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(54) ANTI-COUNTERFEIT FIBER AND ANTI-COUNTERFEIT PAPER CONTAINING THE SAME

(57) An anti-counterfeit fiber and an anti-counterfeit paper containing the same are provided. The anti-counterfeit fiber includes at least a first material part and a second material part that both run parallel along said anti-counterfeit fiber length direction without being twisted. The first material part contains luminescent material A and the second material part contains luminescent material B, of which both have obvious different luminescent colors visually with each other if they are under exciting light. It is **characterized by** that when said anti-counterfeit fiber falls freely onto a horizontal plane, one of surfaces of the two material parts is upward, and the other is downward. The thermal shrinkage rates of these two material parts are the same in order to ensure that the surface of the first material part can orient towards one surface of the anti-counterfeit paper and the surface of the second material part can orient towards the other surface of the anti-counterfeit paper after the anti-counterfeit fiber is added to paper pulps to produce the anti-counterfeit paper. Therefore, when the two surfaces of anti-counterfeit paper are irradiated by exciting light respectively, the luminescent colors of the anti-counterfeit fiber will change apparently.

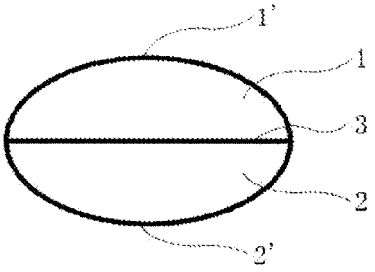

Fig. 1

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Description

Technical field

[0001] An anti-counterfeit fiber, especially a fluorescent anti-counterfeit fiber with performance of color change if irradiation angles of exciting light are changed.

Technical background

[0002] This inventor applied his patent application with Application Number of 200710146239.X, with title of "A fluorescent anti-counterfeit fiber and anti-counterfeit material with changes of visual characteristics induced by changing exciting light angle". The application document of this Chinese invention patent reveals that a single anti-counterfeit fiber is in flat shape in the lateral direction, and has at least two material parts which are distributed on the cross-section and both extend in parallel along the fiber length direction, and these two material parts contain different luminescent materials that are distributed respectively on upper and nether surfaces of flat surfaces of the anti-counterfeit fiber. After said anti-counterfeit fiber is added into anti-counterfeit material, upper and nether surfaces of the flat surfaces are almost parallel to the surfaces of the anti-counterfeit material, and when exciting light irradiates two surfaces of the anti-counterfeit material respectively, luminescent color of the anti-counterfeit fiber will change obviously. After adding the anti-counterfeit fiber into paper, this inventor discovers that color change on the upper and nether surfaces is not apparent generally after adding such anti-counterfeit fiber into paper. On the basis of study, it is considered that the anti-counterfeit fiber manages always to distribute in minimum energy status in the anti-counterfeit material when it is added into the anti-counterfeit material, but these two material parts with different luminescent material are often different materials themselves besides the difference in luminescent material, therefore, when such anti-counterfeit fiber is prepared via spinning process by using two material parts with different luminescent materials, different thermal shrinkage rates of the two material parts will result in tortuosity of the anti-counterfeit fiber, or bending phenomenon that is not benefit to appear luminescent surface of the anti-counterfeit fiber, and make the upper and nether surfaces of the flat surfaces not parallel nearly to the surfaces of the anti-counterfeit material, thus it is impossible to achieve obvious change in luminescent color of the anti-counterfeit fiber when exciting light irradiates respectively the two surfaces of the anti-counterfeit material.

Details of this invention

[0003] This invention solves technical fault being unable to achieve anti-counterfeit visual characteristics caused by appeared tortuosity or bending phenomenon at non-target direction, which happens in current technology when fluorescent anti-counterfeit fiber with different luminescent material respectively on its upper and nether surfaces is added into anti-counterfeit materials in sheet form, such as paper, plastic film and etc.; and after adding fluorescent anti-counterfeit fiber into paper, can make its two surfaces respectively containing different luminescent materials respectively towards two surfaces of the anti-counterfeit material, therefore, obvious change in luminescent color of the anti-counterfeit fiber can be achieved when exciting light irradiates respectively both surfaces of the anti-counterfeit material.

[0004] This invention also involves an anti-counterfeit paper distributed with this anti-counterfeit fiber. Said anti-counterfeit paper refers to anti-counterfeit materials in sheet form such as paper, plastic film and etc., containing with this anti-counterfeit fiber.

[0005] Technical problems are solved in this invention by ways as follows:

> An anti-counterfeit fiber has at least a first material part and a second material part, of which both runs parallel along said anti-counterfeit fiber length direction without being twisted, wherein the first material part has surface of the first material part and the second material part has surface of the second material part, and said first material part and said second material part contain luminescent material A and luminescent material B respectively, there is obvious visual difference in luminescent colors between the luminescent material A and the luminescent material B when they are under exciting light. It is characterized by that when said anti-counterfeit fiber falls freely onto a horizontal plane, for both of the first material part surface and the second material part surface, one is upward and the other is downward. The thermal shrinkage rates of said first material part and said second material part are the same in order to ensure that the surface of the first material part can orient towards one surface of said anti-counterfeit paper and the surface of the second material part can orient towards the other surface of said anti-counterfeit paper after the anti-counterfeit fiber is added to paper pulps to produce the anti-counterfeit paper. Therefore, when the two surfaces of the anti-counterfeit paper are irradiated by exciting light respectively, the luminescent colors of said anti-counterfeit fiber will change apparently.

[0006] Said same thermal shrinkage rates refer to selecting the first material part 1 and the second material part 2 for ensuring that a spanned anti-counterfeit fiber will not bend at ambient temperature (for example, below 35°C) with bending of interface 3 between these two material parts, thus further guaranteeing the anti-counterfeit fiber's orientation in paper after it is blended into the paper.

[0007] A third material part, adjacent to said first and second material parts by sides basically facing the same

direction, is also included and runs, together with them, parallel along said anti-counterfeit fiber length direction without being twisted, and said third material part is colorless or in color.

[0008] At length direction of said anti-counterfeit fiber, said anti-counterfeit fiber bends with bending of interface between said first and second material parts and said third material part.

[0009] The cross section of said anti-counterfeit fiber is round.

[0010] A fourth material part is also included, and said fourth material part is adjacent to said first and second material parts by the other sides basically facing the same direction and runs, together with the first, the second and the third material parts, parallel along said anti-counterfeit fiber length direction without being twisted, and said fourth material part is colorless and in color.

[0011] A fifth material part is also included at least, and said fifth material part runs, together with the first to the fourth material parts, parallel along said anti-counterfeit fiber length direction without being twisted, and said fifth material part is located at middle of said anti-counterfeit fiber and equally divides the first material part and the second material part along the anti-counterfeit fiber length direction to respectively form left section of the first material part and right section of the first material part, and left section of the second material part and right section of the second material part. Said fifth material part is colorless or in color.

[0012] The left section of the first material part and the right section of the first material part may contain different luminescent materials, and/or the left section of the second material part and the right section of the second material part may contain different luminescent materials.

[0013] Said anti-counterfeit fiber also contains an intermediate material part located between the first and the second material parts, which separates the first and the second material parts and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts. Said intermediate substance part is a blocking material used for obstructing exciting light.

[0014] An intermediate material part is also set between the first and the second material parts, which separates the first and the second material parts and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts. Said intermediate substance part is a blocking material used for obstructing exciting light.

[0015] An intermediate material part is also set between the first and the second material parts, which separates the first and the second material parts and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts. Said intermediate material part is a blocking material used for obstructing exciting light.

[0016] Said anti-counterfeit fiber has at least one dyed section and one non-dyed section at its length direction.

[0017] Said anti-counterfeit fiber is fully a dyed section at its length direction.

[0018] An anti-counterfeit paper distributed with said anti-counterfeit fiber, and in said anti-counterfeit paper, the first material part surface of the first material part and the second material part surface of the second material part in the anti-counterfeit fiber appears respectively on upper and lower two surfaces of the anti-counterfeit paper, therefore, when exciting light irradiates respectively both surfaces of the anti-counterfeit paper, the luminescent colors of said anti-counterfeit fiber will change apparently. The anti-counterfeit paper containing said anti-counterfeit fiber is characterized by that the anti-counterfeit fiber in said anti-counterfeit paper is transparent wholly or partly when observed in the transmitted light.

Technical effects:

[0019] When the anti-counterfeit fiber in this invention falls freely onto a horizontal plane, for both of the first material part surface and the second material part surface, one is upward and the other is downward, and the thermal shrinkage rates of the first material part and the second material part are the same, which can ensure that the surface of the first material part can orient towards one surface of the anti-counterfeit paper and the surface of the second material part can orient towards the other surface of the anti-counterfeit paper after the anti-counterfeit fiber is added in paper pulps to produce the anti-counterfeit paper. In this way, tortuosity of the anti-counterfeit fiber or bending phenomenon not benefit to appearing luminescent surfaces of the anti-counterfeit fiber is eliminated, thus, apparent luminescent color change of the anti-counterfeit fiber can be achieved when two surfaces of the anti-counterfeit paper are irradiated by exciting light respectively.

[0020] The third material part and the fourth material part run together with the first material part and the second material part parallel along the fiber length direction without being twisted, and are respectively adjacent to two sides of these two parts, which can also achieve orientations of the first material part and the second material part after adding the anti-counterfeit fiber into an anti-counterfeit paper. It is more difficult to counterfeit because three or four components are involved in spinning. Especially, when thermal shrinkage rate is different between the third material part/the fourth material part and the first material part/the second material part, the anti-counterfeit fiber at each point bends orientally within the paper under condition of invariant relative distance to upper and lower surfaces of the anti-counterfeit paper, such oriented bending further guarantees orientation of the first material part and the second material part.

[0021] The third material part and the fourth material part is colorless and transparent under the transmitted light condition after in-paper press process, thus the anti-counterfeit fiber can be found as its transparency during light-through observation, and the fiber is further irradi-

ated by exciting light from both surfaces of the anti-counterfeit paper to observe its luminescent color change. When the third material part and the fourth material part is in color, they can also induce to identify this anti-counterfeit fiber, thus are useful to identify apparent luminescent color change at both surfaces of the paper via irradiating its two surfaces by using exciting light. Because there is basically no spinning equipment for three components in current textile industry, and certainly not for four components, so such equipment shall be specially manufactured with much higher cost, therefore, this structure meets to independent rule of anti-counterfeit effect, that is, if a forger wants to fake this anti-counterfeit fiber, he will see that it is utterly impossible to find any equipment in textile industry for his purpose, thus it hugely increases difficulty in faking.

[0022] A fifth material part and other material parts are also set in the anti-counterfeit fiber, which are equally divided by the interface into upper and lower sections, and runs, together with the first and the second material parts, parallel along the fiber length direction without being twisted, these material parts in color or colorless divide the first and the second material parts at cross-section respectively, which can also play a guiding function to identify the anti-counterfeit fiber with fluorescent color-change performance at upper and lower surfaces of paper, and simultaneously offers various solutions for applying this fluorescent fiber under different conditions.

Explanations on attached drawings:

[0023]

Figure 1 is a cross-section diagram of an anti-counterfeit fiber in this invention, which is consisted of the first material part and the second material part;

Figure 2 is a cross-section diagram of a paper added with the anti-counterfeit fiber illustrated in Figure 1;

Figure 3-1 and Figure 3-2 are respectively a cross-section diagram and a three-dimensional diagram of the anti-counterfeit fiber, of which each one side of the first material part and the second material part in this invention is adjacent collectively with the third material part;

Figure 4 is a cross-section diagram of the anti-counterfeit fiber, of which each other side of the first material part and the second material part in this invention is adjacent collectively with the fourth material part;

Figure 5 is a cross-section diagram of the anti-counterfeit fiber with the fifth material part equally divided by the interface 3;

Figure 6 is a cross-section diagram with an intermediate material part set between the first material part and the second material part;

Figure 7 is a cross-section diagram of the anti-counterfeit fiber, in which each one side of the first material part, the second material part and the intermediate material part in this invention is collectively adjacent to the third material part;

Figure 8 is a cross-section diagram of the anti-counterfeit fiber, in which each other side of the first material part, the second material part and the intermediate material part in this invention is collectively adjacent to the fourth material part;

Figure 9 is a three-dimensional diagram containing dyed section at length direction.

Embodiments:

[0024] Please see Figure 1, it shows a cross-section of the anti-counterfeit fiber of this invention, respectively presenting the first material part 1 and the second material part 2 on upper surface and lower surface of the anti-counterfeit fiber, in which both material parts run parallel along the anti-counterfeit fiber length direction without being twisted. Viewing its cross section, the anti-counterfeit fiber in this embodiment is only composed of the first material part 1 and the second material part 2, and these two material parts respectively contain luminescent material A and luminescent material B, and if applying exciting light, luminescent color of the luminescent material A is obvious different visually in comparison with the luminescent material B. Interface 3 in this embodiment is the maximum equally-dividing plane of the anti-counterfeit fiber, but also it could not be the maximum equally-dividing plane of the anti-counterfeit fiber on the premise of ensuring the surface of said first material part 1-surface 1' of first material part, and the surface of said second material part 2-surface 2' of second material part are one upwards and the other downwards when said anti-counterfeit fiber falls freely onto a horizontal plane. In order to guarantee the surface 1' of first material part is towards one surface of said anti-counterfeit paper and the surface 2' of second material part is towards the other surface of said anti-counterfeit paper when adding the anti-counterfeit fiber into an anti-counterfeit paper in this invention, so that when exciting light is applied respectively on both surfaces of the anti-counterfeit paper 8, luminescent color of said anti-counterfeit fiber will change obviously, the same thermal shrinkage rates are required for both of the first material part 1 and the second material part 2.

[0025] Figure 2 is a cross section diagram of anti-counterfeit paper 8 added with the anti-counterfeit fiber as shown in Figure 1 in process of paper making. Because the anti-counterfeit fiber will distribute within the anti-counterfeit paper in the minimum energy status in proc-

ess of paper making, and it is equivalent to the minimum energy status that the surface 1' of first material part and the surface 2' of second material part will be one upwards and the other downwards when freely falling down on a horizontal plane, simultaneously the first material part 1 and the second material part 2 have the same thermal shrinkage rates, therefore, the first material part 1 is certainly at upper section of the anti-counterfeit fiber within an anti-counterfeit paper placed horizontally and is close to upper surface of the anti-counterfeit paper 8, and the second material part 2 is certainly at lower section of the anti-counterfeit fiber and is close to lower surface of the anti-counterfeit paper 8. Thus when exciting light is applied on this anti-counterfeit fiber from upper to down over the upper surface of the anti-counterfeit paper 8 (as shown by arrow A), the luminescent material A will give out light; when exciting light is applied on this anti-counterfeit fiber from down to upper below the lower surface of the anti-counterfeit paper 8 (as shown by arrow B), the luminescent material B will give out obvious different light in comparison with that of luminescent material A, thus anti-faking function is achieved.

[0026] Because the thermal shrinkage rates of the first material part 1 and the second material part 2 are the same, the anti-counterfeit fiber in Figure 1 and Figure 2 is straight in length direction of the anti-counterfeit fiber and also straight after adding into the anti-counterfeit paper. Therefore, the anti-counterfeit fiber in Figure 1 and Figure 2 must be a flat fiber, and perfectly the first material part 1 and the second material part 2 respectively corresponds to equally-divided upper section fiber and lower section fiber which two flat surfaces of the flat fiber are belong to respectively. Thus when this anti-counterfeit fiber freely falls onto a horizontal plane, the interface 3 between the first material part 1 and the second material part 2 is parallel to horizontal level.

[0027] In Figure 3-1 and Figure 3-2, the first material part 1 and the second material part 2 are adjacent with the third material part 4 with their same orientation sides, and they all runs parallel along the anti-counterfeit fiber length direction without being twisted, in this embodiment, the interface 3 separates the first material part 1 and the second material part 2 equally, and the interface 3 in this invention also divides the third material part 4 equally into upper and lower sections. If ratio of the third material part 4 is very small in comparison with the first material part 1 and the second material part 2, it is not necessary to equally divide the third material part 4, on the premise of not influencing the orientations of the first material part surface 1' and the second material part surface 2' when the fiber falls down freely on a horizontal plane. The third material part 4 could be colorless or in color, and if it is colorless, said anti-counterfeit paper 8 after adding the anti-counterfeit fiber in it is in-paper pressed to make the third material part 4 transparent under transmitted light. Perfectly, thermal shrinkage rate of the third material part 4 is different with that of the first material part 1 and the second material part 2, thus the anti-counterfeit fiber in Figure 3-1 will bend along with bending of interface 9 between the first material part 1/the second material part 2 and the third material part 4, to form a bended fiber, please see Figure 3-2. Therefore, even if the anti-counterfeit fiber in Figure 3 is not a flat one, the first material part surface 1' and the second material part surface 2' will be one upwards and the other downwards when the anti-counterfeit fiber falls freely down onto a horizontal plane freely, correspondingly if this anti-counterfeit fiber is added into an anti-counterfeit paper, the first material part surface 1' will be towards upper surface of the anti-counterfeit paper and the second material paper surface 2' will be towards to lower surface of the anti-counterfeit paper, and it will appear different luminescent colors when exciting light irradiates respectively both surfaces of the anti-counterfeit paper. The third material part 4 is colorless transparent or in color, which is benefit to find out the anti-counterfeit fiber before identifying by exciting light.

[0028] Anti-counterfeit fiber shown in Figure 4 also contains a fourth material part 5 on the basis of the anti-counterfeit fiber constituted of three material parts shown in Figure 3. The fourth material part 5 is located at the other same orientation sides of the first material part 1 and the second material part 2, perfectly divided equally by said interface into upper section and lower section, and runs, together with the first, the second and the third material parts (1, 2, 4), parallel along the anti-counterfeit fiber length direction without being twisted. The fourth material paper 5 is colorless or in color, and if it is colorless, said anti-counterfeit paper after adding the anti-counterfeit fiber in it is in-paper pressed, its function of colorless transparence or color is the same as that of the third material part 4 shown in Figure 3. Perfectly, thermal shrinkage rate of the fourth material part 5 is different in comparison with that of the first material part 1 and the second material part 2, in order to form special orientation of the first material part surface 1' and the second material part surface 2' to meet with requirement on a bended fiber as mentioned above.

[0029] Anti-counterfeit fiber shown in figure 5 also contains a fifth material part 6 besides the third and the fourth material parts shown in Figure 4, and other material parts can also be contained, these material parts run, together with the first to the fourth material parts, parallel along length direction of the anti-counterfeit fiber without being twisted, and perfectly the interface 3 respectively divides all of material parts equally into upper sections and lower sections except the first material part and the second material part. These material parts are located at middle of said anti-counterfeit fiber and transversally cut off said first and the second material part (1, 2) respectively along said anti-counterfeit fiber in longitudinal parallel extension, that is, the first material part and the second material part are equally divided along length direction of the anti-counterfeit fiber. For the first material part and the second material part 1, 2, they are divided by the fifth material part (6) and respectively form left section 11 of the first

material part and right section 12 of the first material part, and left section 21 of the second material part and right section 22 of the second material part; the left section 11 of the first material part and the right section 12 of the first material part can contain different luminescent materials; and/or the left section 21 of the second material part and the right section 22 of the second material part can contain different luminescent materials. Certainly, for the anti-counterfeit fiber in Figure 5, the fifth material part (6) or other material parts could be colorless fibers or colored fibers, and if they are colorless fibers, said anti-counterfeit paper 8 after adding the anti-counterfeit fiber in it is in-paper pressed to make it transparent under transmitted light, its function of colorless transparence or color is the same as that mentioned before, and said fifth material part 6 and other material parts could be different in thermal shrinkage rate in comparison with that of the first and the second material part (1, 2), in order to form a special bended fiber.

[0030] In Figure 6, the anti-counterfeit fiber contains an intermediate material part 7 that is located between the first and second material parts (1, 2), separates these two material parts away and runs parallel along length direction of said anti-counterfeit fiber without being twisted, together with the first and the second material parts. Perfectly, interface 3 divides equally the intermediate material part 7 into upper section and lower section, and the first and the second material parts are symmetrical to the interface 3, and the intermediate material part 7 is a blocking material to exciting light and can obstruct the exciting light that passes through the first material part 1, to irradiate on the second material part 2, and obstruct the exciting light that passes through the second material part 2, to irradiate on the first material part 1. Certainly, the anti-counterfeit fiber in Figure 6 must be in flat form in order to that the first and the second material parts (1, 2) are respectively towards upper and lower surfaces of the anti-counterfeit paper after adding it into the anti-counterfeit paper.

[0031] Figure 7 and Figure 8 respectively representing the third material part 4 and the fourth material part 5, that both run parallel along fiber length direction without being twisted, are adjacent to the first and the second material parts(1,2) and the intermediate material part. In this embodiment, said third material part 4 and the fourth material part 5 are equally divided into upper section and lower sections by interface 3, these two material parts are colorless or in color, and if they are colorless, said anti-counterfeit paper 8 after adding with the anti-counterfeit fiber should be in-paper pressed to make said two material parts transparent under transmitted light. If thermal shrinkage rate of the third material part 4 and the fourth material part 5 is the same as that of the first and the second material parts (1, 2), the anti-counterfeit fiber shall be in flat form. If the thermal shrinkage rates are different, the anti-counterfeit fiber shall be a specially-bended fiber.

[0032] Certainly, a fifth material part and/or other material parts could also be contained on the basis of Figure 8. These material parts run together with the first to the fourth material parts parallel along length direction of said anti-counterfeit fiber without being twisted, and all of material parts except the first and the second material parts are respectively and equally divided by interface 3 into upper sections and lower sections, these material parts are located at middle of said anti-counterfeit fiber and run parallel along longitudinal direction of said anti-counterfeit fiber to cut off said first and the second material parts transversally, these said material parts are in color or colorless, if they are colorless, after adding the anti-counterfeit fiber into the anti-counterfeit paper, the anti-counterfeit paper should be in-paper pressed to make said material parts transparent under transmitted light.

[0033] Perfectly, the anti-counterfeit fibers mentioned in above Figures are flat ones with their upper surface, lower surface and interface (3) almost being parallel. For a flat fiber in very flat form, it is unnecessary to require that the first material part and the second material part are symmetrical to the interface, or the intermediate material part, the third, the fourth and the fifth material parts and other material parts are divided equally by the interface 3 into upper sections and lower sections.

[0034] The first and the second material parts (1, 2) could be colorless, and after adding the anti-counterfeit fiber into the anti-counterfeit paper, the anti-counterfeit paper is in-paper pressed to make it transparent wholly (under transmitted light) but changing color to exciting light over its two surfaces.

[0035] Certainly, said anti-counterfeit fiber has a dyed section at one section or is dyed wholly at its length direction. In Figure 9, said anti-counterfeit fiber has at least one dyed section 10 and one non-dyed section 11 at its length direction. Said anti-counterfeit fiber could also be dyed in its whole section at the length direction. The dyed section has function to easily identify the anti-counterfeit fiber in the anti-counterfeit paper for further testing the upper and lower surfaces of anti-counterfeit paper via color-change irradiated under an exciting light.

Claims

1. An anti-counterfeit fiber, at least including a first material part (1) and a second material part (2), of which both run parallel along said anti-counterfeit fiber length direction without being twisted, wherein the first material part (1) contains surface (1') of the first material part and the second material part (2) contains surface (2') of the second material part, and said first material part (1) and said second material part (2) contain luminescent material A and luminescent material B respectively, of which both have obvious visual difference in luminescent colors with each other if they are under exciting light, it is **characterized by** that when said anti-counterfeit fiber falls freely onto a horizontal plane, for both of the

first material part surface (1') and the second material part surface (2'), one is upward and the other is downward; and the thermal shrinkage rates of said first material part (1) and said second material part (2) are the same in order to ensure that the surface (1') of the first material part can orient towards one surface of said anti-counterfeit paper and the surface (2') of the second material part can orient towards the other surface of said anti-counterfeit paper after the anti-counterfeit fiber is added into paper pulps to produce the anti-counterfeit paper, therefore, when the two surfaces of the anti-counterfeit paper (8) are irradiated by exciting light respectively, the luminescent colors of said anti-counterfeit fiber will change apparently.

2. The anti-counterfeit fiber as said in Claim 1, it is **characterized by** that a third material part (4) adjacent to said first and second material parts (1, 2) by sides basically facing the same direction is also included, and runs, together with said first and second material parts, parallel along said anti-counterfeit fiber length direction without being twisted, and said third material part (4) is colorless or in color.

3. The anti-counterfeit fiber as said in Claim 2, it is **characterized by** that along with the length direction of said anti-counterfeit fiber, said anti-counterfeit fiber bends along with bending of interface (9) between said first and said second material parts (1, 2) and the third material part (4).

4. The anti-counterfeit fiber as said in Claim 3, it is **characterized by** that the cross section of said anti-counterfeit is round.

5. The anti-counterfeit fiber as said in Claim 2, it is **characterized by** that a fourth material part (5) is also included, and said fourth material part (5) is adjacent to said first and second material parts (1, 2) by the other sides basically facing the same direction and runs, together with the first, second and third material parts (1, 2, 4), parallel along said anti-counterfeit fiber length direction without being twisted, and said fourth material part (5) is colorless or in color.

6. The anti-counterfeit fiber as said in Claim 5, it is **characterized by** that a fifth material part (6) is also included at least, and said fifth material part (6) runs, together with the first to the fourth material parts, parallel along length direction of said anti-counterfeit fiber without being twisted, and said fifth material part (6) is located at middle of said anti-counterfeit fiber and equally divides the first material part (1) and the second material part (2) along with the anti-counterfeit fiber length direction to respectively form left section (11) of the first material part and right section (12) of the first material part, and left section (21) of the second material part and right section (22) of the second material part, and said fifth material part (6) is colorless or in color.

7. The anti-counterfeit fiber as said in Claim 6, it is **characterized by** that the left section (11) of the first material part and the right section (12) of the first material part contain different luminescent materials, and/or the left section (21) of the second material part and the right section (22) of the second material part contain different luminescent material s.

8. The anti-counterfeit fiber as said in Claim 1, it is **characterized by** that sai d a nti-counterfeit fi ber also contains an intermediate material part (7) located between the first and the second material parts (1, 2), which separates the first and the second material part (1, 2) and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts, and said intermediate material part (7) is a blocking material used for obstructing exciting light.

9. The anti-counterfeit fiber as said in Claim 2, it is **characterized by** that an intermediate material part (7) is also set between the first and the second material parts (1, 2), which separates the first and the second material parts (1, 2) and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts (1, 2), and said intermediate material part (7) is a blocking material used for obstructing exciting light.

10. The anti-counterfeit fiber as said in Claim 5, it is **characterized by** that an intermediate material part (7) is also set between the first and the second material parts (1, 2), which separates the first and the second material parts (1, 2) and runs parallel along said anti-counterfeit fiber length direction without being twisted, together with the first and the second material parts (1, 2), and said intermediate material part (7) is a blocking material used for obstructing exciting light.

11. The anti-counterfeit fiber as said in Claim 1, it is **characterized by** that said anti-counterfeit fiber has at least one dyed section (10) and one non-dyed section (11) at its length direction.

12. The anti-counterfeit fiber as said in Claim 1, it is **characterized by** that said anti-counterfeit fiber is fully a dyed section at its length direction.

13. An anti-counterfeit paper distributed with said anti-counterfeit fiber as said in any one of Claims 1-12, and in said anti-counterfeit paper, the first material part surface (1') of the first material part (1) and the

second material part surface (2') of the second material part (2) in the anti-counterfeit fiber appears respectively on upper and lower two surfaces of the anti-counterfeit paper, therefore, when exciting light irradiates respectively both surfaces of the anti-counterfeit paper (8), the luminescent colors of said anti-counterfeit fiber will change apparently.

14. The anti-counterfeit paper containing said anti-counterfeit fiber as said in Claims 13, it is **characterized by** that the anti-counterfeit fiber in said anti-counterfeit paper is transparent wholly or partly when observed in the transmitted light.

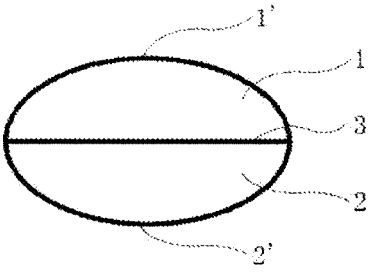

Fig. 1

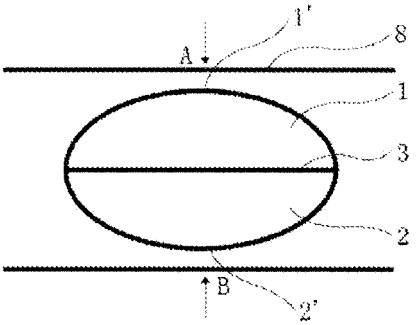

Fig. 2

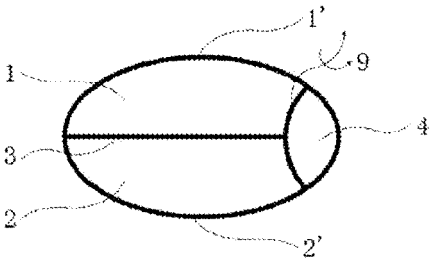

Fig. 3-1

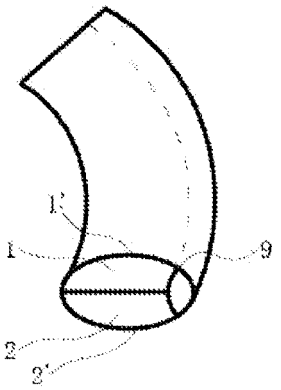

Fig. 3-2

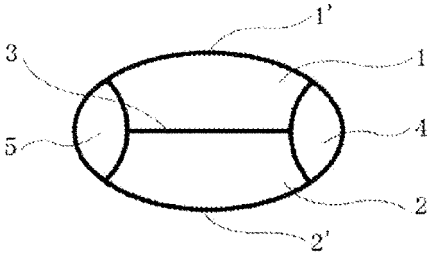

Fig. 4

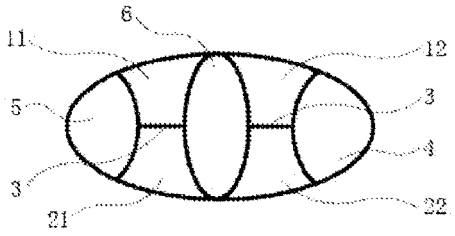

Fig. 5

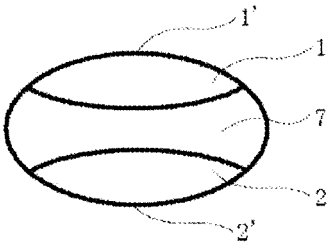

Fig. 6

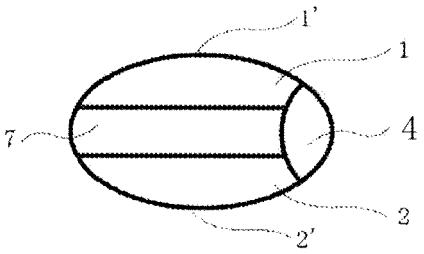

Fig. 7

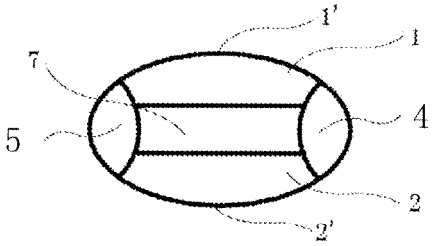

Fig. 8

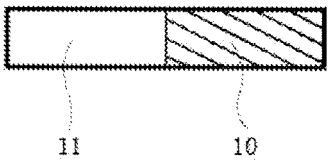

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/073607

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: D21H, D01F, D01D

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)

CNPAT,CNKI,WPI,EPODOC,PAJ and search terms: COUNTERFEIT, FAKE,FORGE, FABRICATION, MINT, FALSIFICATION,FALSE,FIBER,FIBRE,THREAD,FILAMENT,YARN, BICOMPONENT, MULTICOMPONENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN101135127A(SUN, Xianlin), 05 Mar. 2008 (05.03.2008), claims 1,3,13,15, page 6,line 30 to page 7, line 4 of description, figs. 9a-9c	1,8,11-14
Y	Rave H. et al， Manufacturing Technique of Bicomponent Short Fiber, Synthetic Fiber in China, 25 Jul.2007 (25.07.2007), No.7, left column, lines 6-7 of page 47	1,8,11-14
A	CN1343810A(SUN, Xianlin),10 Apr. 2002 (10.04.2002), the whole document	1-14
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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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
18 Nov.2009 (18.11.2009)	**03 Dec. 2009 (03.12.2009)**
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 GAO Beibei Telephone No. (86-10)62084928

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/073607

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No.
PCT/CN2009/073607

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INTERNATIONAL SEARCH REPORT
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International application No.
PCT/CN2009/073607

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/073607

A. CLASSIFICATION OF SUBJECT MATTER

D21H21/42 (2006.01) i
D21H21/48 (2006.01) i
D01F8/00(2006.01)n
D01D5/253(2006.01)n

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REFERENCES CITED IN THE DESCRIPTION

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