



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
16.07.2008 Bulletin 2008/29

(51) Int Cl.:
D04C 5/00 (2006.01) D03C 3/20 (2006.01)
D04B 27/32 (2006.01)

(21) Application number: **06796340.5**

(86) International application number:
PCT/JP2006/315849

(22) Date of filing: **10.08.2006**

(87) International publication number:
WO 2007/023694 (01.03.2007 Gazette 2007/09)

(84) Designated Contracting States:
DE ES FR GB IT

(72) Inventor: **SAWAMURA, Tetsuya**
Takarazuka-shi, Hyogo 665-0042 (JP)

(30) Priority: **22.08.2005 JP 2005239728**

(74) Representative: **Intes, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

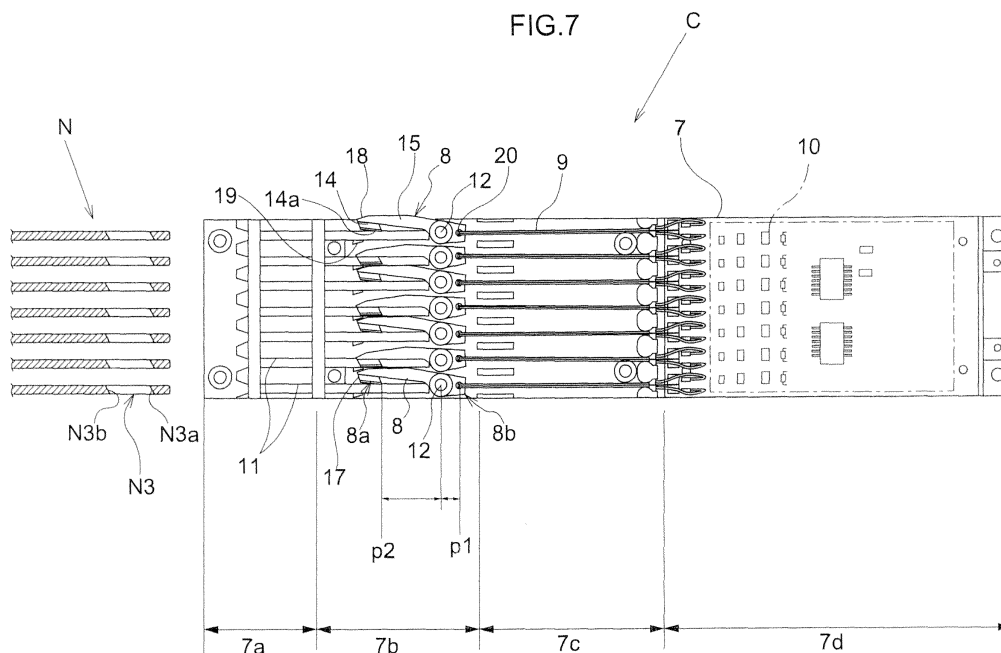
(71) Applicant: **Miyagi Lace Co., Limited**
Takarazuka-shi
Hyogo 665-0042 (JP)

(54) **ELECTRONIC JACQUARD DEVICE AND CASSETTE FOR ELECTRONIC JACQUARD**

(57) An electronic Jacquard apparatus and an electronic Jacquard cassette wherein the needle selection operation in the electronic Jacquard apparatus can be performed stably over prolonged periods of time, and the select hooks can operate reliably even when the tips of the needles come into contact with the distal ends of the select hooks. The electronic Jacquard apparatus comprises select hooks, whose orientation is selected in accordance with the curving of actuating bodies comprising

piezoelectric bodies via oscillating between an engaged orientation in which the select hooks engage with needles, and a non-engaged orientation in which the select hooks do not engage with the needles; and further comprises support pins that act as fulcras for the oscillation of the select hooks. The electronic Jacquard apparatus has a structure whereby the support pins and cassette main body constitute separate entities, and the support pins are supported by a holding plate that supports the cassette against the Jacquard main body.

FIG.7



Description

TECHNICAL FIELD

[0001] The present invention relates to an electronic Jacquard apparatus, and also relates to an electronic Jacquard cassette that is installed on this apparatus.

BACKGROUND ART

[0002] A Jacquard apparatus is designed to control the positions of threads strung over a frame, and also positions needles for handling each thread or multiple threads in groups. The needles provided to the frame are urged away from the Jacquard apparatus in the longitudinal direction.

A reciprocating mechanism for moving the Jacquard main body in a reciprocating manner is provided to the Jacquard main body in the lengthwise direction of the needles. The relative positional relationship between the Jacquard main body and the needles in the lengthwise direction thereof changes when select hooks and the needles are in a disengaged state. In a positional relationship wherein the Jacquard main body and the needles are in their respective original positions, the select hooks are able to engage with the needles, and the needles, once engaged, will be positioned by moving together against an urging force following the movement of the Jacquard main body.

[0003] In other words, when the needles are not in an engaged state with regard to the select hooks, they are held in their original position, while when the needles are in an engaged state with regard to the select hooks, only the needles in the engaged state will move together with the Jacquard main body as a result of the movement thereof. Accordingly, the position of the can be determined in accordance with the positioning of the hooks.

[0004] An apparatus known as an electronic Jacquard is used in such Jacquard apparatuses. An electronic Jacquard changes the positioning of the select hooks based on the curving of a piezoelectric body, and the use of electronic information for thread positioning to perform needle selection allows Jacquards having a broad range of application to be obtained (Patent Document 1).

[0005] A so-called cassette system is adopted in electronic Jacquards, wherein a fixed number of needles (e.g., seven) is selected, with one cassette unit accordingly having a number of select hooks corresponding to the number of needles, and a plurality of such cassettes is provided. Accordingly, the required number of cassettes equates to the number of needles to be positioned divided by the number of select hooks provided to the cassette.

[0006] The cassette is provided with a fixed number of select hooks, whose position is selected in accordance with the curving of actuating bodies comprising piezoelectric bodies via oscillating between a position of engagement with the needles and a position of non-engagement

therewith; and is also provided with support pins that act as fulcra for the oscillation of the select hooks. The distal end side of the select hook is a needle entry part, and the proximal end side of the select hook is the actuating body placement part, which is where the actuating bodies are placed. Electronic control parts for controlling the curving action of these actuating bodies are provided upstream thereof.

[0007] The following description is provided with reference made to FIG. 7. Starting from the proximal end side of the cassette (on the right side of FIG. 7), there are disposed an electronic control part 7d provided with an electronic board 10 for controlling the curving action of the actuating bodies; an actuating body placement part 7c wherein a fixed number of actuating bodies 9 comprising piezoelectric bodies are provided on the left side of the electronic control part 7d so as to allow curving; a hook placement part 7b wherein a number of select hooks 8 are provided on the left of the actuating body placement part 7c. The left of the hook placement part 7b the distal end of the cassette C) is a needle entry part 7a, into which the needles N enter. Partitioning walls 11 defining entry routes for the needles N are provided to the needle entry part 7a.

Cassettes for electronic Jacquards used in conventional electronic Jacquard apparatuses generally have a structure wherein the cassette main body is a resin molded article describing a rectangular solid shape and being bolted or otherwise secured in place to a holding plate, and the holding plate is fixed in place to the reciprocatingly moving Jacquard main body.

The cassette interior has a structure wherein the support pins that form the oscillating fulcra of the select hooks are cylindrical projections provided to parts of the cassette main body. The support pins are therefore integrated within the cassette.

[Patent Document 1] JP (Kokai) 2001-348752

SUMMARY OF THE INVENTION

[0008] Jacquard apparatuses are used to position numerous needles provided to Leaver lace machines, looms, or other machines, in order to determine a pattern or other aspect of a product. Such apparatuses accordingly require the selecting and operating of the select hooks to be performed in a consistently accurate manner. In particular, the select hooks resist the urging force of the needles when in an engaged state therewith, and pull the needles to a prescribed position. Therefore, the select hooks are required to be durable relative to the cassette main body, and hence to the Jacquard main body.

[0009] However, the select hooks in conventional electronic Jacquards have a structure wherein support is provided by support pins that stand upright on the main body, and the support pins are made of the same resin material as that of the cassette main body. Accordingly, cracking or other defects appear in the upright and base regions of support pins, which presents problems insofar as the

inherent functions of the support pin cannot be exhibited.

[0010] Furthermore, with regard to the distal ends shape of the select hooks, the distal ends surfaces of conventional select hooks are formed at right angles with regard to the lengthwise direction of the needles. Therefore, when the tips of the needles are in contact with the distal ends of the select hooks, the oscillation of the select hooks is impeded.

[0011] With the foregoing aspects of the prior art in view, it is an object of the present invention to provide an electronic Jacquard apparatus and an electronic Jacquard cassette wherein the needle selection operation in the electronic Jacquard apparatus can be performed stably over prolonged periods of time, and the select hooks can operate reliably even when the tips of the needles come into contact with the distal ends of the select hooks.

[0012] The electronic Jacquard apparatus according to the present invention and used to achieve the aforesaid object comprises cassettes having select hooks whose orientation is selected by oscillation between orientations of engagement and non-engagement with needles in accordance with the curving of actuating bodies comprising piezoelectric bodies, and support pins for forming fulcrum for oscillating the select hooks; holding plates for securely holding in place a plurality of cassettes in a row; a Jacquard main body for securely supporting the holding plates on which the cassettes are securely held in place; and a reciprocating mechanism for reciprocatingly moving the Jacquard main body along the lengthwise direction of the needles, wherein the support pins and cassette main body constitute separate elements, and the support pins are supported by the holding plate.

[0013] The support pins that support the select hooks in the electronic Jacquard apparatus are supported by a holding plate that is held securely in place on the Jacquard main body, which moves reciprocatingly in a prescribed direction and holds the cassette main bodies securely in place, as is conventionally performed. As a result, the oscillating fulcrum of the select are formed with support provided directly from the holding plate to support the oscillation of the select hooks.

Moreover, support are formed separately with regard to the cassette main body. Therefore, the support pins themselves can be made very strong and durable. Accordingly, the needle selecting operation can be performed stably and reliably over prolonged periods in an electronic Jacquard apparatus.

[0014] The aforescribed structure is preferably one wherein the holding plate is positioned on one side of the cassette main body in the thickness direction, a cover plate is provided to the other side of the cassette main body in the thickness direction, and the support pins is supported by the holding plate as well as the cover plate.

[0015] Adopting such a structure enables the support pins to be supported while being positioned very precisely from both sides of the cassette in the thickness direction via the holding plate and cover plate, so that a durable

structure will be obtained.

[0016] The configuration of the select hooks shall be described hereunder. The distal ends of the select hooks preferably have a slanted guiding part for guiding the select hooks from the engaged orientation side to the non-engaged orientation side when the needles are in a state of contact with the select hooks.

Providing the slanted guiding part to the distal ends of the select hooks will enable the select hooks to oscillate to the non-engaged orientation side and ensure stable oscillation when the Jacquard main body has moved to the needle side and the tips of the select hooks have come into contact with the tips of the needles.

[0017] Surfaces that are disposed on the distal ends of the select hooks and are on the pre-oscillation side during the movement of the hooks from the engaged orientation to the non-engaged orientation are provided with hook-side stoppers that come into contact with the cassette main body in the non-engaged orientation, and cassette-side stoppers are also provided for stopping further oscillation of the select hooks once contact has been made with the hook-side stoppers in the non-engaged orientation.

In this arrangement, the oscillation of the select hooks is stopped when contact is made with either stopper, thereby allowing the non-engaged orientation of the select hooks to be defined relative to the cassette main bodies. Accordingly, when the select hooks are either engaged or not engaged with the needles, their positions can be ensured, thereby allowing the select hooks to operate in a stable manner, and, by association, needle selection to be performed in stable manner.

[0018] The needles have engaging holes in which the hook parts provided to the distal ends of the select hooks enter and engage. The proximal end side of the engaging hole is preferably provided with a detaching guide part for guiding the select hook into a non-engaged orientation from an engaged orientation as a result of contact with the select hook.

[0019] The Jacquard main body of the Jacquard apparatus moves reciprocatingly in the lengthwise direction of the needles which are engaged with the select hooks. The needles, which are urged in a specific direction, are pulled against this urging force.

The hook parts provided to the distal ends of the select hooks engage with the surface on the distal end side of the needles in the engaging hole provided to the needles, the surface being adjacent the Jacquard main body side.

[0020] When the select hooks then move to the proximal end side of the needles, a state arises wherein the distal ends of the select hooks contact the detaching guide parts provided to the proximal end side of the needles. However, when the needles and select hooks come into contact on having achieved such a relative positional relationship, the detaching guide part according to the present application will guide the select hook from the engaged orientation to the non-engaged orientation.

As a result, the select hooks can be engaged and disen-

gaged in a reliable and straightforward manner, and stable operation can be ensured.

BEST MODE FOR CARRYING OUT THE INVENTION

[0021] The following is a description of an example in which an electronic Jacquard apparatus J having multiple electronic Jacquard cassettes C according to the present application is used to control the positioning of bottom bars BB of a Leaver lace machine R. In the following description, a summary of the configuration and operation of the Leaver lace machine R will first be described with reference to FIG. 1 through 3.

Leaver lace machine

[0022] FIG. 1 shows a schematic configuration of a Leaver lace machine R, and FIG. 1 shows the Leaver lace machine R as viewed obliquely from the front.

In this Leaver lace machine R, beam warp threads w wound around beams Bm are guided into a knitting part by a sley S from a position below the frame, lace RL is formed by the doup of the beam warp threads w and bobbin threads B, the resulting lace RL is raised in an alternating fashion by a back point bar BPB and a front point bar (not shown), and the lace, while being held in place, is pulled up by a porcupine roller PPR which is disposed above the back point bar and over which card clothing is wound.

[0023] The resulting Leaver lace RL is structured so as to be wound around a winding roll W that is in contact with the porcupine roller PPR.

[0024] This Leaver lace machine R is provided with an oscillating mechanism (not shown) that causes the bobbins B, which accommodate the bobbin threads b in a wound state, to oscillate in the forward and backward direction of the Leaver lace machine R, as shown in FIG. 1. The positions of these bobbins B do not move to the left and right of the Leaver lace machine R.

[0025] The bottom bars BB and top bars TB, which cause the beam warp threads w to move to the left and right of the Leaver lace machine R, are provided from the underside (the side facing the sley) of the frame between the sley S and the oscillating positions of the bobbins B. These bars BB, TB are configured so as to position the beam warp threads w to the left and right of the frame, and the Leaver lace RL can be formed by varying the relative positional relationship between the beam warp threads w and the bobbin threads b in relation to the timing with which the bobbins B move in the forward and backward direction.

[0026] The process of forming the Leaver lace RL will now be described with reference to FIG. 2.

The lines in the drawing that are drawn in parallel in the longitudinal direction (drawn as single dashed lines extending vertically) indicate the bobbin threads b, and the beam warp threads w are positioned relative to these bobbin threads b by the bottom bars BB and the top bars

TB.

In the Leaver lace machine R, the beam warp threads w are interwoven with the bobbin threads b while moving in the transverse and the forward and backward directions, forming lace RL. Specifically, transverse moving parts ww extending in the transverse direction, and arcuate weave-advancing parts wh for advancing movement in the forward and backward direction; i.e., that advance weaving, are provided in an alternating fashion, whereby the structural positions of the beam warp threads w are specified.

[0027] In the example shown in FIG. 2, the beam warp threads w are placed in an alternating fashion on the back sides, the front sides, the back sides, and the front sides of the bobbin threads b, from the first transverse moving part ww1 at the location that is woven first in the weaving process, to the fourth transverse moving part ww4 that is woven next in the process.

In the description associated with this diagram, the positions of the bobbin threads b are fixed, and the beam warp threads w move to the front side and back side. However, in an actual Leaver lace machine R, the relative relationship between the beam warp threads w and the bobbin threads b is by repeatedly moving the positions of the bobbin threads b in the forward and backward direction of the frame relative to the beam warp threads w at the fixed positions, as previously described with reference to FIG. 1.

[0028] A description has been provided hereinabove of the front/back relationship between the beam warp threads w and the bobbin threads b, while hereunder is described the formation of the previously mentioned transverse moving parts ww and weave-advancing parts wh.

In FIG. 2, the letters (a), (b), (c), (d), and (e) indicate the positions and doup states of the beam warp threads w in the top bars TB and bottom bars BB in each of their respective placements.

[0029] The beam warp threads w are positioned by the top bars TB and the bottom bars BB as previously described, and are also inserted through guiding holes h provided to the top bars TB and the bottom bars BB. The guiding holes ht provided to the top bars TB are relatively large, as illustrated, and are also square in shape. The beam warp threads w can thereby be relatively positioned to the right and left sides of the bobbin threads b. The guiding holes hb provided to the bottom bars BB are relatively small, allowing the positions of the beam warp threads w to be ensured.

Therefore, the positions of the beam warp threads w relative to the bobbin threads b as shown in (a) are determined as described hereunder. The positions relative to the rightmost bobbin thread b1 in the drawing are determined by positioning the threads w at the relative position to the left of the center guiding holes ht provided to the top bars TB.

[0030] As weaving proceeds, the top bars TB move two pitches to the left while the bottom bars BB move the

same distance to the left, causing the positions of the beam warp threads *w* relative to the third bobbin thread *b*3 from the right to be determined at this position: i.e., a moving part *ww*1 is formed. After this step is finished, the bobbin threads *b* move in the forward backward direction of the frame, the beam warp threads *w* are positioned to the front of the bobbin threads *b*, and the bobbin threads *b* become intertwined with the beam warp threads *w*. This state is shown in (b), and the previously described weave-advancing parts *wh* are thus formed.

[0031] The subsequent weave can form a Leaver lace structure as a result of the repeating transverse movement (the state in which the transverse moving part *ww*2 shown in (c) is formed) of the top bars *TB* and bottom bars *BB*, and the repeating forward and backward movement (the change from (c) to (d), and also the change from (d) to (e)) of the bobbin threads *b* in each step.

[0032] FIG. 3 is a schematic view of the relative positional relationship between the top bars *TB* and the bottom bars *BB* in the Leaver lace machine *R*.

The top bars *TB* and the bottom bars *BB* are both configured to move to the left and right of the frame. For example, the top bars *TB* can be positioned at 33 positions of 0 through 32, and the bottom bars *BB* can be positioned at two positions of 0 and 1. Positioning of both bars *TB*, *BB* to the left and right is achieved by Jacquard apparatuses *Jt*, *Jb* provided separately for each of the bars *TB*, *BB*.

The positioning of the top bars *TB* to the left and right is achieved by the top Jacquard apparatus *Jt*. The top Jacquard apparatus *Jt* is configured to achieve this positioning as follows. The top bars *TB* are moved to the left and right in FIG. 3 relative to droppers *D* that are positioned vertically in the frame by two-position selecting Jacquard apparatuses *Jt*1 for the droppers. The left and right movement of the top bars *TB* is confined within spacers *s* provided at the distal ends of the droppers.

[0033] The bottom Jacquard apparatus *Jb*, which is the Jacquard apparatus *J* according to the present invention, is a two-position selecting Jacquard apparatus *Jb*. In this apparatus, the bottom bars *BB* are placed in two positions to the left and right of the frame, which are the left and right in FIG. 3.

The bottom bars are urged to the left by urging mechanisms (pulling springs *sp*) provided to the side left end in FIG. 3) opposite position where the Jacquard apparatus *Jb* is placed, and the distal ends (right, ends) of the bottom bars brought into connect with needles *N* via an adjustment rod *A* for contact adjustment, as shown in FIG. 3. The needles *N* are provided in a one-to-one correspondence with the bottom bars *BB*. The Jacquard apparatus *Jb* for the bottom bars *BB* is the Jacquard apparatus according to the present application, and has a configuration unique to the present application as described hereinbelow.

Bottom Jacquard apparatus

[0034] The bottom Jacquard apparatus *Jb* according to the present application is shown in FIGS. 4 through 8. FIG. 4 is a rear view, FIG. 5 is a side view, and FIG. 6 is an exploded side view, all relating to an electronic Jacquard apparatus *Jb*. FIG. 7 is a plan view of the electronic Jacquard cassette *C* according to the present invention, and FIG. 8 is a side view of the same electronic Jacquard cassette *C*.

The Jacquard apparatus *Jb* is provided to control the positions of threads *w* strung over the frame, and also to position needles *N* for handling each thread or multiple threads *w* in groups.

Jacquard main body

[0035] A Jacquard main body 1 is formed in the shape of a box in general, as shown in FIGS. 4, 5, and 6. FIG. 4 shows the Jacquard main body 1 as seen from the rear, and a front plate 2 is provided at the left end as shown in FIG. 5. The right end of the main body is left open, and is configured to allow a holding plate 3 to be inserted, with the electronic Jacquard cassette *C* being fixed and mounted on the holding plate 3, as shown in FIG. 6. FIG. 5 shows a state in which the holding plate 3 has been completely inserted, and is fixed in place by a cassette fixing plate 4.

[0036] As can be seen in FIGS. 5 and 6, a configuration is adopted in the illustrated example in which four holding 3 are mounted vertically. Also, the front plate 2 previously described is provided with needle holes 5 into which the needles *N* are guidably inserted, as can be seen in FIGS. 4 and 5.

The needles *N* are formed so as to constitute a rod shape extending in the longitudinal direction, as shown in FIGS. 3 and 5. Adjustment rod connecting parts *N*1 are provided at the proximal ends of the needles, projecting parts *N*2 that extend vertically to inhibit excessive needle movement are provided to the intermediate area of the needles, and the distal ends of the needles have engaging holes *N*3 for engaging select hooks 8. The engaging holes *N*3 are configured as substantially square holes as shown in FIG. 7. In the cross-sectional shape in plan view shown in FIG. 7, proximal side end surfaces *N*3b and distal side end surfaces *N*3a are formed to be inclined to the right and downward, constituting a bottom side as one moves to the right in the drawing. Therefore, when engaging protuberances 14a of the select hooks 8 are engaged with the needles, the distal side end surfaces *N*3a can ensure reliable engagement, and the proximal side end surfaces *N*3b are configured so that the select hooks 8 are guided from an engaged orientation to a non-engaged orientation, when the needles unexpectedly move forward (move to the right in the drawings), as shown in FIG. 13C through 13E. Therefore, the proximal side end surfaces *N*3b serve as detaching guide parts that come into contact with the select hooks 8 to guide

the select hooks 8 from an engaged orientation to a non-engaged orientation. The numerical symbol 110 in FIG. 13 indicates a guiding groove in the needle N.

The cross-sectional shapes of the needles N are formed into long squares extending in the height direction, and needle holes 5 provided to the front plate 2 are of a shape that corresponds to the shapes of these needles.

[0037] Seven electronic Jacquard apparatus cassettes C can be mounted on one holding plate 3, and seven needles N are positioned with one cassette C, as can be seen in FIG. 4. Therefore, 49 needles N in one column, or 196 needles N in the entire Jacquard apparatus, can be positioned and operated.

[0038] The Jacquard main body 1 is configured so that a reciprocating mechanism 6 is provided to the Jacquard main body 1, this mechanism allows the main body to move to the left and right in a reciprocating manner, or to move in the longitudinal direction of the bottom bars BB and the needles N, as shown in FIG. 5.

FIGS. 9 through 12 are diagrams showing the operation of the Jacquard apparatus Jb according to the present application, wherein the cassette positions are varied by the reciprocating mechanism 6.

Electronic Jacquard apparatus cassette

[0039] In an electronic Jacquard apparatus cassette C, the select hooks 8, actuating bodies 9 composed of a piezoelectric body that are used for the select hooks 8, and an electronic control board 10 for controlling the components are accommodated within a substantially rectangular solid shaped cassette main body 7, as shown in FIGS. 6 and 7. The cassette comprises a needle entry part 7a, a select hook placement part 7b, an actuating body placement part 7c, and an electronic control part 7d, in order from the distal end side of the cassette main body 7 to the back end side, as shown in FIG. 7.

Needle entry part

[0040] The needle entry part 7a, as shall be described hereunder based on FIGS. 9 through 12, is the area where the distal ends of the needles N enter, and partitioning walls 11 for guiding the needles are provided in parallel to the lengthwise direction of the needles N, which is the direction of entry and exit of the needles.

Select hook placement part

[0041] The select hook placement part 7b is a position configured to allow the select hooks 8 to oscillate and the select hooks 8 to assume a state of engagement or non-engagement with the needles N in accordance with the oscillation of the hooks and the entry or exit of the needles N.

In substantially the center of this position, support pins 12 that act as fulcras for the oscillation of the select hooks 8 are disposed for each select hook 8, as is apparent

from FIG. 7. The select hooks 8 comprise a hook part 8a extending to the front side of the support pins 12, and an actuating body entry part 8b extending to the rear side of the support pins 12. The hook part 8a is longer than the actuating body entry part 8b. Specifically, an action position p1 of the actuating body 9 and an action position p2 of the hook 14 provided to the distal end of the hook part have a positional relationship whereby the action position p2 of the hook 14 is set apart from the oscillation fulcras, as viewed from the oscillation fulcras formed by the support pins 12. As a result, a small displacement of the actuating body 9 can be converted into a large displacement of the hook.

[0042] The hook part 8a comprises an arm 15 extending ahead of the support pins 12, and a hook 14 provided to the distal end. As shown in FIG. 7, the hook 14 comprises an engagement protuberance 14a extending vertically within the drawing with respect to the arm 15. The engagement protuberances 14a are of a fixed thickness, and are generally fashioned to a length that enables entry into the engagement holes N3 provided to the distal end of the needles.

[0043] A slanted guiding part 17 for guiding the select hooks 8 from the engaged orientation side to the non-engaged orientation side when the needles N are in a state of contact with the select hooks 8 is provided to the distal end of the hooks 14, which are on the distal end of the select hooks 8. The slanted guiding part 17 is provided in an area disposed toward the bottom of FIG. 7. According to the example indicated in FIG. 7, a slanted surface disposed in the lower side of the drawing is provided facing from the proximal end of the needles N (on the left of the drawing) towards the distal end (on the right side of the drawing) with respect to the direction of entry of the needles N (movement towards the right side of the drawing). In the resulting arrangement, the select hooks 8 can oscillate and retract to the upper side, i.e., the non-engaged side, due to contact made between the end surface of the distal end of the needles N and the slanted surface. The described state is in FIGS. 13A through 13B.

[0044] Hook-side stoppers 18 that come into contact with the cassette main body 7 in the non-engagement orientation are provided to the distal ends of the hooks 14, which are the distal ends of the select hooks 8. The stoppers are provided on the upper side in FIG. 7. That is, the stoppers are provided to the surfaces that lie on the pre-oscillation side when the select hooks 8 oscillate from the engagement orientation to the non-engagement orientation. According to the example shown in the drawing, the hook-side stoppers 18 form a surface on the upper side of the drawing that inclines from the proximal end of the needles N (left side of the drawing) towards the distal end side (right side of the drawing) in the direction of entry of the needles (movement towards the right side of the drawing).

[0045] The cassette main body 7 is provided with cassette-side stoppers 19 that come into contact with the hook-side stoppers 18 and stop further oscillation of the

select hooks 8 once they have assumed the non-engagement position. Specifically, as shown in FIG. 7, the cassette-side stoppers 19 are fashioned as protuberances that project from the bottom of the cassette main body 7 in the thickness direction thereof, so that the surfaces of the hook-side stoppers 18 and cassette-side stoppers 19 will come into contact (refer to FIG. 13B).

[0046] The actuating body entry part 8b forms an extending part that extends towards the rear end of the select hooks 8, and the center thereof in the width direction is provided with an entry hole 20 into which the actuating body 9 enters. The entry hole 20 is provided with enough space to allow the actuating body 9 to oscillate.

Actuating body placement part

[0047] The actuating bodies 9, which are piezoelectric bodies, are disposed in a quantity corresponding to the number of select hooks 8 in the actuating body placement part 7c. The rear-end positions of these actuating bodies 9 are secured in place, form fulcra for oscillation, and are so that the distal thereof enter the entry holes 20 of the select hooks 8. Each body 9 control from electronic control board 10 on the electronic control part and curves in an upward/downward direction as shown in FIG. 7. Specifically, the piezoelectric bodies may be ceramic piezoelectric resonators. As a result, oscillation of the select hooks 8 can be controlled.

Electronic control part

[0048] The electronic control part 7d has an electronic control board 10 for controlling the actuating bodies 9. Control of the oscillation of the actuating bodies 9 (select switch control) is separately executed according to control data sent to the cassette C.

[0049] The materials constituting the respective members that form the cassette C for the electronic Jacquard are described hereunder. The cassette main body 7 and select hooks 8 are both made of a resin, while the support pins 12 are made of metal (stainless steel). The needles N are also made of the same resin as the select hooks 8.

[0050] The structure of the cassette C for the electronic Jacquard according to the present application has been described hereinabove. A description shall be provided hereunder in regard to the unique structure adopted for the support pins 12 in the present application.

[0051] In the present application, as has been described in the foregoing, the cassette main body 7 and the support pins 12 are different members, and the cassette main body 7 is made of a resin while the support pins 12 are made of a metal. However, as shown in FIG. 8, a structure is adopted in the present application whereby the support pins 12 are supported not only by the cassette main body 7 but by the holding plate 3 and the cover plate 21 as well.

[0052] As shall be apparent from FIGS. 4 and 8, a structure is adopted for the cassette C of the electronic

Jacquard according to the present application whereby the bottom surface is securely held in place by the holding plate 3, and the top surface is covered by the cover plate 21. As has been described in the foregoing, an arrangement is provided whereby the holding plate 3 is secured in place to the Jacquard main body 1, but the cover plate 21 is also securely held in place on the holding plate 3.

[0053] As shall be apparent from FIG. 8, a structure is adopted for the support pins 12 so that the pins pass through the main body 7 in the direction of the thickness of the cassette C, and protrude on both the top and bottom sides. A structure is adopted whereby the protuberances 22 are supported by the holding plate 3 on the bottom side and by the cover plate 21 on the top side. The protuberance that faces the holding plate 3 is referred to as the part supported by the holding plate, and the protuberance that faces the cover plate 21 is referred to as the part supported by the cover plate. Accordingly, the support pins 12 have a structure that is supported by the holding plate 3 as well as the cover plate 21.

[0054] As a result, the support pins 12 are strongly integrated with the Jacquard main body 1 via the plates 3, 21. The support pins 12 are accordingly able to closely follow the reciprocating movement of the Jacquard main body 1, while exhibiting no incidence of excess stresses or cracking in certain areas that can lead to operational failure or other problems.

[0055] A description has been provided hereinabove in regard to the structure of the cassette C for the electronic Jacquard and of the electronic Jacquard Jb according to the present application. A description shall be provided hereunder in regard to the operation thereof, with reference being made to FIGS. 9 to 12.

[0056] These diagrams are used to describe a series of continuous actions. The left side of the drawings corresponds to the side on which the bottom bar BB is disposed, and the right side corresponds to the end of the electronic Jacquard Jb.

[0057] In FIGS. 9 through 12, FIGS. 9A and 11F correspond to states where the needles N and the cassette C are in their original positions, with the needles N being positionally supported in their original position, and the cassette C (and by association the Jacquard main body 1) being situated in its most advanced position; i.e., advanced to the left side of the drawing.

The needles N shown in the drawings are supported in their original position by positional support across the horizontal direction from the Leaver lace machine RL. FIG. 10D shows a state in which the positional support is removed, and if the select hooks 8 are not engaged during this time, springs sp used as an urging mechanism and provided to the proximal end side of the bottom bar BB act to pull the needles towards the left side of the drawing. As the step proceeds, the needles return to their original position, as shown in FIG. 11F.

[0058] The drawings show the cassette C moving from its original position toward a retracted position on the right side of the drawings (with FIG. 10D showing the

position of maximum retraction), and returning to its original position (shown in FIG. 11F) as the step proceeds. The retracting/returning action is based on the reciprocating mechanism 6 provided to the Jacquard main body 1.

[0059] The sequence of the steps shall be described hereunder.

1 Original position

In this state, the positional relationship is shown in FIGS. 9A and 11F. The select hooks 8 adopt either an engaged or non-engaged orientation in accordance with the prior weaving state. As is evident from the drawings, the select hooks adopt an alternately engaged and non-engaged orientation in order from the uppermost select hook 8.

2 Weave data output

In the state shown in FIG. 9B, weave data for each actuating body 9 is output from the operation control apparatus (not shown) provided to the electronic Jacquard apparatus Jb. The weave data is information that specifically prompts each of the actuating bodies 9 to oscillate towards engagement or non-engagement. In the example shown in the drawing, (b) shows the select hooks 8 engaged non-engaged in a reversed state relative to condition shown in (a).

3 Movement of needle and cassette

FIG. 10C shows a state wherein the needles N have moved from the state shown in FIG. 9B toward the left of the drawing, and the cassette C has toward the side. The needles N with which the select hooks 8 have engaged move to the right along with the rightward movement of the cassette C, and the needles N with which the select hooks 8 have not engaged move to the left in accordance with the action on the Leaver lace machine RL.

4 Pattern weaving

The position shown in FIG. 10D is a state in which the bobbin B on the Leaver lace machine RL has moved along the forward and backward direction of the frame, and a single weave has been executed.

5 Returning to original position

As shown in FIG. 11F, the components subsequently return to their original positions via the state shown in FIG. 11E after having followed the previous pattern weave information.

6 Input of new weave data

The state shown in FIG. 12G is the same as the state shown in FIG. 9B, with the state of engagement between the select hooks 8 and needles N being switched based on newly transmitted weave data. The actions from FIG. 10C onwards are then repeated, and the weaving process continues.

INDUSTRIAL APPLICABILITY

[0060] It is possible to provide an electronic Jacquard apparatus and an electronic Jacquard cassette wherein

the needle selection operation in the electronic Jacquard apparatus can be performed stably over prolonged periods of time, and the select hooks can operate reliably even when the distal ends of the needles are in contact with the distal ends of the select hooks.

DESCRIPTION OF DRAWINGS

[0061]

FIG. 1 is a diagram schematically showing the structure of a Leaver lace machine;

FIG. 2 is a diagram showing the state of Leaver lace formation;

FIG. 3 is a diagram showing the state in which a Jacquard operates with regard to the top and bottom bars of a Leaver lace machine;

FIG. 4 is a rear view of an electronic Jacquard apparatus;

FIG. 5 is a side view of an electronic Jacquard apparatus;

FIG. 6 is an exploded side view of an electronic Jacquard apparatus;

FIG. 7 is a top view of a cassette for an electronic Jacquard;

FIG. 8 is a side view of a cassette for an electronic Jacquard apparatus;

FIG. 9 is a diagram showing a needle selection state based on select hooks;

FIG. 10 is a diagram showing a needle selection state based on select hooks;

FIG. 11 is a diagram showing a needle selection state based on select hooks;

FIG. 12 is a diagram showing a needle selection state based on select hooks; and

FIG. 13 is a diagram showing the operation of the select hooks during the needle selection operation in detail.

DESCRIPTION OF THE REFERENCE SIGNS

[0062]

1 JACQUARD MAIN BODY

2 FRONT PLATE

3 HOLDING PLATE

4 CASSETTE FIXING PLATE

5 NEEDLE HOLE

6 RECIPROCATING MECHANISM

7 CASSETTE MAIN BODY

8 SELECT HOOK

9 ACTUATING BODY

10 ELECTRONIC CONTROL BOARD

11 DIVIDING WALL

12 SUPPORT PIN

13 ACTUATING BODY

14 HOOK

15 ARM

16 ENGAGING HOLE
 17 SLANTED GUIDING PART
 18 HOOK-SIDE STOPPER
 19 CASSETTE-SIDE STOPPER
 20 ENTRY HOLE
 21 COVER PLATE
 22 PROTUBERANCE

Claims

1. An electronic Jacquard apparatus, comprising:

a cassette having select hooks whose orientation is selected by oscillation between orientations of engagement and non-engagement with needles in accordance with the curving of actuating bodies comprising piezoelectric bodies, and support pins for forming fulcra for oscillating the select hooks;

a holding plate for securely holding in place a plurality of cassettes in a row;

a Jacquard main body for securely supporting the holding plate on which the cassettes are securely held in place; and

a reciprocating mechanism for reciprocatingly moving the Jacquard main body along the lengthwise direction of the needles, wherein the support pins and cassette main body constitute separate elements; and the support pins are supported by the holding plate.

2. The electronic Jacquard apparatus of Claim 1, wherein

the holding plate is positioned on one side of the cassette main body in the thickness direction and a cover plate is provided to the other side of the cassette main body in the thickness direction; and the support pins are supported from both sides by the holding plate and cover plate.

3. The electronic Jacquard apparatus of Claim 1 or 2, wherein distal ends of the select hooks have a slanted guiding part for guiding the select hooks from the engaged orientation side to the non-engaged orientation side when the needles are in a state of contact with the select hooks.

4. The electronic Jacquard apparatus of Claim 1 or 2, wherein

surfaces that are disposed on the distal ends of the select hooks and are on the pre-oscillation during the movement of the select hooks from the engaged orientation to the non-engaged orientation are provided with hook-side stoppers that come into contact with the cassette main body in the non-engaged orientation; and

cassette-side stoppers are also provided for stopping further oscillation of the select hooks once contact has been made with the hook-side stoppers in the non-engaged orientation.

5. The electronic Jacquard apparatus of Claim 1 or 2, wherein the needles have engaging holes in which hook parts provided to the distal ends of the select hooks enter and engage; and the proximal end side of the engaging holes has a detaching guide part for guiding the select hook into a non-engaged orientation from an engaged orientation as a result of contact with the select hook.

6. The electronic Jacquard apparatus of Claim 1 or 2, wherein the cassette main body is composed of a resin; and the support pins and holding plate are composed of a metal.

7. The electronic Jacquard apparatus of Claim 1 or 2, which is provided to a bottom bar of a Leaver lace machine used to manufacture Leaver lace; and is used for positioning the bottom bar, which is positioned in the lengthwise direction of the needles.

8. An electronic Jacquard cassette, comprising:

select hooks whose orientation is selected by oscillation between orientations of engagement and non-engagement with needles in accordance with the curving of actuating bodies comprising piezoelectric bodies, and support pins for forming fulcra for oscillating the select hooks, wherein

the cassette is used upon being mounted securely in place on a holding plate of an electronic Jacquard apparatus provided with a reciprocating mechanism for reciprocatingly moving a Jacquard main body along the lengthwise direction of the needles, and wherein

the support pins and main body constitute separate elements, and the support pins are provided with a part that is able to be supported by a holding plate in order for support to be provided by the holding plate.

9. The electronic Jacquard cassette of Claim 8, comprising:

a part that is able to be supported by a cover plate for the support pins to be supported by the cover plate, wherein

the holding plate is positioned on one side of the cassette main body in the thickness direction; and

a cover plate is provided to the other side of the cassette main body in the thickness direction, in

which state the support pins are supported from both sides by the holding plate and cover plate.

10. The electronic Jacquard cassette of Claim 8 or 9, wherein distal ends of the select hooks have a slanted guiding part for guiding the select hooks from the engaged orientation side to the non-engaged orientation side when the needles are in a state of contact with the select hooks. 5
11. The electronic Jacquard cassette of Claim 8 or 9, wherein surfaces that are disposed on the distal ends of the select hooks and are on the pre-oscillation side during the movement of the select hooks from the engaged orientation to the non-engaged orientation are provided with hook-side stoppers that come into contact with the cassette main body in the non-engaged orientation; and cassette-side stoppers are also provided for stopping further oscillation of the select hooks once contact has been made with the hook-side stoppers in the non-engaged orientation. 10 15 20
12. The electronic Jacquard cassette of Claim 8 or 9, wherein the cassette main body is composed of a resin; and the support pins and holding plate are composed of a metal. 25 30

35

40

45

50

55

FIG.1

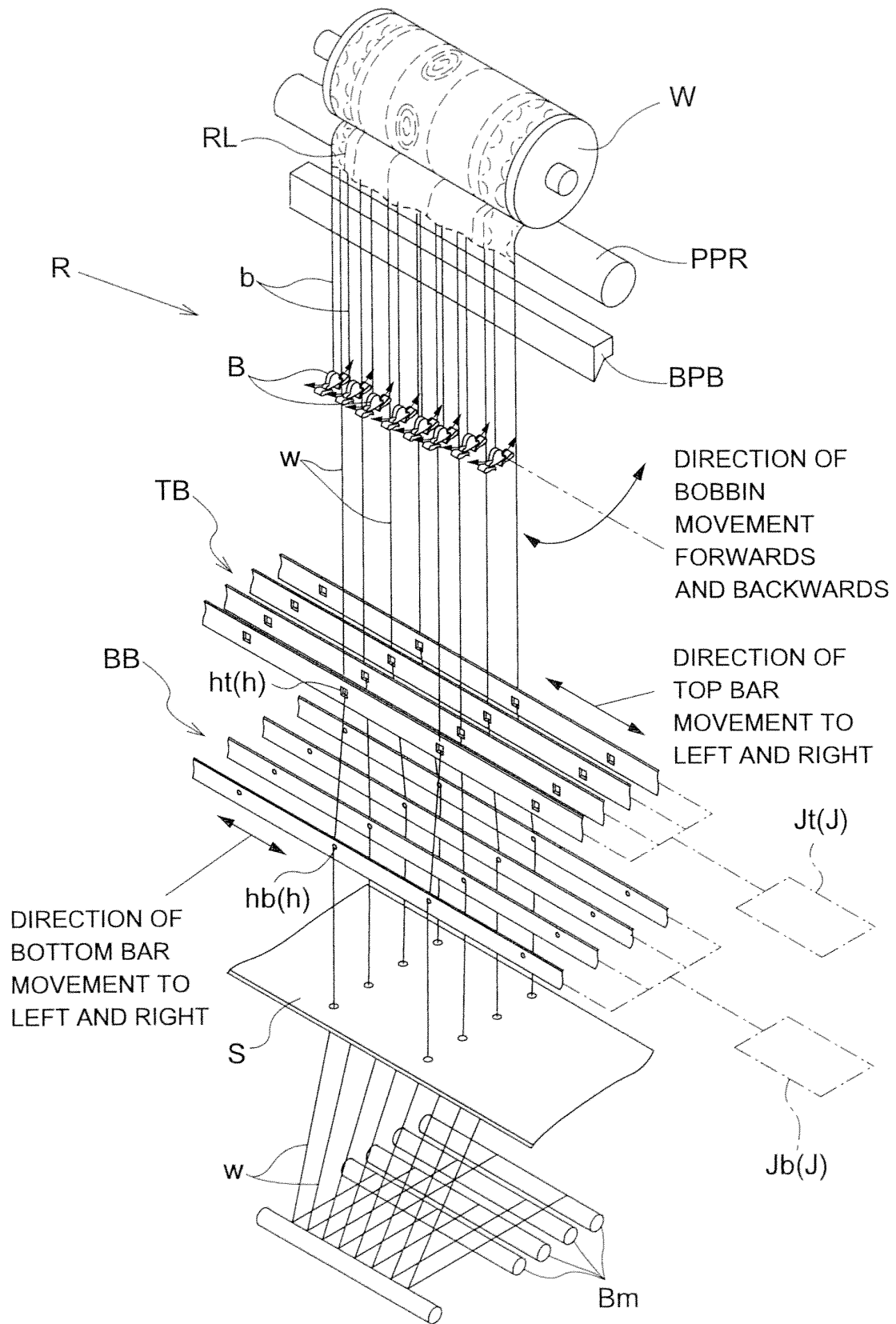


FIG.2

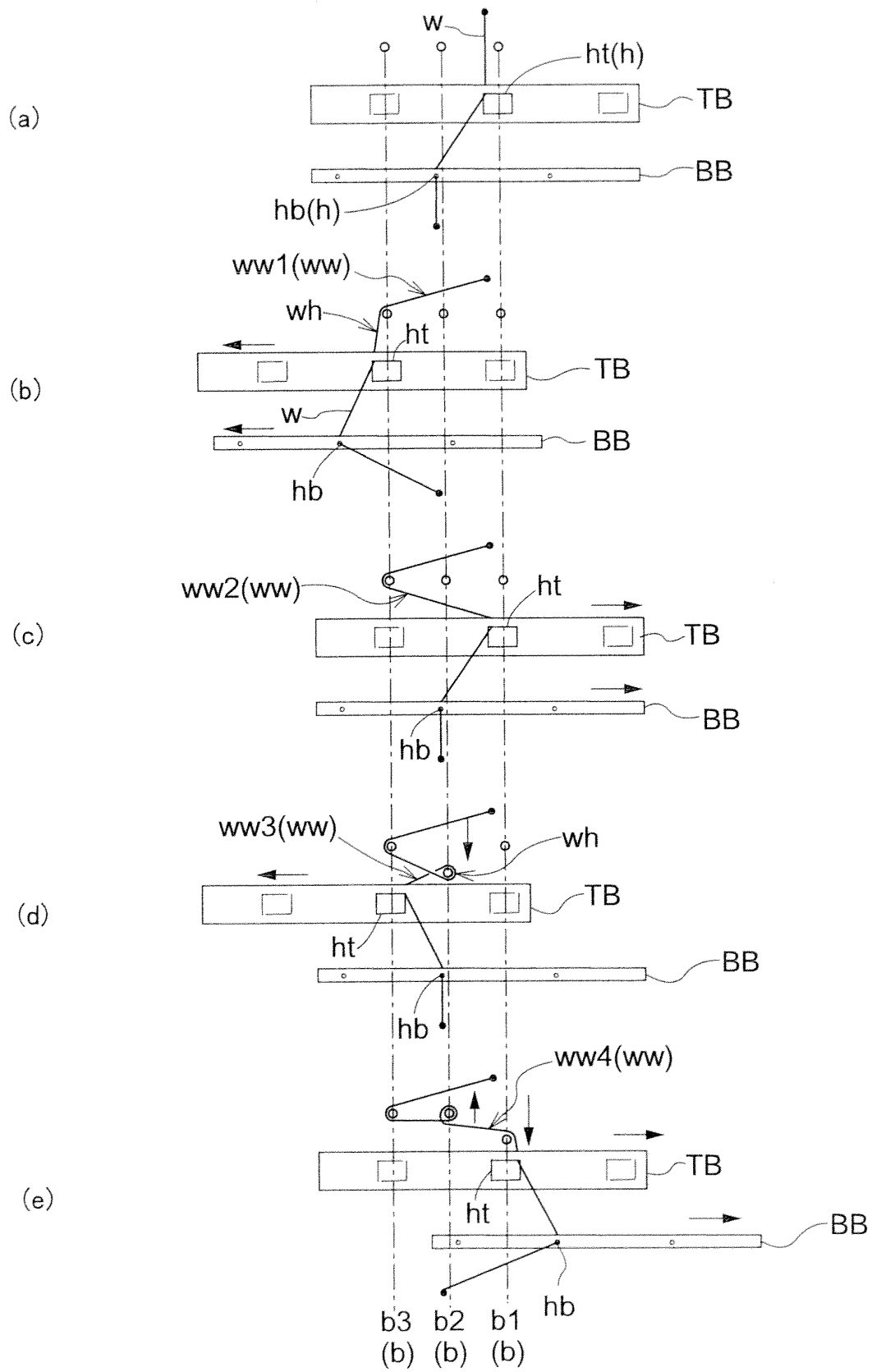


FIG.3

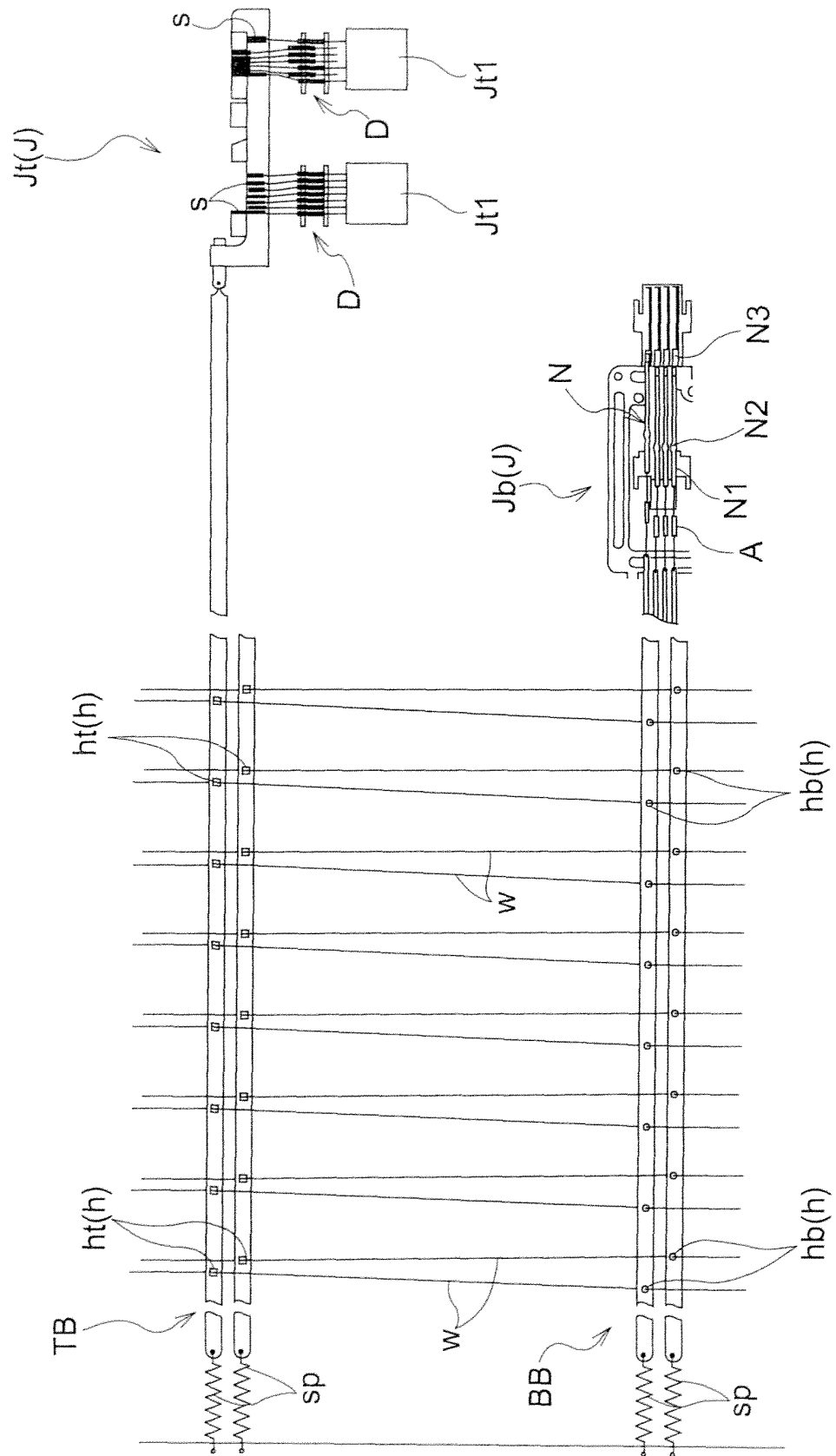


FIG.4

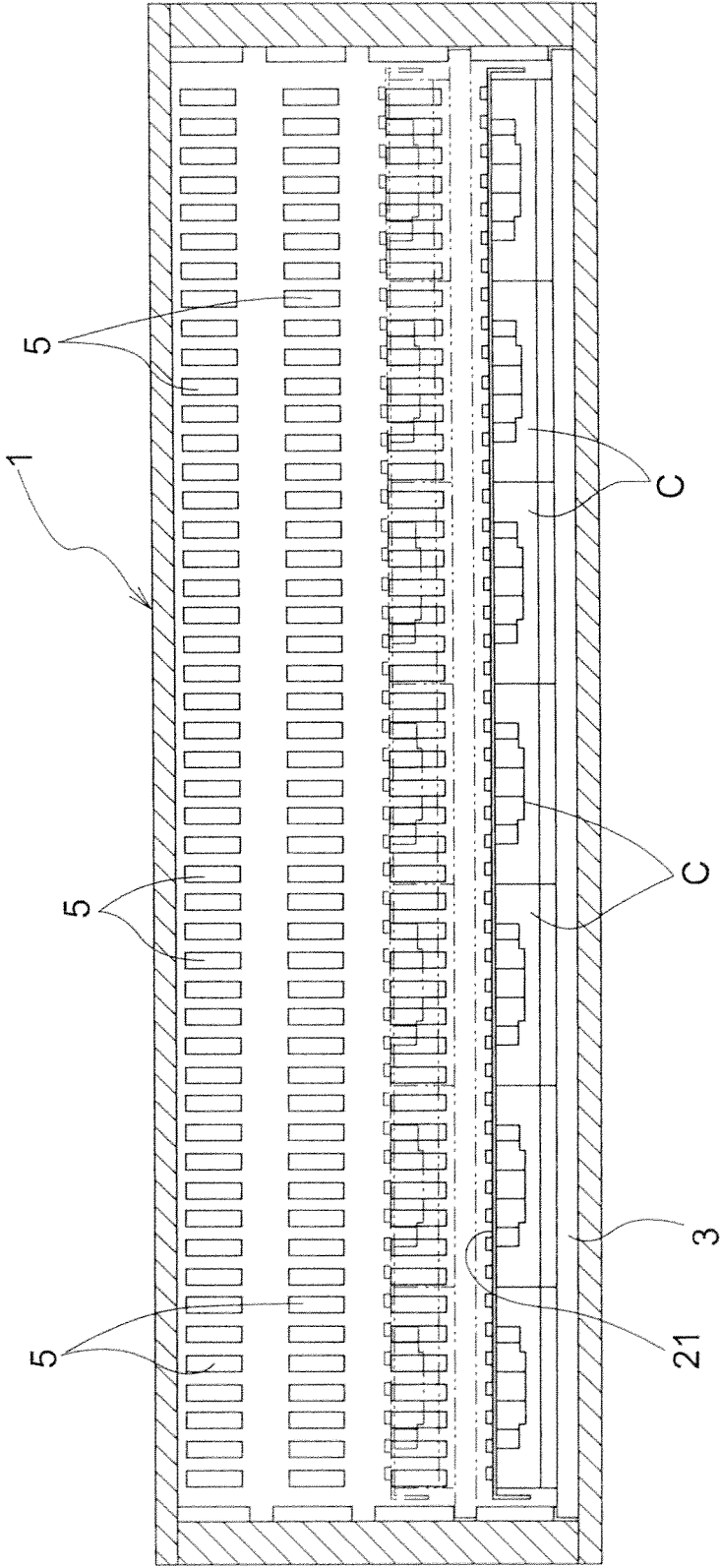


FIG.5

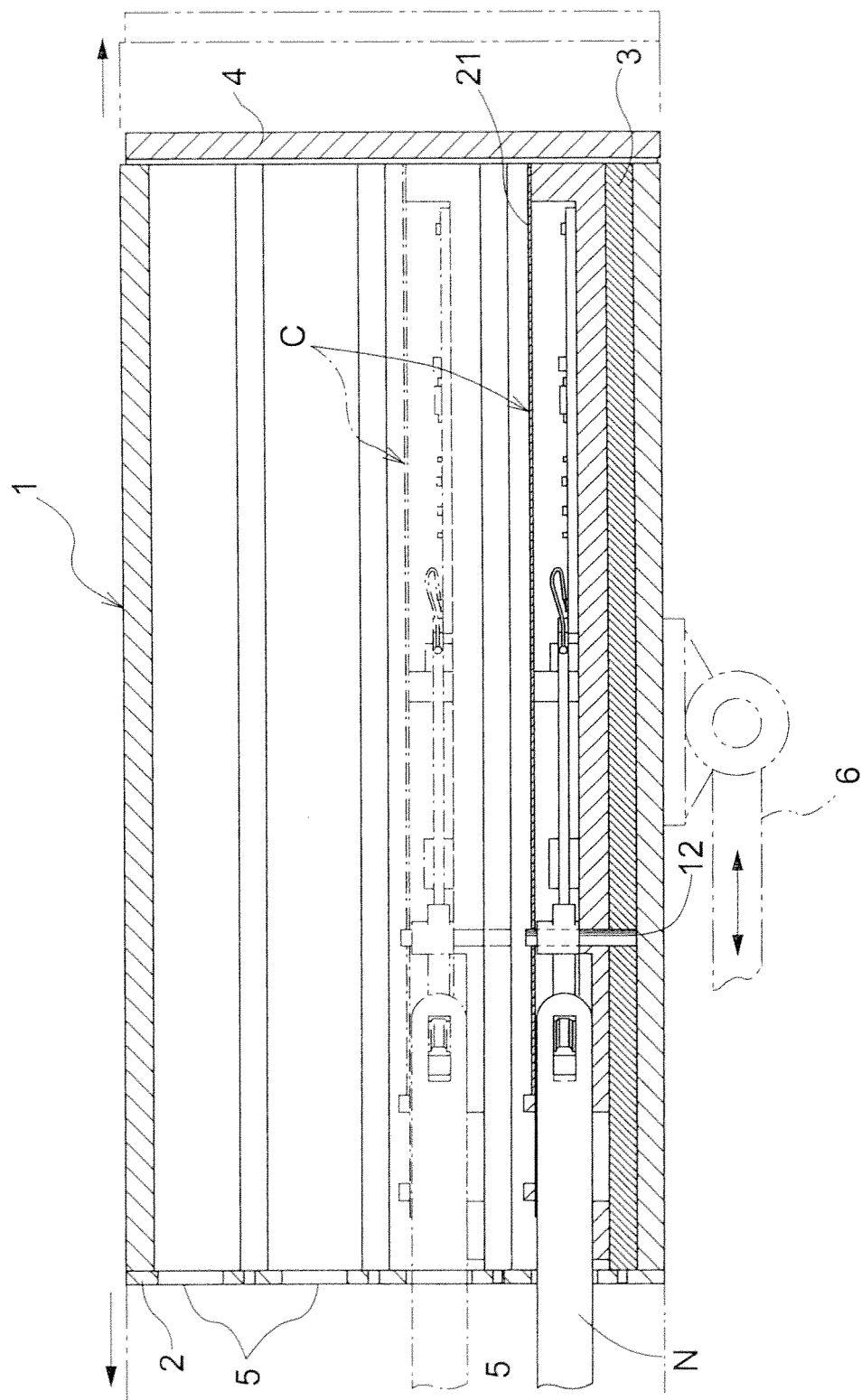


FIG.6

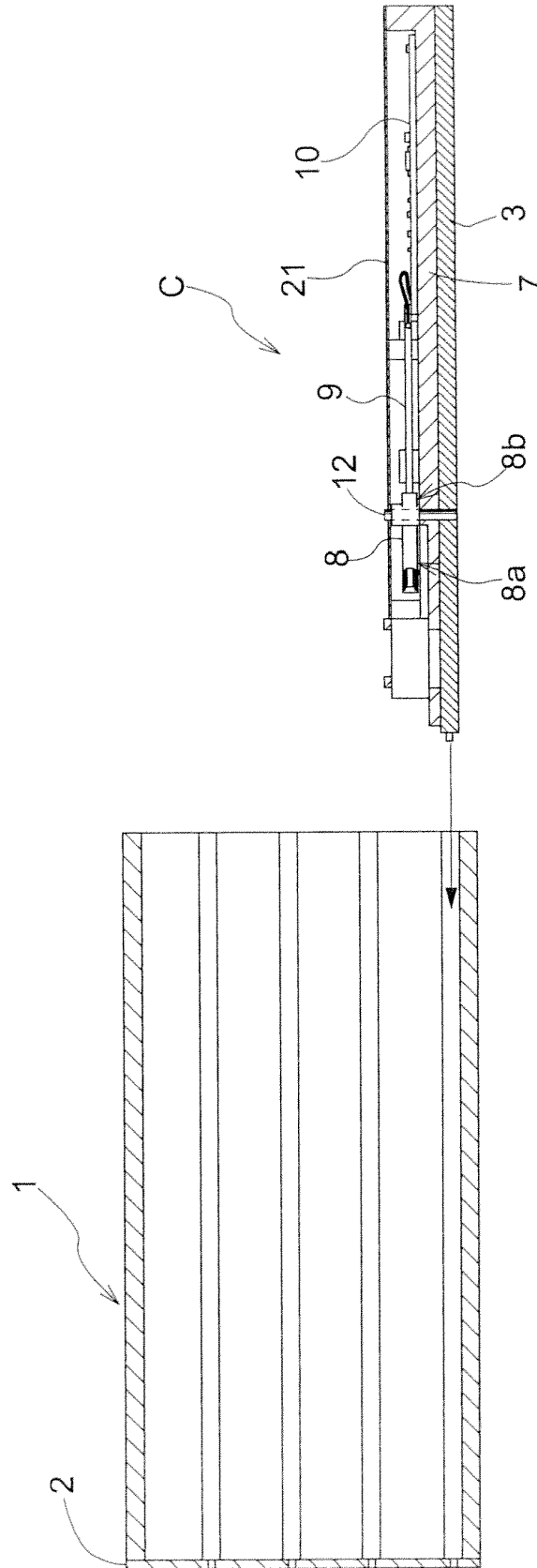
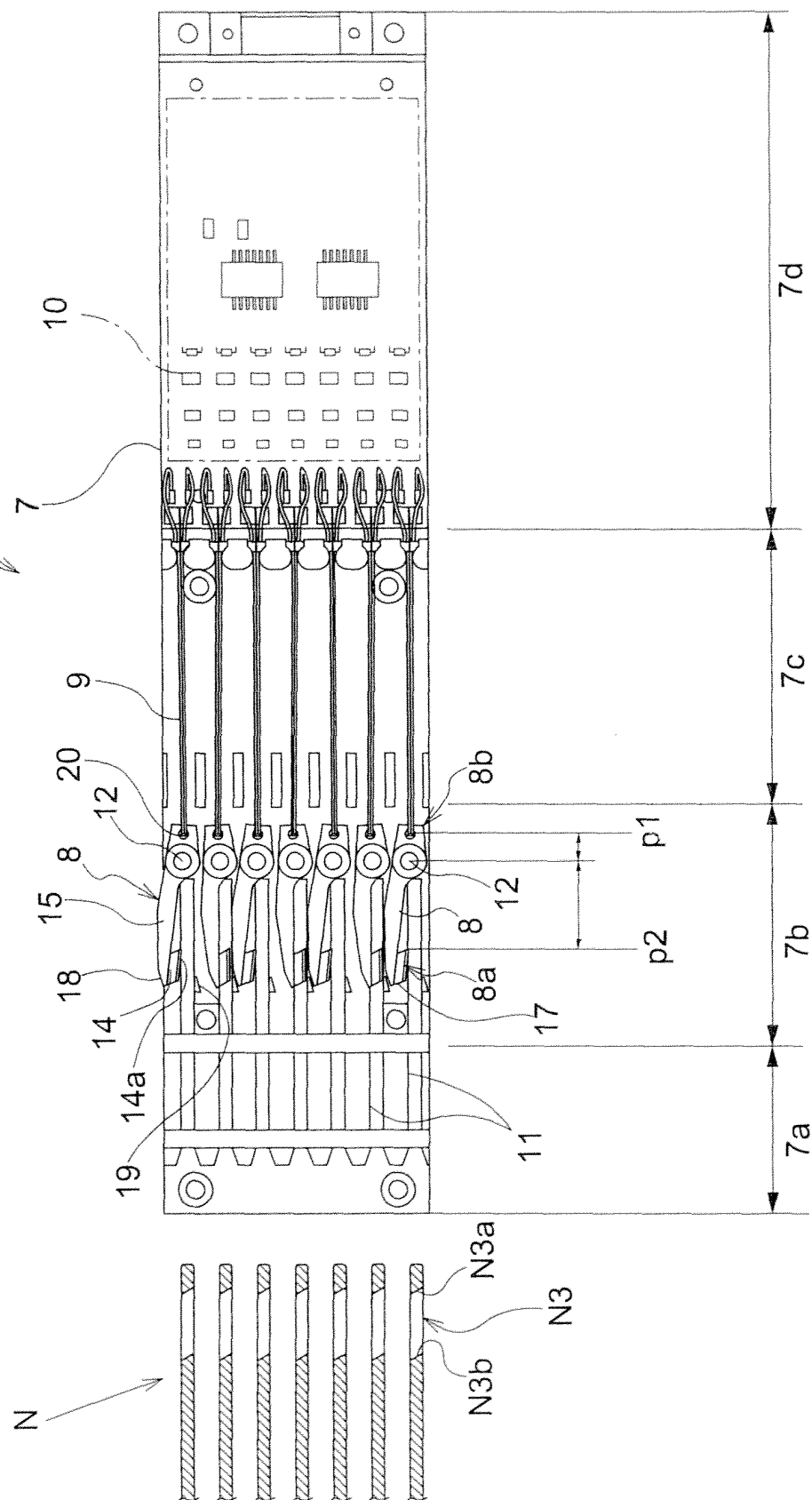


FIG.7



8.
G.
F.

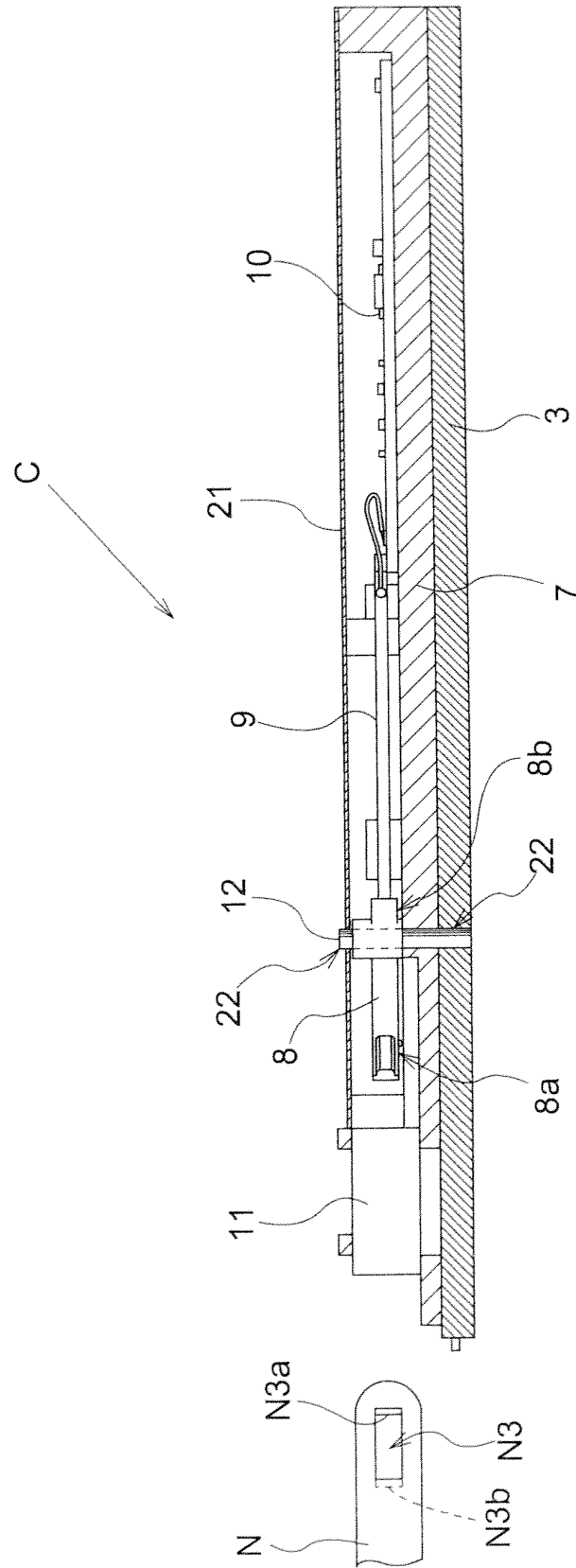


FIG. 9

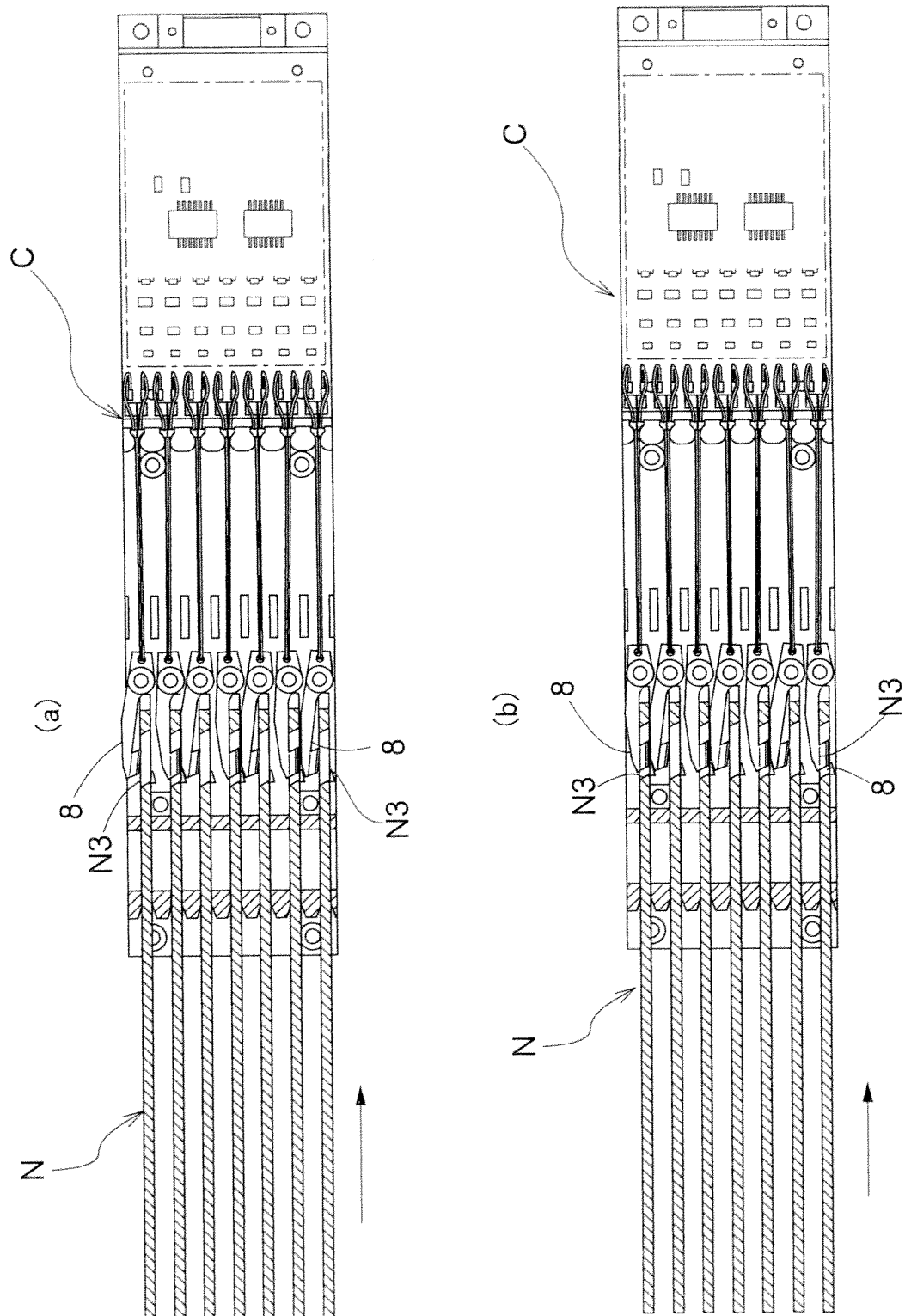


FIG. 10

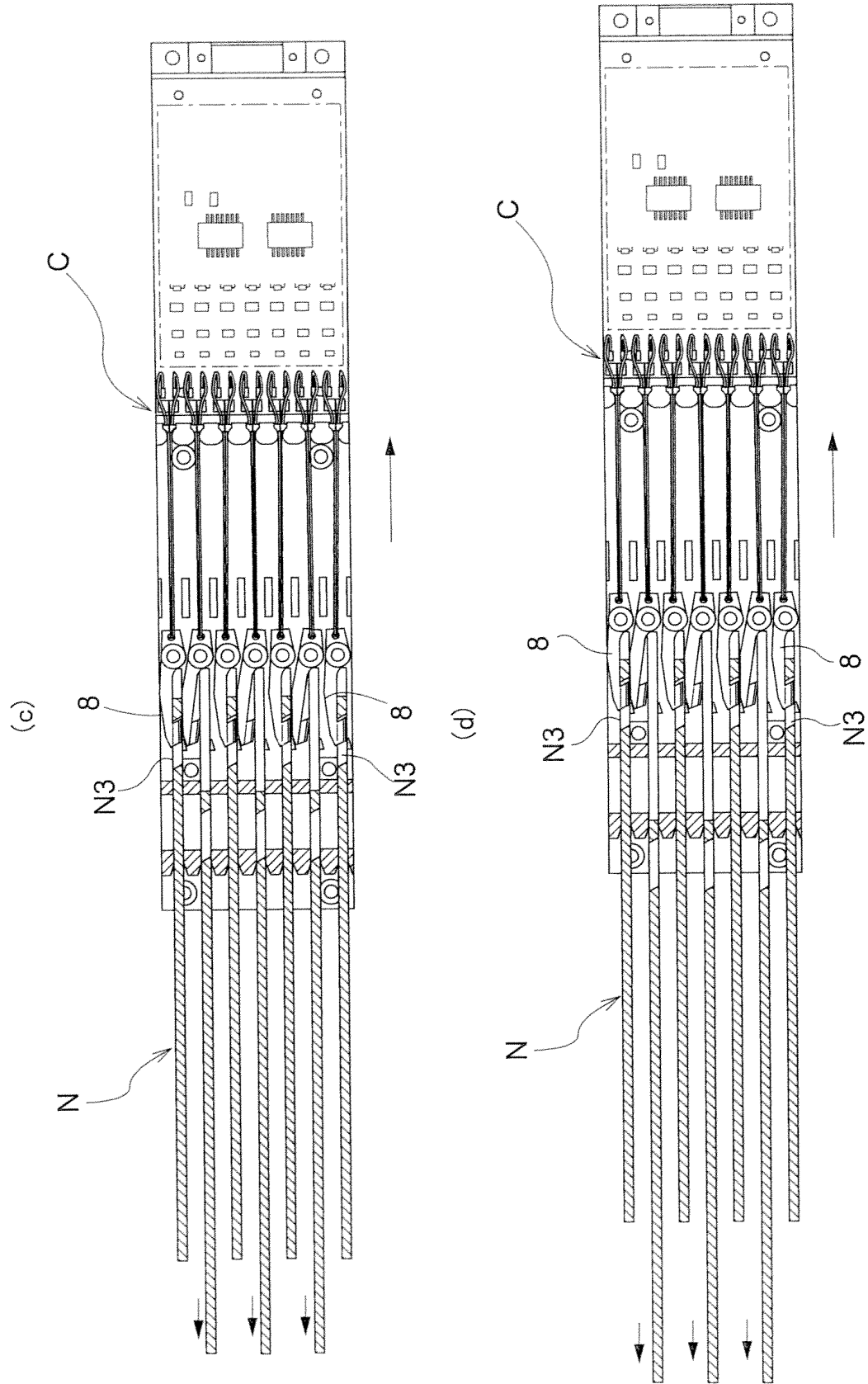


FIG.11

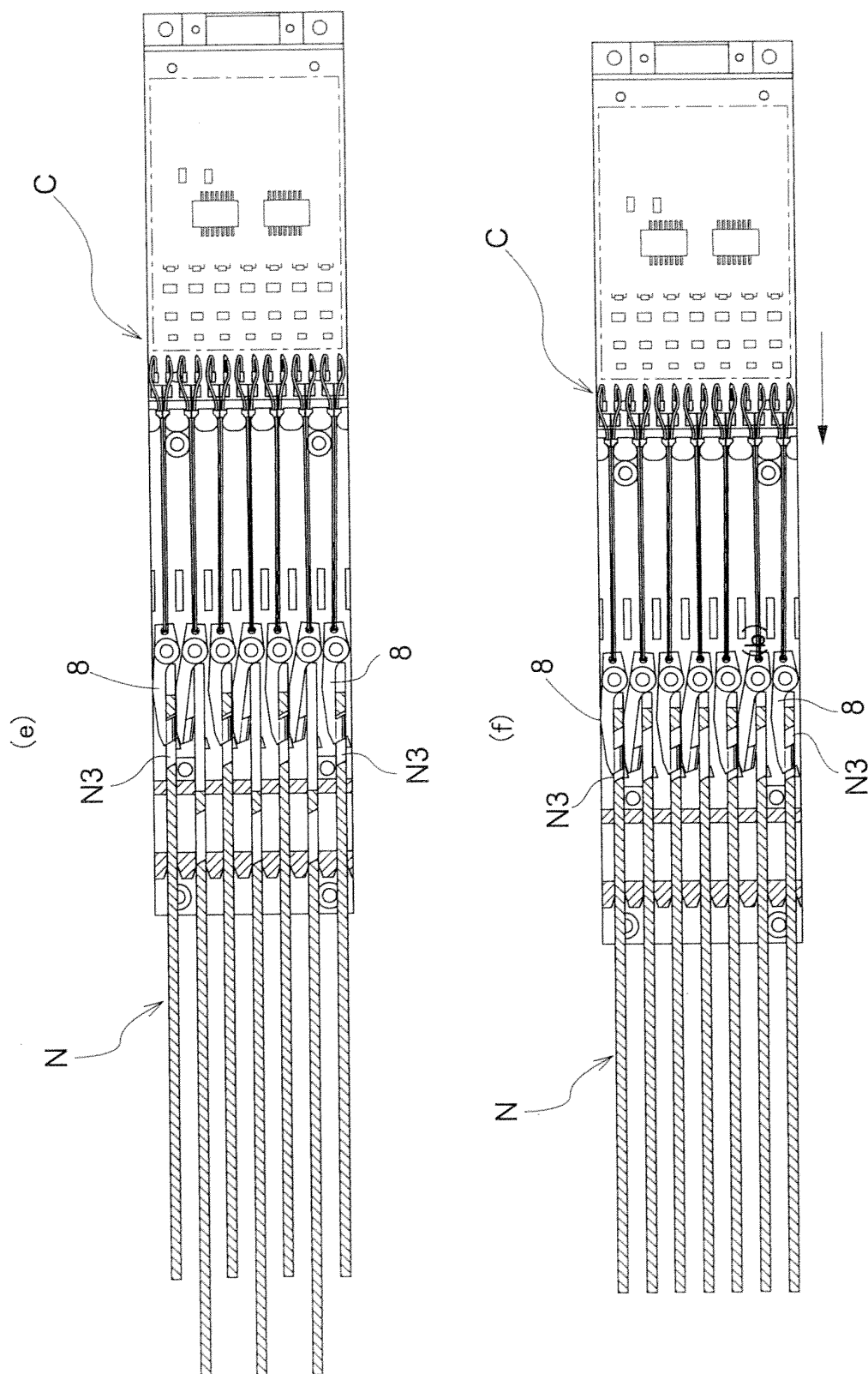


FIG.12

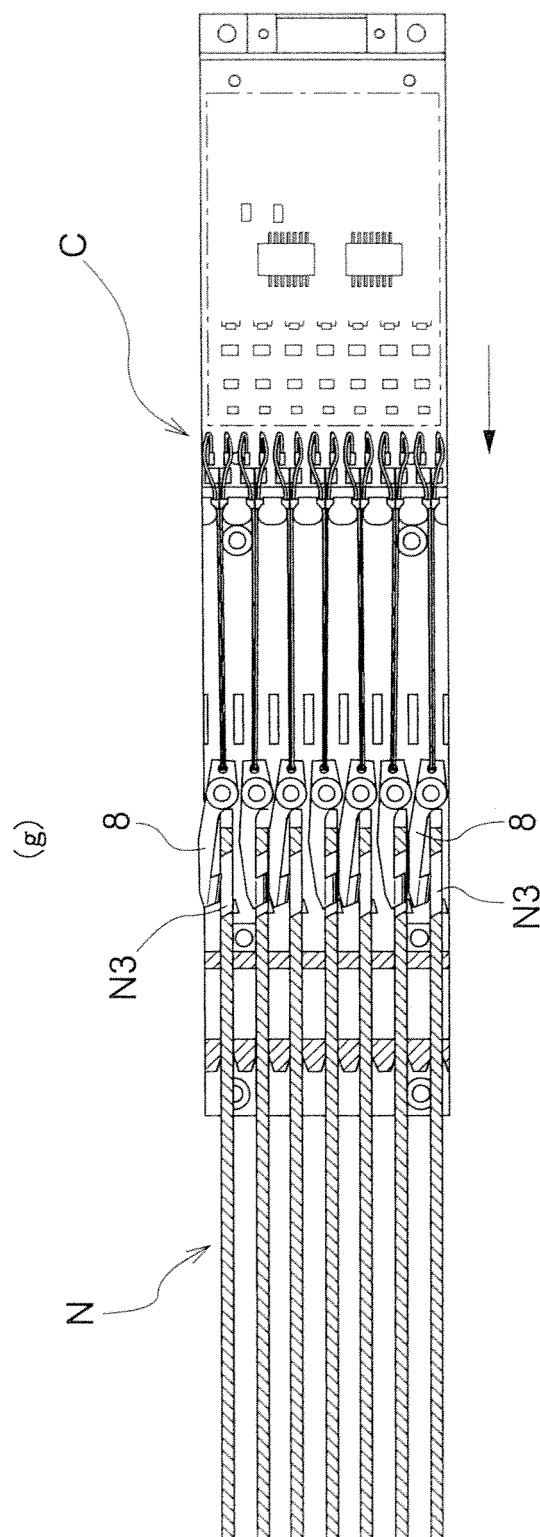
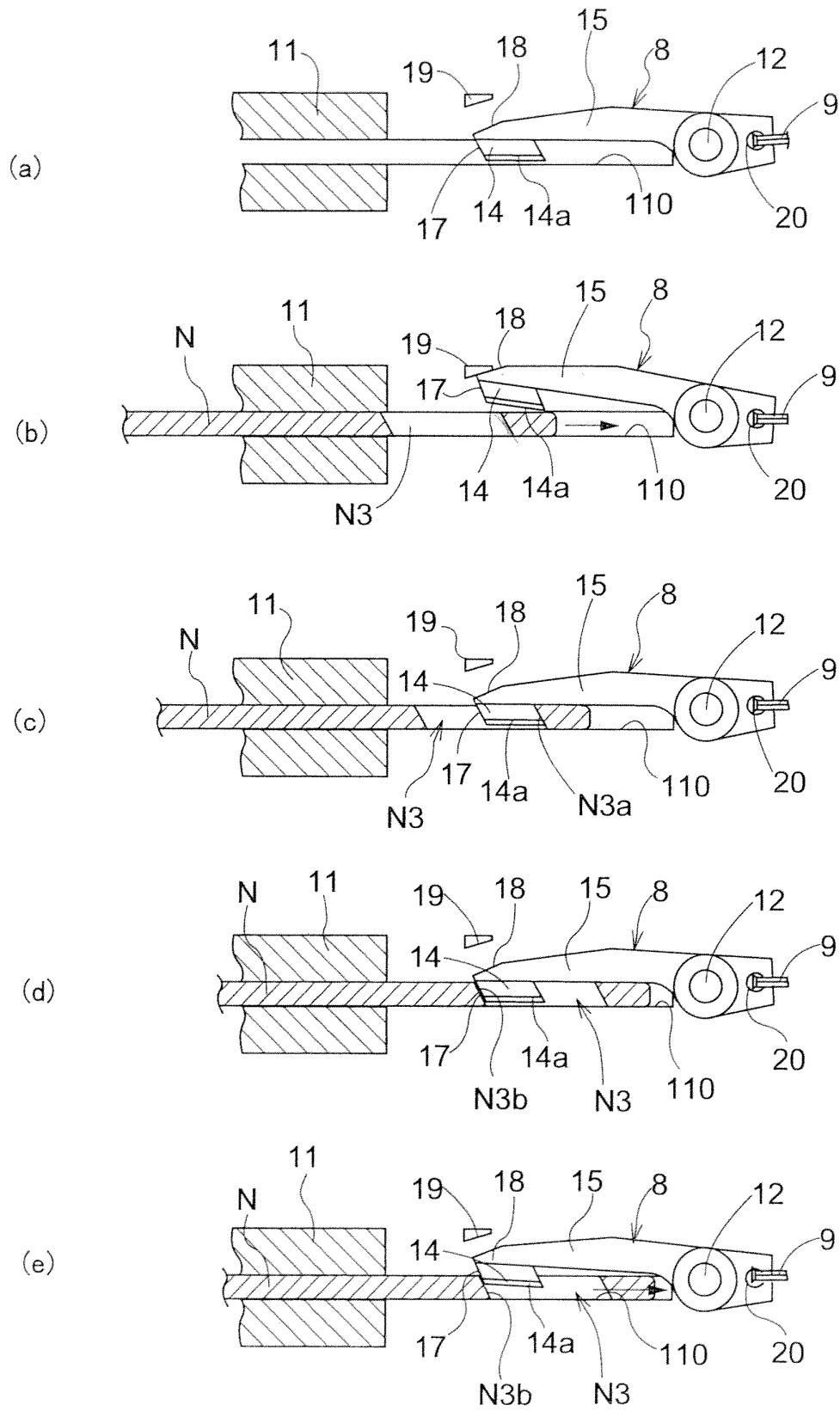


FIG.13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/315849

A. CLASSIFICATION OF SUBJECT MATTER

D04C5/00(2006.01)i, D03C3/20(2006.01)i, D04B27/32(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)

D04C5/00, D03C3/20, D04B27/32

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 1996-2006

Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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 2003-64551 A (Asuka Giken Kabushiki Kaisha), 05 March, 2003 (05.03.03), Claims; drawings (Family: none) | 1-12 |
| A | JP 48-4753 A (Shozo ASAHATA), 22 January, 1973 (22.01.73), Claims; drawings (Family: none) | 1-12 |
| A | JP 2001-348752 A (Yugen Kaisha Takemura Tekuno Wakusu), 21 December, 2001 (21.12.01), Claims; drawings (Family: none) | 1-12 |

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
08 November, 2006 (08.11.06)Date of mailing of the international search report
21 November, 2006 (21.11.06)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001348752 A [0007]