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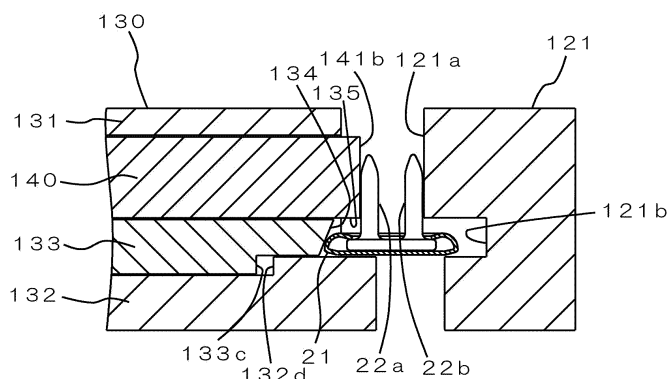
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(54) **BUTTON AND BUTTON FASTENER TRANSPORT DEVICE**

(57) An apparatus for transporting a button fastener (20) to a button fastening section (110), the button fastener (20) having a disk-like base (21) and two pins (22) protruding from the base (21) is provided. The apparatus comprises: a transport path (122) for allowing the button fastener (20) to pass through while keeping its up-and-down posture constant; a pusher (123) for moving the button fastener (20) from an upstream side to a downstream side in the transport path (122); and an adjustment mechanism for adjusting a circumferential orientation of the button fastener (20) which is moving through the transport path (122) to a constant predetermined circumferential orientation. The adjustment mechanism in-

cludes: a rotation providing member (133) for rotating the button fastener (20) to be oriented toward the predetermined circumferential orientation by contacting the base (21) of the button fastener (20) which deviates from the predetermined circumferential orientation in the circumferential direction, and a constraining member (140) which is biased by an elastic member (138) to be positioned in an initial position where the constraining member (140) can constrain the pins (22) against one side surface (121a) of the transport path (122). The constraining member (140) is displaced from the initial position by contacting the pins (22) out of the predetermined circumferential orientation.

Fig.11



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an apparatus for transporting a button or a button fastener, and more particularly to an apparatus for transporting a button or a button fastener which has, for examples, two pins, while adjusting a circumferential orientation of the button or button fastener to a constant orientation.

[Background Technique]

[0002] A button fastening machine for fastening a button onto a cloth generally includes a button fastening unit that has an upper die and a lower die; and a transport unit for transporting and supplying one button and one button fastener to the upper die and the lower die in the button fastening unit, respectively, at a time. In the button fastening unit, after a cloth is placed between a button held in the upper die and a button fastener set in the lower die, the upper die is lowered. Thereby, one or more protrusions of the button fastener pierce the cloth upward. Then, the protrusions are swaged onto the button by the upper die or the button itself. Thereby, the button is mounted onto the cloth.

[0003] As one type of a button fastener, a button fastener which has two pins protruding from a disk-like base is often used (see Fig. 2, etc.). In addition, as one example of a button that is fastened to a cloth by the above-mentioned button fastener, a button referred to as a wire button (see Fig. 1, etc.) is known. The wire button includes a wire member that is bent in a nearly S-shape, and the wire member has two curvatures and a center portion connecting between the two curvatures linearly. In a case that such a wire button is mounted onto a cloth using a button fastener having two pins, in the above-mentioned button fastening unit of the button fastening machine, the two pins 22, which have just penetrated the cloth and then a bottom of the wire button, are bent by the upper die in a J-shape toward each other so as to wind around the center portion of the wire member from above (see Fig. 4) For this reason, when the wire button is fastened onto the cloth, it is required that circumferential orientations of the wire button and the button fastener are adjusted in a manner where the center portion of the wire member of the wire button is perpendicular to the direction connecting between the two pins of the button fastener. Also, a button and a button fastener which have a convex portion at an eccentric position with respect to its center are known.

[0004] In a transport unit for a button or a button fastener in a button fastening machine, techniques for adjusting a circumferential orientation of a button or a button fastener are disclosed in, for example, U.S. Patent No. 2,292,223 and Japanese Utility Model Application Publication H03-51302. In those techniques, a convex mark is provided at a point in a circumferential direction of a

button or the like, and this mark is adjusted to a constant circumferential position. Therefore, such a mark that is originally unnecessary is needed to be added to a button or the like. Also, in order to adjust the mark to a constant circumferential position, a button or the like is required to be rotated by 180 degrees at the maximum. Such techniques cannot be applied to a button fastener or the like with two pins which is sufficient to be rotated up to 90 degrees at the maximum. For this reason, at present, an adjustment of a button fastener having two pins is manually operated by a worker.

[Patent Document 1] U.S. Patent No. 2,292,223

[Patent Document 2] Japanese Utility Model Application Publication H03-51302

[0005] An object of the present invention is to provide an apparatus for transporting a button or a button fastener, in which a circumferential orientation of a button or a button fastener that has, for example, two pins or a convex portion at an eccentric position can be automatically adjusted to a constant circumferential orientation, and a mark for a positional adjustment is not needed to be added.

SUMMARY OF THE INVENTION

[0006] To solve the above-mentioned problems, according to the present invention, there is provided an apparatus for transporting a button or a button fastener to a button fastening section, the button or the button fastener having a disk-like base and at least one protrusion protruding from the base, the apparatus comprising: a transport path for allowing the button or the button fastener to pass through while keeping its up-and-down posture constant; a movement member for moving the button or the button fastener from an upstream side to a downstream side in the transport path; and an adjustment mechanism for adjusting a circumferential orientation of the button or the button fastener which is moving through the transport path to a constant predetermined circumferential orientation, wherein the adjustment mechanism includes: a rotation providing member for rotating the button or the button fastener to be oriented toward the predetermined circumferential orientation by contacting the base of the button or the button fastener which deviates from the predetermined circumferential orientation in the circumferential direction, and a constraining member which is biased by an elastic member to be positioned in an initial position where the constraining member can constrain the protrusion against one side surface of the transport path, wherein the constraining member is displaced from the initial position away from the one side surface of the transport path against the bias from the elastic member when the constraining member contacts the protrusion out of the predetermined circumferential orientation, wherein the constraining member has a second side surface of the transport path.

[0007] The transporting apparatus for buttons or button fasteners according to the invention, mainly, is an appa-

ratus for transporting, to the button fastening unit, a button or a button fastener which changes its position or posture of the protrusion with respect to the base when the button or the button fastener is rotated circumferentially by 90 degrees. As examples of such a button or a button fastener, a button or button fastener that has two pins as the protrusion; a button in which the protrusion protrudes from an eccentric position of the base with respect to its center; a button or a button fastener in which a horizontal cross-section shape of the protrusion is elliptic or ellipsoidal; and the like are quoted.

[0008] In the invention, when a circumferential orientation of a button or a button fastener deviates from the predetermined circumferential orientation (a deviation is 90 degrees at the maximum in the circumferential direction) on an upstream side in the transport path, it is adjusted to the predetermined circumferential orientation by the adjustment mechanism, and then the button or button fastener is sent downstream to the button fastening unit. The adjustment mechanism can adjust a button or a button fastener into the predetermined circumferential orientation by providing a circumferential rotation to the base of the button or the button fastener, which deviates up to 90 degrees in the circumferential direction from the predetermined circumferential orientation by the rotation providing member, and then by constraining the protrusion in the predetermined circumferential orientation between the one side surface of the transport path and the second side surface of the constraining member.

[0009] When the button or the button fastener deviates from the predetermined circumferential orientation maximally by 90 degrees in the circumferential direction, the rotation providing member surely contacts the base of a button or a button fastener so as to rotate it. However, the rotation providing member can rotate the base with a deviation is less 90 degrees by contacting it. With regard to a deviation range of a button or a button fastener from the predetermined circumferential orientation where the rotation providing member can contact the base, an upper limit is the maximum 90 degrees, and a lower limit can be close to 0 degree (0 degree as the predetermined circumferential orientation is not included) depending on a shape of the protrusion or a function of the constraining member of the adjustment mechanism. The rotation providing member can be configured to displace from the initial position corresponding to the lower limit of the set range against the bias from the elastic member toward the upper limit side.

[0010] The constraining member in the initial position can constrain the protrusion of a button or a button fastener in the predetermined circumferential orientation between the one side surface of the transport path and the second side surface of the constraining member. The constraining member is displaced from the initial position against the bias from the elastic member away from the one side surface when the second side surface is brought into contact with the protrusion of a button or a button fastener that deviates from the predetermined circumfer-

ential orientation in the circumferential direction. At this time, a restoring force to the initial position is generated in the constraining member, and with the restoring force, the constraining member can return to the initial position while elastically pushing the protrusion by the second side surface against the one side surface.

[0011] In one embodiment of the invention, the at least one protrusion is two pins of the button fastener or the button, and the predetermined circumferential orientation is an orientation where a direction connecting between the two pins (inter-pin direction) is along the transport direction of the transport path. In this case, the rotation providing member of the adjustment mechanism provides a button or a button fastener in which the inter-pin direction deviates from the transport direction (90 degrees at the maximum) with a rotation by contacting its base. Further, just after the second side surface of the constraining member contacts one pin of the two that is more distant from the one side surface and then is displaced from the initial position, the second side surface returns to the initial position while pushing the one pin by the second side surface against the one side surface of the transport path to adjust the inter-pin direction to be along the transport direction.

[0012] In one embodiment of the invention, the constraining member has an introduction surface adjacent to the second side surface upstream in the transport path, and the introduction surface, in the initial position, is inclined with respect to the one side surface so as to come close to the one side surface downstream. In this case, the protrusion of a button or a button fastener that deviates from the predetermined circumferential orientation in the circumferential direction is introduced into between the one side surface of the transport path and the second side surface of the constraining member while being in contact with the introduction surface of the constraining member.

[0013] In one embodiment of the invention, the protrusion is a convex portion that protrudes from an eccentric position of the base of the button, and the predetermined circumferential orientation is an orientation where a direction (eccentric direction) connecting between the center of the convex portion and the center of the base is along the transport direction of along the transport direction of the transport path. In this case, the rotation providing member of the adjustment mechanism provides the button, in which the eccentric direction deviates from the transport direction (90 degrees at the maximum), with a rotation by contacting the convex portion. Furthermore, just after the constraining member is displaced from the initial position as the convex portion contacts the second side surface, the constraining member returns to the initial position while pushing the convex portion by the second side surface against the one side surface of the transport path so adjust the eccentric direction to be along the transport path.

[0014] In the apparatus for transporting a button or a button fastener in accordance with the present invention,

a circumferential orientation of a button or a button fastener that has, for example, two pins or convex portion at an eccentric position as the protrusion can be automatically adjusted to a constant orientation using the adjustment mechanism which includes the rotation providing member for rotating the base and the constraining member for constraining the protrusion in the predetermined circumferential orientation. Furthermore, a mark for a positional adjustment is not needed to be added.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 (a) is a top view of a button (wire button);
 Fig. 1 (b) is a cross-sectional view taken along A-A line in Fig. 1 (a);
 Fig. 2 (a) is a top view of a button fastener;
 Fig. 2 (b) is a partial cross-sectional explanation view of the button fastener;
 Fig. 3 is a cross-sectional explanation view that shows a state just before the button is fastened onto a cloth using the button fastener;
 Fig. 4 shows a state where the button is fastened onto the cloth with the button fastener;
 Fig. 5 is a front view schematically showing the whole of a button fastening machine;
 Fig. 6 is a schematic side view of the button fastening machine;
 Fig. 7 is a partial top view of a fastener transport section in accordance with an embodiment of the invention;
 Fig. 8 is a cross-sectional view taken along B-B line in Fig. 7;
 Fig. 9 is a C-C line arrow side view of Fig. 8;
 Fig. 10 is a partial top view at the time when the button fastener arrives at a first movable plate with a circumferential deviation of 90 degrees from the predetermined circumferential orientation;
 Fig. 11 is a cross-sectional view taken along D-D line in Fig. 10;
 Fig. 12 is a partial top view showing a state where the button fastener is adjusted to the predetermined circumferential orientation;
 Fig. 13 is a cross-sectional view taken along E-E line in Fig. 12;
 Fig. 14 is a cross-sectional explanation view of a button transport section;
 Fig. 15 is a cross-sectional view showing another example of a button which is fastened onto a cloth using a button fastener with two pins;
 Fig. 16 is a cross-sectional view showing a state where the button in Fig. 15 is fastened to the cloth.
 Fig. 17 is a top view of a button having a convex portion at an eccentric position;
 Fig. 18 is a cross-sectional view showing a state where the button in Fig. 17 is fastened to a cloth;
 Fig. 19 is a partial top view of a button transport sec-

tion in accordance with another embodiment of the invention;

Fig. 20 is a cross-sectional view of the button transport section, wherein the inter-pin direction of the button is perpendicular to the transport direction; and
 Fig. 21 is a cross-sectional view of the button transport section, wherein the button is in the predetermined circumferential orientation.

10 DETAILED DESCRIPTION OF THE INVENTION

[0016] Hereinafter, preferable embodiments of the present invention will be described with reference to the drawings. However, the invention is not limited to those embodiments, and alternations and the like may be properly made within the scope of the claims and equivalents.
 Fig. 1 (a) is a top view of a wire button (hereafter referred to merely as "button") 10, and Fig. 1 (b) is a cross-sectional view taken along A-A line in Fig. 1 (a). The button 10 is a nearly disk-like, metal button to be mounted to clothes or the like. The button 10 comprises a plate-like front member 11, a plate-like rear member 12 and a wire member 13 that is arranged between the front and the rear members 11, 12. The wire member 13 is formed by bending a wire material in a nearly S-shape. The front member 11 includes a circular ring portion 11a defining a circular opening 14 in a center portion, and a front connecting portion 11b that is curved in a C-shape downward (with regard to the button 10, the up-and-down direction is based on the paper surface of Fig. 1 (b)) from the radially outer end of the circular ring portion 11a. The circular ring portion 11a is inclined so as to be slightly higher toward the radially outer end from the boundary with the opening 14. The rear member 12 includes a wire placement portion 12a where the wire member 13 is placed, the wire placement portion 12a being depressed downward and circularly in a center portion; an outer annular portion 12b that extends substantially horizontally and radially outward from the wire placement portion 12a; and a rear connecting portion 12c that is bent upward and radially outward from the radial outer end of the outer annular portion 12b so as to connect with the front connecting portion 11b. The inner diameter of the wire placement portion 12a is slightly greater than the diameter of the opening 14 of the front member 11. Further, the bottom of the wire placement portion 12a is horizontal, and the depth from the outer annular portion 12b to the bottom of the wire placement portion 12a is slightly smaller than the diameter of the wire of the wire member 13. For this reason, an upper portion of the wire member 13 placed in the wire placement portion 12a protrudes slightly higher than the outer annular portion 12b. A part of this protruded upper portion of the wire member 13 is pushed down against the bottom of the wire placement portion 12a by the radial inner end of the circular ring portion 11a of the front member 11. Consequently, the wire member 13 is held in the wire placement portion 12a between the front and the rear members 11, 12.

[0017] The wire member 13 has two curvatures 13a existing on the right and the left sides in the paper surface of Fig. 1 and extending along the annular side surface of the wire placement portion 12a; and a center portion 13b that extends linearly so as to divide the wire placement portion 12a into two half portions and to connect one end of one of the curvatures 13a to one end of the other curvature 13a, this end of the other curvature 13a lying on the side diametrically opposite to the former one end. Each of the curvatures 13a ranges angularly about 170 degrees. In Fig. 1, radially inner portions of the curvatures 13 can be seen through the opening 14 of the front member 11 while radially outer portions of the curvatures 13a cannot be seen behind the circular ring portion 11a of the front member 11. For this reason, the curvatures 13a look sinner thinner than the center portion 13b.

[0018] Fig. 2 (a) is a top view of a button fastener (hereafter also referred to merely as "fastener") 20 for fastening the foregoing button 10 onto a cloth 1 (see Fig. 3, etc.), and Fig. 2 (b) is a partial cross-sectional explanation view of the fastener 20. The fastener 20 includes a disk-like base 21 and two pins 22 as protrusions which protrude upward (the up-and-down direction is based on the paper surface of Fig. 2(b)) from the base 21 in parallel to each other from the base 21. The fastener 20 comprises a fastener body 20a made of synthetic resin or metal in which the pins 22 and a base core 21a of the base 21 are integrally formed; and a cap 20b made of metal that covers the base core 21a of the fastener body 20a from below. When the fastener 20 with the two pins 22 is rotated circumferentially by 90 degrees, a position or posture of the pins 22 with respect to the base 21 is changed, unlike a fastener having only one pin at its center (not shown).

[0019] Fig. 3 is a cross-sectional explanation view that shows a state just before the button 10 is fastened onto the cloth 1 using the fastener 10. Fig. 4 shows a state where the fastening is completed. An operation for fastening the button 10 to the cloth 1 is carried out as below, in a button fastening unit 110 of a button fastening machine 100 as described later. When the button 10 is fastened, the button 10 is held by an upper die 30 in the button fastening unit 110, and the fastener 20 is supported by a lower die 40 in the button fastening unit 110. Moreover, after the cloth 1 is placed between the upper button 10 and the lower fastener 20, the upper die 30 is lowered. Thereby, the pins 22 of the fastener 20 pierce the cloth 1 upward and then penetrate through the bottom of the wire placement portion 12a of the rear member 12 in the button 10. After that, the pins 22 are swaged by a punch (not shown) in the upper die 30. At this time, by the punch, the two pins 22 are bent in a J-shape toward each other so as to wind around the center portion 13b of the wire member 13 from above (see Fig. 4). Thereby, the button 10 is fixed to the cloth 1. In this case, one of the two pins 22 penetrating the rear member 11b passes between the left curvature 13a based on the Fig. 4 paper surface and the center portion 13b and protrudes upward

through the opening 14, and the other pin 22 passes between the right curvature 13a based on the Fig. 4 paper surface and the center portion 13b and protrudes through the opening 14. For this reason, with regard to a positional relationship between the button 10 and the button fastener 20 as the button 10 is mounted to the cloth 1, in addition to the arrangement wherein the button 10 and the fastener 20 are concentrically arranged, circumferential orientations or circumferential positions of the button 10 and the fastener 20 are needed to be adjusted in order that the longitudinal direction of the center portion 13b of the wire member 13 of the button 10 is perpendicular to the direction connecting between the two pins 22 (hereafter referred to as "the inter-pin direction") of the fastener 20. This adjustment of the button 10 and the fastener 20 in the circumferential position is carried out in a transport unit 120 of the button fastening machine 100 as described later.

[0020] Fig. 5 is a front view schematically showing the whole of the button fastening machine 100, and Fig. 6 is a schematic side view of the button fastening machine 100. The button fastening machine 100 comprises a button fastening unit 110 that includes the upper die 30 and the lower die 40 as mentioned above; the transport unit 120 for transporting and supplying one button 10 and one fastener 20 to the button fastening unit 110 at a time; a button hopper 150A and a fastener hopper 150B containing a lot of buttons 10 and fasteners 20, respectively; and a button shoot 151A and a fastener shoot 151B which extend downward from the button hopper 150A and the fastener hopper 150B for supplying the button 10 and the fastener 20 to the transport unit 120 from the button hopper 150A and the fastener hopper 150B, respectively. The transport unit 120 includes an upper button transport section 120A for horizontally transporting the button 10, which is received from the button shoot 151A, to the upper die 30; and a lower fastener transport section 120B for horizontally transporting the fastener 20, which is received from the fastener shoot 151B, to the lower die 40.

[0021] The fastener transport section 120B is one embodiment of an apparatus for transporting a button or a button fastener in accordance with the present invention. Fig. 7 is a partial top view of the fastener transport section 120B. Fig. 8 is a B-B line cross-sectional view of Fig. 7, and Fig. 9 is a C-C line arrow side view of Fig. 8. The fastener transport section 120B includes an adjustment side part 130 on the left side on the paper surface of Fig. 8 (the upper side on the paper surface of Fig. 7); a block side part 121 on the right side on the paper surface of Fig. 8 (the lower side on the paper surface of Fig. 7); a transport path 122 which is provided between the adjustment side part 130 and the block side part 121 in order to allow the fastener 20 to pass through it linearly; and a pusher 123 as a movement member that pushes and moves the fastener 20, which is received from the fastener shoot 151B on an upstream side (the right side on the paper surface in Figs. 7 and 9) in the transport path 122, toward the lower die 40 of the button fastening unit

110 located on a downstream side (the left side on the paper surface of Figs. 7 and 9) in the transport path 122. The pusher 123 is in its initial state in Figs. 7 and 9. The fastener 20 is supplied from the fastener shoot 151B to an upstream side in the transport path 122 with an up-and-down posture (refer to Fig. 9) in which the base 21 comes on the lower side and the tip of each of the pins 22 is oriented upward. This up-and-down posture of the fastener 20 is always kept during the movement through the transport path 122. On the other hand, circumferential orientations of fasteners 20, which are supplied from the fastener shoot 151B to the transport path 123, are various. Those various circumferential orientations of fasteners 20 are adjusted, during the movement through the transport path 123, to a certain circumferential orientation (hereafter referred to as "the predetermined circumferential orientation") in which the inter-pin direction of the fasteners 20 is along the longitudinal direction (hereafter referred to as "the transport direction") of the transport path 122, as described later in detail. This mechanism is also called an adjustment mechanism.

[0022] With reference to Fig. 8, the block side part 121 has a vertical upper surface 121a that can receive a side portion of each pin 22 of the fastener 20; a guide groove 121b that is depressed rectangularly rightward (with regard to the block side part 121, the left-and-right direction is based on the paper surface of Fig. 8) from a lower end of the upper surface 121a, wherein the guide groove 121b receives a portion of the base 21 of the fastener 20; and a lower surface 121c that extends vertically downward from the guide groove 121b. The guide groove 121b includes a guide upper surface 121ba and a guide lower surface 121bb, each of which is horizontal, and a vertical guide right surface 121bc. The upper surface 121a of the block side part 121 also serves as one side surface 121a of the transport path 122. The interval between the guide upper and lower surfaces 121ba, 121bb is about two times the thickness of the base 21 of the fastener 20, in order to prevent interference. The guide right surface 121bc is set on the right side to a degree that the base 21 of the fastener 20 in the predetermined circumferential orientation is not brought into contact with the right surface 121bc (see Fig. 13). In short, the dimension from the upper surface 121a to the guide right surface 121bc is greater than a dimension from the side of the pin 22 to the periphery of the base 21. Further, the bottom surface 121bb can support the base 21 of the fastener 20 in an orientation that deviates from the predetermined circumferential orientation by 90 degrees in the circumferential direction (see Fig. 11).

[0023] The adjustment side part 130 includes a top plate 131 that is statically arranged; a bottom plate 132 that is statically arranged and thicker than the top plate 131; and a first movable plate 133 that is movably arranged between the top and the bottom plates 131, 132 and on the bottom plate 132; and a second movable plate 140 that is arranged between the top plate 131 and the first movable plate 133 and is thicker than the first mov-

able plate 133. The first movable plate 133 is also referred to as a rotation providing member 133. The rotation providing member 133 can provide a button 60 with a rotation toward the predetermined circumferential orientation by contacting the base 21 of the button 60 that deviates from the predetermined circumferential orientation up to 90 degrees in the circumferential direction. The second movable plate 140 is also referred to as a constraining member 140. The constraining member 140 can constrain the pins 22 of the fastener 20 into the predetermined circumferential orientation against the one side surface 121a of the transport path 122. Here, the constraining means that the pin 22 once adjusted to the predetermined circumferential orientation can be kept in the orientation. The top plate 131 and the bottom plate 132 have vertical end surfaces 131a, 132a, respectively, on the right side (with respect to the adjustment side part 130, the left-and-right direction is based on the paper surface of Fig. 8), namely, on the side of the block side part 121. A part of the pusher 123 is inserted between the end surface 132a of the bottom plate 132 and the lower surface 121c of the block side part 121, the end surface 132a and the lower surface 121c serve as a guide when the fastener 20 moves in the transport direction.

The first and second movable plates 133, 140 are independently biased rightward, namely toward the block side part 121 by springs 138, 139 (see Fig. 8) as elastic members, respectively. The positions (hereafter each of the positions is referred to as "the initial position") in which the first and the second movable plates 133, 140 are displaced rightward maximally are shown in Figs. 8, 13, etc. The first movable plate 133 has a right distal portion 133a and a left proximal portion 133b that becomes thicker downward from the distal portion 133a in a stepped manner with a stepped portion 133c formed at the boundary between the distal portion 133a and the proximal portion 133b on the lower side of the first movable plate 133. The thickness and the up-and-down position of the distal portion 133a correspond to those of the guide groove 121b of the block side part 121. A right end surface 134 of the distal portion 133a is slightly inclined downward and leftward. Further, on the end surface 134, there are formed fine irregularities or zigzag flaws in order to increase its friction coefficient. Hereafter, the end surface 134 of the first movable plate 133 is referred to as "the rough surface 134." The bottom plate 132 has a right distal portion 132b and a left proximal portion 132c that becomes thinner downward from the distal portion 132b in a stepped manner with a stepped portion 132d formed at the boundary between the distal portion 132b and the proximal portion 132c on the upper side of the bottom plate 132. The thickness and the up-and-down position of the distal portion 132b correspond to those of the lower surface 121c of the block side part 121. The first movable plate 133 that is biased rightward by the elastic member is held in the initial position without any further rightward displacement since the stepped portion 133c impinges on the stepped portion 132d of the bottom plate 132. The

second movable plate 140 has a vertical right end surface 141, and the up-and-down position of the lower side of the second movable plate 140 coincides with that of the guide upper surface 121ba of the guide groove 121b in the block side part 121. The right end surface 141 of the second movable plate 140 is arranged opposite to the foregoing one side surface 121a of the transport path 122, and the end surface 141 includes a second side surface 141b that is substantially parallel to the one side surface 121a. The dimension between the one side surface 121a and the second side surface 141b is greater than the width of each of the pins 22 that are placed in a manner where the inter-pin direction is along the transport direction.

[0024] The second movable plate 140 has an introduction surface 141a adjacent upstream in transport path 122 to the second side surface 141b. The introduction surface 141a in the initial position is inclined with respect to the one side surface 121a so as to gradually come close to the one side surface 121a downstream. As can be seen in Fig. 7, the end surface 141 of the second movable plate 140 is formed so as to gradually narrow the width of the transport path 122 (the up-and-down interval of the transport path 122 on the paper surface of Fig. 7) downward from the upstream side (the right side on the paper surface of Fig. 7). Therefore, the end surface 141 has the introduction surface 141a that is inclined with respect to the upper surface 121a of the block side part 121 so as to come close to the upper surface 121a downstream in the transport path 122. The introduction surface 141a is adjacent upstream in the transport path 122 to the second side surface 141b. In other words, the end surface 141 has the second side surface 141b, which is substantially parallel to the upper surface 121a of the block side part 121 and is adjacent downstream to the introduction surface 141a. This second side surface 141b is also referred to as a constraint surface 141b, and the pins 22 can be constrained between the constraint surface (second side surface) 141b and the upper surface (one side surface) 121a. Here, constraining the pins 22 means that the pins 22 coming in the predetermined circumferential orientation can be held in the orientation. The introduction surface 141a is inclined at about 30 degrees with respect to the upper surface 121a or the transport direction. Here, the introduction surface 141a refers to the surface to introduce the pins 22 of the fastener 20 into between the one side surface 121a and the constraint surface 141b as the fastener 20 is moved by the pusher 123. The constraint surface 141b in the initial position (see Figs. 8 and 13) is spaced from the upper surface 121a of the block side part 121 by an interval that slightly exceeds the diameter of each of the pins 22 of the fastener 20. With reference to Fig. 9, in the second movable plate 140, a portion corresponding to the introduction surface 141a extends upstream relative to the first movable plate 133. The upstream end of the first movable plate 133 is located near the boundary between the introduction surface 141a and the constraint surface 141b of the

second movable plate. The rough surface 134 of the first movable plate 133 is always retracted leftward on the paper surface of Fig. 8 relative to the right end surface of the bottom plate 132 and the constraint surface 141b of the second movable plate 140. A guide 135 is defined between the rough surface 134 of the first movable plate 133, the lower surface of the second movable plate 140 and the upper surface of the distal portion 132a of the bottom plate 132. A part of the base 21 of the fastener 20 is passed through the guide 135. The rough surface 134 of the first movable plate 133 positioned in the initial position is not in contact with the base 21 of the fastener 20 positioned in the predetermined circumferential orientation (see Fig. 13). That is, there is a gap between the rough surface 134 of the first movable plate 133 and the outer circumference of the base 21 of the fastener 20 in the predetermined circumferential orientation where the inter-pin direction is along the transport direction. Thereby, when the fastener 20 positioned in the predetermined circumferential orientation is transported, the fastener 20 is not brought into contact with the first movable plate 133. Thus, a force for adjusting the fastener 20 into the inter-pin direction is not generated again, and the fastener 20 held in the predetermined circumferential orientation is transported advantageously. Also, since the first movable plate 133 is not always in contact with the fastener 20, it can prevent the fastener 20 from being injured.

[0025] With reference to Fig. 7, the upper surface 121a of the block side part 121 includes an upstream upper surface 121aa parallel to the transport direction; a downstream upper surface 121ab parallel to the transport direction and slightly closer to the adjustment side part 130 than the upstream upper surface 121aa; and a connecting side surface 121ac that gently connects the upstream and the downstream upper surfaces 121aa, 121ab. The connecting side surface 121ac is located somewhat downstream relative to the boundary between the introduction surface 141a and the constraint surface 141b of the second movable plate 140. The end surface 131a of the top plate 131 of the adjustment side part 130 includes an upstream end surface 131aa parallel to the transport direction and upstream relative to the second movable plate 140; a middle end surface 131ab parallel to the transport direction and spaced from the block side part 121 slightly farther than the upstream end surface 131aa; a downstream end surface 131ac parallel to the transport direction and closer to the block side part 121 than the upstream end surface 131aa and the middle end surface 131ab on the downstream side of the second movable plate 140; a connecting end surface 131ad that gently connects the upstream end surface 131aa with the middle end surface 131ab; and a second connecting end surface 131ae that connects between the downstream end of the middle end surface 131ab and the upstream end of the downstream end surface 131ac obliquely toward the downstream side and the block side part 121. The second connecting end surface 131ae is inclined at

about 45 degrees with respect to the transport direction. The downstream end surface 131ac is approximately flush with the constraint surface 141b of the second movable plate 140 positioned in the initial position. The end surface 132a of the bottom plate 132 of the adjustment side part 130 stays constant in the left-and-right direction on the paper surface of Fig. 8 along the transport direction, and the end surface 132a is located on the left side on the paper surface of Fig. 8 relative to constraint surface 141b of the second movable plate 140 in the initial position. The lower surface 121c of the block side part 121 also stays constant in the left-and-right direction on the paper surface of Fig. 8 along the transport direction, and the lower surface 121c is located on the right side on the paper surface of Fig. 8 relative to the downstream upper surface 121ab.

[0026] Next, a process for transporting the fastener 20 to the lower die 40 of the button fastening unit 110 through the fastener transport section 120B in the button fastening machine 100 will be described. The fastener 20 is supplied from the fastener hopper 150B through the fastener shoot 151B onto an upstream side in the transport path 122 of the fastener transport section 120B (see Fig. 9). At this time, circumferential positions of the fasteners 20 are inconstant. Next, the pusher 123 is operated to push and move the fastener 20 downstream in the transport path 122, and thereby the fastener 20 is supplied to the lower die 40. The fastener 20 is adjusted to the predetermined circumferential orientation by the adjustment side part 130, etc. while moving through the transport path 122 as described below in detail. In the fastener 20 shown in Fig. 9, the inter-pin direction is perpendicular to the transport direction, where a deviance from the predetermined circumferential orientation is 90 degrees at the maximum. Hereafter, an example is explained, where the fastener 20 maximally deviated in the circumferential direction as mentioned above is corrected to the predetermined circumferential orientation.

[0027] The fastener 20, which has been supplied on the upstream side in the transport path 122 with a maximal deviation from the predetermined circumferential orientation in the circumferential direction, is pushed by the pusher 123 to move in the transport path 122. At this time, the base 21 slides on the upper surface of the distal portion 132a of the bottom plate 132 of the adjustment side part 130 and on the guide lower surface 121bb in the guide groove 121b while being guided by the guide 135 in the adjustment side part 130 and the guide groove 121b in the block side part 121. Then, the upper pin 22 (hereafter referred to as "first pin 22a") of the fastener 20 on the paper surface of Fig. 10 impinges on the introduction surface 141a of the second movable plate 140, which is positioned in the initial position (see a dash line in Fig. 10), of the adjustment side part 130. Thereby, the second movable plate 140 retreats from the initial position upward and slightly leftward on the paper surface of Fig. 10 against the bias from the elastic member. Since, in the second movable plate 140 displaced from the initial po-

sition, an elastic restoring force to return to the initial position is generated, the second movable plate 140 pushes the first pin 22a toward the block side part 121. Thereby, the lower pin (hereafter referred to as "second pin 22b") on the paper surface of Fig. 10 is received on the upper surface 121a (the upstream upper surface 121aa) of the block side part 121, as shown in Fig. 11. That is, at this time, the first pin 22a of the fastener 20 is in contact with the introduction surface 141a of the second movable plate 140, and the second pin 22b is in contact with the upper surface 121a of the block side part 121. Then, the fastener 20 enters into a region corresponding to the constraint surface 141b of the second movable plate 140 and the first movable plate 133 with a manner in which the inter-pin direction is still perpendicular to the transport direction. At this time, since the introduction surface 141a of the second movable plate 140 is inclined with respect to the transport direction, the first pin 22a can be smoothly transferred from the introduction surface 141a to the constraint surface 141b.

[0028] Fig. 10 is a partial top view at the time when the fastener 20 arrives at the introduction surface 141a of the second movable plate 140 and the first movable plate 133. Fig. 11 is a cross-sectional view taken along D-D line in Fig. 10. In the fastener 20 just after entering into the region corresponding to the constraint surface 141b of the second movable plate 140, the inter-pin direction is still perpendicular to the transport direction. At this time, as shown in Fig. 11, the first pin 22a is in contact with the constraint surface 141b, and the second movable plate 140 is displaced from the initial position. Thereby, the second movable plate 140, which is returning to the initial position, pushes the first pin 22a toward the block side part 121. Therefore, the second pin 22b is received by the upper surface 121a of the block side part 121. At this time, the center of the base 21 of the fastener 20 is positioned at the midpoint between the first and second pins 22a, 22b and is farther away from the block side part 121 than the central position of the fastener 20 in the predetermined circumferential orientation (see Fig. 13). Therefore, the base 21 comes into the guide 135 leftward relatively deeply that is located on the right side on the paper surface of Fig. 11 in the first movable plate 133. Therefore, the base 21 contacts the rough surface 134 of the first movable plate 133 that was positioned in the initial position until just before the contacting, and pushes the first movable plate 133 leftward on the paper surface of Fig. 11. Thereby, the first movable plate 133 is displaced leftward on the paper surface of Fig. 11 from the initial position against the bias from the elastic member, and the stepped portion 133c of the first movable plate 133 comes off the stepped portion 132d of the bottom plate 132. On the other hand, in the fastener 20 with the base 31 in contact with the rough surface 134, a rotation in the clockwise direction based on the paper surface of Fig. 10 is generated by receiving friction from the rough surface 134. Thereby, the inter-pin direction is inclined with respect to the transport path direction. At this time,

the constraint surface 141b of the second movable plate 140, which is trying to return to the initial position, pushes the first pin 22a toward the upper surface 121a of the block side part 121. Thereby, as shown in Fig. 12, the first pin 22a on the upstream side of the second pin 22b is aligned with the second pin 22b along the transport direction. Consequently, the fastener 20 is adjusted to the predetermined circumferential orientation with the inter-pin direction along the transport direction. In this situation, the first and second movable plates 133, 140 return back to the respective initial positions. After that, the fastener 20 is sent downstream in the transport path 122 while the two pins 22 are constrained in the predetermined circumferential orientation between the constraint surface 141b of the second movable plate 140 and the upper surface 121a (the downstream upper surface 121ab) of the block side part 121.

[0029] The above explanation exemplifies a case where the fastener 20 that deviates from the predetermined circumferential orientation by 90 degrees in the circumferential direction is corrected to the predetermined circumferential orientation. However, the fastener 20 whose deviation from the predetermined circumferential orientation is less than 90 degrees can be adjusted to the predetermined circumferential orientation in the same way. In a case that a deviation from the predetermined circumferential orientation is relatively small, the fastener 20 may be adjusted to the predetermined circumferential orientation only by the pushing from the second movable plate 140 toward the block side part 121 without a frictional rotation from the first movable plate 133 because the inter-pin direction is oblique with respect to the transport direction.

[0030] Fig. 14 is a cross-sectional explanation view of the button transport section 120A. The button transport section 120A comprises a pusher body 160 that can move along a transport path of the button 10; and a bar-like holder 161 that is supported by the pusher body 161 via a shaft 162 and protrudes leftward on the paper surface of Fig. 14 (on the downstream side in the transport direction) from the movable pusher body 160. The holder 161 has a wire holder 161a at its left end (based on the paper surface of Fig. 14), and the wire holder 161a can hold the center portion 13b of the wire member 13 of the button 10 from below. The holder 161 is biased by an elastic member such as a spring or the like (that is not shown) in a direction where the wire holder 161a is lifted up, and this upward displacement is limited by a stopper surface 163 of the pusher body 160 up to a almost horizontal position. The button 10 is configured as below. The button 10 is rotated by contacting a friction providing surface as not shown in the transport path and, when the center portion 13b of the wire member 13 becomes perpendicular to the transport direction, the wire holder 161a of the holder 161 is displaced upward so as to hold the center portion 13b of the wire member 13.

[0031] Fig. 15 shows another example of a button which is fastened onto the cloth 1 using the button fas-

tener 20 as mentioned above. This button 50 includes a cylindrical barrel 51 and a disk-like head 52 on the upper side (based on the paper surface of Fig. 15) of the barrel 51 at, the head 52 having an enlarged diameter. Further, the button 50 comprises an outer shell member 50a and a core member 50b contained within the outer shell member 50a. The outer shell member 50a is composed of a shell 50aa which forms a lower surface of the head 52, and a circumferential side and a bottom 51b of the barrel 51; and a cap 50ab that covers the upper surface side of the head 52. The core member 50b includes a core barrel 50ba corresponding to the barrel 51 and a core head 50bb corresponding to the head 52. The lower end of the core barrel 50ba is somewhat spaced from the bottom 51b of the shell 50aa. Moreover, in the bottom of the core barrel 50ba, a concave portion 53 depressed upward is formed in order to swage the pins 22 of the fastener 20. On the bottom 51b of the shell 50aa, an annular groove 54, which is slightly depressed upward, is formed in order to receive the two pins 22 of the fastener 20. When the button 50 is fastened onto the cloth 1, the two pins 22 of the fastener 20, which have pierced the cloth 1 upward and then penetrated the bottom 51b of the shell 50aa from the annular groove 54, are curved in a J-shape toward each other in the concave portion 53 (see Fig. 16). If a logo or the like is displayed on the front surface of the head 52 of the button 50, the fastener 20 is required to be fastened to clothes or the like with a certain constant circumferential orientation. In this case, it is preferable that the circumferential orientation of the fastener 20 with respect to the button 50 is also adjusted in a constant manner. To do so, the foregoing fastener transport section 120B is used.

[0032] In the above explanation, an example of adjusting the circumferential orientation of the button fastener 20 is quoted. Next, an example of adjusting the circumferential orientation of a button will be described below. A button 60 shown in Figs. 17 and 18, which is formed from a metal plate, comprises a disk-like base 61 and a convex portion 62 protruding upward from the base 61 at an eccentric position with respect to the center of the base 61. The convex portion 62 has a circular outer circumference. A diameter of the convex portion 62 is changed upward based on the paper surface of Fig. 18 from the base 61 to firstly expand and then contract. Unlike a button with a convex portion at its center, when the button 60 is circumferentially rotated by 90 degrees, a position of the convex portion 62 with respect to the base 61 is changed. Fig. 18 shows a state in which the button 60 is fixed to the cloth 1 using a button fastener 70. The button fastener 70 has a disk-like base 71 and a post 72 (the post is swaged in Fig. 18) protruding from a center part of the base 71. An operation for mounting the button 60 to the cloth 1 is carried out by inserting the post 72 of the fastener 70, which has penetrated the cloth 1, into an inner space of the convex portion 62 of the button 60 so as to swage it.

[0033] Fig. 19 is a partial top view of a button transport

section 170 for transporting the button 60 to a button fastening unit in a button fastening machine. The button transport section 170 can be installed in the transport unit 120 of the button fastening machine 100. Fig. 19 is a partial top view of a button transport section 170 for transporting the button 60 to a button fastening unit in a button fastening machine. The button transport section 170 comprises an adjustment side part 180 located on the left side of the paper surface of Fig. 20 (the upper side on the paper surface of Fig. 19); a block side part 171 on the right side of the paper surface of Fig. 20 (the lower side on the paper surface of Fig. 19); a transport path 172 between the adjustment side part 180 and the block side part 171; and a pusher 173 as a movement member. When the button 60 is supplied to an upstream side in the transport path 172, the button 60 is in a constant up-and-down posture with the convex portion 62 facing upward. However, circumferential orientations are inconstant. Therefore, the button 60 is adjusted into the constant circumferential orientation where the direction (hereafter referred to as "the eccentric direction") connecting between the center of the convex portion 62 of the button 60 and the center of the base 61 is along the transport direction while being moved through the transport path 173.

[0034] With reference to Fig. 20, the block side part 171 includes a vertical upper surface (one side surface of a transport path) 171a that can receive a side of the convex portion 62 of the button 60; a guide groove 171b that is depressed rectangularly rightward based on the paper surface of Fig. 20 from a lower end of the upper surface 171a, wherein the guide groove 171b receives a portion of the base 61 of the button 60; and a lower section 171c that extends vertically downward from the guide groove 171b.

[0035] The adjustment side part 180 includes a top plate 181, a bottom plate 182, a first movable plate (rotation providing member) 183 and a second movable plate (constraining member) 190 between the top plate 181 and the first movable plate 183. The first and second movable plates 183, 190 are independently biased by an elastic member such as a spring or the like toward the block side part 171 up to the respective initial positions (see Fig. 21). The first movable plate 183 has a stepped portion 183c on a lower surface, and the bottom plate 182 has a stepped portion 182d on an upper surface. The first movable plate 183 that is biased rightward on the paper surface of Fig. 20 by the elastic member is held in the initial position without any further rightward displacement since the stepped portion 183c impinges on the stepped portion 182d. A right end surface 184 based on the paper surface of Fig. 20 (hereafter referred to as "rough surface") of the first movable member 183 is slightly inclined downward and leftward, and there are formed fine irregularities or zigzag flaws on the rough surface 184. The second movable plate 190 has a vertical end surface (second side surface of the transport path) 191 on the right side on the paper surface of Fig. 20.

Further, the second movable plate 190 includes an introduction surface 191a that is inclined with respect to the upper surface 171a of the block side part 171 so as to gradually narrow the width of the transport path 172 (the up-and-down interval on the paper surface of Fig. 19) downstream, and a constraint surface 191b adjacent to the downstream end of the introduction surface 191a and parallel to the upper surface 171a of the block side part 171. The rough surface 184 of the first movable plate 183 is always retracted leftward on the paper surface of Fig. 20 relative to the constraint surface 191b of the second movable plate 190 and the right end surface of the bottom plate 182. A guide 185 is defined between the rough surface 184 of the first movable plate 183, the lower surface of the second movable plate 190 and the upper surface of the bottom plate 182. A part of the base 61 of the button 60 is passed through the guide 185.

[0036] The button 60, which is supplied to an upstream side in the transport path 172 of the button transport section 170, is pushed and moved downstream in the transport path 172 by the pusher 173. During this movement, the button 60 is adjusted by the adjustment side part 180, etc. to the predetermined orientation (see Fig. 21) in which the eccentric direction is along the transport direction. In Figs. 19 and 20, the convex portion 62 of the button 60 is deviated from the predetermined orientation by 90 degrees in the counterclockwise direction on the paper surface of Fig. 19. This button 60 impinges on the introduction surface 191a of the second movable plate 190, which is positioned in the initial position. Thereby, the second movable plate 190 retreats from the initial position leftward on the paper surface of Fig. 20. Then, the button 60 enters into a region corresponding to the constraint surface 191b of the second movable plate 190 and the first movable plate 183 with a manner in which the eccentric direction is still perpendicular to the transport direction. Therefore, the base 61 is brought into contact with the rough surface 184 of the first movable plate 183 and rotated in a clockwise direction on the paper surface of Fig. 19. Then, the convex portion 62 of the button 60 is held between the constraint surface 191b of the second movable plate 190 and the upper surface 171a of the block side part 171 with the eccentric direction along the transport path direction. With this manner, the button 60 is sent downstream in the transport path 172.

DESCRIPTION OF REFERENCE NUMBERS

[0037]

10	wire button (button)
20	button fastener
21	base
22	pin (protrusion)
60	button
61	base
62	convex portion (protrusion)
100	button fastening machine

110	button fastening unit	
120	fastener transport unit	
120B	fastener transport section	
170	button transport unit	
121, 171	block side part	5
121a, 171a	upper surface (one side surface of the transport path)	
121b, 171b	guide groove	
122, 172	transport path	
123, 173	pusher (movement member)	10
130, 180	adjustment side part	
133, 183	first movable plate (rotation providing member)	
134, 184	rough surface of the first movable plate	
138, 139	spring (elastic member)	15
140, 190	second movable plate (constraining member)	
141a, 191a	introduction surface	
141b, 191b	constraint surface (second side surface of the transport path)	20

Claims

1. An apparatus for transporting a button (60) or a button fastener (20) to a button fastening section (110), the button (60) or the button fastener (20) having a disk-like base (21, 61) and at least one protrusion (22, 62) protruding from the base (21, 61), the apparatus comprising:
 - a transport path (122, 172) for allowing the button (60) or the button fastener (20) to pass through while keeping its up-and-down posture constant;
 - a movement member (123, 173) for moving the button (60) or the button fastener (20) from an upstream side to a downstream side in the transport path (122, 172); and
 - an adjustment mechanism for adjusting a circumferential orientation of the button (60) or the button fastener (20) which is moving through the transport path (122, 172) to a constant predetermined circumferential orientation, wherein the adjustment mechanism includes:
 - a rotation providing member (133, 183) for rotating the button (60) or the button fastener (20) to be oriented toward the predetermined circumferential orientation by contacting the base (21, 61) of the button (60) or the button fastener (20) which deviates from the predetermined circumferential orientation in the circumferential direction, and
 - a constraining member (140, 190) which is biased by an elastic member (138) to be positioned in an initial position where the constraining member (140, 190) can con-

strain the protrusion (22, 62) against one side surface (121a, 171a) of the transport path (122, 172), wherein the constraining member (140, 190) is displaced from the initial position away from the one side surface (121a, 171a) of the transport path (122, 172) against the bias from the elastic member (138) when the constraining member (140, 190) contacts the protrusion (22, 62) out of the predetermined circumferential orientation, wherein the constraining member (140, 190) has a second side surface (141b, 191b) of the transport path (122, 172).

2. The apparatus according to claim 1, wherein the at least one protrusion is two pins (22) of the button fastener (20) or the button, and the predetermined circumferential orientation is an orientation where a direction connecting between the two pins (22) is along the transport direction of the transport path.
3. The apparatus according to claim 1 or 2, wherein the constraining member (140, 190) has an introduction surface (141a, 191a) adjacent to the second side surface (141b, 191b) upstream in the transport path (122 or 172), and the introduction surface (141a, 191a), in the initial position, is inclined with respect to the one side surface (121a, 171a) so as to come close to the one side surface (121a, 171a) downstream.
4. The apparatus according to claim 1, wherein the protrusion is a convex portion (62) that protrudes from an eccentric position of the base (61) of the button (60), and the predetermined circumferential orientation is an orientation where a direction connecting between the center of the convex portion (62) and the center of the base (61) is along the transport direction of the transport path.

Fig.1

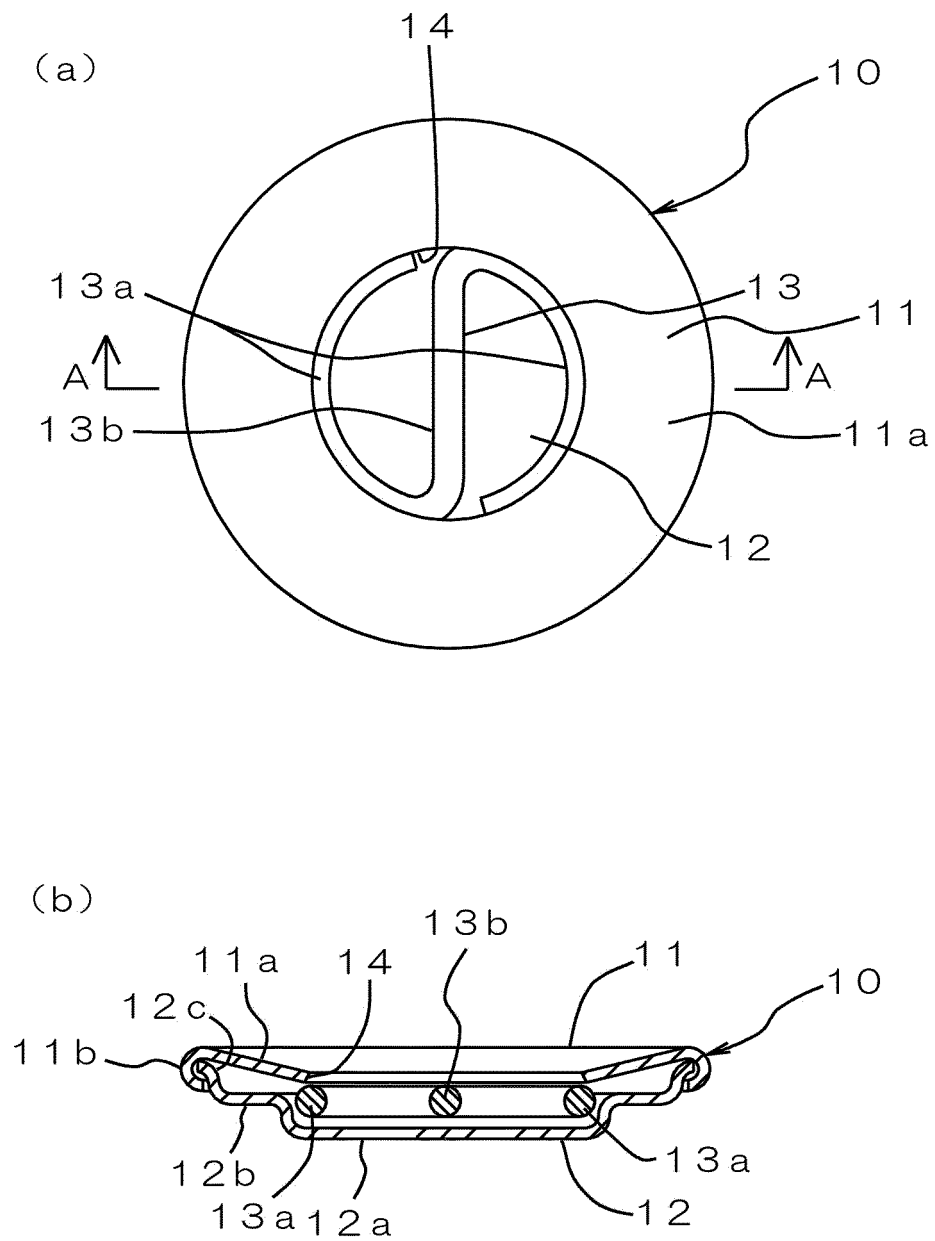


Fig.2

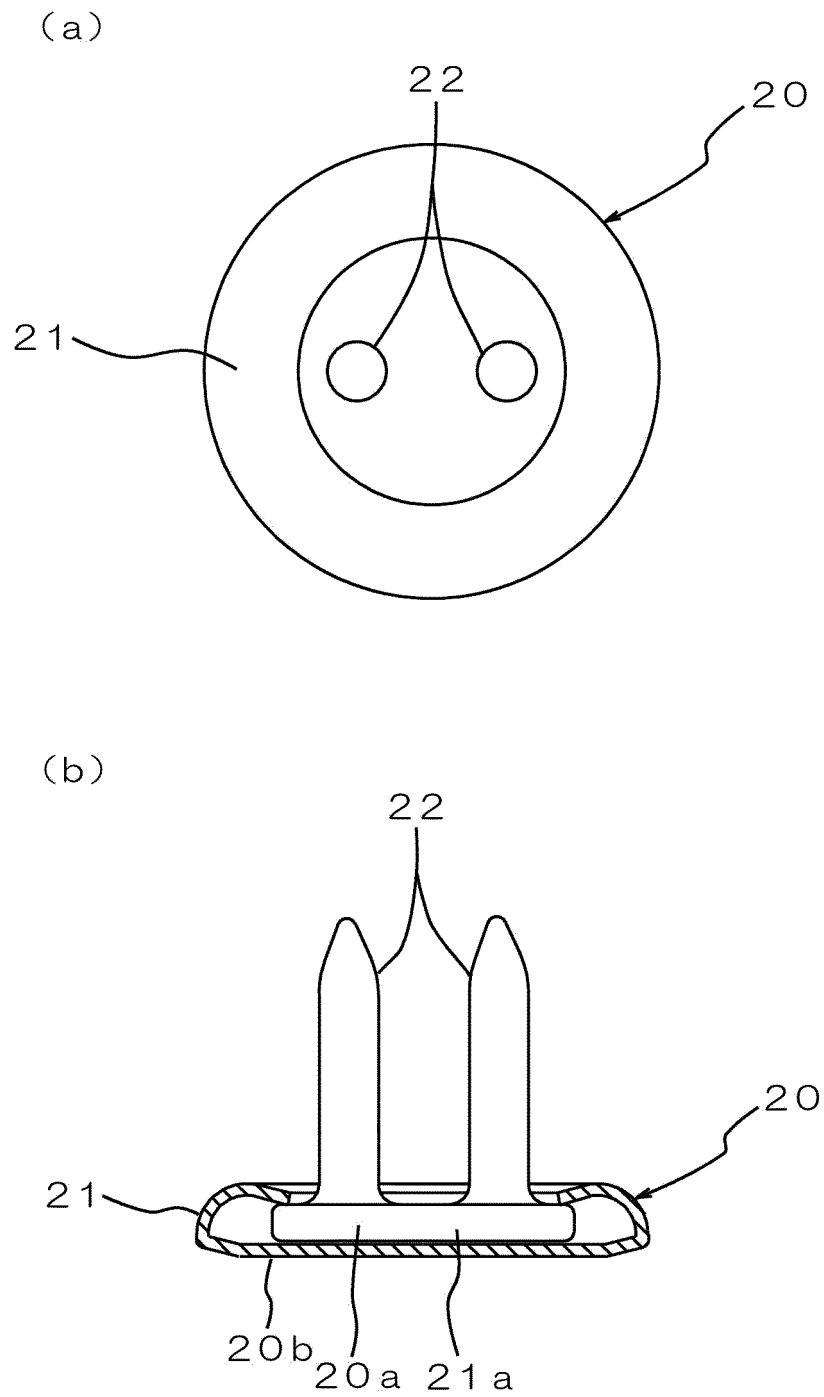


Fig.3

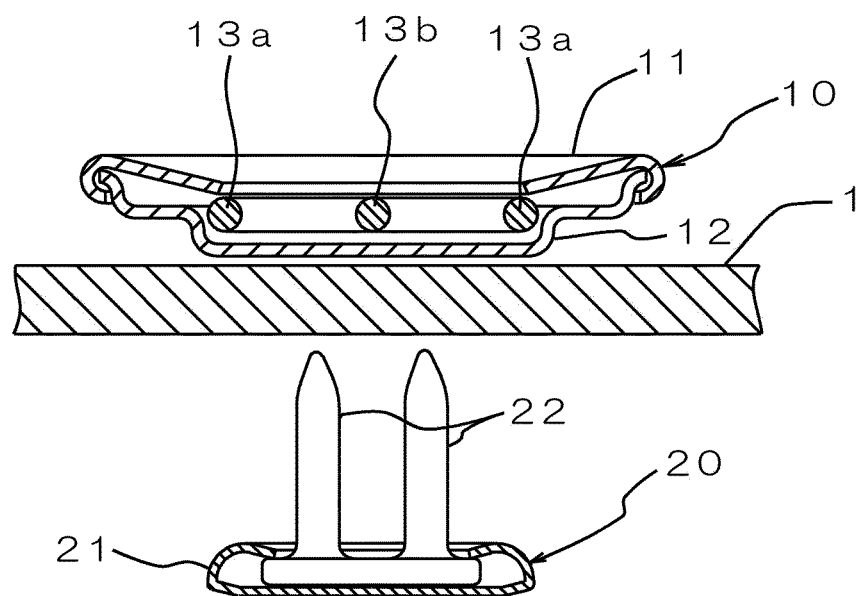


Fig.4

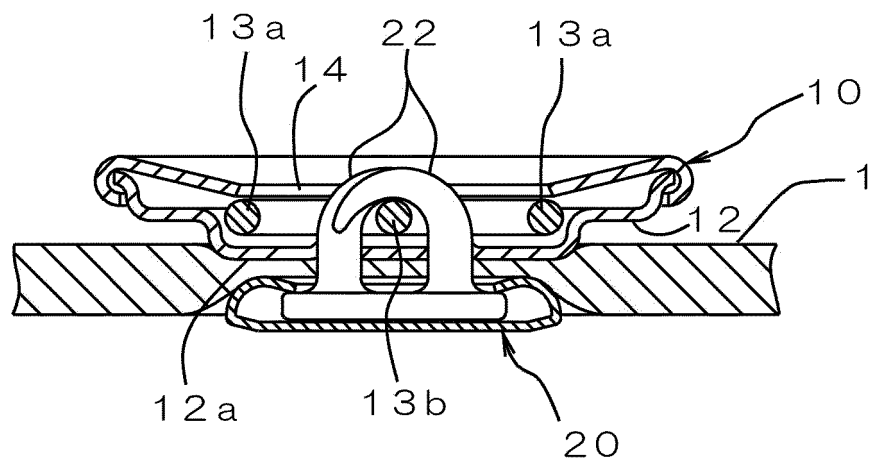


Fig.5

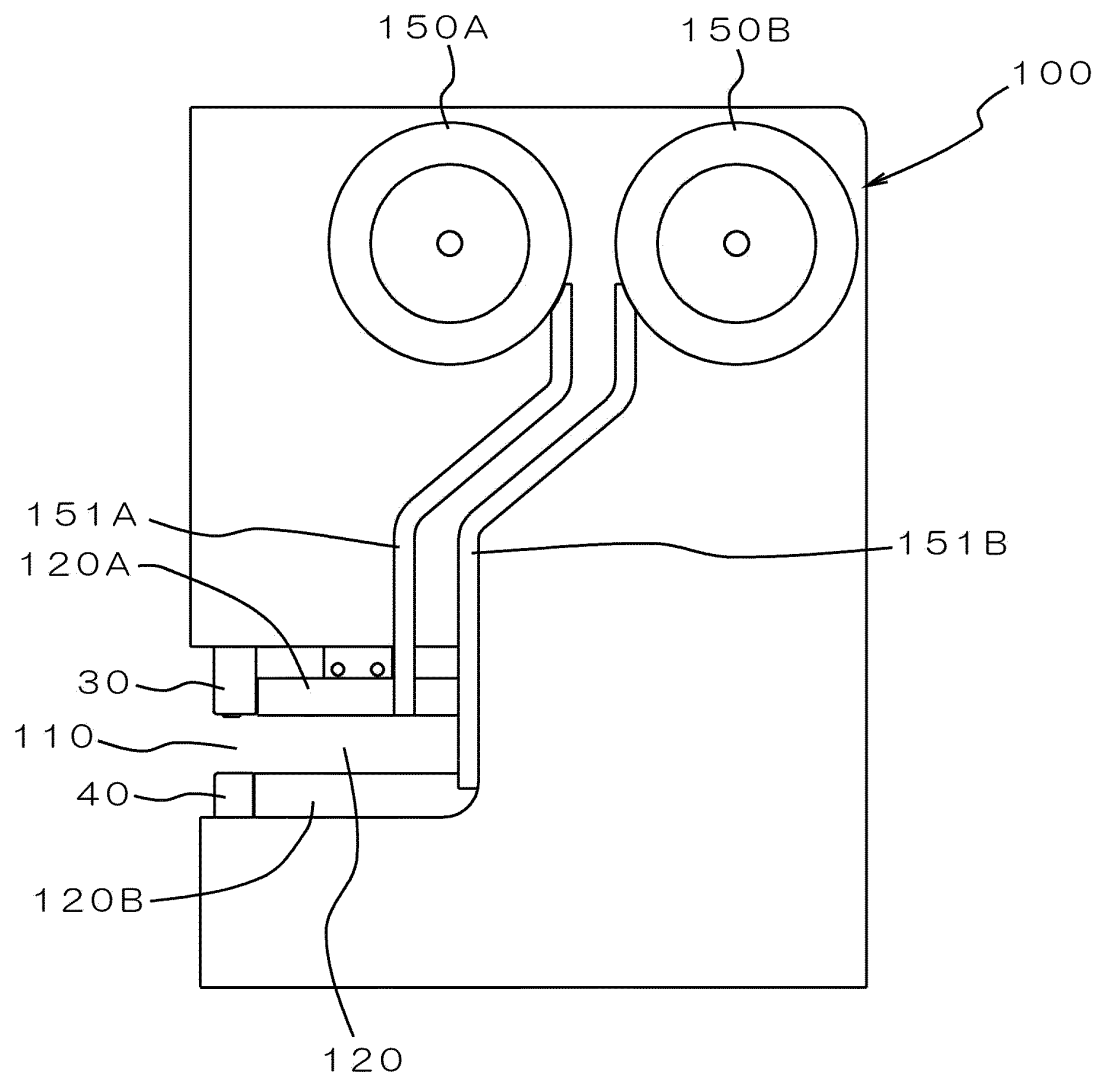


Fig.6

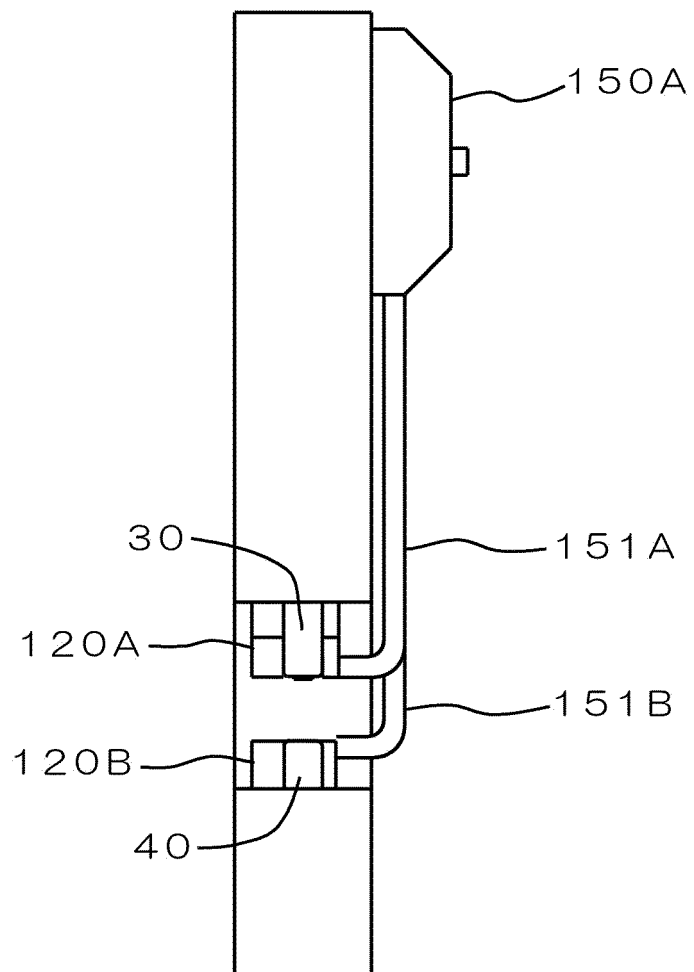


Fig.7

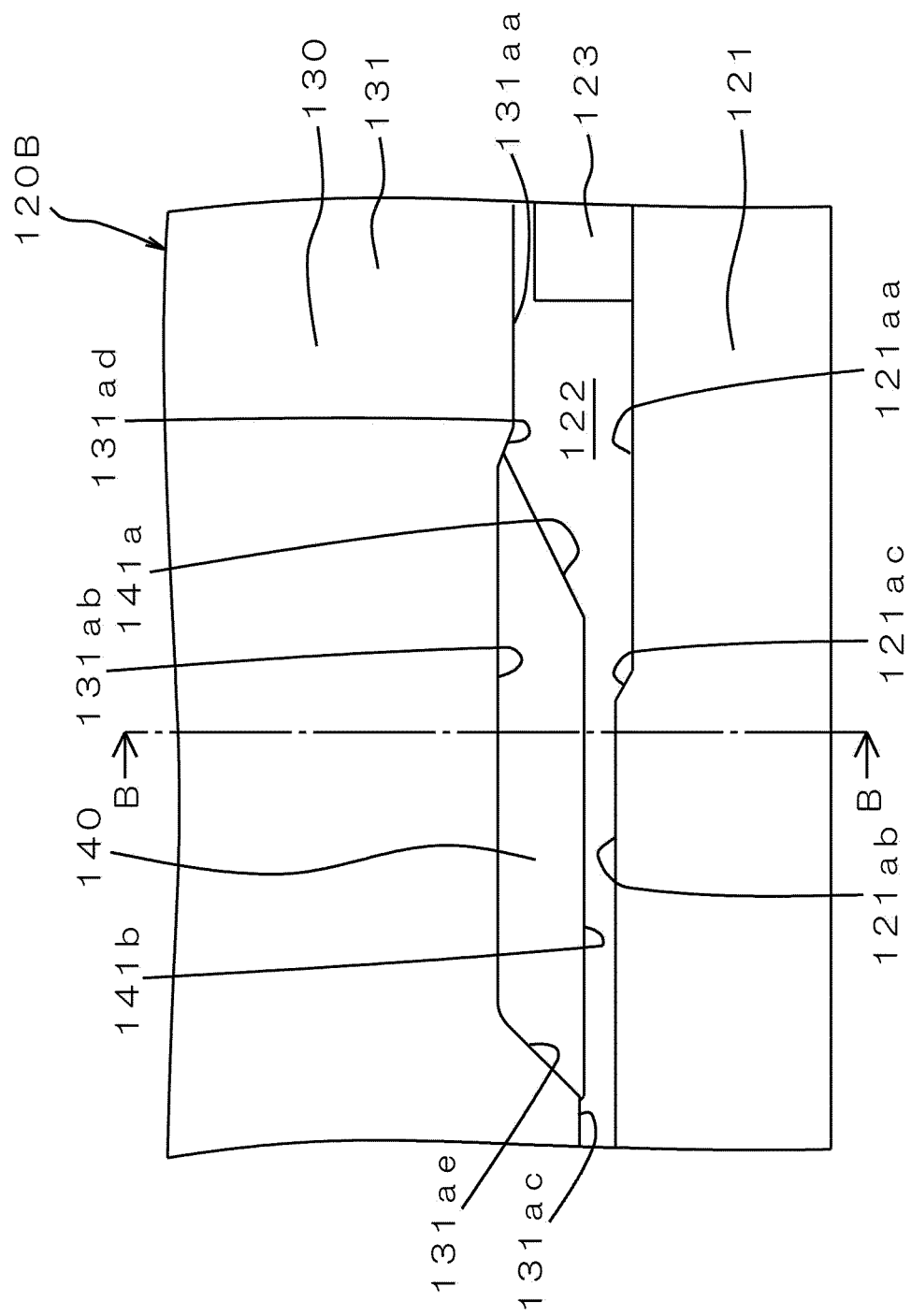


Fig.8

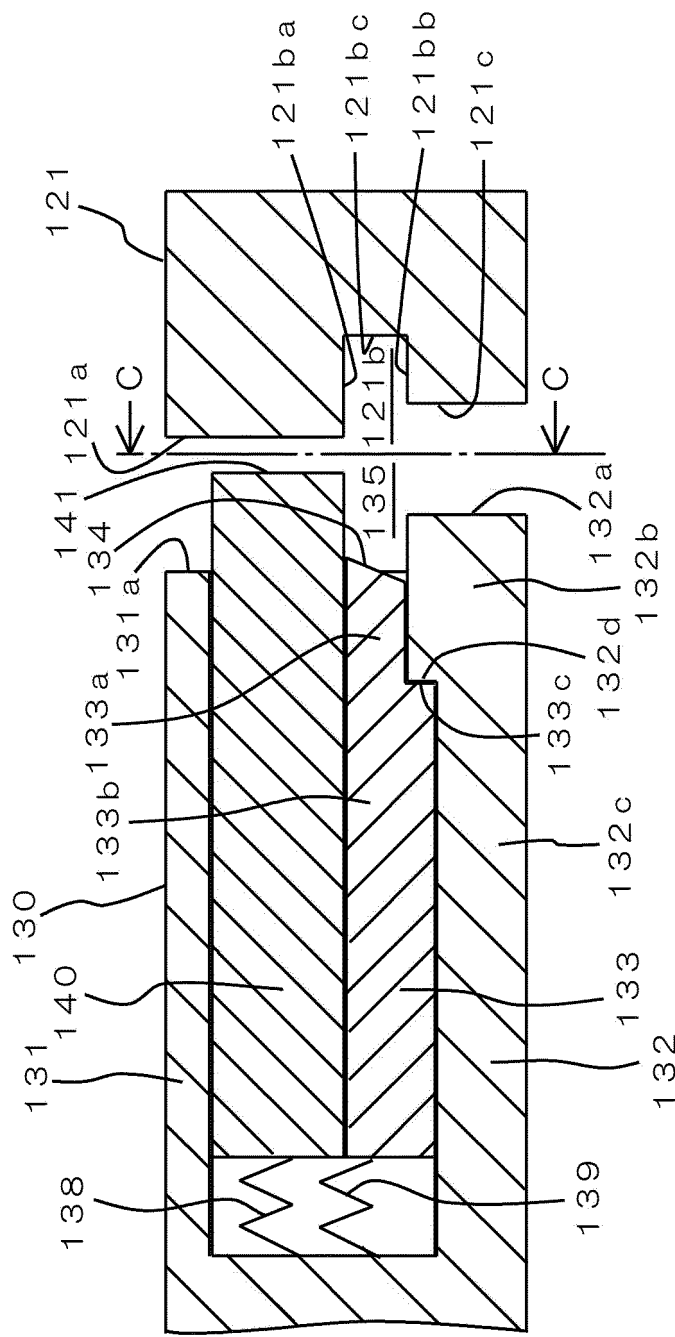


Fig.9

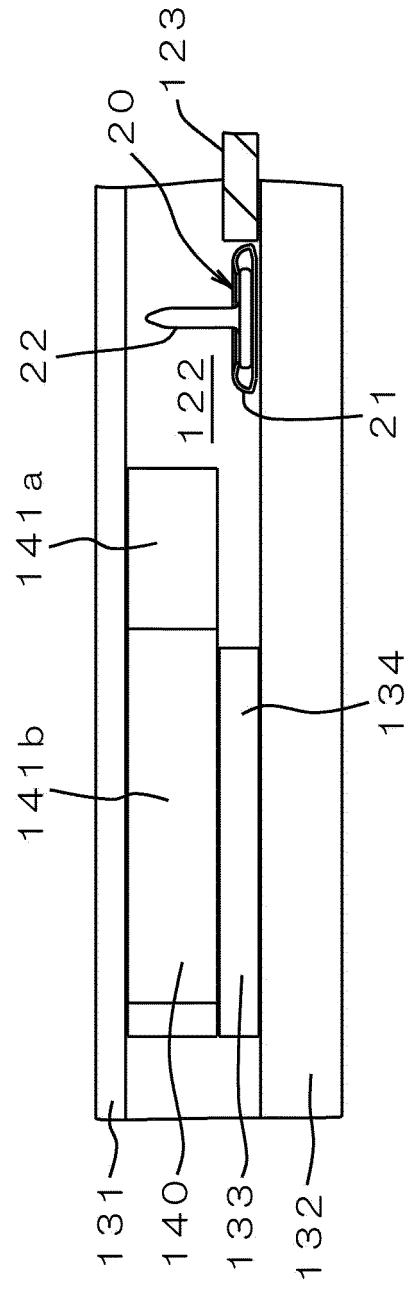


Fig.10

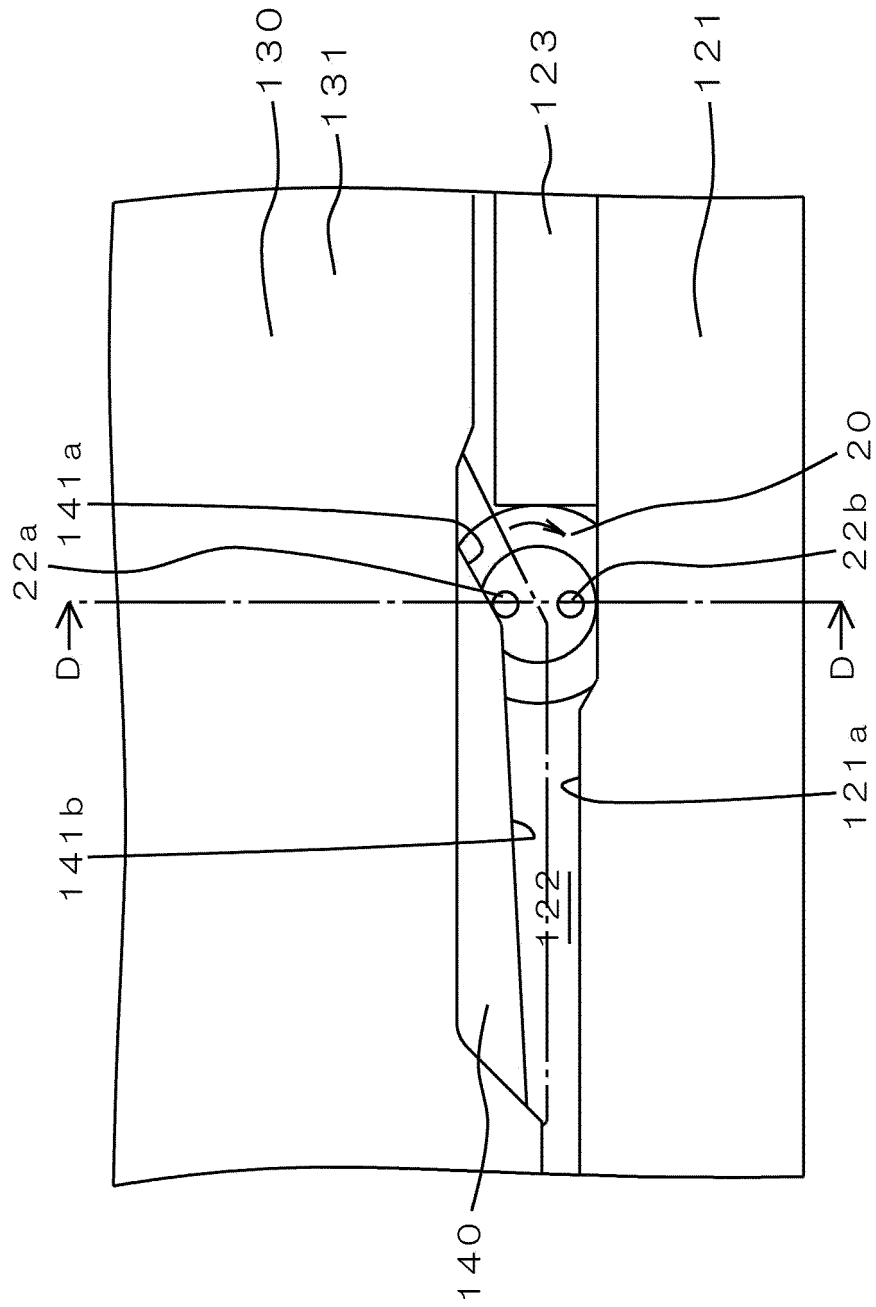


Fig.11

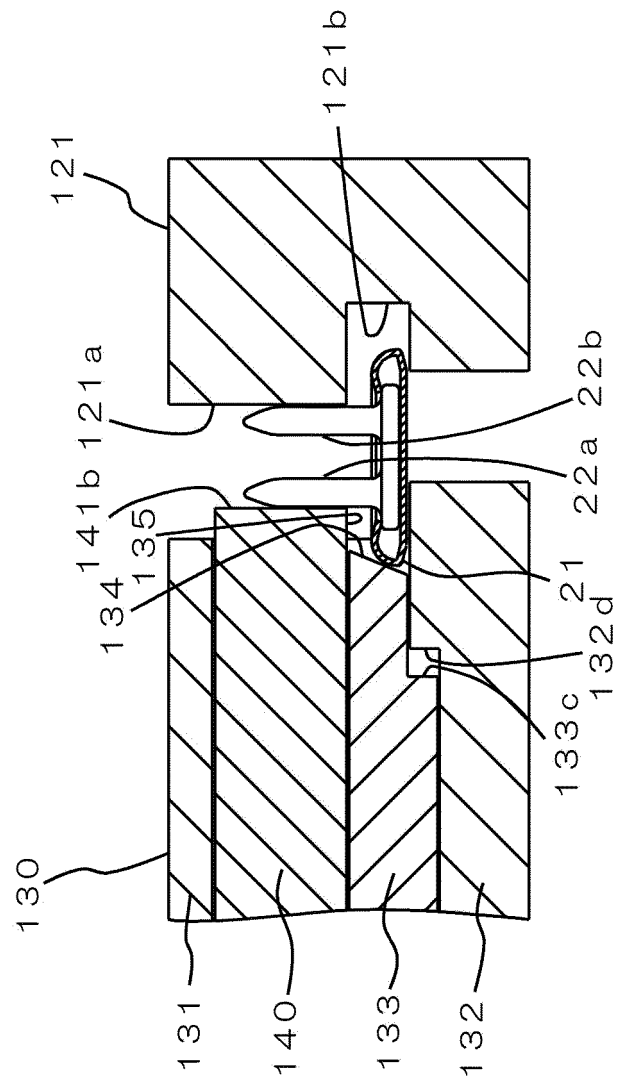


Fig.12

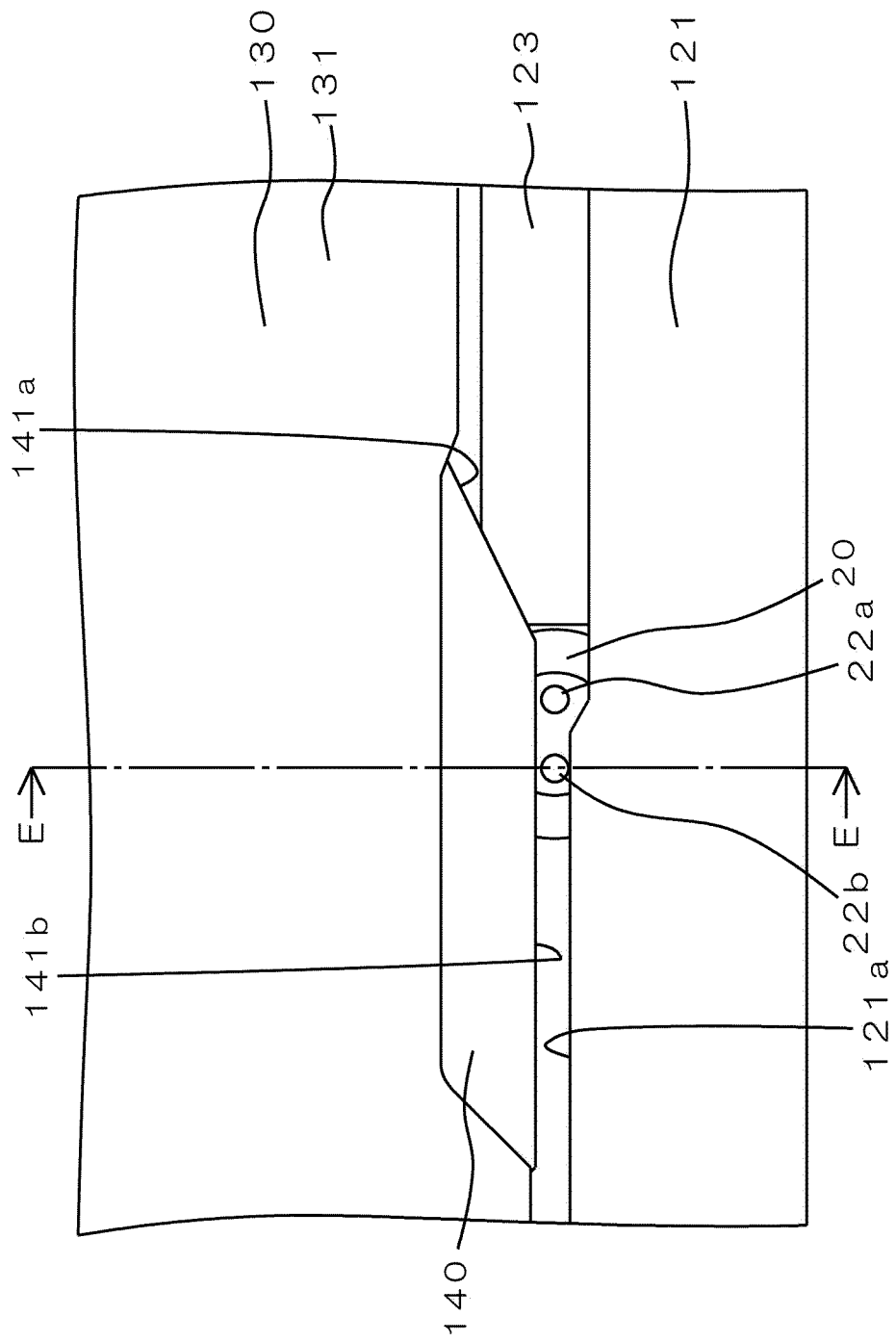


Fig.13

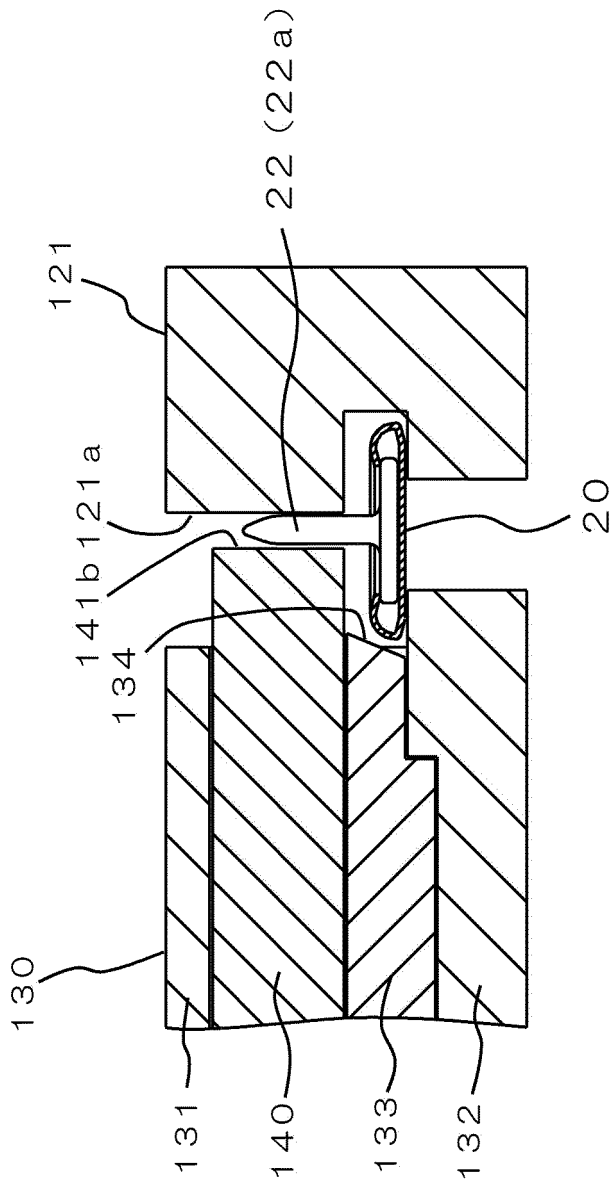


Fig.14

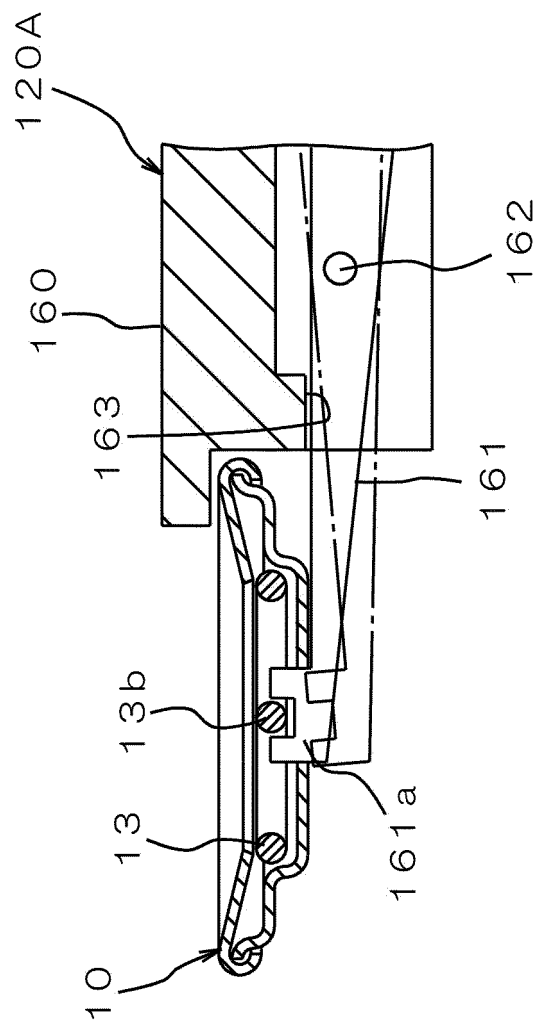


Fig. 15

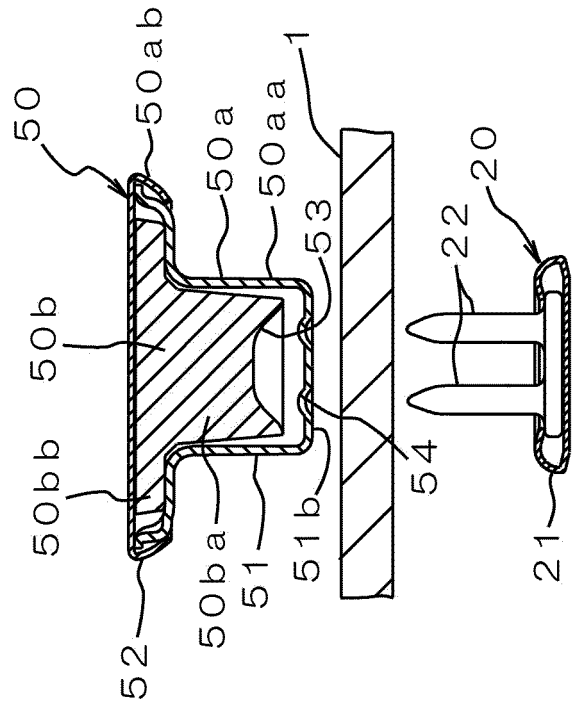


Fig.16

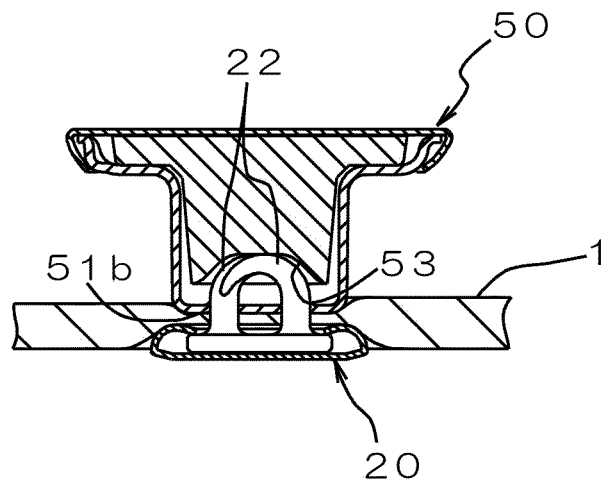


Fig.17

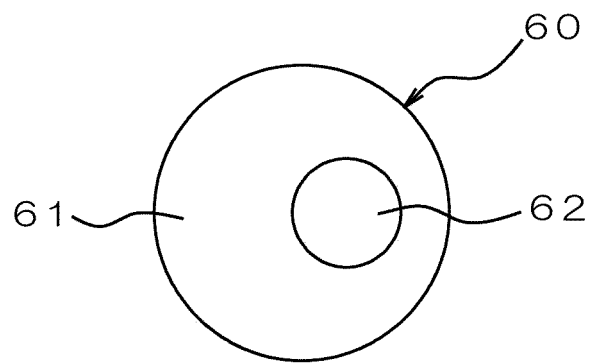


Fig.18

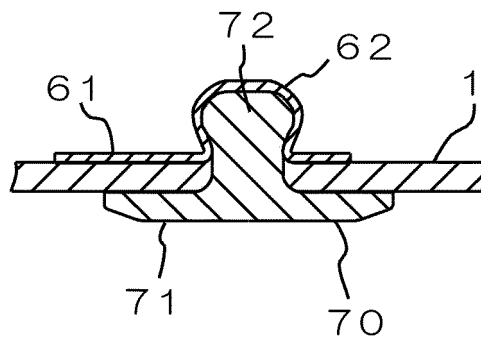


Fig.19

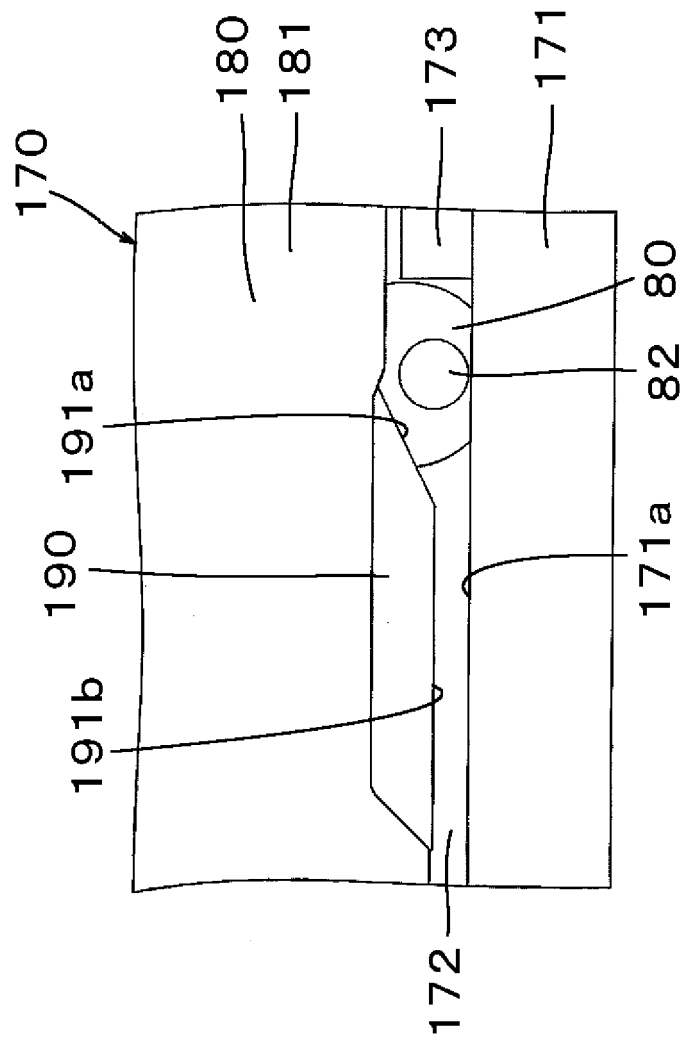


Fig.20

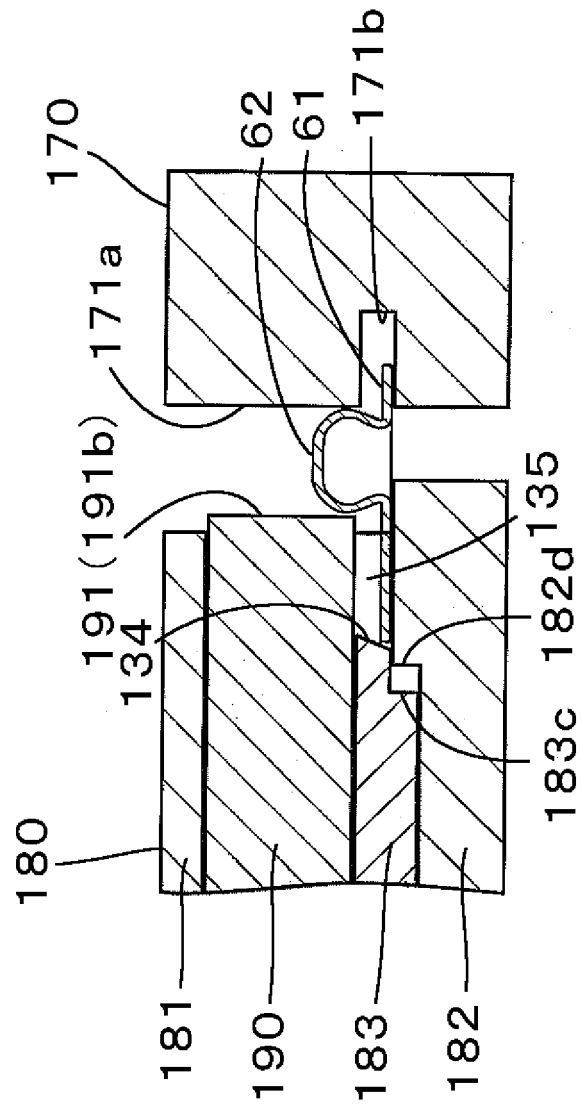
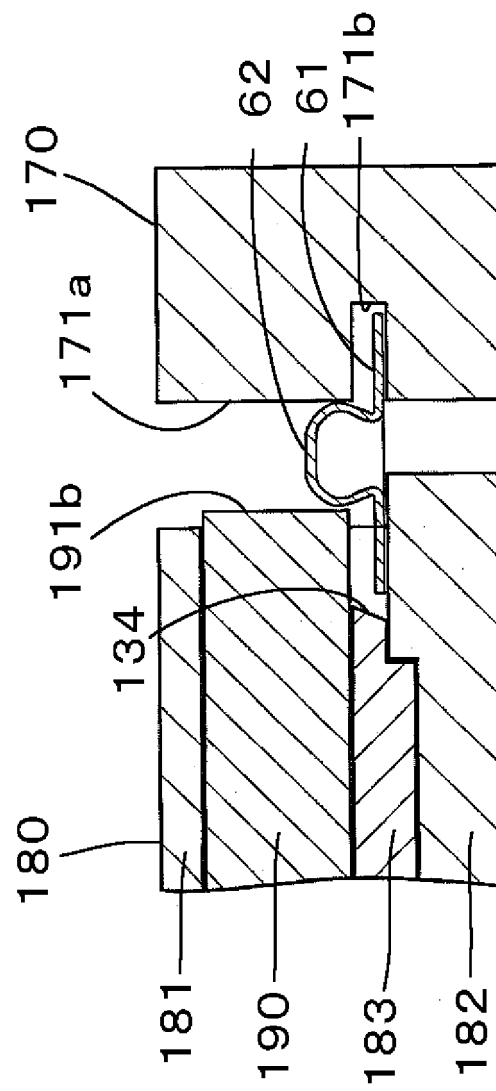


Fig.21



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/071494

A. CLASSIFICATION OF SUBJECT MATTER

A41H37/10 (2006.01) i, A41H37/04 (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)

A41H37/10, A41H37/04

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 1996-2012

Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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 48-076631 A (Textron Inc.), 15 October 1973 (15.10.1973), entire text; all drawings & US 3750925 A & GB 1369110 A & DE 2259330 A & FR 2162546 A & BE 792333 A1 & CH 573229 A	1-4
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 080257/1982 (Laid-open No. 184525/1983) (Yamazaki Machinery Mfg. Co., Ltd.), 08 December 1983 (08.12.1983), entire text; all drawings (Family: none)	1-4

☒ 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
30 October, 2012 (30.10.12)Date of mailing of the international search report
13 November, 2012 (13.11.12)Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 52-028453 A (Textron Inc.), 03 March 1977 (03.03.1977), entire text; all drawings & US 3987950 A & GB 1547836 A & DE 2626849 A & FR 2314680 A & BE 842951 A	1-4
A	JP 51-053366 A (Furuya Industrial Co., Ltd.), 11 May 1976 (11.05.1976), entire text; all drawings (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2292223 A [0004]
- JP H0351302 B [0004]