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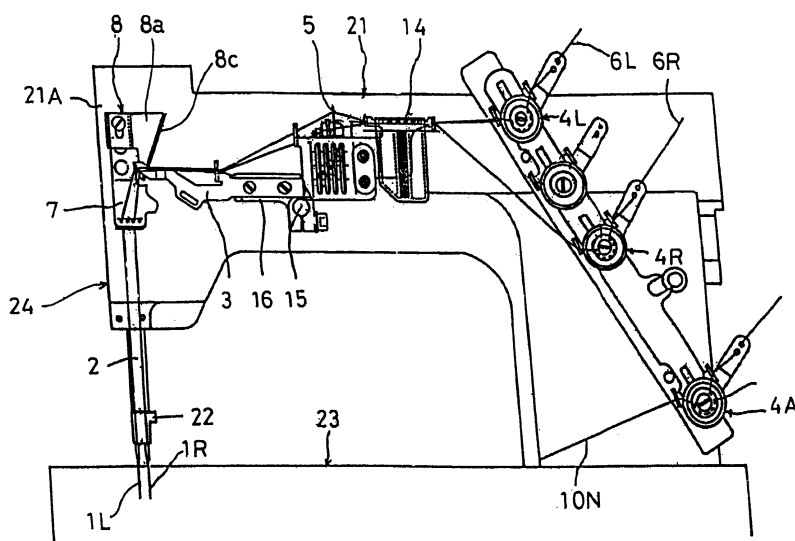
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(54) **Needle thread guide device for double chain stitch sewing machine**

(57) A needle thread guide device for double ring stitch sewing machine is used for the case that a double ring stitch is formed by forming a plurality of needle thread loops below a fabric and allowing a looper to successively enter these needle thread loops. The needle thread guide device has a cam (8c) which is formed at a location near a thread receiving surface (8a) of a needle thread guide (8), so as to be integral with the needle thread guide (8). The cam applies a tensile force, immediately before a looper enters, to a needle thread loop

(6Lr) of a left needle thread (6L) which the looper enters finally in plural needle threads (6R, 6L) being received and supported on the thread receiving surface (8a) of the needle thread guide (8), as a movable needle thread take-up (3) rocks upward relative to rising movement of right and left needles (1R, 1L) from a bottom dead point. With this construction, it is avoided that the looper erroneously enters the plural needle thread loops, and a pre-determined stitch is therefore formed reliably without causing skip-stitch.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention generally relates to a needle thread guide device for double chain stitch sewing machine and, in particular, to a needle thread guide device for double chain stitch sewing machine in which a double chain stitch is formed by allowing a looper to successively enter a plurality of needle thread loops when two or more needles aligned in a direction orthogonal to a sewing direction move upward from a bottom dead point of their vertically reciprocal path, while forming a needle thread loop on a lower part of a fabric.

2. Description of the Prior Art

[0002] As a conventional needle thread guide device for double chain stitch sewing machine having a plurality of needles, Fig. 7 shows an important part of one which has two needles. This needle thread guide device comprises a movable needle thread take-up 3 and a needle thread guide 8 fixedly secured to an arm part (not shown) in the vicinity of the leading end of the movable needle thread take-up 3. The needle thread take-up 3 rocks vertically reciprocally as indicated by the arrow u, in synchronism with the vertically reciprocal motion of right and left needles 1R and 1L, in order to control feed of right and left needle threads 6R, 6L which are supplied to the right and left needles 1R, 1L, via thread tension devices 4R, 4L, a needle thread eyelet 5 and a needle thread take-up guide 7. These needles 1R and 1L are supported via a needle bar 2 aligned in a direction orthogonal to the sewing direction Y, so as to be reciprocally movable in the vertical direction Z. When the right and left needles 1R and 1L are located at the bottom dead point and the movable needle thread take-up 3 rocks downward, the needle thread guide 8 receives and supports from the underside a needle thread portion between a first needle thread through-hole 3a formed at the leading end of the movable needle take-up 3, and a second needle thread through-hole 3b located toward the side of a rocking basal end, as shown in Fig. 8. A needle thread take-up guard 9 is formed at the front of the needle thread guide 8.

[0003] The needle thread guide 8 is, as shown in Figs. 7 and 8, made up of a mounting plate 8a vertically adjustably attached via a slot 11 and a screw 12 to the needle thread take-up guide 7 fixed to an arm part (which is the same as that designated by reference 21 in Fig. 1), and a bar-like thread receiving surface 8b to receive and support the right and left needle threads 6R and 6L on a single plane. The looper 10 is disposed in a bed part (which is the same as that designated by reference 23 in Fig. 1). When a looper thread 10N is supplied via a thread tension device 4A, and the right and left needles 1R and 1L move upward from the bottom dead point, the looper 10 moves forward from one side to the other in the aligned needles 1R and 1L, that is, from the right to the left as viewed in the drawing, thereby successively entering two needle thread loops to be described later.

[0004] Operation of the needle thread guide device for the two-needle double chain stitch sewing machine so constructed will be described by referring to Figs. 9A, 9B, ... 11D. Figs. 9A, 10A, 11A are diagrams illustrating a positional relation between the leading end of the movable needle thread take-up 3 and the needle thread guide 8. Figs. 9B, 10B and 11B are diagrams illustrating a state that the needle thread guide 8 receives a needle thread. Figs. 9C, 10C and 11C are diagrams in which the right and left needles 1R and 1L are slightly drifted for convenience in illustrating a state of a needle thread loop. Figs. 10D and 11D are diagrams when the right and left needles 1R and 1L are viewed from the sewing direction.

[0005] As shown in Figs. 9A, 9B and 9C, when the right and left needles 1R and 1L are both located at the bottom dead point and the movable needle thread take-up 3 rocks downward, portions of the right needle threads 6R and 6L between the first and second needle thread through-holes 3a and 3b of the movable needle thread take-up 3 are received and supported from the underside by the thread receiving surface 8b of the needle thread guide 8.

[0006] In this state, as shown in Fig. 10C, the right and left needles 1R and 1L move upward while forming needle thread loops 6Rr and 6Lr, respectively. As shown in Fig. 10D, the looper 10 moves forward and its leading end enters the right needle loop 6Rr. At this time, as the movable needle thread take-up 3 rocks upward, the right and left needle threads 6R and 6L depart from the thread receiving surface 8b of the needle thread guide 8 and then move upward in a straight line, as shown in Fig. 9B.

[0007] As shown in Figs. 11C and 11D, the leading end of the looper 10 enters the left needle thread loop 6Lr and the looper thread 10N catches both needle threads 6R and 6L. At this time, as shown in Fig. 11B, the right and left needle threads 6R and 6L depart from the thread receiving surface 8b of the needle thread guide 8 and move upward in a straight line. Then, a known sewing operation such as feed of the fabric, descent of both needles 1R and 1L, return of the looper 10 are performed to form a predetermined double chain stitch.

[0008] In the conventional needle thread guide device for double chain stitch sewing machine with a plurality of needles which has such construction and operation as described above, there is a difference in timing that the looper 10 enters the needle thread loops 6Rr and 6Lr. Specifically, in the case of the two-needle double chain stitch sewing machine as described, the looper 10 first enters and passes through the right needle thread loop 6Rr and then enters the left needle thread loop 6Lr.

That is, due to a time deviation in the timing of entering the needle thread loops, the left needle thread loop 6Lr is greater than the right needle thread loop 6Rr by the amount of the time deviation. Because of the twisted state and characteristic of the needle thread, the greater needle thread loop 6Lr falls down in the direction indicated by the arrow c in Fig. 11C, or hangdowns by its own weight. As a result, the leading end of the looper 10 might fail to enter the left needle thread loop 6Lr and the looper needle 10N catches the needle threads 6R and 6L incompletely and unreliably. This results in skip-stitch and fails to form a predetermined double chain stitch.

SUMMARY OF THE INVENTION

[0009] It is therefore an object of the present invention to overcome the foregoing drawback by providing a needle thread guide device for double chain stitch sewing machine in which a simple constructional improvement is made in a needle thread guide to avoid that a looper erroneously enters a plurality of needle thread loops, in order to reliably form a predetermined stitch without causing skip-stitch.

[0010] According to the present invention, a needle thread guide device for double ring stitch sewing machine comprising: (i) plural needles movable vertically reciprocally aligned in a direction orthogonal to a sewing direction; a looper moving forward from one side to the other of the aligned plural needles so as to successively enter plural needle thread loops when the plural needles move upward from a bottom dead point while forming a needle thread loop; (ii) a movable needle thread take-up rocking vertically reciprocally as the needles move vertically reciprocally, thereby to control feed of a needle thread supplied to the needles via a thread tension device and a needle thread eyelet, the movable needle thread take-up being disposed outside of an arm part; and (iii) a needle thread guide fixed to the arm part in the vicinity of the leading end of the movable needle thread take-up, the needle thread guide receiving and supporting, from its underside, needle thread portions between first and second needle thread through-holes when the needles are located at the bottom dead point and the movable needle thread take-up rocks downward, the first needle thread through-hole being formed at the leading end of the movable needle thread take-up, the second needle thread through-hole being formed toward the side of a rocking basal end of the movable needle thread take-up so as to bend and guide part of a needle thread hung between the first needle thread through-hole and the needle thread eyelet, is characterized by having a cam disposed at a location near a thread receiving surface of the needle thread guide, the cam applying a tensile force, immediately before the looper enters, to a needle thread loop of at least one needle thread supplied to a needle which the looper enters finally in plural needle threads being received and

supported on a thread receiving surface of the needle thread guide as the movable needle thread take-up rocks upward relative to rising movement of the needles from the bottom dead point, the tensile force being retained until the looper enters the needle thread loop.

[0011] With this construction, it is avoided that a needle thread loop corresponding to the needle that the looper enters finally becomes large and falls down or hangdowns. Therefore, the looper does not erroneously enter a plurality of needle thread loops thereby to provide the effect that a predetermined double chain stitch is reliably formed without causing any skip-stitch. This permits an improved quality of sewing product.

[0012] In the above needle thread guide device, the cam for applying a tensile force to a needle thread may be separated from the needle thread guide. Preferably, the cam is folded so as to be integral with the thread receiving surface of the needle thread guide. Thereby, the parts are unified so that attachment to the arm part is facilitated and also the timing of applying a tensile force is optimized.

[0013] Alternatively, the cam may be constructed so that it can adjust a tensile force applied to a needle thread. Thereby, according to the twisted state and characteristic of the needle thread, the tensile force can be adjusted appropriately and a predetermined function can be performed reliably irrespective of the kind of the needle thread.

[0014] Alternatively, the cam may be configured so that it can continuously apply a tensile force to tighten the needle thread even after the looper enters the needle thread loop. This enables to tighten the needle thread by tensing the needle thread after the looper thread catches the needle loop, thereby forming a stitch in accordance with stretch of the fabric.

[0015] The timing of applying a tensile force to a needle thread supplied to the needle that the looper enters finally (i.e., the left needle when there are two needles) may be immediately before the looper enters the corresponding needle thread loop, that is, the time between the point the needle starts moving upward from the bottom dead point and the point the leading end of the looper enters the corresponding needle thread loop. In the present specification, this period of time is referred to as "immediately before the looper enters."

[0016] In addition, it is of course able to apply the present invention to interlock stitch sewing machines having a plurality of needles for sewing an upper fancy thread into a double ring stitch.

[0017] These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a front view, partially broken away, disclosing a two-needle double chain stitch sewing machine to which the present invention is applied; Fig. 2 is an enlarged front view of an important part of Fig. 1;

Fig. 3 is a perspective view of an important part of a needle thread guide device for the two-needle double chain stitch sewing machine;

Figs. 4A, 4B and 4C are diagrams illustrating a first state of a needle thread guide operation performed by a needle thread guide device for the two-needle double chain stitch sewing machine;

Figs. 5A, 5B, 5C and 5D are diagrams illustrating a second state of the needle thread guide operation performed by the needle thread guide device for the two-needle double chain stitch sewing machine;

Figs. 6A, 6B, 6C and 6D are diagrams illustrating a third state of the needle thread guide operation performed by the needle thread guide device for the two-needle double chain stitch sewing machine;

Fig. 7 is a perspective view of a conventional needle thread guide device for two-needle double chain stitch sewing machine;

Fig. 8 is a perspective view of an important part of the conventional needle thread guide device for two-needle double chain stitch sewing machine;

Figs. 9A, 9B and 9C are diagrams illustrating a first state of a needle thread guide operation performed by the conventional needle thread guide device;

Figs. 10A, 10B, 10C and 10D are diagrams illustrating a second state of the needle thread guide operation performed by the conventional needle thread guide device; and

Figs. 11A, 11B, 11C and 11D are diagrams illustrating a third state of the needle thread guide operation performed by the conventional needle thread guide device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] Preferred embodiments of the present invention will be described by referring to the accompanying drawings.

[0020] Fig. 1 is a front view, partially broken away, disclosing a two-needle double chain stitch sewing machine to which the present invention is applied. Fig. 2 is an enlarged front view of an important part of Fig. 1. In Figs. 1 and 2, on a leading end 21A of an arm part 21, a needle bar 2 is supported so as to be movable vertically reciprocally via upper and lower bearings (not shown). Disposed near the needle bar 2 is a fabric pressing mechanism, which is well known and a description thereof is thus omitted. Two needles, i.e., right and left needles 1R and 1L, are attached via a pointer

stop 22 to the lower end of the needle bar 2. A bed part 23 extends from a lower part of the basal end of the arm part 21 to the left in parallel relation to the arm part 21. The leading end of the bed part 23 contains components for sewing operation such as a throat plate, pressing mechanism, looper 10 and feed mechanism, which are well known and a description thereof is thus omitted. A double chain stitch sewing machine frame 24 is made up of the bed part 23 and arm part 21.

[0021] In a needle thread guide device for the two-needle double chain stitch sewing machine, the frame 24 is basically provided with components similar to those in the conventional two-needle double chain stitch sewing machine as described with respect to Figs. 7 and 8. Representative components are thread tension devices 4R, 4L and 4A; a needle thread eyelet 5; a needle thread take-up guide 7; a needle thread take-up 3 that rocks vertically reciprocally in synchronism with the vertical reciprocation of the right and left needles 1R and 1L, in order to control feed of right and left needle threads 6R and 6L; and a needle thread guide 8 that receives and supports, from the underside, a needle thread portion between a first needle through-hole 3a formed on the side of the leading end and a second needle thread through-hole 3b formed toward the side of a rocking basal end in the movable needle thread take-up 3. The construction and function of these components are identical with that shown in Fig. 8, and the same reference numerals are used for similar parts and a description thereof is thus omitted.

[0022] In addition to the above-mentioned components, a needle thread oiling device 14 is provided on the needle thread eyelet 5. The oiling device 14 applies a lubricating oil to the right and left needle threads 6R and 6L passing through the needle thread eyelet 5, thereby preventing occurrence of trouble such as broken thread and skip-stitch when using a synthetic fiber thread or fabric. As shown in Fig. 2, the movable needle thread take-up 3 is constructed so that it relatively moves to a driving main shaft (not shown) and is vertically reciprocally rockable via a needle thread feed bracket 16, by reciprocal rotation of a needle thread feed shaft 15 exposed from the outside part of the arm part 21 in the frame 24.

[0023] The needle thread guide 8 of the needle thread guide device in the two-needle double chain stitch sewing machine is, as shown in Figs. 2 and 3, made up of a mounting plate 8a attached vertically adjustably via a slot 11 and a screw 12 to the needle thread take-up guide 7 fixed to the arm part 21, and a bar-like thread receiving surface 8b to receive and support the right and left needle threads 6R and 6L on a single plane. The looper 10 approaches the right and left needle threads 6R and 6L in the order named, which are received and supported on the thread receiving surface 8b, as the movable needle thread take-up 3 rocks upward. In proximity of the thread receiving surface 8b, a cam 8c is integrally formed by folding the mounting plate 8a. The

cam 8c can apply a tensile force to the left needle thread 6L immediately before the looper 10 enters a needle thread loop 6Lr.

[0024] Operation of a needle thread guide for the two-needle double chain stitch sewing machine so constructed will be described by referring to Figs. 4A, 4B, ... 6D. These figures correspond to Figs. 11A, 11B, ... 11D illustrating the operation of the conventional needle thread guide. That is, Figs. 4A, 5A and 6A are diagrams illustrating a positional relation between the leading end of the movable needle thread take-up 3 and the needle thread guide 8. Figs. 4B, 5B and 6B are diagrams illustrating a state that the needle thread guide 8 receives a needle thread. Figs. 4C, 5C and 6C are diagrams in which the right and left needles 1R and 1L are slightly drifted for convenience in illustrating a state of a needle thread loop. Figs. 5D and 6D are diagrams when the right and left needles 1R and 1L are viewed from the sewing direction.

[0025] As shown in Figs. 4A and 4C, when the right and left needles 1R and 1L are both located at the bottom dead point and the movable needle thread take-up 3 rocks downward, portions of the right and left needle threads 6R and 6L between the first and second needle thread through-holes 3a and 3b of the movable needle thread take-up 3 are received and supported from the underside by the thread receiving surface 8b of the needle thread guide 8, as shown in Fig. 4B.

[0026] In this state, as shown in Fig. 5C, the right and left needles 1R and 1L move upward while forming needle thread loops 6Rr and 6Lr, respectively. As shown in Fig. 5D, the looper 10 moves forward and its leading end enters the right needle loop 6Rr. At this time, as the movable needle thread take-up 3 rocks upward, the right and left needle threads 6R and 6L move upward simultaneously and then depart from the thread receiving surface 8b of the needle guide 8, as shown in Figs. 5A and 5B. The right needle thread 6R moves upward in a straight line whereas the left needle thread 6L contacts a lower slope 8c1 of the cam 8c and then moves to the right and upward while being rubbed with the slope 8c1. Thereby, a tensile force is applied to the left needle thread 6L in engagement with the left needle 1L, thus avoiding that the left needle thread loop 6Lr becomes large.

[0027] Referring to Figs. 6C and 6D, the leading end of the looper 10 enters the left needle thread loop 6Lr. At this time, the left needle thread 6L contacts a top projected surface 8c2 of the cam 8c and is tensioned so that the left needle thread loop 6Lr is maintained in a constant size. This avoids that the needle thread loop 6Lr falls down or hangdowns, and thus the looper 10 reliably enters, from its leading end, the left needle thread loop 6Lr. Therefore, the looper thread 10N reliably catches the right and left needle threads 6R and 6L, thereafter, the known sewing operation such as feed of a fabric, decent of both needles 1R and 1L and return of the looper 10 are performed to form a predetermined

double chain stitch.

[0028] Even when the movable needle thread take-up 3 rocks upward as the needles 1R and 1L move upward, the left needle thread 6L can move along the top projected surface 8c2 which is vertically linear, and therefore, even after the looper 10 enters the left needle thread loop 6Lr, a tensile force is continuously applied to the left needle thread 6L for tightening the stitch. Even for a stretch fabric, a predetermined double chain stitch can be reliably formed while following up the stretch of the fabric.

[0029] When, as the needles 1R and 1L move upward, the movable needle thread take-up 3 reaches its top dead point of rock and then starts to rock downward, the left needle thread 6L moves downward to the top projected surface 8c2 while being rubbed with an upper slope 8c3 of the cam 8c. Thereby, a tensile force is applied to the left needle thread 6L hung on the middle of the looper 10, so that a triangle of the back of a stitch is stabilized to prevent skip-stitch.

[0030] Although the foregoing preferred embodiment is directed to one which unifies the parts by forming the cam 8c so as to be integral with the needle thread guide 8, the cam 8c may be separated from the needle thread guide 8. Alternatively, the cam 8c may be fixed or movable, for example, in x direction in Fig. 4B, so that a tensile force applied to the left needle thread 6L is adjustable. Irrespective of the kind of the needle thread, a predetermined function can be reliably performed by suitably adjusting the tensile force depending on the twisted state and characteristic of the left needle thread 6L.

[0031] Although the foregoing embodiment relates to the application to the two-needle double chain stitch sewing machine, the present invention may be applied to any double chain stitch sewing machines having three or more needles, alternatively, to interlock stitch sewing machines having a plurality of needles for sewing an upper fancy thread into a double ring stitch. In any case, it is able to obtain the same effect as described in the foregoing embodiment.

Claims

1. A needle thread guide device for double ring stitch sewing machine comprising:

plural needles movable vertically reciprocally aligned in a direction orthogonal to a sewing direction;

a looper moving forward from one side to the other of the aligned plural needles so as to successively enter plural needle thread loops when the plural needles move upward from a bottom dead point while forming a needle thread loop; a movable needle thread take-up rocking vertically reciprocally as the needles move vertically reciprocally, thereby to control feed of a needle

thread supplied to the needles via a thread tension device and a needle thread eyelet, the movable needle thread take-up being disposed outside of an arm part; and

a needle thread guide fixed to the arm part in the vicinity of the leading end of the movable needle thread take-up, the needle thread guide receiving and supporting, from its underside, needle thread portions between first and second needle thread through-holes when the needles are located at the bottom dead point and the movable needle thread take-up rocks downward, the first needle thread through-hole being formed at the leading end of the movable needle thread take-up, the second needle thread through-hole being formed toward the side of a rocking basal end of the movable needle thread take-up so as to bend and guide part of a needle thread hung between the first needle thread through-hole and the needle thread eyelet,

characterized by having:

a cam disposed at a location near a thread receiving surface of the needle thread guide, the cam applying a tensile force, immediately before the looper enters, to a needle thread loop of at least one needle thread supplied to a needle which the looper enters finally in plural needle threads being received and supported on a thread receiving surface of the needle thread guide as the movable needle thread take-up rocks upward relative to rising movement of the needles from the bottom dead point, the tensile force being retained until the looper enters the needle thread loop.

stitch sewing machine according to claim 2 wherein the cam is configured so that it can continuously apply a tensile force to tighten the needle thread even after the looper enters the needle thread loop.

2. The needle thread guide device for double ring stitch sewing machine according to claim 1 wherein the cam is continuous with the thread receiving surface of the needle thread guide.
3. The needle thread guide device for double ring stitch sewing machine according to claim 1 wherein the cam is configured so that it can adjust a tensile force applied to a needle thread.
4. The needle thread guide device for double ring stitch sewing machine according to claim 2 wherein the cam is configured so that it can adjust the tensile force applied to the needle thread.
5. The needle thread guide device for double ring stitch sewing machine according to claim 1 wherein the cam is configured so that it can continuously apply a tensile force to tighten the needle thread even after the looper enters the needle thread loop.
6. The needle thread guide device for double ring

FIG. 1

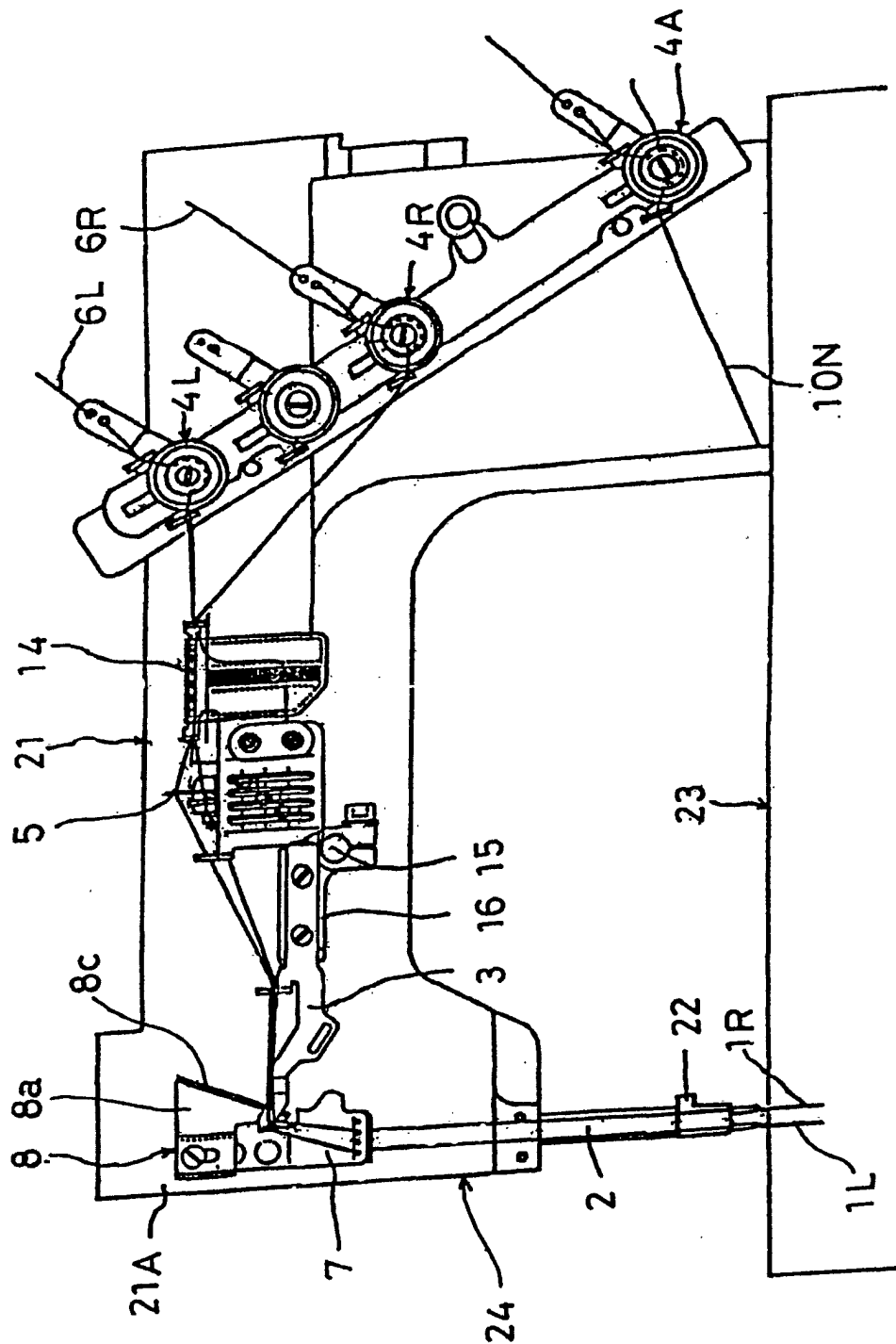


FIG. 2

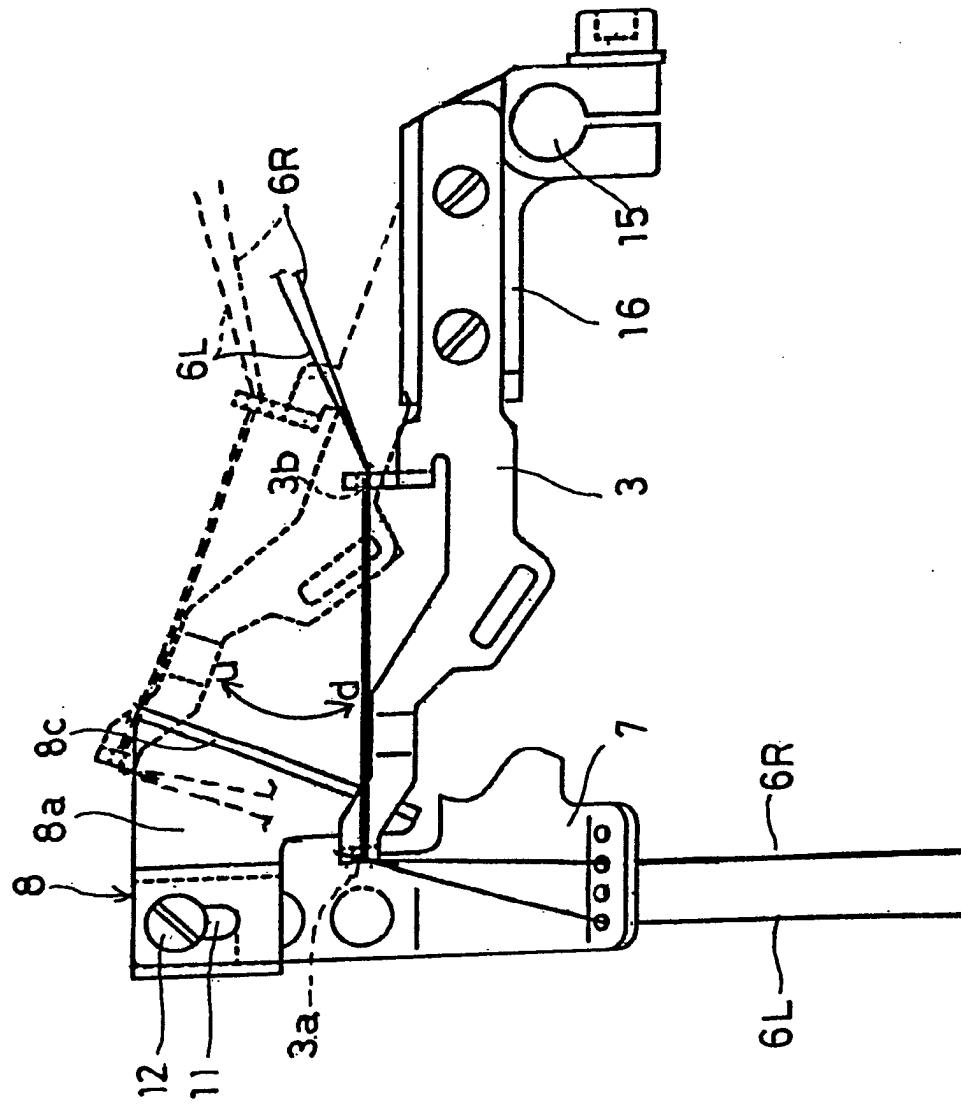


FIG. 3

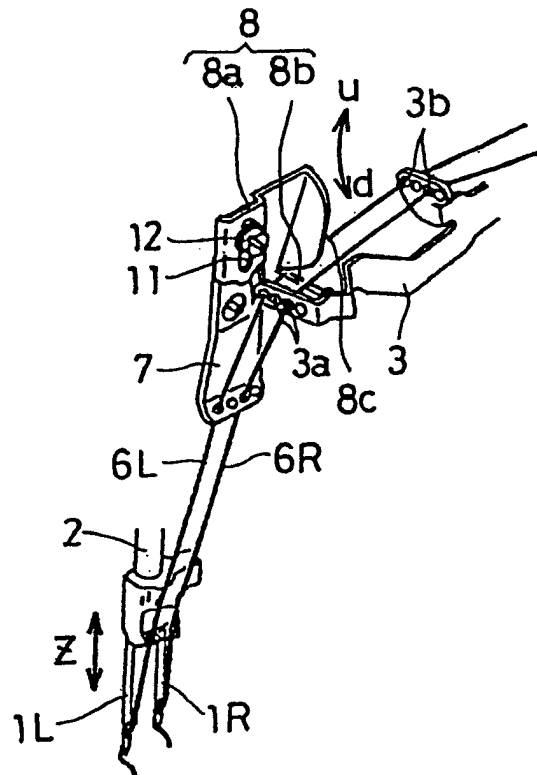


FIG. 4A

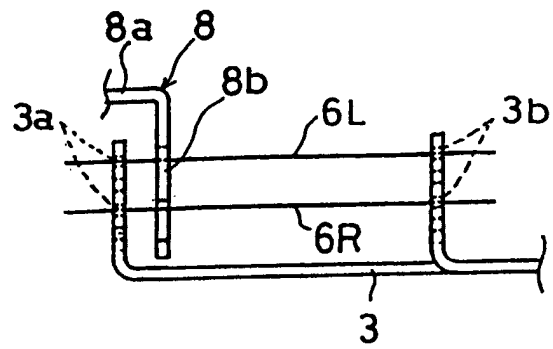


FIG. 4B

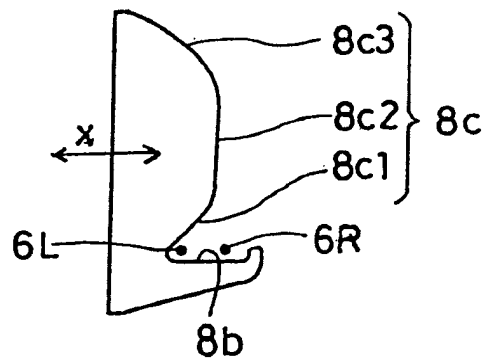


FIG. 4C

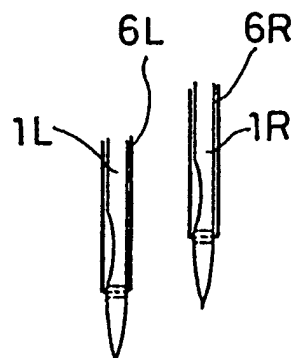


FIG. 5A

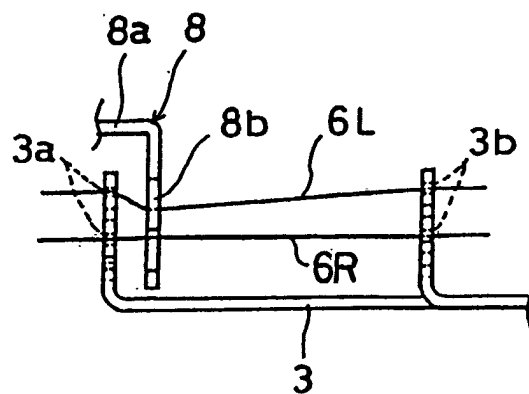


FIG. 5B

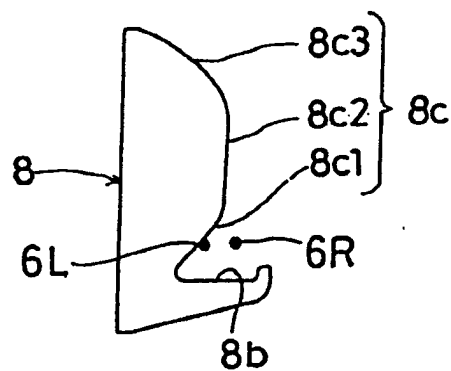


FIG. 5C

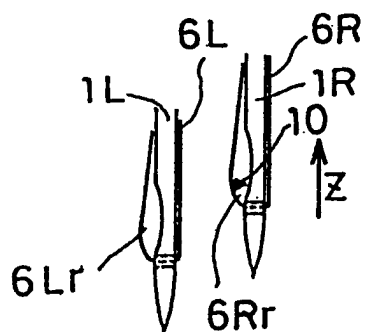


FIG. 5D

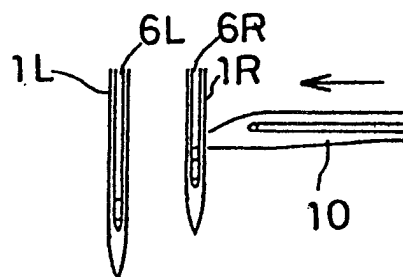


FIG. 6A

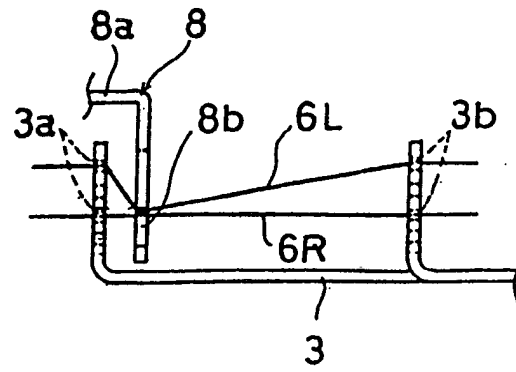


FIG. 6B

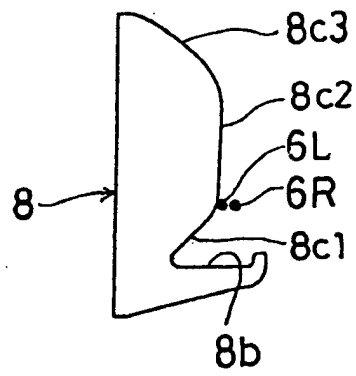


FIG. 6C

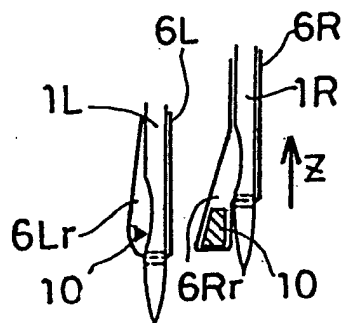


FIG. 6D

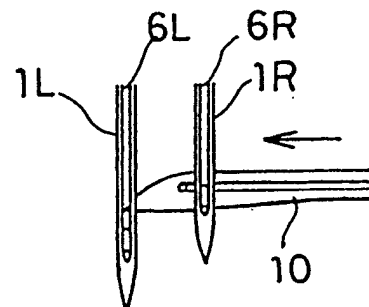


FIG. 7

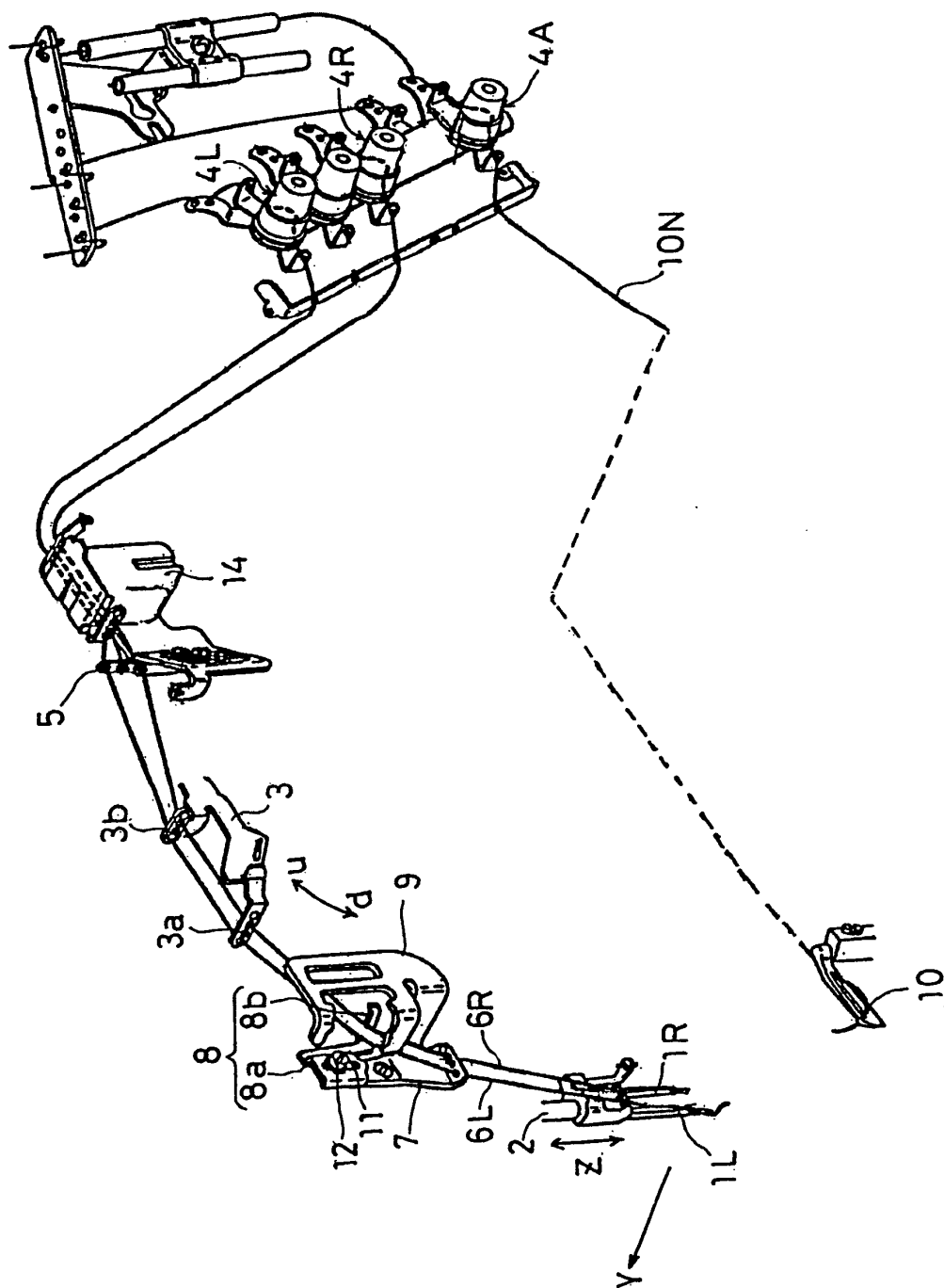


FIG. 8

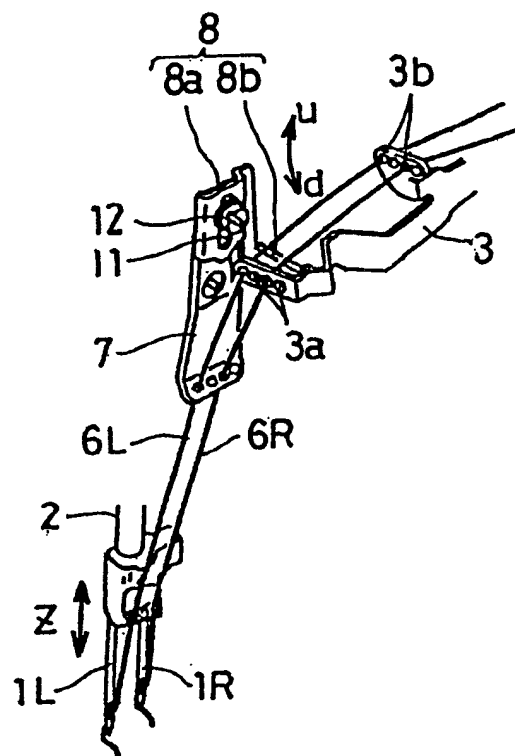


FIG. 9A

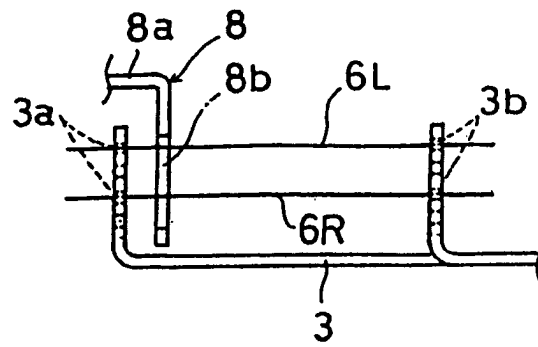


FIG. 9B

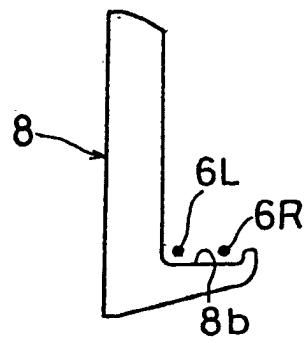


FIG. 9C

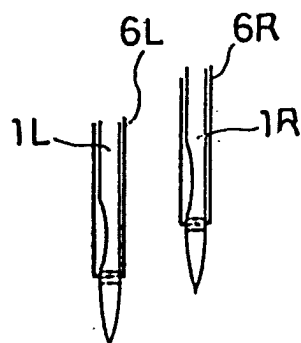


FIG. 10A

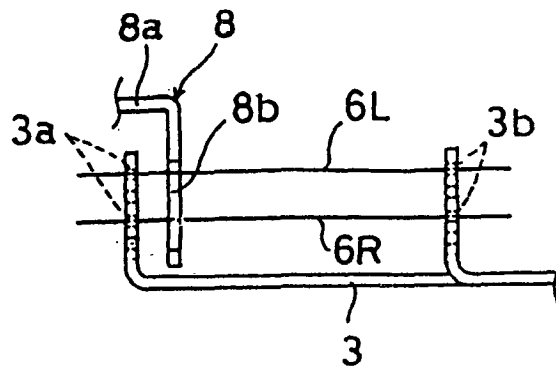


FIG. 10B

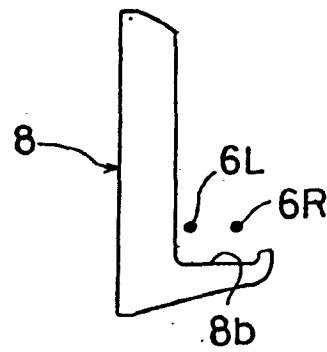


FIG. 10C

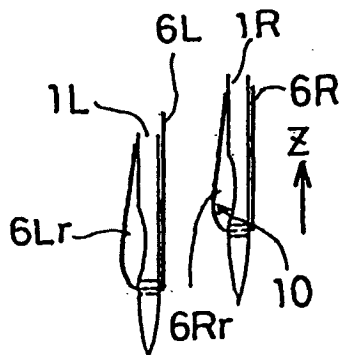


FIG. 10D

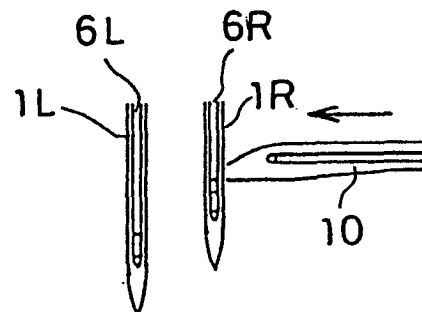


FIG. 11A

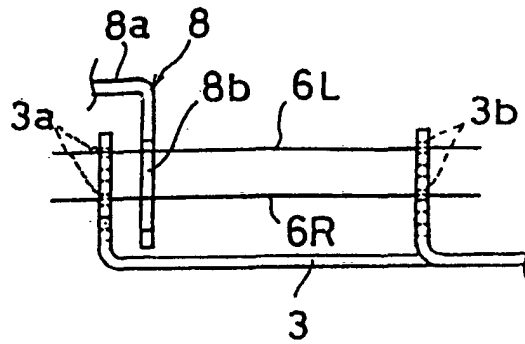


FIG. 11B

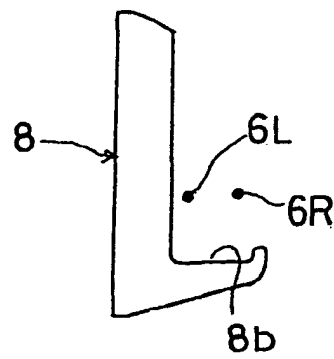


FIG. 11C

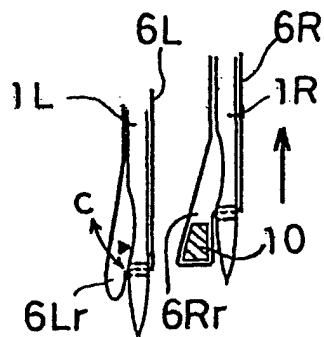


FIG. 11D

