

(19)



(11)

**EP 1 887 132 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:  
**08.08.2018 Bulletin 2018/32**

(51) Int Cl.:  
**D21H 21/44<sup>(2006.01)</sup> C08J 3/20<sup>(2006.01)</sup>**

(21) Application number: **05731849.5**

(86) International application number:  
**PCT/ES2005/000179**

(22) Date of filing: **06.04.2005**

(87) International publication number:  
**WO 2006/108886 (19.10.2006 Gazette 2006/42)**

**(54) SECURITY PAPER OR SPECIAL PAPER COMPRISING HIGH-STRENGTH SYNTHETIC ELEMENTS, AND METHOD FOR MAKING SAME**

SICHERHEITSPAPIER ODER SPEZIALPAPIER MIT HOCHFESTEN SYNTHETISCHEN ELEMENTEN UND HERSTELLUNGSVERFAHREN DAFÜR

PAPIER DE SECURITE OU PAPIER SPECIAL INTEGRANT DES ELEMENTS SYNTHETIQUES A HAUTE RESISTANCE ET PROCEDE DE PRODUCTION DESDITS PAPIERS

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE FI FR GB GR HU  
IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**

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(43) Date of publication of application:  
**13.02.2008 Bulletin 2008/07**

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**Description****OBJECT OF THE INVENTION**

5 [0001] The object of the present invention refers to a security or special paper that incorporates high resistance synthetic elements (fibres, microspheres,...). Another object of the invention refers to a security or special document manufactured with the above-mentioned security or special paper. The invention also refers to a procedure for manufacturing the above-mentioned security paper or special paper incorporating high resistance synthetic elements.

10 [0002] These synthetic elements incorporated in the security paper or special paper are usually provided different qualities such as been fluorescent, phosphorescent, luminescent, with magnetic characteristics, etc, characteristics that are visible to the naked eye all that can be observed under certain conditions, such as under ultraviolet light, magnetic sensors, etc

15 [0003] The synthetic elements incorporated by the security paper or special paper proposed by the invention provide that such characteristics conferred to these elements are embedded within them, such that the loss of properties inherent to these elements becomes more difficult as time goes by, resisting the harsh conditions that security and special documents are subject to, such as bank notes or the like.

**BACKGROUND OF THE INVENTION**

20 [0004] The use of security documents incorporating fluorescent fibres and other synthetic elements with different verification and detection responses that are introduced during the paper manufacturing process such that some elements are embedded within the paper as it is formed is known in the state of the art.

25 [0005] These elements, in the case of the fibre is, for example, are generally manufactured in viscous or polyamide, substances that are related to water since they have hydrogen free radicals. These are, therefore, substances that can be easily integrated in water dispersions, which are the base of the paper manufacturing process, since the fibres the paper is made of are introduced in the paper manufacturing machine as an aqueous dispersion that will form the sheet of paper as the water is extracted.

[0006] The fibre manufacturing procedure is generally performed by obtaining extremely fine filaments in an extrusion line that are cut to a certain length.

30 [0007] Certain pigments are added to this type of elements to confer them the desired characteristics of fluorescence, phosphorescence, luminescence, magnetism etc, these pigments being applied after manufacturing said fibres, such said fibres are superficially impregnated.

35 [0008] The pigments usually used can basically be of two types, inorganic-based pigments are the main characteristic of which is offering good resistance to preserve the fluorescent, phosphorescent, luminescent, magnetic, and other properties, although in contrast they offer deficient response intensity.

[0009] The second type of pigments that can be used organic-based pigments and have bad resistance, the effects lasting little, but however, offering good response intensity.

[0010] The synthetic element impregnation procedure provides introducing these inside pressure tanks, until they are totally dyed by the pigments.

40 [0011] These elements, in order to be incorporated into the paper manufacturing process, are prepared in the form of a water suspension provided to the paper manufacturing process, thus being embedded inside the paper at different depths that are randomly arranged.

45 [0012] It has been demonstrated that superficially arranged pigments lose their features prematurely since light deteriorates their properties very easily, since there are only protected by the possible fibres in the paper. Moreover, since these pigments remain on the surface they can easily deteriorate by friction or the use given to the security paper they are on.

[0013] It has thus been demonstrated that security papers integrating elements with fluorescence, phosphorescence, luminescence, and other features lose such qualities with use, making these authentication and recognition measures practically useless for such security documents.

50 [0014] The U.S patent US-3880706 discloses a security paper containing fused thermoplastic material.

**DESCRIPTION OF THE INVENTION**

[0015] The invention is defined in the attached independent claims 1 and 5.

55 [0016] It is the object of the invention to obtain a security paper or special paper which, based on the previously mentioned technology, internally incorporates synthetic elements that are provided with pigments, either fluorescent, phosphorescent, luminescent, magnetic, etc., that confer them security features, that such pigments are highly resistant to the detachment of their own synthetic elements and that they can be easily integrated in the manufacturing process

of a security paper or special paper used to manufacture security documents or special documents such as banknotes, bills of exchange, security labels, etc.

[0017] Another object of the invention refers to a security or special document manufactured by printing on a security paper or special paper such as described in claim 1 and manufactured by a procedure such as described in claims 5 to 6.

[0018] It is also a non-claimed object of the invention to achieve the security or special document, either a banknote, bill of exchange, security label, etc that has as a substrate this security paper or special paper integrating synthetic elements with the qualities of being highly resistant to wear factors of the document itself without their characteristics being altered.

[0019] Also the object of the invention is an improved procedure for incorporating said synthetic elements in the paper forming process, preventing their caking and therefore favouring their dispersion and integration in the paper pulp.

[0020] In order to carry out the object of the invention we propose using synthetic elements with the pigments or products to be conferred singular characteristics, inside the material of the element itself. The material of the element itself will protect said pigment or product provided to the fibre and conferring it the appropriate security characteristics.

[0021] The pigment introduced in the paste for forming the synthetic element will be protected by the material of the element itself, preventing wear by friction and being protected from attacks from physical and chemical agents that the security document may suffer and from light, so that the features incorporated in the pigments are kept unchanged with time.

[0022] The material of these synthetic elements that allows integrating the pigments in the pulp without their deterioration in is not viscous or polyamide but polypropylene, and has the difficulty of being a material without hydrogen free radicals and is therefore a product that is not related to the water surrounding it, that is, it is not impregnated in the water of the aqueous solution it is in, producing caking of the synthetic elements and therefore not providing a homogeneous dispersion thereof in the water.

[0023] An aqueous solution has been achieved in which the synthetic elements are dispersed without caking, with the addition of dispersing and/or penetrating and/or antifoaming agents in the appropriate proportion. This allows them to be incorporated in the aqueous paper forming solution, achieving the homogenous dispersion of such synthetic elements inside the pulp of the paper that is being formed, preventing the caking of the synthetic elements.

[0024] This homogeneous incorporation of the synthetic elements in the paper forming pulp allows though to be distributed inside the paper, which is compared to the effect is achieved with the viscous or polyamide fibres but with a material that does not present affinity towards water.

[0025] A procedure for incorporating the synthetic elements with this material is to achieve a dispersion of water and synthetic elements that is continuously stirred. Dispersing agents and/or penetrating agents and/or antifoaming agents are added to this dispersion in appropriate proportions, thus preventing the caking of the synthetic elements. The dispersion is prepared in several loading and homogenising deposits prior to it being pumped to the paper production circuit in the machine.

[0026] Incorporation of these synthetic elements can be performed randomly in the entire pulp of the paper being formed or it can be performed in a localised manner at specific points of the paper pulp, thus obtaining longitudinal strips of synthetic elements located at different levels on the thickness of the paper with such elements, which increases the degree of security of the final document thus obtained.

## DESCRIPTION OF THE DRAWINGS

[0027] In order to complete the description being made and to aid towards a better comprehension of the features of the invention, according to our preferred practical embodiment thereof, we incorporate as an integral part of said description a set of drawings that are illustrative and not limiting in nature, and represent the following:

Figure 1 shows an enlarged section of paper incorporating this type of synthetic elements in its pulp, such as that shown in the invention.

Figure 2 equally represents an enlarged section of the paper incorporating the synthetic elements of the invention in strips.

Figure 3 represents a schematic diagram of the tanks for preparing the aqueous solution of synthetic elements before being introduced in the paper manufacturing machine.

## DETAILED DESCRIPTION OF THE DRAWINGS

[0028] Figure 1 shows an embodiment of a security paper or special paper (3) with the synthetic elements integrated in its pulp, in this case in the shape of fibres (1) of the invention, in the same manner as in a traditional embodiment of

the state-of-the-art, achieving that, despite these fibres being made in polypropylene, which does not present affinity towards water, such fibres are not caked or superficially retained on the paper itself, but randomly distributed inside the paper formed.

[0029] Figure 2 is a variant of the embodiment of a security paper or special paper (3) wherein the synthetic elements of the invention, in this case again in the form of fibres (1), can be integrated in strips (4) by means of controlled insertion techniques for inserting such fibres inside the paper during their manufacture, controlling the depth at which said fibre strips are introduced, so that they remained superficially or embedded inside the paper thus formed.

[0030] Figure 3 represents a schematic diagram for the procedure of preparing an aqueous solution of the synthetic elements, wherein these are initially conditioned inside an aqueous dispersion in a tank (5), wherein an amount of dispersing and/or penetrating and/or antifoaming agents is conditioned in an adequate amount, as well as the synthetic elements and the aqueous base for the suspension thereof, said suspension being stirred.

[0031] The dispersion thus prepared then goes through a homogenising step (6) and is then dosed by means of appropriate pumps (7) towards the entry in the paper manufacturing machine (8) for said synthetic elements to be integrated en masse or in a controlled manner.

**PRACTICAL EMBODIMENT OF THE INVENTION**

[0032] Examples of dispersing products would be POLISAL ® by BASF or AMP-90 ® by ANGUS. POLISAL ® is an aqueous solution of a yellowish sodium polyacrylate with an approximate density of 1.3 gr/cm<sup>3</sup>, which is a very active product for dispersion and refinement of the pigments used in the paper industry, especially for coating pigments.

[0033] The dispersing agent AMP-90 ® is an aqueous solution of 2-amino-2-methyl-1-propanol. This dispersing agent is colourless, with a relatively low viscosity and remains liquid at pretty low temperatures, such as -37°C, which allows easy and adequate handling in industrial plants. This product is a very efficient dispersing agent for pigments in plastic paints and, as a fatty acid salt, emulsifier in non-mixing water-liquid systems. It also provides pH stability, low odour and anticorrosive properties, and would even increase the acceptance of universal colorants. This product's density is of 0.949 gr/cm<sup>3</sup> at 25°C.

[0034] As a penetrating product we can mention NOPCOWET LO ®, which is a synergic mixture of surface-active humectants and detergents such as Alkyl phosphate and potassium salt, which in the alkaline bleaching process facilitate the uniform impregnation of bleach in the entire pulp to be treated, facilitating the elimination of waxy compounds coating the fibres. Due to its detergent effect it carries away the dirt on the fibres

[0035] As an antifoaming product we can mention AFRANIL MG ® by BASF, which is a mixture of aliphatic hydroxide compounds in an aqueous emulsion. It has a density of approximately 0.960 gr/cm<sup>3</sup> and a pH of approximately 9. This product has a good deaeration effect for the mixtures it is inserted into, with the advantage that water-repellent impurities do not accumulate, that is, it has a dispersing effect.

[0036] Security paper manufacturing tests have been performed, in which the synthetic elements of the invention have been inserted en masse in the form of fibres with a fluorescent feature, comparing it with the security paper with viscous or polyamide fibres as performed in the known state of the art. These security papers have been subjected to several tests in order to verify the stability of the fluorescence characteristics of the fibres with spectacular results. These tests are basically of three types: the first are subjecting these security papers to acids, the second subjecting them to the action of detergents and the third subjecting them to extreme heat and light situations.

[0037] As an example we enclose a comparative table of fibres with fluorescent response.

**TEST PERFORMED WITH FLUORESCENT FIBRES**

[0038] The results are clearly in favour of the paper of invention.

	% OF FLUORESCENCE REMAINING	
	Security paper according to the state of the art	Security paper of the invention
Acetic acid	45-93	79-100
Hydrochloric acid	7-92	94-100
Sulphuric acid	11-100	96-100
Soapy solution at 95°	7-87	95-100
Synthetic sweat	94	94-100
Heat	82-90	85-100

(continued)

	% OF FLUORESCENCE REMAINING	
	Security paper according to the state of the art	Security paper of the invention
Light	3-25	25-96

[0039] The differences may vary according to pigment colour or the type of response expected but always with an improvement upon the current state of the art.

### Claims

1. A security paper or special paper (3) incorporating synthetic elements, wherein the synthetic elements are visible to the naked eye or under ultraviolet light or detectable by magnetic sensors suitable for detecting said synthetic elements, **characterised in that** the synthetic elements are made of polypropylene, and wherein security pigments are included in a paste of the synthetic elements itself, so that the security pigments confer the synthetic elements security features, and so that the synthetic elements protect the pigments from attack of physical and chemical agents and from damaging effects, the pigments having therefore long continuance in time, and wherein the security pigments are either fluorescent, phosphorescent, luminescent or magnetic.
2. A paper incorporating synthetic elements according to claim 1 wherein the synthetic elements are incorporated randomly in the entire paper.
3. A paper incorporating synthetic elements according to claim 1 wherein the synthetic elements have been incorporated in the paper pulp in a localized manner at specific zones of the paper pulp as to form longitudinal strips.
4. A paper incorporating synthetic elements according to claim 1 wherein the synthetic elements have the shape of fibers (1).
5. A procedure for manufacturing a security paper or special paper incorporating high resistance synthetic elements provided with characteristics that are visible to the naked eye or by ultraviolet light or detectable by magnetic sensors suitable for detecting said synthetic elements defined in claim 1, **characterised in that** the synthetic elements are made of polypropylene and are prepared prior to their introduction in the paper manufacturing procedure by means of an aqueous dispersion thereof in the presence of dispersing and/or penetrating and/or antifoaming agents, and wherein security pigments are introduced in a paste of the synthetic elements itself, so that the synthetic elements protect the pigments.
6. A procedure for manufacturing security paper or special paper according to claim 5, **characterised in that** the dispersion of synthetic elements is incorporated homogenously in the paper pulp during its formation process.
7. A procedure for manufacturing security paper or special paper according to claim 5, **characterised in that** the dispersion of synthetic elements is incorporated to the paper pulp in a controlled manner, forming strips or bands where such synthetic elements accumulate.
8. A security or special document manufactured by printing on a security paper or special paper such as described in claim 1 and manufactured by a procedure such as described in claims 5 to 6.

### Patentansprüche

1. Sicherheitspapier oder Spezialpapier (3), umfassend synthetische Elemente, wobei die synthetischen Elemente für das bloße Auge oder unter ultraviolettem Licht sichtbar sind oder durch Magnetsensoren, welche zum Nachweisen der synthetischen Elemente geeignet sind, nachweisbar sind, **dadurch gekennzeichnet, dass** die synthetischen Elemente aus Polypropylen bestehen, und wobei Sicherheitspigmente in einer Paste der synthetischen Elemente enthalten sind, sodass die Sicherheitspigmente den synthetischen Elementen Sicherheitsmerkmale verleihen und die synthetischen Elemente die Pigmente vor einem Angriff mit physikalischen Kräften oder chemischen Substanzen

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und vor schädlichen Einwirkungen schützen, wodurch die Pigmente eine lange Lebensdauer haben, und wobei die Sicherheitspigmente entweder fluoreszierend, phosphoreszierend, lumineszierend oder magnetisch sind.

- 5 2. Papier umfassend synthetische Elemente nach Anspruch 1, wobei die synthetischen Elemente beliebig verteilt in das gesamte Papier eingearbeitet sind.
3. Papier umfassend synthetische Elemente nach Anspruch 1, wobei die synthetischen Elemente in den Papierzellstoff ortsgelungen in spezifischen Bereichen des Papierzellstoffes eingearbeitet sind und längliche Streifen bilden.
- 10 4. Papier umfassend synthetische Elemente nach Anspruch 1, wobei die synthetischen Elemente die Form von Fasern (1) aufweisen.
- 15 5. Verfahren zum Herstellen eines Sicherheitspapiers oder Spezialpapiers umfassend hochbeständige synthetische Elemente, die mit Eigenschaften versehen sind, welche für das bloße Auge oder durch ultraviolettes Licht sichtbar sind oder durch Magnetsensoren, welche zum Nachweisen der in Anspruch 1 definierten synthetischen Elemente geeignet sind, nachweisbar sind, **dadurch gekennzeichnet, dass** die synthetischen Elemente aus Polypropylen bestehen und vor ihrem Einbringen in dem Papierherstellungsverfahren mit Hilfe von wässriger Dispersion daraus in Gegenwart von Dispergier- und/oder Penetrier- und/oder Antischaummitteln vorbereitet werden, und wobei Sicherheitspigmente in eine Paste der synthetischen Elemente eingebracht werden, sodass die synthetischen Elemente die Pigmente schützen.
- 20 6. Verfahren zum Herstellen von Sicherheitspapier oder Spezialpapier nach Anspruch 5, **dadurch gekennzeichnet, dass** die Dispersion von synthetischen Elementen in den Papierzellstoff während seines Entstehungsvorgangs gleichmäßig eingearbeitet wird.
- 25 7. Verfahren zum Herstellen von Sicherheitspapier oder Spezialpapier nach Anspruch 5, **dadurch gekennzeichnet, dass** die Dispersion von synthetischen Elementen kontrolliert in den Papierzellstoff eingearbeitet wird, wodurch Streifen oder Bänder gebildet werden, dort wo sich die synthetischen Elemente ansammeln.
- 30 8. Sicherheits- oder Spezialdokument, das durch Drucken auf ein Sicherheitspapier oder Spezialpapier wie in Anspruch 1 beschrieben hergestellt ist und durch ein Verfahren wie in den Ansprüchen 5 bis 6 beschrieben hergestellt ist.

### Revendications

- 35 1. Un papier de sécurité ou papier spécial (3) incorporant des éléments synthétiques dans lequel les éléments synthétiques sont visibles à l'oeil nu ou sous lumière ultra-violette ou sont détectables par des capteurs magnétiques susceptibles de détecter ces éléments synthétiques, **caractérisé en ce que** les éléments synthétiques sont formés de polypropylène et **en ce que** des pigments de sécurité sont inclus dans la pâte même des éléments synthétiques de sorte que ces pigments de sécurité confèrent les caractéristiques aux éléments synthétiques et que les éléments synthétiques protègent les pigments de l'attaque des agents physiques et chimiques et de leurs effets dommageables, les pigments se voyant ainsi conféré une longue période de vie et dans lequel les pigments de sécurité sont soit fluorescents, phosphorescents, luminescents ou magnétiques.
- 40 2. Un papier incorporant des éléments synthétiques selon la revendication 1, dans lequel les éléments synthétiques sont incorporés aléatoirement dans l'ensemble du papier
3. Un papier incorporant des éléments synthétiques selon la revendication 1, dans lequel les éléments synthétiques ont été incorporés dans la pâte à papier de manière localisée dans des zones spécifiques de la pâte de façon à former des bandes longitudinales.
- 50 4. Un papier incorporant des éléments synthétiques selon la revendication 1, dans lequel les éléments synthétiques ont la forme de fibres (1).
- 55 5. Un procédé de fabrication de papier de sécurité ou de papier spécial incorporant des éléments synthétiques à haute résistance présentant des caractéristiques qui sont visibles à l'oeil nu ou sous lumière ultra-violette ou qui sont détectables par des capteurs magnétiques susceptibles de détecter ces éléments synthétiques, ce papier étant tel que défini dans la revendication 1 et étant **caractérisé en ce que** les éléments synthétiques sont formés de poly-

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propylène et sont préparés préalablement à leur introduction dans le procédé de fabrication du papier par dispersion aqueuse de ces éléments synthétiques en présence d'agents dispersants et / ou pénétrants et / ou antimousse, et dans lequel les pigments de sécurité sont introduits dans une pâte des éléments synthétiques eux-mêmes de sorte que ces pigments de sécurité protègent les pigments.

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6. Un procédé de fabrication de papier de sécurité ou de papier spécial selon la revendication 5, **caractérisé en ce que** la dispersion d'éléments de sécurité est incorporée de façon homogène à la pâte de papier pendant son processus de formation.

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7. Un procédé de fabrication de papier de sécurité ou de papier spécial selon la revendication 5, **caractérisé en ce que** la dispersion d'éléments de sécurité est incorporée à la pâte de papier de manière contrôlée, en formant des bandes ou rubans où ces éléments synthétiques s'accumulent.

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8. Un document de sécurité ou spécial fabriqué par impression sur un papier de sécurité ou un papier spécial tel que décrit dans la revendication 1 et fabriqué par un procédé tel que décrit dans les revendications 5 ou 6.

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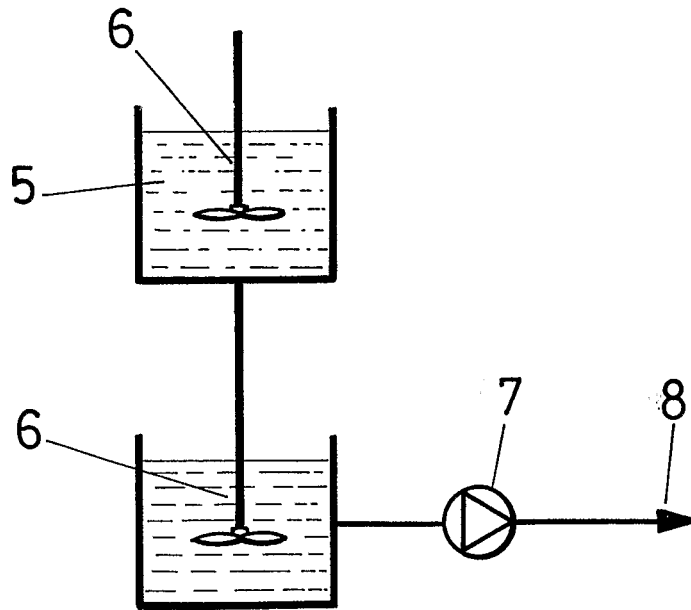
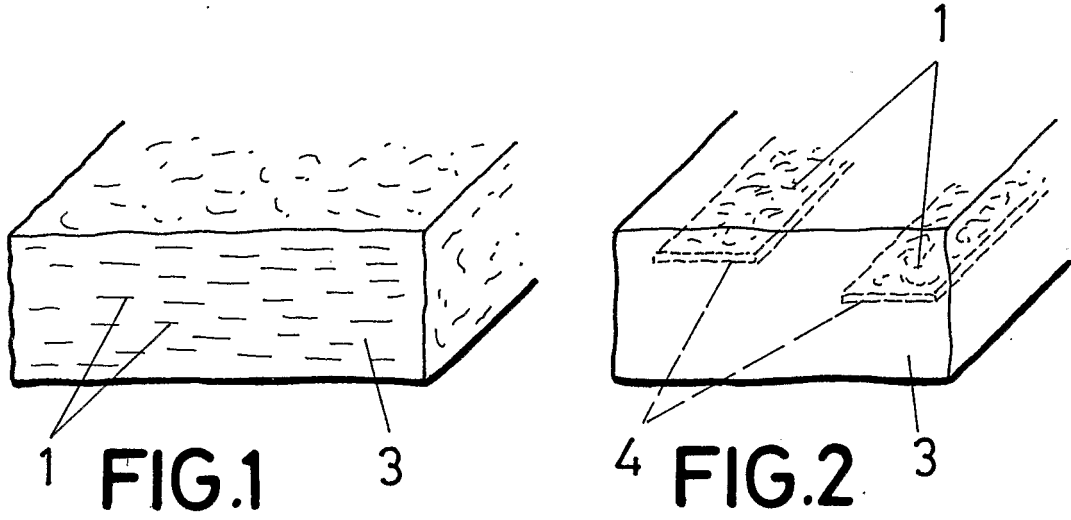


FIG. 3



**REFERENCES CITED IN THE DESCRIPTION**

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