(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 October 2012 (18.10.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/139510 A1

(51) International Patent Classification:
E04C 2/288 (2006.01) *B32B 3/06* (2006.01)
E04F 15/10 (2006.01) *B32B 37/12* (2006.01)

(21) International Application Number:
PCT/CN2012/073933

(22) International Filing Date:
12 April 2012 (12.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
201110090747.7 12 April 2011 (12.04.2011) CN

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

WO 2012/139510 A1

(54) **Title**: BUILDING BOARDS AND METHOD FOR MANUFACTURING THE SAME

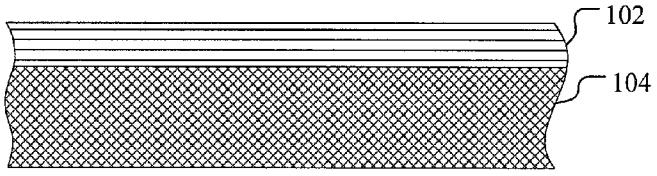

Fig. 1

(57) **Abstract**: Building boards and method for manufacturing the same are provided. The building board comprises a cement layer (102) and a magnesium oxide layer (104). The method for manufacturing the building board comprises the steps of providing a cement board and a magnesium oxide board, dehydrating and binding the cement board and the magnesium oxide board. The performance of moisture proofing, fungus proofing, erode proofing, fireproof and others can be improved by utilizing the building boards.

BUILDING BOARD AND THE METHOD FOR MANUFACTURING THE SAME

TECHNICAL FIELD

[0001] This invention relates generally to the field of building decoration materials technology, and more particularly to a building board and the method for manufacturing the same.

BACKGROUND OF THE INVENTION

[0002] A conventional building board, such as laminate flooring, comprises 2 or 3 wooden layers to make the flooring stable. For 3-layer wooden building boards, an outer layer is generally made of wooden material having certain wood grain patterns, and the surface thereof can be further coated with paints to improve the decorative effect; and an inner layer is normally made of wooden layers with plywood structure or other cheaper woods. The wooden layers of the inner layer provide effects of buffering and soundproofing, thus it further improves user experience.

[0003] However, in practical applications, the building board made of wooden layers is easy to corrode and deform after water ingress or wetting, or deform under humid conditions, and therefore the user experience is affected. Moreover, the manufacturing of wooden building board needs a huge amount of wood with high-energy consumption, which could severely destroy the natural environment.

SUMMARY OF THE INVENTION

[0004] There is a need to provide a building board that features erode proofing, free of deformation, and more environment-friendly.

[0005] Accordingly, in an embodiment of the present invention, a building board is provided,

and the building board comprises a cement layer and a magnesium oxide layer.

[0006] Alternatively, the cement layer and the magnesium oxide layer are bound with glue.

[0007] Alternatively, the cement layer comprises cement and glass fiber.

[0008] Alternatively, the cement layer has a thickness from 2 to 20 millimeters.

[0009] Alternatively, the magnesium oxide layer has a thickness from 8 to 15 millimeters.

[0010] Alternatively, the cement layer has a density from 1.1 to 1.8 g/cm^3.

[0011] In another embodiment of the present invention, a laminate flooring is provided. The laminate flooring comprises a cement layer and a magnesium oxide layer.

[0012] Alternatively, the laminate flooring further comprises a buffer layer, wherein the buffer layer is connected with the magnesium oxide layer.

[0013] Alternatively, the buffer layer comprises rubber or plastics.

[0014] Alternatively, the laminate flooring is shaped as square, rectangle, parallelogram, hexagon or octagon.

[0015] Alternatively, the laminate flooring is covered with a protective coating.

[0016] Alternatively, the protective coating is oil or varnish.

[0017] Alternatively, each side of the laminate flooring has tongue or groove to joint to each other, or has click system to joint to each other.

[0018] In a further embodiment of the present invention, a laminate door is provided. The laminate door comprises a cement layer and a magnesium oxide layer.

[0019] Alternatively, the laminate door further comprises a frame, wherein the frame is placed

around the edge of the building board.

[0020] Alternatively, the frame comprises metal, wood or plastics.

[0021] In a further embodiment of the present invention, a laminate flooring is provided. The laminate flooring comprises cement layer and wooden layer.

[0022] In a further embodiment of the present invention, a method for manufacturing the building board provided. The method comprises the steps of: providing a cement board and a magnesium oxide board; dehydrating the cement board and the magnesium oxide board; and binding the cement board and the magnesium oxide board.

[0023] The building board of the present invention utilizes cement layer as the surface, which significantly improves its duration. The building board of the present invention has features of moisture proofing, mould and fungus proofing, erode proofing, fireproofing, soundproofing and free of deformation. Moreover, since the use of wood can be reduced, the building board of the present invention reduces the influence to the natural environment effectively.

[0024] Furthermore, the use of magnesium oxide board further improves the performance of the building board. Compared with the conventional wooden building boards, the building board of the present invention has better flexibility, and easier to cut.

[0025] These and other features of the present invention will be elucidated in the following embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Features, objects and advantages of the present invention can be easily understood with the reference to detailed description of the non-limiting embodiments taken in conjunction with the accompanying drawings, in which:

[0027] Figure 1 illustrates a cross section view of a building board according to an embodiment of the present invention;

[0028] Figure 2 illustrates a cross section of a building board according to another embodiment of the present invention;

[0029] Figure 3 illustrates an overview of a laminate flooring according to a further embodiment of the present invention;

[0030] Figure 4 illustrates a laminate door according to a further embodiment of the present invention;

[0031] Figure 5 illustrates a flowchart of a method for manufacturing the building board according to an embodiment of the present invention;

[0032] Figure 6 illustrates a cross section of a laminate flooring according to a further embodiment of the present invention.

[0033] DETAILED DESCRIPTION OF EMBODIMENTS

[0034] The embodiments of the present invention are discussed in details below with reference to the accompanying drawings.

[0035] Figure 1 illustrates a cross section view of a building board according to an embodiment of the present invention. The building board comprises a cement layer 102 and a magnesium oxide layer 104. In practical applications, the building board can be used as laminate flooring, or laminate door of kitchen, cupboard and the like.

[0036] When the building board is installed on the ground as laminate flooring, the magnesium oxide layer 104 is positioned close to the ground, for example, on a cement floor or brick floor, and the cement layer 102 is positioned away from the ground. Therefore, with reference to the

ground, the building board comprises the cement layer 102 and the magnesium oxide layer 104 in a top-down order. In an embodiment, the cement layer 102 and the magnesium oxide 104 are bound together with glue.

[0037] Compared with the wooden inner layer of the conventional wooden building boards, the magnesium oxide layer 104 of the building board of the present invention has better flexibility. The magnesium oxide layer 104 has features of nice moisture proofing, mould and fungus proofing, erode proofing, fireproofing, and free of deformation. Moreover, the magnesium oxide layer 104 also has the feature of soundproofing, and therefore the overall soundproof ability of the building board is improved. Thus, this building board is suitable for flooring pavement in storied buildings, or building doors such as kitchen door and the like.

[0038] The cement layer 102 of the building board may comprise cement and glass fiber. The density of the cement layer 102 can be precisely controlled by adjusting the composition of the cement and glass fiber. In an embodiment, the cement layer 102 has a density of 1.1 to 1.8 g/cm^3. Furthermore, since the cement layer 102 has a hard surface and is not easy to wear out, and it also has features of nice moisture proofing, mould and fungus proofing, erode proofing, fireproofing, and free of deformation, and therefore the building board of the present invention is more durable compared with conventional building boards using wooden material.

[0039] In practical applications, the capability of moisture proofing and anti-deformation of the building board changes with the thickness of the cement layer 102 and the magnesium oxide layer 104. In a specific embodiment, the cement layer 102 has a thickness from 2 to 20 millimeters. In another embodiment, the magnesium oxide layer 104 has a thickness from 8 to 15 millimeters. Such configuration in thickness ensures that the building board has perfect performance of anti-deformation and soundproofing. Moreover, since wood which is currently

used with huge consumption has been substituted by the cement layer 102 and the magnesium oxide layer 104, the building board of the present invention reduces the influence on the natural environment with cheaper manufacturing costs.

[0040] Preferably, the building board of the present invention can further comprise a heating device. For example, the heating device is configured outside the magnesium oxide 104. Since heat coming from the heating device can spread easily and fast through the magnesium oxide layer 104 and up into the room, and the magnesium oxide layer 104 can also keep warm longer, the magnesium oxide layer 104 is better for floor heating

[0041] Figure 2 illustrates a cross section view of a building board according to another embodiment of the present invention. The building board comprises a cement layer 202, a magnesium oxide layer 204 and a buffer layer 206, wherein the buffer layer 206 is connected to the magnesium oxide layer 204.

[0042] In an embodiment, the buffer layer 206 comprises plastics or rubber, therefore the laminate floor is elastic and comfortable for walking on. Moreover, the buffer layer 206 makes the magnesium oxide layer 204 of the building board perfectly fit to the installing surface, such as the ground, and therefore the soundproofing performance of the building board is significantly improved.

[0043] Figure 3 illustrates a top view of a laminate flooring according to a further embodiment of the present invention. As described in figure 3, the laminate flooring is shaped as regular hexagon. In other embodiments, the laminate flooring can also be shaped as square, rectangle, parallelogram, octagon and so on.

[0044] In practical applications, different pieces of laminate flooring can joint together. In an

embodiment, each side of the laminate flooring may have a connecting structure such as tongue or groove to joint to each other. In other embodiments, the laminate flooring can have click system to joint to each other, such as single click system or double click system. In a preferred embodiment, the surface of the laminate flooring is covered with a protective coating such as varnish or oil, which can ease the connection and provide further protection to the laminate flooring. In some embodiments, the oil used as the protective coating comprises natural oil or mineral oil. In practical applications, the oil coated on the surface of the laminate flooring may at least partially permeate into the surface of the laminate flooring and mix with the cement or other materials in the laminate flooring. The mixing of the oil and the cement flooring forms a specific surface, which is much stronger and more resistant to chemicals and physical scratches.

[0045] It should be understood that the present invention is not limited to the connection manner between different pieces of the laminate flooring.

[0046] Figure 4 illustrates a laminate door according to a further embodiment of the present invention. The laminate door can be used as kitchen door, cupboard door and the like. The laminate door comprises the building board illustrated in figure 1 or 2.

[0047] In figure 4, the laminate door further comprises a frame 408, which is placed around the edge of the building board. Optionally, the frame 408 can comprise metal, wood or plastics.

[0048] In some other examples, the building board depicted in Figure 1 may also be used for lampshades or housings for receiving lamps. The lampshades or housings may have openings for leaking light out. As the building board of the present invention has features of erode proofing, fireproofing and free of deformation, the lampshades or housings made of the building board is more durable. It should be understood that the previous embodiments for applying the building board of the present invention are merely illustrative and are not limited.

[0049] Figure 5 illustrates a flowchart of a method for manufacturing the building board according to an embodiment of the present invention.

[0050] In step S502, provides a cement board and a magnesium oxide board.

[0051] Specifically, the cement board can be made from cement and glass fibers mixed in a predetermined ratio. The magnesium oxide board can be made from magnesium oxide powder, glass fibers and/or wooden fibers mixed in a predetermined ratio.

[0052] In step S504, dehydrates the cement board and the magnesium oxide board.

[0053] Specifically, the cement board and the magnesium oxide board can be kept in a balance room, where the temperature and the humidity can be precisely controlled. In an embodiment, the magnesium oxide board and the cement board can be kept in the balance room for 2-3 weeks, so as to lower the water in the cement board and the magnesium oxide board down to 10-15% by mass.

[0054] In step S506, binds the cement board and the magnesium oxide board.

[0055] In an embodiment, step S506 further comprises binding the cement board and the magnesium oxide board by cold pressing. The process time of the cold pressing is 6 to 10 hours, and the pressure is 5 kg/cm^2. Optionally, the cement board and the magnesium oxide board can be bound with WBP (Water Boiled Proof) glue such as melamine glue and phenolic aldehyde glue. WBP glue has features of water proofing and water boiled proofing, which can effectively ensure the binding of the cement board and the magnesium oxide board.

[0056] In an embodiment, after step S506, the method further comprises binding buffer material to the magnesium oxide board. That is, the buffer material adheres to the side of the magnesium oxide board far away from the cement board. Further, the buffer material can be bound to the

magnesium oxide board with WBP glue. Optionally, the buffer material can be plastics or rubber.

[0057] In an embodiment, after step S506 or the step of binding buffer material, the method further comprises cutting the bound cement board and magnesium oxide board. Based on different applications, the building board can be separated as different sizes.

[0058] In an embodiment, after the step of cutting the building board, the method further comprises forming a tongue or groove at each side of the building board, or forming a click system at each side of the building board.

[0059] In an embodiment, after the step of cutting the building board, the method further comprises coating a protective coating over the cement board, such as oil, varnish or other comparable materials. Optionally, coloring materials can be added into the protective coating so as to improve the decorative effect of the building board.

[0060] Figure 6 illustrates a cross section of a laminate flooring according to a further embodiment of the present invention. As shown in figure 6, the laminate flooring comprises cement layer 602 and wooden layer 604. When the laminate flooring is installed on the ground, the wooden layer 604 is positioned close to the ground, for example, on a cement floor or brick floor, and the cement layer 602 is positioned away from the ground. Therefore, with reference to the ground, the laminate flooring comprises the cement layer 602 and the wooden layer 604 in a top-down order.

[0061] In an embodiment, the cement layer 602 and the wooden layer 604 are bound together with glue. Optionally, the cement layer 602 and the wooden layer 604 can be bounded with WBP (Water Boiled Proof) glue, such as melamine glue and phenolic aldehyde glue. The WBP glue has features of water proofing and water boiled proofing, which can ensure the binding of the

cement layer 602 and the wooden layer 604.

[0062] The cement layer 602 of the laminate flooring may comprise cement and glass fibers. The density of the cement layer 602 can be precisely controlled by adjusting the composition of the cement and the glass fiber. In an embodiment, the cement layer 602 has a density of 1.1 to 1.8 g/cm^3. Alternatively, the cement layer 602 has a thickness from 2 to 20 millimeters. The cement layer 602 features moisture proofing, mould and fungus proofing, erode proofing, fire proofing, and free of deformation.

[0063] In an embodiment, the laminate flooring further comprises a butter layer which is connected to the wooden layer 604. Specifically, the buffer layer is connected to one side of the wooden layer 604 far away from the cement layer 602. The buffer layer comprises rubber or plastics materials, which has good elasticity, and therefore the laminate flooring has better performance on sound proofing.

[0064] In an embodiment, the laminate flooring can be covered with protective coating, for example, oil or varnish, so as to protect the cement layer 602.

[0065] In an embodiment, the laminate flooring can be shaped as square, rectangle, parallelogram, hexagon, octagon and so on, and each side of the laminate flooring can have a connecting structure such as tongue or groove for the ease of connection. In another embodiment, the laminate flooring can use click systems to joint to each other, such as single click system or double click system. It should be understood that the present invention is not limited to the connection manner.

[0066] Although the present invention has been described above in the accompanying drawings and detailed descriptions, it should be understood that such descriptions are merely illustrative

and are not limited; the present invention is not limited to such embodiments. Those skilled in this art may understand and implement other variations from the disclosed embodiments by studying the specification, disclosed contents, accompanying drawings and appended claims.

WHAT IS CLAIMED IS:

1. A building board comprising a cement layer and a magnesium oxide layer.

2. The building board of claim 1, wherein the cement layer and the magnesium oxide layer are bound with glue.

3. The building board of claim 1, wherein the cement layer comprises cement and glass fiber.

4. The building board of claim 1, wherein the cement layer has a thickness from 2 to 20 millimeters.

5. The building board of claim 1, wherein the magnesium oxide layer has a thickness from 8 to 15 millimeters.

6. The building board of claim 1, wherein the cement layer has a density from 1.1 to 1.8 g/cm^3.

7. A laminate flooring comprising the building board of any of claim 1 to 6.

8. The laminate flooring of claim 7, further comprising a buffer layer, wherein the buffer layer is connected to the magnesium oxide layer.

9. The laminate flooring of claim 8, wherein the buffer layer comprises rubber or plastics.

10. The laminate flooring of any of claim 7 to 9, wherein the laminate flooring is shaped as square, rectangle, parallelogram, hexagon or octagon.

11. The laminate flooring of any of claim 7 to 9, wherein the laminate flooring is covered with a protective coating.

12. The laminate flooring of claim 11, wherein the protective coating is oil or varnish.

13. The laminate flooring of any of claim 7 to 9, wherein each side of the laminate flooring has tongue or groove to joint to each other, or has click system to joint to each other.

14. A laminate door comprising the building board of any of claim 1 to 6.

15. The laminate door of claim 14, further comprising a frame, wherein the frame is placed around the edge of the building board.

16. The laminate door of claim 15, wherein the frame comprises metal, wood or plastics.

17. A laminate flooring, comprising a cement layer and a wooden layer.

18. The laminate flooring of claim 17, wherein the cement layer and the wooden layer is bound with glue.

19. The laminate flooring of claim 17, wherein the cement layer comprises cement and glass fibers.

20. The laminate flooring of claim 17, wherein the cement layer has a thickness from 2 to 20 millimeters.

21. The laminate flooring of claim 17, wherein the cement layer has a density from 1.1 to 1.8 g/cm^3.

22. The laminate flooring of claim 17, further comprising a buffer layer, wherein the buffer layer is connected to the wooden layer.

23. The laminate flooring of claim 22, wherein the buffer layer comprises rubber or plastics.

24. The laminate flooring of claim 17, wherein the laminate flooring is covered with a protective coating.

25. The laminate flooring of claim 24, wherein the protective coating is oil or varnish.

26. The laminate flooring of any of claim 17 to 25, wherein each side of the laminate flooring has tongue or groove to joint to each other, or has click system to joint to each other.

27. A method for manufacturing a building board, comprising the steps of:

providing a cement board and a magnesium oxide board;

dehydrating the cement board and the magnesium oxide board; and

binding the cement board and the magnesium oxide board.

28. The method of claim 27, wherein the dehydrating step further comprises dehydrating water in the cement board and the magnesium oxide board to 10-15% by mass.

29. The method of claim 27, wherein the binding step further comprises binding the cement board and the magnesium oxide board by cold pressing.

30. The method of claim 29, wherein the process time of the cold pressing is 6 to 10 hours, and the pressure of the cold pressing is 5 kg/cm^2.

31. The method of claim 27, wherein the cement board and the magnesium oxide board is bound with WBP glue.

32. The method of claim 27, further comprising binding buffer materials to the magnesium oxide board.

33. The method of claim 32, wherein the buffer material comprises rubber or plastics.

34. The method of claim 33, further comprising forming a tongue or groove at each side of the building board, or forming a click system at each side of the building board.

35. The method of claim 33 or 34, further comprising coating a protective coating over the cement board.

36. The method of claim 35, wherein the protective coating comprises oil or varnish.

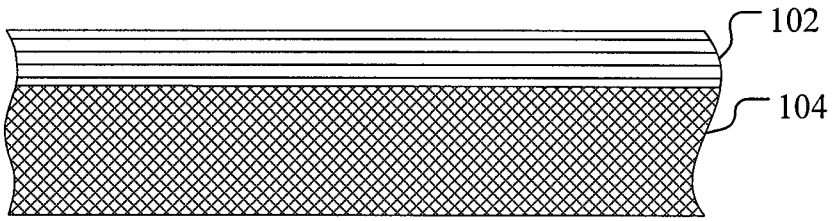

Fig. 1

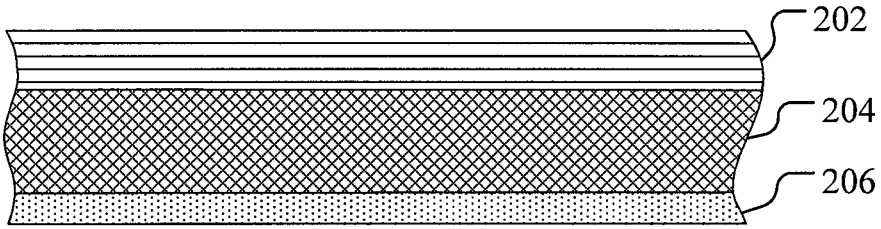

Fig. 2

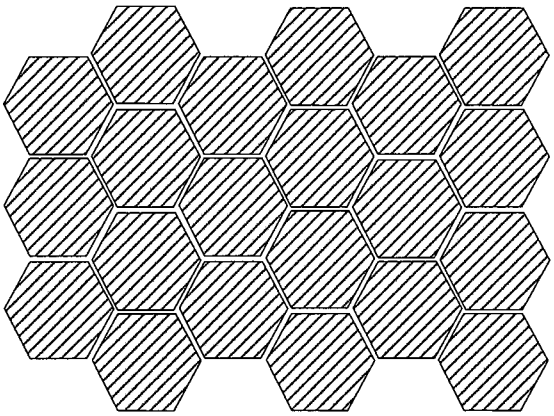

Fig. 3

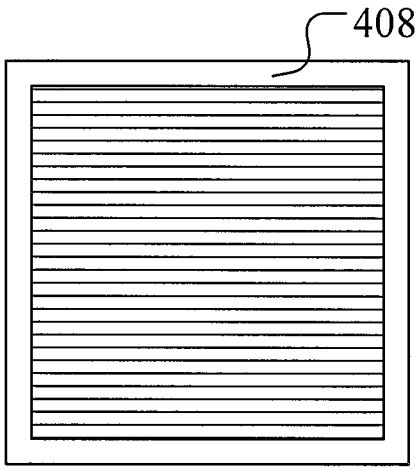

Fig. 4

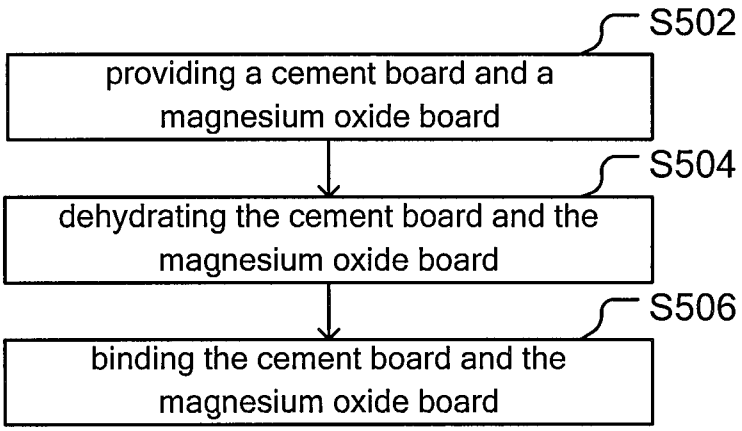

Fig. 5

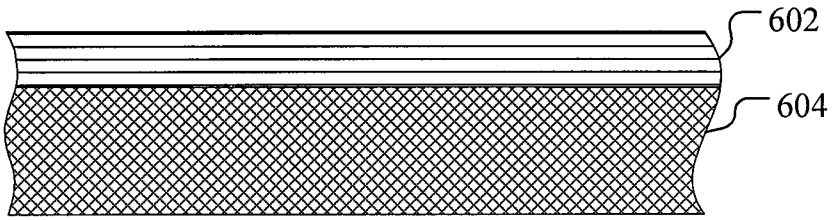

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/073933

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04C, E04F, B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: cement, magnes+, floor+, fibre, fiber, magnesium board?, layer?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN201214878Y(LIANG, Yiming) 01 Apr. 2009(01.04.2009) description, lines 4-20, claim 2	1-7, 10-12, 14-16, 27-31
Y		8-9, 13, 32-36
X	CN2233961Y(YIN, Guoguang) 28 Aug. 1996(28.08.1996) claims 1-3	17-21, 24-25
Y		22-23, 26
Y	CN2182216Y(HUANG, Yongqing) 09 Nov. 1994(09.11.1994) claim 1, figure 1	8-9, 13, 22-23, 26, 32-36
A	KR20080042995A(LG CHEMICAL LTD) 16 May 2008(16.05.2008) the whole document	1-36
A	US2009282759A1(PORTER W H) 19 Nov. 2009(19.11.2009) the whole document	1-36
PX	CN102337770A(SHANGHAI LIANGSHI INT TRADE CO LTD) 01 Feb.2012(01.02.2012) description, paragraphs [0034]-[0063], claims 1-37, figures 1-6	1-36

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 July 2012(05.07.2012)	**19 Jul. 2012 (19.07.2012)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer REN, Qihua Telephone No. (86-10)62084966

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/073933

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The application involves two inventions. The first invention relates to independent claims 1, 7, 14 and 27. The second invention relates to independent claim 17. The same technical feature involved in the first and second invention is a cement layer. However the above technical feature is common knowledge in the art and can not be considered as a special technical feature within the meaning of Rule 13.2 PCT. In conclusion, the two inventions do not belong to a single general inventive concept. Therefore, the application does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/073933

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN201214878Y	01.04.2009	NONE	
CN2233961Y	28.08.1996	NONE	
CN2182216Y	09.11.1994	NONE	
KR20080042995A	16.05.2008	NONE	
US2009282759A1	19.11.2009	NONE	
CN102337770A	01.02.2012	NONE	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/073933

A. CLASSIFICATION OF SUBJECT MATTER

E04C2/288(2006.01)i

E04F15/10(2006.01)i

B32B3/06(2006.01)i

B32B37/12(2006.01)i