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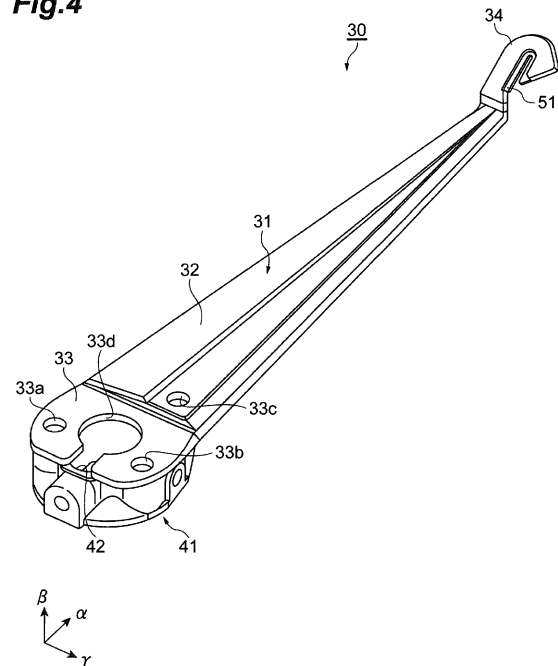
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(54) **TRAVERSE GUIDE, YARN WINDING MACHINE, AND METHOD FOR PRODUCING TRAVERSE GUIDE**

(57) A traverse guide includes: an arm body member (31) having a distal end portion (34) in a hook-like curved shape and containing a metallic material; and a guide member (51) integrally fixed to the distal end portion (34) of the arm body member (31) without adhesive applied therebetween and having a yarn hooking portion (51a, 61a, 62a) configured to hook a yarn (Y). The hardness of the guide member (51) is higher than the hardness of the arm body member (31). At least part of the guide member (51) other than the yarn hooking portion (51a, 61a, 62a) has an embedded portion (51b, 51d, 55a, 61, 62) embedded in the distal end portion (34).

**Fig.4**



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## Description

### TECHNICAL FIELD

**[0001]** The present disclosure relates to a traverse guide, a yarn winding machine, and a method for producing the traverse guide.

### BACKGROUND

**[0002]** A yarn winding machine includes a traverse guide configured to move in a reciprocating rotational manner so as to traverse a yarn to be wound by a winding bobbin. For example, a distal end portion of an arm body member of a traverse guide described in Japanese Unexamined Patent Publication No. 2013-63807 is provided with a guide member having a yarn hooking portion configured to guide a yarn.

### SUMMARY

**[0003]** The guide member described in Japanese Unexamined Patent Publication No. 2013-63807 is fixed to the arm body member with adhesive applied therebetween. Thus, when too little or too much adhesive is applied, adhesion failure of the guide member may occur. Depending on use conditions of the traverse guide, adhesive strength of the adhesive may decrease. In these cases, the guide member may detach. Furthermore, when adhesive is applied, the adhesive may squeeze out from between the arm body member and the guide member. In this case, in the adhesive thus squeezing out, or in a gap generated between the arm body member and the guide member due to squeezing out of the adhesive, a yarn may be caught, whereby the yarn may be cut.

**[0004]** In view of this, the present disclosure aims to provide a traverse guide, a yarn winding machine, and a method for producing the traverse guide in which a guide member can be reliably fixed to an arm body member without applying adhesive.

**[0005]** A traverse guide according to one aspect of the present disclosure includes: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member without adhesive applied therebetween and having a yarn hooking portion configured to hook a yarn. Hardness of the guide member is higher than hardness of the arm body member, and at least part of the guide member other than the yarn hooking portion has an embedded portion embedded in the distal end portion.

**[0006]** In this traverse guide, at least part of the guide member other than the yarn hooking portion has the embedded portion embedded in the distal end portion of the arm body member. With this configuration, the guide member is integrally fixed to the distal end portion of the arm body member, being firmly held on the arm body

member without adhesive applied therebetween so as not to detach. Thus, without applying adhesive, the guide member can be reliably fixed to the arm body member.

**[0007]** In the traverse guide according to one aspect of the present disclosure, a through hole may be formed in the guide member, and the arm body member may have a first bone portion inserted into the through hole and being in close contact with an inner surface of the through hole. In this case, the through hole and the first bone portion can prevent the guide member from detaching. Because the first bone portion is in close contact with the inner surface of the through hole, a backlash of the guide member can be prevented.

**[0008]** In the traverse guide according to one aspect of the present disclosure, the guide member may be tucked into and engage with the arm body member along a traveling direction of the yarn, and may also be tucked into and engage with the arm body member along a direction intersecting the traveling direction. In this case, the arm body member can prevent position error of the guide member in the traveling direction and the direction intersecting the traveling direction.

**[0009]** In the traverse guide according to one aspect of the present disclosure, the guide member may be provided so as to cover part of the arm body member, a through hole may be formed in the arm body member, and the guide member may have a second bone portion inserted into the through hole and being in close contact with an inner surface of the through hole. In this case, the through hole and the second bone portion can prevent the guide member from detaching. Because the second bone portion is in close contact with the inner surface of the through hole, a backlash of the guide member can be prevented.

**[0010]** In the traverse guide according to one aspect of the present disclosure, a protruding portion may be provided on either one of the at least part of the guide member embedded in the arm body member and the arm body member, and a recess with which the protruding portion is in close contact may be formed on the other one of the at least part of the guide member embedded in the arm body member and the arm body member. In this case, the protruding portion and the recess prevent the guide member from detaching. Because the protruding portion is in close contact with the recess, a backlash of the guide member can be prevented.

**[0011]** In the traverse guide according to one aspect of the present disclosure, the protruding portion may protrude along the traveling direction of the yarn. In this case, in the direction intersecting the traveling direction of the yarn, by engaging the protruding portion with the recess, the guide member can be prevented from detaching.

**[0012]** In the traverse guide according to one aspect of the present disclosure, the guide member may have a hook-like curved shape, and the yarn hooking portion may be structured with a portion including an inner peripheral surface of the guide member and may be disposed on a curved-shape inner side than an inner pe-

ripheral surface of the distal end portion is. In this case, the yarn to be traversed can be prevented from coming into contact with portions other than the yarn hooking portion.

**[0013]** In the traverse guide according to one aspect of the present disclosure, a base end of the guide member may be embedded in the arm body member. In this case, a gap or a level difference, for example, formed between the base end of the guide member and the arm body member can be bridged. With this configuration, the yarn to be traversed can be prevented from being caught in the gap or the level difference, for example.

**[0014]** In the traverse guide according to one aspect of the present disclosure, the guide member may have a first member and a second member that have stick shapes separated from each other in parallel, and both ends of the first member and both ends of the second member may be embedded in the arm body member. In this case, the first member and the second member of the guide member can be easily formed. In addition, both ends of the first member and the second member embedded in the arm body member can prevent the guide member from detaching.

**[0015]** In the traverse guide according to one aspect of the present disclosure, the metallic material may be an aluminium alloy, a magnesium alloy, brass, a zinc alloy, a beryllium alloy, or zinc. This can reduce the weight of the traverse guide.

**[0016]** In the traverse guide according to one aspect of the present disclosure, the guide member may contain ceramics. In this case, the guide member having high hardness can be prepared at low cost.

**[0017]** The traverse guide according to one aspect of the present disclosure may further include an intermediate layer provided on a surface of the guide member embedded in the arm body member. In this case, the intermediate layer can improve bondability between the arm body member and the guide member.

**[0018]** In the traverse guide according to one aspect of the present disclosure, the guide member may contain a tungsten alloy, a nickel alloy, a chromium-molybdenum alloy, a nickel-chromium-molybdenum alloy, or a chromium alloy. In this case, the guide member can contain a metallic material having high hardness.

**[0019]** In the traverse guide according to one aspect of the present disclosure, on a surface of the guide member, at least one of a diamond-like carbon film, a titanium nitride film, a titanium carbonitride film, a titanium aluminium nitride film, and an aluminium chromium nitride film may be provided. In this case, abrasion resistance of the guide member improves.

**[0020]** A yarn winding machine according to one aspect of the present disclosure includes: the traverse guide described in any one of the above paragraphs; a drive section configured to move the traverse guide in a reciprocating rotational manner; and a winding member configured to wind the yarn traversed by reciprocating rotational motion of the traverse guide onto a package.

**[0021]** This yarn winding machine includes the above-described traverse guide, in which at least part of the guide member other than the yarn hooking portion is embedded in the arm body member. With this configuration, the guide member is integrally fixed to the arm body member, being firmly held on the arm body member without adhesive applied therebetween so as not to detach. Thus, without applying adhesive, the guide member can be reliably fixed to the arm body member.

**[0022]** A method for producing a traverse guide according to one aspect of the present disclosure includes: a step of forming an arm body member by placing in a die a metallic material and a guide member having a hardness higher than that of the metallic material and having a yarn hooking portion configured to hook a yarn and by molding the metallic material in the die to form an arm body member. In the forming step, by embedding at least part of the guide member other than the yarn hooking portion in the metallic material, the arm body member is molded integrally with the guide member without adhesive applied therebetween.

**[0023]** In the step in the method for producing a traverse guide, by embedding at least part of the guide member other than the yarn hooking portion in the metallic material, the arm body member is molded integrally with the guide member without adhesive applied therebetween. By the step, the guide member is integrally fixed to the arm body member, being firmly held on the arm body member without adhesive applied therebetween so as not to detach. Thus, without applying adhesive, the guide member can be reliably fixed to the arm body member.

**[0024]** According to the present disclosure, the traverse guide, the yarn winding machine, and the method for producing the traverse guide can be provided in which the guide member can be fixed to the arm body member without applying adhesive.

#### BRIEF DESCRIPTION OF THE DRAWINGS

##### **[0025]**

FIG. 1 is a front view of an automatic winder including a winder unit according to one embodiment.

FIG. 2 is a front view schematically illustrating the winder unit.

FIG. 3 is a side view illustrating a traverse device.

FIG. 4 is a perspective view illustrating the traverse guide.

FIG. 5A is an enlarged perspective view illustrating a distal end portion of the traverse guide. FIG. 5B is an enlarged perspective view illustrating a guide member embedded in the distal end portion.

FIG. 6 is a sectional view along line VI-VI in FIG. 5A. FIG. 7 is a flowchart illustrating one example of a method for producing the traverse guide.

FIG. 8 is an enlarged perspective view illustrating a guide member embedded in a distal end portion ac-

cording to a first modification.

FIG. 9 is a sectional view along line IX-IX in FIG. 8.

FIG. 10A is an enlarged perspective view illustrating a distal end portion according to a second modification. FIG. 10B is an enlarged perspective view illustrating a guide member embedded in the distal end portion according to the second modification.

FIG. 11A is a sectional view along line XI-XI in FIG. 10A. FIG. 11B is a sectional view of a distal end portion when bone portions in the second modification are changed to protruding portions.

FIG. 12A is an enlarged perspective view illustrating a distal end portion according to a third modification.

FIG. 12B is an enlarged perspective view illustrating a guide member embedded in the distal end portion according to the third modification.

FIG. 13A is an enlarged perspective view illustrating a guide member according to a fourth modification.

FIG. 13B is an enlarged perspective view illustrating a distal end portion covered by the guide member according to the fourth modification.

FIG. 14 is a sectional view along line XIV-XIV in FIG. 13A.

#### DETAILED DESCRIPTION

**[0026]** An embodiment according to the present disclosure will now be described in detail with reference to the attached drawings. In the following description, like elements or elements having like functions are designated by like numerals, and duplicate description is omitted.

**[0027]** Referring to FIG. 1, an overall configuration of an automatic winder 1 including a winder unit (yarn winding machine) 2 of the present embodiment will be described. In the following description, the terms "upstream" and "downstream" mean upstream and downstream in a traveling direction of a yarn Y during yarn winding.

**[0028]** As depicted in FIG. 1, the automatic winder 1 includes a plurality of winder units 2 disposed in parallel and a machine control device 4. The machine control device 4 controls (manages) operation of the entire automatic winder 1. The automatic winder 1 may further include an automatic doffing device (not depicted).

**[0029]** As depicted in FIG. 2, each winder unit 2 includes a winding unit main body 3 and a unit controller 17 as main components.

**[0030]** The unit controller 17 includes a central processing unit (CPU), a random access memory (RAM), a read only memory (ROM), an I/O port, and a communication port. The ROM stores therein a program for controlling the respective components of the winder unit 2. The I/O port and the communication port are connected to respective sections (described later in detail) and the machine control device 4 included in the winder unit 2 are connected. The I/O port and the communication port are configured to enable communication of control information, for example, therethrough. With this configura-

tion, the unit controller 17 can control operation of the respective sections included in the winder unit 2.

**[0031]** The winding unit main body 3 includes a yarn supplying section 5, a yarn-unwinding assisting device 7, a tension applying device 9, a yarn monitor 11, a splicer device 13, and a winding section (winding member) 15 in a yarn traveling path between a yarn supplying bobbin 6 and a contact roller 22.

**[0032]** In a lower portion of the winder unit 2, the yarn supplying section 5 is provided. The yarn supplying section 5 is configured to be able to hold the yarn supplying bobbin 6 conveyed by a bobbin conveying system (not depicted) in a predetermined position.

**[0033]** The yarn-unwinding assisting device 7 assists unwinding of the yarn Y from the yarn supplying bobbin 6 by lowering a regulation member 8 covering a core tube of the yarn supplying bobbin 6 in conjunction with unwinding of the yarn Y from the yarn supplying bobbin 6. The regulation member 8 comes into contact with a balloon of the yarn Y that is formed in an upper portion of the yarn supplying bobbin 6 by rotation and centrifugal force of the yarn Y unwound from the yarn supplying bobbin 6, and controls the balloon of the yarn Y to an appropriate size, thereby assisting the unwinding of the yarn Y. Near the regulation member 8, a sensor (not depicted) for detecting a chase portion of the yarn supplying bobbin 6 is provided. When this sensor detects descent of the chase portion, the yarn-unwinding assisting device 7 follows the descent of the chase portion to lower the regulation member 8 by an air cylinder (not depicted), for example.

**[0034]** The tension applying device 9 applies a predetermined tension to the traveling yarn Y. As the tension applying device 9, for example, a gate-type device in which movable comb teeth are disposed with respect to fixed comb teeth can be used. By causing the yarn Y to pass through between the comb teeth meshing with each other while causing the yarn Y to bend, resistance can be applied to the traveling yarn Y to apply an appropriate tension thereto. As the tension applying device 9, in addition to the above-described gate-type device, for example, a disk-type device can be used.

**[0035]** The yarn monitor 11 includes a sensor (not depicted) for detecting an abnormal part (yarn defect) of the yarn Y. Near the yarn monitor 11, a cutter 12 configured to cut the yarn Y immediately after the yarn monitor 11 has detected a yarn defect is provided.

**[0036]** When the yarn monitor 11 has detected a yarn defect and cuts the yarn, or when the yarn being unwound from the yarn supplying bobbin 6 breaks, for example, the splicer device 13 splices the lower yarn on the yarn supplying bobbin 6 side and the upper yarn on the side of a winding bobbin 14. As the splicer device configured to splice the upper yarn and the lower yarn, a mechanical knitter or a device using fluid such as compressed air, for example, can be used.

**[0037]** Below the splicer device 13, a lower-yarn catching member 16 configured to catch the lower yarn to guide

the lower yarn to the splicer device 13 is provided. Above the splicer device 13, an upper yarn catching member 18 configured to catch the upper yarn to guide the upper yarn to the splicer device 13 is provided.

**[0038]** The winding section 15 includes a cradle 20 configured to support the winding bobbin 14 around which the yarn Y is wound and the contact roller 22 configured to come into contact with the circumferential surface of the winding bobbin 14 and being rotatable. The winding section 15 includes a rotational driving source (not depicted) configured to rotationally drive the winding bobbin 14 supported by the cradle 20. By rotationally driving the winding bobbin 14, the yarn Y can be wound around the circumference of the winding bobbin 14. The winding bobbin 14 around which the yarn Y has been wound in this manner is called a package P.

**[0039]** The winder unit 2 includes an arm-type traverse device 24 configured to traverse the yarn Y to be wound around the winding bobbin 14 near the cradle 20. As depicted in FIG. 3, the traverse device 24 includes a traverse driving motor (driving section) 26 and a traverse guide 30.

**[0040]** The traverse driving motor 26 is a driving source configured to move the traverse guide 30 in a reciprocating rotational manner. The traverse driving motor 26 is configured with a servo motor, for example. The traverse driving motor 26 has a rotational drive shaft 28 connected to the traverse guide 30 as an output shaft. The traverse guide 30 is fixed to the rotational drive shaft 28 in a relatively non-rotatable manner. As depicted in FIG. 3, in a state in which the traverse guide 30 is fixed to the rotational drive shaft 28, the longitudinal direction of the traverse guide 30 is substantially orthogonal to the rotational drive shaft 28.

**[0041]** The rotor of the traverse driving motor 26 repeats forward and reverse rotations, whereby the traverse guide 30 moves in a reciprocating rotational manner. In a guide member 51 (described later in detail) attached to the traverse guide 30, the yarn Y is caught. Accordingly, this yarn Y reciprocates in the winding width direction (lateral direction in FIG. 2) of the package P in conjunction with the motion of the traverse guide 30. By rotating the winding bobbin 14 while the yarn Y is being guided by the guide member 51, the yarn Y is wound around the winding bobbin 14 while being traversed, whereby the package P of a predetermined shape can be formed.

**[0042]** The following describes the traverse guide 30 in detail. As depicted in FIG. 4, the traverse guide 30 includes an arm body member 31 and an attached member 41 attached to the arm body member 31. The following description is made assuming that the longitudinal direction of the traverse guide 30 is a "direction  $\alpha$ ", the direction along the traveling direction of the yarn Y orthogonal to the direction  $\alpha$  is a "direction  $\beta$ ", and the cross-wise direction of the traverse guide 30 orthogonal to the direction  $\alpha$  and to the direction  $\beta$  is a "direction  $\gamma$ ". The direction intersecting the direction P is any direction in-

cluding the direction  $\alpha$  and the direction  $\gamma$ .

**[0043]** The arm body member 31 has a body portion 32, a base end portion 33 provided to the body portion 32 on the base end side in the direction  $\alpha$ , and a distal end portion 34 provided to the body portion 32 on the distal end side in the direction  $\alpha$ . The arm body member 31 contains a metallic material. The arm body member 31 of the present embodiment is molded by die casting, thixomolding, or injection molding, for example, using the metallic material. The arm body member 31 is molded integrally with the guide member 51 described later without adhesive applied therebetween. The metallic material herein is a material containing metal or an alloy. Examples of the metallic material contained in the arm body member 31 include an aluminium alloy, a magnesium alloy, brass, a zinc alloy, a beryllium alloy, and zinc.

**[0044]** The body portion 32 has a shape of a plate that tapers down from the base end portion 33 toward the distal end portion 34. The base end portion 33 is a portion to which the attached member 41 is attached. On the base end portion 33, through holes 33a, 33b, 33c, and 33d are formed. Into each of the through holes 33a, 33b, and 33c, a fastener (not depicted) such as a screw is inserted. By screwing the fasteners into the attached member 41 through the through holes 33a, 33b, and 33c, the attached member 41 is fastened to the base end portion 33. Into the through hole 33d, the rotational drive shaft 28 (see FIG. 3) is inserted.

**[0045]** The attached member 41 contains aluminium, for example. The attached member 41 is formed by machining, for example. In the attached member 41, an attachment hole 42 into which the rotational drive shaft 28 (see FIG. 3) is inserted is formed. The traverse guide 30 is attached to the rotational drive shaft 28 (see FIG. 3) through the attachment hole 42.

**[0046]** Referring to FIG. 4, FIG. 5A, FIG. 5B, and FIG. 6, the following describes the distal end portion 34 and the guide member 51 that is fixed integrally with the distal end portion 34 in detail.

**[0047]** As depicted in FIG. 5A, the distal end portion 34 has a hook-like curved shape. Specifically, the distal end portion 34 extends straight from the base end side along the direction  $\alpha$  and is then curved, and the distal end thereof extends so as to face the base end portion 33. The distal end portion 34 bends in a hook-like shape to form a substantial J-shape in plan view.

**[0048]** The guide member 51 is a portion that comes into contact with the yarn Y in the traverse guide 30. The guide member 51 has a yarn hooking portion 51a configured to hook the yarn Y. As depicted in FIG. 5B, similarly to the distal end portion 34, the guide member 51 has a hook-like curved shape having a substantial J-shape in plan view. Specifically, the guide member 51 extends straight from the base end 51b thereof along the direction  $\beta$  and is then curved at a curved portion 51f, and the distal end 51c thereof extends so as to face the base end portion 33. In the guide member 51, the base end 51b is positioned closer to the body portion 32 than

the distal end 51c is. The guide member 51 may be surface treated. In this case, on the guide member 51, a surface treatment film is provided. This surface treatment film includes at least one of a diamond-like carbon film (DLC film), a titanium nitride film (TiN film), a titanium carbonitride film (TiCN film), a titanium aluminium nitride film (TiAlN film), and an aluminium chromium nitride film (AlCrN film).

**[0049]** The yarn hooking portion 51a is structured with portions including a side surface of the guide member 51 on the inner peripheral side. The yarn hooking portion 51a is disposed on a curved-shape inner side than a side surface 34a of the distal end portion 34 on the inner peripheral side is. The yarn hooking portion 51a is provided along the shape of the guide member 51, and bends in a hook-like shape to form a substantial J-shape in plan view. The yarn Y (see FIG. 3) traversed by the traverse device 24 slidably travels while being in contact with the yarn hooking portion 51a. The term "inner periphery" herein means a periphery of the curve bending in a hook-like shape on the inner side. The term "curved-shape inner side" means the inner side in the curved shape.

**[0050]** As depicted in FIG. 5B and FIG. 6, part of the guide member 51 other than the yarn hooking portion 51a is embedded in the distal end portion 34 of the arm body member 31. Specifically, in a groove 34b formed on the side surface 34a of the distal end portion 34 on the inner peripheral side, an outer peripheral part 51d of the guide member 51 is embedded. In other words, the outer peripheral part 51d is an embedded portion embedded in the distal end portion 34. In the outer peripheral part 51d, a side surface on the outer peripheral side and a pair of surfaces intersecting the direction  $\beta$  are covered by the groove 34b in a state of being in close contact with the groove 34b without a gap therebetween. In contrast, an inner peripheral part 51e of the guide member 51 including the yarn hooking portion 51a is exposed from the distal end portion 34. The inner peripheral part 51e protrudes toward the curved-shape inner side more than the side surface 34a of the distal end portion 34 on the inner peripheral side does. The term "outer periphery" herein means a periphery of the curve bending in a hook-like shape on the outer side.

**[0051]** The distal end 51c and its vicinity of the guide member 51 jut out toward the body portion 32 more than the distal end 34c of the distal end portion 34 does. With this configuration, the yarn Y to be traversed can be made less likely to come into contact with the distal end 34c of the distal end portion 34.

**[0052]** The guide member 51 thus configured is integrally fixed to the distal end portion 34 of the arm body member 31. The guide member 51 is tucked into and engages with the arm body member 31 in the direction  $\beta$ , and is also tucked into and engages with the arm body member 31 in the direction intersecting the direction  $\beta$ . In other words, the guide member 51 is tucked into and engages with the arm body member 31 in all of the direction  $\alpha$ , the direction  $\beta$ , and the direction  $\gamma$  as depicted

in FIG. 5A and FIG. 5B.

**[0053]** As described above, the hardness of the guide member 51 is higher than the hardness of the arm body member 31. For example, the hardness of material contained in the guide member 51 only needs to be equal to or higher than 120HV in Vickers hardness. Specific examples of the material contained in the guide member 51 include ceramics such as alumina and zirconia, silicon nitride, silicon carbide, and high-hardness alloy materials such as a tungsten alloy, a nickel alloy, a chromium-molybdenum alloy, a nickel-chromium-molybdenum alloy, and a chromium alloy. In the present embodiment, the guide member 51 contains alumina.

**[0054]** The following describes one example of a method for producing the traverse guide 30 with reference to FIG. 7. As depicted in FIG. 7, the guide member 51 containing alumina is prepared (step S1). This guide member 51 is formed in a hook-like shape by sintering using a muffle furnace, for example. On the guide member 51, grinding, for example, may be performed.

**[0055]** Subsequently, the metallic material and the guide member 51 are placed in a die, and the die is closed. The metallic material in the die is hot molded and is then cooled to form the arm body member 31 (step S2). At step S2, the metallic material and the guide member 51 are placed in the die so that at least part of the guide member 51 other than the yarn hooking portion 51a is embedded in the metallic material. When the arm body member 31 is molded from the metallic material in the die, this placement allows the arm body member 31 and the guide member 51 to be integrated without adhesive applied therebetween. In other words, the guide member 51 is fixed integrally with the arm body member 31 when the arm body member 31 is molded.

**[0056]** At step S2, when the arm body member 31 is formed by injection molding, the metallic material in a chip form or a pellet form may be placed in the die. When the arm body member 31 containing the metallic material is formed by injection molding, the melting temperature of the metallic material is set lower, whereby dimensional accuracy and strength, for example, of the arm body member 31 can be improved.

**[0057]** Subsequently, the arm body member 31 in which the guide member 51 is embedded is taken out of the die (step S3). After grinding or other treatment is performed on the arm body member 31 if necessary, the attached member 41 is attached to the arm body member 31 (step S4). At step S4, with screws to be inserted into the through holes 33a, 33b, and 33c, the attached member 41 is fastened to the base end portion 33. Through the above steps, the traverse guide 30 is produced.

**[0058]** It should be noted that directly identifying the structure of the traverse guide 30 may be impossible or unrealistic because the guide member 51 is integrally fixed when the arm body member 31 is molded as described above. In other words, there are circumstances in which directly identifying all of the traverse guide 30 based on the structure or characteristics thereof is im-

possible or unrealistic.

**[0059]** In the traverse guide 30, the winder unit 2 including the traverse guide 30, and the method for producing the traverse guide 30 described above, at least part of the guide member 51 other than the yarn hooking portion 51a has the embedded portion (outer peripheral part 51d) embedded in the distal end portion 34 of the arm body member 31. With this configuration, the at least part of the guide member 51 other than the yarn hooking portion 51a enters and comes into close contact with the distal end portion 34 of the arm body member 31, and is tucked into the arm body member 31 so as not to detach. Consequently, the guide member 51 is integrally fixed, being firmly held on the arm body member 31 without adhesive applied therebetween so as not to detach. Thus, without applying adhesive, the guide member 51 can be reliably fixed to the arm body member 31.

**[0060]** Even if conditions for using the traverse guide 30 have changed, strength of fixing the arm body member 31 to the guide member 51 is less likely to decrease than the case that a guide member is fixed to an arm body member by applying adhesive. Because the hardness of the guide member 51 is higher than the hardness of the arm body member 31, abrasion resistance of the yarn hooking portion 51a can be improved. Thus, in the winder unit 2 including the above-described traverse guide 30, the traverse guide 30 can traverse the yarn Y for a long period of time.

**[0061]** The guide member 51 and the distal end portion 34 integrally fixed to the guide member 51 each have a hook-like curved shape. The yarn hooking portion 51a is structured with portions including the side surface of the guide member 51 on the inner peripheral side, and is disposed on the curved-shape inner side than the side surface 34a of the distal end portion 34 on the inner peripheral side is. With this configuration, the yarn Y to be traversed can be reliably hooked on the yarn hooking portion 51a, and the yarn Y can be prevented from coming into contact with portions other than the yarn hooking portion 51a.

**[0062]** The guide member 51 is tucked into and engages with the arm body member 31 in the direction  $\beta$ , and also is tucked into and engages with the arm body member 31 in the direction intersecting the direction  $\beta$ . With this configuration, position error of the guide member 51 in the direction  $\beta$  and the direction intersecting the direction  $\beta$  can be prevented by the arm body member 31.

**[0063]** The guide member 51 is fixed integrally with the arm body member 31 when the arm body member 31 is molded. In this case, without applying adhesive, the guide member 51 can be firmly fixed to the arm body member 31.

**[0064]** The metallic material contained in the arm body member 31 is an aluminium alloy, a magnesium alloy, brass, a zinc alloy, a beryllium alloy, or zinc. This can reduce the weight of the traverse guide 30.

**[0065]** The guide member 51 contains ceramics. In this case, the guide member 51 having high hardness can

be prepared at low cost. Herein, instead of ceramics, the guide member 51 may contain a tungsten alloy, a nickel alloy, a chromium-molybdenum alloy, a nickel-chromium-molybdenum alloy, or a chromium alloy. In this case, the guide member 51 can contain a metallic material having high hardness.

**[0066]** On a surface of the guide member 51, at least one of a diamond-like carbon film, a titanium nitride film, a titanium carbonitride film, a titanium aluminium nitride film, and an aluminium chromium nitride film may be provided. In this case, abrasion resistance of the guide member 51 improves.

**[0067]** In the traverse guide 30 according to the above-described embodiment, the guide member 51 and the distal end portion 34 may be provided to the body portion 32 on the distal end side in a state of being rotated 180° about the direction  $\beta$  from the state depicted in FIGS. 5A and 5B. In other words, the guide member 51 and the distal end portion 34 bending in hook-like shapes may be formed so that the opening on the curved-shape inner side is open to the distal end side of the arm body member 31, instead of being formed as depicted in FIGS. 5A and 5B in which the opening on the curved-shape inner side is open to the base end side of the arm body member 31. Specifically, the guide member 51 may be integrally fixed to the distal end portion 34 by forming the groove 34b (see FIG. 6) of the distal end portion 34 so that the groove 34b is open to the distal end side, and embedding the outer peripheral part 51d of the guide member 51 along the groove 34b.

**[0068]** In the method for producing the traverse guide 30 according to the above-described embodiment, when the material contained in the guide member 51 is ceramics, before step S2, an intermediate layer may be provided on a surface (e.g., a side surface of the guide member 51 on the outer peripheral side) of the guide member 51 embedded in the arm body member 31. In other words, the traverse guide 30 may further include an intermediate layer provided on a surface of the guide member 51 embedded in the arm body member 31. The intermediate layer is a layer having excellent accessibility (wettability) to the arm body member 31 containing the metallic material. The intermediate layer is a metallization layer, for example. The metallization layer is provided on the surface of the guide member 51 by metallizing with high-melting point metal paste, active-metal plating, or noble-metal plating, for example. By providing such a metallization layer on the surface, bondability between the arm body member 31 containing the metallic material and the guide member 51 containing ceramics can be improved. In addition, by chemical bonding (metal bonding) between the metallic material of the arm body member 31 and the metallization layer, without applying adhesive, the guide member 51 is firmly fixed to the arm body member 31. If the guide member 51 is surface treated, the metallization layer may be provided after the surface treatment film is formed, or may be provided before the surface treatment film is formed. In other words, the sur-

face treatment film may be provided on the metallization layer, or may be provided between the surface of the arm body member 31 and the metallization layer.

**[0069]** Hereinafter, first to fourth modifications of the above-described embodiment will be described. In the description of the first to fourth modifications, points different from those in the above-described embodiment will be mainly described.

**[0070]** The following describes the first modification. In the first modification, as depicted in FIG. 8 and FIG. 9, a portion of a guide member 51A embedded in a distal end portion 34A is provided with a pair of protruding portions 52. The protruding portions 52 are provided extending along the outer peripheral part 51d of the guide member 51A. The protruding portions 52 protrude in the direction  $\beta$  from a pair of surfaces of the outer peripheral part 51d each on the outer peripheral side. This guide member 51A has a substantial T-shape cross section.

**[0071]** In the arm body member 31, recesses 35 in which the protruding portions 52 are embedded in a state of being in close contact therewith are formed. The recesses 35 have shapes corresponding to the protruding portions 52 of the guide member 51A. The recesses 35 are formed extending along the groove 34b. The recesses 35 are formed in a pair on the bottom side of the groove 34b so as to face each other in the direction  $\beta$ . The pair of the recesses 35 each are recessed on one side and the other side in the direction  $\beta$ .

**[0072]** In also the first modification described above, the guide member 51A is integrally fixed to the arm body member 31, being firmly held on the arm body member 31 without adhesive applied therebetween so as not to detach. Thus, the functional effect of enabling the guide member 51A to be reliably fixed to the arm body member 31 without applying adhesive can be obtained. Furthermore, in the first modification, the protruding portions 52 are engaged with the recesses 35 in the direction intersecting the direction  $\beta$ , whereby the guide member 51A can be reliably prevented from detaching. Because the protruding portions 52 are in close contact with the recesses 35, a backlash of the guide member 51 can be prevented.

**[0073]** In the above-described first modification, only either one of the pair of the protruding portions 52 may be provided. The protruding portions 52 do not necessarily have to be provided extending continuously along the outer peripheral part 51d of the guide member 51A, and may be provided extending intermittently, for example. The protruding portions 52 may be provided to the arm body member 31, and the recesses 35 may be formed in the guide member 51A. In also these cases, the above-described functional effect can be obtained. The essential thing is that either one of the portion of the guide member 51A embedded in the arm body member 31 and the arm body member 31 needs to be provided with the protruding portions 52, and the other needs to be provided with the recesses 35.

**[0074]** The following describes the second modifica-

tion. In the second modification, as depicted in FIG. 10A, FIG. 10B, and FIG. 11A, in a guide member 51B, part of the outer peripheral part 51g juts out toward the curved-shape outer side more than a distal end portion 34B does, and part of the inner peripheral part 51e juts out toward the curved-shape inner side more than the distal end portion 34B does. Specifically, areas from the vicinity of the curved portion 51f to a distal end part in the outer peripheral part 51g of the guide member 51B are exposed from the distal end portion 34B. In the same manner, areas from the distal end 51c to the vicinity of the base end 51b in the inner peripheral part 51e of the guide member 51B are exposed from the distal end portion 34B. In contrast, areas other than the above-described exposed areas in the guide member 51B are embedded in the distal end portion 34B. In other words, areas other than the exposed areas in the guide member 51B are embedded portions embedded in the distal end portion 34B.

**[0075]** In the guide member 51B, through holes 53a to 53c are formed each along the direction  $\beta$ . The shape of the through holes 53a to 53c in plan view is circular, but may be substantially rectangular, for example. The through holes 53a to 53c are formed in the guide member 51B at portions embedded in the distal end portion 34B. The through holes 53a to 53c are separated from each other. As depicted in FIG. 10B, the through hole 53a is formed on the base end 51b side with respect to the curved portion 51f of the guide member 51B. The through hole 53b is formed near the curved portion 51f of the guide member 51B. The through hole 53c is formed on the distal end 51c side with respect to the curved portion 51f of the guide member 51B. The number of through holes formed in the guide member 51B may be one or two, or may be four or more. When a plurality of through holes are formed in the guide member 51B, at least one thereof needs to be formed on the base end 51b side with respect to the curved portion 51f of the guide member 51B, and at least one of the others needs to be formed on the distal end 51c side with respect to the curved portion 51f of the guide member 51B.

**[0076]** The distal end portion 34B includes a pair of plate-like portions 34d between which the guide member 51B is sandwiched along the direction  $\beta$  and bone portions 36a to 36c (first bone portion) extending along the direction  $\beta$ . The pair of the plate-like portions 34d are coupled to each other by the bone portions 36a to 36c. The number of bone portions provided to the distal end portion 34B is the same as the number of the through holes. The bone portion 36a is inserted into the through hole 53a and is in close contact with the inner surface of the through hole 53a. In the same manner, the bone portion 36b is inserted into the through hole 53b and is in close contact with the inner surface of the through hole 53b, and the bone portion 36c is inserted into the through hole 53c and is in close contact with the inner surface of the through hole 53c. Thus, the shapes of the bone portions 36a to 36c are the same as the shapes of the through holes 53a to 53c, respectively.

**[0077]** In also the second modification described above, the guide member 51B is integrally fixed to the arm body member 31, being firmly held on the arm body member 31 without adhesive applied therebetween so as not to detach. Thus, the functional effect of enabling the guide member 51B to be reliably fixed to the arm body member 31 without applying adhesive can be obtained.

**[0078]** Furthermore, in the second modification, guide member 51B is engaged with the arm body member 31 in the direction intersecting the direction  $\beta$  by the through holes 53a to 53c and the bone portions 36a to 36c. Thus, the guide member 51B can be reliably prevented from detaching. Because the bone portions 36a to 36c are in close contact with the inner surfaces of the through holes 53a to 53c, respectively, a backlash of the guide member 51B can be prevented.

**[0079]** In the second modification, as depicted in FIG. 10B, the base end 51b of the guide member 51B is embedded in the distal end portion 34B of the arm body member 31. In this case, a gap or a level difference, for example, formed between the base end 51b of the guide member 51B and the arm body member 31 can be bridged. With this configuration, the yarn Y to be traversed can be prevented from being caught in the gap or the level difference, for example.

**[0080]** Alternatively, as depicted in FIG. 11B, instead of the bone portions 36a to 36c (see FIG. 11A), protruding portions 37a to 37d may be provided to the distal end portion 34C. The protruding portions 37a to 37d each protrude toward the guide member 51C along the direction  $\beta$ . The distal end of the protruding portion 37a and the distal end of the protruding portion 37b face each other with a gap interposed therebetween in the direction  $\beta$ . The distal end of the protruding portion 37c and the distal end of the protruding portion 37d face each other with a gap interposed therebetween in the direction  $\beta$ . In the guide member 51C, recesses 54a to 54d in which the protruding portions 37a to 37d are embedded, respectively, in a state of being in close contact therewith are formed.

**[0081]** Alternatively, for example, a plurality of dimples (recesses) may be formed in the guide member 51C, and a plurality of protruding portions that are embedded in the respective dimples in a state of being in close contact therewith may be provided to the distal end portion 34C. Furthermore, for example, the distal end of the protruding portion 37a and the distal end of the protruding portion 37b may be in contact with each other. In the same manner, the distal end of the protruding portion 37c and the distal end of the protruding portion 37d may be in contact with each other.

**[0082]** The following describes the third modification. In the third modification, as depicted in FIG. 12A and FIG. 12B, a guide member 51D has a first member 61 and a second member 62. The first member 61 and the second member 62 are members having stick shapes each extending along the direction  $\alpha$ . The first member 61 and

the second member 62 are separated from each other in parallel. The length of the first member 61 along the direction  $\alpha$  is longer than the length of the second member 62. The stick shape is also called a column shape.

5 The first member 61 and the second member 62 may have a cylindrical column shape or may have a polygonal column shape. The first member 61 and the second member 62 of the third modification are members having cylindrical column shapes.

10 **[0083]** Part of the first member 61 is embedded in a distal end portion 34D. Specifically, both end portions of the first member 61 are embedded in the distal end portion 34D. A portion of the first member 61 on the side opposite to the second member 62 side is embedded in the distal end portion 34D. In other words, both end portions of the first member 61 and the portion of the first member 61 on the side opposite to the second member 62 side are embedded portions embedded in the distal end portion 34D. In contrast, a portion of the first member 61 other than these portions is exposed from the distal end portion 34D.

15 **[0084]** Part of the second member 62 is embedded in the distal end portion 34D. Specifically, both end portions of the second member 62 are embedded in the distal end portion 34D. A portion of the second member 62 on the side opposite to the first member 61 side is embedded in the distal end portion 34D. In other words, both end portions of the second member 62 and the portion of the second member 62 on the side opposite to the first member 61 side are embedded portions embedded in the distal end portion 34D. In contrast, a portion of the second member 62 other than these portions is exposed from the distal end portion 34D.

20 **[0085]** The exposed portion of the first member 61, which is a portion of the first member 61 excluding both end portions and including a surface opposing to the second member 62, forms a yarn hooking portion 61a. The exposed portion of the second member 62, which is a portion of the second member 62 excluding both end portions and including a surface opposing to the first member 61, forms a yarn hooking portion 62a. The yarn hooking portions 61a and 62a have the same function as that of the yarn hooking portion 51a in the above-described embodiment. These yarn hooking portions 61a and 62a are disposed on the curved-shape inner side than the side surface 34a of the distal end portion 34D on the inner peripheral side.

25 **[0086]** Herein, the distal end 34c of the distal end portion 34D protrudes toward a curved direction inner side (first member 61 side) in the direction  $\gamma$ . With this configuration, the end portion of the second member 62 is securely embedded in the distal end portion 34D.

30 **[0087]** In also the third modification described above, the guide member 51D is integrally fixed to the arm body member 31, being firmly held thereon without adhesive applied therebetween so as not to detach. Thus, the functional effect of enabling the guide member 51D to be reliably fixed to the arm body member 31 without applying

adhesive can be obtained. Furthermore, in the third modification, because the first member 61 and the second member 62 are simple members having stick shapes, the guide member 51D can be easily formed. Because both ends of each of the first member 61 and the second member 62 are embedded in the distal end portion 34D, these both ends of each of the first member 61 and the second member 62 can reliably prevent the guide member 51D from detaching.

**[0088]** The following describes the fourth modification. In the fourth modification, as depicted in FIG. 13A, FIG. 13B, and FIG. 14, a guide member 51E covers most part of the distal end portion 34E in the arm body member 31. Specifically, the guide member 51E covers at least the side surface 34a of the distal end portion 34E on the inner peripheral side and a pair of surfaces of the distal end portion 34E that intersect the direction  $\beta$ . In contrast, the side surface of the distal end portion 34E on the outer peripheral side is not covered by the guide member 51E.

**[0089]** In the distal end portion 34E, through holes 38a and 38b are formed along the direction  $\beta$ . The shape of the through holes 38a and 38b in plan view is circular, but may be substantially rectangular, for example. The through holes 38a and 38b are formed in the distal end portion 34E at portions covered by the guide member 51E, and are separated from each other. As depicted in FIG. 13B, the through hole 38a is formed in the distal end portion 34E on the base end side with respect to a curved portion 34e. The through hole 38b is formed in the distal end portion 34E on the distal end side with respect to the curved portion 34e. In the fourth modification, when a plurality of through holes are formed in the distal end portion 34E, at least one of the through holes needs to be formed in the distal end portion 34E on the distal end side with respect to the curved portion 34e, and at least one of the other through holes needs to be formed in the distal end portion 34E on the base end side with respect to the curved portion 34e.

**[0090]** The guide member 51E is provided with bone portions 55a and 55b (second bone portion) extending along the direction  $\beta$ . The number of bone portions provided to the guide member 51E is the same as the number of the through holes. The bone portion 55a is inserted into the through hole 38a and is in close contact with the inner surface of the through hole 38a. In the same manner, the bone portion 55b is inserted into the through hole 38b and is in close contact with the inner surface of the through hole 38b. Thus, the shapes of the bone portions 55a and 55b are the same as the shapes of the through holes 38a and 38b, respectively. The bone portions 55a and 55b are embedded portions embedded in the distal end portion 34E.

**[0091]** In also the fourth modification described above, the guide member 51E is integrally fixed to the arm body member 31, being firmly held thereon without a gap interposed therebetween and without adhesive applied therebetween so as not to detach. Thus, the functional effect of enabling the guide member 51E to be firmly fixed

to the arm body member 31 without applying adhesive can be obtained. Furthermore, in the fourth modification, the guide member 51E is engaged with the arm body member 31 in the direction intersecting the direction  $\beta$  by the through holes 38a and 38b and the bone portions 55a and 55b. Thus, the guide member 51E can be reliably prevented from detaching. Because the bone portions 55a and 55b are in close contact with the inner surfaces of the through holes 38a and 38b, respectively, a backlash of the guide member 51E can be prevented.

**[0092]** In the foregoing, the embodiment according to the present disclosure and the modifications thereof have been described, but the present disclosure is not limited to the above-described embodiment and the above-described modifications. The present disclosure may be modified within a scope not altering the gist described in each claim. The above-described embodiment and the above-described modifications may be used in combination as appropriate.

**[0093]** For example, the base end 51b of the guide member 51 in the above-described embodiment may be embedded in the arm body member 31 as described in the second modification (the base end 51b may be included as an embedded portion). In this case, also in the above-described embodiment, in the same manner as in the second modification, the yarn Y to be traversed can be prevented from being caught in a gap or a level difference, for example, formed between the base end 51b of the guide member 51 and the arm body member 31. In the same manner, also in the fourth modification, the base end of the guide member 51E may be embedded in the arm body member 31 (the base end of the guide member 51E may be included as an embedded portion).

**[0094]** In the above-described embodiment and the above-described modifications, the arm body member 31 contains the metallic material, but the present disclosure is not limited to this. For example, the arm body member 31 may contain metal oxide or resin. The arm body member 31 may be a component having the body portion 32 the length of which is very short in the direction  $\alpha$ . Alternatively, the arm body member 31 may be a relatively small component that does not have the body portion 32 and in which the base end portion 33 and the distal end portion 34 are integrated. In this case, the arm body member 31 may be attached to a member configured to traverse, such as a belt. The essential thing is that the arm body member 31 only needs to be a member integrally fixing the guide member, and does not necessarily have to be a member in itself configured to traverse.

**[0095]** At least some parts of the embodiment and the modifications described above may be optionally used in combination.

**[0096]** A traverse guide includes: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. Hardness of the guide member is higher

than hardness of the arm body member, and in at least part of the guide member other than the yarn hooking portion, an embedded portion to be embedded in the distal end portion is formed.

**[0097]** In the traverse guide, the guide member may be fixed integrally with the arm body member when the arm body member is molded. In this case, without applying adhesive, the guide member can be firmly fixed to the arm body member.

**[0098]** The traverse guide may include: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. In at least part of the guide member other than the yarn hooking portion, an embedded portion to be embedded in the distal end portion may be formed. In this case, without applying adhesive, the guide member can be reliably fixed to the arm body member.

**[0099]** The traverse guide may include: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. A through hole may be formed in the guide member, and the arm body member may have a first bone portion inserted into the through hole and being in close contact with an inner surface of the through hole. In this case, the through hole and the first bone portion can prevent the guide member from detaching. Because the first bone portion is in close contact with the inner surface of the through hole, a backlash of the guide member can be prevented.

**[0100]** The traverse guide may include: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. The guide member may be tucked into and engage with the arm body member along a traveling direction of the yarn, and may also be tucked into and engage with the arm body member along a direction intersecting the traveling direction. In this case, the arm body member can prevent position error of the guide member in the traveling direction and the direction intersecting the traveling direction.

**[0101]** The traverse guide may include: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. The guide member may be provided so as to cover part of the arm body member, a through hole may be formed in the arm body member, and the guide member may have a second bone portion inserted into the through hole and being in close contact with an inner surface of the through hole. In this case,

the through hole and the second bone portion can prevent the guide member from detaching. Because the second bone portion is in close contact with the inner surface of the through hole, a backlash of the guide member can be prevented.

**[0102]** The traverse guide may include: an arm body member having a distal end portion in a hook-like curved shape and containing a metallic material; and a guide member integrally fixed to the distal end portion of the arm body member and having a yarn hooking portion configured to hook a yarn. The guide member may have a hook-like curved shape, and the yarn hooking portion may be structured with a portion including an inner peripheral surface of the guide member and may be disposed on a curved-shape inner side than an inner peripheral surface of the distal end portion is. In this case, the yarn to be traversed can be prevented from coming into contact with portions other than the yarn hooking portion.

## Claims

### 1. A traverse guide comprising:

an arm body member (31) having a distal end portion (34, 34A to 34E) in a hook-like curved shape and containing a metallic material; and a guide member (51, 51A to 51E) integrally fixed to the distal end portion of the arm body member without adhesive applied therebetween and having a yarn hooking portion (51a, 61a, 62a) configured to hook a yarn (Y), wherein

hardness of the guide member is higher than hardness of the arm body member, and at least part of the guide member other than the yarn hooking portion has an embedded portion (51B, 51d, 55a, 55b, 61, 62) embedded in the distal end portion.

2. The traverse guide according to claim 1, wherein a through hole (53a to 53c) is formed in the guide member, and the arm body member has a first bone portion (36a to 36c) inserted into the through hole and being in close contact with an inner surface of the through hole.

3. The traverse guide according to claim 1 or 2, wherein the guide member is tucked into and engage with the arm body member along a traveling direction of the yarn, and is also tucked into and engage with the arm body member along a direction intersecting the traveling direction.

4. The traverse guide according to claim 1, wherein the guide member is provided so as to cover part of the arm body member,

a through hole (38a, 38b) is formed in the arm body member, and the guide member has a second bone portion (55a, 55b) inserted into the through hole and being in close contact with an inner surface of the through hole.

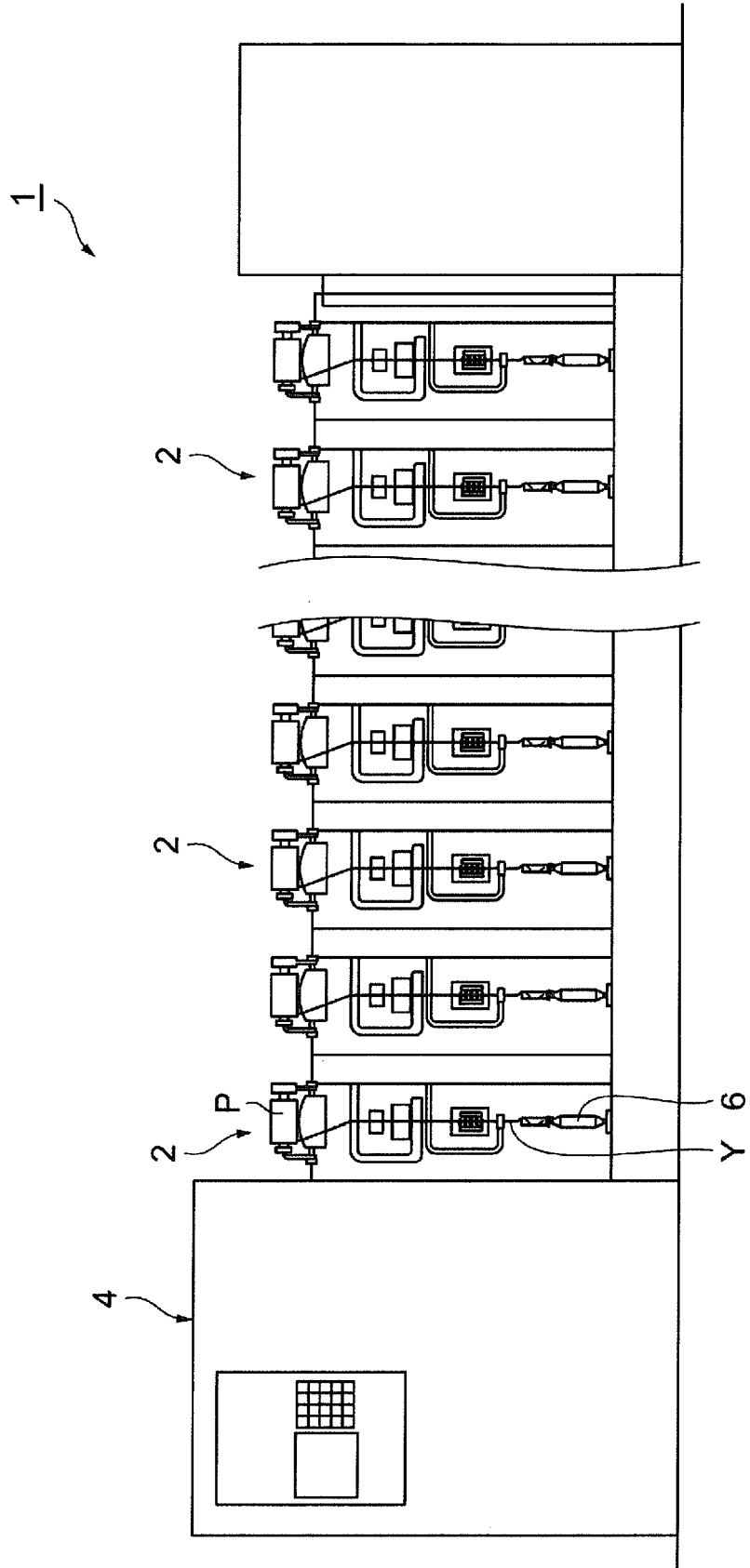
- 5. The traverse guide according to any one of claims 1 to 4, wherein a protruding portion (37a to 37d, 52) is provided on either one of the at least part of the guide member embedded in the arm body member and the arm body member, and a recess (54a to 54d, 35) with which the protruding portion is in close contact is formed on the other one of the at least part of the guide member embedded in the arm body member and the arm body member.
- 6. The traverse guide according to claim 5, wherein the protruding portion protrudes along the traveling direction of the yarn.
- 7. The traverse guide according to any one of claims 1 to 6, wherein the guide member has a hook-like curved shape, and the yarn hooking portion is structured with a portion including an inner peripheral surface of the guide member and is disposed on a curved-shape inner side than an inner peripheral surface of the distal end portion is.
- 8. The traverse guide according to claim 7, wherein a base end of the guide member is embedded in the arm body member.
- 9. The traverse guide according to claim 1, wherein the guide member has a first member (61) and a second member (62) that have stick shapes separated from each other in parallel, and both ends of the first member and both ends of the second member are embedded in the arm body member.
- 10. The traverse guide according to any one of claims 1 to 9, wherein the metallic material is an aluminium alloy, a magnesium alloy, brass, a zinc alloy, a beryllium alloy, or zinc.
- 11. The traverse guide according to any one of claims 1 to 10, wherein the guide member contains ceramics.
- 12. The traverse guide according to claim 11, further comprising an intermediate layer provided on a surface of the guide member embedded in the arm body member.
- 13. The traverse guide according to any one of claims 1 to 10, wherein the guide member contains a tungsten alloy, a nickel alloy, a chromium-molybdenum alloy,

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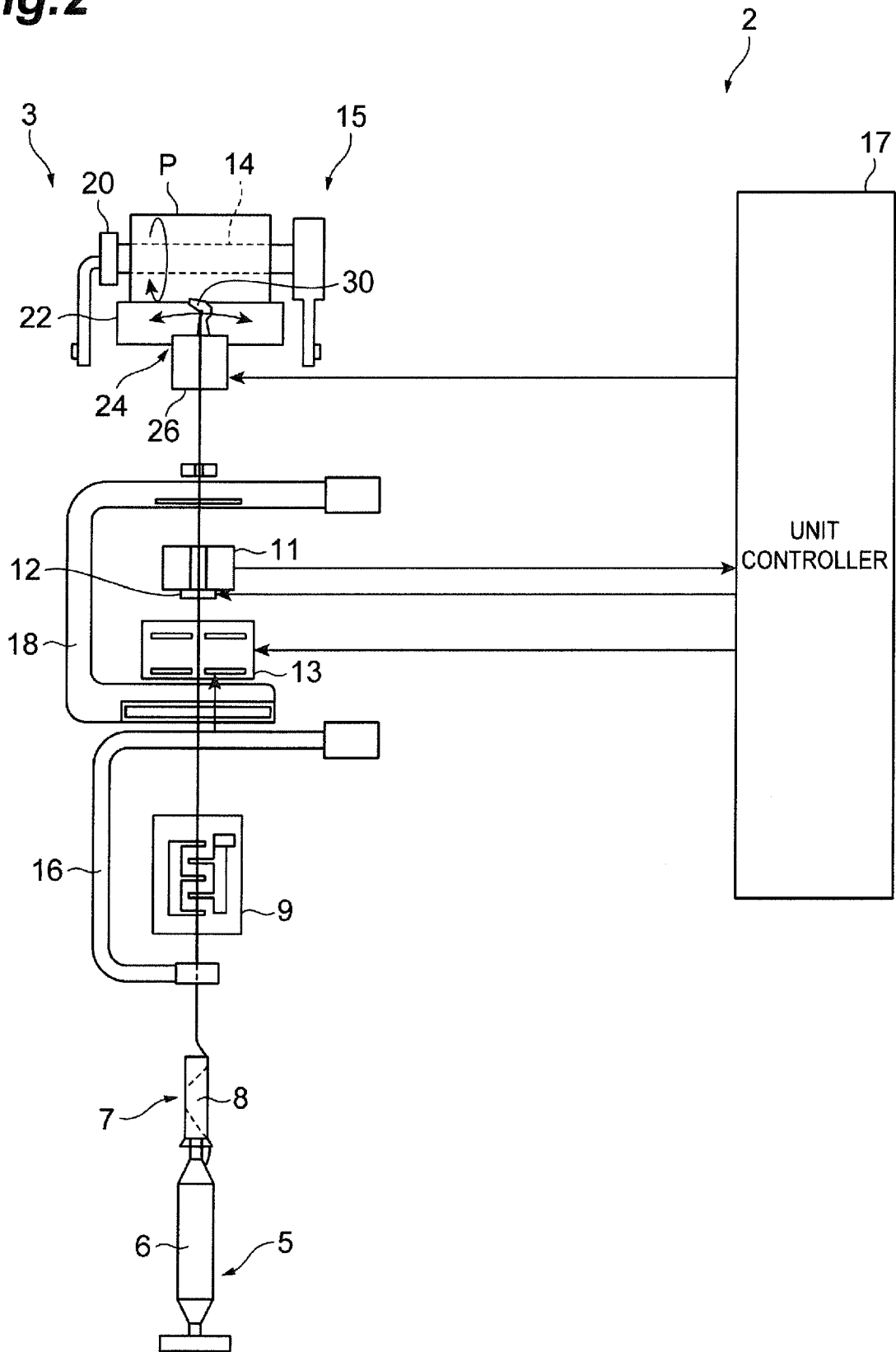
a nickel-chromium-molybdenum alloy, or a chromium alloy.

- 14. The traverse guide according to any one of claims 1 to 13, wherein on a surface of the guide member, at least one of a diamond-like carbon film, a titanium nitride film, a titanium carbonitride film, a titanium aluminium nitride film, and an aluminium chromium nitride film is provided.
- 15. A yarn winding machine comprising:
  - the traverse guide (30) as claimed in any one of claims 1 to 14;
  - a drive section (26) configured to move the traverse guide in a reciprocating rotational manner; and
  - a winding section (15) configured to wind the yarn traversed by reciprocating rotational motion of the traverse guide onto a package (P).
- 16. A method for producing a traverse guide, comprising:
  - a step of forming an arm body member by placing in a die a metallic material and a guide member having a hardness higher than that of the metallic material and having a yarn hooking portion configured to hook a yarn and by molding the metallic material in the die, wherein
  - in the forming step, by embedding at least part of the guide member other than the yarn hooking portion in the metallic material, the arm body member is molded integrally with the guide member without adhesive applied therebetween.

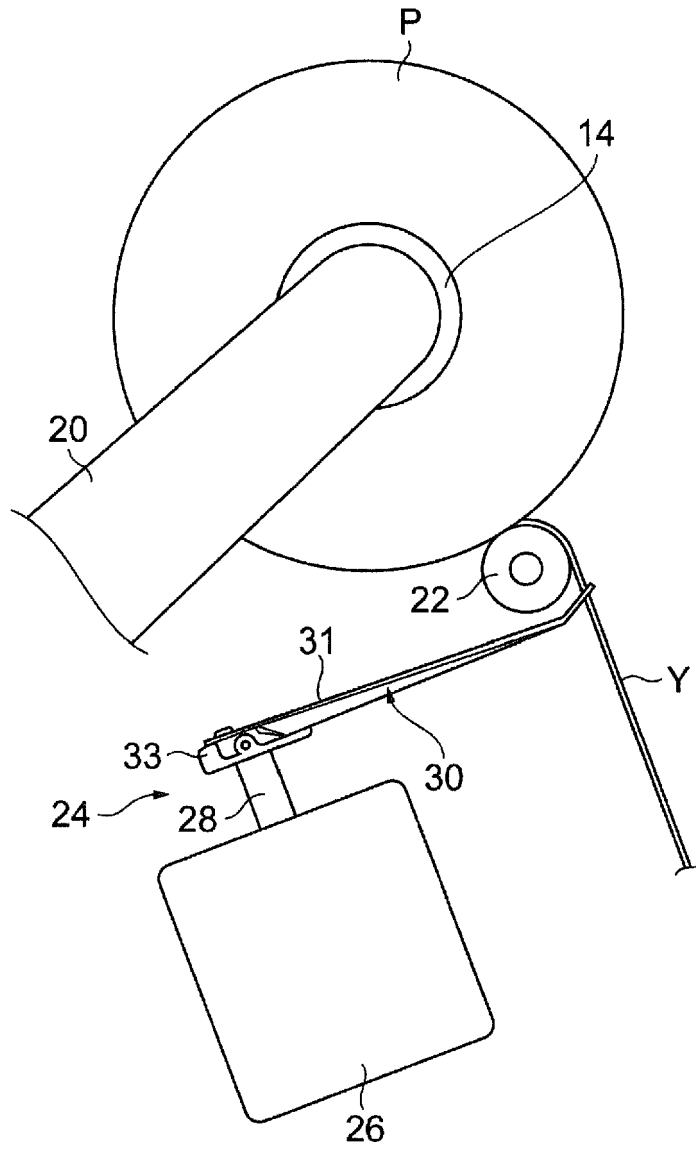
Fig.1



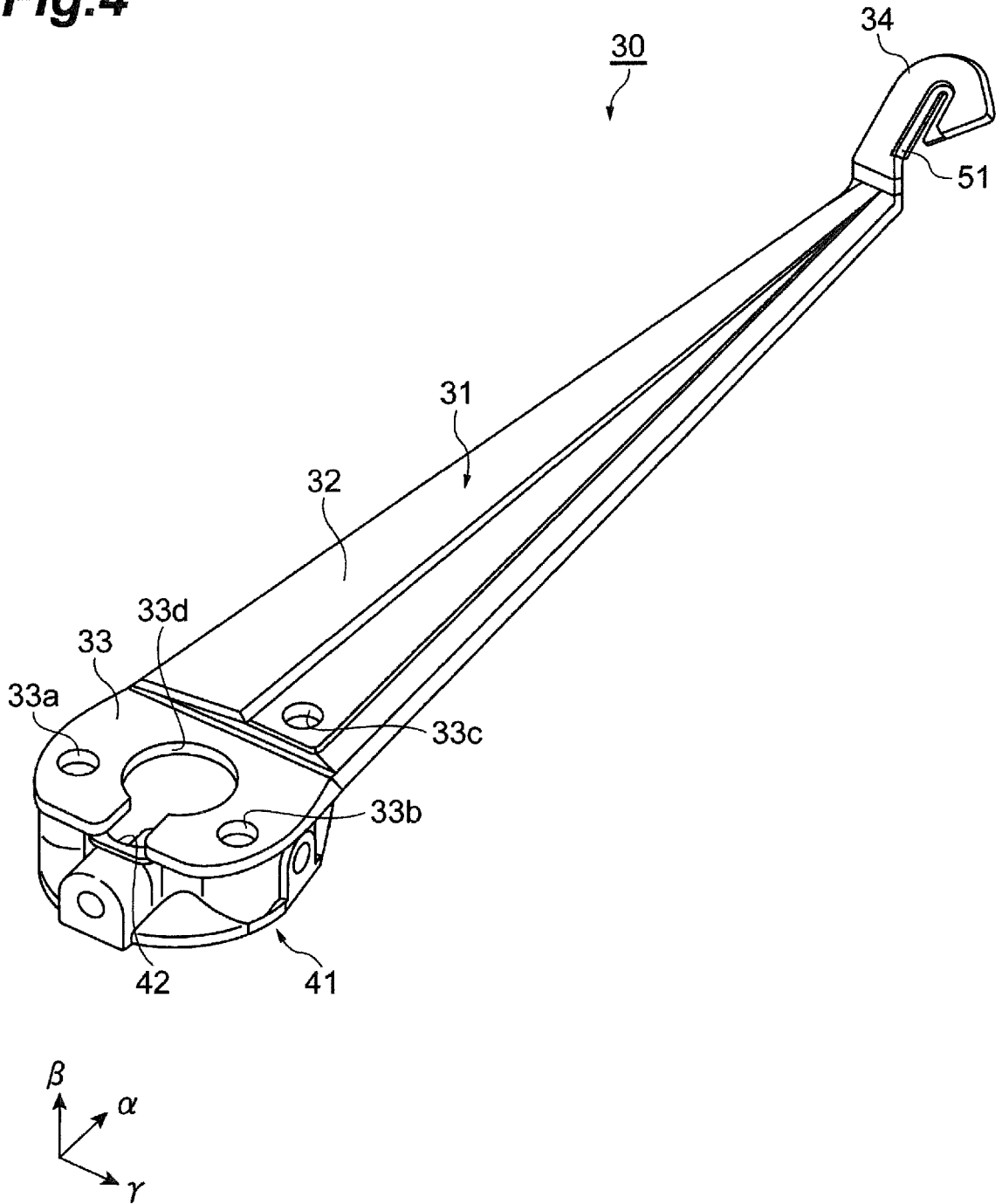
**Fig.2**



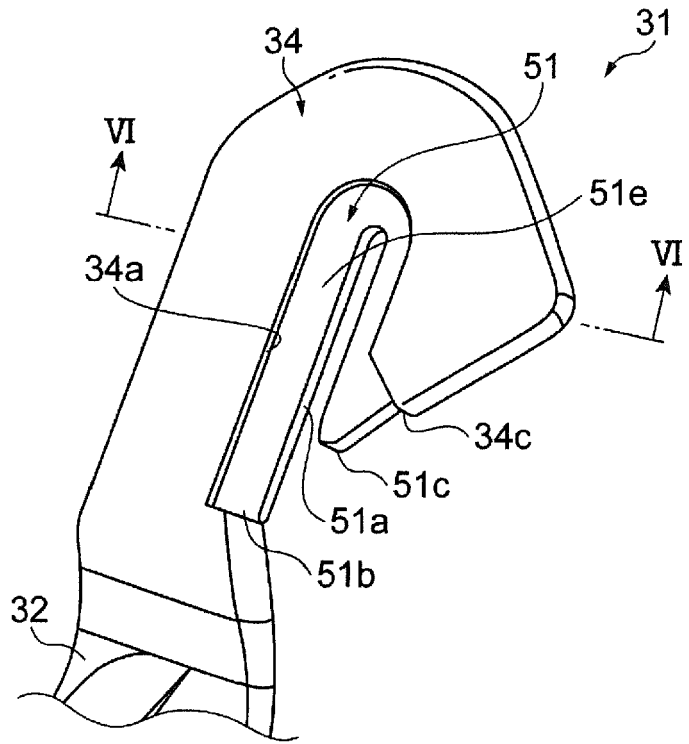
**Fig.3**



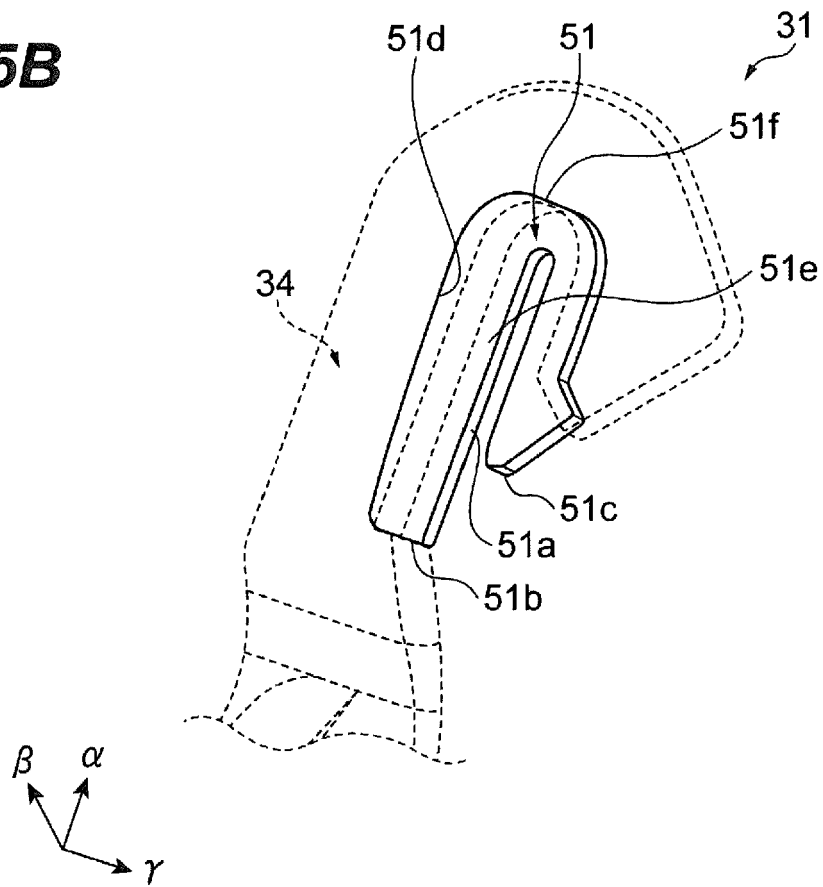
**Fig.4**



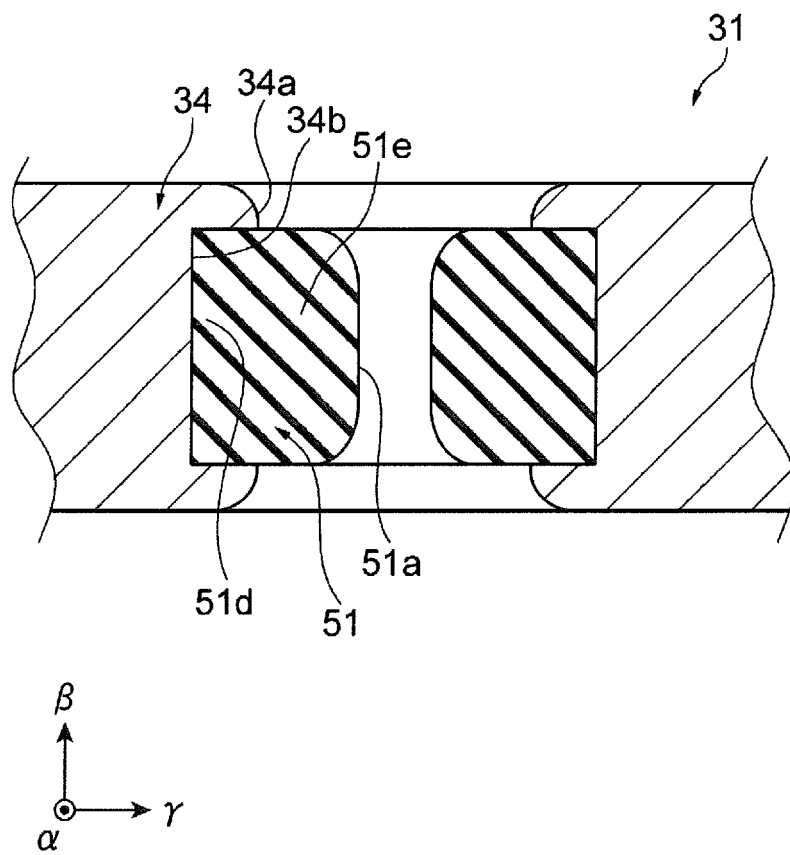
**Fig.5A**



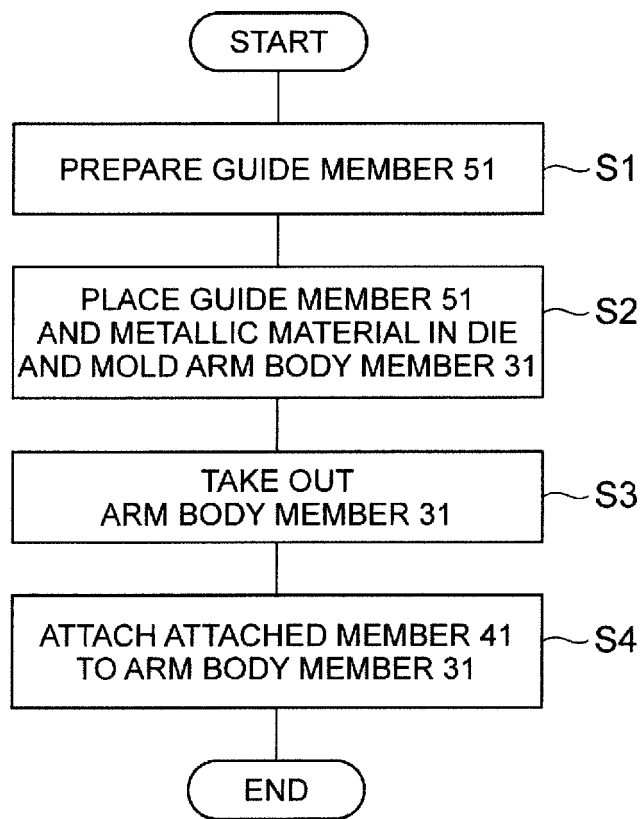
**Fig.5B**



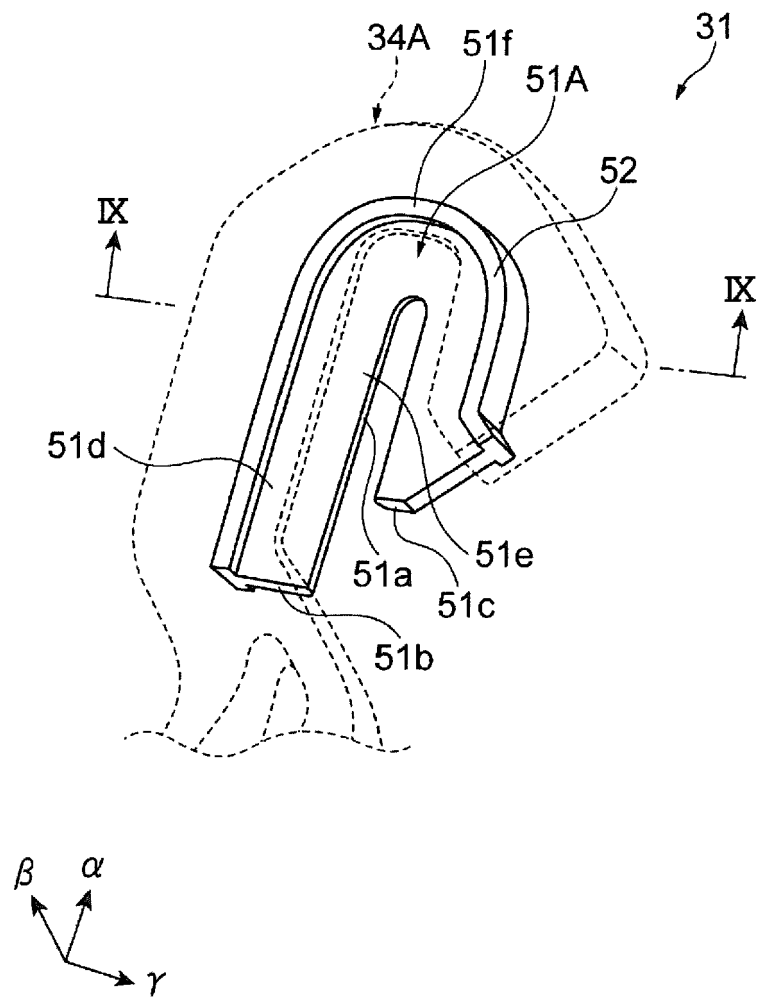
**Fig.6**



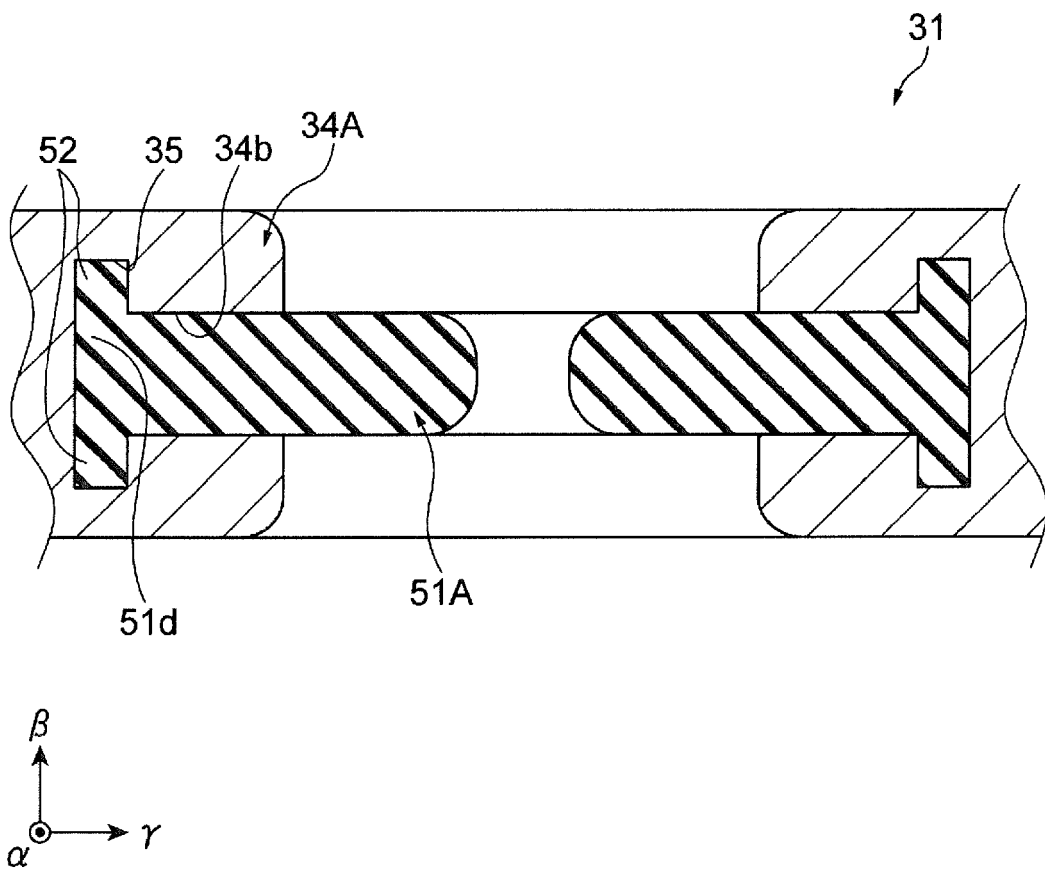
**Fig.7**



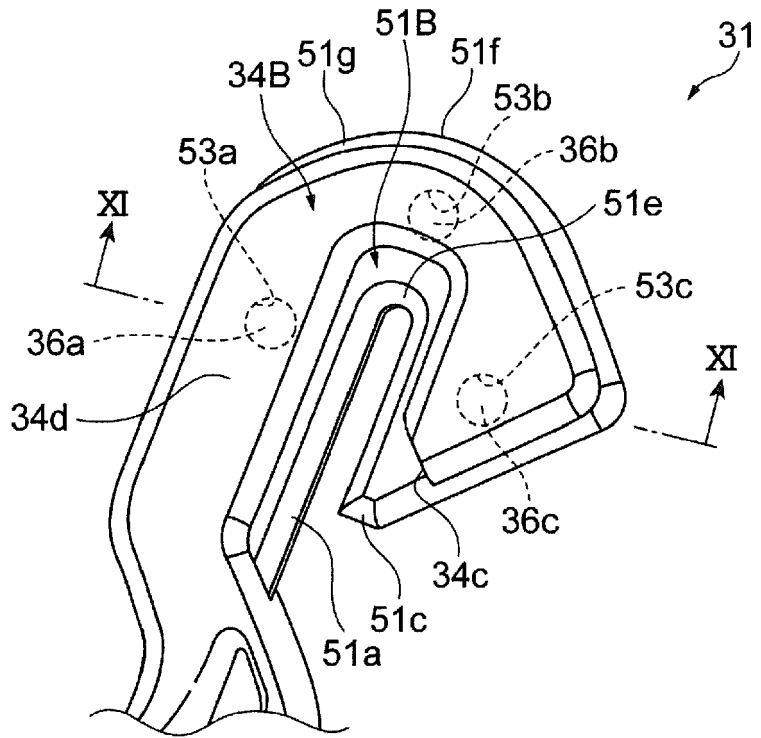
**Fig.8**



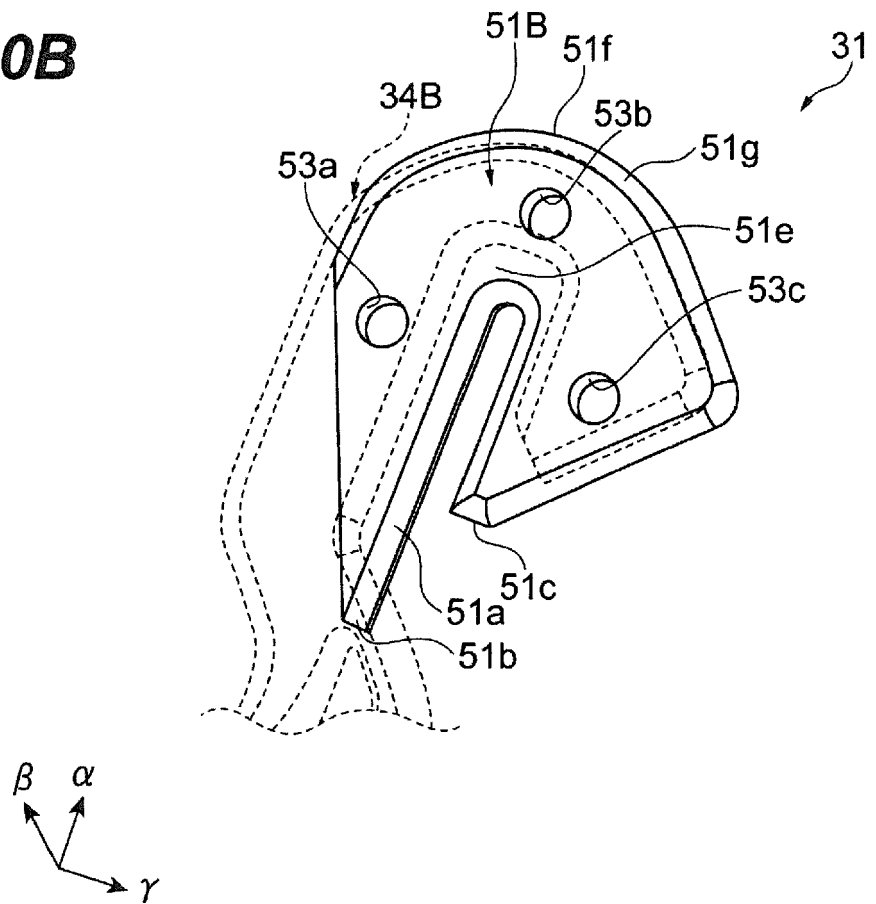
**Fig.9**



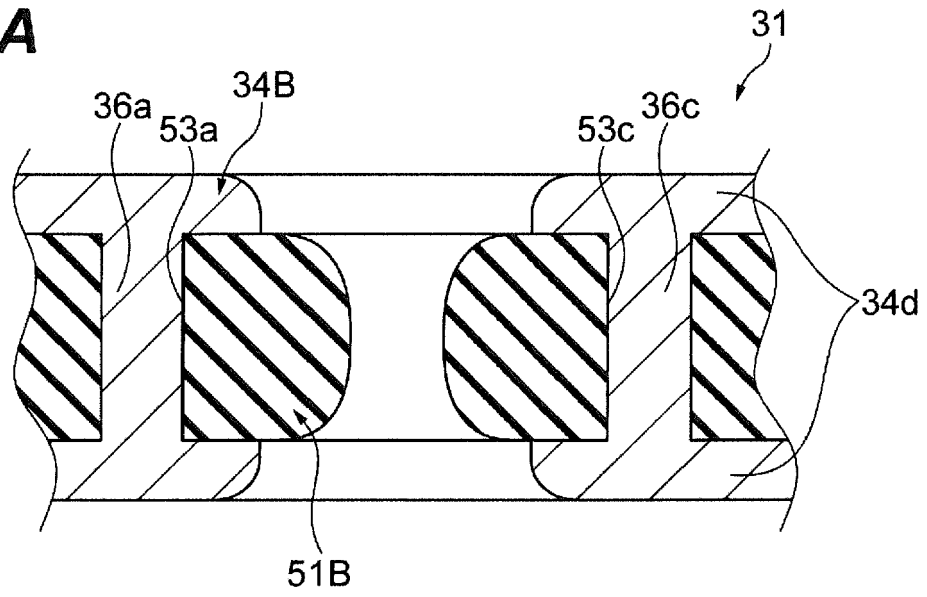
**Fig.10A**



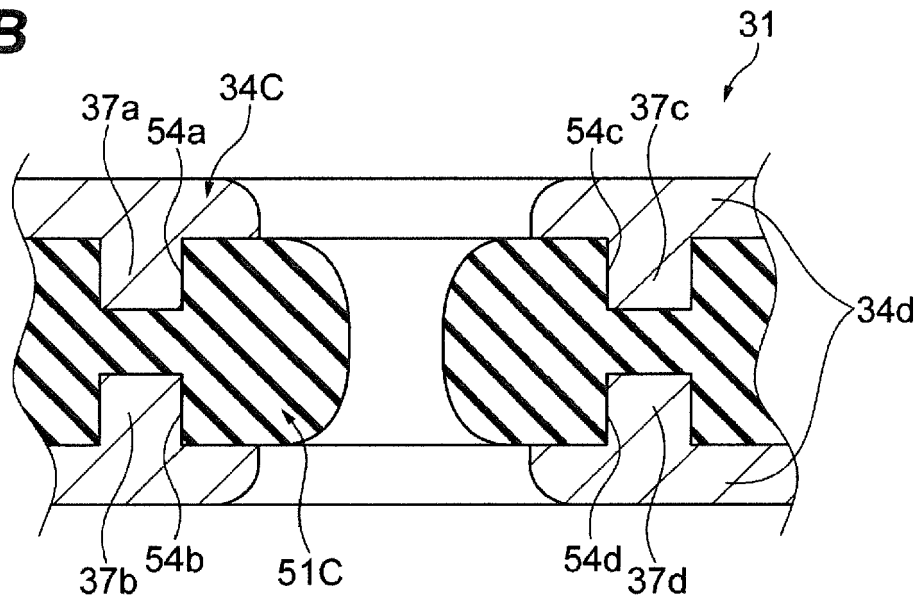
**Fig.10B**



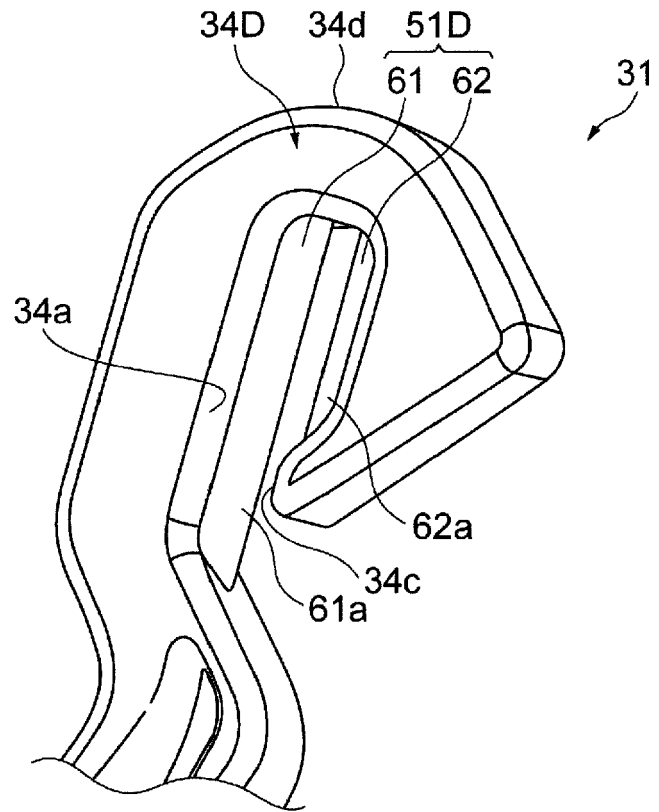
**Fig.11A**



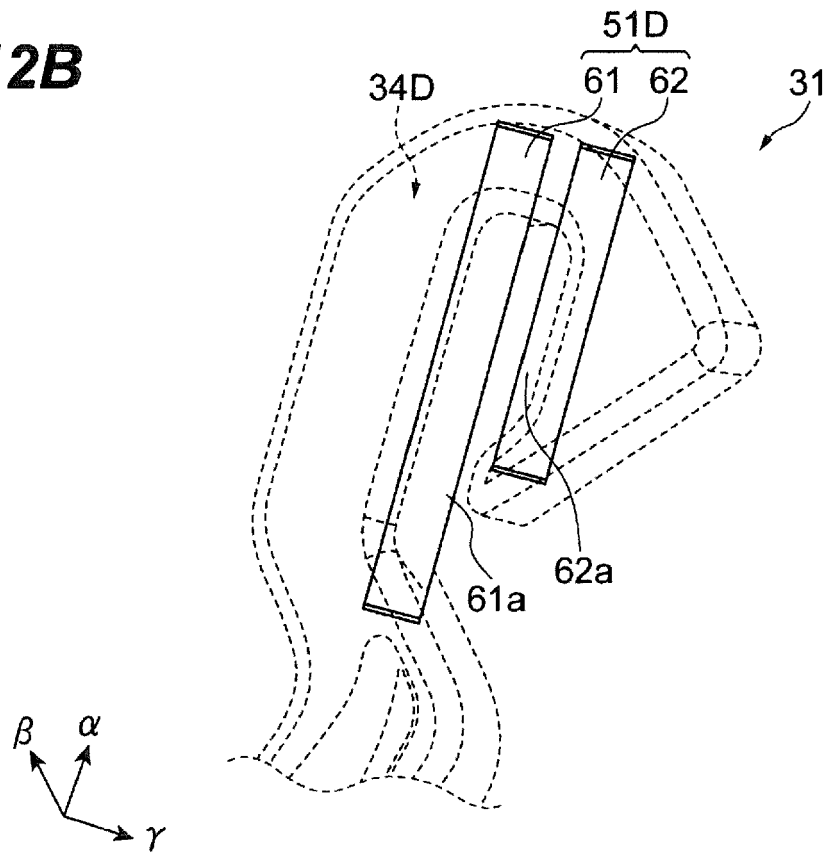
**Fig.11B**



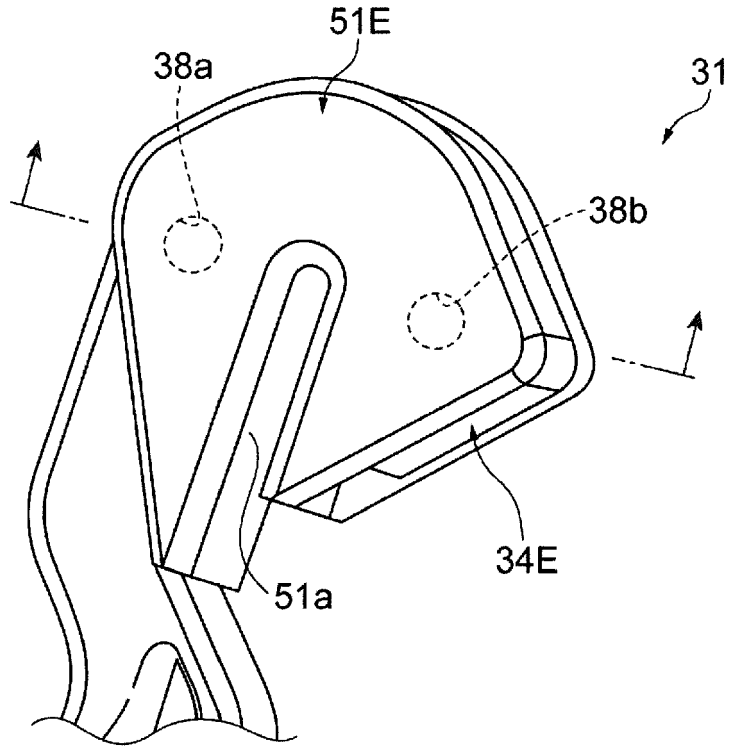
**Fig.12A**



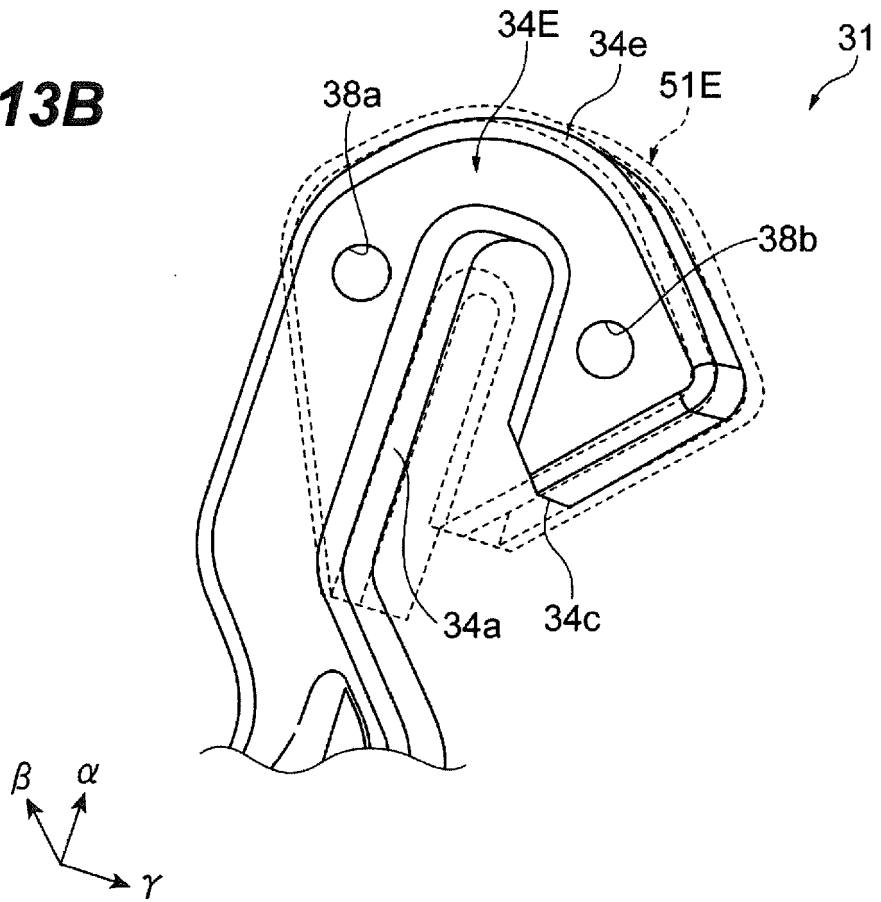
**Fig.12B**



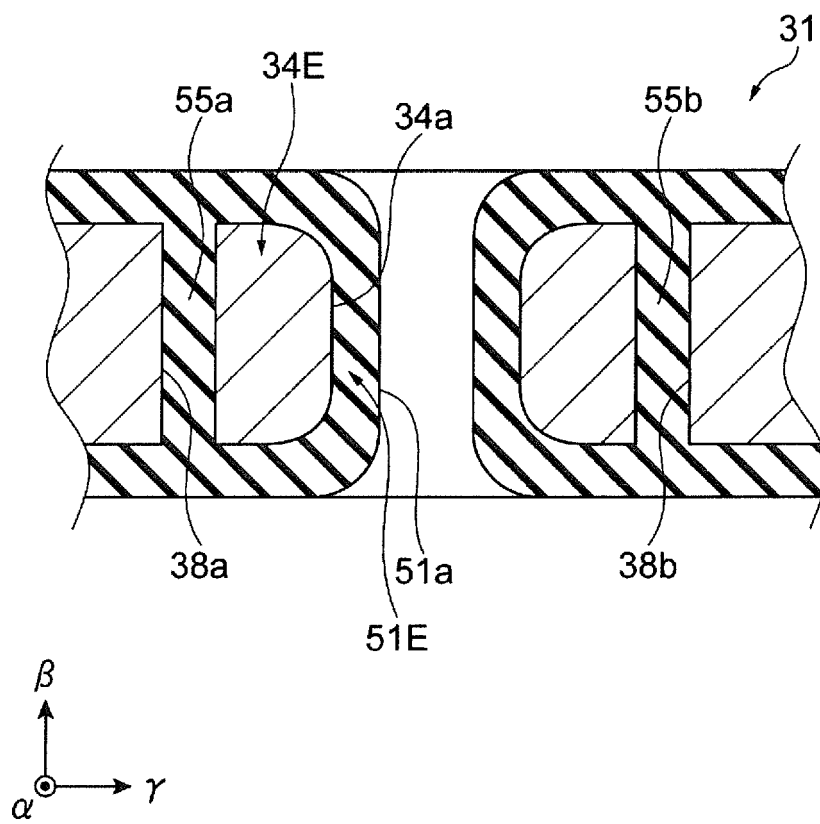
**Fig.13A**



**Fig.13B**



**Fig.14**





EUROPEAN SEARCH REPORT

Application Number  
EP 16 19 5738

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