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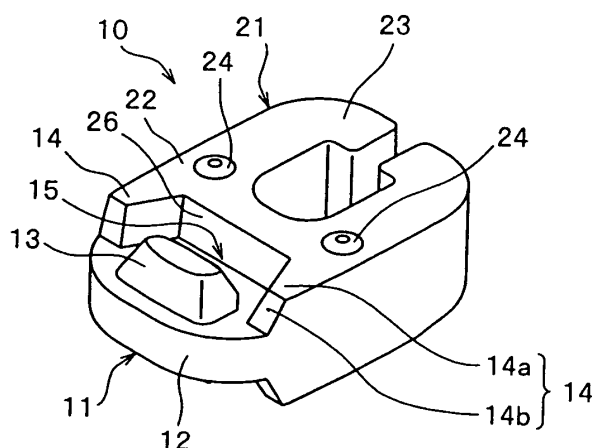
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(54) **FASTENER ELEMENT**

(57) A fastener element (10, 10', 40) according to the invention includes a coupling head (11, 41) and a bifurcated tape-sandwiching portion (21, 21', 51) extending from the coupling head (11, 41). At least one sticking preventing convex portion (24, 54) is projectingly disposed on at least one surface of sticking surfaces where the fastener elements stick to each other when the fastener element (10, 10', 40) is subjected to liquid processing. Thus, when the liquid processing, such as a coating

process is performed on a plurality of fastener elements (10, 10', 40), a phenomenon that the fastener elements strongly stick to each other due to the surface contact of the first element surfaces and do not separate from each other is prevented, and thus processing, such as coating can be uniformly performed on the entire fastener element. For such a reason, it is possible to prevent the occurrence of coating failure or uneven quality in the fastener element.

FIG. 1



Description

TECHNICAL FIELD

[0001] The invention relates to a metal fastener element for a slide fastener.

BACKGROUND ART

[0002] A metal fastener element usually includes a coupling head, a body portion that extends backward from a base end portion of the coupling head, and a pair of left and right leg portions that are two legs branching off from the body portion and extending backward. The metal fastener element is typically manufactured by two representative methods.

[0003] According to one manufacturing method of the metal fastener element, rolling is first performed on a long wire material having a Y-shaped cross section in multiple stages, and the wire material is sequentially cut in a length direction at a desired thickness to fabricate a Y-shaped element material. Subsequently, a portion of the element material corresponding to a coupling head is locally press-deformed to form a coupling convex portion and a coupling concave portion, so that the fastener elements are formed.

[0004] Subsequently, the formed fastener elements are sequentially implanted at a constant pitch along one side edge of a long fastener tape that is delivered separately by a swaging means. As a result, a fastener stringer in which the metal fastener elements are lined is manufactured.

[0005] Further, according to the other manufacturing method of the metal fastener element, a rectangular wire material made of metal is plastic-deformed by pressing of a press punch and a press die to form a coupling head, and the rectangular wire material with the coupling head that is formed is sequentially punched in the shape of an element using a cutting punch and a cutting die, so that fastener elements are manufactured in a discrete state.

[0006] The fastener elements obtained by the above described methods are subjected to a polishing process, such as barrel polishing or chemical polishing and a coating process that performs clear coating on a surface of the element or the like, and then continuously supplied to one side edge of a long fastener tape through a parts feeder that adjusts a posture of the fastener element or the like. Then, the supplied fastener elements are implanted into the fastener tape one by one by a swaging means, so that a fastener stringer is fabricated.

[0007] The fastener element manufactured by the latter method is versatile, for example, in terms of outward shape or structure of the coupling head since it can be shaped into various shapes by the press punch and the press die. Further, the fastener element has merit in visual quality or design since it can be imparted with a gloss in a manner of performing polishing on the entire surface of the element through the polishing process and can be

coated in a desired color tone through the coating process.

[0008] Examples of the slide fastener manufactured by punching the rectangular metal wire material are disclosed in Japanese Utility Model Application Laid-Open No. 1-80012 (Patent Document 1) and Japanese Patent Application Laid-Open No. 2005-237532 (Patent Document 2).

A fastener element 70 disclosed in the Patent Documents includes a coupling head 71 and a tape-sandwiching portion 81 that extends from the coupling head 71 as illustrated in FIG. 18.

[0009] In the fastener element 70, the coupling head 71 includes a flat plate portion 72 of a thin walled shape, coupling convex portions 73 protruding from the upper surface and the lower surface of the flat plate portion 72, and left and right rising portions 74 that are raised from the flat plate portion 72 in a vertical direction and extend toward left and right sides of the coupling convex portions 73 from the tape-sandwiching portion 81.

[0010] The tape-sandwiching portion 81 includes a body portion 82 that thickly extends from a base end portion of the coupling head 71 through a step surface 84 and a pair of leg portions 83 that branch off to the left and right and extend from the body portion 82. Further, the fastener element 70 has a coupling concave portion 76 surrounded by the coupling convex portion 73, the left and right rising portions 74, and the body portion 82, so that the coupling convex portion 73 of the other coupling party is fitted into the coupling concave portion 76.

[0011] In the slide fastener having the metal fastener element 70, fixing strength of the fastener element 70 fixed to the fastener tape is strong. In the slide fastener, since strong coupling strength is obtained when the left and right fastener elements 70 are coupled, even if lateral pulling force is applied, it is possible to prevent the occurrence of so-called chain breaking in which coupling of the fastener elements 70 gets uncoupled.

[0012] Further, in Patent Document 2, as illustrated in FIG. 19, when fastener elements 70 are punched from a rectangular metal wire material 93 using a cutting punch 91 and a cutting die 92, a punch side mouth peripheral end edge of the cutting die 92 is chambered at a radius of 0.01 to 1.0 mm, and a predetermined clearance T is provided between the cutting punch 91 and the cutting die 92.

[0013] As a result, in the fastener element 70 of Patent Document 2 obtained through punching, 80% or more of the cutting surface of the fastener element 70 is a shear surface, and 20% or less is a fracture surface. The shear surface refers to a surface that becomes dark in color as observed from a position other than a specular reflection position due to specular reflection of irradiation light when the cutting surface of the fastener element 70 is irradiated with light at a desired incident angle. Meanwhile, the fracture surface refers to a surface that looks white due to diffused reflection of irradiation light.

[0014] The fastener element 70 in which 80% or more

of the cutting surface is the shear surface becomes a high quality fastener element 70 that is high in smoothness of an element surface, homogenous, and excellent in appearance. Particularly, if 90% or more of the cutting surface is the shear surface, it is excellent in design and thus is used suitably for luxury brand products or the like.

Patent Document 1: Japanese Utility Model Publication No. 1-80012

Patent Document 2: Japanese Patent Application Laid-Open No. 2005-237532

DISCLOSURE OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0015] In the case of manufacturing the fastener element 70 from the rectangular metal wire material 93 using the cutting punch 91 and the cutting die 92 as in Patent Document 2, as illustrated in FIG. 19, the fastener element is punched by moving the cutting punch 91 downward so that the cutting punch 91 is orthogonal to the rectangular wire material 93. For this reason, a shape of an abutting surface portion 94 (a leading end surface portion) of the cutting punch 91 that abuts on the fastener element is transferred onto the upper element surface of the obtained fastener element (a first element surface abutting on the cutting punch 91).

[0016] Further, of the abutting surface portion 94 of the cutting punch 91, a portion (surface) that abuts on upper surfaces of the tape-sandwiching portion and the rising portion of the fastener element is generally formed on a flat surface parallel to an upper surface of the rectangular wire material 93 in order to improve the visual quality of the fastener element.

[0017] Thus, the upper element surface of the fastener element, particularly, the upper surface of the tape-sandwiching portion and the upper surface of the rising portion, which are punched by the cutting punch 91 having the abutting surface portion 94 and the cutting die 92, are formed to be a smooth flat surface. In this case, a ridge line portion disposed between the upper surface of the tape-sandwiching portion and the upper surface of the rising portion and the cutting surface formed at the time of punching the element (that is, an element periphery of the fastener element) is formed in an angular shape.

[0018] On the other hand, on the lower surface of the fastener element (that is, the second element surface disposed at a side opposite to the first element surface), particularly, on a lower surface of the tape-sandwiching portion and a lower surface side of the rising portion, a ridge line portion disposed between the cutting surface formed by punching and the lower surface of the fastener element is formed by being torn apart and cut from the rectangular wire material at the time of punching the fastener element. Thus, the ridge line portion of the lower surface side and the vicinity of the ridge line portion have

a curved surface shape.

[0019] The metal fastener element punched from the rectangular wire material using the cutting punch and the cutting die is usually subjected to processing, such as the polishing process and the coating process described above before implanted into the fastener tape. For example, in the coating process, the fastener elements are coated such that a plurality of fastener elements are input into a bucket, and a coating material is sprayed while rotating the bucket.

[0020] However, in the fastener element punched from the rectangular wire material, the upper surface of the tape-sandwiching portion and the upper surface of the rising portion are formed to be the flat surface, and the ridge line portion disposed between the upper surfaces and the element periphery is formed in an angular shape as described above.

[0021] For this reason, for example, when a plurality of fastener elements are stirred inside the bucket while the coating material is being sprayed in the coating process of the fastener element, due to influence of surface tension of the liquid coating material attached to the surface of the fastener element and atmosphere pressure, the flat surface formed on the fastener element and the flat surface formed on another fastener element stick to each other due to capillary action and become firmly stick to each other, so the fastener elements do not easily separate.

[0022] Thus, when the coating process is performed on a plurality of fastener elements, if the upper surfaces that are the first element surfaces of the fastener elements stick to each other through the liquid coating material as described above, there has been a problem in that appropriate coating cannot be performed on the fastener element, leading to a coating failure. A phenomenon that the upper element surfaces of the fastener elements stick to each other and do not separate from each other does not occur limitedly to the coating process but also occurs during other liquid-using processes, which results in product defects of the fastener element.

[0023] Further, at the lower surface side of the tape-sandwiching portion and the rising portion, the ridge line portion disposed on the lower surface side and the vicinity of the ridge line portion are formed in a curved surface shape. Thus, the lower surfaces of the tape-sandwiching portion and the rising portion disposed on the fastener element are difficult to stick to the upper surfaces or the lower surfaces of the tape-sandwiching portion and the rising portion of another fastener element, and even if another fastener element once sticks the lower surface, the fastener elements easily separate when vibration is applied. For this reason, there has not been a problem in that the fastener elements stick to each other and do not separate from each other at the upper surface (first element surface) side of the fastener element.

[0024] The invention is made in light of the above described conventional problems, and a specific object of the invention is to provide a metal fastener element in

which even if processing using a liquid, such as the coating process, is performed, the elements do not stick to each other during the processing.

MEANS FOR SOLVING THE PROBLEM

[0025] In order to achieve the above object, the invention provides a metal fastener element for a slide fastener, including: a coupling head; and a bifurcated tape-sandwiching portion extending from the coupling head, being mainly **characterized in that** at least one sticking preventing convex portion is projectingly disposed on at least one surface of sticking surfaces on which sticking between the fastener elements occurs when liquid processing is performed on the fastener element.

[0026] In the fastener element according to the invention, it is preferable that the fastener element be manufactured by punching a rectangular metal wire material using a cutting punch and a cutting die, that the sticking surface include a first element surface that abuts on the cutting punch and a second element surface opposite to the first element surface, and that the sticking preventing convex portion be disposed on at least the first element surface.

[0027] Further, the sticking preventing convex portion may be further formed on the second element surface. Further, two sticking preventing convex portions may be preferably formed on at least the first element surface.

[0028] In the invention, it is preferable that the coupling head include a thin walled flat plate portion and coupling convex portions that are projectingly disposed on the first and second element surfaces of the flat plate portion, that the tape-sandwiching portion include a body portion that thickly extends from a base end portion of the coupling head via a step surface and a pair of leg portions that branches off and extends from the body portion, and that the sticking preventing convex portion be projectingly disposed on the tape-sandwiching portion.

[0029] In this case, it is preferable that a ratio of a dimension L2 in an element length direction, from an top of the sticking preventing convex portion to a leg portion side end edge of the tape-sandwiching portion, to a dimension L1 in the element length direction, from a coupling head side end edge of a first area formed by the same plane surface as a first surface of the tape-sandwiching portion to the leg portion side end edge of the tape-sandwiching portion, be set to 1/2 or more.

[0030] In addition, it is preferable that at least a part of the sticking preventing convex portion be included in a second area formed by the body portion.

Furthermore, it is preferable that the leg portion include a base end portion extending from the body portion, an intermediate portion extending from the base end portion and having an outside edge and an linear inside edge that are disposed along an element length direction, and a curved portion that is formed to curve from the intermediate portion in a direction in which the curved portions get closer to each other, and that the sticking preventing

convex portion be included in a third area formed to include an area of the intermediate portion and an area that is ahead of the intermediate portion and surrounded by an extension line extending from an inside edge of the intermediate portion to the coupling head side, an outside edge of the body portion and the base end portion, and a coupling head side end edge of the body portion.

[0031] Furthermore, it is preferable that the leg portion include a base end portion extending from the body portion, an intermediate portion extending from the base end portion and having an outside edge and an inside edge that are disposed along an element length direction, and a curved portion that is formed to be curve from the intermediate portion in a direction in which the curved portions get closer to each other, and that the sticking preventing convex portion be disposed on a center line between the outside edge and the inside edge of the intermediate portion.

Furthermore, it is preferable that the sticking preventing convex portion be disposed to span a boundary line between the body portion and the leg portion.

[0032] On the other hand, in the invention, the coupling head may include a coupling concave portion recessed in the first element surface side and a coupling convex portion disposed projectingly on the second element surface side, the tape-sandwiching portion may include a body portion that extends from a base end portion of the coupling head and a pair of leg portions that branches off and extends from the body portion, and the sticking preventing convex portion may be projectingly disposed on the tape-sandwiching portion.

[0033] In this case, it is preferable that a ratio of a dimension L4 in an element length direction, from the top of the sticking preventing convex portion to a leg portion side end edge of the fastener element, to a dimension L3 of the whole fastener element in the element length direction be set to 1/2 or more.

Furthermore, it is preferable that a protruding height of the sticking preventing convex portion be set to 0.05 mm or less.

EFFECT OF THE INVENTION

[0034] The fastener element according to the invention includes a coupling head and bifurcated tape-sandwiching portions extending from the coupling head. Further, at least one sticking preventing convex portion is projectingly disposed on at least one surface of sticking surfaces due to which the fastener elements stick to each other when processing using a liquid, such as a coating process, is performed on a plurality of fastener elements.

[0035] In the fastener element of the invention, the sticking preventing convex portion is formed in advance on the sticking surface at which the conventional fastener elements come into surface contact with each other and to stick together when liquid processing is performed. Thus, even when liquid processing is performed on the

fastener elements, the clearance is provided between the mutually superimposed fastener elements, and thus a phenomenon in which the fastener elements strongly stick to each other due to the surface contact therebetween, and thus do not separate from each other can be prevented. Thus, even when processing using a liquid is performed on a plurality of fastener elements of the invention it is possible to prevent the occurrence of the product defects caused by sticking between the conventional fastener elements.

[0036] Particularly, the invention can be applied suitably to the fastener element manufactured by punching the rectangular metal wire material using the cutting punch and the cutting die. In this case, the sticking surface includes a first element surface that abuts on the cutting punch and a second element surface at a side opposite to the first element surface, and the sticking preventing convex portion is disposed on at least the first element surface.

[0037] That is, in the conventional art, when the fastener element is manufactured using the cutting punch and the cutting die, the problem caused by sticking between the elements has remarkably occurred. However, in the fastener element of the invention, the sticking preventing convex portion is disposed on the first element surface at the side abutting on the cutting punch, and thus the problem caused by sticking between the elements can be easily solved.

[0038] Further, the fastener element of the invention is not limited to the fastener element manufactured from the rectangular metal wire material using the cutting punch and the cutting die. For example, the invention can be similarly applied to a metal fastener element manufactured such that a long wire material having a Y-shaped cross section is sequentially cut to make a Y-shaped element material, a portion of the obtained element material corresponding to the coupling head is locally press-deformed to form the coupling convex portion and the coupling concave portion, and a metal fastener element formed by so-called die cast molding in which a molten metal is press-fitted into a die.

[0039] Further, in the fastener element of the invention, the sticking preventing convex portion is further formed on the second element surface disposed at a side opposite to the first element surface of the fastener element. Thus, when processing using a liquid is performed on the fastener element, it is possible to prevent the second element surface of the fastener element from sticking to the first or second element surface of another fastener element with a high degree of certainty.

[0040] In addition, as the sticking preventing convex portions are formed on the first element surface and the second element surface of the fastener element, for example, when chemical polishing is performed on the fastener elements, the fastener elements can be prevented from coming into surface contact with each other on the first element surface and the second element surface. Thus, the chemical polishing solution can smoothly

spread over the entire area of the fastener element. For this reason, chemical polishing can be uniformly performed on the entire area of the fastener element, and uneven glossiness does not occur in the fastener element, and the quality of appearance can be further improved.

[0041] Further, in the invention, two sticking preventing convex portions are formed on at least the first element surface. As a result, when processing using a liquid is performed on the fastener element, sticking between the first element surfaces of the fastener elements can be stably prevented, the sticking preventing convex portions can be disposed on the fastener element to be barely noticeable, and the quality of appearance of the fastener element does not deteriorate.

[0042] The fastener element according to the invention is configured such that the coupling head includes a thin walled flat plate portion and a coupling convex portion that is projectingly disposed on the first and second element surfaces of the flat plate portion, the tape-sandwiching portion includes a body portion that thickly extends from a base end portion of the coupling head through a step surface and a pair of leg portions that branch off and extend from the body portion, and the sticking preventing convex portion is projectingly disposed on the tape-sandwiching portion. Even in the fastener element having such a configuration, a phenomenon that the first element surfaces stick to each other can be prevented.

[0043] In this case, as a ratio of a dimension L2, from a top of the sticking preventing convex portion to a leg portion side end edge of the tape-sandwiching portion in an element length direction, to a dimension L1, from a coupling head side end edge of a first area formed by the same plane surface as a first surface of the tape-sandwiching portion to the leg portion side end edge of the tape-sandwiching portion in the element length direction, is set to 1/2 or more, preferably 2/3 or more, even if the fastener elements are superimposed on another, facing in the same direction or different directions, it is possible to prevent the first element surfaces from being stick together with a high degree of certainty.

[0044] Further, as at least a part of the sticking preventing convex portion is included in a second area formed by the body portion, it is possible to prevent the first element surfaces from sticking to each other with a high degree of certainty.

[0045] Further, since the leg portion includes a base end portion extending from the body portion, an intermediate portion extending from the base end portion and having an outside edge and a linear inside edge that are disposed along the element length direction, and a curved portion that is formed to curve in a direction getting closer mutually from the intermediate portion, and the sticking preventing convex portion is included in a third area formed to include an area of the intermediate portion and an area that is ahead of the intermediate portion and surrounded by an extension line extending from an inside

edge of the intermediate portion to the coupling head side, an outside edge of the body portion and the base end portion, and a coupling head side end edge of the body portion, it is possible to prevent the first element surfaces from sticking to each other with a high degree of certainty. What the outside edge and the inside edge of the intermediate portion are disposed along the element length direction means that the outside edge and the inside edge of the intermediate portion are disposed in nearly parallel to each other in the element length direction in a state in which the fastener elements are implanted into the fastener tape.

[0046] Further, the leg portion includes a base end portion extending from the body portion, an intermediate portion extending from the base end portion and having an outside edge and an inside edge that are disposed along the element length direction, and a curved portion that is formed to curve in a direction getting closer mutually from the intermediate portion, and the sticking preventing convex portion is disposed on a center line between the outside edge and the inside edge of the intermediate portion, thus it is possible to prevent the first element surfaces from sticking to each other.

[0047] Further, as the sticking preventing convex portion is disposed to span a boundary line between the body portion and the leg portion, it is possible to prevent the first element surfaces from sticking to each other with a high degree of certainty.

[0048] Meanwhile, the fastener element of the invention may be configured such that the coupling head includes a coupling concave portion recessed in the first element surface and a coupling convex portion protruding from the second element surface, the tape-sandwiching portion includes a body portion that extends from a base end portion of the coupling head and a pair of leg portions that branch off and extend from the body portion, and the sticking preventing convex portion is projectingly disposed on the tape-sandwiching portion. Even in the fastener element having such a configuration, a phenomenon that the first element surfaces stick to each other can be prevented.

[0049] In this case, as a ratio of a dimension L4, from an top of the sticking preventing convex portion to a leg portion side end edge of the fastener element in an element length direction, to a dimension L3 of the entire length of the fastener element in the element length direction is set to 1/2 or more, it is possible to prevent the first element surfaces from sticking to each other with a high degree of certainty.

[0050] Further, in the fastener element of the invention, a protruding height of the sticking preventing convex portion is set to 0.05 mm or less. As a result, for example, when the fastener element is supplied to the fastener tape through the parts feeder or the shooter in order to implant the fastener element into the fastener tape, it is possible to prevent the fastener element from being stuck inside the parts feeder or the shooter, and thus the fastener element can be stably supplied.

[0051] Further, in the invention, the protruding height of the sticking preventing convex portion after the liquid processing is set to 0.05 mm or less, preferably, 0.03 mm or less. Thus, the sticking preventing convex portion can be disposed in the fastener element to be barely noticeable.

[0052] Further, if the protruding height of the sticking preventing convex portion is set as described above, for example, after the fastener element of the invention is supplied to the fastener tape, when the fastener element is swaged into the fastener tape, it is possible to prevent the occurrence of a phenomenon that the element swaging means shaves the sticking preventing convex portion, which scrapes coating off the fastener element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053]

FIG. 1 is a perspective view illustrating a fastener element according to a first embodiment of the invention.

FIG. 2 is a top view illustrating a state of the fastener element before swaged into a fastener tape.

FIG. 3 is a front view of a slide fastener having the fastener element.

FIG. 4 is an explanatory view for explaining a first area of the fastener element.

FIG. 5 is an explanatory view for explaining a second area of the fastener element.

FIG. 6 is an explanatory view for explaining a third area of the fastener element.

FIG. 7 is a side view of the fastener element.

FIG. 8 is a view when the fastener element is viewed from a leg portion side.

FIG. 9 is a perspective view schematically illustrating a cutting punch and a cutting die through which the fastener element is punched from a rectangular wire material.

FIG. 10 is a main part cross-sectional view schematically illustrating a state in which the fastener element is being punched from a rectangular wire material.

FIG. 11 is a side view illustrating a state in which two fastener elements are superimposed on each other so that first element surfaces face in the same direction.

FIG. 12 is a side view illustrating a state in which two fastener elements are superimposed on each other so that first element surfaces face in different directions.

FIG. 13 is a side view illustrating a state in which two fastener elements are superimposed on each other so that second element surfaces face in the same direction.

FIG. 14 is an explanatory view for explaining a relationship between a leg portion width and a gap between left and right leg portion leading ends of a fastener element.

FIG. 15 is a side view illustrating a fastener element according to a modification of the first embodiment.
FIG. 16 is a perspective view illustrating a fastener element according to a second embodiment of the invention.

FIG. 17 is a side view of the fastener element.

FIG. 18 is a perspective view illustrating a conventional fastener element.

FIG. 19 is a cross-sectional view schematically illustrating a cutting punch and a cutting die through which the fastener element is punched from a rectangular wire material.

EXPLANATIONS OF LETTERS AND NUMERALS

[0054]

1	slide fastener
2	fastener tape
3	fastener stringer
4	slider
10,	10' fastener element
11	coupling head
12	flat plate portion
13	coupling convex portion
14	rising portion
14a	extension portion
14b	inclined portion
15	coupling concave portion
21,	21' tape-sandwiching portion
22	body portion
23	leg portion
23a	base end portion
23b	intermediate portion
23c	curved portion
23d	center line
24, 24'	sticking preventing convex portion
25	boundary line
26	step surface
31	rectangular wire material
32	cutting punch
32a	leading end surface portion
32b	concave portion
33	cutting die
33a	mouth portion
40	fastener element
41	coupling head
42	coupling head body
43	coupling convex portion
44	coupling concave portion
51	tape-sandwiching portion
52	body portion
53	leg portion
54	sticking preventing convex portion
61	first area
62	second area
63	third area

BEST MODE FOR CARRYING OUT THE INVENTION

[0055] Hereinafter, embodiments of the invention will be described in detail with reference to the embodiments and accompanying drawings. The invention is not limited to the following embodiments, and various changes can be made as long as substantially the same configuration and the same function effect as in the invention are provided.

[0056] For example, fastener elements of a first embodiment and a second embodiment which will be described later are manufactured in such a manner that a rectangular metal wire material is punched in a predetermined element shape using a cutting punch and a cutting die, and thereafter a polishing process and a coating process is performed. However, the fastener element of the invention is not limited thereto but can be applied to all metal fastener elements that are likely to cause the fastener elements to stick to each other or cause the faster element to stick to a liquid processing apparatus in liquid processing. An example of the fastener element of the invention includes a metal fastener element manufactured in such a manner that a long wire material having a Y-shaped cross section is sequentially cut to make a Y-shaped element material, and a part of the obtained element material corresponding to a coupling head is locally press-deformed to form a coupling convex portion and a coupling concave portion, a metal fastener element formed in a desired shape by die cast molding, and the like.

First Embodiment

[0057] FIG. 1 is a perspective view illustrating a fastener element according to a first embodiment, and FIG. 2 is a top view illustrating a state of the fastener element before it is swaged into a fastener tape.

In the following description on the fastener element, an element vertical direction refers to a tape front-back direction when the fastener element is attached to the fastener tape (a first element surface side is an upper side, and a second element surface side is a lower side). Further, an element length direction or a front-rear direction refers to a tape width direction (a coupling head leading end side is a front side, and a leg portion extended end side is a rear side), and an element width direction (or a left-right direction) refers to a tape length direction.

[0058] A fastener element 10 of the first embodiment is formed in such a manner that a rectangular wire material 31 made of metal, such as a copper alloy, a nickel alloy, and aluminum, and the like, is punched in a predetermined element shape (see FIGS. 9 and 10) using a cutting punch 32 and a cutting die 33, and thereafter a polishing process and a coating process are performed, as will be described later.

[0059] The fastener element 10 includes a coupling head 11 (that may be referred to simply as "coupling head") having coupling convex portions 13 and a tape-

sandwiching portion 21 that extends from a base end portion (a rear end portion) of the coupling head 11 through a step surface 26. The fastener element 10 is configured as a so-called double-side element in which the coupling convex portions 13 are disposed on the upper surface side and the lower surface side of the coupling head 11, respectively.

[0060] In this case, the upper element surface of the fastener element 10 is a first element surface that abuts on a leading end surface of the cutting punch 32 when punched from the rectangular wire material 31, and the lower element surface is a second element surface which is opposite to it.

[0061] The coupling head 11 includes a thin walled flat plate portion 12 disposed at a central portion in the front-back direction, the coupling convex portions 13 that are projectingly disposed on the upper surface and the lower surface of the flat plate portion 12, and left and right rising portions 14 that are raised from the flat plate portion 12 in the vertical direction and extend toward the left and right sides of the coupling convex portion 13 from the tape-sandwiching portion 21. Further, a coupling concave portion 15 surrounded by the coupling convex portion 13, the left and right rising portions 14, and the tape-sandwiching portion 21 are formed in the coupling head 11.

[0062] The flat plate portion 12 of the coupling head 11 is formed at a predetermined thickness thinner than the tape-sandwiching portion 21, and left and right side edges of the flat plate portion 12 are formed to have a circular arc shape or a tapered shape when viewed in the element vertical direction so that a dimension of the left-right width direction of the flat plate portion 12 gradually decreases toward a front end from a base end side.

[0063] The coupling convex portion 13 is projectingly disposed to bulge in a protruding shape at a left-right central portion of the flat plate portion 12. A height position (a position in the vertical direction) of the top of the coupling convex portion 13, that is, a height dimension in the vertical direction, from the upper and lower surfaces of the flat plate portion 12 to the top of the coupling convex portion 13, are set to be equal to or larger than a height dimension in the vertical direction, from the upper and lower surfaces of the flat plate portion 12 to upper and lower surfaces of the tape-sandwiching portion 21 (particularly, a body portion 22 of the tape-sandwiching portion 21 which will be described later), respectively.

[0064] Further, when the fastener element 10 of the present first embodiment is viewed in the element length direction, the position of the front end edge of the coupling convex portion 13 is set behind the position of a front end edge of the flat plate portion 12, and the upper surface of the flat plate portion 12 is disposed between the front end edge of the coupling convex portion 13 and the front end edge of the flat plate portion 12.

[0065] The rising portion 14 is formed to rise from the flat plate portion 12 in the vertical direction. It includes an extension portion 14a that extends forward from the

tape-sandwiching portion 21 and has a constant thickness, and an inclined portion 14b that is inclined downward toward the front side from the front end of the extension portion 14a. In this case, the front end edge of the rising portion 14 is disposed to be positioned ahead of the rear end edge of the coupling convex portion 13.

[0066] In the fastener element 10 of the present first embodiment, the tape-sandwiching portion 21 includes a body portion 22 that extends backward from the coupling head 11 and a pair of left and right leg portions 23 that branches off to the left and right, respectively and extends from the body portion 22. Two sticking preventing convex portions 24 are formed on the upper surface of the tape-sandwiching portion 21.

[0067] The body portion 22 in the tape-sandwiching portion 21 connects the coupling head 11 with the left and right leg portions 23. The upper and lower surfaces and the left and right side surfaces of the body portion 22 are respectively flush with the upper and lower surfaces and the left and right side surfaces of the extension portion 14a of the rising portion 14 and the leg portion 23.

[0068] The leg portions 23 are provided in a manner of branching off from a rear end of the body portion 22 into two legs and extending from the rear end. Each leg portion 23 includes a base end portion 23a extending from the body portion 22, an intermediate portion 23b extending from the base end portion 23a and having an outside edge and an inside edge that are disposed along the element length direction in the form of a straight line in a state in which it is implanted into the fastener tape, and a curved portion 23c that is formed to curve from the intermediate portions 23b in a direction in which the leg portions get closer to each other. In this case, the intermediate portion 23b is formed in such a manner that a width dimension between the outside edge and the inside edge becomes constant along the element length direction.

[0069] Further, in the present first embodiment, the left and right leg portions 23 are disposed to be spread as illustrated in FIG. 2 in a state in which the fastener elements 10 have not yet implanted into the fastener tape. The fastener element 10 has a shape of a nearly letter "Y" when the whole fastener element 10 is viewed from the upper surface side.

[0070] In this case, a gap A between leading end portions of the spread left and right leg portions 23 is set to be larger than a maximum value B of a leg portion 23 width dimension in the curved portion 23c of the leg portion 23 (that is, as illustrated in FIG. 2, a maximum value of a dimension of the curved portion 23c in a direction orthogonal to the outside edge and the inside edge of the intermediate portion 23b when the leg portion 23 is viewed from the top). The gap A is set to be larger than a maximum value C of a dimension of the tape-sandwiching portion 21 excluding the sticking preventing convex portion 24, as illustrated in FIG. 7, in the element vertical direction.

[0071] Since the gap A is set to be larger than the max-

imum value B and larger than the maximum value C, when predetermined processing is performed while a plurality of fastener elements 10 are stirred, for example, in the polishing process, the coating process, or the like, for example, even if the leg portion 23 of a fastener element 10 enters between the left and right leg portions 23 of another fastener element 10 as illustrated in FIG. 14, the leg portions 23 are prevented from tangling with each other, and the leg portion 23 that have entered can be easily extracted from between the left and right leg portions 23. As a result, in a state in which the fastener elements 10 are separated from each other, predetermined processing can be performed smoothly and uniformly, and thus it is possible to prevent the occurrence of unevenness in the quality of the fastener elements 10.

[0072] Further, the fastener element 10 of the present first embodiment is formed by punching the rectangular wire material 31 from the upper surface side by the cutting punch 32 and the cutting die 33 as will be described later (see FIGS. 9 and 10). In this case, in the fastener element 10, the upper element surface including the upper surface of the tape-sandwiching portion 21 and the upper surface of the extension portion 14a of the rising portion 14 are configured with the first element surface that abuts on the cutting punch 32 when the fastener element 10 is punched from the rectangular wire material 31, and, particularly, the upper surface of the tape-sandwiching portion 21 and the upper surface of the extension portion 14a are formed of the same flat surface onto which a shape of a leading end surface portion 32a of the cutting punch 32 is transferred.

[0073] Further, the periphery in the fastener element 10, that is, an element outer periphery in the coupling head 11 and an element outer periphery (left and right side surfaces of the body portion 22 and an outer periphery of the leg portion 23) and an inner periphery (an inner periphery of the leg portion 23) of the tape-sandwiching portion 21 are configured with cutting surfaces formed at the time of element punching. Further, the ridge line portion disposed between the peripheries of the fastener element 10 and the upper surfaces of the tape-sandwiching portion 21 and the extension portion 14a that are formed on the flat surface is formed at an angular shape.

[0074] Meanwhile, on the lower surface side of the tape-sandwiching portion 21 and the extension portion 14a of the fastener element 10, when the fastener element 10 is punched from the rectangular wire material 31, the ridge line portion disposed between the cutting surfaces (that is, the periphery of the fastener element 10) formed at the time of punching and the lower surfaces of the tape-sandwiching portion 21 and the extension portion 14a is formed by being torn apart and cut from the rectangular wire material 31, and thus the ridge line portion of the lower surface side and the vicinity of the ridge line portion have the curved surface shape.

[0075] Further, in the present first embodiment, the two sticking preventing convex portions 24 projectingly disposed on the upper surface of the tape-sandwiching por-

tion 21 are formed in a circular truncated cone shape and disposed to satisfy at least one of 5 conditions specified below.

[0076] First, as a first condition, as illustrated in FIG. 4, when an area formed by the surface on the same plane as the upper surface of the tape-sandwiching portion 21, that is, an area configured with the upper surface of the tape-sandwiching portion 21 and the upper surface of the extension portion 14a is defined as a first area 61 (a hatched portion of FIG. 4), the sticking preventing convex portion 24 needs to be disposed so that a ratio of a dimension L2 in the element length direction from the top of the sticking preventing convex portion 24 to the rear end edge of the tape-sandwiching portion 21 to a dimension L1 in the element length direction from the front end edge of the first area 61 to the rear end edge of the tape-sandwiching portion 21 can be equal to or more than 1/2, preferably equal to or more than 2/3.

[0077] Next, as a second condition, as illustrated in FIG. 5, when the upper surface of the body portion 22 is defined as a second area 62 (a hatched portion of FIG. 5), at least a part of the sticking preventing convex portion 24 needs to be included inside the second area 62.

As a third condition, as illustrated in FIG. 6, when an area including an area of the intermediate portion 23b of the leg portion 23 and an area that is ahead of the intermediate portion 23b and surrounded by extension lines extending from the outside edge and the inside edge of the intermediate portion 23b toward the coupling head 11 side and the front end edge of the body portion 22 is defined as a third area 63 (a hatched portion of FIG. 6), the sticking preventing convex portion 24 needs to be included in the third area 63.

[0078] As a fourth condition, as illustrated in FIG. 6, the sticking preventing convex portion 24 needs to be disposed on a center line 23d between the outside edge and the inside edge in the intermediate portion 23b of the leg portion 23.

Further, as a fifth condition, as illustrated in FIG. 6, the sticking preventing convex portion 24 needs to be disposed to span the boundary line 25 between the body portion 22 and the leg portions 23.

[0079] As the sticking preventing convex portions 24 are disposed to satisfy at least one of the first to five conditions, as will be described later, when processing using a liquid, such as the coating process is performed on the fastener element 10 of the present first embodiment, even if another fastener element 10 is superimposed such that the upper surfaces of the tape-sandwiching portion 21 and the extension portion 14a face the upper surfaces of the tape-sandwiching portion 21 and the extension portion 14a of the fastener element 10 (for example, see FIGS. 11 and 12), since the sticking preventing convex portions 24 form the clearance between the fastener elements 10, the upper surfaces of the fastener elements 10 dissolve a liquid and thus are prevented from sticking to each other due to surface contact with a high degree of certainty.

[0080] In this case, a height dimension (a protruding height) H of the sticking preventing convex portion 24 in the vertical direction from the upper surface of the tape-sandwiching portion 21 to the top of the sticking preventing convex portion 24 is set to 0.05 mm or less, preferably, 0.03 mm or less, for example, when the fastener element 10 is implanted into the fastener tape. If the protruding height H of the sticking preventing convex portion 24 is set to such a range, even though the sticking preventing convex portion 24 is disposed in the fastener element 10, the sticking preventing convex portion 24 is barely noticeable.

[0081] Further, it is preferable the sticking preventing convex portion 24 even slightly protrudes further than the upper surface of the tape-sandwiching portion 21, and particularly, the protruding height H is preferably set to 0.01 mm or more. In this case, since the fastener element 10 of the present first embodiment is subjected to the polishing process after punched from the rectangular wire material 31 as will be described later, the protruding height H of the sticking preventing convex portion 24 at the time of punching the fastener element 10 from the rectangular wire material 31 is set in consideration of the fact that the sticking preventing convex portion 24 is scrapped in the polishing process.

[0082] Next, a method of manufacturing the metal fastener element 10 of the present first embodiment will be described.

First, the rectangular metal wire material 31 is prepared. The rectangular wire material 31 is plastic-deformed by pressing of the press punch and the press die, and the shape of the coupling head 11, particularly, the shapes of the flat plate portion 12 and the coupling convex portion 13 are formed in the rectangular wire material 31 at a predetermined pitch. At this time, the thickness of the prepared rectangular wire material 31 is set to be equal to the thickness of the body portion 22 of the fastener element 10.

[0083] Next, as illustrated in FIG. 9, the rectangular wire material 31 in which the shape of the coupling head 11 is formed is transferred until a portion where the coupling head 11 is formed is placed on the position of a mouth portion 33a of the cutting die 33. When the portion where the coupling head 11 is formed is transferred up to a predetermined position, the rectangular wire material 31 is stopped, and the cutting punch 32 moves down to enter the mouth portion 33a of the cutting die 33 as illustrated in FIG. 10. At this time, a convex portion 32b for forming the sticking preventing convex portion 24 on the upper surface of the tape-sandwiching portion 21 is installed on a leading end surface portion 32a of the cutting punch 32.

[0084] As a result, the approximately Y-shaped fastener element 10 illustrated in FIG. 2 is punched from the rectangular wire material 31, and at the same time, the two sticking preventing convex portions 24 are formed on the first element surface of the tape-sandwiching portion 21 of the fastener element 10. A cross-sectional view

illustrated in FIG. 10 illustrates a cross section in which the fastener element 10 is cut along a portion corresponding to line X-X illustrated in FIG. 2.

[0085] After punching the fastener element 10 from the rectangular wire material 31 as described above, the individual fastener elements 10 are input into a liquid processing container, and the polishing process such as barrel polishing or chemical polishing is performed, so that a gloss is given to the fastener element 10.

[0086] At this time, in the fastener element 10 of the present first embodiment, as described above, the gap A between the leading end portions of the left and right leg portions 23 is set to be larger than the maximum value B of the curved portion 23c of the leg portion 23 in the leg portion 23 width dimension and larger than the maximum value C of the dimension of the tape-sandwiching portion 21 excluding the sticking preventing convex portion 24 in the element vertical direction.

[0087] As a result, when barrel polishing is performed on a plurality of fastener elements 10, it is prevented that the leg portion 23 of another fastener element 10 intertwines between the left and right leg portions 23 of the fastener element 10, and barrel polishing can be uniformly performed in a state in which the fastener elements 10 are separated from one another. Since this effect is obtained even when chemical polishing and coating which will be described later is performed, processing such as chemical polishing and coating can be uniformly performed on each fastener element 10.

[0088] Further, each fastener element 10 of the present first embodiment has the sticking preventing convex portion 24 disposed on the upper surface side of the fastener element 10, and the ridge line portion and the vicinity of the ridge line portion on the lower surface side are formed in the curved surface shape. Thus, for example, when barrel polishing is performed on a plurality of fastener elements 10, it is possible to effectively prevent the fastener elements 10 from sticking to an inner wall surface of a processing tank (barrel) in which barrel polishing is performed. For this reason, more uniform physical polishing can be performed on each fastener element 10, and when the fastener element 10 is recovered from the processing tank after barrel polishing is performed, the recovery work can be easily performed.

[0089] Subsequently, chemical polishing is performed on the fastener element 10 that has been subjected to barrel polishing. In this chemical polishing, since the sticking preventing convex portion 24 is formed in each fastener element 10, it is possible to prevent another fastener element 10 from coming in surface-contact with the upper surfaces of the tape-sandwiching portion 21 and the extension portion 14a of the fastener element 10. Thus, a chemical polishing solution can be smoothly spread on the upper surface side of the fastener element 10, and chemical polishing can be uniformly performed on the fastener element 10.

[0090] After the polishing process is performed as described above, the coating process such as clear coating

is performed on the obtained fastener element 10. In the coating process, clear coating or coating with a desired color tone is performed on the fastener element 10 by the process in which a plurality of fastener elements 10 are input into a bucket, and a coating material is sprayed while rotating the bucket.

[0091] At this time, as the sticking preventing convex portion 24 is formed in the fastener element 10 of the present first embodiment, for example, while the bucket is rotating, for example, even if the fastener elements 10 are superimposed on each other such that the upper surfaces or the lower surfaces of the tape-sandwiching portion 21 and the extension portion 14a face each other and the coupling heads 11 face in the same direction as illustrated in FIG. 11 or even if the fastener elements 10 are superimposed on each other such that the upper surfaces or the lower surfaces of the tape-sandwiching portion 21 and the extension portion 14a face each other and the coupling heads 11 face in different directions as illustrated in FIG. 12, since the sticking preventing convex portion 24 forms the clearance between the fastener elements 10, it is possible to prevent the fastener elements 10 from sticking to each other with a liquid dye interposed therebetween.

[0092] Further, in this case, while the bucket is rotating, for example, even if the lower surfaces of the tape-sandwiching portion 21 and the extension portion 14a of the fastener element 10 are superimposed on the lower surfaces of the tape-sandwiching portion 21 and the extension portion 14a of another fastener element 10 as illustrated in FIG. 13, since the ridge line portion at the lower surface side of the tape-sandwiching portion 21 and the extension portion 14a and the vicinity of the ridge line portion are formed in the curved surface shape, the fastener elements 10 do not stick to each other by liquid dye and thus can easily separate from each other.

[0093] Thus, it does not happen that the fastener elements 10 stick to each other and do not separate during the coating process like the conventional fastener elements 10 do, and thus the entire surface of the fastener element 10 can be smoothly coated. Thus, a coating failure caused by sticking between the fastener elements 10 does not occur, and each fastener element 10 can be stably coated with a desired color tone.

[0094] The fastener element 10 of the present first embodiment obtained by the above described method is input into a parts feeder (not shown), and the posture of the fastener element 10 is adjusted. Thereafter, the fastener elements 10 are supplied to the tape side edge portion of the fastener tape so that the tape end edge portion can be wedged between the left and right leg portions 23 of the fastener element 10 through a shooter (not shown).

[0095] At this time, since the sticking preventing convex portion 24 formed in the fastener element 10 has the protruding height H set to be as small as 0.05 mm or less (preferably, 0.03 mm or less), when the fastener element 10 is supplied to the fastener tape through the parts feed-

er or the shooter, it is possible to prevent the fastener element 10 from being clogged inside the parts feeder or the shooter.

[0096] Thereafter, the fastener element 10 supplied to the tape side edge portion of the fastener tape is swaged by using a swaging means (not shown) and thus implanted into the tape side edge portion. At this time, when the swaging means of the fastener element 10 encompasses and holds the left and right leg portions 23 of the fastener element 10 and swages the left and right leg portions 23 toward the fastener tape, since the protruding height H of the sticking preventing convex portion 24 is set to be as small as 0.05 mm or less (preferably, 0.03 mm or less), it is possible to prevent the swaging means from interfering the sticking preventing convex portion 24. Further, even if the swaging means interferes with the sticking preventing convex portion 24, the interference can be reduced.

[0097] As a result, a work of swaging the fastener element 10 and implanting the fastener element 10 into the fastener tape can be smoothly and stably performed, and it is possible to prevent a phenomenon that coating performed on the fastener element 10 is skinned and thus the skin of the fastener element 10 appears when the swaging means scrapes against the sticking preventing convex portion 24 of the fastener element 10.

[0098] As a plurality of fastener elements 10 are implanted into the tape side edge portion of the fastener tape 2 at a predetermined pitch as illustrated in FIG. 3 by the above described method, a pair of left and right fastener stringers 3 are formed, and as the slider 4 passes through the element rows of the fastener stringers 3, the slider fastener 1 can be manufactured.

[0099] In the slide fastener 1 obtained by the above described method, the coating failure does not occur in the fastener element 10, and a gloss or a desired color tone can be uniformly given to the whole element of each fastener element 10. Thus, the high quality slide fastener that is excellent in visual quality or design can be provided.

[0100] Further, the first embodiment has been described in connection with the case in which the sticking preventing convex portion 24 is formed only on the upper surface side of the tape-sandwiching portion 21 of the fastener element 10, but the invention is not limited thereto. For example, as illustrated in FIG. 15, as the sticking preventing convex portion 24, two sticking preventing convex portion 24' may be disposed on a lower surface side of a tape-sandwiching portion 21' as well as an upper surface of the tape-sandwiching portion 21' of the fastener element 10'.

[0101] Since the sticking preventing convex portion 24' is further disposed even on the lower surface side of the tape-sandwiching portion 21' as described above, when processing using a liquid such as the coating process is performed on the fastener element 10', it is possible to prevent another fastener element 10' from coming in surface contact with and sticking to the lower surfaces of

the tape-sandwiching portion 21' and the extension portion 14a of the fastener element 10' with a high degree of certainty.

[0102] In addition, if the sticking preventing convex portions 24 and 24' are formed on the first element surface and the second element surface of the fastener element 10', for example, when chemical polishing is performed on the fastener element 10', a chemical polishing solution can be smoothly spread on the upper surface side and the lower surface side of the fastener element 10'. Thus, chemical polishing can be more uniformly performed on the whole surface of the fastener element 10', and it is possible to further prevent glossiness from becoming uneven.

[0103] Further, in the first embodiment, the sticking preventing convex portion 24 formed on the upper surface of the fastener element 10 is disposed to satisfy at least one of the 5 conditions described above. However, the invention is not limited thereto, and the position where the sticking preventing convex portion is disposed may arbitrarily change as necessary.

[0104] For example, when two sticking preventing convex portions 24 are formed on the upper surface of the fastener element 10, one sticking preventing convex portion 24 may be disposed on the upper surface of the body portion 22 at the left side (or the right side) further than a center line of the left-right direction of the fastener element 10, and the other sticking preventing convex portion 24 may be disposed on the upper surface of the curved portion 23c of the leg portion 23 at the right side (or the left side) further than the center line of the left-right direction of the fastener element 10.

[0105] Further, in the invention, the number of disposed sticking preventing convex portions 24 needs not necessarily be set to two in each fastener element 10. Three or more sticking preventing convex portions 24 may be disposed according to the shape, the size, or the like of the fastener element 10.

[0106] For example, when three sticking preventing convex portions 24 are formed on the upper surface of the fastener element 10, one sticking preventing convex portion 24 may be disposed on the upper surface of the body portion 22 on the center line of the left-right direction of the fastener element 10, and the remaining two sticking preventing convex portion 24 may be disposed on the upper surfaces of the left and right curved portions 23c.

[0107] Further, in the first embodiment, each sticking preventing convex portion 24 can be formed in a circular truncated cone shape as described above, but in the invention, the shape of the sticking preventing convex portion is not particularly limited. For example, the sticking preventing convex portion may be formed on the upper surface of the intermediate portion 23b of the leg portion 23 in the shape that has an elliptical shape that is long in the element length direction and a central portion of the ellipse most protrudes when viewed from the front surface of the fastener element.

Second Embodiment

[0108] FIG. 16 is a perspective view illustrating a fastener element according to a second embodiment of the invention, and FIG. 17 is a side view of the fastener element.

[0109] A fastener element 40 of the second embodiment is formed such that a rectangular wire material made of metal such as a copper alloy, a nickel alloy, and aluminum is punched in a predetermined shape using a cutting punch and a cutting die, and thereafter a polishing process and a coating process are performed similarly to the case of the first embodiment.

[0110] The fastener element 40 includes a coupling head 41 having a coupling convex portion 43 and a coupling concave portion 44 and a tape-sandwiching portion 51 that extends from a base end portion of the coupling head 41. The fastener element 40 is configured as a so-called single-side element having the coupling convex portion 43 only on a lower surface side of the coupling head 41. In this case, an upper element surface of the fastener element 40 is a first element surface that abuts on a leading end surface of the cutting punch when punched from the rectangular wire material, and a lower element surface is a second element surface of a side opposite thereto.

[0111] The coupling head 41 includes a coupling head body 42, a coupling concave portion 44 that is recessed at the upper surface side of the coupling head body 42, and a coupling convex portion 43 that is projectingly disposed at a lower surface side of the coupling head body 42. The tape-sandwiching portion 51 includes a body portion 52 extends backward from the coupling head 41 and a pair of left and right leg portions 53 that branches off to the left and right and extends from the body portion 52. Two sticking preventing convex portions 54 are formed on an upper surface of the tape-sandwiching portion 51.

[0112] Similarly to the case of the fastener element 40 of the first embodiment, left and right leg portions 53 of the fastener element 40 according to the present second embodiment are also disposed to be spread in the left-right direction in a state in which the fastener element 40 has not yet implanted into the fastener tape. The fastener element 40 has a shape of a nearly letter "Y" when the whole shape of the fastener element 40 is viewed from the upper surface side.

[0113] In the present second embodiment, upper and lower surfaces and left and right side surfaces of the coupling head body 42 of the coupling head 41 are formed as the same surface as upper and lower surfaces and left and right side surfaces of the tape-sandwiching portion 51. Further, the fastener element 40 of the present second embodiment is formed by punching the rectangular wire material from the upper surface side through the cutting punch and the cutting die. Thus, in the fastener element 40, an upper surface of the coupling head body 42 and an upper surface of the tape-sandwiching portion

51 excluding the sticking preventing convex portion 54 become a flat surface onto which the shape of a leading end surface portion of the cutting punch is transferred.

[0114] Further, the upper surfaces of the coupling head body 42 and the tape-sandwiching portion 51 forming the flat surface and a ridge line portion disposed between the peripheries of the fastener element 40 are formed in an angular shape. On the other hand, the lower surfaces of the coupling head body 42 and the tape-sandwiching portion 51 that are the second element surface, the ridge line portion disposed between the peripheries of the fastener element 40, and the vicinity thereof are formed in a curved surface shape.

[0115] Further, the two sticking preventing convex portions 54 disposed in the fastener element 40 of the present second embodiment are formed in a circular truncated cone shape, respectively. In this case, the sticking preventing convex portion 54 is disposed so that a ratio of a dimension L4 in the element length direction from the top of the sticking preventing convex portion 54 to the side end edge of the leg portion 53 of the fastener element 40 to a dimension L3 of the whole fastener element 40 in the element length direction can be equal to or more than 1/2.

[0116] As the sticking preventing convex portion 54 is disposed to satisfy the condition, when processing using a liquid, such as the coating process is performed on the fastener element 40 of the present second embodiment, even if another fastener element 40 is superimposed in such a manner that the upper surfaces of the tape-sandwiching portion 51 and the extension portion face the upper surfaces of the coupling head body 42 and the tape-sandwiching portion 51 of the fastener element 40, and the coupling heads 41 face in the same direction or different directions, the sticking preventing convex portions 54 form the clearance between the fastener elements 40, the fastener elements 40 dissolve a liquid and thus are prevented from coming in surface contact with and sticking to each other with a high degree of certainty.

[0117] Further, in this case, a height dimension (a protruding height) of the sticking preventing convex portion 54 in the vertical direction from the upper surface of the tape-sandwiching portion 51 to the top of the sticking preventing convex portion 54 is set to be 0.05 mm or less, preferably, 0.03 mm or less, for example, when the fastener element 40 is implanted into the fastener tape. When the protruding height of the sticking preventing convex portion 54 is set to such a range, even though the sticking preventing convex portion 54 is disposed in the fastener element 40, it is possible to cause the sticking preventing convex portion 54 to be barely noticeable.

[0118] The fastener element 40 of the present second embodiment can obtain the same effects as the fastener element 40 of the first embodiment.

[0119] For example, after the fastener element 40 of the present second embodiment is punched from the rectangular wire material using the cutting punch and the cutting die, barrel polishing is performed on the fastener

element 40 in the polishing process. At this time, the above described sticking preventing convex portion 54 is formed at the upper surface side of the fastener element 40 of the present second embodiment, and the ridge line portion at the lower surface side and the vicinity thereof are formed in the curved surface shape. Thus, it is possible to prevent the fastener element 40 from sticking to the inner wall surface of the processing tank in which barrel polishing is performed. As a result, uniform physical polishing can be performed on each fastener element 40, and when the fastener element 40 is recovered from the processing tank after barrel polishing is performed, the recovery work can be easily performed.

[0120] Further, in the case of performing chemical polishing after barrel polishing described above, since each fastener element 40 has the sticking preventing convex portion 54, it is possible to prevent another fastener element 40 from coming in surface-contact with the upper surface of the fastener element 40. For this reason, a chemical polishing solution can be smoothly spread on the upper surface side of the fastener element 40, and chemical polishing can be uniformly performed on the fastener element 40.

[0121] Further, the fastener element 40 that has been subjected to chemical polishing described above is thereafter subjected to the coating process. At this time, since each fastener element 40 has the sticking preventing convex portion 54 and the ridge line portion at the lower surface side of the fastener element 40 and the vicinity thereof are formed in the curved surface shape, during the coating process, the fastener elements 40 are prevented from sticking to each other by liquid dye, and coating can be uniformly performed on the whole surface of the fastener element 40. For this reason, the coating failure that has been caused by sticking between the fastener elements 40 does not occur, and each fastener element 40 can be stably coated in a desired color tone.

[0122] The fastener element 40 obtained by the above described method does not cause the coating failure, and is even in glossiness or desired color tone over the entire body of the element. Thus, the slide fastener manufactured using the fastener element 40 is excellent in quality of appearance and design.

Claims

1. A metal fastener element (10, 10', 40) for a slide fastener, including:

a coupling head (11, 41); and
a bifurcated tape-sandwiching portion (21, 21', 51) extending from the coupling head (11, 41),
being **characterized in that** at least one sticking preventing convex portion (24, 24', 54) is projectingly disposed on at least one surface of sticking surfaces on which sticking between the fastener elements occurs when liquid process-

- ing is performed on the fastener element (10, 10', 40).
2. The fastener element according to claim 1, being **characterized in that** the fastener element (10, 10', 40) is manufactured by punching a rectangular metal wire material (31) using a cutting punch (32) and a cutting die (33), the sticking surface includes a first element surface that abuts on the cutting punch (32) and a second element surface opposite to the first element surface, and the sticking preventing convex portion (24, 24', 54) is disposed on at least the first element surface.
 3. The fastener element according to claim 2, being **characterized in that** the sticking preventing convex portion (24') is further formed on the second element surface.
 4. The fastener element according to claim 2, being **characterized in that** the two sticking preventing convex portions (24, 54) are formed on at least the first element surface.
 5. The fastener element according to any one of claims 2 to 4, being **characterized in that** the coupling head (11) includes a thin walled flat plate portion (12) and coupling convex portions (13) that are projectingly disposed on the first and second element surfaces of the flat plate portion (12), the tape-sandwiching portion (21, 21') includes a body portion (22) that thickly extends from a base end portion of the coupling head (11) via a step surface (26) and a pair of leg portions (23) that branches off and extends from the body portion (22), and the sticking preventing convex portion (24, 24') is projectingly disposed on the tape-sandwiching portion (21).
 6. The fastener element according to claim 5, being **characterized in that** a ratio of a dimension L2 in an element length direction, from an top of the sticking preventing convex portion (24) to a leg portion side end edge of the tape-sandwiching portion (21), to a dimension L1 in the element length direction, from a coupling head side end edge of a first area (61) formed by the same plane surface as a first surface of the tape-sandwiching portion (21, 21') to the leg portion side end edge of the tape-sandwiching portion (21, 21'), is set to 1/2 or more.
 7. The fastener element according to claim 5, being **characterized in that** at least a part of the sticking preventing convex portion (24) is included in a second area (62) formed by the body portion (22).
 8. The fastener element according to claim 5, being **characterized in that** the leg portion (23) includes a base end portion (23a) extending from the body portion (22), an intermediate portion (23b) extending from the base end portion (23a) and having an outside edge and an linear inside edge that are disposed along an element length direction, and a curved portion (23c) that is formed to curve from the intermediate portion (23b) in a direction in which the curved portions get closer to each other, and the sticking preventing convex portion (24) is included in a third area (63) formed to include an area of the intermediate portion (23b) and an area that is ahead of the intermediate portion (23b) and surrounded by an extension line extending from an inside edge of the intermediate portion (23b) to the coupling head (11) side, an outside edge of the body portion (22) and the base end portion (23a), and a coupling head side end edge of the body portion (22).
 9. The fastener element according to claim 5, being **characterized in that** the leg portion (23) includes a base end portion (23a) extending from the body portion (22), an intermediate portion (23b) extending from the base end portion (23a) and having an outside edge and an inside edge that are disposed along an element length direction, and a curved portion (23c) that is formed to be curve from the intermediate portion (23b) in a direction in which the curved portions get closer to each other, and the sticking preventing convex portion (24) is disposed on a center line (23d) between the outside edge and the inside edge of the intermediate portion (23b).
 10. The fastener element according to claim 5, being **characterized in that** the sticking preventing convex portion (24) is disposed to span a boundary line (25) between the body portion (22) and the leg portion (23).
 11. The fastener element according to any one of claims 2 to 4, being **characterized in that** the coupling head (41) includes a coupling concave portion (44) recessed in the first element surface side and a coupling convex portion (43) disposed projectingly on the second element surface side, the tape-sandwiching portion (51) includes a body portion (52) that extends from a base end portion of the coupling head (41) and a pair of leg portions (53) that branches off and extends from the body portion (52), and the sticking preventing convex portion (54) is projectingly disposed on the tape-sandwiching portion (51).
 12. The fastener element according to claim 11,

being **characterized in that** a ratio of a dimension L4 in an element length direction, from the top of the sticking preventing convex portion (54) to a leg portion side end edge of the fastener element (40), to a dimension L3 of the whole fastener element (40) in the element length direction is set to 1/2 or more. 5

13. The fastener element according to any one of claims 1 to 4, being **characterized in that** a protruding height of the sticking preventing convex portion (24, 24', 54) is set to 0.05 mm or less. 10

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FIG. 1

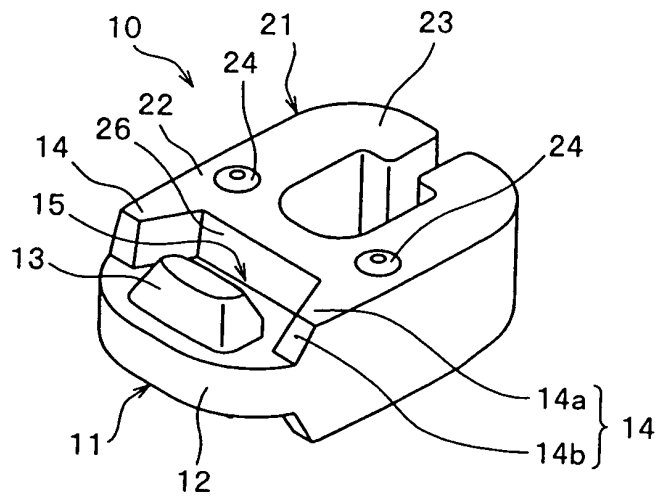


FIG. 2

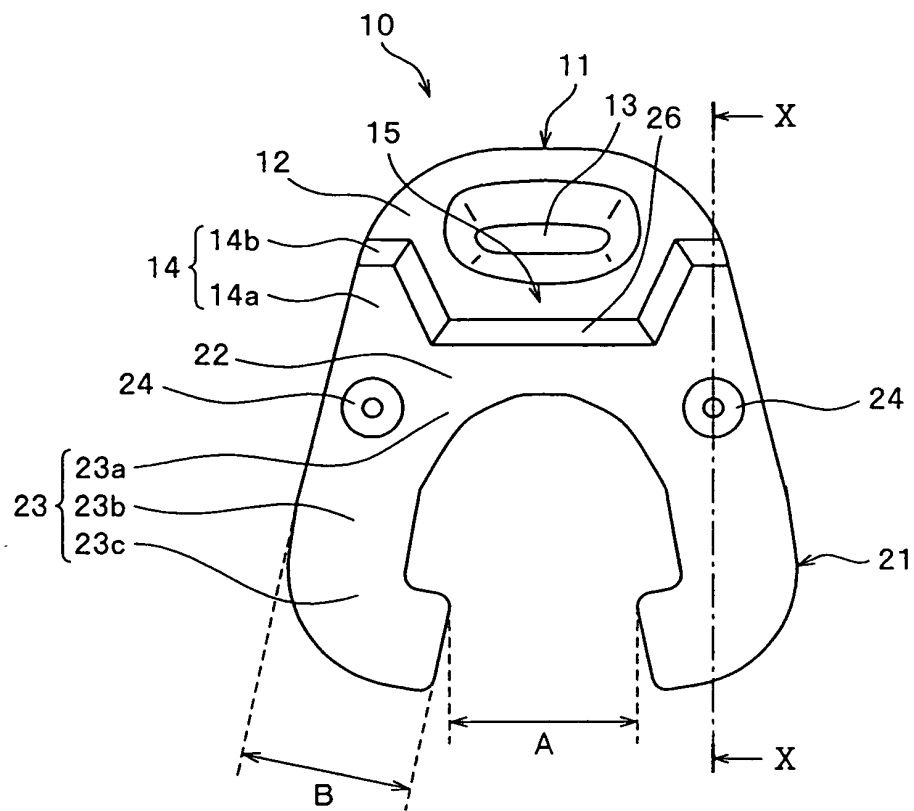


FIG. 3

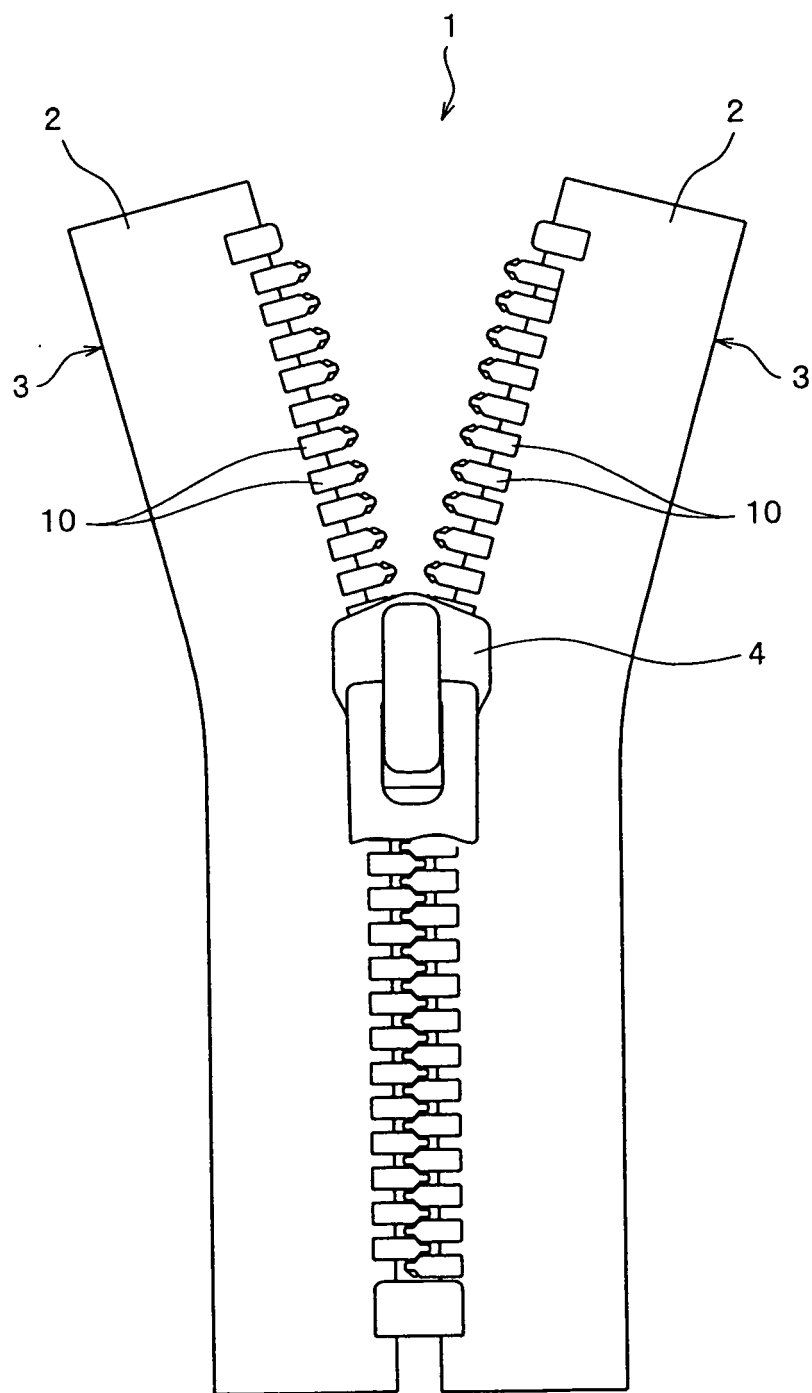


FIG. 4

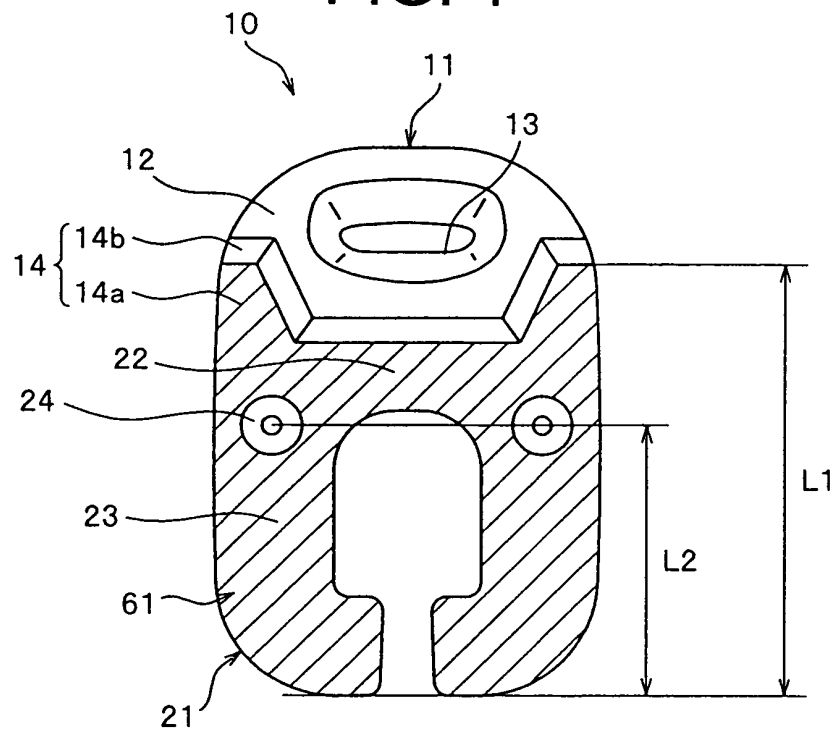


FIG. 5

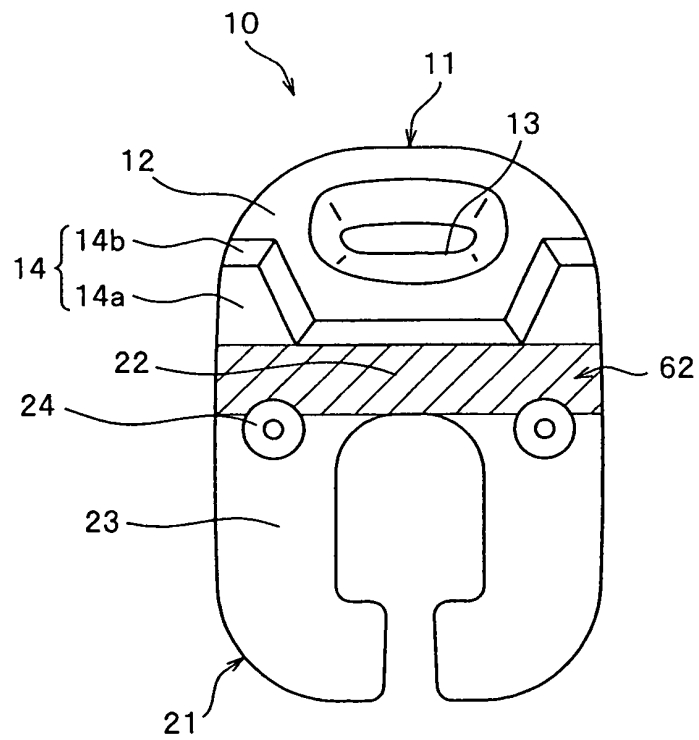


FIG. 6

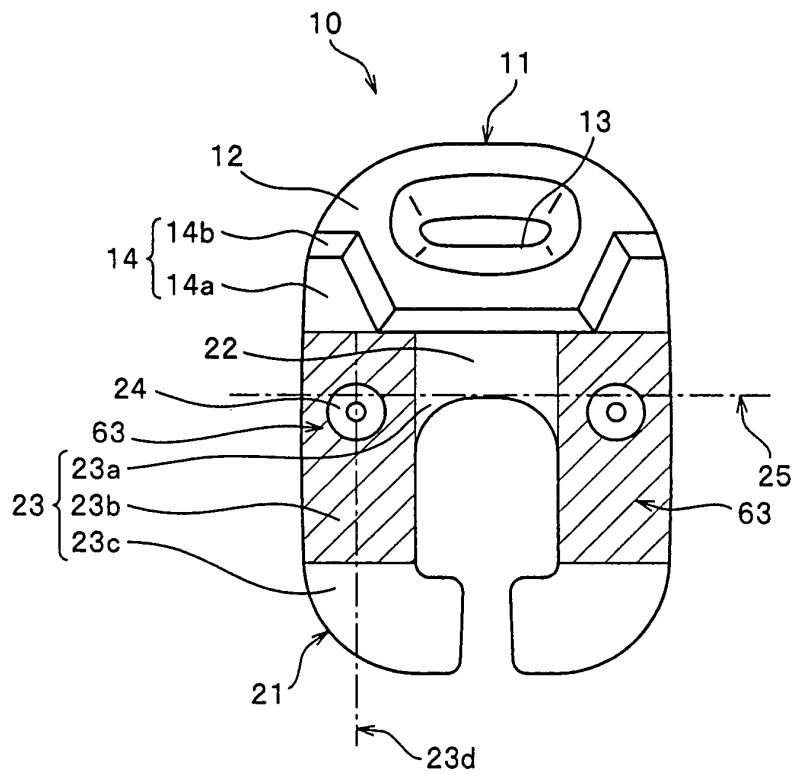


FIG. 7

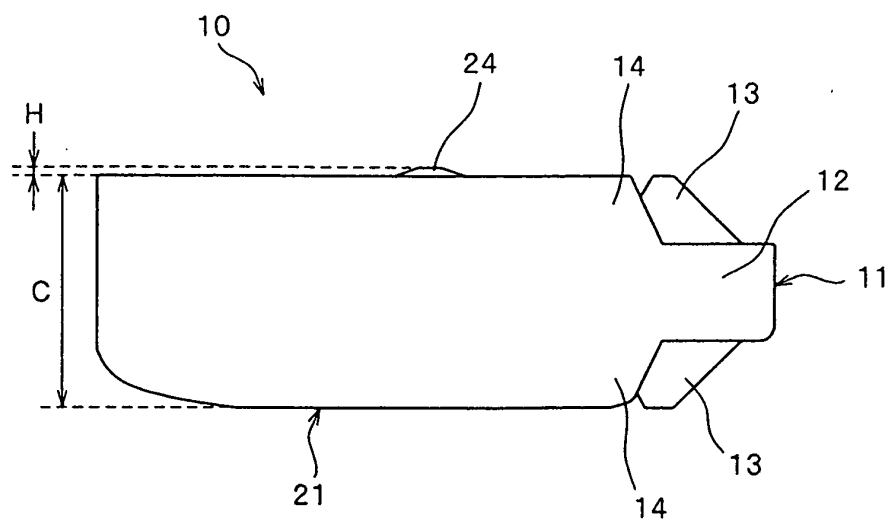


FIG. 8

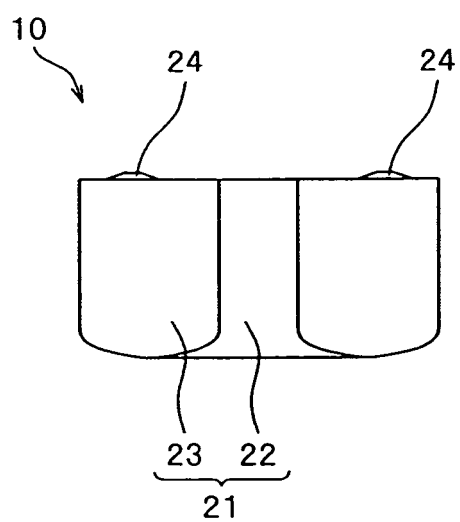


FIG. 9

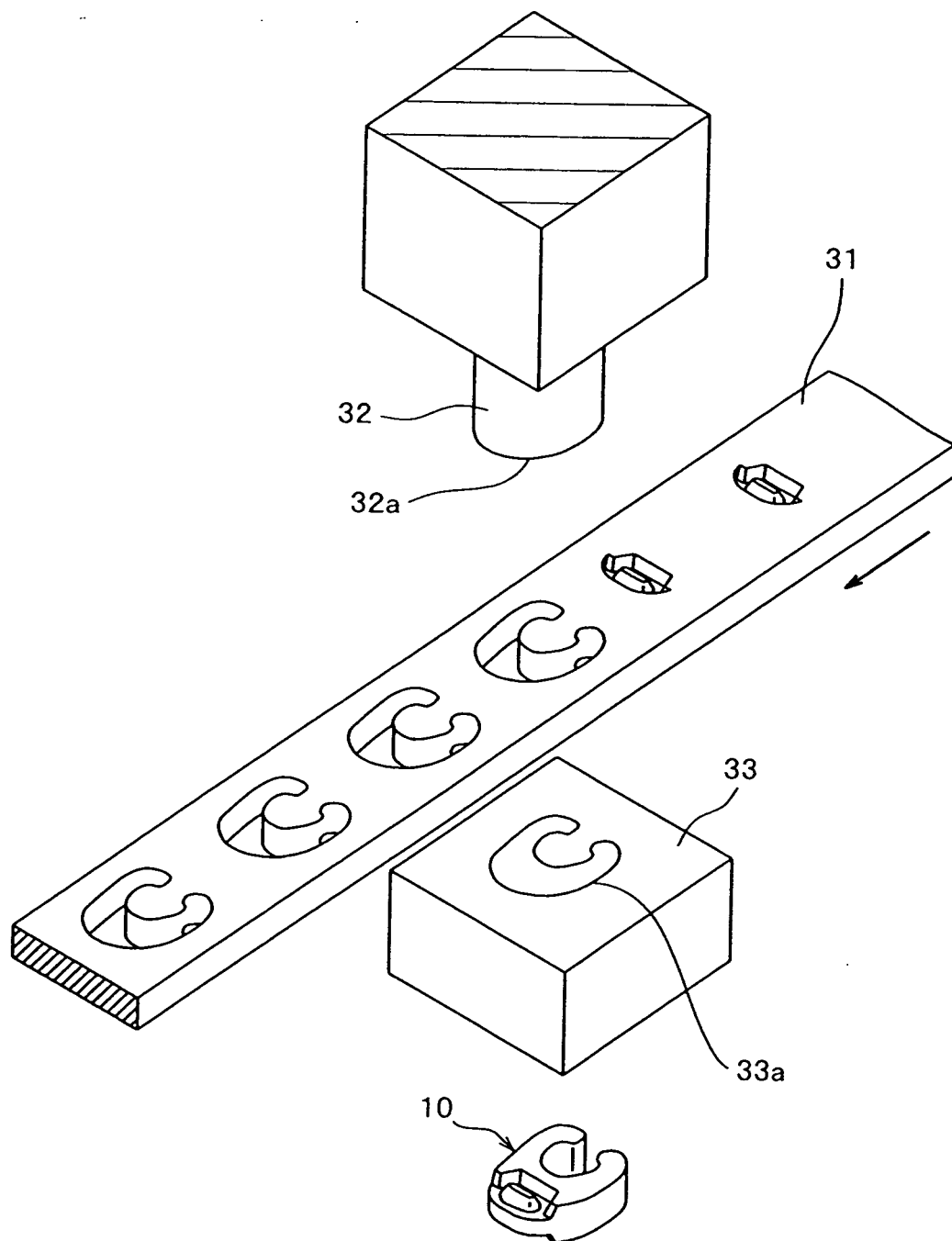


FIG. 10

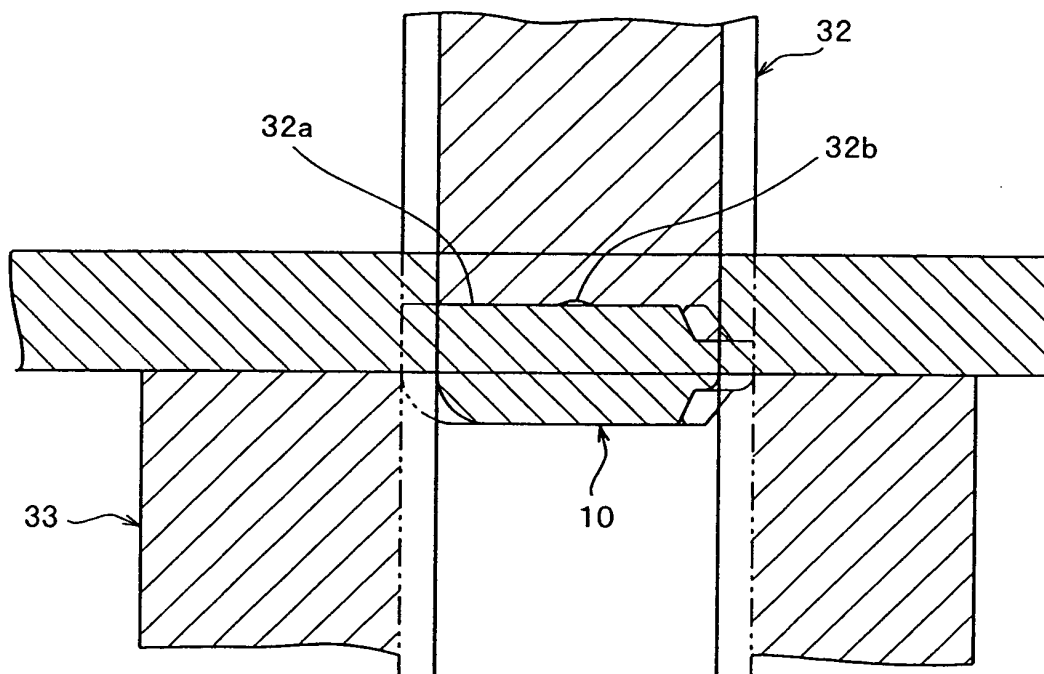


FIG. 11

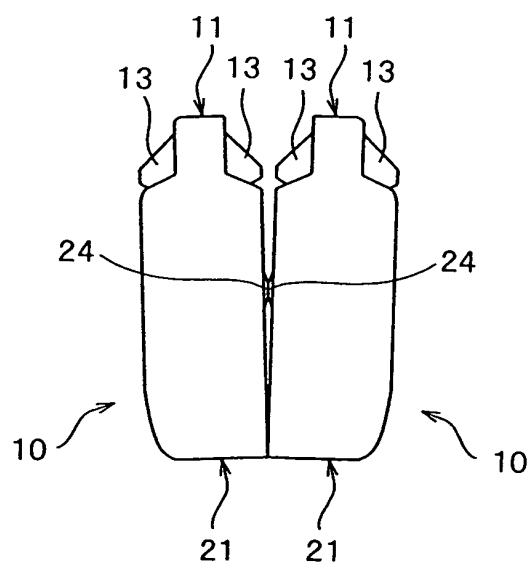


FIG. 12

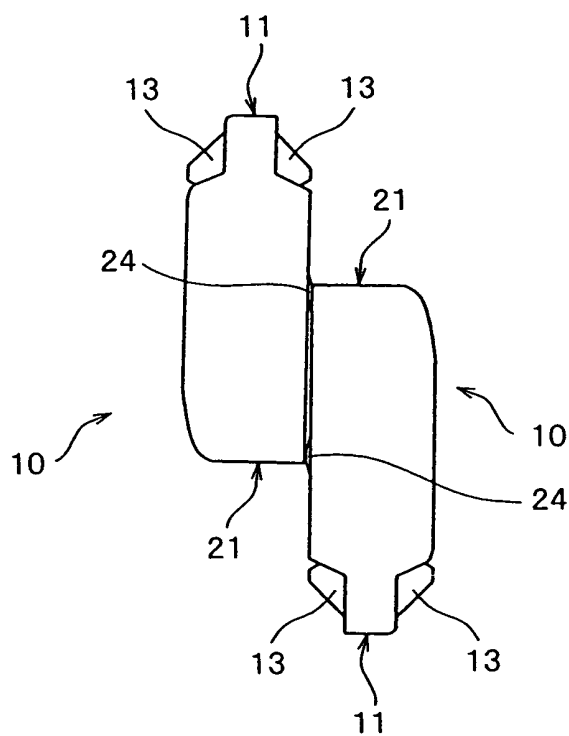


FIG. 13

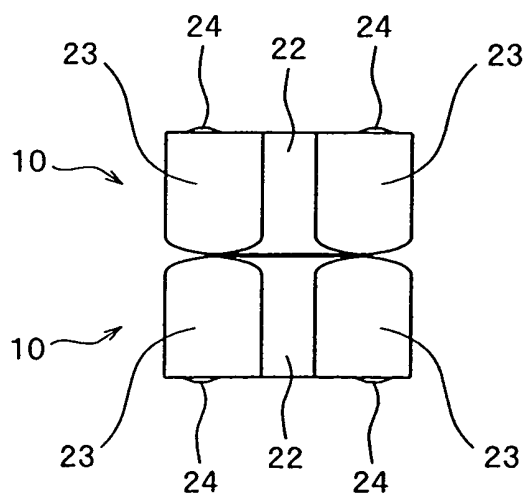


FIG. 14

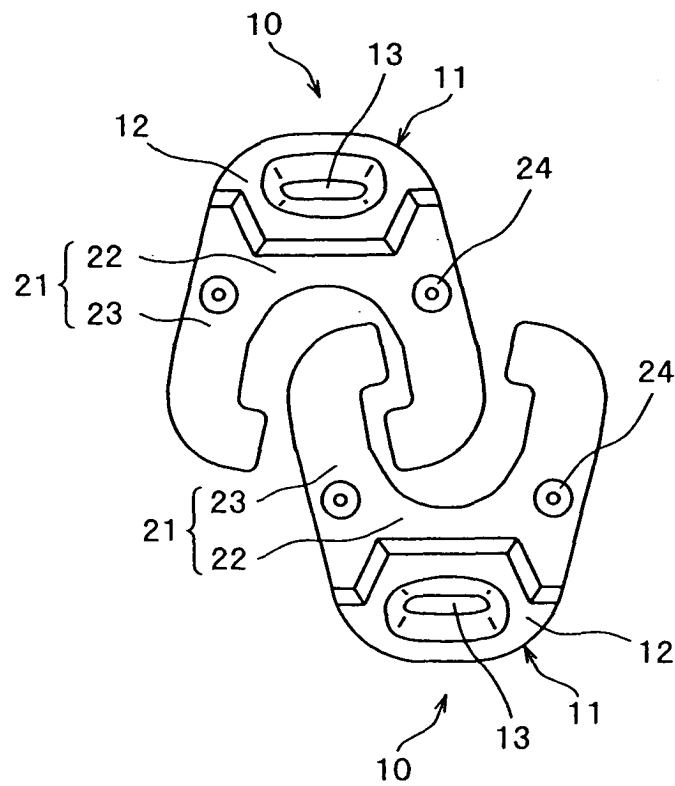


FIG. 15

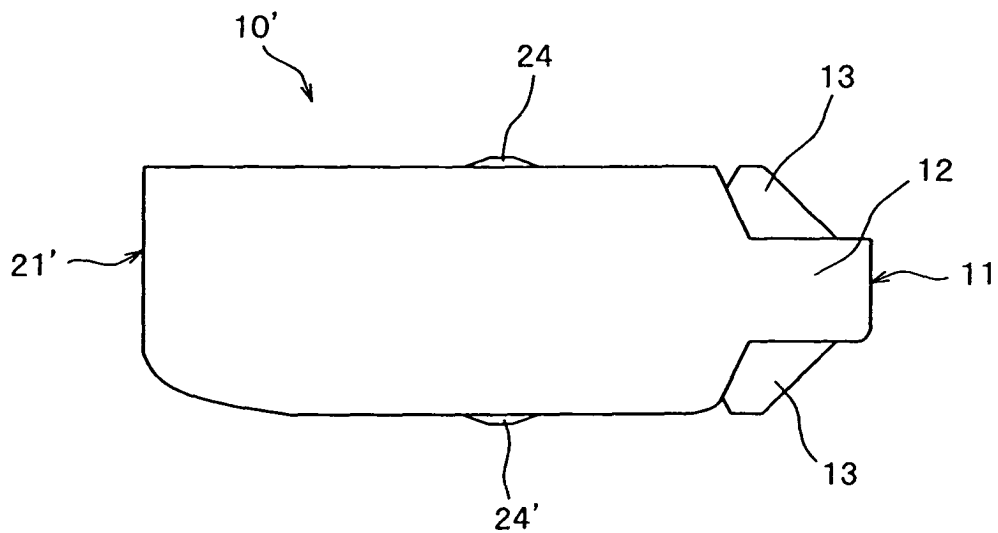


FIG. 16

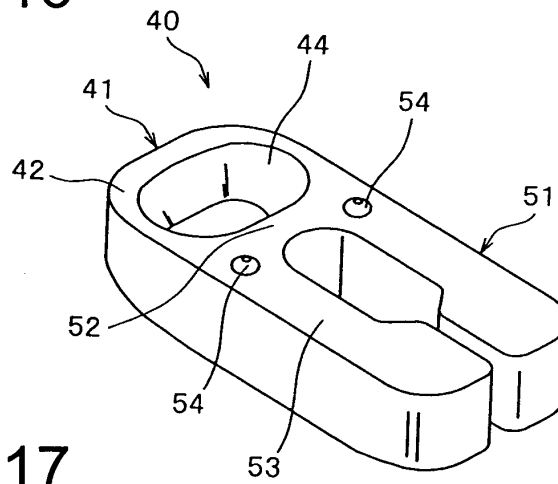


FIG. 17

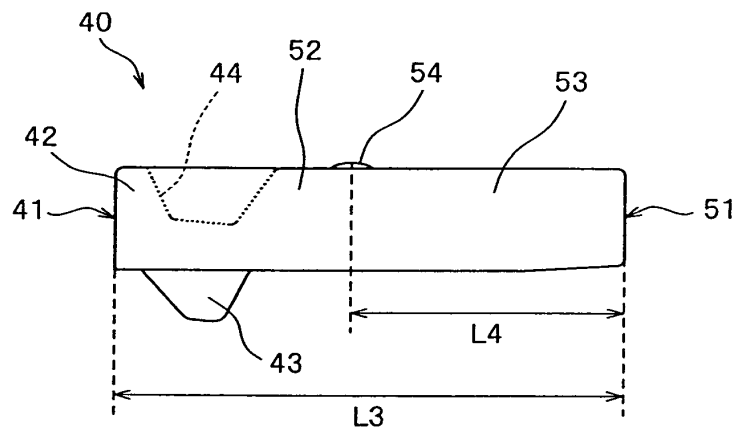


FIG. 18

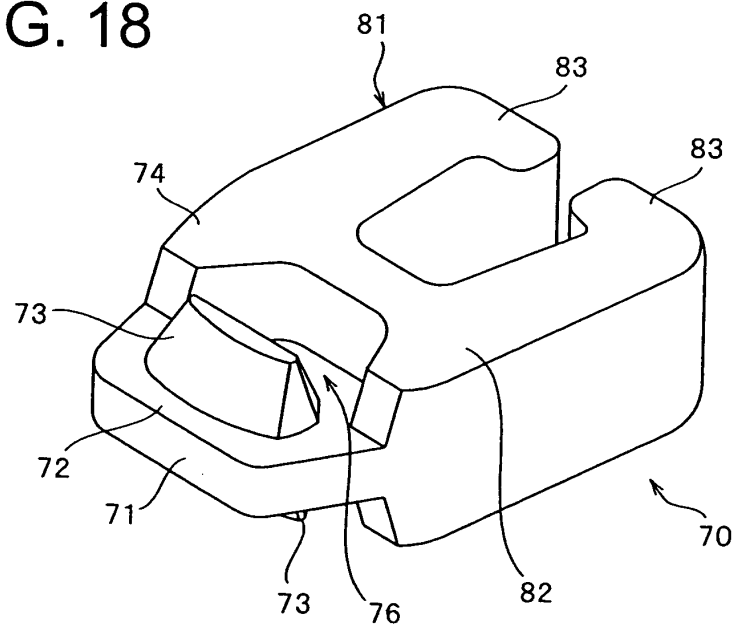
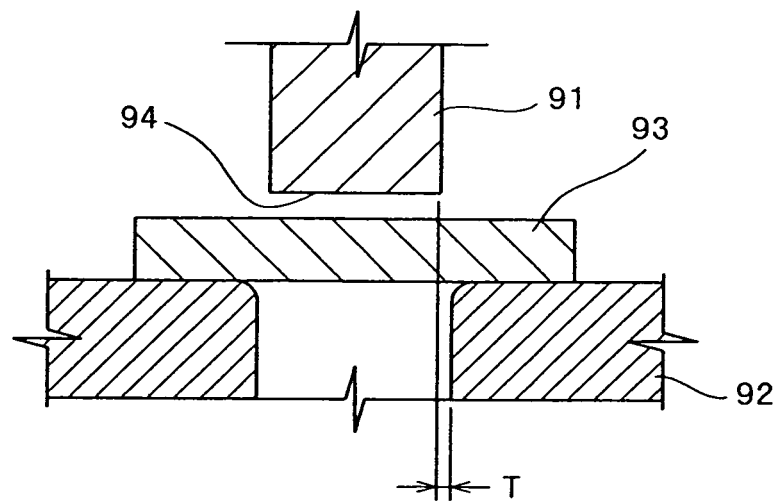


FIG. 19



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/051848

A. CLASSIFICATION OF SUBJECT MATTER A44B19/06 (2006.01) i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A44B19/06		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009 Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 6-217810 A (Yoshida Kogyo Co., Ltd.), 09 August, 1994 (09.08.94), Par. Nos. [0011] to [0022]; Figs. 1 to 2, 7 to 8 & US 5394593 A & EP 608770 A1 & CA 2113504 A1	1-2, 4, 13 3, 5-12
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 17012/1979 (Laid-open No. 116510/1980) (Yoshida Kogyo Co., Ltd.), 16 August, 1980 (16.08.80), Page 3, line 16 to page 4, line 7; Fig. 4 (Family: none)	1-13
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 30 April, 2009 (30.04.09)		Date of mailing of the international search report 19 May, 2009 (19.05.09)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 1080012 A [0008] [0014]
- JP 2005237532 A [0008] [0014]