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File Number: T 244/90 - 3.3.2  
Application No.: 83 903 299.2  
Publication No.: 0 120 921  
Title of invention: Lightweight aggregate

Classification: C04B 18/08

D E C I S I O N  
of 25 March 1992

Applicant: GRANULITE LIMITED

Opponent: AARDELITE HOLDING B.V.

Headword: Aggregate/GRANULITE

EPC Article 56

Keyword: "Inventive step (no) - obvious modification"

Headnote



Europäisches  
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Boards of Appeal

Chambres de recours

Case Number : T 244/90 - 3.3.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.2  
of 25 March 1992

**Appellant :**  
(Opponent)

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**Respondent :**  
(Proprietor of the patent)

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**Representative :**

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**Decision under appeal :**

Decision of Opposition Division of the European  
Patent Office dated 25 January 1990 rejecting the  
opposition filed against European patent  
No. 0 120 921 pursuant to Article 102(2) EPC.

**Composition of the Board :**

**Chairman :** P.A.M. Lançon  
**Members :** I.A. Holliday  
E.M.C. Holtz

## Summary of Facts and Submissions

I. European patent No. 0 120 921 concerning lightweight aggregate was granted on the basis of eight claims contained in European patent application No. 83 903 299.2. Claim 1 reads as follows:

"1. A process for the manufacture of lightweight aggregate for use in the building industry which comprises blending a pulverised fuel ash with a binder consisting essentially of quicklime and/or hydrated lime in an amount less than 5% (calculated as CaO) based on the total dry weight of fuel ash and binder, forming the blend into granules or pellets, if necessary, or desired with the addition of water, and curing or hardening the pellets or granules by maintaining them at a temperature within the range of from 35°C to 100°C in an atmosphere saturated with water vapour.

II. The Appellant filed a notice of opposition against the European patent requesting revocation of the patent on the grounds that its subject-matter lacked inventive step. Eight documents were cited in the course of the proceedings of which the following remain relevant for the present decision:

- (2) Zement-Kalk-Gips, Sonderausgabe 2, December 1952, pages 42-45
- (4) US-A-4 018 619
- (7) US-A-3 192 060

III. The Opposition Division rejected the opposition being of the opinion that the subject-matter of the patent in suit was both novel and inventive vis à vis the closest prior

art document (7). It saw the problem in an improved process permitting a shorter curing time (see point (7) of the decision) and it took the view that there was nothing in the other prior art cited which would lead the skilled person to select a quantity of lime less than that generally taught in (7) and to cure and harden the granules formed at 35-100°C, in an atmosphere saturated with water vapour.

IV. The Appellant, in lodging an appeal against the said decision, argued that using quantities of lime below 5% by weight in association with fly ash was already known from documents (7) and (2). It was also known from (4) to cure compositions comprising fly ash and lime at temperatures in the range 35-100°C in a water vapour saturated atmosphere. Accordingly, it was the Appellant's view that, having regard to a combination of the teachings of (7) and (4), the subject-matter of Claim 1 of the patent in suit lacked inventive step.

V. Oral proceedings took place on 25 March 1992 at which the Appellant was not represented.

VI. The arguments of the Respondent both in the written procedure and at the oral proceedings may be summarised as follows:

The compositions of document (4) contain lime, fly ash and sand, the worked examples thereof containing at least 75% by weight of sand. Neither the compositions themselves, nor the curing conditions used in (4) (sealed containers) were analogous to those employed in the patent in suit. It was thus argued that a combination of the teachings of (7) and (4) could not lead to the process of the patent in suit.

Although the Respondent admitted the overlap in lime content between document (7) and the patent in suit, it was argued that the distinction lay in the water content of the compositions. According to (7), a moisture content of 12-20% was necessary to form the pellets with a preferred value of 17% by weight. Removal of such large amounts of water would involve a large consumption of energy. On the other hand the process of the patent in suit used merely enough water to ensure that pellets formed. Document (7) referred to curing for at least 25 days at 10-32°C (50-90°F) as one alternative. The only references to a more rapid cure in (7) were in an autoclave at 180°C (357°F) or in steam at 177°C (350°F). Using such heat would be uneconomic in terms of energy consumption. It was the Respondent's view that the curing conditions specified in Claim 1 of the patent in suit were not foreshadowed in document (7).

VII. The Appellant requested that the decision of the Opposition Division be set aside and that the patent be revoked.

The Respondent requested that the appeal be dismissed.

#### Reasons for the Decision

1. The appeal is admissible.
2. The process of the patent in suit relates to the manufacture of lightweight aggregate for use in the building industry from mixtures of pulverised fuel ash, otherwise known as fly ash, and lime.
  - 2.1 The Board shares the view of the Opposition Division that the closest prior art is document (7), which also relates

to light weight aggregate and its production. Claim 1 of (7) relates to the preparation of pellets from mixtures of from 5-20 parts by weight of lime with correspondingly 95-80 parts by weight of fly ash. Having regard to the fact that hydrated lime is used in the process (column 2, lines 19 to 20), the minimum figure of 5% corresponds to approximately 3.8% by weight measured as CaO. The lime and fly ash mixture is compounded with water and the resultant mixture discharged into a drum-, pan-, or disc-type pelletiser (column 2, lines 35 to 38). The resultant pellets are then cured. This may be for at least 25 days at temperatures of 10-32°C (50-90°F) and humidity of 50-90% (column 1, lines 23 to 29). Alternatively, suggestions are given involving curing for much shorter periods at up to 180°C (357°F) in an autoclave (Column 1, lines 36 to 41) or in steam at 177°C (350°F) (Column 2, lines 58 to 60). The use of "excess moisture" is also mentioned in Column 2 lines 3 to 15 which is quantified as 12-20% with an excess of up to 30% (Column 2, lines 24 to 29).

- 2.2 As recognised by the Opposition Division and agreed by the Respondent at the oral proceedings before the Board, the problem to be solved in relation to the above prior art, with special reference to Example 2 and Column 2, lines 24 to 29, is to develop a method of curing which permits a shorter curing time. The problem is solved by curing at 35-100°C in an atmosphere saturated with water vapour. Having regard to the experimental evidence provided by both Appellant and Respondent, the Board is satisfied that the problem has in fact been solved.
3. Neither document (7) nor any other document cited in the proceedings discloses the curing of lime/fly ash granules at 35-100°C in an atmosphere saturated with water vapour. The subject-matter of Claim 1 is accordingly new. In any event, novelty is not in dispute.

4. It remains to decide whether or not Claim 1 satisfies the requirements of Article 56 in respect of inventive step.

4.1 Claim 1 of the patent in suit specifies that the lime content shall be less than 5% by weight based on the total dry weight of fly ash and lime. This range accordingly overlaps with the minimum of ca. 3.8% disclosed in (7). Experiments filed during examination (on 27 June 1986) indicated that particles prepared with 3% of lime showed an unexpected strength even after curing for one day and especially after curing for 21 days. However, experiments filed on 12 October 1989 by the Appellant (Opponent) were unable to verify any special effect associated with 3% lime, the crushing strength of particles tending to increase with increasing lime content up to 10% lime. The proprietor has not challenged the view of the Opposition Division that there can be no inventive step associated with the choice of lower amounts of lime. This view is confirmed by reference to document (2), which although concerned with lime/fly ash bricks, mentions lime contents down to 2% by weight. Although the technique of making bricks by compression moulding is different from pelletising, the lime nevertheless must play a part in binding the fly ash particles together. Accordingly, it would have been obvious for the skilled person to select the minimum amount of the more expensive lime necessary to achieve an acceptable crushing strength.

4.2 The temperature range of curing specified in Claim 1 of the patent in suit is not to be found in (7). According to the passage noted above in Column 1 of (7), curing may take place at 10-32°C. However, passages in Columns 1 and 2 suggest higher temperatures up to 180°C with a view to accelerating the curing. A specific suggestion is to cure

the pellets by heating to 177°C (350°F) in an atmosphere of steam for five hours. There is thus a strong incentive for the skilled person seeking a more rapid cure to experiment at temperatures higher than the range 10-32°C mentioned above. This would be especially true when using hot fly ash direct from a power station. The higher temperature range and the results obtained in the curing time corresponds essentially to the teaching of (7). Accordingly, at least insofar as it concerns the lime content range which overlaps with (7), the Board can see nothing inventive in selecting the temperature range specified in Claim 1.

4.2.1 The Opposition Division attached importance to the formation of ettringite at temperatures greater than 35°C. This may well be a factor in granule formation but would presumably also occur at the higher temperature mentioned in (7).

4.3 Especially at the oral proceedings, the Respondent argued that an essential difference between the process of the patent in suit and that of (7) was that according to (7) much larger quantities of water were used. The amounts of water are clearly set out in (7); a range of 12 to 20% and an "excess" of up to 30% by weight based on the dry solids is mentioned in Column 2, lines 24 to 29. According to Example 1 of (7), "sufficient moisture was added to bring the moisture content up to 17%". However, the same Example indicates that the amount of water required varies considerably according to the nature of the fly ash used; the right moisture content could be determined by visual inspection during pelletising.

4.3.1 The patent in suit gives little information concerning the amounts of water used and no specific figures feature therein. When questioned at oral proceedings, the

Respondent indicated that the amount of water added depended upon the actual fly ash used and its initial moisture content. The technician at the pelletising plant would determine visually when it was necessary to spray water to increase the moisture content in order to form granules; this appears remarkably similar to the visual inspection mentioned in Example 1 of (7). Accordingly, in the judgement of the Board, the water content cannot be a factor either in distinguishing the process of pelletising of (7) from that of the patent in suit or in establishing the presence of inventive step.

4.4 If follows from the above that the Board cannot recognise anything beyond the teaching of (7) which might have formed the basis of an inventive step.

4.5 It must be added that the above applies to the range of concentrations which overlap with those of document (7). The Board may well have reached a different conclusion for the concentrations below those of (7) had a permissible restriction been available to the Respondent within the terms of Article 123 EPC. Although no request was made by the proprietor, the Board considered the possibility of such a restrictive amendment. However, a restriction to the preferred range of 1-4.5% mentioned in Column 1, lines 57-60 would still overlap with the range prescribed by (7).

4.6 Since it is the Board's view that the process of Claim 1 lacks inventive step having regard to document (7) together with the common general knowledge, it is not necessary to consider document (4) raised by the Appellant.

5. Claim 1 must be revoked for lack of inventive step. In the absence of any auxiliary request, dependent Claims 2 to 8 must share the same fate.

**Order**

**For these reasons, it is decided that:**

1. The decision under appeal is set aside.
2. European patent No. 0 120 921 is revoked.

**The Registrar**

**The Chairman**

**P. Martorana**

**P.A.M. Lançon**