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Veröffentlichung im Amtsblatt Ja/Nein
Publication in the Official Journal Yes/No
Publication au Journal Officiel Oui/Non

Aktenzeichen / Case Number / N° du recours : T 4/88 - 3.2.2

Anmeldenummer / Filing No / N° de la demande : 80 105 363.8

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 025 929

Bezeichnung der Erfindung: Method for bending a metal pipe
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B21D 9/00

ENTSCHEIDUNG / DECISION

vom / of / du 19 December 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : DAI-ICHI HIGH FREQUENCY CO., LTD

Einsprechender / Opponent / Opposant : COJAFEX B.V.

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step - denied"

Leitsatz / Headnote / Sommaire

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Case Number : T 4/88 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 19 December 1989

Appellant : (Opponent)
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Representative :
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Decision under appeal : Interlocutory decision of the Opposition Division of the European Patent Office dated 26 November 1987 concerning maintenance of European patent No. 25 929 in amended form.

Composition of the Board :

Chairman : G. Szabo

Members : H. Seidenschwarz

W. Moser

Summary of Facts and Submissions

I. European patent No. 25 929 comprising two claims was granted on 30 May 1984 in response to European patent application No. 80 105 363.8 filed on 8 September 1980.

II. An opposition was filed against the European patent requesting that it be revoked due to lack of novelty and inventive step.

III. By interlocutory decision dated 26 November 1987, the Opposition Division maintained the patent as amended on the basis of the documents specified in the Communication pursuant to Rule 58(4) EPC dated 12 June 1987.

IV. The Appellant (Opponent) lodged an appeal against the decision on 18 December 1987, paying the appeal fee on the same date.

In his Statement of Grounds filed on 25 March 1988, the Appellant raised the objections that

- Claim 1 as amended did not comply with the requirements of Article 123(2) and (3) EPC, and

- the subject-matter of said claim was not novel or, at least, did not involve an inventive step.

He referred to the document JP-51-150 809, which had already been mentioned in the application as originally filed, and to the documents DE-A-2 825 723, US-A-4 062 216 and DE-A-2 112 019, which had been cited in the European search report as well as in the description of the patent in suit.

V. In response to the Statement of Grounds the Respondent (Proprietor of the patent) requested with his letter of 5 October 1988 to reject the appeal and to maintain the patent as amended (main request), or on the basis of a further amended Claim 1 filed with said letter (auxiliary request). The Board indicated in a Communication that Claim 1 in the main request might be objectionable under Art. 123(2) and (3) EPC.

VI. Oral proceedings took place on 19 December 1989.

(i) At the beginning of the oral proceedings the Respondent abandoned his earlier main request and requested instead the maintenance of the European patent on the basis of the claims as originally granted. This was, however, considered unacceptable by the Board after deliberation on the grounds that this request was not submitted in due time and that, contrary to the principle of procedural efficiency, its acceptance would therefore inevitably and unduly delay the whole appeal proceedings. Thereupon the Respondent abandoned this request and presented the auxiliary request of 5 October 1988 as his only request.

(ii) The Appellant specified his crucial arguments in the following sense:

Claim 1 of the document JP-51-150 809 disclosed a method for bending a metal pipe, which differed from the method according to new Claim 1 only in that the relative speed of the heated zone to the pipe was kept constant from the start to the end of bending by means of controlling the speed of the heater and the pipe. This was, however, already known from the document DE-B-2 447 657, which had been cited in the

specification of the patent in suit. Therefore, in view of the teachings of these documents, the subject-matter of the Claim 1 now on file did also not involve an inventive step.

(iii) The Respondent contested the above arguments with reference to the application as originally filed (page 1, last line to page 2, second paragraph):

- JP-51-150 809 only disclosed that the bending radius was changed gradually at the start and at the end of the bending procedure and besides these periods the mean radius of bending was made equal to the desired bending radius. From Claim 1 of this document, however, could not be derived that the relative speed was constant because nothing was said about the way in which the speeds of the heater and the pipe change with respect to time. Therefore, it was not possible to control the heat temperature during the initial and final stages of bending.

- The document DE-B-2 447 657 would concern the initial stage of a method for bending a pipe, in which initial stage the movement of the pipe began at the moment when the rearward movement of the heater had come to an end. These consecutive movements would result in keeping constant the relative speed between the pipe and heater (cf. column 3, lines 3 to 8), whereas according to the invention the relative speed of the overlapping movements of the pipe and heater were kept constant.

VII. Valid Claim 1 now on file reads as follows:

"Method for bending a metal pipe by use of a pivoting bending arm (4) of constant length with a fixed pivot point (0), whereby the pipe is heated locally with a circular heater (H), such as induction heater or the like, in which the heater (H) and the pipe (1) are independently movable such that using controlling means the relative speed (V) and temperature of the heated zone of the pipe (1) and the heating power supply are kept at constant values, characterised in that during the initial bending of the pipe through an angle of less than 8° the speed (W) of the pipe (1) is increased by the same value as the speed (h) of the heater (H) is decreased so as to keep the relative speed (V) constant and the effective radius of bending decreases to a constant value (Ro) and during the final bending of the pipe through an angle of less than 8° the change of said speeds is reversed and the effective radius of bending increases from the constant value (Ro), the heater moving during the initial and final bending in a direction opposite to the movement of the pipe, during the initial bending the heater moving from an initial position to a plane perpendicular to the axis of the pipe and containing the fixed pivot point and during the final bending from said plane to the final position."

VIII. The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained on the basis of the following documents:

Claim 1 as filed on 5 October 1988,
Claim 2 and figures as granted, and
Description as filed on 14 May 1987.

Reasons for the Decision

1. The appeal is admissible.

2. Closest state of the art

2.1 In the opinion of the Board and the parties, a method of bending a metal pipe as disclosed by the document JP-51-150 809 is actually the closest prior art with respect to the subject-matter of Claim 1.

In this known method of hot "gradation bending" a metal pipe by use of a pivoting bending arm of constant length with a fixed pivot point, the pipe is heated locally with a circular heater and the heated zone is moved independently and relatively to the longitudinal direction of the pipe by means of moving both the pipe and the heater while a bending moment is applied to the heated zone to cause bending. The bending is started at a larger radius than a desired specified one and reduced gradually until it becomes slightly smaller than the specified radius within a certain predetermined small range of bending angle, and at the end of bending the smaller radius is gradually increased to be larger again within a certain predetermined small range of bending angle. From this it is clear that the radius being smaller than the specified radius represents the effective radius and is kept at a constant value between the initial and final bending of the pipe.

During the initial bending of the pipe the speed of the movement of the heater is changed from large to small, and at the same time the speed of the pipe from small to large and during the final bending the other way around, without any fixed relationships between the two speeds.

In the case of "gradation bending" as disclosed in the above-mentioned document, the direction of the movement of the heater during the initial and the final bending is always in a direction opposite to the movement of the pipe. The heater is first located at a point spaced from the plane perpendicular to the axis of the pipe and containing the fixed pivot point of the bending arm by a certain proper distance towards the bending arm and is then gradually moved towards said plane in order to change gradually the radius of bending from large to small. At the end of the "gradation bending" the heater moves again from said plane further to a final position until the bending is completed (cf. JP-51-150 809, Claims 1 and 2 in connection with the EP-A-0 025 929 (published application), page 1, last line to page 3, line 13).

The purpose of this known method is to avoid abrupt changes of pipe wall thickness at the start and the end of bending when the radius of bending is very small (cf. JP-51-150 809, bottom of page 4, English translation submitted).

2.2 It follows from the submissions of the Respondent during the oral proceedings that the technical problem to be solved vis-à-vis the aforementioned prior art is to provide further improvements in this respect by avoiding any irregularities in the pipe wall at the beginning and the end of the bending procedure (cf. also EP-B-0 025 929, column 1, lines 37 to 42).

2.3 According to the Respondent, this problem is solved by keeping the relative speed constant.

Beside the feature that the predetermined small range of bending angle at the start and the end of bending is set

at less than 8°, the subject-matter of new Claim 1 only differs from the known method in that the relative speed of the heater to the pipe and temperature of the heated zone of the pipe and the heating power supply are kept at constant values by increasing the speed of the pipe by the same value as the speed of the heater is decreased. This results in a heat transfer at a constant rate and consequently in a constant heating temperature and in an uniform heating of the pipe in the heating zone during the whole bending procedure, in spite of two movements opposite to each other.

This difference between the closest prior art and the subject-matter of new Claim 1 establishes novelty which has not been contested by the Appellant.

3. Inventive step

3.1 The importance of the relative speed of the heated zone to the pipe in a method for bending a metal pipe is, however, already known from the document DE-B-2 447 657. In this known method the movement of the pipe begins at the moment when the rearward movement of the heater has come to an end. Thus the relative movement between the heater and the pipe is kept equal with the effect that irregularities of the heating are avoided and that at the beginning of the bending procedure already an homogeneous heated section of the pipe is present (cf. DE-B-2 447 657, column 3, lines 3 to 10 as well as EP-B-0 025 929, column 1, lines 12 to 23).

3.2 Furthermore, the person skilled in the art knows from common knowledge that, when the heater is moved at a high speed, heat transfer and heating temperature become very low if heating power is kept constant. However, increased effective heating power would have to be supplied in order

to provide a higher heating temperature. Knowing the above-mentioned relationship between the changes in relative speed and the irregular changes of pipe wall thickness, the skilled person realises that the teaching known from DE-B-2 447 657 can be applied with corresponding effect to the method according to JP-51-150 809. It is clear that this application of the known teaching means necessarily simultaneous changes of the speeds of the heater and the pipe by the same values from large to small and from small to large and vice versa, respectively.

3.3 As far as the bending angle of less than 8° during the initial and final bending of the pipe is concerned, it is clear that this value represents the "small range of bending angle" mentioned in JP-51-150 809. The person skilled in the art also knows that with such small gradation the deviation of bending radius may become negligibly small, which prevents difficult mechanical problems and imprecision of the bending radius. This feature, therefore, cannot support the patentability of the invention in suit.

4. For the foregoing reasons, the subject-matter of Claim 1 lacks an inventive step as required by Article 56 EPC. Therefore, that claim cannot be maintained having regard to Article 52(1) EPC.

5. Since Claim 1 is not allowable, the patent has to be revoked irrespective of an eventual patentability of the subject-matter of Claim 2. The Board nevertheless looked into Claim 2 and came to the conclusion that it contains no features which could have been considered as imparting patentability to its subject-matter.

Order

For these reasons, it is decided that:

1. The impugned decision is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

J. Fabiani

S. Fabiani

G. Szabo

31.01.90 H. Seidenschwarz

31.1.90 G. Moser

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