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D E C I S I O N
of 20 July 2006

Case Number: T 0346/03 - 3.2.03

Application Number: 94904592.6

Publication Number: 0688384

IPC: E04B 1/78, D04H 1/70, E04C 2/16

Language of the proceedings: EN

Title of invention:
A method of producing a mineral fiber-insulating web

Patentee:
ROCKWOOL INTERNATIONAL A/S

Opponent:
Paroc AB

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty - implicit disclosure (no)"
"Inventive step - non-obvious combination of known features"

Decisions cited:
-

Catchword:
-

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Case Number: T 0346/03 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 20 July 2006

Appellant: (Opponent)	Paroc AB 541 86 Skövde (SE)
Representative:	Avellan-Hultman, Olle Ehrner & Delmar Patentbyra AB Box 10316 S-100 55 Stockholm (SE)
Respondent: (Patent Proprietor)	Rockwool International A/S Hovedgaden 584 DK-2640 Hedehusene (DK)
Representative:	Lawrence, Peter Robin Broughton Gill Jennings & Every LLP Broadgate House 7 Eldon Street London EC2M 7LH (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted 5 February 2003 concerning maintenance of the European Patent No. 0688384 in amended form.**

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
K. Garnett

Summary of Facts and Submissions

I. This appeal lies from the decision of the opposition division, posted on 5 February 2003, to maintain European patent 0 688 384 in amended form. The grant of the patent, which concerns a method for producing a mineral fibre insulating web, had been opposed by the appellant *inter alia* on the ground that the method of claim 1 as granted is not novel and does not involve an inventive step. During the oral proceedings held before the opposition division, the patent proprietor (the respondent in this case) filed amended claims and description, which the opposition division found to meet the requirements of the EPC.

II. The appellant (the opponent) filed an appeal against the above decision on 26 March 2003, paying the appeal fee at the same time; a statement containing the grounds of appeal was filed on 27 May 2003.

In a letter dated 23 October 2003 the respondent replied to the submissions of the appellant and filed three sets of claims, labelled as first, second and third auxiliary requests. The appellant did not respond to these submissions and has made no request for oral proceedings.

III. Claim 1 of the patent, as upheld by the opposition division, reads as follows:

"1. A method of producing a mineral fiber-insulating web (70') comprising the following steps:

(a) producing a first non-woven mineral fiber web (70) defining a first longitudinal direction parallel with said first mineral fiber web and a second transversal direction parallel with said with first mineral fiber web, said first mineral fiber web (70) containing mineral fibres arranged generally in said first longitudinal direction thereof and including a first curable bonding agent,

(b) moving said first mineral fiber web (70) in said first longitudinal direction of said first mineral fiber web,

(c) folding said first mineral fiber web (70) transversely relative to said first longitudinal direction and parallel with said second transversal direction so as to produce a second non-woven mineral fiber web (70'), said second mineral fiber web (70') comprising a central body containing mineral fibers arranged generally perpendicular to said first longitudinal direction and said second transversal direction, and said folding comprising the step of producing ondulations (*sic*) extending perpendicular to said first longitudinal direction and parallel with said second transversal direction,

(d) moving said second mineral fiber web (70') in said first longitudinal direction, and

(e) curing said first curable bonding agent so as to cause said mineral fibers of said second mineral fiber web (70') to bond to one another, thereby forming said mineral fiber-insulating web,

and in which said first mineral fiber web produced in step (a) is a loosely compacted mineral fiber web of an area weight of 50 - 1200 g/m^2."

Dependent claims 2 to 21 relate to preferred embodiments of the method of claim 1.

IV. Prior Art

The following documents, referred to in the opposition proceedings, are relevant for this decision.

D1: SU-A-94 8985
D4: WO-A-87 06631
D6a: US-A-4 917 750
D7: US-A-2 500 690
D8: WO-A-92 10602

V. Submissions of the Parties

(a) Novelty (Article 54 EPC)

In order to simplify the terminology of the claim, the appellant referred to the following expressions, which are also adopted by the Board for the purposes of this decision. The first longitudinal direction, corresponding to the length of the web, is the "X-direction"; the second transversal direction, corresponding to the width of the web, is the "Y-direction", and the "Z-direction" is perpendicular to the first longitudinal direction and second transversal direction i.e. it is perpendicular to the plane of the web.

The appellant submitted that all the features of claim 1 of the contested patent are disclosed in documents D1 and D7. Although not explicitly mentioned

in D1 or D7, the following features are implicit to the processes described in both of these documents:

(i) in step (a), the mineral fibres are arranged generally in the first longitudinal direction; and

(ii) the first mineral fibre web produced in step (a) is a loosely compacted mineral fibre web of an area weight of 50 - 1200 g/m^2 (see feature (e) of claim 1).

Concerning the orientation of the fibres (feature (i) above), the appellant argued that unless special steps are taken, the majority of fibres, i.e. greater than 50%, deposited on a conveyor moving at a high speed, as in D1 and D7, would naturally lie in the moving direction (the X-direction).

The appellant also argued that the claimed area weight for the web produced in step (a) is implicitly disclosed in D1 and D7. The range defined in claim 1 for the area weight of the web is so broad that it is inevitable that the primary web of D1 and D7 would comply with this requirement. In addition, at column 3, lines 19 to 26 of D7, it is stated that the density of the finished board may be as low as 2 pounds per cubic foot. Given a thickness of 2 inches (as in the example at column 5 line 60 of D7), the appellant calculated the area weight of the primary web to be 329 g/m^2, which is within the range given in claim 1.

The respondent emphasised that D1 is silent about the initial fibre orientation. Since it is relatively unusual to utilise a primary web as defined in claim 1 as the starting material, there can be no presumption

that D1 uses such a web. Concerning D7, the respondent referred to column 1, lines 21 to 32, where there is an explicit teaching that the fibres lie not in the Z-direction, but are haphazardly arranged in the X and Y directions. The respondent also argued that, since the appellant had failed to provide any evidence to support the assertion that it is inevitable that the majority would be deposited on the conveyor parallel to the X direction, this feature is not unambiguously disclosed either in D1 or D7.

The respondent disputed the assertion that the defined range of the area weight in claim 1 is so great that the web of D1 must fall within it, since webs are commonly used in this type of process, which have a higher area weight, especially if they are self-supporting as in D1. The respondent also disputed the appellant's calculation of 329 g/m^2 for the area weight in D7, deriving the area weight to be 1626 g/m^2 for the same density and thickness.

(b) Inventive Step (Article 56 EPC)

The appellant viewed D7 as strong prior art and argued, albeit somewhat sparsely, that there is no reason why two or more patents particularly D6a and D7, also D4 and/or D6a and/or D7 may not be combined, since they all discuss the same problem as the contested patent. It can be derived from page 7, fourth paragraph of D4, and from column 10, lines 35 to 39 of D6a that the original web has a fibre orientation predominantly parallel to the longitudinal direction.

The respondent also viewed D7 as the closest prior art, starting from which the problem to be solved is how to improve the properties of the sheet, especially through the thickness in the Z-direction. The method of claim 1 differs from that of D7 in two essential features, namely the orientation of the fibers in the X-direction and the reduction in area weight. The effect of these features is to maximise the proportion of fibres having a perpendicular orientation, thereby providing a solution to the problem. Since there is no hint of this solution in the prior art, the claimed method is inventive.

(c) Admissibility of the Appeal

The respondent alleged that it is possible that no company having the name "Paroc AB" and an address of S541, 86 Skovde, Sweden existed in 2003. If the appellant does not exist, it cannot be an adversely affected party, and accordingly there can be no appeal complying with Article 107 EPC.

VI. Requests

The appellant requests that the patent be revoked.

The respondent requests that the appeal be declared inadmissible. Should the appeal be declared admissible, the respondent requests that the appeal and the opposition be dismissed and the patent be maintained in the form upheld by the opposition division or according to one of the three auxiliary requests filed with the letter of 23 October 2003.

Reasons for the Decision

1. *Admissibility of the Appeal*

The respondent alleges that the appellant company did not exist at the time of filing the appeal. The allegation is somewhat speculative, the respondent arguing that "it is possible that no company existed" and "if this is true, then the appellant does not exist", but this is not supported by any evidence.

The Board is of the view that the respondent has not provided sufficient evidence to demonstrate that the appellant has ceased to exist. Therefore the appeal is deemed to be admissible.

2. *Novelty (Article 54 EPC)*

2.1 In the grounds of appeal, the appellant considers that claim 1 is "fully obvious to the expert, perhaps even fully known", when considering the cited prior art. However, arguments contesting novelty are set out in the grounds of appeal principally only on the basis of documents D1 and D7.

Neither D1 nor D7 explicitly discloses the orientation and the area weight of the primary web, but the appellant argues that these features are implicit to the processes described in these documents.

2.2 Orientation of the Fibres in the Primary Web

Starting with D7, this document describes a process, in which a loose fluffy bat of fibrous material is

deposited on a belt-type conveyor in mat formation (see column 3, lines 13 to 19). D7 does not explicitly describe the orientation of fibres at this point, but at column 1, lines 21 to 32 discusses orientation in relation to a prior art process. Here it is said that the fibres lie in planes parallel to the conveyor (thus are not in the Z-direction) but are haphazardly arranged in other directions, i.e. in the X- and Y-directions. This mat is the primary mat that forms the starting point for the invention of D7, which then goes on to perform a folding operation on the mat (see column 1, lines 51 to 55). It therefore seems reasonable that the primary mat of D7 also has such an arrangement of fibres, and these are not arranged generally in the first longitudinal direction (X-direction), as defined in claim 1 of the disputed patent.

The appellant argues that the majority of fibres deposited on a travelling conveyor will naturally lie in the moving direction (the X-direction). This statement contradicts the teaching of D7, and the appellant has not provided any evidence or explanation as to why the fibres of D7 may nevertheless be considered as being aligned. Consequently, the Board does not concur with this argument.

2.3 Area Weight of the Primary Web

The first mineral fibre web (70) referred to in claim 1 of the disputed patent corresponds to the primary fibrous mat (11) of D7 that enters the first pair of rolls, as shown in Fig. 1. According to the example given at column 5, lines 58 to 65, the primary fibrous

mat has a density of 2 pounds per cubic foot and is 2 inches thick; this gives an area weight of 1627 g/m^2, which is higher than the upper limit of 1200 g/m^2 defined in claim 1. For this particular weight, a final product results, which has a density of 5 or 10 pounds per cubic foot, depending on its thickness. It is thus apparent that the density of the final product not only depends on the area weight of the primary fibrous mat, but also on the thickness of the final mat. Indeed, D7 explains at column 5, lines 45 to 57, that the change in density is directly proportional to the ratio of the thicknesses of the primary and final mats (the reduction ratio).

It is therefore not possible to deduce unambiguously the area weight of the primary fibrous mat, starting from the density of the final product, without knowledge of other variables such as reduction ratio and thickness. The appellant calculated that in order to produce a mat having a final density of 2 pounds per cubic foot, as indicated in the passage from column 3 quoted above, the area weight of the initial fibrous mat must be 329 g/m^2. In doing so, several assumptions are made, in particular that the thickness of both the primary fibrous mat and the final product is 2 inches, and that the speed relationship between the rolls is 1 to 5. Although these values are disclosed in D7 in respect of the specific example given in column 5, where a density of 5 or 10 pounds per cubic foot is obtained, the appellant has applied them to the situation envisaged at column 3, lines 21 to 25, where the aim is to produce a mat having a density of 2 pounds per cubic foot. D7 provides no example of a process for making such a mat, and it is not readily

apparent that the same values of thickness and roll reduction as described in column 5 would inevitably be used for making a mat having a density of 2 pounds per cubic foot. Consequently, it cannot be said that a primary fibrous mat having an area weight of 50 to 1200 g/m^2 is directly and unambiguously derivable from D7.

2.4 D1 also fails to provide any teaching regarding the orientation of the fibres and the area weight of the primary web. For similar reasons as are set out above in respect of D7, these features are not deemed to be implicitly disclosed in D1. The claimed subject-matter is thus novel with respect to both of these documents.

3. *Inventive Step (Article 56 EPC)*

3.1 The contested patent concerns a method of producing a mineral fibre insulating web, from which insulating plates for use in the construction industry are cut. The method is based on the technique of folding a continuous primary web to form an undulated web, in which fibres are arranged in the Z-direction, perpendicular to the plane of the web. The invention sets out to improve the mechanical and thermal-insulating properties of the material, whilst reducing the amount of fibres, thereby providing a more lightweight plate (see paragraph [0009] of the description).

3.2 Document D7 describes the production of a similar type of mineral fibre-insulating web, and in particular, one in which undulations are formed with the fibres arranged generally in the Z-direction (see column 7,

lines 1 to 12). The appellant, the respondent and the opposition division all consider D7 to be the most relevant document and an appropriate starting point for assessing inventive step; the Board sees no reason to differ from this view.

3.3 The subject-matter of claim 1 differs from that of D7 in that the primary web has a low area weight of fibres, which are aligned in the X-direction.

3.4 It is generally known that fibres orientated in the Z-direction improve the mechanical properties of the web. Document D7 is itself directed to preventing delamination, and achieves this by orientating fibres in the Z-direction. Also D6a, in particular the embodiment shown in Fig. 10 (see column 12, lines 42 to 57), teaches that fibres aligned normal to the major plane of the web, i.e. in the Z-direction, increase the compression strength perpendicular to the major surfaces of the panels. Both D7 and D6a achieve the desired alignment by pleating a primary web, as does the contested patent.

Thus, the objective technical problem, starting from D7, is seen as how to improve yet further the mechanical properties of a web in which fibres are orientated in the Z-direction.

3.5 The proposed solution is to provide a given low area weight of fibres, which are aligned in the X-direction prior to folding. The effect of this combination of features is that a greater proportion of fibres are aligned in the Z-direction in the undulated web, and the overall weight of the plates is reduced.

3.6 Although it is not expressly stated in the available prior art, it would seem that the obvious way to align the fibres in the Z-direction is to start out with a web having aligned fibres in the X-direction, it being clear that the more that are aligned in the X-direction, the more will be aligned in the Z-direction after pleating has taken place.

However, it is not immediately obvious that a reduction in area weight of the initial web would increase the proportion of fibres aligned in the Z-direction of the pleated product. When a web is pleated, it is made up of bend sections formed by the folding of the web, and straight sections that connect the bends and which lie in the Z-direction; the ratio denoting the relative amounts of these sections in an undulated web is termed the "bend ratio". In the letter of 23 October 2003, the respondent shows that the bend ratio (BR) is a function of the area weight (Aw) of the primary web according to the following equation:

$$BR = \pi / [\pi + ((T \cdot \rho / Aw) - 2) \cdot 2]$$

where T is the thickness of the final web and ρ is the density of the web in the cured state.

Having been aligned in the X-direction in the initial web, those fibres which find themselves in the straight sections after folding will be orientated in the Z-direction, but those in the bend regions will not. Clearly, the lower the proportion of the final web that is made up of bend regions, i.e. the lower the bend ratio, the higher the overall proportion of fibres that

lie in the Z-direction. According to the above equation, there is a direct link between bend ratio and area weight, and when area weight is reduced, so is the bend ratio, which means that the proportion of fibres lying in the Z-direction increases.

The purpose of D7 is simply to provide a web in which the fibres are aligned perpendicular to the surface; there is no indication of the effect of area weight or density of fibres in the initial web on the degree of alignment. D6a also shows the alignment of fibers in the X-direction prior to pleating, but does not discuss how an optimum alignment in the Z-direction can be achieved. Although it is known to produce primary webs having a low area weight and fibers aligned in the X-direction, as in D8, page 3, lines 9 to 21, this orientation is transformed into an orientation in the Y-direction by cross-lapping the primary web before pleating (see Figure 1 of D8), so that no orientation in the Z-direction can be obtained. D4 does not concern a pleated web, so is not relevant to either the problem or its solution.

3.7 None of the documents put forward by the appellant suggest the combined features of aligned fibres in the initial sheet and low area weight as a solution to the problem of improving the mechanical properties of the sheet of D7.

The method of claim 1, as upheld by the opposition division, thus has an inventive step, and it is not necessary to consider the claims submitted as auxiliary requests by the respondent.

4. The appellant has made no request for oral proceedings and has had ample time to respond to the observations made by the Respondent with the letter of 23 October 2003. Consequently the Board is in a position to reach a decision based on the written submissions of the parties.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Counillon U. Krause