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D E C I S I O N
of 14 July 1999

Case Number: T 1193/97 - 3.2.1

Application Number: 94202949.7

Publication Number: 0648967

IPC: F16L 15/06, E21B 17/043

Language of the proceedings: EN

Title of invention:
Improved integral joint for connecting two pipes

Applicant:
ENI S.p.A.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1193/97 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 14 July 1999

Appellant: ENI S.p.A.
Piazzale Enrico Mattei 1
00144 Roma (IT)

Representative: Fusina, Gerolamo
Ing. Barzanò & Zanardo Milano S.p.A.
Via Borgonuovo, 10
20121 Milano (IT)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 14 July 1997 refusing European patent application No. 94 202 949.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
V. Di Cerbo

Summary of Facts and Submissions

I. European patent application No. 94 202 949.7 was refused by the Examining Division with its decision posted on 14 July 1997.

The reason given for the decision was that the subject-matter of the originally filed single claim lacked novelty with respect to US-A-4 521 042 (document D1).

In addition to document D1 the search report also cited US-A-2 239 942 (D2) and FR-A-2 521 675 (D3) in the "X" category ("particularly relevant if taken alone").

II. An appeal against this decision was filed on 6 August 1999 and the fee for appeal paid at the same time. The statement of grounds of appeal was filed on 11 November 1997. With the statement of grounds the appellants (applicants) submitted a revised single claim for consideration.

III. In a communication pursuant to Article 11(2) RPBA dated 10 December 1998 the Board inter alia raised the question of whether the revised single claim met the requirements of Article 123(2) EPC.

IV. Oral proceedings before the Board were held on 14 July 1999.

At the oral proceedings the appellants submitted a new single claim and requested that a patent be granted on the basis of this new claim. That new claim reads as follows:

"Integral butt joint, useful under extremely high differential pressures and temperatures in petroleum field, between the hollow end portion (1) of a female pipe (3) provided with an internal screw thread (2), and the corresponding end hollow portion (4) of a male pipe (5) to be screwed down inside the end portion (1) of the female pipe (3), provided with an external screw thread (6); an externally overhanging back shoulder which, when both pieces are fully screwed down into each other, cooperates with the annular edge of said end portion of the female pipe;

- from the front end (9) of said end portion (4) or the male pipe (5) extending a first flaring with decreasing cross-section (10), which is suitable for coupling with a corresponding internal counter-flaring (11) provided inside said end portion (1) of the female pipe (3) in order to create a first tight sealing (10,11);
- from the annular edge (8) of said end portion (1) of the female pipe (3) extending a second flaring with decreasing cross-section (12), which is suitable for coupling with a corresponding external counter-flaring (13) provided on said end portion (4) of the male pipe (5) in order to create a second tight sealing (12,13);

characterised in that both tight sealings (10,11 and 12,13) at both ends (1,4) of the screw threads (2,6) of both the male (5) and the female (3) pipes are all-metal interference sealings."

The novelty and inventive step of the subject-matter of the claim were discussed with respect to the three prior art documents D1 to D3. The arguments brought forward by the appellants can be summarised as follows:

The essence of the invention lay in the provision of all-metal interference seals at both ends of the cooperating screw threads on the male and female pipe ends. In this context the term "interference" would be understood by the person skilled in the art as meaning that the mating surfaces would be applied against each other with sufficient force to deform them and give high pressure sealing contact over a significant area. In practice this was achieved by providing cooperating sealing surfaces which tapered at different angles.

Although interference seals were known per se in the relevant field, none of the cited documents taught the provision of two of them in the manner claimed. In particular, the only interference seal present in the joint of document D1 was located in the mid-portion of the screw threads. The respective seals at the ends of the screw threads were merely contact seals; the joint of document D2 had an interference seal between the lower end portion of the male pipe and the corresponding internal portion of the female pipe but merely a contact seal at the other upper end of the screw thread; in the joint of document D3 there was again only one interference seal, this time between the upper end portion of the female pipe and the corresponding portion of the male pipe, with the seal at the other lower end of the screw thread being of the contact type.

Reasons for the Decision

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

therefore admissible.

2. The present application relates to pipe joints capable of providing a tight seal against very high pressures in the harsh environment found in oil wells. Typically such joints comprise a screw-threaded connection between the male and female pipe ends associated with one or more integral metal-to-metal seals formed between respective cooperating surfaces on the pipe ends. Each of the cited documents D1 to D3 relates to a pipe joint of this type. In view of the emphasis placed by the appellants on the particular form of metal-to-metal seals to be achieved in their claimed invention, namely that they are "interference" seals involving the relative deformation of the cooperating surfaces as the joint is made, which is in practice obtained by providing conical sealing surfaces of differing taper angle, discussion centred at the oral proceedings on the state of the art disclosed in document D3, which in this context, as agreed by the Board and the appellants, represents the closest state of the art.

In general terms, document D3 is concerned with means for ensuring that good metal-to-metal sealing contact is obtained as a joint of the type referred to above is made up. For this purpose the male and female pipes have cooperating conical sealing surfaces which have differing taper angles and are of such relative diameter that the first contact between the surfaces is between the end of one of them and a portion lying between the ends of the other. On make up of the joint to completion the conical sealing surfaces deflect with respect to each other to come into substantially full

contact. It is not in dispute that a metal-to-metal seal obtained in the manner described in document D3 constitutes an "interference" seal within the meaning of the present claim.

Within the general teaching of document D3 two specific sealing arrangements are disclosed, one where the seal is formed between the outer surface of the male pipe adjacent its free end and a surface within and spaced from the end of the female pipe by the screw thread (Figures 1, 3, 4, 7 and 8) and the other where the seal is formed between an outer surface of the male pipe spaced from its free end by the screw thread and an internal surface of the female pipe adjacent its free end (Figures 5 and 6). In the first of these arrangements the taper angle of the conical surface on the male pipe is smaller than that on the female pipe; in the second of them the reverse is true.

With reference to Figures 13 to 15 document D3 describes a pipe joint with two seals located at respective opposite ends of the screw thread, each of them being shown in schematic detail in Figures 14 and 15 respectively. The appellants concede that the seal shown in Figure 14, which is the one located at the free end of the female pipe, is an interference seal of the type required by their claim. They argue that this is however not the case with respect to the seal shown in Figure 15, the one located at the free end of the male pipe. In this they base themselves on the fact that in Figure 15 the respective axial reference lines used for determining the taper angles of the conical surfaces of the male and female pipes are illustrated as being collinear. In other words these surfaces do

not actually come into sealing contact at all, with the only seal formed at this location being between an annular end edge of the metal pipe and an internal shoulder on the female pipe. The Board cannot accept that this is how the person skilled in the art would understand the disclosure of document D3 with respect to the embodiment of Figures 13 to 15. When taken in context there can be no genuine doubt that this embodiment is intended to illustrate a pipe joint in which the two specific sealing arrangements referred to above are combined. In particular it is explained in the fourth paragraph of page 8 with reference to both Figures 14 and 15 that the illustrated taper angles are "in conformity" with the invention; in the sixth paragraph of the same page it is stated that in both cases, ie in Figures 14 and 15, the seals are formed according to the invention. Thus, even if the person skilled in the art were to take notice of the collinearity of the axial reference lines relied upon by the appellants, he would dismiss this as being a mere drafting inexactitude within the context of a schematic drawing.

Having regard to the above the Board is in no doubt that document D3 discloses to the person skilled in the art a pipe joint which has metal-to-metal interference seals between respective conical ("flaring and counterflaring") surfaces on the male and female pipes located at both ends of the interengaging screw threads on the pipes. As a consequence it is apparent that the subject-matter of the present claim is only distinguished from this prior art by the requirement of the preamble of the claim that the male pipe have an external shoulder which cooperates with the annular

edge of the end portion of female pipe when both pipes are fully screwed into each other. A shoulder of this type serves to limit the extent the pipe ends may be screwed into each other to prevent damage from overtorquing. Such a shoulder is also provided in the embodiment of Figures 13 to 15 of document D3, but in this case it is an internal shoulder formed within the end of the female pipe and engages the annular end edge of the male pipe. The alternative arrangement with the shoulder formed externally on the male pipe is shown for example in the embodiment of Figures 11 and 12 of document D3 and in document D2. No special functional connection between the provision of the shoulder on the male pipe and the use of two interference seals is recognisable from the present application and none has been advanced by the appellants. It is evident that the provision of the shoulder on the female pipe or on the male pipe are interchangeable design options which the person skilled in the art can apply at will. Accordingly it is not possible to recognise an inventive step in the subject-matter of the claim.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani F. Gumbel