A looped knitted fabric including a foundation having interlaced chain-stitch threads or wales and connecting threads without a weft, and a first network of loops knitted in the foundation, each having two feet (3) knitted in the foundation, two first strands extending from the first feet (3) and a first crest (4) connecting the two first strands, each first crest (4) being on a given side of the two first feet (3) in the case of all the first loops, it includes a second network of loops knitted in the foundation, each having two second feet (3') knitted in the foundation, two second strands extending from the two second feet, and a second crest (4') connecting the two second strands, each second crest (4') being on the side opposite the said side of the two second feet (3') in the case of all the second loops, and each second foot (3') lying on the imaginary line connecting two first feet (3) of a first loop, between and preferably half-way between the two first feet.
FABRIC COMPRISING DOUBLE NETWORKS OF LOOPS AND A METHOD OF MAKING IT

[0001] The invention relates to a knitted fabric comprising loops or plush loops. The loops or plush loops are adapted to engage in hooks to form a self-gripping hooking device. The knitted fabric comprises a foundation made up of interlacing wale threads and connecting threads without a web, and a network of loops formed from threads of loops knitted in the foundation of the fabric, the loops inter alia having a crest and two feet knitted along the wales. In the prior art, knitted fabrics of this kind have a disadvantage, firstly, in that all the loops are formed facing the same direction, i.e. the crest of each loop is always on one side (to the left or right) of the feet of the loop in all the loops in the fabric. This results in less efficient engagement of the hooks of the self-gripping article in one direction than in the opposite direction.

[0002] The prior-art knitted fabrics also have a second disadvantage in that the percentage of threads used for forming the loops is much lower than the percentage of threads used to form the foundation. In the case of a self-gripping article the useful engagement part is made up of loops, and consequently it is desirable to use the maximum proportion of thread to form the loops.

[0003] The invention aims to obviate these two disadvantages simultaneously, i.e. to obtain a knitted fabric having the same hooking capacity as the female part of a self-gripping article in either direction of the fabric (without a web) and wherein a larger proportion of the threads are used to form the loops, e.g. 40 to 70%, inter alia 50 to 60% of all the threads in the fabric.

[0004] According to the invention the looped knitted fabric comprising:

[0005] a foundation comprising interlaced chain-stitch threads or wales and connecting threads without a web, and

[0006] a first network of loops knitted in the foundation, each comprising two feet knitted in the foundation, two first strands extending from the first feet and a first crest connecting the two first strands, each crest being on a given side of the two first feet in the case of all the first loops,

[0007] is characterised in that it comprises a second network of loops knitted in the foundation, each comprising two second feet knitted in the foundation, two second strands extending from the second feet, and a second crest connecting the two second strands, each second crest being on the side opposite the said side of the two second feet in the case of all the second loops, and each second foot lying on the imaginary line connecting two first feet of a first loop, between and preferably half-way between the two first feet.

[0008] To obtain this novel fabric comprising two networks of loops, the applicants have found a novel method which however uses only three bars on the loom by providing a novel spacing on the loom between each row of chain-stitch forming needles, i.e. a spacing of at least two rows of needles between two consecutive rows of chain-stitch forming needles instead of one in the prior art, and the third bar of the loom, which forms the loops, acts simultaneously on the two yarns which it is knitting, the yarns being offset by a spacing corresponding to the spacing between two rows of needles, so that two oppositely oriented networks can be produced simultaneously.

[0009] According to an improvement of the invention, each first crest of a first loop is interlaced in a second crest of a second loop. The result is that the fabric is firmer as a whole and inter alia has greater resistance if a thread in the foundation tears, since the interlaced loops prevent the hole produced by the torn thread from spreading.

[0010] In a preferred embodiment of the invention, the feet of the loop are formed along the wales.

[0011] In a preferred embodiment, the fabric has a weight between 15 g/m² and 150 g/m², inter alia between 15 g/m² and 40 g/m², in the case of a thread diameter between 17 and 120 decitex, inter alia between 22 and 70 decitex.

[0012] The invention also relates to a method of producing a fabric as described hereinbefore.

[0013] According to the invention, the method of producing a looped fabric on a warp knitting machine comprising rows of needles, comprising steps consisting in using three guide bars, a first for forming the chain stitches in cooperation with some needles, a second for forming well-less connections with the chain-stitch-forming needles, and a third for alternately forming meshes (the feet of the loops) on one row of chain-stitch-forming needles and meshes (the crests of the loops) on the needles between two consecutive rows of chain-stitch-forming needles, characterised in that at least two rows of loop crest-forming needles are provided between two consecutive rows of chain-stitch-forming needles and the third bar acts on two threads so as to knit at least two networks of loops between two consecutive rows of chain-stitch-forming needles, the two threads being offset by a spacing corresponding to the distance between two rows of needles on the loom.

[0014] In one possible advantageous embodiment, a 10-23 weave is used for the third bar.

[0015] In another possible advantageous embodiment, a 10-45 weave is used for the third bar.

[0016] The invention also relates to a laminated assembly comprising a fabric according to the invention fixed to a support, inter alia by pasting.

[0017] More particularly the invention relates to a laminated assembly having a support in the form of a pitch.

[0018] Finally the invention relates to a pitch comprising a self-gripping female part comprising a fabric according to the invention.

[0019] Two preferred embodiments of the invention will now be described, given by way of example only, with reference to the drawings in which:

[0020] FIG. 1 diagrammatically shows the production of a looped fabric according to the invention, using a 10-23 weave for the third bar;

[0021] FIG. 2 diagrammatically shows production of a second looped fabric according to the invention using a 10-45 weave for the third bar;
FIG. 3 is another diagrammatic view of production of a looped fabric according to the invention, the wales being separated by three rows of needles instead of two in FIGS. 1 to 2, using a 10-34 weave for the third bar, and

FIG. 4 is a diagram showing production of another looped fabric according to the invention, the wales in this case being separated by three rows of needles instead of two in FIGS. 1 and 2 and a 10-56 weave being used for the third bar, and

FIG. 5 shows a pitch according to the invention comprising the self-gripping part according to the invention.

The method of producing a looped fabric on a warp knitting machine illustrated by the diagram in FIG. 1 consists in working with three guide bars. A first bar forms the chain stitches 1 in co-operation with a row (vertical in the drawing) of needles out of three in the example under consideration. A second guide bar forms the weft connections 2 in cooperation with chain stitch-forming needles 1. Finally a third bar alternately forms meshes 3 and 3’ (the feet of the loops) on the chain stitch-forming needles in one row and meshes corresponding to the loop crests 4, 4’ on the two rows of needles situated between two consecutive rows of chain stitch-forming needles.

The weft connection here is represented by a non-meshed (picked) system; however a meshed system or a varying system are also possible. The chain stitches or wales can be open, closed or alternating (two meshes in one direction, two in another).

The fabric on a loom shown in FIG. 1 also comprises two networks of plush loops, i.e. a first network of loops comprising feet 3 and loop crests 4 and a second network of loops comprising feet 3 and loop crests 4. The guide bar C for forming the loops knits all the loops in the same direction of advance of the fabric on the loom. However it acts on two threads offset by the distance between two adjacent rows of needles and, since two rows of needles have now been left free between two consecutive rows of chain stitches, the two networks of loops face in opposite directions, i.e. in FIG. 1 the network of loops having feet 3 and crests 4 faces to the left of the drawing whereas the network of loops having feet 3’ and crests 4’ faces to the right in the drawing. A foot 3’ of a loop 4’ extends along a chain stitch 1 between two feet 3 of the first network of loops. The foot 3’ in question is halfway between two feet of a first neighbouring loop.

In the case of a 50 decitex thread, about 60% of the threads in the fabric are used to form loops. In the case of a thread having the same decitex, i.e. a 50-decitex thread as before, in prior-art fabrics where only a single row of loop-forming needles was left between two adjacent rows of wales, and with a single network of loops such as the first network of loops described hereinbefore, the percentage was about 30% to 35%.

The gill bar C for forming the loops travels in accordance with a 10-23 weave. The needles (represented by points in FIGS. 1 and 2) are distributed over the loom in a matrix having lines (horizontal in the drawing) and columns or rows (vertical in the drawing), the columns or rows being numbered starting from 0.

FIG. 5 shows a pitch according to the invention comprising the self-gripping part according to the invention.

In a second step, the gill bar unravels the second thread in a needle in the other of the two rows (column 2) to form a crest of the first loop and meshes the second thread in the next wale (column 3) to form a foot of a second loop.

The cycle then repeats.

FIG. 2 shows another embodiment substantially identical with that in FIG. 1. In this case, however, the loops in the first network interface at their crests 4 with the loops in the second network at the level of their crests 4. The loops here are larger since when the interlaced loops are withdrawn from the loom, they retain a greater length than in the embodiment in FIG. 1. The loop bar C for knitting the two networks of loops follows a 10-45 weave.

The beginning of the cycle of bar C is identical with the embodiment in FIG. 1. In the case however of the second part of the cycle, instead of unravelling and meshing at columns 2 and 3, the bar unravels and meshes at columns 4 and 5. This method of interlacing the loops together also provides even more uniform hooking in both directions than in the case of FIG. 1. In the case of FIG. 1, there are admittedly two networks of loops each facing in one direction. However, one network of loops faces the direction of advance of the fabric on the loom and one network of loops faces in the opposite direction. As a result the loops tend to project from the fabric in different ways, depending on whether they are in one network or the other. In the case of the fabric in FIG. 2, this problem is solved since the loops in the direction of advance of the fabric entrain the loops in the opposite direction so that all the loops tend to project from the fabric in the same manner, resulting in even more uniform hooking in both directions.

FIG. 3 shows a fabric looped on a loom identical with that in FIG. 1 except that the wales or chain stitches 1 are separated by three rows of needles instead of two. The bar C therefore follows a weave 10-34.

Likewise FIG. 4 shows a fabric looped on a loom identical with that in FIG. 2 except that the chain stitches 1 are separated by three columns or rows of needles instead of 2. The bar C therefore follows a weave 10-56.

FIG. 5 shows a fabric comprising a self-gripping device comprising a female part 6 in the form of a knitted fabric according to FIG. 1 or 2 pasted to a support which in turn is pasted or heat-sealed or fixed in any other manner to the edge of the pitch, which can be fastened by means of the self-gripping device and the male part 7 situated on the other edge.

1. A looped knitted fabric comprising:

a foundation comprising interlaced chain-stitch threads or wales and connecting threads without a weft, and

a first network of loops knitted in the foundation, each comprising two feet (3) knitted in the foundation, two first strands extending from the first feet (3), and a first
crest (4) connecting the two first strands, each first crest (4) being on a given side of the two first feet (3) in the case of all the first loops,

Wherein it comprises a second network of loops knitted in the foundation, each comprising two second feet (3') knitted in the foundation, two second strands extending from the two second feet, and a second crest (4') connecting the two second strands, each second crest (4') being on the side opposite the said side of the two second feet (3') in the case of all the second loops, and each second foot (3') lying on the imaginary line connecting two first feet (3) of a first loop, between and preferably half-way between the two first feet.

2. A fabric according to claim 1, wherein each first crest (4) of a first loop is interlaced in a second crest (4') of a second loop.

3. A fabric according to claim 1 wherein the feet of the first and second loops are formed along the wales.

4. A fabric according to claim 1, wherein the fabric has a weight between 15 g/m² and 150 g/m², inter alia between 15 g/m² and 40 g/m², in the case of a thread diameter between 17 and 120 decitex, inter alia between 22 and 70 decitex.

5. A method of producing a fabric according to claim 1, comprising steps consisting in using three guide bars, a first for forming the chain stitches in cooperation with some needles, a second for forming weft connections with the chain stitch-forming needles, and a third for alternately forming meshes (the feet of the loops) on the chain stitch-forming needles in one row and loops on the needles between the said chain stitch-forming needles of the chain stitch-forming needles in a following row, wherein at least two rows of needles are provided between two rows of chain stitch-forming needles and the third bar forms at least two networks of loops between two consecutive rows of chain stitch-forming needles.

6. A method according to claim 5, wherein a 10-23 weave is used for the third bar.

7. A method according to claim 6, wherein a 10-45 weave is used for the third bar.

8. A laminated assembly comprising a fabric according to claim 1 fixed to a support, inter alia by pasting.

9. A laminated assembly according to claim 8, wherein the support is a pilch.

10. A pilch comprising a self-gripping female part (6) fixed to a hooked male part (7), the self-gripping female part (6) comprising a fabric according to claim 1.

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