BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File No.: T 0488/92 - 3.2.1

Application No.: 89 900 871.8

Publication No. WO 89/06331

Classification: F16L 21/04

Title of invention: Pipe joints

D E C I S I O N
of 15 September 1993

Applicant: Stanton PLC

EPC: Art. 54, 56 and 84

Keyword: "Claims - functional features"
"Novelty (yes)"
"Inventive step (yes)"

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Case Number: T 0488/92 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 15 September 1993

Appellant: Stanton PLC
Stanton
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Representative: Serjeants
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Decision under appeal: **Decision of the Examining Division 2.3.11.118 of the European Patent Office dated 5 February 1992 refusing European patent application No. 89 900 871.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
J C De Preter

Summary of Facts and Submissions

I. European patent application No. 89 900 871.8 was refused by a decision of the Examining Division dated 5 February 1992.

II. The reasons given for the decision were that the characterising clause of Claim 1 then on file consisted essentially of nothing more than a statement of desired result, and that since all the technical features stated in the claim were known from US-A-2 543 185 (D1), the subject-matter of the claim lacked novelty.

III. An appeal against this decision was filed on 3 March 1993, the appeal fee being paid on the same day. The Statement of Grounds of Appeal was filed on 1 April 1992. With the Statement of Grounds the Appellants (Applicants) submitted new claims on the basis of which the grant of a patent was requested.

IV. With a letter received on 5 June 1992 the Appellants requested oral proceedings as an auxiliary measure.

V. In a communication dated 5 February 1993 pursuant to Article 11(2) RPBA, the Board raised several questions concerning the allowability of the new claims having regard to Articles 84 and 123(2) EPC. It also indicated that the subject-matter of Claim 1 would still appear to be anticipated by document D1.

VI. With a letter dated 13 July 1993 and received on 15 July 1993 the Appellants submitted a further new set of claims and a revised description. They also filed an affidavit of the inventor, Mr Greatorex, relating to a comparison between the claimed subject-matter and the state of the art.

With a further letter dated 16 July 1993 and received on 20 July 1993, the Appellants submitted application documents corresponding to first, second and third auxiliary requests.

VII. In a telephone conversation on 22 July 1993 the Rapporteur of the Board informed the Appellants that the documents submitted with their letter dated 13 July 1993 (i.e. according to their main request) appeared in principle suitable for forming the basis for grant of a patent. The oral proceedings which had been appointed for 17 August 1993 were accordingly cancelled.

VIII. In a further telephone conversation with the Rapporteur of the Board on 25 August 1993, the Appellants agreed to the deletion of dependent Claim 3 from the set of claims filed with their letter dated 13 July 1993, consequential renumbering of the following dependent Claims 4 to 7 and correction of a clerical error on page 1 of the description. (See Minutes.)

IX. Claim 1, according to the main request of the Appellants, reads as follows:

> "A pipe joint comprising a sleeve (2) defining a socket chamber (3) for receiving a spigot (5), an annular sealing member (7) for positioning between the sleeve (2) and the spigot (5), and a gland (9) around the spigot (5) for applying an axial load to a trailing heel portion (12) of the sealing member (7) to move a nose portion (14) of the sealing member (7) axially into contact with a section of the sleeve (2) having a progressively radially inwardly increasing slope to its internal profile, CHARACTERISED IN THAT the internal profile of the sleeve (2) and the nose portion (14) of the sealing member (7) are so shaped, and the sealing

member (7) is so proportioned, that in a wide tolerance situation, when the sealing member (7) is loose on the spigot (5), when the gland (9) applies a load to the trailing heel portion (12) of the sealing member (7) to move the trailing heel portion (12) axially along the socket chamber (3), the internal profile of the sleeve (2) causes the line of attack of the nose portion to turn from a purely axial direction to one with an inward radial component, rotating the nose portion (14) inwardly to advance it towards and against the spigot (5) whilst the heel portion (12) of the sealing member (7) maintains substantially the same radial position in the socket chamber (3)."

Dependent Claims 2 to 6 relate to preferred embodiments of the pipe joint according to Claim 1.

X. In support of their request for grant of a patent the Appellants argue substantially as follows:

The essence of the invention resides in the way the sealing member deforms as it is brought into engagement with the spigot on axial loading by the gland. The type of deformation envisaged was nowhere suggested in the state of the art and had the advantage of allowing use of the joint with pipes having a wide range of external diameters. Since the inventive concept could only be stated in functional terms, it was appropriate to draft Claim 1 in this way. The skilled person would have no difficulty putting the invention into effect based on the teachings of the application.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC; it is therefore admissible.

2. *Clarity of Claim 1*

According to the preamble of Claim 1 of the main request, the pipe joint comprises a sleeve, sealing member and gland for axially loading the sealing member, the parts being arranged in conventional manner.

According to the characterising clause of the claim, the internal profile of the sleeve and the nose portion of the sealing member are so shaped, and the sealing member is so proportioned, that on axial loading of the sealing member it deforms in a particular way as stated in the claim. As will become clear from the discussion under point 4 below, it is the nature of the deformation of the sealing member which distinguishes the pipe joint of the invention from the state of the art and leads to its advantages with respect thereto.

It is apparent that the required deformation of the sealing member will be dependent on the complex interaction of several factors, such as the shape of the co-acting surfaces of the sealing member and sleeve; the length, thickness and stiffness of the sealing member; and the coefficient of friction between the sealing member and sleeve. On the other hand, there is no doubt that in practice the skilled person can, on the basis of the teachings of the application and by routine experimentation, achieve the desired result. In these circumstances it is difficult to see how the invention can be properly defined otherwise than in terms of the

result to be achieved so that present Claim 1 is not objectionable in this respect (see, for example, Guidelines III 4.7).

3. *Admissibility of the amended documents (Article 123(2) EPC)*

Present Claim 1 has been derived from the originally filed Claim 1 by the addition of statements amplifying the way in which the sealing member deforms when moved into sealing engagement with the spigot and providing a clearer indication of how this is achieved. All of the amendments find a proper basis in the originally filed description.

Present Claims 2 to 6 correspond in essence to original Claims 2, 4, 8, 5 and 9 respectively.

The amendments made to the original description do not go beyond those necessary to adapt this to the terms of the new claims and to refer to the most relevant state of the art.

4. *Novelty and inventive step*

The best starting point for the evaluation of the contribution made to the art by the claimed invention is a consideration in general terms of the two types of pipe joints with which the pipe joint defined in present Claim 1 has the closest affinity, to wit stuffing box seal joints and wedge seal joints, such as US-A-2 543 185, on which the preamble of present Claim 1 is based. Stuffing box seal joints are characterised by having a sealing member enclosed by a chamber having a "stopped off" end which tends to prevent the nose portion of the sealing member from being forced into the socket-spigot annulus when it is loaded by the gland.

Such joints seal by Poisson dilation, i.e. the sealing member becomes radially thicker as the axial length is reduced by the gland load. There is a practical limit to the available Poisson dilation and such joints can only be used when the external diameter of the spigot lies within a close tolerance range. If it were attempted to use such a joint with an undersized spigot, the sealing member would extrude out of the socket chamber in an uncontrolled manner but not contact the spigot to provide a seal.

In a wedge seal joint the socket chamber is not "stopped off", thus enabling the sealing member to slide down the socket chamber slope and wedge between the socket and the spigot when loaded by the gland. When in contact with the spigot the sealing member seals partially by Poisson dilation but mainly by the wedging of the sealing member, which is forced to slide bodily down the slope of the socket chamber into contact with the spigot. The wedging action reduces the bore of the sealing member along the whole of its length, and the heel of the sealing member slides radially inwardly across the face of the gland. By using sealing members of substantial cross-section it is possible to increase the range of spigot external diameters with which any particular joint is usable, a limit to this is, however, set by excessive extrusion of the sealing member into the sleeve-spigot annulus and under the gland.

The external diameters of pipes having the same or similar nominal internal diameters vary over a wide range depending on the material from which the pipe is made. Clearly, it would be highly desirable if a pipe joint were available which could accept the entire tolerance range of any particular nominal diameter size of pipe. It is the provision of such a pipe joint that

is the technical problem addressed and solved by the present invention.

The pipe joint of the invention functions in two distinct ways depending on the degree in difference between the internal diameter of the sealing member, in its initial unstressed state, and the external diameter of the spigot. When this difference is small, the sealing member is compressed by the gland as in a conventional stuffing box seal joint. When, however, this difference is large, loading of the sealing member by the gland results in the nose portion of the sealing member being displaced and rotated inwardly until it engages the spigot. The trailing heel portion of the sealing member on the other hand retains substantially the same radial position in the socket chamber. Since the line of attack of the nose portion of the sealing member changes from axial to substantially radial, the sealing members spans the annular gap between the sleeve and the spigot without appreciable extrusion into that gap. Furthermore, since there is no appreciable relative movement between the trailing heel portion of the sealing member and the gland, the risk of extrusion of the sealing member into the space between the gland and the spigot, as can occur with wedge seal joints, is eliminated.

According to the affidavit of the inventor a single pipe joint constructed in accordance with the teachings of the claimed invention is capable of providing an acceptable seal with all conventional 6 inch or 150 mm nominal internal diameter pipes, having external diameters ranging from about 160mm to about 180mm. Previously at least two distinct pipe joints were necessary to cover the whole of this range. This is clearly of significant commercial advantage.

There is nothing in the cited state of the art, all of which is concerned with stuffing box or wedge seal joints with close tolerances between the internal diameter of the sealing member and the external diameter of the spigot, which could suggest to the skilled person the claimed measures which have been adopted to provide an essentially different type of sealing action for the wide tolerance situation, as described above.

The Board has, therefore, come to the conclusion that the subject-matter of Claim 1, according to the main request of the Appellants, is new and inventive (Articles 54 and 56 EPC). This claim together with the claims dependent thereon, the revised description and original drawings, therefore form a suitable basis for the grant of a patent.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The case is referred back to the first instance with the order to grant a patent on the basis of the following documents:

Claims: 1, 2 and 4 to 7 (renumbered as 3 to 6) filed with letter dated 13 July 1993 and received on 15 July 1993;

Description: Pages 1 to 5 filed with letter dated 13 July 1993 and received on 15 July 1993, with the amendment to page 1 agreed by telephone on 25 August 1993;

Drawings: Sheets 1/2 and 2/2 as originally filed.

The Registrar:

S. Fabiani

The Chairman:

F. Gumbel