

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 September 2010 (10.09.2010)

PCT

(10) International Publication Number
WO 2010/099944 A1

- (51) **International Patent Classification:**
B28B 19/00 (2006.01) *B28B 7/34* (2006.01)
B28B 23/00 (2006.01)
- (21) **International Application Number:**
PCT/EP2010/001310
- (22) **International Filing Date:**
3 March 2010 (03.03.2010)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
0903684.9 4 March 2009 (04.03.2009) GB
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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, RO, RS, RU, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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

[Continued on next page]

(54) **Title:** METHOD OF MANUFACTURE OF A COMPOSITE CONCRETE ARTICLE

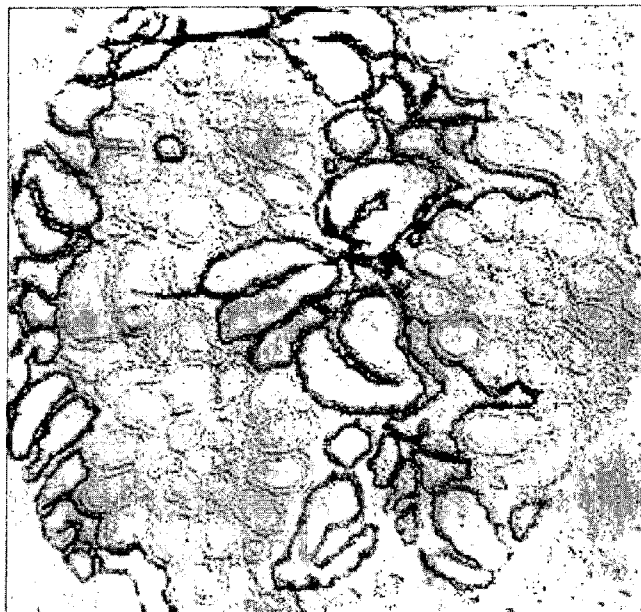


Figure 1

(57) **Abstract:** A method of manufacturing a composite concrete article comprising forming, affixing or applying at least one textile structure onto a base layer, said base layer comprising a soluble substrate, and incorporating the at least one textile structure into a body of wet uncured concrete whereby the base layer dissolves leaving the at least one textile structure embedded in the surface of the concrete, such that the at least one textile structure defines at least a portion of a surface of the cured concrete article.



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Method of manufacture of a Composite concrete article

This invention relates to a method of manufacture of a composite concrete article, and in particular to a method of manufacture of a concrete article having textile structures integrated into the surface of the concrete to provide a novel aesthetic and/or functional surface finish.

Concrete is commonly utilised as a construction material due to its low cost, ease of prefabrication into desired shapes and strength. However, concrete structures have a cold, hard and unattractive surface finish with poor acoustic properties.

10

An object of the present invention is to improve the appearance and/or acoustic or other surface properties of concrete by integrating textile structures into concrete articles such that at least a portion of the textile structures define at least a portion of the exposed surfaces of the articles.

15 Prior art attempts to adhere textile materials to the surface of concrete articles have mainly been focussed on applying such materials to the surface of the finished concrete articles. Few attempts have been made to integrate textile materials into concrete articles, mainly due to the harsh environment posed by uncured concrete (highly alkaline) and the difficulty in adhering a textile material to the concrete structure in a manner such that the textile material will not simply peel off the concrete once it has set. Where it is desired to embed complex and delicate textile structures into the surface of a concrete product, a problem arises in that the act of pouring concrete onto the textile structures may dislodge or damage the textile structures or subsume the textile structures into the concrete.

25 According to the present invention there is provided a method of manufacturing a composite concrete article comprising forming, affixing or applying at least one textile structure onto a base layer, said base layer comprising a soluble substrate, and incorporating the at least one textile structure into a body of wet uncured concrete whereby the base layer dissolves leaving the at least one textile structure embedded in the surface of the concrete, such that the at least one textile structure defines at least a portion of a surface of the cured concrete article.

Preferably the base layer comprises a water soluble polymeric sheet material.

35 The method may comprise affixing the or each textile structure to the base layer by stitching the textile structure to the base layer or forming the textile structure directly on the base layer such that the base layer acts as a temporary support for the textile structure. Alternatively the or each textile structure may be affixed to the base layer by means of an adhesive.

40 In one embodiment, the textile structure may comprise a pattern of stitching, preferably stitched directly onto the base layer. In an alternative embodiment the textile structure may comprise a woven or lace structure which may be interwoven onto the base layer. A plurality of textile structures, which

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may comprise a number of different textile structures, may be affixed to or applied to the concrete structure to create different visual and/or textural effects and textures on the surface of the finished product.

5 In one embodiment the method comprises affixing or forming at least one textile structure onto a water soluble base layer and placing the base layer into a mould with the at least one textile structure in contact with a face of the mould, pouring uncured concrete into the mould such that the concrete dissolves the base layer and flows into the at least one textile structure to embed the at least one textile structure into the concrete. The base layer temporarily supports the textile
10 structures until the concrete is poured onto the textile structures, whereupon the base layer dissolves to leave the textile structures intact and in the desired position in the surface of the concrete. Once cured, the concrete itself supports the textile structures.

Preferably the textile structures are formed from a polymeric thread or yarn, such as polyester
15 thread, nylon or any other suitable alkaline resistant textile material.

An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

20 Figure 1 is a view of a concrete article manufactured in accordance with an embodiment of the present invention; and

Figure 2 is a view of a further example of a concrete article manufactured in accordance with an embodiment of the present invention.

25

A method of manufacturing a composite concrete article in accordance with an embodiment of the present invention comprises initially forming a textile structure, such as a pattern of stitch work, embroidery, appliqué or lacework to create a desired pattern or visual or textural effect to be applied to a concrete article, said textile structure being formed on or adhered to a soluble base layer to temporarily support the textile structure. The textile structure may be formed directly onto the base
30 layer, for example by stitching through the base layer. Alternatively one or more preformed textile structures may be affixed to the base layer, by stitching or by a suitable adhesive, where the textile structure is preformed. Several discrete textile structures of different types may be affixed to, applied to or formed on the base layer to create a desired pattern.

35

The base layer, along with the textile structures formed or affixed thereon, is then placed into a mould, with the textile structures face down, and wet uncured concrete is poured into the mould on top of the base layer. The wet concrete causes the water soluble base layer to dissolve while the concrete flows into and penetrates the textile structures such that they become embedded in the
40 surface of the concrete. Thus the base layer acts as a temporary binder for the textile structures to support the textile structures until they become embedded in and supported by the concrete to form

a surface pattern or texture in the finished product. A wetter than normal mix of concrete may be used.

Once cured, the finished composite concrete article is removed from the mould.

5

A wide variety of patterns and textures can be integrated into the surface of the concrete, utilising the soluble base layer to support the textile structures until they are applied and embedded into the concrete.

10 The textile structures may be formed from any suitable material provided it is able to withstand the strong alkaline environment of the uncured concrete. One suitable material comprises polyester or nylon thread.

15 Figures 1 and 2 show two examples of concrete panels manufactured in accordance with the present invention.

The invention is not limited to the embodiment(s) described herein but can be amended or modified without departing from the scope of the present invention.

20

Claims

1. A method of manufacturing a composite concrete article comprising forming, affixing or applying at least one textile structure onto a base layer, said base layer comprising a soluble substrate, and incorporating the at least one textile structure into a body of wet uncured concrete whereby the base layer dissolves leaving the at least one textile structure embedded in the surface of the concrete, such that the at least one textile structure defines at least a portion of a surface of the cured concrete article.
2. A method as claimed in claim 1, wherein the base layer comprises a water soluble polymeric sheet material.
3. A method as claimed in claim 1 or claim 2, wherein the method comprises affixing at least one or said one or more textile structures to the base layer by stitching the textile structure to the base layer or forming the textile structure directly on the base layer such that the base layer acts as a temporary support for the textile structure.
3. A method as claimed in any preceding claim, wherein at least one or said one or more textile structures is affixed to the base layer by means of an adhesive.
4. A method as claimed in any preceding claim, wherein at least one of said one or more textile structures comprises a pattern of stitching stitched directly onto the base layer.
5. A method as claimed in any preceding claim wherein at least one said one or more textile structures comprises a woven or lace structure which may be interwoven onto the base layer.
6. A method as claimed in any preceding claim, wherein a plurality of textile structures, comprising a number of different, similar or identical textile structures, are affixed to or applied to the concrete structure to create different visual and/or textural effects and textures on the surface of the finished product.
7. A method as claimed in any preceding claim, wherein the method comprises affixing or forming at least one textile structure onto a water soluble base layer and placing the base layer into a mould with the at least one textile structure in contact with a face of the mould, pouring uncured concrete into the mould such that the concrete dissolves the base layer and flows into the at least one textile structure to embed the at least one textile structure into the concrete.
8. A method as claimed in claim 8, wherein the base layer temporarily supports the at least one textile structure until the concrete is poured onto the textile structure, whereupon the base layer dissolves to leave the at least one textile structure intact and in the desired position in the surface of the concrete, such that, once cured, the concrete itself supports the at least one textile structure.

9. A method as claimed in any preceding claim, at least one of said one or more textile structures is formed from a polymeric thread or yarn, such as polyester thread, nylon or any other suitable alkaline resistant textile material.

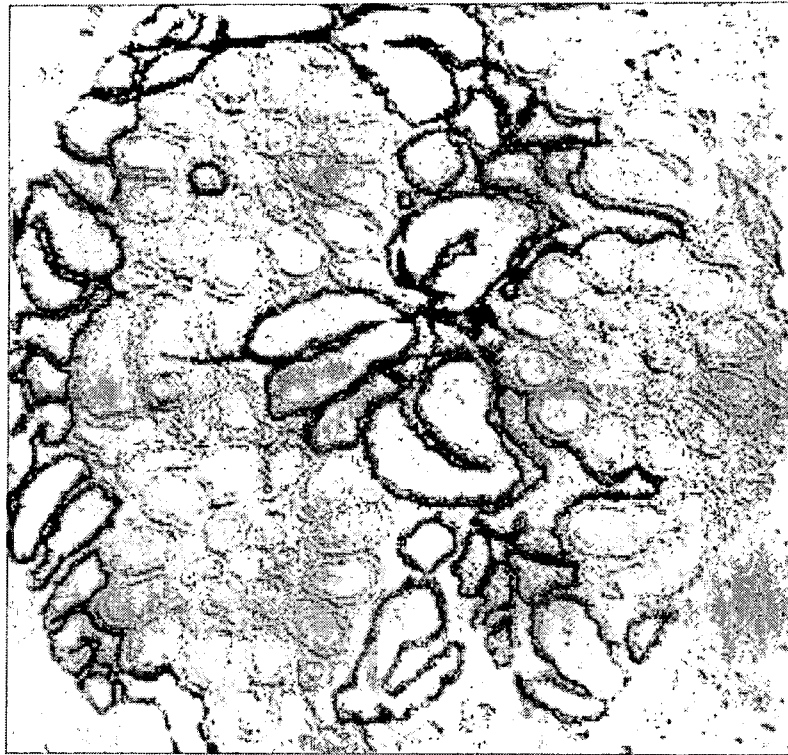


Figure 1

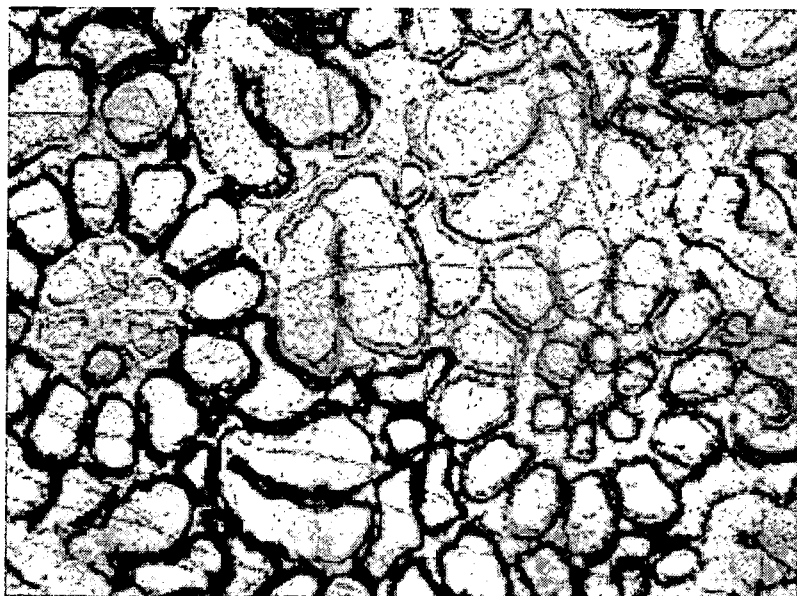


Figure 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/001310

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B28B19/00 B28B23/00 B28B7/34
 ADD.

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)
 B28B

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/072328 A1 (ADVANCED CERAMICS RES INC [US]) 19 September 2002 (2002-09-19) column 1, line 40 - column 3, line 50 -----	1, 2, 6, 10
X	GB 490 667 A (VICTOR LEFEBURE; ICI LTD) 18 August 1938 (1938-08-18) page 9, line 9 - line 28; claims 12-15; figure 1 -----	1
A	DE 36 22 573 A1 (HOECHST AG [DE] DISSELBECK DIETER [DE]) 7 January 1988 (1988-01-07) column 3, line 49 - line 57; figures 1,2 column 4, line 19 - line 37 -----	1
A	US 2 506 244 A (VIKTOR STOPKA) 2 May 1950 (1950-05-02) figures 1,2; example 1 -----	1

 Further documents are listed in the continuation of Box C.

 See patent family annex.

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Date of the actual completion of the international search

24 June 2010

Date of mailing of the international search report

05/07/2010

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2010/001310

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02072328	A1	19-09-2002	EP 1379367 A1 14-01-2004
			JP 4416403 B2 17-02-2010
			JP 2005500909 T 13-01-2005
			US 2002173575 A1 21-11-2002
			US 2005116136 A1 02-06-2005
GB 490667	A	18-08-1938	NONE
DE 3622573	A1	07-01-1988	NONE
US 2506244	A	02-05-1950	GB 631819 A 10-11-1949