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D E C I S I O N
of 1 October 1998

Case Number: T 0433/97 - 3.4.2

Application Number: 89300924.1

Publication Number: 0328288

IPC: G01M 3/28

Language of the proceedings: EN

Title of invention:

Method for externally and internally testing for leaks in
connections between tubular members

Patentee:

Hasha, Brian B., et al

Opponent:

Weatherford U.S., Inc.

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 83, 84

Keyword:

"Disclosure - sufficiency (yes)"
"Novelty and inventive step (yes, confirmed)"

Decisions cited:

T 0301/87

Catchword:

-



Case Number: T 0433/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 1 October 1998

Appellant:
(Opponent)

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Decision under appeal: Interlocutory decision of the Opposition Division of the European Patent Office posted 19 February 1997 concerning maintenance of European patent No. 0 328 288 in amended form.

Composition of the Board:

Chairman: S. V. Steinbrener

Members: A. G. Klein

M. Lewenton

Summary of Facts and Submissions

I. European patent No. 0 328 288 (application No. 89 300 924.1) was maintained in amended form by the Opposition Division, on the basis of a set of claims, of which claim 1, the only independent claim, reads as follows:

"1. A method of hydrostatically testing connections between two segments (10,12) of pipe which have been connected together to form a pipe joint which forms or will form part of a pipe string, which comprises applying pressurised hydrostatic test fluid to the connection characterised by:

selectively applying the pressurised hydrostatic test fluid such that the pressures are principally applied to a selected localised small area in the immediate vicinity and on either side of the radial orifice (56) leading into the sealing elements (18,20) of the connection under test and such that there is no substantial test pressure applied radially to the inner or outer annular surfaces of the connection in the vicinity of at least one of the sealing elements of the connection under test which pressure would tend to substantially affect the bearing pressure of that sealing element or elements."

II. The appellant (opponent) lodged an appeal against the Opposition Division's interlocutory decision.

III. Oral proceedings were held before the Board on 1 October 1998, at which the appellant requested that

the decision under appeal be set aside and that the European patent be revoked.

The respondents (proprietors of the patent) for their part requested that the appeal be dismissed.

The Board announced its decision at the end of the oral proceedings.

IV. In support of his request, the appellant first questioned the ability of claim 1 to cover the embodiments disclosed in the patent in conjunction with Figures 4A, 4B, 6A and 6B. In these embodiments, the passages leading into the sealing elements extended axially and they could not therefore be considered to form a "radial orifice" as was set out in the claim. Even if the orifice in the contested embodiments was considered to extend radially, the pressures applied by the pressurised hydrostatic test fluid would certainly not be applied "on either side" of such radial orifice in the sense of claim 1.

The appellant in this respect expressed his intention to withdraw his appeal in case the Board stated that the embodiments of Figures 4A, 4B, 6A and 6B were not covered by claim 1.

Concerning the statement in claim 1 that the test pressures were applied to a "selected localised small area" in the immediate vicinity and on either side of the radial orifice, the appellant acknowledged that it was shown in the embodiment of Figure 3 of the patent in suit. He however submitted that in the embodiment of Figure 4B, for instance, the axial extension of the

area to which the test pressure was applied was nearly the same as the axial extension of the threaded portions of the connection. In the arrangement disclosed in Figure 3 of document

D1: US-A-4 132 111

the area to which the test pressure was applied also extended axially over a length which was close to the length of the threaded portions of the connection. This area could therefore also be considered to form a "selected localised small area" in the sense of claim 1, as interpreted in view of Figure 4B of the patent in suit. The method of claim 1 therefore lacked novelty in view of Figure 3 of document D1.

Moreover, document D1 in conjunction with Figure 14 disclosed a method of hydrostatically testing the end portions or pins of individual pipes as they come off the factory. This method also involved selectively applying a pressurised hydrostatic test fluid to a selected localised small area in the immediate vicinity and on either side of the radial orifice leading into the sealing element. Admittedly, in the arrangement of Figure 14, the individual pipe end portion under test was inserted into an annular mounting, instead of being connected to another pipe end portion as was set out in claim 1. However, the claimed method only resulted from an obvious use of the technique as disclosed in Figure 14 of document D1 for the testing of individual pipe end portions, to the on-site testing of already connected end portions. In this respect, the fact that one of the inventors mentioned in the patent in suit

was also the inventor mentioned in document D1 provided clear evidence that the arrangement of Figure 14 in document D1 only constituted a natural precursor step in the logical sequence which led from the method disclosed in Figures 1 to 8 of document D1 to the method of the present patent.

V. These submissions were contested by the respondents.

In their view, the area to which the test fluid was applied in the arrangements of Figures 4A, 4B, 6A and 6B no doubt extended "on either side" of the radial orifice leading into the sealing elements. The pressurised hydrostatic test fluid could not possibly be applied to the radial orifice if it was not confined by annular sealing members so disposed as to effectively bridge the radial orifice.

With respect to the patentability of the claimed invention, it was an essential feature of claim 1 that no substantial test pressure was applied radially to the inner or outer annular surfaces of the connection in the vicinity of at least one of the sealing elements of the connection. In contrast, the lower seal member shown in Figure 3 of document D1 necessarily exerted substantial radial pressure in the vicinity of the adjacent sealing element of the connection.

The arrangement disclosed in conjunction with Figure 14 of document D1 only permitted assessment of the manufacturing quality of the threads formed at the end of individual pipe portions. It was however neither adapted, nor intended for, the testing of connections

already established between adjacent pipe end portions as was required by the preamble of claim 1.

Reasons for the Decision

1. The appeal meets the requirements of Articles 106 to 108 and of Rule 64 EPC. It is admissible, accordingly.
2. The amendments brought to the claims and description of the patent in suit comply with the requirements of Article 123(2) and (3) EPC, which was not contested by the appellant.

Claim 1 in substance was only supplemented with the additional limitation that the two segments of pipe to be tested in accordance with the claimed method have been connected together to form a pipe joint which forms or will form part of a pipe string.

This feature was disclosed originally on page 2, lines 5 to 20 of the description as filed.

An evident clerical error was corrected in claim 3, and the description was only amended for consistency with claim 1 as amended.

3. *Sufficiency of the disclosure*

The appellant in his written submissions questioned the sufficiency of the disclosure on the ground that the described embodiments which involved application of

external test pressure would not meet the requirement of claim 1 that no substantial test pressure be applied radially to the inner or outer annular surfaces of the connection in the vicinity of at least one of the sealing elements of the connection under test, which pressure would tend to substantially affect the bearing pressure of that sealing element or elements. In his view, external test pressure would de-energise the seal, i.e. reduce the pressure between the sealing elements, as a result of pressurised fluid entering the threads.

The appellant did not however contest that the embodiments which rely on the application of **internal** test pressure, namely those of Figures 7 to 10 as described in the specification and drawings adequately disclose the claimed method, nor has the Board any doubts in this respect.

Moreover, whilst it seems true that **external** test pressure might tend to de-energise the seal as a result of pressurised fluid entering the threads - at least in the particular circumstances where testing is performed in a partially loose condition of the connection and the sealing element located in the vicinity of the radial orifice is not yet engaged; see the patent specification column 12, lines 20 to 31 - the pressure which claim 1 actually requires not to affect the sealing element(s) is exclusively the pressure exerted **radially** by the test fluid **upon the annular inner or outer surfaces of the connection**, not the pressure exerted within the connection, e.g. internally of the threads.

Since all the embodiments disclosed in the patent, including those which rely on external pressurisation, appear to comprise sealing elements in the vicinity of which there is no substantial pressure applied radially to inner or outer surfaces of the connection by the test fluid, the claimed teaching is applicable irrespective of the test pressure type.

Accordingly, the invention in the Board's opinion is disclosed in the patent in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art in the sense of Article 83 EPC.

4. *Clarity of the claims and their support by the description (Article 84 EPC)*

Independent claim 1 defines a method of hydrostatically testing connections between two segments of pipe, which is characterised by a specific manner of applying the pressurised hydrostatic test fluid: the test pressures are principally applied to a selected localised small area in the immediate vicinity and on either side of the radial orifice leading into the sealing elements of the connection under test; and there should be no substantial test pressure applied radially in the vicinity of at least one of the sealing elements, which pressure would substantially affect the bearing pressure of said element.

The question whether the method disclosed in the patent in suit with reference to Figures 4A, 4B, 6A and 6B falls under the scope of protection afforded by

claim 1, has given rise to discussion at the oral proceedings, at which the appellant offered to withdraw his appeal, should the Board state that this was not the case.

The Board in this respect wishes to emphasise that its powers and duties in the present instance, in which the appeal lies against the Opposition Division's decision to maintain the patent as amended, are limited to considering whether, taking due account of the amendments made by the proprietor of the patent during the opposition proceedings, the patent and the invention to which it relates meet the requirements of the Convention (see Article 102(3) EPC).

The question whether a given embodiment, be it described in the patent itself or elsewhere, falls under the extent of protection conferred by the patent in the sense of Article 69 EPC does not by itself concern a requirement of the Convention to be met by the patent and by the invention to which it relates, and it has not therefore to be decided **as such** by the Board.

Moreover, the alleged inconsistency between claim 1 and certain parts of the description and drawings does not originate from passages of claim 1 as amended during the opposition proceedings but from passages already present in claim 1 as granted. Insofar as the appellant's objections may be understood to be based on Article 84 EPC, the Board follows the established case law of the Boards of Appeal (see, e.g., T 301/87, OJ EPO 1990, 335) to disregard such objections in

opposition appeal proceedings since the requirements of Article 84 EPC do not constitute grounds for opposition under Article 100 EPC.

In the present case, it is considered sufficient for the purpose of assessing novelty and inventive step to establish that in the Board's view the expression "radial orifice" as consistently used in the description (see e.g. column 11, lines 22 to 29, column 13, lines 4 to 11 or column 20, lines 47 to 52 of the patent specification) designates the orifice of a passage leading from either the external or the internal surface of the connection into the sealing elements.

5. *Novelty*

- 5.1 Document D1 discloses several methods of hydrostatically testing connections between two segments of pipe which have been connected together to form a pipe joint. The document in particular discloses the testing of a connection of the so-called "Hydril-type", in which an upper pipe end portion comprising external threads is engaged into a corresponding internally threaded lower pipe end portion (see Figure 3). In this embodiment, pressurised hydrostatic test fluid is externally applied to an outer area of the connection as defined by peripheral chamber 20a, which extends in the axial direction over a length which is more than half the distance between the annular orifice which at the upper portion of the connection leads towards the lower sealing element, and said lower sealing element. The upper portion of said

area, which extends above the annular orifice, is small and comparable to the corresponding area in the arrangement of Figure 3 of the patent in suit, which illustrates the claimed testing method as also applied to a "Hydril-type" connection. The axial length of the lower portion of the area of application of the test fluid in the embodiment of Figure 3 of document D1, which extends below the radial orifice, is about 10 times greater. Given the configuration of the connection shown in Figure 3 of document D1, the extension of the area of application of the test fluid at the lower side of the radial orifice could however be much smaller, and in particular be close to its small extension at the upper side of said orifice, as is shown for instance in Figure 3 of the patent in suit.

Accordingly, in the method disclosed in connection with Figure 3 of document D1, the test fluid is not in the Board's opinion applied to a selected localised small area in the immediate vicinity and on either side of the radial orifice in the sense of claim 1.

The appellant in this respect compared the axial extension of the area to which test fluid is applied in accordance with Figure 3 of document D1 to the corresponding area of the embodiment of Figure 4B of the patent in suit. The connection of the latter embodiment cannot however be fairly compared to that of the former, since in contrast with the "Hydril-type" connection it is formed by threading respective pipe end portions 10, 12 into a common coupling 40, with the annular orifice leading into axial passages 58.

In the embodiment of Figure 2 of document D1 which is directed to the testing of a connection which is actually comparable to that of Figure 4B of the patent, the area to which test pressure is radially applied, as defined by chamber 20a, straddles the whole coupling 19.

Moreover, as was stressed rightly by the respondents, in the embodiment of Figure 3 of D1, it could not be said that there is no substantial test pressure applied radially to the inner or outer annular surfaces of the connection in the vicinity of at least one of the sealing elements since the lower seal means 71 exerts pressure on the outer annular surface of the connection in the immediate vicinity of the lower sealing element which is not the case for the embodiment of Figure 4B of the contested patent.

The further method disclosed in document D1 with reference to Figure 14 is directed to the individual testing of the threads formed at the end of single pipe portions, rather than to the testing of connections formed between two segments of pipe already connected together in the sense of claim 1.

- 5.2 The remaining documents on the file do not come closer to the claimed method.

In particular, document:

D2: US-A-3 871 209

discloses a method of hydrostatically testing connections between two segments of pipe which have been connected together, in which pressurised hydrostatic test fluid is applied radially to an area which straddles the whole connection (see column 3, lines 22 to 40 and Figure 1).

The method of testing connections between two segments of pipe which have been seamed together as described in document:

D3: US-A-3 949 596

does not involve applying hydrostatic test fluid to the connection. On the contrary, the connection is covered externally with an impervious, flexible membrane, the outer edges of which are sealed to the outer surfaces of the respective pipe ends. The volume between the flexible membrane and the outer surfaces of the connection which it covers is then evacuated, and passage of gas through the seam into the evacuated volume when a leak is present in the connection is detected (see claim 1).

Document:

D4: GB-A-1 497 440

discloses a method of hydrostatically testing connections between two segments of pipe which have been connected together. In this method, like in the method of document D2, the entire connection is subjected to external test pressure (see page 1,

lines 50 to 54 and Figure 2).

5.3 For these reasons, the subject-matter of claim 1 is novel in the sense of Article 54 EPC.

6. *Inventive step*

6.1 The nearest prior art in the Board's view is constituted by the method disclosed in document D1 in conjunction with Figure 3. This method already achieves hydrostatic testing of connections between two segments of pipe. In this method, the pressurised hydrostatic test fluid is indeed applied so that it exerts its pressure to a selected localised small area in the immediate vicinity and on the upper side of the radial orifice leading into the sealing element, but this is not the case for the lower side of the radial orifice (see point 5.1 above).

6.2 The technical problem solved by those features of the method of claim 1 which distinguish its subject-matter from the nearest prior art, namely that the test fluid also on the lower side of the radial orifice only applies pressure to a selected localised small area in the immediate vicinity of said orifice, is to prevent the said pressure as radially applied to the annular surface of the connection, from substantially affecting the bearing pressure of at least one sealing element of the connection, as is set out at the end claim 1.

The Board in this respect sees no reason to doubt that reducing the size of the area of the inner or outer annular surfaces of the connection, to which

hydrostatic pressure is applied radially by the test fluid, to a small area in the immediate vicinity and on either side of the radial orifice actually prevents said test pressure from substantially affecting the bearing pressure of at least one sealing element of the connection, which could jeopardize the accuracy of the test (see the description of the patent, column 2, line 37 to column 3, line 34).

In this respect, the report entitled "Analysis of the Leak Tester" filed by the appellant only with his letter dated 7 August 1998 does not in the Board's opinion provide convincing evidence of the contrary. As a matter of fact, this late-filed report consists of a theoretical computer analysis of a 2D-axisymmetrical model of a connection between threaded tubes, subjected to external pressure of a test fluid applied to it through a pressure ring. The computer calculations are performed for three different axial positions of the same pressure ring, the axial length of which is substantially the same as the length of the connection (see Figures 1 to 3). For that reason already, the analysis certainly does not reflect the claimed feature of the fluid pressure being principally applied to a selected localised small area in the immediate vicinity and on either side of the radial orifice leading to the sealing elements. Moreover, the results shown in Figure 10 of page 21 of the report would appear to demonstrate that the thread gap is wider in the lower position of the pressure ring as shown in Figure 3, which comes closest to the requirements of present claim 1, than in the upper position of the pressure ring as shown in Figure 1,

which in substance corresponds to the prior arrangement of Figure 3 of documents D1. Accordingly, the report would rather appear to confirm that the claimed method overcomes the problem of the prior art configuration artificially tightening the connection under test. Since the report filed late by the appellant does not therefore appear to provide highly relevant evidence in support of appellant's argumentation, it will not be taken further into consideration, in accordance with the provisions of Article 114(2) EPC.

- 6.3 None of the prior art citations on the file discloses a method of hydrostatically testing connections between two segments of pipe, in which pressures of the test fluid are radially applied only to a selected localised small area in the immediate vicinity and on either side of the radial orifice leading into the sealing elements. None of these documents even addresses the impact of the axial extension of the area of application of pressure on the reliability of the testing procedure.

On the contrary, those citations which relate to the hydrostatic testing of connections between segments of pipes - like documents D1, D2 and D4 - consistently disclose embodiments in which the area of application of the test fluid either extends axially over most of the length of the connection (see the embodiment of Figure 3 of document D1) or straddles the whole connection (see the embodiments of Figures 2 and 9 of document D1 and all embodiments of documents D2 and D4).

Document D1 indeed stresses that the volume of the test chamber should be minimised. It however explicitly mentions that this requirement, which aims at reducing the volume of test fluid so as to increase the sensitivity or accuracy of the testing device, is actually met in the embodiment of Figure 2, in which the test chamber straddles the whole connection, by providing only a slight clearance between the annular surface of the connection and the test chamber (see column 4, lines 35 to 39). This teaching cannot without hindsight be considered to hint at reducing also the axial extension of the test chamber in the specific way set out in present claim 1.

The testing method disclosed in document D3, which involves disposing a flexible membrane directly over a seamed joint to be leak checked and applying a selected vacuum through an opening in the membrane, is very different from the pressurisation procedure of the present patent, which it precisely aims at replacing (see abstract, second sentence). This document admittedly indicates that it is preferable to concentrate the pressure differential onto the seamed areas to be tested rather than to apply it to the entire surface of the device to be tested, but the solution it proposes, namely the use of an evacuated flexible membrane, in effect teaches away from the method of the present patent.

The appellant also pointed at the testing method disclosed in document D1 with reference to Figure 14. In this testing method, a single externally threaded pipe end portion 120 is engaged into internal threads

123 of an annular test body 122. The threads 123 serve as a control gauge to determine whether the external threads formed onto end portion 120 are correctly cut or formed. To this effect, external hydrostatic pressure is applied radially to an area which admittedly can be qualified as a "localised small area in the immediate vicinity and on either side of the radial orifice" leading into the threads (see D1, column 11, lines 15 to 46).

Again, the document does not describe any advantage of the small axial extension of the area to which pressure of the test fluid is applied in terms of an improved reliability of the testing method. Accordingly, the skilled person in the Board's opinion had no obvious reason to envisage transferring the test pressure application scheme disclosed in the document only in conjunction with the testing of the geometry of external threads provided on single pipe end segments, to the hydrostatical testing of connections already formed between two segments of pipe.

Appellant's further submission that the method of Figure 14 of document D1 was the natural precursor in the logical sequence which led the same inventor from the remaining testing methods for connections formed between two segments of pipe as described also in document D1 to the method of the patent in suit, does not appear to be conclusive either. Indeed, the fact that almost 14 years elapsed between the filing in 1974 of the application corresponding to document D1 and the filing, by the same inventor, of the priority application corresponding to the present patent can

hardly be considered to provide evidence that the claimed method obviously resulted from the disclosure in document D1.

- 6.4 For these reasons, the subject-matter of claim 1 is considered to involve an inventive step in the sense of Article 56 EPC.

The same conclusion applies to the subject-matter of claims 2 to 8, by virtue of their appendency on claim 1.

7. Accordingly, taking into consideration the amendments made by the proprietor of the patent during the opposition proceedings, the patent and the invention to which it relates meet the requirements of the Convention, and the patent can therefore be maintained as amended (Article 102(3) EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana S. Steinbrener