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Datasheet for the decision of 22 April 2016

Case Number: T 1917/12 - 3.2.05

Application Number: 01967182.5

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Title of invention:
Pipe Integral Threaded Joint

Patent Proprietor:
Dalmine S.p.A.

Opponent:
Vallourec Oil and Gas France

Relevant legal provisions:
EPC 1973 Art. 56
EPC Art. 84
EPC R. 103

Keyword:
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Reimbursement of appeal fee - (no)

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Case Number: T 1917/12 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 22 April 2016

Appellant: (Patent Proprietor)	Dalmine S.p.A. Piazza Caduti 6 Luglio 1944, 1 I-24044 Dalmine (Bergamo) (IT)
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Respondent: (Opponent)	Vallourec Oil and Gas France 54, rue Anatole France 59620 Aulnoye-Aymeries (FR)
Representative:	Félix Angelo Pellicani Vallourec & Mannesman Tubes Division Propriété Industrielle 27 Avenue du Général Leclerc 92100 Boulogne-Billancourt (FR)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 27 July 2012 revoking European patent No. 1301738 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	M. Poock
Members:	S. Bridge
	J. Geschwind

Summary of Facts and Submissions

I. The appeal was lodged against the decision of the opposition division revoking the European patent No. 1 301 738 for lack of inventive step.

II. The opposition was filed against the patent as a whole based on Article 100(a) EPC (lack of inventive step, Article 56 EPC 1973).

III. Oral proceedings were held before the board of appeal on 22 April 2016.

IV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted as main request, or that the patent be maintained on the basis of the sets of claims filed as auxiliary requests 1 to 3 with the grounds of appeal, or filed as auxiliary requests 4 and 5 with the letter dated 22 March 2016.
The appellant further requested the reimbursement of the appeal fee.

V. The respondent (opponent) requested that the appeal be dismissed.

VI. Claim 1 as granted (main request) reads as follows (the added feature labelling (a) to (n) is the one used during the opposition procedure):

"Pipe integral threaded joint comprising
(a) a male element (1) provided on its external surface with two radially spaced, truncated cone-shaped threaded portions (6,7)
(b) with tooth of trapezoidal profile,

(c) said two portions (6,7) being divided by a first annular shoulder (5') lying on a plane orthogonal to the pipe axis
(d) and a female element (2) provided on its internal surface with two radially spaced, truncated cone-shaped threaded portions (8,9),
(e) said two portions being divided by a second annular shoulder (5") lying on a plane orthogonal to the pipe axis,
(f) the two threaded portions (6, 7, 8, 9) having the same conicity value
(g) and being adapted to screw mutually and reversibly one inside the other in order to produce a contact between said two annular shoulders (5',5") in an assembled position,
(h) each of said male (1) and female (2) elements being provided with two sealing surfaces (12', 13', 12", 13")
(i) the first annular shoulder (5') and the second annular shoulder (5") have the shape of an annulus, lying on a plane for its entirety without presenting any elevation from the plane
(j) and in that the sealing surfaces (12', 13', 12", 13") are respectively placed at each axial end of the threaded portions (6, 7, 8, 9) of each male (1) and female element (2)

characterised in that

(k) a first one of said respective two sealing surfaces (12',13',12",13") has a conical shape and a second one has a spherical shape
(l) and in that the surface of the second annular shoulder (5") is equal or greater to 25% of the area of the section of the pipe walls
(m) and in that at least one of said male (1) and female (2) elements comprises along its entire surface a circumference cavity (14,15) between one

of said two threading parts and the corresponding annular shoulder (5', 5"),

(n) the at least one cavity (14, 15) being adapted to receive the expansion of the lubricating grease of the joint."

VII. The subject-matter of claim 1 according to auxiliary request 1 only differs from the subject-matter of claim 1 according to the main request in that:

- the claim concerns an "*Integral near-flush threaded pipe joint*" instead of a "*Pipe integral threaded joint*"; and

- the final features (m) and (n) have been replaced by features (m1) and (n1):

(m1) "*and in that both said male (1) and female (2) elements comprise along their entire surface a circumference cavity (14, 15) between one of said two threading parts and the corresponding annular shoulder (5', 5")*,"

(n1) "*the circumference cavities (14, 15) being adapted to receive the expansion of the lubricating grease of the joint*".

VIII. The subject-matter of claim 1 according to auxiliary request 2 only differs from the subject-matter of claim 1 according to auxiliary request 1 in that the text

"*the dimension (D') of the external diameter (3) of said female element (2) at the joint is larger than the dimension (D") of the external diameter (4) of the same female element (2) of a value equal to or smaller than 3%*"

has been inserted after "*characterised in that*".

IX. The subject-matter of claim 1 according to auxiliary request 3 only differs from the subject-matter of claim 1 according to auxiliary request 2 in that the following text has been added at the end of the claim:

"*in that the corresponding two threaded portions (6,7,8,9) of said male (1) and female (2) elements each have the same conicity value, comprised between 6,25 and 12,5%*".

X. The subject-matter of claim 1 according to auxiliary request 4 only differs from the subject-matter of claim 1 according to auxiliary request 3 in that the following text has been further added at the end of the claim:

"*in that said corresponding conical sealing surfaces (13', 12") of said male (1) and female (2) elements have a conicity value comprised between 12,5% and 25%*".

XI. The subject-matter of claim 1 according to auxiliary request 5 only differs from the subject-matter of claim 1 according to auxiliary request 4 in that the claim concerns an "*Integral threaded pipe joint*" instead of an "*Integral near-flush threaded pipe joint*".

XII. The following documents are referred to in the present decision:

D1: EP-A-0 767 335;
D9: US-A-2,992,019;
D10: W0-A-93/18329;
D11: "*Influence of Compound Grease on the Performance of Premium Connections*" 1988 IADC/SPE Drilling Conference - Dallas (US)

28 February 1988 to 3 March 1988 - published in SPE Drilling Engineering in March 1990;

D12: US-A-4,830,411;

D13: US-A-5,066,052;

D14: US-A-5,649,725.

XIII. The arguments of the appellant in the written and oral proceedings can be summarised as follows:

Main request

Document D1 is the closest prior art and discloses features (a) to (j) of claim 1 according to the main request.

Feature (l) of claim 1 is expressed in terms of a ratio of areas having to be equal or greater than 25%. Document D1 only discloses that the ratio of radial heights is between 10% and 35%. The ratio of the annulus areas of the shoulder and tube thickness is only the same as the ratio of their radial heights when their average radius is the same. Document D1 does not explicitly disclose that the average radius is the same. Therefore, document D1 does not disclose feature (l).

The subject-matter of claim 1 according to the main request differs from the joint disclosed in document D1 by features (k), (m) and (n). These features are interdependent, because replacing a conical on conical seal by a conical on spherical seal results in an earlier closure of the seal during joint make-up, thus increasing the problem of grease (lubrication compound) being entrapped under high pressure between the seals at either end of the threads. In consequence, there is

a synergy between features (k) and (m)/(n) in that the circumference cavity resolves the problem of grease pressure which has been made worse by the choice of conical on spherical seals. Furthermore, the position of the circumference cavity between the thread and the shoulder contributes to inventive step.
Features (k), (m) and (n) all contribute to improving the joint's ability to meet increased performance requirements.
The introductory part of document D1 discusses document D10 and teaches away therefrom in terms of a central abutment which does not act as a seal. Therefore, the skilled person will not consider combining the teachings of documents D1 and D10.
None of the prior art documents discloses or suggests the particular combination of features claimed in claim 1 according to the main request.
Therefore the subject-matter of claim 1 according to the main request involves an inventive step.

Auxiliary requests 1 to 3

The term "*near-flush*" added to claim 1 of auxiliary requests 1 to 3 is defined in the patent in suit (column 2, lines 22 to 24, granted claim 3) and is therefore considered to be clear.

The advantages of the invention apply more particularly to "*thin*" (i.e. "*near-flush*") joints in which the build up of excess grease pressure during make up of the joint is even more critical. Although the further feature added to claim 1 according to auxiliary request 3 is known from document D1, the subject-matter of claim 3 remains inventive. Such a joint is not disclosed in the other documents. The inventive step arguments advanced in the context of the main request

carry over to the subject-matter of claim 1 according to auxiliary requests 1 to 3.

Auxiliary requests 4 and 5

The claimed narrow range of conicity values for the conical sealing surface constitutes a purposive selection with respect to the larger range of values known from document D1. The skilled person will not consult document D14, because the seal of document D14 is of the cone-on-cone type. The arguments of the respondent are thus ex-post facto.
Therefore the subject-matter of claim 1 respectively according to auxiliary requests 4 and 5 involves an inventive step.

Request for reimbursement of the appeal fee

This request is maintained with the reasons presented in the written procedure, namely, that the opposition division did not treat the parties equally when it agreed to the postponement of the oral proceedings which the representative of the opponent had only justified in terms of his participation at a professional training convention.

XIV. The arguments of the respondent in the written and oral proceedings can be summarised as follows:

Main request

In the closest prior art document D1 the central abutment is called "*central*" for the reason of being radially central with respect to the tube thickness - otherwise there is no point in referring to it as "*central*".

Even if central were to be interpreted as referring to the axial disposition between the two threaded portions, the central abutment would nevertheless also necessarily be central in the radial direction, because for the joint to be made up, the threads on either side of the central abutment have to have the same slope and lengths.
The skilled person would not consider not having the central abutment positioned other than centrally in the radial direction, because an abutment which is radially offset from the average radius results in one of the box and pin being weakened with respect to the other, which is detrimental to the joint's performance when loaded and thus directly contrary to the purpose of such high performance joints. Instead, the skilled person seeks to balance the load bearing capacity of the pin and box. Therefore, the annulus areas of the shoulder and tube thickness disclosed in document D1 implicitly have the same average radius. It further follows from algebra that the ratio of the area $A_{annulus}$ of the annulus of the central abutment of radial height h to the area A_{tube} of the cross section of the tube of thickness t is equal to the ratio of the radial height h of the central abutment to the thickness t of the tube (see Appendix to the summons to oral proceedings before the board):

$$\frac{A_{annulus}}{A_{tube}} = \frac{h}{t}$$

In consequence, document D1 (column 10, lines 3 to 5) discloses feature (l).

The subject-matter of claim 1 according to the main request differs from the joint disclosed in document D1 by features (k), (m) and (n). The wording of feature (k) is broad in that it does not in fact require that a given seal consists of a conical on

spherical sealing surface. The patent in suit does not mention the synergy now advanced on behalf of the appellant. Instead the patent in suit only discloses separate technical effects whose solutions are known as such in the prior art.

Spherical on conical seals and their properties are generally known in the art (for example, see document D9) and the shape of the sealing surfaces is not directly related to the time at which the seal closes during make up, since this depends on the geometry of the rest of the joint. Furthermore, the majority of the grease is in the threads so that any effect due to the geometry of one of the sealing surfaces is necessarily minor. Replacing a conical on conical seal with a spherical on conical seal will not inevitably lead to an increase in entrapped grease pressure during make up of the joint, nor does the patent in suit disclose this. Thus, there is no synergy between features (k), (m) and (n).

The skilled person is familiar with the prior art disclosed in document D10 which also concerns slim line tubular connections and discloses relief grooves to be disposed in the non critical areas of the pin and box as depository for thread compound to avoid hydraulic lock up of the thread (page 25, lines 4 to 11).

The discussion of the disadvantages of the embodiments of figures 5 and 10 of document D10 in the preamble of document D1 with respect to the sealing or non-sealing nature of the central abutment does not mean that the skilled person will necessarily disregard all other teachings of document D10.

Therefore, the subject-matter of claim 1 according to the main request does not involve an inventive step.

Auxiliary requests 1 to 3

Claim 1 according to auxiliary request 1 is not clear, because the term "*near-flush*" is not defined in the claim.

The features respectively added to the respective claim 1 according to auxiliary requests 2 and 3 are already known from documents D1 and D10. The inventive step arguments advanced in the context of the main request carry over to the subject-matter of the respective claim 1 according to auxiliary requests 1 to 3.

Therefore, the subject-matter of claim 1 respectively according to auxiliary requests 1 to 3 does not involve an inventive step.

Auxiliary request 4 and 5

The feature added to claim 1 according to auxiliary requests 4 and 5 with respect to claim 1 according to auxiliary request 3 concerns the range of conicity values for the taper of the conical seal surfaces. The patent in suit discloses that the claimed range of conicity values ensures a reduced sliding time to avoid galling during make up of the joint.

Document D14 is concerned with the reduction of sliding time to avoid galling during make up of the joint and discloses with embodiment group 2 joints which have both the same thread taper of 1/16 as is used in document D1 and a range of conicity values for the

taper of the conical seal surfaces identical to the claimed range (TABLES 2 and 3). Furthermore, the range of conicity values disclosed in document D14 is compatible with the (larger) range disclosed for the joints according to document D1. Therefore, it is obvious for the skilled person staring from a joint according to document D1 and seeking to solve the additional independent partial problem of avoiding galling at the conical sealing surface to use the narrower range of conicity values disclosed in document D14.

Therefore, the subject-matter of claim 1 respectively according to auxiliary requests 4 and 5 does not involve an inventive step.

Reasons for the Decision

1. *Main request - Inventive step (Article 56 EPC 1973)*

1.1 Closest prior art

Document D1 constitutes the closest prior art and discloses at least features (a) to (j). This was not contested amongst the parties.

1.2 The parties disagree concerning the disclosure of feature (l), namely that "*the surface of the second annular shoulder (5") is equal or greater to 25% of the area of the section of the pipe walls*".

In document D1 the "*central abutment* " is called central for the reason of being disposed centrally with respect to the joint - otherwise there is no point in referring to it as "*central*". Even if "*central*" were to

be interpreted as referring to the axial disposition between the two threaded portions, the central abutment would nevertheless also necessarily be central in the radial direction, because, for the joint to be able to be made up, the threads on either side of the central abutment have to have the same slope and lengths. The geometry of such an arrangement requires the abutment to be disposed centrally in the radial direction. Furthermore, an abutment offset radially outwards results in the box being weakened with respect to the pin. Similarly, an abutment offset radially inwards results in the pin being weakened with respect to the box. Either case is detrimental to the joint's performance when loaded and thus contrary to the purpose of such high performance joints. Therefore, it is implicit for the skilled person that the central abutment is positioned centrally in the radial direction, i.e. such that the average radius of the annulus of the central abutment and the average radius of the tube are the same.

The appellant's argument, that document D1 does not explicitly disclose that the average radius of the annulus of the central abutment and the average radius of the tube are equal, does not invalidate the argumentation (set out above) advanced by the respondent.

In consequence, the board concludes that it is implicit for the skilled person that the "*central abutment*" of document D1 is arranged at the mid point of the threads and is centered on the thickness of the tubes in the sense that the average radius of the annulus of the *central abutment* and the average radius of the tube are the same. In this case, the ratio of the area $A_{annulus}$ of the annulus of the *central abutment* of radial height

h to the area A_{tube} of the cross section of the tube of thickness t is equal to the ratio of the radial height h of the *central abutment* to the thickness t of the tube (see Appendix to the summons to oral proceedings before the board):

$$\frac{A_{annulus}}{A_{tube}} = \frac{h}{t}$$

Since document D1 discloses that "*the height of the central abutment is for example, about 10 to 35% of the thickness of the tube*" (column 7, lines 37 to 38), i.e. that $0.1 \leq h/t \leq 0.35$, feature (l) is disclosed in document D1 for the range of central abutment heights of 25% to 35%.

The appellant's argument that the areas mentioned in feature (l) cannot be related to the "*height*" and thickness disclosed in document D1, because parameters relating to the actual dimensions of the pipe have not been indicated, cannot be followed, because feature (l) is expressed in terms of a ratio of cross sectional areas so that the terms relating to the actual dimensions of the pipe cancel out when the annulus of the central abutment area is disposed centrally with respect to the tube (see Appendix to the summons to oral proceedings before the board).

The board thus concludes that feature (l) is disclosed in document D1 (column 7, lines 37 to 38).

1.3 Differences and their effect(s)

The subject-matter of claim 1 differs from the pipe integral threaded joint disclosed in document D1 in terms of the following features:

(k) a first one of said respective two sealing surfaces (12', 13', 12", 13") has a conical shape and a second one has a spherical shape;

(m) at least one of said male (1) and female (2) elements comprises along its entire surface a circumference cavity (14, 15) between one of said two threading parts and the corresponding annular shoulder (5', 5"); and

(n) the at least one cavity (14, 15) being adapted to receive the expansion of the lubricating grease of the joint.

According to the patent in suit these features have the following technical effects:

"*a spherical sealing surface is able to keep an optimal contact, unlike a truncated cone-shaped seal, which, in this case, because of the rotation imposed by the bending of the end, does not keep the contact on the whole sealing part*" (paragraph [0038], last sentence);

and

"*the cavity ensures an expansion tank for the fat used to lubricate the joint, which is present in the two threaded portions 8, 9 and is entrained by the push generated by the sliding of the elements 1 and 2 during the screwing. Said solution limits the development of an excessive fat pressure, caused by the presence of a double metal seal at the ends of the joint, with a following reduced stress of the joint*" (paragraph [0032]).

1.4 Objective technical problem(s) and known solution(s)

1.4.1 The technical effects disclosed in the patent in suit thus imply the following two corresponding objective technical problems:

(i) to find a seal which withstands bending of the pipe; and

(ii) to reduce the stress on the joint due to the development of high grease pressure as the grease is trapped between the two seals (at the opposite ends of the joint) during make up.

1.4.2 The board notes that the second problem is the known consequence of trapping excess grease (see document D11, the page with figures 11 to 14, last two lines of the first text column to first three lines of the second text column) and is not necessarily causally linked to any particular shape of the sealing surfaces of the seals at the opposite ends of the threads.

1.4.3 The person skilled in the art of sealing pipe integral threaded joints is familiar with various sealing surface geometries and their properties insofar as these depend on straight forward geometric considerations which result from, for example, bending (see for example document D9). The appellant does not appear to contest that "*the advantages of the seal made by the contact of two surfaces one of the spherical type and the other of the conical type is generally recognised in this technical field*" (grounds of appeal, page 5, first sentence).

1.4.4 The appellant considers that feature (k) is involved in a synergy, because:

"*the presence of a conical to sphere metal seal is linked to a grease pressure in the interstices between pin and box threadings because it makes more difficult for the excess grease to exit the interstices if there is one seal at the pin end, and still more difficult if two seals are provided, the second one which at the box end*"; and
"*the pressure created by the entrapped grease is larger if a conical to spherical seal is chosen over the conical-to-conical seal and a reduction of the grease pressure reduces the danger to damage the metal-to-metal seal during operation*".

The board cannot accept the first of these arguments, because it is part of the common general knowledge of the skilled person that the pressure of entrapped grease will increase when compressed in a confined space (see also document D11, document D12, column 4, lines 7 to 12 or document D13, column 4, lines 55 to 60).

The board cannot accept the second of these arguments, because the use of a seal with different sealing surfaces does not inevitably cause a higher grease pressure upon joint make up: the point in time when sealing surfaces close and become effective as a seal during make-up of the joint depends at least on the respective locations and dimensions of the two sealing surfaces, on the amount of pressure to be contained and on the amount of required elastic deformation of the pin and box. Furthermore, for a given seal geometry, the pressure to be contained depends on the amount excess grease used when making up the joint (see document D11, the page with figures 11 to 14, last two lines of the first text column to first three lines of the second text column). In consequence, and as was

argued by the opponent, it does not appear to be possible to derive such a categorical conclusion when replacing a cone-on-cone by a spherical-on-cone sealing surface.

1.4.5 The appellant further argues that replacing conical surface 27-2 (document D1, figure 4) by a spherical surface, all other features remaining the same, would result in earlier closing of the seal. However, such a change is not consistent with the routine practice of the skilled person who would design the seal as a whole to meet the requirements and not consider just exchanging an isolated conical surface by a spherical one.

1.4.6 Features (m) and (n) thus only solve the problem of reducing stress on the joint due to the development of high grease pressure.

The solution in terms of a circumferential cavity (118, 120) located between a thread and the annular shoulder (104) and adapted to receive the expansion of the lubricating grease of the joint is known as such (see for example document D10, page 25, lines 4 to 11, figures 1A, 1B and 1C or document D14, column 10, lines 51 to 55). A skilled person does not require an inventive step to use a known feature for its known purpose when required.

1.4.7 The appellant considers that the reduced pressure in the grease (resulting from features (m) and (n)) contributes to maintaining the sealing conditions in the seal of feature (k). However, the board considers that the skilled person takes such interactions into account when designing the joint as part of routine

work which requires him to determine the loading conditions for the seals and the sealing surfaces.

1.4.8 The appellant further considers that the position of the circumference cavity acting as a relief groove contributes to solving the problem of excessive grease pressure. The patent in suit is silent on this aspect and document D10 discloses the position for the relief groove (page 25, lines 4 to 11) which is required in feature (m) and teaches that this position will not affect the efficiency of the connection, because the groove is located in the larger cross-sectional areas of pin and box (page 44, lines 1 to 4). Thus, the skilled person is already motivated by document D10 to locate the circumference cavity in the manner claimed in feature (m).

1.4.9 The appellant considers that all characterising features of claim 1 cooperate to solve the problem of the invention. However, the features do so merely by producing the effects that each feature is expected to achieve in isolation. There is no synergy when features merely cooperate to solve a problem by functioning in their usual manner without providing a technical effect which goes beyond the combination of their known individual effects, because the skilled person combines such features accordingly as part of his routine practice - as was already pointed out by the respondent in its reply to grounds of appeal in point 2.

1.4.10 The appellant further argued that the skilled person would not take the teachings of document D10 into account when starting from document D1, because document D10 is discussed in the introduction of document D1 with respect to the design of the central shoulder (document D1, column 2, lines 45 to column 3,

line 39) which, in document D10, acts as a seal, whereas, in document D1, it does not (document D1, column 10, lines 6 and 7). It follows that the skilled person would not seek to combine the teachings of document D1 and document D10 with respect to the design of the central abutment.

However, the skilled person is familiar with all prior art and therefore also with the prior art disclosed in document D10, in particular, as document D10 also concerns the same kind of slim line tubular connections (page 22, lines 11 to 14) as the "*near-flush*" joint of the patent in suit (column 3, lines 35 to 39).

Document D10 discloses relief grooves as depository for thread compound to avoid hydraulic lock up of the thread (page 25, lines 4 to 11). These grooves are disposed in the non critical areas of the pin and box (page 44, lines 1 to 4). There is no reason why the skilled person should ignore this teaching of document D10 concerning the resolution of the hydraulic lock up of the thread caused by thread compound (grease) being trapped in the threads during make up of the joint.

1.5 Inventive step

In consequence, the patent in suit only discloses separate technical effects whose solutions are known as such in the prior art. Therefore, the subject-matter of claim 1 according to the main request does not involve an inventive step (Article 56 EPC 1973).

2. *Auxiliary request 1 - Clarity (Article 84 EPC 1973)*

The subject-matter of claim 1 according to auxiliary request 1 has been amended i.a. to limit the claim to "*near-flush*" joints.

The term "*near-flush*" does not have a clear definition in the technical field of pipe joints, because alternative expressions are also used with slightly different limits: see for example document D10, which uses the term "*slim line*" connection where "*the outside diameter of a slim line connection is generally 2 to 3.5% greater than that of the pipe*" (page 2, lines 1 to 4).

Thus the term "*near-flush*" used in claim 1 according to auxiliary request 1 is unclear, because the implied limit on the joint diameter is not clearly defined (Article 84 EPC 1973).

3. *Auxiliary request 2*

3.1 Clarity of the amendment (Article 84 EPC 1973)

Claim 1 according to auxiliary request 2 was further amended with respect to claim 1 according to auxiliary request 1 to include the definition of "*near-flush*" from granted claim 3. Thereby the subject-matter of claim 1 and in particular the meaning of the term "*near-flush*" has been clarified, in terms of an upper limit of 3% on the diameter increase at the joint (Article 84 EPC 1973).

3.2 Inventive step (Article 56 EPC 1973)

3.2.1 Closest prior art document D1 concerns "*making a thin threaded assembly for tubes […] while resorting to assemblies whose outside diameter is close to or a*

little greater than that of a mid-portion of the tube body on which the assembly is cut" (column 3, lines 40 to 56 - underlining added by the board) and according to document D10 the term "*slim line connection*" is used when "*the outside diameter of a slim line connection is generally 2 to 3.5% greater than that of the pipe*" (page 2, lines 1 to 4).

The appellant's argument that the advantages of the invention apply more particularly to "*thin*" (i.e. "*near-flush*") joints (because the build up of excess grease pressure during make up of the joint is more critical) does not add anything to the routine work of the skilled person who has to design the joint of the required kind to meet the required loading conditions.

In consequence, the further limitation of the subject-matter of claim 1 to "*near-flush*" joints (as defined in terms of an upper limit of 3% on the diameter increase at the joint) merely refers to a particular type of joint which is generally known in the prior art and thus does not contribute to an inventive step.

3.2.2 The further amended features (m1) and (n1) of claim 1 according to auxiliary requests 1 to 3:

(m1) "*and in that both said male (1) and female (2) elements comprise along their entire surface a circumference cavity (14, 15) between one of said two threading parts and the corresponding annular shoulder (5', 5")*" and

(n1) "*the circumference cavities (14, 15) being adapted to receive the expansion of the lubricating grease of the joint*"

are known from document D10 (see especially figures 1A to 1C with cavities 118, 120; page 25, lines 10 to 11).

In consequence, the further limitation of the subject-matter of claim 1 to features (m1) and (n1) which are already known from the prior art for solving the same problem of excessive grease pressure cannot contribute to an inventive step.

3.2.3 The inventive step arguments advanced in the context of the main request thus carry over to the subject-matter of claim 1 according to auxiliary request 2. Therefore, the subject-matter of claim 1 according to auxiliary request 2 does not involve an inventive step (Article 56 EPC 1973).

4. *Auxiliary request 3 - Inventive step (Article 56 EPC 1973)*

Claim 1 according to auxiliary request 3 has been further amended with respect to claim 1 according to auxiliary request 2 to include the feature (from granted claim 4) that the conicity of the threaded portions should be between 6.25 and 12.5%.

Document D1 discloses that the slope of the threaded portions "*is for example, about 1/16 to 1/10 with respect to the axis; none of these values is restrictive*" (column 7, lines 27 to 29). The explicit values 1/16 (= 6.25%) and 1/10 (= 10%) known from document D1 lie fully within the claimed range. Thus, the added feature is already known from the closest prior art document D1 and therefore cannot contribute to an inventive step.

In consequence, the inventive step arguments advanced in the context of the main request carry over to the subject-matter of claim 1 according to auxiliary

request 3. Therefore, the subject-matter of claim 1 according to the auxiliary request 3 does not involve an inventive step (Article 56 EPC 1973).

5. *Auxiliary request 4 - Inventive step (Article 56 EPC 1973)*

5.1 The subject-matter of claim 1 according to auxiliary request 4 only differs from the subject-matter of claim 1 according to auxiliary request 3 in that the angles of the conical sealing section have been specified in terms of "*a conicity value comprised between 12,5% and 25%*".

5.2 The technical effect of this feature disclosed in the patent in suit is "*to ensure a good tightness with the corresponding contacting surface of the male element, thus reducing the sliding time during the screwing step*" (column 5, lines 2 to 6). It is part of the common general knowledge of the skilled person that "*reducing the sliding time during the screwing step*" is to prevent galling (for example, see document D14, column 2, lines 5 to 20) and this was not contested by the appellant.

5.3 The corresponding objective technical problem is thus to prevent galling at the conical seal surface during make up of the joint. This constitutes an additional, third partial technical problem which is not related to those corresponding to features (k) and (m1)/(n1) of claim 1.

5.4 Document D14 is concerned with preventing galling at the conical seal surface during make up of the joint (column 3, lines 16 to 20). Embodiments in group 2 (column 13, lines 7 to 13) of document D14 have the

same 1/16 (= 6.25%) taper angle (TABLE 2, column 2) as the joint of document D1 (column 7, lines 27 to 29) and have a sealing portion taper of 1/8 (= 12.5%) to 1/4 (= 25%) (TABLE 3, column "TAPER OF SEALING PORTION", lines J to R) while avoiding galling (TABLE 5, column 2, lines J to R).

Furthermore, this range of sealing portion taper angles is compatible with the teaching of document D1 which discloses that the angles of the frustoconical seal surfaces are between 0.8° and 12°, the angle being measured with respect to the common longitudinal axis of the joint (column 5, lines 21 to 25). The appellant did not contest that these angles correspond to a range of conicity values of 2.8% to 42.5% (as advanced by the respondent), or that the range disclosed in document D14 lies within this range.

5.5 The skilled person starting from a joint according to document D1 and seeking to prevent galling at the conical sealing surfaces is thus led by document D14 to a conicity value comprised between 12,5% and 25% for the conical sealing surfaces of the male and female elements without needing an inventive step.

The appellant's argument that the skilled person would not consult document D14 with respect to the problem of galling at the conical seal surface cannot be followed, because, as is explained in document D14, the risk of galling arises during a period from the beginning of the interference between the sealing portions until the end of the binding, i.e., while screwing-in of the make-up on seal quantity (MOS) is executed, the sealing portions and slide in a spiral direction while maintaining a high surface pressure (column 2, lines 5 to 20). The sliding distance thus depends on the taper

angle of the conical surface and is not dependent on the nature of the mating sealing surface. There is thus no reason for the skilled person not to follow the teaching of document D14.

The inventive step arguments advanced in the context of the main request thus further carry over to the subject-matter of claim 1 according to auxiliary request 4. Therefore, the subject-matter of claim 1 according to the auxiliary request 4 does not involve an inventive step (Article 56 EPC 1973).

6. *Auxiliary request 5 - Inventive step (Article 56 EPC 1973)*

The claim 1 according to auxiliary request 5 only differs from claim 1 according to auxiliary request 4 in that the term "*near-flush*" has been deleted.

This amendment has no bearing on any of the features involved in the inventive step arguments advanced in the context of the subject-matter of claim 1 according to auxiliary request 4.

In consequence, the inventive step arguments advanced in the context of auxiliary request 4 apply likewise to the subject-matter of claim 1 according to auxiliary request 5. Therefore, the subject-matter of claim 1 according to the auxiliary request 5 does not involve an inventive step (Article 56 EPC).

7. *Request for reimbursement of the appeal fee*

7.1 The appellant considers that the opposition division did not treat the parties equally when it agreed to the postponement of the oral proceedings which the

representative of the opponent had justified in terms of his participation at a professional training convention.

The appellant did not, in turn, request a postponement of oral proceedings (for reasons of a participation in a professional training convention) which was refused by the opposition division. Thus, there is no actual evidence of unequal treatment. The mere fact that the opposition division responded favourably to the opponent's request for postponement does not mean that the opposition division would not have reacted similarly, if the patentee had also requested such a postponement.

Furthermore, the appellant only raised this issue in the oral proceedings before the opposition division after the discussion of the main request was concluded. There was no justification for this delay.

Furthermore, the alleged "*procedural error*" is not of a substantial nature, because the outcome of the oral proceedings was not affected by the date on which it took place, nor were any arguments to this effect advanced on behalf of the appellant.

7.2 According to Rule 103(1)(a) EPC, the appeal fee is to be refunded if the Board deems the appeal (in particular the aspect of the appeal which is concerned with the question of whether a substantial procedural violation occurred) to be allowable and if the refund is equitable due to a substantial procedural violation.

Neither condition being met in the present case, the appellant's request that the appeal fee be refunded is refused.

Order

For these reasons it is decided that:

1. The appeal is dismissed.

2. The reimbursement of the appeal fee is refused.

The Registrar: The Chairman:

D. Meyfarth M. Poock

Decision electronically authenticated