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(54) IMPROVEMENT IN SECURITY FEATURES FOR PAPER
VERBESSERUNGEN AN SICHERHEITSMERKMALEN FÜR PAPIER
AMELIORATIONS RELATIVES AUX CARACTERISTIQUES DE SECURITE DU PAPIER

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(56) References cited:
EP-A- 0 234 885
FR-A- 505 373
US-A- 3 985 927

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Description

The invention relates to improvements in security features in paper and in particular to a method of making paper and transparentising selected areas of paper to provide enhanced security features.

Documents of value and means of identification, such as banknotes, passports, identification cards and the like, are vulnerable to counterfeiting. The increasing popularity of colour photocopiers and other imaging systems, and the improving technical quality of colour photocopiers, has led to an increase in the counterfeiting of such documentation. There is, therefore, a need to improve the security features of such documentation, or paper, to add additional security features or to enhance the perceptions and resistance to simulation of existing features. Steps have already been taken to introduce optically variable features into such documentation which cannot be reproduced by a photocopier. There is thus a demand to introduce features which are discernible by the naked eye but "invisible" to, or viewed differently by, a photocopier. Since a photocopier process typically involves reflecting high energy light of an original document containing the image to be copied, one solution is to incorporate one or more features into the document which have a different optical response in reflected and transmitted light. Known examples of such security features include watermarks, embedded security threads, fluorescent pigment and the like.

EP-A2-0203499 discloses a method of applying a pseudo watermark to paper. This method comprises the preparation of a paper containing thermally sensitive material, the presence of which renders the translucency of the paper variable by temperature change. When heat is subsequently applied to a part of the surface of the paper, a region of the paper becomes semi-translucent.

US-A-2021141 discloses a method of applying pseudo watermarks to paper, by applying a resinous composition to finished paper which permeates the paper and causes it to become more transparent, or translucent, than the surrounding area.

GB-A-1489084 describes a method of producing a simulated watermark in a sheet of paper. The sheet is impregnated with the desired watermark pattern with a transparentising composition which, when exposed to ultra violet radiation, polymerizes to form a simulated watermark.

US-A-511526 describes a method of producing simulated watermarks by applying heat, in the desired watermark pattern, onto a thin solid matrix of waxy material placed in contact with a sheet of paper. This results in an impression of a durable translucent watermark.

US-A-4513056 relates to a process for rendering paper either wholly or partially transparent by impregnation in a special bath of a transparentizing resin and subsequent heat cross-linking of the resin.

EP-A1-0388090 describes a method of combining a see-through or print-through feature with a region of paper which has a substantially uniform transparency which is more transparent than the majority of the remainder of the sheet.

JP 61-41397 discloses a method for making paper transparent and a method for its manufacture for see-through window envelopes. The method utilizes the effect of causing ink cross-linked by ultra-violet rays to permeate paper thus causing that part of the paper to become transparent.

All of these methods providing enhanced security features are for use with finished paper and for non-currency and non-security papers. They can be applied to wood pulp based papers for high volume commercial applications. Such substances are still quite porous with little inherent oil or grease resistance and the transparentising can be successful. Furthermore, in such applications it is highly desirable to have the transparentising step as a separate process. Web printing processes are very fast, whereas paper making processes are often much slower. Since there is a certain amount of spoilage in paper making, incorporating an additional process in the paper making has generally been avoided to avoid an increase in the spoilage. None of the prior art method are furthermore particularly suitable for low absorbency low porosity papers, such as are used for banknotes. Such papers have generally been treated so as to minimise the uptake of oily substances and organic solvents. This is generally achieved by using a fibrous substrate designed to reduce the porosity of the paper and by impregnating the paper with any one of a variety of sizing resins such as polyvinylalcohol or gelatine and also by calendering the paper. The sizing and calendering processes help to reduce the porosity of the paper. Finished paper treated in this way does not lend itself to transparentising because its low absorbency inhibits the penetration of the transparentising resin, and, in the case of UV cured resins or those requiring a hot drying process, the moisture content of the paper is disturbed and this is likely to cause print runability problems at the printing stage.

It is an object of the present invention to provide a method of manufacturing paper, in particular security paper, of which at least a portion is transparentized to provide an enhanced security feature in counterfeiting or copying.

According to the invention there is provided a method of making security paper comprising the steps of depositing fibres onto a support surface to form an unfinished porous absorbent sheet, applying a transparentising resin to at least a portion of said porous sheet, subsequently impregnating the porous sheet with a sizing resin, and then further processing it to form a sheet of finished security paper.

A preferred embodiment of the present invention will now be described in detail, by way of example only, with references to the accompanying drawings in which:-
Figure 1 is a schematic section through apparatus used in a method of manufacturing paper according to the invention; and

Figure 2 is a schematic section through alternative paper making apparatus for use in the method of manufacturing paper according to the invention;

Figure 3 is a perspective view of the rotary screen printer of Figure 1;

Figure 4 is a schematic representation of a security document made from paper according to the invention; and

Figure 5 is a schematic representation of an alternative security document made from paper according to the invention.

Referring to Figure 1, there is shown a cylinder mould paper making machine 10 comprises a vat 11 containing paper stock, i.e. a suspension of paper making fibres 12. The major portion of a horizontal cylinder mould 13 dips into the vat 11. The surface of the cylinder 13 is provided by a wire mesh which may be embossed and generally there are several layers of mesh employed, the outermost being the finest. Liquid is drawn through the mesh as the cylinder 13 is rotated causing paper making fibres to deposit on the mesh and form wet paper 14. The wet paper 14 is coughed from the cylinder by couch roll 15 and conveyed away on a moving wire mesh 16.

The wet paper 14 then passes through a wet press 17 which squeezes the paper 14 to remove excess water therefrom. The paper 14 is then dried over heated cylinders 19.

Although the present invention is described with reference to a cylinder mould paper making machine, which is the preferred method, the paper forming process can be achieved in many other ways. The most common alternative is the Fourdriner system shown in Figure 2. In this paper making machine fibre stock is deposited from a stock applicator or flow box 30 on to a continuous moving wire mesh 31. Water from the fibre stock drains through the wire mesh 31 leaving a wet de-watered fibre mat 32. The fibre mat 32 passes under a dandy roll 33 which can be used to apply an embossed watermark. The wet paper then passes through a wet press 34 before being dried.

In a traditional paper making process the paper is impregnated with any one of a variety of sizings resins such as polyvinylalcohol (PVOH) or gelatin, to minimise the uptake of oily substances or organic solvents. The paper sheet 14 is passed through a size bath 18 so that it becomes saturated with size. The resulting paper is thus resistant to grease and has a lower absorbency and it is therefore more appropriate for use as banknote paper and the like. The paper sheet 14 is then passed through an air float or spar dryer 20 for further drying before passing to a calendering device 21 to give a smooth surface before reeling 22.

In the modified process according to the invention, a screen printing process or other resin applicator is used to apply a transparentising resin to the surface of the partially formed paper sheet 14 before it enters the size bath 18. This is shown in more detail in Figure 3. The screen printer 23 is a rotary printer comprising a cylindrical screen 23 of flexible wire mesh mounted on a rigid steel rim covered by a stencil 24. The image required to be reproduced on the paper is formed in the stencil by means of an opening 25. As the paper sheet 14 passes the cylinder, the transparentising resin 26 is applied to the inside of the wire mesh and forced through the mesh with a squeegee blade 27 onto one the paper sheet 14.

At this point the partially formed paper is at its most absorbent, thus allowing good penetration of the transparentising resin. In one embodiment of the invention, no curing process is used, and the sheet 14 is passed directly into the size bath 18. This prevents smudging of the mobile transparentising resin which is effectively frozen in position. This is an unexpected effect. As soon as the sheet 14 enters the size bath 18, the size fills the cells in the paper surrounding those containing the transparentising resin, thus preventing migration of the latter. The transparentising resin can thus be applied to a sharply defined region of the paper so as to create a transparent patch or pattern that is capable of contributing to the overall and counterfeitability of a security document made from the paper. The security document may be a banknote, a cheque, a passport, an identification card, a share certificate or the like.

An example of a security document made by this process is illustrated in Figure 4 which shows a sharply defined translucent area 28. It should be noted that the transparentised area does not reflect as much light as the non-transparentised paper. Therefore the outline of the transparentised patch can be seen reasonably well in reflected light. This provides a further enhancement of the anticounterfeit ability of a security document as it shows benefits in reflected as well as transmitted light.

In an alternative embodiment of the invention, the resin can be “fixed” by using EB or UV radiation cured resins whereby curing takes place shortly after application and prior to entry of the sheet 14 into the size bath 18. These resins have the advantage that, once cured, they are fixed and controlled.

Alternatively the radiation cross-linking could take place between the air float dryer and the calender thereby providing the transparentising resin for a longer period of time to penetrate the paper 14.

When paper is produced using the process described, two additional techniques can be applied to the process in order to increase the receptivity of the paper sheet 14 to the transparentising resin.
The resin can be applied to a low grammage part of the paper created by the well known processes of mould or dandy roll water marking. This results in a very significant enhancement of the watermark as the contrast between the light and dark areas in the watermark are significantly greater. In the case of mould made watermarks, this also has the advantage of the creating a local area low in opacifying pigment such as titanium dioxide which further increases the transparentising effect of the transparentising resin.

Instead of applying a resin to a plain low grammage part of the paper, the transparentising resin can also be applied to a decorative watermark 29, as shown in Figure 4. This significantly extends the usefulness of the transparentising features as a deterrent to counterfeitters by markedly increasing its visual complexity and by generating within it an easily recognisable yet difficult to copy image.

When the translucency is controlled to give an opacity not less than 50%, an unexpected advantage is that the outline definition of the watermark is noticeably enhanced.

In yet another alternative embodiment of the invention, illustrated in Figure 5, the resin can be applied as an outline or frame 36 around a watermark 37 or a low grammage patch of the paper which has the effect of drawing attention to the watermark.

Alternatively, or in addition to the use in relation to a watermark, the transparentising resin can be applied to a streak in the paper. In the manufacturing of paper using a cylinder mould machine 10, it is possible to use a fibre locator to direct different types of fibres to certain places on the mould thus causing a streaking effect in the resulting paper. These different types of fibres may create a streak of more porous paper structure. Where such a streak is created it has the effect of enabling the transparentising resin to absorb into the area of streak better than the surrounding paper and as such can therefore be used to enhance the transparentising effect.

Alternatively, or in addition, a dye may be added to the transparentising resin. This can provide a striking and aesthetically pleasing effect to the transparentised areas. If the dye is fluorescent a very important commercial advantage can be obtained since an ultra-violet lamp can give a transmitted fluorescence which is normally only available in reflected light.

Additionally the fluorescent transparentising resin may be applied to a decorative watermark. The result of the feature which, when viewed in UV transmitted light, reveals the watermark of the shadows. This is an unexpected effect and because of its striking appearance it is a useful security feature.

In yet another embodiment of the invention, the effect of the transparentising resin can be enhanced by the known process of intaglio printing which has the effect of embossing the paper. The combination of heat and pressure used in the intaglio embossing process improves the distribution of resin through the paper, except in the case of non-thermo plastic resins such as the radiation cured type.

In order to maximise the transparentising effect of the resin, paper with a minimum of titanium dioxide (TiO₂), added to make paper more opaque and even cut appearance, or other opacifying pigment needs to be used so as to achieve satisfactory see-through and strike-through in non-transparentised areas.

In yet another embodiment of the invention, the transparent features is applied in register with the watermark in both the machine and cross-direction. Unregistered features have the inherent advantage of technical simplicity, but by the same token are considered by many to be easier to counterfeit in quantity than registered features. Such a process requires the use of optical detectors that identify the watermark position and feeds this information back to the electronic unit that controls the drive of the printing screen in the case of screen printing. Alternatively, in the case of other printing methods, web tension control may be the mechanism by which register is achieved.

Examples of materials and compositions suitable for use in making paper according to the invention will be discussed as follows.

**PAPER-MAKING FIBRES**

Papers suitable for banknotes and security documentation are made from a variety of fibres such as linen, abaca, wood pulp, cotton and blends thereof. Wood pulp is commonly used in non-banknote security documents, whilst cotton is the preferred fibre for banknotes. These cotton fibres are often from waste materials, such as off-cuts from the textile industry. The processed fibres have a ribbon-like profile which have a high surface-to-surface contact area. However, to produce appropriate cotton fibres for manufacturing banknote paper and the like, the fibres must be refined from their original tubular configuration by the mechanical process of defibrillation. In order achieve a high quality base paper, it is necessary to ensure that the preparation of the fibres is carefully carried out and that they are manipulated and defibrillated to the most appropriate length and orientation to achieve a good quality watermark, whilst also maintaining the high strength needed for paper. Such paper generally has a Schopper Riegler value of 45 - 70. Despite careful processing, the fibres are natural fibres and can vary from batch to batch, resulting in a variation of the porosity of the paper. Further porosity variations result from different specification demanded by different customers.

**SIZING RESINS**

It should be noted that the sizing resins referred to are surface sizing resins, as opposed to internal sizing resins. Preferably, traditional sizing resins such as pol-
yvinylalcohol (PVOH) or gelatin are used as functionally these are generally the most successful. There are, however, many other chemicals which can be used such as starch or emulsion based polymers.

Because of the variation in the quality of the paper fibres, the concentration of the size may also be varied during processing.

**TRANSPARENTISING RESINS**

As mentioned above, these may be known ultra violet (UV) curable, non-curable and cross-linkable resins.

The process of screen printing the transparentising resin onto the paper sheet 14 and the time taken for the resin to be absorbed into the paper depends, amongst other things, on the viscosity of the resin. As paper making machines run at different speeds and the properties of the base paper fibres can vary, it is necessary to control the viscosity of the resin in order to control the transparency of the paper. It is therefore recommended that two resins are taken from different ends of the viscosity spectrum, which can be blended to form a resin at an appropriate viscosity for the machine speed, the level of transparency to be achieved, the rate of absorption, and so on. Another option is also to add different types of a wetting agent such as FC-430 Fluorad (trade mark) supplied by 3M which is a fluorolipophile polymeric ester. Thus if the base paper is of a lower porosity than ideal, such a wetting agent can be mixed with the resin and added at the screen printing stage.

**UV-curable Resins** - The preferred resins are 100% resins with no solvent incorporated. They have a Refraction Index in the region of 1.5 and a viscosity in the region of 400-1500 centipoise at 23°C. They should preferably be non-yellowing and transparent. As curable resins harden, it is also necessary that they should have appropriate physical strength requirements. For example, they must not be brittle when they are bent.

Examples of such resins are Photomer 4061 (trade mark) which is a tripropylene glycol diacrylate and Photomer 5018 (trade mark) may be used, which is a polyester tetrofunctional acrylate, both supplied by Hycros Chemical (UK) Limited. These resins are generally at the opposite ends of the viscosity spectrum and can be combined to provide a suitable transparentising resin at an appropriate viscosity.

**Non-curable resins** - The physical criteria for a suitable non-curable resin are basically the same as those of the UV curable resins. Suitable materials include polybutene material such as Hyvis 7 (trade mark) which is a polycisobutylene supplied by BP Chemicals or Hyvis 5 (trade mark) which is also a polycisobutylene supplied by BP Chemicals. Hyvis 5 has a higher viscosity than Hyvis 7.

It should be noted that the non-curable resins generally stay in the liquid state and have no physical strength requirements.

**Cross-linkable resins** - It is suggested that resins such as epoxy and alkyd resins may also be used. However, it is important that a number of these take some considerable time to cure. If the change has not been taken place by the time the paper is reeled, the whole reel of paper is glued together or resin transfer to adjacent sheets can occur.

When non-curable and cross-linkable resins are used, it is necessary that the amount added is carefully controlled. Since these resins do not actually cure, it is important that the paper is not saturated, which could mark adjacent paper on the reel.

**Claims**

1. A method of making security paper comprising the steps of depositing fibres (12) onto a support surface (13) to form an unfinished porous absorbent sheet (14), applying a transparentising resin to at least a portion of said porous sheet, subsequently impregnating the porous sheet with a sizing resin, and then further processing it to form a sheet of finished security paper.

2. A method as claimed in claim 1 in which the transparentising resin is applied using a screen printing process.

3. A method as claimed in claim 1 or 2 in which the transparentising resin is a non-curable or cross-linkable resin.

4. A method as claimed in claim 1 or claim 2 in which the transparentising resin is a curable resin, curable when subjected to ultra-violet or electron beam radiation.

5. A method as claimed in claim 4 further comprising the step of subjecting the porous sheet (14) to ultra-violet radiation to cure the transparentising resin before impregnation with the sizing resin.

6. A method as claimed in any one of the preceding claims further comprising the step of forming a low grammage area in the porous sheet (14) and applying the transparentising resin to at least partially overlap said low grammage area.

7. A method as claimed in any one of claims 1 to 5 further comprising the step of forming a low grammage area in the porous sheet (14) and applying the transparentising resin in a border around said low grammage area.

8. A method as claimed in claim 6 or 7 in which the low grammage area is a watermark (29).
9. A method as claimed in any one of the preceding claims further comprising the step of creating in the porous sheet (14) a streak of fibres of a different type to those of the porous sheet and applying the transparentising resin to at least a part of said streak.

10. A method as claimed in any one of the preceding claims in which a dye or pigment, which may be fluorescent, is added to the transparentising resin.

11. A method as claimed in any one of the preceding claims in which a wetting agent is added to the transparentising resin.

12. A method as claimed in any one of the preceding claims in which the viscosity of the transparentising resin is controlled to control the transparency of the paper.

13. A method as claimed in any one of the preceding claims further comprising the step of embossing the paper (14) using a combination of heat and pressure.

14. A method as claimed in any one of the preceding claims further comprising the step of calendering the sized sheet (14).

15. Security paper obtainable by the method as claimed in any one of the preceding claims.

16. A security document comprising or obtainable from security paper as claimed in claim 15 which is a banknote, a cheque, a passport, an identification card or a share certificate.

17. A papermaking machine for making security paper according to any one of claims 1 to 14 comprising in combination a paper forming machine (10) including means (11) for depositing fibres onto a support surface (13) to form a porous absorbent sheet (14), screen printing means (23) for applying a transparentising resin to at least a portion of said sheet, a sizing resin bath (15) and means (16) for transporting said porous sheet therebetween.

Patentansprüche

1. Verfahren zum Herstellen von Sicherheitssachen, umfassend die Schritte: Fasern (12) auf einer Trägerfläche (13) abzulagern, um eine nicht fertiggestellte poröse absorbierende Lage (14) zu bilden, ein transparent machendes Harz an wenigstens einem Teil der porösen Lage aufzubringen, die poröse Lage nachfolgend mit einem Leimharz zu tränken und sie anschließend weiterzuverarbeiten, um eine Lage an fertiggestelltem Sicherheitssachen zu bilden.

2. Verfahren nach Anspruch 1, bei welchem das transparent machende Harz mittels eines Siebdruckverfahrens aufgebracht wird.

3. Verfahren nach Anspruch 1 oder 2, bei welchem das transparent machende Harz ein nichtauflösbares oder quervernetzbares Harz ist.

4. Verfahren nach Anspruch 1 oder 2, bei welchem das transparent machende Harz ein aushärtbares Harz ist, und zwar aushärtbar, wenn es ultravioletter Bestrahlung oder Elektronenstrahl-Bestrahlung ausgesetzt wird.

5. Verfahren nach Anspruch 4, ferner umfassend den Schritt, die poröse Lage (14) ultravioletter Bestrahlung auszusetzen, um das transparent machende Harz vor dem Tränken mit dem Leimharz auszuhärten.


7. Verfahren nach einem der Ansprüche 1 bis 5, ferner umfassend den Schritt, in der porösen Lage (14) einen Bereich mit niedrigem Flächengewicht zu bilden und das transparent machende Harz an einem Randbereich um den Bereich mit niedrigem Flächengewicht aufzubringen.


9. Verfahren nach einem der vorangegangenen Ansprüche, ferner umfassend den Schritt, in der porösen Lage (14) einen Streifen von Fasern, welche von einer anderen Art sind als jene der porösen Lage, zu bilden und das transparent machende Harz an wenigstens einem Teil des Streifens aufzubringen.

10. Verfahren nach einem der vorangegangenen Ansprüche, bei welchem das transparent machende Harz ein Farbstoff oder Pigment, welches fluoreszierend sein kann, zugefügt wird.

11. Verfahren nach einem der vorangegangenen Ansprüche, bei welchem das transparent machende Harz ein Benetzungsmittel zugefügt wird.
12. Verfahren nach einem der vorangehenden Ansprüche, bei welchem die Viskosität des transparenten machenden Harzes eingestellt wird, um die Transparenz des Papiers einzustellen.

13. Verfahren nach einem der vorangehenden Ansprüche, ferner umfassend den Schritt, das Papier (14) unter Verwendung einer Kombination aus Wärme und Druck zu prägen.

14. Verfahren nach einem der vorangehenden Ansprüche, ferner umfassend den Schritt, die mit Leim ver sehene Lage (14) zu kaltdrucken.

15. Sicherheitspapier, welches durch das Verfahren nach einem der vorangehenden Ansprüche erhalten werden kann.

16. Sicherheitsdokument, welches das Sicherheitspapier nach Anspruch 15 umfaßt oder aus diesem erhalten werden kann und welches eine Banknote, ein Scheck, ein Ausweis, eine Identifikationskarte oder ein Anteilszertifikat ist.

17. Papierherstellungsmaschine zum Herstellen von Sicherheitspapier nach einem der Ansprüche 1 bis 14, welche in Kombination umfaßt: eine papierbildende Maschine (10) mit einer Einrichtung (11) zum Ablagen von Fasern auf einer Trägerfläche (13), um eine poröse absorbierende Lage (14) zu bilden, eine Siebdruckeinrichtung (23) zum Aufbringen eines transparenten machenden Harzes an wenigstens einem Teil der Lage, ein Leimharzbad (16) und eine Einrichtung (16) zum Fördern der porösen Lage zwischen diesen.

Revendications

1. Procédé de fabrication de papier de sûreté comprenant les étapes dans lesquelles on dépose des fibres (12) sur une surface (13) de support pour former une feuille absorbante poreuse non finie (14), on applique une résine de transparence à au moins une partie de ladite feuille poreuse, on imprègne ensuite la feuille poreuse d'une résine de collage, puis on la traite encore pour former une feuille de papier de sûreté finie.

2. Procédé selon la revendication 1, dans lequel la résine de transparence est appliquée en utilisant un processus de sérigraphie.

3. Procédé selon la revendication 1 ou 2, dans lequel la résine de transparence est une résine non durcissable ou réticulable.

4. Procédé selon la revendication 1 ou la revendication 2, dans lequel la résine de transparence est une résine durcissable, pouvant durcir lorsqu'elle est soumise à un rayonnement ultraviolet ou d'un faisceau d'électrons.

5. Procédé selon la revendication 4, comprenant en outre l'étape consistant à soumettre la feuille poreuse (14) à un rayonnement ultraviolet pour faire durcir la résine de transparence avant l'imprégnation avec la résine de collage.

6. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre l'étape de formation d'une zone à faible grammage dans la feuille poreuse (14) et d'application de la résine de transparence pour qu'elle recouvre au moins partiellement ladite zone de faible grammage.

7. Procédé selon l'une quelconque des revendications 1 à 5, comprenant en outre l'étape de formation d'une zone à faible grammage dans la feuille poreuse (14) et d'application de la résine de transparence dans une bordure entourant ladite zone de faible grammage.

8. Procédé selon la revendication 6 ou 7, dans lequel la zone de faible grammage est un filigrane (29).

9. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre l'étape de formation de la feuille poreuse (14) d'une raie de fibres d'un type différent de celles de la feuille poreuse et d'application de la résine de transparence à au moins une partie de ladite raie.

10. Procédé selon l'une quelconque des revendications précédentes, dans lequel un colorant ou un pigment, qui peut être fluorescent, est additionné à la résine de transparence.

11. Procédé selon l'une quelconque des revendications précédentes, dans lequel un agent mouillant est ajouté à la résine de transparence.

12. Procédé selon l'une quelconque des revendications précédentes, dans lequel la viscosité de la résine de transparence est réglée pour régler la transparence du papier.

13. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre une étape de gaufrage du papier (14) en utilisant une combinaison de chaleur et de pression.

14. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre l'étape de calandrage de la feuille collée (14).
15. Papier de sûreté pouvant être obtenu par le procédé selon l'une quelconque des revendications précédentes.

16. Document de sûreté comprenant du papier de sûreté ou pouvant être obtenu à partir de papier de sûreté selon la revendication 15, qui est un billet de banque, un chèque, un passeport, une carte d'identité ou un titre d'action.

17. Machine à papier pour fabrication de papier de sûreté selon l'une quelconque des revendications 1 à 14, comportant en combinaison une machine (10) de formation de papier comprenant des moyens (11) destinés à déposer des fibres sur une surface (13) de support pour former une feuille absorbante poreuse (14), des moyens (23) de sérigraphie destinés à appliquer une résine de transparence à au moins une partie de ladite feuille, un bain (18) de résine de collage et des moyens (16) destinés à transporter ladite feuille poreuse entre eux.