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D E C I S I O N
of 21 July 1995

Case Number: T 0895/92 - 3.2.5

Application Number: 84300309.6

Publication Number: 0115402

IPC: B22C 9/04

Language of the proceedings: EN

Title of invention:

Ceramic shell moulds, manufacture and use

Patentee:

STEEL CASTINGS RESEARCH AND TRADE ASSOCIATION

Opponent:

Hüttenes-Albertus, Chemische Werke GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0895/92 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 21 July 1995

Appellant:
(Opponent)

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Representative:

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office dated 20 July 1992
concerning maintenance of European patent
No. 0 115 402 in amended form.

Composition of the Board:

Chairman: C. V. Payraudeau
Members: M. H. M. Liscourt
A. Burkhart

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal against the decision of the Opposition Division to maintain the European Patent No. 0 115 402 in an amended form on the basis of a set of 4 claims of which Claims 1 and 4 read as follows:

"1. A method of making a ceramic shell mould for subsequent placement in a body of particulate material for casting a metal article, the method comprising forming a combustible pattern of expanded polystyrene corresponding in shape and size to an article to be cast having a section thickness exceeding 1.5 cm and/or a weight in excess of 25 kgm, applying a hardenable coating of refractory material and removing the pattern by shock firing at elevated temperature **characterised in that** (i) the coating is applied to the pattern at least once to form a layer from 2 mm to 4 mm thick and (ii) the coated pattern is subjected to the application of heat at a temperature between 800°C and 1100°C for 5 to 15 minutes to remove the pattern and at the same time harden the resultant ceramic shell mould to provide a readily handleable ceramic shell mould.

4. A method according to any preceding Claim characterised by the subsequent steps of (i) placing the readily handleable thin ceramic shell mould in a casting box (ii) surrounding the ceramic shell mould with loose sand and compacting the sand solely by the application of vibration at a frequency of at least 40 Hertz and (iii) pouring molten metal into the ceramic shell mould to form the desired metal article."

II. The grounds for opposition was lack of novelty and of inventive step of Claims 1 to 4 and insufficiency of disclosure of the subject-matter claimed in Claim 4 and was based on the following documents:

- E1: FR-A-2 083 450
- E2: EP-A-O 052 997
- E3: CA-A-704 724
- E4: Gießerei Lexikon 1968, page 225
- E5: Shimizu et al. IOMONO Vol.42, pages 269/270.

III. In the decision under appeal, the Opposition Division held that the subject-matter of the amended Claim 1 was new and inventive in view of the cited prior art and that, although no upper limit of frequency was given in Claim 4, the person skilled in the art would have had no difficulty to determine the limit at which a meaningful vibration can still be carried out. Therefore, the invention was sufficiently disclosed for it to be carried out by a person skilled in the art.

IV. In the grounds of appeal, the Appellant did not contest any more the novelty of the subject-matter of the amended Claim 1 but objected essentially its lack of inventive step in view of the teaching of the document E2, considered alone or in combination with the document E1. The Appellant insisted especially on the fact that the decision under appeal had without any justification followed the interpretation of the document E2 given by the inventor of both the patent in suit and the document E2 in admitting that the thickness of the shell made according to the document E2 was of about 2 cm and that the temperature for burning out the pattern was of about 300°C. However, a document should be interpreted the way a person skilled in the art would have done at its date of publication. The document E2 did not give any value of thickness and temperature. The

skilled person would have considered that, in conformity to the general trend, the shell should be as thin as possible and that the temperature of burning should be high. In any case, the information as regards the thickness of the shell and the temperature of burning could be found in the document E1. The Appellant also maintained his objection on the insufficiency of disclosure due to the absence of any information as concerns the upper limit of the applied frequency as claimed in Claim 4.

- V. In the answer to the statement of grounds, the Respondent submitted essentially that the document E1 related to a different technique of casting and could not be combined with the document E2. Therefore, the subject-matter of the invention, which had achieved a high degree of commercial success, was not anticipated by the combination of the documents E2 and E1. The objection against Claim 4 was also without merit since the public knew from Claim 4 the area subject to patent monopoly. Consequently, the appeal should be rejected.
- VI. In a communication in accordance to Article 110(2) EPC, the Board of appeal expressed the provisional opinion that, starting from the nearest state of the art considered as being represented by the document E2, the choice of a thickness of between 2 and 4 mm and of a burning out temperature of between 800°C and 1100°C seemed obvious in view of the general knowledge of the person skilled in the art and the teaching of the documents E4, E1 and Metal Handbook, page 245 (E6). The Board observed also that the objection to Claim 4 based in Article 100(b) EPC was not well founded as the upper limit of the frequency could be easily determined by the skilled person.
- VII. None of the parties answered this communication.

Reasons for the Decision

1. *Novelty*

1.1 The document representing the nearest state of the art is considered to be the document E2 which recites all the features of the preamble of Claim 1.

1.2 The method which is subject-matter of Claim 1 differs from this state of the art through the two following features:

- the layer is 2 mm to 4 mm thick,
- the application of heat is made at a temperature between 800 and 1100°C for 5 to 15 minutes to remove the pattern and at the same time harden the resultant ceramic shell mould.

1.3 None of the other cited documents discloses a method comprising all the features of the preamble of Claim 1. The document E1 relates to a method of making a ceramic mould according to which a combustible pattern of foamed polyurethane is coated with a refractory material. The document E3 relates to a method of producing a ceramic mould according to which the pattern is at least partially dissolved in a solvent. The documents E4 and E6 only summarise the general knowledge of the skilled person in the field of the invention and the document E5 has only been cited to show that it was already known to use a polystyrene foamed pattern to produce a mould for relative heavy articles.

1.4 In view of these different citations, the method according to Claim 1 is therefore novel. The novelty has not in fact been contested by the Appellant and has been recognised by the decision under appeal.

2. *Inventive step*

2.1 According to an embodiment of the method disclosed in the document E2, a coating of a ceramic material is applied on the pattern and the coated expendable pattern is removed by heat before (or after) investing the shell in the particular material (see page 5, last paragraph).

2.2 The document E2 does not give any indication as to the applied temperature nor whether the ceramic coating is fired before the casting operation. Therefore, the person skilled in the art will have to use his own general knowledge to apply the teaching of this document.

2.3 However, the document E2 itself indicates that the method according to the embodiment referred to in the above paragraph 2.1 "is seen to good advantage especially when used with relatively thin shells since such shell are well supported" (see page 5, 2 last lines to page 6, line 1). This wording means that the shell should be hard enough after the step of removal of the expendable pattern to be handled without breaking.

2.4 It is usual in the casting industry to fire the ceramic coating before use (see document E4, page 225, first paragraph); the word "ceramic" itself implies in fact a firing step at a temperature of at least 800°C. It would be, of course, possible to burn first the pattern at a low temperature and then fire the ceramic coating to form a hardened shell. However, the use of a single step for burning and eliminating completely the pattern and

for firing the ceramic coating would immediately occur to the person skilled in the art notably in view of the fact that such technique was already known when using polyurethane patterns (see document E1, page 4, lines 3 to 10).

2.5 The corresponding claimed method step was therefore suggested to the skilled person in combination with the method steps enumerated in the pre-characterising part of Claim 1.

2.6 As regards the second feature according to which the coating has a thickness of between 2 and 4 mm, it is obvious that "to maintain optimum permeability, in addition to saving dipping time and cost, shell thickness should be the minimum that will do the job" (see document E6; Metal Handbook, page 245, second column, second paragraph). Therefore, it seems that the skilled person when performing the method described in document E2 will arrive at the optimum thickness without any inventive effort, taking also into account the fact that the particular thickness of the shell may depend, at least in certain cases, on the form of the pattern.

2.7 For these reasons, the second feature of the characterising part of Claim 1 cannot either contribute to let appear an inventive step in the method which is the subject-matter of this claim.

3. Since the subject-matter of Claim 1 is not patentable within the terms of Article 56 EPC, the patent in suit cannot be maintained.

4. Because Claim 1 is unallowable, it is unnecessary to consider the other claims.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

A. Townend

C. Payraudeau

