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(54) **METHOD AND DEVICE FOR MANUFACTURING STITCH BONDED TEXTILES**

VERFAHREN UND VORRICHTUNG ZUR HERSTELLUNG VON NÄHWIRKTEXTILWAREN

PROCEDE ET DISPOSITIF DE FABRICATION DE TEXTILES LIES PAR PIQURE

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Description

Conventional stitch bonded textile fabrics are well known in the art (see GB-A-2 166 460). They are produced by bonding together the fibers of a fleece by means of a plurality of columns of stitches. If envisioned in terms of conventional woven textiles with warp threads and weft threads, the plurality of stitch columns constitute the warp yarns and the bundle of fibers encompassed within an individual stitch and adjacent stitches in the weft direction constitute the weft yarns.

The advantage of such a fabric is that it is composed almost entirely of weft-wise oriented staple fibers laid down in a fleece, which are much less expensive than spun or filament yarns or thread. The only yarns present are those in the columns of stitches. Stitch bonded fabric can also be produced more rapidly than by weaving or knitting.

There are several disadvantages of stitch bonded fabrics that limit its use and which virtually exclude it from use in apparel except, on occasion, as a liner material for suit coats and the like.

One such disadvantage is a low weft-wise strength or stability, which is attributable to a relatively poor binding power between the stitch loops and the weft-wise bundles of fibers that run through such loops. When the fabric is subjected to a weft-wise tension, the fiber bundles tend to slip through the loops, with a resultant distortion of the fabric.

Another disadvantage is a low resistance to pilling, again attributable to the poor binding power between stitch loops and fibers in the weft-wise bundles. Individual fibers pull out of the bundle and pill on the surface of the fabric.

A further disadvantage is that the fabric has poor draping characteristics. This is the result of the relatively large length of the stitches which, in turn, create relatively large diameter weft-wise bundles of fibers. These coarse bundles are relatively stiff, thereby resisting drape folds parallel to the warp-wise stitches.

A machine, also called a sewing-knitting machine, is e.g. described in the DE-OS 25 25 031. This machine is used to reinforce a web consisting of a non-woven fabric by sewing knitting threads into it. It is also known from the DE-PS 31 40 480 to lay parallel filler threads over a textile support layer and to reinforce this combined web by sewing knitting threads into it.

Using the previously known methods and corresponding machines a row of stitches has been sewn into the web parallel to the needle array with each knitting cycle, whereby the distance between individual stitches narrows as the gauge of the needle array becomes finer. As it becomes finer, the penetrations move so closely together that they resemble a tear-off perforation, thus nullifying the reinforcement effect. Furthermore there is the problem that, when the gauge becomes very fine, the filler threads are displaced by the knitting needles penetrating the web thus grouping themselves irregularly in relation to the penetrations. Apart from an excessively irregular appearance of the fabric, this may lead to a bunching of filler threads with the filler threads themselves being penetrated and thus damaged in the process. The bunching of filler threads or fibers of a support layer (non-woven fabric) also leads to the knitting needles becoming bent.

In the DD-PS 33 771 a warp knitting machine for stitching is disclosed which employs offset needles in a stitch bond-type arrangement where the needles are offset in like fashion in repeat units and yarn guides for stitching yarns also offset in a like pattern. The base fabric to be stitched is woven material.

The present invention provides a novel stitch bonded fabric and a machine and process for producing the same.

A conventional machine for producing stitch bonded fabric consists of a supply package of input fleece, feed belts that convey this fleece to an assembly including fleece pins or web holders, sinkers, a reciprocating needle bar with a plurality of needles aligned along said bar in a single plane, corresponding yarn guides on the other side of the web to lay the stitching yarn in the needle hooks, and a take-up means for the finished fabric. The just described elements are the main components of the stitch-bonding machine - numerous other ancillary components also exist in the machine.

In operation, the input fleece is selectively advanced past the needles as they repeatedly pierce the fleece. Each needle - and its corresponding yarn guide - creates a stitch column in the fleece in a warp-wise direction. Since all of the needles are in a single plane, each column of stitches has loops that are in weft-wise alignment with corresponding loops in adjacent columns. The aligned loops in a given weft-wise row capture a bundle of fibers such that the bundle is straight across the fabric in a weft-wise direction.

In the present invention the plurality of needles in the needle bar are not all in one plane, but instead are offset or staggered. Needles in the first, third, fifth, seventh, etc. position are in a first plane and needles in the second, fourth, sixth, eighth, etc. position are in a second plane. When the offset needles pierce the fleece and knit the warp-wise columns of stitches, the loops in adjacent columns are similarly offset from each other such that the weft-wise fiber bundles captured within the loops are distorted in an oscillated fashion - forming a pattern somewhat similar to two sinusoidal curves 180° out of phase with each other - rather than a straight bundle as is present in a conventional stitch-bonded fabric.

These twisted or distorted fiber bundles have a much improved binding power with the loops in the column of stitches, which greatly improves the weft-wise strength or stability of the fabric. The improved binding power is attributable to the wrap angles of the weft-wise fiber bundles relative to the individual stitch-loops in the warp-wise columns.

This improved binding power results in a fabric with a greater pilling resistance as well as a high weft stability. Additionally, the fabric drape is improved across the filling by the oscillating effect of the fiber bundles. The appearance of the fabric is also notable. The fiber bundles, due to the wrap angles, have a degree of alignment both toward the warp-like chains and the filling fiber creating a diagonal pattern having the appearance of a woven twill.

A further advantage of an offset needle configuration is that a finer gauge fabric can be produced. With conventional single plane needle configurations the dimensional relationships between needles, fleece pins, sinkers and yarn guides limit the machines to 28 gauge. When sufficient needle offset is achieved so that the guide bar blades can fit between the needles, two guide bars may be used to create a single bar construction with a fineness as high as 56 gauge. A single sinker and a single fleece pin can serve two needles offset from each other by configuring the sinker and the fleece pin as a crank, in a manner to be more fully described below.

This finer gauge fabric is characterized by superior strength, drape and appearance. It also enables the use of shorter fibers in the fleece.

The invention is further based on the requirement to reduce the separating effect, which the penetrations have upon the web in terms of the above-mentioned tear-off perforation and the bunching effect, whilst maintaining a dense penetration pattern.

According to the invention this is achieved by the characterising features of claim 1.

Due to the zig-zag-shaped needle penetration pattern produced with each knitting cycle and repeated with each subsequent knitting cycle, it becomes possible to select a greater needle distance for each row of penetrations and to compensate for this by arranging for a subsequent row of penetrations to be laterally offset from the former resulting in the zig-zag-shaped needle penetration pattern such that in projection vertically to the needle array a high density of needle penetrations is obtained with correspondingly high reinforcement without the above-mentioned disadvantages.

Perferably the web take-off is set in such a way that its length per knitting cycle is essentially equal to twice the distance of the penetration rows produced by both knitting needle rows. In this case consecutive zig-zag-shaped needle penetration patterns of equal distance are obtained, which imparts a uniform appearance and a correspondingly uniform reinforcement to the web.

The web may e.g. be a non-woven fabric. It is also possible to supply a web formed of diagonal filler threads. Moreover such filler threads may be combined with any given support layer, in particular to form a non-woven fabric.

A warp knitting machine for performing the above-described method is conveniently constructed in such a way that its two knitting needle rows are arranged on a common guide bar, in which case only one drive mechanism is required for operating both knitting needle rows. In other respects a normal warp knitting machine may be used equipped with sharp-nosed knitting needles as normally used for sewing knitting threads into a web.

The invention is more completely described below in relation to preferred embodiments and understanding is facilitated by reference to the drawings herein below.

- Figure 1 is a schematic view of the major components of a stitch bonding machine.
- Figure 2 is an enlarged schematic view of the stitching zone of a conventional stitch bonding machine.
- Figure 3 is an oblique view of the needle bar of the present invention.
- Figure 4 is an enlarged schematic similar to Fig. 2 but with the needle bar of the present invention employed in the stitching zone.
- Figure 5 is an enlarged view of the structure of a conventional stitch bonded fabric.
- Figure 6 is an enlarged view of the structure of a stitch bonded fabric according to the present invention.
- Figure 6a is a still further enlarged view of portions of three stitch columns and three fiber bundles from the fabric of Fig. 6.
- Figure 7 is another enlarged view of a stitch bonded fabric according to the present invention, illustrating the twill-like surface appearance of the fabric.
- Figure 8 is a view similar to Fig. 4 showing modifications to achieve a finer gauge fabric.
- Figure 9 is a cross sectional view of the cooperation between offset needles and crank-shaped sinkers.
- Figure 10 is a cross sectional view of the cooperation between offset needles and crank-shaped fleece pins.
- Figure 11 shows a section of the web with a zig-zag-shaped penetration pattern.
- Figure 12 shows a principal illustration of a side view of the knitting tools of a warp knitting machine, where the web submitted is a non-woven fabric.
- Figure 13 is an illustration corresponding to figure 12 with a web formed of diagonal filler threads.

Figure 1 is a schematic of the major components of a stitch bonding textile machine. A roll 10 of fleece - such as produced by a cross folder - serves as an input supply of the fiber fleece which are to be bonded together to produce the fabric. Alternatively, the input fleece can be fed directly from a cross-folder. Feed belts 20A and 20B convey the fleece to the stitching zone 30, where it passes between fleece pins or web holder pins 50 and sinkers 40 in a conventional manner. Needles 60 stitch through the fleece, creating a plurality of warp-like columns of stitches from yarn

supplied from packages 80 through yarn guides 70. Closing wire 90 functions in a conventional manner to close the hook on needle 60. Additional guide rolls 20C convey the stitch bonded fabric to take-up package 100.

The apparatus in the stitching zone is shown in greater detail in Figure 2. Needle bar 64A holds a plurality of needles 60 (only the closest of which is visible in the figure), each of which has a point 61, a hook 62 and a groove 63 to accommodate closing wire 90. A web path W exists between knocking-over sinkers 40 and web holder pins 50, both of which are attached to the machine by means of sinker leads 41 and web holder pin leads 51, respectively. The point 61 of needle 60 passes through the web, picks up a stitching yarn in hook 62 from yarn guide 70, and pulls the yarn through the web to form, in cooperation with sinker 40, a stitch. In a conventional stitch bonding textile machine, there are a plurality of needles 60, all located in the same plane. In like manner, there are a corresponding plurality of sinkers and fleece pins.

One embodiment of needle bar 64B of the present invention is shown in an oblique view in Figure 3. Needles 60 are staggered or offset from each other both vertically and horizontally such that they fall into two planes A-A and B-B and such that a needle in plane A lies over the space between two needles in plane B. The horizontal spacing between needles may be varied, as may be the vertical spacing. For example, the offset needles illustrated in Fig. 4 show less of a vertical spacing than the needles in Fig. 3. Thus, when viewed from the side, the embodiment of Fig. 4 has the front needle obscuring a portion of the needle behind it, and so on for all the needles in the bar. While this preferred embodiment is described with respect to offset needles in only two planes, it should be understood that offset needles in more than two planes are also contemplated for some applications.

Figure 4 illustrates the stitching zone in a view similar to Figure 2, but in which needle bar 64B of the present invention and its offset needles replace the conventional single plane needle bar 64A of Figure 2. When viewed in conjunction with Figure 3, needle 66 is in plane A-A and needle 65 is in plane B-B, although these planes are vertically closer to each other than those shown in Fig. 3. Again, a plurality of needles exists in each plane - only one in each plane is shown in Figure 4.

A conventional stitch bonded fabric is illustrated in Figure 5. A plurality of stitch columns $C_1, C_2, C_3, C_4, C_5 \dots C_{12}$ are formed in the warp-wise direction, and a plurality of fiber bundles $B_1, B_2, B_3, B_4, B_5 \dots B_{12}$ are formed in the weft-wise direction.

As mentioned above, when envisioned in terms of conventional woven fabrics, the columns of stitches C constitute the warp yarns and the fiber bundles B constitute the weft yarns. The vast majority of the fibers in the fleece are captured by the individual stitches and form part of a given bundle but, as is apparent in Figure 5, a small number of fibers f lie outside the bundles. When the fabric of Figure 5 is subjected to a weft-wise tension, the fiber bundles have a poor binding power with their corresponding stitches, and slip through same with relative ease. This results in a fabric with a poor, or low, weft stability.

A fabric produced according to the present invention is shown in Figure 6. The columns of stitches are indicated by reference letters $C'_1, C'_2, C'_3, C'_4 \dots C'_{12}$ with columns $C'_1, C'_3, C'_5 \dots$ knit by needles in one plane and columns $C'_2, C'_4, C'_6 \dots$ knit by needles in a second plane.

Fiber bundles $B'_1, B'_2, B'_3 \dots B'_{12}$ form an oscillating pattern quite different from the pattern formed by the bundles in Figure 5.

Figure 6A is a greatly magnified view of the upper left corner of the fabric structure shown in Figure 6. Three stitch columns C'_1, C'_2, C'_3 and three fiber bundles B'_1, B'_2, B'_3 are shown in Figure 6A. The oscillating path assumed by each bundle is readily apparent from Figure 6A. Bundle B'_1 is completely encompassed in stitch S_{1a} of column C'_1 but then, moving to the right of the figure (in a weft-wise direction), splits so that roughly half of bundle B'_1 is encompassed in stitch S_{2a} of column C'_2 and the other half is encompassed in stitch S_{2b} of column C'_2 . Continuing to the right of the figure, bundle B'_1 comes together and is completely encompassed within stitch S_{3a} in column C'_3 . The bundle configuration just described occurs with the majority of the fibers in a given bundle. In actual application, there exists some minor but unpredictable fiber cross-over from bundle to bundle, such as shown by filament f' passing from bundle B'_2 to B'_1 and beyond.

This oscillating pattern repeats itself throughout the fabric and creates a more efficient binding power attributable to greater frictional engagement between bundle and stitch created by the wrap angle of the bundle around the stitch yarn. This creates a greatly improved weft-wise tensile strength and resistance to distortion, or a high weft stability. This fabric structure also results in good pilling resistance and improved drape characteristics across the filling.

With particular reference to Fig. 7, it can be seen that the just described oscillating pattern formed by the yarn bundles creates a diagonal, twill-like surface pattern on the fabric. The actual bundles are visible in the upper left corner of Fig. 7 - the twill-like diagonal pattern is schematically illustrated in the remainder of Fig. 7.

Comparative tensile strength tests were run on a sample of conventional stitch bonded fabric and a sample of fabric produced according to the present invention. In the conventional fabric, the distance between stitches in a given column was 1.4 mm. In the sample according to the invention, the needle planes A-A and B-B were offset 0.7 mm and the distance between stitches in a given column was held to 1.4 mm. Thus, the stitches in adjacent columns were offset from each other by half their length. The gauge of the two samples was the same, i.e., 28 gauge. The fleece

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consisted of 4 denier - four inch length polyester. The weight of one sample of the conventional fabric was 4.67 ounces per square yard while the fabric of the invention weighed 4.40 ounces per square yard. Five - test samples measuring four inches by six inches were taken from both the conventional fabric and the fabric made according to this invention. In the tables below, the test results are set forth. The test employed a conventional Scott Tensile Tester, with tension applied until the sample failed.

Conventional Fabric				
	Tensile-Warp Direction lbs.	Tensile Weft Direction (Filling) lbs.	Initial Modulus Filling gm	Modulus Filling gm
Sample 1	81	83	252	1083
Sample 2	80	91	252	1083
Sample 3	80	92	252	1083
Sample 4	77	94	270	1305
Sample 5	79	87	260	1083
Average	79	89	257	1127

Fabric According to Present Invention				
	Tensile-Warp Direction lbs.	Tensile Weft Direction (Filling) lbs.	Initial Modulus Filling gm	Modulus Filling gm
Sample 1	83	105	710	1630
Sample 2	83	92	1054	1640
Sample 3	73	127	1054	1833
Sample 4	73	90	695	1830
Sample 5	78	94	1054	1640
Average	78	102	913	1715
% Difference	-1%	15%	255%	52%

The table headings are defined as follows:

Tensile-Warp Direction - 1bs: A tensile force measured in pounds was applied in the warp direction until failure.

Tensile - Weft Direction (Filling) - 1bs: A tensile force measured in pounds was applied in the weft direction until failure.

Initial Modulus Filling - gms.: An indication of force per unit stress, i.e., stress in grams divided by strain - i.e. % stretch. Thus, for example, Sample 1 of the conventional fabric indicates that for 252 grams of force applied, the sample stretched 1%. This is an indication of the resistance to distortion.

Modulus Filling - grams: i.e., the additional grams of force required to take the sample from its initial modulus to failure. This is an indication of the resistance to failure after the fabric has been distorted.

The samples were also subjected to a standard ASTM Random Tumble Pilling Test, and compared with samples - in a visual grading scale of 1-5, with 5 being excellent. The conventional fabric was 3.0 - i.e. moderate pilling. The fabric of the invention was 4.5 - very slight pilling.

As is apparent from the above reported tests, there was an average 15% improvement in the weft-wise strength of the fabric, and the initial modulus indicates a dramatic 255% improvement in the fabric's ability to resist weft-wise distortion. Also, the ability of the inventive fabric to resist pilling was markedly improved over the conventional fabric.

I have also determined that offsetting the needles in a stitch-bonded textile machine permits the production of a finer gauge stitch-bonded fabric. It is necessary carefully to control dimensions of the various components in the stitching zone.

Figure 8 is a schematic view of the components in the stitching zone when modified to produce a fine gauge fabric. Like elements are numbered as in Fig. 4, but with prime (') designations.

In this embodiment, the plane of needles which includes needle 66' is vertically offset from the plane of needles which includes needle 65' by an amount greater than that shown in either Fig. 4 or Fig. 3. The vertical offset may be, for example, four and one-half stitch lengths - i.e., 6.35-mm which is sufficient to accommodate yarn guide blades that are 2 mm wide. Several of the knitting components, or elements, require modification: (1) the sinker blades 40' must be made longer so that the offset needles can fit between sinker leads 41' and sinker nose 42'; (2) the fleece pins 50'

must also be made correspondingly longer; (3) closing wires 90₁ and 90₂ must be offset in two planes corresponding to the needle offset such that they can ride in the corresponding grooves in the needles; and (4) the needles in the upper plane (as seen in Fig. 8) are cranked at location D so that needles in both planes can be cast into a conventional sized needle bar 64B'. Alternatively, if needle bar 64B is made larger in the vertical dimension, the upper needles need not be cranked.

The clearance between the yarn guide blade and needle - both in front and behind the hook - should preferably be a minimum of 1 mm.

With longer sinker blades, the opening of the sinker window X (see Fig. 9) will be large enough to accommodate both needles - in this example, the window would be 8.85 mm.

Both the sinker blades and the fleece pins are bent into a crank-like configuration, as is visible in Figs. 9 & 10. This cranked configuration permits a single sinker blade, and a single fleece pin, to serve two needles, one in each plane.

Sinker pins 40' should preferably have a hole 43' punched in each with a supporting wire 44' running therethrough to support the back side of the needles 66'. (The lower needles 65' are supported by sinker nose 42'.)

The crank offset of both sinker blades and fleece pins is determined by dividing the gauge - i.e., the number of needles per inch into 25.4 mm - the number of millimeters in one inch. Thus for a 56 gauge needle assembly, the crank offset is 0.454 mm, indicated by Y in Figs. 9 and 10.

A comparison of the relative cost of manufacturing a conventional 4 oz., 28 gauge, 70 den. yarn fabric with an equivalent 4 oz., 56 gauge, 50 den. yarn fabric indicates that the 56 gauge fabric is only about 3 cents/sq. yd. more expensive than the 28 gauge fabric, with no loss of efficiency in knitting.

The finer gauge fabric would have vastly superior strength, drape and appearance, and would enable the use of a shorter staple length fiber in the fleece.

Figure 11 shows a section of a web 101 formed of diagonal filler threads 104, which has been treated by the method according to the invention and which was subjected to two knitting cycles during which two needle penetration rows respectively were produced simultaneously, i.e. rows 102a and 102b and 103a and 103b. Within the two rows 102a and 102b a zig-zag-shaped penetration pattern exists of which the penetrations of row 102b are symmetrically offset in relation to the penetrations of row 102a. Rows 102a and 102b are simultaneously worked in one knitting cycle.

The same applies to the two needle penetration rows 103a and 103b. The take-off length of the web per knitting cycle is such that the distance with which penetration row 103a follows penetration row 102b is twice the distance between penetration rows 102a and 102b. In this way the same penetration pattern repeats, at a distance such that the individual penetration patterns repeat symmetrically following each other resulting in an altogether uniform appearance of all penetration patterns. As a consequence a correspondingly evenly distributed reinforced web 101 is obtained on the basis of the needle penetrations and the worked-in knitting threads. But it is also possible, of course, to operate the respective machine at a shorter or longer web take-off per knitting cycle.

As illustrated the needle penetrations of row 102b as projected, lie resp. centrally between two penetrations of row 102a in feed direction of web 101 (indicated by the arrow) so that when projected this way, a uniform relatively narrow pitch is obtained. But since this narrow pitch does not belong to a row of adjacent needle penetrations, the penetrations of one knitting cycle resp. being spaced and offset at a distance from each other, sufficient distance remains between individual penetrations of rows 102a and 102b to ensure that undesirable bunching of the fibres of web 101 or diagonal filler threads 104 is avoided, although in total a considerable density of individual needle penetrations is obtained across web 101.

In the left half of figure 11 some knitting threads 119 are drawn laid in a fringe. It should be noted, however, that the knitting threads may also be worked into the web in the form of tricot laying. The respective type of laying depends on the requirements which the textile fabric to be produced has to meet.

The adjacent penetration rows shown in figure 11, i.e. 102a and 102b and 103a and 103b are, as already mentioned, produced simultaneously in a single knitting cycle, with 2 rows of sharp-nosed knitting needles penetrating the web 101 submitted at any one time.

The knitting tools of the warp knitting machine used in this case are illustrated in figure 12, the base fabric being a web in the form of a non-woven fabric 107. These knitting tools consist of sharp-nosed slide needles 108 and 109, whereby these two needles belong to one row of slide needles resp. extending longitudinally to the needle array. As the two slide needle rows containing slide needles 108 and 109 therefore penetrate (the web) they produce the penetration rows 102a and 102b seen e.g. in figure 11. The two needle rows containing slide needles 108 and 109 are both attached to sliding guide bar 120, i.e. they are operated jointly as the guide bar 120 is moved up and down in the customary way. Assigned to slide needles 108 and 109 are the slides 111 and 112, which are also operated by a common sliding guide bar 113. Cooperation between needles 108 and 109 and slides 111 and 112 is as commonly known for slide needles.

Laying of the warp threads serving as knitting threads is effected by two laying guides 124, 125 for each two slide needles 108, 109, the laying guides being suspended in the known manner from laying guide bars 116, 117 and operated

by the same. One laying guide would already suffice for each two knitting needles 108 and 109. In order to produce special warp thread layings, however, more than one laying guide may be conveniently provided.

With the warp knitting machine illustrated the web submitted in the form of non-woven fabric 107 is supplied via the knock-over sinker 118 and held from above in a downward direction by the trace comb 106.

When the guide bar 110 is operated, two penetration rows (e.g. 102a and 102b in figure 11 are produced by the two needle rows containing knitting needle 108 and 109, which two penetration rows are repeated with each subsequent knitting cycle. With the web take-off speed set appropriately, consecutive zig-zag-shaped needle penetration patterns of equal distance are obtained resulting in the altogether uniform appearance seen in figure 11. This figure also reveals that the warp knitting machine of figure 12 is able to operate at twice the take-off speed compared to other machines with only one row of knitting needles and thus with twice the output since one knitting cycle on this machine corresponds to two knitting cycles of a machine with only one row of knitting needles. To produce fringe-laying as revealed in figure 11, the two laying guides 114 and 115 are required, which are assigned respectively to the two knitting needles 108 and 109 for laying the warp threads around the respective knitting needles.

The same machine is illustrated in figure 13 but instead of a non-woven fabric 107 a web of diagonal filler threads 104 similar to those illustrated in figure 11 is submitted. It is pointed out that it is, of course, also possible to supply a web which may be a combination of non-woven fabric and diagonal filler thread. Textile webs other than those described may also be submitted provided they can be penetrated by the sharp-nosed needles. In other respects the function of the machine illustrated in figure 13 entirely corresponds to that of figure 12.

Claims

1. Method for sewing knitting threads (119) into a web submitted to a warp knitting machine, whereby a row (108) of sharp-nosed knitting needles penetrate the web (101) thereby sewing the knitting threads (119) into it along a row of stitches with each knitting cycle, whereby with each knitting cycle two rows of knitting needles (108,109) simultaneously penetrate and then withdraw from the web such that a zig-zag-type pattern of two penetration rows (102a,102b; 103a,103b) extending parallel to the needle array is created with each knitting cycle, characterized in that the web is a fiber fleece comprising columns of warp-wise stitches, said stitches adjacent to each other in a weft-wise direction being offset such that bundles of fibers captured within said stitches are distorted in an oscillated fashion forming a pattern similar to two sinusoidal curves 180 degrees out of phase with each other.
2. Method according to claim 1, characterized in that the length of web take-off per knitting cycle essentially corresponds to twice the distance of the needle penetration rows (102a,102b; 103a, 103b) created by the two rows of knitting needles.
3. A machine for executing the method according to claim 1 for making stitch bonded fabric from a web of fiber fleece including a stitching zone comprising a web path, fleece pins and yarn supply guides on one side of said path, and sinkers and a plurality of needles on the other side of said path, said plurality of needles being carried by a needle bar and mounted such that alternate needles are aligned in more than one plane, whereby the needles stitch the fiber fleece in stitches being offset adjacent to each other in the weft-wise direction, thereby capturing the bundles of fibers in the pattern similar two sinusoidal curves 180 degrees out of phase with each other.

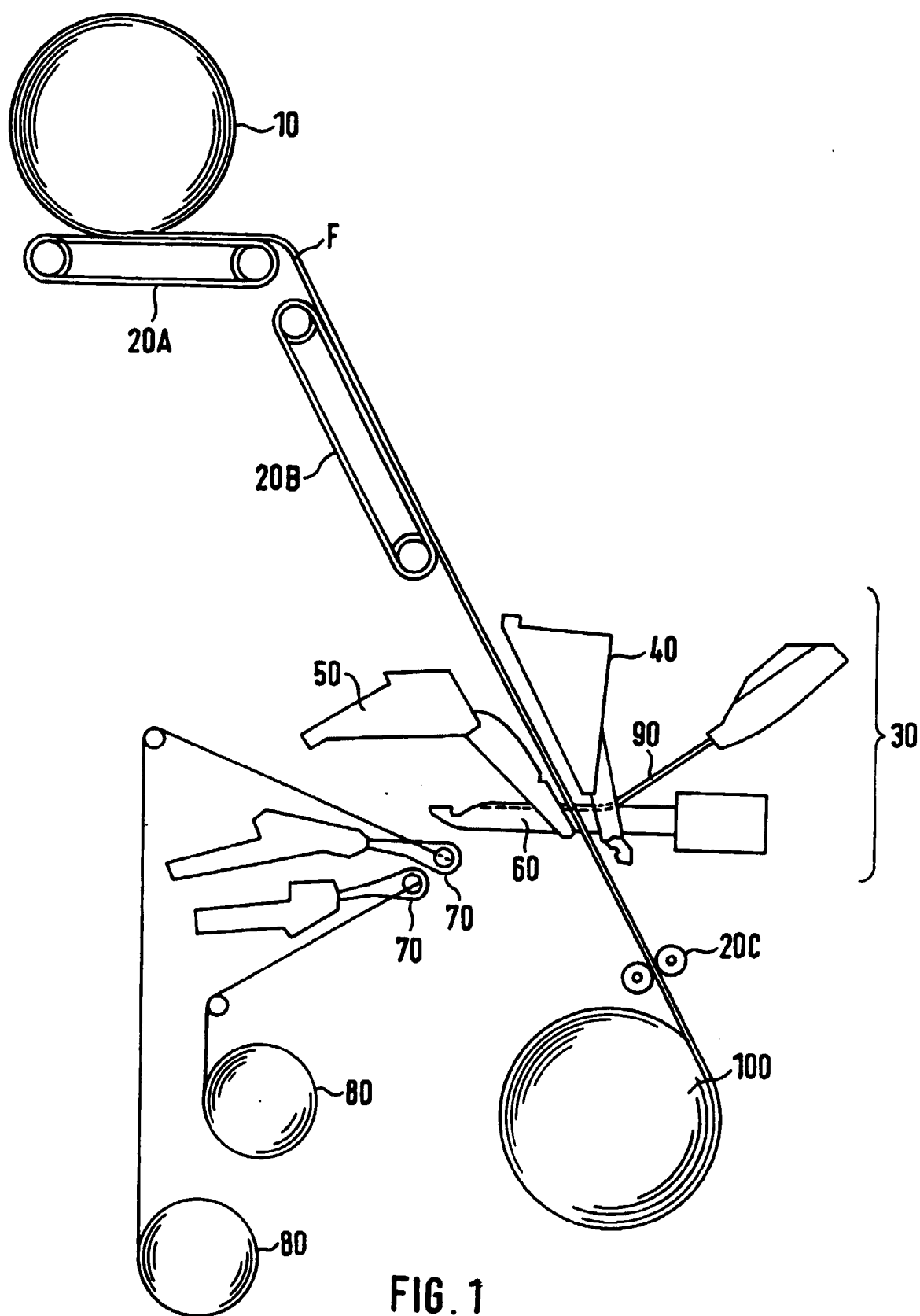
Patentansprüche

1. Verfahren zum Nähen von Wirkfäden (119) in ein Gewirk, das einer Kettenwirkmaschine zugeführt wird, wobei eine Reihe (108) von scharfnasigen Wirknadeln in das Gewirk (101) einsticht und dadurch die Wirkfäden (119) entlang einer Stichreihe mit jedem Wirkzyklus einnäht, wobei mit jedem Wirkzyklus zwei Reihen von Wirknadeln (108, 109) gleichzeitig in die Warenbahn einstechen und dann so zurückgezogen werden, daß mit jedem Wirkzyklus ein Zickzack-Muster aus zwei sich parallel zur Nadelanordnung erstreckenden Einstichreihen (102a, 102b; 103a, 103b) geschaffen wird, **dadurch gekennzeichnet**, daß die Warenbahn ein Faserfließ ist, das Reihen von Stichen in Kettrichtung enthält, die als benachbarte Stiche in Schußrichtung so versetzt sind, daß innerhalb der Stiche eingefangene Faserbündel in einer oszillierenden Weise verzogen werden und dadurch ein Muster bilden, das zwei Sinuskurven mit 180° Phasenverschiebung ähnlich ist.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß die Länge des Warenabzugs je Wirkzyklus im wesentlichen dem doppelten Abstand der Nadeleinstichreihen (102a, 102b; 103a, 103b) entspricht, die durch die beiden Reihen der Wirknadeln erzeugt werden.

3. Maschine zur Durchführung des Verfahrens nach Anspruch 1 zur Herstellung eines Nähwirkstoffes von einer Faserfließbahn, die eine Nähzone mit einer Warenführung, Flieshaltestifte und Fadenzuführer auf der einen Seite besagter Führung sowie Platinen und eine Mehrzahl von Nadeln auf der anderen Seite besagter Führung aufweist, wobei besagte Mehrzahl von Nadeln von einer Nadelbarre getragen und so montiert ist, daß gegeneinander versetzte Nadeln in mehr als einer Ebene angeordnet sind, wobei die Nadeln das Faserfließ in Stichen durchnähen, die benachbart gegeneinander in Schußrichtung versetzt sind, wobei die Faserbündel ein Muster bilden, das zwei Sinuskurven mit 180° Phasenverschiebung ähnlich ist.

Revendications

1. Un procédé pour passer des fils à tricoter (119) dans un tissu (101) travaillé par un métier-chaîne, dans lequel une rangée (108) d'aiguilles à tricoter à pointe acérée pénètrent dans le tissu (101) de manière à passer dans celui-ci les fils à tricoter (119) le long d'une rangée de piqûres à chaque cycle de tricotage, où, à chaque cycle de tricotage, de façon simultanée, deux rangées d'aiguilles à tricoter (108, 109) pénètrent dans le tissu et s'en extraient, de manière à créer à chaque cycle de tricotage un motif de type zigzag de deux rangées de pénétration (102a, 102b ; 103a, 103b) s'étendant parallèlement à la série d'aiguilles, caractérisé en ce que le tissu est un molleton de fibres comprenant des colonnes de piqûres dans le sens de la chaîne, celles de ces piqûres qui sont adjacentes entre elles dans le sens de la trame étant décalées de manière que les faisceaux de fibres enserrés dans ces piqûres soient déformés de façon ondulée en formant un motif semblable à deux courbes sinusoïdales en opposition de phase entre elles.
2. Le procédé de la revendication 1, caractérisé en ce que la longueur de dévidage du tissu par cycle de tricotage correspond essentiellement au double de la distance des rangées de pénétration d'aiguille (102a, 102b ; 103a, 103b) créées par les deux rangées d'aiguilles à tricoter.
3. Une machine pour exécuter le procédé selon la revendication 1 pour fabriquer un article tissé assemblé par piquage à partir d'un molleton de fibres, comportant une zone de piquage comprenant un chemin de tissu, des pointes à molleton et des guides d'alimentation de filé de l'un des côtés de ce chemin, et des platines cueillantes et une pluralité d'aiguilles de l'autre côté de ce chemin, cette pluralité d'aiguilles étant portée par une barre à aiguilles et montée de manière que les aiguilles en alternance soient alignées suivant plus d'un plan, où les aiguilles piquent le molleton de fibres en piqûres adjacentes qui sont décalées dans le sens de la trame, de manière à enserrer les faisceaux de fibres dans le motif semblable à deux courbes sinusoïdales en opposition de phase entre elles.



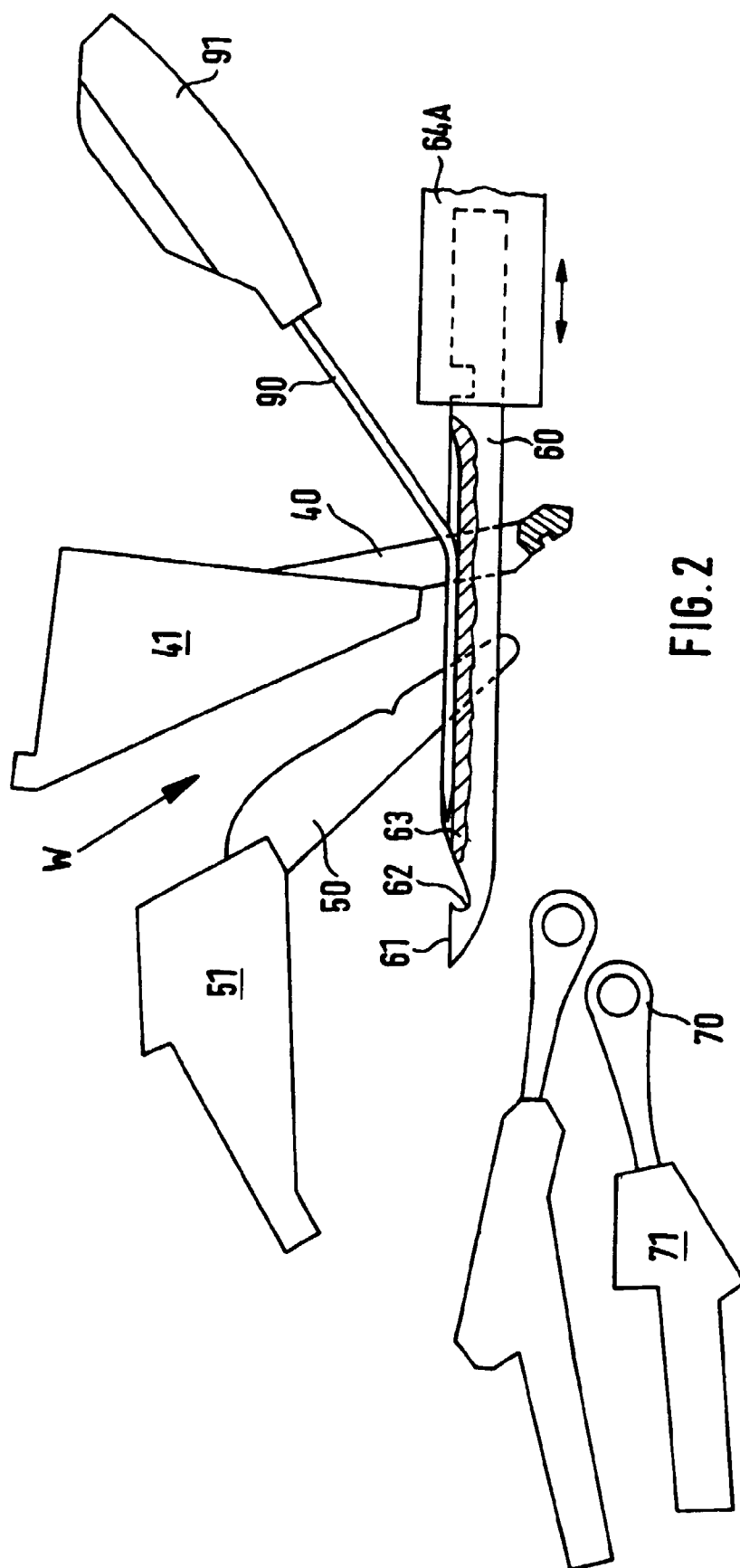


FIG. 2

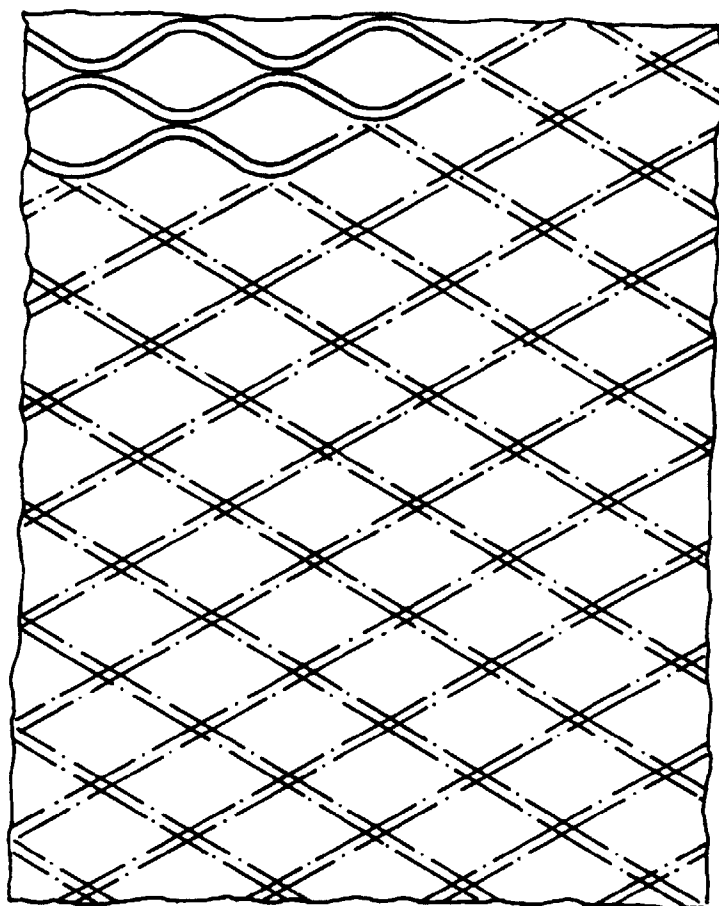
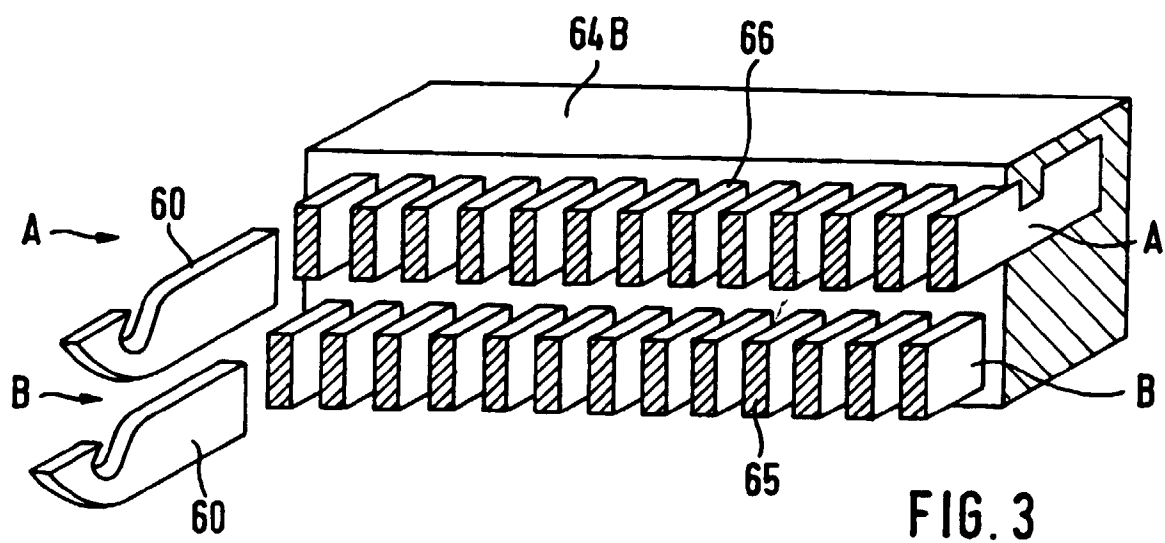
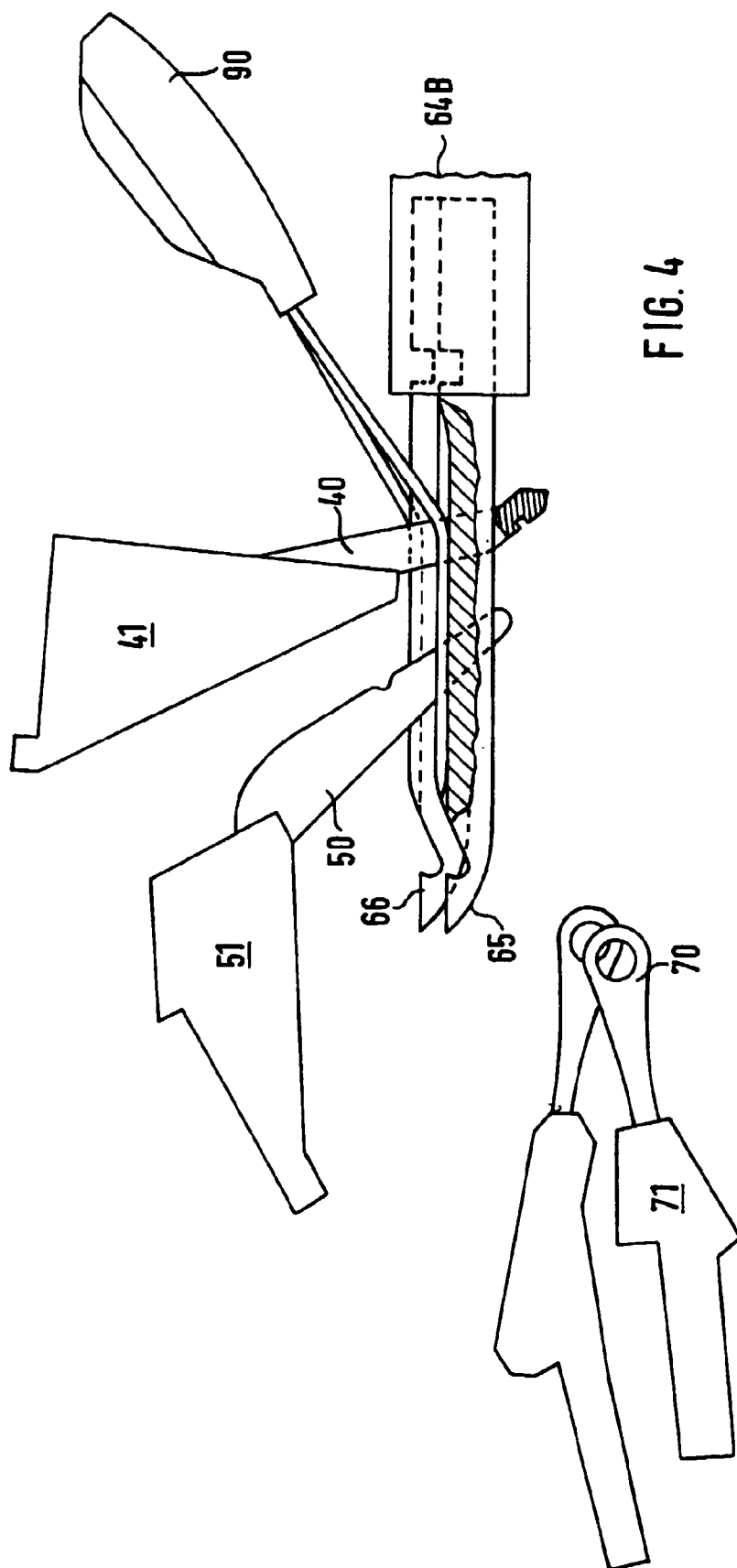


FIG. 7



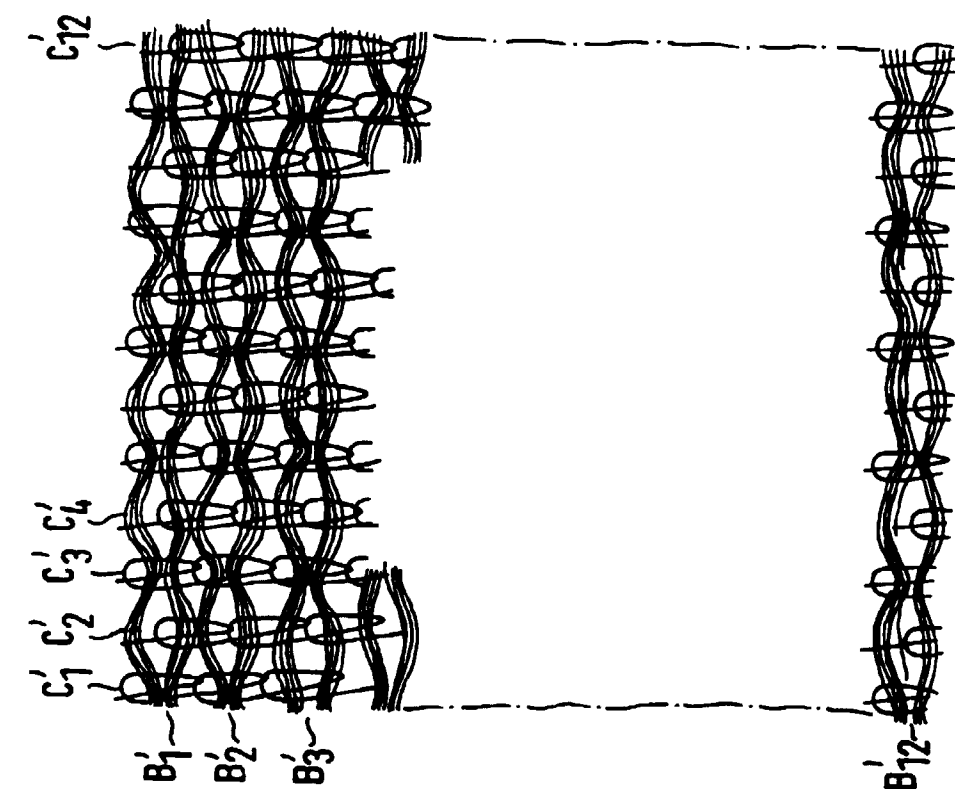


FIG. 6

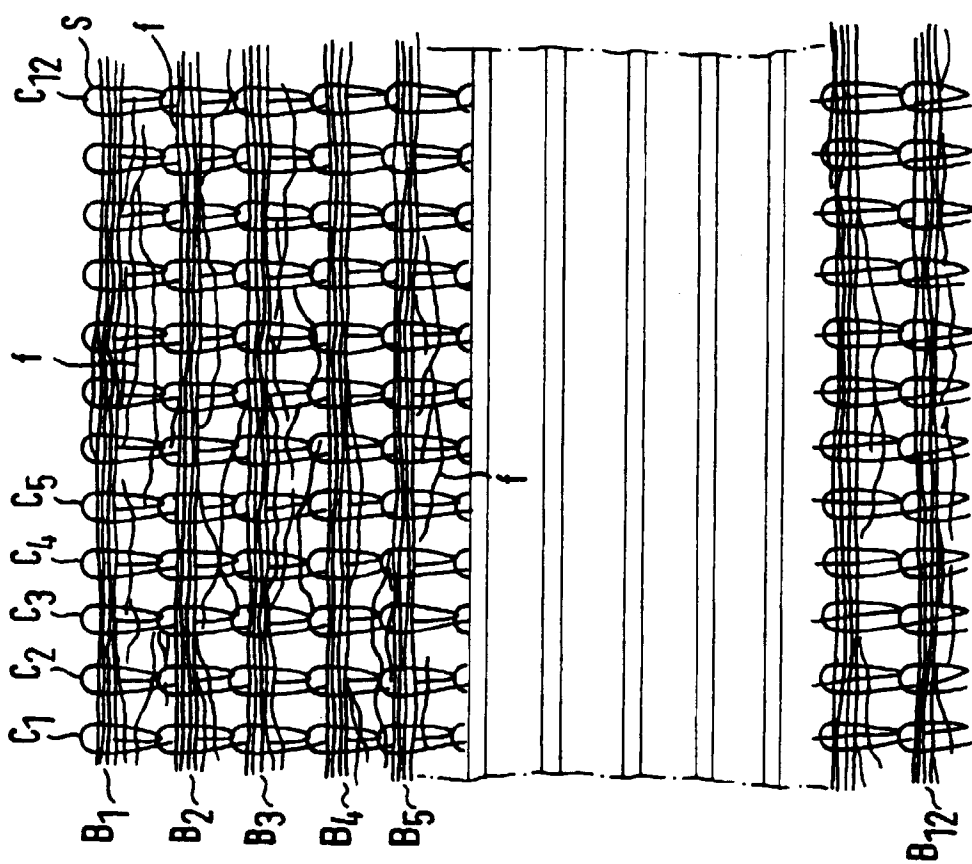
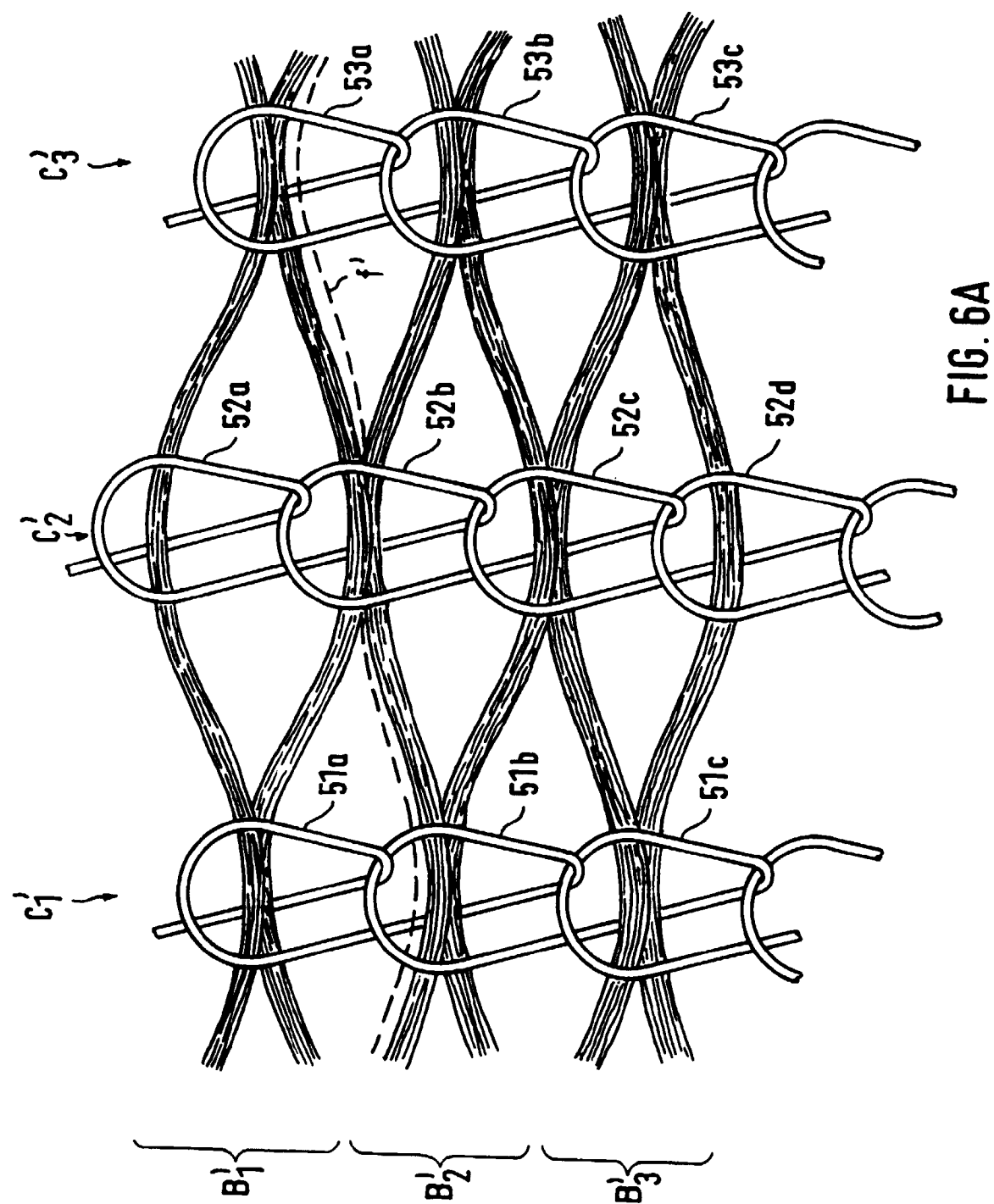
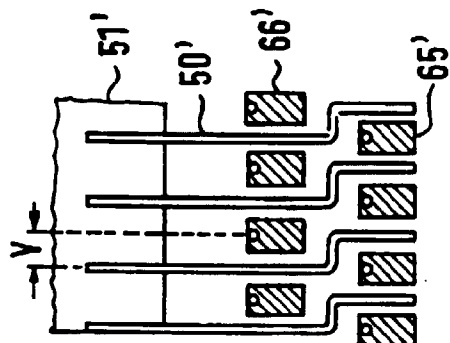
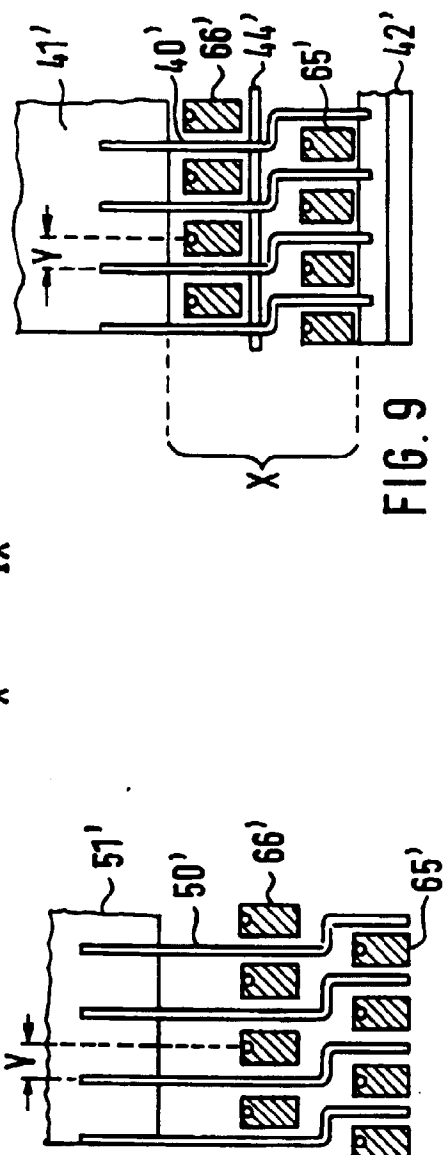
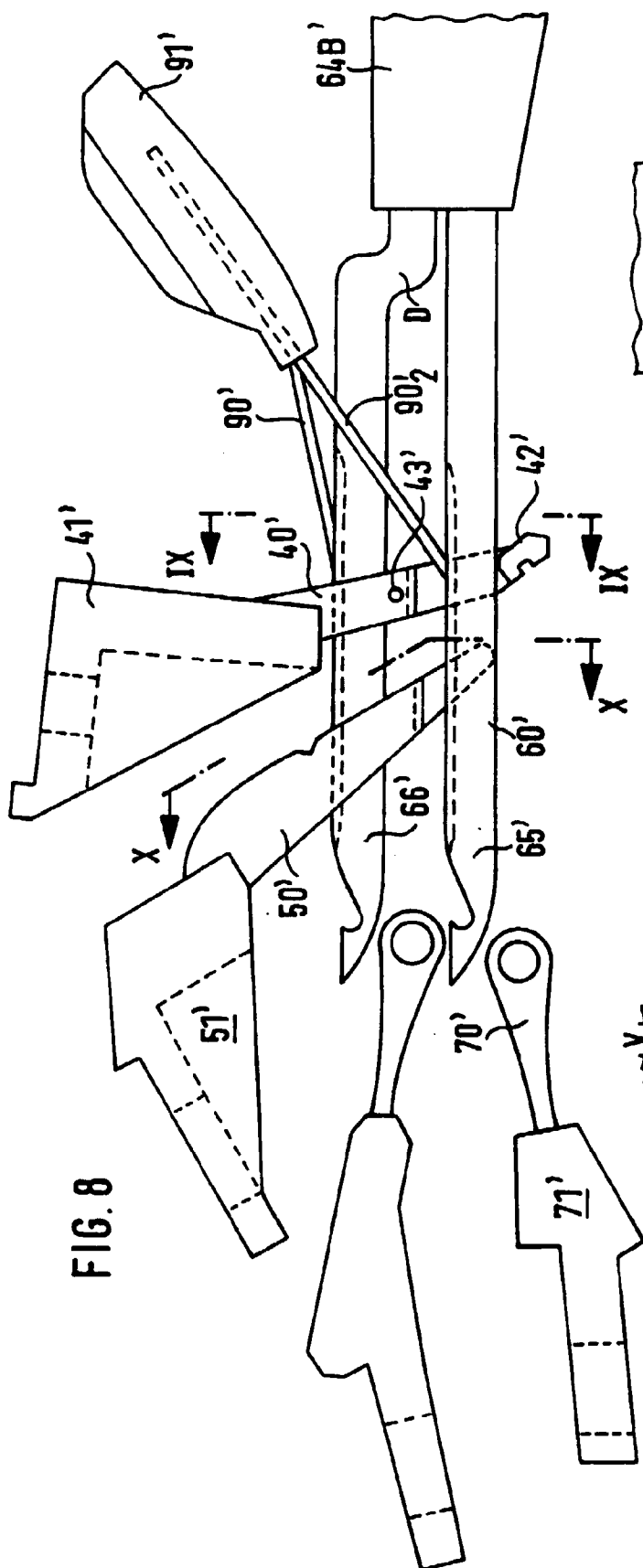


FIG. 5





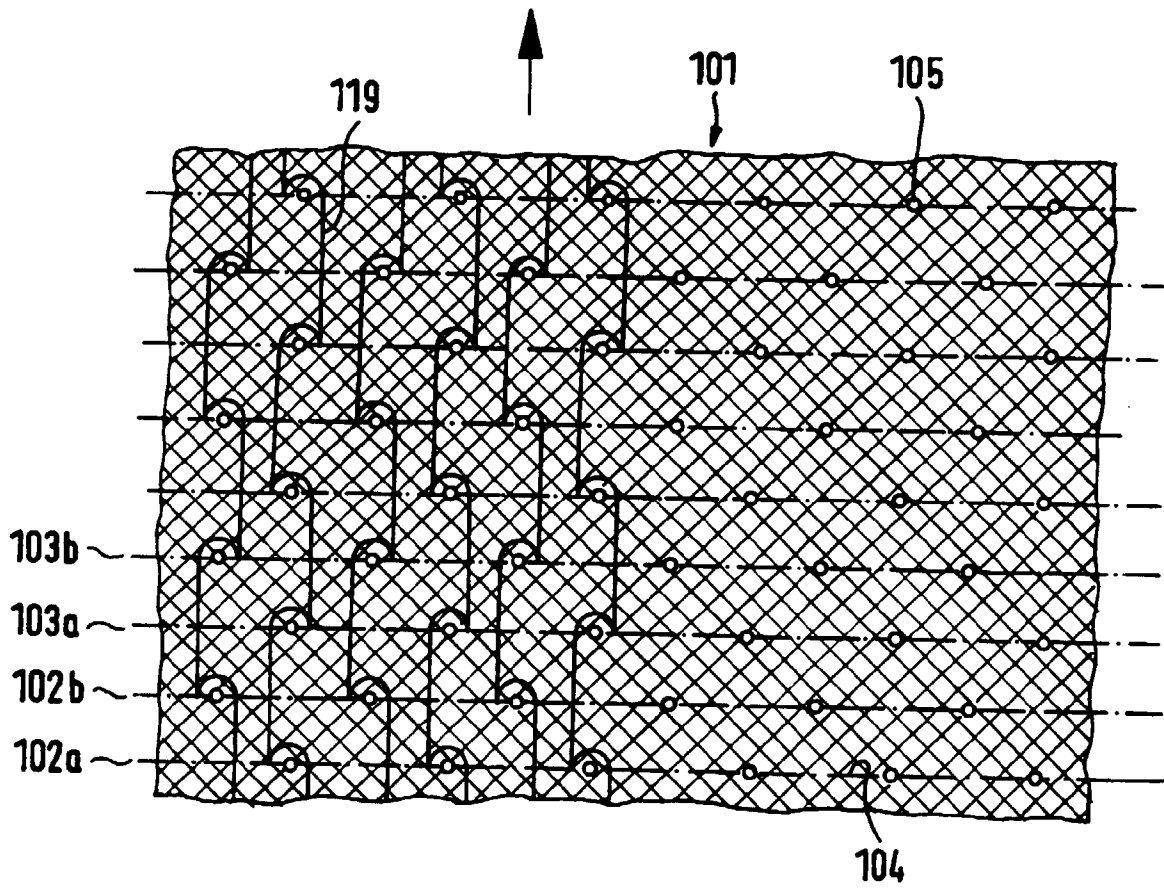


FIG. 11

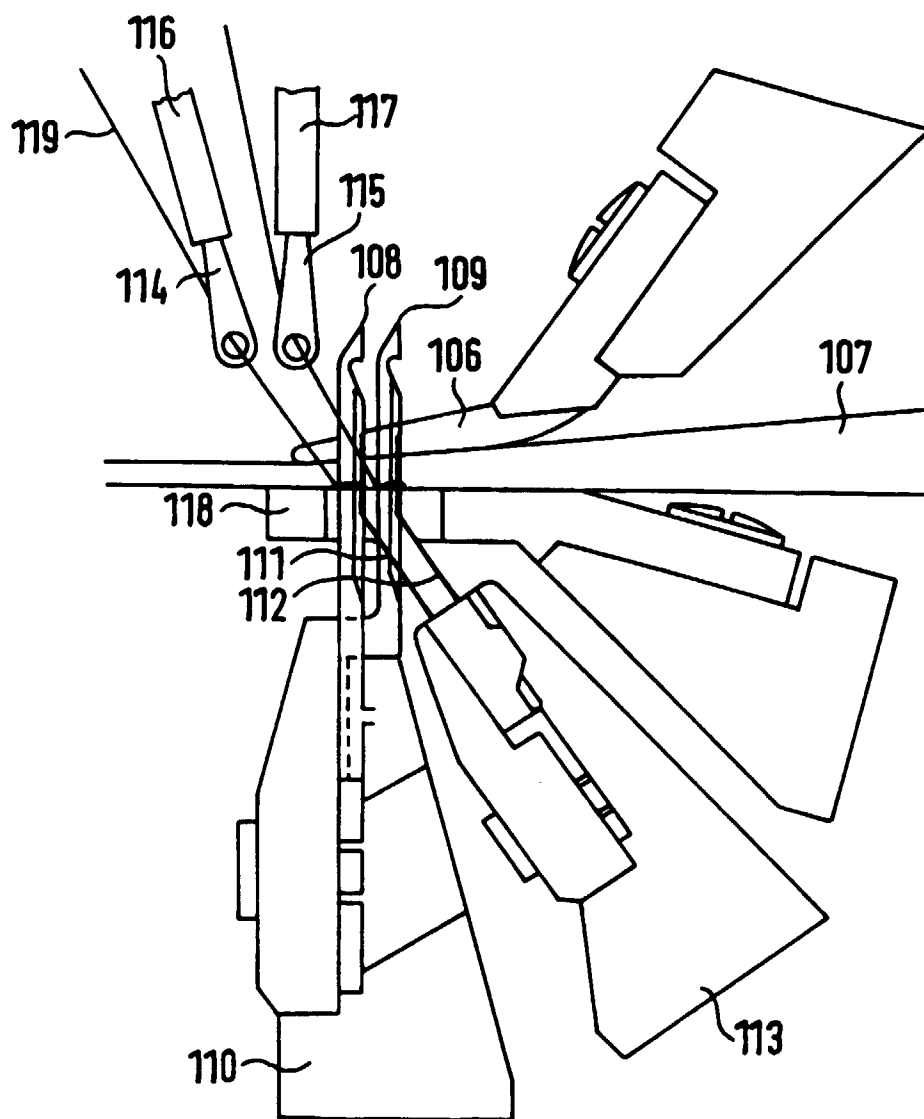


FIG. 12

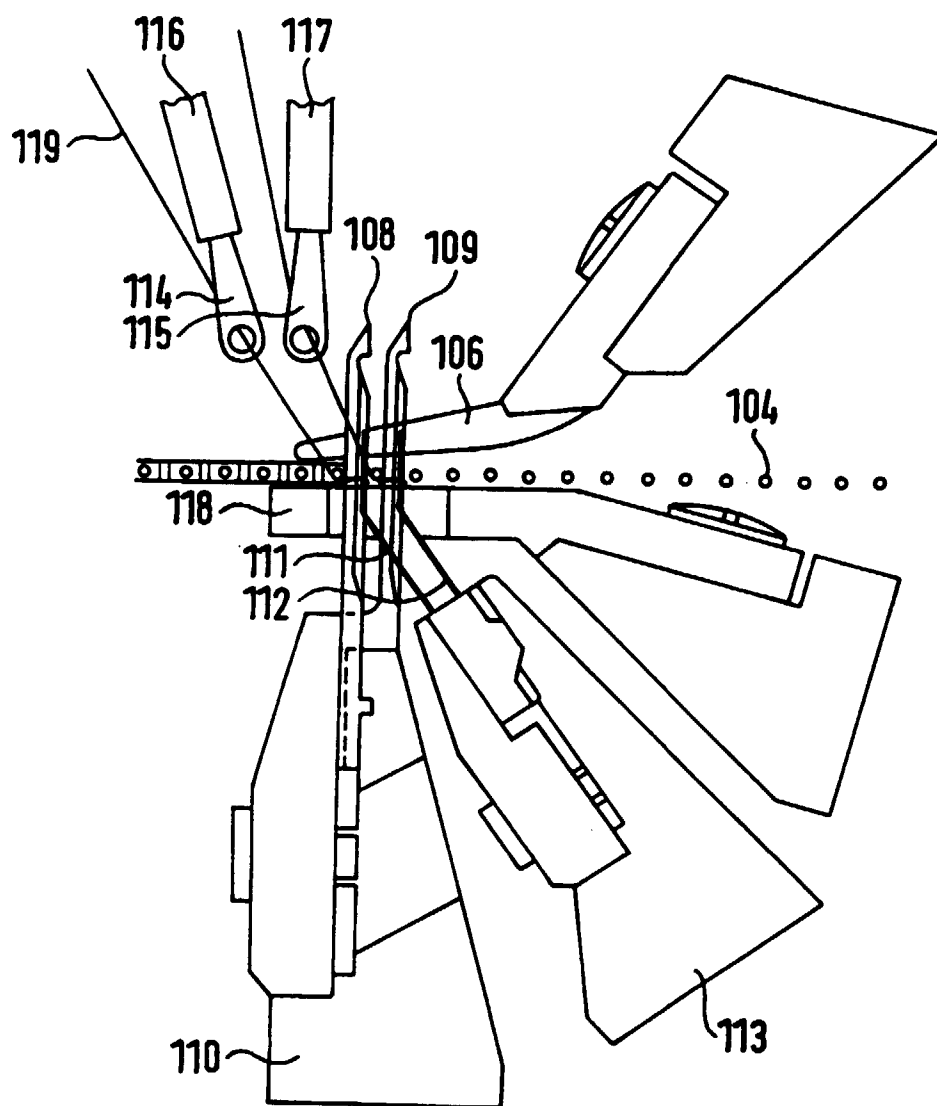


FIG. 13