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(54) **ELASTIC RIBBON MACHINE**

ELASTIKBANDMASCHINE

MACHINE DE RUBANS ÉLASTIQUES

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Description

Technical Field

[0001] The present invention relates to a rubber band machine for processing a rubber band into a rubber ring.

Background of the Invention

[0002] During the production of rubber rings, the common manufacturing process is as follows: taking bundles or rolls of rubber bands as raw materials, cutting into segments and sewing into rings. During the production, those operations are accomplished manually or by a plurality of single machines with different functions. Utility Model Patent No. CN201020269752.5 titled *Rubber Band Feeding Device for Automatic Rubber band Machines*, Utility Model Patent No. CN201020269792.X titled *Rubber Band Length Control Device for Automatic Rubber Band Machines*, Utility Model Patent No. CN201020269783.0 titled *Cutting Device for Automatic Rubber Band Machines*, Utility Model Patent No. CN201020269797.2 titled *Rubber Band Looping Device for Automatic Rubber Band Machines*, and Utility Model Patent No. CN201020269802.X titled *Pulling Device for Automatic Rubber Band Machines* disclosed a full-automatic rubber band processing equipment integrating sorting, feeding, length controlling, cutting, splicing and sewing in one. Such a full-automatic rubber band processing equipment may automatically accomplish the whole production procedure of manufacturing rubber bands into rubber rings. CN201736443U discloses an elastic band looping device for automatic rubber band machine. However, further improvements in the processability and production assembly of such a full-automatic rubber band processing equipment are possible.

Summary of the Invention

[0003] In view of the status of the prior art, the present invention provides a rubber band machine with higher processing efficiency.

[0004] To solve the above technical problem, the present invention employs the following technical solution: a rubber band machine is provided, including a feeding device, a cutting device and a looping device, characterized in that the feeding device includes a first rack and a second rack arranged at intervals, the first rack being provided with a first feeding drive wheel driven by a first motor, the second rack being provided with a second feeding drive wheel driven by a second motor; the looping device includes a first gripper capable of rotating around a first axis, a second gripper capable of rotating around a second axis, a bracket disposed between the first gripper and the second gripper, and a third gripper capable of rotating around a third axis; the first feeding drive wheel rotates and inputs a predetermined length of rubber band between the first feeding drive wheel and

the second feeding drive wheel, the third gripper grips one end of the rubber band at the discharge port of the second feeding drive wheel and rotates around the third axis under the auxiliary feeding of the second feeding drive wheel to allow a predetermined length of the rubber band to pass through the first gripper and the second gripper, and then the rubber band at the discharge port of the second feeding drive wheel is cut by the cutting device; after gripping two ends of the cut rubber band, the first gripper and the second gripper rotate around the first axis and the second axis, respectively, to fix the two ends of the rubber band onto the bracket.

[0005] To optimize the above technical solution, the present invention further includes the following improved technical solution.

[0006] The rubber band input by the first feeding drive wheel is suspended between the first feeding drive wheel and the second feeding drive wheel; a stock sensor for detecting the suspension state of the rubber band is disposed below the first feeding drive wheel; the second feeding drive wheel conveys the suspended rubber band when the third gripper moves rotationally; and, the first motor controls the first feeding drive wheel to convey a next predetermined length of the rubber band after the stock sensor detects that the rubber band in the suspended state is straightened.

[0007] The first rack is provided with a first feeding driven wheel fitted with the first feeding drive wheel; the second rack is provided with a second feeding driven wheel fitted with the second feeding drive wheel; a rubber band conveying passage is disposed above the first feeding drive wheel, and a heating plate for ironing the rubber band and a heating cylinder for controlling the heating plate to get close to or move away from the rubber band conveying passage are provided on one side of the rubber band conveying passage.

[0008] A joint sensor for detecting the thickness of the rubber band is provided on one side of the rubber band conveying passage, and the joint sensor controls the first motor to stop working when detecting that the thickness of the rubber band becomes larger.

[0009] The cutting device includes a moving cutter and a stationary cutter disposed at the discharge port of the second feeding drive wheel, the moving cutter being connected to the drive rod of a cutting cylinder.

[0010] The looping device includes a third rack on which a slidable base is disposed, the base being connected to the drive rod of a sliding cylinder; and, the first gripper, the second gripper and the bracket are all disposed on the base.

[0011] The base is provided with a first rotating cylinder for driving the first gripper to rotate around the first axis and a second rotating cylinder for driving the second gripper to rotate around the second axis at intervals, and the distance from the first axis to the second axis is adjustable.

[0012] The third rack is provided with a third drive shaft capable of rotating, and one end of the third drive shaft

is connected to the third gripper via a third connecting arm while the other end thereof is linked to a third rotating cylinder on the third rack.

[0013] A second guide rail, on which the bracket is slidably disposed, is disposed on the base, and a tension spring is disposed between the bracket and the base.

[0014] Compared with the prior art, the rubber band machine provided by the present invention may allow the first feeding drive wheel to convey a predetermined length of rubber band by controlling the angle of rotation of the first motor, and each segment of the rubber band input by the first feeding drive wheel is stored between the first feeding drive wheel and the second feeding drive wheel so that the second feeding drive wheel coordinates with a looping device to output the rubber band continuously. During feeding, the rubber band machine may perform joint examination and ironing to the rubber band, and automatically cut the rubber band off at the discharge port of the second feeding drive wheel via the cutting device. The looping device grips the rubber band via the third gripper and moves rotationally to convey two ends of the rubber band to the first gripper and the second gripper, respectively. After the first gripper and the second gripper have gripped the two ends of the rubber band, the rubber band forms a rubber ring by rotational motion of the first gripper and the second gripper, and the two jointed ends of the rubber ring are fixed on the bracket for subsequent sewing and fixation. The looping device has the advantages of simple structure and automatic control, and the looping speed of rubber bands is thus greatly improved.

Brief Description of the Drawings

[0015]

Fig. 1 is a stereoscopic structure diagram according to an embodiment of the present invention;
 Fig. 2 is a stereoscopic structure diagram of a feeding part of Fig. 1;
 Fig. 3 is an exploded assembly view of a first rack part of Fig. 2;
 Fig. 4 is an exploded assembly view of a second rack part of Fig. 2;
 Fig. 5 is a stereoscopic structure diagram of a looping device of Fig. 1;
 Fig. 6 is a backside stereoscopic structure diagram of Fig. 5; and
 Fig. 7 is an exploded assembly view of Fig. 6.

Detailed Description of the Invention

[0016] One embodiment of the present invention will be further described as below in details with reference to the accompanying drawings.

[0017] Figs. 1-7 are structure diagrams of the present invention.

[0018] In the drawings: 1-First rack; 11-Heating plate;

11a-Heating guide rail; 11b-Electrical heating rod; 12-Heating cylinder; 13 -Stock sensor; 14-Third motor; 15-Material sorting roller; 16-Backup plate; 17-Adjusting and limiting stopper; 18-Joint sensor; 18a-Sensing flap; 2-Second rack; 21-First mounting substrate; 22-Second mounting substrate; 23-Third mounting substrate; 24-Feeding carrier; 25-Driven wheel shaft; 26-Adjusting block; 3-First feeding drive wheel; 31-First motor; 32-First feeding driven wheel; 33-First driven wheel mounting support; 34-First spring; 4-Second feeding drive wheel; 4a-Rotary drive shaft; 41-Second motor; 41a-First synchronous wheel; 41b-Second synchronous wheel; 41c-First synchronous belt; 42-Second feeding driven wheel; 43-Second driven wheel mounting support; 44-Second spring; 5-Third rack; 5a-Bedplate; 5b-Support frame; 51-Sliding cylinder; 52-Third drive shaft; 52a-Third synchronous wheel; 53-Third connecting arm; 54-Third rotating cylinder; 54a-Fourth synchronous wheel; 54b-Second synchronous belt; 55-First guide rail; 57-Third gripper; 6-Base; 61-Bracket; 61a-Material support frame; 62-Second gripper; 63a-Second cylinder mounting plate; 63b-Second drive shaft; 63c-Second connecting arm; 63d-Second rotating cylinder; 64-Second guide rail; 65-Tension spring; 66-Support plates; 67-Connecting plate; 67a-Carrier mounting frame; 67b-Carrier; 68-Air pipe mounting support; 68a-Air blowpipe; 68b-Mounting shaft; 68c-Positioning backup plate; 7-Moving cutter; 71-Stationary cutter; 72-Cutting cylinder; 73-Moving cutter mounting frame; 74-Moving cutter arm; 8-Gripping cylinder; 81-Fixed arm; and, 82-Moving arm.

[0019] As shown in Fig. 1, the rubber band machine provided by the present invention includes a feeding device, a cutting device and a looping device. The feeding device includes a first rack 1 and a second rack 2 arranged at intervals. The first rack 1 is provided with a first feeding drive wheel 3 driven by a first motor 31. The second rack 2 is provided with a second feeding drive wheel 4 driven by a second motor 41. The looping device includes a first gripper 62 capable of rotating around a first axis, a second gripper 63 capable of rotating around a second axis, a bracket 62 disposed between the first gripper 62 and the second gripper 63, and a third gripper 57 capable of rotating around a third axis. The first feeding drive wheel 3 rotates and inputs a predetermined length of rubber band between the first feeding drive wheel 3 and the second feeding drive wheel 4. The third gripper 57 grips one end of the rubber band at the discharge port of the second feeding drive wheel 4 and rotates around the third axis under the auxiliary feeding of the second feeding drive wheel 4 to allow a predetermined length of the rubber band to pass through the first gripper 62 and the second gripper 63, and then the rubber band at the discharge port of the second feeding drive wheel 4 is cut by the cutting device. After gripping two ends of the cut rubber band, the first gripper 62 and the second gripper 63 rotate around the first axis and the second axis, respectively, to fix the two ends of the rubber band onto the bracket 61.

[0020] As shown Fig. 2, the feeding device of the rubber band machine includes a first rack 1 and a second rack 2 arranged at intervals. The first rack 1 is provided with a first feeding drive wheel 3 driven by a first motor 31. The second rack 2 is provided with a second feeding drive wheel 4 driven by a second motor 41. The first feeding drive wheel 3 inputs a predetermined length of rubber band under the control of the first motor 31, and the rubber band is suspended between the first feeding drive wheel 3 and the second feeding drive wheel 4. A stock sensor 13 for detecting the suspension state of the rubber band is disposed below the first feeding drive wheel 3. The second feeding drive wheel 4 conveys the suspended rubber band under the control of the second motor 41. The first motor 31 controls the first feeding drive wheel 3 to convey a next predetermined length of the rubber band after the stock sensor 13 detects that the rubber band in the suspended state is straightened.

[0021] Fig. 3 shows an exploded assembly view of the first rack 1 part. A rubber band conveying passage is disposed above the first feeding drive wheel 3. A material sorting roller 15 driven by the third motor 14 is disposed above the first feeding drive wheel 3. The rubber band conveying passage is vertically disposed between the material sorting roller 15 and the first feeding drive wheel 3.

[0022] In this embodiment, the first rack 1 is fixedly connected with a backup plate 16, and the rubber band conveying passage is vertically disposed on the backup plate 16. An adjusting and limiting stopper 17 for adjusting the width of the rubber band conveying passage is disposed on the backup plate 16.

[0023] A heating plate 11 for ironing the rubber band and a heating cylinder 12 for controlling the heating plate 11 to get close to or move away from the rubber band conveying passage is disposed on one side of the rubber band conveying passage.

[0024] When the first motor 31 works, the heating cylinder 21 controls the heating plate 11 to get close to the rubber band inside the rubber band conveying passage, and irons the rubber band being conveyed. When the first motor 31 stops working, the heating cylinder 12 controls the heating plate 11 to move away from the rubber band conveying passage.

[0025] The first rack 1 is provided with a heating guide rail 11a on which the heating plate 11 is slidingly disposed. An electrical heating rod 11b is provided in the heating plate 11.

[0026] A joint sensor 18 for detecting the thickness of the rubber band is disposed on one side of the rubber band conveying passage. The rubber band may have joints which cannot be allowed during the manufacturing of rubber rings. As the thickness of the rubber band at a joint will become larger, the first motor 31 and the second motor 41 are controlled to stop conveying the rubber band when the joint sensor 18 detects the thickness of the rubber band becomes larger, so that it is convenient for workers to remove the joints of the rubber band.

[0027] The joint sensor 18 is provided with a freely suspended sensing flap 18a. One bent portion of the sensing flap 18a is fitted with the vertical rubber band in the rubber band conveying passage, while the other bent portion of the sensing flap 18a is positioned in the vicinity of a contact point of the joint sensor 18. When there is a joint on the rubber band, the sensing flap 18a comes into contact with the contact point of the joint sensor 18, so that the joint sensor 18 detects the joint of the rubber band and timely controls the feeding device to stop working.

[0028] The first feeding drive wheel 3 is provided with a first feeding driven wheel 32 clung thereto due to elasticity. A first driven wheel mounting support 33 capable of rotating is disposed on the other side of the backup plate 1. The first feeding drive wheel 3 is rotatably disposed on the first driven wheel mounting support 33. The backup plate 16 is provided with a first spring 34 fitted with the first driven wheel mounting support 33. One end of the first spring is fitted with a mounting rod on the backup plate 16, while the other end thereof is fitted with a connecting member on the first driven wheel mounting support 33. The first driven wheel mounting support 33 enables in the aid of the elasticity of the first spring 34 the first feeding driven wheel 32 to cling to the first feeding drive wheel 3.

[0029] Fig. 4 shows an exploded assembly view of the second rack 2 part. The second rack 2 includes a first mounting substrate 21 and a second mounting substrate 22 which are provided in parallel, and a third mounting substrate 23 vertically connected to the first mounting substrate 21 and the second mounting substrate 22, respectively.

[0030] A rubber band conveying passage is provided between the first mounting substrate 21 and the second mounting substrate 22. A feeding carrier 24 is fixed between the first mounting substrate 21 and the second mounting substrate 22. A driven wheel shaft 25 is disposed above the feeding carrier 24. The rubber band conveying passage is positioned between the feeding carrier 24 and the driven wheel shaft 25.

[0031] After conveyed by the first feeding drive wheel 3, the rubber band passes between the driven wheel shaft 25 and the feeding carrier 24 and is then conveyed by the second feeding drive wheel 4. An adjusting block 26 capable of adjusting the width of the rubber band conveying passage is disposed on the driven wheel shaft 25 in order to adapt for conveying rubber bands in different width.

[0032] The second feeding drive wheel 4 is rotatably disposed between the first mounting substrate 21 and the second mounting substrate 22. The second motor 41 and the second feeding drive wheel 4 are positioned on two sides of the first mounting substrate 21, respectively. A power output shaft of the second motor 41 is connected with a first synchronous wheel 41a. The rotary drive shaft 4a of the second feeding drive wheel 4 passes through the first mounting substrate 21, and the outgoing end thereof is connected with a second synchronous wheel

41b. A first synchronous belt 41c is disposed between the first synchronous wheel 41a and the second synchronous wheel 41b. The second motor 41 drives the second feeding drive wheel 4 to move via the first synchronous wheel 41a, the first synchronous belt 41c and the second synchronous wheel 41b.

[0033] A moving cutter 7 and a stationary cutter 71 for cutting the rubber band off are disposed at the discharge port of the second feeding drive wheel 4. The moving cutter 7 cuts the rubber band at the discharge port off via a cutting cylinder 72 after the second feeding drive wheel 4 completes the feeding of the rubber band.

[0034] In this embodiment, a moving cutter mounting frame 73 is fixedly connected to one side of the third mounting substrate 23 close to the first feeding drive wheel 3. The moving cutter mounting frame 73 is provided with a moving cutter arm 74 capable of rotating. The moving cutter 7 is fixed on the moving cutter arm 74 and positioned below the second feeding drive wheel 4.

[0035] The cutting cylinder 72 for driving the moving cutter 7 to rotate is movably mounted on the first mounting substrate 21, and positioned below the second motor 41. The drive rod of the cutting cylinder 72 drives the moving cutter arm 74 to rotate via a connecting rod.

[0036] The second feeding drive wheel 4 is provided with a second feeding driven wheel 42 clung thereto due to elasticity. A second drive wheel mounting support 43 capable of rotating is disposed on the outer side of the third mounting substrate 23, and the second feeding driven wheel 42 is rotatably disposed on the second drive wheel mounting support 43. The third mounting substrate 23 is provided with a second spring 44 fitted with the second drive wheel mounting support 43. One end of the second spring 44 is fitted with a mounting rod on the third mounting substrate 23, while the other end thereof enables due to the elasticity the second feeding driven wheel 42 on the second driven wheel mounting support 43 to compress the second feeding driven wheel 4.

[0037] When in work, the rubber band passes between the first feeding drive wheel 3 and the first feeding driven wheel 32 at first, and then passes between the second feeding drive wheel 4 and the second feeding driven wheel 42. A stock sensor 13 is fixedly disposed below the first feeding drive wheel 3. The length of the rubber band conveyed by the first feeding drive wheel 3 may be controlled by controlling the rotating revolutions of the first motor 31. After the first feeding drive wheel 3 conveys a predetermined length of rubber band, the rubber band is suspended between the first feeding drive wheel 3 and the second feeding drive wheel 4, and the suspended rubber band coordinates with the stock sensor 13 to enable the stock sensor 13 to detect that the rubber band is in the suspended state.

[0038] When the third gripper 57 grips and rotates the rubber band, the second motor 41 controls the second feeding drive wheel 4 to feed quickly and output the rubber band for subsequent looping operation. The rubber band suspended between the first feeding drive wheel 3

and the second feeding drive wheel 4 is straightened gradually. The rubber band after straightened is separated from the stock sensor 13, and the stock sensor 13 controls the first motor 31 to make the first feeding drive wheel 3 convey a next segment of the rubber band after detecting that the rubber band is separated from it.

[0039] As shown in Fig. 5, the looping device of the rubber band machine includes a third rack 5 and a base 6 disposed on the third rack 3. In this embodiment, the third rack 5 is a composite member consisting of a bedplate 5a and a support frame 5b. The third rack 5 is positioned below the second rack 2, so that it is convenient for the third gripper 57 to grip the rubber band at the discharge port of the second feeding drive wheel 4.

[0040] A first guide rail 55 is provided on the bedplate 5a of the third rack 5, while the base 6 is slidably disposed on the first guide rail 55. A sliding cylinder 51 for driving the base 6 to slide is disposed on the third rack 5. By controlling the base 6 to move via the sliding cylinder 51, the looped rubber band may be conveyed to a sewing position for sewing.

[0041] The first gripper 62 and the second gripper 63 for gripping the rubber band are disposed on the base 6 at intervals, and may rotate around the first axis and the second axis, respectively. In this embodiment, a first cylinder mounting plate 62a and a second cylinder mounting plate 63a are fixed on the base 6 at intervals, with a first rotating cylinder 62d and a second rotating cylinder 63d being mounted on the first cylinder mounting plate 62a and the second cylinder mounting plate 63a, respectively.

[0042] The first rotating cylinder 62d is provided with a first drive shaft 62b connected to the first gripper 62 via a first connecting arm 62c. The first axis is coincided with the axis of the first drive shaft 62b. The second rotating cylinder 63d is provided with a second drive shaft 63b connected to the second gripper 63 via a second connecting arm 63c. The second axis is coincided with the axis of the second drive shaft 63b.

[0043] The first rotating cylinder 62d may drive the first gripper 62 to rotate around the first drive shaft 62 where the first axis is located. The second rotating cylinder 63d may drive the second gripper 63 to rotate around the second drive shaft 63b where the second axis is located.

[0044] The first cylinder mounting plate 62a and the second cylinder mounting plate 63a are formed with adjustable mounting grooves, respectively. The positions of the first cylinder mounting plate 62a and the second cylinder mounting plate 63a on the base 6 may be adjusted by the adjustable mounting grooves, thereby adjusting the distance from the first axis to the second axis.

[0045] A bracket 61 is disposed between the first gripper 62 and the second gripper 63, and fixed on the base 6 via a material support frame 61a.

[0046] The material support frame 61a has an extended end which is positioned between the first gripper 62 and the second gripper 63. The bracket 61 is fixed on the end of the material support frame 61a. The first ro-

tating cylinder 62d and the second rotating cylinder 63d may drive the corresponding first gripper 62 and second gripper 63 to rotate, respectively, to fix the gripped rubber band onto the bracket 61.

[0047] In this embodiment, the extended end of the material support frame 61a is protruded relatively. The bracket 61 will run into a sewing device in the process of moving the base 6 to the sewing position. Therefore, during the movement of the base 6, the movement stroke of the bracket 61 is less than that of the base 6. To make the movement stroke of the bracket 61 less than that of the base 6, a second guide rail 64 is disposed on the base 6. The second guide rail 64 is positioned between the first cylinder mounting plate 62a and the second cylinder mounting plate 63a. The material support frame 61a is slidably disposed on the second guide rail 64, and a tension spring 65 is provided between the material support frame 61a and the base 6. In this way, the bracket 61 may stop moving when running into the sewing device, and the base 6 continues to move and convey the looped rubber band to the sewing position.

[0048] The base 6 is connected to a connecting plate 67 via two support plates 66. An air pipe mounting support 68 is fixed at the upper part of the connecting plate 67. The air pipe mounting support 68 is provided with two air blowpipes 68a connected to an air pump. The outlets of the air blowpipes 68a are positioned above the bracket 61. A mounting shaft 68b is fixed between the two air blowpipes 68a, and fixedly provided thereon with a positioning backup plate 68c for positioning the rubber band. A carrier mounting frame 67a, fixed with a carrier 67b, is fixed on the side wall of the connecting plate 67. The carrier 67b is positioned above the bracket 61. When rotating to the bracket 61, the first gripper 62 and the second gripper 63 are rightly positioned on two sides of the carrier 67b.

[0049] The third rack 5 is provided with the third gripper 57 capable of rotating around the third axis, and a third rotating cylinder 54 for driving the third gripper 57 to rotate around the third axis.

[0050] Before looping the rubber band, the first gripper 62 and the second gripper 63 are positioned on two sides of the bracket 61, and the third axis is positioned between the first axis and the second axis. The radius, by which the third gripper 57 rotates around the third axis, is rightly fitted with the distance from the third gripper 57 to the first gripper 62 and the second gripper 63. Thus, the third gripper 57 may pass through the unfolded first gripper 62 and second gripper 63, respectively, while rotating around the third axis.

[0051] The third rotating cylinder 54 may directly drive the third gripper 57 to move rotationally, or may drive the third gripper 57 to move rotationally via a transmission structure.

[0052] In this embodiment, the support frame 5b of the third rack 5 is provided with a third drive shaft 52 capable of rotating, with the axis of the third drive shaft 52 being coincided with the third axis. The third drive shaft 52 is

connected to the third gripper 57 via a third connecting arm 53. The third gripper 57 may rotate around the third drive shaft 52 where the third axis is located. A third synchronous wheel 52a is fixed on the third drive shaft 52. A fourth synchronous wheel 54a is fixedly provided on the drive shaft of the third rotating cylinder 54. The third synchronous wheel 52a is linked to the fourth synchronous wheel 54a via a second synchronous belt 54b.

[0053] In this embodiment, with a similar structure, the first gripper 62, the third gripper 63 and the third gripper 57 each includes a fixed arm 81, a moving arm 82 and a gripping cylinder 8 for driving the moving arm 82 to coordinate with the fixed arm for gripping. The fixed arm 81 is mounted on the body of the gripping cylinder 8, while the moving arm 82 is connected to the piston rod of the gripping cylinder 8. The moving arm 82 may be controlled to coordinate with the fixed arm 81 for gripping under the drive of the gripping cylinder 8.

[0054] When in work, the first gripper 62 and the second gripper 63 are positioned on two sides of the bracket 61, respectively, and are unfolded for gripping. The third gripper 57 grips an end of the rubber band at the discharge port of the second feeding drive wheel 4, and rotates around the third axis to allow the end of the rubber band to pass through the unfolded first gripper 62 and second gripper 63. After the first gripper 62 and the second gripper 63 have gripped corresponding portions of the rubber band, the cutting device cuts off the segment of rubber band gripped by the first gripper 62 and the second gripper 63. At this time, two ends of this segment of rubber band have been gripped by the first gripper 62 and the second gripper 63. Subsequently, the first gripper 62 and the second gripper 63 move rotationally to the position of the bracket 61, respectively, where the two ends of the rubber band are fixedly joined on the bracket 61, and the rubber band is spliced into a ring. The sliding cylinder 51 controls the base 6 to move to convey the first gripper 62, the second gripper 63 and the bracket 61 to the sewing position for sewing. The air blowpipes 68a and the positioning backup plate 68c may assist in positioning the looped rubber band, thereby conveying the rubber ring to the sewing device.

[0055] The distance from the first axis to the second axis may be adjusted by adjusting the mounting positions of the first cylinder mounting plate 62a and the second cylinder mounting plate 63a. During looping a rubber band, the connecting parts are overlapped or spliced as required. When the distance from the first axis to the second axis shortens, two ends of the rubber band are overlapped after the first gripper 62 and the second gripper 63 rotate and fold the rubber band. When the distance from the first axis to the second axis increases, two ends of the rubber band are spliced after the first gripper 62 and the second gripper 63 rotate and fold the rubber band.

[0056] The preferred embodiment of the present invention has been described above. Various changes or variations made by an ordinary person of skill in the art shall

not depart from the scope of the present invention.

Claims

1. A rubber band machine, comprising a feeding device, a cutting device and a looping device, **characterized in that** the feeding device comprises a first rack (1) and a second rack (2) arranged at intervals, the first rack (1) being provided with a first feeding drive wheel (3) driven by a first motor (31), the second rack (2) being provided with a second feeding drive wheel (4) driven by a second motor (41); the looping device comprises a first gripper (62) capable of rotating around a first axis, a second gripper (63) capable of rotating around a second axis, a bracket (61) disposed between the first gripper (62) and the second gripper (63), and a third gripper (57) capable of rotating around a third axis; the first feeding drive wheel (3) being capable of rotating and inputting a predetermined length of rubber band between the first feeding drive wheel (3) and the second feeding drive wheel (4), the third gripper (57) being capable of gripping one end of the rubber band at the discharge port of the second feeding drive wheel (4) and rotating around the third axis under the auxiliary feeding of the second feeding drive wheel (4) to allow a predetermined length of the rubber band to pass through the first gripper (62) and the second gripper (63), and the cutting device being capable of cutting then the rubber band at the discharge port of the second feeding drive wheel (4), the first gripper (62) and the second gripper (63) being capable of rotating around the first axis and the second axis, respectively, after gripping two ends of the cut rubber band, to fix the two ends of the rubber band onto the bracket (61).
2. The rubber band machine according to claim 1, **characterized in that** the rubber band input by the first feeding drive wheel (3) is suspended between the first feeding drive wheel (3) and the second feeding drive wheel (4); a stock sensor (13) for detecting the suspension state of the rubber band is disposed below the first feeding drive wheel (3); the second feeding drive wheel (4) is capable of conveying the suspended rubber band when the third gripper (57) moves rotationally; and, the first motor (31) is capable of controlling the first feeding drive wheel (3) to convey a next predetermined length of the rubber band after the stock sensor (13) detects that the rubber band in the suspended state is straightened.
3. The rubber band machine according to claim 1 or 2, **characterized in that** the first rack (1) is provided with a first feeding driven wheel (32) fitted with the first feeding drive wheel (3); the second rack (2) is provided with a second feeding driven wheel (42) fitted with the second feeding drive wheel (4); a rubber band conveying passage is disposed above the first feeding drive wheel (3), and a heating plate (11) for ironing the rubber band and a heating cylinder (12) for controlling the heating plate (11) to get close to or move away from the rubber band conveying passage are provided on one side of the rubber band conveying passage.
4. The rubber band machine according to any of the claims 1 to 3, **characterized in that** a joint sensor (18) for detecting the thickness of the rubber band is provided on one side of the rubber band conveying passage, and the joint sensor (18) controls the first motor (31) to stop working when detecting that the thickness of the rubber band becomes larger.
5. The rubber band machine according to any of the claims 1 to 4, **characterized in that** the cutting device comprises a moving cutter (7) and a stationary cutter (71) disposed at the discharge port of the second feeding drive wheel (4), the moving cutter (7) being connected to the drive rod of a cutting cylinder (72).
6. The rubber band machine according to any of the claims 1 to 5, **characterized in that** the looping device comprises a third rack (5) on which a slidable base (6) is disposed, the base (6) being connected to the drive rod of a sliding cylinder (51); and, the first gripper (62), the second gripper (63) and the bracket (61) are all disposed on the base (6).
7. The rubber band machine according to claim 6, **characterized in that** the base (6) is provided with a first rotating cylinder (62d) for driving the first gripper (62) to rotate around the first axis and a second rotating cylinder (63d) for driving the second gripper (63) to rotate around the second axis at intervals, and the distance from the first axis to the second axis is adjustable.
8. The rubber band machine according to claim 6 or 7, **characterized in that** the third rack (5) is provided with a third drive shaft (52) capable of rotating, and one end of the third drive shaft (52) is connected to the third gripper (57) via a third connecting arm (53) while the other end thereof is linked to a third rotating cylinder (54) on the third rack (5).
9. The rubber band machine according to any of the claims 6 to 8, **characterized in that** a second guide rail (64), on which the bracket (61) is slidably disposed, is disposed on the base (6), and a tension spring (65) is disposed between the bracket (61) and the base (6).

Patentansprüche

1. Gummibandmaschine, umfassend eine Zuführungsmaschine, eine Schneidevorrichtung und eine Schleifenvorrichtung, **dadurch gekennzeichnet, dass** die Zuführungsvorrichtung ein erstes Gestell (1) und ein zweites Gestell (2) umfasst, die in Abständen angeordnet sind, wobei das erste Gestell (1) mit einem durch einen ersten Motor (31) angetriebenen ersten Zuführungsantriebsrad (3) versehen ist, das zweite Gestell (2) mit einem durch einen zweiten Motor (41) angetriebenen zweiten Zuführungsantriebsrad (4) versehen ist; die Schleifenvorrichtung einen ersten Greifer (62) umfasst, der in der Lage ist, sich um eine erste Achse zu drehen, einen zweiten Greifer (63) umfasst, der in der Lage ist, sich um eine zweite Achse zu drehen, wobei eine Halterung (61) zwischen dem ersten Greifer (62) und dem zweiten Greifer (63) angeordnet ist, und einen dritten Greifer (57) umfasst, der in der Lage ist, sich um eine dritte Achse zu drehen; das erste Zuführungsantriebsrad (3) in der Lage ist, sich zu drehen und eine vorgegebene Gummibandlänge zwischen das erste Zuführungsantriebsrad (3) und das zweite Zuführungsantriebsrad (4) einzugeben, wobei der dritte Greifer (57) in der Lage ist, ein Ende des Gummibands an der Ausgabeöffnung des zweiten Zuführungsantriebsrads (4) zu greifen und sich um die dritte Achse unter der Hilfszuführung des zweiten Zuführungsantriebsrads (4) zu drehen, damit eine vorgegebene Gummibandlänge den ersten Greifer (62) und den zweiten Greifer (63) passieren kann, und wobei die Schneidevorrichtung in der Lage ist, das Gummiband dann an der Ausgabeöffnung des zweiten Zuführungsantriebsrads (4) durchzuschneiden, wobei der erste Greifer (62) und der zweite Greifer (63) in der Lage sind, sich um die erste Achse bzw. um die zweite Achse zu drehen, nachdem sie zwei Enden des durchgeschnittenen Gummibands gegriffen haben, um die beiden Enden des Gummibands auf der Halterung (61) zu fixieren.
2. Gummibandmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** das durch das erste Zuführungsantriebsrad (3) eingegebene Gummiband zwischen dem ersten Zuführungsantriebsrad (3) und dem zweiten Zuführungsantriebsrad (4) aufgehängt ist; dass ein Vorratssensor (13) zum Detektieren des Aufhängungszustands des Gummibands unter dem ersten Zuführungsantriebsrad (3) angeordnet ist; dass das zweite Zuführungsantriebsrad (4) in der Lage ist, das aufgehängte Gummiband weiterzutransportieren, wenn der dritte Greifer (57) eine Drehbewegung ausführt; und dass der erste Motor (31) in der Lage ist, das erste Zuführungsantriebsrad (3) zu steuern, um eine nächste vorgegebene Gummibandlänge weiterzutransportieren, nachdem der Vorratssensor (13) detektiert, dass das Gummiband
- im aufgehängten Zustand gerade gezogen wird.
3. Gummibandmaschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das erste Gestell (1) mit einem ersten angetriebenen Zuführungsrad (32) versehen ist, das an dem ersten Zuführungsantriebsrad (3) angebracht ist; dass das zweite Gestell (2) mit einem zweiten angetriebenen Zuführungsrad (42) versehen ist, das an dem zweiten Zuführungsantriebsrad (4) angebracht ist; dass eine Gummibandbeförderungspassage über dem ersten Zuführungsantriebsrad (3) angeordnet ist, und dass eine Wärmeplatte (11) zum Bügeln des Gummibands sowie ein Wärmezyylinder (12) zum Steuern der Wärmeplatte (11) nahe an die Gummibandbeförderungspassage heran oder von dieser weg auf einer Seite der Gummibandbeförderungspassage angeordnet sind.
4. Gummibandmaschine nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** ein Verbindungssensor (18) zum Detektieren der Dicke des Gummibands auf einer Seite der Gummibandbeförderungspassage angeordnet ist, und der Verbindungssensor (18) den ersten Motor (31) steuert, um seine Funktion einzustellen, wenn detektiert wird, dass die Dicke des Gummibands größer wird.
5. Gummibandmaschine nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Schneidevorrichtung ein sich bewegendes Messer (7) und ein stationäres Messer (71) umfasst, die an der Ausgabeöffnung des zweiten Zuführungsantriebsrads (4) angeordnet sind, wobei das sich bewegendes Messer (7) mit der Antriebsstange eines Schneidezylinders (72) verbunden ist.
6. Gummibandmaschine nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Schleifenvorrichtung ein drittes Gestell (5) umfasst, auf dem eine schiebbare Basis (6) angeordnet ist, wobei die Basis (6) mit der Antriebsstange eines Schiebezyinders (51) verbunden ist; und wobei der erste Greifer (62), der zweite Greifer (63) und die Halterung (61) alle auf der Basis (6) angeordnet sind.
7. Gummibandmaschine nach Anspruch 6, **dadurch gekennzeichnet, dass** die Basis (6) in Abständen mit einem ersten Drehzylinder (62d) versehen ist, um den ersten Greifer (62) anzutreiben, damit er sich um die erste Achse dreht, und mit einem zweiten Drehzylinder (63d) versehen ist, um den zweiten Greifer (63) anzutreiben, damit er sich um die zweite Achse dreht, und wobei der Abstand von der ersten Achse zur zweiten Achse einstellbar ist.
8. Gummibandmaschine nach Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** das dritte Gestell (5)

mit einer dritten Antriebswelle (52) versehen ist, die in der Lage ist, sich zu sehen, und dadurch, dass ein Ende der dritten Antriebswelle (52) über einen dritten Verbindungsarm (53) mit dem dritten Greifer (57) verbunden ist, während ihr anderes Ende mit einem dritten Drehzylinder (54) auf dem dritten Gestell (5) verbunden ist.

9. Gummibandmaschine nach einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass** eine zweite Führungsschiene (64), auf der die Halterung (61) verschiebbar angeordnet ist, auf der Basis (6) angeordnet ist, und eine Zugfeder (65) zwischen der Halterung (61) und der Basis (6) angeordnet ist.

Revendications

1. Machine à bande de caoutchouc, comprenant un dispositif d'alimentation, un dispositif de coupe et un dispositif de bouclage, **caractérisée en ce que** le dispositif d'alimentation comprend une première crémaillère (1) et une seconde crémaillère (2) disposées à intervalles, la première crémaillère (1) étant munie d'une première roue motrice d'alimentation (3) entraînée par un premier moteur (31), la seconde crémaillère (2) étant munie d'une seconde roue motrice d'alimentation (4) entraînée par un second moteur (41) ; le dispositif de bouclage comprend un premier élément de préhension (62) apte à tourner sur un premier axe, une deuxième élément de préhension (63) apte à tourner sur un deuxième axe, un support (61) disposé entre le premier élément de préhension (62) et le deuxième élément de préhension (63) et un troisième élément de préhension (57) apte à tourner sur un troisième axe ; la première roue motrice d'alimentation (3) étant apte à tourner et à introduire une longueur prédéterminée de bande de caoutchouc entre la première roue motrice d'alimentation (3) et la deuxième roue motrice d'alimentation (4), le troisième élément de préhension (57) étant apte à saisir Une extrémité de la bande de caoutchouc au niveau de l'orifice de sortie de la deuxième roue élément de préhension d'alimentation (4) et à tourner sur le troisième axe pendant l'alimentation auxiliaire de la deuxième roue motrice d'alimentation (4) pour permettre à une longueur prédéterminée de la bande de caoutchouc de passer à travers le premier élément de préhension (62) et le deuxième élément de préhension (63), et le dispositif de coupe étant apte à découper ensuite la bande de caoutchouc au niveau de l'orifice de sortie de la deuxième roue motrice d'alimentation (4), le premier élément de préhension (62) et le deuxième élément de préhension (63) pouvant tourner respectivement sur le premier axe et le deuxième axe après avoir saisi deux extrémités de la bande de caoutchouc découpée, pour fixer les deux extrémités de la bande de

caoutchouc au support (61).

2. Machine à bande de caoutchouc selon la revendication 1, **caractérisée en ce que** la bande de caoutchouc introduite par la première roue motrice d'alimentation (3) est suspendue entre la première roue motrice d'alimentation (3) et la deuxième roue motrice d'alimentation (4) ; un capteur d'approvisionnement (13) destiné à détecter l'état de suspension de la bande de caoutchouc est disposé au-dessous de la première roue motrice d'alimentation (3) ; la deuxième roue motrice d'alimentation (4) est apte à transporter la bande de caoutchouc en suspension lorsque le troisième élément de préhension (57) se déplace en rotation ; et le premier moteur (31) est apte à commander la première roue motrice d'alimentation (3) pour transporter une longueur prédéterminée suivante de la bande de caoutchouc après que le capteur d'approvisionnement (13) a détecté que la bande de caoutchouc à l'état suspendu est redressée.
3. Machine à bande de caoutchouc selon la revendication 1 ou 2, **caractérisée en ce que** la première crémaillère (1) est munie d'une première roue menée d'alimentation (32) équipée de la première roue motrice d'alimentation (3) ; la deuxième crémaillère (2) est munie d'une deuxième roue menée d'alimentation (42) équipée de la deuxième roue motrice d'alimentation (4) ; un passage de transport de bande de caoutchouc est situé au-dessus de la première roue motrice d'alimentation (3) et une plaque de chauffage (11) destinée à repasser la bande de caoutchouc et un cylindre de chauffage (12) destinée à commander la plaque de chauffage (11) pour la rapprocher ou l'écarter du passage de transport de bande de caoutchouc sont prévus sur un côté du passage de transport de bande de caoutchouc.
4. Machine à bande de caoutchouc selon l'une quelconque des revendications 1 à 3, **caractérisée en ce qu'un** capteur de joint (18) destiné à détecter l'épaisseur de la bande de caoutchouc est prévu sur un côté du passage de transport de bande de caoutchouc et le capteur de joint (18) commande le premier moteur (31) d'arrêter de fonctionner lorsqu'il détecte que l'épaisseur de la bande élastique devient plus importante.
5. Machine à bande de caoutchouc selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** le dispositif de coupe comprend un élément de coupe mobile (7) et un élément de coupe fixe (71) disposés au niveau de l'orifice de sortie de la deuxième roue motrice d'alimentation (4), l'élément de coupe mobile (7) étant relié à la tige d'entraînement d'un cylindre de coupe (72).

6. Machine à bande de caoutchouc selon l'une quelconque des revendications 1 à 5, **caractérisée en ce que** le dispositif de bouclage comprend une troisième crémaillère (5) sur laquelle est disposée une base coulissante (6), la base (6) étant reliée à la tige d'entraînement d'un cylindre coulissant (51) ; et le premier élément de préhension (62), le deuxième élément de préhension (63) et le support (61) sont tous disposés sur la base (6).
7. Machine à bande de caoutchouc selon la revendication 6, **caractérisée en ce que** la base (6) est munie d'un premier cylindre rotatif (62d) destiné à entraîner le premier élément de préhension (62) en rotation sur le premier axe et un deuxième cylindre rotatif (63d) destiné à entraîner le second élément de préhension (63) en rotation sur le second axe à intervalles, et la distance entre le premier axe et le deuxième axe est réglable.
8. Machine à bande de caoutchouc selon la revendication 6 ou 7, **caractérisée en ce que** la troisième crémaillère (5) est munie d'un troisième arbre d'entraînement (52) apte à tourner, et une extrémité du troisième arbre d'entraînement (52) est reliée au troisième élément de préhension (57) par l'intermédiaire d'un troisième bras de liaison (53) tandis que l'autre extrémité est reliée à un troisième cylindre rotatif (54) sur la troisième crémaillère (5).
9. Machine à bande de caoutchouc selon l'une quelconque des revendications 6 à 8, **caractérisée en ce qu'**un deuxième rail de guidage (64), sur lequel est disposé le support (61), est disposé sur la base (6) et un ressort de tension (65) est disposé entre le support (61) et la base (6).

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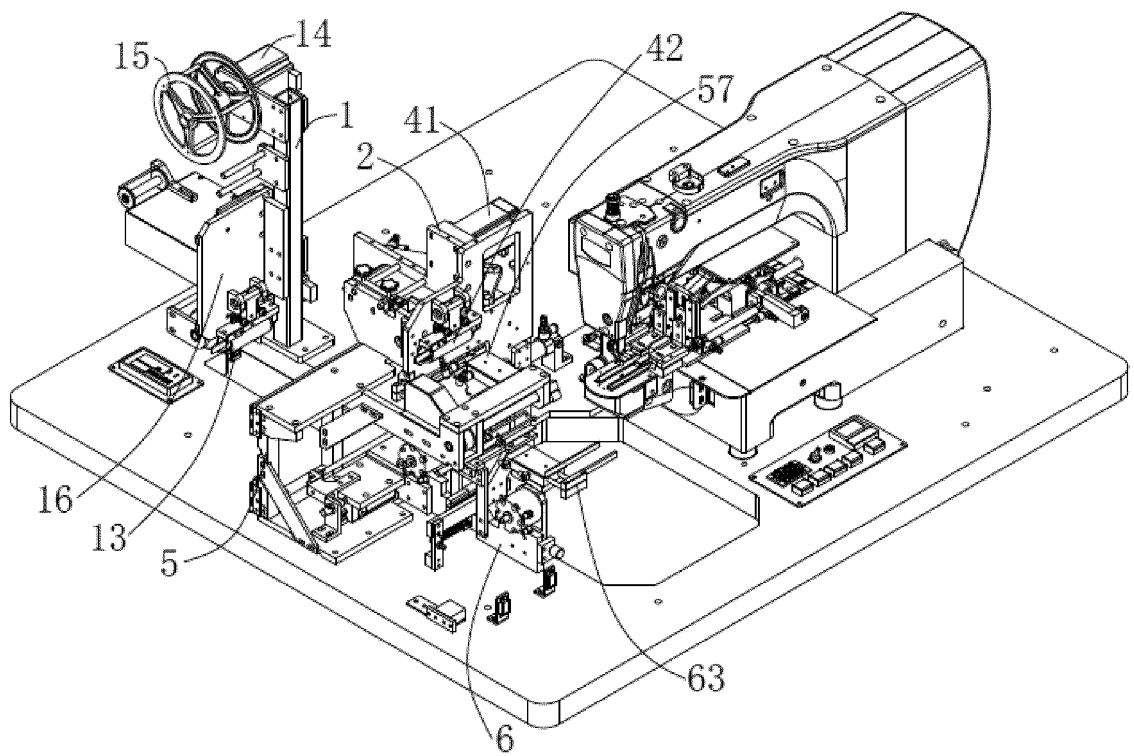


Fig. 1

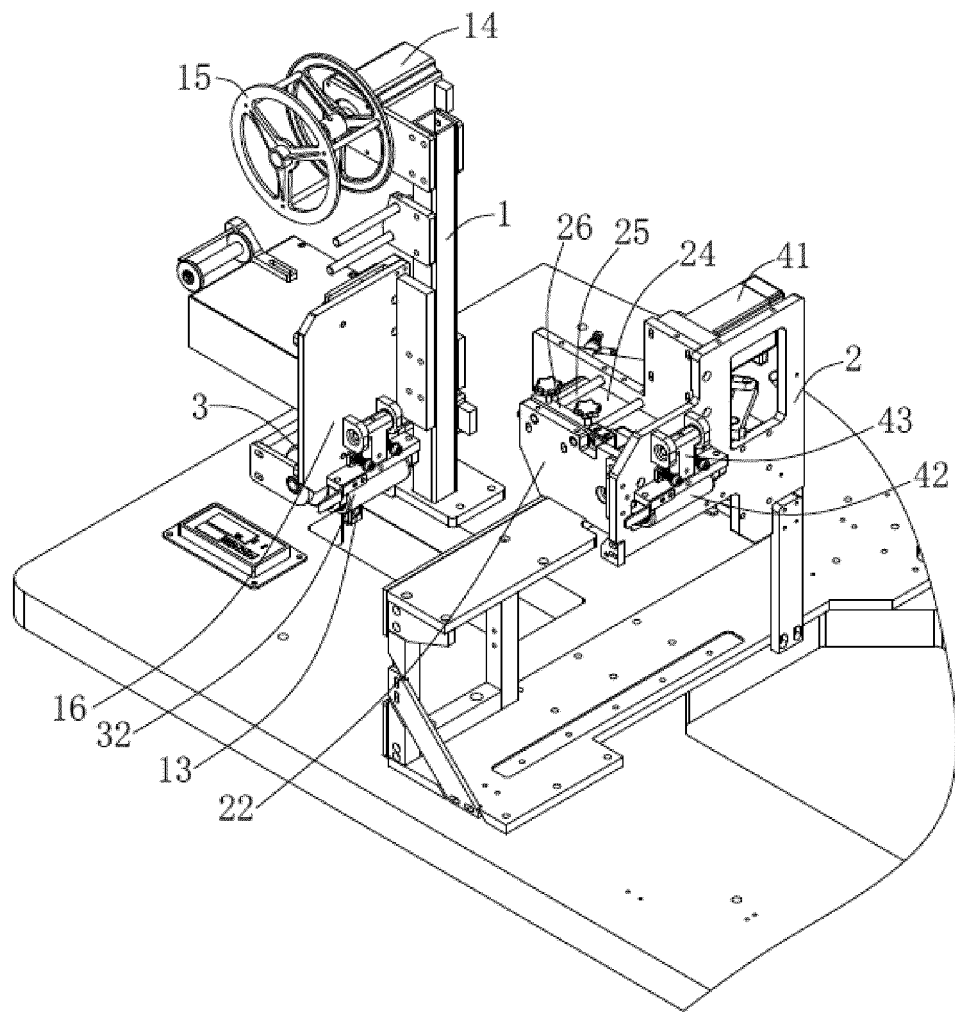


Fig. 2

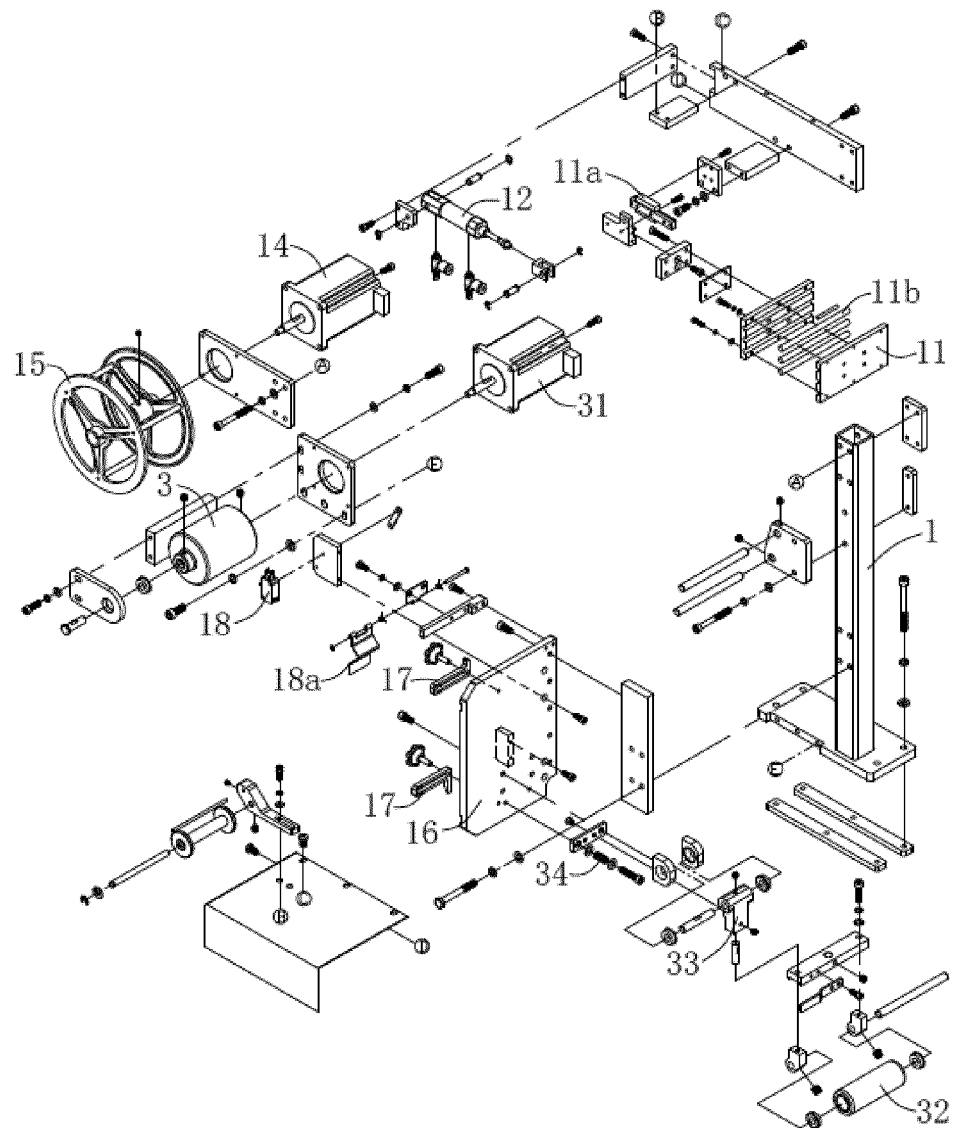


Fig. 3

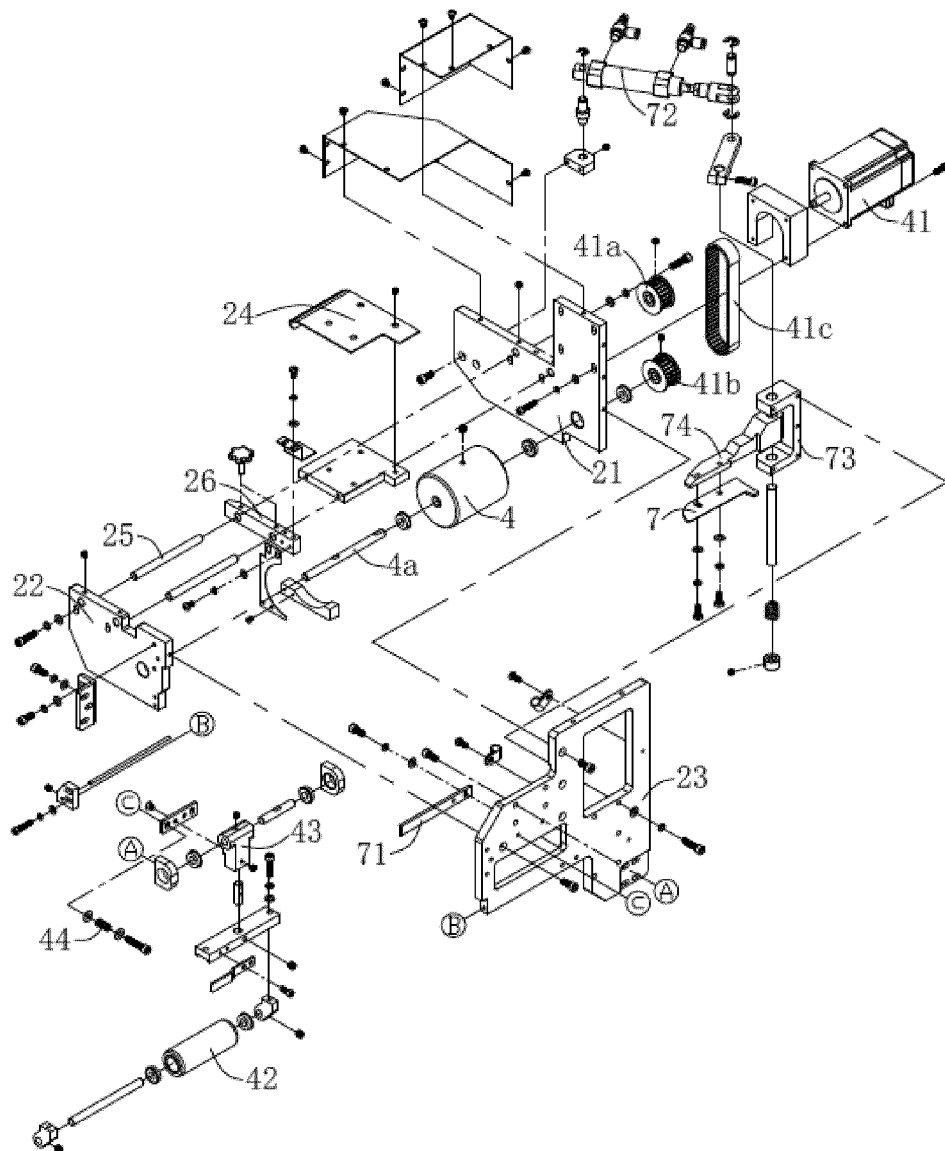


Fig. 4

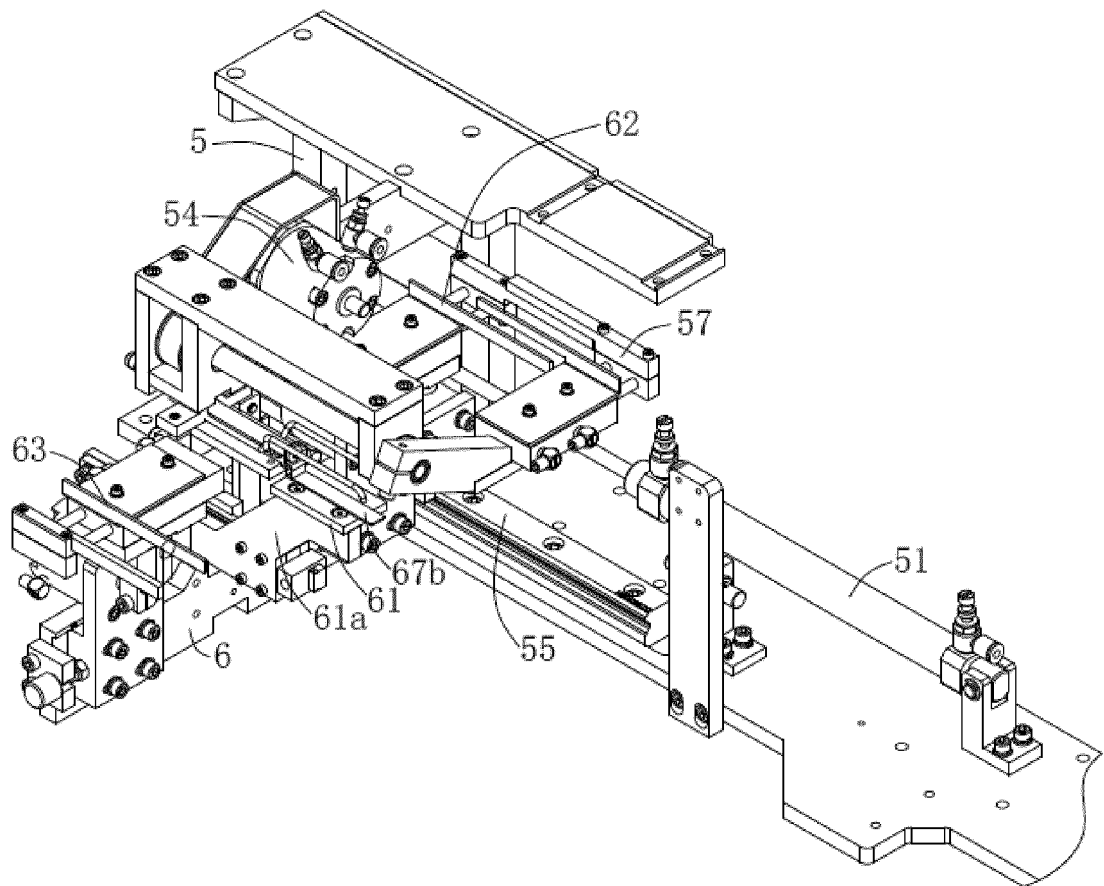


Fig. 5

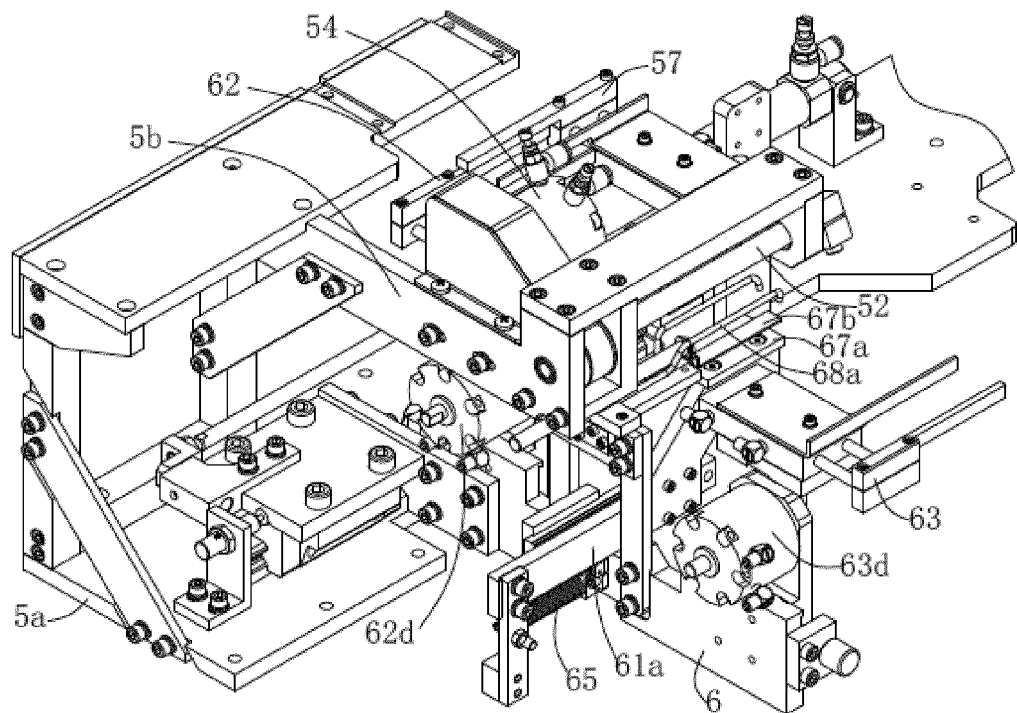


Fig. 6

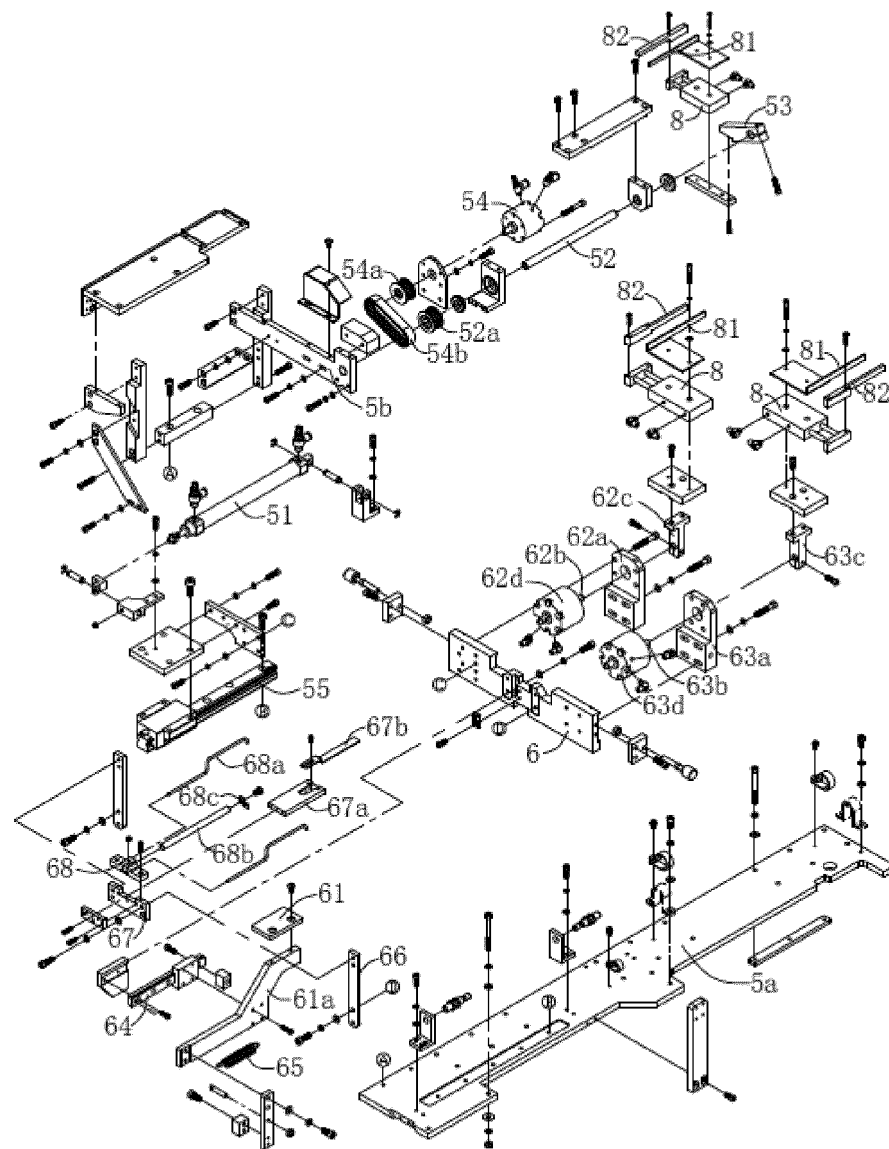


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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