(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 862 966 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
22.04.2015 Bulletin 2015/17

(21) Application number: **14744745.2**

(22) Date of filing: **21.05.2014**

(51) Int Cl.:
D01H 5/18 *(2006.01)* ***D01H 5/72*** *(2006.01)*
D01H 5/88 *(2006.01)*

(86) International application number:
PCT/CN2014/078028

(87) International publication number:
WO 2015/027723 (05.03.2015 Gazette 2015/09)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **28.08.2013 CN 201313816816**

(71) Applicant: **Zhangjiagang Guangzhong Textile Machinery Technology Co., Ltd.**
Suzhou, Jiangsu 215623 (CN)

(72) Inventor: **DENG, Wansheng**
Suzhou
Jiangsu 215623 (CN)

(74) Representative: **Sun, Yiming**
HUASUN Patent- und Rechtsanwälte
Friedrichstraße 33
80801 München (DE)

(54) DRAFTING DEVICE IN SPINNING FRAME

(57) The present invention relates to a drafting system for a ring frame, which comprises front rollers, front belt rollers, middle rollers and middle belt rollers, wherein a front jaw is formed between the front belt roller and the front roller; a middle jaw is formed between the middle belt roller and the middle roller; a negative pressure tube is formed between the front roller and the middle roller; a recess is formed in the middle of an upper surface of the negative pressure tube; the upper surface of the negative pressure tube is provided with a front gathering mouth and a rear gathering mouth; a tension device is disposed below the middle roller and the negative pressure tube; a flexible ring made of poromeric materials winds around the middle roller, the upper surface of the negative pressure tube and the tension device and completely covers openings of the front gathering mouth and the rear gathering mouth; an upper pin is formed between the front belt roller and the middle belt roller, above a connecting line between the front jaw and the middle jaw; a cambered boss is formed on a lower surface of the upper pin; and a downward extending end portion of the cambered boss abuts against the flexible ring at the recess on the upper surface of the negative pressure tube. The drafting system provided by the present invention is applicable to ring frames and mainly used for the orderly and uniformly arrangement of fibers.

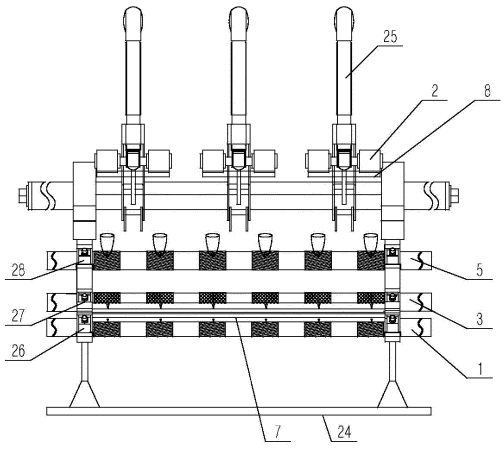

Fig.1

EP 2 862 966 A1

Description

FIELD OF THE INVENTION

[0001] The present invention belongs to the field of textile machinery, relates to a ring frame, in particular to a drafting system for a ring frame.

BACKGROUND OF THE INVENTION

[0002] In the spinning process, rovings are prepared into yarns by a ring frame via unwinding, feeding, drafting, twisting, winding and other processes. A drafting system in the ring frame plays a vital role in spinning speed and quality.

[0003] The traditional drafting system in the ring frame mainly comprises: a main frame and a plurality of roller stands disposed on the main frame; the roller stands are usually arranged in three columns as required, respectively front roller stands, middle roller stands and rear roller stands; the roller stands in each column are all linearly arranged and uniformly distributed; meanwhile, the front roller stands, the middle roller stands and the rear roller stands in the columns of roller stands correspond to each other respectively and are disposed on the same plane; front rollers, middle rollers and rear rollers are respectively disposed on the front roller stands, the middle roller stands and the rear roller stands; central axes of the front rollers, the middle rollers and the rear rollers are all parallel to each other; front belt rollers, middle belt rollers and rear belt rollers are respectively disposed on the front rollers, the middle rollers and the rear rollers; central axes of the front belt rollers, the middle belt rollers and the rear belt rollers are parallel to each other and respectively disposed on Top Arm arranged on the main frame of the ring frame; when the Top Arm are opened upward, the front belt rollers, the middle belt rollers and the rear belt rollers on the Top Arm are respectively disengaged from the front rollers, the middle rollers and the rear rollers; when the Top Arm are pressed and locked, the front belt rollers, the middle belt rollers and the rear belt rollers on the Top Arm are respectively tightly pressed on the front rollers, the middle rollers and the rear rollers; as surfaces of the front belt rollers, the middle belt rollers and the rear belt rollers have certain elasticity, when the cradle applies pressure to press the belt rollers on the rollers, front jaws are formed between the front rollers and the front belt rollers, middle jaws formed between the middle rollers and the middle belt rollers, rear jaws formed between the rear rollers and the rear belt rollers; in general, six groups of front rollers, middle rollers and rear rollers provided with steel tanks are disposed between two adjacent groups of roller stands; correspondingly, three groups of Top Arm are disposed on the six groups of rollers; two front belt rollers, two middle belt rollers and two rear belt rollers are disposed on each cradle; predraft zones of the ring frame are formed between the rear jaws and the middle jaws; main draft zones of the ring frame are formed between the middle jaws and the front jaws; and the draft ratio of the main draft zones is obviously greater than that of the predraft zones. The predraft zones of the ring frame adopt the traditional parallel back zone draft.

[0004] In the working process of the drafting system in the ring frame, rovings must enter the predraft zones of the ring frame at first, namely the rovings are fed into the rear jaws by a feeding mechanism and held by the rear belt rollers and the rear rollers; when the rear belt rollers are driven to rotate by the rotation of the rear rollers, the rovings are sent into the middle jaws again and held by the middle rollers and the middle belt rollers; as the rotation speed of the middle rollers is slightly greater than the rotation speed of the rear rollers, the predraft and unwinding of the rovings between the rear jaws and the middle jaws can be achieved; and subsequently, the predraft rovings are sent out after running through the middle rollers and the middle belt rollers and enter the main draft zones of the ring frame. As the draft ratio of the rovings in the main draft zones of the ring frame is very large, namely the rotation speed of the front rollers is obviously greater than that of the middle rollers, if the rovings could not be effectively controlled in the main draft zones, the yarn evenness may be badly affected, resulting in the production of thick and thin places of yarns and the increase of breakages. Therefore, the main draft zones in the traditional ring frame mostly adopt double apron draft, namely a lower pin is formed between the middle roller and the front roller; a tension bracket is disposed below the middle roller and the lower pin; a lower apron winds around the middle roller and the lower pin and is tensioned by a tension device; an upper pin is formed on a side surface of the middle belt roller, close to the front belt roller, corresponding to the lower apron on the lower pin; an upper apron winds around the upper pin and the middle belt roller; working surfaces of the upper apron and the lower apron are tightly bonded; in the draft process, the middle roller rotates and drives the lower apron to rotate; the lower apron drives the upper apron and the middle belt roller to rotate; when the rovings enter positions between the lower aprons and the upper aprons along with the rotation of the middle rollers and the middle belt rollers, the rovings are effectively controlled by the upper aprons and the lower aprons and driven by the lower aprons and the upper aprons to move towards the front rollers together; and finally, the rovings are sent out from the positions between the upper aprons and the lower aprons, enter the front jaws, and are hence held by the front rollers and the front belt rollers. In the main draft process, as the draft rovings are effectively controlled by the upper aprons and the lower aprons, fibers in the rovings cannot be spread and accelerated points of the rovings in the draft process can also move forwards, and hence the yarn evenness of yarns can be relatively effectively improved and the production of thick places, thin places or breakages of yarns can be relatively effectively controlled.

[0005] However, the traditional drafting system in the ring frame still has many defects: as the main draft zones of the drafting system adopt the double apron draft, further unwinding of the rovings in the main draft zones cannot be easily achieved; as the double apron structure has strong control on the rovings, fibers in the rovings tend to break in the draft process, and hence the strength of yarns can be affected; and moreover, as the main draft zones of the ring frame adopt double apron draft control, the rovings are tight at first and hence loose in the draft process, and hence the unevenness of fiber distribution can be easily caused. Meanwhile, as the linear velocity of the upper aprons and the lower aprons has difference in the draft process of short fibers, the mutual accumulation of the short fibers is likely to occur, so that the number of hooked fibers can be increased, and hence the number of thick and thin places of yarns can be increased and the yarn evenness can be reduced. Moreover, as the rovings are likely to be widened under the compression of the upper aprons and the lower aprons, the width of front twisting triangle zones can be increased, and hence the hairiness of yarns can be increased and the yarn quality can be affected.

SUMMARY OF THE INVENTION

[0006] The first technical problem to be solved by the present invention is to provide a drafting system for a ring frame, in which rovings in main draft zones are effectively controlled by combination of negative pressure adsorption and elastic holding, so that fibers in the rovings can be uniformly drafted in the draft process, and hence the number of broken fibers and hooked fibers can be reduced and the yarn evenness of yarns can be obviously improved.

[0007] In order to solve the above problem, the present invention adopts the technical proposal that: the present invention relates to a drafting system for a ring frame, which comprises front rollers and middle rollers disposed on main draft zones of the ring frame, wherein central axes of the front roller and the middle roller are parallel to each other; a front belt roller is disposed on the front roller; central axes of the front belt roller and the front roller are parallel to each other; a front jaw is formed between the front belt roller and the front roller; a middle belt roller is disposed on the middle roller; central axes of the middle belt roller and the middle roller are parallel to each other; a middle jaw is formed between the middle belt roller and the middle roller; a negative pressure tube with a hollow tubular structure is disposed between the front roller and the middle roller; both sides of an upper surface of the negative pressure tube are respectively close to the front jaw and the middle jaw; an inner cavity of the negative pressure tube is communicated with a negative pressure source; one side of the upper surface of the negative pressure tube, close to the front jaw, is provided with a front gathering mouth communicated with the inner cavity of the negative pressure tube; one side of the upper surface of the negative pressure tube, close to the middle jaw, is provided with a rear gathering mouth communicated with the inner cavity of the negative pressure tube; a central connecting line between the front gathering mouth and the rear gathering mouth is mutually perpendicular to axes of the front roller and the middle roller; a recess is formed between the front gathering mouth and the rear gathering mouth, in the middle of the upper surface of the negative pressure tube; the direction of the recess is parallel to the central axes of the front roller and the middle roller; a tension device is disposed below the middle roller and the negative pressure tube; a flexible ring made of poromeric materials winds around the middle roller, the upper surface of the negative pressure tube and the tension device and completely covers openings of the front gathering mouth and the rear gathering mouth on the upper surface of the negative pressure tube; an upper pin is formed between the front belt roller and the middle belt roller; a smooth cambered boss is formed at the bottom of the upper pin; the direction of the cambered boss is coordinated with that of the recess on the upper surface of the negative pressure tube; and a bottom end portion of the cambered boss abuts against the flexible ring at the recess on the upper surface of the negative pressure tube.

[0008] A pre draft zone of the ring frame is also arranged on the other side of the middle roller in the main draft zone and adopts the traditional parallel back zone draft, single V-shaped back zone draft, double V-shaped back zone draft or double apron back zone draft.

[0009] The second technical problem to be solved by the present invention is to provide a drafting system for a ring frame capable of preventing impurities such as scattered short fibers and short staples from entering main draft zones and being adhered to surfaces of rovings, preventing the draft rovings from being disturbed by external airflow, and reducing the number of neps and breakages of yarns.

[0010] In order to solve the above problem, the present invention adopts the technical proposal that: a rear side surface of the cambered boss of the upper pin is naturally extended towards the middle belt roller to a position above the rear gathering mouth of the negative pressure tube, so that a rear cambered bottom surface is formed on a rear side portion of the upper pin; and the rear cambered bottom surface is separately and gradually extended backwards relative to the upper surface of the negative pressure tube.

[0011] A front side surface of the cambered boss of the upper pin is naturally extended towards the front belt roller to a position above the front gathering mouth of the negative pressure tube, so that a front cambered bottom surface is formed on a front side portion of the upper pin; and the front cambered bottom surface is separately and gradually extended forwards relative to the upper surface of the negative pressure tube.

[0012] The third technical problem to be solved by the present invention is to provide a drafting system for a ring

frame capable of driving accelerated points to move forwards in the process of roving drafting, more effectively controlling the rovings, and further improving the yarn evenness of yarns.

[0013] In order to solve the above problem, the present invention adopts the technical proposal that: after the front cambered bottom surface on the front side portion of the upper pin is naturally extended to the position above the front gathering mouth, along with the continuous natural forward extension of the front cambered bottom surface, the front cambered bottom surface gradually approaches the upper surface of the negative pressure tube and is continuously extended to a position between the front jaw and a front edge of the negative pressure tube; and at this point, a cambered projection is formed on a front end portion of the upper pin, close to the front jaw. The fourth technical problem to be solved by the present invention is to provide a drafting system for a ring frame capable of reducing the width of front twisting triangle zones, reducing the number of the hairiness of yarns, and further improving the yarn quality.

[0014] In order to solve the above problem, the present invention adopts the technical proposal that: an inlet is formed on one side of each of the front gathering mouth and the rear gathering mouth of the negative pressure tube, close to the middle jaw; an outlet is formed on one side of each of the front gathering mouth and the rear gathering mouth of the negative pressure tube, close to the front jaw; the inlets of the front gathering mouth and the rear gathering mouth are all greater than the outlets; and the narrowest position of the rear gathering mouth is greater than the narrowest position of the front gathering mouth.

[0015] The front gathering mouth and the rear gathering mouth are in the shape of a trumpet, an equilateral triangle or an isosceles trapezoid.

[0016] The present invention has the advantages that: in the drafting system of the ring frame, as the rovings in the main draft zones are controlled by combination of negative pressure adsorption and elastic holding, further twisting of the rovings in the main draft zones of the ring frame can be achieved, and hence the single-fiber breaking condition in the draft process can be reduced and the strength of the yarns can be improved; in the fiber draft process, as both long fibers and short fibers in the rovings can be effectively and reasonably controlled, fiber bundles can be guaranteed to be drafted, and hence the yarn evenness of yarns can be obviously improved; and due to the arrangement of the front gathering mouth and the rear gathering mouth, the problem of widening the rovings can be effectively solved. In addition, when the rovings are sent out from the front jaws, the twisting triangle zones are obviously narrowed, so that the cohesion of yarns can be improved; the strength and the surface finish of yarns can be improved; and the technical indexes such as hairiness, thick place, thin place and nep of yarns can be greatly improved. Moreover, the drafting system for the ring frame, provided by the present invention, can prevent external impurities from entering the main draft zones, prevent the rovings in the main draft zones from being affected by external airflow, reduce the number of yarn neps, and improve the yarn evenness of yarns. Furthermore, the drafting system for the ring frame provided by the present invention can drive the accelerated points to move forwards and hence more effectively control the rovings and improve the yarn quality.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a structural front view of the drafting system for the ring frame, provided by the present invention;

FIG. 2 is a schematic structural left view of FIG. 1;

FIG. 3 is a schematic diagram of the drafting system for the ring frame, provided by the present invention;

FIG. 4 is a schematic structural view of a negative pressure tube in FIG. 1;

FIG. 5 is a schematic structural top view of FIG. 4;

FIG. 6 is a schematic structural view of an upper pin in FIG. 3;

FIG. 7 is a schematic structural view illustrating the case of V-shaped draft between a rear roller and a rear belt roller;

FIG. 8 is a schematic structural view illustrating the case of double apron draft between a rear roller and a rear belt roller;

FIG. 9 is a schematic structural view of a sealing plug;

FIG. 10 is a schematic structural left view of FIG. 9; and

FIG. 11 is another schematic structural view of the upper pin.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Further detailed description will be given below to the drafting system for the ring frame, provided by the present invention, with reference to the preferred embodiments.

[0019] As illustrated in FIGS. 1 to 3, the drafting system for the ring frame comprises a main frame 24 of the ring frame and three columns of roller stands disposed on the main frame 24, respectively front roller stands 26, middle roller stands 27 and rear roller stands 28; the roller stands in each column are all linearly arranged and uniformly

distributed; meanwhile, the front roller stands 26, the middle roller stands 27 and the rear roller stands 28 in the columns of roller stands correspond to each other respectively and are disposed on the same plane; front rollers 1, middle rollers 3 and rear rollers 5 are respectively disposed on the front roller stands 26, the middle roller stands 27 and the rear roller stands 28; central axes of the front rollers 1, the middle rollers 3 and the rear rollers 5 are all parallel to each other; front belt rollers 2, middle belt rollers 4 and rear belt rollers 6 are respectively disposed on the front rollers 1, the middle rollers 3 and the rear rollers 5; central axes of the front belt rollers 2, the middle belt rollers 4 and the rear belt rollers 6 are parallel to each other and respectively disposed on Top Arm 25; the Top Arm 25 are disposed on the main frame 24 of the ring frame; when the Top Arm 25 are opened upward, the front belt rollers 2, the middle belt rollers 4 and the rear belt rollers 6 on the Top Arm 25 are respectively disengaged from the front rollers 1, the middle rollers 3 and the rear rollers 5; when the Top Arm 25 are pressed and locked, the front belt rollers 2, the middle belt rollers 4 and the rear belt rollers 6 on the Top Arm 25 are respectively tightly pressed on the front rollers 1, the middle rollers 3 and the rear rollers 5; as surfaces of the front belt roller 2, the middle belt roller 4 and the rear belt roller 6 all have certain elasticity, a front jaw 19 is formed between the front belt roller 2 and the front roller 1, a middle jaw 20 formed between the middle belt roller 4 and the middle roller 3, a rear jaw 21 formed between the rear belt roller 6 and the rear roller 5; a main draft zone of the ring frame is formed between the front jaw 19 and the middle jaw 20; and a predraft zone of the ring frame is formed between the middle jaw 20 and the rear jaw 21. As illustrated in FIGS. 2 and 3, in the embodiment, the predraft zone adopts the traditional parallel back zone draft; central axes of the rear roller 5 and the rear belt roller 6 are approximately on the same vertical plane to form the horizontal rear jaw 21; and the rear jaw 21, the front jaw 19 and the middle jaw 20 are basically on the same plane.

[0020] A negative pressure tube 7 with a hollow tubular structure is disposed between the front roller 1 and the middle roller 3. As illustrated in FIGS. 4 and 5, a sealing plug 14 is respectively disposed at both ends of the negative pressure tube 7 to seal both ends of the negative pressure tube 7. As illustrated in FIGS. 9 and 10, a bayonet pin 141 is formed at an outer end of the sealing plug 14; a clamping recess 15 is formed on the middle roller stand 27; the bayonet pin 141 of the sealing plug 14 is clamped in the recess 15; the inside of thenegative pressure tube 7 is communicated with an external negative pressuresource (not shown in the figure); both sides of an upper surface of the negative pressure tube 7 are respectively close to the front jaw 19 and the middle jaw 20; one side of the upper surface of the negative pressure tube 7, close to the front jaw 19, is provided with a front gathering mouth 9 communicated with an inner cavity of thenegativepressure tube 7; one side of the upper surface of the negative pressure tube 7, close to the middle jaw 20, is provided with a rear gathering mouth 10 communicated with the inner cavity of the negative pressure tube 7; a central connecting line between the front gathering mouth 9 and the rear gathering mouth 10 is perpendicular to axes of the front roller 1 and the middle roller 3; a recess 11 is formedbetween the front gathering mouth 9 and the rear gathering mouth 10, in the middle of the upper surface of the negative pressure tube 7; the direction of the recess 11 is parallel to the central axes of the front roller 1 and the middle roller 3; the recess 11 may have various shapes; in the embodiment, a U-shaped recess 11 is adopted; and the recess 11 may be in other shapes such as triangle, trapezoid, polygon and semicircle. All the cases should all fall within the scope of protection of the present invention.

[0021] An inlet is formed on one side of each of the front gathering mouth 9 and the rear gathering mouth 10 of the negative pressure tube 7, close to the middle jaw 20; and an outlet is formed on one side of each of the front gathering mouth 9 and the rear gathering mouth 10 of the negative pressure tube 7, close to the front jaw 19. The embodiment adopt the preferred proposal that: the inlets of the front gathering mouth 9 and the rear gathering mouth 10 are all greater than the outlets; and the narrowest position of the rear gathering mouth 10 is greater than the narrowest position of the front gathering mouth 9.

[0022] The front gathering mouth 9 and the rear gathering mouth 10 are preferably in the shape of a trumpet, an equilateral triangle, isosceles trapezoid and the like and may also be elongated, rectangular, circular, semicircular, cambered, oval and the like. No specific limitation will be given in the present invention. All the cases should fall within the scope of protection of the present invention.

[0023] A tension device 13 is disposed below the middle roller 3 and the negative pressure tube 7 and is usually composed of a tension roller, a tension hook or a tension bracket and an elastic device. All the cases should fall within the scope of protection of the present invention.

[0024] A flexible ring 12 made of poromeric materials winds around the middle roller 3, the upper surface of the negative pressure tube 7 and the tension device 13 and completely covers openings of the front gathering mouth 9 and the rear gathering mouth 10 on the upper surface of the negative pressure tube 7. The flexible ring 12 is a porous fabric ring which has good permeability and does not allow fibers to run through and may be made of conductive materials such as semiconductor materials, conductive plastics and conductive rubber, preferably made of antistatic materials.

[0025] An upper pin 8 is formed between the front belt roller 2 and the middle belt roller 4 and disposed on the cradle 25. As illustrated in FIG. 6, a smooth cambered boss 16 is formed in the middle of a lower surface of the upper pin 8; the direction of the cambered boss 16 is consistent with that of the recess 11 on the upper surface

of the negative pressure tube 7; and a bottom end portion of the cambered boss 16 abuts against the flexible ring 12 at the recess 11 on the upper surface of the negative pressure tube 7.

[0026] Pre-ferably, a rear side surface of the cambered boss 16 of the upper pin 8 may also be naturally extended towards the middle belt roller 4 to a position above the rear gathering mouth 10 of the negative pressure tube 7, and hence a rear cambered bottom surface 22 is formed on a rear side portion of the upper pin 8. The rear cambered bottom surface 22 is separately and gradually extended backwards relative to the upper surface of the negative pressure tube 7.

[0027] Pre-ferably, a front side surface of the cambered boss 16 of the upper pin 8 may also be naturally extended towards the front belt roller 2 to a position above the front gathering mouth 9 of the negative pressure tube 7, and hence a front cambered bottom surface 23 is formed on a front side portion of the upper pin 8. The front cambered bottom surface 23 is separately and gradually extended forwards relative to the upper surface of the negative pressure tube 7. At this point, the structure of the upper pin 8 is as shown in FIG. 11. In the embodiment, preferably, the upper pin 8 is provided with the front cambered bottom surface 23 and the rear cambered bottom surface 22 so as to prevent impurities such as scattered short fibers and short staples from entering the main draft zone and being adhered to a roving surface, and prevent the roving from being interrupted by external airflow, and hence the number of neps and breakages of yarns can be reduced and the yarn evenness of fibers can be improved. The front cambered bottom surface 23 and the rear cambered bottom surface 22 may be alternatively arranged and may also be arranged together. For instance, the upper pin 8 is not provided with the front cambered bottom surface 23 and/or the rear cambered bottom surface 22. The shape variation of the front cambered bottom surface 23 and the rear cambered bottom surface 22 should also fall within the scope of protection of the present invention.

[0028] More preferably, as illustrated in FIG. 6, after the front cambered bottom surface on the front side portion of the upper pin 8 is naturally extended to the position above the front gathering mouth 9, along with the continuous natural forward extension of the front cambered bottom surface 23, the front cambered bottom surface 23 gradually approaches the upper surface of the negative pressure tube 7 and is continuously extended to a position between the front jaw 19 and a front edge of the negative pressure tube 7; and at this point, a cambered projection 18 is formed on a front end portion of the upper pin 8, close to the front jaw 19. The cambered boss 18 makes contact with the roving to form accelerated points and may drive accelerated points on the main draft zone to move forwards, and hence the roving can be more effectively controlled and the yarn quality can be improved.

[0029] The structures between the rear rollers and the rear belt rollers in the pre-draft zones may also adopt various draft such as single V-shaped back zone draft, double V-shaped back zone draft and double apron back zone draft. The draft is all the traditional draft. The main draft zones described in the present invention may be combined with any foregoing pre-draft zones. All the cases should fall within the scope of protection of the present invention. Wherein:

[0030] The double V-shaped back zone draft is as shown in FIG. 7, wherein the central axes of the rear roller 5 and the rear belt roller 6 are arranged at an angle in the vertical direction; a pressure roller 17 is disposed in the pre-draft zone, so that the direction of the roving running through the rear jaw 21 is V-shaped and the direction of the roving running through the pressure roller 17 is V-shaped again, and hence double V-shaped back zone draft can be formed, and consequently the draft effect is better. The single V-shaped back zone draft only needs to remove the pressure roller 17 in FIG. 7. No further description will be given here.

[0031] The double apron back zone draft is as shown in FIG. 8, wherein a lower pin 29 is formed between the middle roller 3 and the rear roller 5; a tension bracket 30 is formed below the middle roller 3 and the lower pin 29; a lower apron 31 winds around the rear roller 5 and the lower pin 29 and is hence tensioned by the tension bracket 30; correspondingly, an upper pin 8 is formed between the middle belt roller 4 and the rear belt roller 6; an upper apron 32 winds around the upper pin 8 and the rear belt roller 6; and hence the roving can be effectively controlled by reinforcing the control on the roving by the upper apron and the lower apron.

[0032] When the drafting system works, the draft roving enters the middle jaw 20 from the rear jaw 21 after running through the pre-draft zone, and is driven to move forwards by the flexible ring 12 on the middle roller 3 and the negative pressure tube 7; when the roving reaches the rear gathering mouth 10, due to the negative-pressure function at the rear gathering mouth 10, fibers in the roving may be collected for the first time, so that the width of the roving at the rear gathering mouth 10 can be reduced; the roving is driven by the flexible ring 12 to move forwards continuously; as the roving is disposed on a surface of the flexible ring 12, the running speed of partial fibers in the roving, of which head portions have been held by the front jaw 19, shall certainly be greater than the running speed of fibers on the flexible ring 12, not held by the front jaw 19; and when the fibers in the roving, controlled by the front jaw 19, move forwards, fibers with fast running speed will straighten partial front hooks of fibers with slow running speed, and the fibers with slow running speed will straighten partial rear hooks of the fibers with fast running speed.

[0033] When the roving enters a position at which the bottom end portion of the cambered boss 16 of the upper pin 8 abuts against the flexible ring 12 at the recess 11 on the upper surface of the negative pressure tube 7, the roving is reasonably and effectively controlled by means

of elastic holding. As the cambered boss 16 of the upper pin 8 is relatively smooth, the additional friction applied to the roving is relatively small. In the case of large linear velocity of draft of the front jaw 19, fibers in the roving can be uniformly and effectively drafted, and hence the yarn evenness of yarns can be improved and the production of thick and thin places can be avoided.

[0034] When the roving continuously moves forwards and reaches the front gathering mouth 9, due to the negative-pressure function at the front gathering mouth 9, the fibers in the roving may be collected for the second time, so that the width of the roving can be further reduced. The interaction between the fibers in the draft process is the same with that at the rear gathering mouth 10. Moreover, the roving is driven to continuously move forwards by the flexible ring 12 and the front jaw 19; and when the roving reaches the front jaw 19, the roving twisting triangle zone after draft can be narrowed, and hence the number of hairiness, thick places, thin places and neps can be greatly reduced. Moreover, when the roving runs through the front gathering mouth 9, due to the arrangement of the cambered boss 18 of the upper pin 8, the draft roving makes contact with the cambered boss 18 of the upper pin 8 and the accelerated points of the roving can be driven to move forwards, and hence the fibers in the main draft zones can be more effectively controlled and the yarn quality can be improved.

[0035] The embodiments described above only illustrate the principle and effects of the creation of the present invention and partial applied embodiments and are not intended to limit the present invention. It should be noted that various modifications and improvements may be also made by those skilled in the art without departing from the creative concept of the present invention and should all fall within the scope of protection of the present invention.

Claims

1. A drafting system for a ring frame, comprising front rollers and middle rollers disposed on main draft zones of the ring frame, central axes of the front roller and the middle roller parallel to each other, a front belt roller disposed on the front roller, central axes of the front belt roller and the front roller parallel to each other, a front jaw formed between the front belt roller and the front roller, a middle belt roller disposed on the middle roller, central axes of the middle belt roller and the middle roller parallel to each other, a middle jaw formed between the middle belt roller and the middle roller, wherein a negative pressure tube with a hollow tubular structure is disposed between the front roller and the middle roller; both sides of an upper surface of the negative pressure tube are respectively close to the front jaw and the middle jaw; an inner cavity of the negative pressure tube is communicated with a negative pressure source; one side of the upper surface of the negative pressure tube, close to the front jaw, is provided with a front gathering mouth communicated with the inner cavity of the negative pressure tube; one side of the upper surface of the negative pressure tube, close to the middle jaw, is provided with a rear gathering mouth communicated with the inner cavity of the negative pressure tube; a central connecting line between the front gathering mouth and the rear gathering mouth is mutually perpendicular to axes of the front roller and the middle roller; a recess is formed between the front gathering mouth and the rear gathering mouth, in the middle of the upper surface of the negative pressure tube; the direction of the recess is parallel to the central axes of the front roller and the middle roller; a tension device is disposed below the middle roller and the negative pressure tube; a flexible ring made of poromeric materials winds around the middle roller, the upper surface of the negative pressure tube and the tension device and completely covers openings of the front gathering mouth and the rear gathering mouth on the upper surface of the negative pressure tube; an upper pin is formed between the front belt roller and the middle belt roller; a smooth cambered boss is formed at the bottom of the upper pin; the direction of the cambered boss is coordinated with that of the recess on the upper surface of the negative pressure tube; and a bottom end portion of the cambered boss abuts against the flexible ring at the recess on the upper surface of the negative pressure tube.

2. The drafting system for the ring frame according to claim 1, wherein a rear side surface of the cambered boss of the upper pin is naturally extended towards the middle belt roller to a position above the rear gathering mouth of the negative pressure tube, so that a rear cambered bottom surface is formed on a rear side portion of the upper pin; and the rear cambered bottom surface is separately and gradually extended backwards relative to the upper surface of the negative pressure tube.

3. The drafting system for the ring frame according to claim 1 or 2, wherein a front side surface of the cambered boss of the upper pin is naturally extended towards the front belt roller to a position above the front gathering mouth of the negative pressure tube, so that a front cambered bottom surface is formed on a front side portion of the upper pin; and the front cambered bottom surface is separately and gradually extended forwards relative to the upper surface of the negative pressure tube.

4. The drafting system for the ring frame according to claim 3, wherein after the front cambered bottom surface on the front side portion of the upper pin is naturally extended to the position above the front gath-

ering mouth, along with the continuous natural forward extension of the front cambered bottom surface, the front cambered bottom surface gradually approaches the upper surface of the negative pressure tube and is continuously extended to a position between the front jaw and a front edge of the negative pressure tube; and at this point, a cambered projection is formed on a front end portion of the upper pin, close to the front jaw.

5. The drafting system for the ring frame according to claim 1 or 2, wherein a predraft zone of the ring frame is also arranged on the other side of the middle roller in the main draft zone and adopts the traditional parallel back zone draft, single V-shaped back zone draft, double V-shaped back zone draft or double apron back zone draft.

6. The drafting system for the ring frame according to claim 1 or 2, wherein an inlet is formed on one side of each of the front gathering mouth and the rear gathering mouth of the negative pressure tube, close to the middle jaw; an outlet is formed on one side of each of the front gathering mouth and the rear gathering mouth of the negative pressure tube, close to the front jaw; the inlets of the front gathering mouth and the rear gathering mouth are all greater than the outlets; and the narrowest position of the rear gathering mouth is greater than the narrowest position of the front gathering mouth.

7. The drafting system for the ring frame according to claim 6, wherein the front gathering mouth and the rear gathering mouth are in the shape of a trumpet, an equilateral triangle or an isosceles trapezoid.

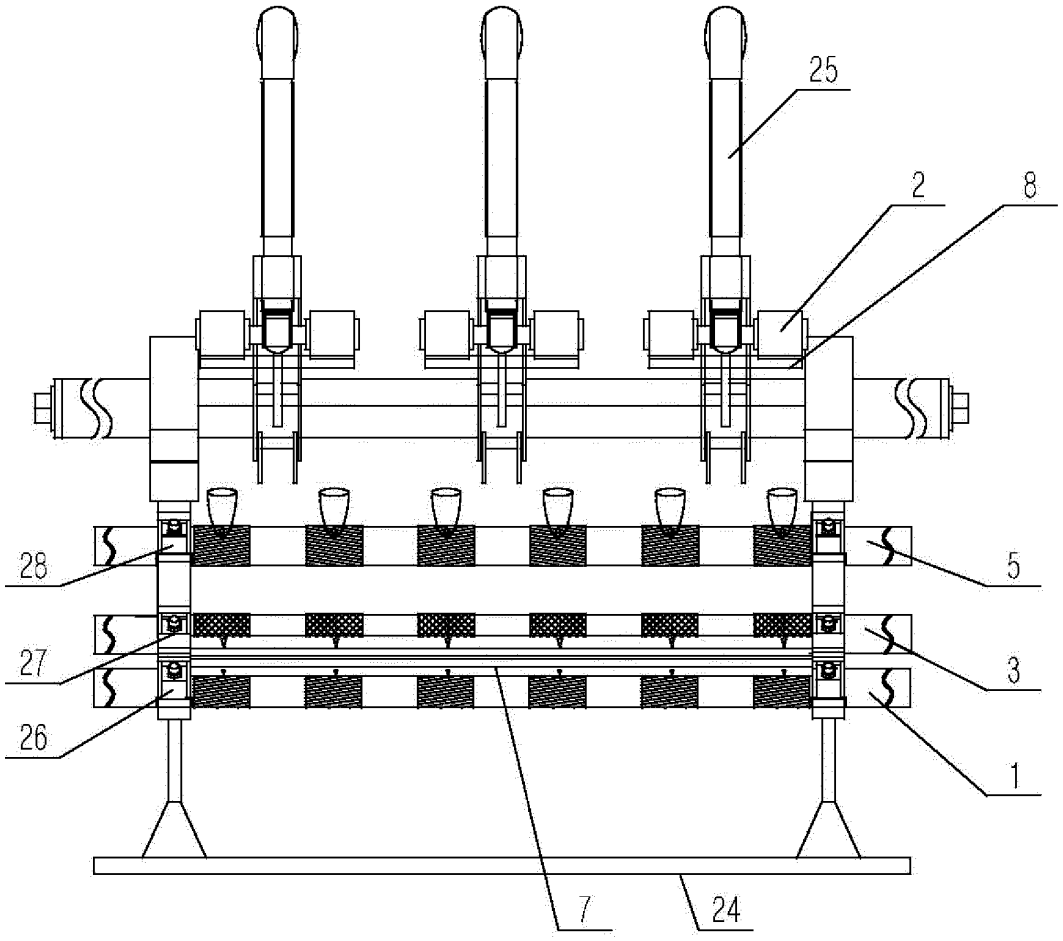

Fig.1

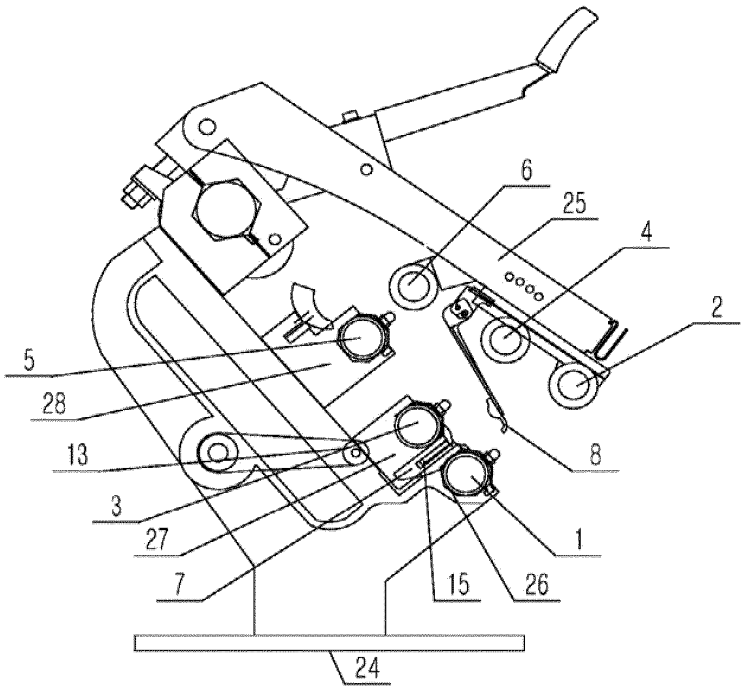

Fig.2

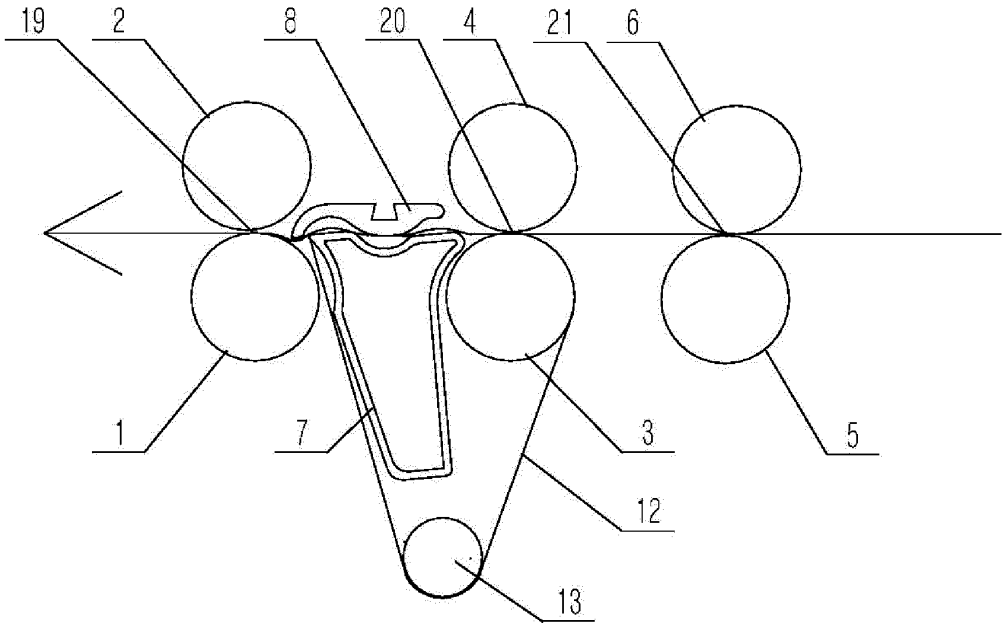

Fig.3

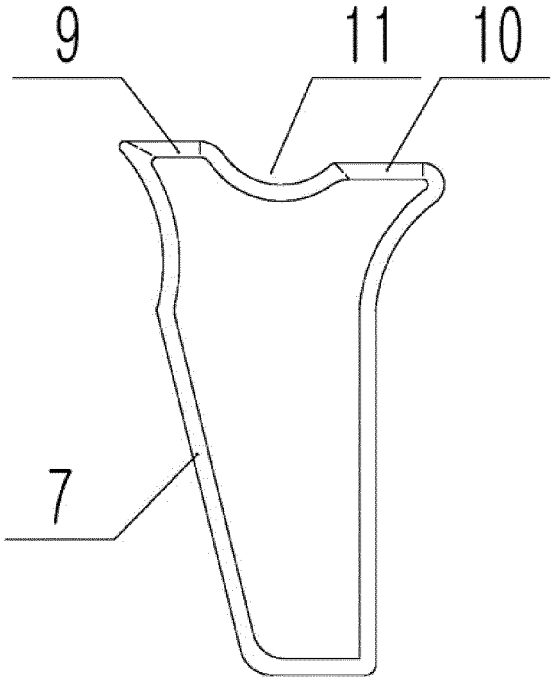

Fig.4

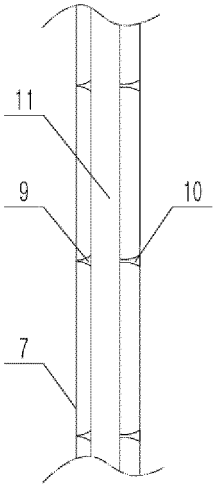

Fig.5

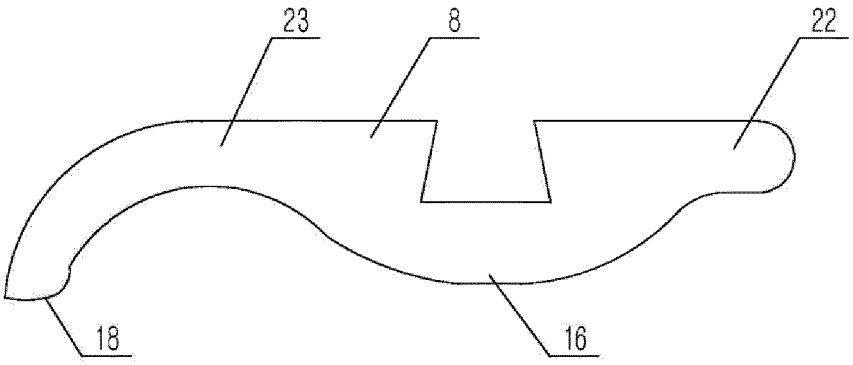

Fig.6

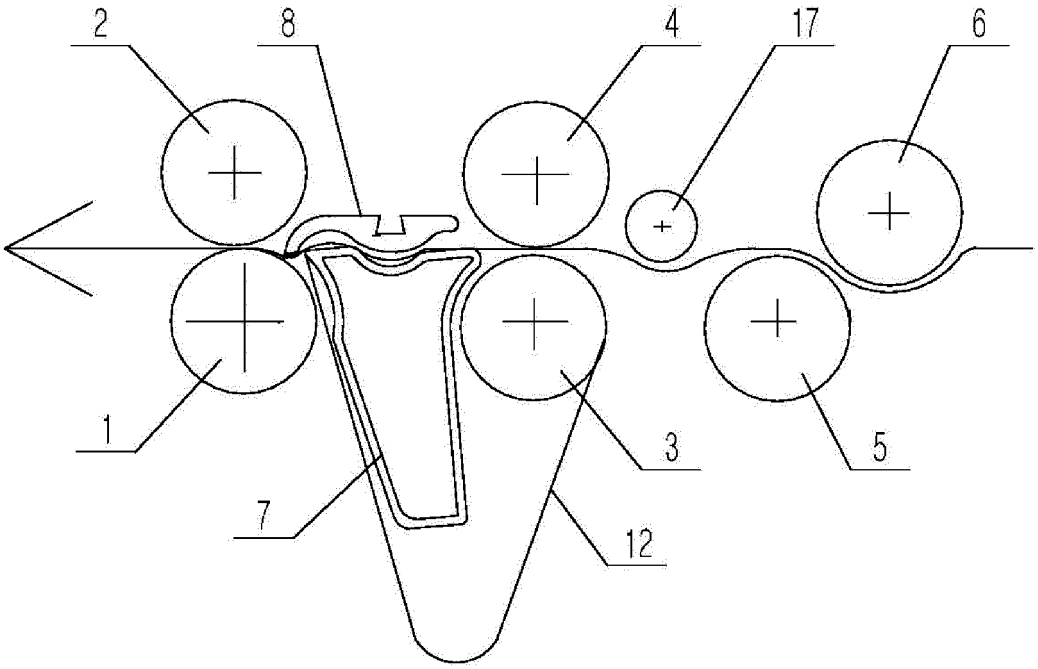

Fig.7

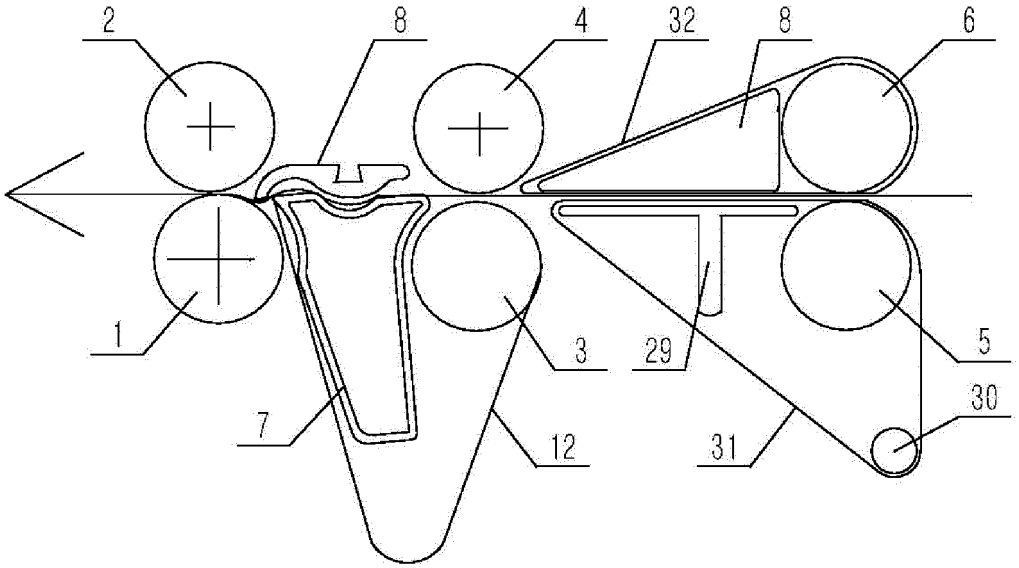

Fig.8

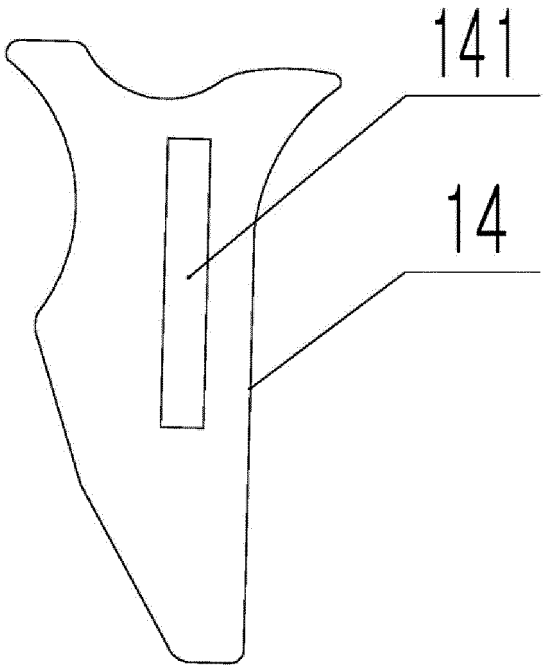

Fig.9

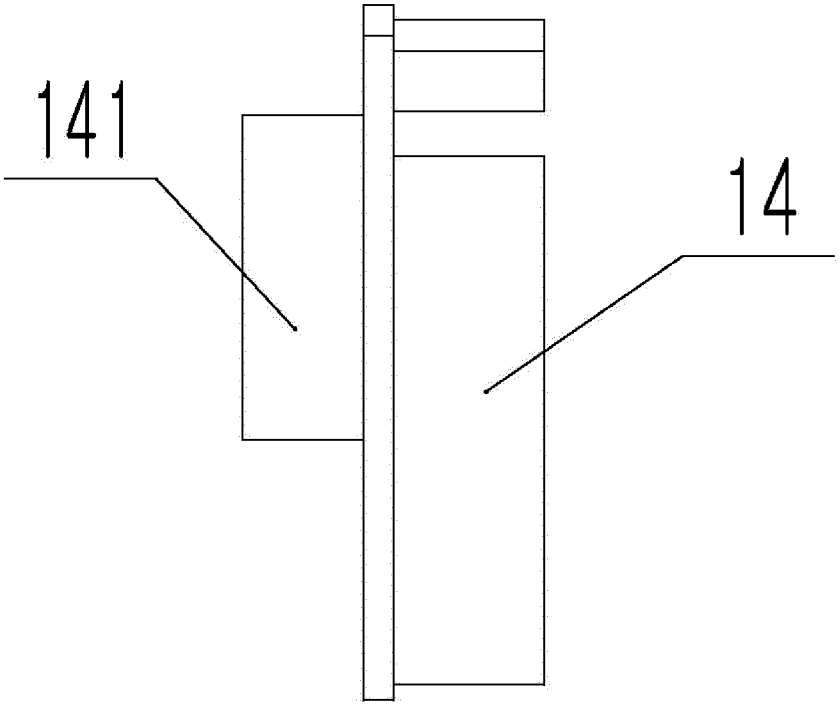

Fig.10

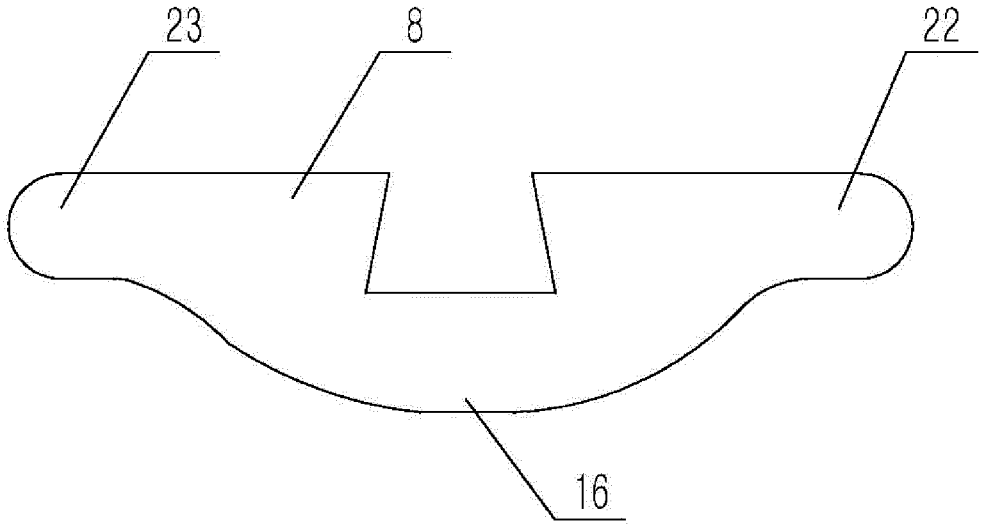

Fig.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/078028

A. CLASSIFICATION OF SUBJECT MATTER

D01H 5/18 (2006.01) i; D01H 5/72 (2006.01) n; D01H 5/88 (2006.01) n

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: D01H 5

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)

CNTXT, SIPOABS, VEN: jaw, draft, grouping, negative press pipe, gather, negative press, air draft, compact, condess, compress, pneumatic, suction, negative

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 103603101 A (ZHANGJIAGANG GUANGZHONG TEXTILE MACHINERY SCIENCE & TECHNOLOGY CO., LTD.), 26 February 2014 (26.02.2014), claims	1-7
PX	CN 203487298 U (DENG, Wansheng), 19 March 2014 (19.03.2014), claims	1-7
PX	CN 103451785 A (WANG, Zhixiang), 18 December 2013 (18.12.2013), claims	1-7
Y	CN 201309992 Y (CHENG, Xinyi), 16 September 2009 (16.09.2009), particular embodiments, and figures	1-7
Y	CN 201236240 Y (TONGHE TEXTILE MACHINERY MANUFACTURE CO., LTD.), 13 May 2009 (13.05.2009), particular embodiments, and figure 2	1-7
A	CN 101403147 A (PAN, Simin et al.), 08 April 2009 (08.04.2009), the whole document	1-7

☐ 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
23 July 2014 (23.07.2014)	**08 August 2014 (08.08.2014)**
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 **WANG, Han** Telephone No.: (86-10) **62085483**

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/CN2014/078028

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 103603101 A	26.02.2014	None	
CN 203487298 U	19.03.2014	None	
CN 103451785 A	18.12.2013	None	
CN 201309992 Y	16.09.2009	None	
CN 201236240 Y	13.05.2009	None	
CN 101403147 A	08.04.2009	CN 101403147 B	22.06.2011

Form PCT/ISA/210 (patent family annex) (July 2009)