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Datasheet for the decision of 25 July 2006

Case Number: T 0014/04 - 3.2.07

Application Number: 92902262.2

Publication Number: 0567486

IPC: C03B 37/05

Language of the proceedings: EN

Title of invention:
Process and apparatus for making mineral wool fibres

Patent Proprietor:
Rockwool International A/S

Opponents:
I. Paroc Oy Ab
II. RHI AG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123(2), 123(3)

Keyword:
"Allowability of amendments (yes)"
"Novelty (yes)"
"Inventive step (main and auxiliary request - no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0014/04 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 25 July 2006

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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 30 October 2003 concerning maintenance of European patent No. 0567486 in amended form.

Composition of the Board:

Chairwoman: C. Holtz
Members: H. Hahn
P. O'Reilly

Summary of Facts and Submissions

I. Opponent I (appellant) lodged an appeal against the decision now under appeal of the Opposition Division to maintain European patent No. 0 567 486 in amended form on the basis on the claims 1-7 according to the main request as filed with letter of 17 July 2002. The case had previously been remitted by Board of Appeal 3.2.2 in accordance with decision T 374/98.

II. Two oppositions had been filed against the patent as a whole and were based on Article 100(a) EPC (i.e. lack of novelty and lack of inventive step), Article 100(b) EPC (i.e. the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art), and Article 100 (c) EPC (for extending beyond the content of the application as originally filed). With its first decision posted on 16 February 1998 the Opposition Division held that said grounds for opposition did not prejudice the maintenance of the patent and rejected the oppositions. Both opponents filed an appeal forming the basis of case T 374/98 wherein the Board 3.2.2 decided that the skilled person is able to carry out the invention and that the apparatus claims lack an inventive step over an obvious combination of D1 and D3. The Board remitted the case to the Opposition Division for further prosecution of the process claims according to the - at that time - second auxiliary request.

In its decision after the remittal the Opposition Division held that the patent as amended meets all requirements of the EPC. In particular it admitted three late filed documents submitted by opponent I with

letter dated 10 June 2003 into the procedure and held that the amendments made to the claims and the description according to the main and the three auxiliary requests fulfilled the requirements of Articles 84 and 123(2) and (3) EPC. Novelty of process claim 1 of the main request was acknowledged. Furthermore, claim 1 of the main request was considered not to be rendered obvious by a combination of the closest prior art D1 with any of D3, D12, D13 or D15.

III. With a communication dated 22 March 2006 and annexed to the summons to oral proceedings the Board presented its preliminary opinion with respect to claims 1-7 according to the main request as filed with letter of 17 July 2002, and claims 1-7 according to the first, second, third and fourth auxiliary requests as filed with letter of 15 July 2004.

All requests appeared to meet the requirements of Articles 54 and 123(2) and (3) EPC. D12 appeared to represent the closest prior art document on which the discussion of inventive step taking account of the technical problem should be based. The alleged advantage of reduction of spontaneous variability in fiberising conditions of the process appeared to have no basis in the application as originally filed so that it should be discussed whether this alleged advantage can be considered or not.

IV. With letter dated 21 June 2006 the respondent (patent proprietor) submitted further arguments with respect to inventive step as a response to the Board's communication.

V. Oral proceedings before the Board were held on 25 July 2006.

(a) The appellant (opponent I) requested that the decision under appeal be set aside and the patent be revoked.

(b) The party as of right (opponent II) did not submit any observations in the appeal procedure.

(c) The respondent (patent proprietor) requested that the appeal be dismissed and that the patent be maintained, alternatively, on the basis of the claims 1-7 according to the main request as filed with letter of 17 July 2002, or alternatively be maintained in accordance with claims 1-6 according to the first auxiliary request as filed during the oral proceedings before the Board on 25 July 2004.

(d) The following documents and pieces of evidence were discussed:

D1: US-A-3 159 475

D3: US-A-4 238 213

D12: JP-A-63 230 535 (Japanese original; English abstract and full English translation)

D13: Karel Strnadel, Ministerium für Technik und Investitionen, CSSR, Silikattechnik 35 (1984), issue 12, pages 363-365

Annexes BMB4a and BMB4b, BMB5 and BMB6 as submitted by the appellant with letter of 9 February 2004

Annexes A and B as submitted by the respondent with letter of 15 July 2004

VI. Claim 1 according to the main request reads as follows (subdivision into features **[a]** to **[h]** based on the appellant's analysis added by the Board):

"1. A process for making mineral wool using apparatus comprising **[a]** a set of least three rotors (4,5,6,7) each mounted for rotation about a different substantially horizontal axis and **[b]** arranged such that when the rotors are rotating melt poured on to the periphery of the top rotor (4) in the set is thrown on to the periphery of the subsequent rotors in turn and fibres are thrown off the rotors, wherein **[c]** the process comprises pouring mineral melt having a temperature of from 1300 to 1700°C on to the top rotor (4) and **[d]** collecting as wool the fibres that are formed and wherein **[e]** the subsequent rotors (5,6,7) have a size and rotate at a speed such that they give a greater acceleration field than the top rotor (4), characterised in that **[f]** the top rotor (4) has a size and is rotated at a speed such that it gives an acceleration field of 50 km/s^2 and below 100 km/s^2 and **[g]** the axes of the first and second rotor (4,5) are arranged such that a line drawn from the axis of the first rotor (4) to the axis of the second rotor (5) makes an angle (C) of from 0° to 20°, preferably 5° to 10°, below the horizontal, and **[h]** the melt strikes the top rotor (4) at a position that makes an angle (B) of from 40° to 65°above the horizontal."

VII. Claim 1 according to the first auxiliary request differs from claim 1 of the main request in that the additional features "… using apparatus comprising a set of **four** rotors …" and ", **and the second rotor in the set has a size and is rotated at a speed such that it gives an acceleration field of 1.1 to 2 times the acceleration field of the top rotor (4), and the acceleration field on each subsequent rotor is 1.2 to 1.6 times the acceleration field on each preceding rotor**" (emphasis added by the Board) have been incorporated in its preamble and at the end of its characterizing portion, respectively.

VIII. The appellant (Opponent I) argued essentially as follows:

The Board 3.2.2 in its decision T 374/98 had decided that the apparatus claims lacked an inventive step over a combination of D1 and D3. Process claim 1 of the main request defines a process of using that apparatus which is mostly defined by apparatus parameters. Only features c) and d) of claim 1 concerning the melting temperature range of the mineral melt of 1300-1700°C and the collection of the produced fibres as a mineral wool, respectively, represent process features. The limitation of the acceleration field to a value "below 100 km/s^2" according to feature f) and the "melt angle B" of from 40-65° above the horizontal according to feature h) of claim 1 concern apparatus features. The features c) and d) represent truisms since mineral compositions typically have a melting temperature in the range of from 1400-1600°C (see patent, page 2, lines 37 to 39 and page 5, lines 41 to 44) and because

the collection of the mineral wool is a technically necessary process step. The said limitation of "below 100 km/s^2" according to feature f) does not distinguish from the value "79.2 km/s^2" specified in D3. The angle B range represents a broad range within the theoretically possible range for pouring melt onto the first rotor, particularly when taking account of the most common rotor diameters of between 100 mm to 300 mm and a width of the poured melt of about 2 cm (compare BMB4a and BMB4b). D1 also deals with the direction in which the melt stream is discharged (see column 3, lines 7 to 14). The problem to be solved by the patent in suit can be defined as the provision of a process which reduces the amount of "shot" (i.e. part of the melt which is not transformed into fibres) while producing good fibres (compare patent, page 3, lines 32 to 37). D1 deals with the same problem (see column 1, lines 64 to 70) and refers to the design of the apparatus to be used (see column 1, lines 52 to 57) having an angle A of 19° (which corresponds to angle C of claim 1) and teaches the importance of parameters and dimensional features shown in the drawing (see Figure 1; column 3, lines 7 to 10). Thus said angle B according to feature h) can be derived from D1. D3 deals with the same problem of "shot" reduction (see column 2, lines 25 to 28) and uses an apparatus which may comprise four rotors (see column 3, lines 45 to 50) so that the skilled person would combine D1 and D3 thereby arriving at the subject-matter of claim 1 based on the conclusions of T 374/98. Although D3 suggests higher acceleration fields the skilled person would consider that it is only for making refractory fibres that such higher values are necessary while for mineral wool lower acceleration fields have to be applied because of the

different viscosity and different melting temperature which partly overlaps with that of the refractory material. The example according to Annex B only applies to a four-rotor system which according to claim 1 is not necessarily present. The differences between different angles B shown in annexes A and B are not so big; only at 60° is an effect apparent but such a value is suggested by D1. Hence Annex B cannot be evidence for a surprising effect over the whole range of claim 1.

D12 discloses a four-rotor system for making inorganic fibres which encompasses explicitly mineral wool so that features a), b), c) and d) are fulfilled since the axes of said rotors are commonly horizontally arranged (see English translation, page 1; Figures 1 and 2). According to the teaching of D12 the top rotor shall have a peripheral speed of 60-180 m/s, which represents an increase of the prior art using 10-50 m/s (see English translation, page 1, eighth paragraph; and claim 1). All other process parameters of the process of D12 may correspond to those of the prior art, including the increase of the peripheral speed from the top rotor to the last rotor (see English translation, page 1, seventh paragraph). D12 reveals three examples designated "this invention". The first two of them were made with rotational speeds of the second rotor being higher than the first (distributing) rotor; only example III was made with a lower speed of the second rotor (see English translation, page 3, examples I to III). Although the best result was achieved with said example III the teaching of D12 cannot be restricted to this example since the general teaching of D12 is to use a specific peripheral speed of the first rotor, particularly since the differences between the results

of examples I to III, i.e. 3.2%, 3.0% and 2.6% shot reduction of shot of ≥ 297 µm, respectively, are relatively small and represent also an improvement when compared to the value of 5.8% of the comparative example (see English translation, page 3, Table). In this context it is remarked that according to industry standard "shot" material is normally defined as including fibres of > 63 µm and not only - as stated in the patent in suit - of fibres of > 250 µm. From the data given for the examples, acceleration field values can be calculated taking account of the commonly used rotor diameters in the range of from 100 to 400 mm (compare BMB5) which results in the examples falling within the range of feature f) of claim 1. Angles B and C were derived from Figure 1 of D12 and their values of about 55° and about 10°, respectively are within the ranges of features g) and h). The criticality of these angles has not been shown and such values belong to the prior art, e.g. D1.

Thus claim 1 of the main request lacks an inventive step.

Two features were added into claim 1 of the first auxiliary request. The restriction to four rotors makes no difference since D12 discloses a four-rotor system. The increase of the acceleration field from rotor to rotor is typical for these systems since the viscosity of the melt increases from step to step due to the cooling of the melt. This increase of rotational speed from the first rotor to the subsequent rotors was known from D12 and the principle was also applied in the comparative example in the patent in suit reflecting the prior art. Taking account of the diameter data of

D1, mentioning diameters of 5 inch to 10 inches, i.e. 128 mm to 256 mm, and applying them onto the peripheral speeds of D12 the first rotor has an acceleration field of 68.9 km/s^2 while the second rotor has 81.0 km/s^2, i.e. a ratio of about 1.2. Furthermore, in the context of these cascade spinner machines tolerances of 10-20% should be considered so that an increase of the acceleration field of about 10% of the rotors is within the tolerance range. The skilled person taking account of the principle of viscosity increase from step to step would result in such an increase of the velocity/acceleration field in order to optimise the process. There is no teaching in D12 to decrease the peripheral speed of the further rotors as proven by examples I and II. The skilled person would read the claim to derive the general teaching of D12, which is the increase of the speed of the first rotor. Annex B is silent with respect to ratios of acceleration fields between the individual rotors of the 4-rotor system and thus not relevant. Therefore claim 1 of the first auxiliary request lacks an inventive step.

IX. The respondent (patent proprietor) argued essentially as follows:

Claim 1 of the main request corresponds to claim 9 as granted and is based on claims 1 and 10 and page 8, lines 1 to 4 and lines 21 to 25 of the application as originally filed (WO-A-92 12939). Claim 1 thus meets the requirements of Article 123(2) and (3) EPC. Novelty of process claim 1 of the main request was no longer disputed by the appellant.

Decision T 372/98 concerned only the apparatus claims and not the process claims. An apparatus is capable of performing certain processes while a process is a specific combination of features and parameters for doing something. D1 is unique for disclosing an angle C of 19° and does not represent a typical document for a spinner cascade apparatus and would produce about 40% "shot". The small rotor thereof should not be enlarged and has a V-shaped distributor roll. The skilled person would have to totally redesign the apparatus of D1. The problem to be solved starting from D1 is the provision of a more efficient process with reduced "shot" and improved fibre distribution. This problem is solved by claim 1. Angle B is critical at high acceleration fields as proven by the experiments underlying Annex A which shows the best result at an angle B of 60° while at 30° (corresponding to D12) it is comparable with the prior art. These experiments were made with a four-rotor system and show the fibre ratio between the third and fourth rotors.

D3 deals primarily with ceramic fibres which can only be made with a two-rotor system and tilts the rotors to reduce the "shot". Furthermore, the value of 79.2 km/s^2 of the acceleration field is taken from the control example while actually higher values of from about 150 to 164 km/s^2 are suggested (see column 6, Table) which cannot be transferred to D1 and plugged in there.

D13 contradicts the appellant's arguments since it teaches that angle B (the value of angle in the first line of Table 2 corresponds to angle B) within a range of 10-80° does not make a large difference. This fact

is accepted since the acceleration field according to D13 is low.

An angle of 55° deduced from the drawing of D12 according to BMB6 is contradicted by the teaching of the description of D12 which discloses a value of 30°. D12 is concerned with problems from the melt spreading axially about the rotor and concentrates on the speed of the rotors which make the width of the melt smaller. Acceleration fields are neither mentioned nor known. The data from BMB5 show that depending upon the wheel diameter that you pick, you may or may not obtain an acceleration field according to claim 1 when starting from the peripheral speeds taken from D12. According to D12 the second rotor should not be faster than the first one (see example III), which contradicts feature e) of claim 1. Furthermore, angle B is 30° and angle C is missing. The problem to be solved with respect to D12 is the provision of an alternative process as the shot reduction is about the same. The advantage of reduction of spontaneous variability in fiberising conditions of the optimised process was not found before the priority date but is an indication of the inventiveness.

The trial and error approach cannot be applied in this technical field to optimise the parameters since it takes a long time and is very expensive. Therefore claim 1 of the main request involves an inventive step.

The additional features of claim 1 of the first auxiliary request can be found on page 8, lines 5 to 9 of the application as originally filed. Therefore the requirements of Article 123(2) and (3) EPC are met.

The data according to Annexes A and B show a comparison based on a particular set of features of a four-rotor system which, although not stated in the accompanying letter, was made with increasing acceleration field ratios of the subsequent rotors 2 to 4. These data show an improvement.

There exist doubts as to whether D12 works as it states it would. In any case there are six differences between claim 1 and D12:
- there is a selection of rotation speed of rotors, whereas there is the same or slower rotational speed according to D12;
- the rotational acceleration field is 50 to below 100 km/s^2, which is not known from D12 at all, let alone from the examples;
- the criticality of the acceleration field;
- the selection of angle C which is not mentioned in D12 at all;
- the selection of angle B of 40-65° which according to D12 is 30°;
- the two extra features concerning the second rotor and its increased acceleration field being within a specific range and concerning the subsequent rotors and their acceleration field, which is not mentioned in D12 and excluded by its best example III. Therefore claim 1 of the first auxiliary request involves an inventive step.

Reasons for the Decision

Main request

1. *Allowability of amendments (Article 123(2) and (3) EPC)*

Claim 1 of the main request corresponds to claim 9 as granted and is based on claims 1 and 10 of the application as originally filed (=WO-A-92 12939), while the additional features of claim 1 "that it gives an acceleration field of 50 km/s^2 **and below 100 km/s^2**" and "**and the melt strikes the top rotor (4) at a position that makes an angle (B) of from 40° to 65°above the horizontal**" (emphasis added by the Board) have a basis in the description at page 8, lines 1 to 4 and lines 21 to 25 of the application as originally filed. By incorporating these further features into claim 1 of the main request the subject-matter of process claim 9 as granted has been restricted.

Consequently, claim 1 of the main request meets the requirements of Article 123(2) and (3) EPC.

2. *Novelty (Article 54 EPC)*

Novelty of the subject-matter of process claim 1 of the main request was not disputed by the appellant. The Board is satisfied that none of the submitted documents, particularly neither D1, D3, D12 nor D13, discloses a process having all the features of claim 1.

The Board therefore concludes that the subject-matter of claim 1 of the main request is novel with respect to these documents.

3. *Inventive step (Article 56 EPC)*

3.1 Document D12 discloses a process for the production of inorganic fibres such as rock wool and glass wool using a multiple rotary drum type fibre forming apparatus wherein the outer peripheral speed of the first rotary drum is within the range of from 60-180 m/s. D12 aims to reduce the amount of "shot" and to increase the yield of fibres (see English abstract; Figures 1-3; see English translation, page 2, claim and third and fourth paragraphs). D12 states that conventionally the rotating speeds were gradually increased from the first drum (see English translation, page 2, seventh paragraph; page 3, fourth paragraph) and that the inventors made the rotating speed of the first rotary drum higher than that of the second rotary drum (see translation, page 3, fifth paragraph) - which statement seems to be inconsistent with claim 1, with the examples I and II being stated to be "this invention" (see English translation, page 4, example and Table) and with the effect of the invention (see English translation, page 4, fourth paragraph). From said examples (made with peripheral speeds of the first drum of 66.4, 88.6 and 110.7 m/s, respectively and outer peripheral speeds of 101.8 m/s of drums 2 to 4) it can be derived that making the peripheral speed of the first drum 60-120 m/s reduces the amount of shot and increases the yield of fibres (see translation, page 4, Table and third paragraph).

3.1.1 D12 does not specify any diameter of the drums/rotors. No angles between the lines joining the axes of drums/rotors are disclosed. Only for the examples does

D12 mention that the molten raw material was caused to flow down to a spot 12 inclined by 60° to the left from the top of the first drum (see English translation, page 4, example; and Figure 1).

3.1.2 Based on trigonometry, an angle B can be calculated for the examples of D12 which is 90° minus 60°, i.e. 30°, so that the appellant's arguments concerning a value of 55° cannot be accepted.

3.1.3 Although D12 does not explicitly specify a melting temperature of the molten mineral material it must fall into the broad range of 1300-1700°C specified in claim 1 since also D12 produces mineral wool and because the melting temperature of the mineral material typically is within the range of from 1400-1600°C (compare patent, page 2, lines 37 to 41).

3.2 Taking account of paragraph 3.1 above document D12 is considered to represent the closest prior art for process claim 1.

3.2.1 D12 is additionally considered to meet all criteria for determining the closest prior art as set out in the existing Case Law of the Boards of Appeal (see Case Law of the Boards of Appeal of the European Patent Office, 4th edition 2001, sections I.D.3.1 to I.D.3.5).

3.2.2 This is because the process according to D12 also aims to reduce the amount of "shot" and has many of the relevant features in common with process claim 1 and thus requires a minimum of structural modifications although it does not mention an acceleration field.

3.2.3 This is also supported by the fact that D12 (published in 1988) represents a much more recent prior art than D1 (published in 1964) which aims to provide a 3-rotor spinning system for the manufacture of inorganic fibres, particularly of mineral wool such that no substantial uncontrolled spattering of molten material occurs in producing high quality fibre at relatively high rates, and to enhance the collection of long, relatively shot-free fibre (see D1, column 1, lines 9 to 20, lines 52 to 57, and lines 64 to 66).

3.2.4 Therefore, the appellant's first line of arguments that D1 should be considered to represent the closest prior art because it was considered as such in decision T 374/98 cannot be accepted. The present Board is not bound by the opinion of a previous Board regarding the patent addressed to an apparatus. Establishing the closest state of the art is thus not *res judicata* vis-à-vis process claims.

3.3 *Problem to be solved*

3.3.1 The process according to claim 1 of the main request therefore comprises the following novel features not disclosed or mentioned in D1:

a) an acceleration field of the first (top) rotor according to feature f) in the range of 50 km/s^2 and below 100 km/s^2,
b) an angle C according to feature g) in the range of from 0-20° below the horizontal, and
c) an angle B according to feature h) within the range of from 40-65°.

3.3.2 In this context the Board remarks that no evidence has been submitted by the respondent that the differences mentioned under points b) and c) are actually critical.

However, annexes A and B seem to have been plotted to show that once angle B is within the range claimed the spread of ratios is narrow and low, provided that the acceleration field is high.

The patent in suit is silent as to what happens if angle C has a value of 0° or what would happen if it were 20°; the same is valid with respect to the range of angle B (see patent, page 4, lines 49 to 54; page 6, lines 5 to 9). The comparison in the patent in suit of an example made in accordance with the invention using an angle C of 9° with an example made in accordance with process described in the prior art GB-A-1559117 using an angle C of 26° does not allow to deduce the influence of angle C since there are too many other parameters which are different.

The Board further notes that Annex B would not appear to be relevant since it concerns a comparison of an unspecified "low" acceleration field with an unspecified "high" acceleration field at only three angle B values of 30°, 45° and 60°, whereas independent claim 1 specifies a range of from 40 to 65°. Thus no tests were carried out at the end points of the range, i.e. 40° and 65°. Furthermore, also a further point above the maximum value of 65°, e.g. 70° is missing in order to prove a purposive selection of said angle B range. Taking account of the process tolerances, as argued by the appellant, it appears that the results at angles of 30° and 45° are about the same for both, the

"low" and the "high" unspecified acceleration fields, so that at least the value of 40° appears to be arbitrarily chosen. The Board thus does not see an effect in the lower part of the angle B range. Furthermore, it is not known whether or not the experiment with a "high" acceleration field was made within the range of 50 km/s^2 to below 100 km/s^2 according to claim 1. Although an effect appears to be visible at 60° but demonstrated to occur at a single point cannot support an inventive step for the whole range, particularly when considering that a further point above the upper limit of 65° of angle B - to prove a purposive selection - has not been provided. Furthermore, as already indicated Annex B does not specify all essential parameters of the comparison of the two processes. Annex B is therefore not relevant even without taking the further step of considering whether the test has shown that there is actually an effect at these points in the range of claim 1.

3.3.3 The alleged advantage - based on Annexes A and B - of reduction of spontaneous variability in fiberising conditions of the process has no basis in the application as originally filed so that this alleged advantage in accordance with the Case Law (see Case Law of the Boards of Appeal of the European Patent Office, 4th edition 2001, sections I.D.4.5 and I.D.7.7.1) cannot be considered.

3.3.4 The respondent argued that the invention aimed at efficient production of mineral wool fibres and the minimisation of "shot", reduced fibre diameter and improved (lower) thermal conductivity (see patent, page 2, line 40; page 3, line 36; page 7, lines 26 to

29 and page 8, lines 26 to 29). However, the respondent has not submitted any comparison of the process and resulting product according to claim 1 with the processes and their resulting products of the most relevant prior art documents D1 and D12. Consequently, a more demanding technical problem including an improvement of the mineral wool fibres cannot be formulated since it has not been proven that such a problem has actually been solved.

3.3.5 The objective technical problem to be solved with respect to the process of D12 is thus the provision of an alternative process which allows the reduction of "shot" (compare patent in suit, page 3, lines 32 to 37).

3.4 *Solution to the problem*

The problem as defined in paragraph 3.3.5 above is solved by a process as defined in claim 1 of the main request.

It is credible that the claimed measure provides a solution to the technical problem (see the single example of the patent in suit).

3.5 The Board considers, however, that the subject-matter of claim 1 of the main request is obvious to the person skilled in the art for the following reasons:

3.6 D12 discloses a four-rotor system for making mineral wool fibres so that features a), b), c) and d) of claim 1 are fulfilled since the axes of said rotors are commonly horizontally arranged (see English translation, page 1; Figures 1 and 2). According to the teaching of

D12 the top rotor shall have a peripheral speed of 60-180 m/s, which represents an increase of the prior art using 10-50 m/s (see English translation, page 1, eighth paragraph; and claim 1). D12 reveals three examples designated "this invention". The first two of them were made with rotational speeds of the second rotor being higher than that of the first (distributing) rotor; only example III was made with a lower speed of the second rotor (see English translation, page 3, examples I to III).

3.6.1 Although the best result with respect to "shot" reduction was achieved with said example III the teaching of D12 is not restricted to this example, firstly since the general teaching of D12 is to use a specific peripheral speed of the first rotor, and secondly since the differences between the results of examples I to III, i.e. 3.2%, 3.0% and 2.6% shot reduction of shot of $\geq$ 297 µm, respectively are relatively small and represent also an improvement when compared to the value of 5.8% of the comparative example (see English translation, page 3, Table). Consequently, the respondent's arguments in this respect - that the teaching should be restricted to example III - cannot be accepted.

3.6.2 The Board holds that the skilled person trying to carry out the teaching of D12 would assume that rotors having the most common diameters have to be used (compare D1, column 3, lines 38 to 49; D3, column 4, lines 18 to 21; D13, page 365, Table 1). From the peripheral speed data given for the three examples the skilled person thereby can calculate acceleration field values taking account of the commonly used rotor diameters in the range of

from 100 to 400 mm (compare BMB5). As a consequence diameters of from 100 mm to 175 mm according to example I, diameters of from 175 to 300 mm according to example II and diameters of from 250 to 400 mm according to example III fall within the acceleration field range of feature f) of claim 1. This fact has been admitted by the respondent during the oral proceedings.

3.6.3 All other process parameters ranges of the process according to D12 are wide enough to be able to correspond to those of the prior art, such as an increase of the peripheral speed from the top rotor to the last rotor (see English translation, page 1, seventh paragraph) or specific angles such as angles B or C. Therefore angle B is not restricted to the value of 30° which was used according to the examples of D12.

The respondent's arguments to the contrary cannot be accepted by the Board since the teaching of D12 is not limited to the parameters disclosed by example III. The skilled person learns from D12 that generally the peripheral speed of the top rotor has to be increased to a certain range and that this teaching represents the core of invention of D12.

3.6.4 According to BMB4a and BMB4b taking account of a combination of melt radius (based on a certain melt load) and rotor diameter the angle B can potentially be selected anywhere between 21.0° and 86.2° (which is in good agreement with the range of about 10 to 80° according to D13; see D13, Table 2 and Figures 11 and 12) so that the melt - at least in theory - would be poured exactly onto a quarter of the rotor surface. It

practice, however, to be on the safe side and in order to reduce the amount of "shot" the skilled person would use only a smaller angle range since the whole diameter of the melt has to be considered. This implies that a certain distance away from the extreme points at the top and at the left edge of the shown rotor has to be kept (compare BMB4a). Consequently, a range of 40-65° for angle B covers most of said theoretically available range which in practice is even smaller. Consequently, said range of 40-65° is not narrow compared to said theoretical range in the sense of a selection. Furthermore, the Board holds that the skilled person normally would either start in the middle of a possible range or at least try the same. Thereby the skilled person when carrying out the process of D12 would fall into the range of feature h) of claim 1.

Consequently, the respondent's arguments in this respect cannot be accepted.

3.6.5 In this context the respondent admitted during the oral proceedings before the Board that the problem underlying the patent in suit represents an optimisation of many parameters, except the acceleration field, which *per se* belong to the prior art. Furthermore, it stated that the trial and error approach cannot be applied in this technical field to optimise the parameters since it takes a long time and is very expensive. The last arguments cannot be accepted since all experiments take a certain time to be carried out and normally high costs do not prevent the skilled person from carrying out such trial and error experiments. On the contrary, the skilled person is expected to fine tune the parameters in order to

optimise a known process, since the expensive nature of a cascade spinner machine makes it particularly essential to save on costs through an efficient process, even when the optimisation may include a change of parts of the apparatus itself.

3.6.6 D12 does not specify any angle C. First of all, the respondent has not proven that this angle is actually critical for the process (compare point 3.3.2 above). Secondly, in the case that a specific parameter is not mentioned in the document in question the skilled person is expected to have a look to another prior art document of the same technical field, e.g. D1, which discloses a corresponding angle of 19° (see column 4, lines 20 to 22). Since there exists no prejudice to use such an angle of 19° the Board considers that the skilled person would use such a value. Thereby the skilled person would arrive at the solution as defined in claim 1 of the main request.

The respondent argued that D1 would be unique for disclosing an angle C of 19° and does not represent a typical document for a spinner cascade apparatus but failed to prove this allegation by submitting any evidence. Consequently, this argument cannot be accepted. The Board also does not find the argument convincing that the skilled person would not look to D1 because of its age.

3.7 The Board therefore concludes that the subject-matter of claim 1 of the main request lacks an inventive step (Article 56 EPC).

The main request is thus not allowable.

First auxiliary request

4. *Allowability of the amendments (Articles 123(2) and (3) EPC)*

The additional features of claim 1 of the first auxiliary request have a basis at page 8, lines 5 to 9 of the application as originally filed.

By adding these features the subject-matter of claim 1 of the first auxiliary request has been further restricted compared to that of claim 9 of the patent as granted.

Consequently, claim 1 of the first auxiliary request meets the requirements of Article 123(2) and (3) EPC.

5. *Novelty (Article 54 EPC)*

Novelty of process claim 1 of the first auxiliary request was not disputed by the appellant. Since claim 1 of the first auxiliary request was further restricted compared to claim 1 of the main request the conclusion of the Board concerning the main request (see point 2 above) applies *mutatis mutandis* to claim 1 of the first auxiliary request.

The subject-matter of claim 1 of the first auxiliary request is thus novel with respect to the documents considered.

6. *Inventive step (Article 56 EPC)*

6.1 Claim 1 according to the first auxiliary request differs from claim 1 of the main request in that the apparatus has been restricted to "**four**" rotors and that **"the second rotor in the set has a size and is rotated at a speed such that it gives an acceleration field of 1.1 to 2 times the acceleration field of the top rotor (4), and the acceleration field on each subsequent rotor is 1.2 to 1.6 times the acceleration field on each preceding rotor**".

6.2 The process according to D12 uses a four-rotor apparatus.

The conclusions concerning Annexes A and B in paragraph 3.3.2 above are also valid for the first auxiliary request, particularly since Annexes A and B as well as the accompanying letters are silent with respect to an increasing acceleration field ratio of the subsequent rotors 2 to 4, let alone the ratios now specified in claim 1. The respondent's arguments in this respect thus cannot be accepted.

6.3 *Problem to be solved*

The process according to claim 1 of the first auxiliary request therefore comprises just the added features concerning the increasing acceleration fields which are not disclosed in D12.

The objective technical problem to be solved with respect to the process of D12 is thus still the provision of an alternative process which allows the

reduction of "shot" (compare patent in suit, page 3, lines 32 to 37).

6.4 *Solution to the problem*

The problem as defined in paragraph 6.3 above is solved by a process as defined in claim 1 of the first auxiliary request.

It is credible that the claimed measures provide a solution to the technical problem (see the example of the patent in suit).

6.5 The Board considers, however, that the subject-matter of claim 1 of the first auxiliary request is obvious to the person skilled in the art for the following reasons:

6.6 The respondent argued that there would be six differences with respect to D12 and that the teaching of D12 would contradict a process according to claim 1. These arguments cannot be accepted for the following reasons:

6.6.1 First of all, as already stated in points 3.6.1, 3.6.3, 3.6.4 and 3.6.6 above, the teaching of D12 is not restricted to the embodiment according to example III and consequently the skilled person would select angle B and angle C values within the ranges of the features g) and h) of claim 1. Furthermore, the acceleration field corresponds to the majority of the results of the specified peripherals speeds of D12 when combined with the most common rotor diameters of the prior art (see BMB5) so that the skilled person would arrive at this

result in applying the general knowledge in this technical area.

6.6.2 Secondly, taking account of its teaching and of the fact that the teaching of D12 is silent with respect to a prejudice of increasing the rotational speed of the subsequent rotors 2 to 4 there exist theoretically three possibilities:

a) the rotors 2 to 4 can have the same peripheral speed which is higher than that of rotor 1;
b) the speed of rotor 2 can be lower than that of rotor 1; and
c) the rotors 2 to 4 can have a gradually increased speed in accordance with the prior art.

6.6.3 As convincingly argued by the appellant the increase of the acceleration field from rotor to rotor is typical for these cascade spinner systems since the viscosity of the melt increases from step to step due to the cooling of the melt. This - conventional - increase of rotational speed from the first rotor to the subsequent rotors was known from D12 (see English translation, page 2, seventh paragraph; and page 3, fourth paragraph) and the principle was also applied in the comparative example in the patent in suit reflecting the prior art.

Therefore, taking account of the viscosity increase from step to step, the skilled person would increase the peripheral velocity and the acceleration field in the subsequent rotor steps in order to optimise the process. The specific ranges for the ratios of the acceleration fields specified in the claims are broad and there is no evidence of any special effect.

Thereby the skilled person, however, would arrive at the subject-matter of claim 1 of the first auxiliary request without an inventive step.

6.7 Therefore claim 1 of the first auxiliary request does not meet the requirement of Article 56 EPC.

The first auxiliary request is therefore not allowable.

6.8 The Board thus considers that neither of the respondent's requests is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

G. Nachtigall C. Holtz