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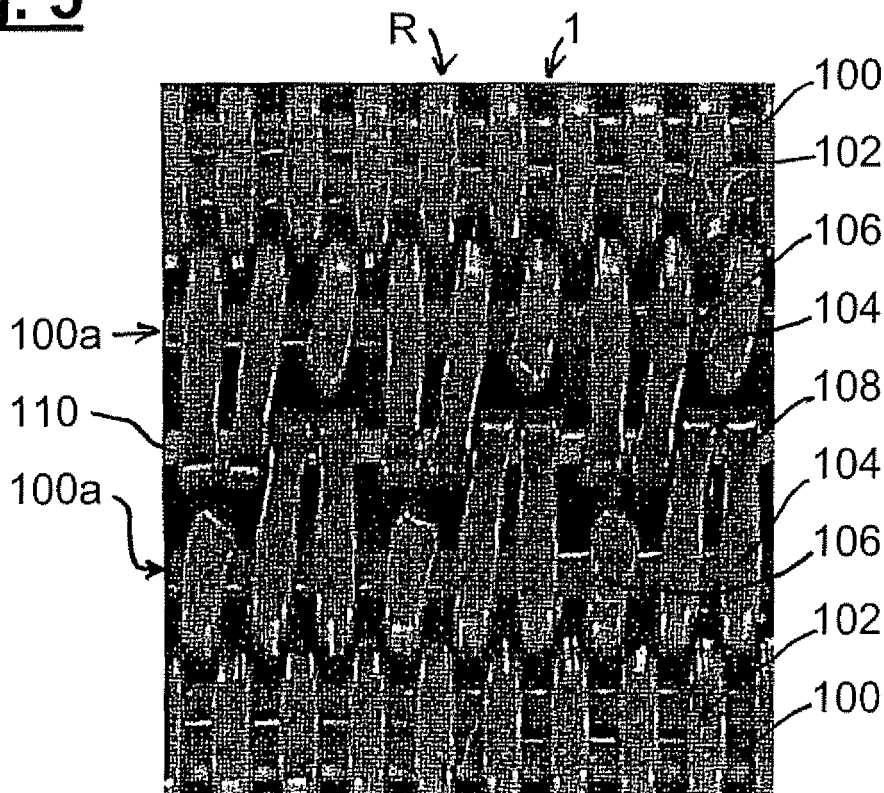
(54) **Woven fabric structure**

(57) The present invention relates to a woven fabric structure comprising at least one array of warp yarns (102) interwoven with at least one array of substantially orthogonally extending weft yarns (100), wherein each end of a warp yarn (102) is extended beyond the last weft (100a) to form either a binder (106) or a seam loop (104) which can be interdigitated with similar seam loops (104)

of the opposing fabric end and joined by at least one pintle wire (108) passed through a tunnel (110) formed by the interdigitated seam loops (104).

The inventive woven fabric structure is characterized in that the seam loops (104) and the binders (106) of the warp yarns (102) possess a ratio (R) above 1:1 and below 4:1.

Fig. 5



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Description

[0001] The present invention relates to a woven fabric structure comprising at least one array of warp yarns interwoven with an array at least one array of substantially orthogonally extending weft yarns, wherein each end of a warp yarn is extended beyond the last weft yarn to form either a binder or a seam loop which can be interdigitated with similar seam loops of the opposing fabric end and joined by at least one pintle wire passed through a tunnel formed by the interdigitated seam loops.

[0002] The woven fabric is preferably for papermachine clothing, such as a forming fabric, a press sleeve, an extended nip press belt, a dryer fabric, a base cloth, for a filter belt or for a conveyor belt.

[0003] A common form of seam is achieved by extending selected longitudinal (machine direction) warp yarns of the fabric beyond the last transverse (cross-machine direction) weft yarn to form a loop, the end of which is back-woven into the fabric. The non-selected machine direction warp yarns are looped about the last cross-direction weft yarn the end of which is woven and the end back-woven into the fabric. Such a fabric structure is described in the British Patent Application GB-A-1,488,815, which discloses two patterns of weaving back the looped yarns and cutting short of certain other machine direction yarns to provide space for the back woven loop ends.

[0004] All warp yarns have usually the same thickness or width, so that as a result when using only half the warp yarns to form the loops, to afford space for interdigitation of the corresponding loops of the opposite end of the fabric, the tensile strength of the seam is significantly less than the fabric strength and there is a higher propensity in the seam region for marking the material sheet due to the greater open area in the seam region, as about 50 % of the total width of the fabric is open space.

[0005] One approach of solving this problem is to use more than 50 % of the warp yarns to form loops. An example of this is the International Patent Application WO 92/17543 A1 wherein the problem of obtaining space for interdigitation of loops where more than 50 % space is used by the loops of each side, is tackled by crossing adjacent loops over each other. However, the use of more than 50 % warp yarns and the crossing of the looped yarns make the already complicated, prolonged and expensive seaming process even more protracted.

[0006] Finally, the European Patent Specification EP 1 070 164 B1 discloses a woven fabric structure comprising an array of warp yarns interwoven with an array of substantially orthogonally extending weft yarns using warp yarns of differing widths. The warp yarns comprise groups of relatively wide warp yarns and groups of relatively thin warp yarns, said groups of relatively wide warp yarns alternating with said groups of relatively thin warp yarns. The groups of relatively wide and relatively thin warp yarns each comprise two or more respectively wide or thin warp yarns and said relatively wide warp yarns are extended in a seam region to provide seaming loops

on each end of the fabric. The disadvantage of this woven fabric structure is that warp yarns of different size can produce an uneven fabric surface leading to marking of the material sheet.

[0007] It is therefore an object of present the invention to provide a woven fabric structure with an improved tensile strength, less open space and a reduced propensity in the seam region.

[0008] In accordance with the invention, this object is satisfied by the provision that the seam loops and the binders of the warp yarns possess a ratio above 1:1 and below 4:1.

[0009] This inventive ratio provides a woven fabric structure with an improved tensile strength, a lower open space and a reduced propensity in the seam region.

[0010] The ratio of the seam loops to the binders is preferably 3:1, 2:1 or 3:2. The ratio of "3:1" means three seam loops, one binder, three seam loops, one binder, three seam loops, etc., the ratio of "2:1" means two seam loops, one binder, two seam loops, one binder, two seam loops, etc., whereas the ratio of "3:2" means either two seam loops, one binder, one seam loop, one binder, two seam loops, one binder, one seam loop, one binder, one seam loop, one binder, two seam loops, etc. or three seam loops, two binders, three seam loops, two binders, three seam loops, etc. These three preferred ratios provide highly improved tensile strengths with significant lower open spaces. The propensity in the seam region is consequently reduced.

[0011] In accordance with two preferred practical embodiments of the invention, the warp yarns for the seam loops are flat or profiled yarns with overall dimensions between 0,25 and 1,00 mm in height and between 0,50 and 2,00 mm in width or they are round yarns with a diameter between 0,25 and 1,00 mm. Furthermore, the warp yarns are preferably of a circular, rectangular or other profile shaped cross-section. The other profile shaped cross-section will preferably have the shape of a triangle, semicircle, hexagon, octagon or parallelogram.

[0012] Moreover, the warp yarn in a preferred embodiment of the invention has a cross-sectional area between 0,125 and 2,00 mm² for the flat or profiled yarns and between 0,05 and 0,79 mm² for the round yarns. These ranges guarantee a reduced propensity of the woven fabric structure and, therefore, a reduced marking of the material sheet. The material sheet is preferably a paper, board or tissue sheet.

[0013] In order to significantly reduce marking of the material sheet, the warp yarns and the weft yarns have preferably the same or similarly the same or different shapes and cross-sectional areas.

[0014] The invention further provides papermachine clothing formed by seaming a woven fabric structure according to the invention.

[0015] In order that the present invention may be more readily understood a preferred embodiment of the woven fabric structure according to the invention will now be described by way of example with reference to the ac-

companying drawings wherein:

Figures 1 to 3 are three fragmentary enlarged detail views of parts of seam regions of woven fabrics, showing parts of the weave structures of the fabrics of the seam formations;

Figure 4 is another fragmentary enlarged detail view of part of a seam region of a woven fabric, showing part of the weave structure of the fabric of the seam formation; and

Figures 5 to 7 are three fragmentary enlarged detail views of part of a seam regions of a woven fabrics according to the invention, showing parts of the weave structures of the fabric of the seam formations.

[0016] In the Figures 1 to 4, a woven fabric structure for a papermachine clothing or another belt, such as an filter or conveyor belt, comprises an array of cross-machine direction weft yarns 10, extending parallel to an edge of the fabric 1, and including a last weft yarn 10a, defining the edge. An array of warp yarns 12 is woven through the weft yarns 10 substantially orthogonally to the weft yarns 10 of and in machine direction of the fabric 1.

[0017] It is shown in the embodiment of Figure 1, which shows a fragmentary enlarged detail view of part of a seam region of a woven fabric 1, that a normal loop seam is made by reweaving the first machine direction warp yarn 12.1 back into the fabric 1 to form a loop 14. The second machine direction warp yarn (12.2 is not visible) is brought out of the fabric within the seam area. This leaves a space for the first machine direction warp yarn to replace the pathway of the second machine direction warp yarn. The third machine direction warp yarn 12.3 is then rewoven back into the fabric to form a binder by replacing the path of the fourth machine direction warp yarn. The process is repeated so that 50% of the seam is comprised of loops 14 and 50% of the seam is comprised of binders 16.

[0018] The seam loops 14 and the binders 16 are interdigitated with similar seam loops 14 of the opposing fabric end and joined by a pintle wire 18 passed through a tunnel 20 formed by the interdigitated seam loops 14.

[0019] Another possibility to join two fabric ends together is the use of a spiral connecting the seam loops of the two opposing fabric ends. A spiral is preferably used in connecting the seam loops of the two opposing fabric ends of a dryer fabric.

[0020] Furthermore, it is shown in the embodiment of Figure 2 that some designs of fabrics 1 have two layers A, B of thin machine direction warp yarns 22. The seam loops 24 are made by reweaving one machine direction warp yarn 22.1 of the first layer A back into the fabric 1 to form a seam loop 24 by replacing the path of the second

machine direction warp yarn 22.2 of the second layer B. The third machine direction warp yarn 22.3 is then rewoven back into the fabric 1 of the first layer A to form a binder 26 by replacing the path of the fourth machine direction warp yarn 22.4 of the second layer B. The process is repeated so that 50 % of the seam is comprised of seam loops 24 and 50 % of the seam is comprised as binders 26. A fabric 1 of this design is disclosed in the European Patent Specification EP 0 612 881 B1.

[0021] As shown in Figure 3, it is also possible to increase the number of seam loops 34 by making a seam without binders 36 so that 50 % of the seam forms seam loops 34 around a pintle wire 38a. Then 50 % of the seam forms seam loops 34 around a second pintle wire 38b.

[0022] Figure 4 shows another fragmentary enlarged detail view of part of a seam region of a woven fabric 1, showing part of the weave structure of the fabric 1 of the seam formation. The seam loops 44 and the binders 46 of the warp yarns 42 possess a ratio R of 1:1, e.g. one seam loop 44, one binder 46, one seam loop 44, one binder 46, one seam loop 44, etc. Additionally, the warp yarns 42 for the seam loops 44 are either flat or profiled yarns with overall dimensions between 0,25 and 1,00 mm in height and between 0,50 and 2,00 mm in width or they are round yarns with a diameter between 0,25 and 1,00 mm. A practical embodiment will have over 48 seam loops 44 a width of 100 mm and 11.52 mm² cross-sectional area F in total.

[0023] Another fragmentary enlarged detail views of parts of a seam regions of a woven fabrics 1 are shown in Figures 5, 6 and 7. Each fabrics 1 comprises an array of cross-machine direction weft yarns 100, extending parallel to an edge of the fabric 1, and including a last weft yarn 100a, defining the edge. An array of warp yarns 102 is woven through the weft yarns 100 substantially orthogonally to the weft yarns 100 of and in machine direction of the fabric 1.

[0024] Each end of a warp yarn 102 is extended beyond the last weft yarn 100a to form either a binder 106 or a seam loop 104 which can be interdigitated with similar seam loops 104 of the opposing fabric end and joined by a pintle wire 108 passed through a tunnel 110 formed by the interdigitated seam loops 104.

[0025] In accordance with the invention, the seam loops 104 and the binders 106 of the warp yarns 102 possess a ratio R above 1:1 and below 4:1. For example, the ratio R can be 2:1 as shown in Figure 5 or 3:2 as shown in Figures 6 and 7. According to the first ratio R, the warp yarns 102 have two seam loops 104, one binder 106, two seam loops 104, one binder 106, two seam loops 104, etc., and according to the second ratio R, the warp yarns 102 have three seam loops 104, two binders 106, three seam loops 104, two binders 106, three seam loops 104, etc. or three seam loops, two binders, three seam loops, two binders, three seam loops, etc. These two preferred ratios provide highly improved tensile strengths with significant lower open spaces. The propensity in the seam region is consequently reduced.

[0026] Additionally, the warp yarns 102 for the seam loops 104 are either flat or profiled yarns with overall dimensions between 0,25 and 1,00 mm in height and between 0,50 and 2,00 mm in width or are round yarns with a diameter between 0,25 and 1,00 mm. The warp yarns 102 of both embodiments are of a circular, rectangular or other profile shaped cross-section C and have a cross-sectional area F between 0,125 and 2,00 mm² for the flat or profiled yarns and between 0,05 and 0,79 mm² for the round yarns. A practical embodiment with a ratio of 2:1 will have over 64 seam loops 104 a width of 100 mm and 15.36 mm² cross-sectional area F in total (0,36 in height and 0,67 mm in width). This is a 33 % increase in material around the seam pintle with respect to the embodiment of Figure 4.

[0027] Moreover, the warp yarns 102 and the weft yarns 104 have the same or similarly the same or different S shapes and cross-sectional areas F.

[0028] The woven fabric 1 according to the invention can be used for papermachine clothing, such as a forming fabric, a press sleeve, an extended nip press belt, a dryer fabric, a base cloth, for a filter belt or for a conveyor belt.

Reference numerals list

[0029]

1	fabric
10	weft yarn
10a	last weft yarn
12	warp yarn
12.1	warp yarn
12.2	warp yarn
12.3	warp yarn
12.4	warp yarn
14	seam loop
16	binder
18	pintle wire
20	tunnel
22	warp yarn
22.1	warp yarn
22.2	warp yarn
22.3	warp yarn
22.4	warp yarn
24	seam loop
26	binder
34	seam loop
36	binder
38a	pintle wire
38b	pintle wire
42	warp yarn
44	seam loop
46	binder
100	weft yarn
100a	last weft yarn
102	warp yarn
104	seam loop
106	binder

108	pintle wire
110	tunnel

A	first layer
B	second layer
C	cross-section
F	cross-sectional area
R	ratio
S	shape

Claims

1. Woven fabric structure comprising at least one array of warp yarns (102) interwoven with at least one array of substantially orthogonally extending weft yarns (100), wherein each end of a warp yarn (102) is extended beyond the last weft (100a) to form either a binder (106) or a seam loop (104) which can be interdigitated with similar seam loops (104) of the opposing fabric end and joined by at least one pintle wire (108) passed through a tunnel (110) formed by the interdigitated seam loops (104),
characterized in that
the seam loops (104) and the binders (106) of the warp yarns (102) possess a ratio (R) above 1:1 and below 4:1.
2. Woven fabric structure according to claim 1,
characterized in that
the ratio (R) of the seam loops (104) to the binders (106) is 3:1, 2:1 or 3:2.
3. Woven fabric structure according to claim 1 or 2,
characterized in that
the warp yarns (102) for the seam loops (104) are flat or profiled yarns with overall dimensions between 0,25 and 1,00 mm in height and between 0,50 and 2,00 mm in width.
4. Woven fabric structure according to claim 1 or 2,
characterized in that
the warp yarns (102) for the seam loops (104) are round yarns with a diameter between 0,25 and 1,00 mm.
5. Woven fabric structure according to claim 3 or 4,
characterized in that
the warp yarns (102) are of a circular, rectangular or other profile shaped cross-section (C).
6. Woven fabric structure according to any claim 3, 4 or 5,
characterized in that
the warp yarn (102) has a cross-sectional area (F) between 0,125 and 2,00 mm² for the flat or profiled yarns and between 0,05 and 0,79 mm² for the round yarns.

7. Woven fabric structure according to any of claims 3 to 6,
characterized in that
the warp yarns (102) and the weft yarns (100) have the same or similarly the same or different shapes (S) and cross-sectional areas (F). 5
8. Papermachine clothing formed by seaming a woven fabric (1) having a structure according to any of claims 1 to 7. 10

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Fig. 1

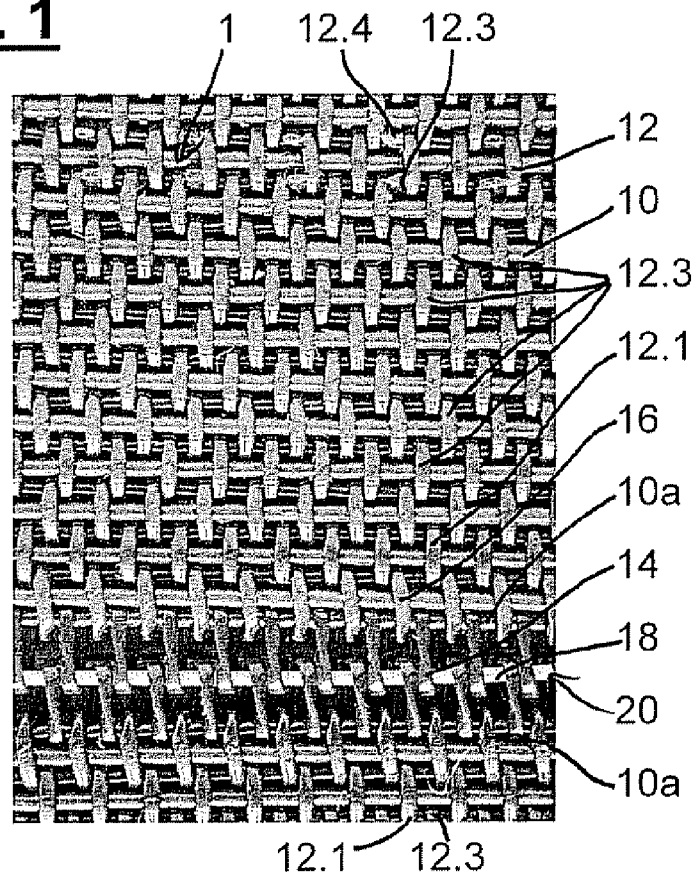


Fig. 2

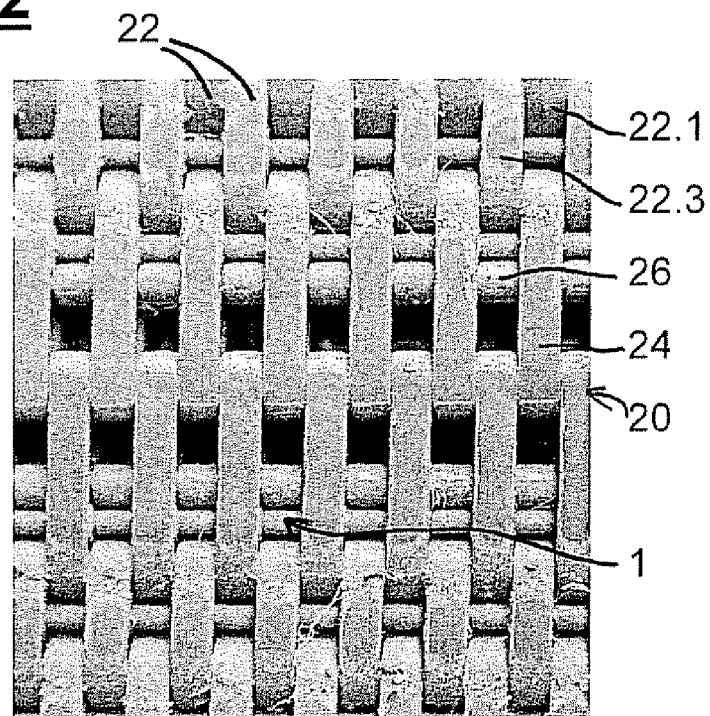


Fig. 3

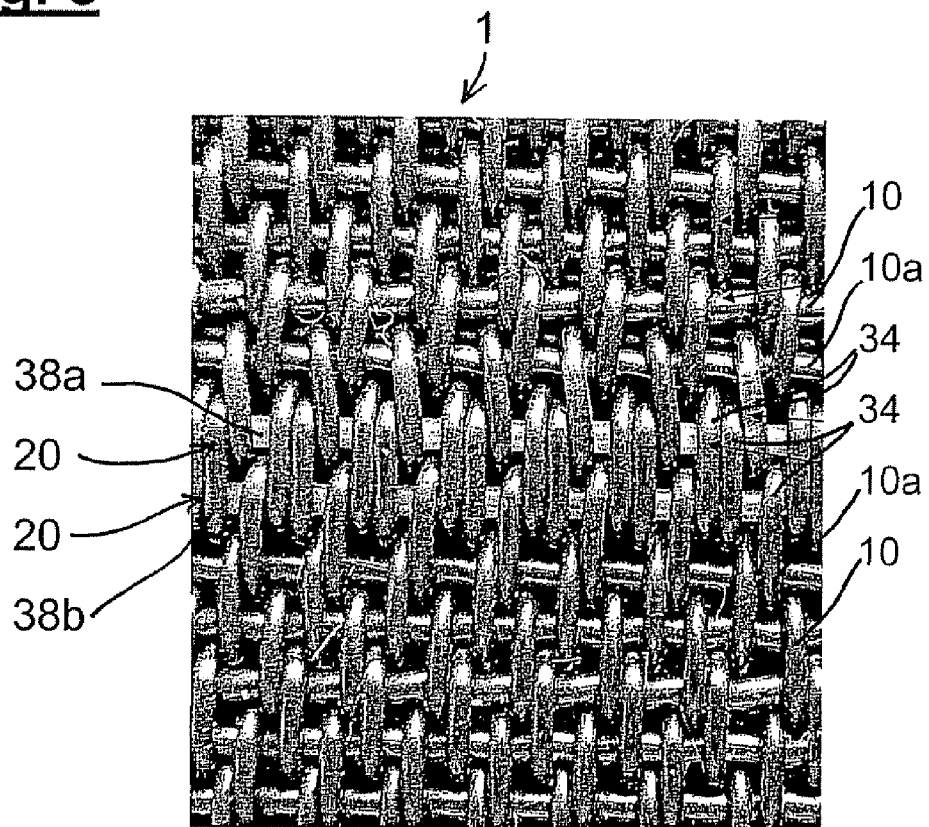


Fig. 4

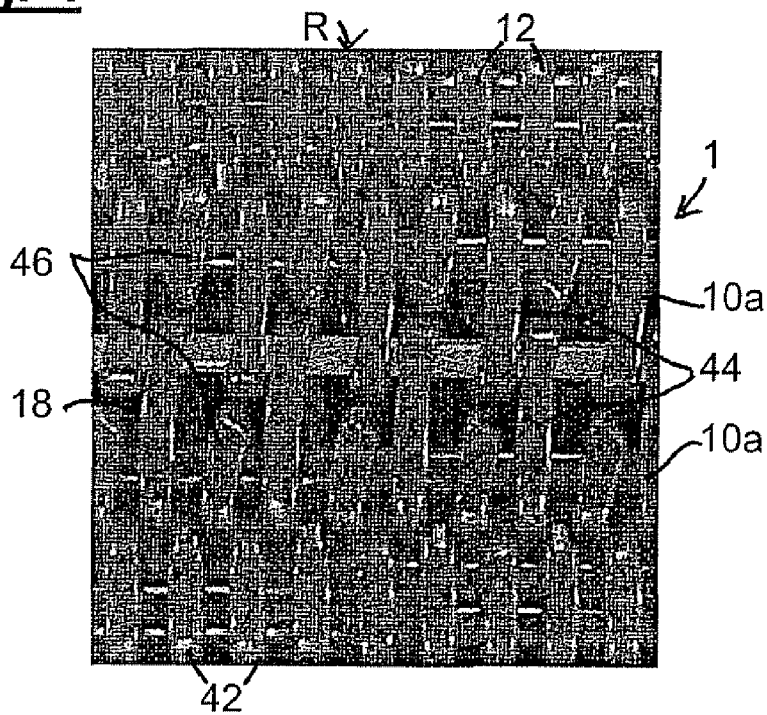


Fig. 5

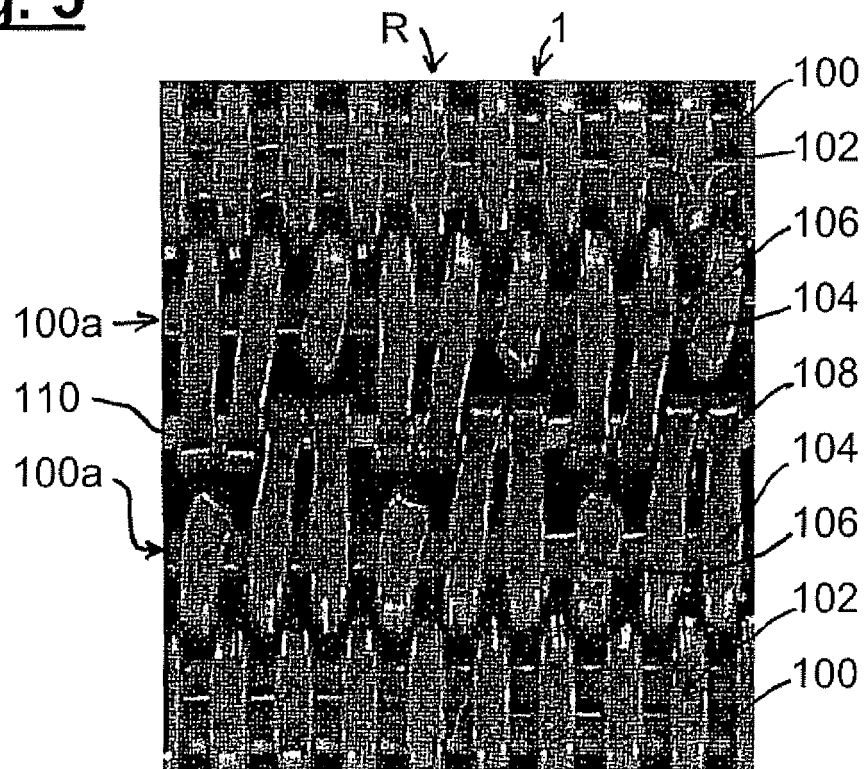


Fig. 6

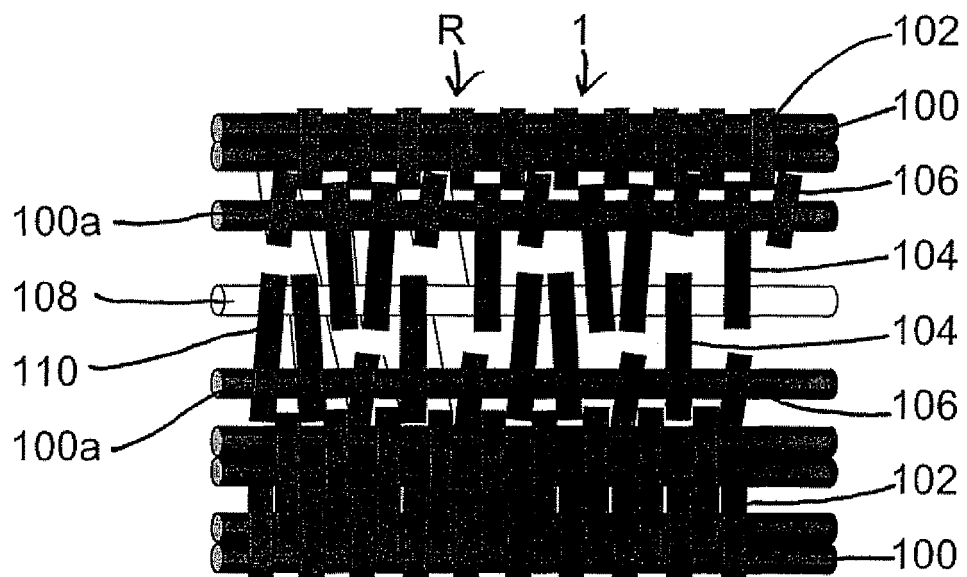
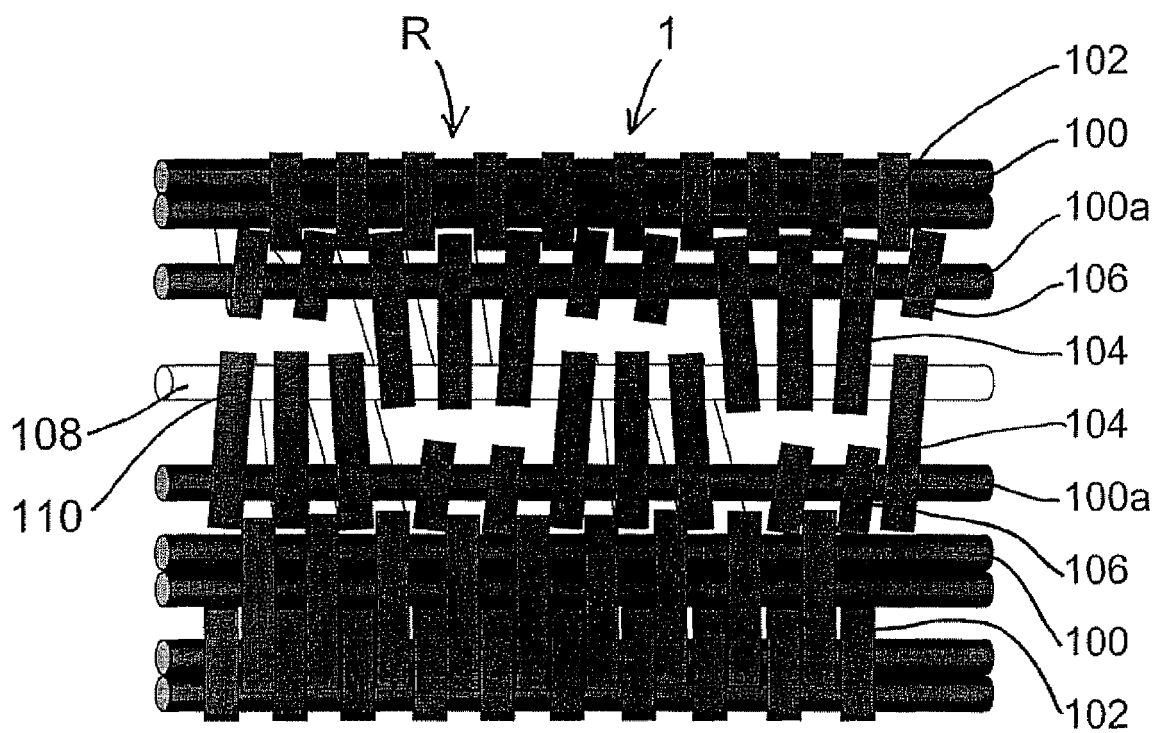


Fig. 7





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Application Number
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