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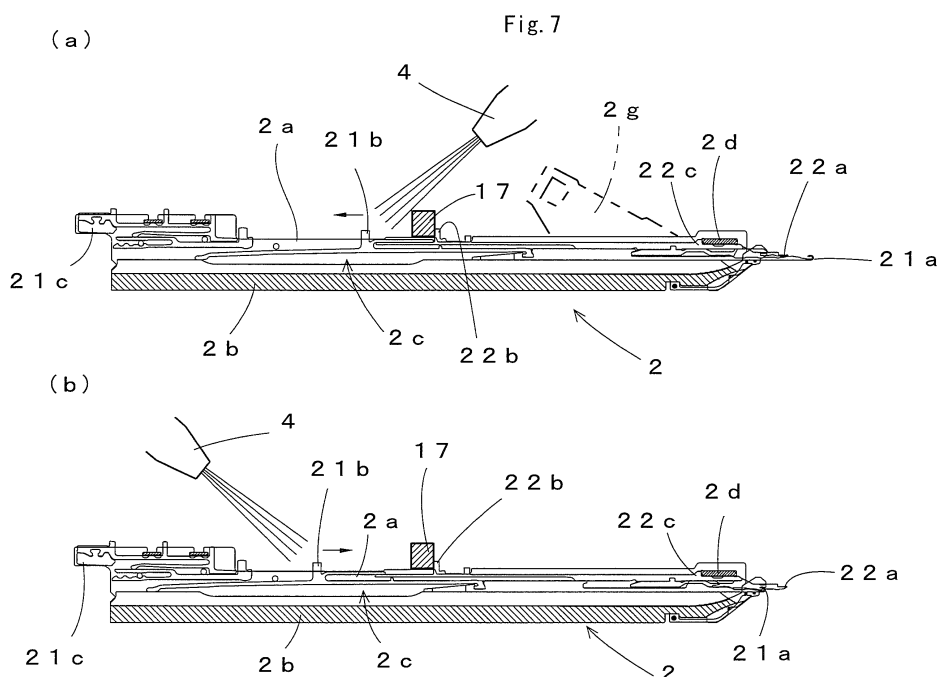
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(54) **CLEANING APPARATUS FOR A NEEDLE BED OF COMPOUND NEEDLES**

(57) There is provided a cleaning apparatus for a needle bed of compound needles that is capable of reliably and efficiently clean a needle bed of a flatbed knitting needle machine equipped with compound needles.

A needle bed 2, removed from a flatbed knitting machine and attached to a cleaning bath 3 of a cleaning apparatus for needle bed 1, is cleaned with a liquid such as a cleaning liquid or water sprayed from a nozzle 4. The nozzle 4 is attached to a head 5 that is movable

along the surface of the needle bed 2. The compound needles are accommodated in needle grooves of the needle bed 2. While holding positions of sliders, spraying the liquid from the nozzle 4 onto butts for driving needle bodies to move the needle bodies with respect to needle grooves makes it possible to clean the needle bed 2 reliably and efficiently, switching relative positions of the needle bodies and the sliders.



## Description

[Technical Field]

**[0001]** The present invention relates to a cleaning apparatus for needle bed of compound needles, which cleans a needle bed used in a flatbed knitting machine equipped with compound needles.

[Background Art]

**[0002]** Conventionally, it has been proposed that a needle bed cleaning apparatus is used to clean a needle bed removed from a flatbed knitting machine (for example, refer to Patent Literature 1). The needle bed extends in a longitudinal direction along needle bed gaps and has needle grooves formed to accommodate knitting needles in advancing and retracting directions orthogonal to the longitudinal direction. The knitting needle has a hook at a leading end, advances and retracts the hook to and from the needle bed gap, and knits a fabric while drawing a knitting yarn supplied to the hook at the needle bed gap into the needle bed. During the fabric is being knitted, dust such as fiber fluff of the knitting yarn may accumulate between the knitting needle and the needle groove. The cleaning apparatus is equipped with a cleaning bath, a nozzle for spraying a liquid such as a cleaning liquid onto a surface of the needle bed in the cleaning bath, and a movement means to move the nozzle, while the needle bed is in a state to accommodate the knitting needles. The dust accumulated on the needle bed is removed by moving the nozzle along the surface of the needle bed and spraying the liquid from the nozzle.

**[0003]** Knitting of the fabric is performed to involve opening and closing the open parts of the hooks. The cleaning apparatus for needle bed described in Patent Literature 1 is targeted for a needle bed equipped with latch needles each of which oscillates a latch to open and close the hook. There are also flatbed knitting machines which have compound needles to open and close the hook at the leading end of a slider sliding on the needle body with the hook (for example, refer to Patent Literature 2). There has been proposed a cleaning method of a flatbed knitting machine equipped with compound needles by using an attached cleaner that sprays a gas to remove dust from the hook and its vicinity (for example, refer to Patent Literature 3).

**[0004]** The cleaner described in Patent Literature 3 is configured to be attached to a needle bed mounted in a flatbed knitting machine, and is equipped with an air nozzle and a cam system on a base body manually slidable along the longitudinal direction of the needle bed. The cam system acts on butts provided on each of the needle bodies and the sliders to cause the butts to advance to and retract from the needle bed gap. The air nozzle has a plurality of nozzle holes longitudinally aligned near the open parts of the hooks driven by the cams to open and close. The needle bed is cleaned by spraying air from

each of the nozzle holes onto the hook and its vicinity to remove the dust while moving the base body to switch the needle body and the slider to different relative positions by the cam system.

[Citation List]

[Patent literatures]

**[0005]**

Patent Literature 1: EP 2841632 B1

Patent Literature 2: JP 2946323 B

Patent Literature 3: JP 2011162894 A

[Summary of Invention]

[Technical Problem]

**[0006]** The cleaner directed to compound needles and described in Patent Literature 3, is configured to attach to a flatbed knitting machine and thus a liquid such as a cleaning liquid cannot be used with the cleaner that is merely capable of removing the dust from the hook and its vicinity. The cleaning apparatus for needle bed described in Patent Literature 1 does not allow the switching of the needle body and the slider to different relative positions, unlike the cleaner described in Patent Literature 3. Each compound needle has a part where the needle body and the slider slide, and thus the slide part needs to be surely cleaned with switching the relative positions. However, if the relative positions are switched by causing the groove cam to act on the driving butt, the butt and its vicinity covered with the groove cam cannot be cleaned.

**[0007]** An object of the present invention is to provide a cleaning apparatus for needle bed of compound needles that is capable of reliably and efficiently cleaning a needle bed of - a flatbed knitting machine equipped with compound needles.

[Solution to Problem]

**[0008]** The present invention is a cleaning apparatus for needle bed of compound needles, cleans a needle bed equipped with compound needles by a liquid sprayed onto a surface of the needle bed, characterized in that the cleaning apparatus comprises:

a nozzle capable of spraying a fluid onto at least one of butts for driving needle bodies or butts for driving sliders of the compound needles, to be configured to switch relative positions between the needle bodies and the sliders; and  
switching means, for moving the nozzle while spraying a fluid onto the one of butts so that the relative positions of the needle bodies and the sliders are switched to be different.

**[0009]** In the present invention, said fluid sprayed from said nozzle onto said butts is said liquid used for cleaning.

**[0010]** In the present invention, the cleaning apparatus comprises holding means for holding one of said butts of said needle bodies or said sliders, and said nozzle sprays said fluid onto the other of said butts of the needle bodies or the sliders to switch said relative positions.

**[0011]** In the present invention, said sliders advance and retract at positions, where the sliders are drawn into the needle bed side beyond hooks of needle bodies, open and close the hooks, and are capable of advancing bifurcated leading ends of blades toward outside of the needle bed beyond the hooks, said holding means holds said butts of the sliders at positions where the leading ends of the blades advance toward the outside of the needle bed, and said switching means switches the relative positions so as to include a positions where the hooks further advance outward beyond the leading ends of the blades and positions where the hooks are drawn into the needle bed side beyond the leading ends of the blades.

**[0012]** In the present invention, said needle bed is cleaned in a state which is attached to a cleaning jig, and the cleaning jig is equipped with a protection member which has slits accommodating said leading ends of said blades of said sliders held by said holding means, at said positions where the leading ends advance toward the outside of the needle bed.

#### [Advantageous Effects of Invention]

**[0013]** According to the present invention, it is possible to clean the needle bed equipped with the compound needles by the liquid sprayed onto the surface of the needle bed. The needles are cleaned while the relative positions of the needle bodies and the sliders are switched so that the dust accumulating on sliding parts can be reliably removed. Switching of the relative positions is performed by spraying the fluid from the nozzle toward the butts, not by using a cam covering the driving butts and their vicinities, so that the needle bed equipped with the compound needles can be cleaned reliably and efficiently.

**[0014]** According to the present invention, the liquid used for cleaning the needle bed can also be used for switching the relative positions of the needle bodies and the sliders by spraying from the nozzle toward the butts. Using the liquid also for switching the relative positions contributes to the simplification of the apparatus and the reduction of cost.

**[0015]** According to the present invention, the positions of either needle bodies or the sliders are held so that the fluid is sprayed from the nozzle onto only the other's butts to switch the needle bodies or the sliders to the different relative positions. The ones of the needle bodies or the sliders have the butts held by the position holding means and thus do not make an accompanied

move to the other's movement so that the reliable switching of the relative positions can be achieved.

**[0016]** According to the present invention, the blades at the leading ends of the sliders are held at the positions that are advanced toward the outside of the needle bed. Advancing the hooks of the needle bodies outward beyond the leading ends of the blades allows the cleaning in a state in which the needle bodies protrude toward the outside of the needle bed. Switching the hooks to the positions that draw the hooks into the needle bed side beyond the leading ends of the blades allow the blades to be reliably cleaned in a state in which the leading ends of the blades are split into two and protruded toward the outside of the needle bed beyond the hooks. The movements of the needle bodies allow efficient relative position switchings by causing simultaneously the switching of the relative positions of the sliders and the switching of the relative positions of the needle groove in the needle bed.

**[0017]** According to the present invention, the protection member of the cleaning jig has the slits to accommodate the leading ends of the blades in the positions that protrude toward the outside of the needle bed. Advancing the hooks of the needle bodies outward beyond the leading ends of the blades causes the needle bodies equipped with the blades to be accommodated in the slits. Thus, the blades and the needle bodies can be protected by the protection member, when being advanced outward for cleaning from the needle bed attached to the cleaning jig, so as not to be swung by the sprayed liquid even if the plate thickness is small with fine-gauge compound needles.

#### [Brief Description of Drawings]

#### **[0018]**

[Fig. 1] Fig. 1 is a simplified perspective view of a schematic outer configuration of a cleaning apparatus for needle bed 1 as an example of the present invention.

[Fig. 2] Fig. 2 is a simplified cross-sectional side view of the cleaning apparatus for needle bed 1 shown in Fig. 1 in which a needle bed 2 to be cleaned is attached to a cleaning jig 11.

[Fig. 3] Fig. 3 is a planar view of the cleaning jig 11 to which the needle bed 2 shown in Fig. 2 is attached.

[Fig. 4] Fig. 4 is a planar view of a configuration of the cleaning jig 11 shown in Fig. 2.

[Fig. 5] Fig. 5 is a planar view and cross-sectional side view of a configuration of a pressure plate 2d shown in Fig. 2.

[Fig. 6] Fig. 6 is a simplified planar view of movement paths of a head 5 equipped with a nozzle 4 at the time of cleaning the needle bed 2 by the cleaning apparatus for needle bed 1 shown in Fig. 1.

[Fig. 7] Fig. 7 is a simplified cross-sectional side view of a state in which a butt 21b of a needle body 21 of

a compound needle 20 is driven by spraying a liquid from the nozzle 4 shown in Fig. 1 to switch the position of the needle body 21 to a needle groove 2c. [Fig. 8] Fig. 8 is a simplified planar view of a schematic state in which part of the compound needle 20 is protected by a protection member 15 shown in Fig. 6.

#### [Description of Embodiments]

**[0019]** Figs. 1 to 8 show a configuration and usage states of a cleaning apparatus for needle bed 1 as an example of the present invention. The configuration and the usage states will be described in sequence with reference to the drawings, and already described components will be shown with the same reference numerals, and duplicated description thereof may be omitted. For the sake of convenience, components not shown or shown without reference numerals in a corresponding drawing may be described with reference numerals shown in other drawings.

#### [Example]

**[0020]** Fig. 1 shows a schematic outer configuration of a cleaning apparatus for needle bed 1 as an example of the present invention. The cleaning apparatus for needle bed 1 is equipped with a cleaning bath 3 in which a needle bed 2 equipped with knitting needles and removed from a flatbed knitting machine is attached and cleaned. The needle bed 2 attached to the cleaning bath 3 is cleaned with a liquid such as a cleaning liquid or water sprayed from a nozzle 4. The nozzle 4 is mounted on a head 5. The head 5 moves along a vertical guide 6 in advancement and retraction directions 2Y and moves along a lateral guide 7 in longitudinal directions 2X of the needle bed 2. The nozzle 4 is swingable around an axial line of the longitudinal directions 2X with respect to the head 5, and is variable in angle of spraying toward an upper surface of the needle bed 2. The cleaning apparatus for needle bed 1 has a housing 8 of which a top can be opened and closed by a transparent cover 9. Spraying of a liquid from the nozzle 4, direction of the spray, and movement of the head 5 are controlled by a program preset in a controller 10. In the present example, the needle bed 2 is attached to the cleaning bath 3 via a cleaning jig 11. However, the needle bed 2 may be directly attached to the cleaning bath 3.

**[0021]** Fig. 2 shows a simplified cross section of the cleaning apparatus for needle bed 1 shown in Fig. 1 in which the needle bed 2 to be cleaned is attached to the cleaning jig 11. The needle bed 2 shown in Fig. 1 has needle plates 2a aligned with constant pitches along the longitudinal directions 2X. The spaces between the needle plates 2a constitute needle grooves 2c extending in the advancement and retraction directions 2Y orthogonal to the longitudinal directions 2X. The needle bed 2 is mounted in an inclined position in the flatbed knitting ma-

chine such that the needle bed gap side is higher on which the hooks of knitting needles knit a fabric with supply of a knitting yarn, whereas the needle bed 2 is attached in an inclined position to the cleaning apparatus for needle bed 1 such that the needle bed gap side is lower. That is, the front side of the advancement and retraction directions 2Y shown in Fig. 1 is on the needle bed gap side of the needle bed 2 attached in the inclined position to become lower, and the end portions of the needle grooves 2c are aligned along the needle bed gaps. Each of the needle plates 2a has a lower part inserted into and supported by a plate groove in a base plate 2b. In the housing 8, supporters 8a and 8b provided in the longitudinal directions 2X shown in Fig. 1 support the cleaning jig 11 to which the needle bed 2 is attached. Since the needle bed 2 is cleaned in the state in which the needle bed gap side is lower, the liquid sprayed from the nozzle 4 onto the needle bed 2 is likely to drop from the end portion of the needle bed 2 on the needle bed gap side along the needle grooves 2c. In the following description, the direction of advancement from the needle bed 2 toward the needle bed gap side in the flatbed knitting machine along the advancement and retraction directions 2Y will be designated as "the direction toward the outside of the needle bed".

**[0022]** The cleaning jig 11 has end plates 12 on both sides of the longitudinal directions 2X shown in Fig. 1. The end plates 12 each have a handle 13 that can be gripped by hand at the time of work such as transportation. The end plates 12 on the both sides are coupled together by a lower frame 14, a protection member 15, and an upper frame 16 therebetween. The needle bed 2 is attached so as to space from the lower frame 14 on the outside. The cleaning jig 11 further is equipped with the protection member 15, a butt bracing 17, and corbels 18. The protection member 15 is opposed to the outside of the needle bed 2. The corbels 18 are provided on the back sides of the end plates 12 and are supported from the supporters 8a, 8b.

**[0023]** The compound needles 20 accommodated in the needle grooves 2c of the needle bed 2 each have a needle body 21 and a slider 22. The needle body 21 has a hook 21a at a leading end on the needle bed gap side, a needle jack with a driving butt 21b coupled to a base end, a selector on the base end side, and an armature 21c for needle selection using magnetic force coupled to a tail end. The armature 21c is covered with the upper frame 16 and is protected from the liquid sprayed during the cleaning. The hook 21a is opened and closed by the leading end of a blade 22a of the slider 22 through the driving of a butt 22b. The slider 22 slides in a slider groove 21d formed in the needle body 21. The blade 22a can be advanced toward the outside of the needle bed 2 such that its bifurcated leading ends extend beyond the hook 21a. The needle bed 2 is attached to and detached from the flatbed knitting machine in a state in which the compound needles 20 are drawn into the needle grooves 2c. At the time of the cleaning as shown in Fig. 2, the butt

bracing 17 acts as position holding means that presses the base end side of the butt 22b to retain the blade 22a advancing toward the outside of the needle bed 2 not so as to return to the needle bed 2 and hold the slider 22. The protection member 15 protects part of the compound needle 20 equipped with the hook 21a and the blade 22a having advanced to the outside of the needle bed 2 so as not to be swung by the sprayed liquid during the cleaning. A pressure plate 2d is provided on the upper part of the needle plate 2a on the needle bed gap side in such a manner as to penetrate through the needle plate 2a in the longitudinal directions 2X shown in Fig. 1 so that the compound needle 20 does not come off above the needle groove. The blade 22a has a projection 22c that, when contacting with the base end side of the pressure plate 2d, blocks the advancement of the slider 22 toward the needle bed gap side. That is, the cleaning in the present example is performed with the blade 22a held by the pressure plate 2d and the butt bracing 17 at the position most advanced toward the outside of the needle bed 2. Cleaning in the present example is also performed by position switching described later with the hook 21a of the compound needle 20 protruding toward the outside of the needle bed 2. The pressure plate 2d used in the needle bed 2 mounted in the flatbed knitting machine is made of a metal band without a hole, but is replaced with a pressure plate with holes for cleaning as described later with reference to Fig. 5.

**[0024]** Fig. 3 shows a state in which the needle bed 2 shown in Fig. 2 is attached to the cleaning jig 11. Fig. 4 shows a configuration of the cleaning jig 11. The butt bracing 17 sets the sliders 22 to control the base end side of the butts 22b in positions where the sliders 22 are advanced toward the outside of the needle bed 2 until the projections 22c contact the pressure plate 2d. Instead of the butt bracing 17, using a member holding both the base end side and the leading end side of the butt 22b makes it possible to hold the position of the slider 22 only by itself, not depending on the contact between the projection 22c and the pressure plate 2d. The protection member 15 has slits 15a as described later at positions corresponding to the needle grooves to protect the leading ends and their vicinities of the blades 22a advancing toward the outside of the needle bed 2. However, as described later with reference to Fig. 8, the relative positions of the needle bodies 21 are switched between the positions where the hooks 21a are advanced and protruded outward beyond the protection member 15 and the positions where the hooks 21a are drawn into the needle bed 2 side and the bifurcated blades 22a relatively protrude outward and spread within the slits 15a. This switching allows reliable cleaning of the needle bodies 21 and the blades 22a. The movement of the needle body simultaneously causes the switching of the relative position to the slider and the switching of the relative position to the needle groove in the needle bed. This allows efficient switching and reliable removal of accumulating dust and the like from the slide part.

**[0025]** Fig. 5 shows a configuration of the pressure plate 2d shown in Fig. 2 by the planar view of Fig. 5(a) and by the cross-sectional side view of Fig. 5(b). The cross-sectional view of Fig. 5(b) corresponds to cut line B-B in Fig. 5(a). As shown in Fig. 5(a), the pressure plate 2d has extraction holes 2e. A plurality of pressure plates 2d may be used in combination to be longer in the horizontal direction of Fig. 5(a). A boundary 2f between the adjacent pressure plates 2d is not vertical but inclined. The extraction hole 2e is provided such that the liquid sprayed from the nozzle 4 at the time of cleaning is applied as much as possible to even the part of the compound needle 20 that is covered with the pressure plate 2d.

**[0026]** Fig. 6 shows a simplified example of movement paths of the head 5 equipped with the nozzle 4 at the time of cleaning the needle bed 2 by the cleaning apparatus for needle bed 1 shown in Fig. 1. The head 5 runs back and forth while the liquid is sprayed from the nozzle 4 onto the surface of the needle bed 2 that is roughly rectangular in shape and extended in the longitudinal directions 2X. The head 5 is shifted by a specific distance in the advancement and retraction direction 2Y at each single-line movement. The liquid sprayed from the nozzle 4 can be a cleaning liquid including a cleaning agent and water. A plurality of nozzles 4 can be provided. The nozzle 4 or another nozzle can spray not only a liquid but also a gas for blowing the liquid on the needle bed 2 after the cleaning. In addition, in the case of spraying water, the nozzle 4 can also apply hot air for drying the water.

**[0027]** Fig. 7 shows a state in which a butt 21b of a needle jack of a compound needle 20 is driven by spraying a liquid from the nozzle 4 shown in Fig. 1 to advance and retract a needle body 21 along a needle groove 2c by switching the spraying direction to switch the position of the needle body 21. Fig. 7(a) shows a state in which the needle body 21 is driven from a position where a hook 21a protrudes toward the outside of the needle bed 2 in a direction of drawing into the needle bed 2. Fig. 7(b) shows a state in which the needle body 21 is driven from a position where the hook is drawn into the needle bed 2 to a position where the hook 21a is advanced toward the outside of the needle bed 2. The liquid sprayed from the nozzle 4 onto the butt 21b can drive the butt 21b to move the needle body 21 along the needle groove 2c. Specifically, while is moved by the head 5 in the longitudinal direction, the nozzle 4 moves the needle body 21 of the compound needle 20 included in the needle bed 2 relative to the needle groove 2c to switch the position. Switching the position of the needle body 21 relative to the needle groove 2c refers to switching the relative positions of the needle body 21 and the slider 22 because the position of the butt 22b of the slider 22 is held by the butt bracing 17. Such switching of the relative positions makes it possible to clean reliably and efficiently the entire needle bed 2 which includes slide parts between the needle bodies 21 and the needle grooves 2c, slide parts between the sliders 22 and the slider grooves 21d, and

the driving butts 21b. At the time of the position switching, the movement in the longitudinal directions 2X can be slower than at the time of the cleaning, and the spraying pressure of the liquid from the nozzle 4 can be increased. Switching the positions by the nozzle 4 provided for cleaning makes it possible to use the liquid for both cleaning and position switching. This eliminates the need for another component for position switching and contributes to the simplification and low cost of the apparatus.

**[0028]** The position switching by spraying the fluid from the nozzle 4 according to the present example is performed by position switching means that is equipped with the head 5 moving the nozzle 4 in the longitudinal directions and a controller 10 controlling to spray the fluid from the nozzle 4, an orientation of the nozzle 4, and the movement of the head 5. In the case of using the nozzle 4 for both cleaning and position switching, position switching can be performed by the nozzle 4 in a position where it is possible to drive the butt 21b on the way to clean the entire surface of the needle bed 2 as shown in Fig. 6. Alternatively, the entire surface of the needle bed 2 may be cleaned before and after the switching. Also, in a case of cleaning with a liquid different from the fluid sprayed from the nozzle 4, the entire surface of the needle bed 2 may be cleaned before and after the position switching.

**[0029]** The nozzle 4 for switching position is possible to be provided separately from the nozzle for spraying the cleaning liquid so that the nozzle 4 drives the butt 21b by spraying a fluid different from the cleaning liquid, for example, a gas for blowing the cleaning fluid, or a liquid or a gas dedicated for driving. In addition, to switch the relative positions of the needle body 21 and the slider 22, the nozzle 4 may spray the fluid onto the butt 22b for driving the slider 22 while the butt 21b for driving the needle body 21 is held. That is, one of the butts 21b, 22b for driving the needle body 21 or the slider 22 of the compound needle 20 is held and the fluid is sprayed from the nozzle 4 onto the other so that the relative positions of the needle body 21 and the slider 22 can be switched. Since either of the butts 21b, 22b is held by the position holding means, one of the needle body 21 or the slider 22 does not make an accompanied move to the other's movement, thereby allowing reliable switching of the relative positions. Alternatively, none of the butts 21b, 22b may be held and at least one of the butts 21b, 22b may be driven by spraying the fluid from the nozzle 4. For example, in a case of not holding one of the butts 21b, 22b by the butt bracing 17 or the like but driving the other in the present example, there is a possibility that the needle body 21 and the slider 22 make an accompanied move and the relative positions cannot be switched. In the present example, however, when the projection 22c contacts the pressure plate 2d, the slider 22 is blocked so that only the needle body 21 can be advanced by driving the butt 21b. Setting slide resistance of the needle body 21 to the needle groove 2c to be larger than slide resistance of the slider 22 to the slider groove 21d makes it possible to switch the relative position of the slider 22

to the needle body 21 by driving the butt 22b.

**[0030]** As for a needle bed 2 for cleaning, such a case may be assumed that the needle bed 2 is used in a configuration to be provided with an upper support part 2g on the needle plate 2a. The upper support part 2g is used for a lower needle bed in a two-tiered type of knitting machine with an upper needle bed or the like. The needle bed 2 with the upper support part 2g can be cleaned in a state where the nozzle 4 is set to be higher than the upper support part 2g or is changeable in height to avoid the upper support part 2g.

**[0031]** Fig. 8 schematically shows a state in which a leading end parts of the compound needles 20 are protected by the protection member 15 shown in Fig. 2. The states shown in Figs. 7(a), 7(b) respectively correspond to a compound needle 20a and a compound needle 20b. The needle body 21 has the slider groove 21d that accommodates the slider 22. In the present example, the advancement position of the blade 22a is held and the advancement and retraction positions of the needle body 21 are switched. The lower frame 14 of the cleaning jig 11 has accommodating holes 14a each of which is configured to accommodate the hook 21a of the compound needle 20a. As for the compound needle 20a, the hook 21a protruding toward the outside of the needle bed 2 beyond the blade 22a is accommodated in the accommodating hole 14a, and a needle shank part of the needle body 21 following the hook 21a is protected by the slit 15a together with the blade 22a retained in the slider groove 21d. As for the compound needle 20b, the needle body 21 is drawn into the needle bed 2 side, and the leading end of the blade 22a relatively protrudes beyond the hook 21a. The bifurcated blades 22a are biased in the vertical direction shown in the drawing which is a width direction of the slider groove 21d, and is protected in the slit 15a in a state of being opened in the width direction. The protection member 15 protects the part of the compound needle 20 that protrudes toward the outside of the needle bed 2 and is accommodated in the slit 15a. In the compound needle 20 used in a fine-gauge of flatbed knitting machine in which the arrangement intervals of the needle grooves 2c in the needle bed 2 are small, the width of the needle body 21 is small and the plate thickness of the blade 22a is thin but the protection member 15 can prevent the needle body 21 and the blades 22a from being swung by the liquid sprayed from the nozzle 4.

**[0032]** In the present example described above, the cleaning apparatus for needle bed 1 is targeted for the needle bed 2 equipped with the compound needles 20 as described in Patent Literature 2. The cleaning apparatus for needle bed 1 can also be targeted for the compound needles as disclosed in JP H4-66941 A, for example.

[Explanation of Reference]

**[0033]**

|          |                                   |
|----------|-----------------------------------|
| 1        | Cleaning apparatus for needle bed |
| 2        | Needle bed                        |
| 2a       | Needle plate                      |
| 2c       | Needle groove                     |
| 2d       | Pressure plate                    |
| 3        | Cleaning bath                     |
| 4        | Nozzle                            |
| 5        | Head                              |
| 10       | Controller                        |
| 11       | Cleaning jig                      |
| 12       | End plate                         |
| 14       | Lower frame                       |
| 15       | Protection member                 |
| 15a      | Slit                              |
| 16       | Upper frame                       |
| 17       | Butt bracing                      |
| 20       | Compound needle                   |
| 21       | Needle body                       |
| 21a      | Hook                              |
| 21b, 22b | Butt                              |
| 21d      | Slider groove                     |
| 22       | Slider                            |
| 22a      | Blade                             |

## Claims

1. A cleaning apparatus for needle bed (1) of compound needles (20), cleans a needle bed (2) equipped with compound needles (20) by a liquid sprayed onto a surface of the needle bed (2),  
**characterized in that** the cleaning apparatus (1) comprises:  
  
a nozzle (4) capable of spraying a fluid onto at least one of butts (21b) for driving needle bodies (21) or butts (22b) for driving sliders (22) of the compound needles (20), to be configured to switch relative positions between the needle bodies (21) and the sliders (22); and  
switching means (5, 10), for moving the nozzle (4) while spraying a fluid onto the one of butts (21b, 22b) so that the relative positions of the needle bodies (21) and the sliders (22) are switched to be different.
2. The cleaning apparatus for needle bed (1) of compound needles (20) according to claim 1, wherein said fluid sprayed from said nozzle (4) onto said butts (21b, 22b) is said liquid used for cleaning.
3. The cleaning apparatus for needle bed (1) of compound needles (20) according to either of claims 1 or 2, wherein the cleaning apparatus (1) comprises holding means (17) for holding one of said butts (21b, 22b) of said needle bodies (21) or said sliders (22), and

said nozzle (4) sprays said fluid onto the other of said butts (21b, 22b) of the needle bodies (21) or the sliders (22) to switch said relative positions.

4. The cleaning apparatus for needle bed (1) of compound needles (20) according to claim 3, wherein said sliders (22) advance and retract at a position, where the sliders (22) are drawn into the needle bed (2) side beyond hooks (21a) of said needle bodies (21), open and close the hooks (21a), and are capable of advancing bifurcated leading ends of a blades (22a) toward outside of the needle bed (2) beyond the hooks (21a),

said holding means (17) holds said butts (22b) of the sliders (22) at positions where the leading ends of the blades (22a) advance toward the outside of the needle bed (2), and said switching means (5, 10) switches the relative positions so as to include positions where the hooks (21a) further advance outward beyond the leading ends of the blades (22a) and positions where the hooks (21a) are drawn into the needle bed (2) side beyond the leading ends of the blades (22a).

5. The cleaning apparatus for needle bed (1) of compound needles (20) according to claim 4, wherein said needle bed (2) is cleaned in a state which is attached to a cleaning jig (11), and the cleaning jig (11) is equipped with a protection member (15) which has slits (15a) accommodating said leading ends of said blades (22a) of said sliders (22) held by said holding means (17), at said positions where the leading ends advance toward the outside of the needle bed (2).

Fig. 1

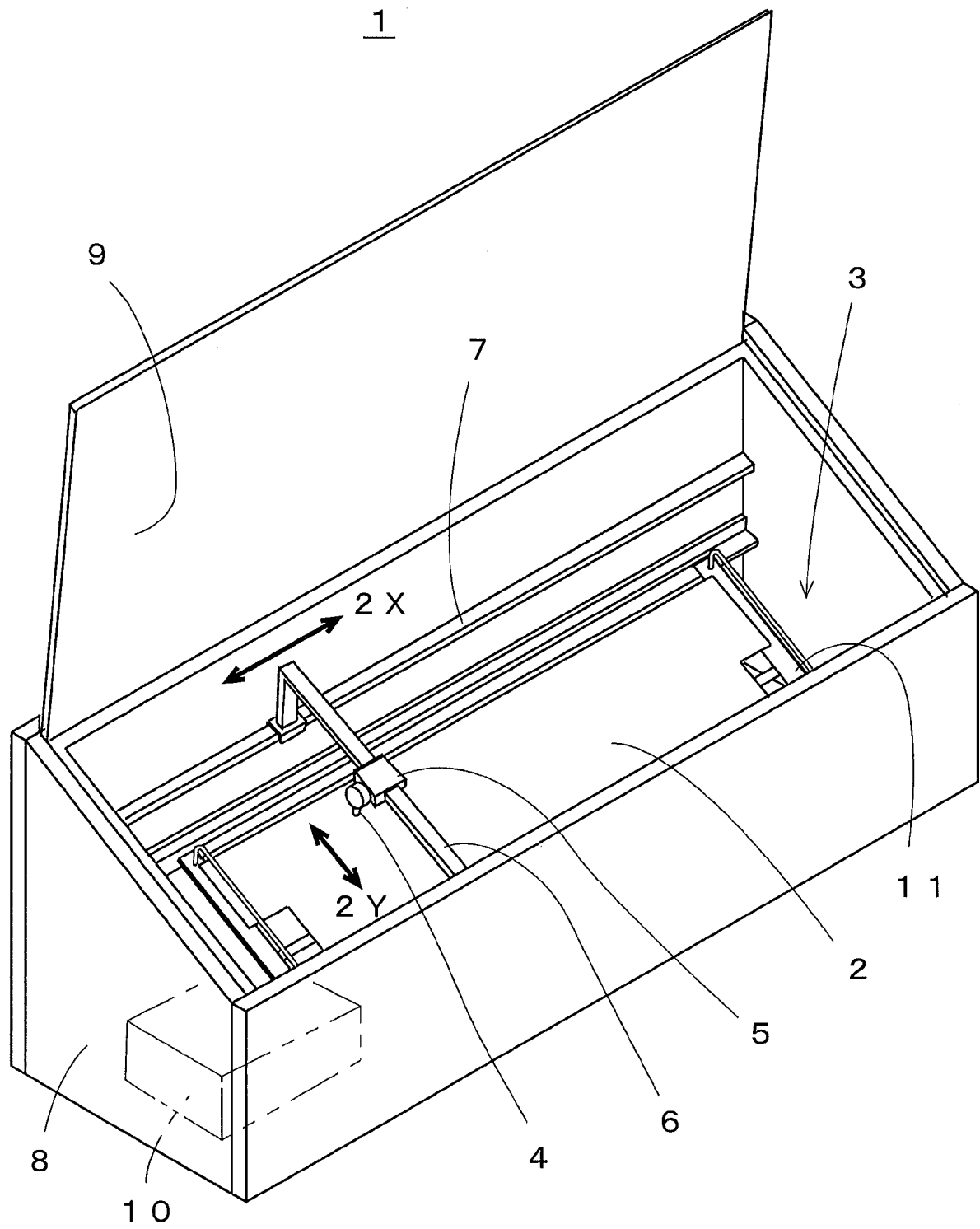


Fig. 2

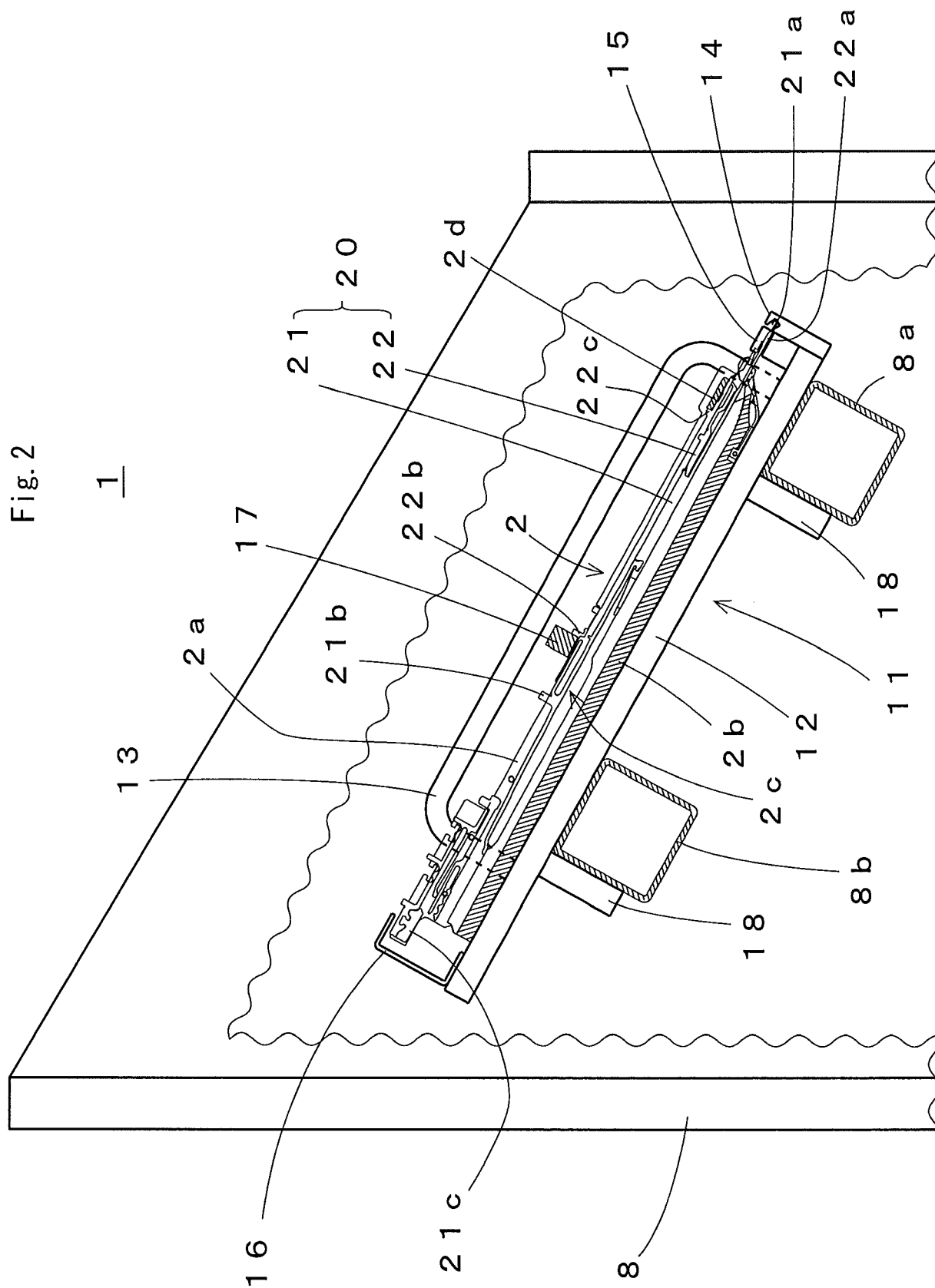


Fig. 3

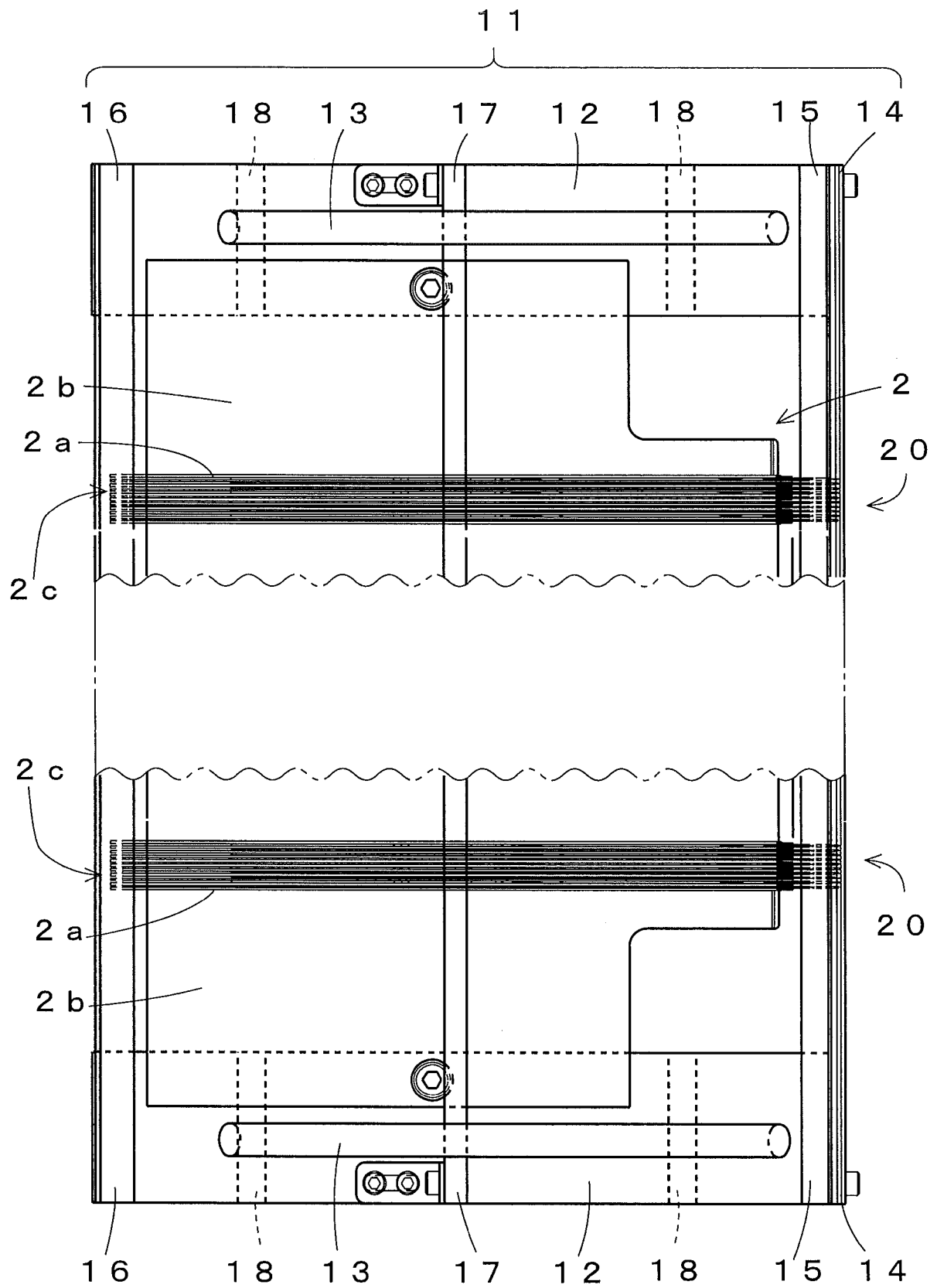


Fig. 4

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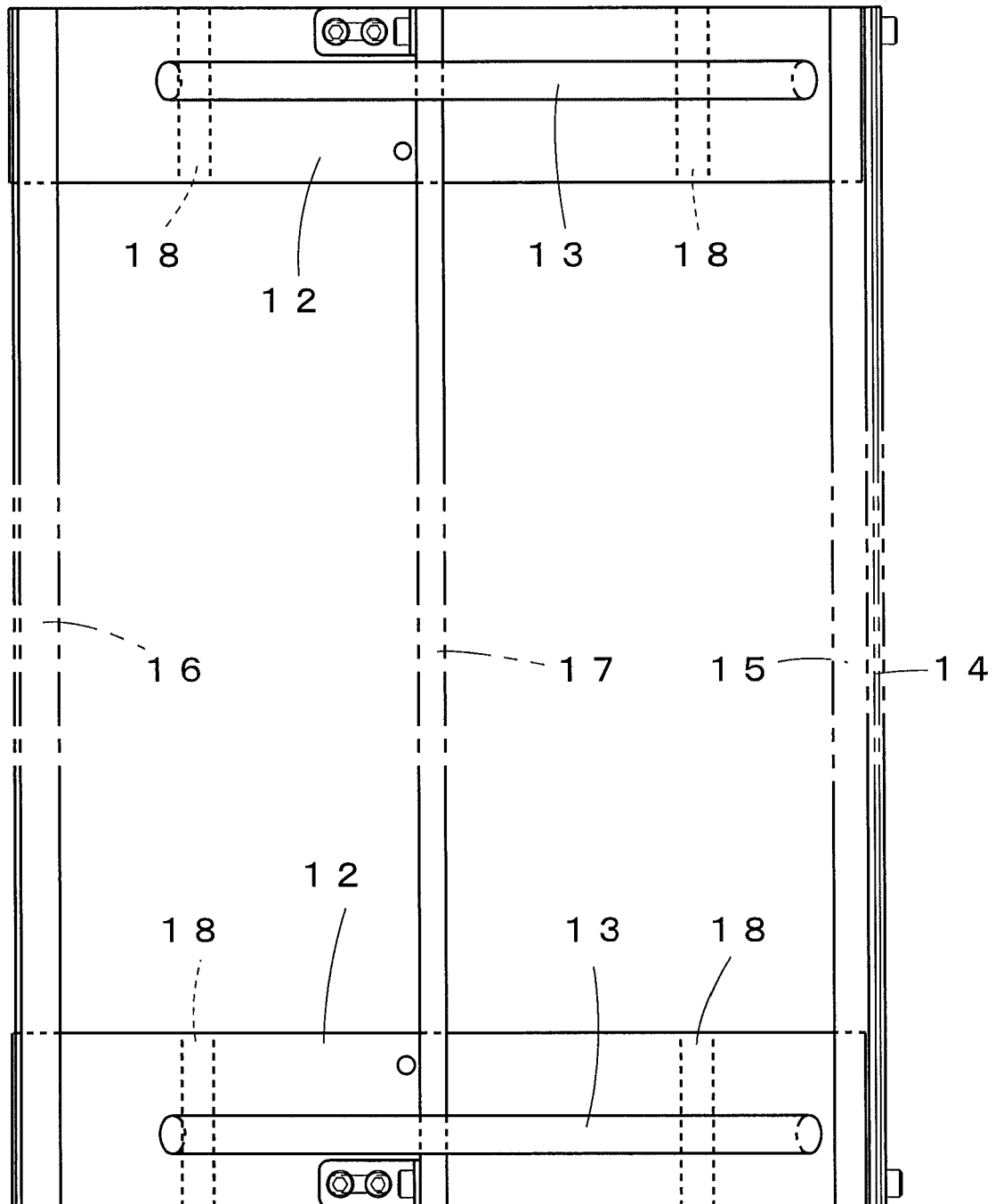


Fig. 5

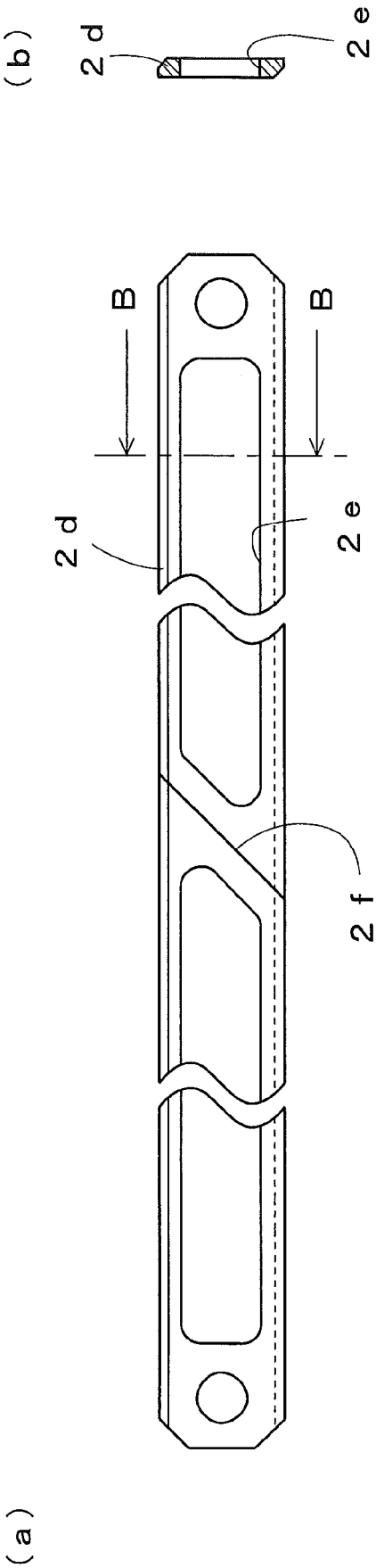


Fig. 6

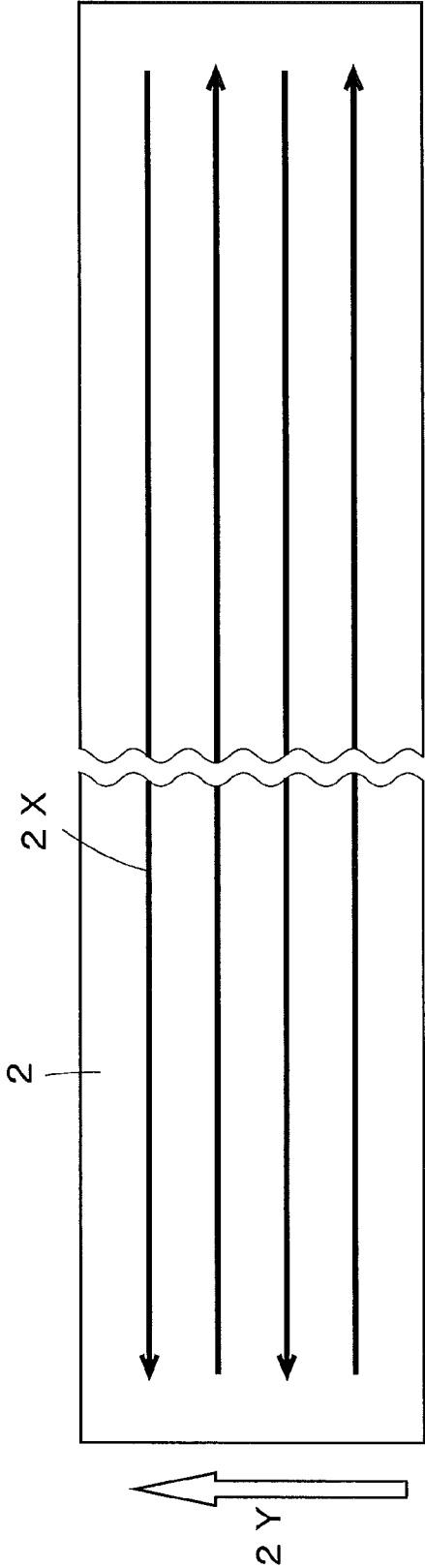
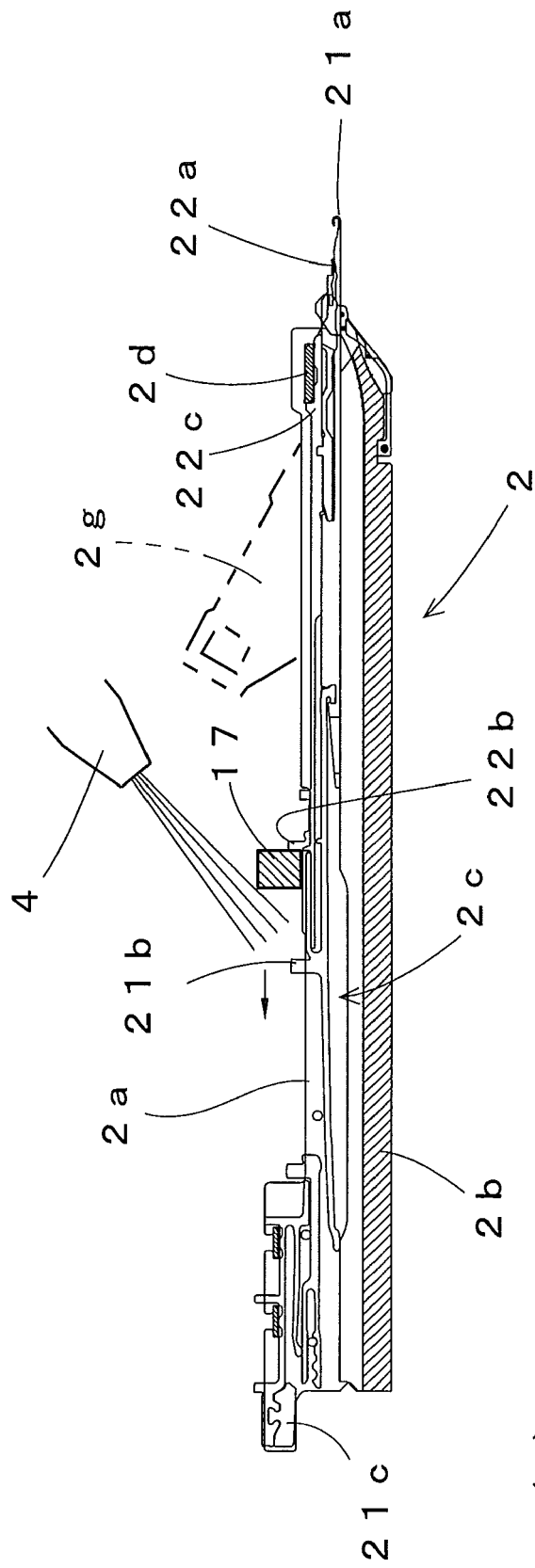
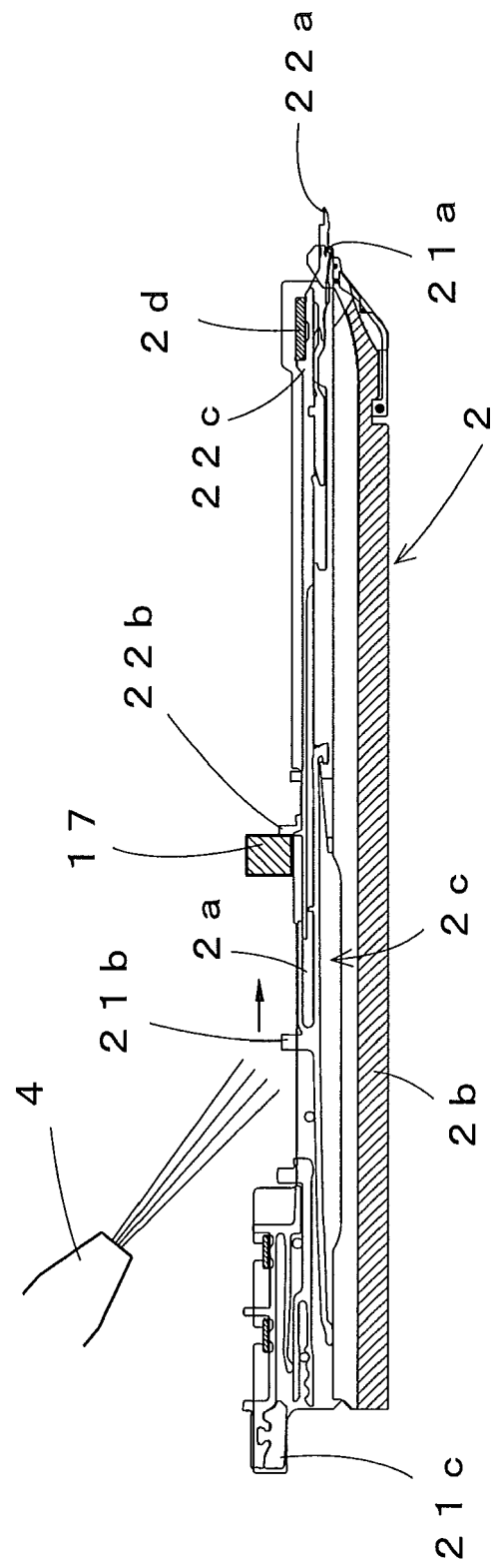


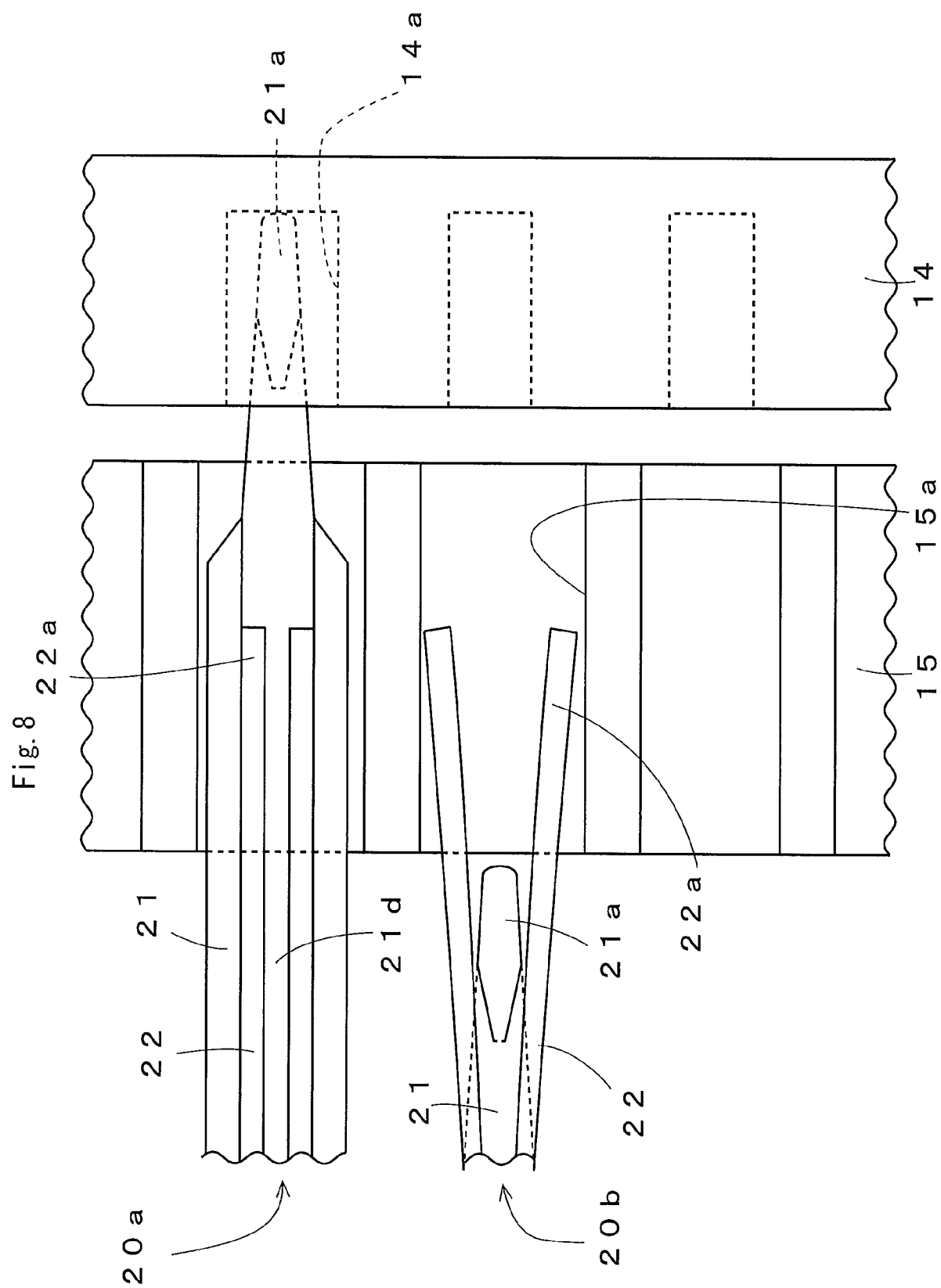
Fig. 7

(a)



(b)







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