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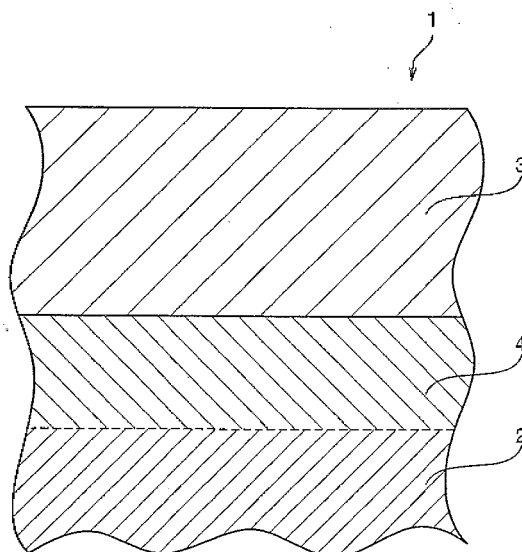
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(54) **ZIPPER COMPONENT AND SLIDE ZIPPER, AND METHOD FOR PRODUCING ZIPPER COMPONENT**

(57) A zipper component (1) according to the invention includes a metal plating film (3) provided on the surface of a component body (2) made of a metal. Further, in the zipper component (1), at least a part of the component body (2) has been thermally treated before bending and thus the metal plating film (3) has a recrystallized

structure wherein at least a part of the metal plating film (3) been recrystallized. Accordingly, since the ductility of the metal plating film (3) can be improved, even when the zipper component (1) is bent, the metal plating film (3) can be deformed to follow the deformation of the component body (2). Therefore, the occurrence of crevicing or cracking in the metal plating film (3) can be prevented.

FIG. 2



Description

TECHNICAL FIELD

[0001] The invention relates to a zipper component for a slide zipper, at least a part of which is subjected to bending, such as caulking and the like, and a method for producing the same, and more specifically, to a zipper component including a component body made of a metal and a metal plating film provided on the surface of the component body and a method for producing the same.

BACKGROUND ART

[0002] In general, various zipper components such as an opening-type separable bottom end stop such as a zipper element, an upper stopper, a lower stopper, an insert pin, a box pin and the like, and a slider are used for a slide zipper, and components made of a metal are variously included in these zipper components.

[0003] One of the zipper components made of a metal is a zipper element. In general, the zipper element made of a metal has a coupling head and the like formed by subjecting a plate material made of a metal such as, for example, copper, a copper alloy and the like, which has a predetermined thickness to press molding, and is formed by punching the plate material, and the like so as to have an approximately Y-shape. Further, the zipper element made of a metal obtained is mounted on a zipper tape by caulking the right and left leg portions toward the inner side of both the leg portions while the zipper tape is interposed between the right and left leg portions.

[0004] In addition, the lower stopper of a metal as one of the other zipper components is described in, for example, U.S. Patent No. 2,884,691 (Patent Document 1). The lower stopper described in Patent Document 1 is formed by subjecting a metal wire having a circular cross-section to rolling processing, deforming the cross-section of the metal wire into an approximately X-shape (or an approximately H-shape), and then cutting the metal wire into a predetermined length. Furthermore, the lower stopper having an approximately X-shape (or approximately H-shape) cross-section obtained is mounted on the zipper tape by caulking a pair of arm portions extended to the left and right, respectively, toward the zipper tape.

[0005] Further, a zipper component such as an upper stopper, an insert pin, a box pin and the like, of a metal is also mounted on the zipper tape by molding or cutting a metal material such as copper, a copper alloy, an aluminum alloy, a zinc alloy and the like into a predetermined shape and then subjecting the zipper component obtained to caulking.

[0006] Meanwhile, in the case of a slider made of a metal, a slider body and a tab having a predetermined shape are formed by performing a die-cast molding using a metal such as, for example, an zinc alloy, an aluminum alloy and the like, and the tab may be mounted on the slider body in some cases by subjecting a part of the

slider body obtained to caulking or bending.

PRIOR ART DOCUMENT

5 PATENT DOCUMENT

[0007]

Patent Document 1: U.S. Patent No. 2,884,691

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SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

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[0008] In the related art, for a product made of a metal, a metal plating film is formed on the surface of the product by subjecting the product to plating treatment for the purpose of imparting new design, improving corrosion resistance and the like. The formation of the metal plating film has been often performed on zipper components made of various metals, which constitute a slide zipper, in the related art.

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[0009] For example, for a zipper component such as a zipper element, upper and lower stoppers and the like made of a metal such as copper, a copper-alloy, and the like, a metal plating film made of a copper-zinc-based alloy (brass), or a white-system metal plating film made of a copper-tin-based alloy or a tin-nickel-based alloy is formed on the surface of the zipper component in order to protect a component body, which is a base material or impart a desired color tone.

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[0010] In addition, for example, for a zipper component such as a zipper element or upper and lower stoppers using a metal such as an aluminum alloy and the like as a matrix, upper and lower stoppers or a slider using a metal such as a zinc alloy and the like as a matrix and the like, a metal plating film made of copper (pure copper) or a copper-zinc-based alloy may be formed on the surface of the component body, for the purpose of imparting a desired color tone or improving corrosion resistance.

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[0011] However, the metal plating film made of a metal described above generally has a high hardness. For this reason, for example, in order to form a metal plating film on a zipper component such as a zipper element, upper and lower stoppers and the like, and then mount a zipper component having the metal plating film on a zipper tape, or in order to mount a tab on a slider body, when bending such as caulking and the like as described above is performed, crevicing or cracking is easily formed in the metal plating film, which is considered defective.

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[0012] When crevicing or cracking is formed in a metal plating film in this manner, a base material is exposed from the portion on which the crevicing or cracking occurs even though the metal plating film is formed in order to impart a desired color tone, and thus the zipper component is visually deteriorated, thereby damaging the design or appearance quality of the slide zipper, which is problematic.

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[0013] Furthermore, when a metal plating film is formed on the surface of the zipper component for the purpose of improving corrosion resistance, corrosion easily occurs in the base material (matrix) of the zipper component from the portion on which crevicing or cracking occurs, which is problematic.

[0014] In particular, recently, in order to allow a product to be fastened, on which a slide zipper is used, to provide an aesthetic appearance, a big-size zipper element, upper and lower stoppers and the like, which look flat, have been used in the slide zipper. However, when the big-size zipper element or upper and lower stoppers are caulked on a zipper tape, the deformation volume of the plastic deformation due to the caulking is so large that crevicing or cracking significantly occurs in the metal plating film, and because the size of crevicing or cracking is increased and the like, a visual problem or a corrosion problem of the zipper component as described above is further deteriorated.

[0015] The invention has been made in view of the problems in the related art, and the specific object of the invention is to provide a zipper component on which crevicing or cracking is less likely to occur in the metal plating film formed on the surface of the component body even though the zipper component is bent, a slide zipper in which the zipper component is bent and used, and a method for producing the zipper component.

MEANS FOR SOLVING THE PROBLEMS

[0016] In order to achieve the object, the zipper component provided by the invention is, as a basic constitution, a zipper component for a slide zipper in which a metal plating film is formed on the surface of a component body made of a metal and at least a part of the component body after the formation of the metal plating film is subjected to bending. A thermal treatment is performed before the bending, and thus the metal plating film has a recrystallized structure wherein at least a part of the crystal structure has been recrystallized.

[0017] In particular, in the zipper component according to the invention, the recrystallized structure is preferably formed by forming the metal plating film as a columnar crystal structure on the surface of the component body, and then subjecting the metal plating film to the thermal treatment to recrystallize at least a part of the columnar crystal structure.

[0018] In the zipper component according to the invention, the component body is preferably made of copper or a copper-zinc-based alloy. In this case, the component body particularly preferably contains copper in an amount of at least from 75 wt% to 100 wt% and zinc in an amount of from 0 wt% to 25 wt%.

[0019] Further, in the zipper component according to the invention, the component body may have a metal body made of zinc or a zinc-based alloy and a base plating film, which is provided on the surface of the metal body and made of copper. Otherwise, the component

body may have a metal body made of an aluminum-based alloy, a first base plating film, which is provided on the surface of the metal body and made of zinc, and a second base plating film, which is provided on the surface of the first base plating film and made of copper.

[0020] In addition, in the zipper component according to the invention, the metal plating film is preferably made of at least one selected from the group consisting of a copper-zinc-based alloy, a copper-tin-based alloy, and a tin-nickel-based alloy.

[0021] In the zipper component of the invention, the metal plating film having the recrystallized structure has a film thickness of preferably from 1 μm to 10 μm .

Further, the metal plating film having the recrystallized structure has a Vickers hardness of preferably from Hv50 to Hv100.

[0022] In addition, a surface layer portion on the metal plating film side of the component body preferably has a diffusion layer formed by diffusing a metal included in the metal plating film.

Furthermore, the zipper component is preferably at least one component selected from the group consisting of a zipper element, a stopper, an opening-type separable bottom end stop, and a slider.

[0023] Further, according to the invention, a slide zipper in which a zipper component having the constitution is bent and used may be provided.

[0024] In addition, a method for producing the zipper component provided by the invention is, as a basic constitution, a method for producing a zipper component for a slide zipper, by which a metal plating film is provided on the surface of a component body made of a metal and at least a part of the component body is bent after the metal plating film is formed, and the method includes forming the metal plating film on the surface of the component body and subjecting the metal plating film to thermal treatment at a temperature which is equal to or more than the recrystallized temperature to form a recrystallized structure wherein at least a part of the crystal structure of the metal plating film has been crystallized.

[0025] In particular, the method for producing a zipper component according to the invention preferably includes forming the metal plating film which is provided on the surface of the component body as a columnar crystal structure and forming the recrystallized structure by subjecting the metal plating film having the columnar crystal structure to the thermal treatment.

[0026] The method for producing a zipper component according to the invention preferably includes allowing the metal plating film to be made of a copper-zinc-based alloy and heating the metal plating film at from 300°C to 400°C with the heat treatment.

[0027] Further, the method for producing a zipper component according to the invention may include allowing the metal plating film to be made of a copper-tin-based alloy and heating the metal plating film at from 400°C to 500°C with the heat treatment. Otherwise, the production method of the invention may include allowing the metal

plating film to be made of a tin-nickel-based alloy and heating the metal plating film at from 500°C to 600°C with the heat treatment.

[0028] In addition, the production method of the invention preferably includes controlling the Vickers hardness of Hv120 or more, which the metal plating film has, to from Hv50 to Hv100, by the thermal treatment.

EFFECT OF THE INVENTION

[0029] In the zipper component according to the invention, a metal plating film is formed on the surface of a component body made of a metal, and then the metal plating film is thermally treated. Accordingly, the metal plating film formed on the zipper component has a recrystallized structure wherein at least a part of the crystal structure has been recrystallized.

[0030] Since at least a part of the metal plating film has a recrystallized structure in this manner and the metal plating film has better ductility than the metal plating film formed on the surface of the component body before the thermal treatment, the metal plating film may be elongated relatively readily, and crevicing or cracking on the metal plating film may be less likely to occur.

[0031] Accordingly, in the case of the zipper component of the invention, when a component body including a metal plating film provided on the surface of the component body as described above is bent, the metal plating film may be readily deformed to follow the deformation of the component body, and thereby making it difficult or impossible to generate crevicing or cracking in the metal plating film.

[0032] For this reason, the zipper component may solve a problem caused by crevicing or cracking in the metal plating film in the zipper component in the related art, that is, a problem that the zipper component is visually deteriorated, and a color imparted to the metal plating film may be uniformly obtained. In addition, the zipper component may readily solve a problem in the related art that corrosion easily occurs on the base material of the zipper component.

[0033] In particular, in the zipper component according to the invention, the recrystallized structure is formed by forming a metal plating film as a columnar crystal structure on the surface of a component body, and then subjecting the metal plating film to thermal treatment to recrystallize at least a part of the columnar crystal structure. The invention may be particularly suitably applied when the metal plating film is grown as a columnar crystal structure.

[0034] That is, the zipper component of the invention with at least a part of the metal plating film having a columnar crystal structure recrystallized has excellent ductility, compared to the metal plating film in the related art, having only a columnar crystal structure. For this reason, this may make it difficult to generate crevicing or cracking in the metal plating film formed on the zipper component.

[0035] The zipper component of the invention may be

suitably applied when the component body is made of copper or a copper-zinc-based alloy. Since copper or the copper-zinc-based alloy has excellent ductility, bending such as caulking and the like may be relatively readily performed, and copper or the copper-zinc-based alloy has been often used in the related art, for example, as a material for the zipper component such as a zipper element, upper and lower stoppers and the like. If a metal plating film having a recrystallized structure is provided on the surface of the zipper component made of copper or a copper-zinc-based alloy, the occurrence of crevicing or cracking in the metal plating film may be effectively prevented when the component body is bent.

[0036] Particularly in this case, the component body may contain copper in an amount of at least from 75 wt% to 100 wt% and zinc in an amount of from 0 wt% to 25 wt% to more securely prevent the occurrence of stress corrosion crevicing in the component body which has been subjected to bending.

[0037] Further, the zipper component of the invention may be suitably applied even when the component body has a metal body made of zinc or a zinc-based alloy and a base plating film which is provided on the surface of the metal body and made of copper. Zinc has generally low costs and may also be readily formed into a desired shape by using a die-cast molding, and thus has been conveniently used as a material for the zipper component such as, for example, an opening-type separable bottom end stop, a slider and the like. In addition, since zinc has low corrosion resistance, a base plating film made of copper having excellent corrosion resistance is formed on the surface of the metal body when zinc or a zinc-based alloy is used as a metal matrix.

[0038] Even when a metal plating film having a recrystallized structure is provided on the surface of the zipper component having the metal body made of copper or a copper-zinc-based alloy and the base plating film, the occurrence of crevicing or cracking in the metal plating film may be effectively prevented when the component body is bent.

[0039] In addition, the zipper component of the invention may be suitably applied even when the component body has a metal body made of an aluminum-based alloy, a first base plating film which is provided on the surface of the metal body and made of zinc, and a second base plating film which is provided on the surface of the first base plating film and made of copper.

[0040] The aluminum-based alloy is lightweight. For this reason, a zipper component made of a metal may be very lightly constructed by using an aluminum-based alloy as a metal matrix of the zipper component. Accordingly, the aluminum-based alloy has been conveniently used as a material for a zipper component such as a zipper element, upper and lower stoppers, a slider and the like.

[0041] Furthermore, the aluminum-based alloy also has low corrosion resistance, and thus when the aluminum-based alloy is used as a metal matrix, a first base

plating film made of zinc is formed on the surface of the metal body by electroless plating and the like, and a second base plating film made of copper having excellent corrosion resistance is also formed on the surface of the first base plating film.

[0042] Even when a metal plating film having a recrystallized structure is provided on the surface of the zipper component having the metal body made of the aluminum-based alloy and the first and second base plating films, the occurrence of crevicing or cracking in the metal plating film may be effectively prevented when the component body is bent.

[0043] Further, in the zipper component of the invention, a material for the metal plating film may use, for example, copper (pure copper), a copper-zinc-based alloy and a white system metal (for example, a copper-tin-based alloy, a tin-nickel-based alloy, nickel, chromium, vanadium, rhodium, platinum and the like), and in particular, the metal plating film in the invention is preferably made of at least one selected from the group consisting of a copper-zinc-based alloy, a copper-tin-based alloy and a tin-nickel-based alloy, which have a relatively low recrystallized temperature region. The metal plating film made of the material may have a recrystallized structure to prevent the occurrence of crevicing or cracking in the metal plating film even when the zipper component is bent, and thus the zipper component may obtain a good appearance quality.

[0044] In addition, in the zipper component of the invention, the metal plating film having a recrystallized structure has a film thickness of from 1 μm to 10 μm and preferably from 2 μm to 6 μm . A metal plating film may be stably and securely formed by setting the film thickness of the metal plating film to 1 μm or more (preferably 2 μm or more).

[0045] Furthermore, the thicker the film thickness of the metal plating film is formed, the better the metal plating film may be stably formed. However, although the film thickness of the metal plating film is set at more than 10 μm , the effect that the metal plating film has been stabilized or the appearance quality obtained by the metal plating film has been improved is not changed very much, and thus the film thickness of the metal plating film is set at 10 μm or less (preferably 6 μm or less).

[0046] Further, in the zipper component of the invention, the metal plating film having a recrystallized structure has a Vickers hardness of from Hv50 to Hv100. When the Vickers hardness of the metal plating film is Hv50 or more, the occurrence of scratch and the like may be prevented on the surface of the zipper component to maintain a good appearance quality.

[0047] Meanwhile, when the Vickers hardness of the metal plating film is Hv100 or less, the metal plating film may be relatively smoothly formed to improve the ductility of the metal plating film. For this reason, when the zipper component is bent, even in the case where the volume of the plastic deformation in the component body of the zipper component due to the bending is large, the occur-

rence of crevicing or cracking in the metal plating film may be more securely prevented.

[0048] In addition, in the zipper component of the invention, a surface layer portion on the metal plating film side of the component body has a diffusion layer formed by diffusing a metal included in the metal plating film. The adhesiveness of a metal plating film on the component body may be improved by having the diffusion layer on the surface layer portion of the component body to allow the metal plating film to have good affinity to the component body.

[0049] The zipper component of the invention is particularly suitably applied to an opening-type separable bottom end stop such as, for example, a zipper element, an upper stopper, a lower stopper, an insert pin, a box pin, and the like and a part such as a slider.

[0050] Moreover, the slide zipper provided by the invention is configured by bending the zipper component having the above-described configuration to be used. Therefore, since the slide zipper of the invention has no occurrence (or very few occurrence) of crevicing or cracking in the metal plating film of the zipper component, the zipper component has uniform color, and thus a slide zipper, which is visually improved and has excellent design or appearance quality, is obtained.

[0051] Subsequently, the method for producing a zipper component provided by the invention includes forming a metal plating film on the surface of a component body of the zipper component and producing the zipper component by subjecting the metal plating film to thermal treatment at a temperature which is equivalent or more than the recrystallized temperature before bending.

[0052] According to the production method of the invention, the crystal structure of the metal plating film is recrystallized by subjecting a metal plating film which is provided on the surface of the component body to thermal treatment, and thus a metal plating film having at least a part of a recrystallized structure in which the crystal orientation is disturbed may be readily formed. Since the metal plating film having the recrystallized structure in this way has improved ductility, the occurrence of crevicing or cracking in the metal plating film may be effectively prevented when the zipper component produced by the production method is bent.

[0053] In particular, in the method for producing a zipper component according to the invention, a metal plating film provided on the surface of the component body is formed as a columnar crystal structure and a recrystallized structure is formed by subjecting the metal plating film having the columnar crystal structure to thermal treatment. In this way, the invention may be particularly suitably applied when the metal plating film is grown as a columnar crystal structure. That is, the ductility of the metal plating film may be improved by subjecting the metal plating film formed as a columnar crystal structure to thermal treatment, thereby making it difficult to generate crevicing or cracking in the metal plating film after the thermal treatment.

[0054] Furthermore, in the production method of the zipper component according to the invention, the metal plating film is made of a copper-zinc-based alloy and heated to a temperature of from 300°C to 400°C by thermal treatment. Accordingly, when the metal plating film is made of a copper-zinc-based alloy, a recrystallized structure may be readily and stably formed in at least a part of the metal plating film.

[0055] Further, in the production method of the zipper component according to the invention, the metal plating film is made of a copper-tin-based alloy, and the metal plating film is heated to a temperature of from 400°C to 500°C by thermal treatment. Accordingly, when the metal plating film is made of a copper-tin-based alloy, a recrystallized structure may be readily and stably formed in at least a part of the metal plating film.

[0056] In addition, in the method for producing a zipper component according to the invention, the metal plating film is made of a tin-nickel-based alloy, and the metal plating film is heated to a temperature of from 500°C to 600°C by thermal treatment. Accordingly, when the metal plating film is made of a tin-nickel-based alloy, a recrystallized structure may be readily and stably formed in at least a part of the metal plating film.

[0057] Furthermore, in the production method of the invention, the Vickers hardness of Hv120 or more, which the metal plating film has, is controlled to a value from Hv50 to Hv100 by the thermal treatment. The occurrence of scratch and the like may be prevented on the surface of the zipper component and a good appearance quality may be maintained by controlling the Vickers hardness of the metal plating film to Hv50 or more. Meanwhile, by controlling the Vickers hardness of the metal plating film to Hv100 or less, the occurrence of crevicing or cracking in the metal plating film may be even more securely prevented when the zipper component is bent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0058]

FIG. 1 is a cross-sectional view schematically illustrating a cross-section of a zipper component before thermal treatment.

FIG. 2 is a cross-sectional view schematically illustrating a cross-section of a zipper component after thermal treatment.

FIG. 3 is a front view illustrating a zipper component constituting a slide zipper.

FIG. 4 is a cross-sectional view illustrating a lower stopper.

FIG. 5 is an explanatory view schematically illustrating bending of a lower stopper against a zipper tape.

FIG. 6 is a flowchart for explaining a method for producing a zipper component according to embodiments of the invention.

MODE FOR CARRYING OUT THE INVENTION

[0059] Hereinafter, preferable embodiments of the invention will be described in detail with reference to the drawings. Further, the invention is not limited to embodiments to be described below, and various modifications can be made as long as the embodiments have a configuration which is substantially equivalent to the configuration of the invention and show the same operational effects.

[0060] Herein, FIG. 1 is a cross-sectional view schematically illustrating a state before a zipper component with a metal plating film formed on the surface of a component body is subjected to thermal treatment, and FIG. 2 is a cross-sectional view schematically illustrating a state after the zipper component is thermally treated.

[0061] A zipper component 1 according to the embodiment is a component in which the matrix of a component body 2 is made of a metal and at least a part of the component body 2 is subjected to bending, such as caulking and the like, among the components constituting the slide zipper. For example, as a general slide zipper 10 is shown in FIG. 3, the zipper component 1 includes a metal zipper element 11, a lower stopper 12, an upper stopper 13, a slider 14 (in particular, a slider body), an insert pin which is not shown, a box pin which is not shown and the like.

[0062] The metal zipper element 11 is generally produced by sequentially cutting a long metal wire having a Y-shaped cross-section into a desired thickness in the longitudinal direction to form an element material having a Y-shape when viewed from the front face, subjecting the element material to press molding to form a coupling head, or subjecting a plate material made of a metal such as copper, a copper alloy and the like, having a predetermined thickness, to press molding to form a coupling head and the like, and punching the plate material.

[0063] The metal zipper element 11 thus-produced is mounted on a zipper tape 15 by bending both the leg portions to plastically deform both the leg portions in the direction in which both the leg portions approach each other in a state where the zipper tape 15 having a core thread portion 15a is interposed between both the leg portions, which are extended to be disposed in a fork shape from the coupling head.

[0064] The lower stopper 12 is generally produced by sequentially cutting a long metal wire having an X-shaped or H-shaped cross section into a desired thickness in the longitudinal direction. In the lower stopper 12 having the X-shaped or H-shaped cross section, first, each of the left and right zipper tapes 15 having the core thread portion 15a is inserted between a group of arm portions 12b extending in the left and right directions from a body portion 12a, as shown in FIG. 4. Moreover, the lower stopper 12 is mounted across the left and right zipper tapes 15 by performing bending to plastically deform each group of the arm portions 12b in the direction in which the groups of the arm portions 12b approaches each other in a state where the zipper tape 15 is interposed between each

group of the arm portions 12b.

[0065] The upper stopper 13 is generally produced by sequentially cutting a long metal wire having a U-shaped cross section into a desired thickness in the longitudinal direction, or sequentially cutting a metal wire having a plate shape into a desired thickness in the longitudinal direction and bending a cut fragment obtained into a U-shape. For the upper stopper 13 having the U-shaped cross section, the upper stopper 13 is mounted on the zipper tape 15 by performing bending to plastically deform both the end portions of the upper stopper 13 in the direction in which both the end portions of the upper stopper 13 approaches each other in a state where the zipper tape 15 is interposed between both the end portions of the upper stopper 13.

[0066] The slider 14, the insert pin and the box pin are generally produced by performing a die-cast molding using a metal mold having a predetermined cavity shape. For example, a slider body and a tab are molded by subjecting the slider 14 to a die-cast molding. In addition, the tab is mounted on the slider body by bending a part of the slider body in a state where the tab is supported on a part of the slider body. Meanwhile, the insert pin and the box pin are produced by a die-cast molding and then mounted on the zipper tape by performing bending.

[0067] The zipper component 1 according to the present embodiment, including the metal zipper element 11, the lower stopper 12 and the like as described above, has a component body 2 made of a metal and a metal plating film 3 provided on the surface of the component body 2, and as described below, the zipper component 1 is subjected to thermal treatment which recrystallizes the crystal structure of the metal plating film 3, and then a diffusion layer 4 is formed on the surface layer portion of the component body 2.

[0068] A metal material that constitutes the component body 2 is not particularly limited. However, since the zipper component 1 of the embodiment is a component that constitutes a slide zipper as described above and at least a part of the zipper component 1 is bent, a metal matrix of the component body 2 is preferably at least one metal selected from the group consisting of copper, a copper-zinc-based alloy, zinc, a zinc-based alloy and an aluminum-based alloy.

[0069] In particular, when the metal matrix of the component body 2 is made of copper or a copper-zinc-based alloy, the component body 2 has excellent ductility, and thus bending such as caulking and the like may be relatively readily performed. In addition, in this case, the higher the ratio of copper ingredients included in the component body 2 (metal body) is, the better ductility or corrosion resistance. Thus, the content of copper in the component body 2 is preferably 75 wt% or more. Furthermore, since copper is generally used for electrical wires and the like, copper wires having various linear diameters are easily available. For this reason, for example, when a slide zipper having a big size is produced, the component body 2 may be made of pure copper (the content of cop-

per is 100 wt%).

[0070] Meanwhile, as the ratio of zinc ingredients included in the component body 2 (metal body) is increased, the production costs may be decreased. However, there is concern that the corrosion resistance of the component body 2 may be reduced to cause the occurrence of stress corrosion crevicing. For this reason, the content of zinc in the component body 2 is preferably 25 wt% or less.

[0071] Furthermore, when the metal body (metal matrix) of the component body 2 is made of zinc or a zinc-based alloy, complicated shapes such as a slider, an insert pin, a box pin, and the like may be readily and massively formed by using a die-cast molding inexpensively. Meanwhile, zinc or the zinc-based alloy tends to be left behind in terms of corrosion resistance. For this reason, in the component body 2, a base plating film made of copper having excellent corrosion resistance on the surface of a metal body made of zinc or a zinc-based alloy is formed by using electrolytic plating and the like.

[0072] Further, when the metal body (metal matrix) of the component body 2 is made of an aluminum-based alloy (specifically, an aluminum-magnesium-based alloy or an aluminum-copper-silicon-based alloy), the weight of the zipper component 1 may be readily reduced. Meanwhile, the aluminum-magnesium-based alloy or aluminum-copper-silicon-based alloy tends to be left behind in terms of corrosion resistance, and thus anti-corrosion treatment is required. For this reason, in the component body 2, a first base plating film made of zinc is first formed on the surface of a metal body made of an aluminum-based alloy by using electroless plating and the like, and then a base plating film made of copper having excellent corrosion resistance is formed on the surface of the first base plating film by using electrolytic plating and the like.

[0073] In addition, when the metal plating film 3 is subjected to thermal treatment to be described below, the component body 2 of the embodiment has the diffusion layer 4 formed by diffusing the metal included in the metal plating film 3 in the surface layer portion of the component body 2.

[0074] When the metal matrix of the component body 2 is made of, for example, copper or a copper-zinc-based alloy, the diffusion layer 4 is formed on the surface layer portion of the component body 2 (metal body) made of copper or a copper-zinc-based alloy. Furthermore, when the metal body of the component body 2 is made of, for example, zinc or a zinc-based alloy, the diffusion layer 4 is formed on the surface layer portion of the base plating film made of copper which is provided on the surface of the metal body. Further, when the metal body of the component body 2 is made of, for example, an aluminum-based alloy, the diffusion layer 4 is formed on the surface layer portion of a second base plating film made of copper which is provided on the side nearest to the surface of the component body 2.

[0075] Since the diffusion layer 4 is formed on the surface layer portion of the component body 2 so that the

metal plating film 3 may have good affinity to the component body 2, the adhesiveness of the metal plating film 3 on the component body 2 may be increased. In addition, for example, when the component body 2 is made of a copper-zinc-based alloy and the metal plating film 3 is also made of a copper-zinc-based alloy, the diffusion layer 4 is not formed when the content of zinc included in the component body 2 is higher than that included in the metal plating film 3.

[0076] In the zipper component 1 according to the embodiment, the metal plating film 3 is formed on the surface of the component body 2 as described above in order to impart a desired color tone to the zipper component 1. The metal plating film 3 is formed on the surface of the component body 2 by first performing a wet or dry plating treatment as described below. In this case, the metal plating film 3 has a columnar crystal structure which is oriented on the (111) plane.

[0077] Furthermore, after the metal plating film 3 having the columnar crystal structure is formed, the metal plating film 3 is subjected to thermal treatment at a temperature which is equal to or more than the recrystallized temperature before the zipper component 1 is bent. At least a part of the columnar crystal structure is recrystallized by the thermal treatment, and thus a metal plating film 3, on which a recrystallized structure wherein the crystal orientation is not observed (the crystal orientation is disturbed) is formed, is constituted.

[0078] In this way, at least a part of the metal plating film 3 may have a recrystallized structure, as described above, and thus the metal plating film 3 is softer than a metal plating film 3 having only a columnar crystal structure and the metal plating film 3 may be readily diffused.

[0079] In the embodiment, for example, copper (pure copper), a copper-zinc-based alloy and a white-system metal (for example, a copper-tin-based alloy, a tin-nickel-based alloy, nickel, chromium, vanadium, rhodium, platinum and the like) may be used as a material for the metal plating film 3.

[0080] In this case, if a metal body made of the metal matrix of the component body 2 is softened by a thermal treatment at a temperature of which a recrystallized structure may be formed in the metal plating film 3, there is concern that the zipper component 1 may be deformed. Therefore, the metal plating film 3 is made of a material which is the same as a material by which a recrystallized structure may be formed at a temperature less than that at which the metal matrix of the component body 2 is softened. For example, considering a color tone which is preferred in the zipper component 1, a recrystallized temperature range of the metal plating film 3 and the like, the metal plating film 3 is preferably made of at least one selected from the group consisting of a copper-zinc-based alloy, a copper-tin-based alloy and a tin-nickel-based alloy.

[0081] In particular, when the metal matrix of the component body 2 is made of copper or a copper-zinc-based alloy, the metal plating film 3 formed on the surface of

the component body 2 is preferably made of, for example, a copper-zinc-based alloy (in particular, a brass having a zinc content of 20 wt% or more) capable of imparting an antique style color tone or a copper-tin-based alloy or a tin-nickel-based alloy, which has a white system color tone.

[0082] Further, when the metal matrix of the component body 2 is made of zinc, a zinc-based alloy or an aluminum-based alloy, the metal plating film 3 formed on the surface of the component body 2 is preferably made of, for example, a copper-zinc-based alloy (in particular, a brass having a zinc content of 20 wt% or more) capable of imparting an antique style color tone.

[0083] In addition, the metal plating film 3 having a recrystallized structure of the embodiment have a film thickness of from 1 μm to 10 μm and preferably from 2 μm to 6 μm . A metal plating film 3 may be stably and securely formed by setting the film thickness of the metal plating film 3 to 1 μm or more (preferably 2 μm or more).

[0084] Meanwhile, the thicker the film thickness of the metal plating film 3 is formed, the metal plating film 3 may be stably formed. However, although the film thickness of the metal plating film 3 is set at more than 10 μm , the effect that the metal plating film 3 has been stabilized or the appearance quality obtained by the metal plating film 3 has been improved is not changed very much, and thus the film thickness of the metal plating film 3 is set at 10 μm or less (preferably 6 μm or less and more preferably 3 μm or less).

[0085] In addition, the metal plating film 3 having the recrystallized structure of the embodiment has a Vickers hardness of from Hv50 to Hv100. When the Vickers hardness of the metal plating film 3 is Hv50 or more, the occurrence of scratch and the like may be prevented on the surface of the zipper component 1 and a good appearance quality may be maintained. Meanwhile, when the Vickers hardness of the metal plating film 3 is Hv100 or less, the ductility of the metal plating film 3 may be effectively improved.

[0086] Subsequently, the method for producing a zipper component 1 of the embodiment having the constitution as described above will be described with reference to FIG. 6.

First, a component body 2 having a predetermined shape is manufactured. For example, when the zipper component 1 is a metal zipper element 11 as described above, the component body 2 of the metal zipper element 11 (including a component body 2 before a base plating film is formed) is manufactured by sequentially cutting a Y-shaped long metal wire into a desired thickness in the longitudinal direction to form an element material having a Y-shape when viewed from the front surface, subjecting the element material to press molding to form a coupling head and the like, or subjecting a plate material made of a metal such as copper, a copper alloy and the like, having a predetermined thickness, to press molding to form a coupling head and the like, and punching the plate material.

[0087] Furthermore, when the zipper component 1 is a lower stopper 12, the component body 2 of the lower stopper 12 is manufactured by sequentially cutting a X-shaped or a H-shaped long metal wire into a desired thickness in the longitudinal direction. When the zipper component 1 is an upper stopper 13, the component body 2 of the upper stopper 13 is manufactured by sequentially cutting a long metal wire having a U-shaped cross section into a desired thickness in the longitudinal direction, or sequentially cutting a metal wire having a plate shape into a desired thickness in the longitudinal direction and bending a cut fragment obtained into a U-shape.

[0088] Further, when the zipper component 1 is a slider, an insert pin, a box pin, or a slider 14, the component body 2 is manufactured by performing a die-cast molding using a metal mold having a predetermined cavity shape. In addition, in the invention, a method or means for manufacturing a component body 2 is not particularly limited, and may be arbitrarily modified depending on a material, a shape and the like of the zipper component 1.

[0089] In this case, when a metal body of the component body 2 is made of, for example, zinc or a zinc-based alloy, a base plating film made of copper is formed on the surface of the metal body by electrolytic plating in order to improve the corrosion resistance of the component body 2. Furthermore, when a metal body of the component body 2 is made of, for example, an aluminum-based alloy (for example, an aluminum-magnesium-based alloy or an aluminum-copper-silicon-based alloy), a first base plating film made of zinc is formed on the surface of the metal body by electroless plating and a second base plating film made of copper is formed on the surface of the first base plating film by electrolytic plating, in order to improve the corrosion resistance of the component body 2.

[0090] Successively, a component body 2 of the zipper component 1 is manufactured as described above, and then the component body 2 is subjected to plating treatment to form a metal plating film 3 having a columnar crystal structure on the surface of the component body 2. In this case, the metal plating film 3 formed on the surface of the component body 2 is crystalline grown in a columnar shape. Further, a material for the metal plating film 3 formed on the surface of the component body 2 is not particularly limited, but as described above, the material is preferably composed of a copper-zinc-based alloy, a copper-tin-based alloy or a tin-nickel-based alloy.

[0091] In addition, in the embodiment, a method for forming the metal plating film 3 is not particularly limited, but any plating treatment of wet or dry plating treatments may be employed. For example, electrolytic plating, hot dipping and the like may be used as a wet plating treatment, while a PVD method, a CVD method and the like may be used as a dry plating treatment.

[0092] Further, when a metal plating film 3 having a columnar crystal structure is formed, the metal plating film 3 is formed by setting the film thickness of the metal plating film 3 at from 1 μm to 10 μm and preferably from

2 μm to 6 μm . Furthermore, the Vickers hardness on the surface of the metal plating film 3 formed in this way also varies depending on the material of the metal plating film 3, but shows a value of basically Hv120 or more.

[0093] Subsequently, the plating treatment is performed as described above, and then the zipper component 1 on which a metal plating film 3 is formed is subjected to thermal treatment (recrystallized treatment) at a temperature which is equal to or more than the recrystallized temperature. In this case, when the metal plating film 3 of the zipper component 1 is made of, for example, a copper-zinc-based alloy, the thermal treatment is performed in a non-oxidizing atmosphere in a temperature range of from 300°C to 400°C for a predetermined time.

[0094] The metal plating film 3 may be prevented from being oxidized during the thermal treatment by performing the thermal treatment in a non-oxidizing atmosphere. In this case, as the non-oxidizing atmosphere, a nitrogen gas atmosphere, an argon gas atmosphere, a carbon monoxide gas atmosphere, vacuum atmosphere and the like may be used. Further, a recrystallized structure wherein a columnar crystal structure is recrystallized may be readily and stably formed in at least a part of the metal plating film 3 made of a copper-zinc-based alloy by performing the thermal treatment in a temperature range of from 300°C to 400°C, and the component body 2 may also be prevented from being softened.

[0095] In addition, when the metal plating film 3 is made of, for example, a copper-tin-based alloy, the thermal treatment is performed in a pressurized non-oxidizing atmosphere in a temperature range of from 400°C to 500°C for a predetermined time. Meanwhile, when the metal plating film 3 is made of a tin-nickel-based alloy, the thermal treatment is performed in a pressurized non-oxidizing atmosphere in a temperature range of from 500°C to 600°C for a predetermined time.

[0096] In this way, the thermal treatment may be performed in a pressurized non-oxidizing atmosphere of, for example, 0.1 MPa or more (preferably 0.5 MPa or more) to prevent tin included in the metal plating film 3 from evaporating during the thermal treatment and prevent the metal plating film 3 from being oxidized. In this case, as the non-oxidizing atmosphere, a nitrogen gas atmosphere, an argon gas atmosphere, a carbon monoxide gas atmosphere and the like may be used. In addition, a recrystallized structure may be readily and stably formed in at least a part of the metal plating film 3 by performing the thermal treatment in a predetermined temperature range.

[0097] The Vickers hardness on the surface of the metal plating film 3 may be reduced to from Hv50 to Hv100 and the ductility of the metal plating film 3 may be improved by performing the thermal treatment (recrystallized treatment) as described above to form a recrystallized structure wherein a columnar crystal structure is recrystallized in at least a part of the metal plating film 3. Furthermore, the thermal treatment is performed to form a diffusion layer 4 from diffusion of the metal included in

the metal plating film 3 into the surface layer portion of the component body 2. Accordingly, the zipper component 1 in the embodiment described above may be obtained.

[0098] Furthermore, the metal plating film 3 is made of a material which may form a recrystallized structure at a temperature less than that at which the metal matrix of the component body 2 is softened. Therefore, even though the thermal treatment which recrystallizes the columnar crystal structure of the metal plating film 3 in the zipper component 1 is performed, the component body 2 is less likely to be softened and the strength of the component body 2 is not reduced.

[0099] The thermal treatment (recrystallized treatment) is completed, and then when the metal plating film 3 is made of a copper-zinc-based alloy, copper included in the metal plating film 3 may be oxidized to additionally performed a blackening treatment (black oxide finish) which imparts the black color to the metal plating film 3. Specifically, a cupric oxide coating film is formed on the surface of the metal plating film 3 by immersing a zipper component 1 having the metal plating film 3 in a strong alkali solution including sodium hydroxide and sodium and sodium chlorite.

[0100] Further, in the invention, the treatment conditions in the blackening treatment of the metal plating film 3 may be arbitrarily selected depending on the composition of an alloy which constitutes the metal plating film 3 and the like. In addition, means for blackening the metal plating film 3 are not particularly limited. Furthermore, in the invention, the blackening treatment is not particularly limited to the blackening of the metal plating film 3 made of a copper-zinc-based alloy, and a color of green or blue may be imparted to the metal plating film 3 by changing the color tone of the metal plating film 3 using, for example, a copper sulfate method or a thiosulfate method.

[0101] Thereafter, the zipper component 1 which is blackened on the surface of the metal plating film 3 may be subjected to polishing treatment. For example, a zipper component 1 which has been subjected to blackening treatment is introduced into a barrel polishing machine along with a polishing material (polishing stone and the like) to perform polishing treatment. Accordingly, a part of the blackened oxide coating film may be peeled off to finish the surface of the zipper component 1 with an antique style old brass color. Further, in the polishing treatment, a polishing method such as shot blast and the like instead of the barrel polishing may be used depending on the shape of the zipper component 1 and the like.

[0102] Meanwhile, the above-described thermal treatment is performed and then when the metal plating film 3 is made of a copper-tin-based alloy or a tin-nickel-based alloy, the metal plating film 3 has a white-system color tone. For this reason, the metal plating film 3 may be subjected to polishing treatment such as barrel polishing, shot blast and the like instead of the blackening treatment as described above.

[0103] In addition, after the polishing treatment is com-

pleted, the obtained zipper component 1 is washed with water and dried. Thereafter, a coating treatment which performs a transparent clear coating on the surface of the zipper component 1 for the purpose of protecting the surface of the zipper component 1, preventing discoloration and preventing corrosion.

[0104] The zipper component 1 manufactured after undergoing the treatment process as described above is then subjected to bending such as caulking and the like to be used as a slide zipper. In this case, the metal plating film 3 provided on the zipper component 1 has excellent ductility because the metal plating film 3 has a recrystallized structure as described above. For this reason, even though the zipper component 1 is bent, the metal plating film 3 may be readily extended to follow the deformation of the zipper component 1 by the bending.

[0105] Accordingly, even though the zipper component 1 is bent, it is difficult to generate crevicing or cracking in the metal plating film 3 and furthermore crevicing or cracking in the metal plating film 3 may not be generated. In particular, for example, even when the zipper component 1 has a big size and the deformation volume of the zipper component 1 during the bending, the bending may be smoothly performed without the occurrence of crevicing or cracking in the metal plating film 3.

[0106] For this reason, a problem in the related art, which is generated due to crevicing or cracking in the metal plating film, for example, a problem that a base material is exposed from crevicing or cracking in the metal plating film to visually deteriorate the zipper component, or a problem that corrosion is easily generated on the base material of the zipper component may be readily solved.

Example 1

[0107] Hereinafter, the invention will be described in more detail with reference to specific Examples.

As Example 1, the case, in which a lower stopper 12 as shown in FIGS. 3 to 5 is produced as a zipper component, will be described. The lower stopper 12 of the present Example 1 has a component body made of pure copper and a metal plating film provided on the surface of the component body. In this case, the metal plating film is made of an alloy of copper and zinc, which has a copper content of 65 wt% and a zinc content of 35 wt%.

[0108] In order to produce the lower stopper 12 of the present Example, a long pure copper wire having a circular cross-section is first subjected to cold rolling to deform the cross-section of the pure copper wire into an H-shape. Successively, the component body of the lower stopper 12 is manufactured by cutting the pure copper wire having a H-shaped cross-section into a desired thickness in the longitudinal direction. Thereafter, the obtained component body was subjected to barrel polishing treatment to remove burrs formed on the component body.

[0109] Subsequently, the component body of the lower

stopper 12 manufactured was subjected to plating treatment by electrolytic plating under a predetermined condition to form a metal plating film of a copper-zinc-based alloy on the surface of the component body. Moreover, the metal plating film is formed, and then the cross-section of the metal plating film was observed by transmission electron microscope (TEM). As a result, it was confirmed that the metal plating film formed was crystalline grown on a columnar shape and the film thickness of the metal plating film was 5.2 μm .

[0110] Further, as a result of analyzing the metal plating film formed by X-ray diffraction (XRD), it was confirmed that the metal plating film is strongly oriented on the (111) plane. In addition, as a result of analyzing the metal plating film by EPMA, it was confirmed that in the metal plating film, a region where copper and zinc were mixed in a different concentration ratio was formed. Furthermore, the Vickers hardness of the metal plating film was measured, and thus the metal plating film was found to have a Vickers hardness of Hv160.

[0111] Subsequently, a lower stopper 12 having a metal plating film of a copper-zinc-based alloy formed on the surface of the component body made of copper is subjected to thermal treatment (recrystallized treatment). In the thermal treatment, the lower stopper 12 was heated under vacuum at 380°C for 1 hour. After the thermal treatment is completed, the cross-section of the metal plating film that the lower stopper had was observed by transmission electron microscope (TEM). As a result, it was confirmed that a columnar crystal structure observed in the thermal treatment was lost and had a recrystallized structure wherein the columnar crystal structure is recrystallized.

[0112] In addition, in the TEM observation, it was confirmed that the film thickness of the metal plating film appeared to be increased from 5.2 μm to 8.0 μm . Therefore, the metal plating film was analyzed by EPMA, and thus it was confirmed that a diffusion layer wherein zinc included in the metal plating film was diffused in copper of the component body was formed in the area in which the film thickness of the metal plating film was increased. From this result, it is determined that the diffusion layer is formed on the surface layer portion of the component body and thus the film thickness of the metal plating film appeared to be increased in the TEM observation.

[0113] Furthermore, as a result of analyzing the metal plating film which had been subjected to thermal treatment by X-ray diffraction (XRD), the orientation on the (111) plane was lost and the crystal orientation was not observed. From this result, it was confirmed that the metal plating film had a recrystallized structure wherein a columnar crystal structure had been recrystallized. Further, the Vickers hardness of the metal plating film after the thermal treatment was measured, and thus it was confirmed that the metal plating film had a Vickers hardness of Hv80 and the Vickers hardness of the metal plating film was reduced by the thermal treatment.

[0114] Subsequently, a blackening treatment which

imparts the black color to the metal plating film was performed by immersing the lower stopper 12 which had been subjected to thermal treatment in a strong alkali solution including sodium hydroxide and sodium chlorite.

5 Thereafter, the color tone of the lower stopper 12 was finished with an antique style old brass color by performing polishing treatment on the lower stopper 12 which had been subjected to a blackening treatment using a barrel polishing machine, and then the lower stopper 12
10 was subjected to a clear coating treatment.

[0115] After the clear coating treatment is completed, the lower stopper 12 obtained was subjected to bending to mount the lower stopper 12 on the zipper tape 15 (see FIGS. 4 and 5). Moreover, the surface of the lower stopper 12 mounted on the zipper tape 15 was observed with the naked eye, and crevicing or cracking in the metal plating film of the lower stopper 12 was not observed and the lower stopper 12 had good appearance quality which uniformly exhibited the antique style color tone.

20 **[0116]** Meanwhile, in order to confirm the effects of the lower stopper in the present Example 1, a lower stopper is produced under the same conditions as in Example 1, except that the thermal treatment was not performed after the metal plating film was formed (Comparative Example), and then the lower stopper was mounted on the zipper tape by caulking the lower stopper. Moreover, the surface of the lower stopper according to Comparative Example, which was mounted on the zipper tape, was observed with the naked eye, and then crevicing or cracking had been significantly generated in the metal plating film of the lower stopper. In addition, crevicing or cracking formed in the metal plating film is interposed in the lower stopper to expose a base metal matrix and thus was visually left behind (in terms of appearance quality).

35

Example 2

[0117] As Example 2, the case, in which a metal zipper element 11 is produced as a zipper component, will be described.

40 The metal zipper element 11 of the present Example 2 has a component body made of an alloy (brass) of copper and zinc and a metal plating film provided on the surface of the component body. In this case, the alloy constituting the component body has a copper content of 85 wt% and a zinc content of 15 wt%. Furthermore, the metal plating film is made of an alloy of copper and tin, which has a copper content of 70 wt% and a tin content of 30 wt%.

[0118] In order to produce the metal zipper element 11 of the present Example 2, a coupling head and the like are formed by subjecting a plate material made of brass, which has a predetermined thickness to press molding, and a component body of the metal zipper element 11 is manufactured by punching the plate material. Thereafter, the obtained component body was subjected to barrel polishing treatment to remove burrs formed on the component body.

55 **[0119]** Subsequently, the component body of the metal

zipper element 11 manufactured was subjected to plating treatment by electrolytic plating under a predetermined condition to form a metal plating film of a copper-zinc alloy on the surface of the component body. Thereafter, the metal zipper element 11 on which the metal plating film was formed was subjected to thermal treatment (recrystallized treatment). In the thermal treatment, the metal zipper element 11 was heated in a pressurized argon gas atmosphere of 0.6 MPa at 430°C for 1 hour.

[0120] Successively, the metal zipper element 11 which had been subjected to thermal treatment was subjected to clear coating treatment. Thereafter, the metal zipper element 11 was mounted on the zipper tape 15 by caulking the metal zipper element 11 which had been subjected to clear coating. Moreover, the surface of the metal zipper element 11 mounted on the zipper tape 15 was observed with the naked eye, and thus it was confirmed that crevicing or cracking was not generated in the metal plating film.

Example 3

[0121] As Example 3, the case, in which a box pin is produced as a zipper component, will be described.

The box pin of the present Example 3 has a component body made of a zinc-based alloy as a metal matrix and a metal plating film provided on the surface of the component body. In this case, the component body has a metal body made of a zinc-based alloy and a base plating film made of copper, which is formed on the surface of the metal body. Further, the metal plating film is made of an alloy of copper and zinc, which has a copper content of 65 wt% and a zinc content of 35 wt%.

[0122] In order to produce the box pin of the present Example 3, a metal body for a box pin having a predetermined shape was first formed by subjecting zinc to a die-cast molding. Successively, a component body of the box pin was manufactured by subjecting the obtained metal body to electrolytic plating under a predetermined condition to form a base plating film made of copper on the surface of the metal body.

[0123] Subsequently, the component body of the box pin manufactured is subjected to plating treatment by electrolytic plating under a predetermined condition to form a metal plating film of a copper-zinc-based alloy on the surface of the component body. Thereafter, the box pin on which the metal plating film was formed was subjected to thermal treatment (recrystallized treatment). In the thermal treatment, the box pin was heated in a pressurized atmosphere of 0.6 MPa at 320°C for 1 hour.

[0124] Successively, a blackening treatment which imparts the black color to the metal plating film was performed by immersing the box pin which had been subjected to thermal treatment in a strong alkali solution including sodium hydroxide and sodium chlorite. Further, the color tone of the lower stopper was finished with an antique style old brass color by performing polishing treatment on the box pin which had been subjected to a

blackening treatment using a barrel polishing machine, and then the box pin was subjected to a clear coating treatment.

[0125] Thereafter, the box pin was mounted on the zipper tape by caulking the box pin which had been subjected to clear coating. Moreover, the surface of the box pin mounted on the zipper tape was observed with the naked eye, and thus it was confirmed that the box pin generally had a uniform color tone and crevicing or cracking was not generated in the metal plating film.

Example 4

[0126] As Example 4, the case, in which a slider body for a slider 14 is produced as a zipper component, will be described. The slider body of the present Example 4 has a component body made of an aluminum-copper-silicon-based alloy as a metal matrix and a metal plating film provided on the surface of the component body.

[0127] In this case, the component body has a metal body made of an aluminum-copper-silicon-based alloy, a first base plating film of zinc, which is formed on the surface of the metal body, and a second base plating film of copper, which is formed on the surface of the first base plating film. In addition, the metal plating film is made of an alloy of copper and zinc, which has a copper content of 65 wt% and a zinc content of 35 wt%.

[0128] In order to produce the slider body of the present Example 4, a metal body having a predetermined shape was first formed by subjecting the aluminum-copper-silicon-based alloy to a die-cast molding. Successively, a component body of the slider body was manufactured by subjecting the obtained metal body to electroless plating under a predetermined condition to form a first base plating film of zinc on the surface of the metal body and by subjecting the obtained metal body to electrolytic plating under a predetermined condition to form a second base plating film made of copper on the surface of the first base plating film.

[0129] Subsequently, the component body of the slider body manufactured is subjected to plating treatment by electrolytic plating under a predetermined condition to form a metal plating film of a copper-zinc-based alloy on the surface of the component body. Thereafter, the slider body on which the metal plating film was formed was subjected to thermal treatment (recrystallized treatment). In the thermal treatment, the slider body was heated under vacuum at 330°C for 1 hour.

[0130] Successively, a blackening treatment which imparts the black color to the metal plating film was performed by immersing the slider body which had been subjected to thermal treatment in a strong alkali solution including sodium hydroxide and sodium chlorite. Furthermore, the color tone of the lower stopper was finished with an antique style old brass color by performing polishing treatment on the slider body which had been subjected to a blackening treatment using a barrel polishing machine, and then the slider body was subjected to a

clear

coating treatment.

[0131] Thereafter, a tab was attached to a tab mounting portion of the slider body which had been subjected to clear coating, and the tab was mounted on the slider body by bending the tab mounting portion. Moreover, the surface of the slider body on which the tab was mounted by bending was observed with the naked eye, and thus it was confirmed that the slider body generally had a uniform color tone and crevicing or cracking was not generated in the metal plating film.

DESCRIPTION OF REFERENCE NUMERALS

[0132]

- 1 Zipper component
- 2 Component body
- 3 Metal plating film
- 4 Diffusion layer
- 10 Slide zipper
- 11 Metal zipper element
- 12 Lower stopper
- 12a Body portion
- 12b Arm portion
- 13 Upper stopper
- 14 Slider
- 15 Zipper tape
- 15a Core thread portion

Claims

1. A zipper component (1) for a slide zipper, including:

a metal plating film (3) formed on the surface of a component body (2) made of a metal; and at least a part of the component body (2) subjected to bending after the metal plating film (3) is formed, being **characterized in that** the metal plating film (3) has a recrystallized structure in which at least a part of a crystal structure has been recrystallized by performing thermal treatment before the bending.

2. The zipper component according to claim 1, being **characterized in that** the recrystallized structure is formed by forming the metal plating film (3) as a columnar crystal structure on the surface of the component body (2), and then subjecting the metal plating film (3) to the thermal treatment to recrystallize at least a part of the columnar crystal structure.
3. The zipper component according to claim 1, being **characterized in that** the component body (2) is made of copper or a copper-zinc-based alloy.
4. The zipper component according to claim 3, being **characterized in that** the component body (2) is made of copper in an amount of at least from 75 wt% to 100 wt% and zinc in an amount of from 0 wt% and 25 wt%.
5. The zipper component according to claim 1, being **characterized in that** the component body (2) has a metal body made of zinc or a zinc-based alloy and a base plating film which is provided on the surface of the metal body and is made of copper.
6. The zipper component according to claim 1, being **characterized in that** the component body (2) has a metal body made of an aluminum-based alloy, a first base plating film which is provided on the surface of the metal body and is made of zinc, and a second base plating film which is provided on the surface of the first base plating film and is made of copper.
7. The zipper component according to claim 1, being **characterized in that** the metal plating film (3) is composed of at least one selected from the group consisting of a copper-zinc-based alloy, a copper-tin-based alloy and a tin-nickel-based alloy.
8. The zipper component according to claim 1, being **characterized in that** the metal plating film (3) having the recrystallized structure has a film thickness of from 1 μm to 10 μm .
9. The zipper component according to claim 1, being **characterized in that** the metal plating film (3) having the recrystallized structure has a Vickers hardness of from Hv50 to Hv100.
10. The zipper component according to claim 1, being **characterized in that** the zipper component has a diffusion layer (4) formed by diffusing a metal included in the metal plating film (3) in the surface layer portion on the metal plating film (3) side of the component body (2).
11. The zipper component according to claim 1, being **characterized in that** the zipper component (1) is at least one component selected from the group con-

sisting of a zipper element (11), stoppers (12, 13), an opening-type separable bottom end stop and a slider (14).

12. A slide zipper, being **characterized in that** the zipper component (1) according to any one of claims 1 to 11 is bent and used. 5

13. A method for producing a zipper component for a slide zipper, being **characterized in that** a metal plating film (3) is provided on the surface of a component body (2) made of a metal and at least a part of the component body (2) is subjected to bending after the metal plating film (3) is formed, including: 10

forming the metal plating film (3) on the surface of the component body (2); and
subjecting the metal plating film (3) to thermal treatment at a temperature which is equal to or more than the recrystallized temperature before the bending to form a recrystallized structure in which at least a part of the metal plating film (3) has been recrystallized. 15 20

14. The method for producing a zipper component according to claim 13, including: 25

forming the metal plating film (3) provided on the surface of the component body (2) as a columnar crystal structure; and
subjecting the metal plating film (3) having the columnar crystal structure to the thermal treatment to form the recrystallized structure. 30

15. The method for producing a zipper component according to claim 13, including: 35

allowing the metal plating film (3) to be made of a copper-zinc-based alloy; and
heating the metal plating film (3) to from 300°C to 400°C through the thermal treatment. 40

16. The method for producing a zipper component according to claim 13, including: 45

allowing the metal plating film (3) to be made of a copper-tin-based alloy; and
heating the metal plating film (3) to from 400°C to 500°C through the thermal treatment. 50

17. The method for producing a zipper component according to claim 13, including:

allowing the metal plating film (3) to be made of a tin-nickel-based alloy; and
heating the metal plating film (3) to from 500°C to 600°C through the thermal treatment. 55

18. The method for producing a zipper component according to claim 13, including:

controlling the Vickers hardness of Hv120 or more which the metal plating film (3) has to from Hv50 to Hv100 through the thermal treatment.

FIG. 1

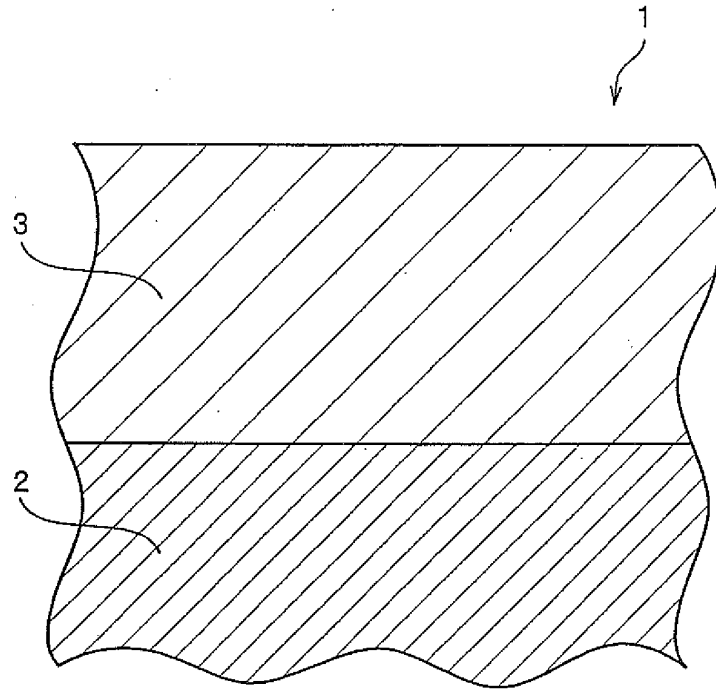


FIG. 2

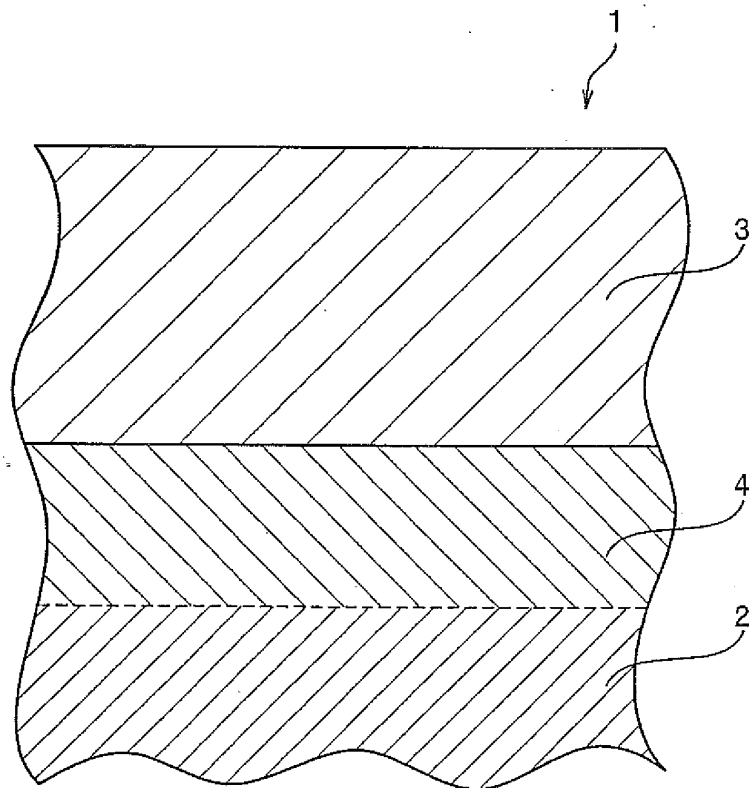


FIG. 3

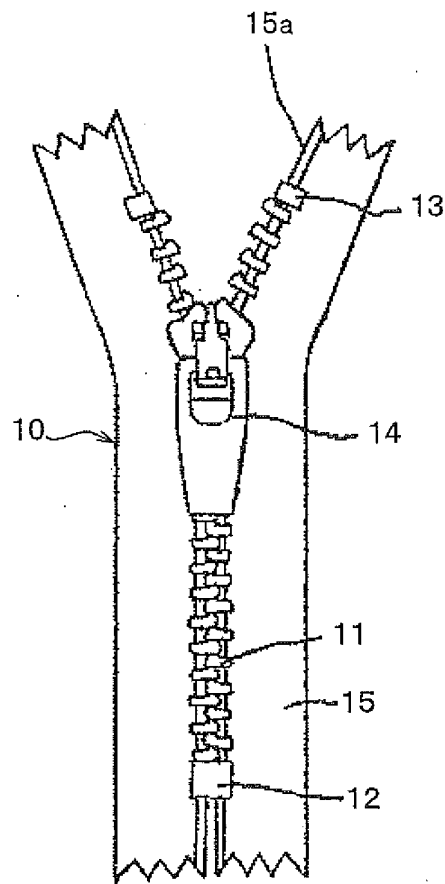


FIG. 4

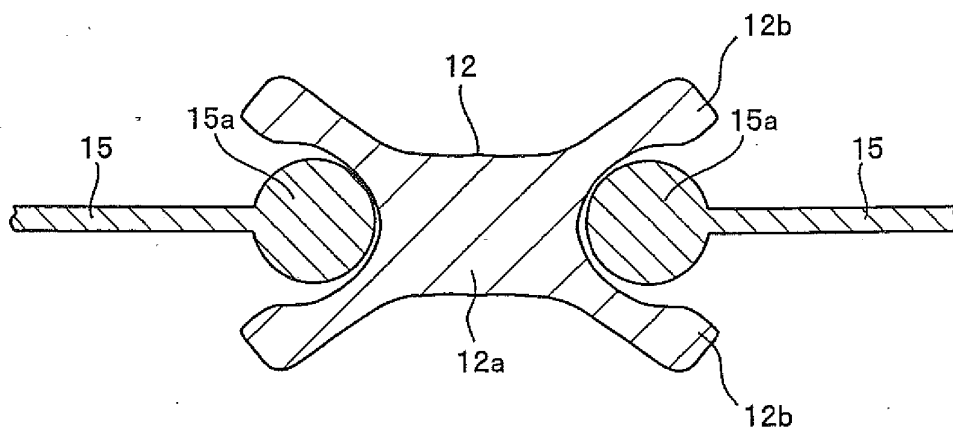


FIG. 5

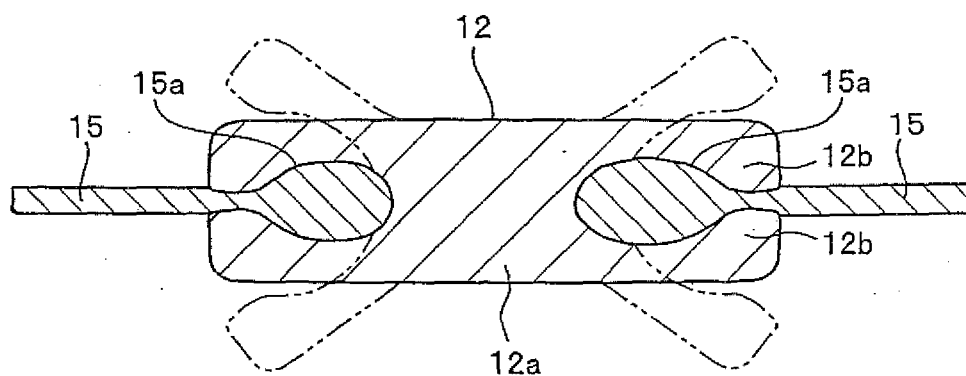
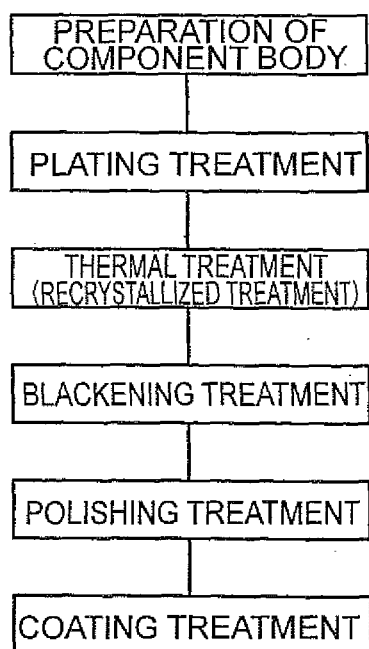


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/071667

A. CLASSIFICATION OF SUBJECT MATTER A44B19/28 (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) A44B19/28		
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 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010		
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.
Y	JP 6-23455 A (Yoshida Kogyo Co., Ltd.), 01 February 1994 (01.02.1994), paragraphs [0017], [0025] (Family: none)	1-18
Y	JP 6-23456 A (Yoshida Kogyo Co., Ltd.), 01 February 1994 (01.02.1994), paragraphs [0006] to [0009] (Family: none)	1-18
Y	JP 1-160502 A (Yoshida Kogyo Co., Ltd.), 23 June 1989 (23.06.1989), entire text; all drawings & US 4937922 A & EP 320912 A1 & DE 3875089 T & BR 8806759 A & HK 191195 A & CA 1323486 A & ES 2034137 T & KR 10-1990-0007981 B1	1-18
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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Date of the actual completion of the international search 25 March, 2010 (25.03.10)		Date of mailing of the international search report 06 April, 2010 (06.04.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/071667

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	JP 2001-98390 A (Usui Kokusai Sangyo Kaisha, Ltd.), 10 April 2001 (10.04.2001), (Family: none)	1-18
A	JP 4372835 B1 (Mitsubishi Shindoh Co., Ltd.), 25 November 2009 (25.11.2009), (Family: none)	1-18
A	JP 2005-350774 A (Dowa Mining Co., Ltd.), 22 December 2005 (22.12.2005), (Family: none)	1-18

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