

SPECIFICATION

A narrow fabric and a method and apparatus for producing the same

This invention relates to a method of producing narrow fabric. Furthermore, it relates to apparatus for carrying out the method, and to narrow fabric produced by said method and apparatus.

Already known are narrow fabrics which, as a rule, have weft thread loops which are inserted from one side of the warp shed and are tied off on the other side by a fabric edge. This fabric edge can be formed either by knitting the weft thread loops with one another or by knitting the weft thread loops with one or more auxiliary threads. Fabric produced in this way has the disadvantage of having different edges, and in particular having a coarse fabric edge. During production of the fabric a coarse fabric edge can lead to warping of one edge of the fabric. When the fabric is washed this warping increases even further. Furthermore, the weft threads of the fabric must be loosely knitted to enable the selvedge knitting needle to produce a fabric edge. The weft thread loops can accordingly be tightened only to a limited extent on the needle side. The known fabrics are therefore unsuitable particularly where the fabrics have to be rolled up or where the edges of the fabrics are subjected to a severe stressing, for example when the fabrics are used in safety belts for vehicles.

Known from German Offenlegungsschrift No. 1,804,973 is a narrow fabric in which weft thread loops are inserted from both sides and are connected in the centre of the fabric by means of an auxiliary thread. The auxiliary thread is drawn through the weft thread loops by means of a knitting needle which acts perpendicularly to the plane of the fabric and is tied off with itself on one side of the fabric. This ensures that the edges on both sides of the fabric are identical but has the disadvantage of producing a bulky stitch course in the centre of the fabric. Not only is this visually undesirable but the exposed stitch wales of the auxiliary thread can easily be damaged or destroyed. This results in the disintegration of the fabric.

An object of the invention is to provide a narrow fabric, of the kind already described but in which that part of the fabric to which the weft thread loops are connected lies between the edges of the fabric and to ensure that this connection is not disposed on one edge of the fabric.

With this object in view the present invention provides a narrow fabric comprising weft thread loops introduced from both sides of a warp thread web and held together between the two fabric edges by means of at least one auxiliary thread, each weft thread loop being formed by a respective weft thread, characterised in that the or each said auxiliary thread extends over part of the width of the fabric parallel to the weft thread loops, is tied off with itself or by a further auxiliary thread, and forms an auxiliary thread loop by

means of which the weft thread loops of one side of the fabric are drawn into the weft thread loops of the other side of the fabric.

As a result of arranging the auxiliary thread so that it extends parallel to the weft thread loops, the connection of the weft thread loops, which is effected by the auxiliary thread, is drawn into the warp shed and between the warp threads. This connection point of the weft thread loops is not disposed on one edge of the fabric and is protected by the warp threads. This gives not only an extremely uniform fabric, but the connection point of the weft thread loops lies inside the warp threads and is thereby protected. Because the connection point of the weft thread loops lies between the fabric edges, this results in a uniform structure of the fabric, so that warping of edge of the fabric is prevented. This structure of the fabric also has advantage that, upon the drawing-in of the connection point of the weft thread loops, the warp threads are drawn together on both sides towards the centre of the fabric. This results in a close warp weave which enables the fabric to withstand stress. In addition, this fabric structure ensures that the fabric does not warp when being washed.

This fabric has many diverse uses, particularly where its application would place high demands upon it as, for example, in safety belts for vehicles, roller blind belts and conveyor belts.

A method of producing the narrow fabric is characterised in that a first weft thread is introduced from one side of a warp shed by means of a weft-thread insertion member to form a first weft thread loop and at least one auxiliary thread is introduced over at least part of the width of the warp shed by means of an auxiliary-thread insertion member to form an auxiliary thread loop, a second weft thread is introduced from the other side of the warp shed, to form a second weft thread loop, between the inserted first weft thread and the auxiliary thread and the auxiliary thread is drawn into the last formed weft thread loop, at the same time crossing the first weft thread and the second weft thread, and is tied off with itself or with a further auxiliary thread.

Apparatus for carrying out a method in accordance with the invention comprises a ribbon loom having a weft-thread insertion member movable through a warp shed, an auxiliary-thread insertion member for supplying at least one auxiliary thread to the warp shed, a selvedge knitting needle arranged on one side of the warp shed, a first weft thread arranged on the opposite side of the warp shed to the selvedge knitting needle and a second weft thread arranged on the selvedge knitting needle side of the warp shed, characterised in that the auxiliary-thread insertion member is movable in the insertion direction of the first weft thread for inserting the auxiliary thread at least over part of the width of the warp shed, and in that the selvedge knitting needle acts to allow the weft threads to cross during the forming of an auxiliary thread loop.

Both the method of producing the narrow

fabric and the apparatus for carrying out the method are simple. In contrast to the conventional production of fabric, with the method of the invention only one additional

5 auxiliary-thread insertion member is necessary, this acting from the side of the weft-thread insertion member and, in the appropriate circumstances, coupled thereto. Thus, conventional ribbon looms can be supply

10 converted to produce the fabric of the invention. The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

15 Figure 1 illustrates in plan view part of the production of a first embodiment of the narrow fabric of the invention having one auxiliary thread;

Figure 2 is a view similar to Figure 1 but showing a second embodiment of the fabric having two auxiliary threads;

20 Figure 3 is a perspective view of part of a first embodiment of the apparatus for producing the fabric of Figure 2;

Figures 4, 5 and 6 each illustrate a control cam for use with the apparatus of Figure 3;

25 Figure 7 is a view similar to Figure 1 but showing a third embodiment of the fabric of the present invention;

Figure 8 is a view similar to Figure 2, but showing a fourth embodiment of the fabric of the present invention;

30 Figures 9 and 10 are views similar to Figure 3 but showing a second embodiment of the apparatus for producing the fabric of Figure 8, and

35 Figure 11 is a view similar to Figures 1, 2, 7, 8 but showing a fifth embodiment of the fabric of the present invention.

Referring first to Figure 1 illustrated therein is a first preferred embodiment of the narrow fabric which has warp threads 1, between which, from an insertion side 2, first weft thread loops 3 are drawn in and, from a selvedge-knitting needle side 4, second weft thread loops 5 are drawn in.

40 Connection points 6 of the first weft thread loops 3 to the second weft thread loops 5 lie between the fabric edges and are formed by one auxiliary thread loop 7 drawing each second weft thread loops 5 into the first weft thread loops 3 and restrain them there. The auxiliary thread loops 7 extend over the entire width of the fabric and lie parallel to the weft thread loops 3 and 5. An auxiliary thread 9 is tied off with itself.

50 To produce the fabric of Figure 1, a first weft thread 8 and the auxiliary thread 9 are supplied at the insertion side 2 and entered into a warp shed, by means of a weft-thread insertion member 10 and an auxiliary-thread insertion member 11, as far as the needle side 4. On the needle side 4, a second weft thread 12 is supplied and placed between the inserted first weft thread 8 and the auxiliary thread 9. A selvedge knitting needle 13, which carries the last auxiliary thread loop 7, catches the auxiliary thread 9 and draws it into the last weft thread loop 3 at the same time crossing the first weft thread 8 and the second weft thread 12. The last weft thread loop 3 is then

5 removed from the needle 13. Upon the return of the weft-thread insertion member 10 and of the auxiliary-thread insertion member 11, the first weft thread loop 3 and the second weft thread loop 5 as well as the auxiliary thread loop 7 are formed. By pre-tensioning of the second weft thread 12, the second weft thread loop 5 can, upon the return of the weft-thread insertion member 10 and of the auxiliary-thread insertion member 11, be drawn into the warp shed, so that the connection point 6 comes to rest between the edges of the fabric. The extent of the drawing-in can be determined by the extent of the pre-tensioning of the second weft thread 12. With the drawing-in of the connection point 6 of the first weft thread loop 3 to the second weft thread loop 5 the weft thread loop 3 is also drawn into the warp shed. The draw-in loops are beaten-up by a reed (not shown). Upon the change of the warp shed, the inserted loops are clamped fast. Thus in the fabric illustrated in Figure 1 the auxiliary thread 9 is tied off with itself.

A second embodiment of the narrow fabric is illustrated in Figure 2 and corresponds substantially to the fabric of Figure 1. Therefore identical parts are provided with the same reference numerals. In contrast to the fabric of Figure 1, in the fabric of Figure 2 two auxiliary threads 14, 15 are present, which form auxiliary thread loops 16 and 17. These auxiliary thread loops 16 and 17 extend only over part of the width of the fabric, and serve alternately for connecting the first weft thread loop 3 and the second weft thread loop 5. Each auxiliary threads 14 and 15 is not tied off with itself, but with the other auxiliary thread. Additionally a locking thread may be present.

As is illustrated in Figures 2 and 3, the production of the fabric is effected as follows. The first weft thread 8 is introduced by means of the weft-thread insertion member 10 from the insertion side 2 into the warp shed. An auxiliary thread insertion member 18 moves with the weft-thread insertion member 10 through the warp shed by means of a fork-shaped entrainment means 19 on the member 10. The first auxiliary thread 14 and the second auxiliary thread 15 are supplied similarly to the warp threads 1, thread guidance elements 20 and 21 being present, in order to bring the first auxiliary thread 14 or the second auxiliary thread 15 respectively into the entrainment region of the auxiliary-thread insertion member 18. This ensures that the first auxiliary thread 14 and the second auxiliary thread 15 pass alternately onto the needle side 4 and into the entrainment region of the needle 13. The weaving operation is then performed in the same manner as with the fabric of Figure 1, with crossing of the weft threads alternately with the first and the second auxiliary thread 14 or 15 respectively. The second auxiliary threads are tied off not with themselves but each with the other auxiliary thread.

130 Illustrated in Figure 3 is a first embodiment of the apparatus for producing the narrow fabric of

Figure 2. The apparatus comprises a ribbon loom having a weft-thread insertion member 10 and auxiliary-thread insertion member 18 both of which engage through the warp shed 22 formed from the warp threads 1. These members 10 and 18 may each have their own drive or have a drive which is common to both. Also, the insertion members 10, 18 may be assembled in such a way that only one member with one insertion part for the auxiliary thread and one insertion part for the weft thread is present. It would also be possible to use, for the auxiliary threads and weft threads, an insertion member which engages from the needle side into the warp shed 22 and draws the auxiliary thread or threads out on the needle side, as will be explained in more detail with reference to Figure 11. The ribbon loom has, furthermore, a known device (not shown) for the pre-conveyance pre-tensioning of the second weft thread 12. The knitting needle 13 is arranged on the needle side 4 opposite to the insertion side 2. For guiding the first auxiliary thread 14 and the second auxiliary thread 15 are thread guidance elements 20 and 21, which are driven by way of control cams 23 and 24. Figures 4 and 6 illustrate further control cams which are suitable for driving the thread guidance elements 20 and 21. The ribbon loom may additionally have a device for introducing a locking thread, which is known 'per se', for preventing the drawing-on of a fabric. The rest of the ribbon loom has a conventional structure so it does not have to be described in greater detail.

Illustrated in Figure 7 is a third embodiment of the narrow fabric which is similar to the narrow fabric of Figure 1, so that identical parts are given the same reference numerals as in Figure 1. In the fabric of Figure 7 the second weft thread 12a is provided with periodically-varying pre-tensioning, so that the connection points 6a or 6b, of the first weft thread loop 3 and of the second weft thread loop 5 respectively, are drawn into the fabric at a varying spacing from the edge of the warp shed. In this way the formation of the fabric becomes yet more uniform and the weaving of the weft thread loops more stable.

Illustrated in Figure 8 is a fourth embodiment of the narrow fabric which is similar to the fabric of Figure 2, so that again the same parts are provided with the same reference numerals. In the fabric of Figure 8, in contrast to that of Figure 2, only one auxiliary thread 25 is present. The thread 25 introduced along the warp threads by means of a thread guidance element 26 and transversely to the plane of the fabric into the warp shed 22. For this purpose there is provided in a further embodiment of the apparatus comprising a ribbon loom having a height control device 27 which is shown in more detail in Figures 9 and 10. A transverse control device 28 makes it possible to introduce the guide element 26 at various points into the warp shed 22. The result of this is that, similar to that shown in Figure 1, the auxiliary thread loops 26a, 26b, are guided to a different extent over the width of the fabric. Also a greater uniformity of the fabric is achieved and, above all,

else, through the varying lengths of the auxiliary thread loops 29a, 29b there is achieved an increase in the bending and different crossing points of the auxiliary thread with the warp thread. This brings about a considerable improvement in the durability of the fabric.

Illustrated in Figures 9 and 10, is a ribbon loom for producing the fabric of Figure 8 having as previously stated a height control device 27 and a transverse control device 28 for the thread guidance element 26. For this purpose the thread guidance element 26 is arranged on a transverse bar 30, which is fastened to a shaft 31 mounted so as to be swingable and adjustable in height. The transverse bar is raised and lowered by a height control cam 32. A transverse control lever 33, which is connected to the shaft 31, cooperates with a transverse control cam 34, to effect a swinging of the shaft 31 and thus displacement of the thread guidance element 26 along the width of the warp shed 22.

Illustrated in Figure 11 is a fifth embodiment of the fabric of the invention which is similar to that shown in Figure 8, and in which the single auxiliary thread 35 is guided over only part of the width of the fabric. For this purpose there is a thread guidance element 36, which stabs from below into a warp shed 22, so that the auxiliary thread 35 can pass into the effective region of an auxiliary-thread insertion member 37. The member 37 is, in contrast to the previously described embodiments, arranged on the knitting needle side 4 and has a hook 38, which can entrain the auxiliary thread 35 inserted into the warp shed and can draw it through onto the needle side 4 of the fabric along with formation of an auxiliary thread loop. The auxiliary thread loop 39 is then entrained in the customary way by the knitting needle 13. In this exemplified embodiment, the auxiliary thread loop 39 has the same length at all times and is tied off with itself.

Claims

1. A narrow fabric comprising weft thread loops introduced from both sides of a warp thread web and held together between the two fabric edges by means of at least one auxiliary thread, each weft thread loop being formed by a respective weft thread, characterised in that the or each said auxiliary thread extends over part of the width of the fabric parallel to the weft thread loops, is tied off with itself or by a further auxiliary thread, and forms an auxiliary thread loop by means of which the weft thread loops of one side of the fabric are drawn into the weft thread loops of the other side of the fabric.

2. A fabric as claimed in claim 1, characterised in that the weft thread loops are held together alternately with a first and a second auxiliary thread, the second auxiliary thread extending over at least part of the width of the fabric, parallel to the weft thread loops.

3. A fabric as claimed in claim 1 or 2 characterised in that connection points of the weft thread loops which are drawn in from both



Figure 2. The apparatus comprises a ribbon loom having a weft-thread insertion member 10 and auxiliary-thread insertion member 18 both of which engage through the warp shed 22 formed from the warp threads 1. These members 10 and 18 may each have their own drive or have a drive which is common to both. Also, the insertion members 10, 18 may be assembled in such a way that only one member with one insertion part for the auxiliary thread and one insertion part for the weft thread is present. It would also be possible to use, for the auxiliary threads and weft threads, an insertion member which engages from the needle side into the warp shed 22 and draws the auxiliary thread or threads out on the needle side, as will be explained in more detail with reference to Figure 11. The ribbon loom has, furthermore, a known device (not shown) for the pre-conveyance pre-tensioning of the second weft thread 12. The knitting needle 13 is arranged on the needle side 4 opposite to the insertion side 2. For guiding the first auxiliary thread 14 and the second auxiliary thread 15 are thread guidance elements 20 and 21, which are driven by way of control cams 23 and 24. Figures 4 and 6 illustrate further control cams which are suitable for driving the thread guidance elements 20 and 21. The ribbon loom may additionally have a device for introducing a locking thread, which is known 'per se', for preventing the drawing-on of a fabric. The rest of the ribbon loom has a conventional structure so it does not have to be described in greater detail.

Illustrated in Figure 7 is a third embodiment of the narrow fabric which is similar to the narrow fabric of Figure 1, so that identical parts are given the same reference numerals as in Figure 1. In the fabric of Figure 7 the second weft thread 12a is provided with periodically-varying pre-tensioning, so that the connection points 6a or 6b, of the first weft thread loop 3 and of the second weft thread loop 5 respectively, are drawn into the fabric at a varying spacing from the edge of the warp shed. In this way the formation of the fabric becomes yet more uniform and the weaving of the weft thread loops more stable.

Illustrated in Figure 8 is a fourth embodiment of the narrow fabric which is similar to the fabric of Figure 2, so that again the same parts are provided with the same reference numerals. In the fabric of Figure 8, in contrast to that of Figure 2, only one auxiliary thread 25 is present. The thread 25 introduced along the warp threads by means of a thread guidance element 26 and transversely to the plane of the fabric into the warp shed 22. For this purpose there is provided in a further embodiment of the apparatus comprising a ribbon loom having a height control device 27 which is shown in more detail in Figures 9 and 10. A transverse control device 28 makes it possible to introduce the guide element 26 at various points into the warp shed 22. The result of this is that, similar to that shown in Figure 1, the auxiliary thread loops 26a, 26b, are guided to a different extent over the width of the fabric. Also a greater uniformity of the fabric is achieved and, above all

else, through the varying lengths of the auxiliary thread loops 29a, 29b there is achieved an increase in the bending and different crossing points of the auxiliary thread with the warp thread. This brings about a considerable improvement in the durability of the fabric.

Illustrated in Figures 9 and 10, is a ribbon loom for producing the fabric of Figure 8 having as previously stated a height control device 27 and a transverse control device 28 for the thread guidance element 26. For this purpose the thread guidance element 26 is arranged on a transverse bar 30, which is fastened to a shaft 31 mounted so as to be swingable and adjustable in height. The transverse bar is raised and lowered by a height control cam 32. A transverse control lever 33, which is connected to the shaft 31, cooperates with a transverse control cam 34, to effect a swinging of the shaft 31 and thus displacement of the thread guidance element 26 along the width of the warp shed 22.

Illustrated in Figure 11 is a fifth embodiment of the fabric of the invention which is similar to that shown in Figure 8, and in which the single auxiliary thread 35 is guided over only part of the width of the fabric. For this purpose there is a thread guidance element 36, which stabs from below into a warp shed 22, so that the auxiliary thread 35 can pass into the effective region of an auxiliary-thread insertion member 37. The member 37 is, in contrast to the previously described embodiments, arranged on the knitting needle side 4 and has a hook 38, which can entrain the auxiliary thread 35 inserted into the warp shed and can draw it through onto the needle side 4 of the fabric along with formation of an auxiliary thread loop. The auxiliary thread loop 39 is then entrained in the customary way by the knitting needle 13. In this exemplified embodiment, the auxiliary thread loop 39 has the same length at all times and is tied off with itself.

Claims

1. A narrow fabric comprising weft thread loops introduced from both sides of a warp thread web and held together between the two fabric edges by means of at least one auxiliary thread, each weft thread loop being formed by a respective weft thread, characterised in that the or each said auxiliary thread extends over part of the width of the fabric parallel to the weft thread loops, is tied off with itself or by a further auxiliary thread, and forms an auxiliary thread loop by means of which the weft thread loops of one side of the fabric are drawn into the weft thread loops of the other side of the fabric.

2. A fabric as claimed in claim 1, characterised in that the weft thread loops are held together alternately with a first and a second auxiliary thread, the second auxiliary thread extending over at least part of the width of the fabric, parallel to the weft thread loops.

3. A fabric as claimed in claim 1 or 2 characterised in that connection points of the weft thread loops which are drawn in from both



fabric edges, have along the ribbon fabric varying spacings from the fabric edges.

4. A fabric as claimed in claim 1, 2 or 3 characterised in that at least one auxiliary thread extends along the fabric over portions of varying width.

5. A method of producing the narrow fabric as claimed in any preceding claim characterised in that a first weft thread is introduced from one side of a warp shed by means of a weft-thread insertion member to form a first weft thread loop and at least one auxiliary thread is introduced over at least part of the width of the warp shed by means of an auxiliary-thread insertion member to form an auxiliary thread loop, a second weft thread is introduced from the other side of the warp shed, to form a second weft thread loop, between the inserted first weft thread and the auxiliary thread and the auxiliary thread is drawn into the last formed weft thread loop, at the same time crossing the first weft thread and the second weft thread, and is tied off with itself or with a further auxiliary thread.

6. A method as claimed in claim 5, characterised in that the extent of the drawing-in of the second weft thread loop is determined by the periodically-alternating magnitude of a predetermined tension of the second weft thread.

7. A method as claimed in claim 5 or 6, characterised in that the first weft thread and the auxiliary thread is drawn from one side through the warp shed into the entrainment region of a selvedge knitting needle arranged on the other side of the warp shed, the second weft thread is arranged between the first weft thread and the auxiliary thread, the auxiliary thread being entrained by the selvedge knitting needle and being also crossing the first and the second weft thread forming an auxiliary thread loop.

8. A method as claimed in claim 5, 6 or 7 characterised in that the weft thread loops are held together alternately by means of the first and of the second auxiliary thread, the second auxiliary thread being guided together with the first weft thread over at least part of the width of the warp shed.

9. A method as claimed in any one of claims 5 to 8, characterised in that at least one auxiliary thread is guided in the direction of the warp threads and is brought by means of a thread guidance element into the entrainment region of the auxiliary-thread insertion member at a varying distance from the edge of the warp shed.

10. A method as claimed in any one of claims 5 to 9, characterised in that one weft thread loop and/or at least one auxiliary thread loop is drawn by means of a hook-shaped insertion member from the side of weaving needle into the warp shed.

11. Apparatus for carrying out the method in

claims 5 to 10 which comprises a ribbon loom having a weft-thread insertion member movable through a warp shed, an auxiliary-thread insertion member for supplying at least one auxiliary thread to the warp shed, a selvedge knitting needle arranged on one side of the warp shed, a first weft thread arranged on the opposite side of the warp shed to the selvedge knitting needle and a second weft thread arranged on the selvedge knitting needle side of the warp shed, characterised in that the auxiliary-thread insertion member is movable in the insertion direction of the first weft thread for inserting the auxiliary thread at least over part of the width of the warp shed, and in that the selvedge knitting needle acts to allow the weft threads to cross during the forming of an auxiliary thread loop.

12. Apparatus as claimed in claim 11, characterised in that the ribbon loom has a device for the adjustable pre-tensioning of the second weft thread relative to the first weft thread.

13. Apparatus as claimed in claim 11 or 12, characterised in that the auxiliary-thread insertion member is designed for the alternating supply of two auxiliary threads.

14. Apparatus as claimed in claim 13, characterised in that at least one auxiliary thread is guided in the warp direction, at least one thread guidance element being present in order to bring the auxiliary thread, at a varying distance from the edge of the warp shed, into the entrainment region of the auxiliary-thread insertion member.

15. Apparatus as claimed in any one of claims 11 to 14, characterised in that the auxiliary-thread insertion member and the weft-thread insertion member have a common drive.

16. Apparatus as claimed in any one of claims 11 to 14, characterised in that the auxiliary-thread insertion member and the weft-thread insertion member have separate drives.

17. Apparatus as claimed in any one of claims 11 to 16, characterised in that the ribbon loom has on that side of the warp shed which is opposite to the insertion side for a weft thread and/or at least one auxiliary thread, an insertion member which is movable through the warp shed and has a catching hook for the reaching-through of the weft and/or auxiliary thread.

18. Apparatus substantially as hereinbefore described with reference to and as illustrated in Figure 3, and in Figures 9 and 10.

19. A method of producing narrow fabric substantially as hereinbefore described with reference to the accompanying drawings.

20. A narrow fabric substantially as hereinbefore described with reference to and as illustrated in any of Figures 1, 2, 7, 8 or 11.

21. Narrow fabric produced by the method of any of claims 5 to 10.