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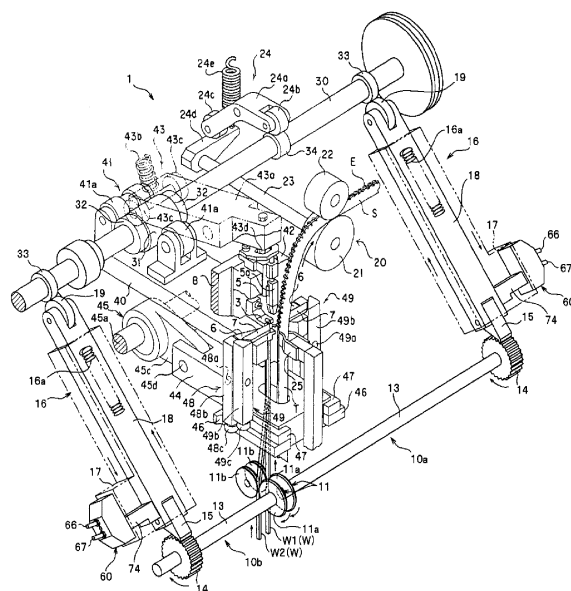
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(54) **MANUFACTURING DEVICE AND MANUFACTURING METHOD FOR FASTENER STRINGER, AS WELL AS FASTENER STRINGER**

(57) A manufacturing device for a fastener stringer according to the present invention comprises a wire material supply unit which intermittently supplies element-use wire materials (W) at a predetermined pitch so as to project the same upon a sliding contact surface of a cutting die (2). This wire material supply unit comprises: a plurality of supply unit parts (10a and 10b) which perform supply toward the cutting die (2) by way of each of separate supply means; and a control unit which controls the amount of supply of the wire materials (W) by way of each of the supply unit parts (10a and 10b) so as to sequentially project, upon the sliding contact surface of the cutting die (2), one among the plurality of wire materials (W) in accordance with a preset order. As a result, it is possible to manufacture, simply and at low cost, a fastener stringer (S) for which such properties as colors in fastener elements (E) are different within a contiguous element column.

FIG. 1



Description

Technical Field

[0001] The present invention relates to a manufacturing device and a manufacturing method of a fastener stringer for cutting an element-use wire material to form fastener elements and sequentially implanting the obtained fastener elements to a fastener tape to manufacture a fastener stringer, and a fastener stringer.

Background Art

[0002] A metallic fastener element (hereinafter, also simply referred to as a metal element) has, in general, an engaging head, a body portion extending rearwards from a base end portion of the engaging head, and a pair of left and right leg portions bifurcated from the body portion and extending rearwards. The metal element is typically manufactured by two following representative methods.

[0003] According to a first method for manufacturing metal elements, a metallic rectangular wire material is plastically deformed by pressing to form an engaging head and the like, and the formed rectangular wire material is stamped or cut into an element shape by using a punch, a die or the like, so that fastener elements are manufactured in a discrete state.

[0004] The fastener elements obtained by the above method are subjected to a polishing process, such as a barrel polishing, a chemical polishing or the like, and a coating process of performing clear coating on an element surface, and are then implanted into one side edge portion of a fastener tape one by one by using a crimping means. Thereby, a fastener stringer of which a plurality of metal elements is consecutively provided for a fastener tape is continuously manufactured.

[0005] Also, an example of a device and a method for manufacturing a fastener stringer by attaching a plurality of the metal elements manufactured from a rectangular wire material to a tape side edge portion of a fastener tape is disclosed in Japanese Examined Patent Publication No. H07-049002 B2 (Patent Document 1).

[0006] In particular, according to the manufacturing device and the manufacturing method disclosed in Patent Document 1, it is possible to select metal elements of different colors and to supply and implant the same to the fastener tape by a simple method, so that it is possible to manufacture a fastener stringer where a desired pattern is formed on an element row.

[0007] Specifically, the manufacturing device of Patent Document 1 includes a plurality of vertical chutes arranged in parallel with each other, one element feeding rod arranged below the plurality of vertical chutes, a cam configured to reciprocate the element feeding rod so as to bring the same into contact with lower ends of the plurality of vertical chutes on the basis of a preset program, and an element attaching unit arranged below the

element feeding rod and at a central position of the plurality of vertical chutes.

[0008] When manufacturing the fastener stringer by using the manufacturing device, the plurality of the metal elements of different colors is classified on the basis of the respective colors and is then accommodated in the separate vertical chutes. Then, the element feeding rod is reciprocally moved on the basis of the preset program by the cam so that it is contacted to the lower ends of the plurality of vertical chutes. Thereby, only one metal element accommodated in the lowest end of any one vertical chute is dropped and accommodated in a pocket part of the element feeding rod and is then fed to the element attaching unit.

[0009] In the element attaching unit, the fed metal element is dropped towards the below fastener tape, and a posture of the metal element is kept with the leg portions of the metal element straddling over the fastener tape. Subsequently, the leg portions of the metal element are pressed and crimped by an attaching punch of the element attaching unit, so that the metal element is attached to the fastener tape.

[0010] According to Patent Document 1, the above processes are continuously performed while intermittently conveying the fastener tape, so that the metal elements of different colors can be attached to the fastener tape in desired order. Therefore, it is possible to obtain a fastener stringer where a pattern is formed on the element row.

[0011] In the meantime, a second method for manufacturing metal elements is disclosed in Japanese Patent No. 2862758 B (Patent Document 2), for example. According to the second manufacturing method, a long metal wire material having a circular section is passed through a plurality of mill rolls so that the cross section thereof has a substantial Y shape. Then, the formed element-use wire material (so-called, a Y bar) is sequentially cut to have a desired thickness in a longitudinal direction by using a cutting punch and a cutting die. Thereby, elements are formed.

[0012] Subsequently, a portion to collide with an engaging head of the obtained element is locally pressed and deformed by a forming die and a forming punch, so that an engaging convex portion and an engaging concave portion are formed. Thereby, metal elements are manufactured.

[0013] After the formation of the engaging convex portions and engaging concave portions, the metal elements obtained in this way are implanted one by one into one side edge portion of a fastener tape, which is conveyed separately from the metal elements, by a crimping unit (crimping punch), so that a fastener stringer is manufactured.

[0014] When manufacturing the fastener elements from the element-use wire material having a substantially Y-shaped section by using the second manufacturing method, as described above, the shape of the fastener elements is limited but the fastener stringer and the slide

fastener can be manufactured at lower cost, as compared to the case where the fastener elements are manufactured from the metallic rectangular wire material by using the first manufacturing method.

[0015] Therefore, while the fastener elements to be obtained using the first manufacturing method are appropriately used for a slide fastener or the like of a brand-name product for which a design, a premium feel and the like are required, the fastener elements to be obtained using the second manufacturing method are appropriately used for a slide fastener or the like of clothes for which it is intended to suppress a product pricing.

Prior Art Document

Patent Document

[0016]

Patent Document 1: Japanese Examined Patent Publication No. H07-049002 B2

Patent Document 2: Japanese Patent No. 2862758 B

Summary of Invention

Problems to Be Solved by Invention

[0017] After manufacturing the diverse metal elements of different colors by forming the metal elements from the rectangular wire material by using the first manufacturing method and performing a coating process and the like for the plurality of obtained metal elements, when a fastener stringer is manufactured by using the method disclosed in Patent Document 1, for example, it is possible to obtain a fastener stringer where a desired pattern is formed on an element row by the metal elements of different colors.

[0018] However, when the element manufacturing method (the first manufacturing method) of manufacturing the metal elements from the rectangular wire material is used, the manufacturing cost increases, as compared to the configuration of using the element manufacturing method (the second manufacturing method) of manufacturing the metal elements from the Y bar, as described above. Therefore, it is difficult to use a slide fastener having metal elements manufactured by the first manufacturing method for a product for which it is intended to suppress a product pricing.

[0019] On the other hand, when using the second manufacturing method of manufacturing metal elements from the Y bar, one Y bar is supplied to the manufacturing device in which it is sequentially cut into a desired thickness to manufacture fastener elements in succession and the fastener elements are sequentially implanted into a fastener tape, so that a fastener stringer is manufactured.

[0020] Therefore, when the metal elements are man-

ufactured by the second manufacturing method, it is possible to provide a slide fastener at low cost. However, it is not possible to make properties of the metal elements such as colors different in a continuous element row of one fastener stringer, unlike Patent Document 1, for example, so that it is difficult to provide the slide fastener with a design, a premium feel and the like.

[0021] The present invention has been made in view of the above-mentioned problems of the related art, and a specific object of the present invention is to provide a manufacturing device and a manufacturing method for a fastener stringer capable of forming a plurality of fastener elements from an element-use wire material to manufacture a fastener stringer and making properties of metal elements such as colors different in a continuous element row of one fastener stringer to be manufactured, and a fastener stringer.

Means for Solving Problems

[0022] In order to achieve the above object, a manufacturing device for a fastener stringer according to the present invention is a manufacturing device, as a basic configuration, which includes a wire material supply unit configured to intermittently supply an element-use wire material with a predetermined pitch, a tape supply unit configured to intermittently supply a fastener tape with a predetermined pitch, a cutting die having a sliding contact surface and at least one wire material guide hole opening to the sliding contact surface, a cutting punch arranged to reciprocate relative to the cutting die while sliding contacting the sliding contact surface and configured to cut the wire material protruding above the sliding contact surface of the cutting die by a predetermined thickness, a forming die configured to put thereon elements cut by the cutting punch, a forming punch arranged to move up and down relative to the forming die and configured to press and form the elements put on the forming die into fastener elements, and a crimping unit configured to crimp and implant the fastener elements to the supplied fastener tape. The manufacturing device is configured to sequentially attach the plurality of fastener elements to the fastener tape, thereby manufacturing a fastener stringer. The wire material supply unit includes a plurality of supply unit parts configured to supply a plurality of different wire materials towards the cutting die by each of separate supply means, and a control unit configured to control a supply amount of the wire material by each supply unit part and to sequentially make one of the plurality of wire materials protrude above the sliding contact surface of the cutting die in accordance with a preset order.

[0023] In particular, in the manufacturing device for a fastener stringer according to the present invention, preferably, the supply means includes a pair of supply rollers configured to rotate with nipping therebetween the wire material and to thus supply the wire material, and is configured to supply the wire material with a preset supply

amount by controlling rotations of the pair of supply rollers.

[0024] In the manufacturing device for a fastener stringer according to the present invention, preferably, the cutting die is formed with the plurality of wire material guide holes aligned along a reciprocating direction of the cutting punch relative to the cutting die, and a stroke of the relative reciprocation of the cutting punch is set to be greater than a formation area in which the openings of the plurality of wire material guide holes are formed.

[0025] Also, in the manufacturing device of the present invention, preferably, each supply unit part includes a driving unit, a transmission unit configured to transmit a driving force of the driving unit to the pair of supply rollers, and a stopper unit configured to stop the transmission of the driving force by the transmission unit, and the control unit is configured to control an operation of the stopper unit.

[0026] Also, in the manufacturing device of the present invention, the pair of supply rollers of each supply unit part, the tape supply unit, the cutting die, the forming die, the forming punch, and the crimping unit are preferably connected to and driven by a single main shaft.

[0027] Also, preferably, the plurality of wire materials are configured by the same material and have outer surfaces of different colors.

[0028] A manufacturing method for a fastener stringer according to the present invention is a manufacturing method, as a basic configuration, which includes a preparation process of preparing an element-use wire material, a supply process of intermittently supplying the wire material with a predetermined pitch, a cutting process of cutting the wire material supplied in the supply process into a thickness corresponding to a supply amount of the wire material in a direction orthogonal to a supply direction by a cutting means and thus forming elements, a forming process of pressing and forming cut surfaces of the elements into fastener elements having engaging heads by a forming means, and an implanting process of crimping and implanting the fastener elements into a fastener tape intermittently supplied with a predetermined pitch by a crimping means. The manufacturing method is provided to sequentially attach the fastener elements to the fastener tape, thereby manufacturing a fastener stringer. The manufacturing method includes preparing a plurality of different wire materials in the preparation process, and supplying one of the plurality of wire materials with a predetermined pitch in accordance with a preset order in the supply process by controlling a plurality of the supply means configured to individually supply the plurality of wire materials.

[0029] The manufacturing method for a fastener stringer according to the present invention preferably includes supplying the plurality of different wire materials to the cutting means via different supply routes by each of separate supply means in the supply process, and processing the elements cut from the plurality of wire materials and the fastener elements formed from the elements via

a same route by using the same cutting means, forming means and crimping means in the cutting process, the forming process and the implanting process.

[0030] A fastener stringer according to the present invention is a fastener stringer where a plurality of metallic fastener elements are attached to a tape side edge portion of a fastener tape with a predetermined attaching pitch, as a basic configuration. The respective fastener elements are manufactured by selecting one of a plurality of different element-use wire materials having a substantially Y-shaped section, cutting the same to form elements with a predetermined pitch and press-forming the elements. The respective fastener elements manufactured from the plurality of wire materials are crimped and fixed to the tape side edge portion of the single fastener tape in a predetermined arrangement. Cut surfaces of the respective fastener elements formed by cutting the element-use wire material and outer surfaces except for the cut surfaces have different outward appearances.

[0031] In the fastener stringer of the present invention, the respective element-use wire materials are preferably configured by making different decorations on an outer surface of the same metal wire material. Also, the respective element-use wire materials may be configured by different metal wire materials.

Advantageous Effects of Invention

[0032] The manufacturing device for a fastener stringer according to the present invention is configured as a device for manufacturing a fastener stringer by supplying the element-use wire material to the wire material supply unit and forming the plurality of fastener elements from the supplied element-use wire material.

[0033] The wire material supply unit of the present invention includes the plurality of supply unit parts configured to supply each of the different element-use wire materials towards the cutting die by the separate supply means and the control unit configured to control the supply amount of the wire material by each supply unit part and to sequentially make one of the plurality of wire materials protrude above the sliding contact surface of the cutting die in accordance with the preset order.

[0034] According to the manufacturing device of the present invention, since the fastener stringer can be manufactured by using the plurality of element-use wire materials to sequentially form the fastener elements, it is possible to manufacture the fastener stringer at low cost. Also, according to the manufacturing device of the present invention, since one of the different element-use wire materials can be selected and supplied to the cutting die in accordance with the preset order in the wire material supply unit, it is possible to continuously form the metal elements having different properties in a desired order and to sequentially implant the same into the fastener tape. Thereby, it is possible to manufacture the fastener stringer where the properties of the metal elements such as colors are different in a continuous ele-

ment row, simply and at low cost.

[0035] In the manufacturing device of the present invention, the supply means includes the pair of supply rollers configured to rotate with nipping therebetween the wire material and to supply the wire material, and is configured to supply the wire material with the preset supply amount by controlling rotations of the pair of supply rollers. Thereby, it is possible to stably control the supply amount of the wire material of each supply unit part by the control unit and to make one of the plurality of element-use wire materials protrude above the sliding contact surface of the cutting die by a predetermined thickness.

[0036] Also, in the manufacturing device of the present invention, the cutting die is formed with the plurality of wire material guide holes aligned along the reciprocating direction of the cutting punch, and the stroke of the relative reciprocation of the cutting punch is set to be greater than the formation area in which the openings of the plurality of wire material guide holes are formed.

[0037] Thereby, it is possible to configure the manufacturing device with a simple structure. Also, even when the element-use wire materials are supplied from the plurality of supply unit parts, respectively, the relative reciprocation of the cutting punch relative to the cutting die is repeated, so that it is possible to sequentially form and implant the fastener elements into the fastener tape in a desired order. Therefore, it is possible to stably manufacture the fastener stringer without greatly lowering the manufacturing rate of the fastener stringer, as compared to the related art.

[0038] Also, in the present invention, Also, each supply unit part includes the driving unit, the transmission unit configured to transmit the driving force of the driving unit to the pair of supply rollers (the supply roller pair), and the stopper unit configured to stop the transmission of the driving force by the transmission unit. Also, the control unit of the wire material supply unit is configured to control an operation of the stopper unit.

[0039] Thereby, it is possible to manufacture the wire material supply unit with a simple structure. Also, in each of the supply unit parts, the element-use wire material can be supplied towards the cutting die by the supply roller pair thereof and smoothly protrudes above the sliding contact surface of the cutting die. Further, the control unit can stably control the rotations of the supply roller pair of each supply unit part, correctly select one of the element-use wire materials from the plurality of element-use wire materials in accordance with a preset order, and stably make the selected material protrude above the sliding contact surface of the cutting die at predetermined timing.

[0040] Also, in the present invention, the pair of supply rollers of each supply unit part, the tape supply unit, the cutting die, the forming die, the forming punch, and the crimping unit are driven with being connected to the single main shaft. Thereby, it is possible to effectively operate the respective operation units in synchronization

with each other, and to integrally configure the entire manufacturing device, thereby saving the space.

[0041] Also, in the present invention, the plurality of wire materials to be supplied by each of the supply roller pairs is configured by the same material and has the outer surfaces of different colors. Thereby, it is possible to suppress a forming mechanism for forming elements from being complex. Also, since it is possible to smoothly attach the fastener elements of different colors to the fastener tape in a desired order, it is possible to stably manufacture a fastener stringer having a high quality-outward appearance where the colors of the fastener elements are different in the continuous element row.

[0042] The manufacturing method for a fastener stringer according to the present invention includes the preparation process of preparing the element-use wire material, the supply process of intermittently supplying the wire material with the predetermined pitch, the cutting process of cutting the wire material supplied in the supply process into the thickness corresponding to the supply amount of the wire material in the direction orthogonal to the supply direction by the cutting means, the forming process of pressing and forming the cut surfaces of the elements obtained in the cutting process into the fastener elements having engaging heads by the forming means, and the implanting process of crimping and implanting the formed fastener elements into the fastener tape intermittently supplied with the predetermined pitch by the crimping means.

[0043] Also, in the preparation process, the plurality of the different wire materials is prepared, and in the supply process, the plurality of the supply means configured to individually supply the plurality of wire materials is controlled to continuously perform the process of supplying one of the plurality of wire materials to the cutting means with the predetermined pitch in accordance with the preset order.

[0044] According to the manufacturing method of the present invention, it is possible to manufacture a fastener stringer by using the plurality of the element-use wire materials to sequentially form the fastener elements. Also, in the supply process, since one of the different element-use wire materials can be selected and supplied to the cutting means in accordance with the preset order, it is possible to continuously form the metal elements having different properties in a desired order and to sequentially implant the same into the fastener tape. Thereby, it is possible to manufacture the fastener stringer where the properties of the metal elements such as colors are different in a continuous element row, simply and at low cost.

[0045] Also, the manufacturing method of the present invention includes supplying the plurality of different wire materials to the cutting means via the different supply routes by the separate supply means in the supply process, and processing the elements cut from the plurality of wire materials and the fastener elements formed from the elements via the same route by using the same cut-

ting means, forming means and crimping means in the cutting process, the forming process and the implanting process.

[0046] Thereby, it is possible to sequentially form the fastener elements from the one wire material selected from the wire materials in accordance with a desired order by using the one cutting means and forming means and to sequentially implant the formed fastener elements into the fastener tape by using the one crimping means. Thereby, it is possible to stably manufacture a fastener stringer without greatly lowering the manufacturing rate of the fastener stringer, as compared to the related art.

[0047] In the fastener stringer of the present invention, the respective fastener elements are manufactured by selecting one of the plurality of different element-use wire materials having a substantially Y-shaped section, cutting the same to form elements with the predetermined pitch and press-forming the elements. The respective fastener elements manufactured from the plurality of wire materials are crimped and fixed to the tape side edge portion of the single fastener tape in the predetermined arrangement. Also, the cut surfaces of the respective fastener elements formed by cutting the element-use wire material and the outer surfaces except for the cut surfaces have different outward appearances.

[0048] According to the fastener stringer of the present invention, since the fastener elements having different properties are implanted to the fastener tape in a desired order, it is possible to make the properties of the fastener elements such as colors different in the continuous element row at low cost. Like this, since the product pricing of the fastener stringer of the present invention is suppressed and the properties such as outward appearances are different from a general fastener stringer of the related art, the fastener stringer of the present invention can be appropriately used for a slide fastener or the like of a product for which a design, a premium feel and the like are required.

[0049] Particularly, according to the fastener stringer of the present invention, the cut surfaces of the respective fastener elements formed by cutting the element-use wire material and the outer surfaces except for the cut surfaces have different outward appearances. Thereby, it is possible to easily provide the fastener stringer with a variety of outward appearance qualities and to remarkably increase product variation of the slide fastener.

[0050] Also, according to the fastener stringer of the present invention, the respective element-use wire materials are configured by making different decorations (for examples, colors) on the outer surface of the same metal wire material. Thereby, it is possible to easily make the decorations of the fastener elements different in the continuous element row, so that it is possible to provide a slide fastener having a fresh design and a stable fastener quality such as engaging strength at low cost.

[0051] Also, according to the fastener stringer of the present invention, the respective element-use wire materials may be configured by different metal wire materi-

als. Thereby, since it is possible to easily make the materials of the fastener elements different in the continuous element row, it is possible to provide a slide fastener having a property or function, which has not been provided in the related art, at low cost.

Brief Description of Drawings

[0052]

FIG. 1 is a perspective view pictorially depicting a manufacturing device for a fastener stringer according to the present invention.

FIG. 2 is an enlarged pictorial view of a main part of the manufacturing device.

FIG. 3 is a pictorial view pictorially depicting a cutting die, a cutting punch and a crimping unit of the manufacturing device.

FIG. 4 is a sectional view pictorially depicting a relation of a forming die and a forming punch of the manufacturing device and a fastener tape.

FIG. 5 is a sectional view pictorially depicting a part of a transmission unit and a stopper unit of a supply unit part of the manufacturing device.

FIG. 6 is a pictorial view depicting a control unit of a wire material supply unit of the manufacturing device.

FIG. 7 is a pictorial view depicting a state where a first element-use wire material protrudes above a sliding contact surface of the cutting die in the manufacturing device.

FIG. 8 is a pictorial view depicting a state where elements cut from the first element-use wire material are formed into fastener elements in the manufacturing device.

FIG. 9 is a pictorial view depicting a state where the fastener elements are implanted and a second element-use wire material protrudes above the sliding contact surface of the cutting die in the manufacturing device.

FIG. 10 is a pictorial view depicting a state where elements cut from the second element-use wire material are formed into fastener elements in the manufacturing device.

FIG. 11 is a pictorial view depicting a state where the fastener elements are implanted and the first element-use wire material protrudes above the sliding contact surface of the cutting die in the manufacturing device.

FIG. 12 is a plan view depicting an example of a fastener stringer to be manufactured by the present invention.

FIG. 13 is a plan view depicting another example of the fastener stringer to be manufactured by the present invention.

FIG. 14 is a plan view depicting still another example of the fastener stringer to be manufactured by the present invention.

FIG. 15 is a plan view depicting still another example of the fastener stringer to be manufactured by the present invention.

Embodiments of Invention

[0053] Hereinafter, preferred illustrative embodiments of the present invention will be described in detail with reference to the drawings.

[0054] Herein, FIG. 1 is a perspective view pictorially depicting a manufacturing device for a fastener stringer according to the illustrative embodiment.

[0055] In the illustrative embodiment, a manufacturing device 1 includes a wire material supply unit configured to intermittently supply an element-use wire material W with a predetermined pitch, a tape supply unit 20 configured to intermittently supply a fastener tape T with a predetermined pitch, a cutting unit configured to cut the element-use wire material W and to form elements by a cutting die 2 and a cutting punch 3, an element forming unit configured to press-form the cut elements into fastener elements E by a forming die 4 and a forming punch 5, a crimping unit configured to crimp and implant the fastener elements E to the fastener tape T by crimping punches 6, and a chamfering unit configured to chamfer the fastener elements E attached to the fastener tape T by chamfering punches 7.

[0056] Also, the manufacturing device 1 includes a cradle 8 configured to support some components and a single main shaft 30 configured to rotate by a motor (not shown). The main shaft 30 is provided with a first ram driving cam (a cutting die driving cam) 31, second ram driving cams (forming punch driving cams) 32, a third ram connection mechanism 45, wire material feeding cams 33, and a tape feeding cam 34, which will be described later.

[0057] The cradle 8 of the manufacturing device 1 is attached with a first ram 40 configured to reciprocate so that it is repeatedly advanced and retracted in a front-rear direction between a front end position and a rear end position by rotation of the main shaft 30. To the first ram 40, the cutting die 2 of the cutting unit and the forming die 4 of the element forming unit are sequentially fixed towards the advancing direction of the first ram 40. The cutting die 2 and the forming die 4 are configured to reciprocate in the front-rear direction together with the first ram 40.

[0058] As described above, the main shaft 30 has the first ram driving cam (cutting die driving cam) 31, and the first ram driving cam 31 and the first ram 40 are connected via a first ram driving cam-follower mechanism 41.

[0059] The first ram driving cam-follower mechanism 41 has a pair of front and rear first rollers 41a fixed to the first ram 40 and configured to rolling-contact the first ram driving cam 31. In this case, the front and rear first rollers 41a are arranged at an advancing side and a retract side of the first ram 40 with respect to the first ram driving cam 31 so as to interpose the first ram driving cam 31 there-

between.

[0060] Therefore, in the first ram driving cam-follower mechanism 41, when the first ram driving cam 31 is rotated in one direction together with the main shaft 30, the pair of front and rear first rollers 41a is pressed in conformity to a cam shape of the first ram driving cam 31, so that the first rollers 41a and the first ram 40 having the first rollers fixed thereto can be linearly moved in the front-rear direction.

[0061] In the illustrative embodiment, as shown in FIG. 3, the cutting die 2 has a first die configuring part 51a arranged adjacent to the forming die 4, a second die configuring part 51b arranged adjacent to a rear side of the first die configuring part 51a and a third die configuring part 51c arranged adjacent to a rear side of the second die configuring part 51b. The first die configuring part 51a to the third die configuring part 51c are assembled and fixed with being aligned in the reciprocating direction of the first ram 40, so that the cutting die 2 is configured.

[0062] An upper surface of the cutting die 2 is formed as a sliding contact surface to which the cutting punch 3 is to be sliding-contacted. Also, a central portion of the cutting die 2 in a width direction is formed with a first wire material guide hole 52a and a second wire material guide hole 52b opening to the sliding contact surface of the cutting die 2 and penetrating the cutting die 2 in an upper-lower direction. The first wire material guide hole 52a and the second wire material guide hole 52b are arranged with being aligned in the reciprocating direction of the cutting die 2.

[0063] In this case, the first wire material guide hole 52a is formed to have a shape corresponding to a cross section of a first element-use wire material W1 (which will be described later) by the first die configuring part 51a and the second die configuring part 51b. Also, the second wire material guide hole 52b is arranged with being spaced rearwards from the first wire material guide hole 52a, and is formed to have a shape corresponding to a second element-use wire material W2 (which will be described later) by the second die configuring part 51b and the third die configuring part 51c.

[0064] Particularly, in the illustrative embodiment, since the first element-use wire material W1 and the second element-use wire material W2 have the same cross sectional shape, the opening shapes of the first wire material guide hole 52a and the second wire material guide hole 52b opening to the sliding contact surface also have the same shape.

[0065] In the illustrative embodiment, as described above, the cutting die 2 is provided with one wire material guide hole for one element-use wire material W so that the first wire material guide hole 52a for inserting there-through the first element-use wire material W1 and the second wire material guide hole 52b for inserting there-through the second element-use wire material W2 are provided. However, in the present invention, the cutting die 2 may be provided with one wire material guide hole for a plurality of element-use wire materials W, and the

plurality of element-use wire materials W may be inserted into the one wire material guide hole.

[0066] On the upper surface of the cutting die 2, the cutting punch 3 is immovably fixed to the cradle 8 of the manufacturing device 1. The cutting punch 3 is configured to reciprocate relative to the cutting die 2 with sliding-contacting the sliding contact surface of the cutting die 2 as the cutting die 2 reciprocates together with the first ram 40.

[0067] Therefore, as described later, when the cutting die 2 is retracted from the most advanced position (front end position) together with the first ram 40 with the first element-use wire material W1 or the second element-use wire material W2 protruding from the sliding contact surface of the cutting die 2, the cutting punch 3 is advanced relative to the cutting die 2. Thereby, the protruding portion of the first element-use wire material W1 or the second element-use wire material W2 from the sliding contact surface of the cutting die 2 is cut by the cutting punch 3 being relatively advanced, so that elements can be formed (refer to FIGS. 7 and 9, for example).

[0068] In this case, a stroke of the relative reciprocation of the cutting punch 3 relative to the cutting die 2 (i.e., a stroke of the reciprocation of the cutting die 2) is set to a predetermined size greater than a size in the front-rear direction (reciprocating direction) of a formation area (formation range) in which the first wire material guide hole 52a and the second wire material guide hole 52b are formed so that when the cutting punch 3 is relatively advanced or retracted, the cutting punch can pass above both openings of the first wire material guide hole 52a and the second wire material guide hole 52b of the cutting die 2.

[0069] Thereby, even though the first element-use wire material W1 protrudes from the first wire material guide hole 52a of the cutting die 2 or the second element-use wire material W2 protrudes from the second wire material guide hole 52b, when the cutting punch 3 is relatively advanced by one backward movement of the cutting die 2, the protruding first element-use wire material W1 or second element-use wire material W2 can be easily and securely cut. In the illustrative embodiment, the formation area in which the first and second wire material guide holes 52a, 52b are formed refers to an area ranging from the most forward position of the first wire material guide hole 52a to the most rearward position of the second wire material guide hole 52b.

[0070] In front of the cutting die 2, the forming die 4 is arranged adjacent to the cutting die 2. The forming die 4 has a predetermined shape on which elements are to be put and by which the forming die press-forms the elements into fastener elements E in cooperation with the forming punch 5.

[0071] A second ram 42 configured to reciprocate so that it repeatedly moves down and up in the upper-lower direction between an upper end position and a lower end position by rotation of the main shaft 30 is slidably attached to the cradle 8 of the manufacturing device 1.

Particularly, the second ram 42 is arranged above the cutting punch 3 fixed to the cradle 8 so that it can move up and down along the upper-lower direction orthogonal to the forward-and-backward reciprocation of the first ram 40.

[0072] Also, an urging member (a compression spring) 42a of a second ram driving cam-follower mechanism 43 (which will be described later) is accommodated in the second ram 42. By the urging member 42a, the second ram 42 is kept at the upper end position with being urged upwards. Also, the second ram 42 moved down by the second ram driving cam-follower mechanism 43 (which will be described later) can be moved up and returned to the original upper end position.

[0073] The forming punch 5 configured to press-form elements is fixed to a front surface of the second ram 42 via a punch holder 42b. The forming punch 5 is arranged to move up and down in the upper-lower direction together with the second ram 42. Also, a pressing pad part 5a configured to press portions (leg portions) of an element from above upon the press-forming of the element is kept to be moveable in the upper-lower direction at the second ram 42. The pressing pad part 5a is urged downwards by a plate spring 5b fixed to an upper end portion of the second ram 42.

[0074] The main shaft 30 has the second ram driving cams (forming punch driving cams) 32 at both left and right sides of the first ram driving cam (cutting die driving cam) 31. The second ram driving cams 32 and the second ram 42 are connected via the second ram driving cam-follower mechanism 43.

[0075] The second ram driving cam-follower mechanism 43 has a pair of left and right second rollers 43c configured to rolling-contact the second ram driving cams 32, a lever part 43a configured to pivotally support the second rollers 43c to one end portion thereof (a rear end portion) and having a central portion pivotally attached to the cradle 8 of the manufacturing device 1, a contact pin 43d attached to the other end portion (a front end portion) of the lever part 43a and abutting on a head of the second ram 42, and an urging member (a spring member) 43b configured to urge downwards the one end portion (rear end portion) of the lever part 43a.

[0076] The lever part 43a is kept to be swingable up and down about a shaft portion pivotally attached to the cradle 8, and the rear end portion thereof is urged downwards by the spring member 43b. Thereby, the pair of second rollers 43c pivotally supported to the rear end portion of the lever part 43a is pressed towards the second ram driving cams 32, respectively.

[0077] Therefore, when the second ram driving cams 32 are rotated together with the main shaft 30, the second rollers 43c and the rear end portion of the lever part 43a are pushed up against the urging force of the spring member 43b in accordance with the cam shape of the second ram driving cams 32 and the front end portion of the lever part 43a and the contact pin 43d can be moved down. Thereby, the second ram 42 on which the contact pin

43d abuts and the forming punch 5 are pushed down, so that the elements can be press-formed by the forming punch 5.

[0078] At this time, the pressing pad part 5a is also moved down together with the second ram 42 and the forming punch 5. However, since the pressing pad part 5a is kept to be vertically moveable at the second ram 42, after it is contacted to the portions (leg portions) of the element, the pressing pad part moves up relative to the second ram 42 and presses the portions (leg portions) of the element from above by the urging force of the plate spring 5b fixed to the upper end portion of the second ram 42.

[0079] A third ram 44 configured to reciprocate so that it is repeatedly advanced and retracted in the front-rear direction between the front end position and the rear end position by the rotation of the main shaft 30 is slidably attached to the cradle 8 of the manufacturing device 1. By the reciprocation of the third ram 44, the pair of left and right crimping punches 6 and the pair of left and right chamfering punches 7 can be operated.

[0080] In this case, the third ram 44 is arranged below the first ram 40 and is connected (coupled) to the main shaft 30 via a third ram connection mechanism 45. Also, the pair of crimping punches 6 and the pair of chamfering punches 7 are configured to be moveable between a processing position close to the fastener elements E and a standby position spaced from the fastener elements E, and are kept to be moveable in the front-rear direction together with the first ram 40.

[0081] The third ram connection mechanism 45 has a rotary shaft 45a arranged to be substantially parallel with the main shaft 30, a timing belt (not shown) configured to transmit rotation of the main shaft 30 to the rotary shaft 45a, and a driving lever part 45c eccentrically attached to the rotary shaft 45a. The driving lever part 45c of the third ram connection mechanism 45 is coupled to a rear end portion of the third ram 44 via a pin 45d.

[0082] With the third ram connection mechanism 45, the driving lever part 45c is eccentrically moved around the rotary shaft 45a by the rotation of the main shaft 30, so that the third ram 44 coupled to the driving lever part 45c can be reciprocated in the front-rear direction.

[0083] The pair of left and right crimping cams 46 and the pair of left and right chamfering cams 47 are arranged on both left and right side surfaces of a front end portion of the third ram 44. The pair of left and right crimping cams 46 has cam surfaces formed on outer surfaces of rear end portions thereof, and is connected to the pair of crimping punch 6 via a pair of left and right crimping cam-follower mechanisms 48.

[0084] The crimping cam-follower mechanism 48 has a crimping lever part 48b attached to the cradle 8 of the manufacturing device 1 via a pin 48a to be swingable in the left-right direction and a cam receiving roller 48c attached to a lower end portion of the crimping lever part 48b. The cam receiving roller 48c is elastically contacted to the cam surface of the crimping cam 46.

[0085] Therefore, in the illustrative embodiment, when the third ram 44 reciprocates in the front-rear direction, the pair of crimping cams 46 moves the cam receiving rollers 48c in the left-right direction along the cam surfaces of the crimping cams 46, thereby swinging the crimping lever parts 48b. By the swinging of the crimping lever parts 48b, the pair of crimping punches 6 is moved between the processing position and the standby position, so that the crimping punches 6 can crimp and implant the fastener elements E into the fastener tape T.

[0086] The pair of left and right chamfering cams 47 has cam surfaces formed on outer surfaces of rear end portions thereof, and is connected to the pair of chamfering punches 7 via a pair of left and right chamfering cam-follower mechanisms 49. The chamfering cam-follower mechanism 49 has a chamfering lever part 49b attached to the cradle 8 of the manufacturing device 1 via a pin to be swingable in the left-right direction. Also, the chamfering cam-follower mechanism 49 has a cam receiving roller 49c attached to a lower end portion of the chamfering lever part 49b. The cam receiving roller 49c is elastically contacted to the cam surface of the chamfering cam 47.

[0087] Therefore, in the illustrative embodiment, when the third ram 44 reciprocates in the front-rear direction, the pair of chamfering cams 47 moves the cam receiving rollers 49c in the left-right direction along the cam surfaces of the chamfering cams 47, thereby swinging the chamfering lever parts 49b. By the swinging of the chamfering lever parts 49b, the pair of chamfering punches 7 is moved between the processing position and the standby position, so that the chamfering punches 7 can chamfer the fastener elements E.

[0088] Also, in the illustrative embodiment, the pair of crimping punches 6 is arranged at both sides of the forming die 4 and below the pair of chamfering punches 7. Also, the pair of crimping punches 6 is obliquely provided with respect to the reciprocating direction of the cutting die 2, for example. Also, the pair of crimping punches 6 is configured so that when the crimping punches 6 are pressed and moved to the processing position by the crimping lever parts 48b, tip processing parts of the crimping punches 6 are located at the substantially same positions as the fastener elements E on the forming die 4.

[0089] The pair of chamfering punches 7 is arranged at both sides of the forming die 4. Also, the pair of chamfering punches 7 is configured so that when tip processing parts of the chamfering punches 7 are moved to the processing position, the chamfering punches are located at higher positions than the tip processing parts of the crimping punches 6 by an attachment pitch of the fastener elements E to the fastener tape T.

[0090] In the illustrative embodiment, the wire material supply unit has a first supply unit part 10a configured to supply the first element-use wire material W1 towards the cutting die 2, a second supply unit part 10b configured to supply the second element-use wire material W2 towards the cutting die 2, and a control unit (not shown)

configured to control operations of the first supply unit part 10a and the second supply unit part 10b.

[0091] In this case, the first supply unit part 10a and the second supply unit part 10b are arranged to be bilaterally symmetric and are configured to be substantially the same. Therefore, herein, the configuration of the first supply unit part 10a is mainly described, and the configuration of the second supply unit part 10b is denoted using reference numerals corresponding to the first supply unit part 10a and the description thereof is omitted.

[0092] In the illustrative embodiment, the first supply unit part 10a has a pair of supply rollers (a supply roller pair) 11. The supply rollers 11 are configured by a wire material feeding roller 11a configured to intermittently rotate by rotation of the main shaft 30 and a guide roller 11b configured to rotate as the wire material feeding roller 11a rotates. The wire material feeding roller 11a and the guide roller 11b rotate with nipping the first element-use wire material W1 therebetween, thereby intermittently conveying the first element-use wire material W1 towards the cutting die 2.

[0093] Particularly, in the illustrative embodiment, the pair of supply rollers 11 of the first supply unit part 10a and the pair of supply rollers 11 of the second supply unit part 10b are arranged side by side in the left-right direction below the first and second wire material guide holes 52a, 52b formed in the cutting die 2.

[0094] In this case, since the height positions of the first and second wire material guide holes 52a, 52b of the cutting die 2 and the height positions of the supply rollers 11 of the first and second supply unit parts 10a, 10b are spaced from each other, when supplying the first and second element-use wire materials W1, W2 from the supply rollers 11 of the first and second supply unit parts 10a, 10b to the first and second wire material guide hole 52a, 52b of the cutting die 2, respectively, it is possible to secure a sufficient distance for bending the first and second element-use wire materials W1, W2, as shown in FIG. 2.

[0095] For this reason, even though the supply rollers 11 of the first and second supply unit part 10a, 10b are not arranged immediately below the first and second wire material guide holes 52a, 52b of the cutting die 2, it is possible to smoothly supply the first and second element-use wire materials W1, W2 towards the first and second wire material guide holes 52a, 52b of the cutting die 2 by the supply rollers 11 of the first and second supply unit parts 10a, 10b.

[0096] Meanwhile, in the illustrative embodiment, in order to supply the first and second element-use wire materials W1, W2 to the first and second wire material guide holes 52a, 52b of the cutting die 2 more smoothly, a guide part configured to guide the conveying of the wire materials W may be provided between the supply rollers 11 of the first and second supply unit parts 10a, 10b and the cutting die 2.

[0097] The main shaft 30 has the wire material feeding cams 33. The wire material feeding cams 33 and the wire

material feeding rollers 11a of the supply rollers 11 are connected via wire material feeding cam-follower mechanisms 16 becoming a transmission unit.

[0098] The wire material feeding cam-follower mechanism 16 has a transmission shaft 13 having one end portion to which the wire material feeding roller 11a is fixed, a ratchet wheel 14 fixed to the other end portion of the transmission shaft 13 and configured to rotate in one direction, a ratchet claw 15 configured to be engaged/disengaged to/from the ratchet wheel 14 and to rotate the ratchet wheel 14, a slider 18 having one end portion to which the ratchet claw 15 is attached, a holder 17 configured to keep the slider 18 to be reciprocally moveable, a slider urging member (a spring member) 16a configured to urge the slider 18, and a third roller 19 pivotally attached to the other end portion of the slider 18 and configured to rolling-contact the wire material feeding cam 33.

[0099] As shown in FIG. 5, the holder 17 has a holder base part 17a fixed to the cradle 8 of the manufacturing device 1 and having an accommodation space part for accommodating therein the slider 18, a cover part 17b configured to cover the holder base part 17a and the slider 18 after accommodating the slider 18 in the holder base part 17a, a guide groove 17c formed by the holder base part 17a and the cover part 17b, and a spring holding part 17d provided in the accommodation space part of the holder base part 17a and configured to keep the slider urging member 16a.

[0100] The slider 18 slidably held at the holder 17 has a slider main body 18e, a spring receiving part 18a provided for the slider main body 18e and configured to receive an urging force of the slider urging member 16a, a claw insertion groove 18b provided at one end portion (a lower end portion) of the slider main body 18e, and a roller holding part 18f provided at the other end portion (an upper end portion) of the slider main body 18e and configured to rotatably hold the third roller 19. The slider 18 is held in the accommodation space part of the holder 17 with a part of the slider main body 18e being sliding-contacted to the guide groove 17c of the holder 17.

[0101] Also, the slider urging member (spring member) 16a is arranged with being compressed between the spring holding part 17d of the holder base part 17a and the spring receiving part 18a of the slider 18. By the slider urging member 16a, the slider 18 is kept at the holder 17 with being urged towards the main shaft 30 (the upper side), and the third roller 19 kept at the other end portion (the upper end portion) of the slider 18 can be pressed and elastically contacted to the cam surface of the wire material feeding cam 33 of the main shaft 30.

[0102] Therefore, when the wire material feeding cam 33 is rotated together with the main shaft 30, the slider 18 can be reciprocally moved via the third roller 19. In this case, when a portion (highest portion) of the cam surface most spaced from the main shaft 30 of the wire material feeding cam 33 is contacted to the third roller 19, the slider 18 is moved to a forward movement stroke

end position at which it is most advanced against the urging force of the slider urging member 16a. On the other hand, when a portion (lowest portion) of the cam surface closest from the main shaft 30 of the wire material feeding cam 33 is contacted to the third roller 19, the slider 18 is moved to a backward movement stroke end position at which it is urged by the slider urging member 16a and is most retracted.

[0103] The ratchet claw 15 is pivotally supported to be swingable by a pin 18c with being inserted in the claw insertion groove 18b of the slider 18, and is urged to be pressed towards the ratchet wheel 14 by the spring member 18d arranged on a groove bottom of the claw insertion groove 18b.

[0104] Thereby, it is possible to keep a state where a tip end portion of the ratchet claw 15 is engaged with a tooth of the ratchet wheel 14. Further, the slider 18 is moved forward with the ratchet claw 15 being engaged with the ratchet wheel 14, so that the ratchet claw 15 is also advanced together with the slider 18 with being engaged with the tooth of the ratchet wheel 14. Therefore, it is possible to securely rotate the ratchet wheel 14 in the feeding direction by a predetermined angle of rotation corresponding to one tooth.

[0105] After the rotation of the ratchet wheel 14, the slider 18 is moved backward, so that the ratchet claw 15 swings about the pin 18c and retracts together with the slider 18 with overriding the teeth of the ratchet wheel 14. For this reason, it is possible to engage the ratchet claw 15 with a next tooth of the ratchet wheel 14 without rotating the ratchet wheel 14 by a predetermined angle or greater.

[0106] Thereby, it is possible to intermittently rotate the transmission shaft 13 and the supply rollers 11 by a predetermined amount of rotation. For this reason, it is possible to stably supply the first or second element-use wire material W1, W2 by the preset supply amount with the supply rollers 11.

[0107] Also, in the illustrative embodiment, a stopper unit 9 configured to stop the driving force resulting from the rotations of the main shaft 30 and the wire material feeding cam 33 from being transmitted to the ratchet wheel 14 and the supply rollers 11 via the slider 18 and the ratchet claw 15 is provided. The stopper unit 9 operates, so that even though the wire material feeding cam 33 is rotated together with the main shaft 30, the ratchet wheel 14 is not rotated. Thereby, it is possible to stop the feeding operation of the supply rollers 11 to feed the first element-use wire material W1.

[0108] The stopper unit 9 has a movement mechanism 60 and a stopper member 70 configured to move between a holding position and a holding-release position by the movement mechanism 60. Also, the movement mechanism 60 has a housing 61 and a rotary solenoid attached to the housing 61. The housing 61 has a housing main body 61a having a circular recessed portion 63 and a plate (not shown) detachably mounted to the housing main body 61a and having a cover shape.

[0109] An output shaft 62 of the rotary solenoid protrudes in the recessed portion 63 of the housing main body 61a, and a lever part 64 is fixed to the output shaft 62. Also, the lever part 64 and the stopper member 70 are coupled via a coupling rod 65.

[0110] Also, to the housing main body 61a, a first contact part 66 and a second contact part 67 configured to contact the lever part 64 and to keep a posture of the lever part 64 are fixed with protruding into the recessed portion 63 of the housing main body 61a. In this case, a posture of the lever part 64, which is made when the lever part 64 is contacted to the first contact part 66 arranged at the upper side, is a slider holding posture. On the other hand, a posture of the lever part 64, which is made when the lever part 64 is contacted to the second contact part 67 arranged at the lower side, is a slider holding-release posture.

[0111] In the illustrative embodiment, the stopper member 70 has a stopper main body 71 coupled to the coupling rod 65, a sliding part 72 slidably held at the stopper main body 71, an urging member (a spring member) 73 configured to urge the sliding part 72, and a stopper guide part 74 configured to guide reciprocation of the stopper main body 71. In this case, the sliding part 72 is held at the stopper main body 71 with being urged in a predetermined direction towards the urging member 73. Also, the stopper guide part 74 is fixed to the holder 17.

[0112] Also, as shown in FIG. 5, a side of the slider 18 facing the sliding part 72 is formed with a step portion 18g in which a portion of the sliding part 72 can be inserted. A wall surface of the step portion 18g parallel with a sliding direction of the sliding part 72 is a contact surface that is contacted to the sliding part 72 and interrupts the backward movement of the slider 18 when the portion of the sliding part 72 is inserted into the step portion 18g.

[0113] The contact surface of the step portion 18g is set at the same height as a lower surface of the sliding part 72 so that the portion of the sliding part 72 is smoothly inserted into the step portion 18g when the slider 18 is moved to the forward movement stroke end position. Also, the contact surface of the step portion 18g is set to be arranged above the lower surface of the sliding part 72 when the slider 18 is moved to the backward movement stroke end position.

[0114] In the stopper unit 9 of the first supply unit part 10a of the illustrative embodiment, the sliding part 72 of the stopper member 70 is kept at the slider holding posture at which the output shaft 62 of the rotary solenoid is rotated forward (in a clockwise direction in FIG. 5) and the lever part 64 is thus contacted to the upper first contact part 66, so that the stopper main body 71 of the stopper member 70 is moved to the most advanced position and is kept at the advanced position.

[0115] At this time, when the slider 18 is close to the backward movement stroke end position, a tip surface of the sliding part 72 is pressed to the side surface of the slider 18 and the urging member configured to urge the sliding part 72 is bent and kept with being compressed.

[0116] Thereafter, as the main shaft 30 and the wire material feeding cam 33 are rotated, the slider 18 is advanced to the forward movement stroke end position, so that the contact surface of the step portion 18g of the slider 18 is moved to the same height as the lower surface of the sliding part 72. At this time, the sliding part 72 is urged by the urging member, so that it is introduced into the step portion 18g of the slider 18 and is further contacted to the contact surface of the step portion 18g.

[0117] Thereby, the backward movement of the slider 18 is restrained by the sliding part 72 and the slider 18 is kept with being stopped at the forward movement stroke end position against the urging force of the slider urging member 16a. As a result, since the third roller 19 kept at the other end portion of the slider 18 is not pressed to the wire material feeding cam 33 by the urging force of the slider urging member 16a, the reciprocation of the slider 18 and the rotation of the ratchet wheel 14 are stopped, so that it is possible to stop the feeding operation of the supply rollers 11 to feed the first element-use wire material W 1.

[0118] On the other hand, the sliding part 72 of the stopper member 70 is kept at the slider holding-release posture at which the output shaft 62 of the rotary solenoid is rotated in a reverse direction (a counterclockwise direction in FIG. 5) and the lever part 64 is contacted to the lower second contact part 67, so that the stopper main body 71 of the stopper member 70 is moved to the most retracted position and is kept at the retracted position.

[0119] Thereby, the sliding part 72 inserted in the step portion 18g of the slider 18 is separated from the step portion 18g and spaced from the side surface of the slider 18, so that the restraint on the backward movement of the slider 18 by the sliding part 72 is released. As a result, since it is possible to press the third roller 19 kept at the upper end portion of the slider 18 to the cam surface of the wire material feeding cam 33 by the urging force of the slider urging member 16a, it is possible to smoothly reciprocate the slider 18 by the rotation of the wire material feeding cam 33, thereby resuming the feeding operation of the supply rollers 11 to feed the first element-use wire material W1.

[0120] In the first supply unit part 10a of the illustrative embodiment, as described above, the forward rotating direction of the output shaft 62 of the rotary solenoid is the clockwise direction of FIG. 5 and the reverse rotating direction of the output shaft 62 is the counterclockwise direction of FIG. 5. In contrast, since the second supply unit part 10 is arranged to be bilaterally symmetric to the first supply unit part 10a, the forward rotating direction of the output shaft 62 of the rotary solenoid is the counterclockwise direction and the reverse rotating direction of the output shaft 62 is the clockwise direction, when seeing the section of the second supply unit part 10b in the same direction as FIG. 5.

[0121] Also, the manufacturing device 1 of the illustrative embodiment has a rotation sensor 80 configured to

detect the rotation of the main shaft 30, as shown in FIG. 5. The rotation sensor 80 has a sensor unit 82 attached to the holder 17 via a bracket 81 and a rotor 83 attached to the main shaft 30. The sensor unit 82 detects rotation of the rotor 83, so that a rotating angle and a number of rotations of the main shaft 30 can be detected. Also, a detection signal of the rotation sensor 80 is input to the control unit.

[0122] Also, as shown in FIG. 6, the control unit is connected to the ratchet wheel 14 of the first supply unit part 10a and the rotary solenoid of the first supply unit part 10a and to the ratchet wheel 14 of the second supply unit part 10b and the rotary solenoid of the second supply unit part 10b. The rotating angles and the number of rotations of the ratchet wheels 14 of the first and second supply unit parts 10a, 10b are input to the control unit, and the operations of the rotary solenoids of the first and second supply unit parts 10a, 10b are controlled by the control unit.

[0123] Further, in the control unit, a number of the fastener elements E to be continuously attached to the fastener tape T, a tape length within which the fastener tape T is to be fed without attaching the fastener element E thereto, a rotating angle position of the main shaft 30 when an intermediate part between a high part and a low part of the wire material feeding cam 33 is contacted to the third roller 19, and the like are preset. Also, in the control unit, a sequence of attaching fastener elements E (first fastener elements E1) to be obtained from the first element-use wire material W1 and fastener elements E (second fastener elements E2) to be obtained from the second element-use wire material W2 to the fastener tape T and the like are preset.

[0124] Therefore, for example, when the number of rotations of the main shaft 30 input from the rotation sensor 80 coincides with the preset number of the fastener elements E to be attached and a rotating angle matching the rotating angle position of the main shaft 30 is input, the control unit outputs a command of the forward rotation to the rotary solenoids of the first and second supply unit parts 10a, 10b. Thereby, the output shafts 62 of the rotary solenoids of the first and second supply unit parts 10a, 10b are rotated in the forward direction to advance the stopper main bodies 71 of the stopper members 70, thereby stopping the reciprocation of the sliders 18.

[0125] Thereby, even when the main shaft 30 is being rotated, the feeding operation of the supply rollers 11 to feed the first and second element-use wire materials W1, W2 is stopped. Therefore, the fastener tape T is delivered but the first fastener elements E1 and the second fastener elements E2 are not implanted into the fastener tape T. For this reason, it is possible to easily form a space part in the fastener stringer S to be manufactured, in which both the first fastener elements E1 and the second fastener elements E2 are not attached.

[0126] In the meantime, after rotating the output shafts 62 of the rotary solenoids in the forward direction, when the number of rotations of the main shaft 30 input from

the rotation sensor 80 to the control unit coincides with the number of rotations corresponding to the tape length within which the fastener tape T is fed without attaching the fastener elements E thereto, the control unit outputs a command of the reverse rotation to the rotary solenoid of the first supply unit part 10a or the second supply unit part 10b. Thereby, the output shaft 62 of the rotary solenoid of the first supply unit part 10a or the second supply unit part 10b is rotated in the reverse direction, so that it is possible to retract the stopper main body 71 of the stopper member 70. Therefore, it is possible to resume the reciprocation of the slider 18, thereby sequentially implanting the first fastener elements E1 or the second fastener elements E2 to the fastener tape T.

[0127] Herein, the control unit is configured not to output the command of the reverse rotation to the rotary solenoid of the first supply unit part 10a or the second supply unit part 10b at the same time. That is, in the illustrative embodiment, the control unit is configured to perform the control so that while the one supply unit part feeds the wire material W, the other supply unit part cannot supply the other wire material W.

[0128] In the illustrative embodiment, the sliding part 72 of the stopper member 70 is advanced or retracted using the rotary solenoid for the stopper unit 9, thereby switching the reciprocation of the slider 18 and the stopping of the reciprocation of the slider 18. However, the present invention is not limited thereto. For example, instead of the rotary solenoid, a linear motion type solenoid or cylinder may be used to advance or retract the sliding part 72 of the stopper member 70 or a linear motion type solenoid or cylinder may be configured to directly operate the slider 18, so that it is possible to switch the reciprocation of the slider 18 and the stopping of the reciprocation of the slider 18.

[0129] In the illustrative embodiment, the tape supply unit 20 has a tape supply roller 21 configured to intermittently rotate by the rotation of the main shaft 30 and a pressing roller 22 configured to nip the fastener stringer S between the tape supply roller 21 and the pressing roller. The tape supply roller 21 and the pressing roller 22 are arranged downstream of the crimping unit and the chamfering unit of the manufacturing device 1 with respect to the feeding direction of the fastener tape T.

[0130] Therefore, in the tape supply unit 20, the tape supply roller 21 is intermittently rotated to intermittently deliver the fastener stringer S towards a downstream side and to intermittently supply the fastener tape T towards the crimping unit and the chamfering unit of the manufacturing device 1. Also, the crimping unit of the illustrative embodiment is provided with a tape guide part 25 at a position corresponding to the arrangement position of the crimping punch 6 so as to intermittently convey the fastener tape T along a predetermined conveying path.

[0131] The tape supply roller 21 of the tape supply unit 20 is fixed to one end portion of a transmission shaft 23 having one-way clutch mounted to an intermediate part thereof. Also, the main shaft 30 has a tape feeding cam

34. The tape feeding cam 34 and the transmission shaft 23 of the tape supply roller 21 are connected via a tape feeding cam-follower mechanism 24.

[0132] The tape feeding cam-follower mechanism 24 has a first lever part 24a swingably attached to the cradle 8 of the manufacturing device 1, a fourth roller 24b pivotally supported to one end portion of the first lever part 24a and configured to rolling-contact the tape feeding cam 34, a fifth roller 24c pivotally supported to the other end portion of the first lever part 24a, a second lever part 24d fixed to the other end portion of the transmission shaft 23, and an urging member (a tensile spring member) 24e configured to urge the second lever part 24d.

[0133] In this case, the urging member 24e is configured to urge upwards the second lever part 24d to the fifth roller 24c. Also, the second lever part 24d is pressed to the fifth roller 24c, so that the first lever part 24a can also press the fourth roller 24b to the tape feeding cam 34 by receiving the urging force of the urging member 24e via the second lever part 24d.

[0134] Therefore, in the tape feeding cam-follower mechanism 24, the tape feeding cam 34 is rotated in one direction together with the main shaft 30, so that the first lever part 24a swings in accordance with the cam surface of the tape feeding cam 34. By the swinging of the first lever part 24a, the second lever part 24d is enabled to swing with the fifth roller 24c. Thereby, it is possible to intermittently rotate the tape supply roller 21 only in one direction by rotating the transmission shaft 23 having one-way clutch mounted to the middle thereof, so that it is possible to deliver the fastener stringer S towards a downstream side.

[0135] Also, as described above, in the manufacturing device 1 of the illustrative embodiment, the first ram 40 configured to reciprocate the cutting die 2 and the forming die 4, the second ram 42 configured to move up and down the forming punch 5, the third ram 44 configured to move the crimping punch 6 and the chamfering punch 7, the supply rollers 11 configured to deliver the first element-use wire material W1 and the second element-use wire material W2, respectively, and the tape supply roller 21 configured to supply the fastener tape T by feeding the fastener stringer S are respectively configured to operate as the single main shaft 30 is rotated. For this reason, it is possible to effectively manufacture the fastener stringer S by easily matching the timings at which the respective operation units operate, and to integrally configure the entire manufacturing device 1, thereby saving the space.

[0136] In the below, a method of manufacturing the fastener stringer S by forming the fastener elements E from the first element-use wire material W1 and the second element-use wire material W2 and sequentially attaching the same to the fastener tape T with the manufacturing device 1 is described.

[0137] Particularly, in the illustrative embodiment, a case where the fastener stringer S is manufactured by alternately implanting the first fastener element E1

formed from the first element-use wire material W1 and the second fastener element E2 formed from the second element-use wire material W2 into the fastener tape T is described.

[0138] First, as a preparation process, the first element-use wire material W1 and the second element-use wire material W2 are prepared. The first element-use wire material W1 and the second element-use wire material W2 prepared in the illustrative embodiment are made of the same material and are manufactured from the wire materials W having outer surfaces of different colors.

[0139] In this case, the first element-use wire material W1 and the second element-use wire material W2 are formed of aluminum or aluminum alloy. Also, the first element-use wire material W1 and the second element-use wire material W2 are respectively colored by anodizing to uniformly form anodic oxide films (alumite films) having desired colors on the outer surfaces of the wire materials W. Thereby, it is possible to obtain the first and second element-use wire materials W1, W2 having outer surfaces of desired different colors.

[0140] In this case, as described later, when cutting the first and second element-use wire materials W1, W2 to form the first and second fastener elements E1, E2, since element upper surfaces and element lower surfaces, which are cut surfaces of the first and second fastener elements E1, E2, are not formed with the anodic oxide films, the element upper surfaces and the element lower surfaces have an aluminum or aluminum alloy color. That is, the element upper surfaces and lower surfaces of the first and second fastener elements E1, E2 and the outer surfaces having the anodic oxide films formed thereon except for the element upper surfaces and lower surfaces have different outward appearances.

[0141] In the present invention, the material of the element-use wire material W and the method of coloring the element-use wire material W are not particularly limited. For example, the first and second element-use wire materials W1, W2 may be formed of copper alloy, and the first and second element-use wire materials W1, W2 made of copper alloy may be coated or plated into desired colors to obtain the first and second element-use wire materials W1, W2 having outer surfaces of desired colors. Also, the first and second element-use wire materials W1, W2 may be made of copper alloys having different compositions.

[0142] In the manufacturing method of the illustrative embodiment, a supply process of intermittently supplying one of the first element-use wire material W1 and the second element-use wire material W2 with a predetermined pitch by controlling the first and second supply unit parts 10a, 10b, which are a supply means, is performed.

[0143] In the supply process, at a state where the first ram 40 stops at the front end position, the control unit of the wire material supply unit controls the operations of the rotary solenoids of the first and second supply unit parts 10a, 10b in accordance with a preset sequence, thereby making one of the first element-use wire material

W1 and the second element-use wire material W2 (in this case, the second element-use wire material W2) protrudes above the sliding contact surface of the cutting die 2 by a thickness of the fastener element E.

[0144] As described above, at the state where the first ram 40 stops at the front end position, the implantation of the fastener elements E first formed (i.e., the first fastener elements E1) into the fastener tape T has been completed, and the pair of crimping punches 6 and the pair of chamfering punches 7 keep away from the fastener elements E implanted to the fastener tape T.

[0145] Herein, the method of making one of the first element-use wire material W1 and the second element-use wire material W2 protrude is described in more detail.

[0146] For example, when forming the second fastener elements E2 from the second element-use wire material W2 and attaching the same to the fastener tape T in accordance with the sequence preset in the control unit, the control unit controls the operation of the rotary solenoid of the second supply unit part 10b, thereby reversely rotating the output shaft 62 of the rotary solenoid in the clockwise direction. Then, the control unit smoothly reciprocates the slider 18 of the second supply unit part 10b to rotate the supply rollers 11 by a predetermined rotating angle, thereby supplying the second element-use wire material W2 by a predetermined supply amount. Thereby, as shown in FIG. 7, it is possible to make the second element-use wire material W2 protrude above the sliding contact surface of the cutting die 2 by the thickness of the fastener element E.

[0147] Almost simultaneously, the control unit controls the operation of the rotary solenoid of the first supply unit part 10a, thereby rotating forward the output shaft 62 (refer to FIG. 5) of the rotary solenoid in the clockwise direction. Then, the control unit stops the reciprocation of the slider 18 and the rotation of the ratchet wheel 14. Thereby, it is possible to stop the feeding operation of the supply rollers 11 of the first supply unit part 10a to feed the first element-use wire material W1. For this reason, the first element-use wire material W1 does not protrude above the sliding contact surface of the cutting die 2.

[0148] In the meantime, as described above, since the first supply unit part 10a and the second supply unit part 10b are arranged to be bilaterally symmetric, the directions of the forward and reverse rotations of the output shafts 62 of the rotary solenoids are opposite to each other in the first supply unit part 10a and the second supply unit part 10b.

[0149] After making the second element-use wire material W2 protrude above the sliding contact surface of the cutting die 2, as shown in FIG. 7, the first ram driving cam 31 is rotated in one direction together with the main shaft 30, thereby moving rearwards (retracting) the first ram 40. Thereby, since the cutting punch 3 fixed to the cradle 8 is moved forward (advanced) relative to the cutting die 2, it is possible to cut the second element-use wire material W2 into a thickness corresponding to the

protruding amount above the sliding contact surface by the cutting punch 3 and the cutting die 2, which are a cutting means, thereby forming a second element.

[0150] Further, as the first ram 40 is moved to the rear end position, the second element cut from the second element-use wire material W2 is guided to the forming die 4 arranged in front of the cutting die 2 by the cutting punch 3 and is put on the forming die 4.

[0151] The first ram 40 is stopped when it is moved to the rear end position. Also, at the state where the first ram 40 is stopped at the rear end position, the forming punch 5 moves down and the second element put on the forming die 4 is subjected to a press forming referred to as ridge formation by the forming die 4 and the forming punch 5, which are a forming means, as shown in FIG. 8.

[0152] By the forming process, the second element is formed with an engaging head, so that the second fastener element E2 is manufactured. The second fastener element E2 manufactured can be implanted to a position of the fastener tape T shown with a virtual line of FIG. 8. In this case, the fastener stringer S is pulled up by the tape supply roller 21 and the fastener tape T of a predetermined length is thus supplied after the first ram 40 starts to retract until the first ram 40 is advanced to move the crimping punches 6.

[0153] After manufacturing the second fastener element E2, the first ram 40 is advanced from the rear end position and the crimping punches 6 (the crimping means) start to move while the first ram 40 is advanced, so that the left and right leg portions of the second fastener element E2 are sandwiched by the pair of crimping punches 6.

[0154] Further, the first ram 40 is moved to the front end position, so that a tape side edge portion of the fastener tape T is inserted between the left and right leg portions of the second fastener element E2 put on the forming die 4. At the same time, the crimping punches 6 are moved to the processing position, and the left and right leg portions of the second fastener element E2 are pressed by the crimping punches 6, so that the second fastener element E2 is crimped to the fastener tape T. Thereby, the second fastener element E2 is implanted into the fastener tape T, so that the implanting process is completed.

[0155] At this time, before the crimping punches 6 operate, the chamfering punches 7 arranged above the crimping punches 6 start to operate. By the chamfering punches 7, the chamfering process of chamfering a portion of the antecedent fastener element E (the first fastener element E1) first implanted into the fastener tape T is performed simultaneously with the implantation of the second fastener element E2 by the crimping punches 6.

[0156] While the second fastener element E2 is implanted into the fastener tape T as described above, the first element-use wire material W1 protrudes above the sliding contact surface of the cutting die 2 by the thickness of the fastener element E.

[0157] Specifically, the control unit controls the operation of the rotary solenoid of the first supply unit part 10a, thereby reversely rotating the output shaft 62 (refer to FIG. 5) of the rotary solenoid in the counterclockwise direction. Then, the control unit smoothly reciprocates the slider 18 of the first supply unit part 10a to rotate the supply rollers 11 by a predetermined rotating angle, thereby supplying the first element-use wire material W1 by a predetermined supply amount. Thereby, as shown in FIG. 9, it is possible to make the first element-use wire material W1 protrude above the sliding contact surface of the cutting die 2 by the thickness of the fastener element E.

[0158] Almost simultaneously, the control unit controls the operation of the rotary solenoid of the second supply unit part 10b, thereby rotating forward the output shaft 62 of the rotary solenoid in the counterclockwise direction. Then, the control unit stops the reciprocation of the slider 18 and the rotation of the ratchet wheel 14. Thereby, it is possible to stop the feeding operation of the supply rollers 11 of the second supply unit part 10b to feed the second element-use wire material W2. For this reason, the second element-use wire material W2 does not protrude above the sliding contact surface of the cutting die 2.

[0159] In this way, according to the illustrative embodiment, it is possible to alternately make the first element-use wire material W1 and the second element-use wire material W2 protrude above the sliding contact surface of the cutting die 2 via the different supply routes by controlling the first and second supply unit parts 10a, 10b with the control unit.

[0160] After making the first element-use wire material W1 protrude above the sliding contact surface of the cutting die 2, the first ram 40 is retracted, as shown in FIG. 9, so that the first element-use wire material W1 is cut to form a first element by the cutting punch 3 and the cutting die 2. Further, the formed first element is put on the forming die 4 as the first ram 40 is moved to the rear end position.

[0161] After the first ram 40 is moved to the rear end position and is stopped, the forming punch 5 moves down and the first element put on the forming die 4 is subjected to the press forming by the forming die 4 and the forming punch 5, as shown in FIG. 10.

[0162] Thereby, the first element is formed with an engaging head, so that the first fastener element E1 is manufactured. The first fastener element E1 manufactured is implanted to a position of the fastener tape T shown with a virtual line of FIG. 10. In this case, the fastener stringer S is pulled up by the tape supply roller 21 and the fastener tape T of a predetermined length is thus supplied after the first ram 40 starts to retract until the first ram 40 is advanced to move the crimping punches 6.

[0163] After manufacturing the first fastener element E1, the first ram 40 is advanced from the rear end position and the crimping punches 6 start to move, so that the left and right leg portions of the first fastener element E1 are

sandwiched by the pair of crimping punches 6. Further, the first ram 40 is moved to the front end position, so that the tape side edge portion of the fastener tape T is inserted between the left and right leg portions of the first fastener element E1. At the same time, the crimping punches 6 are moved to the processing position, and the first fastener element E2 is crimped to the fastener tape T by the crimping punches 6. Thereby, as shown in FIG. 11, the first fastener element E1 is implanted into the fastener tape T subsequently to the second fastener element E2, so that the implanting process is completed.

[0164] At this time, the chamfering punches 7 arranged above the crimping punches 6 start to operate, and the chamfering process of chamfering a portion of the antecedent second fastener element E first implanted into the fastener tape T is performed by the chamfering punches 7 simultaneously with the implantation of the first fastener element E2 by the crimping punches 6.

[0165] In this way, according to the illustrative embodiment, after making the first element-use wire material W1 or the second element-use wire material W2 protrude above the sliding contact surface of the cutting die 2 through the different supply route, the first fastener element E1 or the second fastener element E2 is implanted into the fastener tape T via the same route by using the same cutting punch 3 and cutting die 2, the same forming die 4 and forming punch 5 and the same crimping punches 6.

[0166] Then, the above processes are continuously repeated, so that it is possible to stably manufacture the fastener stringer S of which the first fastener elements E1 and the second fastener elements E2 having the outer surfaces of different colors are alternately implanted along the tape length direction of the fastener tape T, as shown in FIG. 12.

[0167] The fastener stringer S of the illustrative embodiment manufactured in this way is colorfully configured as a whole by easily making the colors (decorations) of the fastener elements E different in the continuous element row in accordance with a desired sequence. Therefore, for example, the fastener stringer S is appropriately used for a slide fastener of a product for which a design, a premium feel and the like are required. Also, the fastener stringer S of the illustrative embodiment can be manufactured at lower cost than a fastener stringer having metal elements of different colors manufactured using the method of Patent Document 1, for example.

[0168] In the above illustrative embodiment, the case where the fastener stringer S is manufactured by using the first and second element-use wire materials W1, W2 having the outer surfaces of different colors to alternately implant the first fastener elements E1 and the second fastener elements E2 having different colors into the fastener tape T has been described. However, the present invention is not limited thereto and a variety of fastener stringers different from the above illustrative embodiment can be manufactured.

[0169] For example, by changing the sequence of im-

planting the first fastener elements E1 and the second fastener elements E2 and the number of implantations, which are set in the control unit of the wire material supply unit, it is possible to manufacture a fastener stringer S in which the three first fastener elements E1 and the two second fastener elements E2 are alternately implanted, as shown in FIG. 13.

[0170] That is, according to the present invention, it is possible to manufacture a fastener stringer by alternately implanting a plurality of first fastener elements E1 and a plurality of second fastener elements E2 into the fastener tape T and to manufacture a fastener stringer by making the number of implantations of the first fastener elements E1 and the number of implantations of the second fastener elements E2 different from each other.

[0171] Also, according to the present invention, a manufacturing device may be configured by increasing the number of the supply unit parts provided for the wire material supply unit and increasing the number of the wire material guide holes formed in the cutting die 2, and the fastener stringer S may be manufactured by forming the fastener elements E from three or more element-use wire materials W having different properties with the manufacturing device. Thereby, for example, as shown in FIG. 14, it is possible to stably manufacture the fastener stringer S at low cost, in which the metallic fastener elements E of three types are implanted in predetermined order.

[0172] Also, according to the present invention, when making types of the fastener elements E different in the element row of one fastener stringer S, for example, continuously manufacturing a plurality of fastener stringers, it is possible to make properties of the fastener elements E different, which configure the element row, for each fastener stringer. Thereby, for example, it is possible to configure a slide fastener where colors of the element rows are different between left and right fastener stringers.

[0173] For example, as shown in FIG. 15, when manufacturing a plurality of fastener stringers S while forming a space part 90 therebetween in which the fastener elements E are not to be formed, the element row of each fastener stringer is configured by the single first fastener elements E1 or second fastener elements E2. However, it is possible to easily make the properties (colors) of the fastener elements E configuring the element row different for each fastener stringer S. In the meantime, the plurality of the continuous fastener stringers S shown in FIG. 15 is divided into the respective fastener stringers S by cutting the fastener tape T in an area of the space part 90.

[0174] In the above illustrative embodiment, the fastener stringer S is manufactured by using the first and second element-use wire materials W1, W2 having the outer surfaces of different colors to implant the first fastener elements E1 and the second fastener elements E2 having different colors into the fastener tape T. However, according to the present invention, it is also possible to manufacture the fastener stringer by sequentially forming the fastener elements from a plurality of the element-use

wire materials, which are made of different materials, not the element-use wire materials having the outer surfaces of different colors, and to implant the same into the fastener tape.

[0175] The present invention is not limited to the above illustrative embodiment and can be diversely changed without departing from the scope of the present invention.

Description of Reference Numerals

[0176]

1: Manufacturing Device
 2: Cutting Die
 3: Cutting Punch
 4: Forming Die
 5: Forming Punch
 5a: Pressing Pad Part
 5b: Plate Spring
 6: Crimping Punch
 7: Chamfering Punch
 8: Cradle
 9: Stopper Unit
 10a: First Supply Unit Part
 10b: Second Supply Unit Part
 11: A Pair Of Supply Rollers (Supply Roller Pair)
 11a: Wire Material Feeding Roller
 11b: Guide Roller
 13: Transmission Shaft
 14: Ratchet Wheel
 15: Ratchet Claw
 16: Wire Material Feeding Cam-Follower Mechanism
 16a: Slider Urging Member (Spring Member)
 17: Holder
 17a: Holder Base Part
 17b: Cover Part
 17c: Guide Groove
 17d: Spring Holding Part
 18: Slider
 18a: Spring Receiving Part
 18b: Claw Insertion Groove
 18c: Pin
 18d: Spring Member
 18e: Slider Main Body
 18f: Roller Holding Part
 18g: Step Portion
 19: Third Roller
 20: Tape Supply Unit
 21: Tape Supply Roller
 22: Pressing Roller
 23: Transmission Shaft
 24: Tape Feeding Cam-Follower Mechanism
 24a: First Lever Part
 24b: Fourth Roller
 24c: Fifth Roller
 24d: Second Lever Part
 24e: Urging Member (Tensile Spring Member)

25: Tape Guide Part
 30: Main Shaft
 31: First Ram Driving Cam (Cutting Die Driving Cam)
 32: Second Ram Driving Cam (Forming Punch Driving Cam)
 33: Wire Material Feeding Cam
 34: Tape Feeding Cam
 40: First Ram
 41: First Ram Driving Cam-Follower Mechanism
 41a: First Roller
 42: Second Ram
 42a: Urging Member (Compression Spring)
 42b: Punch Holder
 43: Second Ram Driving Cam-Follower Mechanism
 43a: Lever Part
 43b: Urging Member (Spring Member)
 43c: Second Roller
 43d: Contact Pin
 44: Third Ram
 45: Third Ram Connection Mechanism
 45a: Rotary Shaft
 45c: Driving Lever Part
 45d: Pin
 46: Crimping Cam
 47: Chamfering Cam
 48: Crimping Cam-Follower Mechanism
 48a: Pin
 48b: Crimping Lever Part
 48c: Cam Receiving Roller
 49: Chamfering Cam-Follower Mechanism
 49b: Chamfering Lever Part
 49c: Cam Receiving Roller
 51a: First Die Configuring Part
 51b: Second Die Configuring Part
 51c: Third Die Configuring Part
 52a: First Wire Material Guide Hole
 52b: Second Wire Material Guide Hole
 60: Movement Mechanism
 61: Housing
 61a: Housing Main Body
 62: Output Shaft of Rotary Solenoid
 63: Recess Portion
 64: Lever Part
 65: Coupling Rod
 66: First Contact Part
 67: Second Contact Part
 70: Stopper Member
 71: Stopper Main Body
 72: Sliding Part
 73: Urging Member (Spring Member)
 74: Stopper Guide Part
 80: Rotation Sensor
 81: Bracket
 82: Sensor Unit
 83: Rotor
 90: Space Part
 E: Fastener Element
 E1: First Fastener Element

E2: Second Fastener Element
 S: Fastener Stringer
 T: Fastener Tape
 W: Element-Use Wire Material
 W1: First Element-Use Wire Material
 W2: Second Element-Use Wire Material

Claims

1. A manufacturing device for a fastener stringer (S) comprising:

a wire material supply unit configured to intermittently supply an element-use wire material (W) with a predetermined pitch;
 a tape supply unit configured to intermittently supply a fastener tape (T) with a predetermined pitch;
 a cutting die (2) having a sliding contact surface and at least one wire material guide hole (52a, 52b) opening to the sliding contact surface;
 a cutting punch (3) arranged to reciprocate relative to the cutting die (2) while sliding contacting the sliding contact surface and configured to cut the wire material (W) protruding above the sliding contact surface of the cutting die (2) by a predetermined thickness;
 a forming die (4) configured to put thereon elements cut by the cutting punch (3);
 a forming punch (5) arranged to move up and down relative to the forming die (4) and configured to press and form the elements put on the forming die (4) into fastener elements (E), and a crimping unit configured to crimp and implant the fastener elements (E) to the supplied fastener tape (T),
 wherein the manufacturing device being configured to sequentially attach the plurality of fastener elements (E) to the fastener tape (T), thereby manufacturing the fastener stringer (S), wherein the wire material supply unit comprises a plurality of supply unit parts (10a, 10b) configured to supply a plurality of different wire materials (W) towards the cutting die (2) by each of separate supply means, and a control unit configured to control a supply amount of the wire material (W) by each of the supply unit parts (10a, 10b) and to sequentially make one of the plurality of wire materials (W) protrude above the sliding contact surface of the cutting die (2) in accordance with a preset order.

2. The manufacturing device according to claim 1, wherein the supply means comprises a pair of supply rollers (11a, 11b) configured to rotate with nipping therebetween the wire material (W) and to thus supply the wire material, and is configured to supply the

wire material (W) with a preset supply amount by controlling rotations of the pair of supply rollers (11a, 11b).

3. The manufacturing device according to claim 1 or 2, wherein the cutting die (2) is formed with the plurality of wire material guide holes (52a, 52b) aligned along a reciprocating direction of the cutting punch (3) relative to the cutting die (2), and wherein a stroke of the relative reciprocation of the cutting punch (3) is set to be greater than a formation area in which the openings of the plurality of wire material guide holes (52a, 52b) are formed.

4. The manufacturing device according to claim 2, wherein each of the supply unit parts (10a, 10b) comprises a driving unit (30), a transmission unit (16) configured to transmit a driving force of the driving unit (30) to the pair of supply rollers (11a, 11b), and a stopper unit (9) configured to stop the transmission of the driving force by the transmission unit (16), and wherein the control unit is configured to control an operation of the stopper unit (9).

5. The manufacturing device according to one of claims 2 to 4, wherein the pair of supply rollers (11a, 11b) of each of the supply unit parts (10a, 10b), the tape supply unit, the cutting die (2), the forming die (4), the forming punch (5) and the crimping unit are connected to and driven by a single main shaft (30).

6. The manufacturing device according to claim 1, wherein the plurality of wire materials (W) are configured by the same material and have outer surfaces of different colors.

7. A manufacturing method for a fastener stringer comprising:

a preparation process of preparing an element-use wire material (W);
 a supply process of intermittently supplying the wire material (W) with a predetermined pitch;
 a cutting process of cutting the wire material (W) supplied in the supply process into a thickness corresponding to a supply amount of the wire material (W) in a direction orthogonal to a supply direction by a cutting means (2, 3) and thus forming elements;
 a forming process of pressing and forming cut surfaces of the elements into fastener elements (E) having engaging heads by a forming means (4, 5); and
 an implanting process of crimping and implanting the fastener elements (E) into a fastener tape (T) intermittently supplied with a predetermined pitch by a crimping means,
 wherein the manufacturing method being pro-

vided to sequentially attach the fastener elements (E) to the fastener tape (T), thereby manufacturing a fastener stringer (S),
the manufacturing method comprising:

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preparing a plurality of different wire materials (W) in the preparation process, and supplying one of the plurality of wire materials (W) with a predetermined pitch in accordance with a preset order in the supply process by controlling a plurality of supply means configured to individually supply the plurality of wire materials (W).

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8. The manufacturing method for a fastener stringer according to claim 7, comprising: 15

supplying the plurality of different wire materials (W) to the cutting means (2, 3) via different supply routes by each of separate supply means in the supply process, and

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processing the elements cut from the plurality of wire materials (W) and the fastener elements (E) formed from the elements via a same route by using the same cutting means (2, 3), forming means (4, 5) and crimping means in the cutting process, the forming process and the implanting process.

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9. A fastener stringer (S) where a plurality of metallic fastener elements (E) are attached to a tape side edge portion of a fastener tape (T) with a predetermined attaching pitch, wherein the respective fastener elements (E) are manufactured by selecting one of a plurality of different element-use wire materials (W) having a substantially Y-shaped section, cutting the same to form elements with a predetermined pitch and press-forming the elements, wherein the respective fastener elements (E) manufactured from the plurality of wire materials (W) are crimped and fixed to the tape side edge portion of the single fastener tape (T) in a predetermined arrangement, and wherein cut surfaces of the respective fastener elements (E) formed by cutting the element-use wire materials (W) and outer surfaces except for the cut surfaces have different outward appearances.

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10. The fastener stringer according to claim 9, wherein the respective element-use wire materials (W) are configured by making different decorations on an outer surface of the same metal wire material.

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11. The fastener stringer according to claim 9, wherein the respective element-use wire materials (W) are configured by different metal wire materials.

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FIG. 1

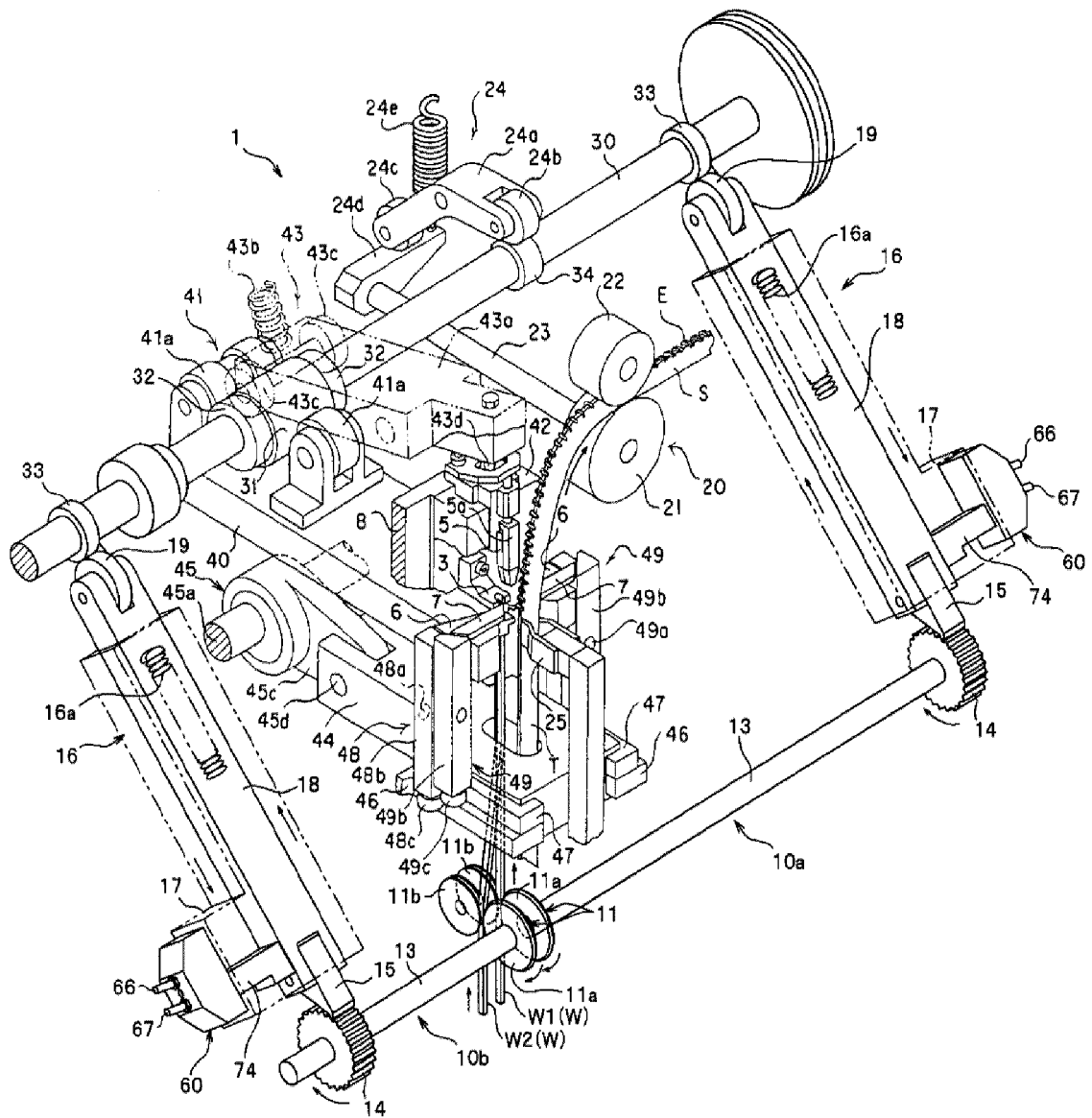


FIG.2

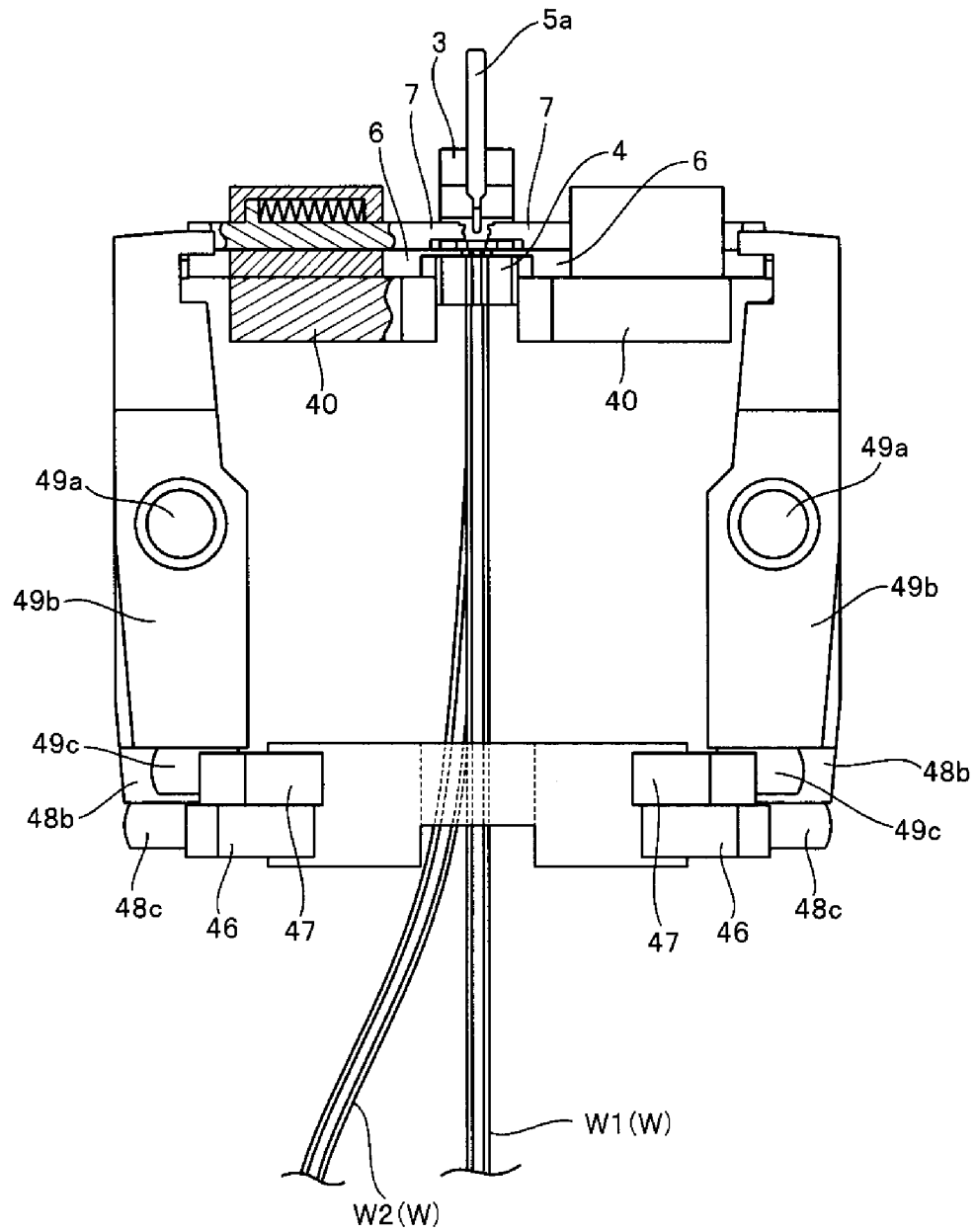


FIG.3

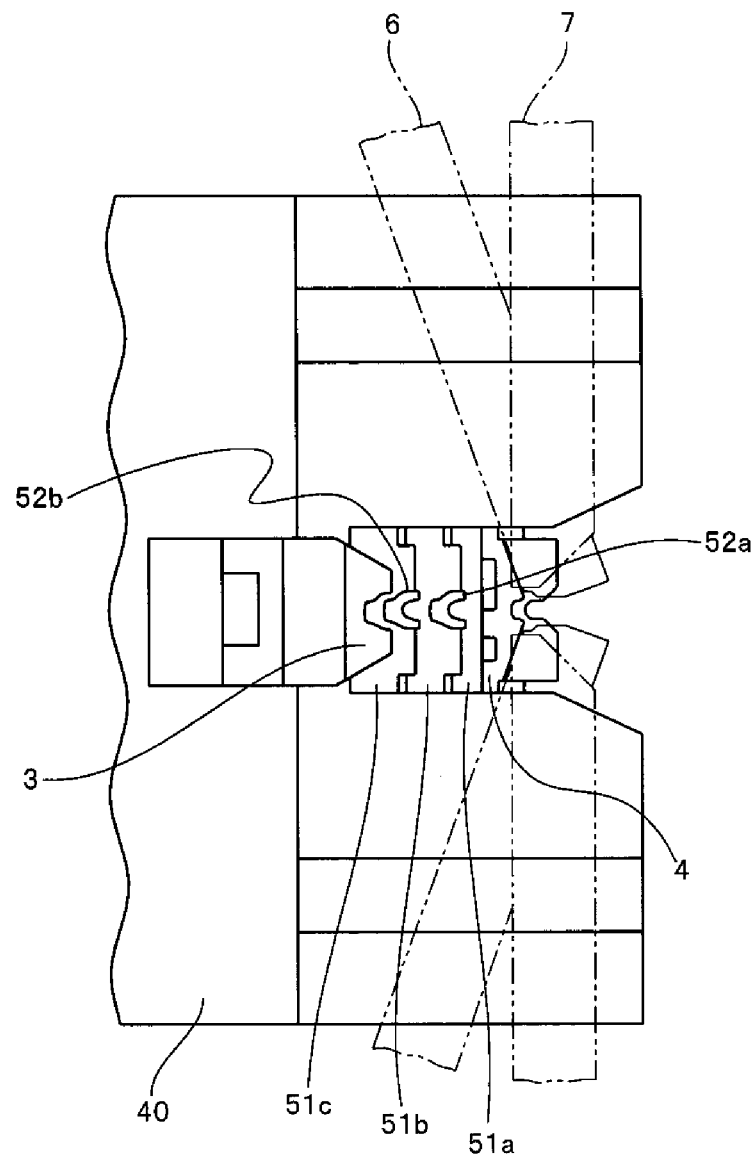


FIG.4

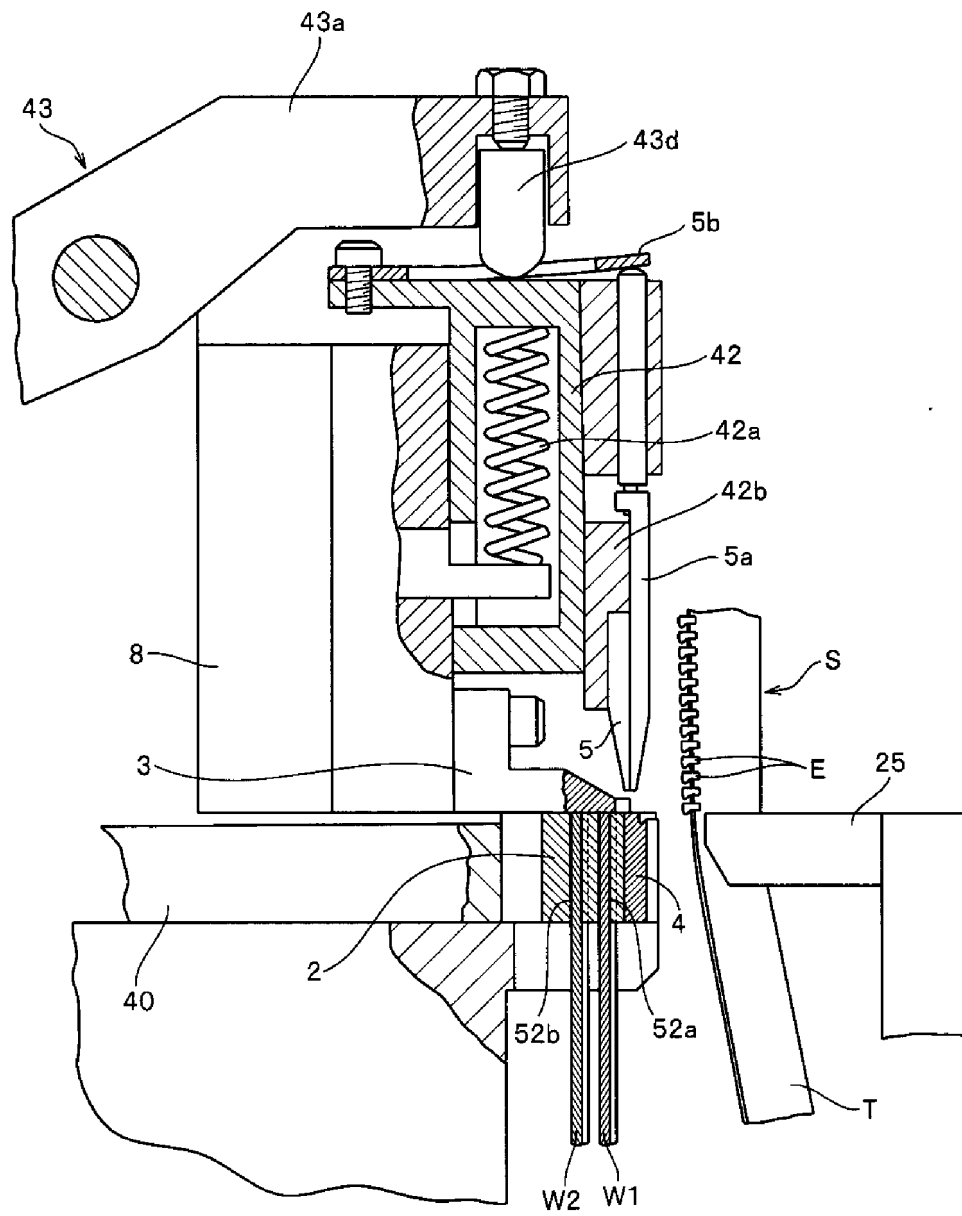


FIG.5

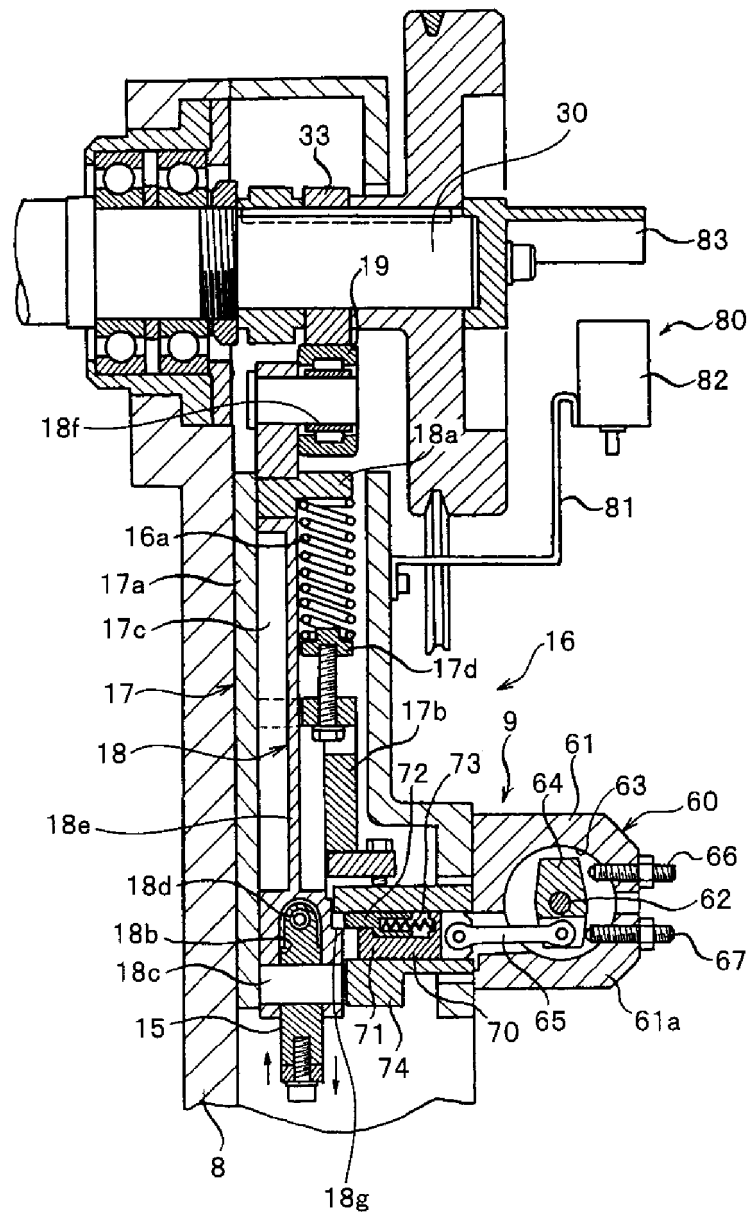


FIG.6

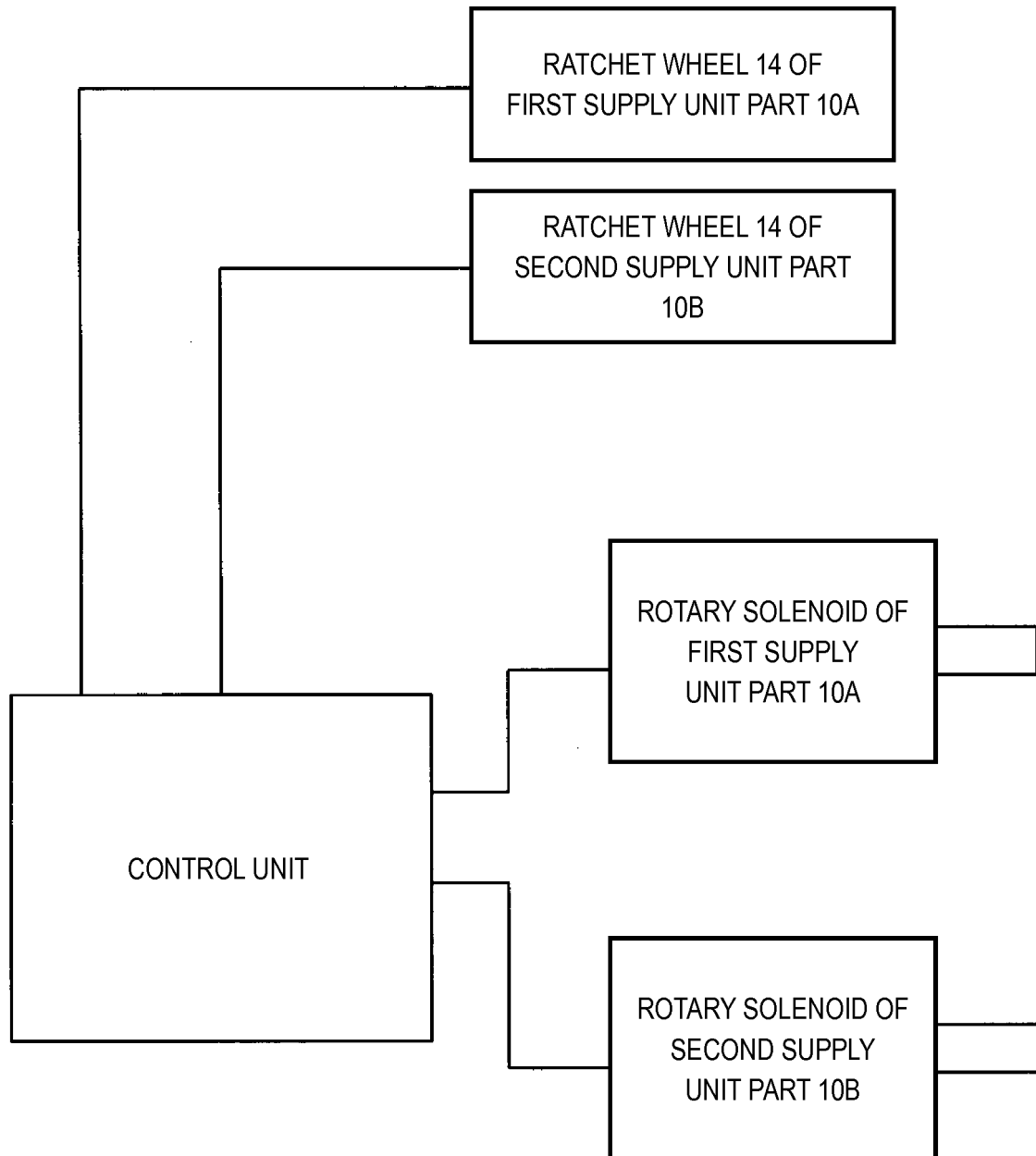


FIG.7

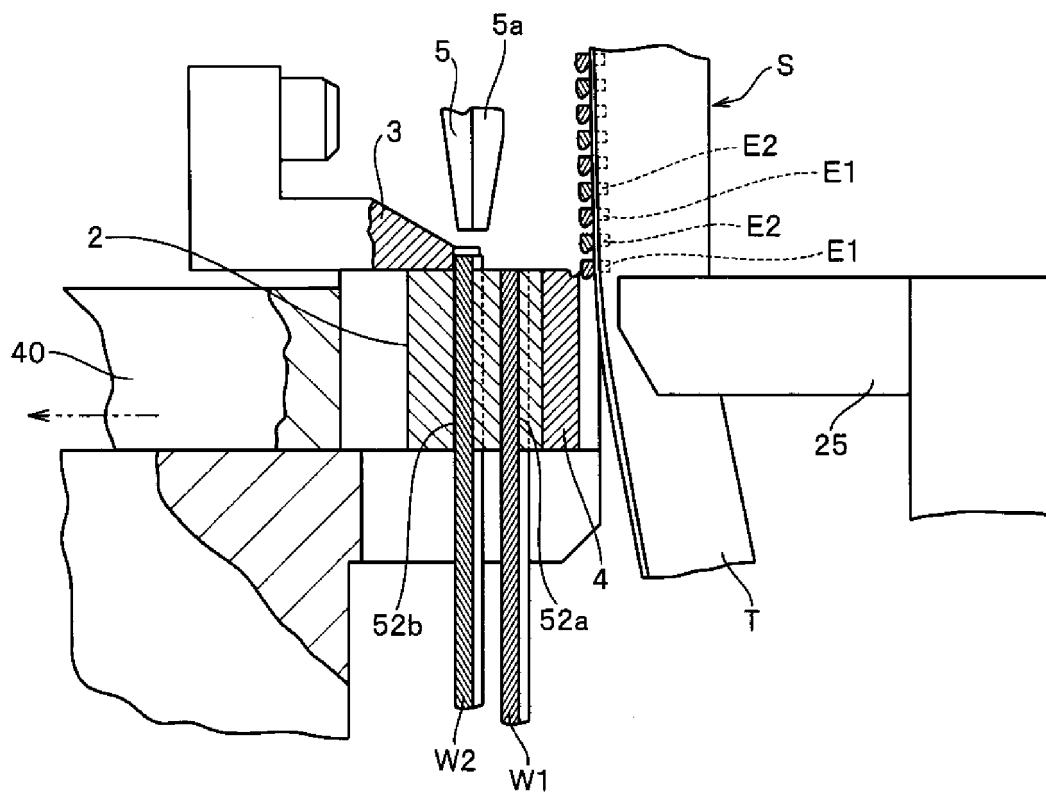


FIG.8

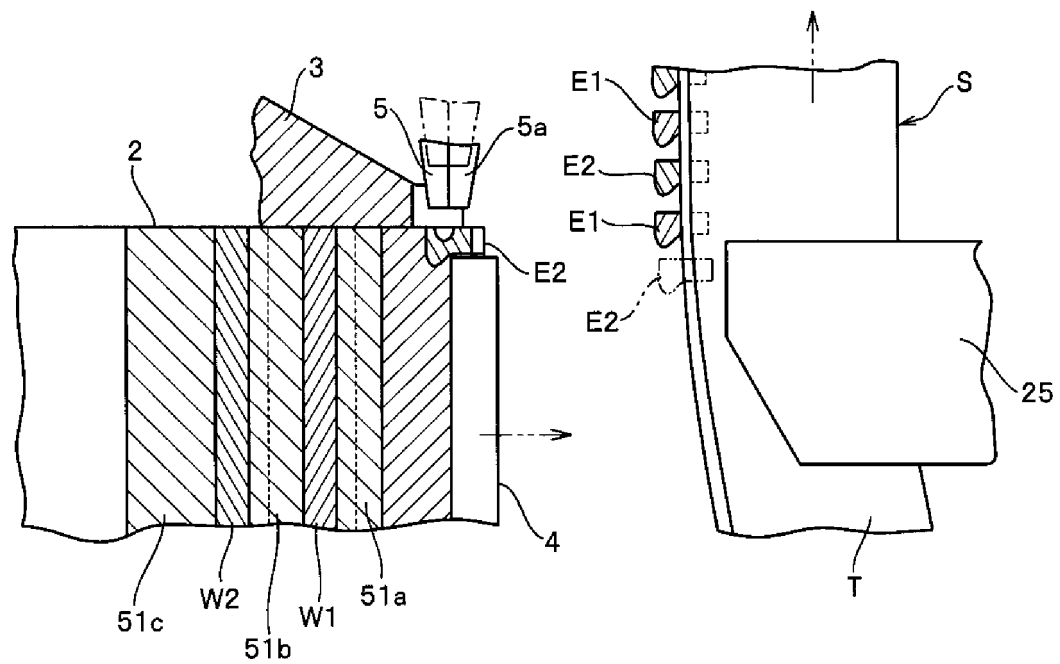


FIG.9

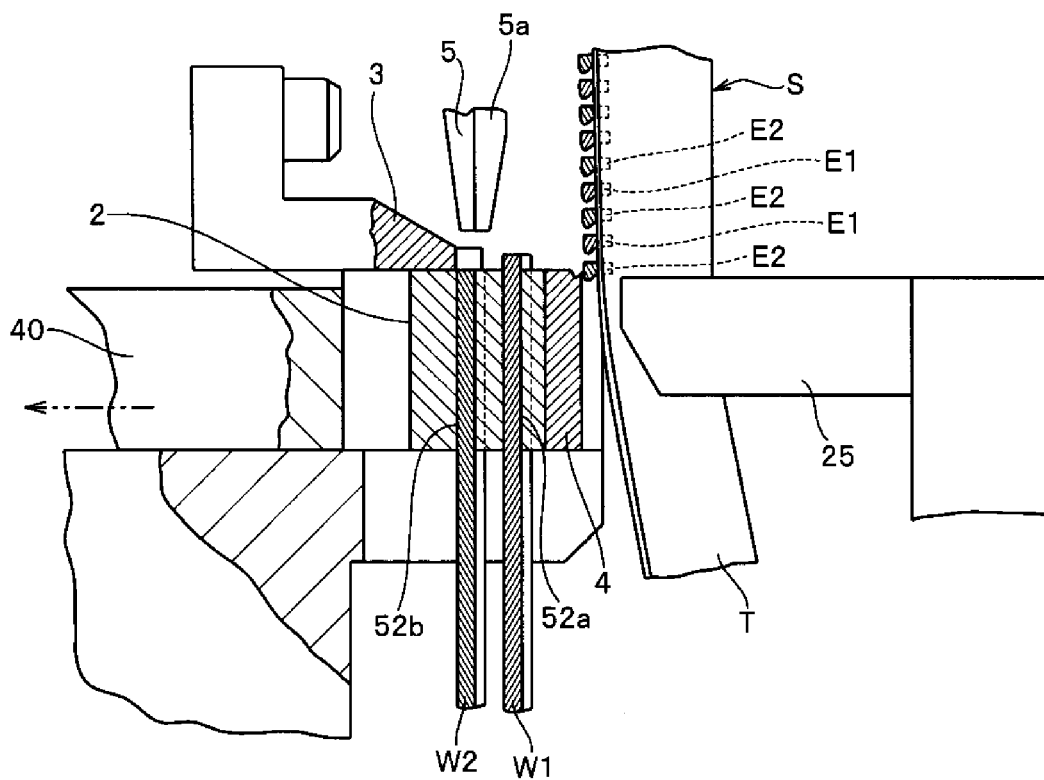


FIG.10

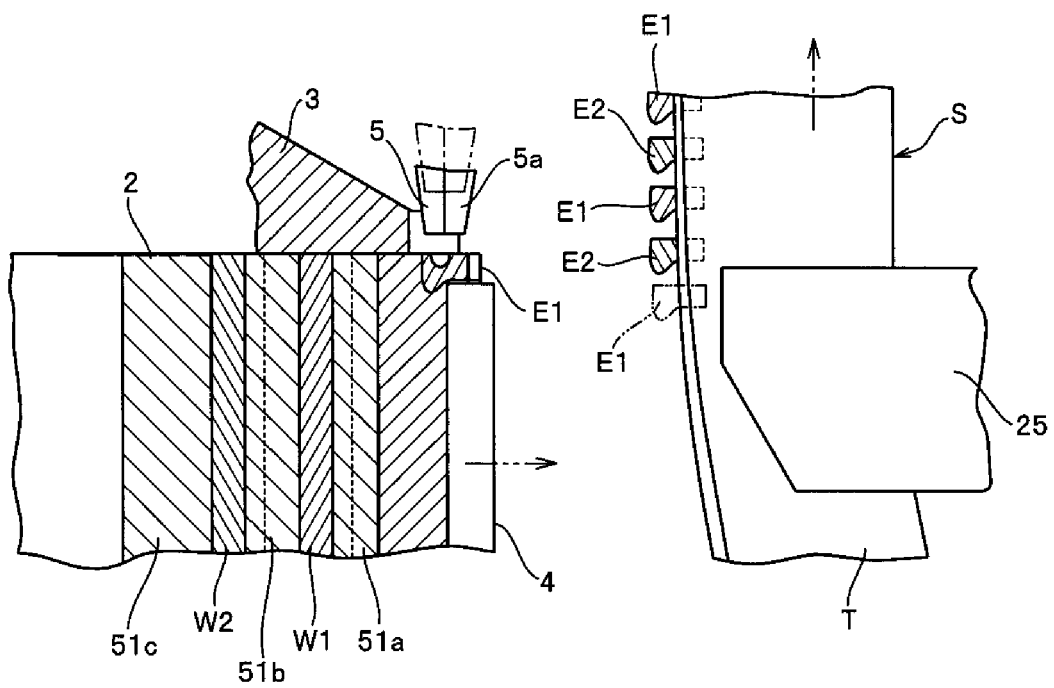


FIG. 11

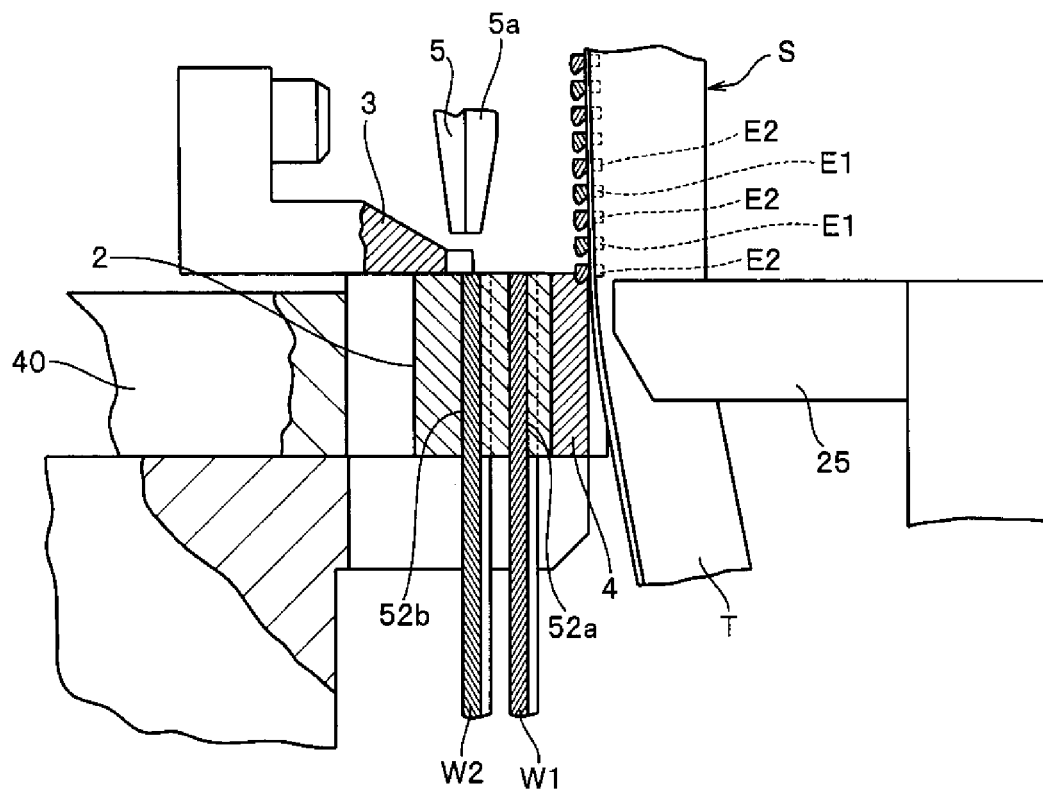


FIG. 12

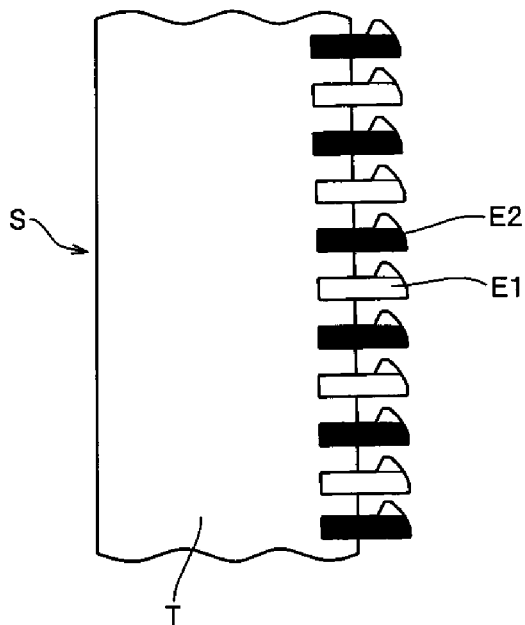


FIG.13

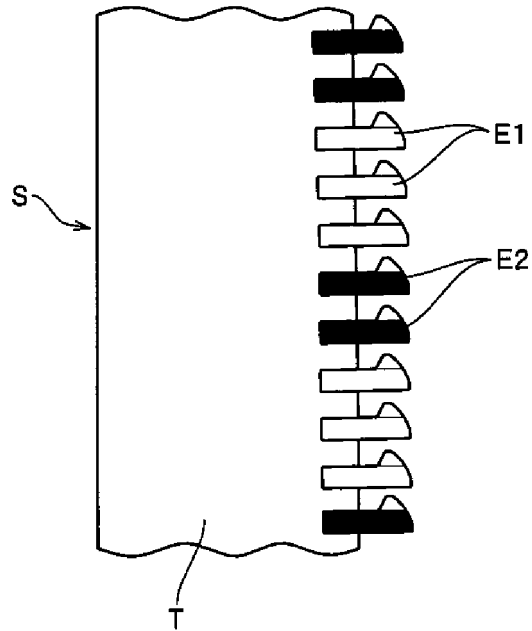


FIG.14

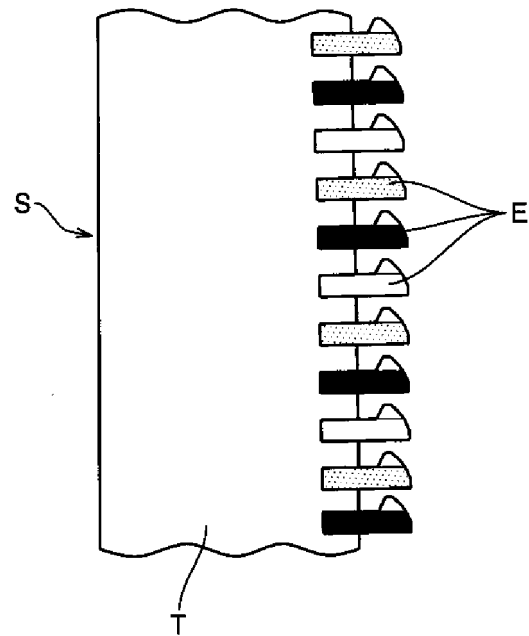
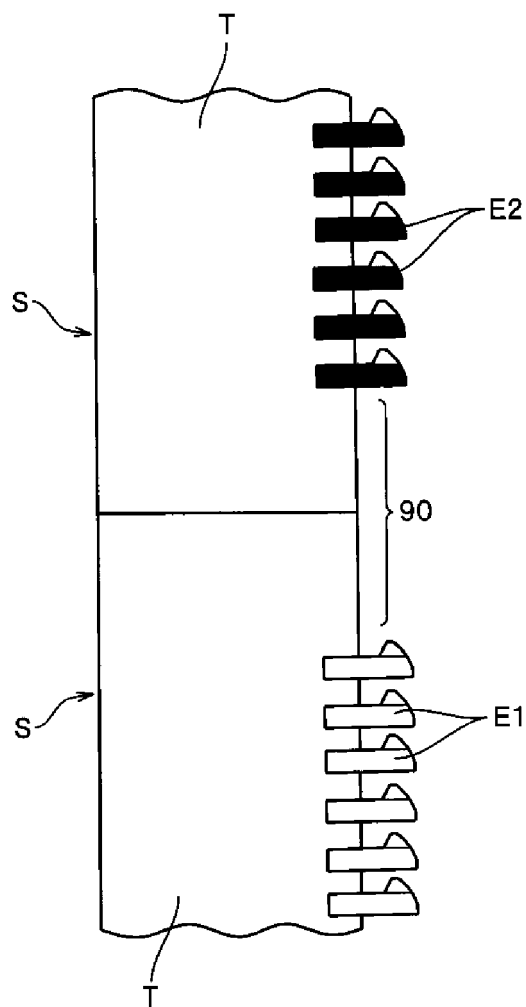


FIG. 15



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/076987

A. CLASSIFICATION OF SUBJECT MATTER

A44B19/44(2006.01)i, B21D53/52(2006.01)i, B21F45/18(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)

A44B19/44-19/50, B21D53/52, B21F45/18

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 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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.
A	JP 07-049002 B2 (YKK Corp.), 31 May 1995 (31.05.1995), entire text; all drawings & US 4962580 A & EP 385343 A1 & BR 9001005 A & CA 2010421 A & HK 76397 A & KR 10-1992-0008565 B	1-11
A	JP 2862758 B2 (YKK Corp.), 03 March 1999 (03.03.1999), entire text; all drawings & US 5495655 A & EP 630706 A1 & DE 69400732 C & SG 44882 A & HK 127597 A & CA 2125124 A & KR 10-0147780 B & CN 1100913 A & MY 115153 A	1-11

☒ 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
10 December, 2013 (10.12.13)Date of mailing of the international search report
24 December, 2013 (24.12.13)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/JP2013/076987

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101731797 A (YKK Corp.), 16 June 2010 (16.06.2010), entire text; all drawings (Family: none)	1-11
A	US 2734546 A (SCOVILL MANUFACTURING CO.), 14 February 1956 (14.02.1956), entire text; all drawings (Family: none)	1-11
A	JP 64-080467 A (Yoshida Kogyo Co., Ltd.), 27 March 1989 (27.03.1989), entire text; all drawings (Family: none)	1-11

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H07049002 B [0005] [0016]
- JP 2862758 B [0011] [0016]