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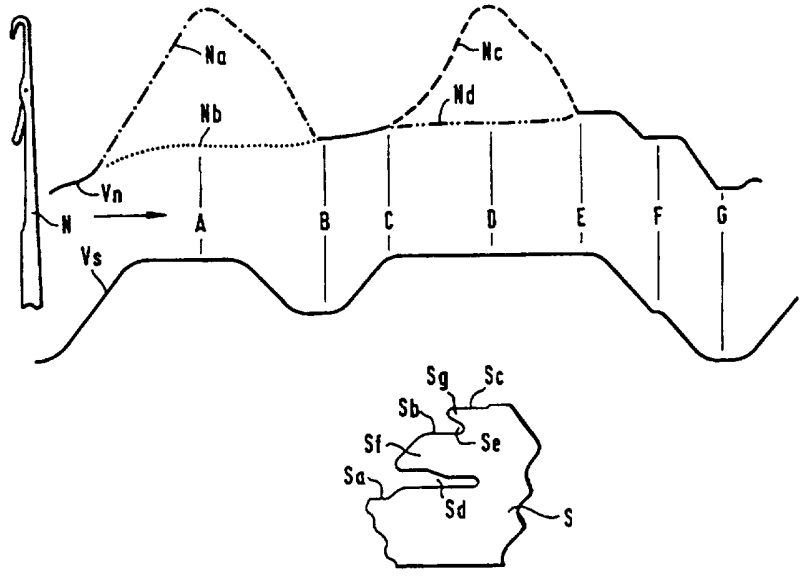

(57) Abstract

The present invention relates to float plated fabrics which are patterned in adjoining areas of the fabric from one of at least two yarns knitted in a float plated relationship to the other yarn alternatively to one another, herewith knitting sectional ground fabric portions from all yarns succeeding one another complementary to a complete ground fabric, so that a specific ground yarn is substituted or additionally used for plating effects. In a preferred method for manufacturing such fabrics the yarns are successively fed and engaged in the hooks of predetermined needles which will kink the yarns subsequent to the feeding to sectional loop portions and will knit the loop portions together to a complete course in the final knitting action (cast off).

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Description

PATTERNED FLOAT PLATED FABRICS AND METHODS FOR MANUFACTURING AFORESAID

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

Float plated fabrics are patterned in adjoining areas of the fabric alternatively by floats from one of at least two yarns from which the courses are composed.

2. DESCRIPTION OF PRIOR ART

To obtain a circular single jersey fabric with a woven-like appearance it is necessary to arrange yarn floats on the reverse stitch side of the fabric (technical back). Such fabric structures are created widely by knitting in lay-in yarns in a plain jersey ground fabric. By an individual arrangement of the tuck stitches of the lay-in yarn the surface of the fabric is shaped according to a pattern. Lay-in yarns will restrict the elasticity of the fabric, so that this fabrics, as well as woven fabrics, for special applications, in which stretchable fabrics are required (for example highly molded parts in the transportation industry), are of inadequate suitability.

Another disadvantage of lay-in yarn type fabrics is, that in case of a stress to the surface of the fabric, especially by abrasion, instead of the lay-in yarn the meshing ground yarn is destroyed, so that the fabric becomes useless. Furthermore under the conditions of lay-in constructions the patterning is widely limited to plain-color structures.

A qualitative improvement is performed by individual controlled float plating. This technique is well known, for examples as "mesh", in which a course is composed from a ground yarn knitted in all stitches and a plating yarn knitted in predetermined stitches in between floats.

With this method fabrics with sufficient flexibility are realized and if the surface is stressed by abrasion at first the floats of the plating yarn are destroyed and then the ground fabric. Comparable to lay-in fabrics the patterning of this fabrics is limited by the same restrictions.

To increase the patterning possibilities and the density of the floats it is practised recently to compose a course from one ground and two plating yarns.

According to a previous proposal, as disclosed in German Patent 664 661 in each feeder first two plating yarns are fed alternately to predetermined needles before the ground yarn is fed to all needles. The disadvantage of this method is that, notwithstanding an extraordinary exact adjustment of the yarn carriers, a great number of faults occur. The required arrangement of the plating

yarns alternatingly in the hooks and behind them on adjacent needles leads to an uncontrollable tensioning of the yarns, especially when the needle selection is continuously changed. For this reason, this proposal, as well as variations based thereon, for example, as disclosed in German Patent 671333, were not realized to a great degree.

The manufacturing of plated fabrics in which in each course two plating yarns are alternately knitted together with a ground yarn is now performed as a variation according to the European Patent 0 295 703, for example referred to in Wirkerei-Strickerei-Technik, number 10/1994 pages 824-830; Melliand Textilberichte number 1/1994, pages 34-38). Previous to the stitch forming action the first plating yarn is kinked to loops so that the above described disadvantages are avoided.

Comparable fabric constructions were also knitted on machines used for manufacturing three thread fleece, according to the disclosure in U.S. Patent No. 3,406,538. The method is modified in that the first yarn (lay-in) is not meshed into a lay-in construction. Moreover, both yarns are kinked alternately from the needle hooks on the medium ledge of the sinkers and will be knitted subsequently with the face yarn looped from all needles to plated stitches.

A modified method hereto is also disclosed for knitting a sectional ground fabric portion in the proposal according to German Patent No. 31 45 307 (identical with US-Patent No. 4,612,784; column 5, lines 54 to 66)

in accordance with manufacturing plush fabrics, especially with fabric portions in which no plush loops are provided. With reference to this method in the German patent publication no. 39 27 815 (column 6, line 68 to column 7 lines 1 to 9) several fabric constructions and an alternative method (Fig. 9) are described. If the needles are selected for knitting both ground yarns, it is especially recommended, that both yarns are knitted preferably to sectional courses complementary to on another (column 10, lines 18 to 22 and claim 2).

A disadvantage of the described last plated fabrics is presence of the additional required ground yarn which increases material costs and impedes the construction of light-weight fabrics.

SUMMARY OF THE INVENTION

With the foregoing in mind it is an object of this invention to create patterned float plated fabrics and relevant methods for their production on circular knitting machines in which a ground yarn, exclusively knitting a plain course, is avoided and the possibilities for creating new fabrics are increased.

The objects of the invention are realized by knitting a single jersey fabric in which each course is composed from ground fabric portions knitted complementary from at least two yarns one another according to a pattern and cooperatively knitting the alternative yarn(s) in float plating relationship to plated stitches

in predetermined wales with floats inbetween. Knitting with three predetermined float forming yarns facilitates the ability to increase the creation of additional collared fabrics.

Additional to the manifold patterning possibilities by saving an exclusive ground yarn, the knitting process is performed faster by a reduced space therefor whereby the production capacity is increased. The special and unlimited possibilities for creating new pattern constructions will rise from the description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention shall be explained in more details by the description of basic constructions of patterned float plated fabrics and methods for their manufacturing by means of embodiments therefore, illustrated in the enclosed simplified schematic drawings, wherein:

Fig. 1 and Fig. 2 are excerpts of fabric constructions composed from two float plating yarns per course.

Fig. 3 is a diagram showing the tracks of the needles and sinkers for knitting a float plated course from two yarns.

Fig. 3A to 3G is a side view of the stitch forming parts of the needles and sinkers at the positions indicated by A to G in Fig. 3.

Fig. 3H illustrates the arrangement of yarn 1 according to Fig. 3C.

Fig. 4 is a diagram showing the tracks of needles and sinkers alternatively to Fig. 3 for knitting a float plated fabric from two yarns per course.

Fig. 4A to 4E is a side view to the stitch forming parts of the needles and sinkers according to the positions indicated by A1 to E1.

Fig. 5. and Fig. 6 are different excerpts of fabric constructions in which three float plating yarns are composed in each course.

Fig. 7 is a diagram of the needle and sinker track for knitting fabrics according to Fig. 5 and Fig. 6.

Fig. 7A to 7L are side views to the stitch forming parts of the needles and sinkers according to the positions in Fig. 7 indicated with A2 to L2.

Fig. 7M and 7N illustrate the disposition of the kinked yarns according to Fig. 7B and 7G, seen from the top.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Fig. 1 and Fig. 2 each illustrate part of a patterned float plated fabric in which each course in-

cludes two yarns. A first group of yarns 1 (1a, 1b, 1c in Fig. 1, and 1d, 1e, 1f in Fig 2, respectively) are knit together with a second group of yarns (2a, 2b, 2c in Fig. 1, and 2d, 2e, 2f in Fig. 2, respectively) plated stitches according to a predetermined pattern. Each second stitch in Fig. 1 and each third stitch in Fig. 2 is knit from both groups of yarns.

Corresponding to these arrangements the first course knit in Fig. 1 from the yarns 1a and 2a includes predetermined yarn floats F1a and F2a from yarns 1a and 2a, respectively. In the same way the second course is composed of the yarns 1b and 2b while the third course is knit using yarns 1c and 2c. According to the provided pattern, floats of both groups of yarns are individually arrangeable, one to the other.

Referring to Fig. 2 in which each third stitch is knit from both groups of yarns in the first course from the yarns 1d and 2d, floats F1d and F2d are arranged to spread over two wales. Corresponding to the first course the second course is knit from the yarns 1e and 2e and the third course is knit from the yarns 1f and 2f.

From both illustrations in Figs. 1 and 2 and the description, predetermined and changing sections of the fabric result when one of the two yarns is knit to a ground yarn portion in all stitches of the relevant section while the other yarn is arranged to float according to a pattern.

When floats of the float plating yarn portions are damaged, the stitches of the ground fabric portion behind formed from the other yarn remain intact and by forming the floats between plated stitches the adjoining portions of the fabric are not affected therefrom. This essential interlocking of the floats may be improved on the connection of different portion of the fabric by knitting two or more plated stitches, so that a perfect solidity fabric is obtained when the knitting of ground yarns portions is changed from one yarn to the other.

As is evident from the drawings of Fig. 1 and Fig. 2 and the foregoing description each pattern area of a fabric produces an arrangement of plated stitches and corresponding to this the arrangement and length of the floats from both yarns is disposable according to the requirements of a pattern. The length of the floats are preferably limited to overlaps of three wales. Varying from Fig. 1 and Fig. 2, two or more plated stitches may be arranged between floats, respectively, and plain plated portions of the fabric can be provided to achieve an additional pattern effect.

Proceeding from this it must be noted that for the creation of patterns for plated fabrics unlimited possibilities are available.

One different possibility for manufacturing the above described patterned float plated fabrics is shown in the diagram according to Fig. 3. The movement of the needles N and sinkers S according to their tracks Vn re-

spectively Vs is performed from the left to the right and after a complete pass a course is knitted.

For knitting a fabric according to the invention a circular knitting machine with an individual needle selection is used. Such machines are well known so that a description of the operation is not necessary.

The process shown in Fig. 3 also requires sinkers which are used for the manufacturing of invisible fleece (three thread fleece). They have looping ledges (Sa, Sb, Sc) in different levels, two throats (Sd, Se) and two sinker nebs (Sf, Sg).

As well known from the manufacturing of three thread fleece fabrics, as described in US-Patent 3,406,538, subsequent to the stitch forming action of a course the sinkers S are actuated inwardly to a position toward the inside of the machine, as in Fig. 3A, so that the previous knitted course is engaged by the lower throat Sd which will prevent the fabric from being raised together with the needles.

For the engagement of a first yarn 1 predetermined needles are raised, according the curve Na, to the clearing position while the other needles remain in an idle position as indicated by curve Nb.

When the selected needles are raised into the clearing position, according position A in Fig. 3, the stitches on these needles will slide onto the needle stems as shown in Fig. 3A. In this position a first yarn

1 is fed to the raised needles. Subsequently, the raised needles are retracted to an intermediate position and the sinkers are moved slightly outwardly as on Fig. 3B so that the first yarn is kinked from the relevant needles into loops over the looping ledge Sb as demonstrated in Fig. 3B. Thereafter, the sinkers are actuated again to move inwardly to control the previous loops in their length, respectively, arranging the floats of the first yarn behind the backs of the needles by their throats Se, according to Fig. 3C for position C in Fig. 3. This is also illustrated in Fig. 3H.

In the succeeding action all needles that are to engage the second yarn 2 are raised to the clearing position according to curve Nc at position D in Fig. 3. These are the needles which previously were in an idle position and the needles predetermined for knitting both yarns to plated stitches.

Accordingly, curve Nc the stitches of such needles which remained previously in an idle position now will slide to the stems (as shown before in Fig. 3A) while the remaining needles are controlled corresponding to curve Nd in an idle position.

By the described movements of the sinkers the loops and floats from yarn 1 are engaged by the sinker throat Se which prevents their movement together with the needles. Thereby the closed needle hooks of those needles which have looped previously yarn 1 are opened as shown in Fig. 3D.

Accordingly, in position D in Fig. 3 the yarn 2 is fed to the raised needles as shown in Fig. 3D. Thereafter corresponding to the Nc curve raised needles are retracted to the intermediate idle position to kink loops from yarn 2 corresponding to position E in Fig. 3.

As shown in Fig. 3E the yarn 2 is kinked over the upper looping ledge Sc to form loops or floats where needles are missing, respectively.

Subsequently, all the needles are further retracted and the sinkers are again moved outwardly. Their cooperating movement is adjusted one to the other to control the previous looped yarns close to the stitch forming action, as illustrated in Fig. 3F which shows position F in Fig. 3.

The knitting of a course is performed over the knitting ledge Sa of the sinkers S at position G in Fig. 3 and is shown in more detailed in Fig. 3G.

Thereafter, the sinkers S are moved inwardly whereby the next knitting cycle for knitting a course, as described above, is initiated as in Fig. 3A.

The described process can be simplified among other things by the retraction of the needles raised to engage the second yarn 2 immediately thereafter to the stitch forming action. The outward movement of the sinkers must be controlled thereby in a way in which a looping of yarn 2, prior to the stitch forming action, is avoided.

Another modification of the described process is performed by kinking the first yarn 1 over the upper looping ledges Sc of the sinkers. These loops must be transferred by an adequate needle and sinker movement to the looping ledge Sb analogous to the actions performed thereafter with yarn 2 referred in the above description according to Fig. 3E and 3F.

The essential difference of the described process according to the invention and Fig. 3, 3A to 3G in contrast to the referred prior modification of the three thread fleece process (US Patent No. 3,406,538) is based in raising part of needles in the second dividing action as well as in the first dividing action and kinking the yarns on different ledges of the sinkers so that a third raising action of all needles for engaging a special ground yarn is not necessary.

The described process requires a correct adjustment of the loop length of both yarns to one another and, therefore, an exact adjustment of the knitting machine for controlling each of the looped yarns.

To avoid the exact adjustment for controlling the both looped yarns previous to the knitting action, float plated fabrics composed from two yarns per course can also be manufactured according to the knitting diagram in Fig. 4 with details of this process being illustrated in Fig. 4A to 4D corresponding to positions A1 to D1 in Fig. 4.

Referring to Fig. 4 all needles N1 are controlled corresponding to the curve Nv and its subdivisions Ne and Nk, respectively. The required selection mechanism to raise and retract predetermined needles are well known and details thereof are not required for a full understanding of this invention.

The sinkers S1 are provided with an enlarged sinker throat Sh, a sinker neb Si and a knitting ledge Sk.

The knitting process will start with raising all needles according curve Ne into a clearing position at position A1. Corresponding to Fig. 4A the sinkers have engaged and positioned the fabric on the needle stems. In this position a first yarn I is fed to all the raised needles.

Subsequent to the feeding of yarn I predetermined needles are retracted, corresponding to curve Nf, to an intermediate position which is realized at position B1/C1 of Fig. 4 for subsequent knitting stitches from this yarn I. Simultaneously with the needle retraction the sinkers are actuated and moved outwardly from their previous inward position shown in Fig. 4A, so that the retracted needles and the sinkers are arranged relative to another as shown in Fig. 4B. The retracted needles thereby will arrange the yarn I on the needle stems of such needles which remain raised, corresponding to curve Ng in Fig. 4, in a clearing position as shown schematically in Fig. 4C.

Thereafter, the needles that had previously remained in a clearing position are retracted to a feeding posi-

tion so that the latches of these needles will cover the yarn I and the hooks must be further secured to close without a yarn. Simultaneously to this needle movement the sinkers are actuated with their nebs positioned between the needles.

In the subsequent action, predetermined needles, which additionally to yarn I will also engage yarn II, are raised corresponding to curve Nh from an intermediate position to the feeding position whereby their latches will open the needle hooks without problems by the enlarged sinker throat. According to position D in Fig. 4, yarn II is fed to the needles then in a feeding position as illustrated in Fig. 4D. In contrast to the illustration of Fig. 4D, in which both yarns I and II are engaged by the needle with yarn I being positioned on the latch, yarn I is positioned on needles actuated corresponding to curve Ng behind the latch, so that this yarn portion become a float after the stitch forming action.

Subsequent to the feeding of yarn II the sinkers are actuated to move outwardly and the needles are actuated into the knock over position corresponding to position E1 in Fig. 4 and as illustration Fig. 4E. Needles actuated corresponding curves Nf, Nh and Nk will knit stitches from both yarns, needles actuated in the process according the curves Nf and Ni will knit stitches from yarn I and will miss yarn II, while stitches from yarn II and floats from yarn I are knitted from needles which are controlled corresponding the curves Ng and Nk.

The last referred process for manufacturing patterned float plated fabrics from two yarns per course do not require additional adjustments of the sinkers as was necessary in the process before. Certainly it is not possible with this process to manufacture patterned float plated fabrics composed from three yarns per course.

Sections of such fabric constructions in which three yarns per course are controlled for float plating according to a pattern are illustrated in Fig. 5 and Fig. 6.

Referring to Fig. 5 in each course a first group of yarns (11a, 11b and 11c) is meshed together with a second group of yarns (12a, 12b and 12c) and a third group of yarns (13a, 13b and 13c) to such an extent that each group of yarns is knit to float plated portions in predetermined sections of the fabric. According to the first knit course of Fig. 5 comprised of yarns 11a, 12a and 13a, in alternating areas, floats F11 are formed from the first yarn 11a, the second yarn 12a is knit with floats F12 and the third yarn 13a with floats F13.

Corresponding to the above description the second course is knit from yarns 11b, 12b and 13b while the third course is prepared from yarns 11c, 12c and 13c. The arrangement of floats from each yarn is formed according to a predetermined pattern.

In contrast to the fabric constructions referred to Fig. 1 and Fig. 2 when alternating between different pattern sections, it is not necessary to knit at least one stitch from all yarns when a course is composed from

three yarns, because if two floats will overlap (as illustrated in Fig. 5) the third group of yarns will form the ground fabric portion for the required solidity of the fabric.

Corresponding to the section of the fabric construction in Fig. 6 therefore in a pattern area, dominated by the floats of one group of yarns, another group of yarn is floating when the patterning float plating group of yarn is knot to stitches since all needles in this section will knit a ground fabric portion from the remaining group of yarn.

In the first course, which is illustrated in Fig. 6, therefore, between the main floats F11a of a pattern area dominated from yarn 11d floats F12b from yarn 12d are arranged. In an alternative pattern area dominated by floats F12a of yarn 12d, floats F13b from the third yarn 13d are disposed between floats F12a while in other pattern areas dominated by floats F13a, between these floats, floats F11b from the first yarn 11d as well as floats F12b from the second yarn 12d are formed.

According to the predetermined pattern the succeeding courses from the yarns 11e, 12e and 13e, respectively, yarns 11f, 12f and 13f are knitted alternatively forming floats corresponding to the description above.

Therefore, in float plated fabrics formed from three alternatively floating yarns, innumerable constructions are enabled which are illustrated only basically in the

Fig. 5 and Fig. 6 when the yarns are arbitrarily positioned.

Again, it should be noted that the length of the floats is preferably restricted to overlap one, two or three wales and that the creation of pattern areas with floats of different lengths is an additional possibility for pattern development.

The knitting of courses as described corresponding to Fig. 5 and Fig. 6 is realized in the tracks of the needles and sinkers according to Fig. 7, with the relevant arrangement of the positions A2 to L2 being illustrated in Fig. 7A to 7L. In this mode of proceeding sinkers are used which are described and illustrated as referred previously in Fig. 3 and Figs. 3A to 3G. Therefore, this process is performed hitherto the second yarn is looped in a manner analogous to that previously described.

Subsequent to the knitting of a course, therefore, the stitches of the last course are engaged from the lower sinker throat. By actuating the sinkers and causing them to move inwardly, so that the loops on such needles N, selected to raise into the clearing position corresponding to curve Ne, are prevented from moving with the needles. Non-selected needles are slightly raised and remain in an idle position as controlled by curve Nm.

At position A2 selected needles are raised to the clearing position, pursuant to curve N1, so that, as shown in Fig. 7A, the previously knitted stitches are

arranged on the needle stems and a first yarn 11 can be fed to these needles.

Simultaneously to the retraction of the selected needles to an intermediate position the sinkers are also moved outwardly, so that the previously fed first yarn 11 can be kinked over the intermediate looping ledge Sb of the sinkers S executed in position B2 of Fig. 7 and Fig. 7B, respectively.

Prior to the raising of selected needles for the engagement of a second yarn the sinkers are again moved inwardly at position C2 in Fig. 7. As illustrated in Fig. 7C the upper sinker throats Se will control the previous loops from the first yarn 11 and arrange floats of the first yarn 11 behind the needle stems. This is also illustrated in Fig. 7M.

Thereafter, selected needles that were determined to engage the second yarn 12 are raised corresponding to curve Nn into clearing position. This raising movement includes all needles previously have missed so that the previous knit stitches will slide onto the needle stems in this action. The latches of such needles, which have engaged the first yarn 11 and will now also engage the second yarn, will open the needle hook by the loops of the first yarn 11, which are controlled in the upper sinker throats Se. Thereby the loops of the first yarn 11 are disposed on the latches of the relevant raised needles or remain in the needle hooks when such needles remain in the idle position corresponding to curve No in Fig. 7.

In the position indicated in Fig. 7 at D2, corresponding to the illustrated needle and sinker relationship shown in Fig. 7D, the second yarn 12 is fed to the raised needles which are retracted thereafter into an intermediate position.

While the sinkers S remain in their inward position the loops of the second yarn 12 are kinked over the upper looping ledge Sc when the selected needles are retracted to their intermediate position corresponding to position E2 in Fig. 7 and Fig. 7E, respectively.

Subsequent to the kinking of the second yarn 12 the sinkers S are moved slightly outwardly and the needles with the loops from the second yarn 12 are retracted to a lower intermediate position, according to position F2 in Fig. 7. By this most important step of operation the loops and floats of yarn 12 are transferred from the upper sinker ledge Sc to the medium ledge Sb under continuance of the previous calibrated loop structures of yarns 11 and 12 as illustrated in Fig. 7. With this action it is assured that all loops are controlled furtheron by the subsequent inward movement of the sinkers S by the upper sinker throat Se and the floats of both yarns are arranged behind the needle stems as shown in Fig. 7G. This yarn, needle and sinker relationship is shown in a top plan view in Fig. 7N.

When the previous kinked yarns and floats are again controlled subsequent to the position G2, those needles that have been determined to engage a third yarn are

raised corresponding to curve Np. Since each of the raised needles have previously kinked loops of at least from one of the yarns 11 and 12, these loops will open the needle hooks by sliding onto the latches on which they will rest. The loops on needles remaining in an idle position corresponding to curve Nr are controlled in their length between the needle hooks and the sinker throats Se. According to position H2 in Fig. 7 a third yarn 13 is fed to the selected raised needles as shown in Fig. 7H.

Thereafter the selected and raised needles are retracted to an intermediate position so that they will kink the fed yarn 13 over the upper looping ledge Sc according position J2 in Fig. 7, as is respectively illustrated in Fig. 7J.

The subsequent retraction of the needles and sinkers must be realized in a way, in which the shape of the yarn loops is also controlled when resting on the intermediate looping ledge Sm (Fig. 7K) directly in front of the stitch forming action (Fig. 7L). When the stitch forming action is terminated the process for knitting the next course is initiated and repeated as described before.

As the foregoing description makes clear, the essential characteristic of the process according to the present invention is that the looping of the second and succeeding yarns is performed over the upper looping ledge Sc. Thereafter, by an adequate movement of the needles and the sinkers, the loops from the ledge SC are transferred to ledge Sb and to the throats Se and

selected needles are raised for the next yarn engagement. (Fig. 7E, 7F, 7G). This enables exact control of the yarn loops during the complete process and avoids uncontrolled deformations of the previously kinked yarns.

Contrary to the described embodiments according to Fig. 3 and 7, the first fed yarn can also be formed into loops over the upper looping ledge Sc which are subsequently transferred to the intermediate looping ledge Sb to be controlled in the succeeding part of the process.

To perform this modification the needle and sinker track of Fig. 7 must be adapted according to the dash lines so that between the position B2 and C2 the needles and sinkers are actuated analogous to Figs. 7E, 7F and 7G for forming loops from the first yarn.

In addition to the described patterned float plated fabrics, the described methods according to Fig. 5 and 7 enable the manufacturing of "false intarsia" fabrics. Each yarn is kinked from predetermined needles for separated pattern sections one to the other which are connected by at least of one stitch knitted (in between) from the yarns of the adjoining pattern sections which will interlock these sections, each being formed from single yarn stitches into a solid fabric. If more than three yarns are provided to be knitted per course in the process of Fig. 7 the action for feeding and kinking the second yarn (positions C2 to F2) must be repeated analogous to the number of additional yarns. The length of the floats performed in this action are disposable and will

be cut off and removed by well known devices in the knitting machine or in a subsequent shearing process.

While the invention has been described in connection with what are presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

CLAIMS

1. A patterned float plated fabric in which adjacent pattern sections are dominated alternatively from the floats of one of at least two plating yarns, wherein succeeding in one pattern section to the other alternatively at least one of at least two yarns is incorporated to all stitches of a pattern section for knitting the ground fabric portion and at least one [of the other] yarn is meshed with the ground fabric yarn by float plating to stitches and floats which are provided for the effect of the relevant pattern section.

2. A patterned float plated fabric according to claim 1, wherein the floats creating the effect of the pattern areas are arranged to overlap one but preferably not more than three wales.

3. A patterned float plated fabric according to claim 1 or 2 wherein each yarn which is knitted to a float plated portion in predetermined pattern areas is formed into floats of different length.

4. A process for manufacturing patterned float plated fabrics according to claim 1, wherein in at least two succeeding sections in each predetermined needles are raised into the clearing position in which in each section a yarn is fed whereupon the selected needles are retracted to an intermediate position to kink the

yarn to loops over a looping ledge of the sinkers S and thereafter arranging the loops in the upper sinker throat Se of the sinkers S prior to the raising of selected needles in a succeeding section and retracting all needles N subsequent to the feeding of all predetermined yarns from which the course is composed into the knock over position for stitch forming, whereby the sinkers S, are actuated in cooperation to the needles N. (curve Vs, S) (Fig. 3, 7).

5. A process according to claim 4, wherein the first fed yarn (1, 11) after feeding is kinked to loops over the intermediate looping ledge (Sb) of the sinkers S, whilst the kinking of succeeding yarns (2; 12, 13) is realized on the upper looping ledge (Sc) of said sinkers S and thereafter by an adequate movement in the needles N and sinkers S are performed to said intermediate looping ledge (Sb) to be subsequent engaged from the upper sinker throats (Se) previous to a succeeding feeding of a yarn provided for the same course (Fig. 3).

6. A process according to claim 4, wherein all yarns (1,2; 11, 12, 13) from which a course is proposed are kinked to loops over the upper looping ledges (Sc) of the sinkers and are subsequent transferred to the intermediate looping ledges (Sb) of said sinkers by an adequate movement of said needles and sinkers to engage and control the loops of kinked yarns in the upper throats (Se) of said sinkers S until the stitch forming action is initiated (Fig. 7).

7. Process according to claim 4 wherein in the action previous to the stitch forming action subsequent to the feeding of a yarn (2; 13) and simultaneously to the retracting of the relevant needles the sinkers S are actuated outwardly so that said yarn (2; 13) is meshed to the fabric without previous kinking with the previous fed yarns over the knitting ledge (Sa) of said sinkers S.

8. Process for manufacturing patterned float plated fabrics according to claim 1, wherein in a first action (curve Ne) all needles are raised for clearing whereby a first yarn (I) is fed and thereafter predetermined needles are retracted (curve Nf) to an intermediate position so that said first yarn I is positioned on the needles remaining in clearing position (curve Ng) on their stems, so that said yarn I is arranged on said remaining needles after retraction to the feeding position behind the latches of these needles, successively raising a predetermined part of needles from the intermediate to the feeding position (curve Nh) whereby a second yarn II is fed to the needles in feeding position which are retracted subsequent with the needles remaining in the intermediate position (curve Ni) in the stitch forming process to the knock over position (Fig. 4) and the sinkers S1 are actuated in a cooperative relationship (curve Sv).

Fig. 1

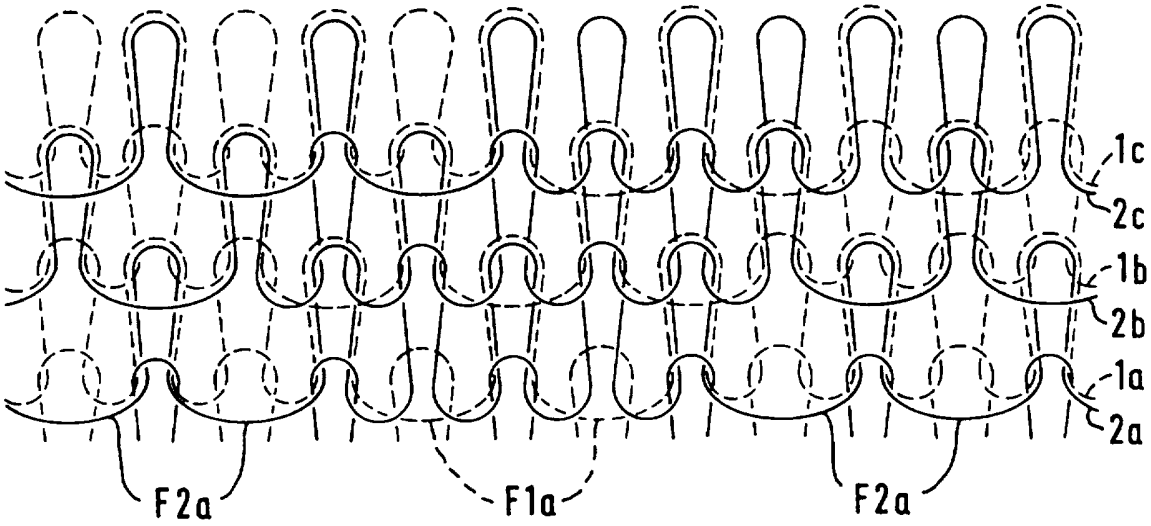
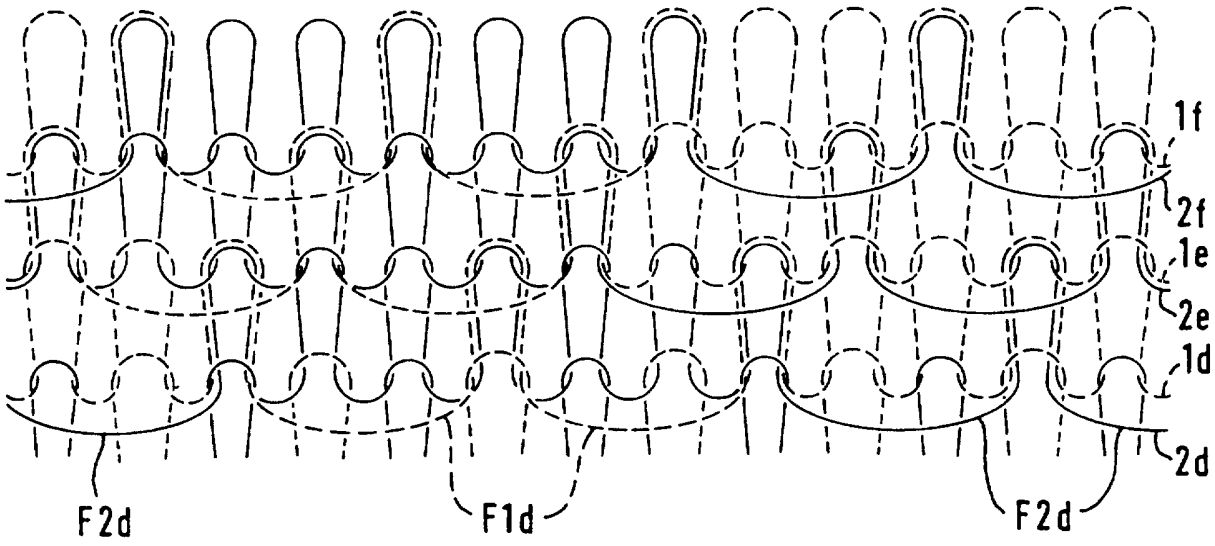


Fig. 2



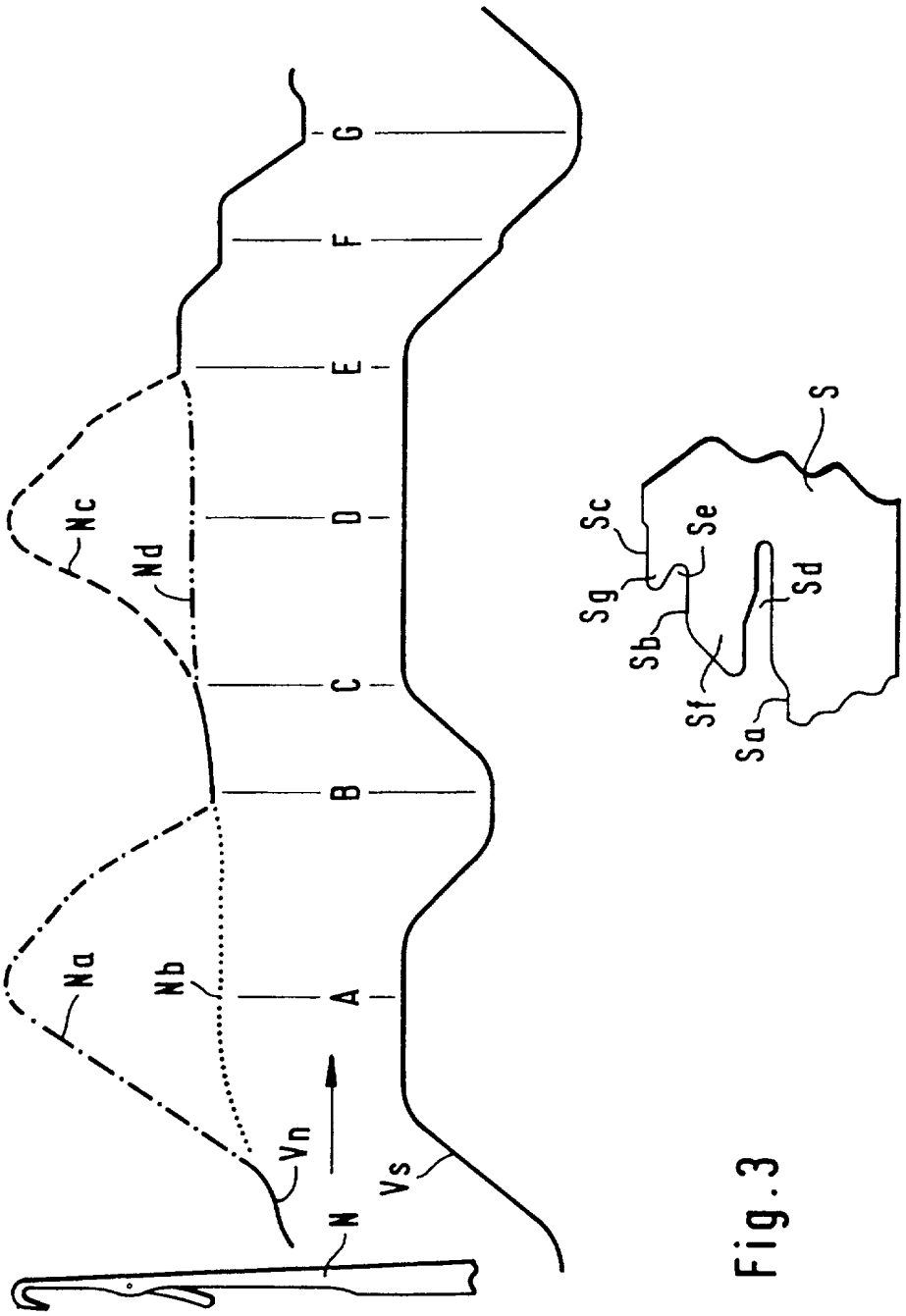
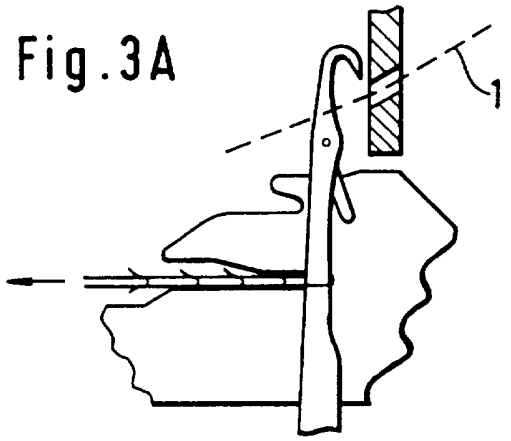


Fig.3

Fig.3A



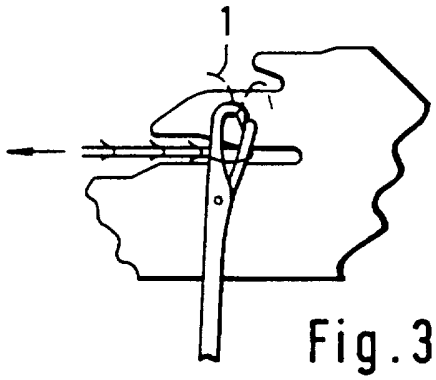


Fig.3B

Fig.3C

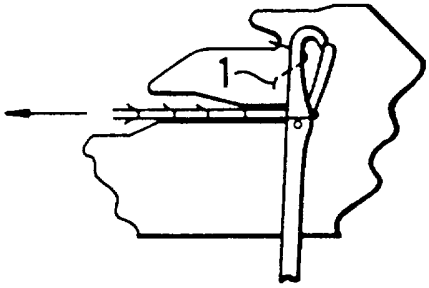
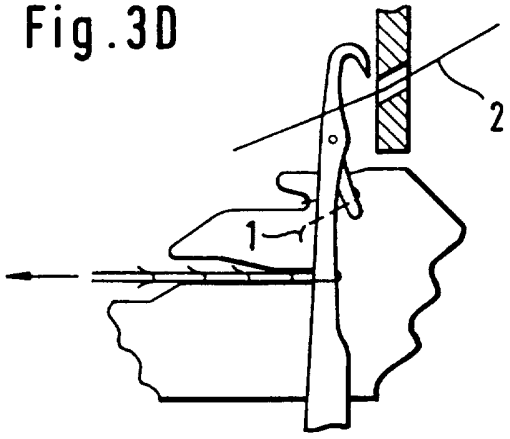


Fig.3H

Fig.3D



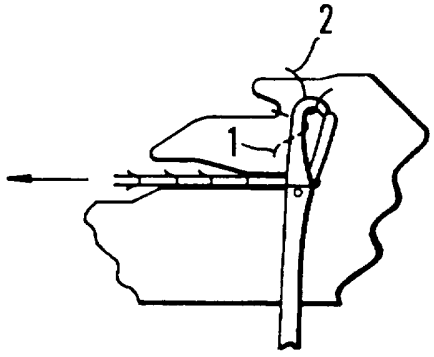
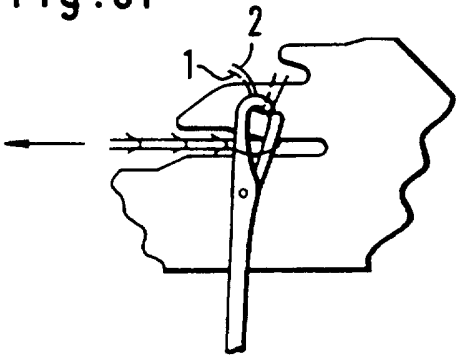


Fig.3E

Fig.3F



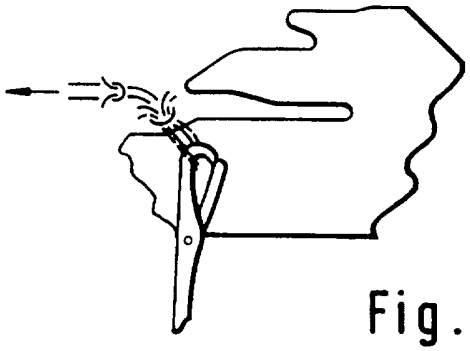


Fig.3G

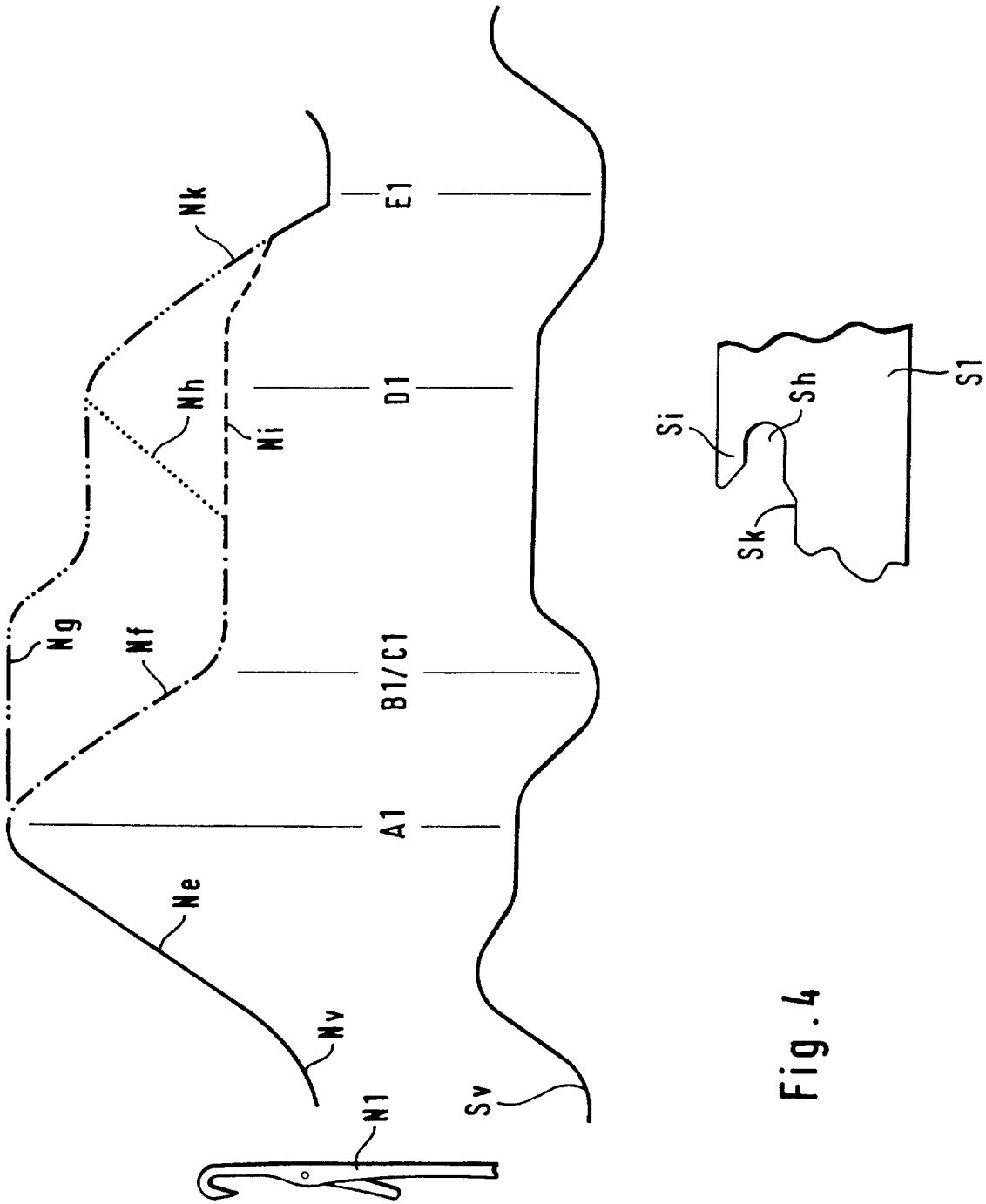


Fig. 4

Fig. 4A

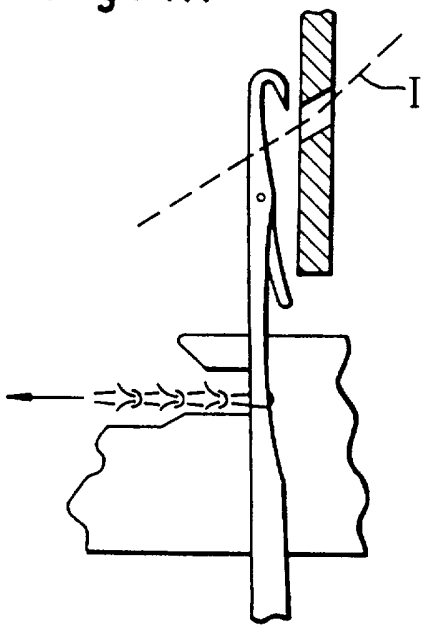


Fig. 4B

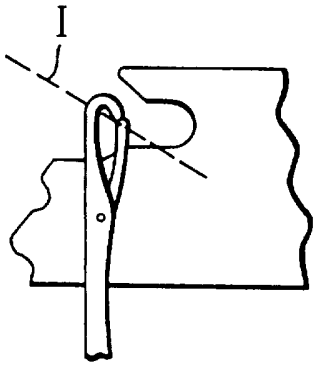


Fig. 4C

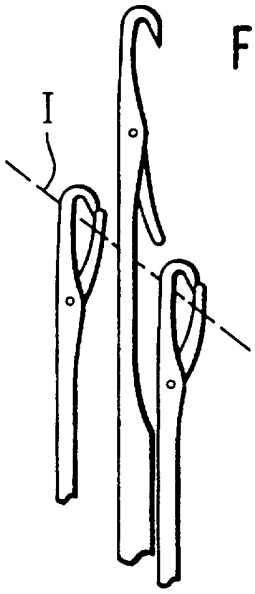


Fig. 4D

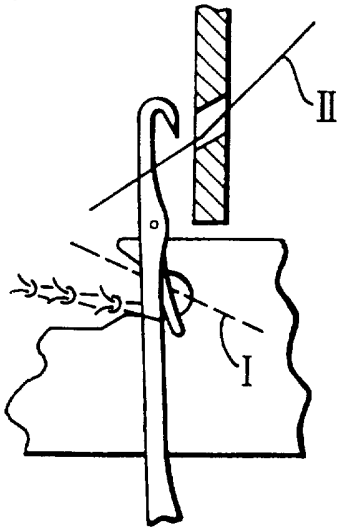
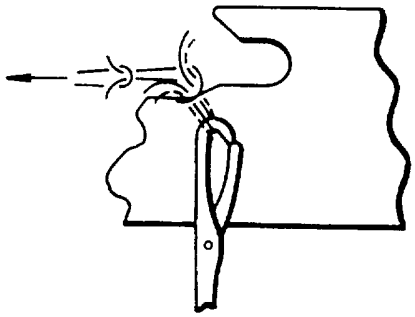


Fig. 4E



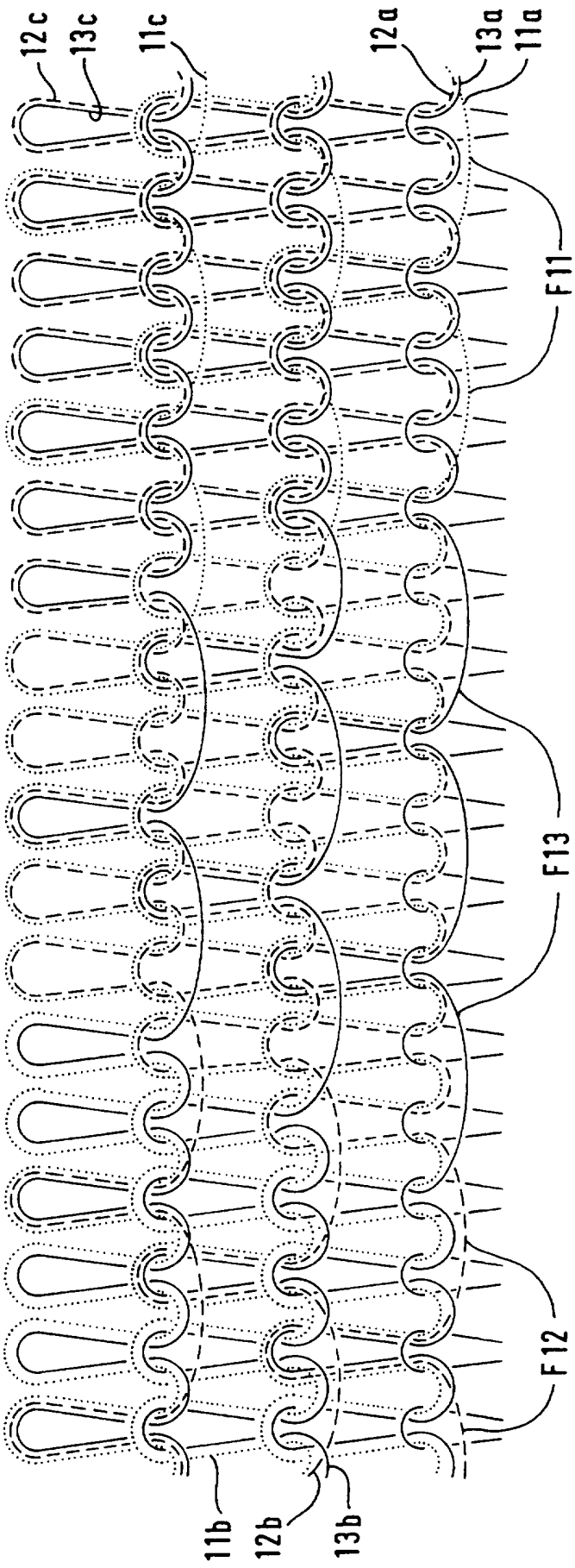
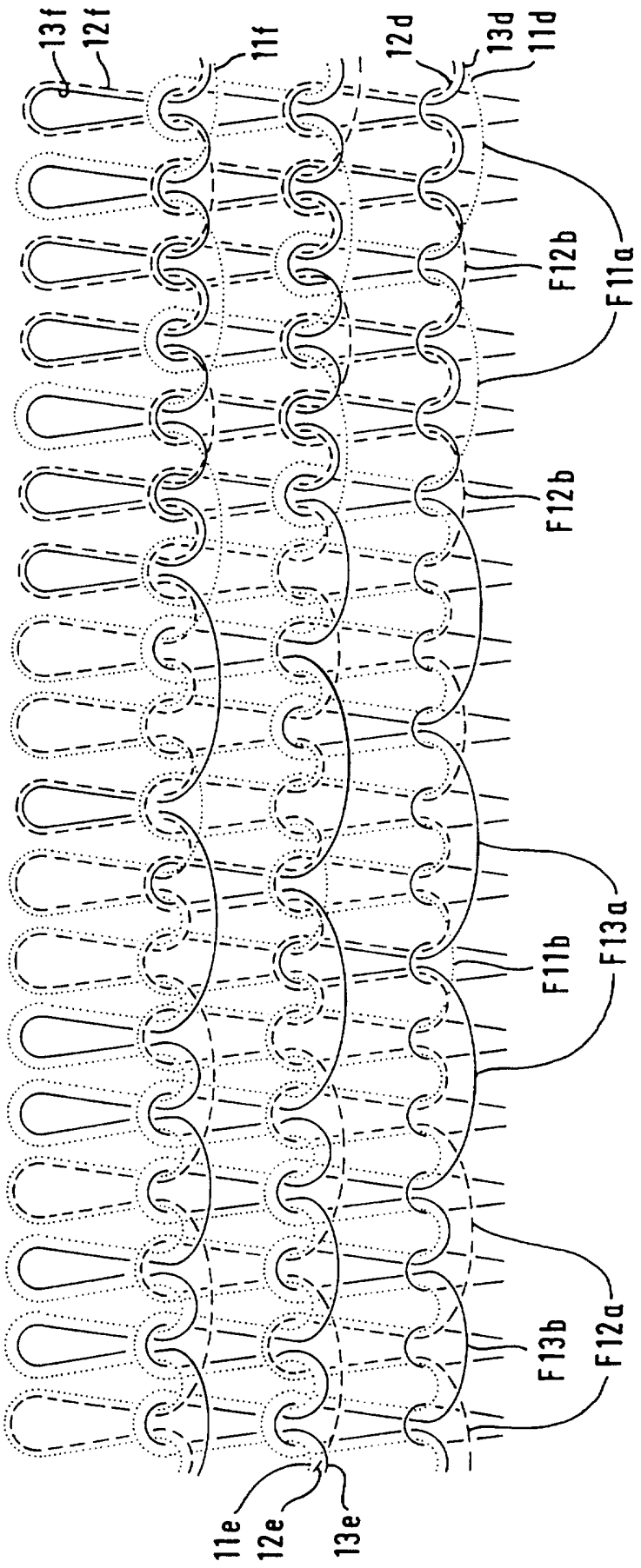


Fig.5

Fig.6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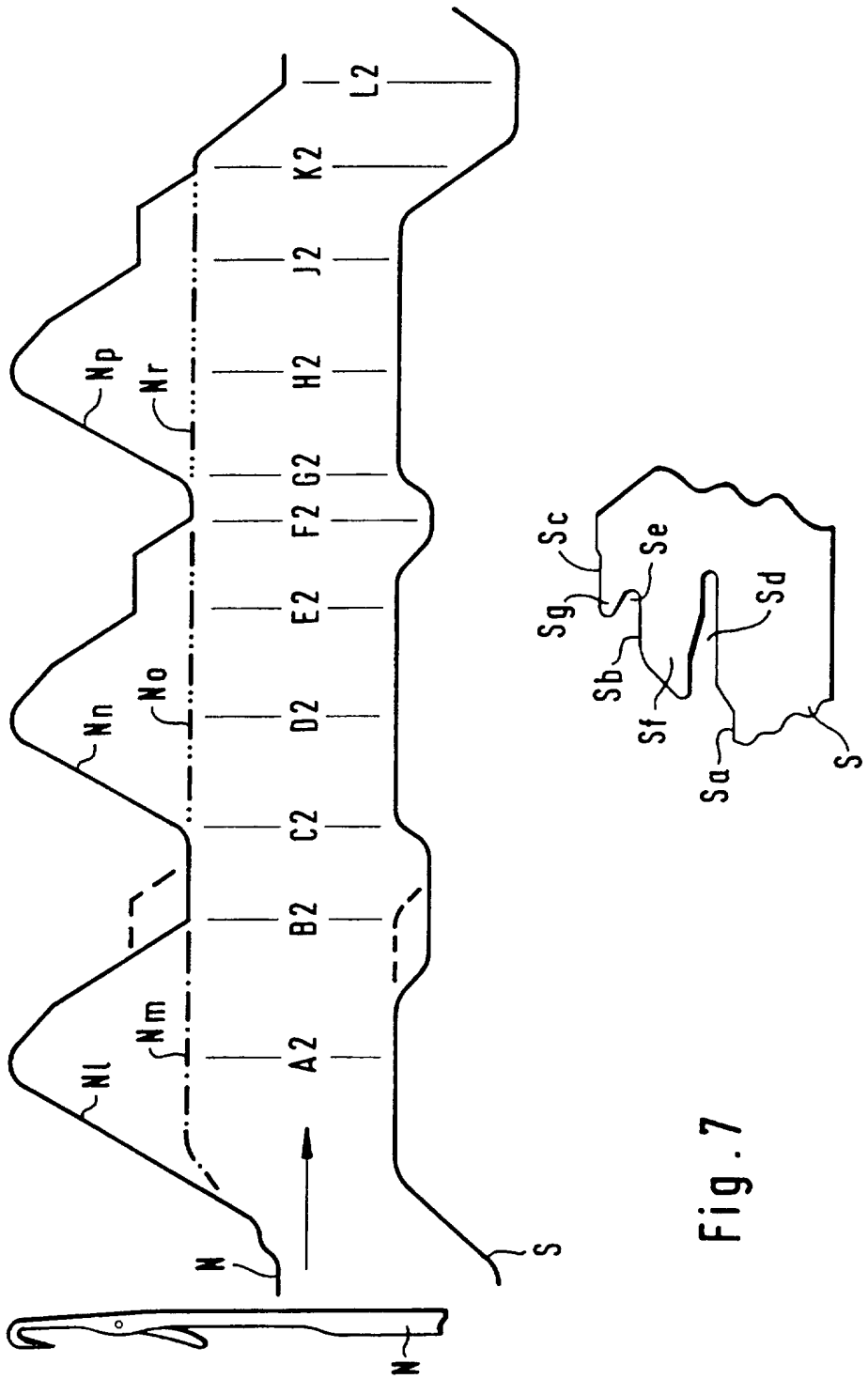
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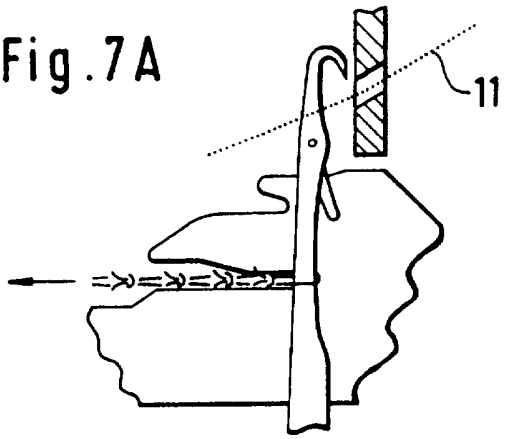
Fig. 7

Fig.7A



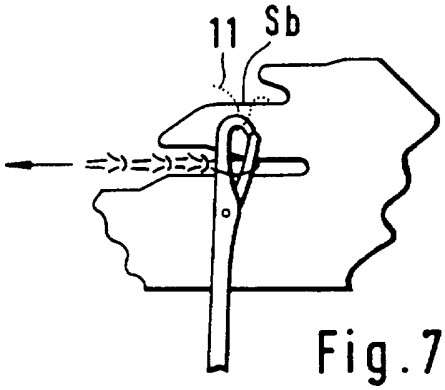
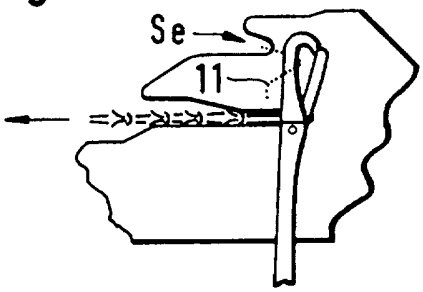


Fig.7B

Fig.7C



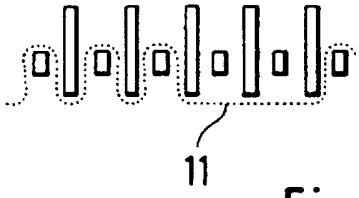
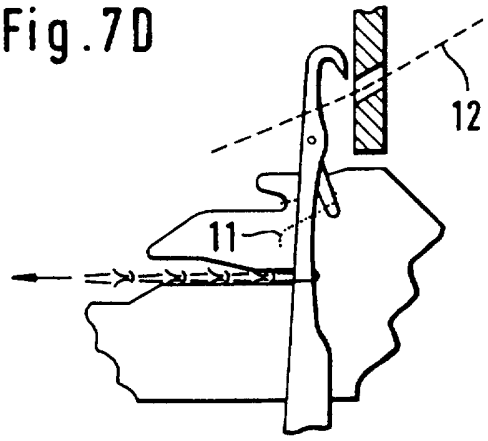


Fig.7M

Fig.7D



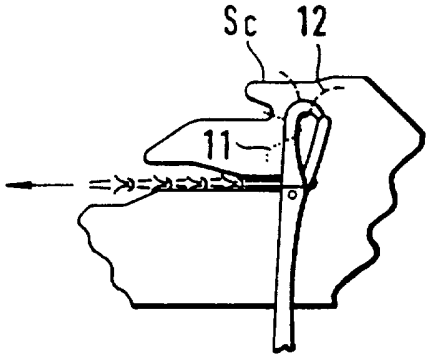


Fig.7E

Fig.7F

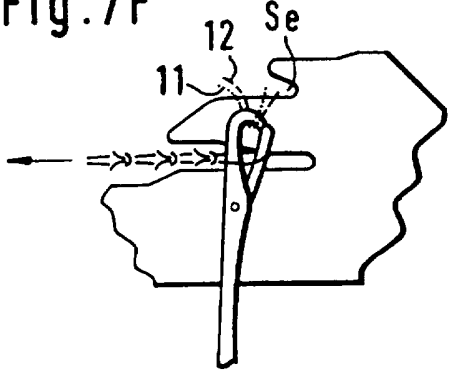
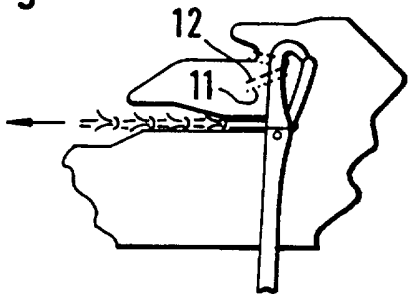


Fig.7G



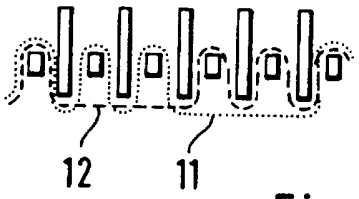
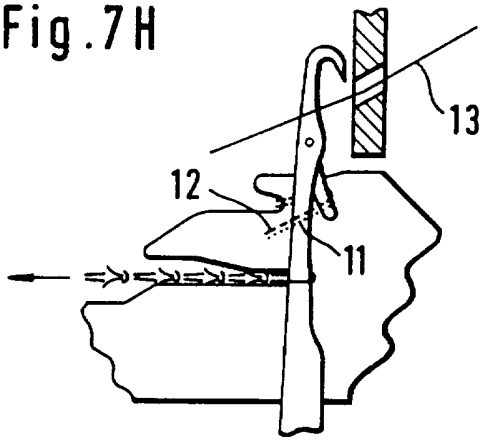


Fig.7N

Fig.7H



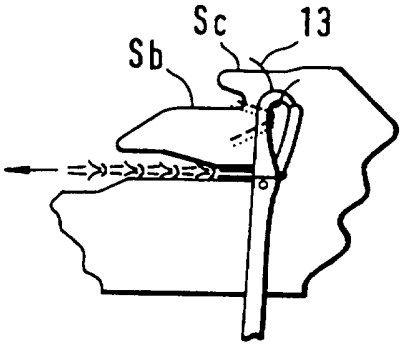
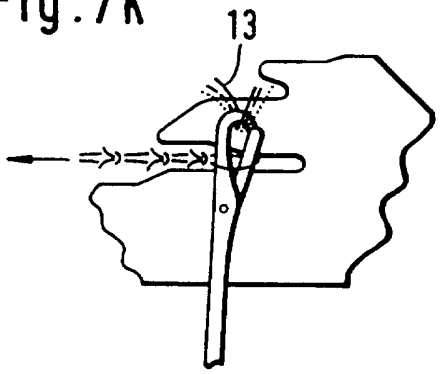


Fig.7J

Fig.7K



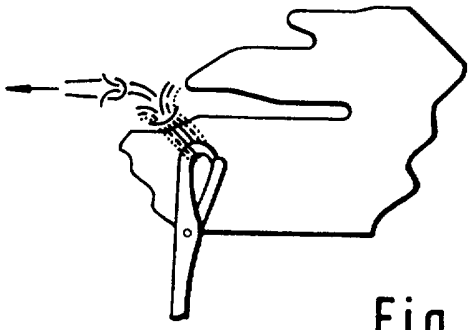


Fig.7L

INTERNATIONAL SEARCH REPORT

International App on No
PCT/EP 96/05476

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D04B1/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 034 581 A (SWAFFORD) 12 July 1977 see claim 1; figure 4	1
A	DE 31 35 702 A (SULZER MORAT GMBH) 17 March 1983	
A	DE 39 27 815 A (SIPRA PATENTENTWICKLUNGS- UND BETEILIGUNGSGESELLSCHAFT MBH) 28 February 1991 cited in the application	
A	EP 0 295 703 A (SCHMIDT) 21 December 1988 cited in the application	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
28 April 1997	09.05.97

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Van Gelder, P

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Appl on No
PCT/EP 96/05476

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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