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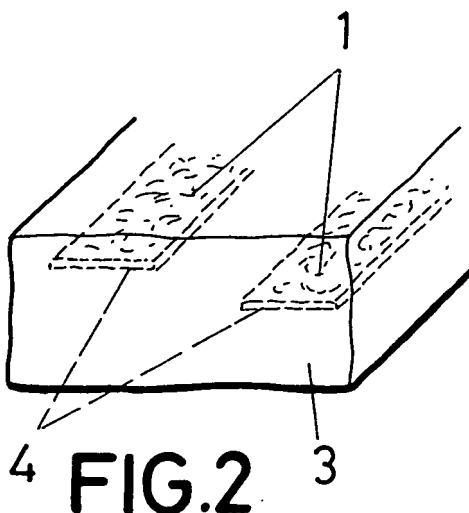
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(54) **SECURITY PAPER OR SPECIAL PAPER COMPRISING HIGH-STRENGTH SYNTHETIC
ELEMENTS, AND METHOD FOR MAKING SAME**

(57) It consists in performing a security paper or special paper incorporating pigments within the paste of the synthetic element itself during its manufacture, providing

pigment properties to said synthetic element, the pigments being protected from the attack of physical and chemical agents by the synthetic element itself.



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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,...), as well as a security document manufactured with said support.

[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

10 **[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

[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.

20 **[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.

25 **[0006]** The fibre manufacturing procedure is generally performed by obtaining extremely fine filaments in an extrusion line that are cut to a certain length.

[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.

30 **[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.

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.

35 **[0009]** The synthetic element impregnation procedure provides introducing these inside pressure tanks, until they are totally dyed by the pigments.

[0010] 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.

40 **[0011]** 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.

45 **[0012]** 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.

DESCRIPTION OF THE INVENTION

50 **[0013]** 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.

55 **[0014]** It is also the 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.

[0015] 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 paste.

[0016] 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.

[0017] 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.

[0018] The material of these synthetic elements that allows integrating the pigments in the paste without their deterioration 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.

[0019] 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 paste of the paper that is being formed, preventing the caking of the synthetic elements.

[0020] This homogeneous incorporation of the synthetic elements in the paper forming paste 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.

[0021] 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.

[0022] Incorporation of these synthetic elements can be performed randomly in the entire paste of the paper being formed or it can be performed in a localised manner at specific points of the paper paste, 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

[0023] 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 paste, 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

[0024] Figure 1 shows an embodiment of a security paper or special paper (3) with the synthetic elements integrated in its paste, 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.

[0025] 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.

[0026] 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.

[0027] 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

[0028] 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/cm³, which is a very active product for dispersion and refinement of the pigments used in the paper industry, especially for coating pigments.

[0029] 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/cm³ at 25°C.

[0030] 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 paste 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

[0031] 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/cm³ 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.

[0032] 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.

[0033] As an example we enclose a comparative table of fibres with fluorescent response.

TEST PERFORMED WITH FLUORESCENT FIBRES

[0034] 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
Light	3-25	25-96

[0035] 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 incorporating high resistance synthetic elements with characteristics that are visible to the naked eye or under specific conditions and/or with "ad hoc" detectors, **characterised in that** the pigments are included in the paste of the synthetic element itself during its manufacture, conferring the pigment properties to the synthetic elements and the synthetic element protecting the pigments from the attack of physical and chemical agents and from damaging effects, having a long continuance in time.
2. A procedure for manufacturing security paper or special paper incorporating high resistance synthetic elements provided with characteristics that are visible to the naked eye or under certain conditions, such as defined in claim 1, **characterised in** at the synthetic elements 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.
3. A manufacturing procedure for security paper or special paper according to claim 2, **characterised in that** the dispersion of security elements is incorporated homogenously in the paper paste during its formation process.
4. A manufacturing procedure for security paper or special paper according to claim 2, **characterised in that** the dispersion of security elements is incorporated to the paper paste in a controlled manner, forming strips or bands where such synthetic elements accumulate.
5. 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 2 to 4.

