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**D E C I S I O N**  
**of 11 October 2004**

**Case Number:** T 0806/01 - 3.3.5

**Application Number:** 96910129.4

**Publication Number:** 0821617

**IPC:** B01F 5/06

**Language of the proceedings:** EN

**Title of invention:**  
Mixing

**Applicant:**  
Watson Brown HSM Ltd.

**Opponent:**  
-

**Headword:**  
Mixing/WATSON BROWN

**Relevant legal provisions:**  
EPC Art. 54(1), 56

**Keyword:**  
"Novelty - yes"  
"Inventive step - yes, non-obvious alternative"

**Decisions cited:**  
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**Catchword:**  
-



Case Number: T 0806/01 - 3.3.5

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.5  
of 11 October 2004

**Appellant:** Watson Brown HSM Ltd.  
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**Representative:** Coles, Graham Frederick  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 18 January 2001  
refusing European application No. 96910129.4  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** M. M. Eberhard  
**Members:** G. J. Wassenaar  
H. Preglau

## Summary of Facts and Submissions

I. European patent application No. 96910129.4, publication No. WO 96/33008, was refused by a decision of the Examining Division.

II. Ground of the decision was lack of novelty over

D2: DE-U-94 10 196.5.

It was also indicated that the subject-matter of the claims then on file lacked an inventive step over D2 in combination with

D1: GB-A-2 142 554.

III. The appellant lodged an appeal against this decision. In the statement of the grounds of appeal not only arguments in favour of novelty and inventive step were provided but it was also argued that the procedure followed by the Examining Division was not in agreement with the principles of the EPC. Reimbursement of the appeal fee was requested. During prosecution before the board new sets of claims were filed in reply to communications from the board. The final set of 12 claims, forming the basis of this decision, comprised two independent claims 1 and 7. These claims read as follows:

Claim 1:

"A mixer in which two members (1,2;23,28) are mounted for rotation relative one to the other about a central axis, and opposed grooved-surfaces (7) of the two

members (1,2;23,28) are spaced apart to define a gap (3) between them and are such that during the relative rotation one or more grooves (8;14;17;22,30) and lands (10) of each grooved surface are traversed within the gap (3) by one or more grooves (8;14;17;22,30) and lands (10) of the other grooved surface for subjecting material entered within the gap (3) to shearing and splitting, and the space within the grooves (8;14;17;22,30) reduces towards the axis and each groove (8;14;17;22,30) has walls that are mutually inclined to open outwardly from one another, characterised in that the two members (1,2;23,28) are mounted within a closely-fitting housing (6,21), that the grooving of each member (1,2;23,28) comprises one or more spiral grooves or parts of such grooves (8;14;17;22,30) for interacting with the traversing grooves (8;14;17;22,30) of the other member (1,2;23,28) to urge entered material progressively inwardly towards the central axis, and that the grooves (8;14;17;22,30) are of reducing width and depth inwardly towards the axis for creating increasing pressure on the material as it is urged progressively inwardly along the grooves (8;14;17;22,30) towards the central axis so that, aided by the inclined walls, it wells up from the grooves (8;14;17;22,30) into the gap (3) for extensional-shear and distributive mixing in the gap (3), and in welling up forces return movement of material in the gap (3) outwardly away from the central axis against the movement inwardly of material in the grooves (8;14;17;22,30)."

Claim 7:

"A method of mixing wherein material to be mixed is entered into a gap (3) defined between grooved-surfaces (7) of two members (1,2;23,28), and there is relative rotation between the two members (1,2;23,28) such that one or more grooves (8;14;17;22,30) and lands (10) of each grooved surface are traversed within the gap (3) by one or more grooves (8;14;17;22,30) and lands (10) of the other grooved surface so as to subject the material entered within the gap (3) to shearing and splitting, and the space within the grooves (8;14;17;22,30) reduces towards the axis and each groove (8;14;17;22,30) has walls that are mutually inclined to open outwardly from one another, characterised in that the two members (1,2;23,28) are mounted within a closely-fitting housing (6,21), that the grooving of each member (1,2;23,28) comprises one or more spiral grooves or parts of such grooves (8;14;17;22,30) for interacting with the traversing grooves (8;14;17;22,30) of the other member (1,2;23,28) to urge entered material progressively inwardly towards the central axis, and that the grooves (8;14;17;22,30) are of reducing width and depth inwardly towards the axis for creating increasing pressure on the material as it is urged progressively inwardly along the grooves (8;14;17;22,30) towards the central axis so that, aided by the inclined walls, it wells up from the grooves (8;14;17;22,30) into the gap (3) for extensional-shear and distributive mixing in the gap (3), and in welling up forces return movement of material in the gap (3) outwardly away from the central axis against the movement inwardly of material in the grooves (8;14;17;22,30)".

IV. The appellant's arguments may be summarized as follows:

D2 disclosed a method and an apparatus for transfer mixing, whereby the material was urged onwards in one rotational direction along each channel-space and was progressively transferred from a "giving" space to a "receiving" space where it was subject to rotation in the opposite sense. This required that the channels had vertical walls. A cross-section with inclined walls would be counter-productive and against the teaching of the art. The mixing procedure according to the invention, whereby the material urged inwardly towards the axis was mixed with material forced outwardly away from the axis, was completely different and required a different cross-section of the channels. The closest prior art was rather D1, which disclosed a mixing device comprising two opposite discs with grooved surfaces. The material entered through one of the discs into the mixing zone and moved outwardly to the periphery of the mixing discs. D1 did not disclose that the grooves of each member were curved and of reduced space towards the rotational axis for urging entering material towards the central axis nor that the material was caused to well up and to move outwardly away from the central axis. With the claimed mixer a better and more consistent mixing could be obtained.

V. The appellant requested that the decision under appeal be set aside and a patent be granted with claims 1 to 12, an amended description pages 1, 1a, 2, 2a, 3 to 11, 11a, 12 to 18, and drawing sheets 1 to 3, filed with the letter dated 14 September 2004. The original request for reimbursement of the appeal fee was

withdrawn (appellant's letter of 9 September 2004, last paragraph).

### **Reasons for the Decision**

1. The appeal is admissible.
  
2. Amended claim 1 and 7 have been limited with respect to claim 1 as originally filed by features which have been disclosed in original Figures 1 to 6 and 9 to 11 and their corresponding description (published PCT application, page 4, line 29 to page 8, line 5, page 8, lines 20 to 26 and page 9, lines 1 to 26). The extensional-shear mixing is clearly and unambiguously derivable from the passage on page 6, lines 11 to 14. Furthermore the term "extensional-shear mixing" is disclosed on page 12, lines 27 to 29. With respect to the characterising feature "one ore more spiral grooves of reducing width and depth inwardly towards the central axis" see also original claims 3 and 6. The independent claims 1 and 7, therefore fulfil the requirements of Article 123(2) EPC.

Dependent claims 2, 3, 4, 5, 8, 9, 10, 11, and 12 correspond essentially to original claims 4, 2, 7, 8, 15, 20, 21, 22, and 23 respectively. Dependent claim 6 corresponds to original claim 9 in combination with original Figure 11 and page 9, lines 9 to 12 of the published application. Thus also the dependent claims are in agreement with Article 123(2) EPC.

3. None of the documents on file discloses in combination all the features of the independent claims 1 and 7. These claims differ from the disclosure of D1 by their characterising features. They differ from the disclosure of D2 at least in that the spiral grooves have walls that are mutually inclined to open outwardly from one another, and in that the grooves are of reducing width and depth inwardly towards the axis so as to urge material inwardly towards the central axis and to cause its welling up and return movement outwardly away from the central axis. The mixer according to D2 is a transfer mixer, whereby the material is urged onwards in one rotational direction along each channel-space and is progressively transferred from a "giving" space to a "receiving" space where it is subject to rotation in the opposite sense (Figure 3). The argument of the examining division that a cross-section of the grooves as claimed is the "first and foremost cross-section which would occur to the skilled man" might be a valid argument for inventive step but not for novelty (point 2 of the reasons). For lack of novelty a feature need not be explicitly described, it may be inherently disclosed. In the latter case, however, it must be unambiguously clear that the inherently disclosed feature is the only, technically meaningful, possibility. In the present case there is no technical reason why the grooves in D2 inevitably have mutually inclined walls that open outwardly from one another. The subject-matter of the claims is therefore novel.



4. Since the mixer according to claim 1 is not a transfer mixer, D1, rather than D2, represents the closest prior art. D1 discloses a mixing device comprising a pair of grooved plates or discs of which at least one can be rotated with respect to the other so that the grooves of one plate or disc may cross the grooves of the other plate or disc (claims 1 and 2). The grooves can be arranged in various patterns and the cross-section of the grooves can be V-shaped, semicircular or wedge-shaped (page 3, lines 28 to 39). Several patterns are shown in Figures 5 and 6. The grooves are formed along straight lines. Spiral grooves or parts thereof are not disclosed. The material is introduced into the mixing zone between the discs through a feed port, it is then subjected to the mixing operation and the mixed product is discharged from the outer periphery of the discs, where it is collected in an annular vessel (page 2, lines 4 to 23 and Figures 1 and 2). Although the present application mentions several advantages of the claimed mixer such as improved quality characteristics of the mixed products (page 12, lines 16 to 21, page 13, lines 3 to 10), no specific advantage with respect to D1 has been put forward. It is stressed in the application (page 1, lines 6 to 9 of the published application) that the claimed mixer is especially applicable for heavy-duty mixing (ie mixing material having a viscosity of more than 3000 poise) but there is no evidence that the mixer according to D1 is not suitable for that purpose. In this respect the board notices that the use of the mixer for example for mixing fillers into plastics (page 1, lines 14 to 15 of the published application) is the same as disclosed in D1. The title thereof reads "Mixing-milling apparatus for plastics and fillers". Under these circumstances

the board can only consider as problem underlying the invention the provision of a further mixer and process for mixing high viscosity materials. According to the invention it is proposed to solve that problem by a mixer in which the two members which rotate relative one to the other have spiral grooves or parts thereof of reducing width and depth inwardly towards the axis such as to urge entered material progressively towards the central axis and to cause the welling-up and return movement of the material as defined in claims 1 and 7. It is undisputed that the mixer according to claim 1 and the process according to claim 7 actually solve that problem.

5. D1 does not suggest the use of spiral grooves having reducing width and depth inwardly towards the axis for urging the material towards the central axis and forcing material to well-up and to move outwardly away from the central axis. Since according to D1 the material is discharged from the periphery, the grooves rather urge the material outwardly away from the central axis.
  
6. D2 does disclose spiral grooves but they have the function of transporting the material in one rotational direction along each channel-space whereby the material is progressively transferred from a "giving" space to a "receiving" space where it is subject to rotation in the opposite sense (Figure 3). The board cannot see an obvious reason for combining the feature of using spiral grooves, known from D2, with a mixer according to D1, to create a material movement as defined in claim 1, which is not disclosed or suggested in either D1 or D2. The other citations are still farther away

from the subject-matter of the application and do not provide any incentive for the claimed solution of the above-mentioned problem either. The subject-matter of claims 1 and 7, therefore, involves an inventive step within the meaning of Article 56 EPC.

7. Claims 2 to 6 and 8 to 12 are dependent upon claims 1 and 7 respectively. The inventive step of their subject-matter follows from this dependency.
8. The description has been adapted to the amended set of claims. The amendments do not introduce subject-matter beyond the content of the application as filed. The amended description, therefore, fulfils the requirements of Article 123(2) EPC.
9. As already indicated in the previous communications from the board, in the board's view no substantial procedural violation took place during the opposition proceedings which would have justified the reimbursement of the appeal fee (Rule 67 EPC). The request for reimbursement of the appeal fee being withdrawn, it is not necessary to provide further reasons for this finding.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent on the basis of the following documents:

Claims 1 to 12; description, pages 1, 1a, 2, 2a, 3 to 11, 11a, 12 to 18; and drawings, pages 1/3 to 3/3 (Figures 1 to 9), all filed with the letter dated 14 September 2004.

The Registrar:

The Chairman:

A. Wallrodt

M. M. Eberhard