

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference see form PCT/ISA/220		FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/US2018/042613	International filing date (day/month/year) 18.07.2018	Priority date (day/month/year) 18.07.2017
International Patent Classification (IPC) or both national classification and IPC INV. C04B28/14		
Applicant UNITED STATES GYPSUM COMPANY		

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	Date of completion of this opinion see form PCT/ISA/210	Authorized Officer Kolb, Ulrike Telephone No. +31 70 340-0
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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1</u>
	No: Claims	<u>2-10</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-10</u>
Industrial applicability (IA)	Yes: Claims	<u>1-10</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

- D1 WO 2015/050804 A1 (UNITED STATES GYPSUM CO [US]) 9 April 2015
- D2 WO 2014/066079 A2 (UNITED STATES GYPSUM CO [US]) 1 May 2014
- D3 WO 2011/020528 A1 (CARGILL INC [US]; BILTRESSE STEPHANE [BE]; BREGOLA MASSIMO [IT]; FORIN) 24 February 2011
- D4 WO 2015/095600 A2 (STAV ELI [US]; MIATUDILA MA-IKAY [US]; WIGGINS SUSAN [US]) 25 June 2015
- D5 WO 2006/122095 A2 (NAT GYPSUM PROPERTIES LLC [US]; HILKEN MATTHEW M [US]; PETERSON DAVID) 16 November 2006
- D6 US 4 392 896 A (SAKAKIBARA SYOJI [JP]) 12 July 1983, cited in the application
- D7 US 2010/203317 A1 (SAHAY PARNIKA [GB]) 12 August 2010

2 Novelty (Art. 33(2) PCT)

2.1 The subject-matter of claims 3,4 and 6-9 is known from

- D1, since disclosed (paragraph [0024]; paragraph [0083]; paragraph [0093] - paragraph [0095]; paragraph [0100] - paragraph [0102]; paragraph [0111]; paragraph [0196]; claims 8,9) is a gypsum core made from a slurry comprising a pregelatinized, partially hydrolyzed starch having a cold water viscosity of 10 - 120 BU.
- D2, since disclosed (abstract; paragraph [0037]; paragraphs [0057], [0059]; paragraph [0078]; paragraph [0195] - paragraph [0196]; claims 1,3,6,8,12,13) is a gypsum core made from a slurry comprising a pregelatinized, partially hydrolyzed starch having a cold water viscosity of 20 - 300 BU.

2.2 The subject-matter of claims 2, 5 and 10 is known from

- D3, since disclosed (page 7, line 8 - line 29; page 9; example A; table 1) is a gypsum core made from a slurry comprising C*Plus 05483 standard thinned starch of peak viscosity 332 BU.
- D4, since disclosed (page 3, line 7 - line 20; abstract; claims 3,11,13) is a gypsum core made from a slurry comprising C*Plus 05483 standard thinned starch of peak viscosity 332 BU.

3 Inventive step (Art. 33(3) PCT)

3.1 The subject-matter of claim 1 differs from the product known from D1-D6 in that uncooked starch comprised in the set core disposed between two cover sheets of the gypsum board explicitly has a hot water viscosity of 20 - 300 Brabender Units when the viscosity is measured by the HWVA method.

3.2.1 Regarding the technical effect, the applicant describes

- (§5) that it is believed that uncooked starches having the viscosity as described herein allows for the starch molecules to move out of granules and thereby impart strength in the gypsum composition (e.g., containing an interlocking matrix of set gypsum) resulting from the stucco slurry.
- (§36) that such a type of uncooked starch results in lower water demand in gypsum slurries because of the high fluidity of the stucco slurry containing uncooked starches.
- (§46) that the uncooked starch having this hot water viscosity characteristic can be included in the slurry in a relatively low amount (solids/solids basis) and still achieve significant strength enhancement in the board.

3.2.2 However, the applicant did not provide any comparative examples with respect to the starches disclosed in D1 - D6; it is not even sure if one of the starches disclosed in D1-D6 does not inherently exhibit the hot water viscosity of 20 - 300 BU.

3.3 The technical problem to be solved is thus considered to provide an alternative starch that allows to achieve the same technical effect as the starches defined by peak viscosity and cold water viscosity defined in D1 - D4, but to express its characteristics by means of hot water viscosity.

3.4 Notwithstanding the objections regarding lack of clarity (see below, point 4), the technical solution defined in claim 1 cannot be considered to involve an inventive step, since starting from the composition known from D1, the skilled person might just need to perform a different method to determine the hot instead of the cold water viscosity in order to provide the same composition, just defined by different parameters.

Re Item VIII

Certain observations on the international application

4 Clarity (Art. 6 PCT)

Independent claims 1-3 attempt to define the uncooked starch by means of different functional features, namely by

- having a hot water viscosity of from 20 to 300 Brabender Units when the viscosity is measured by the HWVA method.
- having a peak viscosity of from 120 to 1000 Brabender Units when the viscosity is measured by putting the starch in a slurry with water at a starch concentration of 15% solids, and using a Viscograph-E instrument set at 75 rpm and 700 cmg, where the starch is heated from 25°C to 95°C at a rate of 3°C/minute, the slurry is held at 95°C for ten minutes, and the starch is cooled to 50°C at a rate of -3°C/minute.
- having a cold water viscosity at 10% of solids of from 5 to 50 centipoise when the viscosity is measured by a Brookfield viscometer method at 25°C.

4.1 Upon reading the claims 1-3, it is not clear if 3 different gypsum boards are claimed, which are not interrelated products or if the same gypsum board is defined in alternative ways upon defining three different functional features exhibited by the same uncooked starch.

4.2 Upon reading the description (§25,§26) it becomes apparent, that the uncooked starch needs not to be added to the slurry under the conditions defined in claims 1-3. Furthermore, the hot, peak and cold water viscosities specified in claims 1-3 do not by itself contribute to the strength enhancement in a resulting board. However, since the origin of the uncooked starch is not relevant (may be tapioca, wheat, potato, corn, etc.) the definition of the uncooked starch by viscosity properties offers the possibility to cover a whole scope of starch types, as long as they exhibit the same rheology properties when tested in the laboratory.

4.3 However, upon choosing this way of expression, the applicant puts an undue burden on the skilled person that would like to use the slurry composition as a starting point for his own invention. How many uncooked starches would the skilled person need to test in his own laboratory in order to find at least one that complies to the

defined characteristics? Furthermore, how would the examiner know, if a uncooked starch used in a prior art slurry composition would fulfil these rheology requirements if the author of the document does not explicitly disclose these viscosity values?

4.4 It seems that there are other - and possibly better - ways to characterize a starch, namely by means of its molecular size and molecular weight.

4.5 With respect to the embodiments, wherein acid-modified starch was used, it seems that the applicant attempts to define the starch by means of "what has not been done to it" rather than specifying "what has been done to it". An acid modified starch is just one possible starch that was modified upon not being cooked. Does a substituted or complexed or hydrolyzed starch fall under the scope of the term "uncooked starch"?

4.6 Furthermore, the term "uncooked starch" is misleading, since it obviously does not refer to raw resp. virgin starch, but a type of processed starch that did not undergo thermal treatment.

4.6 Is peak viscosity synonymous to mid-range viscosity?

4.7 It is understood from the prior art, that pre-gelatinization may be obtained by processes other than cooking.

5 Support (Art. 6 PCT)

While independent claims 1-3 formulate "uncooked starch", 3 specific types of "uncooked acid-modified corn starches" are used throughout the embodiments. The scope of the claims might thus need to be further limited.