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(71) Applicant: **M.I.T.I Manifattura Italiana Tessuti Indemagliabili S.p.A.**
24059 Urgnano (BG) (IT)

(72) Inventor: **SPADA, Daniela**
24123 Bergamo (BG) (IT)

(74) Representative: **Cosenza, Simona et al Barzanò & Zanardo S.p.A.**
Via Borgonuovo, 10
20121 Milano (IT)

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(54) **LADDERPROOF STRETCH FABRIC WITH INTEGRATED GRIPPING BAND**

(57) A gripping ladderproof stretch fabric (1) is described, comprising at least one set of background threads (3, 3'), knitted according to a closed or open stitch weave, and at least one set of gripping threads (5, 5'), inserted according to a weft weave; the set of gripping threads (5, 5') comprises elastomeric yarns, each thread (5, 5') of the set of gripping threads (5, 5') has a anchored portion (51) blocked by the set of background threads (3, 3'), and a non-knitted free portion (52); the free portion (52) is configured to come into contact with the skin of a user to make a gripping effect.

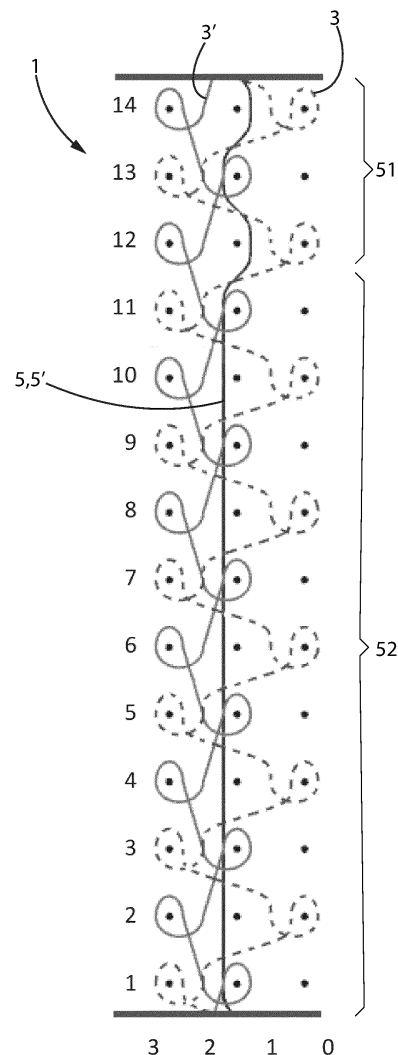


Fig. 2

EP 4 502 256 A1

Description

[0001] The present invention relates to a gripping ladderproof stretch fabric, i.e., having an integrated gripping band. The present invention is usefully employed, for example, for producing garments intended for sports activities, such as activewear and sportswear, but also underwear.

[0002] Ladderproof fabrics are chain-knitted fabrics (also known as warp-knitted), which, being "ladderproof," are generally more resistant to stress and damage (i.e., the so-called laddering) that develop during the use of the garment made of such fabric. For this reason, they are particularly employed to make sports and/or shaping garments.

[0003] Fabrics having a gripping band adapted to grip the skin are known, which are used to make garments that require a tight and compressive fit. Such fabrics can be mainly used, by way of non-exhaustive example, to make sports or endurance garments, such as shorts, bodysuits, shirts, caps, sleeves, and accessories for cycling, triathlon, running, but also garments for indoor use, such as yoga, Pilates, fitness, spinning, or for lingerie-shapewear, corsetry, and underwear, to make bras, briefs, shaping girdles, strips, and belts, but also for use in the medical and orthopedic field, and rehabilitation, and also for leisurewear and athleisure clothing, all with gripping edge(s) (hem(s)).

[0004] Some types of such fabrics provide elastic strips that are sewn or heat-sealed to the fabric of which the garment is made. In other cases, silicone inserts are hot-applied.

[0005] Disadvantageously, in the case of sewn or heat-sealed strips, the main limit of such fabrics is the presence of a seam or heat-seal, which, although properly designed for the application, represents a rigid point in the fabric, which negatively affects the overall comfort of the garment.

[0006] Instead, in the case of hot-applied silicone inserts, disadvantageously, the silicone used has a different elasticity compared to the support fabric, and furthermore, it tends to dry out and detach from the fabric itself over time. Furthermore, at an aesthetic level, colour variations can occur between the fabric and the band over time, since they are made of different materials.

[0007] The object of the present invention is to overcome the above-mentioned disadvantages and, in particular, to provide a gripping ladderproof fabric that is seamless, resulting in garments that are more comfortable for the wearer.

[0008] A further object of the present invention is to provide a gripping ladderproof fabric that allows for a wide variety of aesthetic effects.

[0009] The object of the present invention is also to provide a gripping ladderproof fabric that is more resistant to aging, while still ensuring a homogeneous level of compression over time.

[0010] A further object of the present invention is to

provide a gripping ladderproof stretch fabric that is simple and quick to make.

[0011] The task set forth above, as well as the mentioned and other objects that will be more apparent later, are achieved by a gripping ladderproof stretch fabric as recited in claim 1.

[0012] Other features are provided in the dependent claims.

[0013] Further features and advantages will be more apparent from the description of preferred, but not exclusive, embodiments of a gripping ladderproof stretch fabric, illustrated by way of indication and not limitation, with the aid of the attached drawings, in which:

- 15 - Figures 1a-1c schematically illustrate an example of a three or four-bar (or three or four-comb) weave, on each of which threads are inserted to make an embodiment of a gripping ladderproof stretch fabric according to the present invention;
- 20 - Figure 2 schematically illustrates a weave on single bars (or combs) obtained by combining the bars of Figures 1a-1c;
- Figure 3 illustrates an example of the textile construction of an embodiment of a gripping ladderproof stretch fabric according to the present invention, made based on the weave of Figure 2.

[0014] With reference to the attached figures, a gripping ladderproof stretch fabric, globally indicated by reference number 1, is described below.

[0015] The gripping ladderproof stretch fabric 1 comprises at least one set of background threads 3, 3' that is knitted according to a closed or open stitch weave. The threads of at least one set of background threads 3, 3' make the base of the gripping ladderproof stretch fabric 1.

[0016] The gripping ladderproof stretch fabric 1 further comprises at least one set of gripping threads 5, 5', which is inserted according to a weft weave.

[0017] In closed stitch weaves, the thread bushing closes around the needle of the needle bar, unlike in open stitch weaves where the thread bushing does not close around the needle but only surrounds it. Instead, in so-called weft weaves, the thread does not surround the needle but only lies beside it.

[0018] In accordance with the present invention, the set of gripping threads 5, 5' moves entirely in weft.

[0019] The gripping ladderproof stretch fabric 1 can be produced with this construction on tricot-type looms.

[0020] The gripping ladderproof stretch fabric 1 is a flat covering fabric. For example, the gripping ladderproof stretch fabric 1 is made with a background constructed as an elastic charmeuse.

[0021] The tricot looms for producing the gripping ladderproof stretch fabric 1 can comprise 2 to 4 combs (or bars) depending on the weave of the gripping ladderproof stretch fabric 1.

[0022] It should be noted that, in the attached figures, the threads of the set of background threads 3, 3' are

depicted by a thin dotted or solid line, while the threads of the set of gripping threads 5, 5' are depicted by a thick solid line.

[0023] In accordance with the present invention, the set of gripping threads 5, 5' comprises elastomeric yarns.

[0024] It should be noted that each thread 5, 5' of the set of gripping threads 5, 5' has a anchored portion 51, which is blocked by the set of background threads 3, 3', and a free portion 52, which is non-blocked.

[0025] Even in the anchored portion 51, the set of gripping threads 5, 5' moves in weft.

[0026] In other words, the threads of the set of gripping threads 5, 5' never form a stitch.

[0027] In other words, each thread of the set of gripping threads 5, 5', without forming a stitch, is inserted and blocked within the stitch structure formed by the set of background threads 3, 3', which are instead knitted according to a closed or open stitch weave.

[0028] In particular, the free portion 52 is configured to come into contact with the skin of a user, to make a gripping effect. Indeed, the free portion 52 is configured to adhere to the skin due to its elastomeric nature, generating a gripping effect.

[0029] The anchored portion 51, instead, has the function of constraining the set of gripping threads 5, 5' to the set of background threads 3, 3'.

[0030] In practice, the threads of at least one set of gripping threads 5, 5', when contacting the skin, exert a gripping effect due to the free portion 52 of such threads.

[0031] The set of gripping threads 5, 5' is preferably adapted to make the side of the gripping ladderproof stretch fabric 1, the so-called skin side, i.e., the side of the fabric intended to face and be in contact with the skin.

[0032] For example, at least one set of gripping threads 5, 5' is mainly visible from a first face of the gripping ladderproof stretch fabric 1, while the at least one set of background threads 3, 3' is also visible from a second face of the ladderproof stretch fabric 1 opposite to said first face. The second face is preferably the one intended to face the external environment (air side), while the first is intended to face the skin (skin side).

[0033] In this case, for example, the technical back of the set of background threads 3, 3' is visible from the second face, while the technical front of the set of background threads 3, 3' is visible from the first face, i.e., the face from where the set of gripping threads 5, 5' is placed.

[0034] According to an alternative embodiment, at least one set of gripping threads 5, 5' could be moved to the technical back side of the set of background threads 3, 3', leaving the technical front of the set of background threads 3, 3' exposed on the second face.

[0035] The free portion 52 of the set of gripping threads 5, 5' protrudes from the gripping ladderproof stretch fabric 1 on the skin side, and creates, when contacting the skin, the necessary friction for generating the gripping effect without extending beyond the air side.

[0036] In accordance with the present invention, the gripping ladderproof stretch fabric 1 preferably com-

prises a gripping zone 11 and also a background zone 12. The gripping zone comprises at least one set of background threads 3, 3' and at least one set of gripping threads 5, 5', which is overlapping to at least one set of background threads 3, 3'.

[0037] In other words, the gripping zone 11 consist of both threads from the set of background threads 3, 3' and threads from the set of gripping threads 5, 5'.

[0038] The background zone 12, instead, consists of at least one set of background threads 3, 3', and is contiguous to the gripping zone 11. The background zone 12 is seamlessly made from the gripping zone 11. In other words, the background zone 12 solely consists of threads from the set of background threads 3, 3'.

[0039] In practice, the background zone 12 only contains bound stitches, while the gripping zone 11 contains both bound stitches, solely given by the threads of the set of background threads 3, 3', and unbound threads, given by the threads of the set of gripping threads 5, 5' that remain blocked without forming a stitch.

[0040] In accordance with an embodiment, such as for example that shown in the attached figures, the gripping ladderproof stretch fabric 1 comprises two sets of background threads 3, 3'.

[0041] In this way, the two sets of threads, knitted according to a closed or open stitch weave, i.e., the sets of background threads 3, 3', make a tricot stitch that also allows to hold the third set of threads, i.e., the set of gripping threads 5, 5', inserted according to a weft weave.

[0042] For example, the gripping ladderproof stretch fabric 1 comprises a first set of background threads 3 and a second set of background threads 3'.

[0043] For instance, each set of background threads 3, 3' is knitted in a closed stitch by the respective comb.

[0044] By way of example, the first set of background threads 3 can be knitted according to a 1-0/2-3// type binding, also referred to as 2x1 tricot, as shown in Figure 1a.

[0045] Still by way of example, the second set of background threads 3' can be knitted according to a 1-0/1-2// type binding, also referred to as 1x1 tricot, as shown in Figure 1b.

[0046] Alternatively, one of the sets of background threads 3, 3' can be knitted according to a 1-0/3-4// type binding, also referred to as 3x1 tricot.

[0047] The gripping ladderproof stretch fabric 1 can also comprise three sets of background threads.

[0048] In accordance with an embodiment, the gripping ladderproof stretch fabric 1 comprises two sets of gripping threads 5, 5', each weft inserted by the respective comb.

[0049] The sets of gripping threads 5, 5' are particularly completely overlapping each other.

[0050] Alternatively, the gripping ladderproof stretch fabric 1 can comprise only one set of gripping threads 5, 5'.

[0051] In any case, in each of the sets of gripping threads 5, 5', the thread of the set of gripping threads

5, 5' has a combination of two movements, i.e., the movement that defines the anchored portion 51 and the movement that defines the free portion 52. Both of such movements are in weft.

[0052] For example, with reference to Figure 1c, the thread of the set of gripping threads 5, 5' is inserted according to a $(2-2/2-2) \times 5 / (2-2/1-1) \times 2 //$ -type binding.

[0053] It should be noted that the movement of the comb may be more or less wide.

[0054] The free portion 52 of the threads in the set of gripping threads 5, 5' can vary in length; for example, the set of gripping threads 5, 5' can be inserted according to a $(2-2/2-2) \times 10 / (2-2/1-1) \times 4 //$ -type binding, or in width; for example, the set of gripping threads 5, 5' can be inserted according to a $(2-2/2-2) \times 5 / (3-3/1-1) \times 2 //$ -type binding.

[0055] The combination of movements with fewer repetitions is a $(2-2/2-2) / (2-2/1-1) //$ -type binding.

[0056] The gripping action of the threads of at least one set of gripping threads 5, 5' is expressed by the part of the thread that is inserted in a straight mode, i.e., the free portion 52. Therefore, the same result can be achieved even by modifying the construction of the anchored portion 51, which has the function of constraining the thread of the set of gripping threads 5, 5' to the fabric.

[0057] Preferably, at least one set of gripping threads 5, 5' is completely made of elastomeric yarns. In other words, all the threads of the at least one set of gripping threads 5, 5' are made of elastomeric yarns.

[0058] Such elastomeric yarns preferably have a count comprised between 22 and 300 dtex. More preferably, such elastomeric yarns have a count comprised between 44 and 156 dtex.

[0059] The set of background threads 3, 3' preferably comprises one or more natural, artificial and/or synthetic yarns, selected from the group consisting of polyamide, polyester, wool, elastomer, or vegetable-origin artificial threads.

[0060] The threads of the set of background threads 3, 3' or the set of gripping threads 5, 5' can be smooth or textured.

[0061] The threads of the set of background threads 3, 3' or the set of gripping threads 5, 5' can be standard, dope-dyed, or recycled.

[0062] Generally, the threads of the set of background threads 3, 3' can be of any type among those normally used in ladderproof weaving, making a base with a wide variety of aesthetic effects.

[0063] The yarns used for the sets of background threads 3, 3' can be of animal or vegetable origin, properly prepared for ladderproof weaving.

[0064] For example, the above-mentioned polyamide can be polyamide 6 or polyamide 6.6 or other type of polyamide suitable for ladderproof weaving. The polyamide yarn usable for the threads of the set of background threads 3, 3' can have, for example, a count comprised between 22 and 78 dtex.

[0065] The polyester yarn usable for the threads of the set of background threads 3, 3' can have a count com-

prised between 22 and 83 dtex.

[0066] Variants produced with polyamide/wool threads or vegetable-origin artificial threads allow to make solid-coloured fabrics in all colour variants or printable with technology suitable for the type of fiber (wet-printing, also ink-jet); while those with polyester threads allow to make fabrics printable with transfer technology (sublimation printing), to be used alone or in combination with other yarn variants, to make various garments adapted to the different aesthetic requirements of the market.

[0067] In Figure 3, the complete gripping ladderproof stretch fabric 1 is shown, with two repetitions in the length direction. In the gripping ladderproof stretch fabric 1, bar 1 and bar 2 (visible in Figures 1a and 1b) have a full threading, while bar 3 and bar 4 (visible in Figure 1c) have a partial threading and carry the thread only to the needles positioned in the gripping zone 11, i.e., the zone where the gripping band is to be made.

[0068] In this example, the background zone 12 is given by an elastic charmeuse, but the same can be made with other typologies of weaves with one, two, or three combs, either smooth or operated, employing the tricot, inlay, atlas, köper (also referred to as 'two-needle stitch' or twill) movements, and combinations thereof.

[0069] The object of the present invention is also a garment made from the gripping ladderproof stretch fabric described above. The garment can be a sports or endurance garment, such as a pair of shorts, a bodysuit, a shirt, a cap, a sleeve, and generally an accessory for cycling, triathlon, running, but also a garment for indoor use, such as yoga, Pilates, fitness, spinning, or for lingerie-shapewear, corsetry, and underwear, to make bras, briefs, shaping girdles, strips, and belts, but also for use in the medical and orthopedic field, rehabilitation, and for leisurewear and athleisure clothing, all with gripping edge(s) (hem(s)).

[0070] Advantageously, the present invention allows to make a gripping ladderproof stretch fabric (warp-knitted stretch fabric) having a gripping band that is weft knitted in the fabric.

[0071] In particular, using a set of elastomer threads, at least partially free, that move inside the weave, results in a gripping band integrated in the finished fabric. Such fabric is usable in placed cuts to make an entire garment with a single cut, comprising the gripping band.

[0072] The introduction of a gripping element directly inside the fabric has several advantages, particularly eliminating the subsequent processing related to the grip of the fabric and allowing to have a more homogeneous level of compression throughout the fabric. Furthermore, the gripping band does not create thickness nor can detach from the rest of the fabric. Finally, the aging of the gripping band progresses in parallel with that of the fabric, and there are also no differences in appearance, colour, or print quality in the garment due to the presence of the band.

[0073] The gripping ladderproof stretch fabric 1 thus conceived is susceptible to numerous modifications and

variants, all within the scope of the inventive concept; furthermore, all details are replaceable by technically equivalent elements. In practice, the materials used, as long as they are compatible with the specific use, as well as the contingent dimensions and shapes, can be any depending on the technical requirements.

Claims

1. Gripping ladderproof stretch fabric (1) comprising:

- at least one set of background threads (3, 3') knitted according to a closed or open stitch weave;
- at least one set of gripping threads (5, 5') inserted according to a weft weave, said set of gripping threads (5, 5') comprising elastomeric yarns, each thread (5, 5') of said set of gripping threads (5, 5') having a anchored portion (51) blocked by said set of background threads (3, 3'), and a non-blocked free portion (52); said free portion (52) being configured to come into contact with the skin of a user, to make a gripping effect.

2. Gripping ladderproof stretch fabric (1) according to preceding claim, comprising:

- a gripping zone (11) comprising said at least one set of background threads (3, 3') and said at least one set of gripping threads (5, 5') overlapping to said at least one set of background threads (3, 3');
- a background zone (12) consisting of said at least one set of background threads (3, 3'), contiguous to said gripping zone (11) and seamlessly made from said gripping zone (11).

3. Gripping ladderproof stretch fabric (1) according to any one of the preceding claims, comprising two sets of background threads (3, 3').

4. Gripping ladderproof stretch fabric (1) according to claim 3, wherein each set of background threads (3, 3') is knitted in a closed stitch by the respective comb.

5. Gripping ladderproof stretch fabric (1) according to any one of the preceding claims, comprising two sets of gripping threads (5, 5'), each weft inserted by the respective comb.

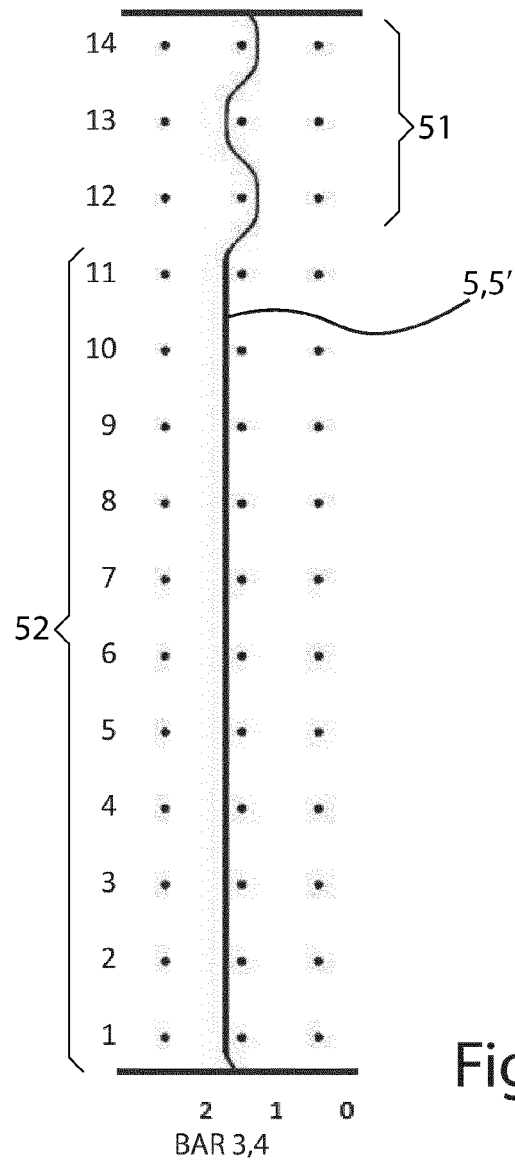
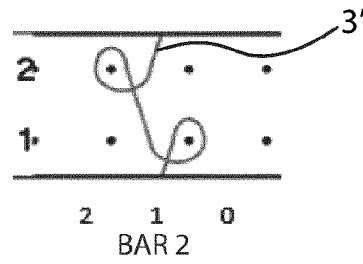
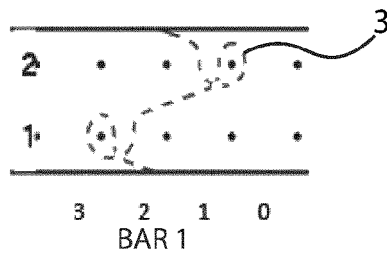
6. Gripping ladderproof stretch fabric (1) according to claim 5, wherein said sets of gripping threads (5, 5') completely overlap each other.

7. Gripping ladderproof stretch fabric (1) according to any one of the preceding claims, wherein said at

least one set of gripping threads (5, 5') is completely made with elastomeric yarns.

8. Gripping ladderproof stretch fabric (1) according to any one of the preceding claims, wherein said elastomeric yarns have a count comprised between 22 and 300 dtex, preferably between 44 and 156 dtex.

9. Gripping ladderproof stretch fabric (1) according to any one of the preceding claims, wherein said set of background threads (3, 3') comprises one or more natural or synthetic yarns, selected from the group of polyamide, polyester, wool, elastomer, or vegetable-origin artificial threads.



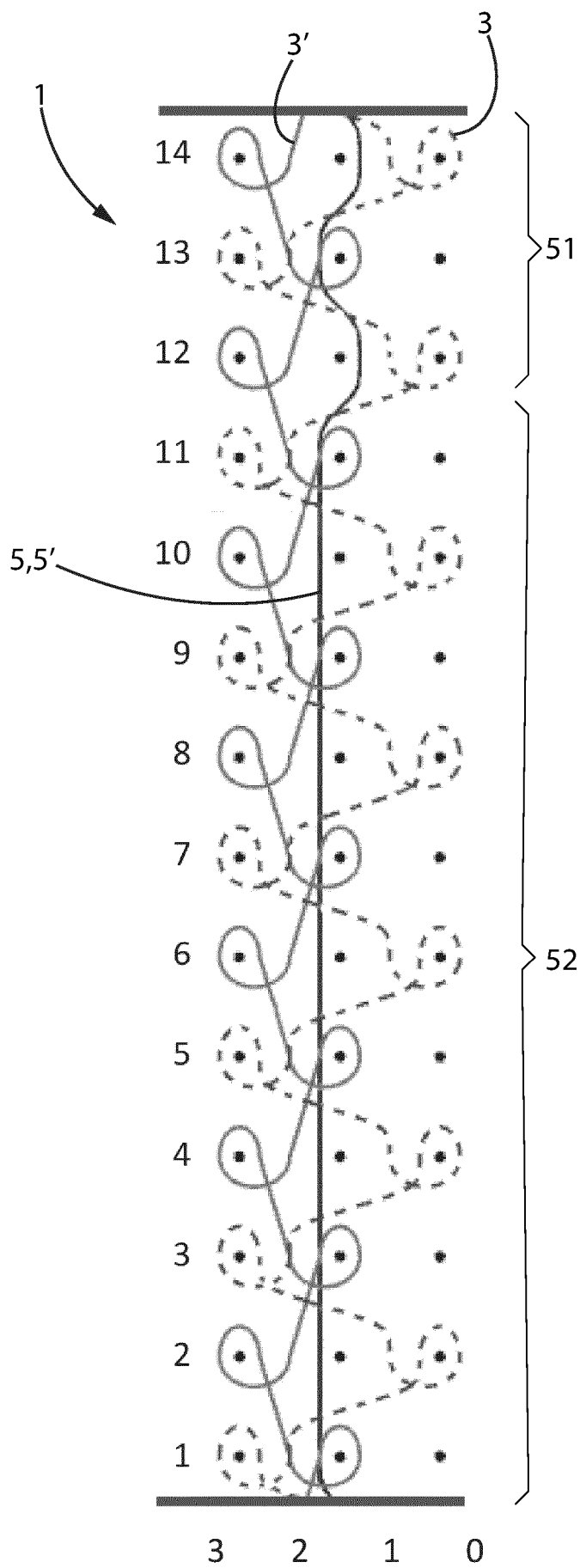


Fig. 2

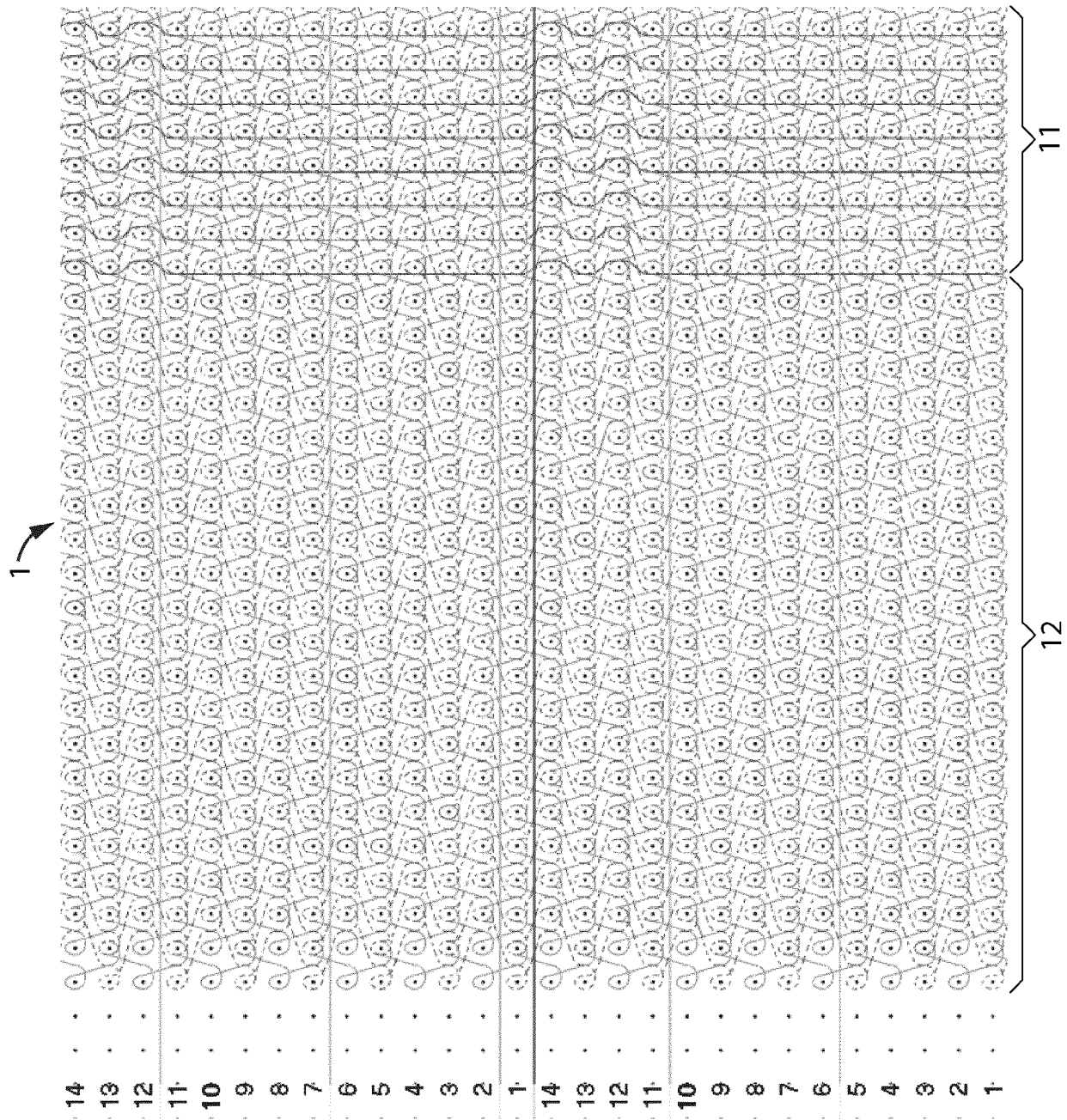


Fig. 3



EUROPEAN SEARCH REPORT

Application Number

EP 24 19 1954

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		18 October 2024	Messai, Sonia
CATEGORY OF CITED DOCUMENTS			
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EP 24 19 1954

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