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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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(54) Title: MIXTURE FOR MAKING ELEMENTS FOR BUILDING AND ELEMENTS FOR BUILDING OBTAINABLE WITH SUCH A MIXTURE

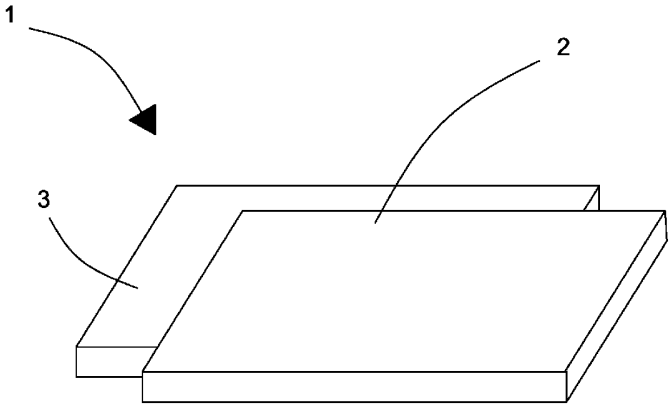

Fig. 1

(57) Abstract: A mixture for making elements for building is obtained by mixing together glass, in a percentage near 50% in weight of the mixture, feldspar, clay, sand, ceramic waste material, bentonite and, possibly, colouring and fluidifying substances. The mixture is intended for obtaining elements for building by pressing and firing in a kiln. An element for building (1) comprises a first part (2) and a second part (3) that are superimposed on one another and both have the same size and shape, the second part (3) being arranged in a staggered position with respect to the first part (2).

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Mixture for making elements for building and elements for building obtainable with such a mixture

The present invention relates to a mixture for making elements for building such as bricks, wall tiles and floor tiles, elements for making floating floors, of any size and thickness.

In the prior art a large variety of elements for building is known, which elements are made of ceramic material, bricks or natural stones.

All the known types of elements for building require the use of natural materials, which affects, even significantly, the manufacturing costs of the product.

An object of the present invention is to provide a mixture for manufacturing elements for building that is cheap and enables elements to be obtained that have mechanical strength that is at least similar to the mechanical strength of known elements for building.

A further object of the present invention is to provide a mixture for manufacturing elements for building that enables coloured elements to be made that have homogeneous colouring, minimising the quantity of colouring substances used in the mixture.

A further object of the present invention is to provide elements for building that are manufacturable with the aforesaid mixture and can be implemented in such a manner that the connections between adjacent elements do not affect the entire thickness of the elements.

The objects of the invention are achieved with a mixture for elements for building according to claim 1 and with an element for building according to claim 9.

Non-limiting embodiments of the invention will be disclosed below, with reference to the attached drawings, in which:

Figure 1 is a perspective view of a first embodiment of an element for building according to the invention;

Figure 2 is a top view of Figure 1;

Figure 3 shows an example of a connection of a plurality of elements for building according to Figure 1;

Figure 4 is a raised frontal view of the elements for building in Figure 3;

Figure 5 is a view from the right of the elements for building in Figure 3.

The elements for building 1, according to the invention are characterised in that they are made with a mixture that uses a high percentage of recycled material, in particular vitreous material, obtained from milling glass objects and waste vitreous materials.

Typical ceramic mixture materials, such as clays, feldspar, sand, waste raw ceramic material, bentonite and possible colouring and fluidifying substances are added to the glass used for obtaining the mixture according to the invention.

Further, said mixture may comprise allumina, obtained from milling allumina supports of compact fluorescent lamps.

The vitreous material and the allumina can also be obtained from milling pyroceram objects.

The mixture is pressed in a normal ceramic press and subjected to firing. The presence of the glass in a prevalent quantity enables the solidification of the mixture to be obtained at a firing temperature comprised between approximately 850°C and approximately 1000 °C, which is significantly below the normal firing temperatures of the ceramic mixtures, which are comprised between approximately 1150 °C and 1250 °C. This enables significant energy to be saved in manufacturing the elements for building according to the invention.

For example, for firing elements for building made of vitrified stoneware energy consumption is approximately 1.16 kWh/kg, whereas for firing elements for building made with the mixture according to the invention energy consumption is approximately 0.8 kWh/kg, with energy saving of approximately 30%. The reduction in energy consumption also entails a consequent reduction of CO_2 emissions.

According to one embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	48%-80%
Feldspar	8%-20%
Granitic clay	2.5%-4.5%
Ceramic clay	2.5%-4.5%
Sand	1.5%-3%
Waste raw ceramic material	1.5%-3%
Colouring substances (optional)	1.5%-3%
Bentonite	0.2%-0.45%
Fluidifying substance (optional)	0.4%-0.6%

According to a further embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	48%-78%
Allumina	2%-5%
Feldspar	8%-20%
Granitic clay	2.5%-4.5%
Ceramic clay	2.5%-4.5%
Sand	1.5%-3%
Waste raw ceramic material	1.5%-3%
Colouring substances (optional)	1.5%-3%
Bentonite	0.2%-0.45%
Fluidifying substance (optional)	0.4%-0.6%

According to a preferred embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	65%-80%
Feldspar	9.5%-15.5%
Granitic clay	2.5%-3.5%
Ceramic clay	2.5%-3.5%
Sand	1.5%-2.5%
Waste raw ceramic material	1.5%-2.5%
Colouring substances (optional)	1.5%-2.5%
Bentonite	0.2%-0.45%

Fluidifying substance (optional)	0.4%-0.6%

According to a further preferred embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	65%-78%
Allumina	2%-5%
Feldspar	9.5%-15.5%
Granitic clay	2.5%-3.5%
Ceramic clay	2.5%-3.5%
Sand	1.5%-2.5%
Waste raw ceramic material	1.5%-2.5%
Colouring substances (optional)	1.5%-2.5%
Bentonite	0.2%-0.45%
Fluidifying substance (optional)	0.4%-0.6%

According to a particularly preferred embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	74%
Feldspar	12.95%
Granitic clay	3%
Ceramic clay	3%
Sand	2%
Waste raw ceramic material	2%
Colouring substances (optional)	2.25%
Bentonite	0.3%
Fluidifying substance (optional)	0.5%

According to a further particularly preferred embodiment of the present invention, the formulation of the mixture for elements for building is as follows:

Vitreous material	71%
Allumina	3%
Feldspar	12.95%
Granitic clay	3%
Ceramic clay	3%
Sand	2%
Waste raw ceramic material	2%

Colouring substances (optional)	2.25%
Bentonite	0.3%
Fluidifying substance (optional)	0.5%

The elements for building obtained with the mixture according to the present invention have a mechanical strength that is at least equal to that of the elements for building made of ceramic material and further, owing to the presence of the glass in the mixture are substantially impermeable. This makes the elements for building particularly suitable for wall and floor coverings on the outside and inside of buildings and for making so-called floating floors.

A further advantage of the mixture according to the present invention lies in the fact that elements for building made with said mixture require, in wet-cutting operations, a smaller quantity of water than elements for building made with traditional ceramic mixtures. The reduction of the consumption of water for wet-cutting operations is quantifiable as approximately 3 litres for each square metre of cut elements, with a proportional reduction in the quantity of mud produced, which is calculable as approximately 1.16 kg for square metre of cut elements.

A still further advantage consists of the possibility of obtaining coloured elements for building with a uniform colouring by using a quantity of pigments that is much less than that which would be necessary to obtain the same result in the case of elements for building made with traditional ceramic mixtures, for example also less than 90%. This is due to the presence of glass in the mixture according to the invention.

Lastly, the elements for building made with the mixture according to the invention are completely recyclable, inasmuch as they are used, after being milled, to produce other elements for building.

In Figures 1 and 2 there is illustrated an embodiment of an element for building according to the invention, that enables floor or wall coverings to be made in which there are not

joints that extend for the entire thickness of the wall or floor covering, which ensures that no humidity or dirt in general infiltrate through the wall or floor covering. This is particularly advantageous in the case of so-called floating floor covering, under which electrical circuits or pipes are normally arranged, because there is no risk that humidity or dirt can penetrate through the joints of the flooring, reaching and possibly damaging the electric circuits and pipes below.

In the embodiment, illustrated in Figure 1, the element for building 1 comprises a first part 2 and a second part 3 that are superimposed on one another and both have the same size and shape, preferably quadrangular. The second part 3 is arranged in a staggered position with respect to the first part 2 so as to be displaced by a first distance D with respect to the first part 2, in a first direction that is perpendicular to a pair of sides opposite the first part 2 and displaced by a second distance D1 with respect to the first part 2, in a second direction that is perpendicular to said first direction. The element for building 1 according to the invention can be obtained by moulding, in a single body, or the first part 2 and the second part 3 can be made separately and fixed together subsequently by gluing. As can be seen from Figures 3, 4 and 5, by joining together a plurality of elements 1 a set 4 is obtained in which the joint lines G between adjacent elements 1 extend only half way through the thickness S of the set and no joint line extends through the entire thickness of the set 4.

The elements for building 1, can have a square, rectangular, or parallelogram shape.

CLAIMS

1. Mixture for making elements for building, characterised in that it comprises vitreous material in a percentage that is at least equal to 48%-50% in weight, feldspar, clays, waste raw ceramic material, sand and bentonite.
2. Mixture according to claim 1, further containing colouring allumina, in a percentage comprised between 2% and 5% in weight.
3. Mixture according to claim 1, or 2, wherein said vitreous material and said allumina are obtained from milling vitreous material waste, pyroceram waste and allumina waste.
4. Mixture according to any preceding claim, further containing possible colouring substances and possible fluidifying substances.
5. Mixture according to any one of claims 1, 3 and 4, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	48%-80%
Feldspar	8%-20%
Granitic clay	2.5%-4.5%
Ceramic clay	2.5%-4.5%
Sand	1.5%-3%
Waste raw ceramic material	1.5%-3%
Bentonite	0.2%-0.45%

6. Mixture according to any one of claims 1 to 4, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	48%-78%
Allumina	2%-5%
Feldspar	8%-20%
Granitic clay	2.5%-4.5%
Ceramic clay	2.5%-4.5%
Sand	1.5%-3%
Waste raw ceramic material	1.5%-3%

Bentonite	0.2%-0.45%

7. Mixture according to claim 5, or 6, further comprising colouring substances in a percentage comprised between 1.5% and 3% in weight and possibly fluidifying substances in a percentage comprised between 0.4% and 0.6% in weight.

8. Mixture according to claim 5, or 7, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	65%-80%
Feldspar	9.5%-15.5%
Granitic clay	2.5%-3.5%
Ceramic clay	2.5%-3.5%
Sand	1.5%-2.5%
Waste raw ceramic material	1.5%-2.5%
Bentonite	0.2%-0.45%

9. Mixture according to claim 6, or 7, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	65%-78%
Allumina	2%-5%
Feldspar	9.5%-15.5%
Granitic clay	2.5%-3.5%
Ceramic clay	2.5%-3.5%
Sand	1.5%-2.5%
Waste raw ceramic material	1.5%-2.5%
Bentonite	0.2%-0.45%

10. Mixture according to claim 8, or 9, further comprising colouring substances in a percentage comprised between 1.5% and 2.5% in weight and possibly fluidifying substances in a percentage comprised between 0.4% and 0.6% in weight.

11. Mixture according to claim 5, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	74%

Feldspar	12.95%
Granitic clay	3%
Ceramic clay	3%
Sand	2%
Waste raw ceramic material	2%
Bentonite	0.3%

12. Mixture according to claim 6, characterised in that it is obtained with the following formulation, expressed in weight percentages:

Vitreous material	71%
Allumina	3%
Feldspar	12.95%
Granitic clay	3%
Ceramic clay	3%
Sand	2%
Waste raw ceramic material	2%
Bentonite	0.3%

13. Mixture according to claim 11, or 12, further comprising colouring substances in a percentage equal to approximately 2.25% in weight and possibly fluidifying substances in a percentage equal to approximately 0.5% in weight.

14. Element for building (1) obtained with the mixture according to any one of claims 1 to 13, characterised in that it comprises a first part (2) and a second part (3) that are superimposed on one another and both have the same size and shape, the second part (3) being arranged in a staggered position with respect to the first part (2).

15. Element for building (1) according to claim 14, wherein said shape is a quadrangular shape.

16. Element for building (1) according to claim 15, wherein said second part (3) is arranged in a staggered position with respect to the first part (2) so as to be displaced by a first distance (D) with respect to the first part (2), in a first direction that is perpendicular to a pair

of sides opposite the first part (2) and displaced by a second distance (D1) with respect to the first part (2), in a second direction that is perpendicular to said first direction.

17. Element for building (1) according to any one of claims 14 to 16, wherein said first part (2) and said second part (3) are made as a single body.

18. Element for building (1) according to any one of claims 14 to 16, wherein said first part (2) and said second part (3) are made separately and are fixed together by gluing.

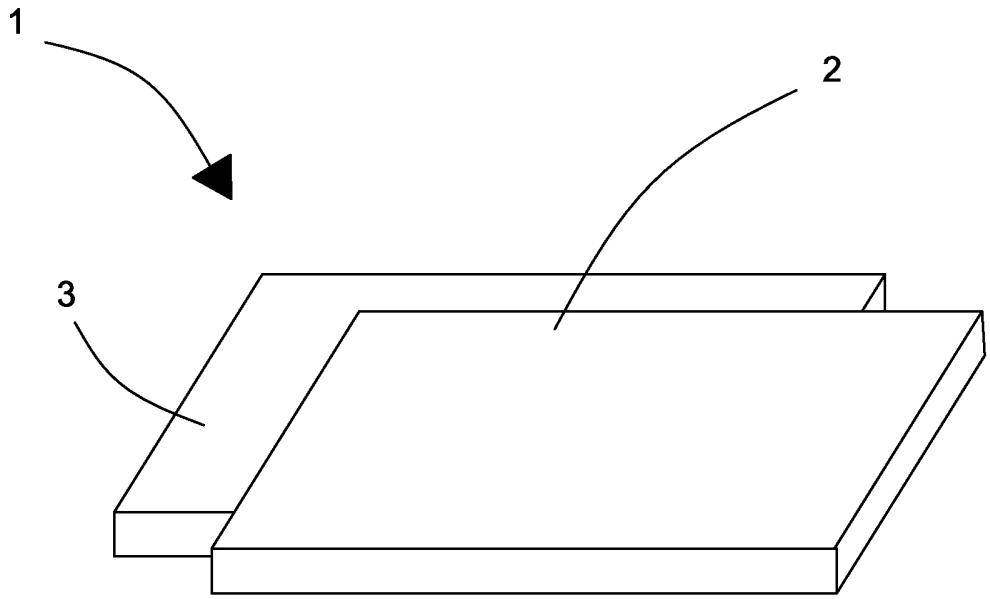

Fig. 1

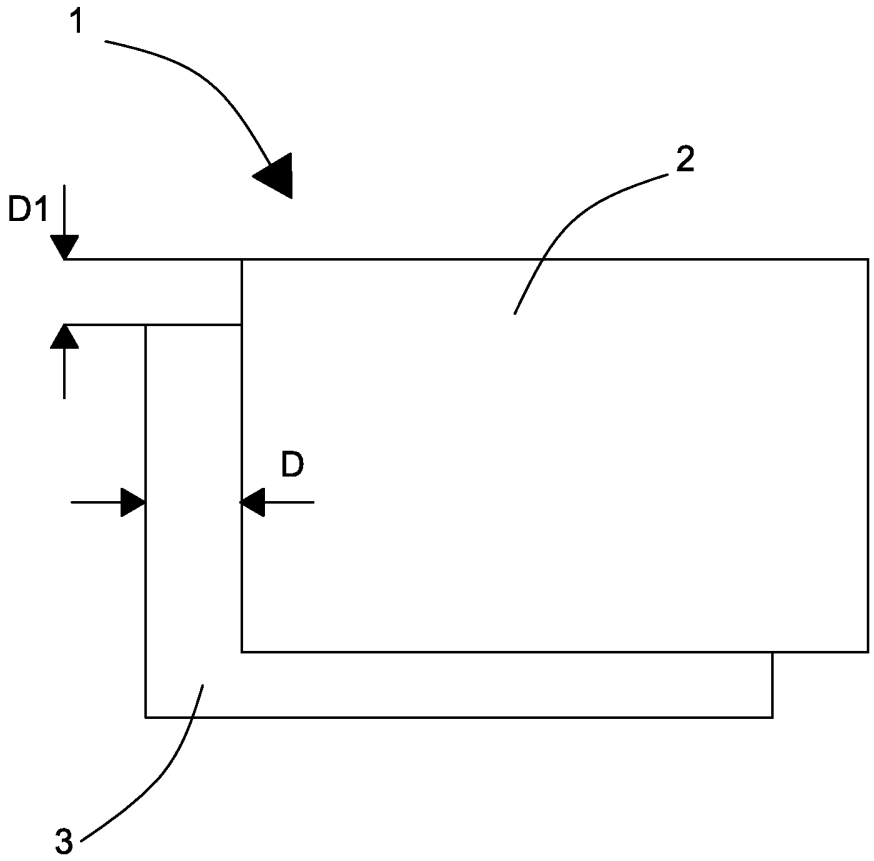

Fig. 2

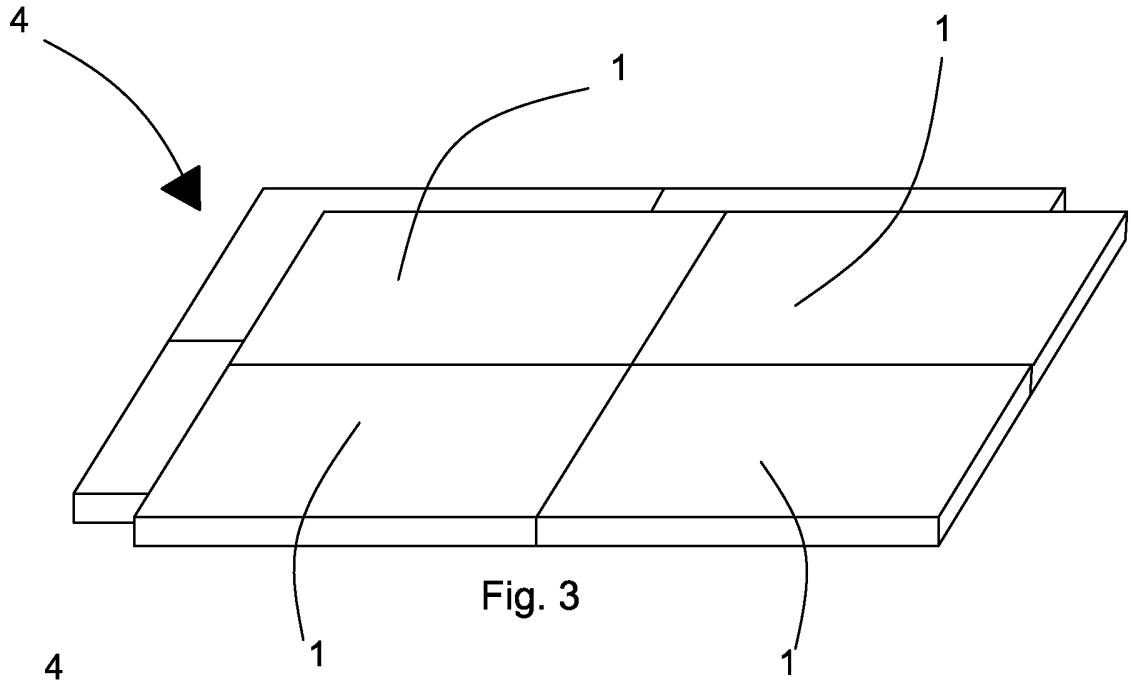

Fig. 3

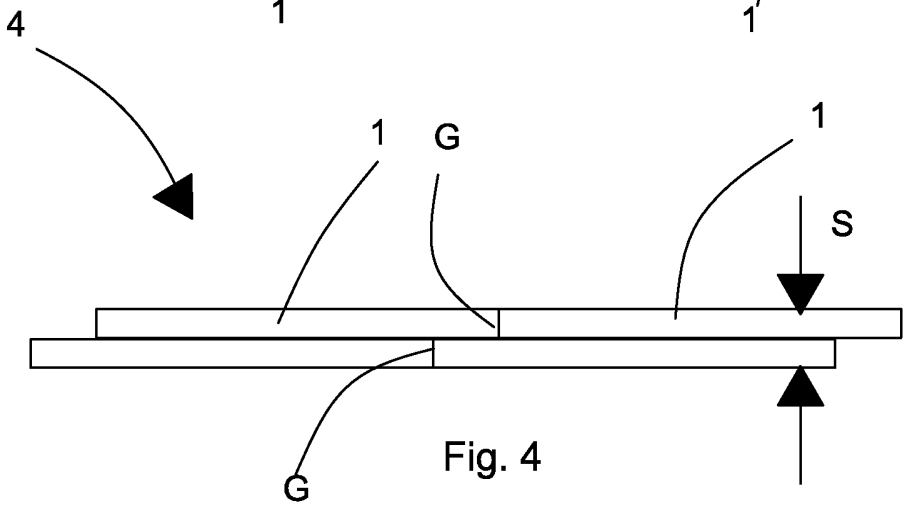

Fig. 4

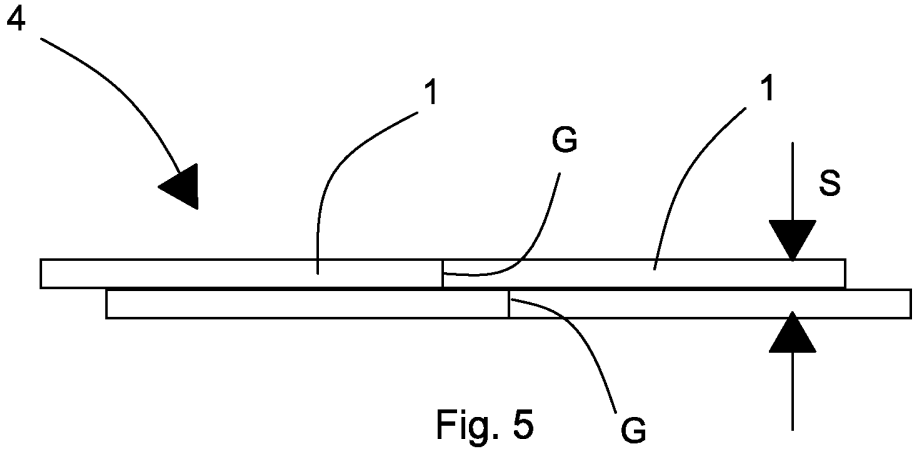

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/051636

A. CLASSIFICATION OF SUBJECT MATTER
INV. B32B18/00 C04B33/13 C04B33/14 C04B33/18 C04B37/00
C04B33/132 E04C2/04 C04B35/626
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)
B32B C04B E04C

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, WPI Data, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BR 9 301 424 A (IND DE AZULEJOS DE BAHIA S A [BR]) 20 December 1994 (1994-12-20) table 1	1-4
A	US 2 776 899 A (DONAHEY JOHN W) 8 January 1957 (1957-01-08) column 4, lines 51-54	1-8
X	DATABASE WPI Week 197636 Thomson Scientific, London, GB; AN 1976-68241X XP002601754, & SU 490 781 A (NAUMOV A M) 4 February 1976 (1976-02-04)	1,3,4
Y	abstract	14-18

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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"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
6 September 2011	13/09/2011

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/051636

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 47 939 A1 (SCHOELLER BLECKMANN STAHLWERKE) 15 April 1971 (1971-04-15) claim 3	1,3,4
Y	FR 1 006 660 A (BENNDORF KURT REINHOLD) 25 April 1952 (1952-04-25) claim 1; figure 10	14-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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