



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.09.2022 Bulletin 2022/37

(51) International Patent Classification (IPC):
D03D 39/22 ^(2006.01) **D02G 3/36** ^(2006.01)
D02G 3/32 ^(2006.01)

(21) Application number: **21161785.7**

(52) Cooperative Patent Classification (CPC):
D03D 15/56; D03D 13/004; D03D 13/008;
D03D 15/283; D03D 15/43; D03D 15/567;
D03D 27/00; D02G 3/32; D10B 2331/10;
D10B 2401/041; D10B 2401/061

(22) Date of filing: **10.03.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

- **Kaya, Kemal**
Yesilyurt, Malatya (TR)
- **Sentürk, Kenan**
Battalgazi, Malatya (TR)
- **Erkoç, Merve**
44900 Yesilyurt, Malatya (TR)

(71) Applicant: **Calik Denim Tekstil San. Ve Tic. A.S.**
34169 Istanbul (TR)

(74) Representative: **Schmid, Nils T.F.**
Boehmert & Boehmert
Anwaltpartnerschaft mbB
Pettenkoferstrasse 22
80336 München (DE)

(72) Inventors:
• **Karaduman, Ahmet Serhat**
44900 Yesilyurt, Malatya (TR)

(54) **WOVEN FABRIC, GARMENT AND METHOD FOR MANUFACTURING THE WOVEN FABRIC**

(57) The invention relates to a woven fabric, comprising a base weave comprising base warp yarns and base weft yarns, a loop weave comprising anchor yarns and loop yarns extending orthogonal to the anchor yarns, and a frontside and a backside, wherein each of the base warp yarns, base weft yarns, anchor yarns and loop yarns has a front facing the frontside and a back facing the backside, wherein each anchor yarn comprises at least one under portion extending on the back of at least one of the base warp yarns or weft yarns and two over portions confining the at least one anchor yarn under portion and connecting it with the base weave by extending on the front of at least one of the base warp yarns or weft yarns, and wherein each loop yarn comprises at least one under portion extending on the back of at least one of the anchor yarns and two over portions confining the at least one loop yarn under portion and extending on the front of at least one of the anchor yarns, and wherein the at least one anchor yarn under portion and loop yarn under portion extend in between their confining over portions on the back of at least five yarns.

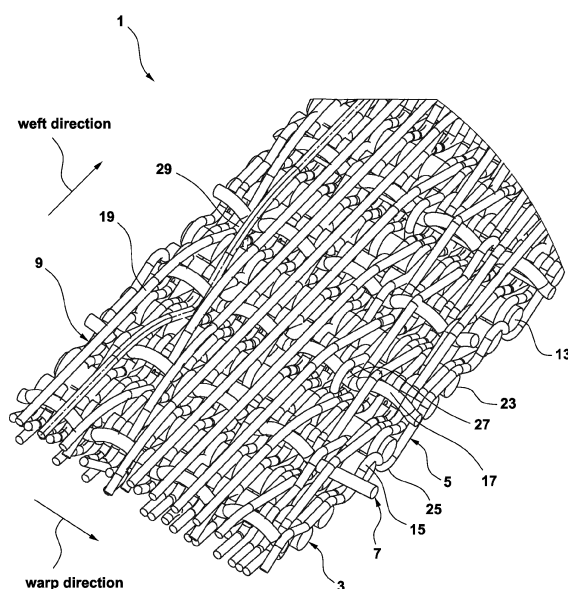


Fig. 1

Description

[0001] The invention relates to a woven fabric, in particular to a denim fabric, a garment comprising such fabric and a method for manufacturing such fabric or garment. The woven fabric has a frontside and a backside. In particular, the woven fabric has a denim-like appearance on the frontside and a knit-like appearance on the backside.

[0002] Woven fabrics and knitted fabrics generally have different properties. Woven fabrics such as denim, gabardine, poplin or linen, are more stable than knitted fabrics but also more rigid so that they do not drape well and feel uncomfortable on a wearers skin. Denim is a very popular woven fabric. Usually, denim fabrics have a 3/1 weave in that the warp yarns have over portions extending along three weft yarns on the frontside and under portions extending along only one weft yarn on the backside. Thereby, in particular, the frontside becomes visually dominated by the warp yarns whereas the backside of the fabric commonly shows mainly weft yarns. In particular, such denim fabrics are warp-faced fabrics. In particular, warp-faced fabrics are fabrics in which the frontside of the fabric is visibly dominated by warp yarns. Other warp-faced fabrics include twill, cavalry twill, chino, covert, drill, fancy twill, gabardine, and lining twill. Another characteristic of a denim fabric is in particular the presence of a diagonal pattern on the frontside. Such diagonal pattern is in particular realized by an diagonal offset of the warp yarn over portions on the frontside of the fabric. In particular, another characteristic of denim fabrics is the use of indigo dyed warp yarns and in particular undyed weft yarns. In particular in combination with the warp-faced structure, this allows providing the typical indigo blue look of a denim fabric's frontside while the backside remains substantially white. In the case of ring dyed yarns used for the denim fabric, the indigo dye is most concentrated at the surface of the yarns whereas the yarns' cores remain undyed which allows for very characteristic coloring options. Different finishing techniques can be applied to denim to enhance the coloring properties. For example, denim can be hand scraped, sand-blasted, stone washed, or treated in other ways that allow varying amounts of the undyed cores of the indigo yarns to become visible. In the following, one or more of the above characteristics of denim fabrics will be referred to as denim-like appearance.

[0003] Although denim is very popular, it has, due to its woven nature, rarely been used for articles of clothing that are expected to drape well over the wearer's body and/or to feel soft on a wearers skin, particularly for tops, such as shirts, blouses and sweat-shirts. For articles of clothing providing such characteristics, knitted fabrics are used most often, because knitted fabrics are generally more flexible and able to stretch in every direction so that they drape well over the wearer's body and/or provide a soft feeling on the wearers' skin. In the following, one or more of these characteristics will be referred to as knit-like appearance.

[0004] Drawbacks of knit-like fabrics are in particular their lower stability, high manufacturing costs and limited suitability to provide a denim-like appearance. In particular, it is very expensive to create knitted fabric of indigo color. In particular, the yarns used to create a knitted fabric must first be wound on a bobbin for dyeing, so that a time consuming and thus expensive additional manufacturing step is necessary. Contrary thereto, in weaving processes, the yarns are in anyway wound on a bobbin prior to weaving so that no additional step is required. Furthermore, when manufacturing a knitted fabric, both sides thereof will be dyed, including the fabric's back side which is in contact with the wearer's skin and may thus leave stains.

[0005] In the past, attempts have been made to combine advantageous of knit fabrics and woven fabrics. For instance, in order to create a fabric that can be manufactured easily by weaving but which provides a look and feeling similar to a knitted fabric, EP 2539 493 B1 suggests to weave warp yarns with two different types of weft yarns, namely elastomeric and hard weft yarns. By means of a larger shrinkage ratio of the elastomeric weft yarns, the hard weft yarns form droopy loops which shall provide a knit-like feeling and look on the backside of the fabric.

[0006] However, the inventors identified a need to further increase the knit-like appearance on the backside. Additionally, the inventors found that the woven fabric according to EP 2539 493 B1 does not look like a denim on the frontside, in particular because the over portions on the frontside of the fabric create not only one diagonal pattern, which is typical for denim, but also a second diagonal pattern created by the over portions of the hard weft yarn, which is offset with respect to the first diagonal pattern.

[0007] The applicant of the present invention identified some of these drawbacks of EP 2539 493 B1 in the past and provided a solution in EP 3231907 A1. Therein, instead of using two weft yarn systems, two warp yarn systems comprising frontside warp yarns and backside warp yarns are used for providing droopy loops on the backside of the fabric. Thanks to the use of two warp yarn systems, the loop providing warp yarns can be offset from the frontside of the fabric towards the backside of the fabric so that their over portions do not impair the denim-like appearance on the frontside of the fabric. However, the inventors of the present invention identified a need to further increase the knit-like appearance on the backside in particular without impairing the denim-like appearance on the frontside.

[0008] Therefore, it is an object of the invention to overcome drawbacks of the prior art, in particular to provide a woven fabric, a garment comprising such fabric and a method for manufacturing such fabric with increased knit-like appearance on the backside and in particular with a denim like appearance on the frontside.

[0009] The object is solved by the independent claims.

[0010] The invention relates to a woven fabric, in par-

particular a denim fabric. The woven fabric comprises a base weave comprising base warp yarns and base weft yarns. The base warp yarns and weft yarns are in particular woven into a base weave being a warp faced fabric and/or a denim fabric as described below. The warp faced fabric is in particular realized by a base weave in which the base warp yarns comprise under portions extending on the back of at least one, in particular exactly one, of the base weft yarns and over portions being confined by two such over portions and extending in between the confining over portions on the front of at least two, three or four, in particular of exactly three, base weft yarns. Additionally or alternatively, the base weave has a diagonal pattern on the frontside. Such diagonal pattern is in particular realized by an diagonal offset of the warp yarn over portions on the frontside of the fabric. Additionally or alternatively, the base warp yarns comprise under portions, wherein the under portions of adjacent base warp yarns form a diagonal pattern which in particular enhances the denim like look of the base weave. In particular the denim fabric is a warp faced fabric having a diagonal pattern.

[0011] The woven fabric further comprises a loop weave comprising anchor yarns and loop yarns extending orthogonal to the anchor yarns. In other words, if the anchor yarns are warp yarns, the loop yarns are weft yarns and vice versa. In particular, the anchor yarns connect the loop weave with the base weave, in particular by over portions extending on the front of at least one, in particular exactly one, base weft yarn or base weft yarn and being confined by two under portions of the anchor yarns extending on the back of at least one base warp yarn or base weft yarn.

[0012] The woven fabric further comprises a frontside and a backside, wherein each of the base warp yarns, base weft yarns, anchor yarns and loop yarns has a front facing the frontside and a back facing the backside. In particular, it shall be clear that the terms front and back of a yarn does not necessarily require the yarn to be present on the frontside or, respectively, the backside of the woven fabric. Rather, in particular, the front and the back are defined as the sides facing the frontside and, respectively the backside. In particular, the frontside can be defined as a fictitious straight plane lying flat on one side of the fabric while the backside can be defined as a fictitious straight plane lying flat on the opposite side of the fabric.

[0013] Each anchor yarn comprises at least one under portion extending on the back of at least one of the base warp yarns or weft yarns and two over portions confining the at least one anchor yarn under portion and connecting it with the base weave by extending on the front of at least one, in particular exactly one, of the base warp yarns or weft yarns.

[0014] In particular, confining over portions within the meaning of the present invention, regardless of whether warp yarns or weft yarns are concerned, are over portions between which the under portion extend, in other word which limit the extension of the under portion in the di-

rection in which the respective yarn extends. In particular, this applies mutatis mutandis to previously and subsequently described confining under portions.

[0015] Each loop yarn comprises at least one under portion extending on the back of at least one of the anchor yarns and two over portions confining the at least one loop yarn under portion and extending on the front of at least one of the anchor yarns. In particular, the confining loop yarn over portions connect the loop yarns with respective anchor yarns, in particular in that each of the confining over portions extend on the front of at least one, in particular exactly one, anchor yarn being confined by two loop yarn under portions.

[0016] In particular, within the meaning of the present invention, a yarn extending on the front of another yarn is to be understood in that it extends between the frontside of the woven fabric and that other yarn. In particular, within the meaning of the present invention, a yarn extending on the back of another yarn is to be understood in that it extends between the backside of the woven fabric and that other yarn. In particular, a yarn portion, such as an over portion or under portion, extending on minimum or specific number of yarns on the front or the back of a yarn has to be understood in that the yarn floats in its direction of extension, for instance for warp yarns the warp direction, along this number of yarns in between its confining portions, for instance if an under portion is concerned between its two confining over portions.

[0017] According to one aspect of the invention the at least one anchor yarn under portion and loop yarn under portion extend in between their confining over portions on the back of at least five yarns. This aspect of the invention will be described in more detail with respect to embodiments in which the anchor yarns are warp yarns and in which the loop yarns are weft yarns. However, instead, the anchor yarns can also be weft yarns and the loop yarns can be warp yarns. All subsequently described embodiments of the invention, according to which the anchor yarns are warp yarns and the loop yarns are weft yarns, shall be considered to be mirrored with this alternative configuration.

[0018] In particular, the at least one anchor yarn under portion extends in between their confining over portions on the back of at least five weft yarns. In particular, these at least five weft yarns can be base weft yarns and/or loop yarns as long as the sum of the base weft yarns and the loop yarns on the back of which the at least one anchor yarn under portion extends is at least five. Additionally or alternatively, the at least one loop yarn under portion extends in between their confining over portions on the back of at least five warp yarns. In particular, these at least five warp yarns can be base warp yarns and/or anchor yarns as long as the sum of the base warp yarns and the anchor yarns on the back of which the at least one anchor yarn under portion extends is at least five.

[0019] In particular, the at least one anchor yarn under portion and the at least one loop yarn under portion can be classified as long under portion. The inventors found

that the use of long under portions in the anchor yarns and in the loop yarns and therefore in warp direction and in weft direction increases the knit-like appearance on the backside compared to the use of long under portions only in weft direction or warp direction. Surprisingly, it has been found that the knit-like appearance is thereby increased beyond a knit-like appearance which would be achieved by the same number of long under portions only in warp or weft direction. In addition to the advantageous described below with respect to the inventive concept of droopy under portions in warp and weft direction, one reason for this increased knit-like appearance is that the long under portions extending in warp and weft direction particularly provide a visual barrier hiding large sections of the base weave from being seen and felt at the backside.

[0020] In particular, the at least one anchor yarn under portion extends in between its confining over portions on the back of at least six, seven, eight, nine, ten, eleven or twelve yarns. In the case of the anchor yarns being warp yarns, these number of yarns can be the sum of base weft yarns and/or loop yarns. In particular, it is within the scope of this invention that the anchor yarn under portion also extends on the front of loop yarns. However, such loop yarns do not count for the defined minimum number of yarns to be bypassed by the anchor yarn under portion. However, in particular, in the case of the anchor yarns being warp yarns, it shall be clear that the anchor yarn under portion does not extend on the front of base weft yarns in between its confining over portions. The above applies mutatis mutandis to configurations in which the anchor yarns are weft yarns.

[0021] In particular, the at least one loop yarn under portion extends in between its confining over portions on the back of at least five, seven, nine, eleven, thirteen, fifteen, seventeen, eighteen, twenty, twenty-two, twenty-four or twenty-six yarns. In the case of the loop yarns being weft yarns, these number of yarns can be the sum of base warp yarns and/or anchor yarns. In particular, it shall be clear that the loop yarn under portion does not extend on the front of anchor yarns in between its confining over portions. The above applies mutatis mutandis to configurations in which the loop yarns are warp yarns.

[0022] In particular, the at least one anchor yarn under portion extends in between its confining over portions on the back of at least four, five, six, seven or eight base warp yarns, in configurations in which the anchor yarns are weft yarns, or base weft yarns, in configurations in which the anchor yarns are warp yarns. Additionally or alternatively, the at least one anchor yarn under portion extends in between its confining over portions on the back of at least one, two, three or four loop yarns. Additionally or alternatively, the at least one anchor yarn under portion extends in between its confining over portions on the front of at least five, six, seven or eight loop yarns.

[0023] In particular, the at least one loop yarn under portion extends in between its confining over portions on the back of at least three, four, five, six, seven, eight or

nine base warp yarns, in configurations in which the loop yarns are weft yarns, or base weft yarns, in configurations in which the loop yarns are warp yarns. Additionally or alternatively, the at least one loop yarn under portion extends in between its confining over portions on the back of at least two, three, four, five, six, seven or eight anchor yarns.

[0024] According to another aspect of the invention, which can be combined with the previously described aspect of the invention and all of its embodiments, the at least one anchor yarn under portion and loop yarn under portion are droopy in that they have a length surplus compared to the distance between their confining over portions. In particular, the at least one anchor yarn under portion and/or the loop yarn under portion extend between their confining over portions curved and spaced from the yarns on the backside of which they extend.

[0025] In particular, the presence of droopy under portions in the anchor yarns and the loop yarns and in particular therefore in warp direction and in weft direction increases the knit-like appearance on the backside compared to the use of droopy under portions only in weft direction or warp direction. In particular, the inventive solution increases the knit-like appearance of the backside to such an extent that a person wearing a garment made of the inventive fabric or looking on the backside of such garment, i.e. the side facing the skin, would classify the fabric to be a knit fabric. Surprisingly, it has been found that the knit-like appearance is thereby increased beyond a knit-like appearance which would be achieved by the same number of droopy under portions only in warp or weft direction. One reason for this is that with the inventive solution, the same number of droopy under portions can be provided by a reduced number of backside warp yarns compared to the solution known from EP 3231 907 A1 and with a reduced number of backside weft yarns compared to the solution known from EP 2539 493 B1. Thereby, the warp density and the weft density of the fabric can be chosen more similar which leads to a more uniform fabric coming closer to a knit appearance. Additionally, the inventors of the present invention surprisingly found that distributing the required number of yarns providing droopy under portions for the desired knit-like appearance in warp and weft direction reduces the impairment of the denim-like look on the frontside by these droopy loop providing yarns compared to providing such number of yarns only in warp direction or weft direction. Another reason is that droopy under portions extending in warp direction and weft direction provide the appearance of a loosely woven fabric being independent from base warp yarns and/or base weft yarns. Additionally, the extension of droopy under portions in warp and weft direction provides a visual barrier better hiding the frontside warp yarns and/or frontside weft yarns from being seen and felt from the backside of the fabric.

[0026] In particular, the at least one anchor yarn under portion and/or the loop yarn under portion extend in between their confining over portions on the back of at least

three, four, five, six, seven or eight yarns, in particular as described with respect to the previously described aspect of the invention. It has been found that realising the droopy under portions of this aspect of the invention as long under as described with respect to the previous aspect of the invention leads to a significant increase of the knit-like appearance on the backside of the woven fabric. In particular, the length surplus of the at least one anchor yarn under portion is at least 10 %, 20%, 30%, 50% or 70%. Additionally or alternatively, the length surplus of the at least one loop yarn under portion is at least 10 %, 20%, 30%, 50% or 70%.

[0027] The length surplus of an under portion compared to the distance between its confining over portions can be calculated by the following equation:

$$LS = \left(\frac{LU}{DO} - 1 \right) * 100 \%$$

[0028] Therein, LS is an abbreviation for the length surplus, LU is an abbreviation for the length of an under portion between its two confining over portions, and DO is an abbreviation for the distance between the two over portions confining the under portion.

[0029] In particular, the base warp yarns comprise under portions extending on the back of at least one of the base weft yarn and over portions confining the base warp yarn under portions and extending on the front of at least one of the base weft yarns. In particular, the base weft yarns comprise under portions extending on the back of at least one of the base warp yarn and over portions confining the base weft yarn under portions and extending on the front of at least one of the base warp yarns. In particular, the base warp yarn under portions and/or the base weft yarn under portions do not have a length surplus or at least a smaller length surplus compared to the distance between their confining over portions than the length surplus of the at least one anchor yarn under portion and/or of the at least one loop yarn under portion. In particular in cases where the base warp yarn under portions and/or base weft yarn under portion have a length surplus compared to the distance between its confining over portions, the length surplus is smaller than 70%, 60%, 50%, 40%, 30%, 20%, 10%, 5 %, 3%, 2% or 1%. In particular by weaving and/or choosing the material of the base warp yarns and/or base weft yarns in that their under portions have no length surplus or a smaller length surplus than the anchor yarn under portion and/or the loop yarn under portion, the knit-like appearance of the fabric can be increased on the backside of the fabric by the droopy under portions of the loop weave while the denim-like look can be maintained or enhanced by in particular relatively straight extension of the base warp yarns and weft yarns. In particular, under portions having no length surplus extend straight between their confining over portions, in particular not curved and/or without a space to the yarns on the back of which the under portions

extend.

[0030] According to yet another aspect of the invention, which can be combined with the previously described aspect of long loops and/or of droopy loops in the anchor yarns and in the loop yarns, the loop yarns do not comprise over portions extending on the front of the base warp yarns and/or of the base weft yarns. This aspect of the invention will be described in more detail with respect to a configuration in which the anchor yarns are warp yarns and in which the loop yarns are weft yarns. In such configuration, the loop yarns do not comprise over portions extending on the front of the base warp yarns. However, according to an alternative configuration, the anchor yarns can also be weft yarns and the loop yarns can be warp yarns. With this configuration, the loop yarns do not comprise over portions extending on the front of the base weft yarns. All subsequently described embodiments of the invention, according to which the anchor yarns are warp yarns and the loop yarns are weft yarns, shall be considered to be mirrored with this alternative configuration.

[0031] In particular, the loop weave is only connected with the base weave by over portions of the anchor yarns extending over at least one, in particular exactly one, base weft yarn. In particular, the loop yarn is exclusively interwoven with the anchor yarns. Thereby, the loop yarns can exclusively extend on the backside of the fabric. Such loop yarns can in particular be called hidden yarn. In particular, the loop yarns exclusively form over portions with respect to the anchor yarns but not with respect to the base warp yarns. In particular thereby, the loop yarn do not impair the appearance of the frontside of the fabric. In particular therefore, with this aspect of the invention, the knit-like appearance on the backside can be increased without impairing the denim-like appearance by the loop yarns. Additionally in combination with the aspect of droopy anchor yarn under portions and droopy loop yarn under portion, the loop yarns are exclusively connected with yarns being itself droopy, namely the anchor yarns, thereby providing droopy loop yarn under portions which can easily move in warp direction thereby further increasing the knit-like appearance.

[0032] In particular, the anchor yarns and/or the loop yarns are offset, in particular along their entire extension, from the front side towards the backside. In particular, the frontside can be defined as a fictitious straight plane lying flat on one side of the fabric. Accordingly, the offset of the anchor yarns and/or of the loop yarns can be understood in that they extend, in particular along their entire extension, spaced from this fictitious straight plane. In other words, in particular, the anchor yarns and/or of the loop yarns extend, in particular along their entire extension, spaced from this fictitious straight plane. In particular the offset or the space is at least 5%, 10%, 20%, 30% or 50% of the diagonal extension of at least one, in particular all, of the base warp yarns. Additionally or alternatively, at least 20 %, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100 % of the base warp yarns and/or of the

base weft yarns can be in lateral contact with each other. In particular thereby, the base warp yarns and/or of the base weft yarns can form a closely woven base warp yarn and/or base weft yarn arrangement hiding the anchor yarns and/or the loop yarns from being seen and/or felt on the frontside of the woven fabric. Additionally or alternatively, at least 20 %, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100 % of the anchor yarns can be located substantially above, in a configuration where the anchor yarns are warp yarns, at least one or two base warp yarn/s. Additionally or alternatively, at least 20 %, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100 % of the loop yarns can be located substantially above, in a configuration where the loop yarns are weft yarns, at least one or two base weft yarn/s. In this regard, substantially can in particular be understood in that a yarn being located substantially above another yarn overlaps the other yarn in the orthogonal direction of its extension, for instance if a warp yarn is concerned in the weft direction, with at least 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95% or 100% of its radial extension. In case of an 100% overlap, the respective yarn can in particular be considered to extend directly above at least one other yarn having a larger diameter than the yarn or two other yarns each of which having at least a diameter of 50% of the yarn. By one or more of the above embodiments, the anchor yarns and/or the loop yarns can be hidden by the base weft yarns and/or warp yarns from being seen and/or felt at the frontside of the fabric. In particular thereby, the anchor yarns and/or the loop yarns can provide the backside of the fabric with a knit-like appearance without impairing the look, in particular the denim like look, provided by the base weave on the frontside of the fabric.

[0033] Additionally or alternatively, the base warp yarns have axial centrelines and define a base warp/weft plane extending through the axial centrelines along over portions of the base warp yarns extending on the front of the base weft yarns, wherein the anchor yarns and/or the loop yarns have axial centrelines and wherein the anchor yarns and/or the loop yarns axial centrelines particularly along their entire extension extend on the back of the base warp/weft plane.

[0034] In particular, the at least one anchor yarn under portion extends in between the base warp yarns or weft yarns and the loop yarns along at least two, in particular three, four, five, six, seven or eight, loop yarns and/or along at least two, in particular three, four, five, six, seven or eight, base warp yarns, in a configuration in which the anchor yarns are weft yarn, or base weft yarns, in a configuration in which the anchor yarns are warp yarns.

[0035] An anchor yarn under portion extending in between the base weft yarns, in a configuration in which the anchor yarns are warp yarns, and the loop yarns along such minimum number of base weft yarns and loop yarns can in particular be called concealed under portion. The inventors found that such concealed under portions are of particular advantage because they allow on the one hand the concealed under portions to be in particular

substantially not interrupted in particular in their long or droopy extension in this section and on the other hand shield the concealed under portion in this section from being seen and/or felt at the frontside of the woven fabric.

[0036] In particular, the base warp yarns and/or the base weft yarns are elastic yarns. Additionally or alternatively, the anchor yarns and/or the loop yarns are elastic yarns. In particular, elastic yarns can be described as being capable of being elastically stretched, for example for around 10% to around 25% of their original length. The initial or original length of the yarn can be measured while essentially no tensile tension is applied. In particular, an elastic yarn, may consist of or comprise T400, spandex or elastane, as for instance Lycra® made by Invista. Preferably, an elastic yarn is a composite yarn comprising at least one inelastic filament and at least one elastic filament consisting of T400, spandex or elastane, as for instance Lycra® made by Invista.

[0037] In particular, an elastic yarn comprises an elastic core and a sheath, in particular a cotton or polyester sheath. In particular, the elastic core can comprise at least one, two or three elastic filament. In particular, such elastic filament is capable of stretching at least about two times of its initial length, i.e. package length. After having stressed the elastic filament by stretching at least about two times of its initial length, an elastic recovery of at least 90 % up to 100 % arises. The elastic recovery is a parameter for the elastic performance of said filament. The elastic recovery in percent represents a ratio of the length of the elastic filament following the release of tension stress with respect to the length of the elastic filament prior to be subjected to said tension stress (package length). In particular, an elastic recovery having a high percentage, i.e. between 90 % and 100 %, is to be considered as providing an elastic capability of returning substantially to the initial length after the stress was applied. In particular, contrary to an elastic filament, an inelastic filament, is defined by a low percentage elastic recovery, i.e. an inelastic filament will not be able to return substantially to its initial length, if a stretching of at least two times of its initial length is realized. Said percent elastic recovery of filaments can be tested and measured according to the standard ASTM D3107, the entire content of which is expressively incorporated hereinto by reference. Said test method ASTM D3107 is a testing method for a fabric made from yarns. Of course, it is possible to deviate from the test results of the fabric the elastic recovery for the yarn itself. However, a yarn testing method and testing device can be used for individual measuring filaments and/or yarns. For instance, USTER TENSOR RAPID-3 device (Uster, Switzerland) is able to measure elasticity, breaking force, etc. of yarns or filaments. An example of said testing device is described in WO 2012/062480 A2 which shall be incorporated hereinto by reference.

[0038] In particular, typical examples for an elastic filament are a polyurethanic fiber such as elastane, spandex and those filaments that have similar elastic proper-

ties. In particular, an elastic filament according to the invention particularly may be stretched at least 300 % or 400 % of the package length (e.g. as elongation at break). Package length shall be understood as the initial or original length of the elastic filament while essentially no tensile tension is applied. In particular, examples of elastic filaments which can be used include but are not limited to, Dowla, Dorlastan (Bayer, Germany), Lycra (Invista, USA), Clerrspan (Globe Mfg. Co., USA), Glospan (Globe Mfg. Co., USA), Spandaven (Gomelast C.A., Venezuela), Rocia (Asahi Chemical Ind., Japan), Fujibo Spandex (Fuji Spinning, Japan), Kanebo LooBell 15 (Kanebo Ltd., Japan), Spantel (Kuraray, Japan), Mobilon (Nisshinbo Industries), Opelon (Toray-DuPont Co. Ltd.), Espa (Toyoba Co.), Acelan (Teakwang Industries), Texlon (Tongkook Synthetic), Toplon (Hyosung), Yantai (Yantei Spandex), Linel, Linetex (Fillatice SpA). In general, these elastic filaments provide as a basis of the yarn sufficient elastic properties. It is noted that also elastic filaments made of polyolefin could be used. Besides, a preferred elastic performance filament, according to its (own) manufacturing process, may be formed of multiple elastic monofilaments which are coalesced by one another so as to form a single or mono elastic performance filament. The single elastic filament, after its manufacturing step, is to be used as an interstage product, i.e. its own manufacturing process was finalized, however, each single elastic filament particularly provided on a mandrel or the like, is ready to be used particularly for realizing an the elastic yarn, in particular the elastic base warp yarns and/or base weft yarns.

In particular, the base warp yarns, the base weft yarns, the anchor yarns and/or the loop yarns can comprise a filamentary core as described in WO 2016/135211 and/or can be an elastic composite yarn as described in WO 2016/135211 which shall be incorporated hereinto by reference.

[0039] The inventors have found that the use of elastic base warp yarns and/or base weft yarns is of particular advantage because they can on the one hand be used to provide the anchor yarns and/or the loop yarns with droopy under portions upon taking the fabric from the loom and provide the woven fabric with stretch ability in warp direction and in weft direction. In particular in combination with droopy anchor yarn under portions and/or droopy loop yarn under portions being inelastic yarns, such as pure cotton yarns or polyester yarns, a safety mechanism can be established in warp and/or weft direction avoiding an overstretching of the fabric in warp and/or weft direction as soon as the length surplus of the droopy under portions is compensated by stretching the woven fabric in the respective direction. In particular thereby, a slaggy look of the woven fabric, which can be caused by overstretching of the elastic yarns, can be avoided.

[0040] In particular, the anchor yarns and/or the loop yarns are less elastic than the base warp yarns and/or the base weft yarns. In particular, the anchor yarns and/or

the loop yarns are inelastic yarns, in particular cotton yarns or polyester yarns. In particular, an inelastic yarn can be described as not being capable of being stretched beyond a maximum length without permanent deformation, said maximum length being less than 1.05 times, preferably less than 1.02 times, of its original length; or not at all. In particular, typical material for an inelastic yarn are: natural fibers, such as cotton or wool, polyester, nylon, etc.

[0041] Additionally or alternatively, the base warp yarns and/or the base weft yarns have a greater shrinkage ratio than the anchor yarns and/or the loop yarns. In particular, the shrinkage ratio of the base warp yarns and/or base weft yarns is at least 5 %, 10 %, 15%, 20%, 25% or 30 % higher and/or maximally 200%, 150%, 100%, 80%, 50%, 45%, 40% or 35% higher than the shrinkage ratio of the base warp yarns. In particular, the shrinkage ratio relates to shrinkage occurring upon taking a fabric from the loom, washing or wetting the yarns and/or a fabric made of these yarns and/or to thermal shrinkage. In particular, methods for measuring the shrinkage ratio of a yarn have been described in EP 3231 907 which shall be incorporated hereinto by reference.

[0042] It has been found that using base warp yarns and/or weft yarns having a greater shrinkage ratio than the anchor yarns and/or loop yarns is of particular advantage in that it can be used to provide the anchor yarns and/or the loop yarns with the previously described loose under portions.

[0043] In particular, the base warp yarns and/or the base weft yarns have a greater weave tightness than the anchor yarns and/or loop yarns. In particular, the sum of a number of over portions and under portions of one yarn in relation to the number of picks bypassed by said over portions and under portions, defines that yarn's weave tightness. In particular, the term "greater weave tightness" shall be understood in that the respective yarn having the greater weave tightness makes more ups and downs than the yarn having the lower weave tightness. In particular, ups and downs mean, in the example of a warp yarn, that the warp yarn comes up to the front of a weft yarn and, after passing on the front of a certain number of weft yarns (defining an over portion) goes down to the back of a weft yarn. In particular, for the same unitary length of fabric, in the case of warp yarns in warp direction, the number of ups and downs of the yarn having the greater weave tightness is larger than the number of up and down movements of the yarn having the smaller weave tightness.

[0044] In particular after weaving the fabric, the warp yarns and weft yarns are not straight anymore, but corrugated. This effect can be referred as to crimping, and, depending on the yarn that it relates to, either as warp crimp or weft crimp. For example, 100 cm of a straight warp yarn will in particular be woven to a fabric length of less than 100 cm, for example 98 to 89 cm. In particular, the shorter length of the woven fabric in warp direction with respect to the original length of the warp yarn can

be referred to as crimp ratio. In particular, the crimp ratio depends on the diameters of the warp yarns and weft yarns, the densities of the warp yarns and weft yarns, as well as on the weaving pattern. If the warp yarn changes up or down for every successive weft yarn, a 1:1 weave pattern would be realized which would in particular result in the maximum corrugation or maximum warp crimp. Such a warp moving up and down with respect to each successive weft yarn realizes the maximum possible weave tightness. If another warp yarn defines a pattern having alternating over portions bypassing one weft yarn and under portions bypassing five weft yarns (which may be called 1/5 weave pattern), the weave tightness would be much less.

[0045] In particular by choosing the base warp yarns and/or the base weft yarns to have a greater weave tightness than the anchor yarns and/or loop yarns, droopy anchor yarn under portions and/or loop yarn under portions can be provided.

[0046] In particular, the base warp yarns and/or weft yarns are tensioned, in particular remain tensioned after taking the woven fabric from the weaving loom, and/or the anchor yarns and/or loop yarns are tensionless.

In particular, the base warp yarns, the base weft yarns, the anchor yarns and/or the loop yarns are composite yarns or comprise a fibrous core as described and claimed in WO2020/211977 which shall be incorporated hereinto by reference. Preferably the base warp yarns and the base weft yarns are such composite yarns and/or comprise such fibrous core.

[0047] In particular, at least one, in particular all, of the base warp yarns and/or base weft yarns are indigo dyed, and/or wherein the anchor yarns and/or the loop yarns are not indigo dyed. In particular, the base warp yarns are indigo dyed and the base weft yarns are undyed. In particular in combination with the warp-faced structure, this allows providing the typical indigo blue look of a denim fabric's frontside while the backside remains substantially white. In the case of using ring dyed yarns for the indigo dyed yarns, the indigo dye is most concentrated at the surface of the yarns whereas the yarns' cores remain undyed which allows for very characteristic coloring options. Different finishing techniques can be applied to the woven fabric to enhance the coloring properties. For example, the woven fabric can be hand scraped, sand-blasted, stone washed, or treated in other ways in particular to allow varying amounts of the undyed cores of the indigo yarns to become visible. In particular in combination with the above described long and/or droopy anchor yarn under portions and loop yarn under portions, using dyed base warp yarns and/or dyed base weft yarns in combination with undyed anchor yarns and undyed loop yarns significantly increases the protection of the backside of the woven fabric and in particular a wearers skin contacting the backside from staining.

[0048] In particular, at least one, in particular all, of the base warp yarns and/or base weft yarns is thicker than at least one, in particular all, of the anchor yarns and/or

of the loop yarns. The inventors have found that in particular choosing thicker base warp yarns and/or base weft enhances the effect of hiding the anchor yarns and/or the loop yarns by the base warp yarns and/or weft yarns as well as the previously described closely woven base warp yarn and/or base weft yarn arrangement. In particular thereby, the effect of hiding the anchor yarns and/or the loop yarns from being seen and/or felt at the frontside of the woven fabric is increased thereby avoiding the look of the frontside, in particular the denim like look provided by the base weave, to be impaired by the anchor yarns and/or the loop yarns. The inventors have found that this effect can be surprisingly increased by choosing the base warp yarns and the base weft yarns to be thicker than the anchor yarns and/or the loop yarns.

[0049] In particular, the base warp yarns have a yarn count between 7 and 30 Ne, in particular between 7 and 20 Ne, more in particular between 7 and 10 Ne. In particular alternatively, the base warp yarns can have a yarn count between 20 and 30 Ne or between 10 and 20 Ne.

[0050] In particular, the base weft yarns have a yarn count between 10 and 40 Ne, in particular between 10 and 30 Ne, more in particular between 10 and 20 Ne. In particular alternatively, the base weft yarns have a yarn count between 30 and 40 Ne or between 20 and 30 Ne.

[0051] In particular, the anchor yarns have a yarn count between 10 and 75 Ne, in particular between 30 and 75 Ne, more in particular between 50 and 75 Ne. In particular alternatively, the anchor yarns have a yarn count between 10 and 30 Ne or between 30 and 50 Ne.

[0052] In particular, the loop yarns have a yarn count between 40 and 90 Ne, in particular between 60 and 90 Ne, more in particular between 70 and 90 Ne. In particular alternatively, the loop yarns have a yarn count between 40 and 60 Ne or between 60 and 70 Ne.

[0053] In particular, the base warp yarns and/or the base weft yarns have a larger yarn density than the anchor yarns and/or the loop yarns.

[0054] In particular, the base warp yarns have a yarn density between 20 and 60 yarns/cm, in particular between 20 and 40 yarns/cm, more in particular between 20 and 30 yarns/cm. In particular alternatively, the base warp yarns have a yarn density between 40 and 60 yarns/cm or between 30 and 40 yarns/cm.

[0055] In particular, the base weft yarns have a yarn density between 10 and 50 yarns/cm, in particular between 20 and 40 yarns/cm, more in particular between 20 and 30 yarns/cm. In particular alternatively, the base weft yarns have a yarn density between 30 and 50 yarns/cm or between 10 and 20 yarns/cm.

[0056] In particular, the anchor yarns have a yarn density between 5 and 30 yarns/cm, in particular between 5 and 20 yarns /cm, more in particular between 10 and 20 yarns /cm. In particular alternatively, the anchor yarns have a yarn density between 20 and 30 yarns/cm or between 5 and 10 yarns/cm.

[0057] In particular, the loop yarns have a yarn density between 5 and 30 yarns/cm, in particular between 5 and

20 yarns/cm, more in particular between 5 and 10 yarns/cm. In particular alternatively, the loop yarns have a yarn density between 20 and 30 yarns/cm or between 10 and 20 yarns/cm.

[0058] In particular, the woven fabric has a fabric weight between 6 and 16 ounces/yard, in particular between 8 and 14 ounces/yard, more in particular between 10 and 12 ounces/yard.

[0059] In particular, the anchor yarns and the base warp yarns or weft yarns are alternated in particular in that each anchor yarn is followed by at least one, in particular at least two, base warp yarn or weft yarn and/or in that each base warp yarn or weft yarns is followed by at least one, in particular at least two, anchor yarn. Additionally or alternatively, the loop yarns and the base warp yarns or weft yarns are alternated in particular in that each loop yarn is followed by at least one, in particular at least two, base warp yarn or weft yarn and/or in that each base warp yarn or weft yarn is followed by at least one, in particular at least two, loop yarn.

[0060] In particular, the at least one anchor yarn under portion comprises at least 20 %, 40%, 60%, 80 % or 100 % of the anchor yarn under portions. Additionally or alternatively the at least one loop yarn under portion comprises at least 20 %, 40%, 60%, 80 % or 100 % of the loop yarn under portions.

[0061] The invention also relates to a garment, in particular a trouser, more in particular a denim trouser, comprising a woven fabric according to any of the above described aspects of the inventions or any of its embodiments, in particular wherein the frontside is the side being visible upon wearing the garment and/or wherein the backside is the side facing a wearers skin.

[0062] The invention also relates to a method for manufacturing a woven fabric according to any of the above described aspects of the inventions or any of its embodiments and/or for manufacturing the above described garment. In particular the method can be conducted in that such woven fabric or garment can be manufactured.

[0063] Preferred embodiments of the invention are described in the dependent claims. Further advantages, features, and characteristics of the invention become apparent by the subsequent description of the preferred embodiments which are illustrated in the figures, wherein:

Fig 1 illustrates a schematic view of an exemplary woven fabric according to the invention;

Fig. 2a does not illustrate an embodiment of the invention but schematically illustrates the extension of anchor yarn under portions and loop yarn under portions when the woven fabric is on the loom;

Fig 2b illustrates the droopy nature of the anchor yarn under portions and of the loop yarn under portions after taking the woven fabric from the

loom;

Fig. 3 illustrates a first example of a weave structure of the inventive woven fabric;

Fig. 4 illustrates a second example of a weave structure of the inventive woven fabric;

Fig. 5 illustrates a third example of a weave structure of the inventive woven fabric;

Fig 6 illustrates a fourth example of a weave structure of the inventive woven fabric;

Fig 7 illustrates a fifth example of a weave structure of the inventive woven fabric;

Fig 8 illustrates a sixth example of a weave structure of the inventive woven fabric;

Fig 9 illustrates a seventh example of a weave structure of the inventive woven fabric;

Fig 10 illustrates an eighth example of a weave structure of the inventive woven fabric;

Fig 11 illustrates a ninth example of a weave structure of the inventive woven fabric; and

Fig 12 illustrates a tenth example of a weave structure of the inventive woven fabric;

[0064] Fig 1 illustrates an exemplary, schematic embodiment of a woven fabric 1 according to the invention. The woven fabric 1 comprises a base weave comprising base warp yarns 3 and base weft yarns 5. The base warp yarns 3 and the base weft yarns 5 are woven into the base weave in that the base warp yarns 3 comprise under portions 13 extending on the back of one weft yarn 5 and over portions 23 confining the base warp yarn under portions 13 and extending on the front of three base weft yarns 5. The base weft yarns 5 comprise under portions 15 extending on the back of three base warp yarns 3 and over portions 25 confining the base weft yarn under portions 15 and extending on the front of one base warp yarn 3. The base weft yarn over portions 25 of adjacent base weft yarns 5 are diagonally offset from each other to provide a base weave with a diagonal pattern on the frontside FS. The base weave has a 3/1 weave providing the base weave with a typical denim look on the frontside (FS).

[0065] The woven fabric further comprises a loop weave comprising anchor yarns 7 and loop yarns 9 extending orthogonal to the anchor yarns 7. In the illustrated embodiment of Fig. 1, the anchor yarns 7 are warp yarns so that the loop yarns 9 are weft yarns. This is also the case for the subsequently described weaving patterns shown in Figs. 3 to 12. However, as explained above, it

is also within the scope of the present invention that the anchor yarns 7 are weft yarns, so that the loop yarns 9 are warp yarns. Where it is described in the claims and the description of the present invention that an over portion or an under portion extends along base warp yarns 3 or base weft yarns 5, the "or" alternative relates to these alternative configurations. In other words, in an embodiment where the anchor yarns 7 are warp yarns, the subsequently described anchor yarn under portions 17 and anchor yarn over portions 27 extend on the front and, respectively, the back of the base weft yarns. In the alternative configuration, in which the anchor yarns 7 are weft yarns and in which the loop yarns 9 are warp yarns, the subsequently described anchor yarn under portions 17 and over portions 27 respectively extend on the back and, respectively, the front of the base warp yarns 3. The same applies mutatis mutandis to the loop yarns 9. In the illustrated embodiment, in which the loop yarns 9 are weft yarns, the subsequently and previously described loop yarn under portions 19 and over portions 29 extend on the back and, respectively, on the front of the base warp yarns 3. However, in the alternative configuration where the anchor yarns 7 are weft yarns, so that the loop yarns 9 are warp yarns, the respectively described loop yarn under portions 19 and loop yarn over portions 29 extend on the back and, respectively, on the front of base weft yarns 5.

[0066] In the following, the invention will be described with respect to embodiments in which the anchor yarns 7 are warp yarns and in which the loop yarns 9 are weft yarns. However, as previously described, it is also within the embodiment of the invention that the anchor yarns 7 are weft yarns and the loop yarns 9 are warp yarns. In this case, as previously described, the extension of the respective anchor yarn under portions 17 and of the anchor yarn over portions 27 do not extend on the back of the base weft yarns 5 and, respectively, on the front of the base weft yarns 5 but on the back of the base warp yarns 3 and, respectively, on the front of the base warp yarns 3. The same applies mutatis mutandis for the loop yarns 9.

[0067] The woven fabric 1 shown in Figure 1 comprises a frontside FS and a backside BS. The side facing the viewer in Figure 1 is the backside BS. The side facing away from the viewer is the frontside FS. Each of the base warp yarns 3, base weft yarns 5, anchor yarns 7 and loop yarns 9 has a front facing the frontside FS and a back facing the backside BS. For purpose of illustration, the frontside FS and the backside BS are indicated in Figures 2a and 2b.

[0068] In Figure 1, the anchor yarns 7 and the base warp yarns 3 are alternated in that each anchor yarn 7 is followed in weft direction by a group of two base warp yarns 3. Each group of two base warp yarns 3 is followed in weft direction by a single anchor yarn 7. Beside this preferred embodiment of the invention, the anchor yarns 7 can also be alternated with the warp yarns 3 in that each anchor yarn 7 is followed by a single base warp

yarn 3 or by more than two base warp yarns. Additionally or alternatively, the anchor yarns 7 can be alternated with the base warp yarns 3 in that each base warp yarn 3 or group of base warp yarns 3 is followed by a group of at least two adjacent anchor yarns 7.

[0069] In Figure 1, the loop yarns 9 are alternated with the base weft yarns 5 in that each loop yarn 9 is followed in warp direction by a group of two adjacent base weft yarns 5. Each group of these two adjacent base weft yarns 5 is followed in warp direction by a single loop yarn 9. Besides this embodiment, the loop yarns 9 can also be followed in warp direction by single-base weft yarns 5. Additionally, or alternatively, each base weft yarn 5 or group of two adjacent base weft yarns can be followed in warp direction by a group of at least two adjacent loop yarns 9.

[0070] In Figure 1, each anchor yarn 7 comprises a plurality of under portions 17 extending on the back of five base weft yarns 5 and a plurality of over portions 27 confining each of the anchor yarn under portions 17 and connecting the anchor under portions 17 with the base weave by extending on the front of one of the base weft yarns 5.

[0071] Further, each loop yarn 9 comprises a plurality of under portions 19 extending on the back of multiple anchor yarns 7 and on the back of multiple base warp yarns 3. The loop yarns 9 further comprise a plurality of over portions 29 confining the plurality of loop yarn under portions 19 and extending on the front of at least one of the anchor yarns 7.

[0072] The previously described aspect of the invention, according to which the at least one anchor yarn under portion 17 and loop yarn under portion 19 extend in between their confining over portions 27, 29 on the back of at least five yarns can be seen in Figure 1. Therein, the anchor yarn under portions 17 extend in between their confining anchor yarn over portions 27 on the back of five base weft yarns 5. As can be seen in Figure 1, some of the anchor yarn under portions 17 additionally extend on the back of one loop yarn 9 so that they extend in total on the back of six yarns, namely five base weft yarns 5 and one loop yarn 9. It shall be clear that the number of yarns along which the anchor yarn under portions 17 extend represent the sum of base weft yarns 5 and loop yarns 9 on the back of which the anchor yarn under portions 17 extend in between their confining anchor yarn over portions 27. As can be seen in the different embodiments of weave patterns shown in Figures 3 to 12, the aspect of the invention relating to the number of yarns along which the anchor yarns under portions 17 pass does not necessarily exclusively relate to the number of base weft yarns 5 and/or loop yarns 9. As, for instance, shown in Fig. 12, the anchor yarn under portions 17 can only extend on the back of two loop yarns 9 between their confining anchor yarn over portions 27 as long as they additionally extend on the back of at least three base weft yarns 5 between their confining anchor yarn over portions 27. The same applies mutatis

mutandis to the number of yarns bypassed by the loop yarn under portions 19 between their confining loop yarn over portions 29.

[0073] In Figure 1, the loop yarn under portions 19 extend in between their confining over portions 29 on the back of at least five anchor yarns 7. Since the anchor yarns 7 are alternately arranged with groups of two adjacent base warp yarns 3, the loop yarn under portions 19 additionally extend in between their confining over portions 29 on the back of six groups of two base warp yarns 5 (in other words, in addition on the back of twelve base warp yarns 5). Thus, in total, the loop yarn under portions 19 extend between their confining over portions 29 on the back of at least seventeen yarns.

[0074] The aspect of the invention, according to which the at least one anchor yarn under portion 17 and loop yarn under portion 19 are droopy in that they have a length surplus compared to the distance between their confining over portions 27, 29 can also be seen in Fig. 1. In Fig. 1, the anchor yarn under portions 17 extend curved in that they are spaced from the base weft yarns 5 and loop yarns 9 on the back of which they extend. The same applies to the loop yarn under portions 19 extending curved and being spaced from the base warp yarns 3 and the anchor yarns 7 on the back of which they extend. Contrary thereto, the base warp yarn under portions 13 and the base weft yarn under portions 15 are in contact with the yarns 5, 3 on the back of which they extend.

[0075] A method for calculating the length surplus of the anchor yarn under portions 17 and loop yarns under portion 19 compared to the distance between their confining over portions 27, 29 can be explained on the basis of figure 2b. In Fig. 2b, droopy under portions are only shown in one. However, as previously described, contrary to figure 2b, the inventive fabric can comprise droopy under portions in warp direction and in weft direction. In Fig. 2b, droopy under portions 17, 19 can be seen extending curved and spaced from the yarns 3, 5 on the back of which they extend. The droopy under portions 17, 19 are confined by two over portions 27, 29 extending on the front of one yarn 3, 5. The length surplus of an under portion 13, 15, 17, 19 compared to the distance between its confining over portions 23, 25, 27, 29 can be calculated by the following equation:

$$LS = \left(\frac{LU}{DO} - 1 \right) * 100 \%$$

[0076] Therein, LS is an abbreviation for the length surplus, LU is an abbreviation for the length of an under portion 13, 15, 17, 19 between its two confining over portions 23, 25, 27, 29, and DO is an abbreviation for the distance between the two over portions 23, 25, 27, 29 confining the under portion 13, 15, 17, 19. In particular, the length surplus of the droopy under portions 17, 19 has to be calculated after taking the fabric from the loom. As long as the fabric is on the loom, the anchor yarn

under portions 17 and the loop yarn under portions 19 can extend straight as shown in figure 2a between their confining over portions 27, 29, in other words do not have a length surplus.

[0077] The aspect of the invention, according to which the loop yarns 9 do not comprise over portions extending on the front of the base warp yarns 3 and/or the base weft yarns 5 can be seen in Fig. 1. As previously described, Fig. 1 shows an embodiment in which the loop yarns 9 are weft yarns 5. Respectively, with respect to Fig. 1, this aspect of the invention requires the loop yarns 9 to not comprise over portions extending on the front of the base warp yarns 3. In other words, the loop yarns 9 do never extend on the front of the base warp yarns 3.

[0078] As can be seen in Fig. 1, the anchor yarns 7 and the loop yarns 9 are offset along their entire extension from the front side FS. In order to check whether the loop yarns 9 and the anchor yarns 7 are offset from the front side FS, the front side FS can be defined as a fictitious straight plane lying flat on one side of the fabric. Additionally or alternatively it could be said that the base warp yarns 3 have axial centerlines and define a base warp/weft plane extending through the centerlines along over portions 23 of the base warp yarns 3 extending on the front of the base weft yarns 5, wherein the anchor yarns 7 and/or the loop yarns 9 have axial centerlines and wherein the anchor yarns 7 and/or the loop yarns 9 axial centerlines particularly along their entire extension extend on the back of the base warp/weft plane. In Fig. 1, the anchor yarn under portions 17 extend in between the base weft yarns 5 and the loop yarns 9 along one or two loop yarns 9 and along five base weft yarns 5.

[0079] The droopy nature of the anchor yarn under portions 17 and/or of the loop yarn under portions 19 can be realized for instance by choosing elastic yarns for the base warp yarns 3 and/or the base weft yarns 5 and/or by choosing anchor yarns 7 and/or loop yarns 9 being less elastic than the base warp yarns 3 and/or the base weft yarns 5. Additionally or alternatively, the droopy nature might be realized by choosing base warp yarns 3 and/or base weft yarns 5 having a greater shrinkage ratio than the anchor yarns 7 and/or the loop yarns 9. As exemplarily illustrated in figure 2b, after taking the woven fabric 1 from the loom, the base warp yarns 3 and/or the base weft yarns 5, can be tensioned. Additionally or alternatively, the anchor yarn under portions 17 and/or the loop yarn under portions 19 can be tensionless.

[0080] As illustrated in Fig. 1, the base warp yarns 3 can be thicker than the anchor yarns 7 and/or the loop yarns 9. Additionally or alternatively, the base warp yarns 3 can be thicker than the base weft yarns 5. Additionally or alternatively, the anchor yarns 7 can be thicker than the loop yarns 9.

[0081] In the following, the invention will be described in more detail with respect to ten embodiments of weave patterns shown in Figures 3 to 12. In all of these weave patterns, the vertical direction is the warp direction and the horizontal direction is the weft direction. All of these

weave patterns comprise base warp yarns 3, base wefts yarns 5, anchor yarns 7 and loop yarns 9. All of these weave patterns comprise three sub-weave patterns, namely a selvage sub-weave pattern 31, a base warp yarn sub-weave pattern 33 and an anchor yarn sub-weave pattern 37. In Fig. 3, the selvage sub-weave pattern 31 is highlighted by the frame 31 framing all weft yarns 5, 9 and the first two warp yarns in weft direction. The base warp yarn sub-weave pattern 33 is highlighted by the frame 33 framing all weft yarns 5, 9 and the base warp yarns 3. The anchor yarn sub-weave pattern 37 is highlighted by the frame 37 framing all weft yarns 5, 9 and the anchor yarns 7.

[0082] In all of the weave patterns shown in the figures 3 to 12, the alternation of the base weft yarns 5 with the loop yarns 9 is specified. In the weave pattern illustrated in Figs. 3, 4 and 7, the loop yarns 9 and the base weft yarns 5 are alternated in that single loop yarns 9 are followed by groups of two base weft yarns 5. In the weave pattern illustrated in Figs 5, 8 and 9, the loop yarns 9 and the base weft yarns 5 are alternated in that groups of two loop yarns 9 are followed by groups of two base weft yarns 5. In the weave pattern illustrated in Figs 6, 10, 11 and 12, the loop yarns 9 and the base weft yarns 5 are alternated in that single loop yarns 9 are followed by single base weft yarns 5.

[0083] Contrary to the alternation of the loop yarns 9 and the base weft yarns 5, the alternation of the base warp yarns 3 and the anchor yarns 7 is not specified in the weave patterns shown in Figs. 3 to 12. The preferred alternation of anchor yarns 7 and base warp yarns 3 of any of the weave patterns shown in Figures 3 to 12 is the previously described and in Fig. 3 illustrated alternation, according to which each anchor yarn 7 is alternated with base warp yarns 3 in that single anchor yarn 7 are followed in weft direction by groups of two base warp yarns 3. However, it shall be clear that the weave patterns shown in Figures 3 to 12 can also be realized by different alternations of the anchor yarns 7 and base warp yarns 3, such as those alternations described above.

[0084] The base warp yarn sub-weave pattern 33 illustrates how the base weft yarns 5 and the loop yarns 9 are interwoven with respect to the base warp yarns 3. This means that, regardless of the alternation of the base warp yarns 3 and the anchor yarns 7, the base weft yarns 5 and the loop yarns 9 will always, with respect to the base warp yarns 3, be woven as illustrated in the base warp yarn sub-weave pattern 33. As can be seen by comparing Figs. 3 to 12, in the base warp yarns sub-weave pattern 33 of all Figs. 3 to 12, the base weft yarns 5 are woven with the base warp yarns 3 in an 3/1 alternation in that the base weft yarns 5 comprise over portions 25 extending on the front of one base warp yarn 3 and under portions 15 extending between two confining over portions 25 on the back of three base warp yarns 3. Contrary thereto, the loop yarns 9, in the base warp yarn sub-weave pattern 33 shown in all Figs. 3 to 12, do not comprise over portions extending on the front of the base

warp yarns 3. In other words, the loop yarns 9 always remain on the back of the base warp yarns 3. The base weft yarn over portions 25 extending on the front of the base warp yarns 3 form a diagonal pattern in all base warp yarn sub-weave patterns 33 shown in Figs. 3 to 12 for providing the base weave with the diagonal look of a denim fabric.

[0085] Now, the anchor yarn sub-weave pattern 37 will be described in more detail for each of the weave patterns shown in Figures 3 to 12 separately. In Fig. 3, in the anchor yarn sub-weave pattern 37, the base weft yarns 5 comprise under portions extending on the back of one anchor yarn 7 confining over portions extending on the front of eight anchor yarns 7. The loop yarns 9 comprise in the anchor yarn sub-weave pattern 37 over portions 29 extending on the front of one anchor yarn 7 and confining loop yarn under portions 19 extending on the back of six anchor yarns 7 between its confining over portions 29. In particular, these under portions 19 can be called longer under portions. In weft direction, each longer under portion 19 is followed by one shorter under portion, after an intermediate over portion 29, extending on the back of one anchor yarn 7.

[0086] In Fig. 3, in the anchor yarn sub-weave pattern, the anchor yarns 7 comprise under portions 17 extending on the back of eight base weft yarns 5 between two confining anchor yarn over portions 27 extending on the front of one base weft yarn 5 and confining the anchor yarn under portion 17. As can be seen in the small frame, framing such anchor yarn under portion 17 and its two confining over portions 27, the anchor yarn under portion 17 can in addition extend on the back of two loop yarns 9 (black boxes) and on the front of three loop yarns 9 (white boxes) in between its confining over portion 27. Respectively, the framed anchor yarn under portion 17 extends on the back of ten yarns, namely on the back of eight base weft yarns 5 and on the back of two loop yarns 9, between its confining over portions 27. The over portions and under portions of the base weft yarns 5 and of the loop yarns 9 are arranged in all examples shown in the Figs. 3 to 12 in a diagonal pattern.

[0087] In Fig. 4, in the anchor yarn sub-weave pattern 37, the base weft yarns 5 comprise under portions extending on the back of one anchor yarn 7 confining over portions extending on the front of eight anchor yarns 7. The loop yarns 9 comprise in the anchor yarn sub-weave pattern 37 over portions 29 extending on the front of one anchor yarn 7 and confining loop yarn under portions 19 extending on the back of four anchor yarns 7 between its confining over portions 29. In particular, these under portions 19 can be called longer under portions. In weft direction, each longer under portion 19 is followed by two shorter under portion, after respective intermediate over portions 29, extending on the back of one anchor yarn 7. In Fig. 4, in the anchor yarn sub-weave pattern, the anchor yarns 7 comprise under portions 17 extending on the back of eight base weft yarns 5 between two confining anchor yarn over portions 27 extending on the front of

[0094] In Fig. 8, in the anchor yarn sub-weave pattern

[0100] In Fig. 11, in the anchor yarn sub-weave pattern 37, the base weft yarns 5 comprise under portions extending on the back of one anchor yarn 7 confining over portions extending on the front of eight anchor yarns 7. The loop yarns 9 comprise in the anchor yarn sub-weave pattern 37 over portions 29 extending on the front of one

anchor yarn 7 and confining loop yarn under portions 19 extending on the back of eight anchor yarns 7 between its confining over portions 29.

[0101] In Fig. 11, in the anchor yarn sub-weave pattern, the anchor yarns 7 comprise under portions 17 extending on the back of eight base weft yarns 5 between two confining anchor yarn over portions 27 extending on the front of one base weft yarn 5 and confining the anchor yarn under portion 17.

[0102] In Fig. 12, in the anchor yarn sub-weave pattern 37, the base weft yarns 5 comprise under portions extending on the back of one anchor yarn 7 confining over portions extending on the front of eight anchor yarns 7. The loop yarns 9 comprise in the anchor yarn sub-weave pattern 37 over portions 29 extending on the front of one anchor yarn 7 and confining loop yarn under portions 19 extending on the back of two anchor yarns 7 between its confining over portions 29. In particular, these under portions 19 can be called longer under portions. In weft direction, each longer under portion 19 is followed by three shorter under portion, after respective intermediate over portions 29, extending on the back of one anchor yarn 7.

[0103] In Fig. 12, in the anchor yarn sub-weave pattern, the anchor yarns 7 comprise under portions 17 extending on the back of eight base weft yarns 5 between two confining anchor yarn over portions 27 extending on the front of one base weft yarn 5 and confining the anchor yarn under portion 17.

[0104] The features disclosed in the above description, the figures and the claims may be significant for the realisation of the invention in its different embodiments individually as in any combination.

Reference signs:

[0105]

1	woven fabric
3	base warp yarns
5	base weft yarns
7	anchor yarns
9	loop yarns
13	base warp yarn under portion
15	base weft yarn under portion
17	anchor yarn under portion
19	loop yarn under portion
23	base warp yarn over portion
25	base weft yarn over portion
27	anchor yarn over portion
29	loop yarn over portion
31	selvedge sub-weave pattern
33	base warp yarn sub-weave pattern
37	anchor yarn sub-weave pattern
FS	front side
BS	back side

Claims

1. Woven fabric (1), in particular denim fabric, comprising:

- a base weave comprising base warp yarns (3) and base weft yarns (5); and
- a loop weave comprising anchor yarns (7) and loop yarns (9) extending orthogonal to the anchor yarns (7); and
- a frontside (FS) and a backside (BS), wherein each of the base warp yarns (3), base weft yarns (5), anchor yarns (7) and loop yarns (9) has a front facing the frontside (FS) and a back facing the backside (BS); wherein
- each anchor yarn (7) comprises at least one under portion (17) extending on the back of at least one of the base warp yarns or weft yarns (5) and two over portions (27) confining the at least one anchor yarn under portion (17) and connecting it with the base weave by extending on the front of at least one of the base warp yarns or weft yarns (5), and wherein
- each loop yarn (9) comprises at least one under portion (19) extending on the back of at least one of the anchor yarns (7) and two over portions (29) confining the at least one loop yarn under portion (19) and extending on the front of at least one of the anchor yarns (7); and wherein
- the at least one anchor yarn under portion (17) and loop yarn under portion (19) extend in between their confining over portions (27, 29) on the back of at least five yarns.

2. The woven fabric (1) according to claim 1, wherein the at least one anchor yarn under portion (17) extends in between its confining over portions (27) on the back of at least six, seven, eight, nine, ten, eleven or twelve yarns (5, 9), and/or wherein the at least one loop yarn under portion (19) extends in between its confining over portions (29) on the back of at least five, seven, nine, eleven, thirteen, fifteen, seventeen, eighteen, twenty, twenty-two, twenty-four or twenty-six yarns (3, 7).

3. The woven fabric (1) according to claim 1 or 2, wherein the at least one anchor yarn under portion (17) extends in between its confining over portions (27)

- on the back of at least four, five, six, seven or eight base warp yarns or weft yarns (5), and/or
- on the back of at least one, two, three or four loop yarns (9), and/or
- on the front of at least five, six, seven or eight loop yarns (9).

4. The woven fabric according to one of the claims 1 to 3, wherein the at least one loop yarn under portion

(19) extends in between its confining over portions (29)

- on the back of at least three, four, five, six, seven, eight or nine base warp yarns (3) or weft yarns, and/or
- on the back of at least two, three, four, five, six, seven or eight anchor yarns (7).

5. Woven fabric (1), in particular denim fabric, in particular according to one of the preceding claims, comprising:

- a base weave comprising base warp yarns (3) and base weft yarns (5); and
- a loop weave comprising anchor yarns (7) and loop yarns (9) extending orthogonal to the anchor yarns (7); and
- a frontside (FS) and a backside (BS), wherein each of the base warp yarns (3), base weft yarns (5), anchor yarns (7) and loop yarns (9) has a front facing the frontside (FS) and a back facing the backside (BS); wherein
- each anchor yarn (7) comprises at least one under portion (17) extending on the back of at least one of the base warp yarns or weft yarns (5) and two over portions (27) confining the at least one anchor yarn under portion (17) and connecting it with the base weave by extending on the front of at least one of the base warp yarns or weft yarns (5), and wherein
- each loop yarn (9) comprises at least one under portion (19) extending on the back of at least one of the anchor yarns (7) and two over portions (29) confining the at least one loop yarn under portion (19) and extending on the front of at least one of the anchor yarns (7); and wherein
- the at least one anchor yarn under portion (17) and loop yarn under portion (19) are droopy in that they have a length surplus compared to the distance between their confining over portions (27, 29).

6. The woven fabric according to claim 5, wherein

- the length surplus of the at least one anchor yarn under portion (17) is at least 10 %, 20%, 30%, 50% or 70%, and/or
- the length surplus of the at least one loop yarn under portion (19) is at least 10 %, 20%, 30%, 50% or 70%.

7. The woven fabric according to claim 5 or 6, wherein the base warp yarns (3) comprise under portions (13) extending on the back of at least one of the base weft yarn (5) and over portions (23) confining the base warp yarn under portions (13) and extending on the front of at least one of the base weft yarns

(5), and wherein

the base weft yarns (5) comprise under portions (15) extending on the back of at least one of the base warp yarn (3) and over portions (25) confining the base weft yarn under portions (15) and extending on the front of at least one of the base warp yarns (3), in particular wherein

the base warp yarn under portions (13) and/or the base weft yarn under portions (15) do not have a length surplus or at least a smaller length surplus compared to the distance between their confining over portions (23, 25) than the length surplus of the at least one anchor yarn under portion (17) and/or of the at least one loop yarn under portion (19).

8. Woven fabric (1), in particular denim fabric, in particular according to one of the preceding claims, comprising:

- a base weave comprising base warp yarns (3) and base weft yarns (5); and
- a loop weave comprising anchor yarns (7) and loop yarns (9) extending orthogonal to the anchor yarns (7); and
- a frontside (FS) and a backside (BS), wherein each of the base warp yarns (3), base weft yarns (5), anchor yarns (7) and loop yarns (9) has a front facing the frontside (FS) and a back facing the backside (BS); wherein
- each anchor yarn (7) comprises at least one under portion (17) extending on the back of at least one of the base warp yarns or weft yarns (5) and two over portions (27) confining the at least one anchor yarn under portion (17) and connecting it with the base weave by extending on the front of at least one of the base warp yarns or weft yarns (5), and wherein
- each loop yarn (9) comprises at least one under portion (19) extending on the back of at least one of the anchor yarns (7) and two over portions (29) confining the at least one loop yarn under portion (19) and extending on the front of at least one of the anchor yarns (7); and wherein
- the loop yarns (9) do not comprise over portions extending on the front of the base warp yarns (3) and/or of the base weft yarns.

9. The woven fabric (1) according to one of the preceding claims, wherein the anchor yarns (7) and/or the loop yarns (9) are offset, in particular along their entire extension, from the front side (FS) towards the backside (BS), and/or wherein the base warp yarns (3) have axial centrelines and define a base warp/weft plane extending through the axial centrelines along over portions (23) of the base warp yarns (3) extending on the front of the base weft yarns (5), wherein the anchor yarns (7) and/or the loop yarns (9) have axial centrelines and wherein

the anchor yarns and/or the loop yarns axial centrelines particularly along their entire extension extend on the back of the base warp/weft plane.

10. The woven fabric (1), according to one of the preceding claims, wherein

- the at least one anchor yarn under portion (17) extends in between the base warp yarns or weft yarns (5) and the loop yarns (9) along at least two, in particular three four, five, six, seven or eight, loop yarns (9) and/or along at least two, in particular three, four, five, six, seven or eight, base warp yarns or weft yarns (5).

11. The woven fabric (1) according to one of the preceding claims, wherein

- the base warp yarns (3) and/or the base weft yarns (5) are elastic yarns in particular comprising an elastic core and a sheath, in particular a cotton or polyester sheath, and/or wherein
 - the anchor yarns (7) and/or the loop yarns (9) are less elastic than the base warp yarns (3) and/or the base weft yarns (5), and/or wherein
 - the base warp yarns (3) and/or the base weft yarns (5) have a greater shrinkage ratio than the anchor yarns (7) and/or the loop yarns (9); and/or wherein
 - the base warp yarns (3) and/or the base weft yarns (5) have a greater weave tightness than the anchor yarns (7) and/or loop yarns (9); and/or wherein
 - the base warp yarns (3) and/or weft yarns (5) are tensioned; and/or wherein
 - the anchor yarns (7) and/or loop yarns (9) are tensionless.

12. The woven fabric (1) according to one of preceding claims, wherein

- at least one, in particular all, of the base warp yarns (3) and/or base weft yarns (5) are indigo dyed, and/or wherein the anchor yarns (7) and/or the loop yarns (9) are not indigo dyed.

13. The woven fabric (1) according to one of preceding claims, wherein

- at least one, in particular all, of the base warp yarns (3) and/or base weft yarns (5) is thicker than at least one, in particular all, of the anchor yarns (7) and/or of the loop yarns (9), and/or wherein
 - the base warp yarns (3) have a yarn count between 7 and 30 Ne, in particular between 7 and 20 Ne, more in particular between 7 and 10 Ne, and/or wherein

- the base weft yarns (5) have a yarn count between 10 and 40 Ne, in particular between 10 and 30 Ne, more in particular between 10 and 20 Ne, and/or wherein

- the anchor yarns (7) have a yarn count between 10 and 75 Ne, in particular between 30 and 75 Ne, more in particular between 50 and 75 Ne, and/or wherein

- the loop yarns (9) have a yarn count between 40 and 90 Ne, in particular between 60 and 90 Ne, more in particular between 70 and 90 Ne.

14. The woven fabric (1) according to one of the preceding claims, wherein

- the base warp yarns (3) and/or base weft yarns (5) have a larger yarn density than the anchor yarns (7) and/or the loop yarns (9), and/or wherein

- the base warp yarns (3) have a yarn density between 20 and 60 yarns/cm, in particular between 20 and 40 yarns/cm, more in particular between 20 and 30 yarns/cm, and/or wherein

- the base weft yarns (5) have a yarn density between 10 and 50 yarns/cm, in particular between 20 and 40 yarns/cm, more in particular between 20 and 30 yarns/cm, and/or wherein

- the anchor yarns (7) have a yarn density between 5 and 30 yarns/cm, in particular between 5 and 20 yarns /cm, more in particular between 10 and 20 yarns /cm, and/or wherein

- the loop yarns (9) have a yarn density between 5 and 30 yarns/cm, in particular between 5 and 20 yarns/cm, more in particular between 10 and 20 yarns/cm; and/or wherein

- the woven fabric (1) has a fabric weight between 6 and 16 ounces/yard, in particular between 8 and 14 ounces/yard, more in particular between 10 and 12 ounces/yard.

15. The woven fabric (1) according to one of the preceding claims, wherein

- the anchor yarns (7) and the base warp yarns (3) or weft yarns are alternated in particular in that each anchor yarn (7) is followed by at least one, in particular at least two, base warp yarn (3) or weft yarn and/or in that each base warp yarn (3) or weft yarns is followed by at least one, in particular at least two, anchor yarn (7), and/or wherein

- the loop yarns (9) and the base warp yarns or weft yarns (5) are alternated in particular in that each loop yarn (9) is followed by at least one, in particular at least two, base warp yarn or weft yarn (5) and/or in that each base warp yarn or weft yarn (5) is followed by at least one, in particular at least two, loop yarn (9).

16. The woven fabric (1) according to one of the preceding claims, wherein

- the at least one anchor yarn under portion (17) comprises at least 20 %, 40%, 60%, 80 % or 100 % of the anchor yarn under portions (17) and/or wherein 5
- the at least one loop yarn under portion (19) comprises at least 20 %, 40%, 60%, 80 % or 100 % of the loop yarn under portions (19). 10

17. A garment, in particular a trouser, more in particular a denim trouser, comprising the woven fabric (1) according to one of the preceding claims, in particular wherein the frontside (FS) is the side being visible upon wearing the garment and/or wherein the backside (BS) is the side facing a wearers skin. 15

18. A method for manufacturing a woven fabric (1) according to one of the claims 1 to 16 and/or for manufacturing a garment according to claim 17. 20

25

30

35

40

45

50

55

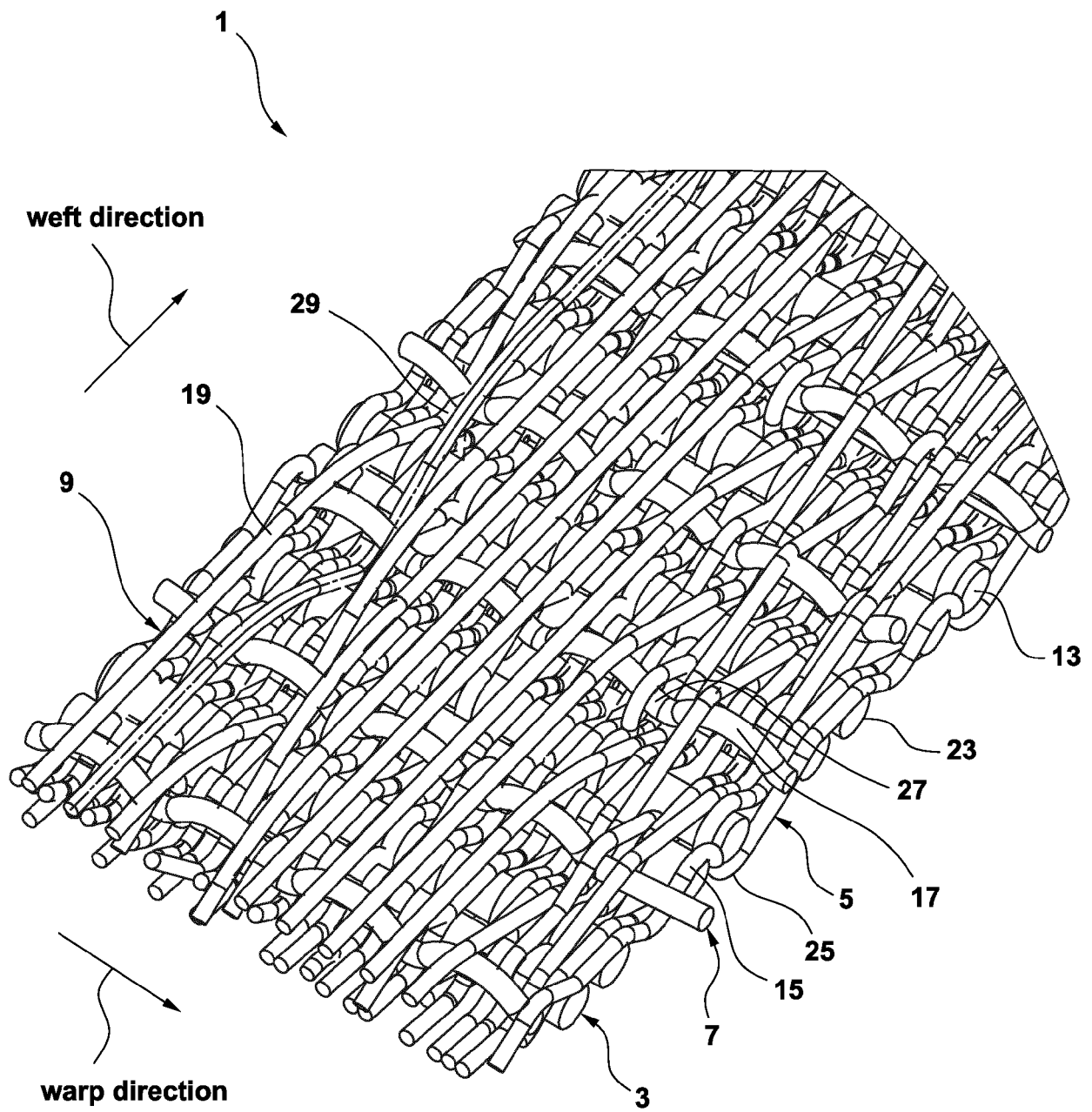


Fig. 1

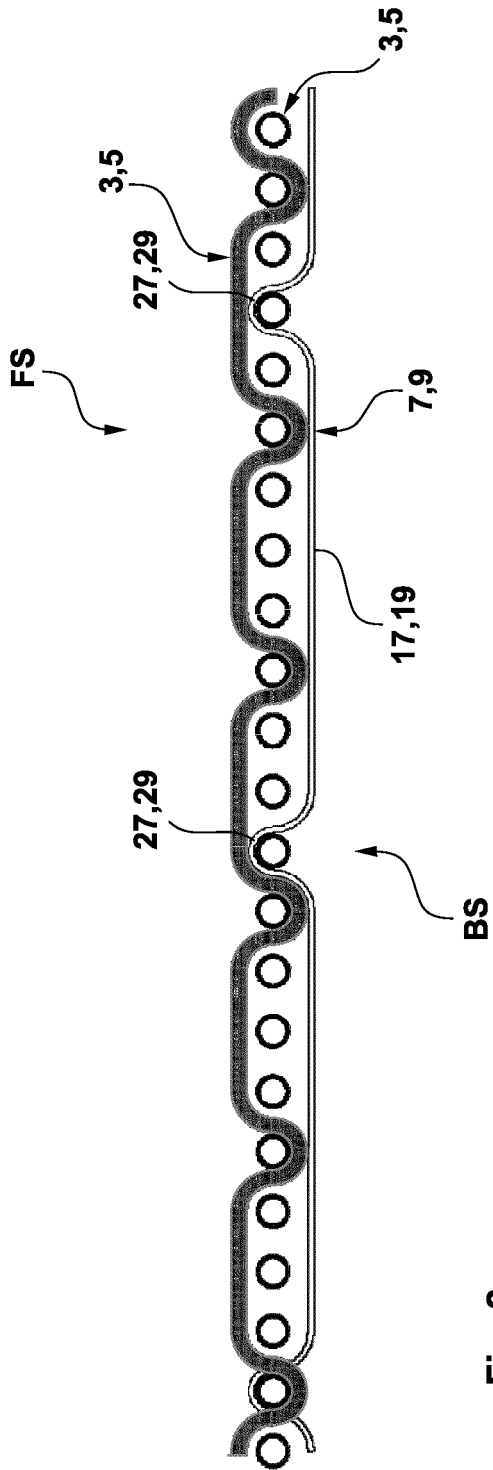


Fig. 2a

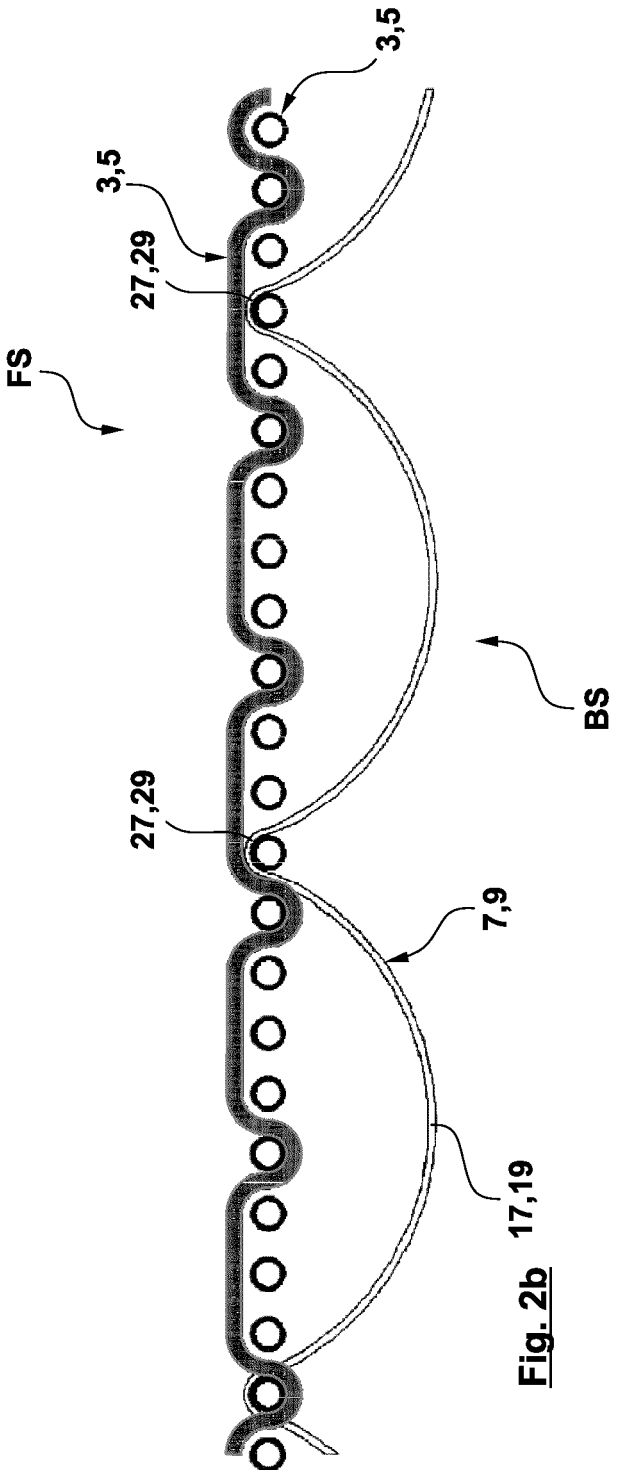


Fig. 2b

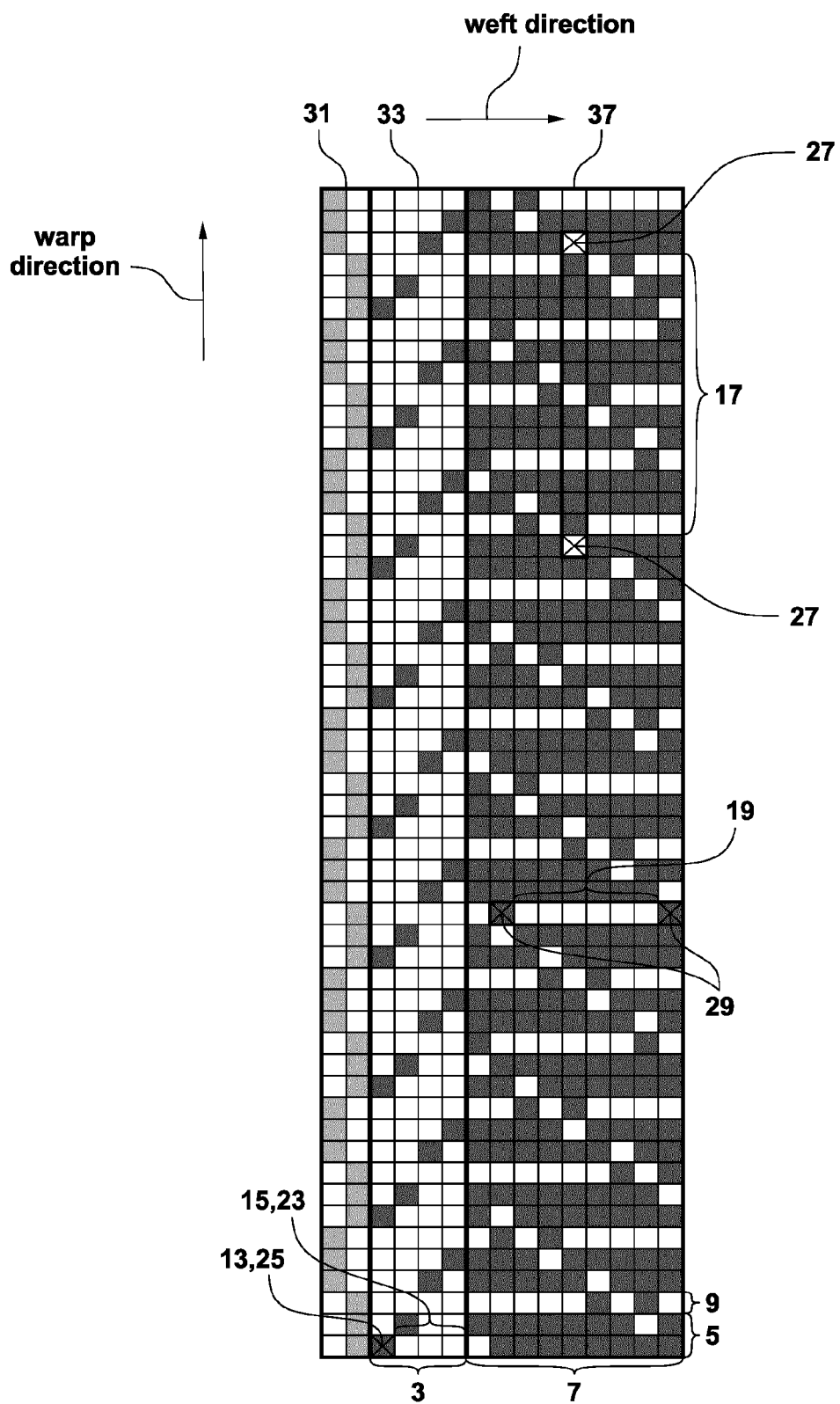


Fig. 3

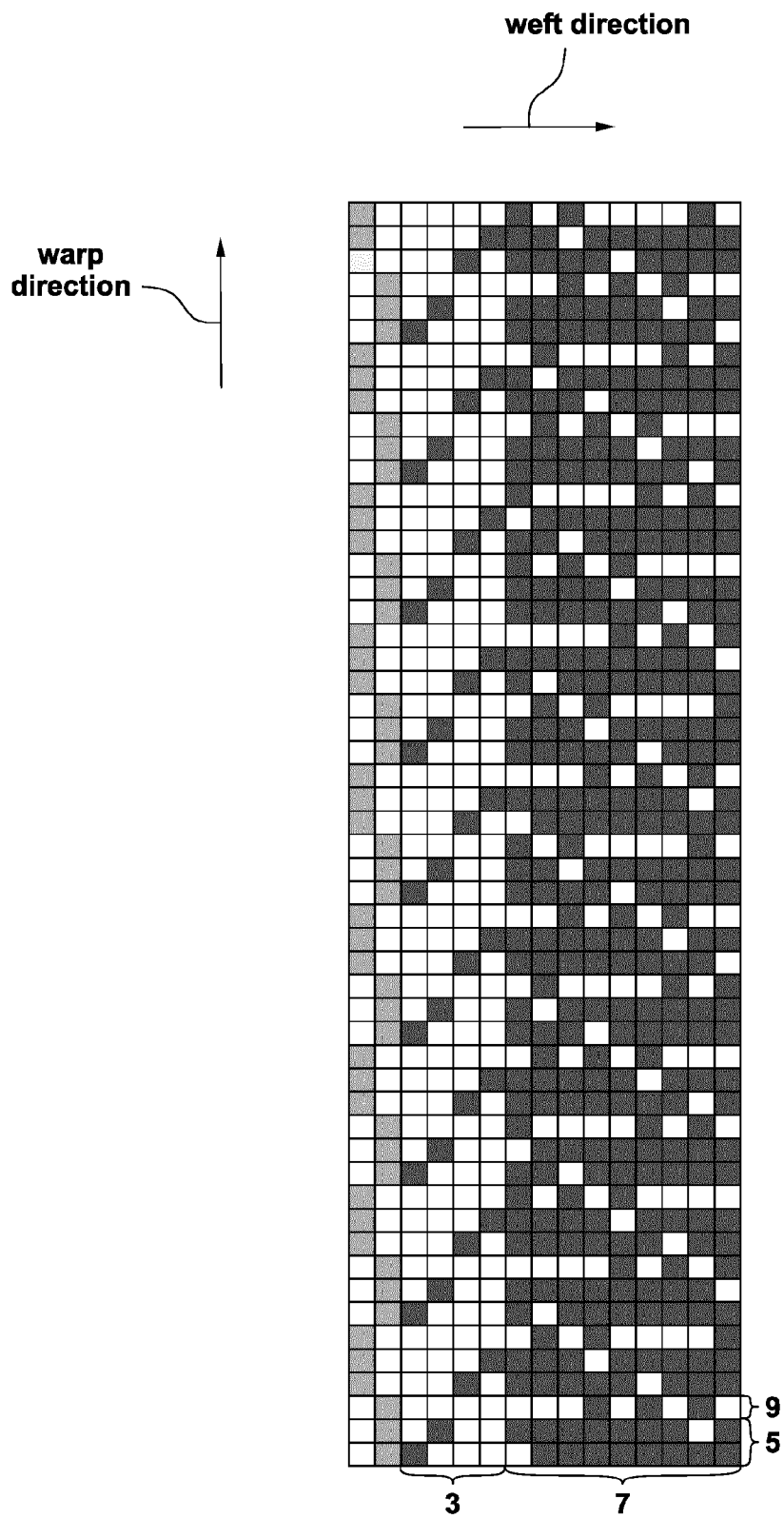
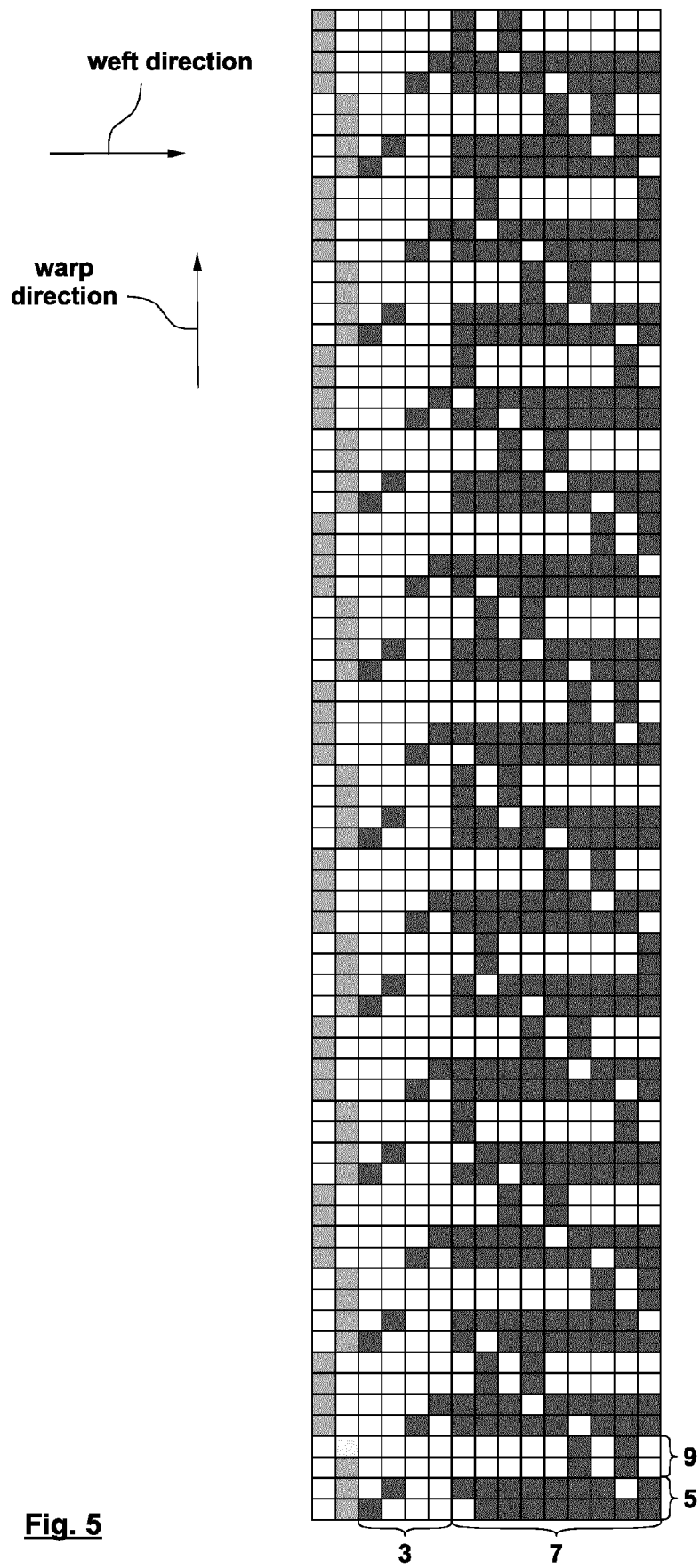
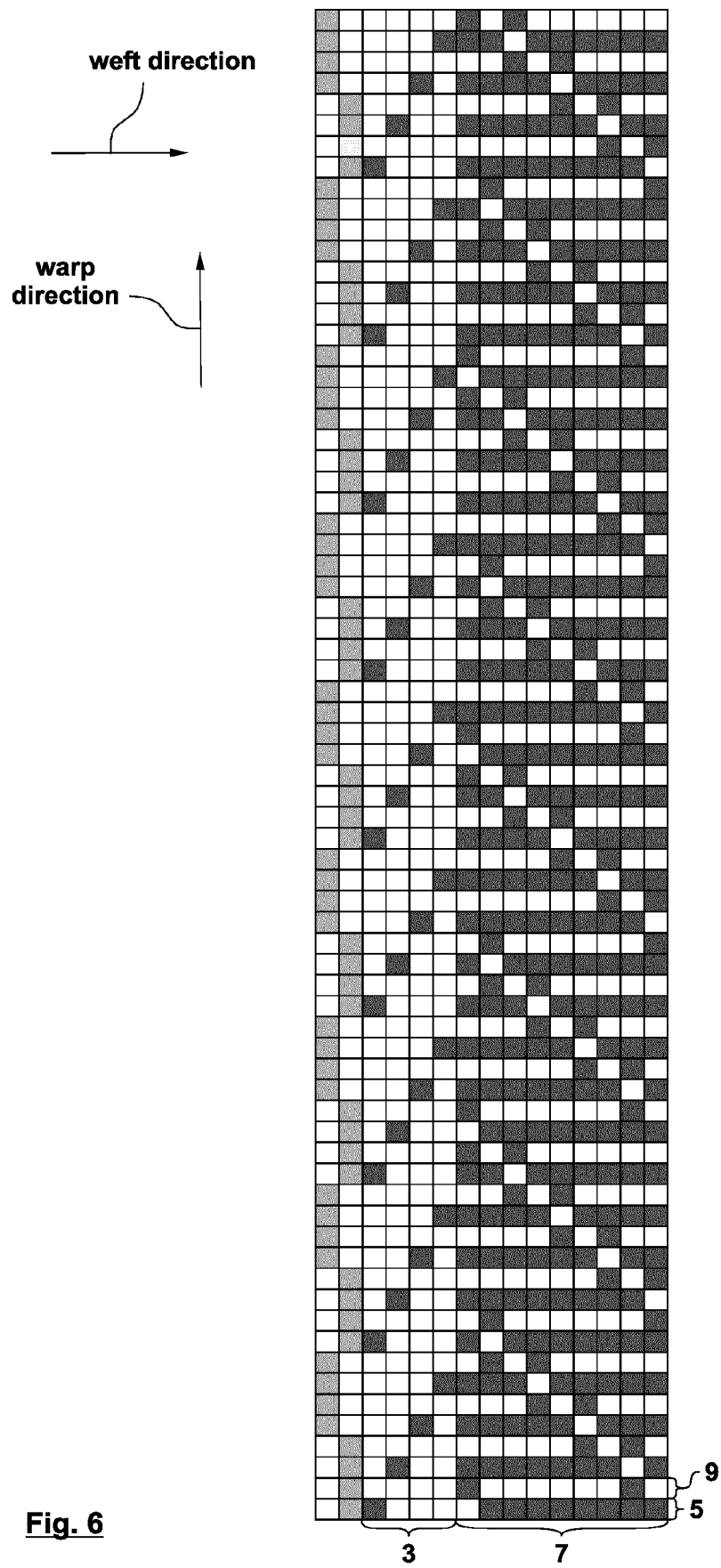


Fig. 4





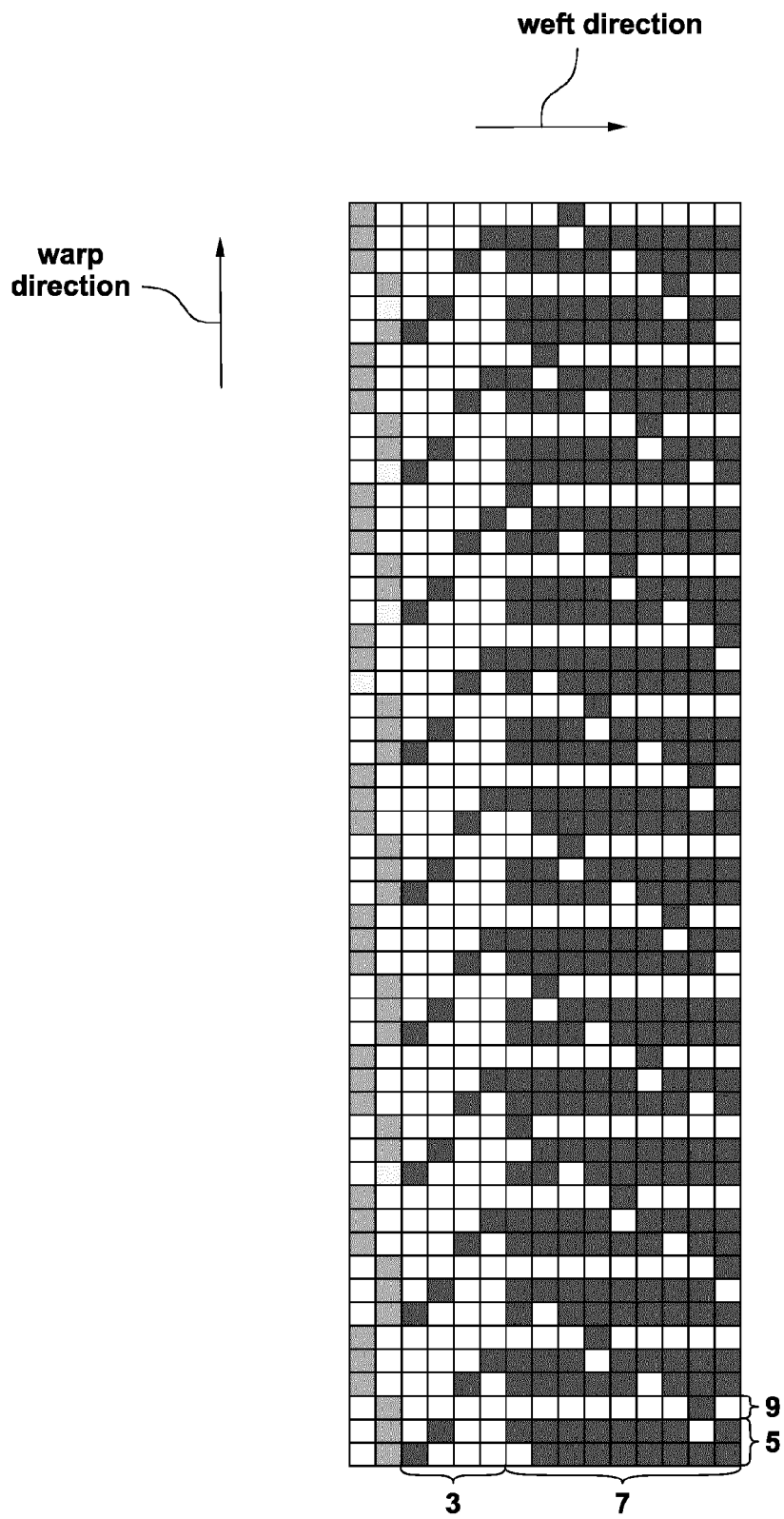
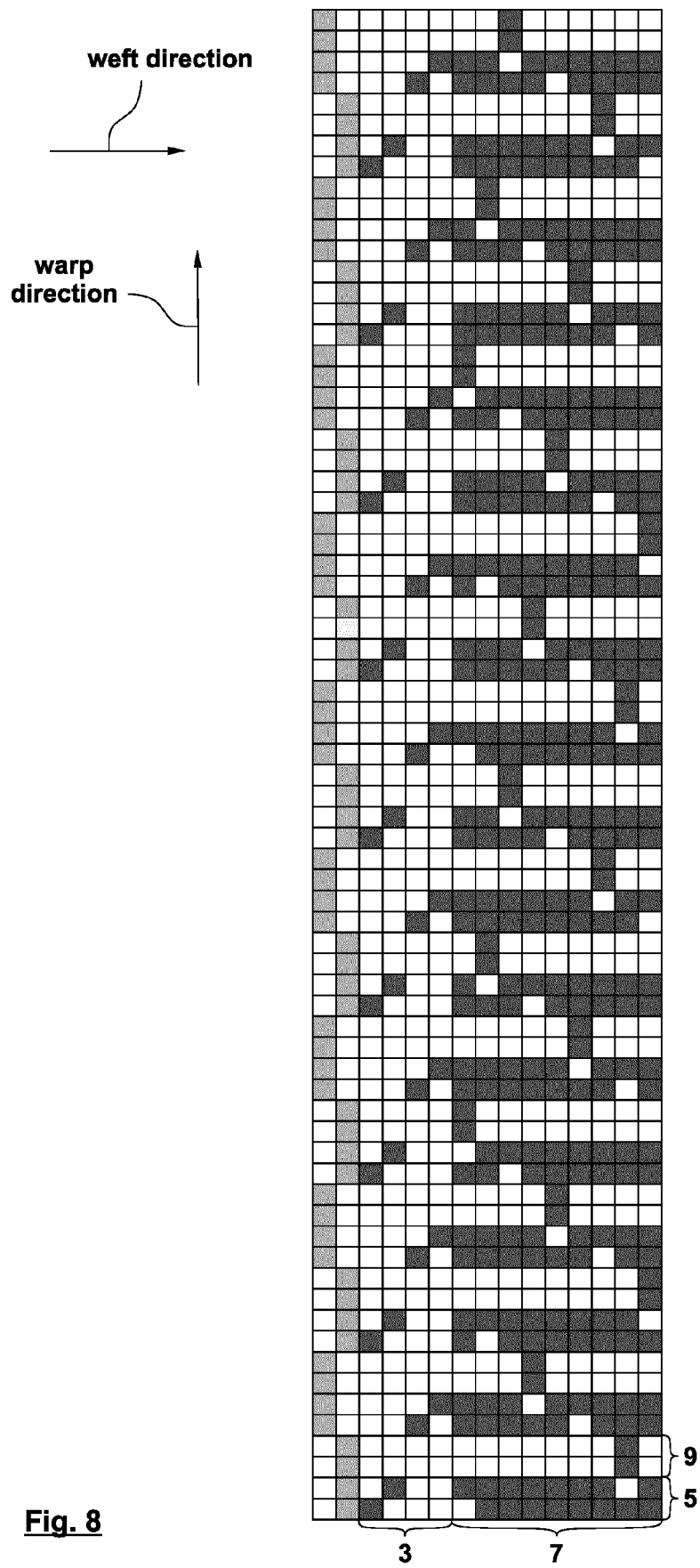
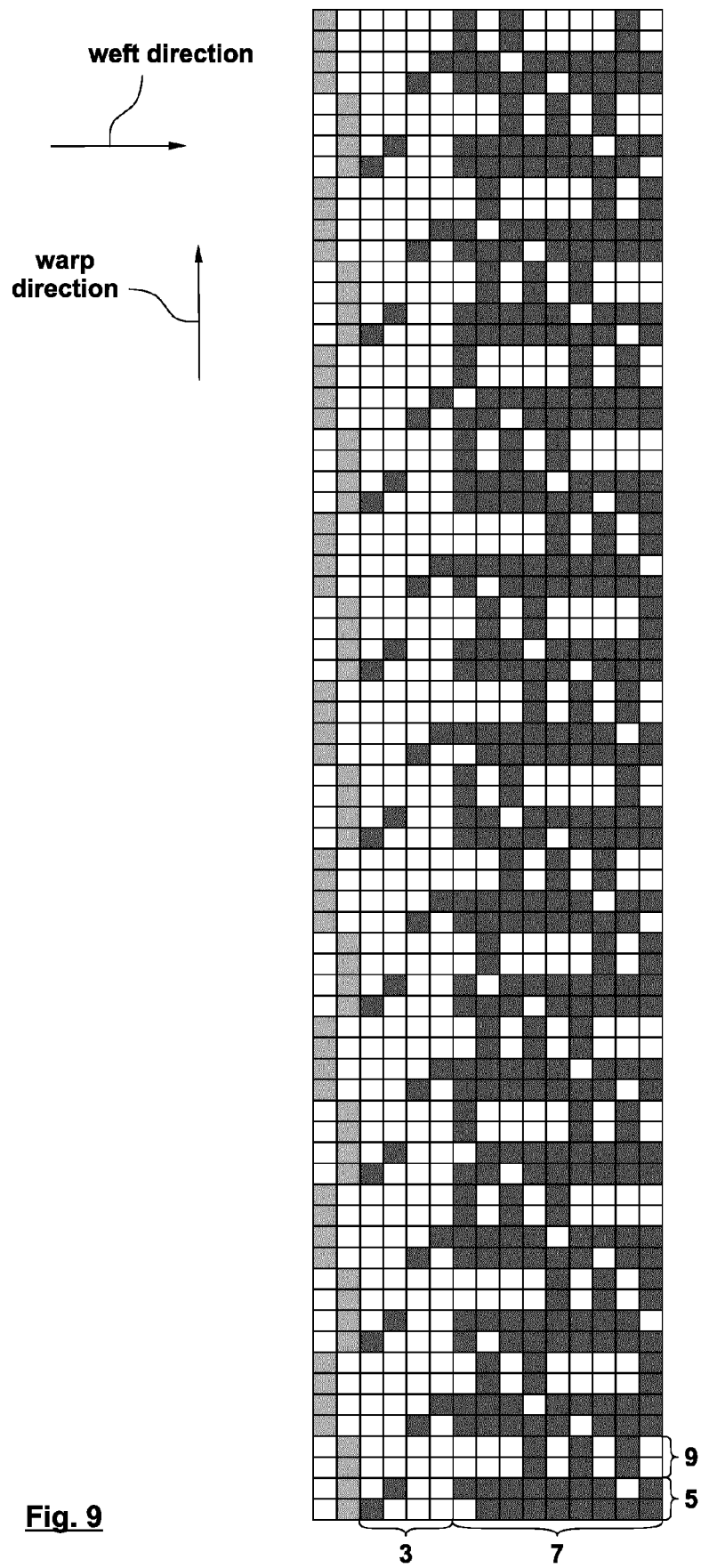
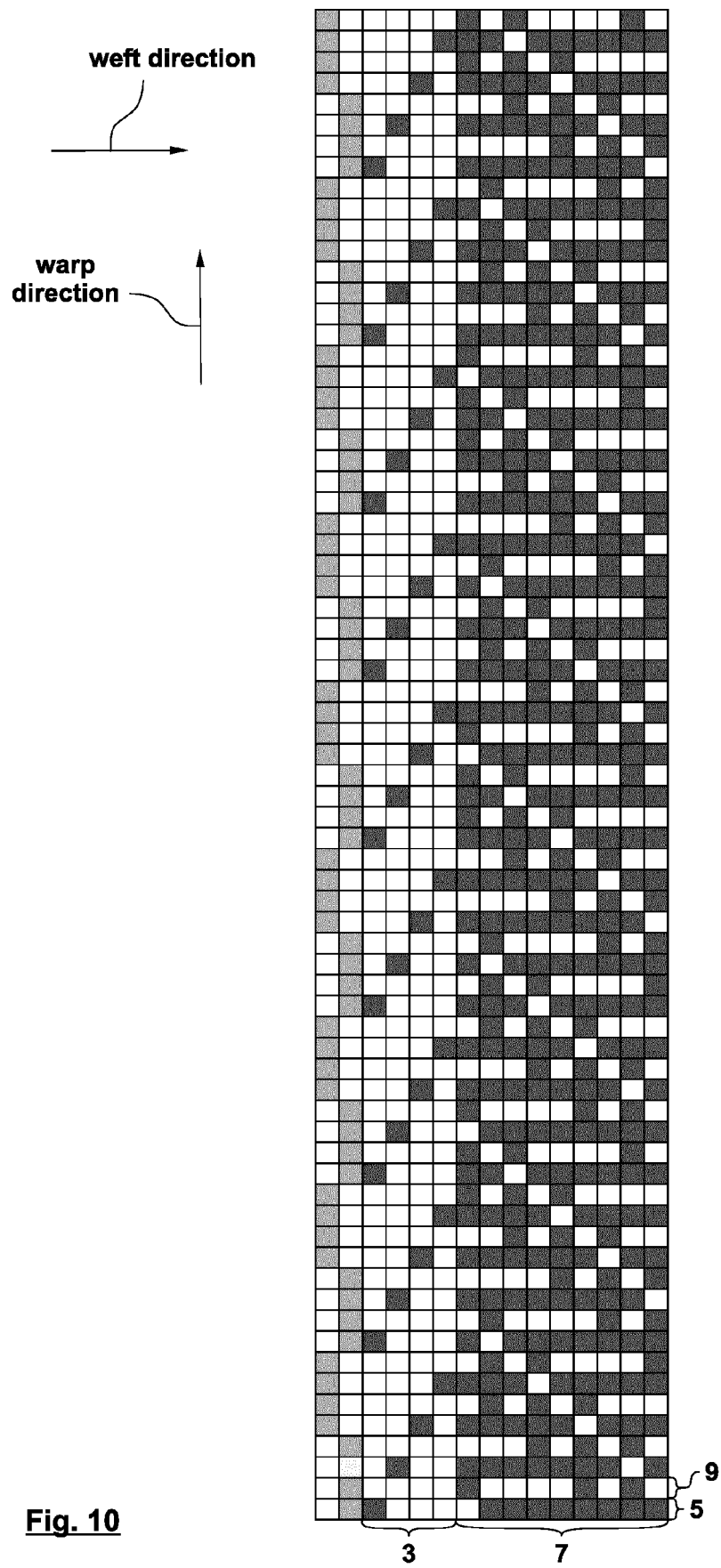


Fig. 7







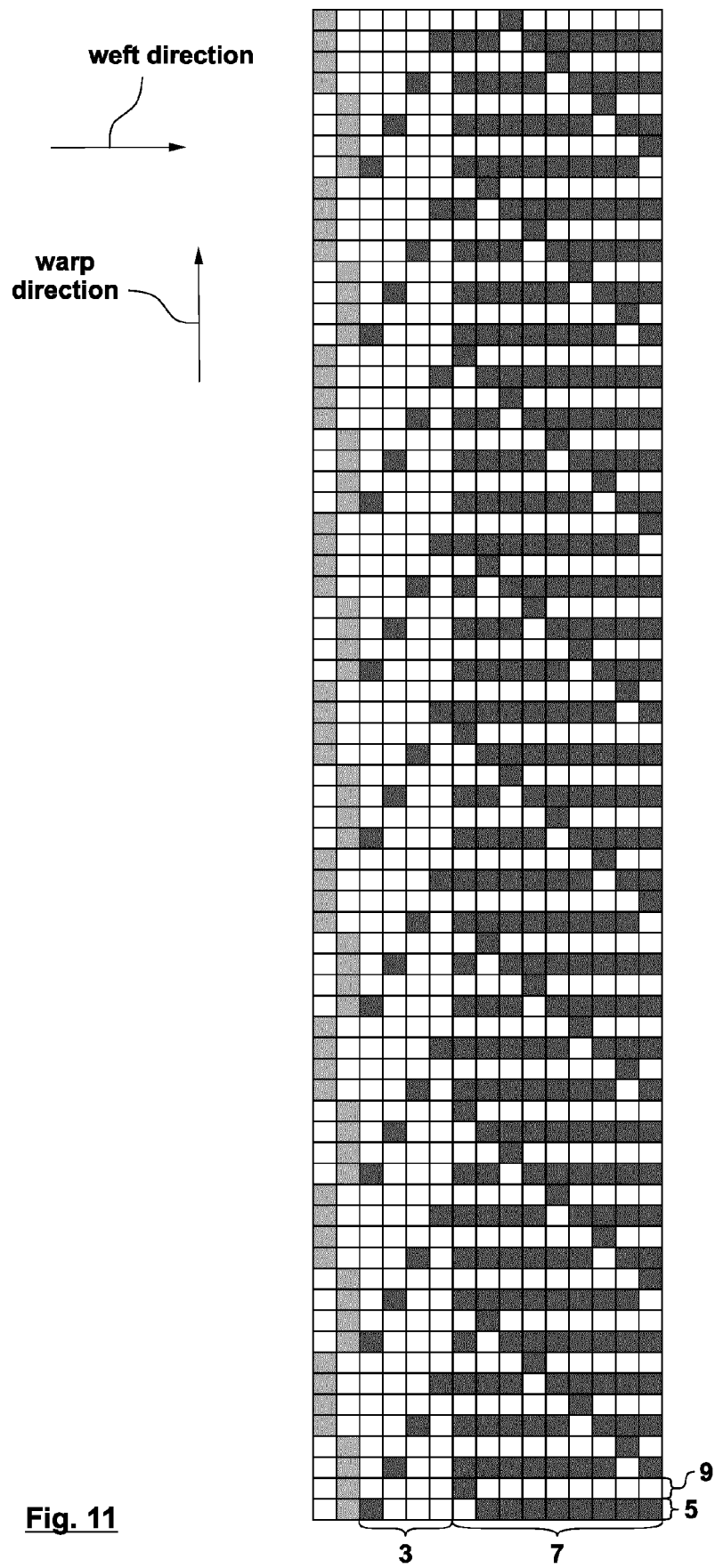
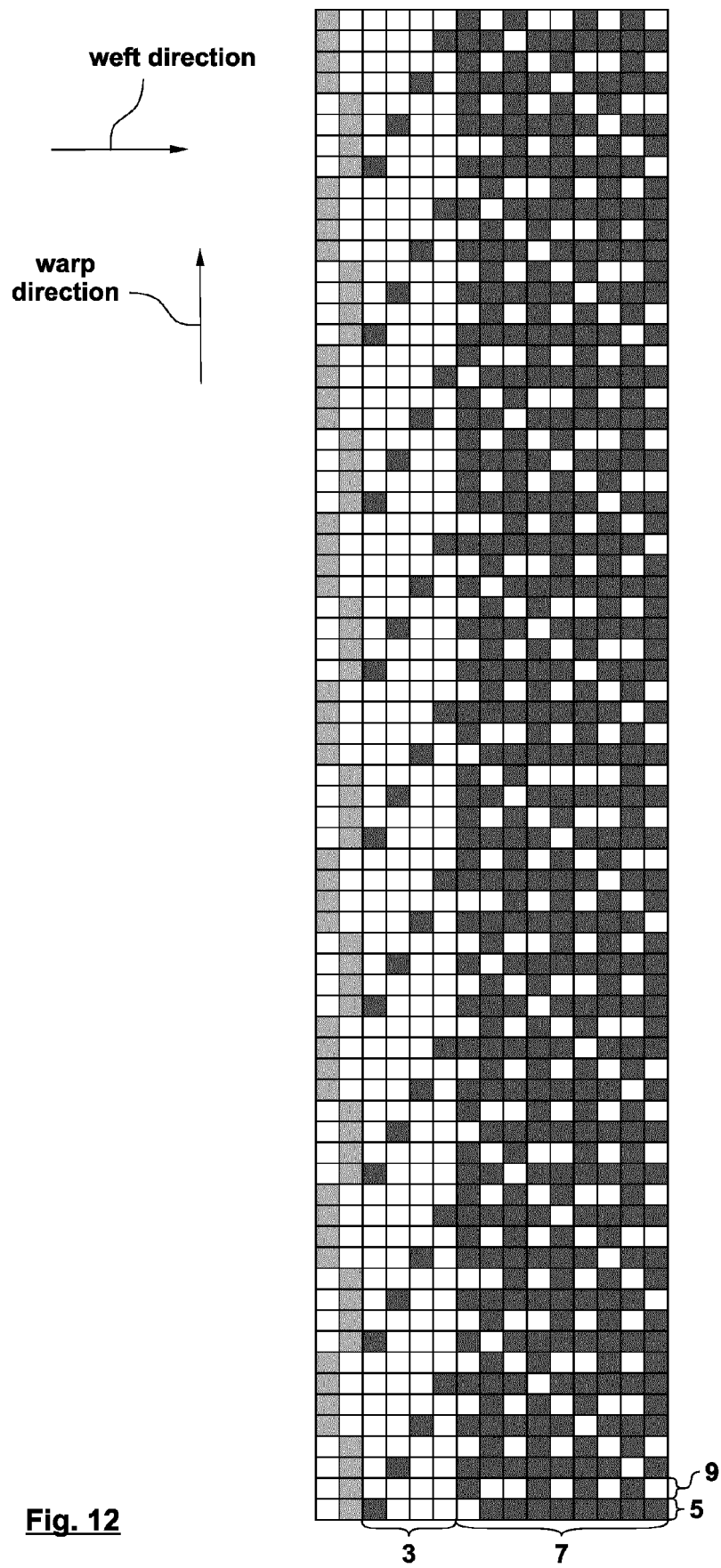


Fig. 11





EUROPEAN SEARCH REPORT

Application Number
EP 21 16 1785

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2019/119835 A1 (YENICI HAMIT [TR] ET AL) 25 April 2019 (2019-04-25) * abstract * * claims 1,2,12,13,15,16 * * figures 1,2,2a,2b,4b,5a,5b,6a,6b * * paragraph [0001] - paragraph [0005] * * paragraph [0007] - paragraph [0010] * * paragraph [0014] - paragraph [0017] * * paragraph [0031] * * paragraph [0036] * * paragraph [0041] - paragraph [0042] * * paragraph [0045] * * paragraph [0051] - paragraph [0055] * * paragraph [0061] * * paragraph [0065] * * paragraph [0073] - paragraph [0075] * * paragraph [0077] - paragraph [0082] * * paragraph [0086] * * paragraph [0097] - paragraph [0101] * * tables 1, #14 * -----	1-18	INV. D03D39/22 D02G3/36 D02G3/32
X	US 2011/212659 A1 (YENICI HAMIT [TR] ET AL) 1 September 2011 (2011-09-01) * abstract * * claims 1-3,9-12,14,22-36, * * figures 1-15 * * paragraph [0001] - paragraph [0019] * * paragraph [0039] - paragraph [0048] * * paragraph [0058] - paragraph [0059] * * paragraph [0067] * * paragraph [0071] - paragraph [0073] * * table 1 * -----	1,2,4-12,16,17	TECHNICAL FIELDS SEARCHED (IPC) D03D D02G A41D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 August 2021	Examiner Heinzelmann, Eric
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 16 1785

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-08-2021

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2019119835 A1	25-04-2019	BR 112018070936 A2	29-01-2019
		CA 3020433 A1	19-10-2017
		CN 109072502 A	21-12-2018
		EP 3231907 A1	18-10-2017
		EP 3443155 A1	20-02-2019
		JP 2019511645 A	25-04-2019
		KR 20180128066 A	30-11-2018
		US 2019119835 A1	25-04-2019
US 2011212659 A1	01-09-2011	WO 2017178438 A1	19-10-2017
		CN 102834557 A	19-12-2012
		CN 105696149 A	22-06-2016
		CN 106592062 A	26-04-2017
		CN 106757656 A	31-05-2017
		DE 11706485 T1	16-04-2015
		DK 2539493 T1	13-04-2015
		EP 2539493 A1	02-01-2013
		EP 2942427 A2	11-11-2015
		ES 2531979 T1	23-03-2015
		HK 1215596 A1	02-09-2016
		JP 6033087 B2	30-11-2016
		JP 6383757 B2	29-08-2018
		JP 2013520579 A	06-06-2013
		JP 2017020154 A	26-01-2017
		PL 2539493 T3	31-07-2015
		PT 2539493 E	22-06-2015
		US 2011212659 A1	01-09-2011
		US 2013048140 A1	28-02-2013
		US 2018127902 A1	10-05-2018
		WO 2011104022 A1	01-09-2011

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2539493 B1 [0005] [0006] [0007] [0025]
- EP 3231907 A1 [0007] [0025]
- WO 2012062480 A2 [0037]
- WO 2016135211 A [0038]
- EP 3231907 A [0041]
- WO 2020211977 A [0046]