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D E C I S I O N
of 24 October 2001

Case Number: T 0179/98 - 3.2.6

Application Number: 92311454.0

Publication Number: 0550205

IPC: B23K 9/04

Language of the proceedings: EN

Title of invention:
Steam turbine rotor welding

Patentee:
GENERAL ELECTRIC COMPANY

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 54

Keyword:
"Novelty (yes)"

Decisions cited:
-

Catchword:

Europäisches Patentamt | European Patent Office | Office européen des brevets

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Case Number: T 0179/98 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.26
of 24 October 2001

Appellant: (Proprietor of the patent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 19 December 1997 revoking European patent No. 0 550 205 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: P. Alting van Geusau
Members: H. Meinders
M. J. Vogel

Summary of Facts and Submissions

I. European Patent Nr. 0 550 205, granted on application Nr. 92 311 454.0, was revoked by the Opposition Division by decision posted on 19 December 1997. It based the revocation on the finding that the subject-matter of claims 1 and 10 of the patent as granted did not fulfil the requirement of novelty (Article 54 EPC) in view of document:

D1: US-A-4 948 936.

II. Claims 1 and 10 read:

"1. A process of welding a rotatable machine component (10,12) comprising the steps of:

a) rotating the component about a longitudinal axis of rotation thereof;

b) preheating an area of the component to be welded;

c) depositing a plurality of weld beads (22,26,28,30) in said area;

d) post weld heat treating said area; and

e) cooling said area to room temperature;

wherein steps b) through e) are carried out during continuous rotation of said component.

10. A process of repairing a defect in a turbine rotor (12) by welding comprising the steps of:

a) removing the defect by machining an area containing the defect;

b) rotating the rotor (12) about its longitudinal axis of rotation;

c) preheating said area and adjacent areas to a predetermined temperature;

d) welding said area;

e) post-weld heat treating said area at predetermined temperatures; and ; and

f) cooling said rotor to room temperature;

wherein said rotor (12) is continuously rotated during steps c) through f).

III. On 13 February 1998 the Appellant (Patentee) simultaneously filed an appeal by facsimile and paid the appeal fee. The statement of grounds of appeal was filed by facsimile dated 29 April 1998. It requested setting aside the decision in question and maintaining the patent as granted or according to one of three auxiliary requests.

The Respondent (Opponent) replied to the appeal with letter of 27 August 1998, requesting rejection of the appeal. It requested remittal to the first instance for considering the question of inventive step in case the Board could not dismiss the appeal.

IV. In a communication pursuant to Article 12 of the Rules of Procedure of the Boards of Appeal the Board

expressed the opinion that the subject-matter of claims 1 and 10 as granted appeared to fulfil the requirements of novelty over D1. Since no examination in respect of inventive step had been carried out by the Opposition Division on these claims, the Board intended to refer the case back to the Opposition Division, pursuant to Article 111(1) second sentence EPC, for continuation of the opposition proceedings. Oral proceedings could thus be dispensed with. The parties agreed to this procedure and withdrew their requests for oral proceedings.

V. In support of its request the Appellant argued that D1 did not disclose rotation of the component during preheating, post-weld heat treatment as well as cooling.

The Respondent argued that according to example I of D1 a groove was made in a shaft to be repaired to form an undercut. A flame was used to preheat the undercut during 30 minutes at 500°F; to achieve this, it was necessary to rotate the shaft (steps b) and c) of claims 1 and 10 respectively). As the post-weld heat treatment was performed at the same temperature for 15 minutes, it was clear that this should also take place while rotating the shaft (steps d) and e) of claims 1 and 10 respectively). According to example II of D1 the cooling also took place while rotating the shaft. On a proper interpretation of D1 also the cooling of the shaft in example I had to take place while rotating it (steps e) and f) of claims 1 and 10 respectively).

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty (Article 54 EPC)*

2.1 The closest prior art for the discussion of novelty of claim 1 is considered to be D1, which discloses a process for welding a shaft comprising the steps of:

a) rotating the shaft about its longitudinal axis to form an undercut;

b) preheating the undercut;

c) depositing a plurality of weld beads in the area of the undercut;

d) post weld heat treating said area; and

e) cooling said area to room temperature.

2.2 D1 discloses step b) as being performed while rotating the shaft, see column 12, lines 39-43, which state that after the shaft was mounted for rotation in a lathe, the undercut was preheated at 500° for 30 minutes. The passage then further reads: "The shaft was revolved at a circumferential rate of 0.7 to 1.3 foot/min. A gas shielded flux cored weld head was set to travel .....". If the preheating did not take place while rotating the shaft, in the Board's opinion the sentence would have read: "The shaft was **then** revolved at a circumferential rate of 0.7 to 1.3 foot/min. A gas shielded flux cored weld head was set to travel .....".

D1 also discloses the deposit of a plurality of weld beads in the area of the undercut while rotating the

shaft, see column 12, lines 43-60 (step c)).

2.3 However, D1 does not disclose steps d) and e) as being performed while rotating the shaft.

D1 contains two separate disclosures of this process:

- one relating to Example I (column 12, line 33 to column 13, line 15), in which there is a mention of post weld heat treatment at 500°F for 15 minutes and of cooling, however both without a mention of rotation of the shaft during each of these steps and

- one relating to Example II (column 13, lines 18-30), repeating Example I "**with the exception that instead of post weld heat treating (PWHT) the deposited weld metal** (emphasis added by the Board), the deposited weld metal was wrapped in or with an insulator and the shaft was continually rotated, both of which functioned to slowly cool the weld deposit instead of cooling ambiently."

Wrapping the workpiece in or with an insulator and slowly cooling the shaft is described as a **replacement** for the post weld heat treatment and ambient cooling and therefore cannot be considered as a post weld heat treatment.

2.4 The Respondent argued that from the fact that the preheating took 30 minutes and the post-weld heat treatment 15 minutes, both steps must have been performed while continuously rotating the shaft.

However, the Board, except for the rotation in the preheating step, cannot find any objective basis for that assumption in the description of the welding process in D1.

2.5 In its decision the opposition division argued that D1, when considered as a whole, in particular the passage relating to example II and claims 34 and 41, clearly appeared to teach continuous rotation of the workpiece throughout the entire process.

2.5.1 In view of the fact that the examples discussed above relate to two different processes, in which certain process steps of the first example are replaced in the second example by other process steps, the Board cannot share this opinion.

2.5.2 Considering claims 34 and 41 relied upon by the Opposition Division, it is to be noted that:

Claim 34 is dependent on claim 28 and as such relates to a "flux cored arc welding process for depositing a weld metal onto a revolving cylindrical workpiece having a longitudinal axis comprising the steps of:

(a) moving along a longitudinal axis of a revolving cylindrical workpiece a weld deposit zone to deposit a weld metal onto the revolving cylindrical workpiece in a spiral fashion to form a deposited weld metal, and

(b) insulating the deposited weld metal,

additionally comprising revolving the cylindrical workpiece".

Claim 41 is dependent on claim 38, thus on claim 37 and as such relates to a "flux cored arc welding process for depositing a weld metal onto a revolving cylindrical workpiece comprising above about 0.30% by weight carbon and having a longitudinal axis comprising the steps of:

- moving along a longitudinal axis of a revolving cylindrical workpiece, per each 0.1 foot/min. to 2 feet/min. circumferential rate of revolution of the cylindrical workpiece, a weld deposit zone at a relative feed velocity of from about 1/32 inch per each revolution of the cylindrical workpiece to about 2 inches per each revolution of the cylindrical workpiece, wherein the weld deposit zone is depositing a weld metal onto the revolving cylindrical workpiece in a spiral fashion to form a deposited weld metal, and

- insulating the deposited weld material

- additionally revolving the cylindrical workpiece".

2.5.3 It is correct that these two claims do not explicitly exclude the presence of a post-weld heat treatment, as do the other claims of D1 referring to insulating the deposited weld material (claims 8, 18, 22, 30, 40). However, such an explicit combination of insulation with post-weld heat treatment finds no support in the description of D1 and is contradictory to the examples (all based on either example I or II) contained therein. The latter clearly indicate the insulation of the deposited weld material as an alternative to the post-weld heat treatment of the area of the weld deposit and not as a step which could or should be

added to the step of post-weld heat treatment.

According to the case law of the Boards of Appeal a document comprised in the state of the art only discloses those features which are directly and unambiguously derivable for the skilled person. According to the Board that is not the case here in respect of the combination of the post-weld heat treatment of the deposited weld material and the insulation of the area of the weld deposit.

2.6 Thus there is no explicit nor an implicit disclosure in D1 of a post weld heat treatment while rotating the shaft as claimed in claim 1.

3. The above considerations equally apply to the process of claim 10, which also involves the step of post-weld heat treatment under rotation (step e)).

The process according to either claim 1 or claim 10 is therefore deemed novel over D1.

4. The decision under appeal has only gone into the question of novelty of the subject-matter of claims 1 and 10 in respect of the document D1. The other documents available in these opposition appeal proceedings were not brought forward by the Respondent in connection with an objection for lack of novelty, but for lack of inventive step. The Board is satisfied that none of these documents discloses all features of either claim 1 or claim 10.

The process according to either claim 1 or claim 10 is therefore novel (Article 54 EPC).

5. In the decision under appeal the question of inventive step has not been addressed by the Opposition Division. To allow the parties a consideration of this question in two instances the Board decides to make use of its powers pursuant to Article 111(1), second sentence EPC to remit the case to the Opposition Division for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division for further prosecution.

The Registrar: The Chairman:

M. Patin P. Alting van Geusau