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D E C I S I O N
of 12 February 2001

Case Number: T 0481/98 - 3.3.3

Application Number: 92300938.5

Publication Number: 0508566

IPC: G08G 8/10

Language of the proceedings: EN

Title of invention:

Alkaline resol phenol-aldehyde resin binder compositions

Patentee:

FOSECO INTERNATIONAL LIMITED

Former Opponent:

Ashland Chemical Inc.

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - known element - new purpose"

Decisions cited:

T 0789/89

Catchword:

-



Case Number: T 0481/98 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 12 February 2001

Appellant: FOSECO INTERNATIONAL LIMITED
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Representative: Moore, John Hamilton
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Former Respondent: Ashland Chemicals Inc.
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Representative: Weinberger, Rudolf, Dr.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 19 March 1998
revoking European patent No. 0 508 566 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: B. ter Laan
Members: C. Idez
A. Lindqvist

Summary of Facts and Submissions

I. The mention of the grant of European Patent No. 0 508 566 in respect of European patent application No. 92 300 938.5, filed on 4 February 1992 and claiming priority of the earlier GB patent application No. 9105315 of 13 March 1991 was announced on 15 November 1995 (Bulletin 95/46) on the basis of eight claims, Claim 1 reading:

"A binder composition comprising an alkaline aqueous solution of a resol phenol-aldehyde resin and an oxyanion which can form a stable complex with the resin, wherein the amount of alkali present in the solution is sufficient to substantially prevent stable complex formation between the resin and the oxyanion, characterised in that the binder composition has a molar ratio of alkali to phenol of from 1.5:1 to 2.5:1 and the binder composition also contains a phenyl ethylene glycol ether."

Claims 2 to 7 were directed to preferred embodiments of the binder composition of Claim 1.

Claim 8 read:

"A process for the production of an article of bonded particulate material in which a mixture comprising particulate material and a binder composition is formed to a desired shape and the binder composition is cured by passing carbon dioxide gas through the formed shape, characterised in that the binder composition used is a composition according to any one of Claims 1 to 7."

II. On 16 August 1996 a notice of Opposition against the granted patent was filed, in which the revocation of the patent in its entirety was requested on the ground of lack of inventive step (Article 100(a) EPC).

The opposition was, *inter alia*, supported by the following documents:

D1: EP-A-0 323 096 and

D2: EP-A-0 389 082.

III. By a decision announced orally on 9 March 1998 and issued in writing on 19 March 1998, the Opposition Division revoked the patent. That decision was based on the set of eight claims as granted as the main request and a set of seven claims (identical to Claims 1 to 7 of the claims as granted) as the sole auxiliary request. The Opposition Division found that the subject-matter of Claims 1 to 4 and 8 of the main request and of Claims 1 to 4 of the auxiliary request did not meet the requirements of Article 56 EPC. More specifically, the problem to be solved was to provide binder resins which would lead to cores with improved strength immediately after gassing and after storage, which problem was solved by the use of phenoxyethanols in binder compositions such as described in D1. The ability of such additives for increasing the strength of cores and moulds made from resole binders was taught in document D2. Therefore, it would have been obvious to use phenoxyethanols with a reasonable expectation of success in binder compositions according to document D1 in order to improve the strength of the cured products.

IV. On 6 May 1998 the Appellant (Patent Proprietor) lodged an appeal against the decision of the Opposition Division and

paid the prescribed fee on the same day.

The Statement of Grounds of Appeal filed on 8 July 1998 was accompanied by a set of seven claims as the sole auxiliary request, which was identical to the auxiliary request before the Opposition Division.

The arguments presented by the Appellant in the Statement of Grounds of Appeal can be summarized as follows:

- (i) The teaching of D2 concerning the ability of phenoxyethanols to increase the tensile strength of cores was directed to conventional resole binders whereas the resin binder system of D1 could not be regarded as conventional, in particular in view of its curing system.
- (ii) The improvement of the strength of the cores achieved in the patent in suit was substantially greater than any of the individual results achieved in D2 and these unexpectedly good results supported a finding of inventive step.
- (iii) The person skilled in the art would have been deterred to use phenoxyethanols in view of the results achieved in the examples of D2 and the different chemistry involved in that document. This general opinion was supported by the lack of commercial success of those compositions.

V. By a letter dated 21 July 1998 the Respondent (the Opponent) withdrew the opposition.

VI. In a communication sent together with the summons to oral proceedings, the Rapporteur, having regard to the arguments

submitted by the Appellant, pointed out the issues to be discussed and indicated that the results realised in the examples of the patent in suit and those achieved in the examples of D2 could not be compared since different properties were measured (tensile strength in D2 and compression strength in the patent in suit).

- VII. With a letter dated 8 January 2001 the Appellant informed the Board that he would not be represented at the Oral Proceedings, which were held on 12 February 2001.
- VIII. The Appellant requested that the decision of the Opposition Division be set aside and the patent be maintained in the form in which it had been originally granted, or, alternatively, on the basis of Claims 1 to 7 submitted with the Statement of Grounds of Appeal.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*
 - 2.1 As mentioned above, (point V) the Respondent withdrew the opposition in a letter dated 21 July 1998 and is therefore not a party to the proceedings anymore insofar as the substantive issues are concerned (See decision T 789/89 (OJ EPO, 1994, 482)).
 - 2.3 With a letter of 8 January 2001 the Appellant indicated that he would not be represented at the Oral Proceedings. In accordance with Rule 71(2) EPC, the proceedings therefore continued without the Appellant.

Main request

3. *Novelty*

The subject-matter claimed in the patent in suit was held to be novel by the Opposition Division. In the light of the cited documents, the Board sees no reason to depart from that view.

4. *Inventive step*

4.1 The patent in suit relates to alkaline resol phenol-aldehyde resin binder compositions useful in the manufacture of foundry cores and moulds by a cold box process. Such compositions are described in D1, which the Board, in common with the Appellant and the Opposition Division, regards as the closest state of the art.

4.2 D1 describes binder compositions comprising an alkaline aqueous solution of a resol phenol-aldehyde resin and an oxyanion capable of forming a stable complex with the resin, in which the amount of alkali present in the solution is sufficient to substantially prevent stable complex formation between the resin and the oxyanion (Claim 1). Those binder compositions have a preferred molar ratio of alkali to phenol of from 1.5:1 to 2.5:1 (Claim 12; page 4, lines 8 to 9) and may also contain a silane such as gamma-aminopropyl-triethoxysilane, phenol trimethoxy-silane or gammaglycidoxypropyltrimethoxysilane (Claims 20 and 21; page 4, lines 22 to 23). D1 also describes the use of those binder compositions in the manufacture of foundry cores and moulds by passing carbon dioxide gas through the formed shape (Claim 23; page 2, lines 31 to 40; page 4, lines 35 to 41; Examples).

The compositions according to D1, when tested as binders for foundry sand, are shown to result in a good compression strength immediately after gassing (Examples 1 to 10).

- 4.3 According to the patent in suit, the aim of the claimed invention is to provide foundry cores and moulds obtained by using resole binder compositions, which exhibit improved strength immediately after gassing as well as after storage, improved mixed sand flowability and improved surface finish and edge hardness (page 2, lines 35 to 45).

According to the Appellant in the Statement of Grounds of Appeal, an object of the invention was the improvement of the **tensile** strength of cores both immediately after gassing as well as after storage.

However, all the examples of the patent in suit only deal with the **compression** strength of cores immediately after gassing and after storage. Compression strength and tensile strength are two different mechanical properties; products having a high compression strength may exhibit a low tensile strength. There is no indication in the present case that these properties could be regarded as identical or that they would be linked in such a way that an increase of compression strength would inevitably imply an increase of tensile strength. Thus, there is no evidence in the patent in suit that an improvement of **tensile** strength in comparison to the binder compositions of D1 has in fact been achieved. The same is valid for the other properties mentioned in the patent specification.

- 4.4 In view of the above, the technical problem underlying the patent in suit may thus be seen as to provide improved alkaline resol phenol-aldehyde resin binder compositions resulting in an increase of the compression strength

immediately after gassing as well as after storage in comparison to those obtained from the binders of D1.

- 4.5 According to the patent in suit that problem is to be solved by adding a phenyl ethylene glycol ether to the binder composition, as defined in Claim 1.
- 4.6 The examples (binder compositions 2 to 7) and comparative examples (binder composition 1) in the patent specification demonstrate that the above-defined problem is effectively solved. In particular, the claimed binder compositions lead to an improvement of the compression strength of cores made out of foundry sand and the binder composition.
- 5. It remains to be decided whether this solution can be regarded as obvious having regard to the documents on file.
 - 5.1 D1 does not mention the use of phenyl ethylene glycol ether at all, so that that document by itself cannot render the claimed subject-matter obvious.
 - 5.2 D2 describes a modified benzylic resole resin obtained by a process comprising the steps of (a) reacting a phenol with a molar excess of an aldehyde in the presence of a divalent metal ion catalyst at a pH below 7 until from about 20% to about 90% by weight of the aldehyde has combined with the phenol, (b) adding sufficient basic catalyst to the mixture of step (a) to raise the pH to at least about 8 and (c) heating the mixture obtained in step (b) until the free aldehyde in the mixture is less than about 5% by weight of the mixture (Claim 8) and a binder composition which comprises an aqueous alkaline solution of a phenolic resole resin, said aqueous solution having a solids content of from about 40% to about 75% by weight, said phenolic resole having an aldehyde:phenol molar ratio of from about 1.2:1

to about 2.6:1 and an alkali:phenol molar ratio of from about 0.2:1 to about 1.2:1, wherein the phenolic resole resin is the modified benzylic ether resole resin of Claim 8 (Claim 15). The binder composition may be used in the manufacture of foundry cores and moulds by a "cold box" process (page 2, lines 23 to 27). Additives such as phenoxyethanols and silanes can be incorporated in the binder compositions (Claims 27 and 30; page 4, lines 8 to 25).

According to D2, phenoxyethanol, 1-phenoxy-2-propanol, 2-(4-bromophenoxy)ethanol and 2-(4-chlorophenoxy)ethanol have the ability to increase the tensile strength of cores or moulds made with the binders there described, as well as those made with conventional resole resin binders (page 4, lines 23 to 25). A comparison of Examples 1 and 2 shows that the addition of 4% by weight, based on the phenolic resole resin, of phenoxyethanol leads to an increase of the tensile strength of the cores prepared therefrom immediately after gassing both for the specific binders according to D2 and for a conventional binder. The values after a storage of 24 hours show respectively a slight decrease for the resin according to D2 and a slight increase for the conventional binder. However, D2 is totally silent about the compression strength of the cores immediately after gassing as well as after storage, so that there is no teaching concerning any effect of phenoxyethanols on those properties.

Therefore, a combination of D1 with D2 with a view to improving the compression strength of cores or moulds would not be considered by the skilled person. The sole fact that a feature disclosed in D2 - the use of phenoxyethanol in a binder composition - corresponds to a feature as claimed cannot provide any incentive to use the same feature in

- order to improve a different property.
- 5.3 The other documents on file are even more remote, so that those, too, would not form an incentive to combine the features now being claimed.
- 5.4 For these reasons, the Board comes to the conclusion that the subject-matter of Claim 1 of the main request involves an inventive step within the meaning of Article 56 EPC.
6. As Claim 1 of the main request is allowable, the same is valid for dependent Claims 2 to 7, the patentability of which is supported by that of Claim 1.
7. The same considerations also apply to Claim 8 since its subject-matter is based upon the same combination of features as that of Claim 1.
8. Since the main request is allowable, the auxiliary request needs not be considered.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is maintained unamended.

The Registrar:

The Chairman:

E. Görgmaier

B. ter Laan