(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 375 317 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
30.06.2021 Bulletin 2021/26

(21) Application number: **15908297.3**

(22) Date of filing: **11.11.2015**

(51) Int Cl.:
A44B 19/06 *(2006.01)* ***A44B 19/42*** *(2006.01)*

(86) International application number:
PCT/JP2015/081787

(87) International publication number:
WO 2017/081777 (18.05.2017 Gazette 2017/20)

(54) FASTENER STRINGER, METHOD FOR MANUFACTURING SAME, AND SLIDE FASTENER

VERSCHLUSSLEISTE, VERFAHREN ZUR HERSTELLUNG DAVON UND REISSVERSCHLUSS

DEMI-CHAÎNE DE FERMETURE, SON PROCÉDÉ DE FABRICATION, ET FERMETURE À GLISSIÈRE

(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

(43) Date of publication of application:
19.09.2018 Bulletin 2018/38

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- **None**

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Description

[Technical field]

[0001] The present disclosure is related to fastener stringers, methods of manufacturing the same, and slide fasteners.

[Background Art]

[0002] Japanese Patent Application Laid-open No. 2005-144895 discloses that a color film is formed onto a stainless steel plate on which a plated layer has been formed.

[0003] EP 2 653 050 A1 discloses a fastener stringer comprising: a fastener tape and a plurality of fastener elements attached to a side-edge portion of the fastener tape, wherein the fastener element comprises a metal base member and a single layered or multi layered surface resin layer formed on the metal base member.

[Summary] [Technical Problem]

[0004] A metal base member of a fastener element may be covered by a plated layer of a desired color, or a metal-oxide layer is formed onto a surface of a metal base member of a fastener element, thereby a desired color, including a chromatic color or achromatic color, of external appearance of fastener elements is achieved. However, the plated layer or the metal-oxide layer may wear off gradually as the number of times of round trip of slider increases, and external appearance of fastener elements may possible be changed. It is envisaged that, in a case where the number of times of round trip of slider exceeds 2 thousand or 3 thousand times, the plated layer or the metal-oxide layer may be removed widely and the metal base member may be exposed widely.

[Solution to Problem]

[0005] A fastener stringer according to the present invention includes a fastener tape (10); and a plurality of fastener elements (20) attached to a side-edge portion of the fastener tape (10), wherein the fastener element (20) comprises: a metal base member (21); a single layered or multi layered surface resin layer (22) formed on the metal base member (21); and one or more intermediate metal layers (23) interposed between the metal base member (21) and the surface resin layer (22), wherein the one or more intermediate metal layers (23) include an exposure metal layer (26) that will be exposed by at least a partial removal of the surface resin layer (22), and wherein the surface resin layer (22) and the exposure metal layer (26) are made of material having the same color tone.

[0006] In some embodiments, the surface resin layer (22) and the exposure metal layer (26) are made of material having black color tone.

[0007] In some embodiments, the exposure metal layer (26) is a SnCo layer, and the one or more intermediate metal layers (23) includes a SnNi layer interposed between the metal base member (21) and the SnCo layer.

[0008] In some embodiments, the one or more intermediate metal layers (23) further includes a Ni layer interposed between the metal base member (21) and the SnNi layer.

[0009] In some embodiments, a thickness of the surface resin layer (22) is equal to or greater than 10 μm.

[0010] A slide fastener according to further aspect of the present disclosure may include: a pair of the fastener stringers (30) as described above; and at least one slider (40) for opening and closing the pair of fastener stringers (30).

[0011] A method of manufacturing a fastener stringer according to yet further aspect of the present disclosure is a method of manufacturing a fastener stringer that comprises a fastener tape (10) and a plurality of fastener elements (20) attached to a side-edge portion of the fastener tape (10), the method comprising: forming one or more intermediate metal layers (23) on a metal base member (21) of the fastener element (20); and forming a single layered or multi layered surface resin layer (22) on the one or more intermediate metal layers (23), wherein the one or more intermediate metal layers (23) include an exposure metal layer (26) that will be exposed by at least a partial removal of the surface resin layer (22), and wherein the surface resin layer (22) and the exposure metal layer (26) are made of material having the same color tone.

[0012] In some embodiments, the surface resin layer (22) and the exposure metal layer (26) are made of material having black color tone.

[0013] In some embodiments, a thickness of the surface resin layer (22) is equal to or greater than 10 μm.

[Advantageous Effects of Invention]

[0014] According to the present invention, it is possible to suppress an extent of change in external appearance of fastener elements regardless of the number of times of round trip of slider exceeding 2 thousand or 3 thousand times.

[Brief Description of Drawings]

[0015]

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

[Fig. 2] Fig. 2 is a schematic perspective view of a fastener element included in a slide fastener according to an exemplary embodiment of the present disclosure.

[Fig. 3] Fig. 3 is a schematic view in which a rear mouth of a slider is viewed in elevation in a slide

fastener according to an exemplary embodiment of the present disclosure, a pull tab of a slider is in an upstanding state.

[Fig. 4] Fig. 4 is a schematic view showing a lamination structure of a fastener element according to an exemplary embodiment of the present disclosure.

[Fig. 5] Fig. 5 is a schematic view showing a lamination structure of a fastener element according to an exemplary embodiment of the present disclosure.

[Fig. 6] Fig. 6 is an expanded partial view of engaged fastener elements of a slide fastener according to an exemplary embodiment of the present disclosure.

[Fig. 7] Fig. 7 is a schematic flowchart showing a method of manufacturing a slide fastener according to an exemplary embodiment of the present disclosure.

[Fig. 8] Fig. 8 is a schematic flowchart showing a method of manufacturing a slide fastener according to an exemplary embodiment of the present disclosure.

[Fig. 9] Fig. 9 is a schematic elevational view of a slide fastener according to another exemplary embodiment of the present disclosure.

[Fig. 10] Fig. 10 is a schematic view showing an engaged state of left and right elements of a slide fastener according to another exemplary embodiment of the present disclosure.

[Fig. 11] Fig. 11 is a picture showing fastener elements of a slide fastener after a sliding test according to a comparative example.

[Fig. 12] Fig. 12 is a picture showing fastener elements of a slide fastener after a sliding test according to a working example.

[Fig. 13] Fig. 13 is a picture showing fastener elements of a slide fastener after a sliding test according to a comparative example.

[Fig. 14] Fig. 14 is a picture showing fastener elements of a slide fastener after a sliding test according to a working example.

[Description of Embodiments]

[0016] Hereinafter, non-limiting exemplary embodiments of the present invention will be described with references to Figs. 1 to 14. 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 combination. 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.

[0017] A slide fastener 100 shown in Fig. 1 has a left-right pair of fastener stringers 30, and a slider 40 for opening and closing the left-right pair of fastener stringers 30. Frontward movement of the slider 40 opens the left-right fastener stringers 30, and rearward movement of the slider 40 closes the left-right fastener stringers 30. Front-rear direction is equal to a direction of movement of slider 40. Left-right direction is equal to a direction of side-by-side arrangement of fastener stringers 30. 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.

[0018] Each fastener stringer 30 has a fastener tape 10, and a plurality of fastener elements 20 attached to a side-edge portion of the fastener tape 10. The fastener tape 10 of one of the left-right fastener stringers 30 has a side-edge portion that is opposed to the fastener tape 10 of the other one of the left-right fastener stringers 30. The plurality of the fastener element 20 is attached to this side-edge portion.

[0019] In some cases, the fastener element 20 is manufactured through a step of die-cutting, by using a punch having an outer shape corresponding to a fastener element 20, a metal plate that has a thickness corresponding to a thickness of fastener element 20. In some cases, the fastener element 20 is manufactured through a step of cutting, by a cutter at a length corresponding to a thickness of fastener element 20, an elongated element-base (element-mother) member that has a terminal shape corresponding to a fastener element 20. Afterward, each fastener element obtained by the die-cutting of metal plate or the cutting of the element-base member may be pressed, if necessary. Then, after passing through at least steps of plating and coating, the fastener elements 20 are attached to the side-edge portion of the fastener tape 10 by a swaging apparatus. At the time of this attachment, the fastener elements 20 will be plastically deformed. In another case, the fastener elements 20 are attached to the fastener tape 10 in arbitrary way, then the fastener elements 20 are plated and coated.

[0020] The fastener tape 10 is a woven or knitted fabric for example, and is a cloth having a flexibility. The fastener element 20 has a pair of legs 211, 212, which sandwich the side-edge portion of the fastener tape 10 or a core thread provided there as schematically shown in Fig. 2, and an engagement head 213 coupled to the pair of legs 211, 212. The above-described swaging apparatus operates so as to reduce a spacing between the pair of legs 211, 212, thereby a fastener element 20 being attached to the side-edge portion of the fastener tape. The engagement head 213 is provided outwardly of fastener tape relative to the pair of legs 211, 212. Outwardly of fastener tape indicates a direction directed from a point or position on the fastener tape to a point or position external of the fastener tape in a plane where the fastener tape exists. Inwardly of fastener tape indicates a direction directed opposite to the outwardly of fastener tape.

[0021] The engagement head 213 of the fastener element 20 has a first projection 214 being projected frontward and a second projection 215 being projected rear-

ward at the opposite side of the first projection 214. The engagement head 213 of the fastener element 20 further has a first recess 216 being recessed at a position between the side-edge portion of the fastener tape 10 and the first projection 214, and a second recess 217 being recessed at a position between the side-edge portion of the fastener tape 10 and the second projection. A fastener element 20 of one of the left-right fastener stringers 30 is inserted into a space between adjacent fastener elements 20 in front-rear direction of the other one of the left-right fastener stringers 30. The first projection 214 of that fastener element 20 inserted between the adjacent fastener elements 20 in front-rear direction is fitted to the second recess 217 of the adjacent front-side fastener element 20, and the second projection 215 of that fastener element 20 is fitted to the first recess 216 of the adjacent rear-side fastener element 20.

[0022] Each fastener stringer 30 has a front stop 50 that is provided adjacent to and at a front-side of a line of elements in which fastener elements 20 are arranged, and a rear stop 60 that is provided adjacent to and at a rear-side of the line of elements. The front stops 50 are separately provided to the respective left-right fastener stringers 30. The rear stop 60 is commonly provided to the left-right fastener stringers 30. In some cases, stops different from the illustrated ones may be employed.

[0023] As schematically shown in Fig. 3, the slider 40 has a top wing 41, a bottom wing 42 arranged to be opposed to the top wing 41, a coupling pillar 43 interconnecting the top wing 41 and the bottom wing 42, a pull-attachment column 44 provided at the top surface of the top wing 41, and a pull tab 45 attached to the pull-attachment column 44. Flange portions 46, 47 are formed along the left-right side-edges of the top wing 41 and the bottom wing 42. The flange portion 46 of the top wing 41 is projected toward the bottom wing 42. The flange portion 47 of the bottom wing 42 is projected toward the top wing 41. The slider 40 has two front mouths 48 at left-right positions of the coupling pillar 43. The slider 40 has one rear mouth 49 at the opposite side of the two front mouths 48. Y-like element passage is provided between the two front mouths 48 and the one rear mouth 49. The element passage is provided between the top wing 41 and the bottom wing 42 and is defined by them in up-down direction. The element passage is also defined by the flange portion 46 of the top wing 41 and the flange portion 47 of the bottom wing 42 from out-side in left-right direction.

[0024] When a fastener element 20 moves between the front mouth 48 and the rear mouth 49 of the slider 40, the top surface of the fastener element 20 touches the top wing 41, the bottom surface of the fastener element 20 touches the bottom wing 42, and the engagement head 213 of the fastener element 20 touches the coupling pillar 43, and legs 211, 212 of the fastener element 20 touches the flange portion 46 of the top wing 41 and the flange portion 47 of the bottom wing 42. When the fastener element 20 moves while touching the top wing 41, the bottom wing 42, the coupling pillar 43 or the flange portion 46, 47, the surface of the fastener element 20 may wear off. It is considered that an extent of wear of surface of fastener element 20 is proportional to the number of times of round trip of slider 40.

[0025] As shown in Figs. 4 and 5, the fastener element 20 includes a metal base member 21 that is made of a metal. The metal base member 21 includes relatively soft metal from a view point of workability. In some cases, the metal base member 21 is made of a single metal. The exemplary single metal includes iron (Fe), zinc (Zn) or aluminum (Al), for example. In some cases, the metal base member 21 is made of an alloy that includes a plurality of metal elements. Copper-zinc alloy (CuZn), copper-zinc-nickel alloy (CuZnNi), red brass, brass or copper-zinc-manganese alloy (CuZnMn) can be used as an exemplary alloy.

[0026] As shown in Figs. 4 and 5, the fastener element 20 includes a single layered or multi layered surface resin layer 22 formed on the metal base member 21, and one or more intermediate metal layers 23 interposed between the metal base member 21 and the surface resin layer 22. The one or more intermediate metal layers 23 includes an exposure metal layer 26 that will be exposed by at least a partial removal of the surface resin layer 22. Note that, in a case where the intermediate metal layer 23 is a single layer, the intermediate metal layer 23 is equal to the exposure metal layer 26.

[0027] As described at the beginning, it is envisaged that, in a case where the number of times of round trip of slider exceeds 2 thousand or 3 thousand times, the plated layer or the metal-oxide layer formed on the metal base member 21 of the fastener element 20 may be removed widely and the metal base member may be exposed widely. In order to solve this problem, it may be considered to cover the metal base member 21 of the fastener element 20 with an extremely-high-rigidity surface metal layer. However, even employing the extremely-high-rigidity surface metal layer, it may be not possible to avoid the emergence of wear in a case where the number of times of round trip of slider exceeds 2 thousand or 3 thousand times or in a case where it reaches up to 5000 times.

[0028] In light of the above consideration, the present inventors have newly recognized that it is not a realistic approach to cover the metal base member 21 with a layer that will never wear and never be removed. Based on this finding, the present inventors have newly discovered that a realistic way would be adopting a surface resin layer 22 which is expected to be removed by wear undoubtedly, and adopting an exposure metal layer 26 which will be exposed by wear of the surface resin layer 22, wherein the surface resin layer 22 and the exposure metal layer 26 are configured to have the same color tone. According to such a configuration, at the initial stage of wear, exposure of the surface resin layer 22 will continue, and initial color of the fastener element 20 is thus maintained. Even if wear of the surface resin layer 22 progresses and the exposure metal layer 26 is exposed,

a partial removal of the surface resin layer 22 is not distinctive as the color of the exposure metal layer 26 and the color of the surface resin layer 22 are the same tone. Even wear of the surface resin layer 22 progresses much further, this would just result in increase of exposed area of the exposure metal layer 26, thereby avoiding or suppressing remarkable change in external appearance of the fastener element 20. Wear of the surface resin layer 22 and the exposure metal layer 26 progresses gradually. Therefore, the change in external appearance of fastener element 20 is also moderate. Note that the colors of the surface resin layer 22 and the exposure metal layer 26 include an achromatic color or chromatic color. In some cases, colors of the surface resin layer 22 and the exposure metal layer 26 are accompanied by luster or metallic luster. Metal includes a single metal or alloy.

[0029] The color of surface resin layer 22 is determined by color of resin forming this surface resin layer 22 and/or color of additive that is mixed into this surface resin layer 22. The additive mixed into the surface resin layer 22 may be inorganic pigment, metal powder, organic pigment or dye, for example. The color of the exposure metal layer 26 is determined by color of metal forming this exposure metal layer 26, i.e. spectral reflectance of the metal. Note that an exemplary exposure metal layer 26 is made of a single metal. Another exemplary exposure metal layer 26 is made of an alloy that includes a plurality of metal elements.

[0030] *"The same color tone"* stated in this specification basically indicates that they are seen as the same color under illumination of white light seen by a human having a normal sight and color vision. The same color is evaluated from at least one aspect of hue, brightness, and chroma. White LED or fluorescent light is employed as an illuminating source. The same color includes color-difference that is not perceivable by human. A range of color in which human eyes cannot distinguish is called a color identification gamut.

[0031] In a case where colors to be compared are achromatic color, brightness of color will be taken into account to compare. The achromatic color includes black, white and gray that is an intermediate color between black and white. A case is assumed where brightness of black is set to be 0, brightness of white is set to be 10, and brightness of gray between the black and white is set to be 1 to 9.

[0032] In a case where colors to be compared have metallic luster, degree of similarity of spectral reflectance (reflectance spectrum) of colors may be taken into account to compare. For example, gold (Au), silver (Ag) and copper (Cu) each has a distinguishable spectral reflectance (reflectance spectrum). Reflectance of gold changes greatly around 500 nm, and yellow and red colors are more reflected than blue color. Silver has a high reflectance over a wide range of visual band from blue color to red color of 400 nm to 700 nm.

[0033] In a case where the surface resin layer 22 has a metallic luster, the surface resin layer 22 is made of a resin into which metal powder is mixed. The metal powder exists in the internal of the surface resin layer 22, and thus metallic luster of the surface resin layer 22 is maintained even if wear of the surface resin layer 22 progresses.

[0034] In an example described with reference to Fig. 4, the surface resin layer 22 and the exposure metal layer 26 have black color tone. That is, the surface resin layer 22 and the exposure metal layer 26 are made of material of black color tone. Change of the external appearance of the fastener element 20 is suppressed even if the exposure metal layer 26 is exposed due to progress of wear of the surface resin layer 22.

[0035] In a specific example, the surface resin layer 22 is made of a transparent resin into which black pigment is mixed. The exposure metal layer 26 is made of a metal layer of black color. The intermediate metal layer 23 between the exposure metal layer 26 and the metal base member 21 includes Ni layer 24 and SnNi layer 25. The metal base member 21 is made of a red brass.

[0036] The surface resin layer 22 can include a synthetic resin such as a melamine resin, alkyd resin, acrylic resin, epoxy resin, polyurethane resin, vinyl chloride resin, silicone resin, and fluorine resin. Pigment to be mixed into the surface resin layer 22 includes carbon black or black color natural mineral, for example. The surface resin layer 22 can include ingredients not described in this specification. The thickness of the surface resin layer 22 is between 5 to 20 pm, for example.

[0037] The exposure metal layer 26 can include black color nickel-zinc (Ni-Zn) alloy, black color tin-nickel (Sn-Ni) alloy, black color tin-cobalt (Sn-Co) alloy or black color chrome, for example. The thickness of the exposure metal layer 26 is between 0.05 to 2 μm, for example.

[0038] The Ni layer 24 is provided mainly for securing wear resistance of the fastener element 20. The thickness of Ni layer is between 0.5 to 5 pm, for example. The SnNi layer 25 is formed to suppress elution of Ni layer. The thickness of the SnNi layer25 is between 0.1 to 1 μm, for example.

[0039] The surface resin layer 22 is formed by a step of coating. The exposure metal layer 26 is formed by a step of plating. Ni layer 24 and SnNi layer 25 are also formed by a step of plating. An electroplating and so on can be suggested as examples of the step of plating. Various conditions of each step may be determined properly by a skilled person in the art. Note that, it is possible to omit the Ni layer 24 by forming the SnNi layer 25 thicker.

[0040] In some specific embodiments, the thickness of the surface resin layer 22 is greater than the total thickness of the intermediate metal layer 23. In some cases, the surface resin layer 22 has a thickness equal to or greater than 10 μm or 15 μm or 20μm. In some cases, the surface resin layer 22 has a thickness equal to or less than 1 μm or 5 μm or 10 μm. In a case where the thickness of the surface resin layer 22 is great, the fastener element 20 may likely touch the slider 40 when the fas-

tener element 20 moves through the slider 40. However, if the thickness of the surface resin layer 22 is great, then the number of round trip of slider required for wear of the surface resin layer 22 is expected to increase.

[0041] In another example described with reference to Fig. 4, the surface resin layer 22 and the exposure metal layer 26 have gold color tone. In this case either, change in the external appearance of the fastener element 20 is suppressed even if the exposure metal layer 26 is exposed due to progress of wear of the surface resin layer 22.

[0042] In a specific example, the surface resin layer 22 is made of a transparent resin into which gold-color metal powder is mixed. The exposure metal layer 26 is made of gold (Au) or gold-color copper-tin (CuSn) alloy or gold-color copper-zinc (CuZn) alloy. Ni layer 24 and SnNi layer 25 are formed between the exposure metal layer 26 and the metal base member 21. The metal base member 21 is made of iron, zinc or nickel silver. The gold-color metal powder mixed into the surface resin layer 22 is a powder of gold (Au) or gold-color copper-tin (CuSn) alloy or gold-color copper-zinc (CuZn) alloy. Note that, it is possible to omit the Ni layer 24 by forming the SnNi layer 25 thicker.

[0043] In yet another example described with reference to Fig. 4, the surface resin layer 22 and the exposure metal layer 26 have copper color tone, i.e. reddish gloss color. In this case either, change in the external appearance of the fastener element 20 is suppressed even if the exposure metal layer 26 is exposed due to progress of wear of the surface resin layer 22.

[0044] In a specific example, the surface resin layer 22 is made of a transparent resin into which copper-color metal powder is mixed. The exposure metal layer 26 is made of copper cyanide or copper sulfate or copper pyrophosphate. Ni layer 24 and Sn-Ni layer 25 are formed between the exposure metal layer 26 and the metal base member 21. The metal base member 21 is made of red brass, nickel silver, iron or zinc. The copper-color metal powder mixed into the surface resin layer 22 is a powder of copper cyanide or copper sulfate or copper pyrophosphate, for example. Note that, it is possible to omit the Ni layer 24 by forming the SnNi layer 25 thicker.

[0045] In an example described with reference to Fig. 5, the surface resin layer 22 and the exposure metal layer 26 have black color tone. Change of the external appearance of the fastener element 20 is suppressed even if the exposure metal layer 26 is exposed due to progress of wear of the surface resin layer 22.

[0046] In a specific example, the surface resin layer 22 is made of a transparent resin into which black pigment is mixed. The exposure metal layer 26 is made of a metal layer having black color. In particular, the exposure metal layer 26 is made of black-color Sn-Co layer. Sn-Ni layer 27 is formed between the exposure metal layer 26 and the metal base member 21. The metal base member 21 is made of a red brass.

[0047] In another example described with reference to Fig. 5, the surface resin layer 22 and the exposure metal layer 26 have silver color tone, and have whitish gross color. Change of the external appearance of the fastener element 20 is suppressed even if the exposure metal layer 26 is exposed due to progress of wear of the surface resin layer 22.

[0048] In a specific example, the surface resin layer 22 is made of a transparent resin into which silver-color metal powder is mixed. The exposure metal layer 26 is made of silver-color metal layer. In particular, the exposure metal layer 26 is made of silver-color Sn-Ni layer. Ni layer 27 is formed between the exposure metal layer 26 and the metal base member 21. The metal base member 21 is made of red brass.

[0049] As shown in Fig. 6, the fastener element 20 has a first surface 28 arranged at one side of the fastener tape 10 and a second surface that extends toward a terminal end of the engagement head. The first surface 28 is a flat surface that is opposed to the top wing 41 of the slider 40 and arranged substantially parallel to the inner surface of the top wing 41 that is opposed to the bottom wing 42. The first surface 28 is a top surface of the fastener element 20 which touches the top wing 41 when the fastener element 20 moves between the front mouth 48 and the rear mouth 49 of the slider 40. The second surface 29 is a sloped surface or curved surface that is downwardly sloped toward the terminal end of the engagement head. In other words, the second surface 29 is sloped or curved in a direction away from the opposed inner surface of the top wing 41 as extending away from the first surface 28.

[0050] In some cases described above, area of the surface resin layer 22 which remains after 5000 times of slider round trip test is between 90 to 99 % or 80 to 90 % or 70 to 80 % of area of the first surface 28. A ratio of exposed area of the exposure metal layer 26, after 5000 times of slider round trip test, to area of the first surface 28 is between 1 to 10 %, or 10 to 20% or 20 to 30 %. There are cases where the intermediate metal layer 23 is exposed which is an under-layer of the exposure metal layer 26, after 5000 times of slider round trip test. However, a ratio of exposed area of the intermediate metal layer 23 to area of the first surface 28 is between 1 to 3 %, or 3 to 7% or 7 to 10 %.

[0051] In some embodiments described above, fastener elements are manufactured in accordance with flowcharts of Figs. 7 and 8, and then are attached to side-edge portions of fastener tapes. In a case of Fig. 7, at step S10, firstly fastener elements are manufactured. The step S10 may be accompanied by the above-described die-cutting or cutting processes. In some cases, the step S10 includes a step of die-cutting, by using a punch having an outer shape corresponding to a fastener element, a metal plate having a thickness corresponding to a thickness of fastener element. In some cases, the step S10 includes a step of cutting, by a cutter at a length corresponding to a thickness of fastener element, an elongated element-base member that has a terminal

shape corresponding to a fastener element. The step S10 may additionally include a step of pressing each fastener element obtained by the die-cutting of the metal plate or the cutting of the element-base member.

[0052] Next, at step S20, fastener elements are plated. A fastener element made of a metal base member 21 which is obtained by the step of die-cutting or cutting and which is not plated and coated will be covered by one or more intermediate metal layers 23 and the exposure metal layer 26 in this order through a step of plating. As shown in Figs. 4 and 5, in cases where a plurality of metal layers is formed, plural times of plating are done for forming the plurality of metal layers. Therefore, in some cases, fastener elements are immersed in plural plating tanks and transferred between the plural plating tanks. In an exemplary embodiment shown in Fig. 4, Ni layer 24 is formed by a step of Ni-plating, SnNi layer 25 is formed by a step of SnNi-plating, and exposure metal layer 26 made of black-color NiZn alloy is formed by black-color NiZn alloy plating. The Ni layer 24, the SnNi layer25, and the black-color NiZn alloy layer are formed successively on the metal base member 21. Note that the step of plating can include a step of electroplating or electroless plating. The composition of plating solution stored in a plating tank will be preferably determined in accordance with a desired composition of plated layers to be formed in the fastener element.

[0053] Next, at step S30, the fastener element is coated after the step of plating. The fastener element after the step of plating is covered by a single layered or multi layered surface resin layer 22 through a step of coating. It is possible to coat the fastener elements by immersing the fastener elements into a coating solution or spraying a coating liquid to the fastener elements. In an exemplary embodiment shown in Fig. 4 described above, a black-color surface resin layer 22 is laminated onto the above-described black-color NiZn alloy layer. The composition of coating solution will be preferably determined in accordance with a desired composition of surface resin layer to be formed in the fastener element.

[0054] Next, at step S40, the fastener element is attached to the side-edge portion of the fastener tape. Specifically, a spacing between a pair of legs of fastener element is reduced by a swaging apparatus, and the side-edge portion of fastener tape is sandwiched by the pair of legs of fastener element. In some cases, additionally to steps S10 to S40, washing step, heating step or drying step may be performed.

[0055] In a case shown in Fig. 8, fastener elements are attached to a side-edge portion of a fastener tape before steps of plating and coating. Fastener stringers 30 can be manufactured suitably even in such a method. Description is omitted as method of manufacturing slide fasteners 100 from fastener stringers 30 has been widely known in this art.

[0056] In some embodiments, a slide fasteners 100 shown in Figs. 9 and 10 is presented. In the slide fastener 100 shown in Fig. 9, fastener element 20s having a different shape with fastener elements 20 of the slide fastener 100 shown in Fig. 1 are employed. Even in this case, similar technical effects as above can be obtained. Note that a rear stop shown in Fig. 9 is called a separable stop and has a structure which allows separation of left and right fastener stringers 30.

[0057] As shown in Fig. 10, a head portion 213 of fastener element 20 is provided with one engagement projection 218 projected frontward and an engagement recess 219 recessed frontward, and the engagement projection 218 and the engagement recess 219 are arranged oppositely in the front-rear direction. As shown in Fig. 10, with respect to the illustrated three fastener elements 20, an engagement projection 218 of fastener element 20 positioned at the center is fitted into an engagement recess 219 of fastener element 20 positioned at front-side. In Fig. 10, the front-side fastener element 20 is shown in a partial cross-sectional view for clearly illustrating the engagement recess 219 of the front-side fastener element 20. Note that the fastener stringer 30 shown in Fig. 9 can be manufactured in accordance with manufacturing methods of Figs. 7 and 8.

Working Example

[0058] Figs. 11 and 12 have the same configuration with the slide fastener 100 shown in Fig. 1. Fig. 11 is a picture showing a condition, after 5000 times of slider round trip test, of a slide fastener 100 having fastener elements 20 according to a comparative example. The fastener element 20 according to a comparative example has a metal base member 21 of red brass and a black-color surface resin layer 22 formed directly onto the metal base member 21. The surface resin layer 22 is a transparent resin into which carbon black is mixed. The resin material of the surface resin layer 22 is acrylic resin and its thickness is 10 μm.

[0059] Fig. 12 is a picture showing a condition, after 5000 times of slider round trip test, of a slide fastener 100 having fastener elements 20 according to a working example. The fastener element 20 according to working example has a metal base member 21 of red brass, Ni layer 24, SnNi layer 25, and black-color SnCo layer 26, and a surface resin layer 22. Thickness of Ni layer 24 is 2 pm, thickness of SnNi layer 25 is 0.5 pm, thickness of the black-color SnCo layer 26 is 0.1 pm, and thickness of the surface resin layer 22 is 10 μm. The surface resin layer 22 is a transparent resin into which carbon black is mixed. The resin material of the surface resin layer 22 is acrylic resin.

[0060] As would be understood from comparison between Fig. 11 and Fig. 12, in the case of comparative example of Fig. 11, the remaining region of the surface resin layer is narrow and contrast between black-color and silver-white-color is noticeable. On the other hand, in the case of the working example of Fig. 12, the remaining region of the surface resin layer 22 is wider than the comparative example of Fig. 11, and contrast between

black-color and silver-white-color is suppressed because the surface resin layer 22 and the exposure metal layer 26 have the same color tone.

[0061] In the comparative example of Fig. 11, a ratio of area of the surface resin layer 22, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 85 to 99 %.

[0062] In the working example of Fig. 12, a ratio of area of the surface resin layer 22, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 85 to 99 %. A ratio of exposed area of the exposure metal layer 26, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 1 to 15 %. The intermediate metal layer 23 is exposed which is an under-layer of the exposure metal layer 26, after 5000 times of slider round trip test. A ratio of this exposed area of the intermediate metal layer 23 to area of the first surface 28 is between 0.5 to 5 %.

[0063] Fig. 13 and Fig. 14 have the same configuration with the slide fastener 100 shown in Fig. 9. Fig. 13 is a picture showing a condition, after 5000 times of slider round trip test, of a slide fastener 100 having fastener elements 20 according to a comparative example. The fastener element 20 according to a comparative example has a metal base member 21 of red brass and a black-color surface resin layer 22 formed directly onto the metal base member 21. The surface resin layer 22 is a transparent resin into which carbon black is mixed. The resin material of the surface resin layer 22 is acrylic resin and its thickness is 10 μm.

[0064] Fig. 14 is a picture showing a condition, after 5000 times of slider round trip test, of a slide fastener 100 having fastener elements 20 according to a working example. The fastener element 20 according to a working example has a metal base member 21 of red brass, Ni layer 24, SnNi layer 25, and black-color SnCo layer 26, and a surface resin layer 22. Thickness of Ni layer 24 is 2 pm, thickness of SnNi layer 25 is 0.5 pm, thickness of the black-color SnCo layer 26 is 0.1 μm, and thickness of the surface resin layer 22 is 10 μm. The surface resin layer 22 is a transparent resin into which carbon black is mixed. The resin material of the surface resin layer 22 is acrylic resin.

[0065] As would be understood from comparison of Figs. 13 and 14, in a case of comparative example of Fig. 13, red brass is exposed at regions of leg portion 212 of fastener element 20 which are positioned outwardly of fastener tape. Color difference between red brass and black-color surface resin layer 22 is presented noticeably, and thus change in external appearance of fastener element 20 would be noticeable for users. In a case of working example of Fig. 14, such color change in external appearance of fastener element 20 is not noticeable for users.

[0066] In the comparative example of Fig. 13, a ratio of area of the surface resin layer 22, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 85 to 99 %.

[0067] In the working example of Fig. 14, a ratio of area of the surface resin layer 22, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 85 to 99 %. A ratio of exposed area of the exposure metal layer 26, which remains after 5000 times of slider round trip test, to area of the first surface 28 is between 1 to 15 %. The intermediate metal layer 23 is exposed which is an under-layer of the exposure metal layer 26, after 5000 times of slider round trip test. A ratio of this exposed area of the intermediate metal layer 23 to area of the first surface 28 is between 0.5 to 5 %.

[0068] 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. The specific shapes of fastener element should not be limited to ones disclosed in this specification.

[Reference Signs List]

[0069]

10	the fastener tape
20	the fastener element
21	the metal base member
22	the surface resin layer
23	the intermediate metal layer
26	the exposure metal layer
30	the fastener stringer

Claims

1. A fastener stringer (30) comprising:

a fastener tape (10); and
a plurality of fastener elements (20) attached to a side-edge portion of the fastener tape (10), wherein
the fastener element (20) comprises:

a metal base member (21);
a single layered or multi layered surface resin layer (22) formed on the metal base member (21);
and
one or more intermediate metal layers (23) interposed between the metal base member (21) and the surface resin layer (22), wherein

the one or more intermediate metal layers (23) include an exposure metal layer (26) that will be exposed by at least a partial removal of the surface resin layer (22), **characterized in that**
the surface resin layer (22) and the exposure metal layer (26) are made of material having the

same color tone.

2. The fastener stringer of Claim 1, wherein the surface resin layer (22) and the exposure metal layer (26) are made of material having black color tone.

3. The fastener stringer of Claim 1 or 2, wherein the exposure metal layer (26) is a SnCo layer, and the one or more intermediate metal layers (23) includes a SnNi layer interposed between the metal base member (21) and the SnCo layer.

4. The fastener stringer of Claim 3, wherein the one or more intermediate metal layers (23) further includes a Ni layer interposed between the metal base member (21) and the SnNi layer.

5. The fastener stringer of any one of Claims 1 to 4, wherein a thickness of the surface resin layer (22) is equal to or greater than 10 μm.

6. A slide fastener comprising:

a pair of the fastener stringers (30) of any one of Claims 1 to 5; and
at least one slider (40) for opening and closing the pair of fastener stringers (30).

7. A method of manufacturing a fastener stringer that comprises a fastener tape (10) and a plurality of fastener elements (20) attached to a side-edge portion of the fastener tape (10), the method comprising:

forming one or more intermediate metal layers (23) on a metal base member (21) of the fastener element (20); and
forming a single layered or multi layered surface resin layer (22) on the one or more intermediate metal layers (23), wherein
the one or more intermediate metal layers (23) include an exposure metal layer (26) that will be exposed by at least a partial removal of the surface resin layer (22), **characterized in that**
the surface resin layer (22) and the exposure metal layer (26) are made of material having the same color tone.

8. The method of manufacturing a fastener stringer of Claim 7, wherein the surface resin layer (22) and the exposure metal layer (26) are made of material having black color tone.

9. The method of manufacturing a fastener stringer of Claim 7 or 8, wherein a thickness of the surface resin layer (22) is equal to or greater than 10 μm.

Patentansprüche

1. Reißverschlusskette (30), aufweisend:

ein Tragband (10); und
eine Vielzahl von an einem Seitenkantenbereich des Tragbands (10) befestigten Kuppelgliedern (20), wobei
das Kuppelglied (20) aufweist:

ein metallisches Grundelement (21);
eine ein- oder mehrschichtige Oberflächenharzschicht (22), die auf dem metallischen Grundelement (21) ausgebildet ist; und
eine oder mehrere Metallzwischenschicht(en) (23), die zwischen dem metallischen Grundelement (21) und der Oberflächenharzschicht (22) angeordnet ist/sind, wobei

die eine oder mehreren Metallzwischenschicht(en) (23)
eine freigelegte Metallschicht (26), die durch zumindest eine teilweise Entfernung der Oberflächenharzschicht (22) freigelegt ist, umfasst/umfassen, **dadurch gekennzeichnet, dass**
die Oberflächenharzschicht (22) und die freigelegte Metallschicht (26) aus Material mit demselben Farbton hergestellt sind.

2. Reißverschlusskette nach Anspruch 1, wobei die Oberflächenharzschicht (22) und die freigelegte Metallschicht (26) aus Material mit schwarzem Farbton hergestellt sind.

3. Reißverschlusskette nach Anspruch 1 oder 2, wobei die freigelegte Metallschicht (26) eine SnCo-Schicht ist und die eine oder mehreren Metallzwischenschicht(en) (23) eine SnNi-Schicht umfasst/umfassen, die zwischen dem metallischen Grundelement (21) und der SnCo-Schicht angeordnet ist.

4. Reißverschlusskette nach Anspruch 3, wobei die eine oder mehreren Metallzwi-schenschicht(en) (23) weiter eine Ni-Schicht umfasst/umfassen, die zwischen dem metallischen Grundelement (21) und der SnNi-Schicht angeordnet ist.

5. Reißverschlusskette nach einem der Ansprüche 1 bis 4, wobei eine Dicke der Oberflächenharzschicht (22) gleich oder größer als 10 μm ist.

6. Reißverschluss, aufweisend:

ein Paar der Reißverschlussketten (30) nach einem der Ansprüche 1 bis 5; und
mindestens einen Schieber (40) zum Öffnen

und Schließen des Paares von Reißverschlussketten (30).

7. Verfahren zum Herstellen einer Reißverschlusskette, die ein Tragband (10) und eine Vielzahl von an einem Seitenkantenbereich des Tragbands (10) befestigten Kuppelgliedern (20) aufweist, wobei das Verfahren aufweist:

das Ausbilden einer oder mehrerer Metallzwischenschicht(en) (23) auf einem metallischen Grundelement (21) des Kuppelglieds (20); und
das Ausbilden einer ein- oder mehrschichtigen Oberflächenharzschicht (22) an der einen oder mehreren Metallzwischenschicht(en) (23), wobei
die eine oder mehreren Metallzwischenschicht(en) (23) eine freigelegte Metallschicht (26) umfassen, die durch zumindest eine teilweise Entfernung der Oberflächenharzschicht (22) freigelegt ist,
dadurch gekennzeichnet, dass
die Oberflächenharzschicht (22) und die freigelegte Metallschicht (26) aus Material mit demselben Farbton hergestellt sind.

8. Verfahren zum Herstellen einer Reißverschlusskette nach Anspruch 7, wobei die Oberflächenharzschicht (22) und die freigelegte Metallschicht (26) aus einem Material mit schwarzem Farbton hergestellt sind.

9. Verfahren zum Herstellen einer Reißverschlusskette nach Anspruch 7 oder 8, wobei eine Dicke der Oberflächenharzschicht (22) gleich oder größer als 10 μm ist.

Revendications

1. Demi-chaîne de fermeture (30) comprenant :

un ruban de fermeture (10) ; et
une pluralité d'éléments de fermeture (20) attachés à une portion de bord latéral du ruban de fermeture (10), dans laquelle
l'élément de fermeture (20) comprend :

un organe de base en métal (21) ;
une couche de surface en résine (22), monocouche ou multicouche, formée sur l'organe de base en métal (21) ;
et
une ou plusieurs couches intermédiaires en métal (23) interposées entre l'organe de base en métal (21) et la couche de surface en résine (22), dans laquelle
la ou les couches intermédiaires en métal (23) comportent une couche d'exposition en métal (26) qui sera exposée par au moins une élimination partielle de la couche de surface en résine (22),
caractérisée en ce que la couche de surface en résine (22) et la couche d'exposition en métal (26) sont réalisées dans un matériau ayant le même ton.

2. Demi-chaîne de fermeture de la revendication 1, dans laquelle la couche de surface en résine (22) et la couche d'exposition en métal (26) sont réalisées dans un matériau ayant un ton noir.

3. Demi-chaîne de fermeture de la revendication 1 ou 2, dans laquelle la couche d'exposition en métal (26) est une couche en SnCo, et la ou les couches intermédiaires en métal (23) comportent une couche en SnNi interposée entre l'organe de base en métal (21) et la couche en SnCo.

4. Demi-chaîne de fermeture de la revendication 3, dans laquelle la ou les couches intermédiaires en métal (23) comportent en outre une couche en Ni interposée entre l'organe de base en métal (21) et la couche en SnNi.

5. Demi-chaîne de fermeture de l'une quelconque des revendications 1 à 4, dans laquelle une épaisseur de la couche de surface en résine (22) est supérieure ou égale à 10 μm.

6. Fermeture à glissière comprenant :

une paire de demi-chaînes de fermeture (30) de l'une quelconque des revendications 1 à 5 ; et
au moins un curseur (40) pour ouvrir et fermer la paire de demi-chaînes de fermeture (30).

7. Procédé de fabrication d'une demi-chaîne de fermeture qui comprend un ruban de fermeture (10) et une pluralité d'éléments de fermeture (20) attachés à une portion de bord latéral du ruban de fermeture (10), le procédé comprenant :

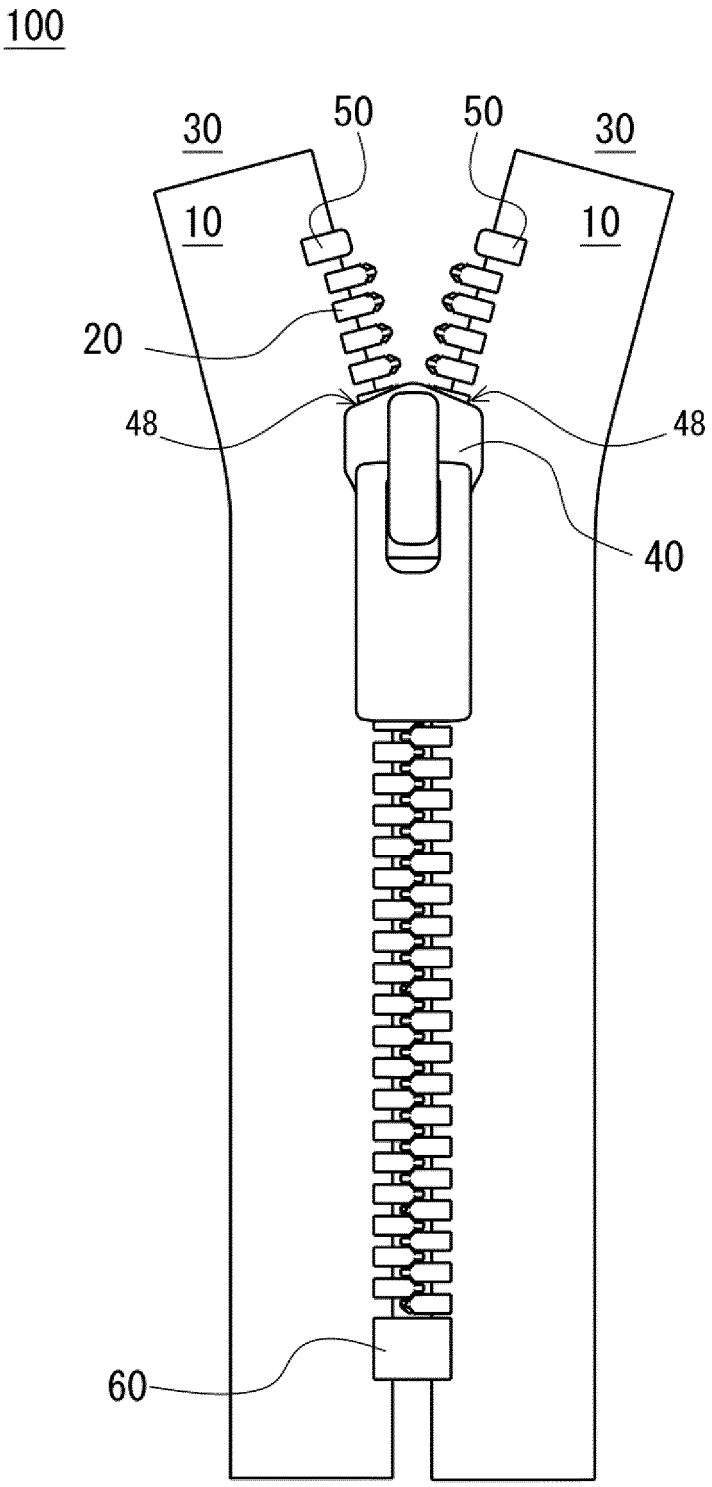
la formation d'une ou de plusieurs couches intermédiaires en métal (23) sur un organe de base en métal (21) de l'élément de fermeture (20) ; et
la formation d'une couche de surface en résine (22), monocouche ou multicouche, sur la ou les couches intermédiaires en métal (23), dans lequel
la ou les couches intermédiaires en métal (23) comportent une couche d'exposition en métal (26) qui sera exposée par au moins une élimination partielle de la couche de surface en rési-

ne (22), **caractérisé en ce que**
la couche de surface en résine (22) et la couche d'exposition en métal (26) sont réalisées dans un matériau ayant le même ton.

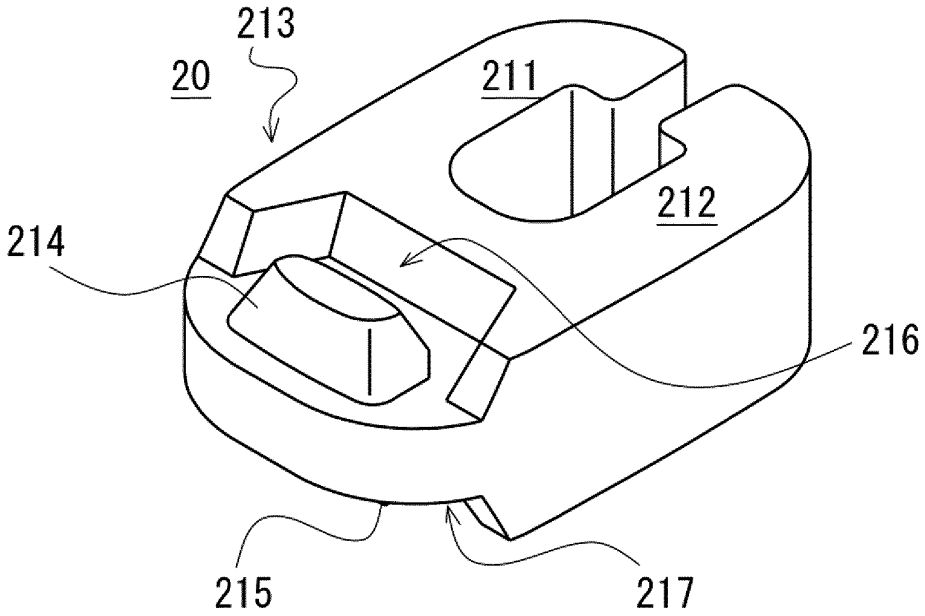
8. Procédé de fabrication d'une demi-chaîne de fermeture de la revendication 7, dans lequel la couche de surface en résine (22) et la couche d'exposition en métal (26) sont réalisées dans un matériau ayant un ton noir.

9. Procédé de fabrication d'une demi-chaîne de fermeture de la revendication 7 ou 8, dans lequel une épaisseur de la couche de surface en résine (22) est supérieure ou égale à 10 μm.

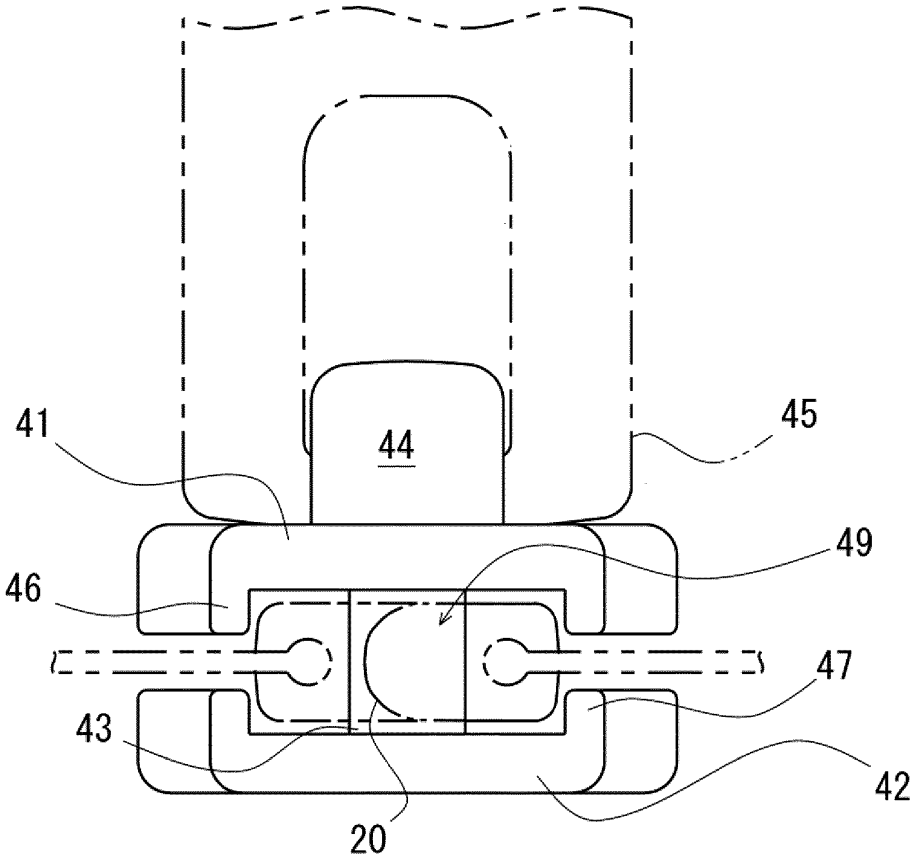
[Fig. 1]



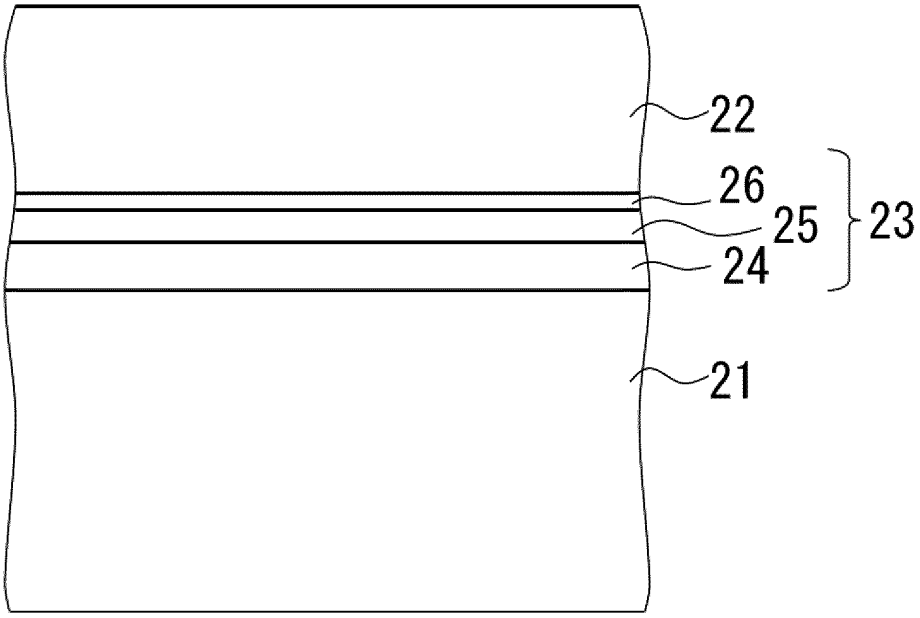
[Fig. 2]



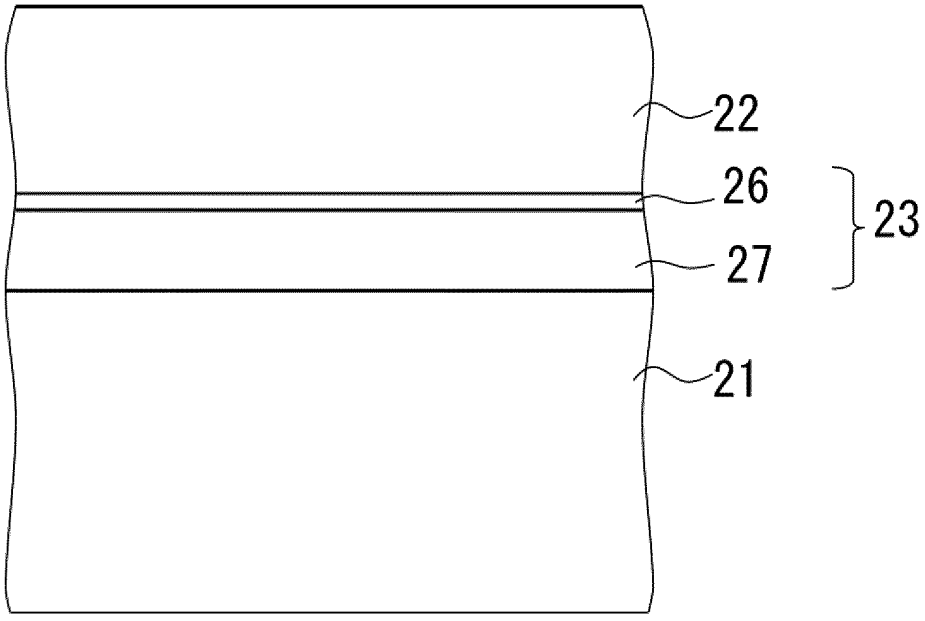
[Fig. 3]



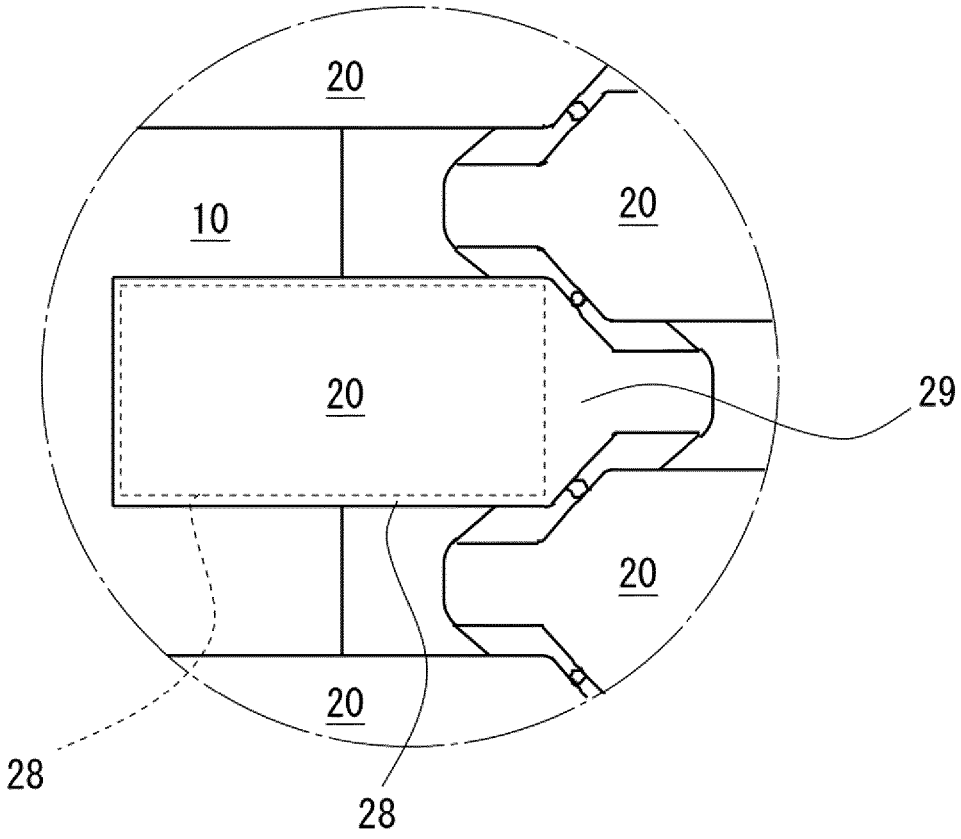
[Fig. 4]



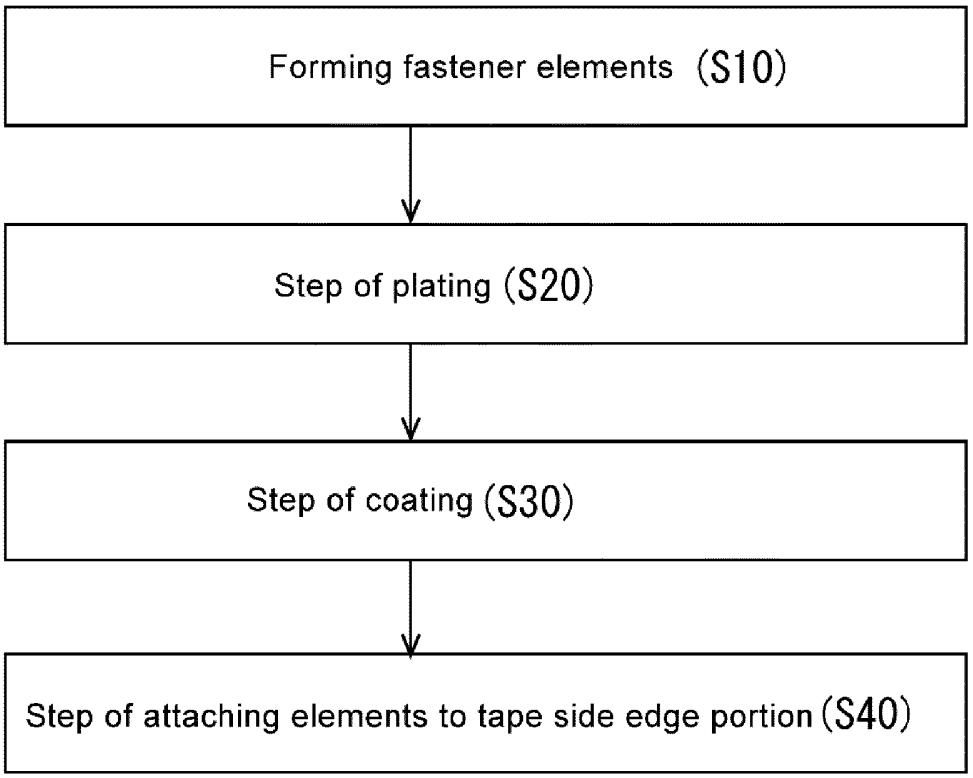
[Fig. 5]



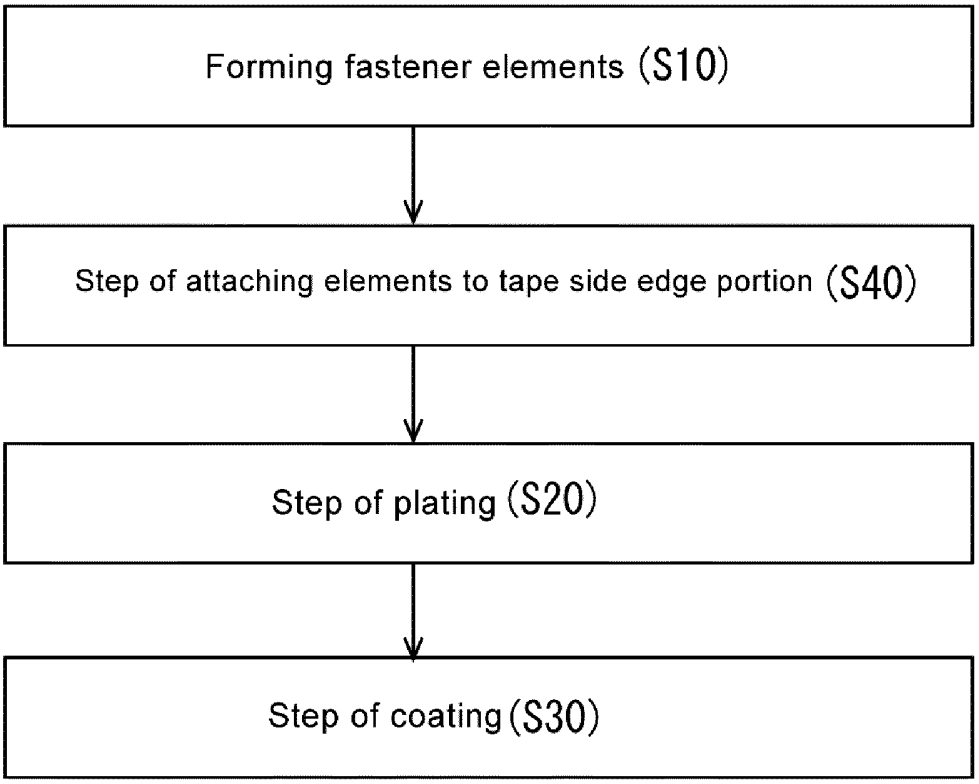
[Fig. 6]



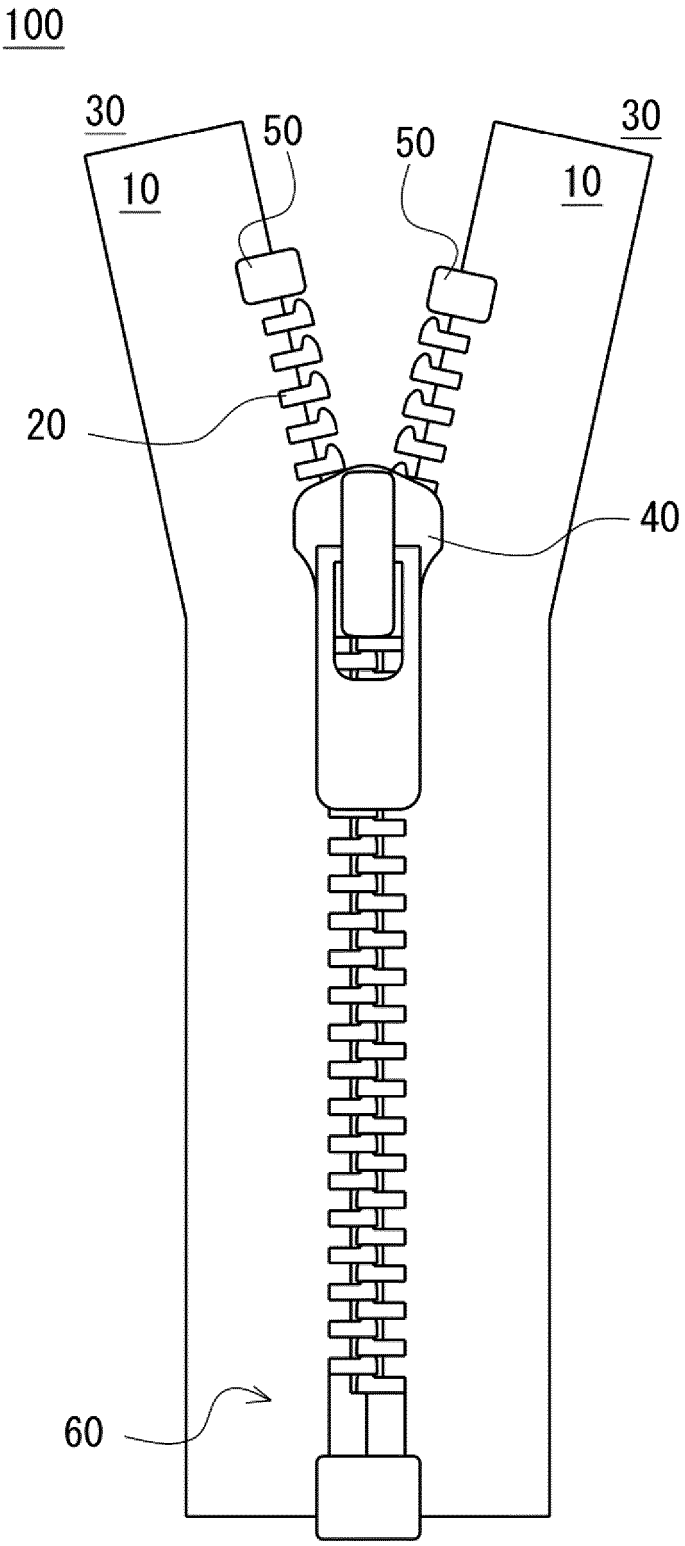
[Fig. 7]


Forming fastener elements (S10)
Step of plating (S20)
Step of coating (S30)
Step of attaching elements to tape side edge portion (S40)

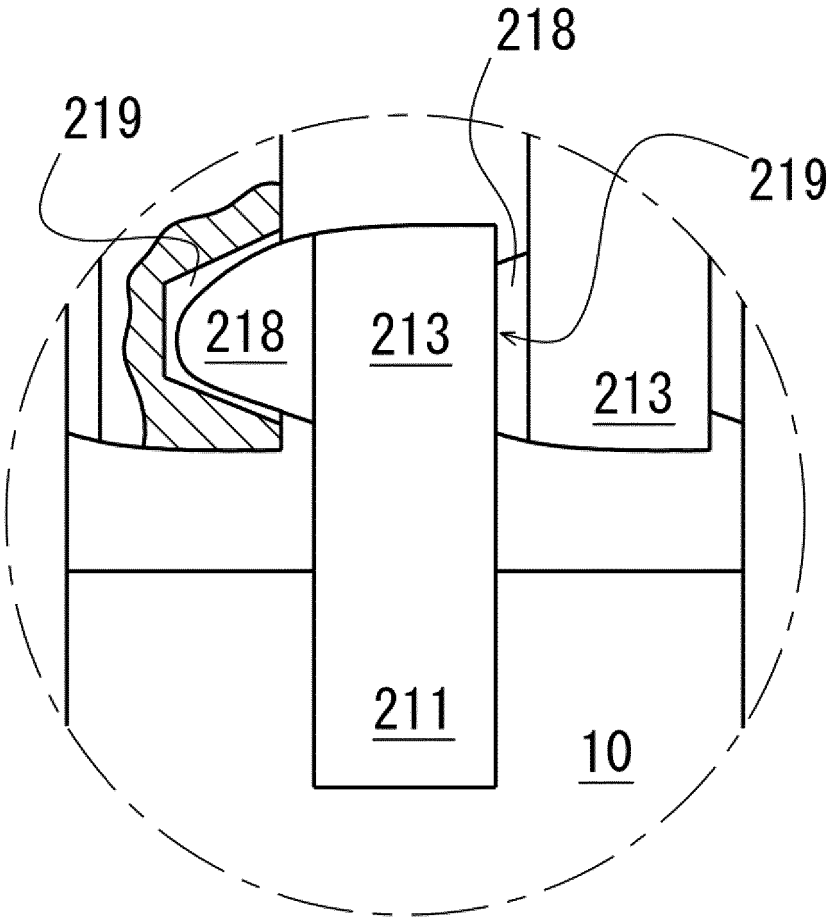
[Fig. 8]


Forming fastener elements (S10)
Step of attaching elements to tape side edge portion (S40)
Step of plating (S20)
Step of coating (S30)

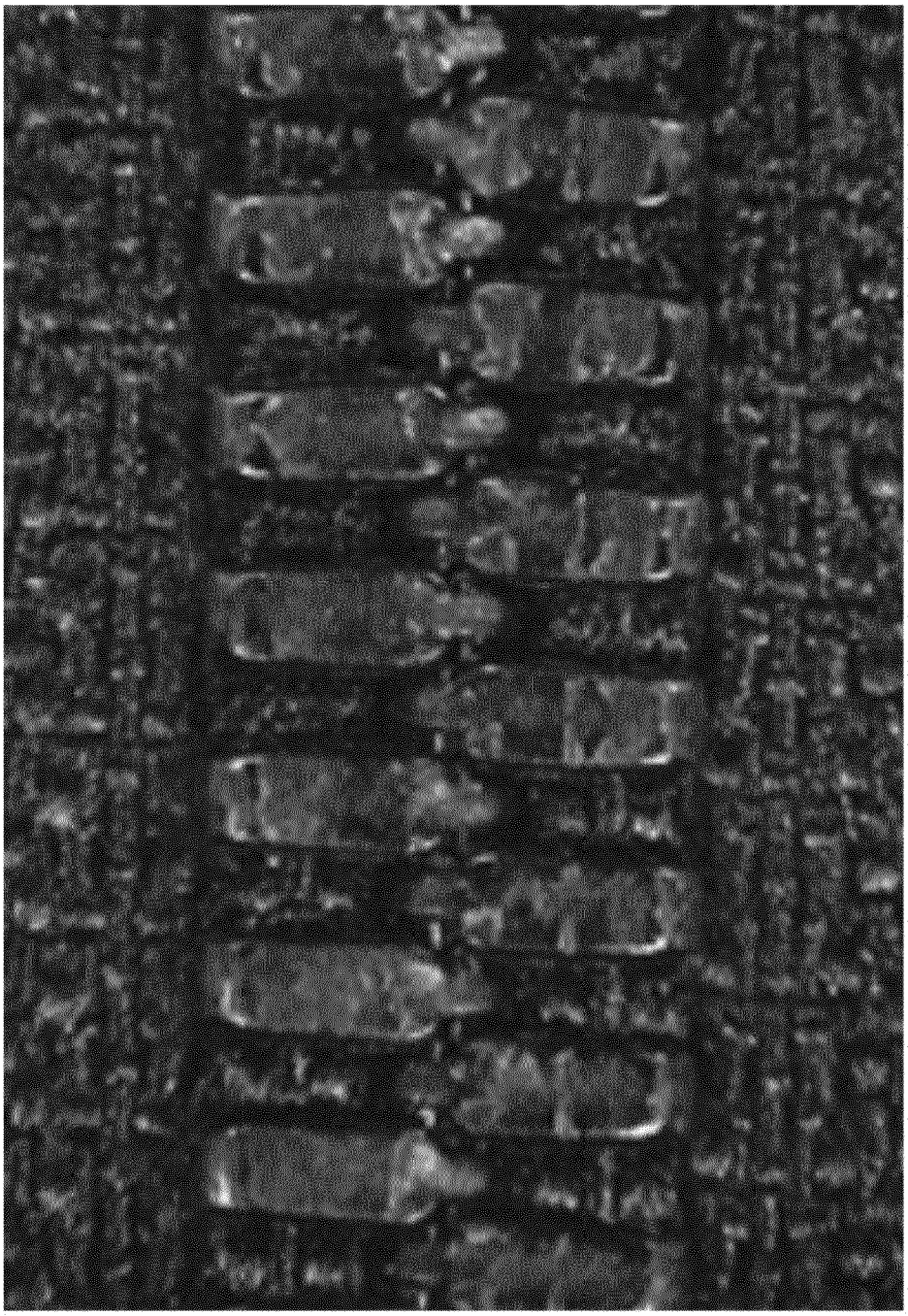
[Fig. 9]



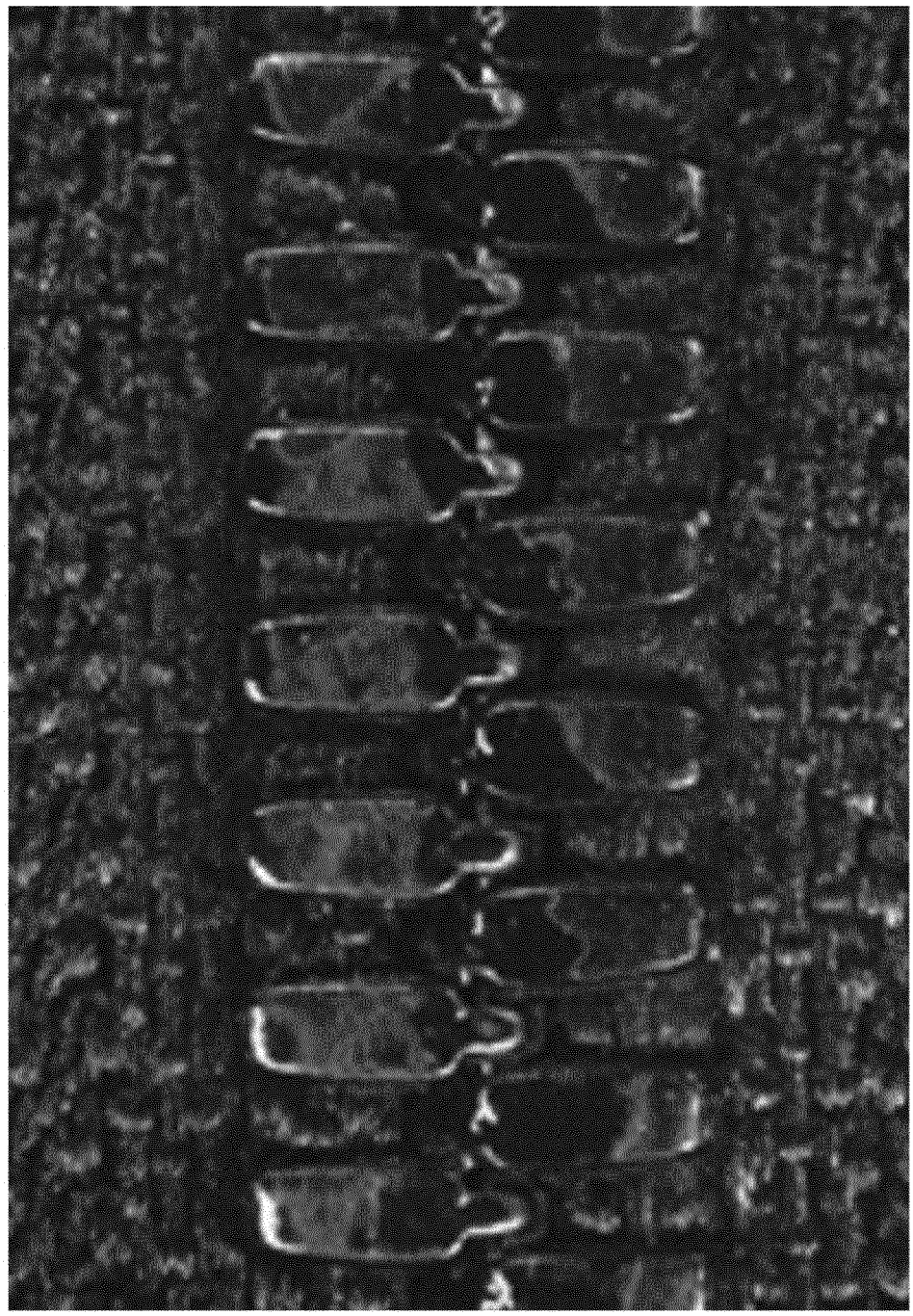
[Fig. 10]



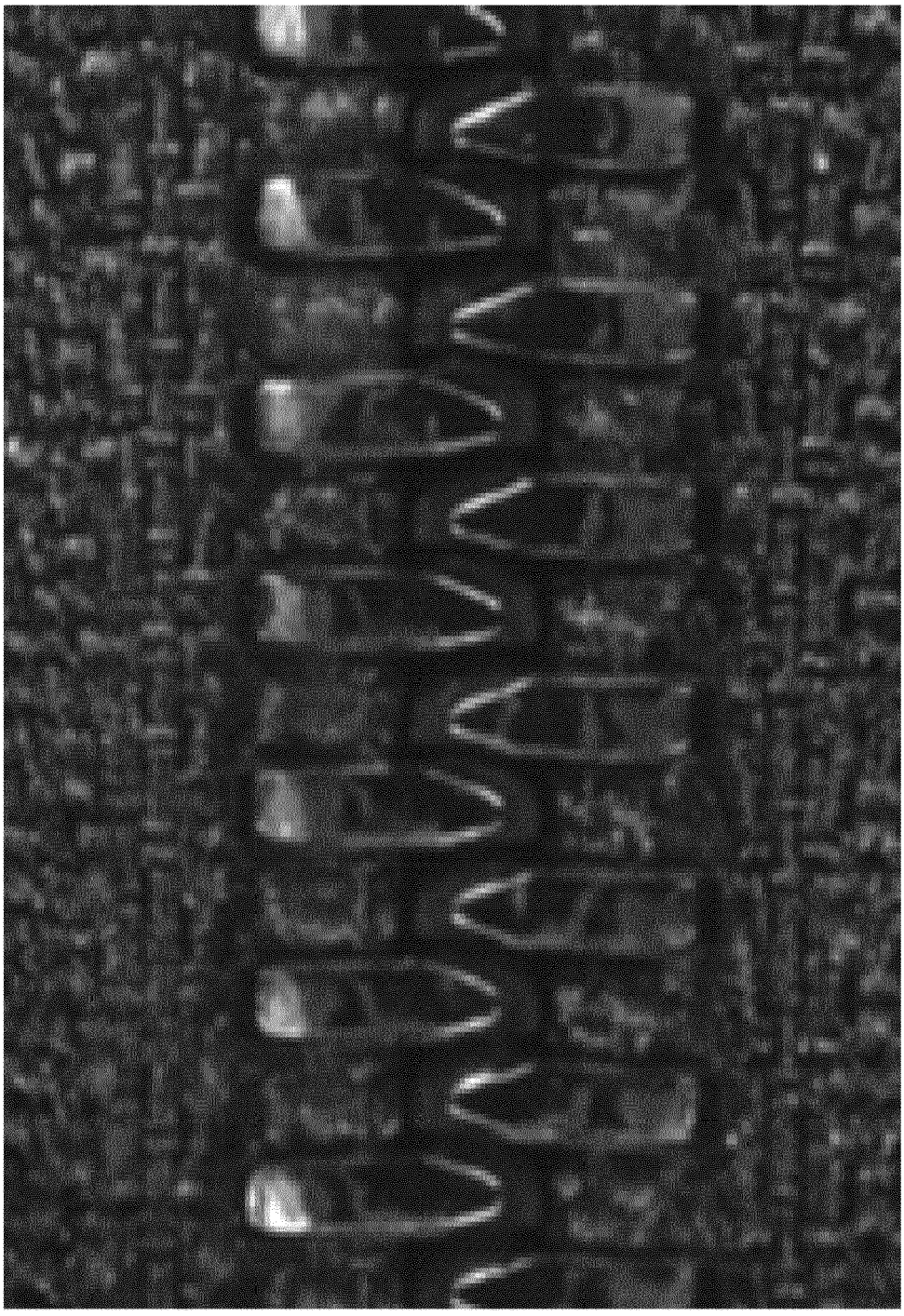
[Fig. 11]



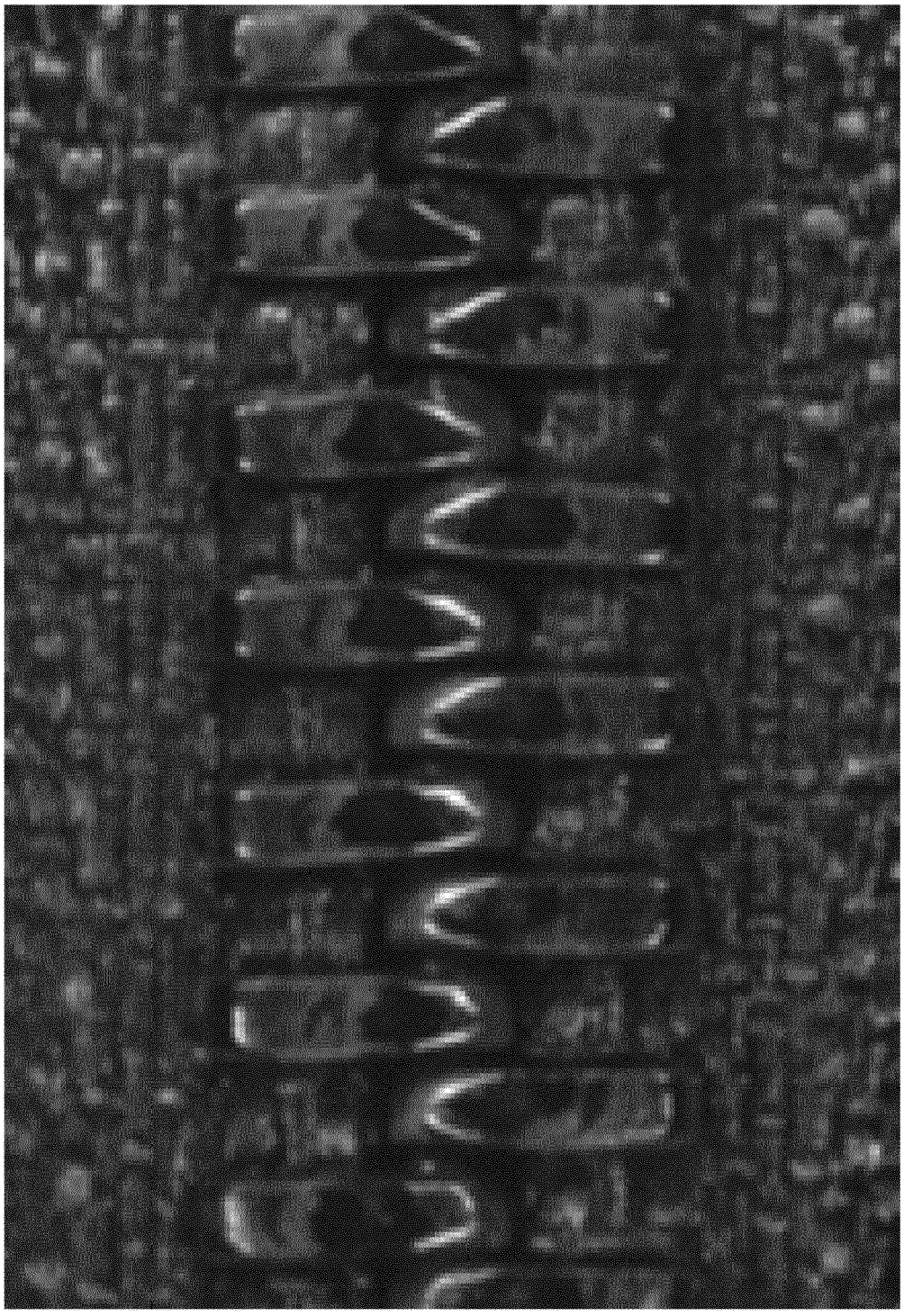
[Fig. 12]



[Fig. 13]



[Fig. 14]



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005144895 A **[0002]**
- EP 2653050 A1 **[0003]**