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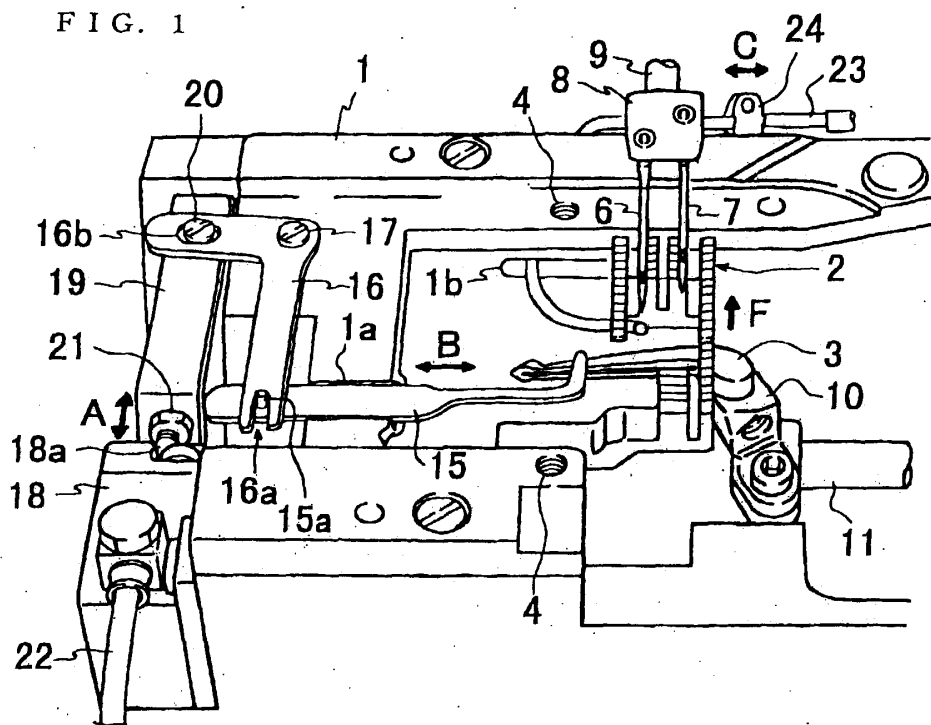
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(54) Double needle sewing machine for forming an angled stitching in fabric

(57) In a double needle sewing machine for forming an angled stitching in fabric, when turning a fabric clockwise, an air blower is operated from first several stitches immediately before turning to second several stitches immediately after turning, and a thread loop at right needle side is moved away from the trajectory of a looper. In this sewing machine, when turning the fabric counterclockwise, a thread loop at left needle side captured

by the looper is slid to the looper base end side at the timing of said first several stitches by hook, while the thread loop is captured by the right needle, and the air blower is operated continuously for said second several stitches, and the thread loop at left needle side is moved away from the trajectory of the looper. As a result, whether the fabric is turned clockwise or counterclockwise, passing thread is not formed, and the appearance of sewn product is improved.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a double needle sewing machine for forming an angled stitching in fabric, which the fabric is turned at the time of pause of sewing by these needles and looper, and an angled stitching is formed in the turned fabric by resuming the sewing operation, and in particular a decorative double chain stitch is formed at the back side of the fabric.

2. Description of the Prior Art

[0002] Hitherto, a double needle sewing machine for forming an angled stitching in fabric as disclosed in Japanese Laid-open Patent No. 63-186688 has been known. The known double needle sewing machine comprises right and left needles and a looper. The needles are threaded respectively, and penetrate through a needle plate. The looper moves back and forth from the right side along the needle penetration points of the needle plate so as to capture each thread loop formed behind the needles. In the case of the angled stitching, the sewing operator turns the fabric at the time of pause of sewing by the needles and looper, and resumes the sewing operation after turning of the fabric, so that an angled stitching is formed in the fabric. This sewing machine is intended to form decorative stitches on the face and back side of the fabric, and a double chain stitch can be formed if upper covered thread is not used.

[0003] In the conventional double needle sewing machine for forming an angled stitching in fabric, when an angled stitching is formed by a double chain stitch, as shown in Fig. 19, a passing thread PT is formed in the overlapping portion of first stitching S1 and second stitching S2 on the upper surface of the stitching angle portion of the fabric W, and this passing thread PT is visible and spoils the appearance of the sewn product.

SUMMARY OF THE INVENTION

[0004] The present invention is devised in the light of the above background, and it is an object thereof to present a double needle sewing machine for forming an angled stitching in fabric capable of obtaining a sewn product of excellent appearance by forming an angled stitching without appearing a passing thread on the upper surface of the stitching angle portion of the fabric.

[0005] To achieve the object, the double needle sewing machine for forming an angled stitching in fabric as set forth in claim 1 of the present invention comprises right and left needles and a looper. The right and left needles are threaded respectively, and penetrate through the needle plate. The looper moves back and forth from the right side along the needle penetration

points of the needle plate, and captures each thread loop formed behind the needles. At the time of pause of sewing by the right and left needles and looper, the fabric is turned, and an angled stitching is formed in the fabric when resuming the sewing operation after turning of the fabric.

[0006] This sewing machine further comprises an air blower and a hook. The air blower blows air to the thread loop formed in the rear portion when the needle ascends, and moves the thread loop away from the trajectory of the looper. The hook is disposed so as to be movable toward and away from the looper, and slides the thread loop captured by the looper to the base side of the looper.

[0007] To turn the fabric clockwise, the air blower is operated continuously at the timing of first several stitches immediately before turning of the fabric and second several stitches immediately after turning of the fabric, and air is blown to the thread loop formed behind the right needle from its blowing position. As a result, the thread loop at the right needle side is moved away from the trajectory of the looper.

[0008] To turn the fabric counterclockwise, the hook is moved forward to the looper side at the timing of said first several stitches so as to slide at least the thread loop of the left needle captured by the looper to the base side of the looper, and the thread loop of the left needle is captured by the right needle, and then the air blower is operated at the timing of second several stitches so as to blow air to the thread loop formed behind the left needle from its blowing position. As a result, the thread loop at the left needle side is captured by the right needle and the thread loop of the left needle side is moved away from the trajectory of the looper.

[0009] According to the present invention as set forth in claim 1, when turning the fabric clockwise, from first several stitches immediately before turning of the fabric to second several stitches immediately after turning of the fabric, the thread loop at the right needle side is moved away from the trajectory of the looper, and a double chain stitch is formed in the fabric only at the left needle side. When turning the fabric counterclockwise, from said first several stitches to said second several stitches, the thread loop at the left needle side is captured by the right needle, and the thread loop at the left needle side is moved away from the trajectory of the looper, and a double chain stitch is formed in the fabric only at the right needle side.

[0010] In this way, from first several stitches immediately before turning of the fabric to second several stitches immediately after turning of the fabric, a stitching is formed at the left needle side or right needle side only depending on the turning direction of the fabric, and by turning the fabric about the base of the stitching, visible passing thread is not formed on the upper surface of the stitching angle portion formed on the fabric whether the fabric turning direction is clockwise or counterclockwise, so that the appearance of the sewn product may be en-

hanced.

[0011] In particular, when turning the fabric counter-clockwise, the thread loop of the left needle captured by the looper slides to the base side of the looper at the timing of first several stitches immediately before turning of the fabric, the thread loop of the left needle is captured by the right needle. This action prevented the angle portion of the stitching formed in the fabric from raveling, the quality of the sewn product is enhanced.

[0012] Moreover, as set forth in claim 2, the air blower is disposed slidably right and left, and its blowing position is changeable depending on the turning direction of the fabric by such sliding motion, and therefore it is not required to install the air blower at each position corresponding to the turning direction of the fabric, and the number of parts disposed in the sewing machine is decreased and the cost is lowered.

[0013] Further, as set forth in claims 3 and 4, by disposing the hook and air blower so as to be movable back and forth and changeable in position by way of a pneumatic cylinder, the hook and blower can be moved flexibly as required, and angled stitching operation can be executed efficiently.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is an essential perspective view showing a double needle sewing machine for forming an angled stitching in fabric according to the present invention.

Fig. 2 is a perspective explanatory diagram showing a needle plate shape of said sewing machine.

Fig. 3 is a perspective view showing a first stroke of angled stitching process by said sewing machine.

Fig. 4 is a perspective view showing a second stroke of angled stitching process by said sewing machine.

Fig. 5 is a perspective view showing a third stroke of angled stitching process by said sewing machine.

Fig. 6 is a perspective view showing a fourth stroke of angled stitching process by said sewing machine.

Fig. 7 is a perspective view showing a fifth stroke of angled stitching process by said sewing machine.

Fig. 8 is a schematic top view showing a plane state of fifth stroke of angled stitching process by said sewing machine.

Fig. 9 is a schematic top view showing a sixth stroke of angled stitching process by said sewing machine.

Fig. 10 is a schematic top view showing a seventh stroke of angled stitching process by said sewing machine.

Fig. 11 is a perspective view showing other first stroke of angled stitching process by said sewing machine.

Fig. 12 is a perspective view showing other second stroke of angled stitching process by said sewing

machine.

Fig. 13 is a perspective view showing other third stroke of angled stitching process by said sewing machine.

Fig. 14 is a perspective view showing other fourth stroke of angled stitching process by said sewing machine.

Fig. 15 is a perspective view showing other fifth stroke of angled stitching process by said sewing machine.

Fig. 16 is a schematic top view showing a plane state of other fifth stroke of angled stitching process by said sewing machine.

Fig. 17 is a schematic top view showing other sixth stroke of angled stitching process by said sewing machine.

Fig. 18 is a schematic top view showing other seventh stroke of angled stitching process by said sewing machine.

Fig. 19 is a schematic top view showing a finished state of angled stitching process by a conventional sewing machine.

PREFERRED EMBODIMENT OF THE INVENTION

[0015] Referring now to the drawings, a preferred embodiment of the present invention is explained in detail below.

[0016] Fig. 1 is an essential perspective view showing a double needle sewing machine for forming an angled stitching in fabric according to the present invention. A cylinder bed 1 of this sewing machine comprises a feed dog 2, a looper 3, and a needle plate 5. The feed dog 2 moves in four directions to feed the fabric in the direction of arrow F, and the looper 3 oscillates in a direction intersecting with the fabric feed direction F. The needle plate 5 (see Fig. 2) is fixed at screw holes 4. Above the cylinder bed 1, there is a needle bar 9 having a left needle 6 and a right needle 7 attached through a needle holder 8. The needles 6, 7 extend downward, and their leading ends penetrate the needle plate 5 by the vertical motion of the needle bar 9. Needle penetration points 5a, 5a of the needle plate 5 are formed at the base side of a tongue 5b extended in the fabric feed direction F as shown in Fig. 2.

[0017] The looper 3 is mounted on a looper shaft 11 by way of a looper stand 10, and the looper shaft 11 moves back and forth from the right side in cooperation with the rotation of the main shaft (not shown). The forward and backward moving direction of the looper shaft 11 runs along the needle penetration points 5a, 5a of the needle plate 5, and the looper 3 moves back and forth laterally beneath the needle plate 5. When the looper 3 moves forward from the right side as shown in Fig. 1, the leading ends of the needles 6, 7 are elevated higher than the needle penetration points 5a, 5a of the needle plate 5. At the leading ends of the needles 6, 7, thread holes 6a, 7a are provided for passing the needle

threads 12, 13 as shown in Fig. 3 through Fig. 7, and an eyelet 3a for passing a looper thread 14 is provided at the leading end of the looper 3.

[0018] At the left side of the feed dog 2 in Fig. 1, that is, at the leading end side of the cylinder bed 1, a hook 15 is provided for sliding the thread loop captured by the looper 3. The hook 15 is slidably supported laterally in a groove 1a formed in the cylinder bed 1. A protrusion 15a is formed at the base side of the hook 15, and the protrusion 15a is engaged with a bifurcate portion 16a formed at one end of a bell-crank lever 16. The bell-crank lever 16 is rotatably fixed to the cylinder bed 1 by way of a stepped screw 17.

[0019] A pneumatic cylinder 18 is disposed at the leading end of the cylinder bed 1. An operating piece 19 is fitted to a piston rod 18a of the pneumatic cylinder 18. The operating piece 19 is coupled to a slot 16b of the bell-crank lever 16 by way of a stepped screw 20. The mounting position of the operating piece 19 to the piston rod 18a can be adjusted by means of a nut 21. The pneumatic cylinder 18 is connected to a high pressure air source (not shown) by way of a pipe 22. By air pressure from the high pressure air source, when the operating piece 19 at the leading end of the piston rod 18a of the pneumatic cylinder 18 moves back and forth in the direction of arrow A, the bell-crank lever 16 rotates about the stepped screw 17, and the hook 15 slides along the direction of arrow B.

[0020] An air blower 23 is disposed behind the cylinder bed 1. The leading end portion of the air blower 23 proceeds into the inside of the cylinder bed 1 through a groove hole 1b, and the leading end blowing position is directed toward the looper 3 side so that air may be blown to the thread loop formed behind the needle at the time of ascending. The air blower 23 is attached to a bracket 24 fixed to a piston rod (not shown) of the pen type pneumatic cylinder. When the piston rod of the pen type pneumatic cylinder moves back and forth, the air blower 23 slides laterally along the direction of arrow C, and the blowing position of the air blower 23 is changed. A slit type oil shield (not shown) is provided in the groove hole 1b so that the lubricating oil supplied in the cylinder bed 1 may not leak out.

[0021] The operation of the double needle sewing machine for forming an angled stitching in fabric having such configuration is explained below while referring to Fig. 3 through Fig. 17.

[0022] In this sewing machine, the fabric W pressed down to the needle plate 5 by means of a presser foot (not shown) is fed in the direction of arrow F by the feed dog 2. At this time, as shown in Fig. 3, a stitching (first stitching) S1 related to the stitch type 406 is formed by the needle threads 12, 13 and looper thread 14 threaded the needle holes 6a, 7a of the needles 6, 7 and the eyelet 3a of the looper 3, respectively.

[0023] To turn the fabric W clockwise at temporarily stopping such sewing operation, from the timing of several stitches immediately before turning of the fabric, as

shown in Fig. 4, the blowing position of the air blower 23 is changed to the right needle 7 side by sliding. When the air blower 23 is operated at the changed position, the thread loop formed behind the right needle 7 in ascending motion is moved away from the trajectory of the looper 3. When the looper 3 advances from the right side along the direction of arrow x in this state, as shown in Fig. 5, the thread loop formed behind the right needle 7 is not captured by the looper 3, but only the thread loop 12L formed behind the left needle 6 is captured. When the needles 5,6 descend after passing the upper dead center, the left needle 6 proceeds into a triangle formed by the looper 3 retreating to the left as indicated by arrow y, the looper thread 14 from the eyelet 3a of the looper 3 to the fabric W, and the thread loop 12L of the left needle captured by the looper 3. The looper thread 14a of said triangle is captured by the left needle 6 as shown in Fig. 6. At this time, the right needle 7 merely penetrates through the fabric W.

[0024] When the sewing machine is driven in this state, as shown in Fig. 7, a stitching (several stitches) Sa related to stitch type 401 is formed in the fabric W by the needle thread 12 threaded the thread hole 6a of the left needle 6 and the looper thread 14 threaded the eyelet 3a of the looper 3. After stopping the driving of the sewing machine at the upper dead center of the needles 6, 7 (see Fig. 8), the fabric W is turned clockwise by a specified angle from the base end SS of the stitching (see Fig. 9). After this turning, the fabric W is pressed to the needle plate 2 by the presser foot (not shown), and sewing operation by the sewing machine is resumed. For several stitches immediately after resuming the sewing operation, the operation of the air blower 23 continues, and a stitching Sa related to stitch type 401 is formed in the fabric W consecutively to the base end SS of the first stitching. Then, stopping the air blow by the air blower 23, as shown in Fig. 10, a stitching (second stitching) S2 related to the same stitch type 406 is formed in succession, and therefore only the outside is left over as sewing line (stitches Sa, Sa related to stitch type 401) on the upper surface of the stitching angle portion, and passing thread is not formed.

[0025] To turn the fabric W counterclockwise at temporarily stopping the sewing operation, the hook 15 is operated when the looper 3 moves forth in several stitches immediately before turning of the fabric. As a result, the thread loops 12L, 13L captured by the looper 3 are moved to slide to the base end side of the looper 3 as shown in Fig. 11. When the looper 3 retreats to the right, the left needle 6 descending after passing the upper dead center proceeds into a triangle formed by the looper 3, the looper thread 14 from the eyelet 3a of the looper 3 to the fabric W, and the thread loop 12L of the left needle captured by the looper 3. At this time, the right needle 7 captures said thread loop 12L, and proceeds into a triangle formed by the looper 3, the looper thread 14 from the eyelet 3a of the looper 3 to the fabric W, and the thread loop 13L of the right needle 7 captured

by the looper 3. The looper thread 12L of the left needle 6 captured by the right needle 7 is released from the looper 3 moving backward when the needles 6, 7 descend, and the thread loop 12LL of the left needle 6 released from the looper 3 is lifted to the fabric W side while being captured by the right needle 7 as shown in Fig. 12.

[0026] Then the blowing position of the air blower 23 is changed to the left needle 6 side, and the air blower 23 is operated. When the air blower operates 23, the thread loop 12L formed behind the left needle 6 in ascending motion is moved away from the trajectory of the looper 3. Therefore, when the looper 3 moves forth from the right side in this state, as shown in Fig. 13, the thread loop 13L formed behind the right needle 7 is captured by the looper 3, but the thread loop formed behind the left needle 6 is not captured by the looper 3. The needles 6, 7 descending after passing the upper dead center, as shown in Fig. 14, into a triangle formed by looper 3 retreating to the right, the looper thread 14 from the eyelet 3a of the looper 3 to the fabric W, and the thread loop 13L of the right needle captured by the looper 3. When the sewing machine is driven in this state, as shown in Fig. 15, a stitching (several stitches) Sa related to stitch type 401 is formed in the fabric W by the needle thread 13 threaded the thread hole 7a of the right needle 7 and the looper thread 14 threaded the eyelet 3a of the looper 3.

[0027] After stopping the driving of the sewing machine at arriving the needles 6,7 in the upper dead center (see Fig. 16), the fabric W is turned counterclockwise by a specified angle from the base end SS of the stitching (see Fig. 17). After this turning, the fabric W is pressed to the needle plate 2 by the presser foot (not shown), and sewing operation by the sewing machine is resumed. For several stitches immediately after resuming the sewing operation, the operation of the air blower 23 continues, and a stitching Sa related to stitch type 401 is formed in the fabric W consecutively to the base end SS of the first stitching. Then, stopping the air blow by the air blower 23, as shown in Fig. 18, a stitching (second stitching) related to the same stitch type 406 is formed in succession. Therefore only the outside is left over as sewing line (stitching Sa, Sa related to stitch type 401) on the upper surface of the stitching angle portion, and passing thread is not formed.

[0028] In this preferred embodiment, the thread loops 12, 13L are moved by the hook 15 to slide to the base end side of the looper 3, but not limited to this operation, for example, only the thread loop 12L of the left needle may be moved to slide so that the thread loop 12L of the left needle may be captured by the descending right needle 7.

[0029] Also in the preferred embodiment, the fabric turning angle is 90°, but not limited to this angle, the fabric can be turned at any arbitrary angle.

[0030] In the preferred embodiment, moreover, the blowing position of the air blower is changed by the pen

type pneumatic cylinder, but not limited to this operation, for example, the blowing position may be changed by foot pedal, knee switch or hand-operated parts.

[0031] The entire disclosure of Japanese Patent Application No. 2002-138586 filed on May 14, 2002 including specification, claims, drawings and summary are incorporated herein by reference in its entirety.

10 Claims

1. A double needle sewing machine for forming an angled stitching in fabric by resuming the sewing operation after turning the fabric (W) at the time of pause of seam working, said double needle sewing machine comprising:

right and left needles (6,7) threaded with a corresponding needle thread (12,13) respectively for penetrating through a needle plate (5), and a looper (3) moving back and forth from the right side along a needle penetration points (5a,5a) of the needle plate (5) so as to capture individual thread loop formed behind the needles,

characterised in that said double needle sewing machine further comprises:

an air blower (23) for blowing air to said thread loop when the needles ascend so as to move the thread loop away from the trajectory of the looper (3), and
a hook (15) for sliding the thread loop captured by looper (3) to the base side of the looper (3), said hook being disposed so as to be movable toward and away from the looper (3),

wherein to turn the fabric clockwise, the air blower (23) is operated continuously at the timing of first several stitches immediately before turning of the fabric and second several stitches immediately after turning of the fabric, and air is blown to the thread loop formed behind the right needle (7) from its blowing position, and thereby the thread loop at the right needle side is moved away from the trajectory of the looper (3), and

to turn the fabric counterclockwise, the hook (15) is moved forward to the looper side at the timing of said first several stitches so as to slide at least the thread loop of the left needle (6) captured by the looper (3) to the base side of the looper (3), and the thread loop of the left needle side is captured by the right needle (7), and then the air blower (23) is operated at the timing of said second several stitches so as to blow air to the thread loop formed behind the left needle from its blowing position, and thereby the thread loop of the left needle side is moved away from the trajectory of the looper (3).

2. The double needle sewing machine for forming an angled stitching in fabric of claim 1, wherein said air blower (23) is disposed slidably right and left, and its blowing position is changeable depending on the turning direction of the fabric by such sliding motion. 5
3. The double needle sewing machine for forming an angled stitching in fabric of claim 1, wherein said hook (15) is be movable back and forth toward and away from the looper (3) in cooperation with a bell-crank lever (16) rotating along with forward and backward motion of an operating piece (19) attached to a piston rod (18a) of a pneumatic cylinder (18). 10 15
4. The double needle sewing machine for forming an angled stitching in fabric of claim 2, wherein said air blower (23) is attached to a bracket (24) fixed to a piston rod of a pen type pneumatic cylinder, and its blowing position is changeable by forward and backward motion of the piston rod of the pen type pneumatic cylinder. 20 25 30 35 40 45 50 55

FIG. 1

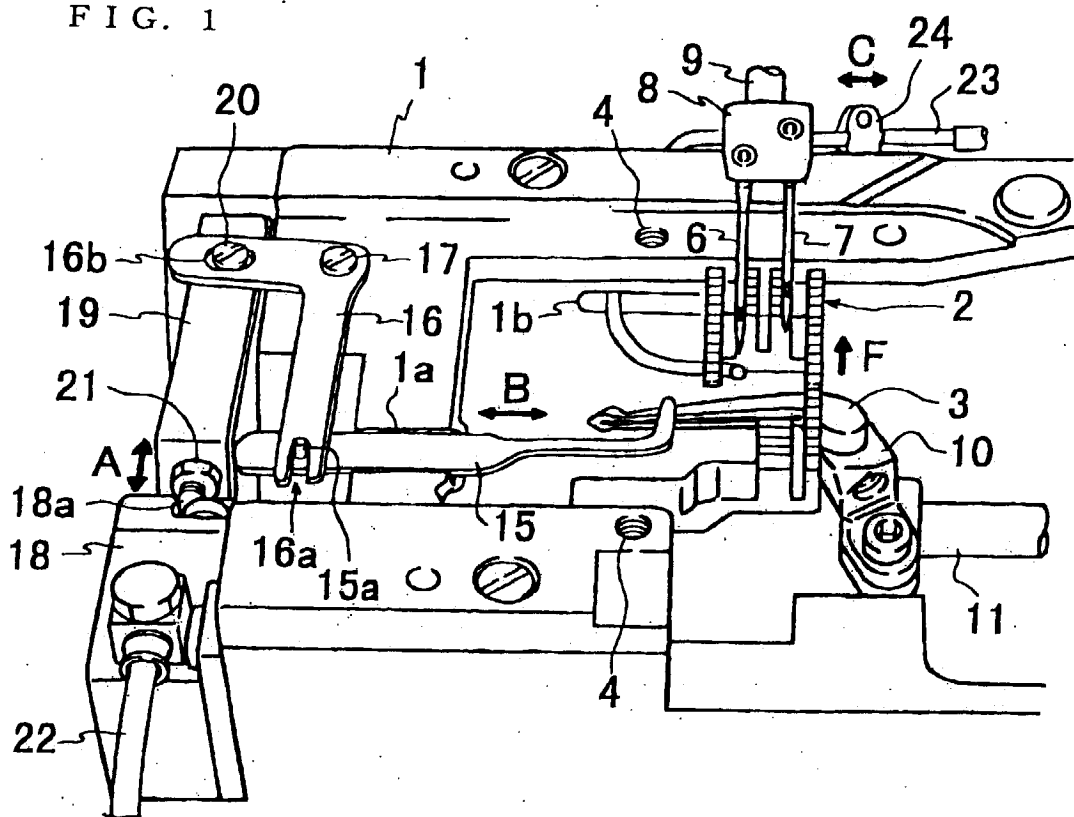


FIG. 2

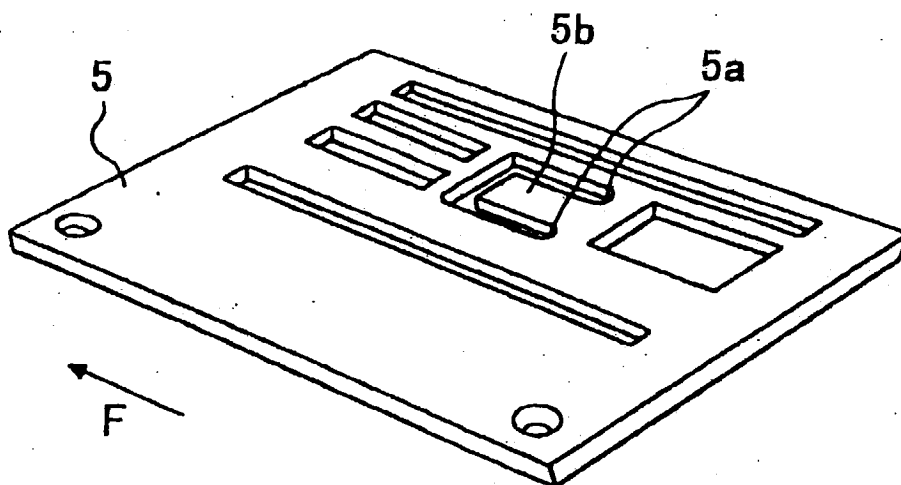


FIG. 3

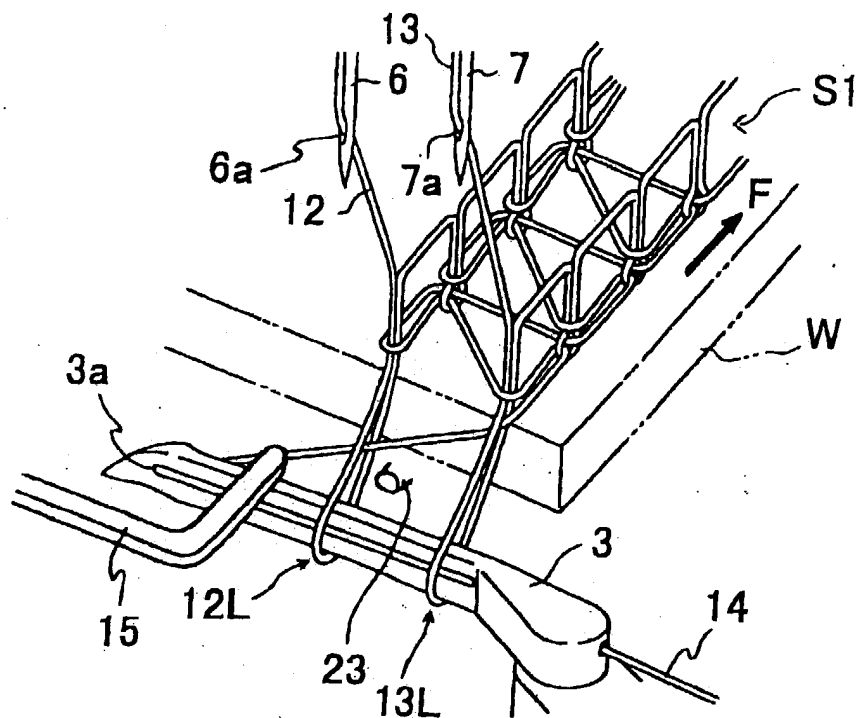


FIG. 4

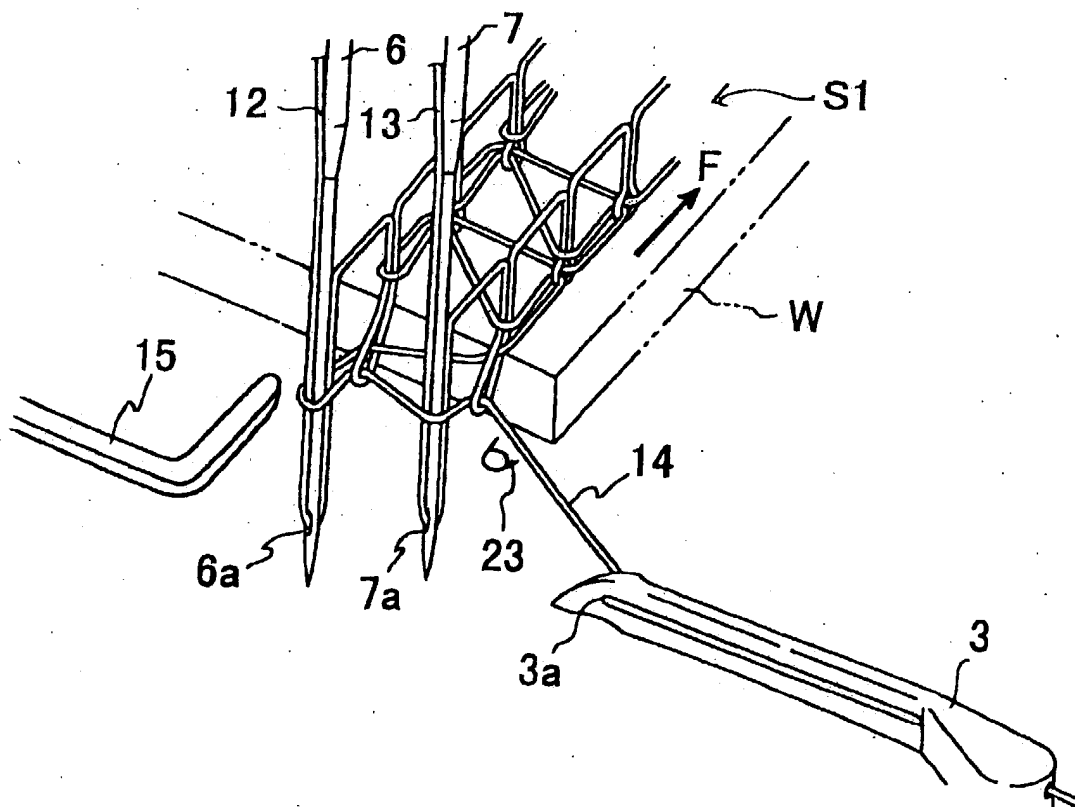


FIG. 5

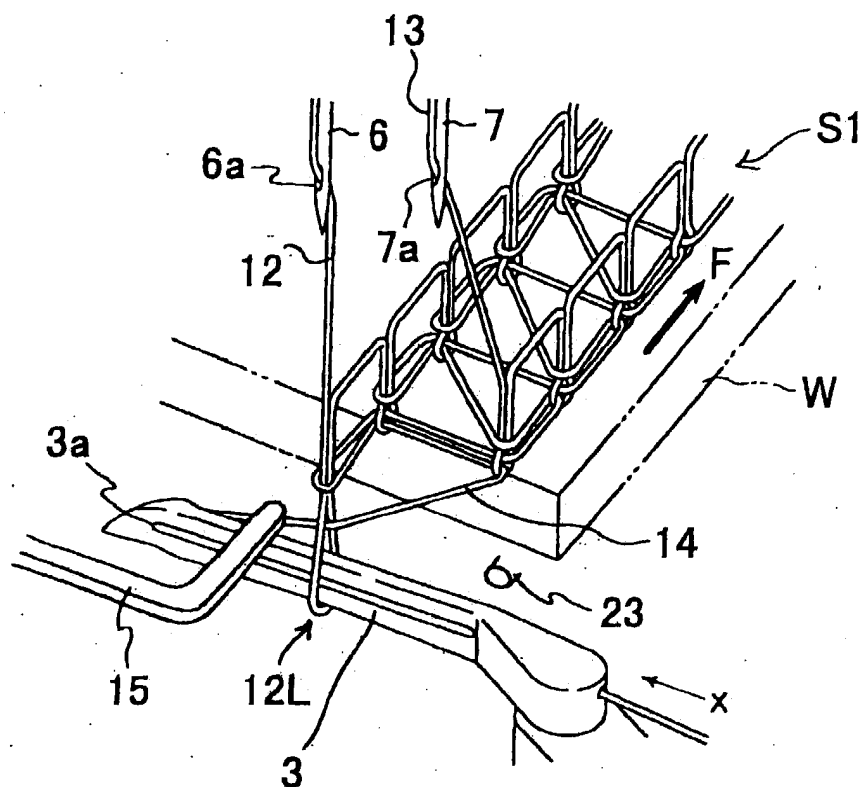


FIG. 6

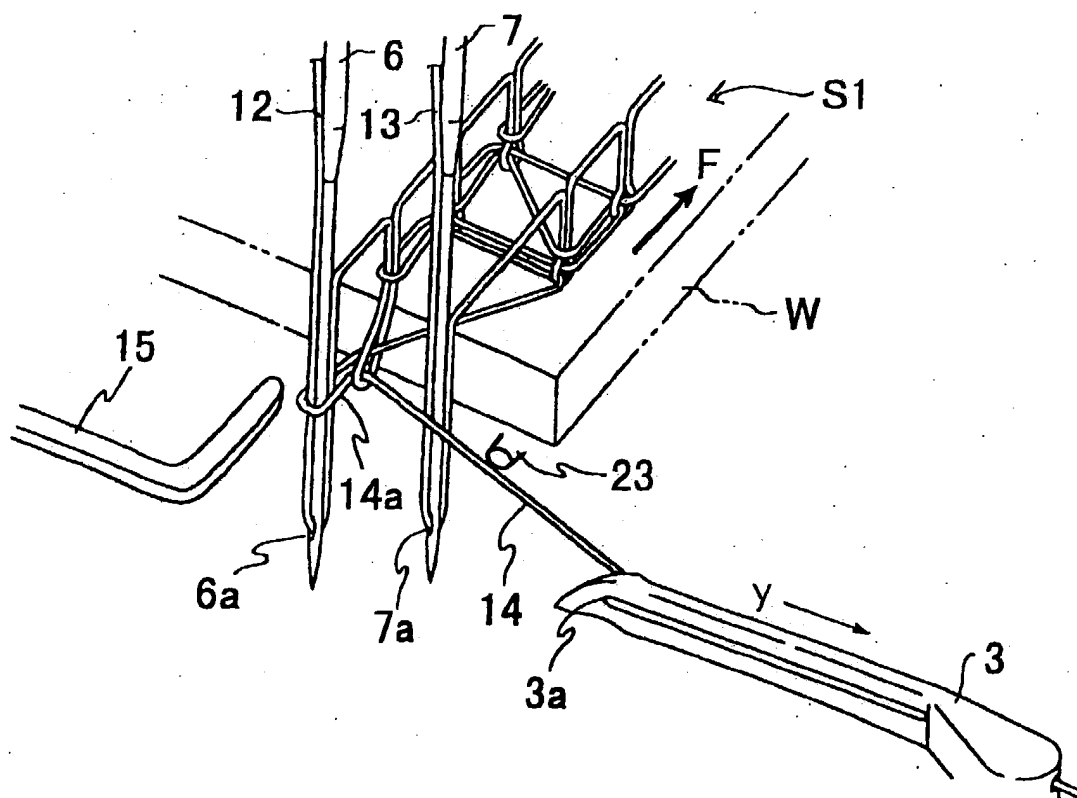


FIG. 7

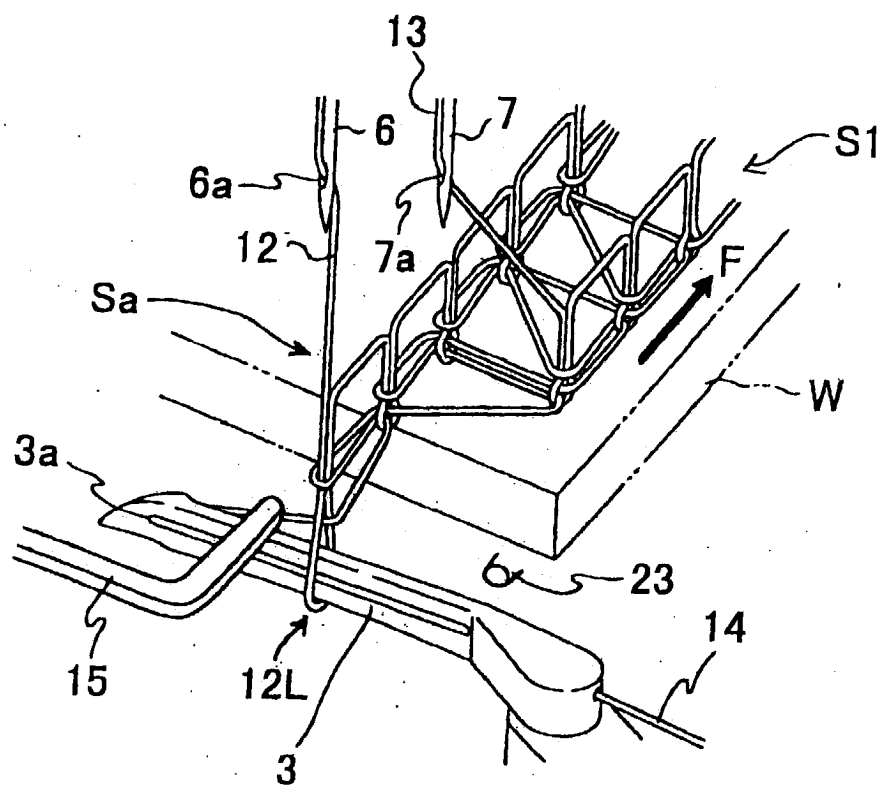


FIG. 8

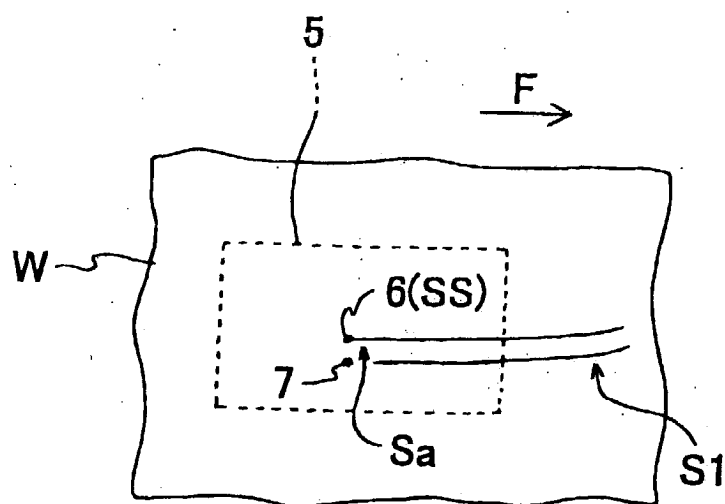


FIG. 9

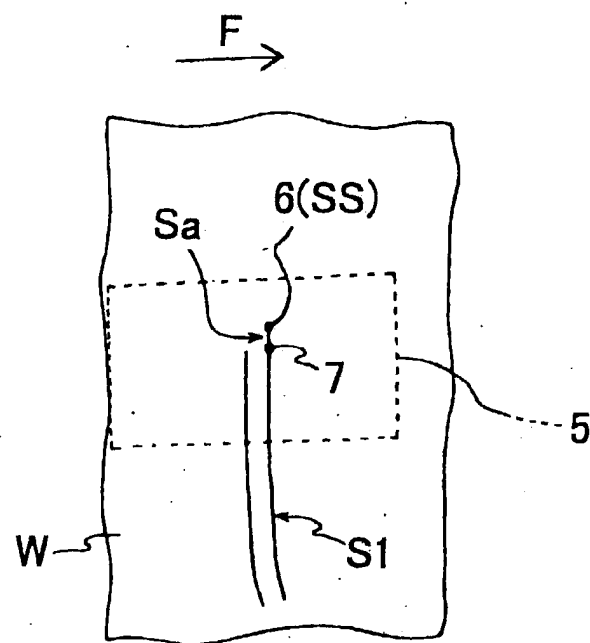


FIG. 10

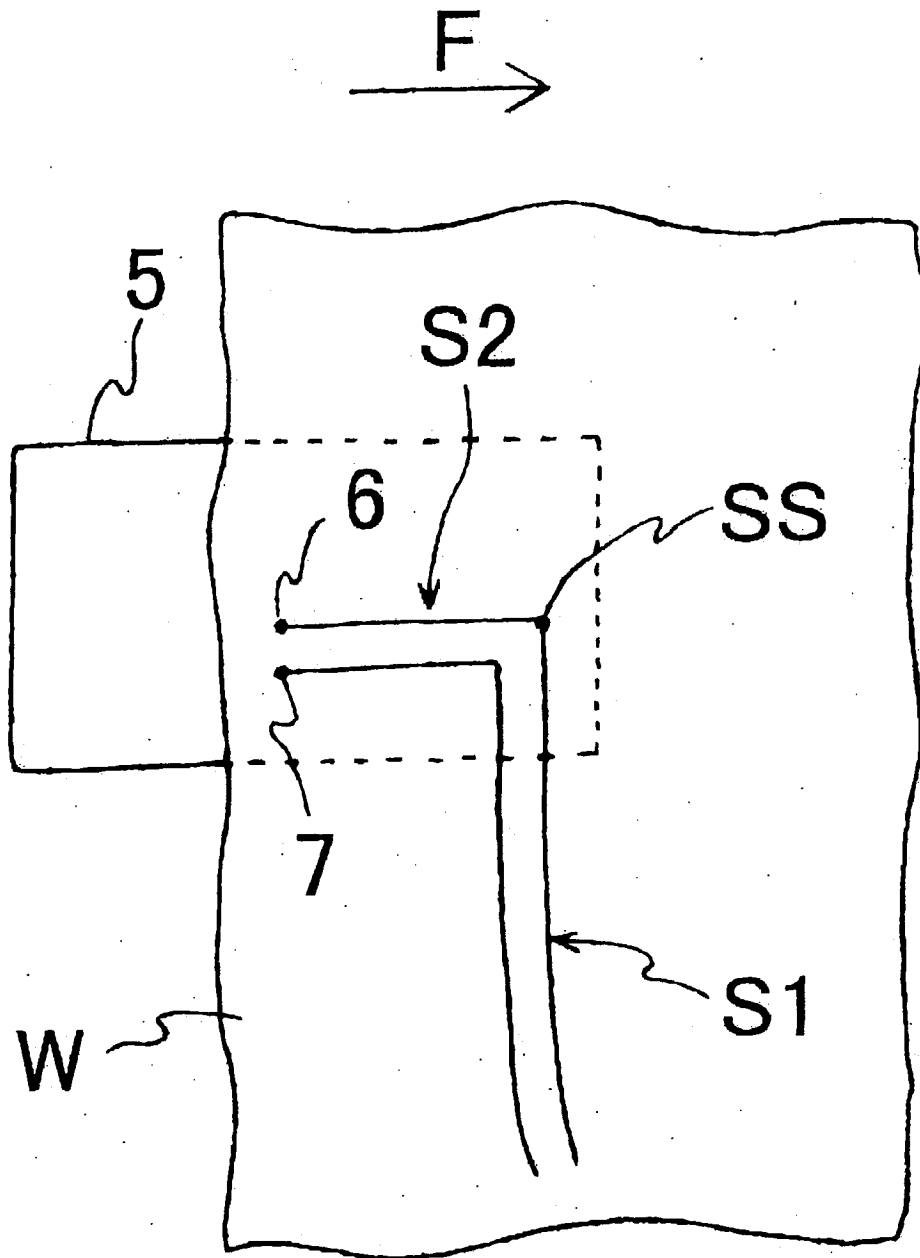


FIG. 11

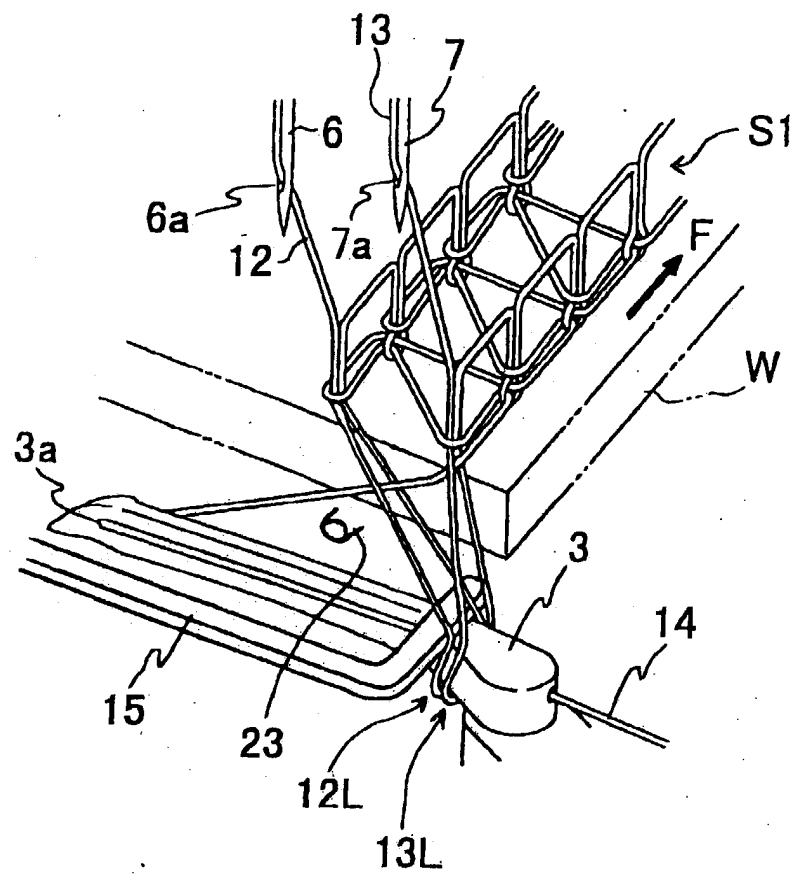


FIG. 12

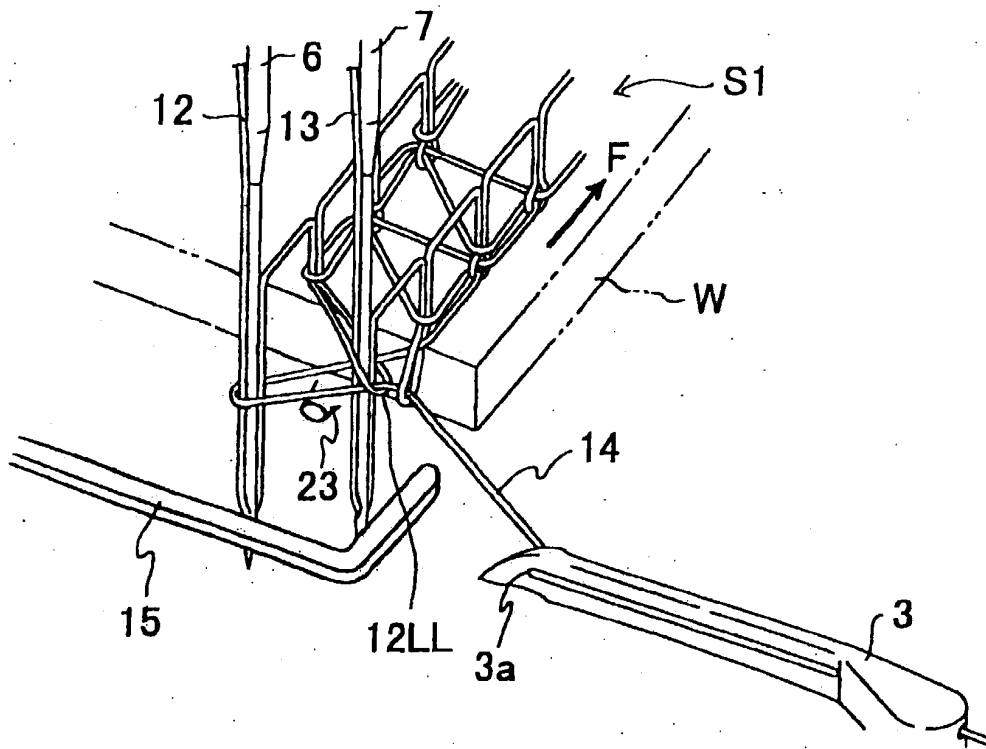


FIG. 13

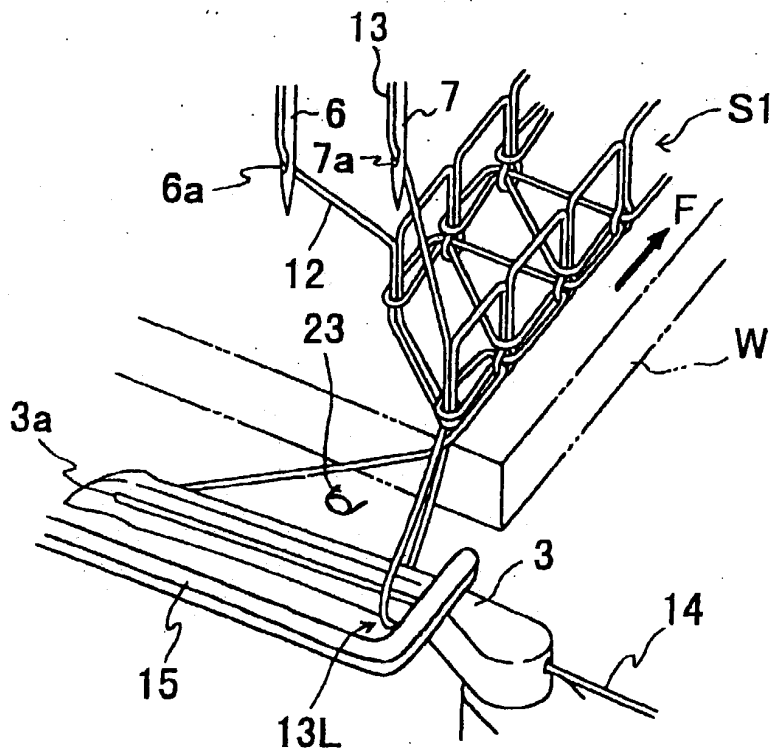


FIG. 14

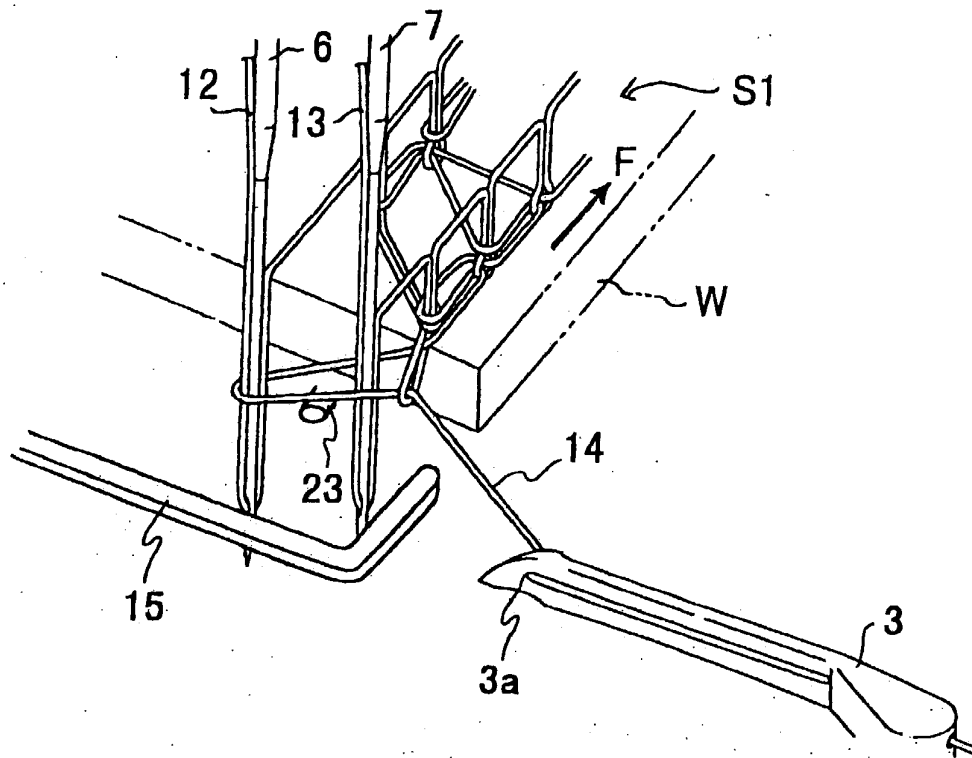


FIG. 15

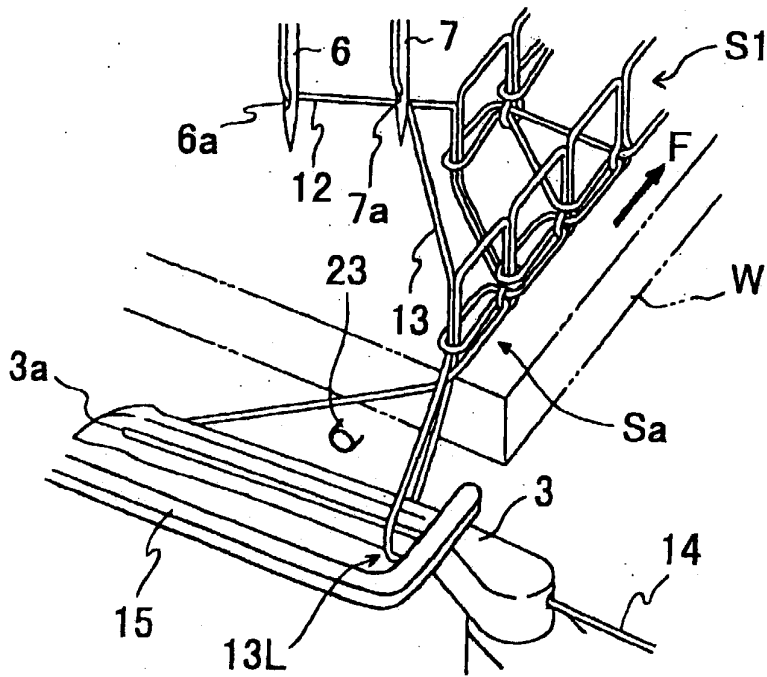


FIG. 16

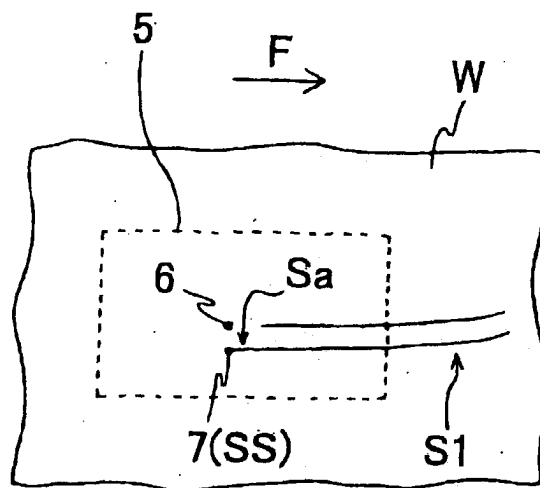


FIG. 17

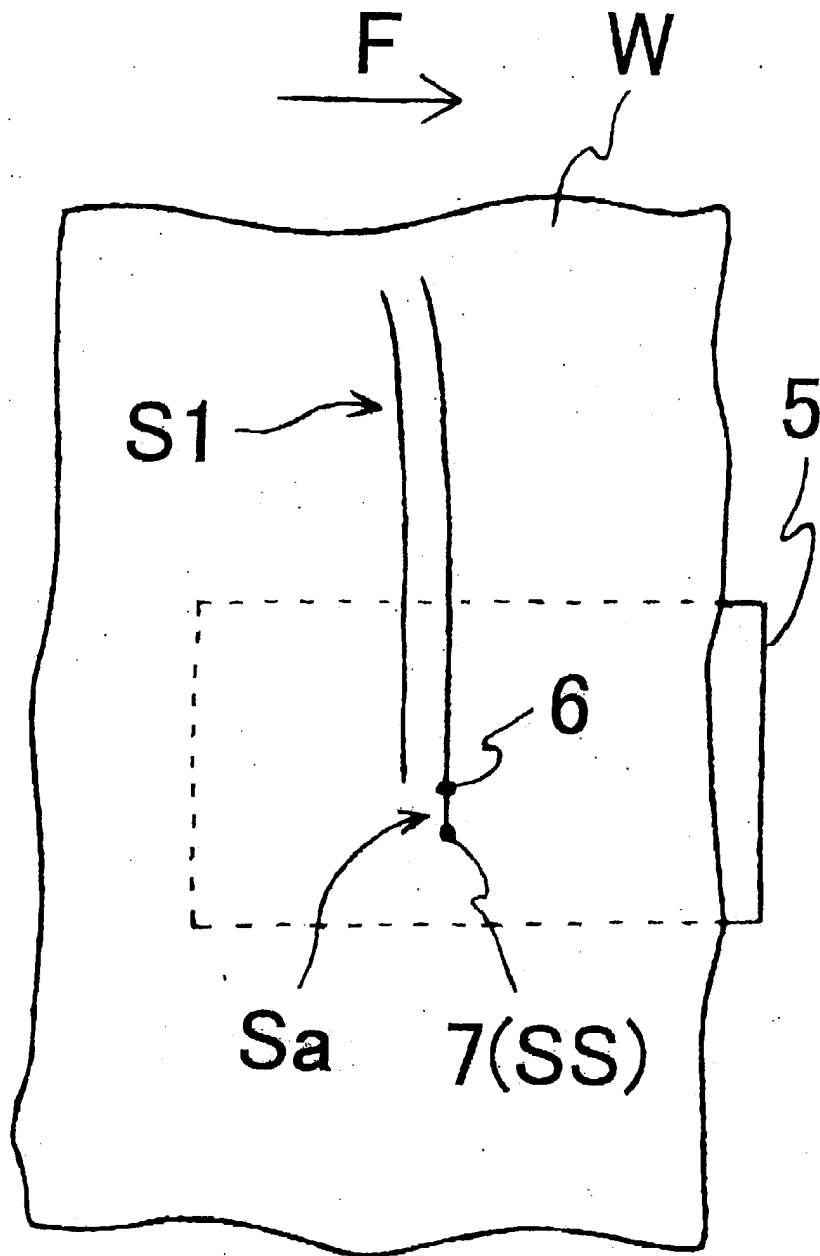


FIG. 18

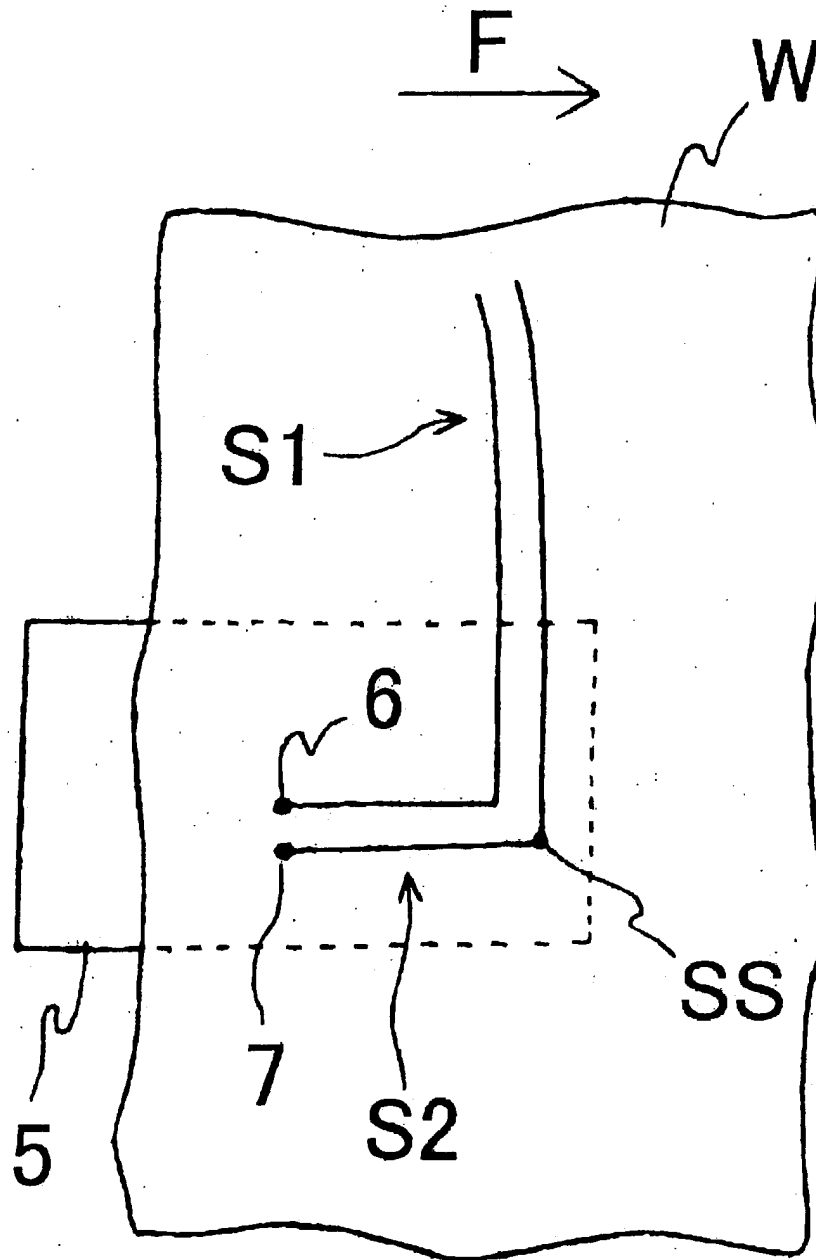
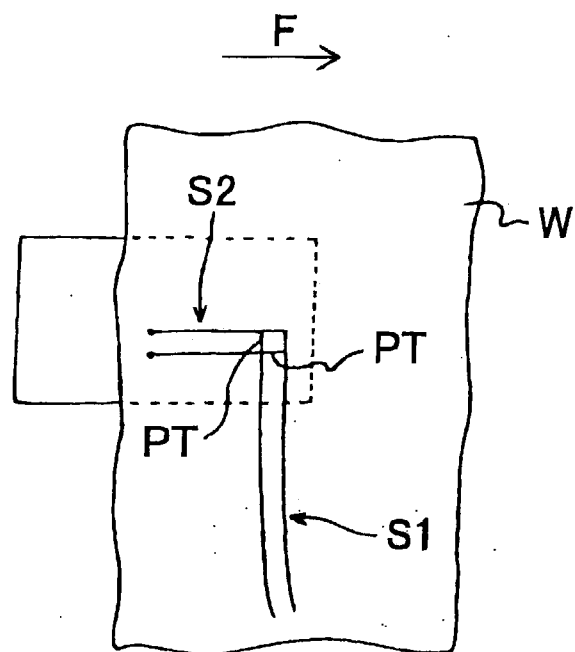


FIG. 19





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 9182

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 512 145 A (DUERKOPP ADLER AG) 11 November 1992 (1992-11-11) * the whole document *	1	D05B61/00
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 01, 31 January 2000 (2000-01-31) & JP 11 276752 A (BROTHER IND LTD), 12 October 1999 (1999-10-12) * abstract; figures 13,16 *	1	
A	EP 0 019 048 A (DUERKOPPWERKE) 26 November 1980 (1980-11-26) * abstract; figures *	1	
D,A	JP 63 186688 A (PEGASUS SEWING MACHINE MFG CO) 2 August 1988 (1988-08-02)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D05B
Place of search		Date of completion of the search	Examiner
THE HAGUE		1 October 2003	Debard, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 9182

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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