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(54) MANUFACTURING PROCESS OF MINIATURE PAPER HANDKERCHIEF

(57) A manufacturing process of miniature paper handkerchief comprises the steps of feeding paper, embossing, longitudinally folding, transversely folding, separating sheets and packaging. By means of a longitudinal-folding unit (1), a transverse-folding unit (2) and a flower disc unit (5) mounted on a machine platform and connected in sequence, paper webs are sequentially tensioned on and arranged to go through the longitudinal-folding unit (1) and transverse-folding unit (2). The paper webs are folded in Z-shape along the width direction to form three folding surfaces through the longitudinal-folding unit (1), and then folded in half twice along the length direction to form four folding surfaces through the transverse-folding unit (2). The manufacturing process of miniature paper handkerchief presents the advantages of high production efficiency, fast speed, and reduced production cost, and the produced paper presents the advantages of suitable to adjust the specification, convenient to carry, small and exquisite.

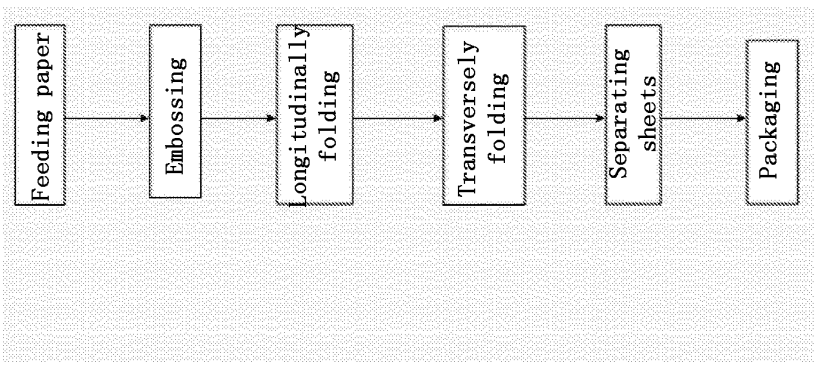

Fig. 1-A

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of manufacturing process of paper handkerchief, and more particularly, to a manufacturing process of miniature paper handkerchief.

BACKGROUND OF THE INVENTION

[0002] As a new-type cleaning paper, a paper handkerchief which is made of soft paper, plays a role of wiping like that of a conventional handkerchief. Due to the characteristics of small size, convenient carry, water-absorbing ability and dirt wiping thereof, the paper handkerchief brings great convenience to the life of people. It becomes an article that is used by every family in daily life and is well received by consumers.

[0003] The paper handkerchiefs normally used in the present market have fixed sizes generally, and some paper handkerchiefs are even inconvenient to carry due to oversize packaging thereof. Accordingly, a manufacturing process of paper handkerchief and a corresponding production unit can only produce the paper handkerchief having such specifications or approaching to such specifications.

[0004] Moreover, there are too many processes in the packaging procedure of the existing paper handkerchief production line, which require a large number of labors to assist and complete. Such a production manner causes high manual cost, low production efficiency and slow speed; moreover, the paper sheets produced are not adjustable in specifications and have single shapes and sizes; some paper handkerchiefs after being put into the packaging bag are often inconvenient to carry due to oversize specifications, which cause visual uncomfortableness to people. It has become an urgent demand for producers and consumers to produce a super-miniature paper handkerchief which is smaller and more beautiful, is more convenient to carry, and has higher utilization ratio, but the existing manufacturing process of paper handkerchief cannot satisfy the demands of industrial production.

SUMMARY OF THE INVENTION

Technical Problems

[0005] With respect to the foregoing defects in the related art, the present invention provides a manufacturing process of miniature paper handkerchief, so as to solve the technical problems that the original paper handkerchief folding process has the defects of high manual cost, low production efficiency and slow speed, and the produced paper handkerchief has the defects of nonadjustable specifications, single shapes and sizes, and inconvenient carry.

Solution to Problems

Technical Solutions

[0006] The present invention provides a manufacturing process of miniature paper handkerchief, including the following steps of:

1) feeding paper: mounting and fixing a paper web to be manufactured on a bobbin bracket;

2) embossing: opening the end of the foregoing fixed paper web, then passing the paper web through a embossing roll from a paper guiding roll slowly, so that corresponding patterns are formed on the paper web by the embossing roll;

3) longitudinally folding: folding the paper web rolled by the embossing roll along a width direction thereof to form three folding surfaces through a longitudinal-folding unit;

4) transversely folding: cutting the paper web which is longitudinally folded through a transverse-folding unit to form tissues according to an actually required length, and then folding the tissues in half and in quarter;

5) separating sheets: separating sheets on the tissues which are transversely folded through a sheet counter according to the quantity required by each packaging bag so that the tissues are stacked and arranged in a certain quantity to form a tissue pack; and

6) packaging: clearing up the tissue pack formed after the foregoing sheet separating through a flower disc at a rabbet thereof and putting the tissue pack into the packaging bag.

[0007] Further, the longitudinal-folding unit includes a first pulling roll, a second pulling roll, a third pulling roll, a first longitudinal folding component mounted between the first pulling roll and the second pulling roll, and a second longitudinal folding component mounted between the second pulling roll and the third pulling roll, wherein, the first longitudinal folding component includes a first folding plate and a second folding plate, the first folding plate is provided with a first bevel edge, the first folding plate and the second folding plate are provided with a partially overlapped region, and the partially overlapped region leaves a first gap for the paper web to go through; the second longitudinal folding component includes a third folding plate and a fourth folding plate, the third folding plate is provided with a second bevel edge, the third folding plate and the fourth folding plate are provided with a partially overlapped region, and the partially overlapped region leaves a second gap for the paper web to go

through.

[0008] Further, the first folding plate and the third folding plate are in a right trapezoid shape, the second folding plate and the fourth folding plate are in a rectangle shape, the first bevel edge and the second bevel edge are the oblique waists of the right trapezoid, a segment is made vertically downwards along the top point of the oblique waists to the length of the segment be equal to the altitude of the trapezoid, and one of the sides of the second folding plate and the fourth folding plate is coincided with the segment.

[0009] Further, the other side of the second folding plate is also provided with a guiding plate for introducing the paper web, and the guiding plate forms a certain angle with the second folding plate.

[0010] Further, the width of the second folding plate is 160 to 183 mm; and the width of the fourth folding plate is 52 to 62 mm or 79 to 92 mm.

[0011] Further, the width of the second folding plate is 182 mm, and the width of the fourth folding plate is 61 mm or 91 mm.

[0012] Further, the transverse-folding unit includes a paper-guiding dead knife roll arranged on the machine platform, a surface knife roll tangential to the paper-guiding dead knife roll, a main folding roll as well as a first paper-folding roll and a second paper-folding roll respectively tangential to the main folding roll, wherein the paper-guiding dead knife roll is provided with two dead knives for parting off, the surface knife roll is provided with two surface knives for parting off, the first paper-folding roll is provided with a first paper-folding knife and a first air hole, and the second paper-folding roll is provided with a second paper-folding knife and a second air hole.

[0013] Further, the machine platform is also provided with a paper-throwing roll tangential to the main folding roll, and the paper web which is folded in quarter is extruded by the paper-throwing roll and the main folding roll.

[0014] Further, the arc length between the two dead knives for parting off is a half of the circumference of the paper-guiding dead knife roll.

[0015] Further, the arc length between the two dead knives for parting off is 148 to 188 mm; and the circumference of the paper-guiding dead knife roll is 296 to 376 mm; the radius of circle of the paper-guiding dead knife roll is 46 to 61 mm; the arc length between the first air hole and the first paper-folding knife is 69 to 96 mm; and the arc length between the second air hole and the second paper-folding knife is 34 to 49 mm.

[0016] Further, the arc length between the dead knives for parting off is 186 mm, and the circumference of the paper-guiding dead knife roll is 372 mm; the radius of circle of the paper-guiding dead knife roll is 59.24 mm; the arc length between the first air hole and the first paper-folding knife is to 92 mm; and the arc length between the second air hole and the second paper-folding knife is to 47 mm.

[0017] Further, the depth of the rabbet of the flower disc ranges from 37 to 48 mm, and the width of the rabbet ranges from 17 to 19 mm; the tissue pack formed by stacking is just accommodated in the rabbet, so that the size of the tissue pack is limited and restrained.

[0018] Further, the depth of the rabbet of the flower disc is 37 mm, and the width of the rabbet is 18 mm.

[0019] Further, the surface of the embossing roll is provided with a plurality of bulges, and the bulges may be arranged into different patterns.

[0020] Further, labeling is also performed on the packaging bag after step 6) by pasting a half moon patch on one side of the packaging bag so that the tissues can be taken out conveniently.

Advantageous Effects of the Invention

Advantageous Effects

[0021] Compared with the prior art, the manufacturing process of miniature paper handkerchief according to the present invention implements the following technical effects:

(1) By means of the devices like the longitudinal-folding unit, the transverse-folding unit and the flower disc unit mounted on the machine platform and connected in sequence, the paper web is sequentially tensioned on and arranged to go through the longitudinal-folding unit and the transverse-folding unit; after such steps like feeding paper, embossing, longitudinally folding, transversely folding, separating sheets and packaging, the paper handkerchief is folded in a "Z" shape along a width direction to form three folding surfaces, and then folded in half twice along a length direction to form four folding surfaces; the present invention employs an assembly line production mode, which not only has high production efficiency and fast speed, but also reduces the production cost.

(2) By means of improving the components and specifications of the longitudinal-folding unit slightly, the transverse-folding unit and the sheet counter to make them operate more harmonically and smoothly, the present invention has fewer process failures, and manual procedures are greatly reduced; therefore, the production yield is improved; meanwhile, the produced tissues have the advantages of better quality, clear embossing and low defective rate, and are folded orderly.

(3) The specifications of the paper sheets produced using the method of the present invention may be adjusted according to the market requirements. To be specific, the length edge of the packaging bag of the present invention ranges from 54 to 62 mm, the width edge ranges from 37 to 48 mm, and the height edge ranges from 17 to 19 mm. The width of the

paper handkerchief in the packaging bag ranges from 150 to 190 mm, and the length thereof ranges from 149 to 187 mm. Therefore, the product of the present invention is smaller and more beautiful, and is more convenient to carry.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1-A is a block diagram showing a flow of a manufacturing process of paper handkerchief according to the invention.

Fig. 1 is a structure diagram of a longitudinal-folding unit in the invention.

Fig. 2 is a front view of a structure diagram of a first longitudinal folding component in the invention.

Fig. 3 is a rear view of the structure diagram of the first longitudinal folding component in the invention.

Fig. 4 is a cross-sectional view of Fig. 3 on A-A direction.

Fig. 5 is a structure diagram of the first longitudinal folding component without paper web in the invention.

Fig. 6 is a structure diagram II of the first longitudinal folding component with paper web in the invention.

Fig. 7 is a structure diagram II of the first longitudinal folding component with paper web in the invention.

Fig. 8A is a structure schematic diagram I for folding paper web in the invention.

Fig. 8B is a transverse sectional view of folding the paper web according to the structure schematic diagram I in the invention.

Fig. 9A is a structure schematic diagram II for folding paper web in the invention.

Fig. 9B is a transverse sectional view of folding the paper web according to the structure schematic diagram II in the invention.

Fig. 10 is a structure diagram of a transverse-folding unit in the invention.

Fig. 11 is a structure diagram of a flower disc in the invention.

Fig. 12 is a structure diagram of a device for the manufacturing process of miniature paper handkerchief according to the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0023] The invention will be further described hereinafter with reference to the drawings, but the description is not restrictive of the invention.

[0024] As shown in Fig. 1-A and Fig. 10, a manufacturing process of miniature paper handkerchief according to the embodiments of the present invention includes the steps of feeding paper, embossing, longitudinally folding, transversely folding, separating sheets and packaging. By means of a longitudinal-folding unit 1, a transverse-folding unit 2, and a flower disc unit 5 mounted on a machine platform and connected in sequence, a paper web 3 is sequentially tensioned on and arranged to go through the longitudinal-folding unit 1 and the transverse-folding unit 2. The handkerchief is folded in a "Z" shape along a width direction to form three folding surfaces through the longitudinal-folding unit 1, and then folded in half twice along a length direction to form four folding surfaces through the transverse-folding unit 2. Please refer to the following steps for details.

(1) Feeding paper

[0025] A paper feeding operation is performed firstly before the paper web 3 is fed into the folding unit, i.e., push the paper web to be manufactured on a hydraulic hoist, step on a hydraulic switch to lift the paper webs, so that the center of the paper drum of the paper web is aligned with a bobbin bracket, slightly push the hoist towards the bobbin bracket, so that the core of the paper drum is completely matched with the axis of the bobbin bracket, then fix the bobbin paper on the bracket using a fixing bolt to complete the procedure of feeding paper.

[0026] To be specific, the paper web has two specifications ranges: when the production line is a single row production line, the width of the paper web ranges from 150 mm to 190 mm; and when the production line is a double row production line, the width of the paper web ranges from 300 mm to 380 mm.

(2) Embossing

[0027] After the completion of feeding paper, embossing is performed on the paper web by opening the end of the foregoing fixed bobbin paper and opening an inching switch manually so that the paper web slowly passes through a embossing roll from a paper guiding roll, wherein the embossing roll is provided with a plurality of different bulges to form different patterns, and various corresponding patterns are left when the paper web passes through the embossing roll.

(3) Longitudinally folding

[0028] The paper web 3 rolled by the embossing roll

is folded along a width direction thereof to form three folding surfaces through the longitudinal-folding unit 1.

[0029] Referring to Fig. 1, the longitudinal-folding unit 1 includes a first pulling roll 11, a second pulling roll 12, a third pulling roll 13, a first longitudinal folding component 14 and a second longitudinal folding component 15, wherein the first longitudinal folding component 14 is mounted between the first pulling roll 11 and the second pulling roll 12, and the second longitudinal folding component 15 is mounted between the second pulling roll 12 and the third pulling roll 13.

[0030] Referring to Fig. 2, Fig. 3 and Fig. 4, the first longitudinal folding component 14 includes a first folding plate 141 and a second folding plate 142, and the first folding plate 141 is provided with a first bevel edge 1411. To be specific, the first folding plate 141 is in a right trapezoid shape, the second folding plate 142 is in a rectangle shape, and the oblique waist of the right trapezoid is namely the first bevel edge 1411 above-mentioned. A segment is made vertically downwards along the top point A of the oblique waist of the first folding plate 141 to make the length of the segment be equal to the altitude of the trapezoid, and the oblique waist and the first side 1421 of the second folding plate 142 are mutually overlapped; moreover, the mutually overlapped region of the first side 1421 of the second folding plate 142 and the first folding plate 141 leaves a first gap 4 for the paper web 3 to go through; the first side 1421 of the second folding plate 142 is coincided with the altitude, and the end of the second folding plate 142 for guiding the paper web 3 is bent to form a first guiding plate 1422. The second longitudinal folding component 15 includes a third folding plate and a fourth folding plate, and has the same structure as that of the first longitudinal folding component 14, which is adjusted in position and direction, so that the paper web can be folded in a "Z" shape, and the structure of the second longitudinal folding component will not be restated herein.

[0031] During longitudinal folding, as shown in Fig. 1, Fig. 5, Fig. 6 and Fig. 7, the paper web 3 is transmitted into the first gap 4 of the first longitudinal folding component 14 along the first guiding plate 1422 under the action of the first pulling roll 11. During this process, the first guiding plate 1422 is configured to guide to smoothly convey the paper web 3 into the first gap 4 of the first longitudinal folding component 14, and avoid the paper web 3 from being damaged or avoid off production due to fracture of the paper web 3. Under the limit of the first bevel edge 1411 of the first folding plate 141, the paper web 3 is folded along the first side 1421 of the second folding plate 142, and then the paper web 3 is conveyed into the second gap of the second longitudinal folding component 15. According to the foregoing principle, the other side of the paper web 3 on the longitudinal direction is folded. As shown in Fig. 8A and Fig. 8B, the paper web 3 is folded to form three folding surfaces evenly along the width direction in a "Z" shape according to the width of the paper web 3. To be specific, in the embodiment of the present invention, the width of the paper web 3 ranges from 161 to 182 mm. Then accordingly, the width of the side a of the second folding plate 142 in the first longitudinal folding component 14 ranges from 160 to 183 mm, and the width of the side b of the fourth folding plate in the second longitudinal folding component 15 ranges from 52 to 62 mm. Preferably, the width of the side a is 182 mm, and the width of the side b is 61 mm.

[0032] As another implementation mode, as shown in Fig. 9A and Fig. 9B, the paper web 3 is folded to form three folding surfaces in a "Z" shape along a width direction thereof, wherein the paper web 3 is folded by 1/4 of the width thereof respectively for the first and second times, then the width of the folded paper web 3 is 1/2 of the width of the original paper web 3. The width of the paper web 3 ranges from 161 to 182 mm. Then accordingly, the width of the side a of the second folding plate 142 in the first longitudinal folding component 14 ranges from 161 to 183 mm, and the width of the side b of the fourth folding plate in the second longitudinal folding component 15 ranges from 79 to 92 mm. Preferably, the width of the side a is 182 mm, and the width of the side b is 91 mm. After the completion of longitudinally folding, the paper web 3 is conveyed to the transverse-folding unit 2 under the action of the third pulling roll 13.

(4) Transversely folding

[0033] The paper web which is longitudinally folded through the longitudinal-folding unit 1 is cut through the transverse-folding unit 2 to form tissues according to an actually required length, and then the tissues are folded in half and in quarter.

[0034] As shown in Fig. 10, the transverse-folding unit 2 includes a paper-guiding dead knife roll 21 arranged on the machine platform, a surface knife roll 22 tangential to the paper-guiding dead knife roll 21, a main folding roll 23 as well as a first paper-folding roll 24 and a second paper-folding roll 25 respectively tangential to the main folding roll 23. The paper-guiding dead knife roll 21 is provided with two dead knives for parting off 211, the surface knife roll 22 is provided with two surface knives for parting off 221, the first paper-folding roll 24 is provided with a first paper-folding knife 241 and a first air hole 242, and the second paper-folding roll 25 is provided with a second paper-folding knife 251 and a second air hole 252. A paper-throwing roll 26 after being tangential to the main folding roll 23 is fixedly mounted on the machine platform.

[0035] In the transverse-folding unit 2, the paper web 3 is firstly parted off into predetermined length, and then the length of the paper web 3 is folded in half, and then folded in quarter. To be specific, the paper-guiding dead knife roll 21 is provided with the two dead knives for parting off 211, the arc length between the two dead knives for parting off 211 is a half of the circumference of the paper-guiding dead knife roll 21. The paper web 3 is firstly fed into the paper-guiding dead knife roll 21, parted off

into segments between the paper-guiding dead knife roll 21 and the surface knives for parting off 221 of the surface knife roll 22, wherein the parting off length is equal to the arc length between the two dead knives for parting off 211, i.e., a half of the circumference of the paper-guiding dead knife roll 21. Because the length of the paper handkerchief ranges from 149 to 187 mm, then the arc length between the two dead knives for parting off 211 also ranges from 148 to 188 accordingly, the circumference of the paper-guiding dead knife roll 21 ranges from 296 to 376 mm, and the radius of circle of the paper-guiding dead knife roll 21 ranges from 46 to 61 mm. Preferably, the arc length between the dead knives for parting off 211 is 186 mm, and the circumference of the paper-guiding dead knife roll is 372 mm. When a single row production line is employed for production, the radius of circle of the paper-guiding dead knife roll 21 is preferably 59.24 mm. When a double row production line is employed for production, the radius of circle of the paper-guiding dead knife roll 21 is preferably 88.85 mm, and accordingly, the circumference of the paper-guiding dead knife roll 21 and the arc length between the dead knives for parting off 211 are adjusted correspondingly, which will not be elaborated herein.

[0036] After parting off, the paper web 3 is cut into an actually required size and is absorbed on the main folding roll 23 to move clockwise together with the main folding roll 23. The first paper-folding roll 24 is provided with a first air hole 242 for absorbing the header of the paper web 3, and is also provided with a first paper-folding knife 241. As shown in Fig. 10, the theoretical value of the arc length between the first air hole 242 and the first paper-folding knife 241 is a half of the length of the paper web 3. At this moment, the opening size of the first air hole 242 is not taken into consideration, and the first air hole 242 and the first paper-folding knife 241 are considered as one point. At the moment that the header of the paper web 3 is contacted with the first air hole 242 of the first paper-folding roll 24, the paper web 3 is absorbed on the first paper-folding roll 24 and move counterclockwise with the first paper-folding roll 24. When the length of the paper web 3 absorbed on the first paper-folding roll 24 is equal to a half of the total length of the paper web 3, the first air hole 242 releases air, then the paper web 3 will not be absorbed and will not move with the first paper-folding roll 24, but is folded and coincided with the last half of the paper web 3 and move clockwise with the main folding roll 23. The arc length between the first air hole 242 and the first paper-folding knife 241 ranges from 69 to 96 mm, and preferably, the arc length between the first air hole 242 and the first paper-folding knife 241 is 92 mm.

[0037] After being folded in half, the paper web 3 is absorbed on the main folding roll 23 and move clockwise together with the main folding roll 23. The second paper-folding roll 25 is provided with a second air hole 252 which is configured to absorb the header of the paper web 3, and is also provided with a second paper-folding knife 251. The theoretical value of the arc length between the second air hole 252 and the second paper-folding knife 251 is a quarter of the length of the paper web 3. At this moment, the opening size of the second air hole 252 is not taken into consideration, and the second air hole 252 and the second paper-folding knife 251 are considered as one point. At the moment that the header of the paper web 3 is contacted with the second air hole 252 of the second paper-folding roll 25, the paper web 3 is absorbed on the second paper-folding roll 25 and move counterclockwise with the second paper-folding roll 25. When the length of the paper web 3 absorbed on the second paper-folding roll 25 is equal to a quarter of the total length of the paper web 3, the second air hole 252 releases air, then the paper web 3 will not be absorbed and will not move with the second paper-folding roll 25, but is folded and coincided with the last quarter of the paper web 3 and move clockwise with the main folding roll 23. The arc length between the second air hole 252 and the second paper-folding knife 251 ranges from 34 to 49 mm, and preferably, the arc length between the second air hole 252 and the second paper-folding knife 251 is 47 mm.

[0038] After being folded in quarter, the paper web 3 is manufactured into a proper size, fed between the paper-throwing roll 26 and the main folding roll 23 and extruded, so that the folding effect is better.

(5) Separating sheets

[0039] Sheet separating is performed on the tissues which are transversely folded through a sheet counter 7 according to the quantity required by each packaging bag so that the tissues are folded and arranged in a certain quantity (for example, 4-10 sheets/pack) to form a tissue pack.

(6) Packaging

[0040] The tissue pack formed after the foregoing sheet separating is cleared up through a flower disc unit 5 at a rabbet thereof and put into the packaging bag.

[0041] As shown in Fig. 11, the depth of the rabbet 51 of the flower disc 5 ranges from 37 to 48 mm, and the width thereof ranges from 17 to 19 mm. Preferably, the depth of the rabbet 51 of the flower disc 5 is 47 mm, and the width thereof is 18 mm; in this way, the tissue pack 6 formed by folding is just accommodated in the rabbet 51, so that the size of the tissue pack is limited and restrained.

[0042] After the completion of packaging, a half moon patch may be pasted on one side of the packaging bag so that the tissues can be taken out conveniently; when the tissues are not in use, the half moon patch can be pasted tightly to prevent foreign materials from entering the packaging bag to affect the neatness and sanitarian of the tissues.

[0043] Through the foregoing process and arranging the longitudinal-folding unit 1, the transverse-folding unit

2 and the flower disc unit 5 on the machine platform and connected in sequence on the basis of the foregoing process, the present invention has the advantages of high production efficiency, fast speed and reduced production cost; moreover, the produced paper is adjustable in specifications according to market requirements, convenient to carry, and small and exquisite. Moreover, by means of improving the components and specifications of the longitudinal-folding unit slightly, the transverse-folding unit and the sheet counter to make them operate more harmonically and smoothly, the present invention has fewer process failures, and manual procedures are greatly reduced; therefore, the production yield is improved; meanwhile, the produced tissues have the advantages of better quality and low defective rate, and are folded orderly.

[0044] It should be noted that the above description is preferred embodiments of the invention merely, but is not intended to limit the protection scope of the invention. Equivalent improvements may further be made on the structures of the foregoing various spare parts of the invention. Therefore, any equivalent structure change figured out using the contents of the description and the drawings of the invention, or used directly or indirectly in other related technical fields shall all similarly fall within the scope of the invention.

Claims

1. A manufacturing process of miniature paper handkerchief, comprising the following steps of:

   1) feeding paper: mounting and fixing a paper web to be manufactured on a bobbin bracket;
   2) embossing: opening the end of the foregoing fixed paper web, then passing the paper web through a embossing roll from a paper guiding roll slowly, so that corresponding patterns are formed on the paper web by the embossing roll;
   3) longitudinally folding: folding the paper web rolled by the embossing roll along a width direction thereof to form three folding surfaces through a longitudinal-folding unit;
   4) transversely folding: cutting the paper web which is longitudinally folded through a transverse-folding unit to form tissues according to an actually required length, and then folding the tissues in half and in quarter;
   5) separating sheets: separating sheets on the tissues which are transversely folded through a sheet counter according to the quantity required by each packaging bag, so that the tissues are stacked and arranged in a certain quantity to form a tissue pack; and
   6) packaging: clearing up the tissue pack formed after the foregoing sheet separating through a flower disc at a rabbet thereof and putting the tissue pack into the packaging bag.

2. The manufacturing process of miniature paper handkerchief according to claim 1, **characterized in that**, the longitudinal-folding unit comprises a first pulling roll, a second pulling roll, a third pulling roll, a first longitudinal folding component mounted between the first pulling roll and the second pulling roll, and a second longitudinal folding component mounted between the second pulling roll and the third pulling roll, wherein the first longitudinal folding component comprises a first folding plate and a second folding plate, the first folding plate is provided with a first bevel edge, the first folding plate and the second folding plate are provided with a partially overlapped region, and the partially overlapped region leaves a first gap for the paper web to go through; the second longitudinal folding component comprises a third folding plate and a fourth folding plate, the third folding plate is provided with a second bevel edge, the third folding plate and the fourth folding plate are provided with a partially overlapped region, and the partially overlapped region leaves a second gap for the paper web to go through.

3. The manufacturing process of miniature paper handkerchief according to claim 2, **characterized in that**, the first folding plate and the third folding plate are in a right trapezoid shape, the second folding plate and the fourth folding plate are in a rectangle shape, the first bevel edge and the second bevel edge are the oblique waists of the right trapezoid, a segment is made vertically downwards along the top point of the oblique waists to make the length of the segment be equal to the altitude of the trapezoid, and one of the sides of the second folding plate and the fourth folding plate is coincided with the segment.

4. The manufacturing process of miniature paper handkerchief according to claim 2 or 3, **characterized in that**, the other side of the second folding plate is also provided with a guiding plate for introducing the paper web, and the guiding plate forms a certain angle with the second folding plate.

5. The manufacturing process of miniature paper handkerchief according to claim 2 or 3, **characterized in that**, the width of the second folding plate is 160 to 183 mm, and is preferably 182 mm; the width of the fourth folding plate is 52 to 62 mm or 79 to 92 mm, and is preferably 61 mm or 91 mm.

6. The manufacturing process of miniature paper handkerchief according to claim 1, **characterized in that**, the transverse-folding unit comprises a paper-guiding dead knife roll arranged on the machine platform, a surface knife roll tangential to the paper-guiding dead knife roll, a main folding roll as well as a first

paper-folding roll and a second paper-folding roll respectively tangential to the main folding roll, wherein the paper-guiding dead knife roll is provided with two dead knives for parting off, the surface knife roll is provided with two surface knives for parting off, the first paper-folding roll is provided with a first paper-folding knife and a first air hole, and the second paper-folding roll is provided with a second paper-folding knife and a second air hole.

7. The manufacturing process of miniature paper handkerchief according to claim 6, **characterized in that**, the machine platform is also provided with a paper-throwing roll tangential to the main folding roll, and the paper web which is folded in quarter is extruded by the paper-throwing roll and the main folding roll.

8. The manufacturing process of miniature paper handkerchief according to claim 6, **characterized in that**, the arc length between the two dead knives for parting off is a half of the circumference of the paper-guiding dead knife roll.

9. The manufacturing process of miniature paper handkerchief according to claim 6, **characterized in that**, the arc length between the two dead knives for parting off is 148 to 188 mm, and is preferably 186 mm; the circumference of the paper-guiding dead knife roll is 296 to 376 mm, and is preferably 372 mm; the radius of circle of the paper-guiding dead knife roll is 46 to 61 mm, and is preferably 59.24 mm; the arc length between the first air hole and the first paper-folding knife is 69 to 96 mm, and is preferably 92 mm; the arc length between the second air hole and the second paper-folding knife is 34 to 49 mm, and is preferably 47 mm.

10. The manufacturing process of miniature paper handkerchief according to claim 1, **characterized in that**, the flower disc is provided with a plurality of rabbets, the depth of the rabbet ranges from 37 to 48 mm, and is preferably 47 mm; the width of the rabbet ranges from 17 to 19 mm, and is preferably 18mm; the tissue pack formed by stacking is just accommodated in the rabbet, so that the size of the tissue pack is limited and restrained.

11. The manufacturing process of miniature paper handkerchief according to claim 1, **characterized in that**, the surface of the embossing roll is provided with a plurality of bulges, and the bulges may be arranged into different patterns.

12. The manufacturing process of miniature paper handkerchief according to claim 1, **characterized in that**, labeling is also performed on the packaging bag after step 6) by pasting a half moon patch on one side of the packaging bag so that the tissues can be taken out conveniently.

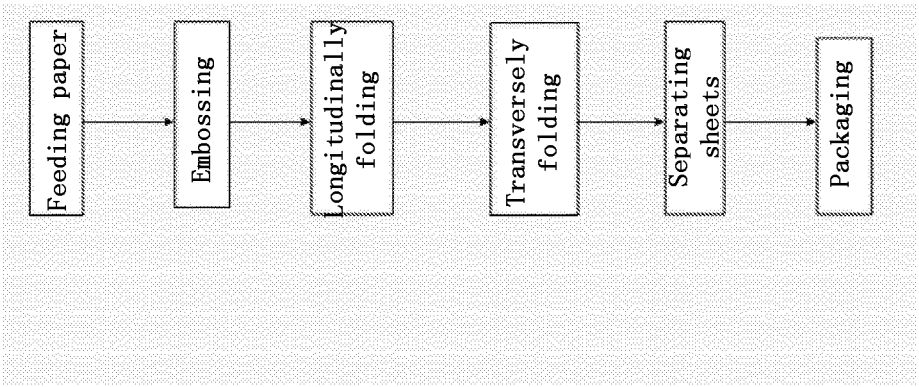
Feeding paper
Embossing
Longitudinally folding
Transversely folding
Separating sheets
Packaging

Fig. 1-A

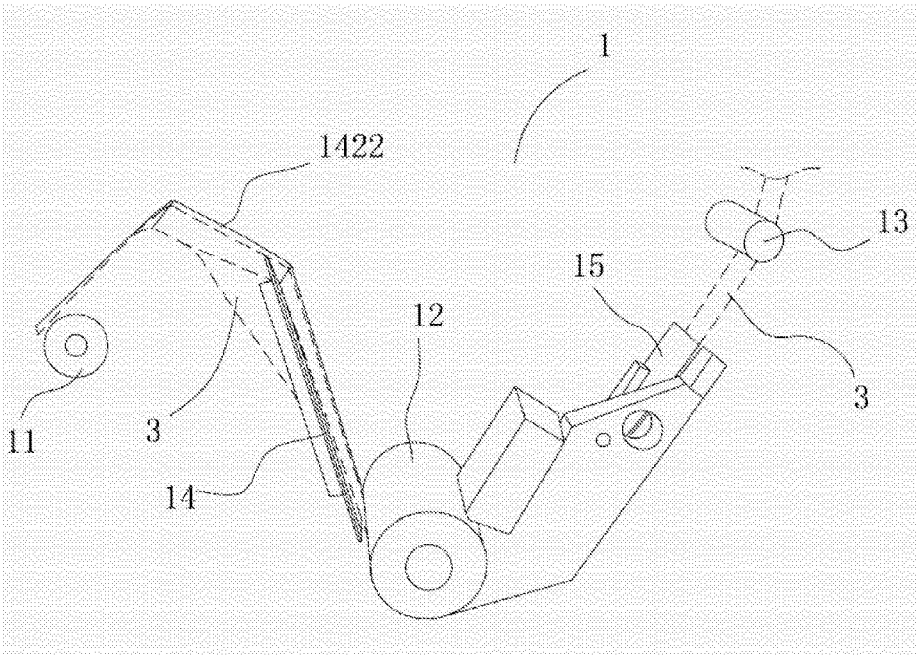
1
1422
13
15
12
3
11
3
14

Fig. 1

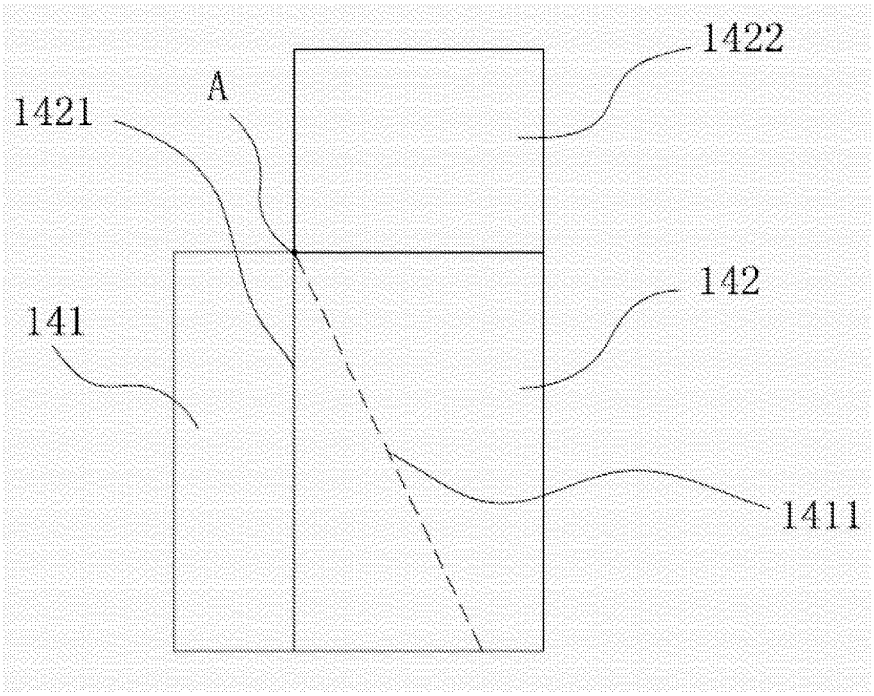

Fig. 2

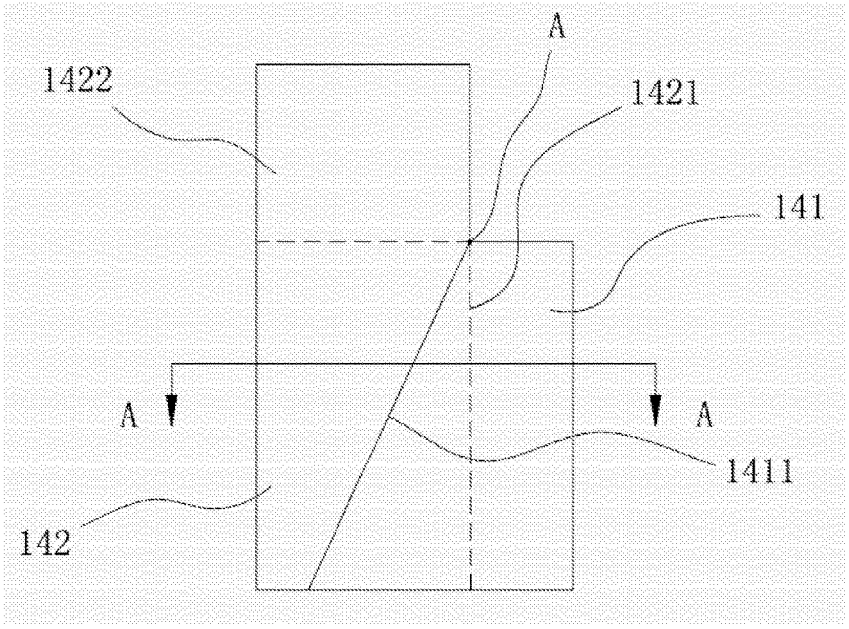

Fig. 3

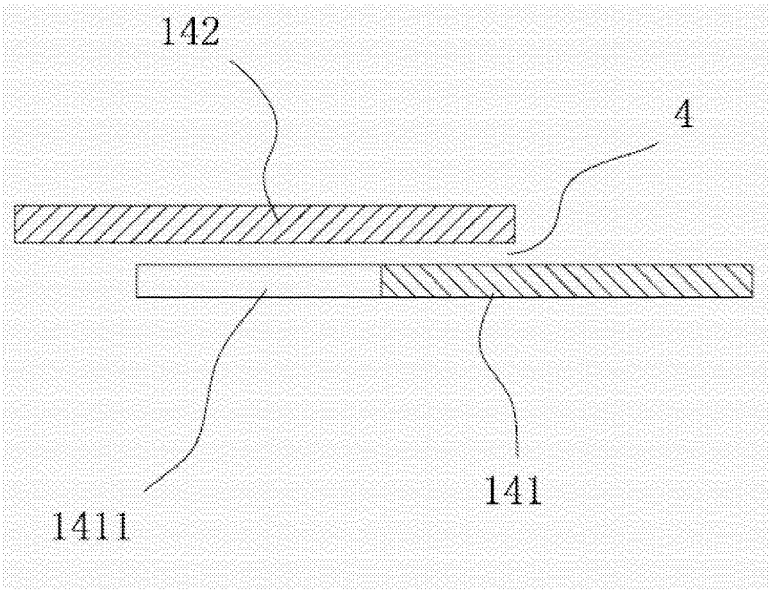

Fig. 4

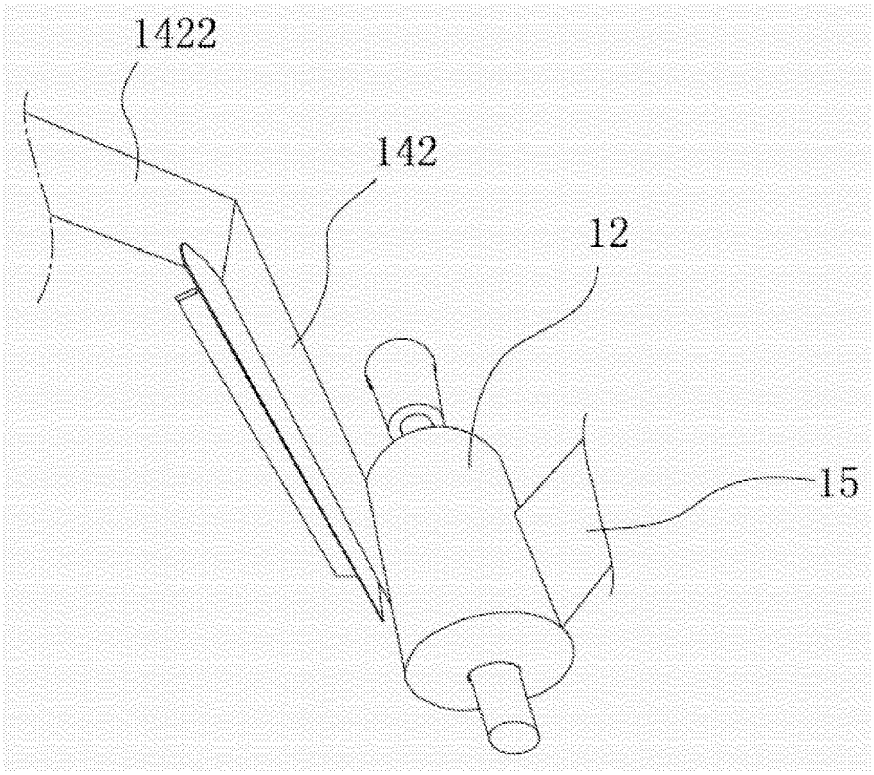

Fig. 5

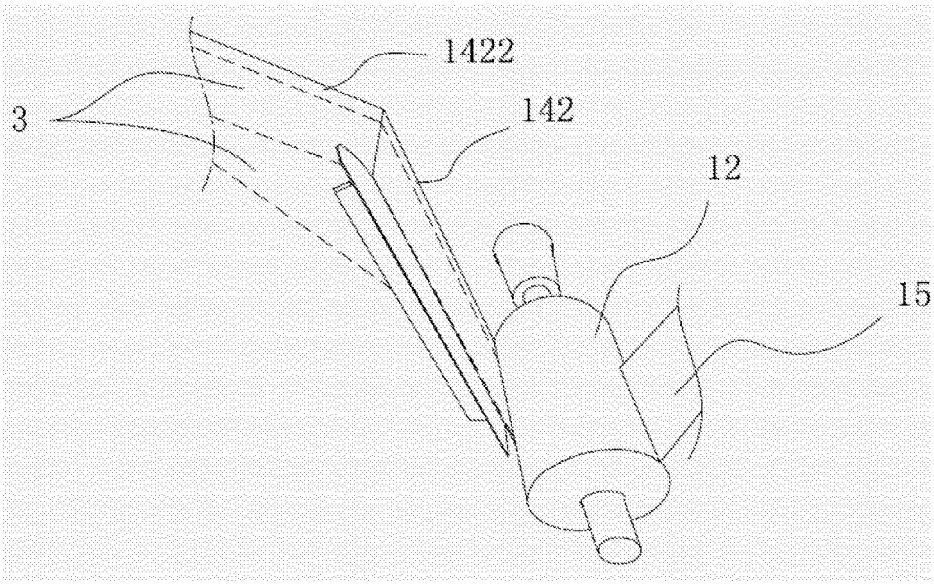

Fig. 6

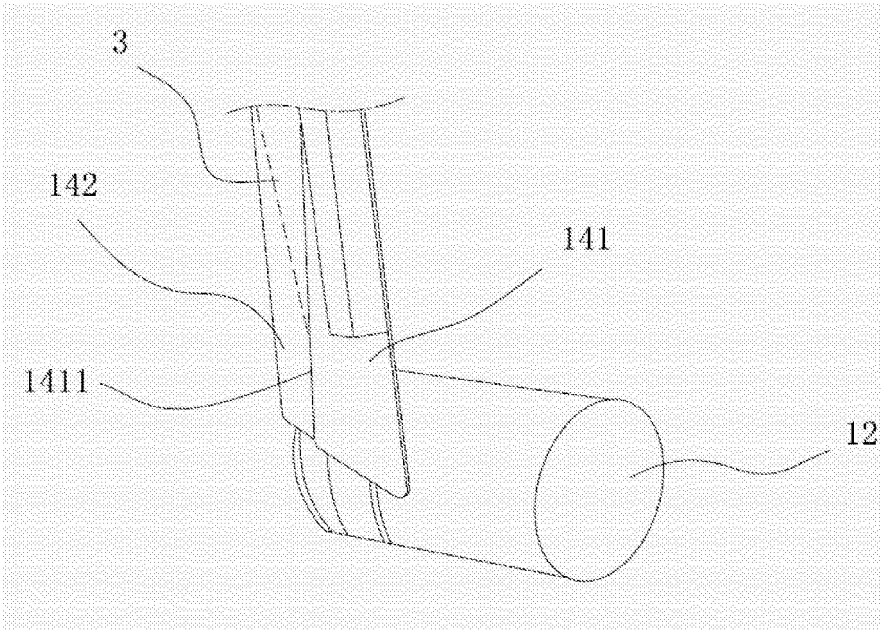

Fig. 7

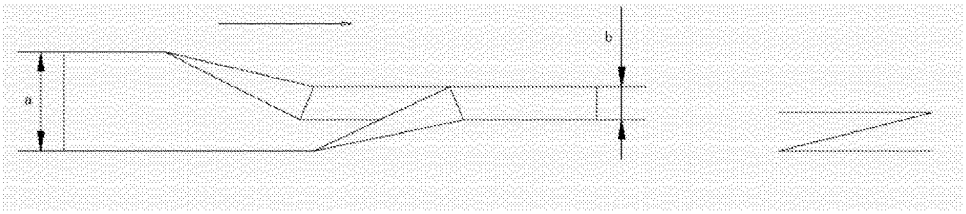

Fig. 8A

Fig. 8B

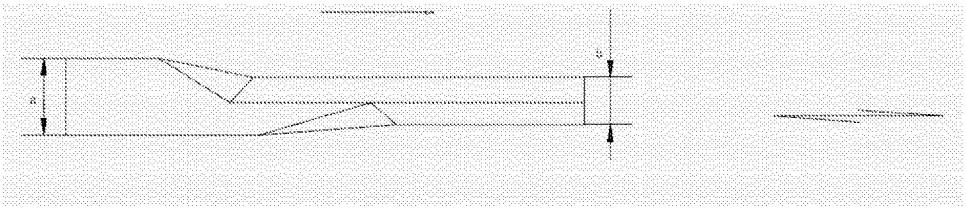

Fig. 9A

Fig. 9B

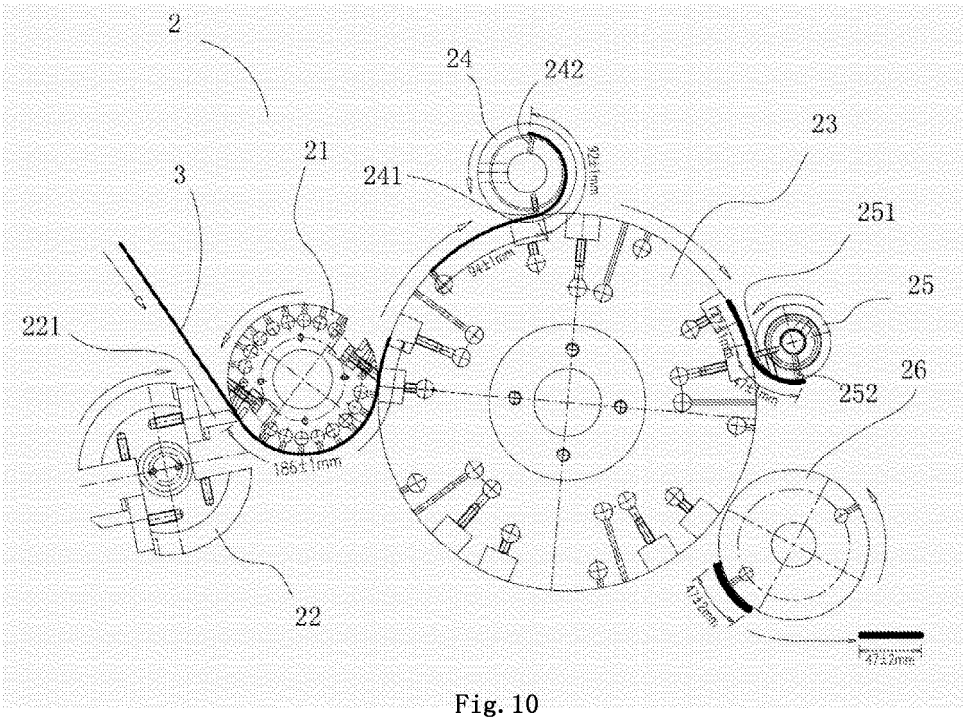

Fig. 10

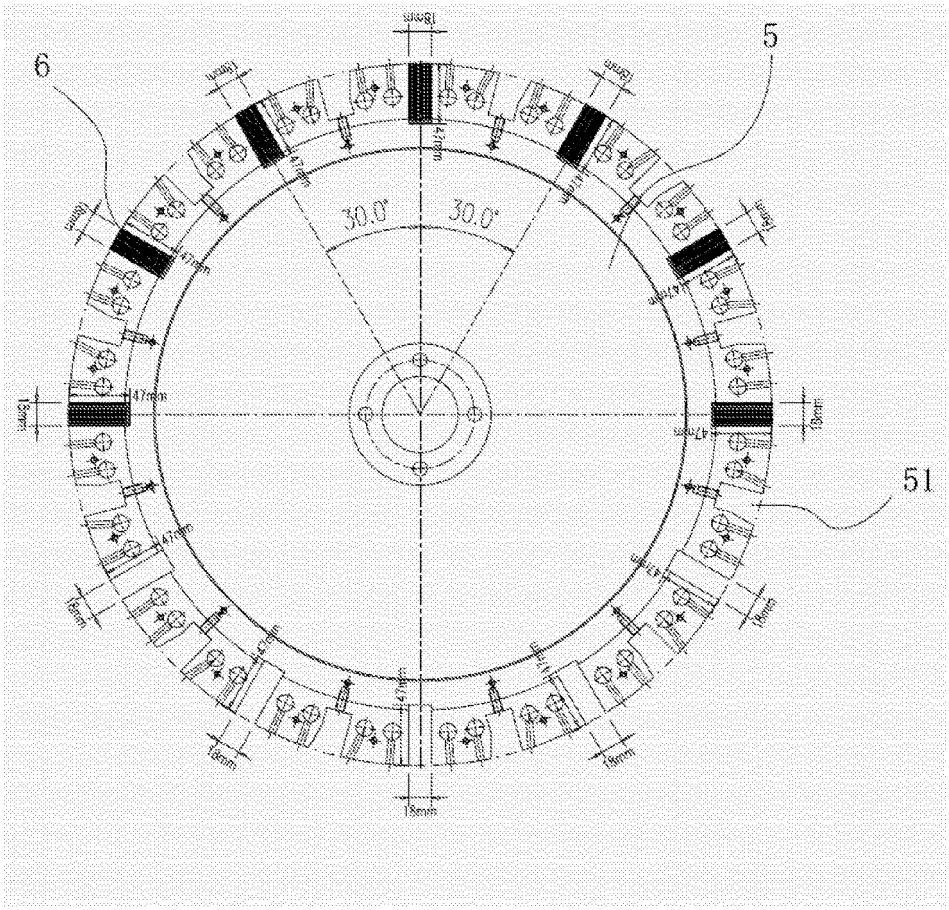

Fig. 11

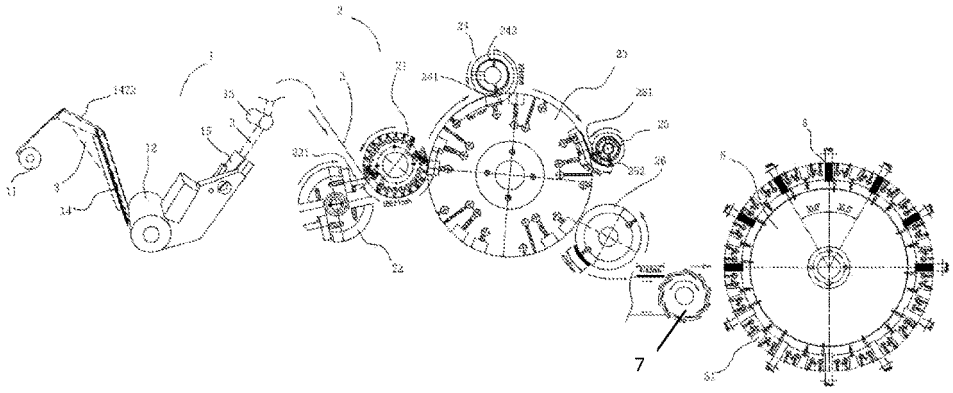

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/079471

A. CLASSIFICATION OF SUBJECT MATTER

B31D 1/04 (2006.01) i

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: B31D; B65H

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)

CPRSABS, CNABS, VEN: paper, tissue paper, HANDKERCHIEF, TISSUE, MINI, FOLD

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 103342007 A (C&S PAPER CO., LTD.), 09 October 2013 (09.10.2013), claims 1-12	1-12
X	CN 202293441 U (JIANGXI OUKE TECHNOLOGY CO., LTD.), 04 July 2012 (04.07.2012), description, pages 2-3, and figures 2-9	1, 10-12
A	EP 0893242 A1 (FORT JAMES FRANCE), 27 January 1999 (27.01.1999), the whole document	1-12
A	US 4969862 A (WINKLER DUENNEBIER KG MASCH), 13 November 1990 (13.11.1990), the whole document	1-12
A	CN 201140552 Y (LU, Dechang), 29 October 2008 (29.10.2008), the whole document	1-12
A	GB 2061233 A (PAPER CONVERTING MACHINE CO.), 13 May 1981 (13.05.1981), the whole document	1-12
A	GB 2028774 A (PAPER CONVERTING MACHINE CO.), 12 March 1980 (12.03.1980), the whole document	1-12

☐ 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

"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

"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

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 August 2014 (25.08.2014)	**09 September 2014 (09.09.2014)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **LI, Weiwei** Telephone No.: (86-10) **62085325**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/079471

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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CN 202293441 U	04 July 2012	None	
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		DK 0893242 T4	28 April 2008
		FR 2766125 A1	22 January 1999
		AT 212905 T	15 February 2002
		DK 0893242 T3	02 April 2002
		DE 69803725 T3	10 July 2008
		FR 2766125 B1	24 September 1999
		PT 893242 E	31 July 2002
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		ES 2172866 T5	16 May 2008
		ES 2172866 T3	01 October 2002
		PT 893242 T	31 July 2002
		EP 0893242 B1	06 February 2002
		EP 0893242 B2	26 December 2007
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Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/079471

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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		FR 2467810 B1	09 November 1984
		IT 1118187 B	24 February 1986
		AT 372905 B	25 November 1983
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		IT 7949769 D0	16 July 1979
		AU 513029 B2	06 November 1980
		BE 878209 A1	03 December 1979
		CA 1114411 A1	15 December 1981
		JP S5778930 U	15 May 1982
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