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(54) **THREAD CUTTING APPARATUS AND AUTOMATIC STITCHING APPARATUS**

(57) The present invention provides a thread cutting apparatus, including: a fixed seat (73); a fixed cutting piece (61) fixed on the fixed seat (73); a movable cutting piece (62) fixed on the fixed seat (73) by a bolt (74); a bent pull plate (65), where the upper end of the bent pull plate (65) is combined with the tail end of the movable cutting piece (62); and a large angle pull plate (69), where the upper end of the large angle pull plate (69) is combined with the lower end of the bent pull plate (65). When the lower end of the large angle pull plate (69) is pushed and pulled, the movable cutting piece (62) is opened and closed relative to the fixed cutting piece (61). The present invention further provides an automatic stitching apparatus, including the thread cutting apparatus (6) and a sewing apparatus (1), where the position of the thread cutting apparatus (6) is close to a sewing point of the sewing apparatus (1). The thread cutting apparatus provided by the present invention can automatically cut off a sewing coil after the sewing is completed without the need for secondary processing of the fabric, thereby achieving the automated production.

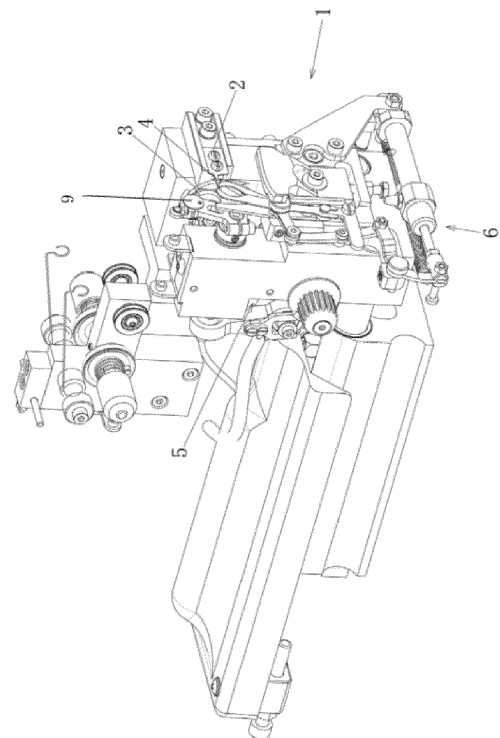


FIG. 1

Description

Technical Field

[0001] The present invention relates to sewing, more specifically to a thread cutting apparatus and an automatic stitching apparatus.

Background Art

[0002] At present, the technology of sewing machines can only complete basic weaving tasks. For example, a cylindrical fabric can only be woven as a whole, and one end of the fabric cannot be automatically stitched. The completed woven fabric needs to be placed separately on another stitching device for secondary processing and stitching, so as to complete all processes of the fabric. During this period, multiple workers need to cooperate with each other to complete all processes. At present, the production processes cannot improve the production efficiency or reduce the production cost.

Summary of the Invention

[0003] In view of the problems in the background art, the present invention provides a thread cutting apparatus, including: a fixed seat; a fixed cutting piece fixed on the fixed seat; a movable cutting piece fixed on the fixed seat by a bolt; a bent pull plate, where the upper end of the bent pull plate is combined with the tail end of the movable cutting piece; and a large angle pull plate, where the upper end of the large angle pull plate is combined with the lower end of the bent pull plate. When the lower end of the large angle pull plate is pushed and pulled, the movable cutting piece is opened and closed relative to the fixed cutting piece.

[0004] Preferably, the thread cutting apparatus further includes: a bent hook piece attached to and mounted together with the movable cutting piece and moving together with the movable cutting piece; a bent push piece fixed on the fixed seat by the bolt; and a plectrum, where the first end of the plectrum is combined with the tail end of the bent push piece to push and pull the bent push piece, and the second end of the plectrum is capable of moving between an eccentric tightening ring on the bent pull plate and the upper end of the large angle pull plate.

[0005] Preferably, the heads of the bent hook piece and the bent push piece are respectively in a bent hook shape, and bent hooks are opposite.

[0006] Preferably, when the lower end of the large angle pull plate is pushed, the movable cutting piece is close to the fixed cutting piece, and the plectrum pushes the bent push piece to approach the middle; before a thread is cut, the bent push piece first contacts and pushes out a certain length of the thread to be cut, then the bent hook piece contacts and tightens the thread to be cut, and the movable cutting piece and the fixed cutting piece cut the thread; and when the lower end of the large angle

pull plate is pulled, the bent hook piece and the movable cutting piece are away from the fixed cutting piece, and the bent push piece and the bent hook piece move in opposite directions.

[0007] Preferably, the thread cutting apparatus further includes: a cylinder connected to the lower end of the large angle pull plate; and a tension spring connected to the cylinder and the large angle pull plate.

[0008] The thread cutting apparatus provided by the present invention is ingenious and compact in structure and can highly cooperate with a sewing machine for thread cutting.

[0009] The present invention further provides an automatic stitching apparatus, including the foregoing thread cutting apparatus; and a sewing apparatus provided with a first sewing needle, a second sewing needle and a plate metal needle that cooperate with each other for knotting. The position of the thread cutting apparatus is close to a sewing point of the sewing apparatus, and after the sewing of the sewing apparatus is completed, the thread on a sewing coil is cut.

[0010] Preferably, the sewing apparatus further includes: a first connecting rod, where the first end of the first connecting rod is connected to the second end of a long crank, a first needle holder is mounted at the first end of the long crank, and the first sewing needle is mounted on the first needle holder; and a second connecting rod, where the first end of the second connecting rod is connected to the second end of a short crank, a second needle holder is mounted at the first end of the short crank, and the second sewing needle is mounted on the second needle holder.

[0011] Preferably, the automatic stitching apparatus further includes a motor apparatus, and the motor apparatus includes: a motor shaft; a large gear connected to one end of the motor shaft, where the large gear is provided with an eccentric mounting hole, and the eccentric mounting hole is configured to accommodate the second end of the first connecting rod; and a small needle eccentric wheel connected to the other end of the motor shaft, where the small needle eccentric wheel has an eccentric shaft end, and the eccentric shaft end is combined together with the second end of the second connecting rod.

[0012] Preferably, the automatic stitching apparatus further includes: a pinion handwheel meshed with the large gear.

[0013] Preferably, the distance between a thread cutting plane of the thread cutting apparatus or a thread cutting point position and a plate metal needle tip head of the plate metal needle is 10.1-20 mm, and the distance between the thread cutting plane or the thread cutting point position and a motion intersection point of the first sewing needle and the second sewing needle is 15.1-25 mm.

[0014] According to the automatic stitching apparatus of the present invention, after a sewing machine completes weaving, the fabric is transferred to the stitching

apparatus by a transfer apparatus, and one end of the fabric is automatically stitched; and after the stitching is completed, the thread cutting apparatus automatically cuts off the sewing coil on the sewn fabric.

[0015] The present invention has the following beneficial effects: in a weaving process, the opening of the fabric, such as the sock head of a sock, can be automatically sewn; and the thread cutting apparatus is provided, which can automatically cut off the sewing coil after the sewing is completed without the need for secondary processing of the fabric, thereby greatly improving the production efficiency, reducing the cost, and achieving the automated production.

Brief Description of the Drawings

[0016] In order to make the present invention easier to understand, the present invention is described in more detail with reference to specific embodiments shown in the accompanying drawings. These accompanying drawings only describe typical embodiments of the present invention and should not be considered as limiting the scope of protection of the present invention.

FIG. 1 is a three-dimensional view of an automatic stitching apparatus of the present invention.

FIG. 2 is a front view of an automatic stitching apparatus of the present invention.

FIG. 3 is a three-dimensional view of an automatic stitching apparatus of the present invention from another perspective.

FIG. 4 is a three-dimensional view of a motor apparatus of an automatic stitching apparatus of the present invention from one perspective.

FIG. 5 is a three-dimensional view of a motor apparatus of an automatic stitching apparatus of the present invention from another perspective.

FIG. 6 is a left view of the automatic stitching apparatus of the present invention shown in FIG. 2.

FIG. 7 is a right view of the automatic stitching apparatus of the present invention shown in FIG. 2.

FIG. 8 is a rear view of the automatic stitching apparatus of the present invention shown in FIG. 2.

FIG. 9 is a schematic structural view of a plate metal needle of an automatic stitching apparatus of the present invention.

FIG. 10 is a top view of the automatic stitching apparatus of the present invention shown in FIG. 2.

FIG. 11 to FIG. 14 show motion processes of sewing needles and a plate metal needle of the present invention.

FIG. 15 is a schematic structural view of a thread cutting apparatus in an open state of an automatic stitching apparatus of the present invention.

FIG. 16 is a schematic structural view of a thread cutting apparatus in a closed state of an automatic stitching apparatus of the present invention.

List of Reference Numerals

[0017] Sewing apparatus 1, plate metal needle 2, plate metal needle tip head 211, plate metal needle tip 212, plate metal needle body 213, plate metal needle mounting seat 22, first sewing needle 3, second sewing needle 4, motor apparatus 5, large gear 51, eccentric mounting hole 511, first connecting rod 52, long crank 53, pinion handwheel 54, small needle eccentric wheel 55, eccentric shaft end 551, second connecting rod 56, short crank 57, thread cutting apparatus 6, fixed cutting piece 61, movable cutting piece 62, bent hook piece 63, bent push piece 64, bent pull plate 65, eccentric tightening ring 66, plectrum 67, hanging seat 68, large angle pull plate 69, tension spring 70, cylinder 71, support plate 72, fixed seat 73, bolt 74, sewing coil 8, first needle holder 9, second needle holder 10, motor rotation direction 11, first connecting rod motion direction 12, first sewing needle motion direction 13, second connecting rod motion direction 14, second sewing needle motion direction 15, and sewing direction 16.

Detailed Description of the Invention

[0018] Embodiments of the present invention are described with reference to the accompanying drawings below, so that those skilled in the art can better understand and implement the present invention. However, the present invention is not limited by the listed embodiments. In the case of no conflict, the following embodiments and technical features in the embodiments can be combined with each other, where the same components are represented by the same reference numerals.

[0019] The opening of the fabric is taken as an example for describing the apparatus of the present application below, and the present application is not limited to stitching of the opening of the fabric.

[0020] As shown in FIG. 1 and FIG. 2, the present invention provides an automatic stitching apparatus capable of automatically cutting threads, including a sewing apparatus 1 and a thread cutting apparatus 6.

[0021] The sewing apparatus 1 includes: a first sewing needle 3, a second sewing needle 4 and a plate metal needle 2. The first sewing needle 3 (large needle) and the second sewing needle 4 (small needle) knot with each other and cooperate with the plate metal needle 2 to form a sewing coil 8 (shown in FIG. 10), so as to sew the opening of the fabric. The first sewing needle 3 is mounted on a first needle holder 9, the second sewing needle 4 is mounted on a second needle holder 10, and the first needle holder 9 and the second needle holder 10 are driven by a motor apparatus 5 to drive the first sewing needle 3 and the second sewing needle 4 to knot. As shown in FIG. 3, the first sewing needle 3 moves along a direction 13 (first sewing needle motion direction), the second sewing needle 4 moves along a direction 15 (second sewing needle motion direction), and motion planes in which the motion directions of the first sewing needle

3 and the second sewing needle 4 are located are perpendicular to each other.

[0022] FIG. 4 shows a three-dimensional view of a motor apparatus 5 from one perspective. A large gear 51 is fixedly mounted on the motor apparatus 5, a protrusion is mounted on the large gear 51, and the protrusion is provided with an eccentric mounting hole 511.

[0023] FIG. 5 shows a three-dimensional view of a motor apparatus 5 from one perspective. A small needle eccentric wheel 55 is fixedly mounted on the motor apparatus 5, and an eccentric shaft end 551 is fixed on the small needle eccentric wheel 55. The large gear 51 and the small needle eccentric wheel 55 can be mounted on both sides of the motor apparatus 5.

[0024] The large gear 51 and the small needle eccentric wheel 55 can be mounted on a motor shaft. When the motor shaft rotates, the large gear 51 and the small needle eccentric wheel 55 can be driven to rotate simultaneously, thereby simultaneously actuating the first sewing needle 3 and the second sewing needle 4. In this way, the sewing adjustment can be carried out by manually rotating a pinion handwheel 54 (shown as follows).

[0025] As shown in FIG. 6, the sewing apparatus 1 includes a first connecting rod 52 and a long crank 53 which are mounted on a box body. The first needle holder 9 is mounted at the first end of the long crank 53, and the first sewing needle 3 is mounted on the first needle holder 9. The second end of the long crank 53 is connected to the first end of the first connecting rod 52, and the second end of the first connecting rod 52 is mounted on the eccentric mounting hole 511 on the large gear 51 of the motor apparatus 5. When the motor apparatus 5 operates, the large gear 51 is driven to rotate clockwise in a direction 11 of the arrow, and the first connecting rod 52 swings up and down in a direction 12 (first connecting rod motion direction shown in FIG. 8), thereby driving the second end of the long crank 53 to move back and forth in a direction 16. When the eccentric mounting hole 511 operates to the lowest position, the second end of the long crank 53 is pulled and pressed down. When the eccentric mounting hole 511 operates to the highest position, the second end of the long crank 53 restores to the original position. In this way, the first needle holder 9 on the first end of the first connecting rod 52 moves back and forth in the direction 13, so that the first sewing needle 3 moves according to a fixed motion path.

[0026] As shown in FIG. 7, the sewing apparatus 1 further includes a short crank 57 and a second connecting rod 56 which are also mounted on the box body. The second needle holder 10 is mounted on the first end of the short crank 57, and the second sewing needle 4 is mounted on the second needle holder 10. The second end of the short crank 57 is connected to the first end of the second connecting rod 56, the second end of the second connecting rod 56 is connected to the eccentric shaft end 551 of the small needle eccentric wheel 55, and the small needle eccentric wheel 55 is mounted on the motor apparatus 5 and is driven by the motor appa-

ratus 5. When the motor apparatus 5 rotates, the small needle eccentric wheel 55 is driven to rotate in the direction 11 (motor rotation direction, counterclockwise direction), the second connecting rod 56 swings up and down and left and right in a direction 14 (shown in FIG. 8), the short crank 57 is driven to move, and the needle holder 9 moves back and forth in the direction 15, so that the second sewing needle 4 moves according to a fixed motion path.

[0027] Preferably, as shown in FIG. 6 and FIG. 8, a pinion handwheel 54 is mounted on the box body and is meshed with the large gear 51. In the early stage of debugging, the handwheel 54 is manually rotated to drive the large gear 51 to rotate to cause the first sewing needle 3 and the second sewing needle 4 to move, thereby being convenient for observing whether the sewing position is correct and observe the sewing effect. After debugging, the speed of the motor apparatus 5 (controlled by a textile machine computer control system) is configured to achieve a uniform speed and a stable motion effect.

[0028] As shown in FIG. 1 to FIG. 3, the sewing apparatus 1 further includes a plate metal needle mounting seat 22 and the plate metal needle 2, and the plate metal needle 2 is mounted on the plate metal needle mounting seat 22. The structure of the plate metal needle 2 is shown in FIG. 9. The plate metal needle 2 includes a plate metal needle tip 212 and a plate metal needle body 213. The plate metal needle tip 212 is located at one end of the plate metal needle body 213, the plate metal needle tip 212 extends outward and gradually narrows on both sides, and the most front end of the plate metal needle tip 212 has a plate metal needle tip head 211. The plate metal needle 2 is located on the outer side of the first sewing needle 3, and the plate metal needle 2 is parallel to the plane in which the motion direction of the first sewing needle 3 is located, and perpendicular to the plane in which the motion direction of the second sewing needle 4 is located. The first sewing needle 3 and the second sewing needle 4 are interwoven with the plate metal needle 2 for sewing to form a chain stitch (sewing coil 8).

[0029] The motion processes of the first sewing needle 3 and the second sewing needle 4 are described with reference to FIG. 10 to FIG. 14.

[0030] As shown in FIG. 10, the fabric to be stitched is placed in a stitching position. The stitching position is located below the first sewing needle 3, above the second sewing needle 4, and on the left side of the plate metal needle 2. The fabric to be stitched is supported by circular sewing teeth (not shown), and the sewing teeth can rotate or move, so that the sewing coil 8 is always placed in the stitching position. According to the approximate motion direction of the fabric, the motion direction of the fabric to be stitched is shown in the direction 16 (sewing direction) in the figure, which is consistent with the body direction of the plate metal needle 2.

[0031] As shown in two views in a 90 degree direction in FIG. 11, before sewing, the first sewing needle 3 and the second sewing needle 4 are located in initial posi-

tions.

[0032] As shown in two views in a 90 degree direction in FIG. 12, when sewing, the second sewing needle 4 moves upward (shown in the right view in FIG. 12) and passes through a sewing thread carried by the first sewing needle 3, the sewing thread is wound on the needle back of the second sewing needle 4 to form a loop, and the second sewing needle 4 passes through the coil of the fabric; and at the same time, the first sewing needle 3 moves backward (shown in the left view in FIG. 12), the thread wound on the second sewing needle is tightened, and the sewing thread on the first sewing needle 3 is wound on the plate metal needle 2.

[0033] As shown in two views in a 90 degree direction in FIG. 13, after both the first sewing needle 3 and the second sewing needle 4 move to the other end, as shown in FIG. 14, the first sewing needle 3 moves forward (shown in the left view in FIG. 14), the needle tip passes through the sewing thread carried on the second sewing needle, and the sewing thread is wound on the needle back of the first sewing needle 3 to form a loop; and at the same time, the second sewing needle 4 moves downward (shown in the right view in FIG. 14), the thread wound on the first sewing needle is tightened, the sewing thread on the second sewing needle is wound on the plate metal needle 2, and the sewing threads on the first sewing needle 3 and the second sewing needle 4 can be interlaced to form a knot.

[0034] The automatic stitching apparatus of the present invention further includes a thread cutting apparatus 6. After the sewing is completed, the thread needs to be cut. As shown in FIG. 1, FIG. 2, FIG. 15 and FIG. 16, the thread cutting apparatus 6 of the present invention includes: a fixed cutting piece 61 and a movable cutting piece 62.

[0035] The fixed cutting piece 61 and the movable cutting piece 62 form a pair of scissors. When the movable cutting piece 62 moves and overlaps with the fixed cutting piece 61, the thread is cut.

[0036] The fixed cutting piece 61 is fixed on a fixed seat 73, the fixed cutting piece 61 remains stationary, the fixed seat 73 can be mounted on the box body of the sewing apparatus 1, and the fixed cutting piece 61 is located below the first sewing needle 3, thereby being convenient for cutting the thread.

[0037] The movable cutting piece 62 is mounted at the upper end of a bent pull plate 65, the lower end of the bent pull plate 65 is connected to the upper end of a large angle pull plate 69, the lower end of the large angle pull plate 69 is connected to a cylinder 71, and the cylinder 71 extends and retracts to enable the movable cutting piece 62 to move. When air enters the cylinder 71, the thread cutting apparatus 6 is in a closed state (as shown in FIG. 15). When air leaves the cylinder 71, the thread cutting apparatus 6 is in an open state (as shown in FIG. 16). The cylinder 71 is connected to the fixed seat 73 by a support plate 72.

[0038] Preferably, in order to ensure that the thread

cutting apparatus 6 can be quickly opened when air leaves, a tension spring 70 is mounted on the cylinder 71, and the tension spring 70 is connected between the lower end of the large angle pull plate 69 and the cylinder 71. By means of the tension of the tension spring 70, the scissors formed by the fixed cutting piece 61 and the movable cutting piece 62 can be quickly opened after being closed, so as to be prepared for the next thread cutting.

[0039] Preferably, the thread cutting apparatus 6 of the present invention further includes a bent hook piece 63 and a bent push piece 64. The bent hook piece 63 and the movable cutting piece 62 are attached to the upper end of the bent pull plate 65 and can move together. The tail ends of the bent hook piece 63 and the movable cutting piece 62 are fixed on a hanging seat 68 by a bolt 74, and the hanging seat 68 is fixed on the fixed seat 73. When the cylinder 71 moves, the bent hook piece 63 and the movable cutting piece 62 are driven to move around the bolt 74 together. The front end of the bent hook piece 63 is in the shape of a hook, which can hook the sewing coil 8 in the thread cutting process to prevent the sewing coil 8 from sliding out of the cutting position.

[0040] The bent push piece 64 is mounted on the outer side of the bent hook piece 63 and is attached to the bent hook piece 63, and the bent push piece 64 and the bent hook piece 63 can move oppositely. The middle section of the bent push piece 64 can also be fixed on the hanging seat 68 by the bolt 74. The tail end of the bent push piece 64 has a forked structure, and the forked structure accommodates the first end of a plectrum 67.

[0041] The plectrum 67 has an L-shaped structure, and the first end of the plectrum 67 is clamped in the forked structure at the tail end of the bent push piece 64. The second end of the plectrum 67 is clamped between an eccentric tightening ring 66 of the bent pull plate 65 and the upper end of the large angle pull plate 69 (that is, the joint between the large angle pull plate 69 and the bent pull plate 65), and the motion route of the second end of the plectrum 67 is also located between the eccentric tightening ring 66 and the upper end of the large angle pull plate 69.

[0042] The bent push piece 64 and the bent hook piece 63 move in opposite motion directions, as described in detail below.

[0043] As shown in FIG. 15 and FIG. 16, before thread cutting, the movable cutting piece 62 and the bent hook piece 63 are opened. When thread cutting is required, the cylinder 71 is propelled to push the lower end of the large angle pull plate 69, the upper end of the large angle pull plate 69 descends, the lower end of the bent pull plate 65 is pulled, the bent pull plate 65 descends, and the movable cutting piece 62 and the bent hook piece 63 are driven to approach the middle. On the other hand, when the bent pull plate 65 descends, the eccentric tightening ring 66 descends, and the second end of the plectrum 67 is pressed down. Correspondingly, the first end of the plectrum 67 pushes the forked structure at the tail

end of the bent push piece 64 to swing leftward, and the bent push piece 64 approaches the middle to achieve thread cutting.

[0044] After the thread cutting is completed, the cylinder 71 is deflated and evacuated outward, the lower end of the large angle pull plate 69 is pulled, the upper end of the large angle pull plate 69 rises, and the upper end raises the second end of the plectrum 67. Correspondingly, the first end of the plectrum 67 pushes the forked structure at the tail end of the bent push piece 64 to swing rightward, and the bent push piece 64 moves outward. At the same time, the upper end of the large angle pull plate 69 rises, the lower end of the bent pull plate 65 is pushed, the bent pull plate 65 rises, and the movable cutting piece 62 and the bent hook piece 63 are pushed to move outward, thereby achieving the opening of the thread cutting apparatus 6. From FIG. 16, it can be seen that the positions of the bent push piece 64 and the bent hook piece 63 may be staggered.

[0045] The front end of the bent push piece 64 and the front end of the bent hook piece 63 are similar in the shape of a bent hook and both have an inward bent hook (when the front end of the bent push piece 64 and the bent hook piece 63 are opened, the bent hook directions of both are opposite to each other) to play the following roles: before the thread cutting action is completed, the bent push piece 64 pushes the sewing coil, at this time, the movable cutting piece 62 and the bent hook piece 63 are not closed with the fixed cutting piece 61, some space is left, and the bent push piece 64 can push out the sewing coil for a certain length, thereby leaving a safe sewing coil length. In the thread cutting process, the front end of the bent hook piece 63 is in the shape of a hook, which can hook the sewing coil 8 to prevent the sewing coil 8 from sliding out of the cutting position. By the bent push piece 64, after the thread cutting action is completed, the lengths of the sewing coil left at both ends of the opening of the fabric are consistent, and the lengths of the sewing coil left at both ends of the opening of the fabric may be controlled by adjusting the position of the eccentric tightening ring 66 (that is, the route range of the plectrum 67), which may be long or short.

[0046] The thread cutting apparatus 6 is placed below the sewing point of the sewing apparatus 1 in the illustrated embodiments, and may also be placed above or on both sides. The distance between a thread cutting plane of the thread cutting apparatus 6 or a thread cutting point position and the plate metal needle tip head 211 is preferably 10.1-20 mm, and the distance between the thread cutting plane or the thread cutting point position and a motion intersection point of the first sewing needle 3 and the second sewing needle 4 is preferably 15.1-25 mm. If the distance is too close, there will be mutual interference in mechanical structures. If the distance is too far, the thread cutting apparatus will be unable to cut the thread and lose the thread cutting function.

[0047] The present invention achieves the function of automatically sewing the opening of a cylindrical fabric

such as a sock; after the sewing is completed, the sewing coil can be automatically cut off, and the length dimension of the cut-off coil can be adjusted freely, thereby greatly improving the production efficiency of the fabric; there is no need to perform secondary processing on the fabric to form a finished product, thereby greatly reducing the production cost, and achieving the purpose of automated production; and the sewing speed is high, the sewing is accurate, and the qualification rate of the fabric is greatly improved.

[0048] The above embodiments are only the preferred specific embodiments of the present invention. This specification uses the phrases "in one embodiment", "in another embodiment", "in further another embodiment", or "in other embodiments", which can all refer to one or more of the same or different embodiments according to the present disclosure. General changes and replacements made by those skilled in the art within the scope of the technical solution of the present invention should be included in the scope of protection of the present invention.

Claims

1. A thread cutting apparatus, comprising:

- a fixed seat (73);
- a fixed cutting piece (61) fixed on the fixed seat (73);
- a movable cutting piece (62) fixed on the fixed seat (73) by a bolt (74);
- a bent pull plate (65), wherein the upper end of the bent pull plate (65) is combined with the tail end of the movable cutting piece (62); and
- a large angle pull plate (69), wherein the upper end of the large angle pull plate (69) is combined with the lower end of the bent pull plate (65); and
- when the lower end of the large angle pull plate (69) is pushed and pulled, the movable cutting piece (62) is opened and closed relative to the fixed cutting piece (61).

2. The thread cutting apparatus according to claim 1, further comprising:

- a bent hook piece (63) attached to and mounted together with the movable cutting piece (62) and moving together with the movable cutting piece (62);
- a bent push piece (64) fixed on the fixed seat (73) by the bolt (74); and
- a plectrum (67), wherein the first end of the plectrum (67) is combined with the tail end of the bent push piece (64) to push and pull the bent push piece (64), and the second end of the plectrum (67) is capable of moving between an eccentric tightening ring (66) on the bent pull plate

- (65) and the upper end of the large angle pull plate (69).
3. The thread cutting apparatus according to claim 2, wherein
the heads of the bent hook piece (63) and the bent push piece (64) are respectively in a bent hook shape, and bent hooks are opposite. 5
 4. The thread cutting apparatus according to claim 3, wherein 10
when the lower end of the large angle pull plate (69) is pushed, the movable cutting piece (62) is close to the fixed cutting piece (61), and the plectrum (67) pushes the bent push piece (64) to approach the middle; before a thread is cut, the bent push piece (64) first contacts and pushes out a certain length of the thread to be cut, then the bent hook piece (63) contacts and tightens the thread to be cut, and the movable cutting piece (62) and the fixed cutting piece (61) cut the thread; and 15
when the lower end of the large angle pull plate (69) is pulled, the bent hook piece (63) and the movable cutting piece (62) are away from the fixed cutting piece (61), and the bent push piece (64) and the bent hook piece (63) move in opposite directions. 20 25 30
 5. The thread cutting apparatus according to claim 4, further comprising:
a cylinder (71) connected to the lower end of the large angle pull plate (69); and 35
a tension spring (70) connected to the cylinder (71) and the large angle pull plate (69).
 6. An automatic stitching apparatus, comprising: 40
the thread cutting apparatus (6) according to any one of claims 1 to 4; and
a sewing apparatus (1) provided with a first sewing needle (3), a second sewing needle (4) and a plate metal needle (2) that cooperate with each other for knotting; wherein 45
the position of the thread cutting apparatus (6) is close to a sewing point of the sewing apparatus (1), and after the sewing of the sewing apparatus (1) is completed, the thread on a sewing coil (8) is cut. 50
 7. The automatic stitching apparatus according to claim 6, wherein the sewing apparatus (1) further comprises: 55
a first connecting rod (52), wherein the first end of the first connecting rod (52) is connected to

- the second end of a long crank (53), a first needle holder (9) is mounted at the first end of the long crank (53), and the first sewing needle (3) is mounted on the first needle holder (9); and
a second connecting rod (56), wherein the first end of the second connecting rod (56) is connected to the second end of a short crank (57), a second needle holder (10) is mounted at the first end of the short crank (57), and the second sewing needle (4) is mounted on the second needle holder (10).
8. The automatic stitching apparatus according to claim 7, further comprising a motor apparatus (5), wherein the motor apparatus (5) comprises:
a motor shaft;
a large gear (51) connected to one end of the motor shaft, wherein the large gear (51) is provided with an eccentric mounting hole (511), and the eccentric mounting hole (511) is configured to accommodate the second end of the first connecting rod (52); and
a small needle eccentric wheel (55) connected to the other end of the motor shaft, wherein the small needle eccentric wheel (55) has an eccentric shaft end (551), and the eccentric shaft end (551) is combined together with the second end of the second connecting rod (56).
 9. The automatic stitching apparatus according to claim 8, further comprising:
a pinion handwheel (54) meshed with the large gear (51).
 10. The automatic stitching apparatus according to claim 6, wherein
the distance between a thread cutting plane of the thread cutting apparatus (6) or a thread cutting point position and a plate metal needle tip head (211) of the plate metal needle (2) is 10.1-20 mm, and the distance between the thread cutting plane or the thread cutting point position and a motion intersection point of the first sewing needle (3) and the second sewing needle (4) is 15.1-25 mm.

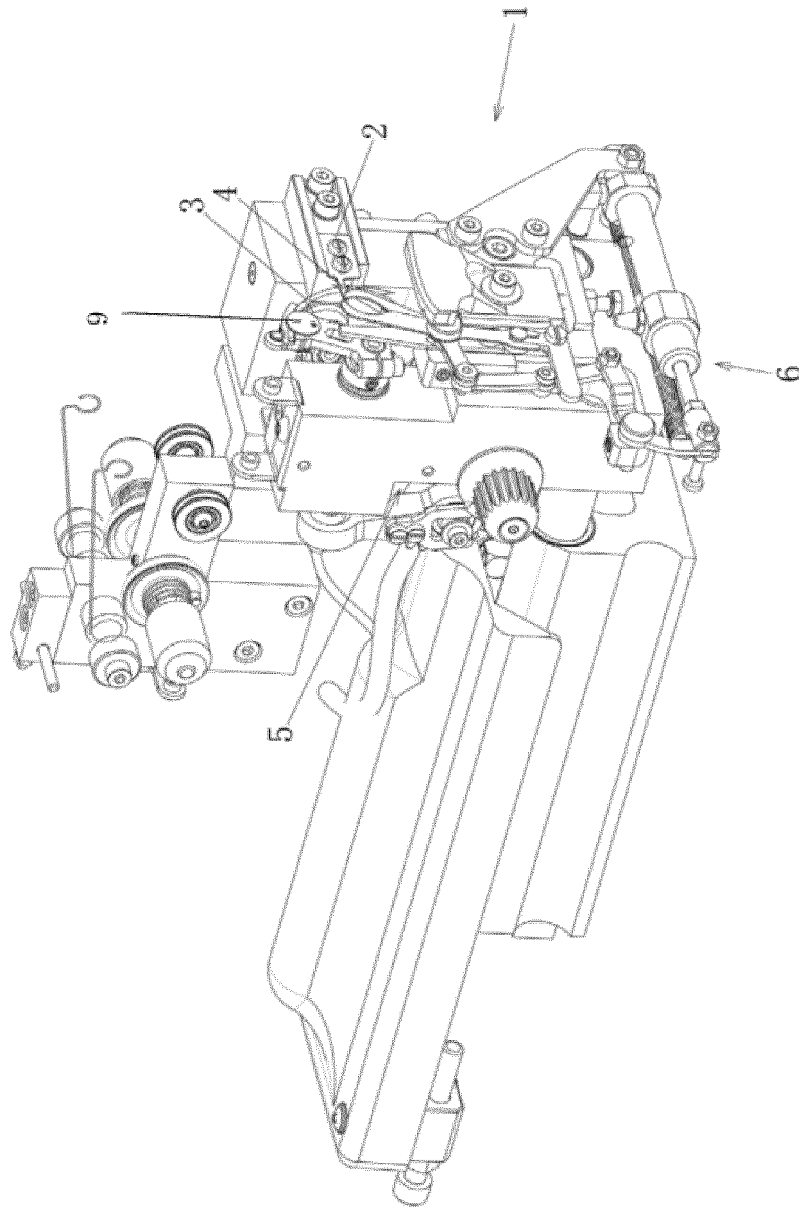


FIG. 1

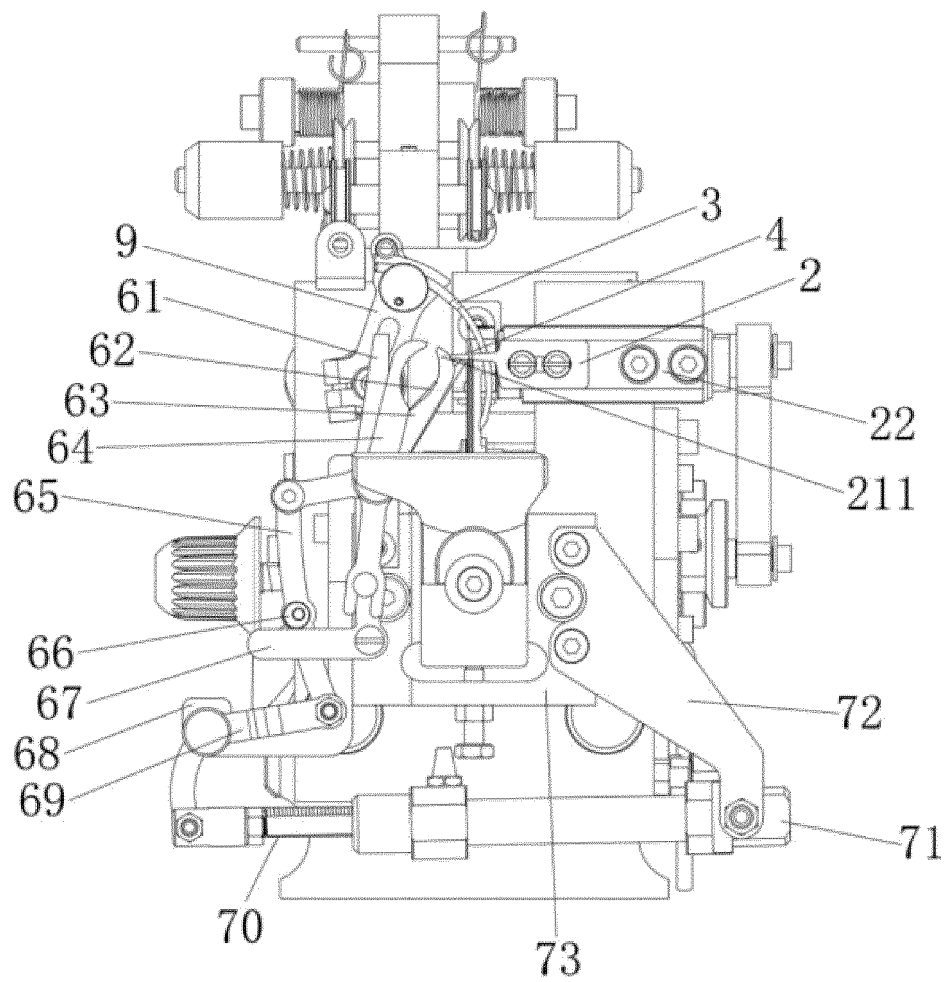


FIG. 2

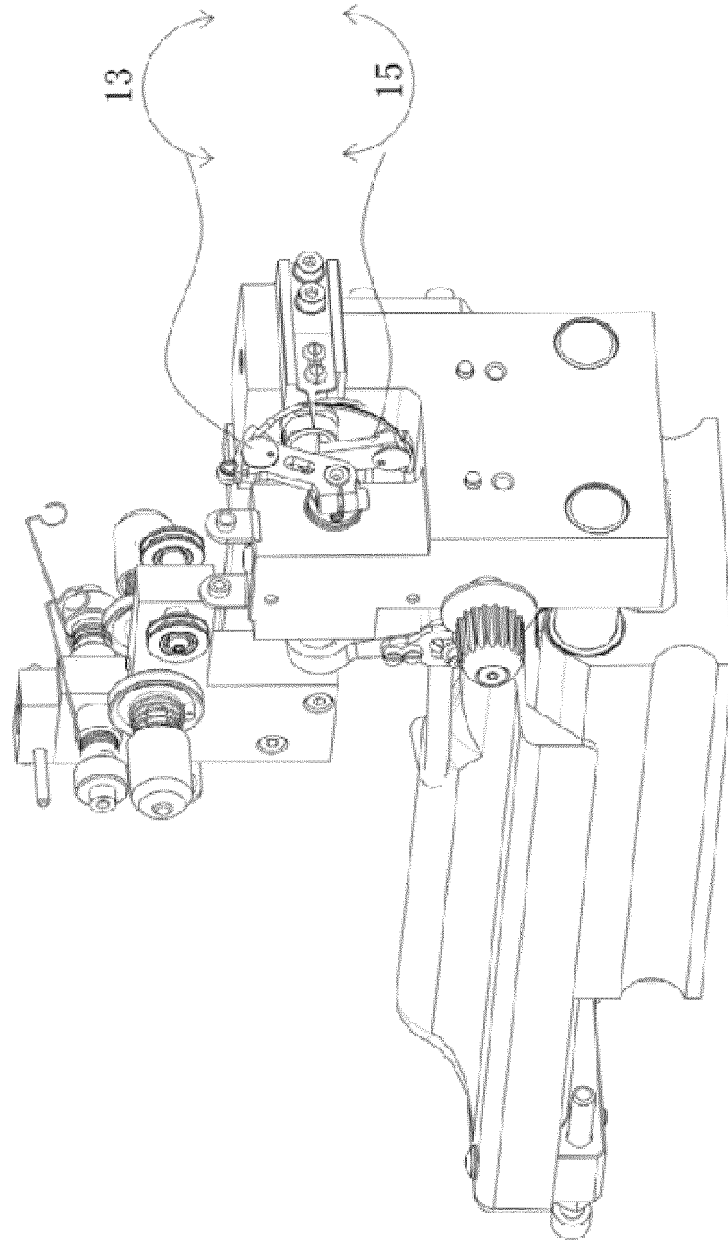


FIG. 3

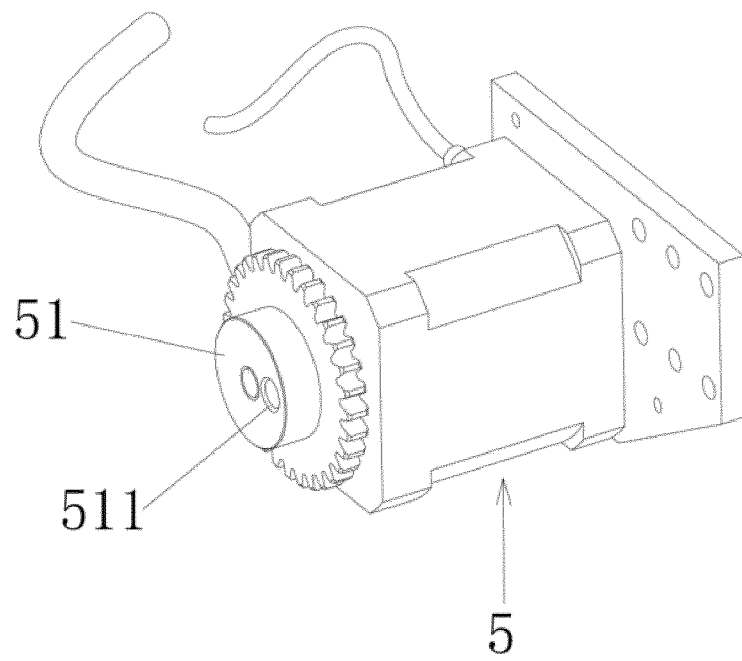


FIG. 4

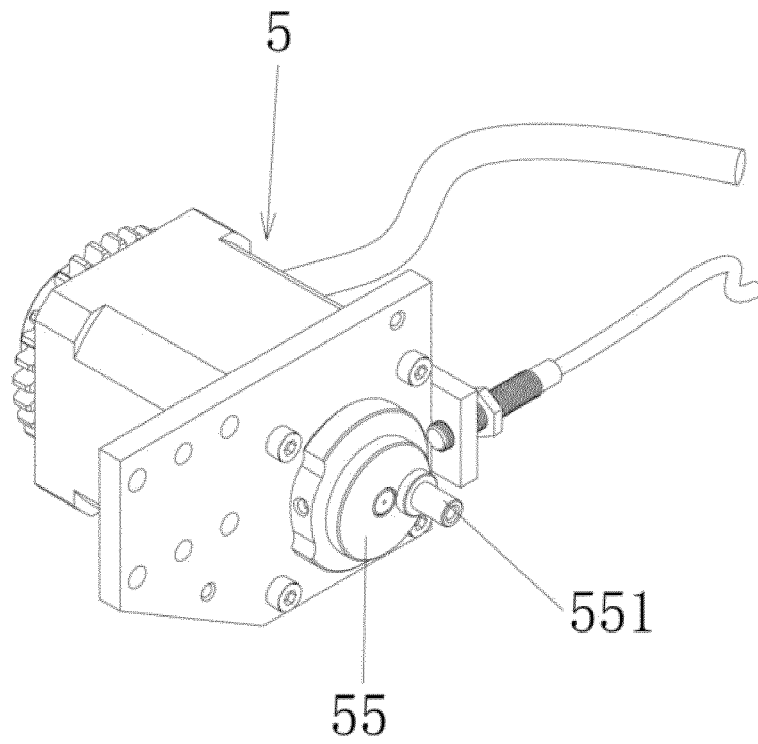


FIG. 5

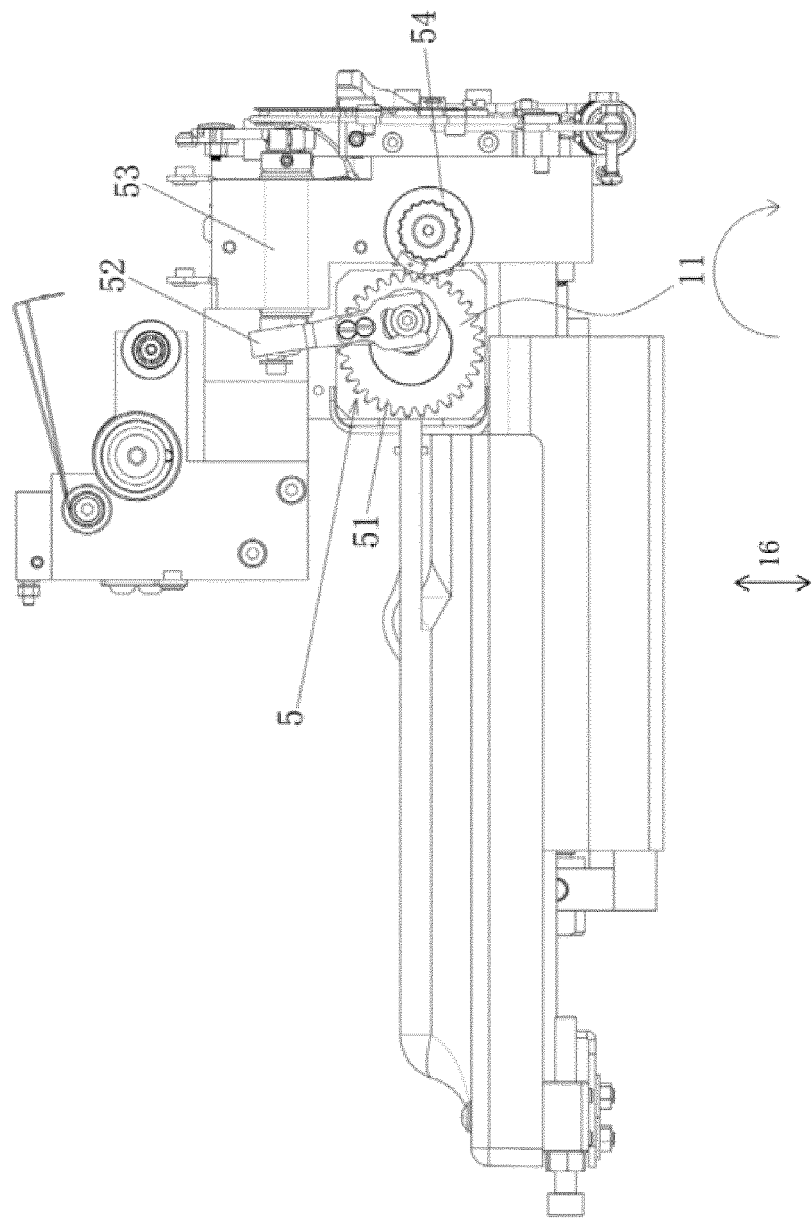


FIG. 6

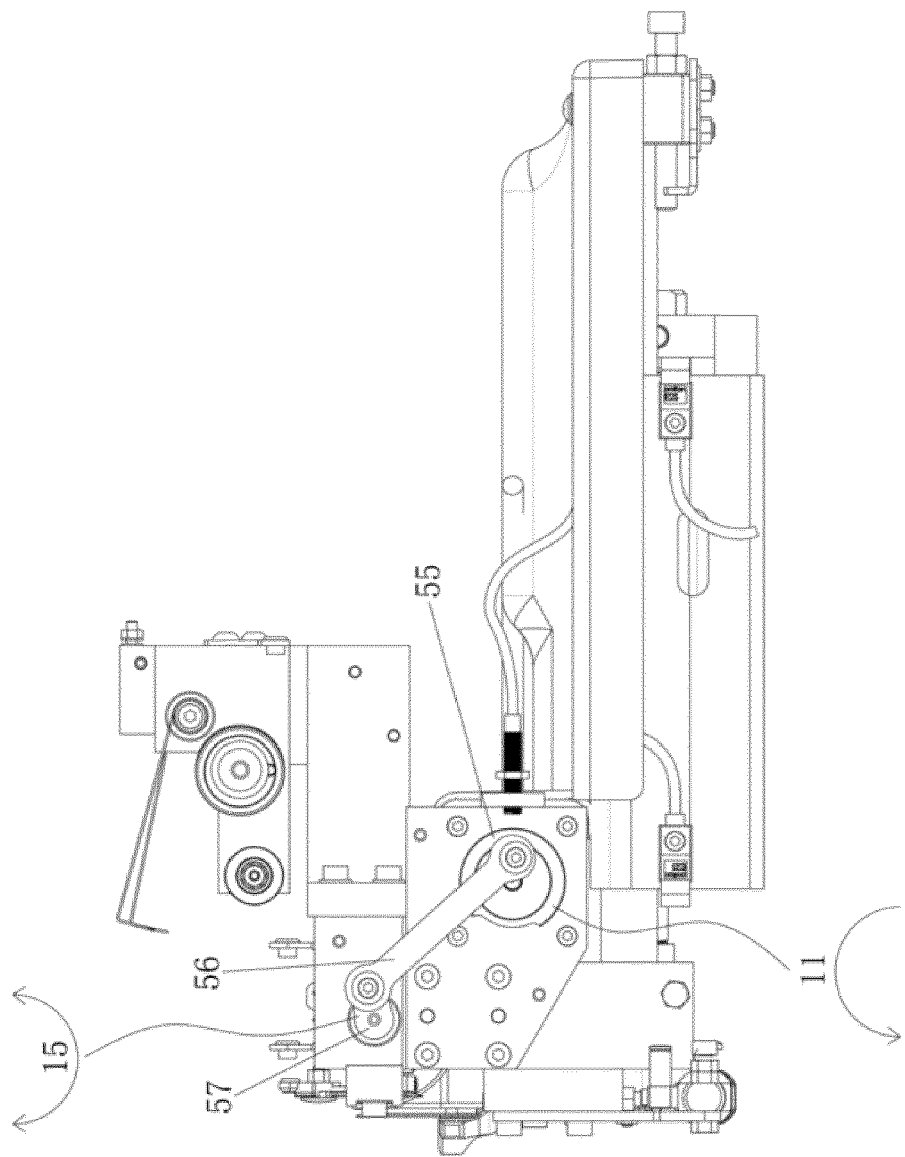


FIG. 7

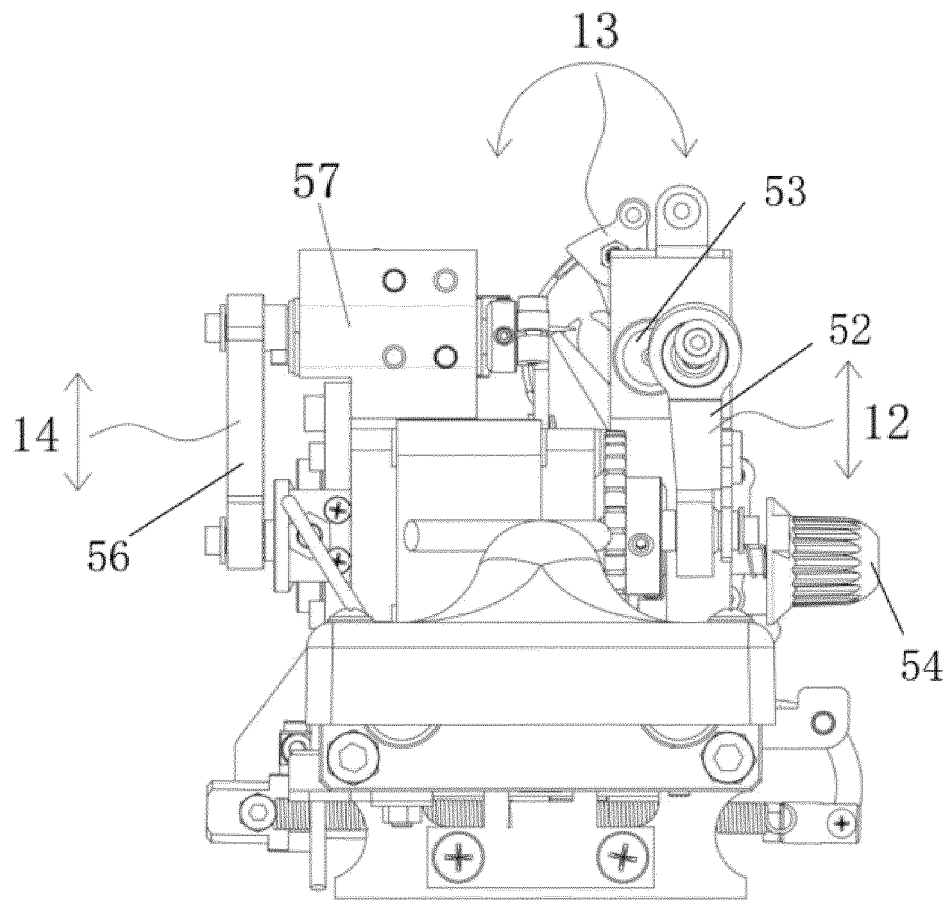


FIG. 8

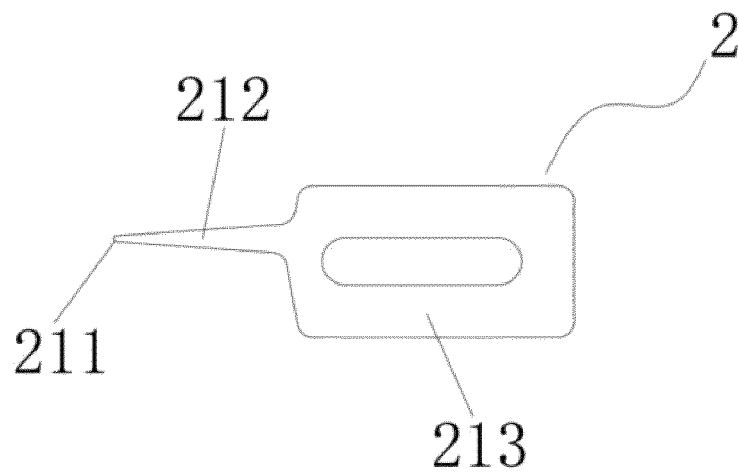


FIG. 9

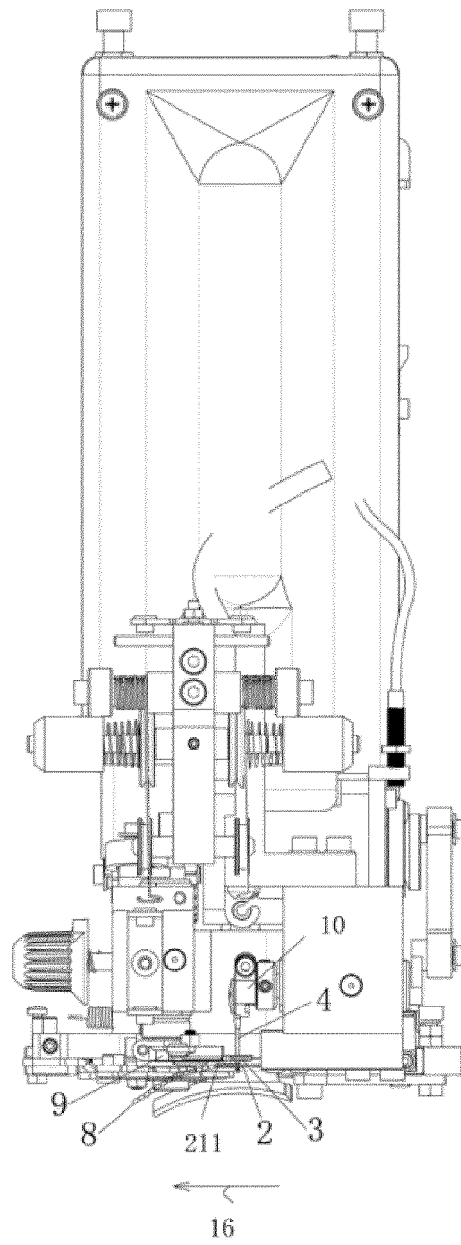


FIG. 10

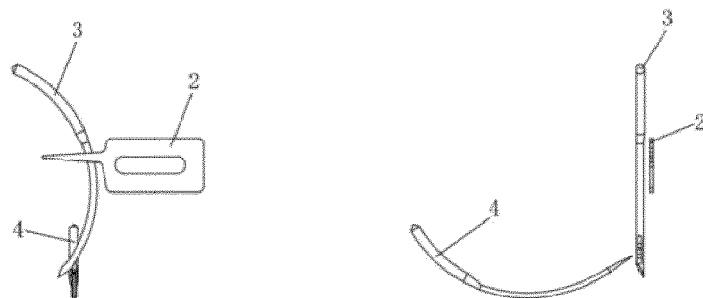


FIG. 11

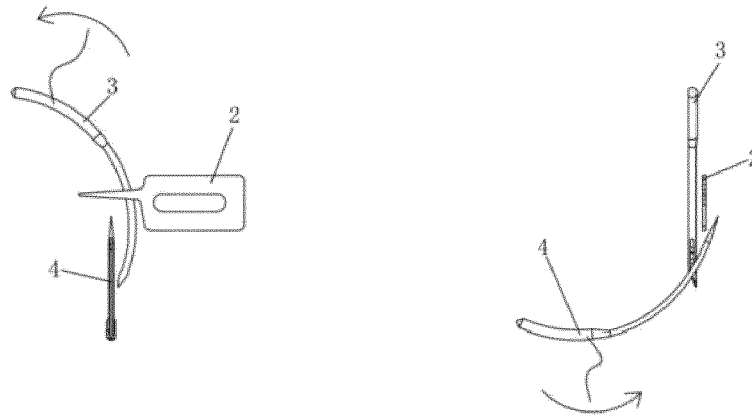


FIG. 12

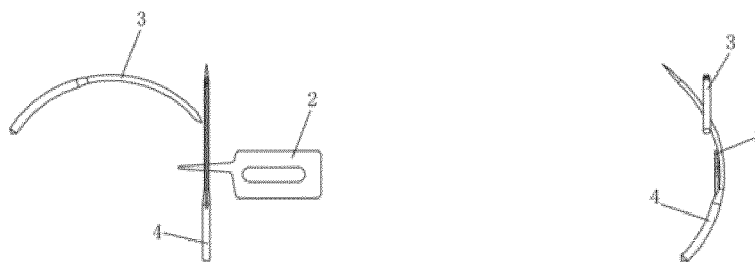


FIG. 13

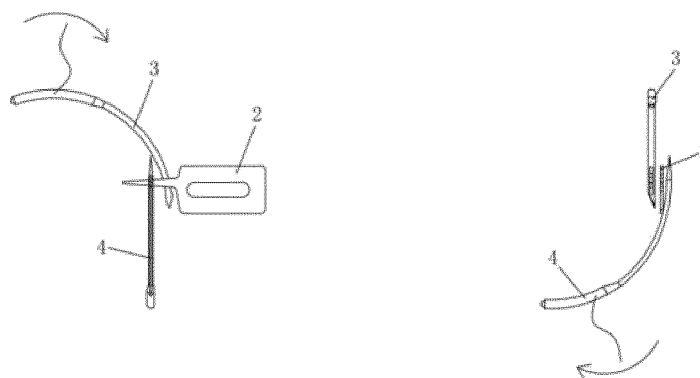


FIG. 14

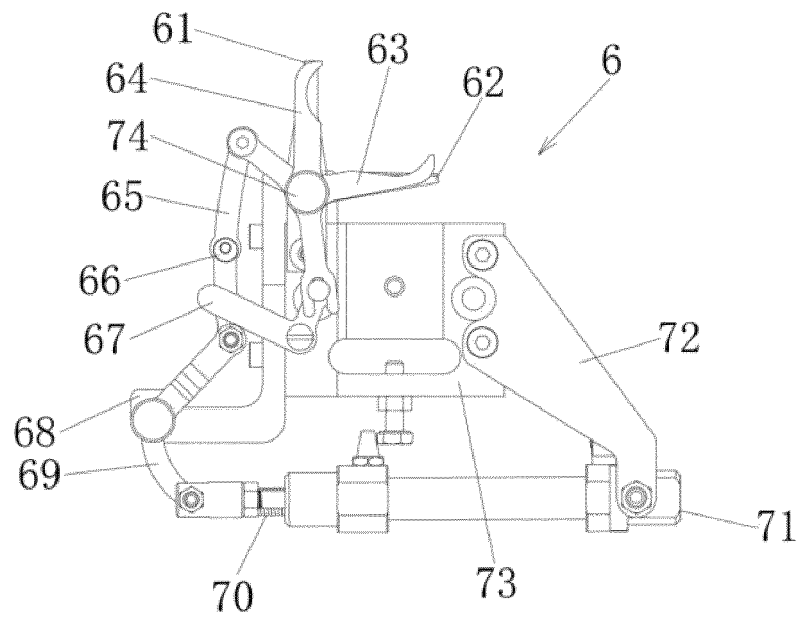


FIG 15

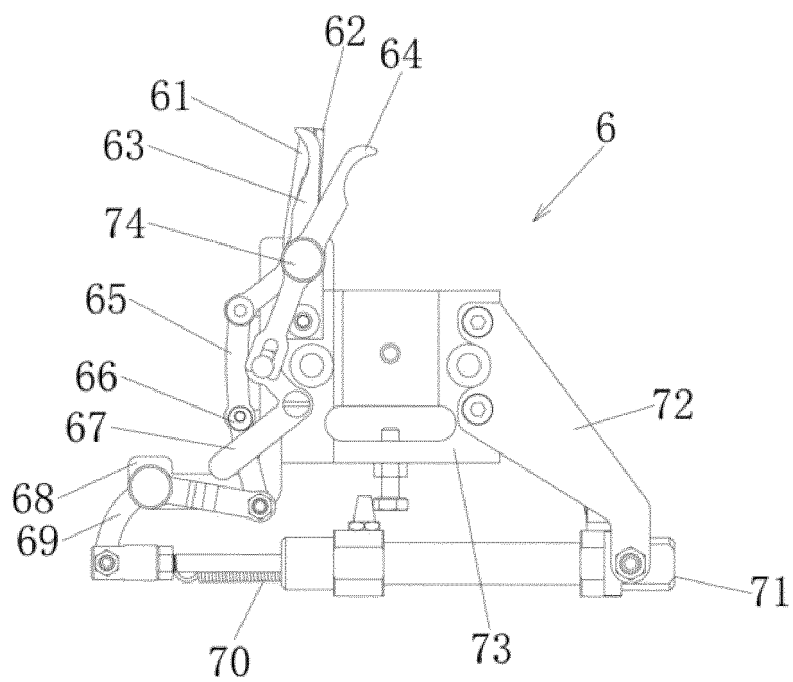


FIG 16



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Application Number

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Place of search Munich		Date of completion of the search 8 January 2024	Examiner Braun, Stefanie
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