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**Datasheet for the decision
of 2 July 2024**

Case Number: T 2181/22 - 3.3.05

Application Number: 12841852.2

Publication Number: 2768788

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C04B28/04, C04B20/02

Language of the proceedings: EN

Title of invention:
PARTICLE PACKED CEMENT-SCM BLENDS

Patent Proprietor:
Roman Cement, LLC

Opponent:
Heidelberg Materials AG

Headword:
CEMENT-SCM BLENDS/Roman Cement

Relevant legal provisions:
EPC Art. 100(b), 111(1)

Keyword:
Grounds for opposition - insufficiency of disclosure (no)
Appeal decision - remittal to the department of first instance
(yes)

Decisions cited:

T 1076/21, T 1487/18, T 1596/16

Catchword:



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Case Number: T 2181/22 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 2 July 2024

Appellant: Roman Cement, LLC
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Representative: Zellentin & Partner mbB Patentanwälte
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 15 July 2022
revoking European patent No. 2768788 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman R. Winkelhofer
Members: J. Roider
S. Besselmann

Summary of Facts and Submissions

I. The appeal lies from the opposition division's decision to revoke patent EP 2 768 788 B1 under Article 100(b) EPC.

II. The following documents, which were already cited in the opposition proceedings, are relevant here:

E4 Zhang et al., "A new gap-graded particle size distribution and resulting consequences on properties of blended cement", *Cement & Concrete Composites*, 33 (2011), pages 543-550

E10 Test report by opponent, filed with the notice of opposition

E30 Test report by patent proprietor, filed on 18 March 2022

III. With the statement of the grounds of appeal, the patent proprietor filed the following document:

E32 British Standard BS EN 196-1:1995, pages 6 and 7

E33 Images and short descriptions of Mortar Mixer ToniMIXTM, HobartTM Mixer, and WAB T2F TurbulaTM Heavy-Duty Shaker Mixer

IV. Product claim 1 of the main request in the appeal proceedings (claims as granted) reads as follows:

*1. A cement-SCM (supplementary cementitious material) blend comprising:
a narrow PSD hydraulic cement fraction having a*

particle size distribution (PSD) characterized by a d_{10} , d_{50} , and d_{90} ; and
at least one SCM fraction having a PSD characterized by a d_{10} , d_{50} , and d_{90} that differ from the d_{10} , d_{50} , and d_{90} of the hydraulic cement fraction in order for the cement-SCM blend to form a cement paste having a maximum particle packing density of at least 57.0%, determined by means of equation (1):

$$\varphi = \frac{\rho_{wet} - \rho_w}{\rho_c - \rho_w}$$

where φ = maximum solids volume concentration in a cement paste

ρ_{wet} = maximum density of wet paste

ρ_w = density of water

ρ_c = density of cement

wherein the cement-SCM blend comprises a first SCM fraction having a d_{50} such that the d_{50} of the hydraulic cement fraction is at least 3.0 times the d_{50} of the first SCM fraction and a second SCM fraction having a d_{50} that is at least 3.0 times the d_{50} of the hydraulic cement fraction."

Claims 2-9, 13 and 14 are product claims that are dependent on claim 1 and relate to particular embodiments of claim 1.

Claim 10 is an independent method claim which reads as follows:

"10. A method of manufacturing the cement-SCM (supplementary cementitious material) blend as in claim 1 comprising:

 providing the narrow PSD hydraulic cement fraction;
 blending the narrow PSD hydraulic cement fraction

with the at least one SCM fraction to form the cement-SCM blend."

Claims 11 and 12 are method claims that are dependent on claim 10 and relate to particular embodiments of claim 10.

- V. The key arguments by the appellant (patent proprietor) can be summarised as follows:

The tests in E10 did not follow the test procedure disclosed in E4, particularly concerning the type of mixer used for the tests. Moreover, the guidance in paragraphs [0078]-[0082] and [0092]-[0094] of the patent in suit had been disregarded in E10.

The skilled person would have chosen reasonable amounts of the particle fractions and was able to define the PSD by d10, d50 and d90.

- VI. The key arguments by the opponent (respondent) can be summarised as follows:

Test report E10 proved that the claimed invention was insufficiently disclosed.

The type of mixer was not important as long as the mixing was sufficient.

Paragraphs [0078]-[0082] and [0092]-[0094] of the patent in suit did not provide guidance because, according to paragraph [0094], Figures 3A to 3E were merely exemplary. It did not teach that little or no overlap of the PSDs was important.

Essential information regarding how to measure the

maximum particle packing density (maximum PPD) was missing.

The meaning of the feature "SCM fraction" was extremely unclear and the amount of particle fractions in the mixture could also be very low, and therefore the claimed invention was not sufficiently disclosed over the whole claimed range.

VII. Substantive requests:

(a) The appellant requests that the decision under appeal be set aside and amended such that the opposition be rejected, or that the patent be maintained on the basis of auxiliary requests 1 to 25 (auxiliary requests 1-20 as before the opposition division and annexed to the decision under appeal, auxiliary requests 21-25 as filed with the statement of grounds of appeal); in the alternative, they request remittal.

(b) The respondent requests that the appeal be dismissed.

Reasons for the Decision

1. Main request, sufficiency of disclosure, Article 100(b) EPC

In *inter partes* proceedings, it is up to the opponent to prove that the guidance disclosed in a patent is insufficient for carrying out the invention (Case Law of the Boards of Appeal, 10th edition 2022, II.C.9, e.g. T 1076/21, point 1.1.7 of the Reasons; T 1596/16,

point 2.2 f of the Reasons).

- 1.1 Claim 1 under consideration essentially requires that a cement paste has a maximum PPD of at least 57.0%, as determined by the formula in claim 1, whereby the cement paste comprises a hydraulic cement fraction and two SCM fractions, one of them being finer and the other being coarser than the hydraulic cement fraction, whereby the d50 of the coarser SCM fraction is a multiple of at least three of the d50 of the hydraulic cement fraction, and the d50 of the hydraulic cement fraction is a multiple of at least three of the finer SCM fraction (this criterion is referred to in the following as the *d50 multiple of at least three*).
- 1.2 The opposition division held that the required maximum PPD (the parameter ϕ) was a result to be achieved (paragraph 3.1.1 of the impugned decision), which could not be reliably determined (paragraph 3.1.2), and that the PSD was moreover ill-defined and could not remedy the lack of disclosure caused by the PPD parameter (paragraph 3.1.3).
- 1.3 Examples 1A, 2A, 4A and 5 in test report E10 demonstrate that by merely mixing the fractions as defined in claim 1, the maximum PPD is not necessarily achieved.

Evidently, such material blends having too low a PPD are not covered by the subject-matter of claim 1.

However, this also demonstrates that the skilled person must consider the description and use additional measures in order to achieve the claimed maximum PPD.

The opposition division was thus correct that the

maximum PPD is a result to be achieved.

- 1.4 The macroscopic effect associated with the maximum PPD of at least 57.0% is that of decreasing the water demand and increasing the strength of the cement blend (paragraphs [0007] and [0092] of the patent in suit).

For the patent in suit to be sufficiently disclosed, it is essential that the required maximum PPD can be achieved with the guidance in the patent in suit, read with common general knowledge in mind.

- 1.5 The question to be assessed is whether the respondent submitted persuasive evidence that the patent in suit did not provide sufficient guidance to achieve the claimed maximum PPD (cf. again T 1076/21, point 1.1.7 of the Reasons; T 1596/16, point 2.2 f of the Reasons).

In this context, the appellant referred to paragraphs [0092]-[0094] of the patent in suit as containing the basic teaching underlying the invention and the maximum PPD of 57.0% (see section I.2 on pages 9-10 of the statement of grounds of appeal).

- 1.6 Paragraph [0093] of the patent in suit discloses that a maximum PPD of less than 57.0% (see Figure 2) is obtained in cases in which there is a considerable overlap of the particle size distribution (PSD) of adjacent particle fractions, and in which the mean particle size (MPS) of a particle fraction is a multiple of less than three of the MPS of the adjacent finer particle fraction (referred to in the following as the *MPS multiple of less than three*).

By contrast, the cement-SCM blends taught as an example of the invention exhibit little or no overlap of the

PSD and have an MPS multiple of at least three (see paragraph [0094]; Figures 3A-3E), i.e. there is also a high degree of separation of the d10 and d90 values between the PSD of the three components, as argued by the appellant. The appellant also referred to the guidance for selecting d10 and d90 of the respective PSDs given in paragraphs [0078]-[0082] of the patent in suit, arguing that a gap in the PSD of adjacent fractions was important for achieving the required PPD.

- 1.7 When assessing the examples in E10, it is immediately apparent that the d10 of the coarsest SCM fraction is **less** than the d50 of the cement fraction in all cases.

The PSD of the particle fractions used in E10 thus exhibits a considerable overlap, contrary to the guidance in paragraphs [0078]-[0082], [0093] and [0094].

All the examples in the further test report E30 which yield a maximum PPD of at least 57.0% demonstrate that the d10 of at least one coarse SCM fraction is **greater** than the d50 of the cement fraction.

The approximation in Example 2 on page 4 of E30 does not fulfil the d50 multiple of at least three and therefore falls outside of the claimed subject-matter. The fact that it also achieves the maximum PPD does not negate the fact that the other examples achieve the maximum PPD.

In Comparative Test 4 on page 9 of E30, the d50 multiple of at least three is not fulfilled, and the d10 of the coarse SCM fraction is less than both the d50 of the cement fraction and the d50 of the fine SCM fraction. The PSDs of these particle fractions

therefore overlap significantly. In accordance with the guidance given in the patent in suit, the maximum PPD is not achieved.

The considerations regarding the overlap of the PSD of adjacent particle fractions apply irrespective of whether the PSD is further characterised by the d50 or the MPS.

The tests in E10 therefore disregard the guidance given in paragraphs [0078]-[0082] and [0093] and [0094] of the patent in suit, because the PSDs of adjacent particle fractions considerably overlap.

- 1.8 It was common ground that the patent in suit referred to E4 for the measurement method.

The appellant argued that the respondent moreover used a TurbulaTM mixer for the tests in E10, whereas E4 disclosed determining the water requirement in accordance with EN 196-3 (see paragraph 3.2.2), which implied that the mixer was in accordance with EN 196-1 (E32, HobartTM mixer; statement of grounds of appeal, page 32). These mixers functioned according to different principles; the HobartTM was a kneader mixer exerting shear force, whereas the TurbulaTM mixer acted by shaking (E33).

The appellant argued that it was not clear whether the claimed PPD would have been achieved in E10 if the mixer had been a HobartTM mixer.

The respondent argued, in view of the last sentence of paragraph 3.2.2 of E4, that the use of a specific mixer was not required and that, in any event, the TurbulaTM mixer gave the same results as the HobartTM mixer.

EN 196-3 is indeed referenced in the relevant paragraph 3.2.2 of E4 and it is clear that this applies to all the water-mixing ratios used ("at the same time"). E33 demonstrates that specific kneader mixers are marketed as being standard-compliant for use in tests according to EN 196. It is thus apparent that the test procedure according to E4 may require a kneader mixer and not a shaker mixer such as a TurbulaTM. The procedure described in E4 with reference to E5 demonstrates that the PPD has a local maximum at a certain water addition. This immediately raises the question of why the tests in E10 did not find a local maximum of the PPD and merely produced a "lumpy aggregation of particles" (E10, page 3, first paragraph). Although the reasons for this remain unclear, it may well be due to the use of a different mixer. It is thus also unclear whether the paste had been brought to its maximum density in the tests in E10.

If a material fact cannot be proven ("non liquet"), a decision has to be made on the basis of the burden of proof: it is to the detriment of the party bearing the burden of proof for that fact, this being the opponent here, who performed the tests with a different mixer.

- 1.9 The tests in E10, provided by the respondent, therefore cannot demonstrate that the patent in suit was insufficiently disclosed (see point 1.1.7 of T 1076/21; point 2.2 of T 1596/16).

- 1.10 It is acknowledged that some samples in E10 and E30 do not fulfil the d50 multiple of three, but still have a PPD of at least 57.0%; however, this does not call into question the sufficiency of the disclosure of the

patent in suit. It simply demonstrates that there are ways of achieving the claimed PPD by means not covered by claim 1.

1.11 Since E10 does not reproduce the test procedure as indicated in the patent in suit, it does not demonstrate that there is ambiguity to the extent that it affects the whole claim. Uncertainty in the measurement procedure may be confined to the limits of the claimed subject-matter and thus only affect the clarity of the claim.

1.12 The question of the interpretation of the feature "SCM fraction" also relates to clarity. With reference to Working Example 4, the impugned decision concludes that the effect of ground granulated blast-furnace slag (GGBFS) on the maximum PPD was not clear, that the combination of two SCM fractions could also have been considered as one fraction, and that the meaning of the PSD was thus ill-defined.

However, according to claim 1, the PSD is defined by d_{10} , d_{50} and d_{90} . Irrespective of the actual shape of the PSD, these parameters can be determined and do not call into question the sufficiency of disclosure on the basis of the available evidence.

1.13 The respondent also argued that the amounts of the respective particle fractions were open-ended and, moreover, were not limited to the three particle fractions mentioned in claim 1.

The examples in the patent in suit set out suitable amounts of the respective particle fractions, even when more than three fractions are included. There is no evidence that the required maximum PPD is not achieved

over substantially the entire claimed range.

1.14 Dependent claims

The objections raised under Article 100(b) EPC in the decision under appeal and by the opponent are limited to claim 1. It is therefore undisputed that the requirements of sufficiency of disclosure are met, provided that claim 1 satisfies those requirements. Since claims 2-9, 13 and 14 merely specify further details and claims 12 and 13 only cover generic steps, these claims meet the requirements of sufficiency for the same reasons as claim 1.

2. Remittal

The ground for opposition under Article 100(b) EPC was the only ground covered in the decision under appeal. Further grounds, in particular those under Article 100(a) EPC, were not addressed.

Therefore, there is nothing which could be reviewed as per Article 12(2) RPBA 2020, which stipulates that the primary object of the appeal proceedings is to review the decision under appeal in a judicial manner.

Dealing with a ground of appeal for the first time on appeal would run counter to this objective because that ground was not covered by the decision under appeal (see T 1487/18, point 4 of the Reasons).

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 Chair:



A. Pinna

R. Winkelhofer

Decision electronically authenticated