected and tightened.
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2. A pipe joint according to Claim 1, wherein the generatrices of said conic surfaces form an angle of 10° to 30° to the axis of said truncated cone.



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5 Conforming to one preferred method of practicing the invention, the metal located near the extremity 3 of the male element and situated near shoulder 7 of the female element have undergone a treatment such as thermal or cold-hardening treatment, in order
10 to increase their elastic limit.

As can be seen clearly on Figure 3, the chamfered edge 4 of the extremity of male pipe 3 comes, during connecting, to flatten against surface 8 of the female element and is thus pushed back against inner wall 9 of the female element as is shown by 4a.

This compressing or flattening (which is produced all the more easily as the elastic limit of the metal near the surfaces 3 and 7 has been increased) assures an excellent tightness even during successive operations of the elements constituting the joints.

It is also noted that this flattening action is greatly favoured by the conic shoulder according to the invention, a shoulder which has the effect of displacing the extremity of the male element toward the exterior.

Figure 4 shows how according to one particular characteristic of the invention, the threading 2 of the male part 1 is limited at its extremity by a surface 2a presenting a perceptible conic decrease in helix, while threading 6 of female part 5 is limited by a similar surface 6a, which allows for obtaining advantages which have been indicated above.

Of course, it is preferable for surfaces 2a and 6a not to come in contact with one another during process of connection of the joint.

In one variant, the threading of the male and female parts may decrease by stages.

Female element 5 and its threading 6 as well as male element 1 and its threading 2 are shown on Figures 5, 6 and 7 which represent variants of the embodiment shown in Figure 3.

In these embodiments are also found the characteristics of shoulder 7 of the joint according to the invention.

In the three embodiments shown in Figures 5, 6 and 7 there has been added a supplementary fluid tightness device which increases still more the secureness of the joint according to the invention.

In the variant represented in Figure 5, there is placed in a groove made on shoulder 7, a washer 10 of hard steel, which is preferably removable and at the inside of which is attached a plastics ring 11 which also has the advantage of protecting the enamelled or coated surfaces 12a which might run the risk of damage during tightening.

The lips of ring 11 are applied against enamelled surfaces 12 which cover the inner

wall of the elements of the pipe and which extend slightly toward the interior at 12a near the plane of the joint.

This protective enamel or coating which can be of a conventional type, is for example formed from epoxy resin.

It will be noticed that in this embodiment, the washer 10 performs the functions of surfaces 3 and 7 illustrated in Figure 3 the elastic limits whereof have been increased by suitable treatments, whereas on the other hand ring 11 assures supplementary fluid tightness.

In the embodiment according to Figure 6, contact is effected, according to the invention, of the extremity 3 of male element 1 on the conic shoulder 7 of the female element, a fluid tightness ring 13 being mounted in a groove on the inner edge of the male extremity. The layer of enamel 12 covering the inner surface of the pipe 1 is also, in this particular case, extended to 12a over the edges of ring 13.

In the embodiment shown in Figure 7, the supplementary fluid tightness is realised by the fact that there has been provided a greater thickness of plastics coating 12b in the vicinity of shoulder 7 and surface 3, fluid tightness being assured by elastic contact of the plastics coating at the joint.

It is within the scope of the invention to omit the chamfer made on the outer edge of the male element or to omit the concave tapered part around the periphery of the convex conic shoulder according to the invention.

Sufficient fluid tightness can be obtained by reason of plastic deformations of metal during tightening.

The invention may be applied as well to the joining of two male elements by means of a double female sleeve as to other joinings presenting similar characteristics.

WHAT WE CLAIM IS:—

1. A pipe joint for disengageably connecting pipe sections, comprising a screw threaded male portion, and a correspondingly screw threaded female portion, said threaded portions each tapering inwardly and having the overall contour of the surface of a truncated cone, said female portion being provided with a peripheral shoulder adjacent the inner end of said joint, the periphery of the inner end of said threaded male portion having a concave conic surface, said peripheral shoulder having a convex conic surface the shape of said convex conic surface corresponding to the shape of said concave conic surface, said conic surfaces abutting each other when said portions are connected and tightened.

2. A pipe joint according to Claim 1, wherein the generatrices of said conic surfaces form an angle of 10° to 30° to the axis of said truncated cone.

3. A pipe joint according to Claim 1, wherein the generatrices of said conic surfaces form an angle of 15° to 20° with the axis of said truncated cone.
- 5 4. A pipe joint according to Claim 1, wherein the conic surface of the shoulder of said female portion includes on its periphery a concave tapered surface.
- 10 5. A pipe joint according to Claim 1, wherein the outer terminal edge of said male portion is slightly chamfered.
- 15 6. A pipe joint according to Claim 1, wherein the shoulder of said female portion has been treated in a manner having the elastic limit increasing effect of cold hardening.
- 20 7. A pipe joint according to Claim 1, wherein the surface of inner end of said threaded male portion is treated in a manner having the elastic limit increasing effect of cold hardening.
- 25 8. A pipe joint according to Claim 1, wherein a hard steel washer is interposed between the surface of said shoulder and the surface of the inner end of said male portion.
9. A pipe joint according to Claim 1, wherein a sealing ring is placed so that its inner surface is flush with the inner wall of said pipe sections and said sealing ring abuts at the plane of said joint. 30
10. A pipe joint according to Claim 9, wherein said sealing ring is coated and the inner walls of said pipe sections are coated with a composition on the part thereof to which said ring is applied. 35
11. A pipe joint according to Claim 1, wherein the walls of said portions are coated with a plastics coating having a thickness greater than that of the protective coating in the vicinity of said joint. 40
12. A pipe joint according to claim 1 in which said threaded portions each taper inwardly, the depths of the grooves of said threads deepening progressively toward the inner end of said joint. 45
13. A pipe joint substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.
14. A pipe joint substantially as hereinbefore described with reference to any one of Figures 5, 6 or 7 of the accompanying drawings. 50

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