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 0135/90 - 3.3.3

Application No.: 83 300 606.7

Publication No.: 0 086 615

Classification: B22C 1/00

Title of invention: Foundry moulds and cores

D E C I S I O N
of 12 May 1993

Applicant: -

Proprietor of the patent: Borden (UK) Limited

Opponent: Perstorp AB
Ashland Oil, Inc.

Headword:

EPC: Art. 56

Keyword: "Inventive step (confirmed)"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0135/90 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 12 May 1993

Appellant: (Opponent 01)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office of 10 October 1989, issued on 19 December 1989 rejecting the opposition filed against European patent No. 0 086 615 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: F. Antony
Members: H.H.R. Fessel
S.C. Perryman

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 086 615 in respect of European patent application 83 300 606.7 filed on 7 February 1983 and claiming a GB priority of 9 February 1982 (GB 8203686) was announced on 22 May 1985 (Bulletin 85/21). The patent was granted on the basis of 11 claims, of which the only independent Claim 1 reads as follows:

"1. A method of making a foundry mould or core which method comprises mixing a granular refractory material with from 0.5 to 8% by weight on the weight of the said material of a binder which comprises
(i) an aqueous solution, having a solids content of from 50 to 75% by weight of a potassium alkali phenolformaldehyde resin having the following characteristics:-
(a) a weight average molecular weight ($\overline{M}_w$) of from 600 to 1500;
(b) a formaldehyde: phenol molar ratio of from 1.2:1 to 2.6:1, and
(c) a KOH: phenol molar ratio of from 0.2:1 to 1.2:1, and
(ii) at least one silane in an amount of from 0.05 to 3% by weight on the weight of the resin solution,

forming the mixture in a vented core or mould box and gassing the formed mixture with at least one C_1 to C_3 alkyl formate to cure the binder."

II. Notices of opposition were filed on

- 20 February 1986, by Perstorp AB (hereinafter Appellant 01);
- 20 February 1986, by Rütgerswerke Aktiengesellschaft, (withdrawn by a letter dated 12 March 1987); and
- 21 February 1986 by telex, confirmed in writing on 24 February 1986, by Ashland Oil Inc. (hereinafter Appellant 02).

The oppositions were supported by numerous documents inter alia by:

(A) EP-A-27 333
(B) JP-A-50 130 627, in the form of an English translation,
(D) GB-A-1 411 975, corresponding to DE-C-2 239 835, and
(Q) JP-A-49 16 793, in the form of an English translation.

III. By a decision which was given at the end of oral proceedings held on 10 October 1989 and issued in writing on 19 December 1989 the Opposition Division maintained the patent as granted in accordance with the Patentee's second auxiliary request, but rejected the main and first auxiliary requests seeking maintenance in amended form.

IV. The Opposition Division in exercising its discretion under Article 114(2) EPC did not consider the issue of sufficiency because this had been raised late and without appropriate substantiation. It held that the subject-matter of Claim 1 was admittedly novel. As to inventive step, the problem with regard to the closest prior art, viz. (D), was to provide a gas-curing system resulting in a fast cure without the need for toxic agents. As

evidenced by documents (B), (Q) and (D), there had been a long-felt need for an efficient gaseous curing system. It was therefore inventive to solve the existing problem by the selection of suitable esters, in combination with an appropriate molecular weight of the resin.

V. The Patentee has not appealed the rejection of his main and first auxiliary requests. However, on 14 and 28 February 1990 appeals were lodged against the above decision by Appellants 01 and 02 respectively. The prescribed fees were paid at the same time. On 25 and 30 April 1990 the statements of grounds of appeal were filed by the Appellants.

Both in writing and during oral proceedings held on 12 May 1993, the Appellants argued that the disclosure was not sufficient to work the alleged invention due to the admittedly incorrect definition of the molecular weight given in the specification.

While novelty was unchallenged during appeal, both Appellants contested the arguments of commercial success and of satisfaction of a long-felt want in support of an inventive step. They stated that no evidence had been provided for the existence of commercial success, and that the publication dates of (A), (B) and (Q) (1981, 1975 and 1974 respectively) in conjunction with the priority date of the patent in suit (1982) could not serve as evidence for said need; nor could even the gap of seven years following publication of (D), since the skilled worker was aware of the fact that each of the different known techniques had its advantages and disadvantages.

The man skilled in the art, being a chemist familiar with the problems of making foundry moulds using liquid

systems (no bake) or gassing systems (cold box), starting from (A), (B) and (Q) would have no problem in seeking to avoid the evolution of pungent acid gases on thermal decomposition, even when applied to gassing systems, since he would immediately realise that the only measure he had to take was to replace the "just liquid" methyl formate known from (B) by gaseous methyl formate.

VI. The Respondent disputed these arguments. He insisted that (D) concerned the same technology as the patent in suit and had to be regarded as the closest prior art. There was no pointer in (A), (B) or (Q) to the solution proposed by the patent in suit for the problem specified on page 2, lines 6 to 41 of the patent specification.

VII. The Appellants 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 as granted. This was his sole request at the end of oral proceedings, although at an earlier stage he had argued in favour of what had been his main and first auxiliary requests before the Opposition Division.

Reasons for the Decision

1. The appeal is admissible.

2. The opposition ground of Article 100(b) was not invoked within the nine-month period of Article 99(1) EPC, and was not considered by the Opposition Division in the exercise of its discretion under Article 114(2) EPC. The Board is satisfied that the Opposition Division correctly exercised such discretion. In accordance with the

Enlarged Board's Decision G 10/91 of 31 March 1993 (OJ EPO 1993, 420) to which the Chairman referred during oral proceedings, fresh grounds for opposition may be considered in appeal proceedings only with the approval of the patentee (cf. point 18), and in the present case the Board saw no reason to raise the question of such approval. This opposition ground is therefore disregarded.

3. The Board is also satisfied that the claimed subject-matter is novel over the cited prior art. Further details need not be given since novelty has not been disputed in the appeal proceedings.

4. The Board considers (D) to represent the closest prior art since the technology applied is, as in the patent in suit, the curing of foundry moulds or cores by gassing.

(D) discloses one of several industrially applied gassing systems (cf. page 2, lines 20 to 39 of the patent in suit) and seeks to overcome drawbacks of other so-called "cold box" methods. Examples of such other methods are those using as binders sodium silicate in combination with carbon dioxide (cf. (D), page 1, lines 52 to 69); phenolic type resins cured by polyisocyanate and catalysed by amines (cf. (D), page 1, lines 70 to 80); and synthetic resins containing an acid curing agent, the resins being of the urea-formaldehyde, phenol/formaldehyde or furane type (cf. (D), page 1, lines 81 to 87). The best previously known process is said to be the last one which, however, has the disadvantage of curing times which tend to be either too long or too short, whereas the ideal time should be in the order of a few seconds, e.g. 1 to 5 seconds, to about 1 minute (cf. (D), page 2, lines 1 to 52). To overcome said shortcomings (D) teaches the use of either a)

gaseous or aerosol sulphur dioxide together with an oxidising agent for the sulphur dioxide or b) a gas or aerosol of sulphuryl chloride (page 2, lines 85 to 96). Both these agents are pungent and unpleasant to handle.

5. The problem to be solved by the patent in suit may therefore be seen in providing foundry moulds and cores which are industrially applicable with regard to curing times and product properties, without evolving pungent fumes on thermal decomposition, or in other words, development of a gas-curing system which results in a fast cure without the need for toxic agents.

With regard to the description of the patent in suit, especially the worked examples the Board is satisfied that the above problem is effectively solved.

6. It has now to be considered whether the proposed solution, viz. using a binder as specified in Claim 1 and gassing the mixture formed of the refractory material and the binder with a C_1-C_3 alkyl formate to cure the binder, involved an inventive step in view of the prior art which is before the Board.

6.1 Document (D) itself does not contain any hint as to replacing the gaseous curing agents specified therein by volatile esters such as those of the patent in suit, and can thus taken alone not cast any doubt on the existence of an inventive step.

6.2 The Board considers the man skilled in the art concerned in the present case to be one who is conversant with both gasecus and liquid curing systems as acknowledged on page 2, lines 10 to 39 of the disputed patent.

6.3 Liquid systems whose chemistry is closely related to the claimed subject-matter of Claim 1 of the patent in suit are disclosed in references (A), (B) and (Q).

6.3.1 Document (Q), published February 1974, deals with liquid systems and teaches that the gelation time at room temperature of hardenable resin compositions obtained from water-soluble phenolic resins and comprising various esters is reduced from 90 to 5 min. when methyl acetate is replaced by methyl formate. Moreover it is shown that such compositions are satisfactory binders for moulding silica sand (cf. Tables on page 5). A faster setting is also produced when urea/formaldehyde resins are used (cf. Example 3, page 6). The conclusion is that, in liquid systems, the fastest curing agent for binder compositions with a pH of 9 or more is methyl formate.

There is, however, no pointer that lower alkyl formates may equally be applied in gassing systems. In the absence of such a pointer, and without inadmissible hindsight, a man skilled in the art seeking to solve the above specified problem would, in the Board's conviction, not try to use the liquid, though volatile esters disclosed in (Q) in a process such as that known from (D).

6.3.2 Document (B), published in October 1975, discloses a method of producing a mould from a mixture of an aqueous solution of resol-type sodium phenolate resin, an organic ester and a moulding sand. It is said on page 3, first full paragraph, that a method is provided wherein a chemical reaction between aqueous solutions of resol-type sodium phenolate resin and organic ester is utilised. Organic esters to be used include lactone-type or linear esters, e.g. ethyl lactate and methyl formate.

This document seeks to improve breaking properties and contemplates reduction of the number of cast finishing processes. There is thus no relationship with the problem to be solved by the patent in suit, nor is there any disclosure hinting at a preference for linear esters over cyclic esters, and especially for C_1 to C_3 alkyl formates. The skilled person concerned with the existing problem would therefore not combine (B) with document (D).

6.3.3 Document (A), published in April 1981, may be regarded as the up-to-date art of making foundry moulds and cores in liquid systems before the priority date of the patent in suit. This document teaches that foundry moulding compositions do not evolve pungent acid gases on thermal decomposition when cyclic esters, viz. lactones, are used as curing agents instead of acids. Moreover it is said that difficulties commonly associated with the bonding of sands of alkaline reaction, such as olivine, chromite or beach sands, arising from neutralisation or partial neutralisation of the acid catalyst used, are completely overcome, since the resin binder is cured under alkaline conditions (page 3, lines 18 to 26). The setting times of said composition may vary from 2 minutes to 24 hours but are preferably adjusted to 5 to 45 minutes (page 6, lines 3 to 7).

There is no mention or hint of using as curing agents esters other than lactones. Accordingly, (A) provides no incentive in the process known from (D) to substitute C_1-C_3 alkylformate for the gases specified therein, in order to solve the existing problem.

6.3.4 Since, as stated by the Respondent and not disputed by the Appellants, the chemistry of curing an aqueous solution of an alkaline phenol-formaldehyde, a refractory

material, silane and an ester by gassing is still not understood, the Board can see no reason why a man skilled in the art would seek to solve the said problem by combining the teachings given in (A),(B) and (D), all the more so as the esters specified in Claim 1 of the patent do not only act as catalysts but also as co-reactants. To say that the problem underlying the patent in suit consists in adapting the disclosures for liquid systems in references (A), (B) or (Q) to the conditions of curing by gassing would be an inadmissible exercise in hindsight.

6.4 For the reasons given above, the Board is satisfied that the subject-matter claimed in Claim 1 of the patent in suit involves an inventive step. It need not, therefore, be decided whether further features of Claim 1, e.g. solid content, $\overline{M}_w$, formaldehyde:phenol ratios or KOH:phenol ratios also provide inventive contributions. The same applies to the questions of commercial success and long-felt want. As to the subject-matter of dependent Claims 2 to 11, their patentability derives from that of the main claim.

Order

For these reasons, it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

E. Görgmaier F. Antony