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(54) **ANTI-FALSIFICATION WATERMARK PAPER AND METHOD OF MAKING SAME**

(57) An anti-falsification watermark paper, a method of making the same and the apparatus for performing the method is disclosed. The method comprises the following steps. The moist paper is predried after shaping step. The predried paper is pressed by a dandy roll or a plate which comprising concave, bulgy or scraggy patterns in part or in full to form watermarks. The moist paper is redried after the pressing step.

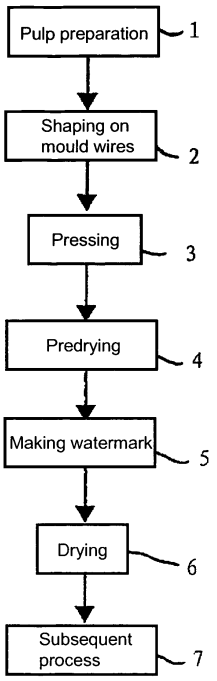

FIG 1

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Description

FIELD OF INVENTION

[0001] The present invention relates to paper for manufacturing currency or the like. More particularly, relates to an anti-falsification watermark paper and its manufacturing method.

BACKGROUND OF INVENTION

[0002] It is well known that watermarks are usually used on important papers, for example, paper money, security paper, certificate paper, note paper, each of which consists of watermark used to prevent it from forgery. Watermark is normally formed by the difference of paper brightness and darkness, when a viewer observes paper patterns against light, different light penetrating rate results the pattern of the watermark. Conventional methods for making watermark can be concluded as follows:

[0003] 1. Pressing convex and/or concave patterns on papermaking forming wires. During the process of papermaking, pulp amount relatively increases or decreases at the patterns positions due to the existence of the intaglio and gravure, which results different distribution of fiber amount in paper.

[0004] 2. Varying partial water penetration via welding, weaving or agglutination on forming wires. The pulp amount on corresponding positions is relatively less due to worse filtration of water so as to realize uneven distribution of fibers.

[0005] The conventional watermark making methods mentioned above has the following defects:

[0006] 1. Uneven fiber distribution results less fibers exist at particular areas of a paper and reduces the strength of this area. Especially for highlight watermark patterns, the paper strength is extremely low.

[0007] 2. The watermarks are not clear enough.

SUMMARY OF INVENTION

[0008] The object of the invention is to provide a new manufacturing method of making an anti-falsification watermark paper while addressing the above existent defects.

[0009] In order to doing so, the present invention uses the solution as follows: a method for manufacturing an anti-falsification watermark paper, the moist paper is dried till the water content is 10%-55%, then partial or full surface of the paper is pressed by rolls or plane plates with convex patterns, concave patterns or combination of convex and concave patterns roll to form watermarks. The pressure is 50N-1.5KN/cm when pressing the paper. Patterns are formed directly or indirectly on the surfaces of pressing rolls or on the plane plates.

[0010] A method for manufacturing an anti-falsification watermark paper, comprising the steps of stock beating, pulp refining, forming, pressing and drying, wherein further comprises pressing partial or full surface of the paper by rolls with convex patterns, concave patterns or combination of convex and concave patterns roll to form watermarks. When drying the moist paper, water content is controlled between 10%-55%. The pressure is 50N-1.5KN/cm when pressing the paper. Patterns are formed directly or indirectly on the surfaces of pressing rolls or on the plane plates.

[0011] An anti-falsification watermark paper, when observing the anti-falsification paper against light, bright and shade variation of watermark patterns can be seen. Light or shade strips with the width less than 0.3mm are contained in the patterns of the paper. Transition of the light and shade parts is continuous and smooth.

[0012] An apparatus for manufacturing an anti-falsification paper, comprising a drive system and a pressure applying system. The drive system is connected with a pair of rolls with convex patterns, concave patterns or a combination of convex and concave patterns on partial or full surface. Wherein the surface material of one of the rolls is plastic or rubber whose shore A hardness is more than 99.

[0013] The apparatus anti-falsification may also be configured as follows: the drive system is connected with a roll and the pressure applying system is connected with a plane plate. Convex patterns, concave patterns or a combination of convex and concave patterns is made on partial or full surface of the plane plate and the roll. The surface materials of at least one of the plane plate or the roll is plastic or rubber whose shore A hardness is more than 99.

[0014] The apparatus anti-falsification may also be configured as follows: the pressure applying system is connected with two corresponding plane plates with convex patterns, concave patterns or a combination of convex and concave patterns on partial or full surfaces. The surface material of at least one of the plane plates is made of plastic or rubber whose shore A hardness is more than 99.

BREIF DESCRIPTIONS OF DRAWINGS

[0015] The features and nature of the invention will now be described in more detail with reference to the exemplary embodiments accompany with the drawings, in which:

[0016] Fig. 1 is a schematic illustration of the process of manufacturing an anti-falsification watermark paper according to the present invention.

[0017] Fig. 2 is a schematic illustration of the structure of the apparatus for manufacturing an anti-falsification watermark paper according to the first embodiment of the present invention.

[0018] Fig. 3 is a schematic illustration of the structure of the apparatus for manufacturing an anti-falsification watermark paper according to the second embodiment of the present invention.

[0019] Fig. 4 is a schematic illustration of the structure of the apparatus for manufacturing an anti-falsification watermark paper according to the third embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0020] Referring to Fig. 1. The manufacturing method of making an anti-falsification watermark paper according to the present invention comprises the step of: preparing pulp (1); shaping on mould wires (2); pressing (3); predrying (4); making watermarks (5); drying (6); and subsequent procedures (7).The step of making watermarks (5) further comprises the following steps:

[0021] a. Predrying the moist paper made on a sheet former or a paper machine. Water content is controlled to between 10%-55% when predrying the moist paper.

[0022] b. Pressing the partial or full surface of the predried paper by rolls or plane plates with convex patterns, concave patterns or a combination of convex and concave patterns to form watermarks. When pressing the predried paper, the pressure applied on the pressed area of paper is between 0.5Mpa to 100Mpa.

[0023] c. After pressingmoist paper, drying the pressed paper.

[0024] When observing the anti-falsification watermark paper made according to the aforesaid method against light. Watermarks with light and shade variation can be seen. The watermark patterns contain light or shade strips with the width less than 0.3mm. The minimum width of the strips can be 0.06mm. The transition of the light and shade parts is continuous and smooth.

[0025] Regarding step b, the predried moist paper is pressed by a group of pressing devices composed of rolls or plane plates. The components of the pressing devices can be two rolls, one roll and one plane plate or two plane plates. Fig. 2, Fig. 3 and Fig. 4 illustrate different embodiments of the pressing devices.

[0026] The apparatus for manufacturing an anti-falsification watermark paper may be composed of a drive system 100. The drive system 100 is connected with a pair of rolls 81 and 82 with convex patterns, concave patterns or a combination of convex and concave patterns on partial or full surface of the rolls, as shown in Fig. 2. Wherein Fig. 2a shows the condition that the patterns are made on roll 81, Fig. 2b shows the condition that the patterns are made on roll 82, while Fig. 2c shows the condition that a combination of convex and concave patterns are made on the rolls 81 and 82. The surface material of one of the two rolls is made of plastic or rubber whose shore A hardness is more than 99 (indicated by letter "A" in the figure).

[0027] The apparatus for manufacturing an anti-falsification watermark paper may be composed of a drive system 100 and a pressure applying system 200. The drive system 100 is connected with a roll 8 and the pressure applying system 200 is connected with a plane plate 9, as shown in Fig. 3. Partial or full surface of the plane plate and the roll has convex patterns, concave patterns or a combination of convex and concave patterns roll. Wherein, Fig. 3a shows the condition that patterns are made on the roll 8, Fig. 3b shows the condition that patterns are made on the plane plate 9 and Fig. 3c shows the condition that a combination of concave and convex patterns are made on the roll 8 and the plate 9. The surface material of at least one of the two components is made of plastic or rubber whose shore A hardness is more than 99 (as indicated by letter "A" in the figure).

[0028] The apparatus for manufacturing an anti-falsification watermark paper may be composed of a pressure applying system 200, which is connected with two pieces of inter-corresponding plane plates 91 and 92, on surfaces of which there are convex patterns, concave patterns or a combination of convex and concave patterns, as shown in Fig. 4. Fig. 4a shows a condition that the patterns are made on the plane plate 91 (patterns are at the bottom of the plate, so they can't be seen). Fig. 4b shows a condition that patterns are made on the plate 92 and Fig. 4c shows the condition that convex and concave patterns are made on both plates 91 and 92. At least one of the above two plates is made of plastic or rubber whose shore A hardness is more than 99 (as indicated by letter "A" in the figure).

[0029] Raw materials for manufacturing the paper of the present invention should contain more than 90% of plant fibers. Watermarks can be pressed on paper note, security paper, credential paper and receipt paper according to the method of the present invention. Subsequent process will be different according to different usage of paper.

[0030] The watermark manufacturing process of the present invention will be explained in detail by the following examples:

[0031] Example 1:

[0032] A group of pressing rolls with concave and convex patterns are erected between drying cylinders of a drying section on a paper machine. Moist paper of 50% water content will be continuously dried after being pressed by the pressing rolls. The surfaces of the pressing rolls are packed by rubber whose shore A hardness is 99. Convex patterns are engraved on the surface of one of the rolls. When pressing, each one centimeter length of paper bears a force of 50N. After being pressed, the paper will be processed by post dryness, subsequent treatment and reel. When observing against transmission light, half transparent patterns can be seen on the other side of the pressed paper.

[0033] Example 2:

[0034] Treat the bleached wood pulp paper to control the water content to be 10%, pressing the paper with pressing rolls, of which the surface material has a shore Hardness of rolls 82D. Concave and convex patterns are engraved by mechanical method on the surface of one of the pressing rolls. Pressing the paper under a pressure as each centimeter length of paper bears a force of 1.5

KN, then processing it by post dryness, subsequent treatment and reel. After being pressed, the paper can be seen with formed watermark patterns against light.

[0035] Example3:

[0036] Putting the paper of 25% water content between two pressing plates engraved with concave and convex patterns thereon. Let the pattern side of the plates touch the paper to be printed, pressing the plate to enable intensity of pressure on the pressed area of the paper to be 80 Mpa. Paper with light and shade patterns can be formed after the same post dryness and subsequent treatment.

[0037] One of the ordinary skilled in the art should realize that the present invention shall not be considered as restricted to the aforedescribed and illustrated exemplary embodiments. Various modification or variations can be made within the scope of the following Claims.

INDUSTRIAL APPLICATION

[0038] Compared with conventional method of manufacturing an anti-falsification paper, the present invention performs the step of pressing the moist paper by rolls or plane plates with convex patterns, concave patterns or a combination of concave and convex patterns on surfaces during the course of drying, instead of using traditional vat formation process. It will not cause uneven distribution of fibers that may results fiber amounts to decrease on partial area of the paper, which may reduce the strength on partial area or bring poor clearness of watermark of the paper. To use the present invention, the bright and shade lines of watermarks in the paper are less than 0.3mm wide, and the transition between bright and shade layers of watermark area are smooth, so as to improve the watermark clearness.

Claims

1. A method for manufacturing an anti-falsification paper, wherein comprising:

   pressing the paper by rolls or plane plates engraved with convex patterns, concave patterns or a combination of convex and concave patterns on partial or full surfaces roll after drying the moist paper till the water content being 10%-55%.

2. The method of claim 1, wherein the applied pressure is 50N-1.5KN per cm-length when pressing the moist paper.

3. The method of claim 1, wherein patterns are formed directly or indirectly on the surfaces of the rolls or the plane plates.

4. A method for manufacturing an anti-falsification paper, comprising the steps of:

   stock beating;
   pulp refining;
   shaping on mould wires;
   pressing; and
   drying;
   wherein that the step of pressing comprises pressing the moist paper by rolls with convex patterns, concave patterns or a combination of convex and concave patterns on partial or full surfaces roll to form watermarks.

5. The method of claim 4, wherein the step of drying comprises drying the moist paper till water content to be between 10%-55%.

6. The method of claim 4, wherein that the applied pressure is between 50N-1.5KN per cm-length when pressing the moist paper.

7. The method of claim 4, wherein the patterns are formed directly or indirectly on the surfaces of rolls or the plane plates.

8. An anti-falsification paper made according to the method of the above claims, wherein when observing the paper against light, watermarks patterns with bright and shade variations is visible, and the patterns contains light or shade strips with the width less than 0.3mm.

9. The anti-falsification paper of claim 8, wherein the minimum width of the strips is 0.06mm.

10. The anti-falsification paper of claim 8, wherein when observing the paper again light, watermarks patterns with bright and shade variations is visible, and the transition between bright and shade parts in the watermark area is smooth.

11. An apparatus for manufacturing an anti-falsification paper, comprising:

    a drive system, a pressure applying system and a connecting mechanism, wherein the drive system is connected with a pair of rolls engraved with convex patterns, concave patterns or a combination of concave and convex patterns on partial or full surface roll, the surface material for one of the two rolls is plastic or rubber, whose shore A hardness is more than 99.

12. An apparatus for manufacturing an anti-falsification paper, comprising:

    a drive system, a pressure applying system and a connecting mechanism, wherein the drive sys-

tem is connected with a roll and the pressure applying system is connected with a plane plate, convex patterns, concave patterns or a combination of concave and convex patterns is engraved on partial or full surface of the roll or the plane plate, the surface material of at least one of the two components is plastic or rubber, whose shore A hardness is more than 99.

13. A device for manufacturing an anti-falsification paper, including a set of pressure applying system, wherein the pressure system is connected with two pieces of corresponding plane plates.

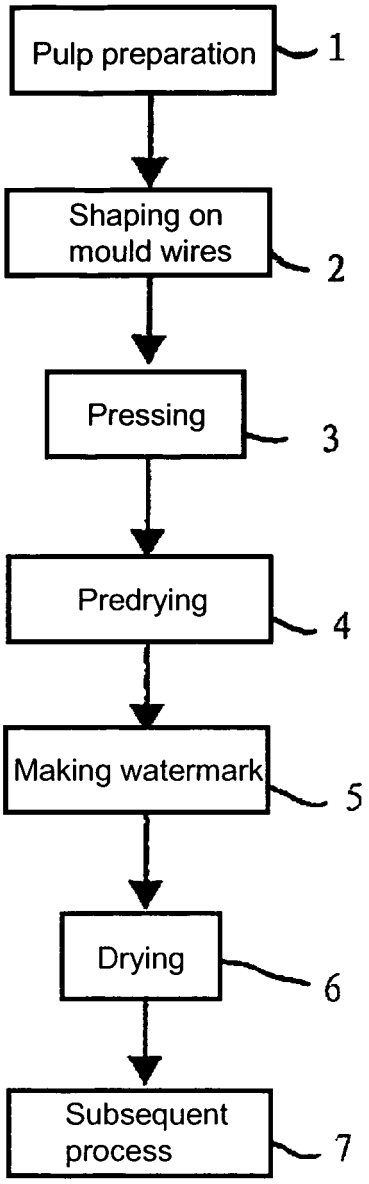
Pulp preparation
1
Shaping on mould wires
2
Pressing
3
Predrying
4
Making watermark
5
Drying
6
Subsequent process
7

FIG 1

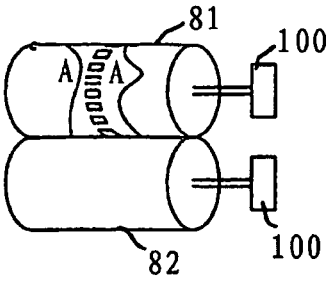

FIG 2a

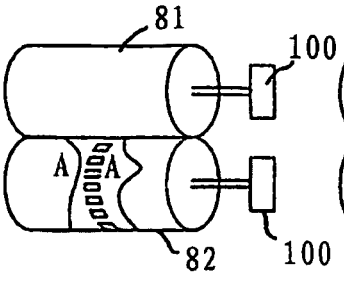

FIG 2b

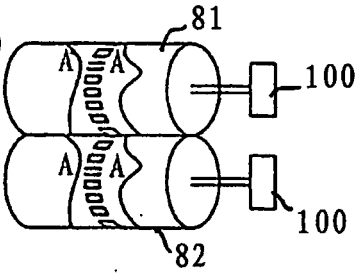

FIG 2c

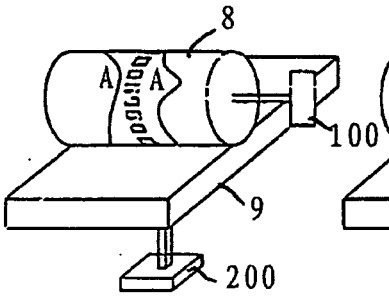

FIG 3a

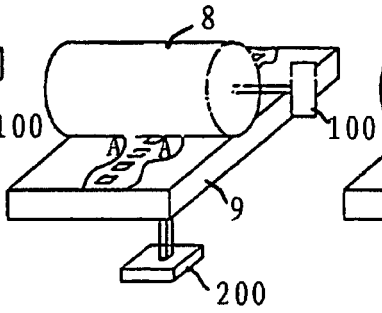

FIG 3b

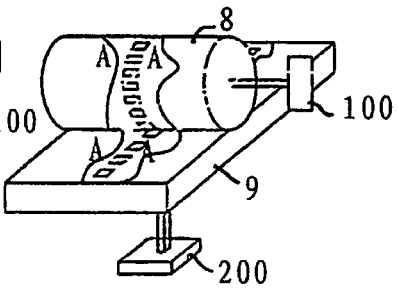

FIG 3c

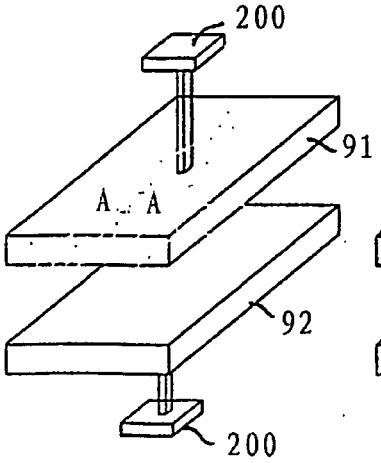

FIG 4a

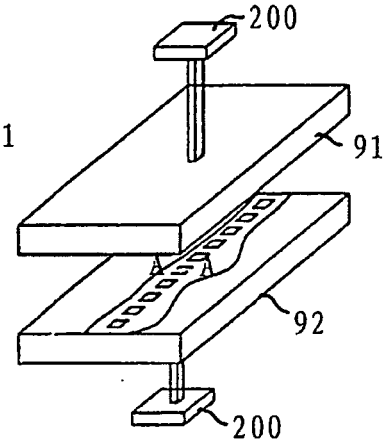

FIG 4b

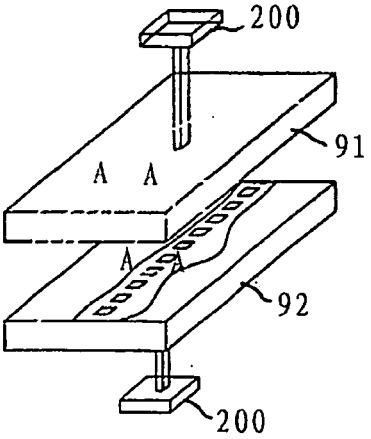

FIG 4c

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2006/003191

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: D21F, B42D, B41M, B41F

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 practicable, search terms used)

EPODOC,WPI,PAJ,CNPAT, watermark, anti-falsification, forgery, counterfeit, fraud, paper, roll, plate, pattern, dehydration

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN1083511C (TOKUSHU PAPER MFG CO LTD) 24.Apr.2002 (24.04.2002) ,see the embodiment shown in figures1-5	1,3-5,7
Y		2,6,11
Y	JP6-264392A (TOKUSHU SEISHI KK) 20.Sep.1994(20.09.1994), see column 3,line 34	2,6
X	JP8-246375A (MISHIMA PAPER CO LTD et al.) 24.Sep.1996 (24.09.1996) , see the embodiment shown in figures1-5	12
Y		11
A	US5766416A (Hiyoshi et al.) 16.Jun.1998 (16.06.1998) ,see the whole document	1-13
A	JP11-152695A (TOKUSHU PAPER MFG CO LTD) 08.Jun.1999 (08.06.1999) ,see the whole document	1-13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10.Feb.2007 (10.02.2007)	08 · MAR 2007 (08 · 03 · 2007)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer JIN,Li Telephone No. (86-10) 62085436

Form PCT/ISA /210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2006/003191

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Form PCT/ISA /210 (patent family annex) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2006/003191

CLASSIFICATION OF SUBJECT MATTER

D21F1/44(2007.01)i
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