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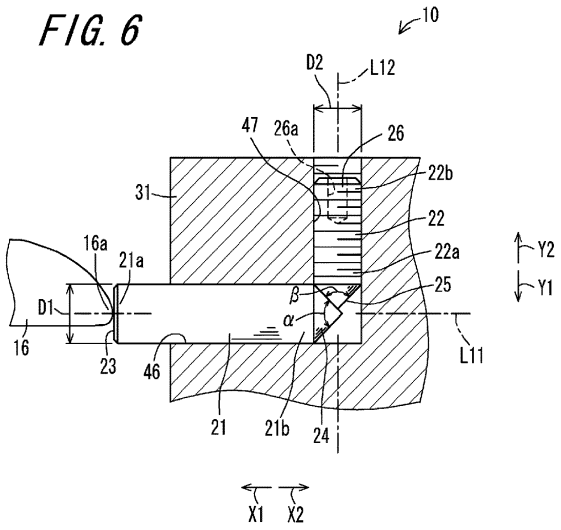
(54) NEEDLE-HANDLER POSITION ADJUSTING DEVICE

(57) There is provided a needle-handler position adjusting device capable of smoothly finely adjusting the amount of deflection of a needle guard (16) with a high degree of accuracy, and capable of reducing the number of parts, thereby simplifying a configuration, and improve maintainability. There are provided a first pin (21) supported by an outer shuttle (17) so as to be displaced in a direction of a first axis (L11) intersecting a radial line centered on a rotation axis (L2), on an imaginary plane perpendicular to the rotation axis (L2), an end face (23) which supports a tip portion (16a) of the needle guard (16)being formed at one end (21a) of the first pin in the direction of the first axis (L11), a first contact surface (24) having a conical shape being formed at the other end (21b) of the first pin in the direction of the first axis (L11); and a second pin (22) screwed into the outer shuttle (17) so as to be displaced in a direction of a second axis (L12) orthogonal to the first axis (L11), a second contact surface (25) having a conical shape and contacting the first contact surface (24) of the first pin (21) being formed at one end (22a) of the second pin (22) in the direction of the second axis (L12), a tool fitting portion (26) into which a tool for advancing and retreating the second pin (22) in a screw manner in the direction of the second axis (L12) is fitted being provided at the other end (22b) of the second pin (22) in the direction of the second axis (L12).

FIG. 6



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Description

Technical Field

[0001] The present invention relates to a needle-handler position adjusting device for adjusting the position with respect to a sewing needle, of a needle guard which is provided in an outer shuttle of a horizontal full rotating hook.

Background Art

[0002] In sewing work using a sewing machine which is provided with a horizontal full rotating hook, in a case where the distance between a sewing needle and a needle receiving portion is increased by changing the sewing needle from a thick needle to a thin needle, a case where the sewing needle and the needle receiving portion become too close to each other by changing the sewing needle from a thin needle to a thick needle, and the like, it is necessary to adjust the distance between the needle receiving portion of an outer shuttle and the sewing needle so as to become appropriate such that the sewing needle is not damaged due to contact with the outer shuttle even if the deflection of the sewing needle holding a needle thread and reciprocating changes due to a change in tension of the needle thread. For this reason, in the past, the outer shuttle has been provided with a needle-handler position adjusting device.

[0003] FIG. 9 is a sectional view showing a needle-handler position adjusting device of a typical related art, and this related art is disclosed in, for example, Patent Literature 1. This drawing shows a portion of a side surface when viewed from the front side perpendicular to a rotation axis of an outer shuttle. The needle-handler position adjusting device of this related art is provided with: a movable pin 3 that is a first pin which supports, in order to appropriately adjust the distance between a sewing needle and an arc-shaped needle receiving portion 2 that is a needle guard in which a base end is fixed to the outer shuttle and a tip portion 1 is a free end, the tip portion 1 of the needle receiving portion 2 at one end 3a; a spherical body 4 which is disposed in the outer shuttle so as to come into contact with the other end 3b of the movable pin 3; and an adjustment screw 5 that is a second pin which is disposed in a state of being screwed into a screw hole 6 of the outer shuttle such that a conical end face of one end 5a comes into contact with the spherical body 4.

[0004] The movable pin 3, the spherical body 4, and the adjustment screw 5 are fine metal parts each having a diameter of about 3 mm, and it is possible to change the amount of deflection by elastic deformation of the needle receiving portion 2 by transmitting the movement in a direction of an axis of the adjustment screw 5 by advance and retreat thereof in a screw manner to the movable pin 3 disposed in a direction of an axis orthogonal to the axis of the adjustment screw 5 through the spherical body 4 and thus pressing the tip portion 1 of the needle receiving portion 2 by one end 3a of the movable pin 3 from slightly the inside with respect to a tangent line to an imaginary circle which the tip portion 1 describes when the outer shuttle rotates, on an imaginary plane perpendicular to a rotation axis of the outer shuttle.

[0005] Therefore, if a screw tightening tool such as a driver is engaged with the adjustment screw 5 and rotated in a direction in which the adjustment screw 5 advances in a screw manner, the adjustment screw 5 moves in a direction approaching the spherical body 4, and thus a pressing force acting on the movable pin 3 from the spherical body 4 increases, whereby the movable pin 3 moves toward the needle receiving portion 2 side, and if the tool is rotated in a direction in which the adjustment screw 5 retreats in a screw manner, thereby moving the adjustment screw 5 in a direction away from the spherical body 4, the pressing force acting on the movable pin 3 from the spherical body 4 is reduced, and thus the movable pin 3 is pushed back by an elastic recovery force of the needle receiving portion 2, thereby moving in a direction retreating from the needle receiving portion 2.

[0006] In this manner, the needle-handler position adjusting device of the related art is configured such that it is possible to adjust the position of the needle receiving portion 2 with respect to the sewing needle by changing the amount of deflection of the needle receiving portion 2 in a radial direction by transmitting the displacement of the adjustment screw 5 to the movable pin 3 through the spherical body 4 by an operation to advance and retreat the adjustment screw 5 in a screw manner and thus moving the movable pin 3 in a direction approaching the needle receiving portion 2 and a direction away from the needle receiving portion 2.

Citation List

Patent Literature

[0007] Patent Literature 1: Japanese Unexamined Patent Publication JP-A 2004-229874

Summary of Invention

Technical Problem

[0008] In the needle-handler position adjusting device of the related art described above, the movement of the adjustment screw 5 is transmitted to the movable pin 3 through the spherical body 4, and therefore, the spherical body 4 comes into point contact with one end 5a of the adjustment screw 5 and the other end 3b of the movable pin 3, whereby one end 5a of the adjustment screw 5 and the other end 3b of the movable pin 3 are deformed or worn away at the contact positions with the spherical body 4 due to long-term use.

[0009] If in a state where such deformation or wear has occurred, the adjustment screw 5 is moved in order to

adjust a needle-handler position, since a contact position between the conical end face of one end 5a of the adjustment screw 5 and the spherical body 4 is shifted, the spherical body 4 comes into contact with a position in the direction of the axis and around the axis of the adjustment screw 5, which is different from the deformed or worn position of the conical end face, and thus it does not become possible to move the movable pin 3 according to the movement amount of the adjustment screw 5 with a high degree of accuracy, and therefore, there is a problem in that it becomes difficult to smoothly finely adjust the amount of deflection in a radial direction of the needle receiving portion 2 with a high degree of accuracy.

[0010] Further, the needle-handler position adjusting device of the related art described above is configured with the movable pin 3, the spherical body 4, and the adjustment screw 5 which are fine parts each having a diameter of about 3 mm, and therefore, the number of parts increases, and thus there is a problem in that time and effort are required for the replacement of the parts when having been deformed and worn away and thus maintainability is poor.

[0011] An object of the invention is to provide a needle-handler position adjusting device capable of smoothly finely adjusting the amount of deflection of a needle guard with a high degree of accuracy.

[0012] Another object of the invention is to provide a needle-handler position adjusting device capable of reducing the number of parts, thereby simplifying a configuration, and improve maintainability.

Solution to Problem

[0013] The invention provides a needle-handler position adjusting device provided in a horizontal full rotating hook comprising an outer shuttle fixed to a lower shaft rotated around a rotation axis which is parallel to an axis of a needle bar on which a sewing needle is mounted, the outer shuttle comprising a blade point portion which is tapered so that a tip portion thereof is directed toward a downstream side in a rotation direction of the lower shaft, and a needle guard which is tapered so that a tip portion thereof is directed toward an upstream side in the rotation direction and is disposed further toward the downstream side in the rotation direction than the blade point portion, the needle-handler position adjusting device comprising:

a first pin supported by the outer shuttle so as to be displaced in a direction of a first axis intersecting a radial line centered on the rotation axis, on an imaginary plane perpendicular to the rotation axis, an end face which supports the tip portion of the needle guard being formed at one end of the first pin in the direction of the first axis, a first contact surface having a conical shape being formed at the other end of the first pin in the direction of the first axis; and

a second pin screwed into the outer shuttle so as to be displaced in a direction of a second axis orthogonal to the first axis, a second contact surface having a conical shape and contacting the first contact surface of the first pin being formed at one end of the second pin in the direction of the second axis, a tool fitting portion into which a tool for advancing and retreating the second pin in a screw manner in the direction of the second axis is fitted being provided at the other end of the second pin in the direction of the second axis.

[0014] Further, in the invention, it is preferable that the end face of the first pin is a flat surface perpendicular to the first axis.

[0015] Further, in the invention, it is preferable that the end face of the first pin is a curved surface curved to be convex toward the other end in the direction of the first axis.

[0016] Further, in the invention, it is preferable that the tip portion of the needle guard has a curved surface curved to be convex toward the end face of the first pin.

Advantageous Effects of Invention

[0017] According to the invention, in a horizontal full rotating hook, an outer shuttle is fixed to a lower shaft which is rotated around a rotation axis parallel to an axis of a needle bar on which a sewing needle is mounted. The outer shuttle has a blade point portion which is tapered so that a tip portion thereof directed toward a downstream side in a rotation direction of the lower shaft, and a needle guard which is tapered so that a tip portion thereof is directed toward an upstream side in the rotation direction and is disposed further toward the downstream side in the rotation direction than the blade point portion. A needle-handler position adjusting device is provided in the outer shuttle of such a horizontal full rotating hook in order to adjust the position of the needle guard with respect to the sewing needle by making the needle guard be displaced in a direction approaching or away from a movement pathway of the sewing needle mounted on the needle bar.

[0018] The needle-handler position adjusting device is configured to include a first pin and a second pin. The first pin is supported by the outer shuttle so as to be displaced in a direction of a first axis intersecting a radial line centered on the rotation axis, on an imaginary plane perpendicular to the rotation axis, and an end face which supports the tip portion of the needle guard is formed at one end of the first pin in the direction of the first axis, and a first contact surface having a conical shape is formed at the other end of the first pin in the direction of the first axis.

[0019] Further, the second pin is screwed into the outer shuttle so as to be displaced in a direction of a second axis orthogonal to the first axis, and a second contact surface having a conical shape and contacting the first contact surface of the first pin is formed at one end of the

second pin in the direction of the second axis, and a tool fitting portion into which a tool for advancing and retreating the second pin in a screw manner in the direction of the second axis is fitted is provided at the other end of the second pin in the direction of the second axis.

[0020] In a case of moving the needle guard in a direction approaching the sewing needle, the second contact surface of the second pin presses the first contact surface of the first pin in the direction of the first axis by fitting a tool such as a wrench, for example, into the tool fitting portion of the second pin and operating the tool in a direction in which the second pin advances in a screw manner, whereby the first pin moves in the direction of the first axis by a distance corresponding to the movement amount in the direction of the second axis of the second pin, thereby pressing the tip portion of the needle guard and thus moving the needle guard in a direction approaching the sewing needle, and thus it is possible to guide the sewing needle to the optimum needle-handler position by the needle guard.

[0021] Further, in a case of moving the needle guard in a direction away from the sewing needle, the second contact surface of the second pin moves in a direction away from the first contact surface of the first pin by fitting the tool into the tool fitting portion of the second pin and operating the tool in a direction in which the second pin retreats in a screw manner. However, the first pin is resiliently pressed by the tip portion of the needle guard, and therefore, the first pin moves in the direction opposite to a direction in which the first pin advances in a screw manner, that is, in a direction approaching the second axis, while maintaining a state where the first contact surface is in contact with the second contact surface of the second pin. The movement of the first pin in the direction approaching the second axis corresponds to the movement amount in the direction of the second axis of the second pin, and thus it is possible to retract the first pin in the direction of the first axis by a distance corresponding to the operation amount in the direction retreating the second pin in a screw manner.

[0022] In this manner, it is possible to smoothly finely adjust the amount of deflection of the needle guard with a high degree of accuracy by moving the second pin in the direction of the first axis according to the operation amount to advance or retreat the second pin in a screw manner. Further, it is possible to change the amount of deflection of the needle guard by the first pin and the second pin without using a spherical body as in the related art described above, and therefore, it is possible to reduce the number of parts and thus simplify a configuration. It is possible to easily perform the replacement of parts such as the first pin and the second pin, and thus it is possible to improve maintainability.

[0023] Further, according to the invention, the end face of the first pin is a flat surface perpendicular to the first axis, and therefore, it is possible to smoothly move the tip portion of the needle guard in a state of being in contact with the end face of the first pin. In this way, it is possible to smoothly change the deflection of the needle guard according to the movement of the first pin, and it is possible to smoothly finely adjust the amount of deflection of the needle guard with a higher degree of accuracy.

[0024] Further, according to the invention, the end face of the first pin is a curved surface curved to be convex toward the other end in the direction of the first axis, and therefore, displacement of the tip portion of the needle guard on the end face of the first pin due to vibration or the like is suppressed, and thus the deflection of the needle guard can be prevented from undesirably varying during sewing.

[0025] Further, according to the invention, the tip portion of the needle guard has a curved surface curved to be convex toward the end face of the first pin, and therefore, it is possible to smoothly move the tip portion of the needle guard in a state of being in contact with the end face of the first pin, and displacement of the tip portion of the needle guard on the end face of the first pin due to vibration or the like is suppressed, and thus it is possible to prevent an undesired variation of the deflection of the needle guard.

Brief Description of Drawings

[0026] Other and further objects, features, and advantages of the invention will be more explicit from the following detailed description taken with reference to the drawings wherein:

FIG. 1 is a sectional view of a horizontal full rotating hook provided with a needle-handler position adjusting device of an embodiment of the invention;

FIG. 2 is a partially enlarged sectional view when the vicinity of the needle-handler position adjusting device of the horizontal full rotating hook is viewed from the upper side of FIG. 1;

FIG. 3 is a plan view showing a state where an inner shuttle 18 is accommodated in the horizontal full rotating hook shown in FIG. 1;

FIG. 4 is a side view of the inner shuttle 18;

FIG. 5 is a sectional view as viewed from cutting surface line V-V of FIG. 3;

FIG. 6 is an enlarged sectional view as viewed from cutting surface line VI-VI of FIG. 2;

FIG. 7 is a graph showing the relationship between a movement amount δy of the second pin 22 and a movement amount δx of the first pin 21;

FIG. 8 is an enlarged sectional view showing the configuration of a needle-handler position adjusting device 10A of another embodiment of the invention; and

FIG. 9 is a sectional view showing a needle-handler position adjusting device of a typical related art.

Description of Embodiments

[0027] FIG. 1 is a sectional view of a horizontal full

rotating hook 11 provided with a needle-handler position adjusting device 10 of an embodiment of the invention, and FIG. 2 is a partially enlarged sectional view when the vicinity of the needle-handler position adjusting device 10 of the horizontal full rotating hook 11 is viewed from the upper side of FIG. 1. FIG. 3 is a plan view showing a state where an inner shuttle 18 is accommodated in the horizontal full rotating hook 11 shown in FIG. 1, FIG. 4 is a side view of the inner shuttle 18, and FIG. 5 is a sectional view as viewed from cutting surface line V-V of FIG. 3.

[0028] A lockstitch sewing machine is provided with a needle bar 13 on which a sewing needle 12 is detachably mounted, and a lower shaft 14 which is rotated in a rotation direction A around a rotation axis L2 parallel to an axis L1 of the needle bar 13. At the lower shaft 14 is provided the horizontal full rotating hook 11 comprising an outer shuttle 17 which has a blade point portion 15 which is tapered so that a tip portion thereof is directed toward the downstream side in the rotation direction A, and a needle guard 16 which is tapered so that a tip portion thereof is directed toward the upstream side in the rotation direction A and is disposed further toward the downstream side in the rotation direction A than the blade point portion 15, and the inner shuttle 18 which is accommodated in the outer shuttle 17, and the needle-handler position adjusting device 10 of this embodiment is provided in the horizontal full rotating hook 11.

[0029] The needle-handler position adjusting device 10 includes a first pin 21 supported by the outer shuttle 17 so as to be displaced in a direction of a first axis L11 intersecting a radial line centered on the rotation axis L2, on an imaginary plane perpendicular to the rotation axis L2, and a second pin 22 screwed into the outer shuttle 17 so as to be displaced in a direction of a second axis L12 orthogonal to the first axis L11.

[0030] The second axis L12 of the second pin 22 is inclined at an angle θ in a direction away from the rotation axis L2 toward the outer shuttle opening end side, that is, the upper side of FIG. 5, from the first axis L11, on a imaginary plane which includes the rotation axis L2 of the outer shuttle 17 and the first axis L11 of the first pin 21. The angle θ is selected in a range of 30° to 45°, for example.

[0031] The outer shuttle 17 has a mounting portion 31 in which an insertion hole 30 is formed coaxially with the rotation axis L2, an upper end of the lower shaft 14 being inserted into the insertion hole 30, and a peripheral wall portion 34 which is disposed above the mounting portion 31 with a distance therebetween and connected to the mounting portion 31 on one side in a direction of the rotation axis L2, a track groove 33 extending in an annular shape being formed in an inner peripheral portion of the peripheral wall portion 34, and the blade point portion 15 being provided at an outer peripheral portion of the peripheral wall portion 34.

[0032] The inner shuttle 18 is accommodated in a space surrounded by the mounting portion 31 and the peripheral wall portion 34 of the outer shuttle 17. The inner shuttle 18 is locked so as not to rotate in accordance with the rotation in the rotation direction A of the outer shuttle 17, by a rotation stop member (not shown) connected to a machine body of a sewing machine.

[0033] The needle guard 16 is a part which is formed in an arc shape and in which one end is screwed into the outer shuttle 17 and the other end is a free end, and is positioned such that a movement pathway of the sewing needle 12 reciprocating in an up-and-down direction is located on the outer periphery side thereof.

[0034] The inner shuttle 18 has a bottom portion 32 which is disposed in close proximity to the mounting portion 31, and a peripheral wall portion 40 which is connected to one side in the direction of the rotation axis L2 from a peripheral edge portion of the bottom portion 32. A track projection 41 which extends in an annular shape and is fitted into the track groove 33 of the outer shuttle 17 is formed at an outer peripheral portion of the peripheral wall portion 40.

[0035] At the bottom portion 32, a stud 35 is provided to be erect coaxially with the rotation axis L2 and in a substantially cylindrical shape, and a guide shaft 36 and a latch spring 37 which resiliently presses the guide shaft 36 toward an opening end of the stud 35, that is, the upper side of FIG. 1, are provided in the stud 35. The latch spring 37 is realized by a helical compression spring having a cylindrical shape.

[0036] A latch pin 38 is provided at a free end which is disposed on the outer shuttle opening end side, of the stud 35, and the latch pin 38 is inserted into a base end of a latch piece 39, thereby connecting the latch piece 39 to the free end of the stud 35 such that the latch piece 39 can be angularly displaced. One end of the latch spring 37 resiliently comes into contact with the base end of the latch piece 39 and the other end of the latch spring 37 is supported by an annular stepped surface formed at an inner peripheral portion of the stud 35, and thus a configuration is made such that in a state where the latch piece 39 can be angularly displaced around an axis of the latch pin 38, the latch piece 39 is stable at two positions, namely, an opening position where the latch piece 39 is approximately parallel to the stud 35 and a closed position where the latch piece 39 is approximately parallel to a radial line from the stud 35 to the peripheral wall portion 34.

[0037] A substantially truncated cone-shaped presser spring 42 which is enlarged in diameter toward the opening end side from the bottom portion 32, is mounted on the stud 35. The presser spring 42 is configured so as to resiliently press a bobbin 43 accommodated in the inner shuttle 18 to the opening end side, thereby suppressing the rattling in the direction of the axis L2 of the bobbin 43 in the inner shuttle 18 and thus preventing a change in tension of a bobbin thread wound around the bobbin 43 due to the rattling.

[0038] FIG. 6 is an enlarged sectional view as viewed from cutting surface line VI-VI of FIG. 2. An end face 23

supporting a tip portion 16a of the needle guard 16 is formed at one end 21a of the first pin 21 in a direction of the first axis L11, and a first contact surface 24 having a conical shape is formed at the other end 21b of the first pin 21 in the direction of the first axis L11. The end face 23 of the first pin 21 is a flat surface perpendicular to the first axis L11. In this manner, the end face 23 is a flat surface, and therefore, it is possible to smoothly move the tip portion 16a of the needle guard 16 on the end face 23, whereby it is possible to smoothly change the deflection of the needle guard 16 according to the movement of the first pin 21, thereby smoothly finely adjusting the amount of deflection of the needle guard 16 with a high degree of accuracy.

[0039] A second contact surface 25 having a conical shape and coming into contact with the first contact surface 24 of the first pin 21 is formed at one end 22a of the second pin 22 in the direction of the second axis L12, and a tool fitting portion 26 in which a hexagonal columnar fitting hole 26a for making, for example, a hexagonal wrench that is a tightening tool for advancing and retreating the second pin 22 in a screw manner in the direction of the second axis L12 be fitted therein is formed is provided at the other end 22b of the second pin 22 in the direction of the second axis L12.

[0040] In this embodiment, the end face 23 of the first pin 21 is a flat surface perpendicular to the first axis L11. However, in another embodiment of the invention, the end face 23 may be a curved surface curved to be convex toward the other end 21b in the direction of the first axis L11. In this way, the tip portion 16a of the needle guard 16 is prevented from being shifted on the end face 23 due to vibration or the like during sewing, and it is possible to stably support the tip portion 16a of the needle guard 16.

[0041] Further, the tip portion 16a of the needle guard 16 has a curved surface curved to be convex toward the end face 23 of the first pin 21. Such a curved surface may be realized by, for example, a portion of a spherical surface. In this way, the tip portion 16a of the needle guard 16 is prevented from being shifted on the flat surface or curved surface-shaped end face 23 due to vibration or the like during sewing, and it is possible to stably support the tip portion 16a of the needle guard 16.

[0042] An angle (hereinafter referred to as an "apex angle") α corresponding to an apex angle of a cone of the first contact surface 24 of the first pin 21 is selected in a range of 60° to 120°, or preferably, selected in a range of 80° to 100°. Further, an apex angle β of the second contact surface 25 of the second pin 22 is the supplementary angle of the apex angle α of the first contact surface 24 and is selected in a range of 120° to 60°, or preferably, selected in a range of 100° to 80°.

[0043] The first pin 21 has a straight cylindrical outer peripheral surface having a diameter D1 in a range of 3 mm to 6 mm, for example. An insertion hole 46 in which the first pin 21 is movably guided along the first axis L11 is formed in a portion of the outer shuttle 17 which is connected to the mounting portion 31 and the peripheral wall portion 34. The inner peripheral surface of the insertion hole 46 is composed of a cylindrical surface having an inner diameter slightly greater than the outer peripheral surface of the first pin 21 in the range of a tolerance.

[0044] Further, an external screw is engraved in the outer peripheral portion of the second pin 22, and a diameter (a nominal diameter) D2 is selected in a range of 2 mm to 4 mm, for example. A screw hole 47 in which an internal screw which is engaged with the external screw of the second pin 22 is engraved along the second axis L12 is formed in the portion of the outer shuttle 17 which is connected to the mounting portion 31 and the peripheral wall portion 34.

[0045] FIG. 7 is a graph showing the relationship between a movement amount δy of the second pin 22 and a movement amount δx of the first pin 21. If an engaging portion of the tightening tool such as a wrench described above is fitted into the fitting hole 26a of the tool fitting portion 26 of the second pin 22 and advances the second pin 22 in a screw manner along the second axis L12 in a direction C1 pressing the other end 21b of the first pin 21, the first pin 21 moves to one side C11 in the direction of the first axis L11 by the movement amount δy ($=\delta x \cdot \tan(\beta/2)$) corresponding to the movement amount δx in the direction of the second axis L12 of the second pin 22, as shown by a line m1.

[0046] In such a configuration, in a case where the distance between the sewing needle 12 and the needle guard 16 is increased because the sewing needle 12 used is changed from a thick needle to a thin needle, or in a case where the distance between the sewing needle 12 and the needle guard 16 is increased for other reasons, adjustment to reduce the distance so as to be within a proper range is performed. Further, in a case where the sewing needle 12 and the needle guard 16 come too close to each other by changing the sewing needle 12 which is used from a thin needle to a thick needle and thus the distance becomes too small, adjustment to increase the distance so as to be within a proper range is performed.

[0047] In a case of moving the needle guard 16 in a direction approaching the sewing needle 12, a tool such as a hexagonal wrench, for example, is fitted into the tool fitting portion 26 of the second pin 22 and operated in a direction in which the second pin 22 advances in a screw manner, whereby the second contact surface 25 of the second pin 22 presses the first contact surface 24 of the first pin 21 in the direction of the first axis L11, thereby moving the first pin 21 in the direction of the first axis L11 by a distance corresponding to the movement amount in the direction of the second axis L12 of the second pin 22 and thus pressing the tip portion 16a of the needle guard 16, thereby moving the needle guard 16 to the side approaching the sewing needle 12, whereby it is possible to guide the sewing needle 12 to the optimum needle-handler position by the needle guard 16.

[0048] Further, in a case of moving the needle guard

16 in a direction away from the sewing needle 12, the tool is fitted into the tool fitting portion 26 of the second pin 22 and operated in a direction in which the second pin 22 retreats in a screw manner, whereby the second contact surface 25 of the second pin 22 moves in a direction away from the first contact surface 24 of the first pin 21. However, since the first pin 21 is resiliently pressed by the tip portion 16a of the needle guard 16, the first pin 21 moves in a direction approaching the second axis L12 while maintaining a state where the first contact surface 24 is in contact with the second contact surface 25 of the second pin 22.

[0049] Such a movement of the first pin 21 in the direction approaching the second axis L12 corresponds to the movement amount in the direction of the second axis L12 of the second pin 22, and thus it is possible to retract the first pin 21 in the direction of the first axis L11 by a distance corresponding to the operation amount in a direction retreating the second pin 22 in a screw manner.

[0050] In this manner, it is possible to smoothly finely adjust the amount of deflection of the needle guard 16 with a high degree of accuracy by moving the first pin 21 in the direction of the first axis according to the operation amount to advance or retreat the second pin 22 in a screw manner. Further, it is possible to change the amount of deflection of the needle guard 16 by the first pin 21 and the second pin 22 without using a spherical body as in the related art described above, and therefore, it is possible to reduce the number of parts and thus simplify a configuration. It is possible to easily perform the replacement of parts such as the first pin 21 and the second pin 22, and thus it is possible to improve maintainability.

[0051] FIG. 8 is an enlarged sectional view showing the configuration of a needle-handler position adjusting device 10A of another embodiment of the invention. In addition, portions corresponding to those of the embodiment described above are denoted by the same reference numerals and overlapping description is omitted. In the needle-handler position adjusting device 10A of this embodiment, the apex angle α of the first contact surface 24 of the first pin 21 is selected in a range of 110° to 150°, preferably, selected in a range of 120° to 140°. Further, the apex angle β of the second contact surface 25 of the second pin 22 is the supplementary angle of the apex angle α of the first contact surface 24 and is selected in a range of 70° to 30°, preferably, selected in a range of 60° to 40°. The diameter D1 of the first pin 21 and the diameter (the nominal diameter) D2 of the second pin 22 are the same as those in the embodiment described above.

[0052] According to such a configuration, the movement amount δy of the first pin 21 is reduced with respect to the movement amount δx of the second pin 22, as shown by a line m2 in FIG. 7, and thus it is possible to finely adjust the amount of deflection of the needle guard 16 with a higher degree of accuracy.

[0053] In another embodiment of the invention, the end face 23 of the first pin 21 may be configured with a curved surface curved to be convex toward the other end 21b in the direction of the first axis L11. In this way, displacement of the tip portion 16a of the needle guard 16 on the end face 23 of the first pin 21 due to vibration or the like is suppressed, and thus the deflection of the needle guard 16 can be prevented from undesirably varying during sewing.

[0054] In another embodiment of the invention, the tip portion 16a of the needle guard 16 is configured with a curved surface curved to be convex toward the end face 23 of the first pin 21. In this way, it is possible to smoothly move the tip portion 16a of the needle guard 16 in a state of being in contact with the end face 23 of the first pin 21, and displacement of the tip portion 16a of the needle guard 16 on the end face 23 of the first pin 21 due to vibration or the like is suppressed, and thus it is possible to prevent an undesired variation of the deflection of the needle guard 16.

[0055] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and the range of equivalency of the claims are therefore intended to be embraced therein.

Reference Signs List

[0056]

10, 10A: Position adjusting device
11: Horizontal full rotating hook
12: Sewing needle
13: Needle bar
14: Lower shaft
15: Blade point portion
16: Needle guard
17: Outer shuttle
18: Inner shuttle
21: First pin
21a: One end of the first pin 21
21b: Other end of the first pin 21
22: Second pin
22a: One end of the second pin 22
22b: Other end of the second pin 22
23: End face
24: First contact surface
25: Second contact surface
26: Tool fitting portion
26a: Fitting hole
30: Insertion hole
31: Mounting portion
32: Bottom portion
33: Track groove
34: Peripheral wall portion
35: Stud

36: Guide shaft
37: Latch spring
38: Latch pin
39: Latch piece
40: Peripheral wall portion
41: Track projection
42: Presser spring
43: Bobbin
46: Insertion hole
47: Screw hole
A: Rotation direction
L1: Axis of the needle bar 13
L2: Rotation axis
L11: First axis
L12: Second axis

Claims

1. A needle-handler position adjusting device provided in a horizontal full rotating hook comprising an outer shuttle fixed to a lower shaft rotated around a rotation axis which is parallel to an axis of a needle bar on which a sewing needle is mounted, the outer shuttle comprising a blade point portion which is tapered so that a tip portion thereof is directed toward a downstream side in a rotation direction of the lower shaft, and a needle guard which is tapered so that a tip portion there of is directed toward an upstream side in the rotation direction and is disposed further toward the downstream side in the rotation direction than the blade point portion, the needle-handler position adjusting device comprising:

a first pin supported by the outer shuttle so as to be displaced in a direction of a first axis intersecting a radial line centered on the rotation axis, on an imaginary plane perpendicular to the rotation axis, an end face which supports a tip portion of the needle guard being formed at one end of the first pin in the direction of the first axis, a first contact surface having a conical shape being formed at the other end of the first pin in the direction of the first axis; and
a second pin screwed into the outer shuttle so as to be displaced in a direction of a second axis orthogonal to the first axis, a second contact surface having a conical shape and contacting the first contact surface of the first pin being formed at one end of the second pin in the direction of the second axis, a tool fitting portion into which a tool for advancing and retreating the second pin in a screw manner in the direction of the second axis is fitted being provided at the other end of the second pin in the direction of the second axis.

2. The needle approach position adjusting device according to claim 1, wherein the end face of the first pin is a flat surface perpendicular to the first axis.

3. The needle approach position adjusting device according to claim 1, wherein the end face of the first pin is a curved surface curved to be convex toward the other end in the direction of the first axis.

4. The needle approach position adjusting device according to any one of claims 1 to 3, wherein the tip portion of the needle guard has a curved surface curved to be convex toward the end face of the first pin.

FIG. 1

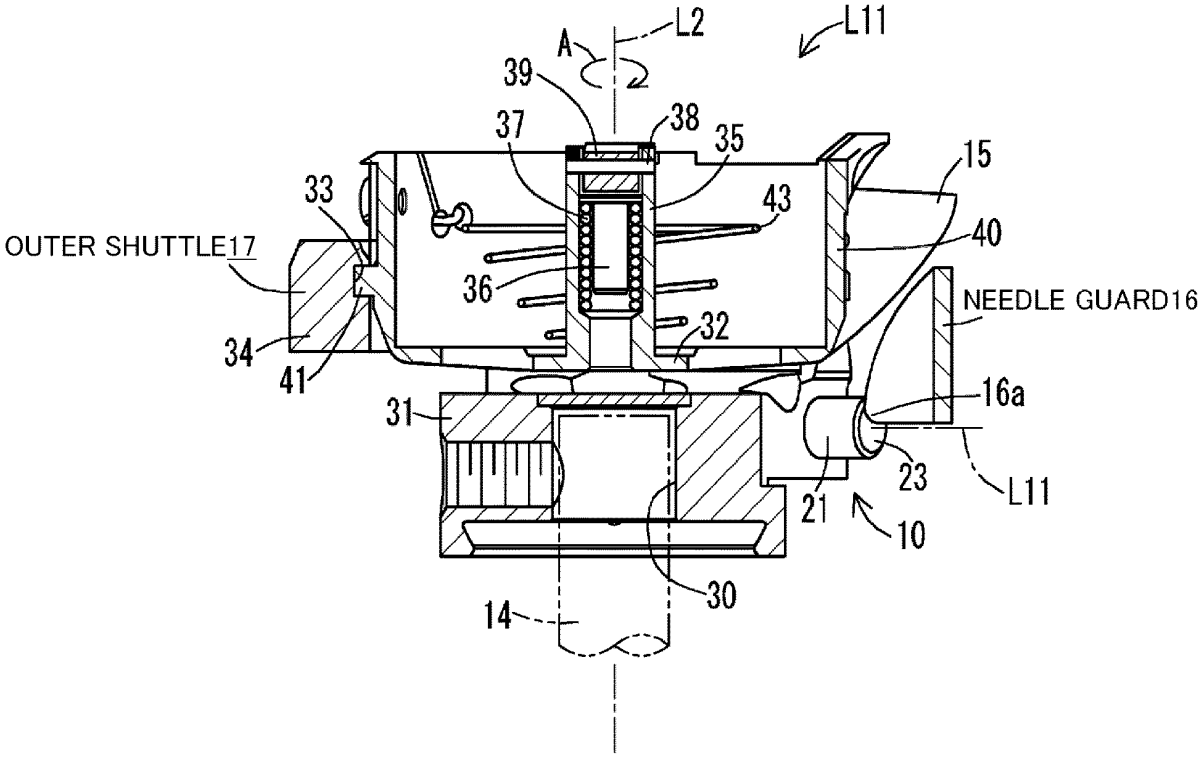

A
L2
L11
39
37
38
35
15
33
43
OUTER SHUTTLE17
40
36
NEEDLE GUARD16
32
34
41
16a
31
23
L11
21
10
30
14

FIG. 2

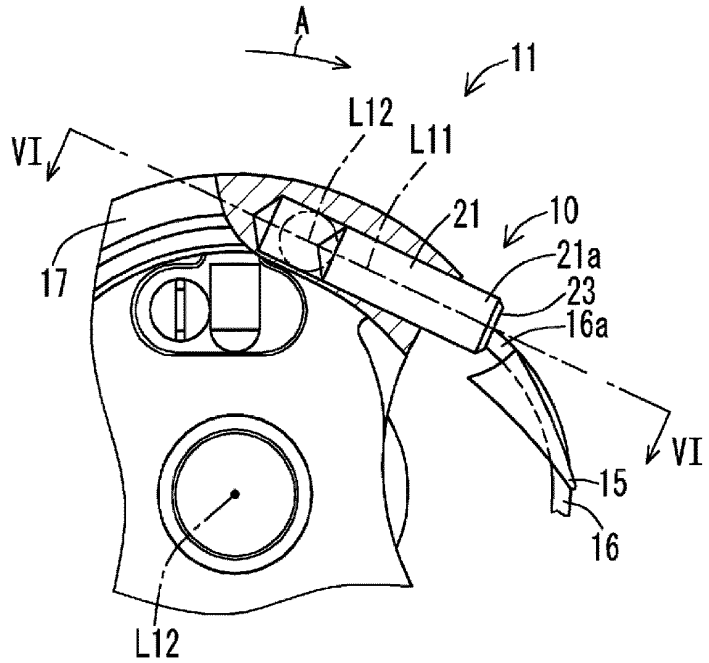

A
11
L12
L11
VI
21
10
21a
17
23
16a
VI
15
16
L12

FIG. 3

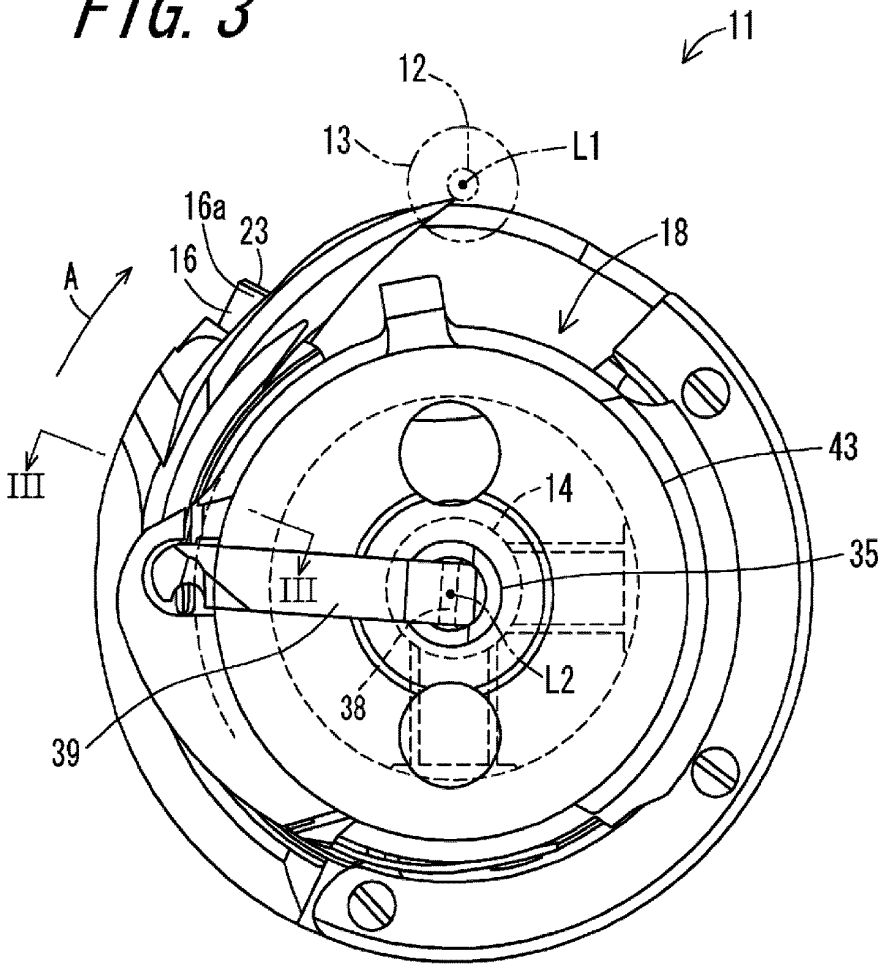

11
12
13
L1
16a
23
16
18
A
III
43
14
35
III
L1
L2
38
39

FIG. 4

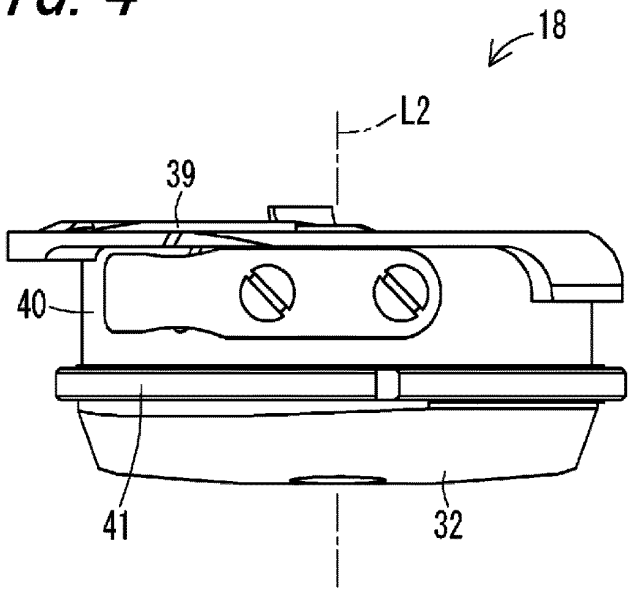

18
L2
39
40
41
32

FIG. 5

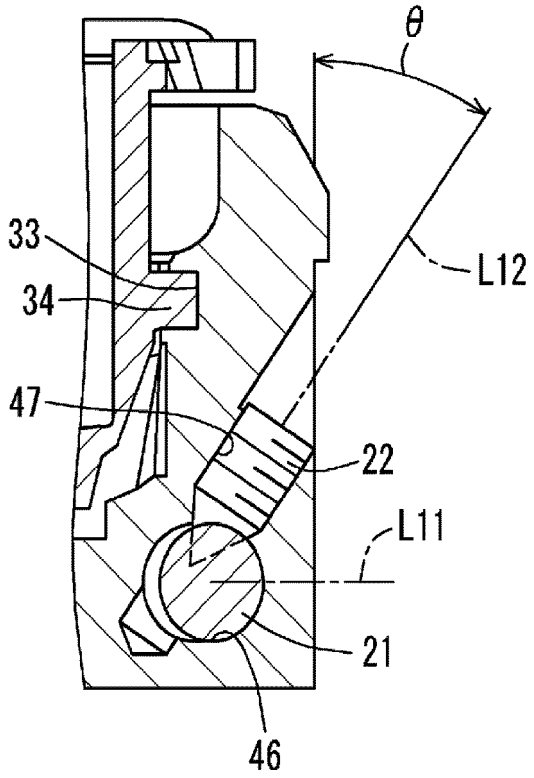


FIG. 6

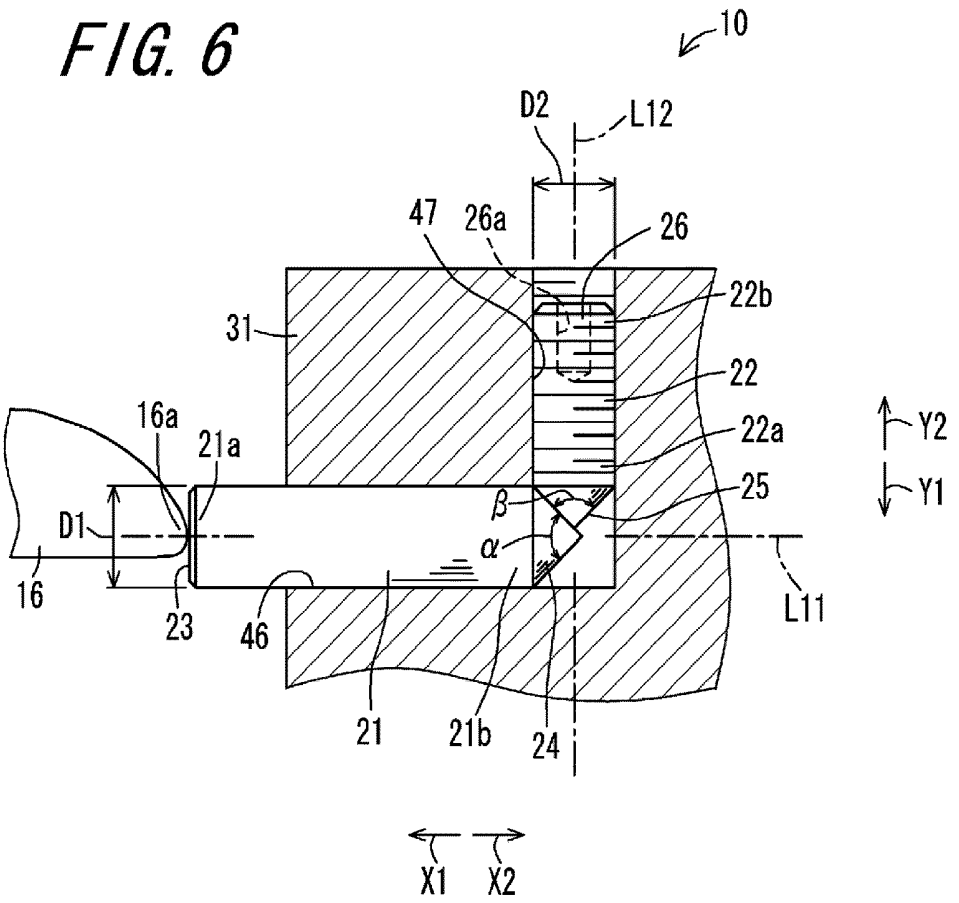

10
D2
L12
47
26a
26
22b
31
22
16a
21a
22a
Y2
Y1
25
β
D1
α
16
23
46
L11
21
21b
24
X1
X2

FIG. 7

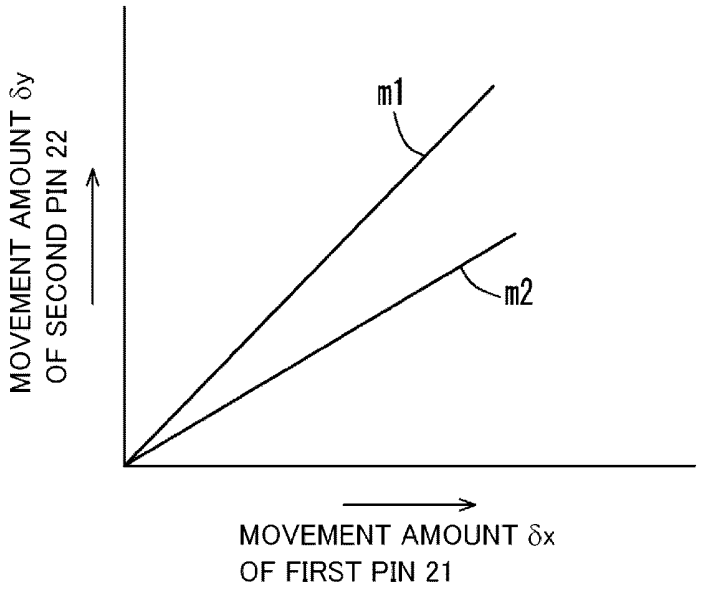

MOVEMENT AMOUNT δy
OF SECOND PIN 22
m1
m2
MOVEMENT AMOUNT δx
OF FIRST PIN 21

FIG. 8

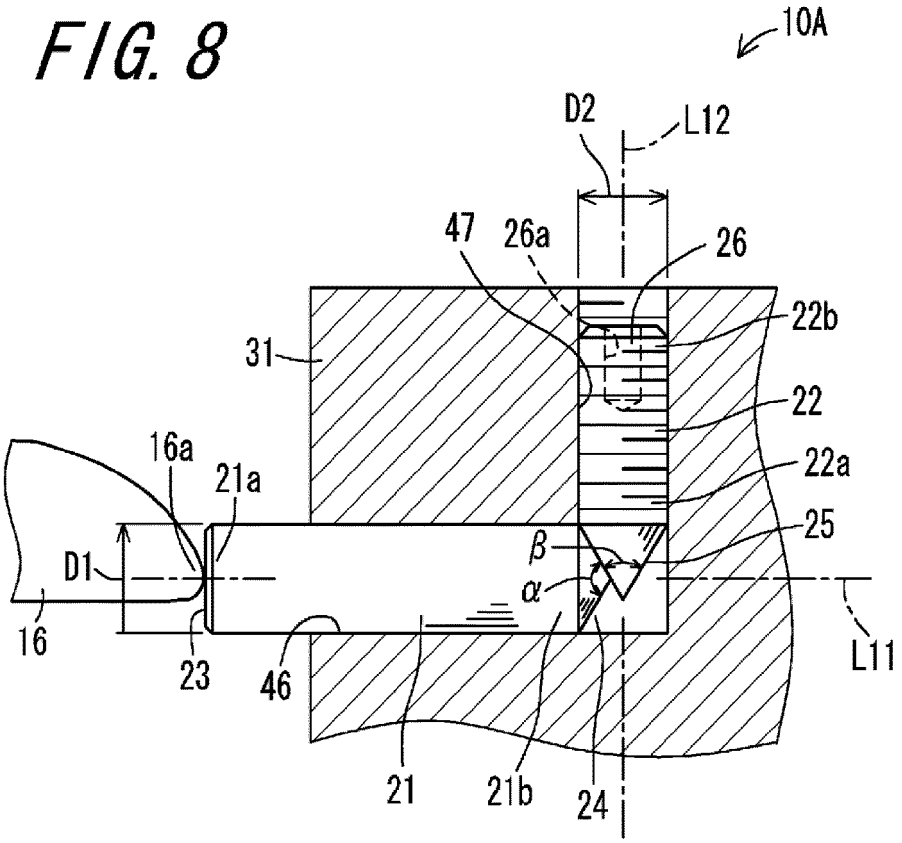
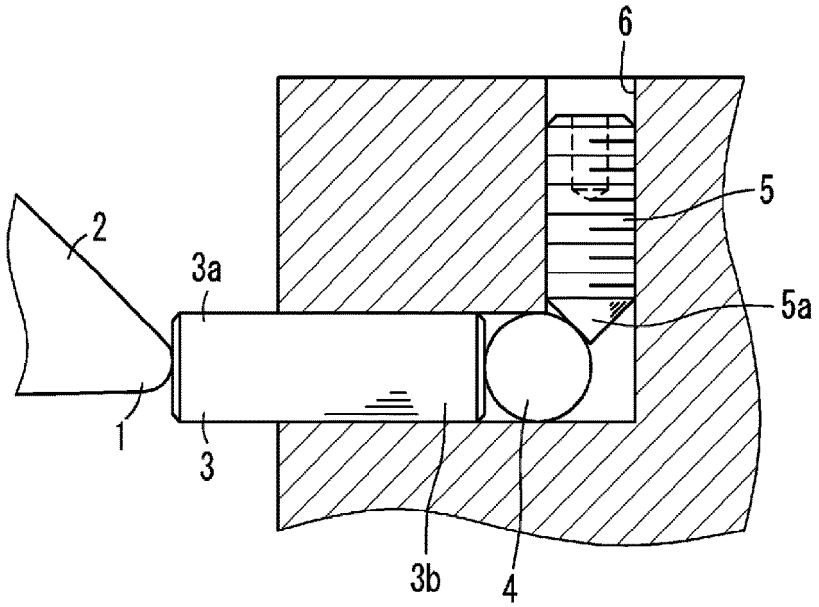

10A
D2
L12
47
26a
26
22b
31
22
16a
21a
22a
25
β
D1
α
16
23
46
L11
21
21b
24

FIG. 9


6
5
2
3a
5a
1
3
3b
4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/064947

A. CLASSIFICATION OF SUBJECT MATTER
D05B57/14(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D05B57/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004-229874 A (Sabun Industrial Co., Ltd.), 19 August 2004 (19.08.2004), entire text; all drawings & EP 1443137 A1 & CN 1519414 A	1-4
A	JP 2003-000981 A (Sabun Industrial Co., Ltd.), 07 January 2003 (07.01.2003), entire text; all drawings (Family: none)	1-4

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

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 August, 2013 (08.08.13)	20 August, 2013 (20.08.13)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/064947

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 062288/1987(Laid-open No. 014378/1989) (Kabushiki Kaisha Hirose Seisakusho), 25 January 1989 (25.01.1989), entire text; all drawings (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004229874 A **[0007]**