

[54] WEFT KNITTED FABRIC AND METHOD OF PRODUCING THE SAME

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[51] Int. Cl. .... **D04b 7/04, D04b 11/04**

[58] Field of Search..... 66/196, 197, 198, 66/199, 200

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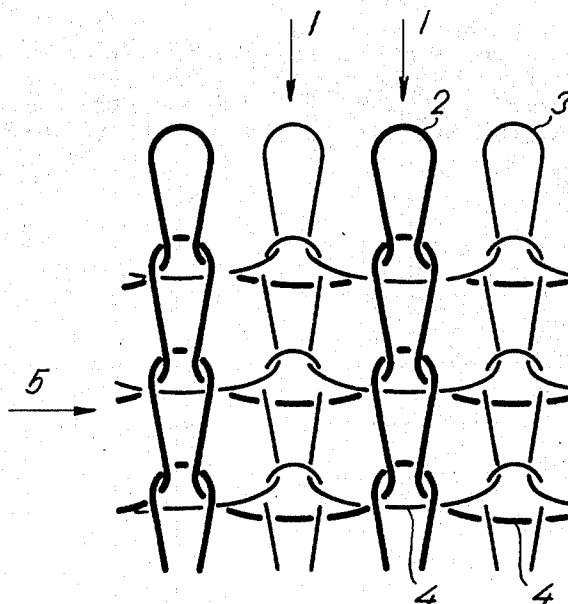
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[57] **ABSTRACT**

Method of producing a weft knitted fabric on a rib knitting machine, and fabric produced thereby, at least a part of the fabric being a double fabric composed of two single fabrics. In the practice of the method, for the formation of connecting elements of the linking course of the double fabric, the corresponding stitches of one single fabric are formed on selected needles of one needle bed, and the corresponding stitches of the other single fabric are formed on selected second needles of a second needle bed, the second needles being opposite to the needles of the first needle bed inactive in this course, while for the laying of the sinker loops of both single fabrics in the same connecting element of the double fabric on one side of the same, a stitch of one single fabric is transferred on to the opposite needle of the other needle bed which needle is inactive in this course, on the active needle of which needle bed the stitch of the other fabric is immediately formed. In the process of knitting the stitches of the first single fabric on the active needles of the first needle bed the stitch of the other single fabric remains on the needle of the second needle bed.

**13 Claims, 10 Drawing Figures**



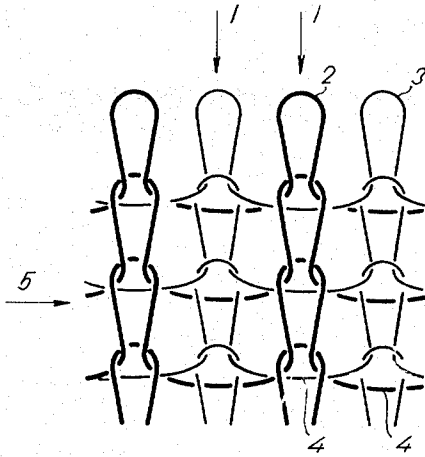


Fig. 1.

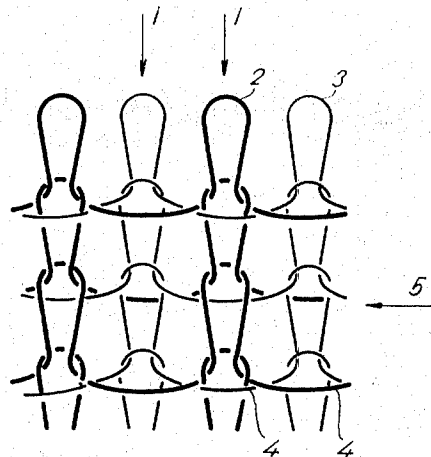


Fig. 2.

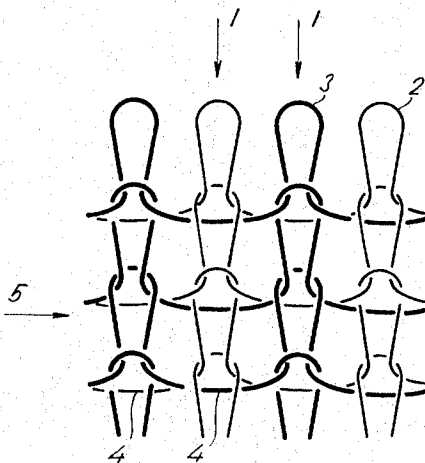


Fig. 3.

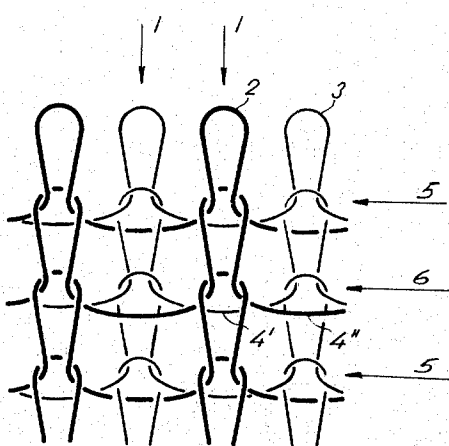


Fig. 4.

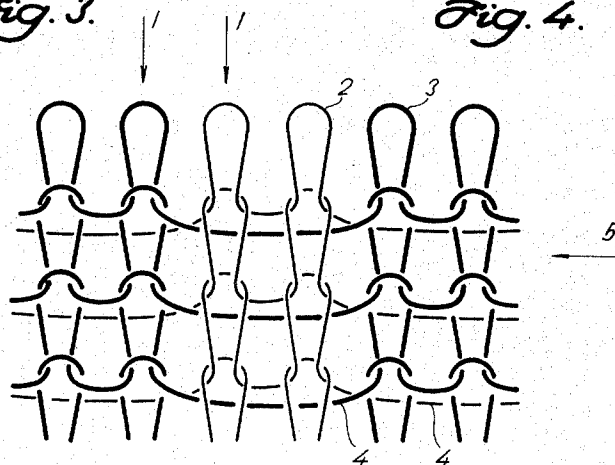


Fig. 5.

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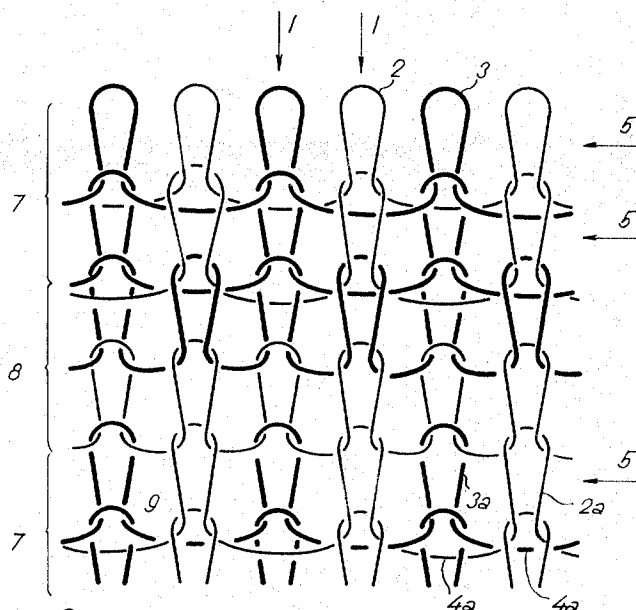


Fig. 6.

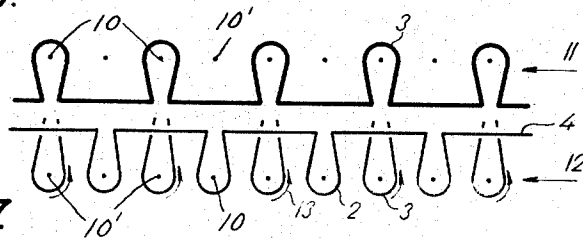


Fig. 7.

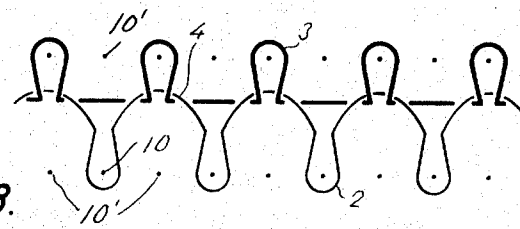


Fig. 8.

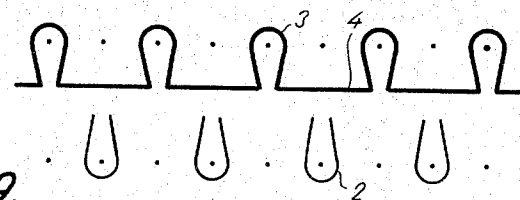


Fig. 9.

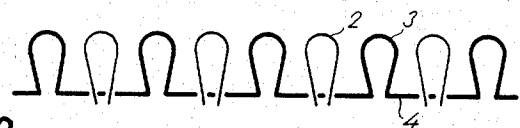


Fig. 10.

## WEFT KNITTED FABRIC AND METHOD OF PRODUCING THE SAME

The weft knitted fabric produced by the method of the invention has at least one part of the same formed by a double fabric consisting of two single fabrics, which double fabric comprises linking courses with connecting elements in which at one side of the double fabric there is, at least one rib stitch of one single fabric adjacent, a pearl stitch of the other single fabric, and at the other side of said double fabric behind said pearl stitch there is a sinker loop of said one single fabric and behind said rib stitch there is a sinker loop of said other single fabric, this arrangement of adjacent stitches and sinker loops forming a connecting element of both single fabrics.

The present invention relates to a weft knitted fabric and a method of producing the same on a rib knitting machine.

Commonly produced weft knitted fabrics have a reduced shape retention and a reduced dimensional stability, especially in the direction of the stitch courses. A particular improvement as to these properties of the fabric can be achieved by increasing the density of the fabric, and by the finishing of the knitted fabric; however, the weight of the knitted fabric is undesirably increased by such method.

The invention has among its objects the elimination of all of these shortcomings, and the enabling of the production of articles made from weft knitted fabrics that can replace woven articles, while at the same time retaining the high efficiency of knitting techniques.

The object of weft knitting according to the invention is to produce a knitted fabric in which at least one part of the same is a double knit fabric consisting of two single fabrics with linking courses, in which at one side of the fabric at least one pearl stitch of the other single fabric is adjacent the rib stitch of one single fabric, and at the other side of the fabric behind each of said stitches there is a sinker loop of the other single fabric. This arrangement of the adjacent stitches and sinker loops forms the connecting element of both single fabrics. The shape retention and the dimensional stability of the fabric according to the invention are increased when the connecting elements are placed side-by-side over the In the method according to the invention, in order to form the connecting elements of the linking course of the double fabric, there are formed the stitches of one single fabric on selected active needles of one needle bed, and the corresponding stitches of the other single fabric on selected active needles of the second needle bed, said needles being opposite the needles of the first needle bed, which needles are inactive in this course, while for laying the sinker loops of the two single fabrics in the same connecting element of the double fabric at its one side, stitches of one single fabric are transferred on to opposite needles, inactive in this course, of the second needle bed, on the active needles of which stitches of the other single fabric are immediately formed while in the process of forming the stitches of the first fabric on the active needles of the first needle bed the stitches of the other single fabric remain on the active needles of the second needle bed. for instance, single fabrics of purl stitch pattern. The sinker loops can be all courses at one and the same side of the double fabric, or the double fabric can comprise at least one pair of adjacent courses, the sinker loops of which are on opposite sides of the double fabric. A

further increased effect can be achieved by using weft threads.

The method according to the invention forms the corresponding stitches of one single fabric on the selected knitting needles of one needle bed in order to form the connecting elements of the linking course of the double fabric, and forms the corresponding stitches of the other single fabric on the selected active needles of the second needle bed, these needles being opposite to the needles of the first bed which are inactive in this course, whereby for laying the sinker loops of both single fabrics in the same connecting element of the double fabric at its one side, a stitch of one of the single fabrics is transferred on to an opposite needle, inactive in this course, of the second needle bed, on the active needles of which a stitch course of the second fabric is immediately formed, while in the process of forming the stitch course of the first fabric on the

To form a double fabric consisting of two single jersey fabrics, all courses of one single fabric are formed on the needles of one needle bed and all courses of the other single fabric are formed on the needles of the second needle bed. According to another method, after forming a stitch course of the single fabric on the needles of one needle bed, the following course of the same is formed on the opposite needles of the second needle bed.

The method and product according to the invention are illustrated in the accompanying drawings.

In the drawings:

FIGS. 1-6, inclusive, schematically show six examples of a weft knitted fabric according to the invention; FIGS. 7, 8, and 9 schematically show the individual steps of knitting one linking course; and

FIG. 10 schematically shows the resulting position of the sinker loops of one of the single fabrics and of the stitches of the second single fabric in the linking course.

Similar reference characters are employed to designate the same parts throughout the several views.

The fabrics shown in FIGS. 1 to 5 are formed by double fabrics consisting of two single fabrics, one of which is illustrated by thick lines and the other by thinner lines. In the fabric according to FIG. 6, the double fabric is combined with cross stripes of a double jersey.

In the double fabric according to FIG. 1, the single fabrics are of a plain knitted structure. On the face of the double fabric facing the reader in FIG. 1 the wales 1 of the rib stitches 2 of one jersey fabric and the wales 1 of the pearl stitches 3 of the second jersey fabric alternate, thus on this side the fabric having a double jersey look. The sinker loops 4 of both fabrics alternate on the face of the double fabric remote from the reader in FIG. 1. Behind the wales 1 of the stitches 2, 3, of one fabric there are the sinker loops 4 of the second fabric and vice-versa; thus the fabrics are interlocked and connected in all stitch courses 5 and in all wales 1, 1'.

In the double fabric shown in FIG. 2, both single fabrics are also of plain structure. This fabric differs from that illustrated in FIG. 1 in that the sinker loops 4 in FIG. 2 alternate in the adjacent courses 5 on the one and the other side. In each individual course 5 the sinker loops 4 of both fabrics are at the same side of the double fabric; thus each course 5 of the same is a connecting course.

The fabric shown in FIG. 3 includes two single fabrics, each being of purl stitch pattern. Similar to the

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fabric according to FIG. 1, in FIG. 3 all sinker loops 4 on the back of the same and all stitch courses 5 are linking ones. In their wales 1, rib stitches 2 and pearl stitches 3 of the same single fabric alternate on its face; in the individual stitch courses 5 there is a pearl stitch 3 of the other fabric adjacent the rib stitch 2 of the first fabric. Thus on the face of this double fabric rib stitches 2 and pearl stitches 3 are arranged chess-board-like.

FIG. 4 illustrates a double fabric consisting of two single jersey fabrics; this double fabric differs from the fabric shown in FIG. 1 by a linking course formed by every second course 5 of the same. Between the linking courses 5 there are courses 6 in which the sinker loops 4' of one of the single fabric are at one side and the sinker loops 4'' of the other single fabric are at the other side. In this course 6 the fabrics are not connected, between two linking courses 5 there being formed a hollow space.

FIG. 5 shows a double fabric consisting of two single fabrics interconnected in each stitch course 5. This double fabric differs from the fabric shown in FIG. 1 in that the groups of wales 1, of the single fabrics alternate therein, whereby the number of wales 1, in each group can be naturally different from that shown in the illustrated fabric.

The weft knitted fabric according to FIG. 6 differs from the fabrics previously described and shown, on the one hand, by having cross stripes 7 of the double fabric alternating with cross stripes 8 of the single fabric and, on the other hand, by the construction of the connecting courses 5. While in the previous fabrics both single fabrics are interlocked and connected over the whole length of the linking courses 5, in the fabric shown in FIG. 6 the connecting elements 9 are spaced apart according to a pattern scheme in the connecting courses 5, between which elements the single fabrics are not interconnected so that a hollow space is formed between them at such locations.

For the purposes of the description of the fabric of FIG. 6, the term "connecting element" is to be understood to include that part of the connecting course 5 in which at one side of the double fabric there is at least adjacent one rib stitch 2a of one of the single fabric a pearl stitch 3a of the other single fabric, and at the other side there is behind each of the said stitches 2a, 3a a sinker loop 4a of the other single fabric.

The first, fourth, and fifth stitch courses from below are the linking courses 5 of the double fabric of FIG. 6. In the first course 5 the connecting elements 9 are on the selvages of the same, in the middle of the fourth and in the fifth course the connecting elements 9 are side-by-side over the whole length of the stitch course 5, analogously to the fabric shown in FIG. 1. The second and the third courses form the stripe 8 of the double jersey fabric.

The scope of the present invention is not limited to the illustrated examples of the fabrics. The double fabrics of the individual described embodiments can be combined in the fabric according to the invention in lengthwise and crosswise stripes with different known structures and patterns, and the fabric can be of a color or relief pattern; the stretchability of extensibility of the same can be further reduced by a laid-in weft.

The method of producing the double fabric shown in FIG. 1 is illustrated in FIGS. 7, 8, 9, and 10. FIGS. 7, 8, and 9 are top views of the individual steps of forming

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the connecting course 5; FIG. 10 is a view from the symmetry plane of the two needle beds.

After knitting the stitches 3 of the course of one single fabric on the odd-numbered needles 10 of the rear needle bed 11 (upper in FIG. 7), these stitches 3 are transferred on to the opposite (lower) inactive needles 10' of the front needle bed 12. The transferred (lower) stitches 3 are illustrated in FIG. 7 by thinner lines.

The course of the other single fabric is formed immediately on the even-numbered needles 10 of the front needle bed 12. The odd-numbered needles 10 are inactive and remain in the clearing position so that the sinker loops 4 of the stitches 2 of the second fabric are placed on the transferred stitches 3 of the first fabric.

In the following step the stitches 3 of the first fabric return in the direction of the arrows 13 (FIG. 7) to the active needles 10 of the rear needle bed 11 to the position shown in FIG. 8 and trail the sinker loops 4 of the other single fabric, the sinker loops thus getting behind the stitches 3 of the first single fabric, as shown in FIG. 8.

The knitting of the next course of the first single fabric is illustrated in FIG. 9, in which, for the sake of clarity, neither the previous course of this fabric nor the sinker loops 4 of the stitches 2 of the other fabric are illustrated. The stitches 2 of the second fabric remain on the needles of the front needle bed 12 and the course of the first fabric is formed without stitch transfer. Thus the sinker loops 4 of the first fabric are, in the double fabric, also placed behind the stitches 2 of the other fabric, as shown in FIG. 10; this figure illustrates the relative position of the stitches 2 and the corresponding sinker loops 4 after being arranged in the plane of symmetry of the two needle beds 11, 12.

It can be readily understood from the described method, that in order to place all the sinker loops 4 in the connecting course 5 in front of the stitches 2, 3 of both fabrics, the stitches 2 of the course of one of the fabrics formed on the needles 10 of the front needle bed 12, are transferred on to the needles 10' of the rear needle bed 11, which are inactive in this course, and from which they depend in the process of forming the course of the other fabric on the needles 10 of the rear needle bed 11, whereupon they return to the front needle bed 12, on which the course of the first fabric is formed again, while the new formed stitches 3 of the other fabric are not transferred and remain on the needles 10 of the rear needle bed 11.

The fabric according to FIG. 2, in which linking courses 5 with sinker loops 4 on its face alternate with linking courses 5 sinker loops 4 on its back, is formed by alternating both described methods.

In general, it can be stated that for forming one linking course 5 of the double fabric the course of one single fabric can be formed on the selected active needles 10 of the needle bed 11 or 12, respectively, and the corresponding course of the other single fabric on the selected active needles 10 of the second bed 12 are 11, respectively, which are opposite to the needles 10' which are inactive in this course of the first needle bed 11 or 12, respectively. In order to place all the sinker loops 4 in the same linking course 5 of the double fabric on one side of the same, the stitches 3 or 2, respectively, of one of the single fabrics are transferred on to the opposite needles 10' which are inactive in this course of the second needle bed 12 or 11, respectively, on the knitting needles 10 of which a course of the

other fabric is immediately formed. On the other hand, in the process of forming the stitch course of the first fabric on the active needles 10 of the first needle bed 11 or 12, respectively, the stitches 2 and 3, respectively, of the other fabric are not transferred on to the first needle bed 11 or 12, respectively, but remain on the needles 10 of the second needle bed 12 or 11, respectively.

The method of producing the fabric according to FIG.3 is similar to that used for the production of the fabric according to FIG.1, as far as the laying of the sinker loops 4 is concerned. All the sinker loops 4 are, namely, on the back of the double fabric. There is, however, a difference consisting in knitting each single fabric alternately on the front needle bed 12 and on the rear needle bed 11. Thus in each individual stitch course the method is exactly the same, when forming a fabric according to FIG.1, since in each individual stitch course while knitting one single fabric on the needle 10 of the front needle bed 12, the other fabric is knitted on the needles 10 of the rear needle bed.

The method of forming the linking courses of the fabric according to FIG.4 is similar to that of the fabric according to FIG.1. The other, not linking, courses 6 are formed according to a known method used when knitting a tubular fabric on a flat-bed knitting machine, i.e., the course of one single fabric is knitted on the front needle bed 12 and the second on the rear needle bed 11 without stitch transfer.

The fabric according to FIG.5 is produced in a manner similar to the fabric according to FIG.1, only the selection of the needles 10 being different. One fabric is knitted on the 1st, 2nd, 5th, 6th, etc. needle 10 of the rear needle bed 11 and the other fabric is knitted on the 3rd, 4th, 7th, 8th, etc. needle 10 of the front needle bed 12.

In the fabric according to FIG.6, the connecting elements 9 of each linking course 5 are formed similarly to the course 5 of the fabric shown in FIG.1. The corresponding stitches 2 or 3, respectively, of one single fabric are formed on the selected active needles 10 of one needle bed 12 or 11, respectively, and the corresponding stitches 3 or 2, respectively, of the other single fabric on the selected active needles 10 of the other needle bed 11 or 12, respectively, opposite to the needles 10' which are inactive in this course, of the first needle bed 12 or 11, respectively. For laying the sinker loops 4 of both single fabrics in the same connecting element 9 of the double fabric at one side of the same, the stitch 2 or 3, respectively, of one single fabric is transferred on to the opposite needle 10', which is inactive in this course, of the other needle bed 11 or 12, respectively, on the knitting needle 10 of which the stitch 3 or 2, respectively, of the other fabric is immediately formed. On the other hand, when forming the stitch 2 or 3, respectively, of this first fabric on the active needle 10 of the first needle bed 12 or 11, respectively, the stitch 3 or 2, respectively, of the other fabric remains on the needle 10 of the other needle bed 11 or 12, respectively. The tubular parts of the linking course 5 between the connecting elements 9 are knitted in a known manner so that one single fabric is knitted on the needles 10 of one needle bed 12 and the other single fabric is knitted on the needles 10 of the other needle bed 11 without stitch transfer.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments

thereof, it is expressly understood that the invention is in no way limited to the disclosure of such preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A weft knitted fabric having at least one part thereof formed by a double fabric made up of two single fabrics, the double fabric comprising linking courses in which at one side of the double fabric there is at least one rib stitch of one single fabric a purl stitch of the other single fabric, and at the other side of said double fabric behind said purl stitch there is a sinker loop of said one single fabric and behind said rib stitch there is a sinker loop of said other single fabric, this arrangement of adjacent stitches and sinker loops forming an element connecting the two single fabrics.

2. A weft knitted fabric as claimed in claim 1, wherein the connecting elements are arranged side-by-side over the whole length of the linking course of the double fabric, so that in said linking course at one side of the double fabric at least one rib stitch of one single fabric and at least one purl stitch of the other single fabric alternate, and at the other side sinker loops of the two single fabrics alternate.

3. A weft knitted fabric as claimed in claim 2, wherein every course of the double fabric is a linking course.

4. A weft knitted fabric as claimed in claim 1, wherein the single fabrics are of a jersey structure.

5. A weft knitted fabric as claimed in claim 1, wherein in each single fabric there is at least one pair of adjacent courses of which one course comprises rib stitches, and the other comprises purl stitches at the same side of the single fabric.

6. A weft knitted fabric as claimed in claim 5, wherein the single fabrics are of a purl stitch pattern.

7. A weft knitted fabric as claimed in claim 1, wherein the sinker loops in all the linking courses are at the same side of the double fabric and form its back.

8. A weft knitted fabric as claimed in claim 1, comprising at least one pair of adjacent linking courses in which the sinker loops are disposed on opposite sides of the double fabric.

9. A weft knitted fabric as claimed in claim 1, wherein the fabric contains weft threads.

10. A method of producing on a rib knitting machine a weft knitted fabric in which at least on part is formed by a double fabric made up of two single fabrics, the single fabrics being linked by connecting elements in linking courses wherein the connecting elements are formed of at least one rib stitch of one single fabric adjacent at least one purl stitch of the other single fabric at one side of said double fabric, and at the other side of said double fabric there is a sinker loop of said one single fabric behind said purl stitch and a sinker loop of said other single fabric behind said rib stitch, said method comprising forming said stitches of said one single fabric on selected active needles of one needle bed forming the corresponding stitches of said other single fabric on selected active needles of the second needle bed, which needles are opposite inactive needles of said first needle bed, while for laying the sinker loops of both single fabrics in the same connecting element of the double fabric on one side of the same said stitches of said one single fabric are transferred into the opposite inactive needles of said second needle bed, on the active needles of which the corresponding stitches

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of said other single fabric are formed immediately on the active needles of the second needle bed, while in the process of knitting the stitches of said first single fabric on the active needles of said first needle bed the stitches of said other single fabric remain on the active needles of said second needle bed.

11. A method as claimed in claim 10, wherein to form the linking course containing the connecting elements only the course of one single fabric is formed on the selected active needles of one needle bed, and the corresponding course of the other single fabric is formed on the selected active needles of the other needle bed, which latter needles are opposite the needles, inactive in this course, of said first needle bed, while for laying the sinker loops of both single fabrics in the same linking course of the double fabric at one side of the same the stitches of said one single fabric are transferred on to the opposite needles, inactive in this

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course, of said other needle bed, on the active knitting needles of which the course of said other single fabric is formed immediately, while in the process of knitting the course of said first single fabric on the active needles of said first needle bed, the stitches of said other single fabric remain on the active needles of said second needle bed.

12. A method as claimed in claim 11, comprising forming all courses of a single fabric on the needles of one needle bed and forming all courses of the other single fabric on the needles of the second needle bed.

13. A method as claimed in claim 11, wherein after the formation of a course of the single fabric on the needles of one needle bed the adjacent course of this single fabric is formed on the opposite needles of the second needle bed.

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