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Datasheet for the decision of 14 October 2020

Case Number: T 2670/18 - 3.2.03

Application Number: 13872310.1

Publication Number: 2949983

IPC: E21B17/042, F16L15/00, F16L15/04

Language of the proceedings: EN

Title of invention:
SCREW COUPLING FOR STEEL PIPE

Applicant:
JFE Steel Corporation

Headword:

Relevant legal provisions:
EPC Art. 83, 84, 111(1)
RPBA 2020 Art. 11, 13

Keyword:
Late-filed request - admitted (yes)
Claims - clarity - auxiliary request (yes)
Sufficiency of disclosure - (yes)
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

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Case Number: T 2670/18 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 14 October 2020

Appellant: (Applicant)	JFE Steel Corporation 2-3, Uchisaiwaicho 2-chome Chiyoda-ku Tokyo 100-0011 (JP)
Representative:	Grünecker Patent- und Rechtsanwälte PartG mbB Leopoldstraße 4 80802 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 18 June 2018 refusing European patent application No. 13872310.1 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Ashley
Members:	V. Bouyssy
	E. Kossonakou

Summary of Facts and Submissions

I. European patent application No. 13872310.1 (in the following: "the application") was filed as International patent application PCT/JP2013/000436 in Japanese and was published as EP 2 949 983 A1 in English (D0).

II. The examining division refused the application because
- claim 1 of main request a filed with letter of 30 April 2018 was unclear (Article 84 EPC);
- claim 1 of main request b filed with letter of 30 April 2018 was unclear (Article 84 EPC), and its subject-matter was insufficiently disclosed (Article 83 EPC);
- the subject-matter of claim 1 of main request c filed in the oral proceedings extended beyond the content of the application as filed (Article 123(2) EPC); and
- auxiliary requests Ia, Ib, IIa and IIb filed with letter of 30 April 2018 were not admitted into the proceedings (Rule 137(3) EPC).

III. This decision was appealed by the applicant (in the following "the appellant").

IV. In the statement setting out the grounds of appeal (letter dated 29 October 2018), the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of either the claim filed as the main request or of one of the two claims filed as auxiliary requests I and II with the statement of grounds of appeal. The appellant also made a conditional request for oral proceedings.

V. In a communication pursuant to Rule 100(2) EPC dated 12 May 2020 the Board indicated its preliminary opinion of the case. In particular, the Board indicated its view that neither the main request nor any of auxiliary requests I and II could be allowed.

VI. In response to the Board's preliminary opinion (letter dated 31 August 2020), the appellant filed an amended claim as new auxiliary request II, in replacement of auxiliary request II, as well as an amended claim as new auxiliary request III. The appellant requested that the decision under appeal be set aside and that, should the Board conclude that the claim filed as the main request or one of the three claims filed as auxiliary requests I, II and III fulfills the requirement of Articles 84 and 83 EPC, the case be remitted to the examining division to decide further on patentability. In addition, the appellant made it clear that their conditional request for oral proceedings would not be upheld should their request regarding the claims be granted.

VII. The claims of the appellant's requests relevant for the present decision are as follows.

(a) Main request

The sole claim of the appellant's main request reads as follows (the feature numbering is introduced by the Board for ease of reference; compared with claim 1 of D0, added passages are indicated in bold, deleted passages in strike-through):

(a) A threaded joint for steel pipes comprising~~:~~
(b) a pin **(3)** including an externally threaded male portion **(7)**, a pin nose **(8)** extending from the

externally threaded male portion **(7)** toward an end of pipe~~,~~ and a shoulder portion **(12)** disposed at the end of the pin nose **(8)**, and

(c) a box **(1)** including an internally threaded female portion **(5)** to be threadedly coupled with the externally threaded male portion **(7)**, a seal face **(21)** facing an outer peripheral face **(31)** of the pin nose **(8)**~~,~~ and a shoulder portion **(14)** that contacts the shoulder portion **(12)** of the pin **(3)**,

(d) wherein the pin **(3)** and the box **(1)** are threadedly coupled with each other in such a way that the outer peripheral face **(31)** of the pin nose **(8)** and the seal face **(21)** of the box **(1)** come into metal-to-metal contact with each other, and the contact portion serves as a seal portion **(20)**,

~~characterized in that~~

(e) the outer peripheral face **(31)** of the pin nose **(8)** has a single tapered shape~~,~~ **and**

(f) the seal face **(21)** of the box **(1)** has an outwardly convex curved shape, ~~and~~

characterized in that

(g) a seal point x_p defined by the following equation is greater than or equal to **5,08 mm** (0.2 inches),

[Equation 1] $$x_p = \frac{\int_{x_1}^{x_2} p(x)x\,dx}{F}$$ **, where**

$$F = \int_{x_1}^{x_2} p(x)\,dx$$ **, and**

~~where~~ p**(x)** is a contact face pressure, x is a distance from an end of the pin **(3)** in a pipe axis direction, and x_1 and x_2 are respectively a lower limit and an upper limit of a domain of x corresponding to the seal portion **(20)**.

(b) Auxiliary request I

The claim differs from the claim of the main request in that the limitation has been introduced that the contact face pressure p(x) **"is obtained as a function of x by performing an FEA calculation that simulates LP2 of the series A test of ISO 13679: 2002, wherein the element size is in the range of 0.0254 mm to 0.254 mm (0.001 to 0.01 inches) and the box and the pin are elasto-plastic bodies".**

(c) Auxiliary request II

The claim differs from the claim of auxiliary request I in that the limitation has been introduced that **"x_1 and x_2 of the interval of the integral are defined as the x coordinates of two intersecting points of the outer peripheral face (31) of the pin nose (8) and the seal face (21) when cross-sectional views of the pin (3) and the box (1) having the same size are placed one on top of the other so that the pipe axes and shoulder faces of the pin (3) and the box (1) coincide with each other".**

VIII. Cited evidence

(a) The decision under appeal refers to the following document which was filed by the appellant during the oral proceedings and is annexed to the minutes:

A1: International standard ISO 13679:2002, "Petroleum and natural gas industries — Procedures for testing casing and tubing connections", December 2002, pages 1, 7, 12, 13, 38, 52 to 57, 62, 63, 134 and 135

(b) In addition, the appellant has filed the following documents with the statement setting out the grounds of appeal:

A2: International standard ISO 13679:2002, "Petroleum and natural gas industries — Procedures for testing casing and tubing connections", December 2002, 148 pages;
A3: Example of Excel calculation sheet for finite element analysis according to ISO 13679:2002;
A4: Drawings of pin and box of JFELION^{TM} joint with O.D. 9-5/8", September 2018

IX. The arguments of the appellant, insofar as relevant for the present decision, can be summarised as follows:

(a) Main request

The examining division erred in deciding that the claimed invention was insufficiently disclosed in the application for the relevant skilled person and that the definition of the seal point x_p in feature (g) of claim 1 was not clear for the skilled person.

The claimed invention lies in the field of threaded joints for steel pipes as used in the oil industry (paragraphs 1 and 2 of D0). A specific example of the threaded joint by which two pipes 3 are connected is shown in Figure 3 of the application. It is explained in the application (paragraphs 16 and 17 and table 1 in D0) how the seal point x_p defined in feature (g) of the claim is calculated, namely by means of a finite element analysis (FEA) simulating load point 2 (LP2) of the series A test of ISO 13679:2002 (see A1 and A2). At this load point a specific pressure and force is

applied to a test piece to determine whether a leakage occurs (table 6 on page 42 of A2). Page 41 of A2 gives the principles of the series A test. As written in section 7.4.1 of A2, the limit load tests are useful for correlating with finite element analysis data. Thus, the relevant skilled person is familiar with the testing procedure as well as finite element analysis (FEA) simulating the series A test of ISO 13679:2002.

The claim as such is clear as a seal point x_p is defined therein which must be greater or equal than a certain length, namely 5.08 mm, whereby feature (g) provides a formula for calculating x_p. This formula corresponds to the sketch shown in the upper part of Figure 1 and involves summing up the pressure p(x) along the distance dx from the first point x_1, where a contact pressure occurs, to the last point x_2, where a contact pressure occurs. This simple mathematical equation describes the extension of the seal point: it has a certain minimum length between x_1 and x_2, i.e. the length of the hatched area in the graph on top of Figure 1.

Contrary to the examining division's view, the seal point x_p is not an unusual parameter. Instead, it has a common definition in the field of threaded joints and the formula in feature (g) gives a good explanation where the sealing starts and finishes, namely between x_1 and x_2.

It is also not true that the environmental conditions should be provided when defining the seal point x_p. Feature (g) of the claim requires that $x_p \geq 5{,}08$ mm and provides a specific formula for calculating x_p. This definition does not raise any problem of clarity, let alone of legal certainty.

(b) Auxiliary Request I

The claim clarifies that the contact face pressure p(x) is calculated as function of x by performing an FEA analysis that simulates LP2 of test series A as defined in ISO 13679:2002. This amendment is supported by the teaching in paragraph 16 of D0 where reference is made to ISO 13679. Since at the time of filing the application (28 January 2013) ISO 13679:2002 was the only ISO norm 13679 available, the limitation to ISO 13679:2002 is fully supported by the application documents as originally filed.

Although the FEA calculation of p(x) and x_p might seem to be complicated for a layman, it is a routine task for a person skilled in the art. A3 provides an example of how the calculation of p(x) and x_p can be carried out using Abaqus FEA. The technical drawings A4 show a threaded joint constructed accordingly.

(c) Auxiliary request II

The claim of new auxiliary request II differs from the claim of auxiliary request I in that it further incorporates the feature concerning the definition of x_1 and x_2 as disclosed in paragraph 16 of D0.

Since the respective features concerning p(x) and x_1 and x_2 are contained in the claim of auxiliary request II, clarity and sufficiency of disclosure should be acknowledged. In fact, the new amendments overcome the clarity objection raised by the Board in its communication pursuant to Rule 100(2) EPC.

Reasons for the Decision

1. Applicable Rules of Procedure of the Boards of Appeal

1.1 The revised Rules of Procedure of the Boards of Appeal (RPBA 2020) entered into force on 1 January 2020 (Articles 24 and 25(1) RPBA 2020). Subject to the transitional provisions (Article 25 RPBA 2020), the revised version also applies to appeals pending on the date of the entry into force. In the present case the statement of grounds of appeal was filed before 1 January 2020. Thus, Article 12(4) to (6) RPBA 2020 does not apply, and instead Article 12(4) RPBA 2007 applies to the grounds of appeal (Article 25(2) RPBA 2020).

1.2 Since the Board communication pursuant to Rule 100(2) EPC has been notified after 1 January 2020, Article 13 RPBA 2020 is to be applied for questions regarding any amendment to the appellant's appeal case in response to the communication.

2. Main and auxiliary request I - Consideration in the appeal proceedings

2.1 The main request and auxiliary request I respectively correspond to main request a and main request b already filed before the examining division with letter of 30 April 2018 in response to the summons to oral proceedings.

2.2 Since the examining division based its decision on main request a and main request b, the main request and auxiliary request I must be considered in the appeal proceedings.

3. In its communication pursuant to Rule 100(2) EPC, the Board set out and reasoned its intention not to allow the main request and auxiliary request I, as follows (points 8 and 9):

"8.1 Since the purpose of Article 84 EPC is to ensure legal certainty as to the actual scope of protection conferred by a claim, the meaning of the features recited in a claim should be clear for the skilled person in the art from the wording of the claim alone.

8.2 The Board shares the view of the examining division that claim 1 does not meet the clarity requirement of Article 84 EPC.

8.3 In a nutshell, claim 1 defines a threaded joint for steel pipes comprising a pin (3) and a box (1) with mating threaded portions (7, 5), mating torque shoulder portions (12, 14) and mating seal portions (31, 21) to provide a metal-to-metal seal.

8.4 Feature (g) of claim 1 requires that $x_p \geq 5{,}08$ *mm, where*

[Equation 1] $$x_p = \frac{\int_{x_1}^{x_2} p(x)x\,dx}{F}, \quad F = \int_{x_1}^{x_2} p(x)\,dx$$

p(x) is a contact face pressure, x is an axial distance from a pin end, and x_1 *and* x_2 *are respectively a lower limit and an upper limit of a domain of x corresponding to the seal portion (20).*

8.5 In the context of claim 1, it is clear that x_1 *and* x_2 *are the lower und upper limits of the seal portion while p(x) is the contact pressure between the*

outer peripheral surface (31) of the pin nose (8) and the seal face (21) of the box (1) in the seal portion.

8.6 Thus, it is apparent that x_p corresponds to the average location of the contact pressure in the seal portion, i.e. the centre of pressure, and feature (g) requires that it is located at least 5,08 mm away from an axial end of the pin.

8.7 Whilst the centre of pressure is a known parameter in the technical field of fluid mechanics, it appears to be an unusual parameter in the relevant field of threaded joints for steel pipes, as argued by the examining division.

8.8 In the context of claim 1, x_p is not clearly defined because $p(x)$, x_1 and x_2 are functions of the load applied to the threaded joint, e.g. fluid pressure (internal and/or external), axial force (tension or compression), bending (buckling and/or wellbore deviation) and/or make-up torsion, and there is no mention in the claim of the conditions under which these parameters are to be measured or calculated. Thus, it is uncertain how the calculation of x_p should actually be carried out. For instance, it is unclear whether $x_p \geq 5,08$ mm must be fulfilled for any load condition or only for a specific load condition which is undefined.

8.9 A skilled reader of the claim is thus left in doubt as to which position of the centre of pressure is actually covered by the claim language and which is not, so that it cannot be ascertained whether a given threaded joint falls within the scope of the claim or not.

8.10 The calculation of x_p is further defined in the description of the application (paragraphs 16 and 17 of D0):

(h) p(x) is obtained as a function of x by performing an FEA calculation that simulates LP2 of the series A test of ISO 13679, wherein the element size is in the range of 0.001 to 0.01 inches and the box and the pin are elasto-plastic bodies, and

(i) x_1 and x_2 correspond to two intersecting points of the outer peripheral surface (31) of the pin nose (8) and the seal face (21) of the box (1) when cross-sectional views of the pin and the box having the same size are placed one on top of the other so that the pipe axes and shoulder faces of the pin and the box coincide with each other.

8.11 The Board shares the appellant's view that, in light of this definition, the skilled person would for the following reasons face no difficulty in determining x_p.

8.11.1 They would understand that the expression "LP2 of the series A test of ISO 13679" refers to load point 2 of test series A defined in table 6 of International standard ISO 13679:2002, namely a combined load of axial tension and internal pressure corresponding to hold point 2 in the first quadrant of the load path of test series A as shown in figure 13 or 14. The abbreviation "LP" is used in this standard to designate any load point (page 7). Even though the abbreviation "LP2" is used in the standard to designate limit load test path 2 defined in section 7.5.2 and shown figures 18 and 19 (page 7), namely a test under axial compression with external pressure increasing to failure, it is apparent that the expression "LP2 of the series A test" cannot refer to this limit load test. In

fact, among eight limit load tests defined in the standard, limit load test path 2 is applied to demonstrate connection performance beyond the sealability tests according to test series A and C (table 2) and it is defined independently of these tests. The above understanding of the abbreviation "LP2" in the context of paragraphs 16 and 17 of the application appears to be confirmed by the reference to "LP12" in table 1 of the application, which can only refer to load point 12 of test series A, since there does not exist any limit load test path 12.

8.11.2 The skilled person would know that finite element analysis can be used to simulate the test procedures defined in standard ISO 13679:2002 (section 7.4.1, "Limit load tests may be useful for correlating with finite element analysis data") and they would understand that, in paragraphs 16 and 17 of the application, the abbreviation "FEA" means "finite element analysis", whereby the statements "the element size is in the range of 0.001 to 0.01 inches" and "the box and the pin are elasto-plastic bodies" refer to the FE modelling of the joint structure and material.

8.11.3 Whilst finite element analysis to simulate load point 2 of test series A of ISO 13679:2002, and thus obtain p(x) under this specific load condition, may involve challenging issues such as modelling of the joint structure, the material and the load, the Board sees no reason to doubt that this would be a routine task for the skilled person, as submitted by the appellant with reference to A3. The skilled person would thus be able to calculate p(x), x_1, x_2 and thus x_p and thereby make a meaningful comparison with the prior art.

8.12 However, this special meaning of p(x), x_1, x_2 and x_p is not suggested by the wording of claim 1 of the main request and there is no reason to read it into the claim.

8.13 The above objection would be overcome, if claim 1 were to be amended so that the definition of p(x), x_1, x_2 and x_p is clear from the wording of the claim alone.

8.14 This is important because it is only the claims of the patent, not the description, which will be published in all the official languages of the EPO (see the Guidelines for Examination in the EPO, 2019, F-IV, 4.2).

9. The above objection under Article 84 EPC applies also to auxiliary requests I and II. The definition of x_1 and x_2 is not clear from the amended wording of claim 1 according to either auxiliary request."

4. In the absence of any counter-arguments in the appellant's response dated 31 August 2020, the conclusions reached by the Board in its communication pursuant to Rule 100(2) EPC continue to apply. Hence, neither the main request nor auxiliary request I can be allowed.

5. Auxiliary request II - Admissibility in the appeal proceedings

5.1 The appellant filed new auxiliary request II in response to the Board communication pursuant to Rule 100(2) EPC.

5.2 The Board exercised its discretion pursuant to Article 13(2) RPBA 2020 to admit this new request into the appeal proceedings for the following reasons.

5.3 The claim of the new auxiliary request II differs from that of auxiliary request II filed with the statement of grounds of appeal in that the definition of x_1 and x_2 of the integral in feature (g) of the claim has been introduced. This amendment is in response to the objection under Article 84 EPC which was raised for the first time in the Board communication pursuant to Rule 100(2) EPC (points 8.12 to 8.14 above).

5.4 The amendment to the claim clearly overcomes all outstanding objections without introducing new issues.

6. The Board is satisfied that the amendments to the claim are supported by the information in the application documents as originally filed (Article 123(2) EPC), as indicated by the appellant (see points IX-b) and IX-c) above).

7. Contrary to the examining division (see decision under appeal, point 2.3 of the reasons), the Board is also satisfied that the application discloses the claimed invention in a manner sufficiently clear and complete for it to be carried out by the skilled person (Article 83 EPC). As explained above, the Board shares the appellant's view that, following the guidance provided in the application and using common general knowledge, the skilled person would be able to calculate $p(x)$, x_1, x_2 and thus x_p and thereby make a meaningful comparison with the prior art. In particular, even though finite element analysis to simulate load point 2 of test series A of ISO 13679:2002 and thus obtain $p(x)$ under this specific

load condition may involve challenging issues such as modelling of the joint structure, the material and the load, the Board sees no reason to doubt that this would be a routine task for the skilled person, as submitted by the appellant. In the absence of any serious doubts substantiated by verifiable facts, there is no reason not to believe that the skilled person, following the guidance provided in the application and using common general knowledge, would be able to put the claimed invention into practice.

8. Remittal of the case

8.1 In its communication pursuant to Rule 100(2) EPC, the Board set out and reasoned its intention to remit the case to the examining division, as follows (point 12):

"12. Should the appellant file amendments to the claims which overcome the above objection under Article 84 EPC, the Board considers that it would be appropriate to remit the case to the examining division for further prosecution (Article 111(1) EPC), as requested by the appellant.

Even though a board normally does not remit the case (Article 11 RPBA 2020), special reasons are apparent in the present case for doing so. In particular, the appealed decision only deals with objections of lack of clarity, insufficient disclosure and added subject-matter, and the question of whether or not the claimed invention is novel and inventive in light of D1 to D3 has not been addressed in the decision. It is the primary object of the appeal proceedings to review the appealed decision in a judicial manner (Article 12(2) RPBA 2020), not to conduct a complete examination of the application."

8.2 The appellant did not contest the above conclusions of the Board and in fact, requested that the case be remitted to the examining division to decide on patentability.

8.3 Hence, the case is remitted to the examining division for further prosecution on the basis of the amended claim of auxiliary request II.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division for further prosecution.

The Registrar: The Chairman:

C. Spira G. Ashley

Decision electronically authenticated