US 20180368537A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0368537 A1

Nishida et al. (43) Pub. Date: Dec. 27, 2018

(54) **FASTENER STRINGER AND SLIDE FASTENER**

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(21) Appl. No.: **16/062,623**

(22) PCT Filed: **Jan. 7, 2016**

(86) PCT No.: **PCT/JP2016/050376**

§ 371 (c)(1),
(2) Date: **Jun. 14, 2018**

Publication Classification

(51) **Int. Cl.**

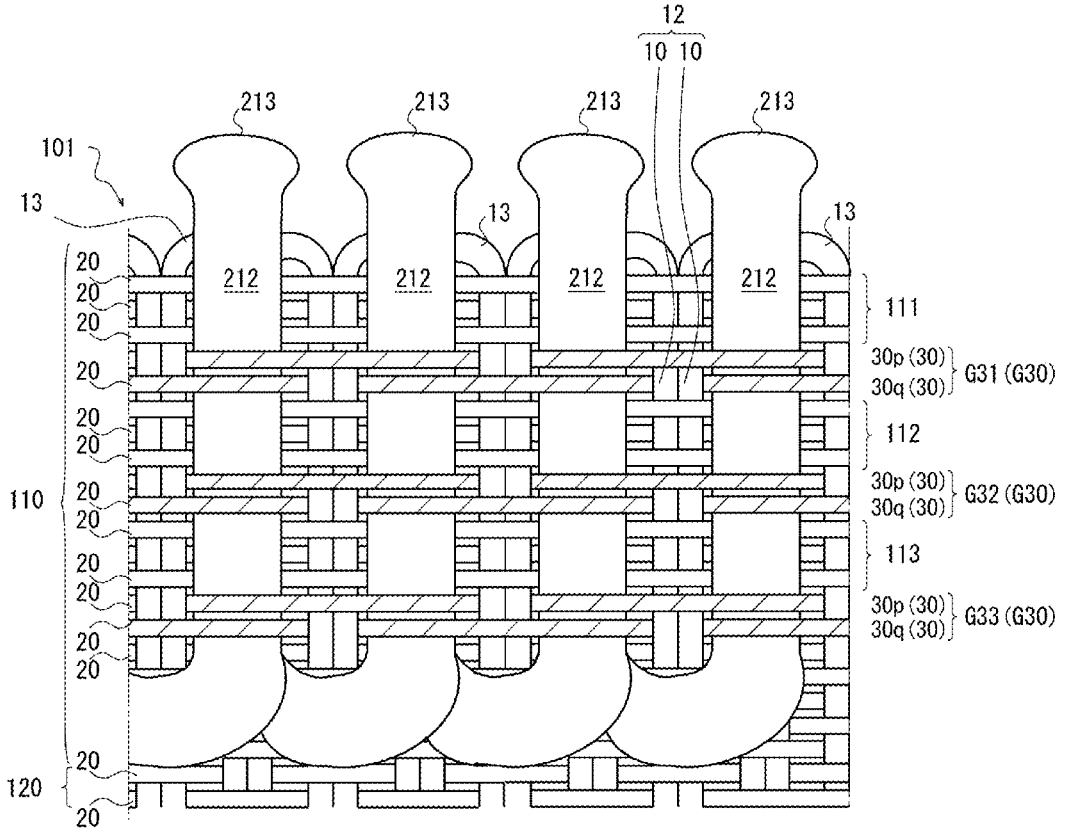
A44B 19/54	(2006.01)
A44B 19/34	(2006.01)
A44B 19/12	(2006.01)

(52) **U.S. Cl.**

CPC *A44B 19/54* (2013.01); *A44B 19/12* (2013.01); *A44B 19/346* (2013.01)

(57) **ABSTRACT**

A plurality of warp threads includes total N adjacent tightening threads each repeats crossing over N second legs at a side of the first tape-surface and crossing over the weft thread at a side of the second tape-surface so as to tighten the coil-shaped element to the weft thread. Said N indicates a natural number equal to or greater than 2. Each tightening thread includes an exposed portion that crosses over the weft thread and is exposed at a side of the second tape-surface. As the N adjacent tightening threads extend, the respective exposed portions of the tightening threads appear at a side of the second tape-surface one-by-one alternately or one-by-one sequentially.



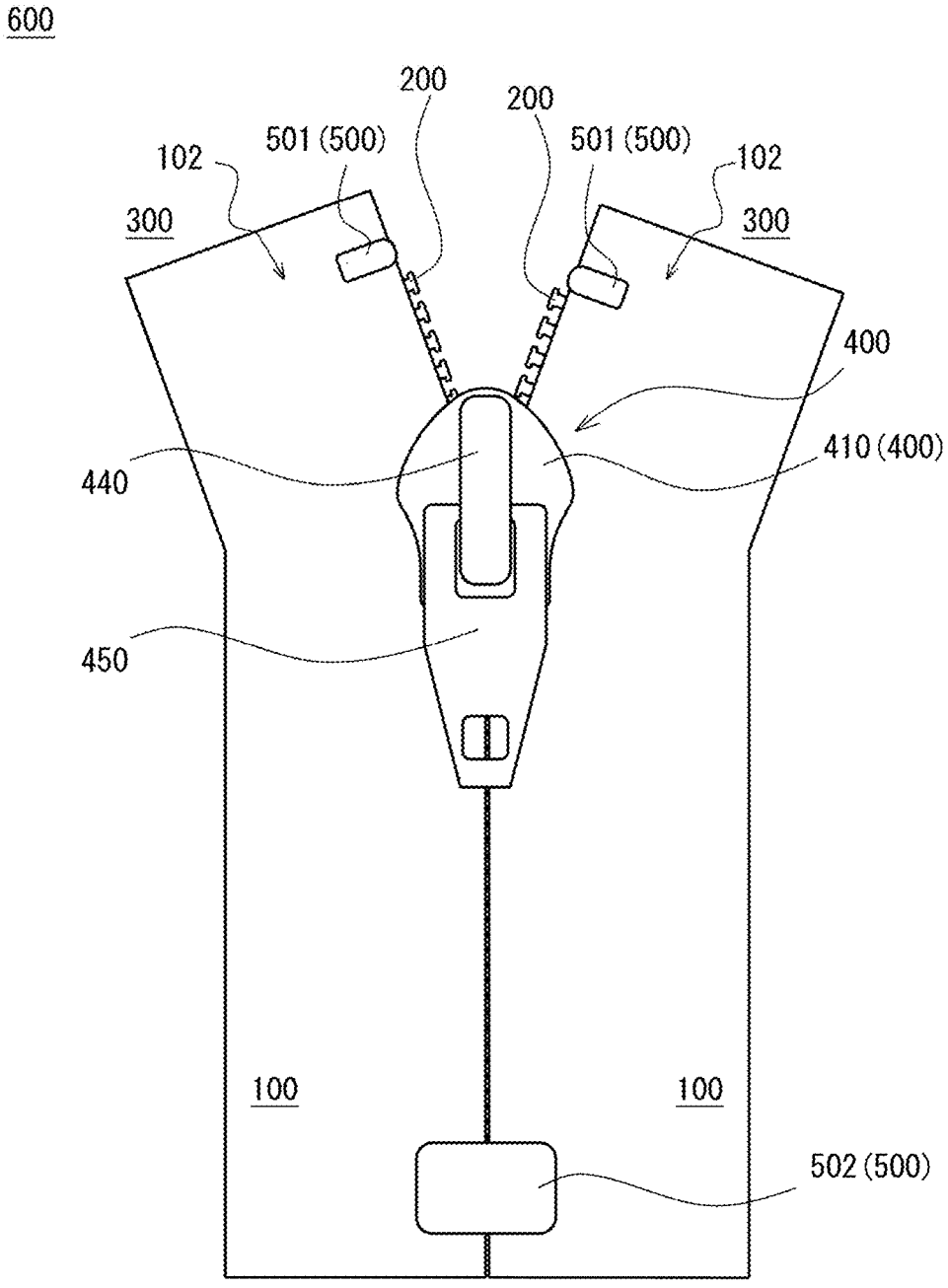

600
200
200
501 (500)
501 (500)
102
102
300
300
400
410 (400)
440
450
100
100
502 (500)

FIG. 1

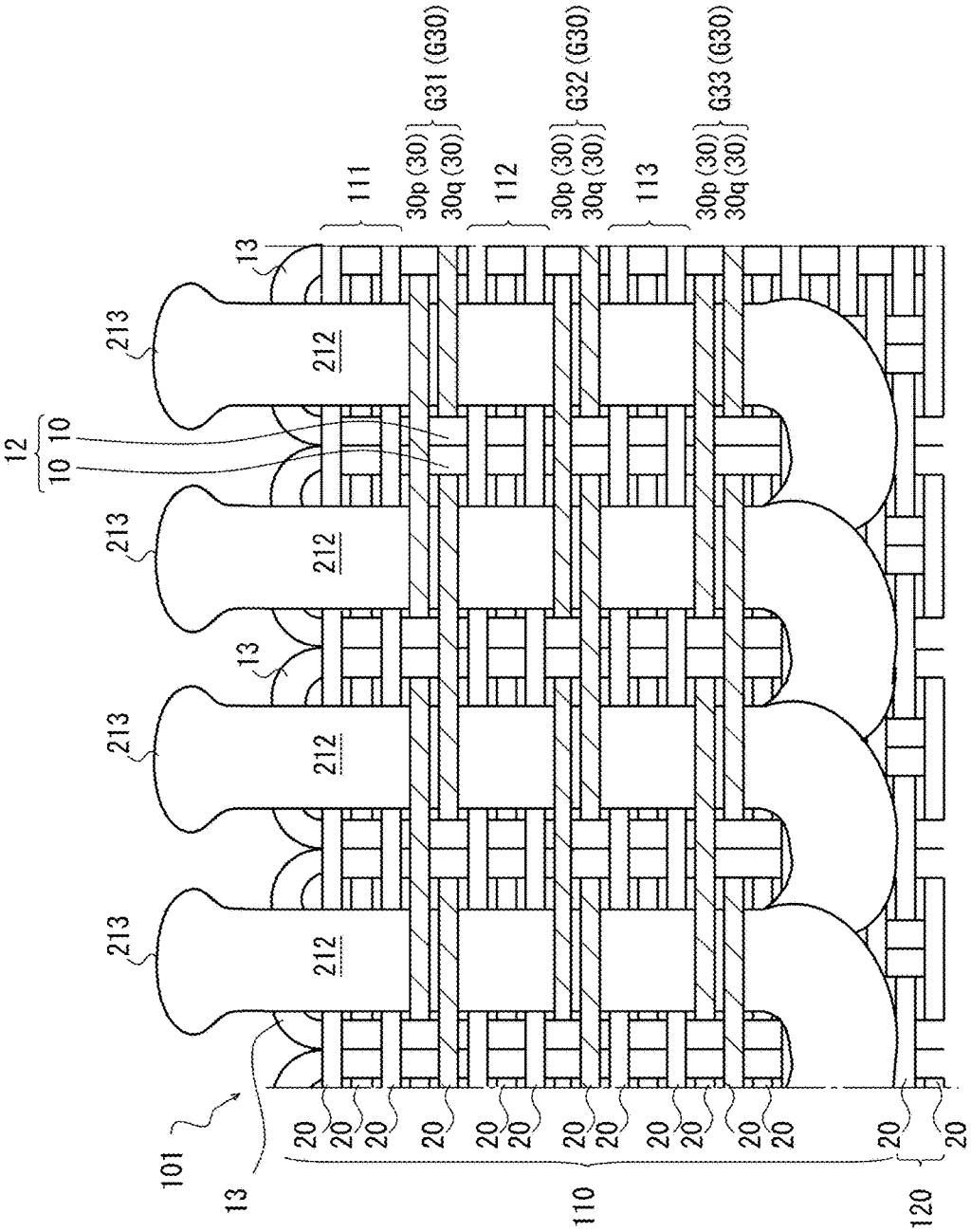

101
13
110
120
20
111
112
113
30p (30)
30q (30)
G31 (G30)
G32 (G30)
G33 (G30)
12
10
213
212

FIG. 2

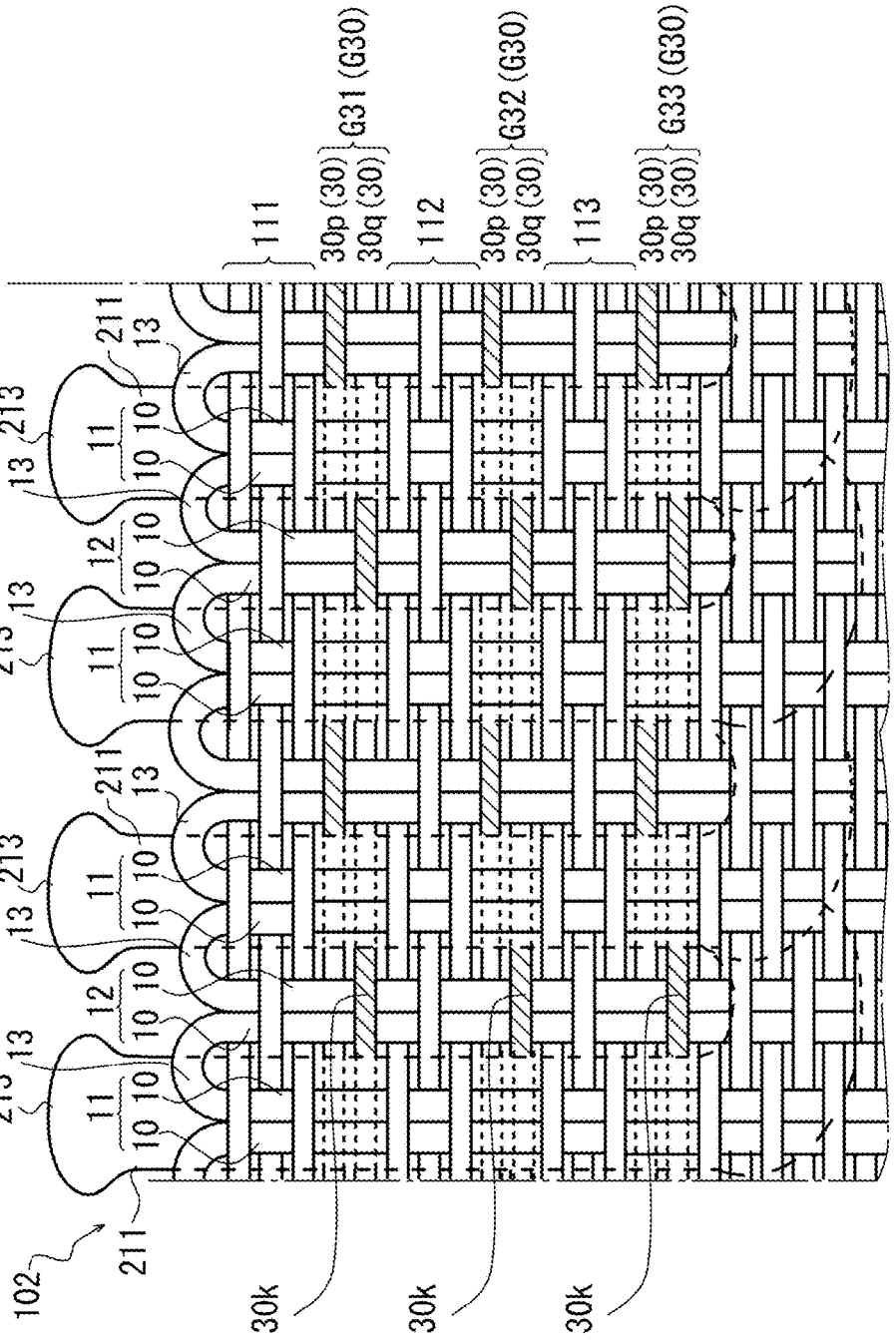

111
112
113
30p (30)
30q (30)
G31 (G30)
G32 (G30)
G33 (G30)
211
213
10
11
12
13
102
30k

FIG. 3

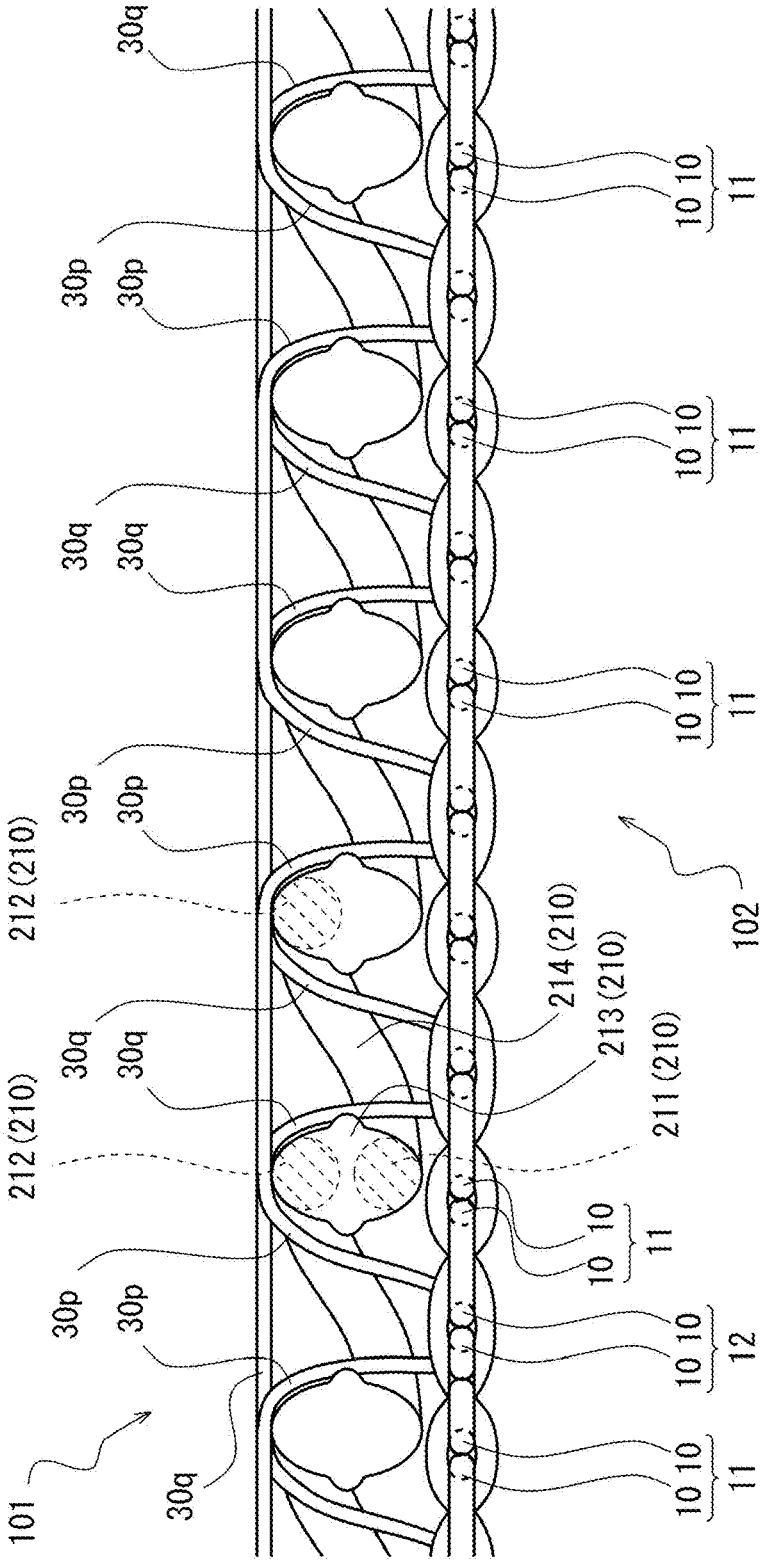

101
30q
30p
30q
30p
30q
30p
30q
30p
30q
212 (210)
212 (210)
214 (210)
213 (210)
211 (210)
102
10 10
11
12

FIG. 4

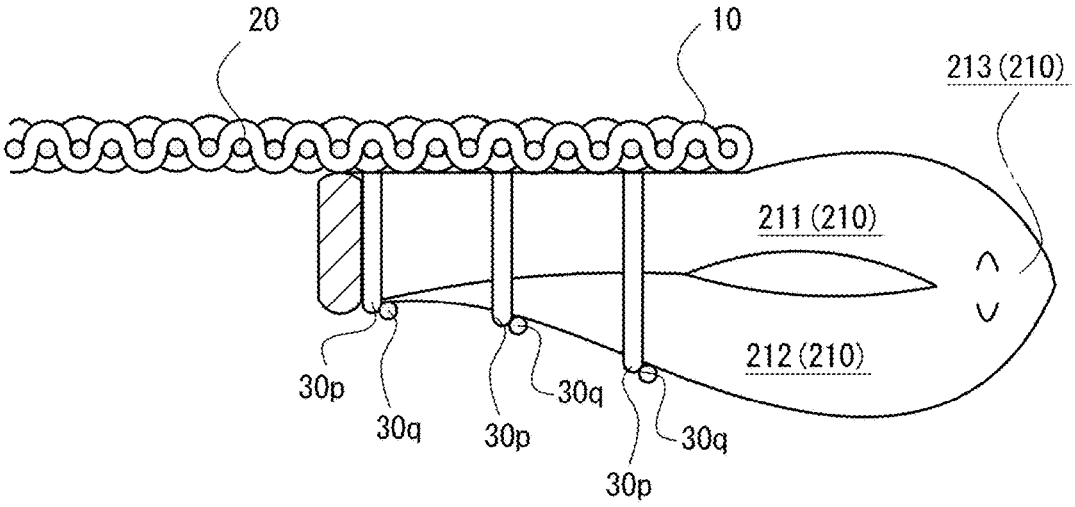


FIG. 5

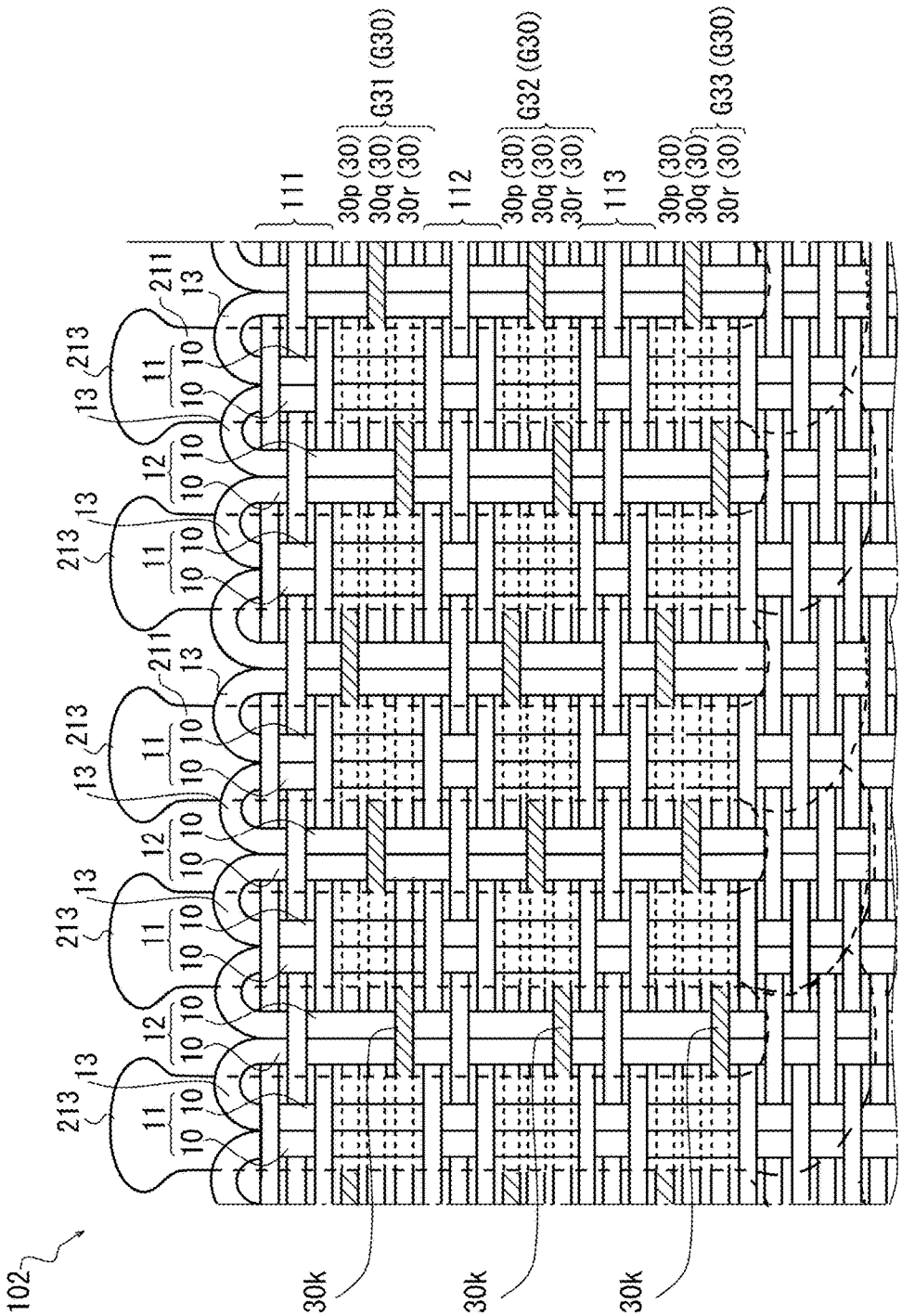

102
111
112
113
30p (30)
30q (30)
30r (30)
G31 (G30)
G32 (G30)
G33 (G30)
30k
211
213
11
12
13
10

FIG. 6

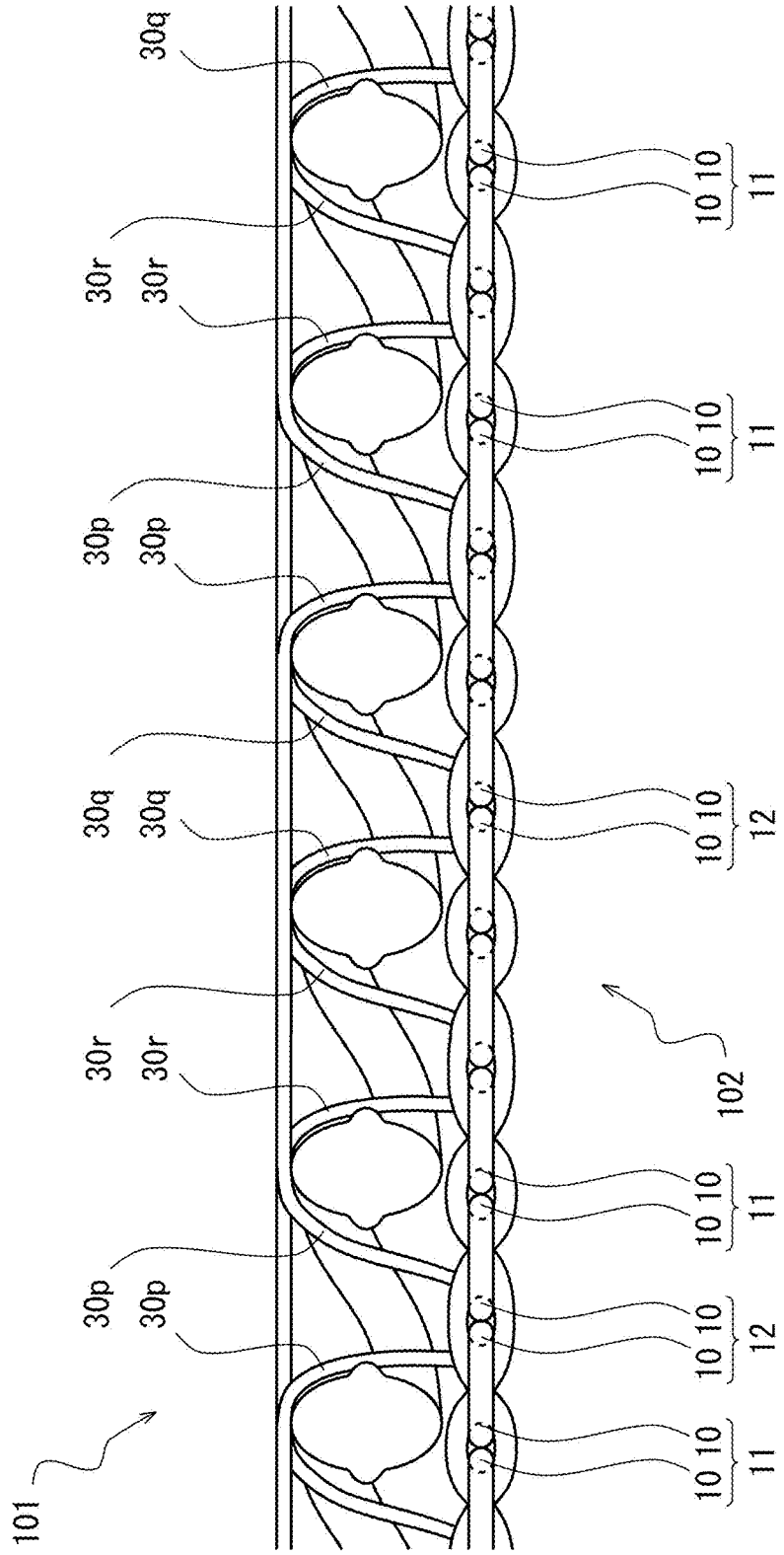


FIG. 7

FASTENER STRINGER AND SLIDE FASTENER

TECHNICAL FIELD

[0001] The present disclosure is related to fastener stringers and slide fasteners.

BACKGROUND ART

[0002] Patent literature 1 discloses a type of an exemplary fastener stringer in which warp threads include pressing warp threads for pressing a coil-shaped element against weft threads. FIG. 1 of the same literature illustrates total 4 adjacent tightening threads 19-22. The tightening threads 19-22 extend to cross over a top surface of the top leg 31 and a bottom surface of the bottom leg 32 alternately. FIG. 4 of the same literature illustrates total 4 adjacent tightening threads. With respect to the total 4 tightening threads, 2 tightening threads at a side of engaging head 33 extend to cross over a top surface of the top leg 31 and a bottom surface of the bottom leg 32 alternately, similar to that described for FIG. 1. As illustrated, the remaining 2 tightening threads extend differently to the two tightening threads at the side of the engaging head 33.

CITATION LIST

Patent Literature

[0003] [Patent literature 1] Japanese Examined Utility-Model Publication No. 62-41609

SUMMARY

Technical Problem

[0004] Further improvement of endurance against lateral-pulling-force has been desired for a fastener stringer in which a coil-shaped element is tightened to a weft thread by tightening threads included in warp threads. If engaging heads of coil-shaped element are arranged at small pitch interval, a weft thread arranged at a space between adjacent legs of coil-shaped element in an elongated direction of a fastener stringer may be relatively steeply or greatly entrained by tightening threads of warp threads to a side of tape surface of a fastener tape on which the coil-shaped element is provided. As a result, non-negligible recesses may possibly be formed on a tape surface of the fastener tape on which the coil-shaped element is not provided. In a case where the weft thread between the legs of coil-shaped element is caught by a plurality of tightening threads, there is a possibility that larger recesses may be formed. The present inventor has newly recognized a problem to avoid or suppress formation of recesses at a tape-surface of a fastener tape opposite to a tape-surface on which a coil-shaped element is provided while achieving small-pitch arrangement of engaging heads.

Solution to Problem

[0005] A fastener stringer according to an aspect of the present disclosure may include: a fastener tape (**100**) that includes one or more weft threads (**10**) and a plurality of warp threads (**20**), the fastener tape (**100**) having a first tape-surface (**101**) and a second tape-surface (**102**); and a coil-shaped element (**200**) that is provided onto the fastener tape (**100**) so as to appear at a side of the first tape-surface (**101**) of the fastener tape (**100**), the coil-shaped element (**200**) including a series of unit structures (**210**), each unit structure (**210**) including: a first leg (**211**) that extends along the weft thread (**10**); a second leg (**212**) arranged farther away from the weft thread (**10**) than the first leg (**211**); an engaging head (**213**) that couples the first leg (**211**) and the second leg (**212**) at a position outwardly of fastener tape; and a return portion (**214**) that couples the first leg (**211**) and a second leg (**212**) of an adjacent unit structure (**210**) at a position inwardly of fastener tape, wherein

[0006] the plurality of warp threads (**20**) includes total N adjacent tightening threads (**30**) each repeats crossing over N second legs (**212**) at a side of the first tape-surface (**101**) and crossing over the weft thread (**10**) at a side of the second tape-surface (**102**) so as to tighten the coil-shaped element (**200**) to the weft thread (**10**), said N indicating a natural number equal to or greater than 2, wherein

[0007] each tightening thread (**30**) includes an exposed portion (**30***k*) that crosses over the weft thread (**10**) between the first legs (**211**) arranged adjacent in a length direction of the fastener tape (**100**) and that is exposed at a side of the second tape-surface (**102**), and wherein

[0008] as the total N adjacent tightening threads (**30**) extend, the respective exposed portions (**30***k*) of the tightening threads (**30**) appear at a side of the second tape-surface (**102**) one-by-one alternately or one-by-one sequentially.

[0009] In some embodiments, the total N adjacent tightening threads (**30**) is referred to as a first group of tightening threads (G**31**), the plurality of warp threads (**20**) includes a second group of tightening threads (G**32**) including total M adjacent tightening threads (**30**) each repeats crossing over M second legs (**212**) at a side of the first tape-surface (**101**) and crossing over the weft thread (**10**) at a side of the second tape-surface (**102**) so as to tighten the coil-shaped element (**200**) to the weft thread (**10**), said M indicating a natural number equal to or greater than 2, and the fastener tape (**100**) includes a tape texture (**112**) arranged between the the first group of tightening threads (G**31**) and the second group of tightening threads (G**32**).

[0010] In some embodiments, the plurality of warp threads (**20**) includes a third group of tightening threads (G**32**) including total R adjacent tightening threads (**30**) each repeats crossing over R second legs (**212**) at a side of the first tape-surface (**101**) and crossing over the weft thread (**10**) at a side of the second tape-surface (**102**) so as to tighten the coil-shaped element (**200**) to the weft thread (**10**), said R indicating a natural number equal to or greater than 2, and the fastener tape (**100**) includes a tape texture (**113**) arranged between the second group of tightening threads (G**32**) and the third group of tightening threads (G**33**).

[0011] In some cases, the tape texture (**112**, **113**) includes a plain weave structure.

[0012] In some cases, said N and said M and said R indicate the same number.

[0013] A slide fastener according to another embodiment of the present disclosure includes: a pair of fastener stringers (**300**) according to any one described above; and at least one slider (**400**) for opening and closing the pair of fastener stringers, wherein

[0014] a pull tab (**450**) attached to a pull-attachment column (**440**) provided at a top wing (**410**) of the slider (**400**) is arranged at a side of the second tape-surface (**102**) of the fastener tape (**100**).

Advantageous Effects of Invention

[0015] According to an aspect of the present disclosure, it may be possible to avoid or suppress formation of recesses at a tape-surface of a fastener tape opposite to a tape-surface on which a coil-shaped element is provided while achieving small-pitch arrangement of engaging heads.

BRIEF DESCRIPTION OF DRAWINGS

[0016] FIG. **1** is a schematic elevational view of a slide fastener according to an exemplary embodiment of the present disclosure.

[0017] FIG. **2** is a schematic partially expanded view of a fastener stringer according to an exemplary embodiment of the present disclosure, showing that a coil-shaped element is tightened and attached to a weft thread by tightening threads at a side of first tape-surface of a fastener tape.

[0018] FIG. **3** is a schematic partially expanded view of a fastener stringer according to an exemplary embodiment of the present disclosure, showing that tightening threads cross over a weft thread between adjacent legs of coil-shaped element and are exposed at a side of second tape-surface of a fastener tape.

[0019] FIG. **4** is a schematic view showing that two adjacent tightening threads included in a fastener tape of a fastener stringer according to an exemplary embodiment of the present disclosure are exposed one-by-one alternately at a side of a second tape-surface.

[0020] FIG. **5** is a schematic view showing that a leg of coil-shaped element is tightened and attached to a weft thread by tightening threads included in warp threads of a fastener tape in a fastener stringer according to an exemplary embodiment of the present disclosure.

[0021] FIG. **6** is a schematic partially expanded view of a fastener stringer according to another exemplary embodiment of the present disclosure, showing that tightening threads cross over a weft thread between adjacent legs of coil-shaped element and are exposed at a side of second tape-surface of a fastener tape.

[0022] FIG. **7** is a schematic view showing that three adjacent tightening threads included in a fastener tape of a fastener stringer according to another exemplary embodiment of the present disclosure are exposed one-by-one sequentially at a side of a second tape-surface.

DESCRIPTION OF EMBODIMENTS

[0023] Hereinafter, non-limiting exemplary embodiments of the present invention will be described with references to FIGS. **1** to **7**. One or more disclosed exemplary embodiments and respective features included in the exemplary embodiment are not mutually exclusive. A skilled person would properly combine the respective exemplary embodiments and/or respective features without requiring excess descriptions. A skilled person would also understand synergic effect by such combinations. Overlapping descriptions among exemplary embodiments will be basically omitted. Referenced drawings are mainly for the purpose of illustrating an invention and may possibly be simplified for the sake of convenience of illustration.

[0024] A slide fastener **600** shown in FIG. **1** includes a pair of left-right fastener stringers **300**, and a slider **400** that moves frontward or rearward so as to open or close the pair of left-right fastener stringers **300**. The frontward movement of the slider **400** closes the pair of left-right fastener stringers **300**. The rearward movement of the slider **400** opens the pair of left-right fastener stringers **300**. The slider **400** includes a top wing **410**, a bottom wing (not shown), a coupling pillar that couples the top wing **410** and the bottom wing, and a pull-attachment column **440** that is provided on the top wing **410**, and a pull tab **450** attached to the pull-attachment column **440**. It should be noted that, in some embodiments, sliders having a structure other than that of illustrated exemplary slider **400** would be employed.

[0025] Front-rear direction will be understood based on a movement of the above-described slider **400**. Left-right direction will be understood from lateral arrangement of the pair of fastener stringers **300** to be opened and closed by the above-described slider **400**. The left-right direction is orthogonal to the front-rear direction. Up-down direction is orthogonal to the front-rear direction and the left-right direction.

[0026] Each fastener stringer **300** includes a fastener tape **100** and a coil-shaped element **200**. The fastener tape **100** includes one or more weft threads **10** and a plurality of warp threads **20**. The fastener tape **100** is a woven fabric in which the weft thread **10** and the warp threads **20** are woven. The fastener tape **100** has a first tape-surface **101** and a second tape-surface **102** that is opposite to the first tape-surface **101**.

[0027] The coil-shaped element **200** is provided onto the fastener tape **100** such that it appears at a side of first tape-surface **101** of the fastener tape **100**. The coil-shaped element **200** includes a plurality of and a series of unit structures **210**. The unit structure **210** includes a first leg **211** that extends along the weft thread **10**, a second leg **212** that extends along the weft thread **10** and/or the first leg **211** and is arranged farther from the weft thread **10** than the first leg **211**, an engaging head **213** that couples the first leg **211** and the second leg **212** at a position outwardly of fastener tape, and a return portion **214** that couples the first leg **211** and a second leg **212** of an adjacent unit structure **210** at a position inwardly of fastener tape. The engaging head **213** has projections projected to both sides in a length direction of the fastener tape **100** so that appropriate engagement between left and right engaging heads **213** is ensured. The length direction of the fastener tape **100** matches the front-rear direction.

[0028] Inwardly of fastener tape may indicate a direction directed from a position or point external to the fastener tape **100** to a position or point on the fastener tape **100** in a plane in which the fastener tape **100** exists. More particularly, inwardly of fastener tape may indicate a direction that is directed from a position or point external to the fastener tape **100** to a position or point on the fastener tape **100** while crossing an opposed side edge portion of the fastener tape **100**. Outwardly of fastener tape may indicate a direction directed from a position or point on the fastener tape **100** to a position or point external to the fastener tape **100** in a plane in which the fastener tape **100** exists. More particularly, outwardly of fastener tape may indicate a direction that is directed from a position or point on the fastener tape **100** to a position or point external to the fastener tape **100** while crossing an opposed side edge portion of the fastener tape **100**.

[0029] The fastener tape **100** is a woven fabric in which the weft thread **10** and the warp threads **20** are woven. A loom is utilized to configure a fastener tape **100** from the weft thread **10** and the warp threads **20**. The loom forms a coil-shaped element **200** in parallel to the formation of fastener tape **100**, and embeds the coil-shaped element **200** in the fastener tape **100**. Legs of coil-shaped element that is made of a spirally wound monofilament are tightened to the weft thread **10** by tightening threads **30** included in the warp threads **20**.

[0030] As shown in FIGS. **2** and **3**, the weft thread **10** includes weft thread main portions that extend in a width direction of the fastener tape **100**. The width direction of fastener tape **100** is orthogonal to the length direction of fastener tape **100**. The width direction of fastener tape **100** matches the left-right direction. The warp thread **20** extends in the length direction of fastener tape **100**. In particular, as shown in FIG. **3**, one or more weft threads **10** included in the fastener tape **100** includes a first pair **11** of weft thread main portions onto which a first leg **211** is at least partially overlaid at a side of first tape-surface **101** of the fastener tape **100**. The one or more weft threads **10** included in the fastener tape **100** further includes a second pair **12** of weft thread main portions provided between the first legs **211** that are adjacent in the length direction of fastener tape **100**. The first pair **11** of weft thread main portions and the second pair **12** of weft thread main portions are arranged alternately in the length direction of fastener tape **100**.

[0031] In some cases, the first pair **11** of weft thread main portions is configured as a result of that one weft thread **10** makes a round trip in the width direction of fastener tape **100** so that the weft thread main portions are placed side by side. Similarly, the second pair **12** of weft thread main portions is configured by the round trip of one weft thread **10**. One weft thread main portion included in the first pair **11** of weft thread main portions is continuously coupled to one weft thread main portion included in the second pair **12** of weft thread main portions via a curved weft thread return portion **13**. The paired weft thread main portions configuring the first pair **11** and the paired weft thread main portions configuring the second pair **12** are different portions included in the same single weft thread **10**. That is, in this case, the weft thread **10** included in the fastener tape **100** is configured by the first pairs **11** of weft thread main portions and second pairs **12** of weft thread main portions which are formed from the common weft thread **10** and it configures the fastener tape **100** together with the plurality of warp threads **20** by weaving.

[0032] The warp threads **20** includes a first warp thread that crosses over the second pair **12** of weft thread main portions at a side of first tape-surface **101** of the fastener tape **100** and crosses over the first pair **11** of weft thread main portions at a side of second tape-surface **102** of the fastener tape **100**. The first warp thread floats and emerges from the first tape-surface **101** side to the second tape-surface **102** side by passing through a space between the first pair **11** of weft thread main portions and the second pair **12** of weft thread main portions, and then sinks from the second tape-surface **102** side to the first tape-surface **101** side by passing through a space between the first pair **11** of weft thread main portions and the second pair **12** of weft thread main portions.

[0033] The warp thread **20** includes a second warp thread that crosses over the first pair **11** of weft thread main portions at a side of first tape-surface **101** of the fastener tape **100** and crosses over the second pair **12** of weft thread main portions at a side of second tape-surface **102** of the fastener tape **100**. The second warp thread floats and emerges from the first tape-surface **101** side to the second tape-surface **102** side by passing through a space between the first pair **11** of weft thread main portions and the second pair **12** of weft thread main portions, and then sinks from the second tape-surface **102** side to the first tape-surface **101** side by passing through a space between the first pair **11** of weft thread main portions and the second pair **12** of weft thread main portions. Plain weave structure of fastener tape **100** is configured by the warp threads **20** and the weft thread **10**. It should be noted that the fastener tape **100** can include a structure of a twill weave structure, a satin weave structure or other structures, alternatively or additionally to the plain weave structure.

[0034] The warp thread **20** includes total N or more adjacent tightening threads **30** that tighten the coil-shaped element **200** to the weft thread **10**. Said N indicates a natural number equal to or greater than 2. In a case shown in FIGS. **2** and **3**, N=2. Each of the total N adjacent tightening threads **30** extends so as to tighten the coil-shaped element **200** to the weft thread **10**. Each of the total N adjacent tightening threads **30** repeats crossing over N second legs **212** at the first tape-surface **101** side and crossing over, at the second tape-surface **102** side, the weft thread **10**, i.e. the second pair **12** of weft thread main portions. Each tightening thread **30** crosses over the weft thread **10**, i.e. the second pair **12** of weft thread main portions at a position between the first legs **211** that are adjacent in the length direction of fastener tape **100**. In FIG. **2**, the tightening threads **30** are schematically hatched for easiness of recognition by eyes. The dotted line of tightening thread **30** shown in FIG. **3** indicates that the tightening threads **30** crosses over the second leg **212** at the first tape-surface **101** side. FIG. **4** specifically shows that total two adjacent tightening threads **30** cross over two second legs **212** at the first tape-surface **101** side, and crosses over the second pair **12** of weft thread main portions at the second tape-surface **102** side.

[0035] As shown in FIG. **3**, each tightening thread **30** has an exposed portion **30***k* that is exposed at the second tape-surface **102** side while crossing over the weft thread **10**, i.e. the second pair **12** of weft thread main portions. As shown in FIG. **4**, the exposed portion **30***k* is a part of a tightening threads **30** that emerges to the second tape-surface **102** side by the tightening thread **30** crossing over the weft thread **10**, i.e. the second pair **12** of weft thread main portions at a position between the first legs **211** that are adjacent in the length direction of fastener tape **100**. Note that, also in FIG. **3**, the exposed portions **30***k* are schematically hatched for easiness of recognition by eyes. In the embodiment of the present disclosure, the respective exposed portions **30***k* of the tightening threads **30** appear at a side of the second tape-surface **102** one-by-one alternately as the total N adjacent tightening threads **30** extend. The second pair **12** of weft thread main portions is slightly drawn to the first tape-surface **101** side by the exposed portion **30***k* of the tightening thread **30**. Therefore, in a case where the weft thread main portions of the same second pair **12** are drawn all together to the first tape-surface **101** side by the total N adjacent tightening threads **30**, then a recess may possibly be formed at the second tape-surface **102** side. It is envisaged that the recess will be larger as the number of tightening threads **30** included in the total N adjacent

tightening threads **30** increases. The recess is not preferred from an aspect of design in some cases and other than that, the recess may possibly form a catch on a tape-surface.

[0036] In the present exemplary embodiment, the total N adjacent tightening threads **30** are configured such that the above-described pattern of exposed portions **30***k* appears at the second tape-surface **102** side. Therefore, even if the engaging heads **213** are arranged densely in the length direction of fastener tape **100**, the weft threads **10**, i.e. the weft thread main portions of the second pair **12** all together are not drawn by the N adjacent tightening threads **30** to the first tape-surface **101** side, and thus avoiding or suppressing formation of larger recesses. Moreover, the regular pattern of exposed portion **30***k* presented by the total N adjacent tightening threads **30** appears at the second tape-surface **102** side of fastener tape **10** as a regular design, which not only suppresses the formation of larger recesses or improves the flatness at the second tape-surface **102** side, but also improves a design of the second tape-surface **102** side. As shown in FIG. **1**, when the slide fastener **600** is used such that the second tape-surface **102** appears at a facing side, the above feature would be particularly beneficial. Furthermore, according to such arrangement of tightening threads, endurance of coil-shaped elements **200** against lateral-pulling-force is expected to be increased. It should be noted that if N indicates a natural number equal to or greater than 3, then the respective exposed portions **30***k* of the tightening threads **30** appear at a side of the second tape-surface **102** one-by-one sequentially as the N adjacent tightening threads **30** extend.

[0037] As shown in FIG. **4** particularly, the tightening threads **30** function as a pressing thread that presses the unit structure **210**, i.e. the second leg **212** to the organization of fastener tape **100**, and also function as a winding thread that extends across the unit structures **210** that are adjacent in the length direction of fastener tape **100** and restricts displacement of unit structures **210** along the length direction of fastener tape **100**. As such, in the illustrated example, the tightening thread concurrently serves as the pressing thread and the winding thread, and thus the tape texture would be simplified compared to an embodiment where pressing threads and winding threads are provided separately to the tightening threads. In other words, in the illustrated example, fixing of the coil-shaped element **200** to the fastener tape **100** is achieved beneficially by the tightening threads only.

[0038] The total 2 adjacent tightening threads **30** are referred collectively as a group G**30** of tightening threads. As shown in FIG. **2**, FIG. **3** and FIG. **5**, the coil-shaped element **200** is tightened to the weft thread **10** by first to third groups G**31**-G**33** of tightening threads. Each of the first to third groups G**31**-G**33** of tightening threads includes total 2 tightening threads **30**. In other embodiments, the total number of tightening threads **30** is different in each of the first to third groups G**31**-G**33** of tightening threads. It is assumed that total N tightening threads are included in the first group of tightening threads, total M tightening threads are included in the second group of tightening threads, and total R tightening threads are included in the third group of tightening threads. In some cases, N=M=R is satisfied. In other cases, NWR is satisfied. For example, N=3; the first group G**31** of tightening threads includes total 3 tightening threads **30**: M=4; the second group G**32** of tightening threads includes total 4 tightening threads **30**: R=5; the third group G**32** of tightening threads includes total 5 tightening threads **30**.

[0039] The fastener tape **100** has an element-placed-region **110** on which the coil-shaped element **200** is placed, and a tape main portion **120** that is a remaining portion other than the element-placed-region **110**. The first to third groups G**31**-G**33** of tightening threads are provided in the element-placed-region **110** and continuously cross over the N second legs **212** of the coil-shaped element **200**. A tape texture **112** is provided between the first group G**31** of tightening threads and the second group G**32** of tightening threads. The tape texture **112** includes a plurality of warp threads **20** (3 warp threads in the illustrated case) which cross over the weft thread **10** and are exposed at the first tape-surface **101** side or the second tape-surface **102** side of the fastener tape **100**. In a non-limiting example, the tape texture **112** has a plain weave structure. The tape texture **111** exists at a position outwardly of fastener tape relative to the first group G**31** of tightening threads. The tape texture **111** includes a plurality of warp threads **20** (3 warp threads in the illustrated case) which cross over the weft thread **10** and are exposed at the first tape-surface **101** side or the second tape-surface **102** side of the fastener tape **100**. In a non-limiting example, the tape texture **111** has a plain weave structure. A tape texture **113** is provided between the second group G**32** of tightening threads and the third group G**33** of tightening threads. The tape texture **113** includes a plurality of warp threads **20** (3 warp threads in the illustrated case) which cross over the weft thread **10** and are exposed at the first tape-surface **101** side or the second tape-surface **102** side of the fastener tape **100**. In a non-limiting example, the tape texture **113** has a plain weave structure. The tape main portion **120** (a plain weave structure as an example) of the fastener tape **100** exists inwardly of fastener tape relative to the third group G**33** of tightening threads. The tape texture (a plain weave structure as an example) exists between the plural groups G**30** of tightening threads contributes in avoiding or suppressing formation of larger recesses at the second tape-surface **102** side. It should be noted that, in another example, the number of warp threads included in the tape textures **111**-**113** are different.

[0040] In an example of FIG. **3**, with respect to the total 2 adjacent tightening threads **30**, the exposed portions appear alternately in the length direction of fastener tape **100**. This is a 1/1 structure analogous to the 1/1 plain weave structure of the tape main portion **120**, allowing the element-placed-region **110** to be much analogous to the tape main portion **120**. Furthermore, owing to the tape textures **111**-**113** existing between the plural groups G**30** of tightening threads, the element-placed-region **110** can be more analogous to the tape main portion **120**.

[0041] The total 2 tightening threads **20** included in the group G**30** of tightening threads shown in FIGS. **2** and **3** are referred to as a first tightening thread **30***p* and a second tightening thread **30***q*. FIG. **4** schematically illustrates how the first tightening thread **30***p* and the second tightening thread **30***q* extend along the length direction of fastener tape **100**. When heading from the first tape-surface **101** side to the second tape-surface **102** side, the first tightening thread **30***p* passes by a side of the second leg **212** and/or the first leg **211** included in the unit structure **210** of the coil-shaped element **200** at the first tape-surface **101** side, and passes through the space between the first pair **11** of weft thread main portions

and the second pair **12** of weft thread main portions. This is followed that the first tightening thread **30***p* crosses over the second pair **12** of the weft thread main portions at the second tape-surface **102** side at a position between the first legs **211** that are adjacent in the length direction of fastener tape **100**. When heading from the second tape-surface **102** side to the first tape-surface **101** side, the first tightening thread **30***p* passes through a space between the second pair **12** of weft thread main portions and the first pair **11** of the weft thread main portions, and passes by a side of first leg **211** and/or the second leg **212** included in a unit structure **210** that is adjacent to the above-described unit structure **210**. Next, the first tightening thread **30***p* continuously crosses over 2 second legs **212** at the first tape-surface **101** side. At the first tape-surface **101** side of a place where the first tightening thread **30***p* crosses over the second pair **12** of weft thread main portions at the second tape-surface **102** side, there is a second tightening thread **30***q* that crosses over the 2 second legs **212** that are adjacent in the length direction of fastener tape **100**.

[0042] The second tightening thread **30***q* also makes a round trip or swings between the first tape-surface **101** side and the second tape-surface **102** as extending in a length direction of fastener tape **100** likewise the first tightening thread **30***p*. At the first tape-surface **101** side of a place where the second tightening thread **30***q* crosses over the second pair **12** of weft thread main portions at the second tape-surface **102** side, there is a first tightening thread **30***p* that crosses over the 2 second legs **212** that are adjacent in the length direction of fastener tape **100**. As the first tightening thread **30***p* and the second tightening thread **30***q* extend in the length direction of fastener tape **100**, the exposed portion **30***k* of the first tightening thread **30***p* appears at the second tape-surface **102** side, and next the exposed portion **30***k* of the second tightening thread **30***q* appears at the second tape-surface **102** side. That is, the exposed portions **30***k* of the tightening threads **30** appear at the second tape-surface **102** side alternately one-by-one as the 2 adjacent tightening threads **30** extend.

[0043] There is a second pair **12** of weft thread main portions between the first legs **211** and between the second legs **212** which are adjacent in the length direction of fastener tape **100**. The tightening threads **30**, having passed over the second legs **212** of the coil-shaped element **200**, is required to catch the second pair **12** of weft thread main portion in a relatively short distance in the length direction of fastener tape **100**. Compared to cases where two or more second pair **12** of weft thread main portions exist between the first legs **211** and between the second legs **212** which are adjacent in the length direction of fastener tape **100**, it is envisioned that, in the preset case, the second pair **12** of weft thread main portions is pulled stronger to the first tape-surface **101** side and the recess can be more noticeable. In the present exemplary embodiment, the total N adjacent tightening threads **30** does not draw the weft thread main portions of second pair **12** all together to the first tape-surface **101** side, avoiding or suppressing the formation of larger recesses regardless of dense arrangement of engaging heads **213**.

[0044] FIGS. **6** and **7** illustrates an exemplary embodiment of N=3. As would be understood from FIGS. **6** and **7**, the group G**30** of tightening threads included in the warp thread **20** includes a third tightening threads **30***r* additionally to the first tightening thread **30***p* and the second tightening thread **30***q*. Each group G**30** of tightening threads is configured from total 3 adjacent tightening threads **30**. The first to third tightening threads **30***p*-**30***r* each repeats crossing over 3 second legs **212** at the first tape-surface **101** side and crossing over the second pair **12** of weft thread main portions at the second tape-surface **102** side. As the first to third tightening threads **30***p*-**30***r* extend in the length direction of fastener tape **100**, the exposed portion **30***k* of the first tightening thread **30***p* appears at the second tape-surface **102** side, then the exposed portion **30***k* of the third tightening threads **30***r* appears at the second tape-surface **102** side, and then the exposed portion **30***k* of the second tightening thread **30***q* appears at the second tape-surface **102** side. That is, the exposed portions **30***k* of the tightening threads **30** appear at the second tape-surface **102** side sequentially one-by-one as the total N adjacent tightening threads **30** extend. When an exposed portion **30***k* of one tightening thread **30** appears at the second tape-surface **102** side, exposed portion **30***k* of the other tightening thread **30** included in the total N adjacent tightening threads **30** does not appear at the second tape-surface **102** side. One of the total N tightening threads **30** catches the weft thread **10**, i.e. the second pair **12** of weft thread main portions. In such a case either, the effects similar to above can be achieved.

[0045] A skilled person in the art would understood how a fastener stringer would be manufactured without difficulties, thus undue description is omitted. Reference should be made to the disclosure of Japanese Examined Patent Application Laid-open No. 59-51815, the disclosure of which is incorporated herein by reference.

[0046] Given the above teachings, a skilled person in the art would be able to add various modifications to the respective embodiments. Reference codes in Claims are just for reference and should not be referenced for purposes of narrowly construing the scope of claims. An embodiment is envisaged where the tightening threads cross over one weft thread not the pair of weft threads, and this should also be included in the claimed scope.

REFERENCE SIGNS LIST

[0047] **10** Weft thread
[0048] **11** First pair of weft thread main portions
[0049] **12** Second pair of weft thread main portions
[0050] **20** Warp thread
[0051] **30** Tightening thread
[0052] **30** Exposed portion
[0053] **100** Fastener tape
[0054] **101** First tape-surface
[0055] **102** Second tape-surface
[0056] **200** Coil-shaped element
[0057] **210** Unit structure
[0058] **211** First leg
[0059] **212** Second leg
[0060] **213** Engaging head
[0061] **214** Return portion
[0062] **300** Fastener stringer
[0063] **600** Slide fastener

1. A fastener stringer comprising:

a fastener tape that includes one or more weft threads and a plurality of warp threads, the fastener tape having a first tape-surface and a second tape-surface; and

a coil-shaped element that is provided onto the fastener tape so as to appear at a side of the first tape-surface of

the fastener tape, the coil-shaped element including a series of unit structures, each unit structure including:

a first leg that extends along the weft thread;

a second leg arranged farther away from the weft thread than the first leg;

an engaging head that couples the first leg and the second leg at a position outwardly of fastener tape; and

a return portion that couples the first leg and a second leg of an adjacent unit structure at a position inwardly of fastener tape, wherein

the plurality of warp threads includes total N adjacent tightening threads each repeats crossing over N second legs at a side of the first tape-surface and crossing over the weft thread at a side of the second tape-surface so as to tighten the coil-shaped element to the weft thread, said N indicating a natural number equal to or greater than 2, wherein

each tightening thread includes an exposed portion that crosses over the weft thread between the first legs arranged adjacent in a length direction of the fastener tape and that is exposed at a side of the second tape-surface, and wherein

as the total N adjacent tightening threads extend, the respective exposed portions of the tightening threads appear at a side of the second tape-surface one-by-one alternately or one-by-one sequentially.

2. The fastener stringer according to claim **1** in which the total N adjacent tightening threads is referred to as a first group of tightening threads, wherein the plurality of warp threads includes a second group of tightening threads including total M adjacent tightening threads each repeats crossing over M second legs at a side of the first tape-surface and crossing over the weft thread at a side of the second tape-surface so as to tighten the coil-shaped element to the weft thread, said M indicating a natural number equal to or greater than 2, wherein

the fastener tape includes a tape texture arranged between the first group of tightening threads and the second group of tightening threads.

3. The fastener stringer according to claim **2**, wherein the plurality of warp threads includes a third group of tightening threads including total R adjacent tightening threads each repeats crossing over R second legs at a side of the first tape-surface and crossing over the weft thread at a side of the second tape-surface so as to tighten the coil-shaped element to the weft thread, said R indicating a natural number equal to or greater than 2, wherein

the fastener tape includes a tape texture arranged between the second group of tightening threads and the third group of tightening threads.

4. The fastener stringer according to claim **2**, wherein the tape texture includes a plain weave structure.

5. The fastener stringer according to claim **3**, wherein said N and said M and said R indicate the same number.

6. A slide fastener comprising:

a pair of fastener stringers according to claim **1**; and

at least one slider for opening and closing the pair of fastener stringers, wherein

a pull tab attached to a pull-attachment column provided at a top wing of the slider is arranged at a side of the second tape-surface of the fastener tape.

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