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(54) Method for obtaining shiny-surfaced objects using a cementitious material

(57) The invention describes a method for obtaining a reflective or polished-like surface (similar to that of polished stone) using a plastic lining (8, 20) as the surface of the mould (22). The plastic lining (8, 20) must be left attached to the surface of the cementitious mixture for a predetermined curing time. The cementitious mixture will then achieve the required surface quality. The use of e.g. polyethylene sheeting in a structural mould has the advantage that it can be left on the object for the desired curing time after the structural mould (22) has been removed for further immediate casting. This is convenient because the plastic has a low cost and is recyclable.

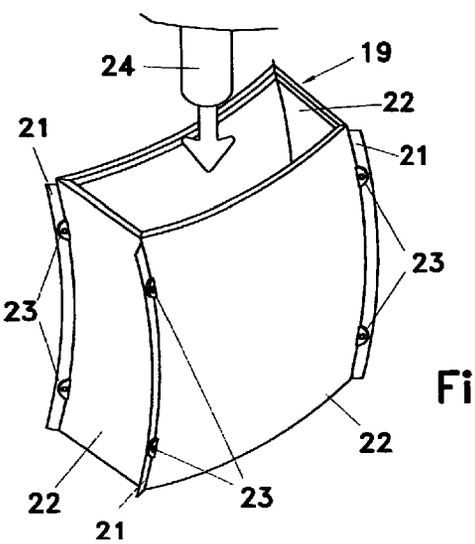

Fig.9

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Description

[0001] The present invention concerns a method of improving the appearance of the surface of any cementitious structure or object, and in particular it relates to a method for obtaining a reflective surface similar to that of polished stone, marble or glazed ceramic using a cementitious material.

[0002] It is commonly known that the conventional aspect of cast concrete is of a dull grey and matt appearance, which has led to its general unpopularity although its functional convenience has enormous advantages in the construction industry. In the concrete market the use of coloured white cement is growing and market demand has required that concrete should have a more natural appearance (rock like, stone like etc.); as a consequence there has been a general tendency to try to change the aesthetic characteristics of cement.

[0003] As a general rule a cementitious material will always take on the textural appearance of the surface of the mould. Conventional casting in the construction industry usually makes use of moulds of wood (pine or fir). In this case the cast object has a rough and opaque surface with visible graining.

[0004] To give a smoother aspect to the surface of the cast object, moulds of plywood coated with synthetic resin (or with Formica) or moulds of metal are used, in particular for casting prefabricated elements, leaving the cast to cure for a suitable time. For instance, the architect Paolo Portoghesi in his construction of the Rome mosque used Formica covering in his moulds to cast concrete with a bright and translucent quality. Obviously the smoother the internal surface of the mould is, the better the result. For instance, the mould of a shiny appearance will impart these shiny properties to the poured concrete. However, the current moulds are too expensive to be left in contact with the concrete for the curing time necessary to achieve a shiny effect.

[0005] It has been now surprisingly discovered a method which allows the obtaining of shiny-surfaced objects using a cementitious material with a considerably lower cost than that of the above described known systems, and, thanks to this, the actual carrying out a large range of high-quality aesthetic solutions and of new decorative effects so far unseen in concrete, by way of a simple use of this cheap and widespread material.

[0006] According to an essential feature of the method of the invention, the material is cast into contact with a sheeting made of a plastic or plastic-like material; after casting, the cast is left to cure with the sheeting attached thereon, whereby the cementitious material becomes shiny in contact with the sheeting during the curing time. The sheeting is finally removed.

[0007] In this way, if the cementitious material is poured for instance into direct contact with a common, low-cost plastic (e.g. polyethylene) sheeting, when the dried concrete and the plastic sheeting are detached, the object is left with an extremely smooth and shiny surface. Since the cost of the plastic is low, it can be left to cure on the cast for the required time. In particular and advantageously, in case of the casting of pre-fabricated elements, a detachable covering (or sealed) polyethylene sheeting unit of the same size as the inside of the mould can be used. The elements can be left in a stacking area with the plastic sheeting still attached to the cement surface for the full curing time, while the mould can be reused.

[0008] Plastics to be used are in particular polyethylene, polycarbonate and PVC. Using standard concrete (cement 3.25 N/mm^2, water/cement ratio = 0.45, cement/inerts ratio = 0.333) the standard time at an average temperature of 20° C is approx. 7/8 days to impart a shiny surface. The required curing time decreases with higher temperatures or faster curing cementitious materials.

[0009] Other features and advantages of the method according to the present invention will be apparent from the following description of its embodiments, which have to be intended only as examples and not limitations, with reference to the attached drawings in which:

- figures 1 to 6 schematically show successive steps of a procedure for the manufacture of pre-fabricated substantially bidimensional elements according to the method disclosed in the present invention;
- figure 7 schematically represents a mould for the casting of a pre-fabricated tridimensional, multi-surfaced element according to the method disclosed in the present invention;
- figure 8 represents a lining to be placed in the mould of figure 7;
- figure 9 represents the assembly between the mould of figure 7 and the lining of figure 8.

[0010] With reference to figures from 1 to 6, the following example relates to the manufacturing of marble-like tiles and large flat slabs such as cladding or facing for buildings.

[0011] With reference now in particular to figure 1, with 1, 2, 3 and 4 are indicated four cement mixers containing variously coloured concrete mixes. The concrete mixes flow down, past flow regulators 5 into a general mixing container 6, where the coloured concrete mixes are only partly mixed, before being released through a delivery nozzle 7 onto a band-like polyethylene sheeting 8, which is unrolled from a coil 10 onto a conveyor belt 11 moving below nozzle 7. Sheeting 8 can be optionally pre-moulded in order to provide it with trays 9 having the shape of the tiles to be manufactured.

[0012] A layer of coloured mixture 12 is poured on sheeting 8, as shown in figure 2, and then moved along belt 11, where an optional reinforcement steel framework 13 is sunk into it, the mixture being still wet. Framework 13 is provided with upwardly extending attachment rings 14 for the final mounting of the tiles.

[0013] With reference to figures 3 and 4, a strengthening backside layer 15 of standard grey concrete is then poured from a nozzle 16 onto coloured layer 12, leaving rings 14 uncovered. In this way layer 12 can be very thin, relatively expensive coloured concrete being used minimally, while inexpensive, standard concrete is used for the backside of the tiles, where it remains invisible. Sheeting 8 is then fed from belt 11 to a flat and level board 16, where it is cut by a matrix 17, which gives the tile the required outline. If the plastic of sheeting 8 hasn't been pre-moulded matrix 17 cuts both layers 12 and 15 and sheeting 8 (as in figure 4). If it has been pre-moulded then only sheeting 8 is cut at this stage, as pre-moulded trays 9 have acted as containers for the concrete poured thereinto.

[0014] The tile is then moved on its board and placed in a drying rack 18 where it is left to set, as shown in figure 5. During this initial curing time the cut object must be placed on a perfectly flat surface, the concrete being still wet. As soon as it has set, the tile can be stacked vertically, as in figure 6, with plastic sheeting 8 still attached to the surface for the full curing time needed.

[0015] The tile is then conveniently protected by sheeting 8 until it is fitted in its final position. When this occurs sheeting 8 is removed, leaving the surface of layer 12 with a smooth, shiny appearance.

[0016] It has to be pointed out that, even if reference was made to a pouring of the coloured cementitious mixture from above onto sheeting 8, it can be squirted, blobbed or sprayed to achieve the same results.

[0017] According to the invention, when casting concrete in a conventional steel mould for large or small prefabricated multi-surfaced shapes a polyethylene liner or bag of a slightly smaller shape can be placed inside the steel mould prior to the concrete pouring.

[0018] With reference to figures 7 to 9, a steel mould 19 of double curvature is formed by curved plates 22 respectively connected at their edges by clamps 23. In use, a flexible plastic sleeve 20 is inserted within mould 19, sleeve 20 being slightly smaller than the inside of the mould. In particular, in the depicted embodiment, the rims of sleeve 20 have the same length of the respective chords subtended by arc-shaped edges of plates 22. In this way sleeve 20 has no complicated double curvature and when concrete is poured in, as in figure 9 from a delivery nozzle 24, it can stretch, perfectly taking the shape of mould 19. Sleeve 20 has strips 21 extending along its lateral corner seams, which, when sleeve 20 is placed inside mould 19, are clamped in between steel plates 22, by way of clamps 23. After the object has set mould 19 may be removed leaving it protected in the plastic sleeve 20 for its complete curing time. Conventional reinforcement can be applied prior to casting.

[0019] The above method applies also in the construction of walls *in situ* using conventional concrete casting, but ordinary wood panelling is used instead of steel plates. If only one special shiny surface is required the plastic is stretched over the relevant wood panelling with a means of maintaining it on the concrete after the wood panelling has been removed.

[0020] The shiny surfaced objects obtained with the method according to the present invention are an attractive and cost effective improvement to ordinary cast concrete. The above method will produce outstanding artificial marbles, granites, polished stones and glazed ceramics, and a large range of new decorative effects when white or grey cement is combined with suitable colours and relevant casting and mixing techniques.

[0021] These techniques of imitating marble and stone are substantially known per se if carried out with gypsum (the so-called "scagliola" technique), but allow brilliant and unknown achievements if combined with the method according to the invention. In the prior art the use of the "scagliola" technique with a cementitious material was prevented because, according to this technique, to create a smooth marble- or stone- like surface, the material has necessarily to be sanded and/or polished. While the sanding of coloured gypsum doesn't involve any problems, this material not containing any structural aggregate and being used only with a decorative function, the sanding of concrete exposes its inerts and aggregates, impairing the final appearance of the object.

[0022] With the above method, when the appropriate coloured cementitious mixture is applied to the plastic it can contain any modern cement aggregate. These will not be exposed as the skin formed on the plastic is composed of the finest inerts and cement. It is the skin itself that contains the marble or stone-like appearance and therefore no further polishing is required. All the aggregates are left intact and money can be saved since expensive grinding treatments are avoided. According to various mixing and application methods an infinite range of decorative effects and designs can be achieved.

[0023] Besides, marquetry and stone inlay are easily achievable as the cementitious mixture can be cut in its wet form, or poured into shapes onto the plastic and thus variously coloured surfaces can be juxtaposed, which bond each other as they cure. Finally, the plastic enhances the subtlety of colour gradation and depth due to its water-repellent properties.

[0024] Even if reference was made to a sheeting made of a plastic material, this being the most advantageous solution, other suitable smooth-surfaced, waterproof materials can be used, e.g. rubber, latex, leather and similar.

[0025] Variations and/or modifications can be brought to the method for obtaining shiny-surfaced objects using a cementitious material according to the present invention, without departing from the scope of the invention itself as stated in the appended claims.

Claims

1. A method for obtaining shiny-surfaced objects using a cementitious material characterised in that it comprises the following steps:

   - casting said material into contact with a sheeting (8, 20) made of a plastic or plastic-like material;
   - leaving the cast to cure with said sheeting (8, 20) attached thereon, whereby said cementitious material becomes shiny in contact with said sheeting (8, 20) during the curing time;
   - removing said sheeting (8, 20).

2. The method according to claim 1, wherein said object is cast in a mould (22), said sheeting being made by a lining (20) which internally covers said mould (22), said mould being removed during the curing time, leaving said cast to complete the cure with said lining (20) attached thereon.

3. The method according to the previous claims, wherein said sheeting (8, 22) is left attached to said cast object until said object is placed in its final position.

4. The method according to the previous claims, wherein said lining is a bag (20) of substantially the same shape of the inside of said mould (22).

5. The method according to claims 1 to 3, wherein said sheeting is made by a continuous band (8) unwound from a coil (10), which is cut after the casting to form substantially bidimensional panels.

6. The method according to claim 5, wherein said band (8) is pre-moulded.

7. The method according to the previous claims, wherein said plastic material is chosen among the group consisting of polyethylene, polycarbonate and PVC.

8. The method according to the previous claims, wherein said cementitious material contains coloured, cement compatible pigments.

9. The method according to the previous claims, wherein said cast is cut in its wet form, or poured into shapes onto said sheeting, to carry out variously coloured juxtaposed surfaces.

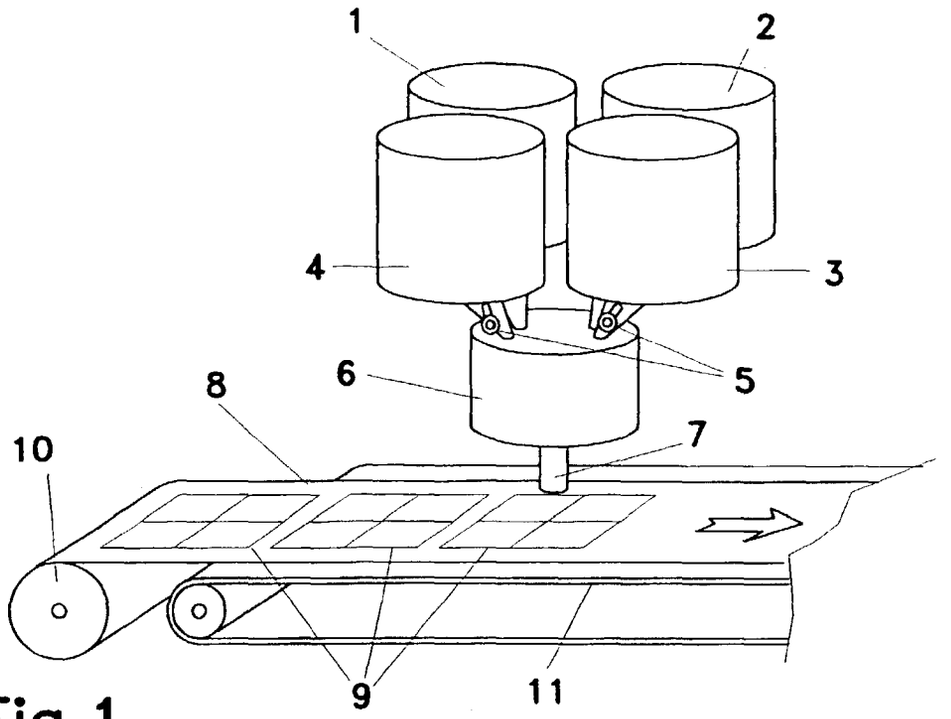

Fig.1

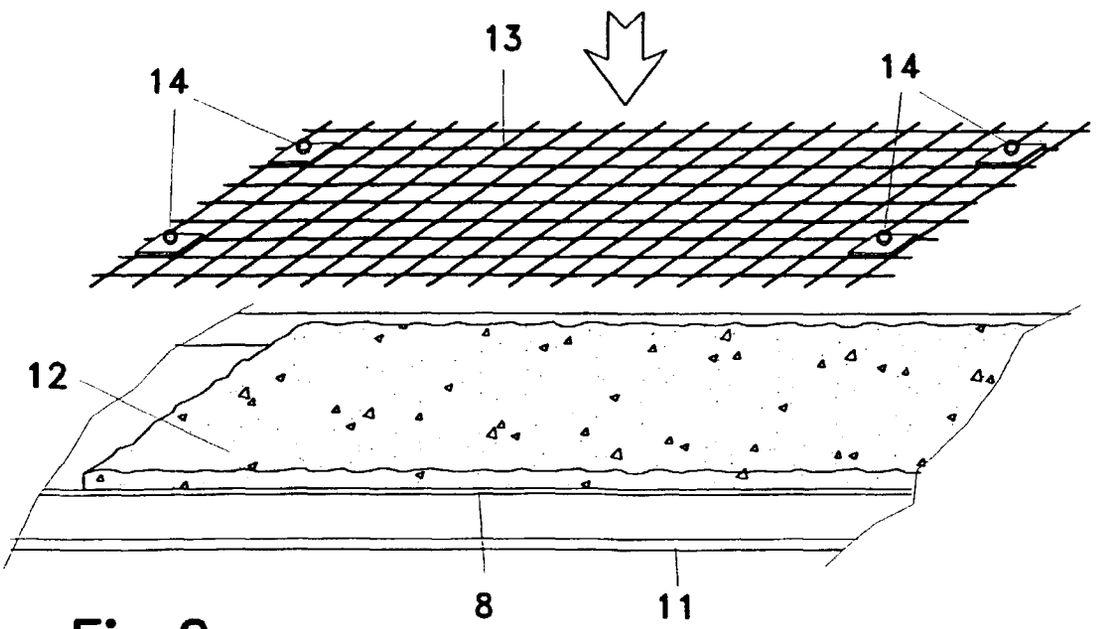

Fig.2

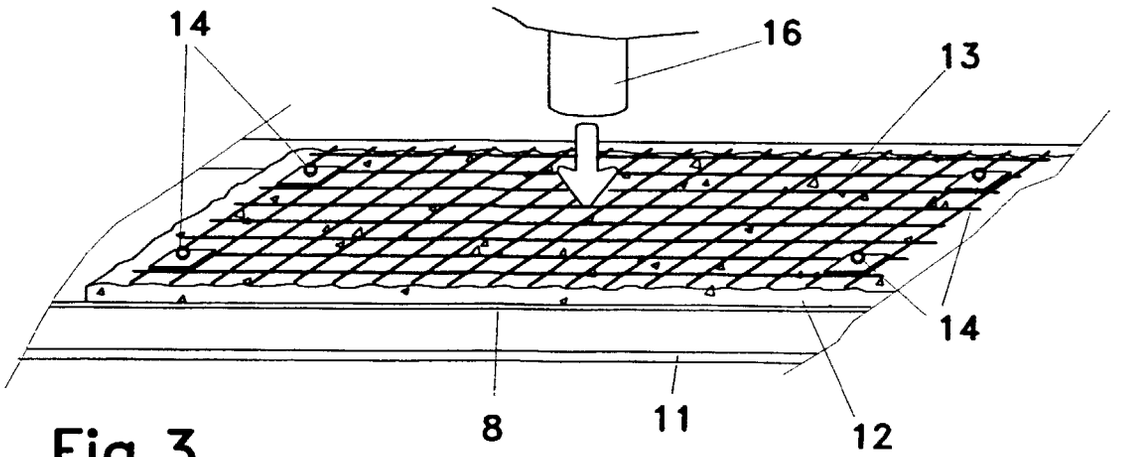

Fig.3

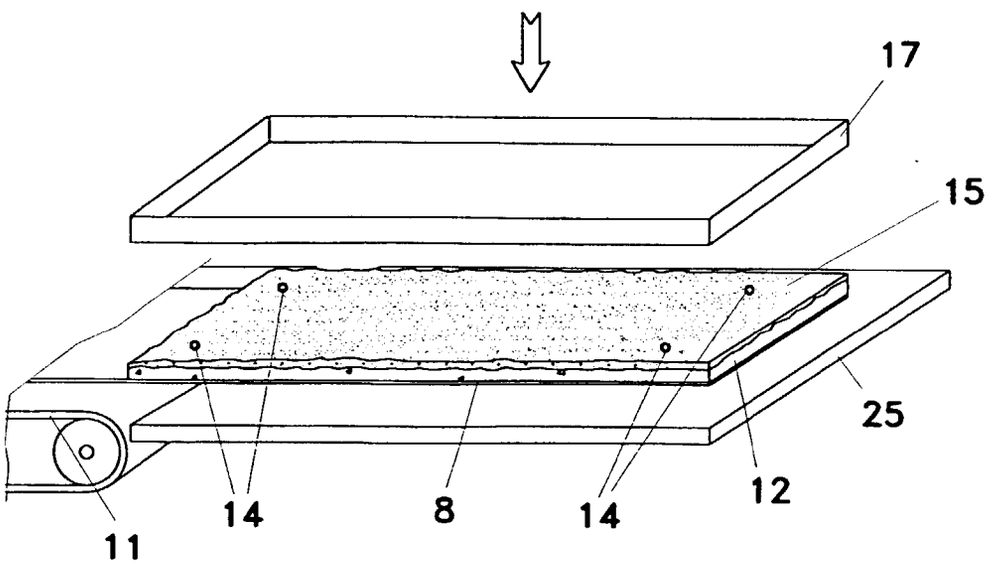

Fig.4

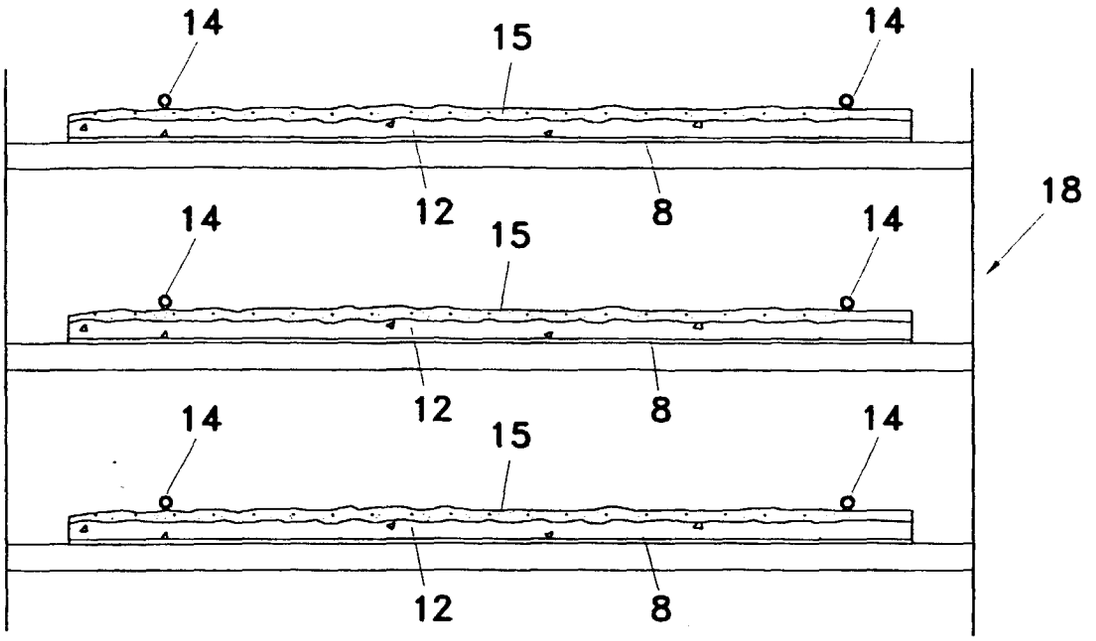

Fig.5

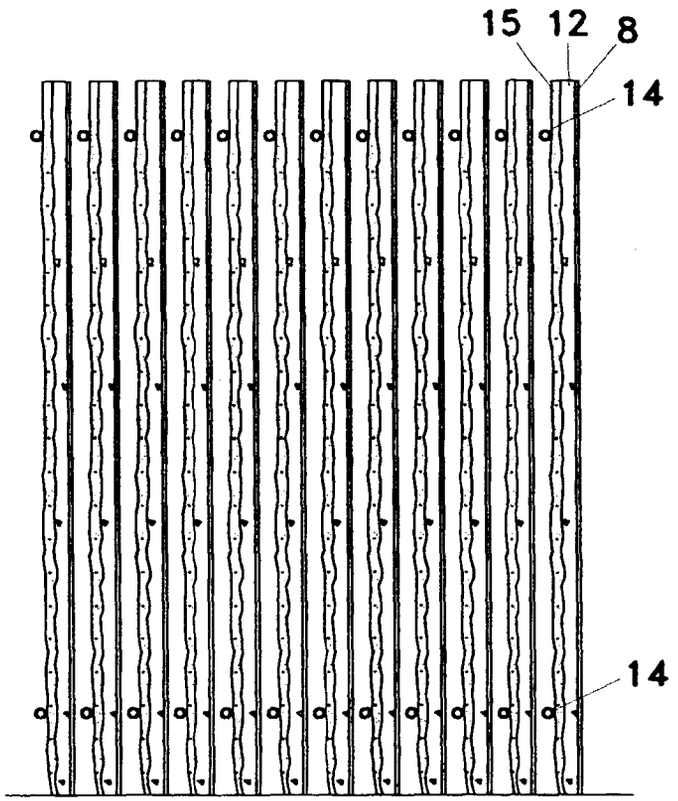

Fig.6

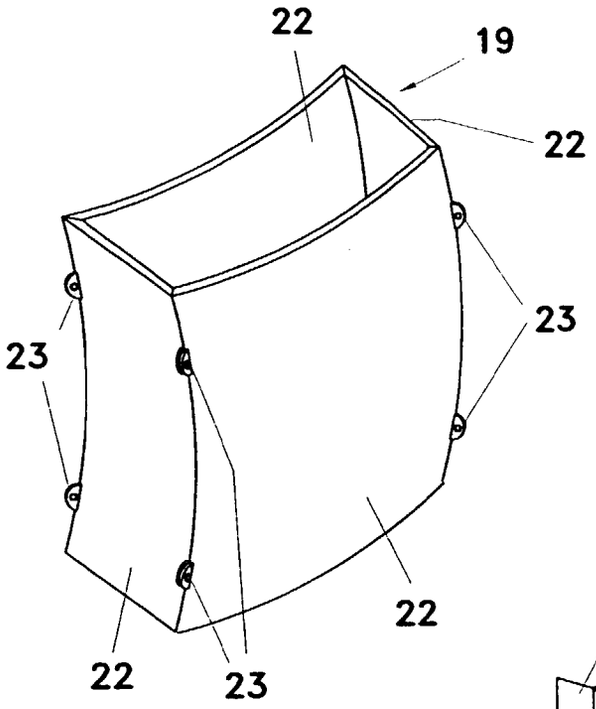

Fig.7

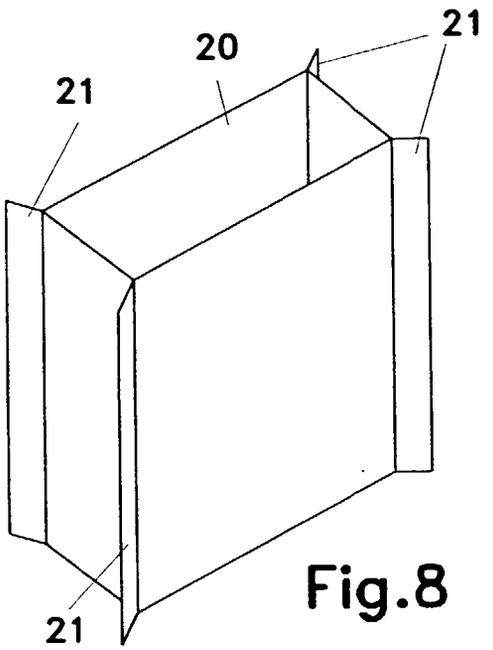

Fig.8

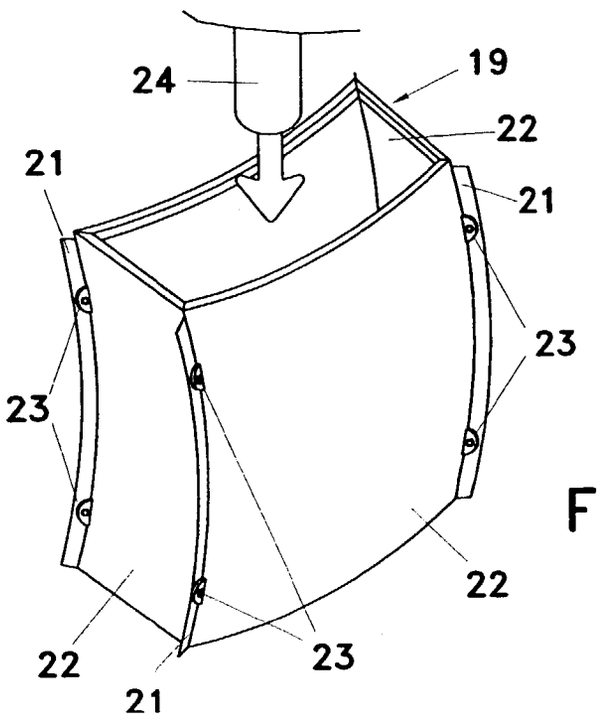

Fig.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 9001

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR 2 359 691 A (FELDMUEHLE ANLAGEN PROD) 24 February 1978 * the whole document * * page 8, line 26 - page 9, line 11 * * claims 1-10 * ---	1-4,6-8	B28B7/36
X	US 2 321 638 A (F. A. WILLIAMS) 15 June 1943 * the whole document * * page 1, column 2, line 19 - page 1, column 2, line 45 * ---	1,2	
X	US 4 702 877 A (DAVIS JR LINDSEY B) 27 October 1987 * the whole document * * column 3, line 53 - column 4, line 10 * * column 6, line 57 - column 7, line 10 *	1,2,4-6	
Y	---	7-9	
X	CH 665 244 A (BSA INGENIEURS CONSEILS) 29 April 1988 * the whole document * * page 2, column 2, line 67 - page 3, column 1, line 34 * * page 3, column 2, line 5 - page 3, column 2, line 7 * * page 3, column 2, line 16 - page 3, column 2, line 19 * * claims 1-5,8,16 * ---	1-3,8	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B28B
Y	US 4 088 808 A (CORNWELL CHARLES E ET AL) 9 May 1978 * column 1, line 31 - column 1, line 47 * * column 2, line 13 - column 2, line 16 *	7,8	
A	--- -/--	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 October 1998	Gourier, P

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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 9001

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	FR 579 365 A (MME S. SEAILLES) 17 October 1924 * the whole document *	8,9	
A		1	
A	US 3 995 086 A (PLUNGUIAN MARK ET AL) 30 November 1976 * the whole document * * column 1, line 18 - column 1, line 35 * * column 2, line 47 - column 2, line 56 * * column 3, line 14 - column 3, line 51 * * claim 8 *	1,4-8	
A	FR 1 553 609 A (AKTIEBOLAGET SILBETO) 10 January 1969 * the whole document * * page 3, column 1, line 1 - page 3, column 1, line 36 * * page 3, column 2, line 10 - page 3, column 2, line 15 *	1,2,4-7	
A	DD 136 828 A (KOHNERT PAUL F J) 1 August 1979 * the whole document *	1-3,5,8,9	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 140 (M-810), 6 April 1989 & JP 63 306003 A (ASAHI CHEM IND CO LTD), 14 December 1988 * abstract *	1,2,7	

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THE HAGUE	19 October 1998	Gourier, P

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19-10-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2359691 A	24-02-1978	DE 2633900 A	02-02-1978
		AT 354925 B	11-02-1979
		AT 496477 A	15-06-1979
		BE 857262 A	30-01-1978
		CA 1109238 A	22-09-1981
		CH 621510 A	13-02-1981
		GB 1590634 A	03-06-1981
		JP 1281432 C	13-09-1985
		JP 53022519 A	02-03-1978
		JP 60004761 B	06-02-1985
		LU 77841 A	02-02-1978
		NL 7707973 A	31-01-1978
		SE 424836 B	16-08-1982
		SE 7708358 A	29-01-1978
		US 4331628 A	25-05-1982
US 2321638 A	15-06-1943	NONE	
US 4702877 A	27-10-1987	DE 3726752 A	23-02-1989
		US 4836762 A	06-06-1989
		US 4944907 A	31-07-1990
CH 665244 A	29-04-1988	NONE	
US 4088808 A	09-05-1978	US 4036839 A	19-07-1977
		US 4310486 A	12-01-1982
		US 4098755 A	04-07-1978
FR 579365 A	15-10-1924	NONE	
US 3995086 A	30-11-1976	US 4036839 A	19-07-1977
FR 1553609 A	10-01-1969	BE 710889 A	01-07-1968
		NL 6801896 A	22-08-1968
DD 136828 A	01-08-1979	NONE	

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