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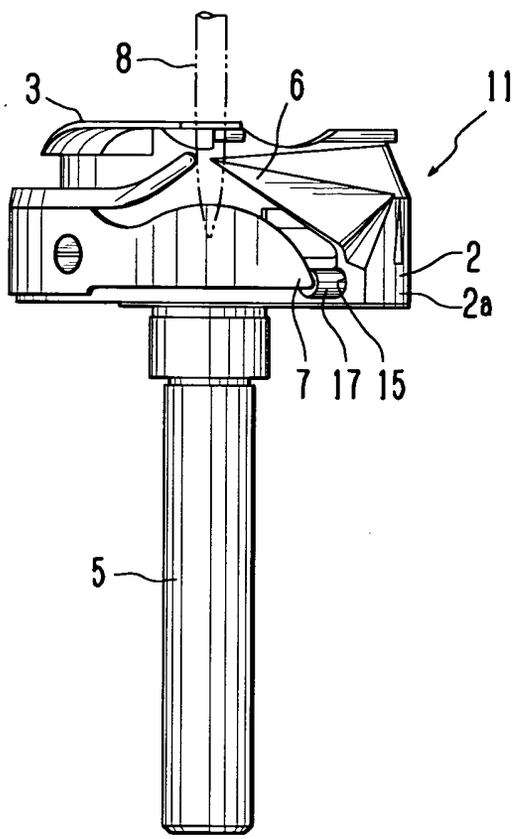
(54) Horizontal rotating shuttle of sewing machine

(57) A horizontal rotating shuttle (11) of sewing machine having a shuttle hook point (6), provided on a rotating hook (2) accommodating a rotating hook bobbin case holder (3) rotatably about an axis, tapered along an axial rotational direction of the rotating hook, and a needle guard (7) having a shape distorted along the axial rotational direction, with one end fixed to the rotating hook and the other end as a free end. Adjustment means (21) adjustably displaces the needle guard (7) in a direction to increase/reduce an outer diameter of the rotating hook. In a case where the horizontal rotating shuttle (11) is mounted in a sewing machine, and the clearance between a needle (8) which reciprocates in a vertical direction while holding a needle thread and the needle guard of the rotating hook becomes outside an appropriate range, the adjustment means (21) displaces the needle guard in the direction to increase the outer diameter of the rotating hook or in the direction to reduce the outer diameter of the rotating hook. Thus the clearance between the needle and the needle guard can be adjusted to a value within the appropriate range.

Fig. 1



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Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application is based on Japanese Priority Document JP2003-21625 filed on January 30, 2003 the content of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The present invention relates to a horizontal rotating shuttle of sewing machine.

DISCUSSION OF THE BACKGROUND

[0003] A horizontal rotating shuttle of sewing machine is defined as a shuttle of sewing machine where its drive shaft is arranged in vertical in this specification and claims. The horizontal rotating shuttle is rotatable such that its rotating direction is horizontal. The definition of the horizontal rotating shuttle of sewing machine is general in Japan, but the above definition of the horizontal rotating shuttle of sewing machine means the vertical rotating shuttle of sewing machine in Europe. The above definition of the horizontal rotating shuttle of sewing machine is used in the specification and claims according to Japanese patent application No. 2003-21615, which is based on priority claim of this patent application.

[0004] Conventionally, a horizontal rotating shuttle where a bobbin case is omitted is known as a rotary shuttle used in a sewing machine. The horizontal rotating shuttle is rotatable such that its rotating direction is horizontal to a needle moving upward/downward along a vertical direction. The needle has a hole through which a needle thread passes.

[0005] Next, the structure of the conventional horizontal rotating shuttle of sewing machine will be described with reference to Figs. 8 to 11. Fig. 8 is a front view of the conventional horizontal rotating shuttle; and Fig. 9, a plan view of the conventional horizontal rotating shuttle. A horizontal rotating shuttle 1 has a rotating hook 2, a rotating hook bobbin case holder 3 accommodated in a rotating hook bobbin case holder accommodation unit (not shown) formed inside the rotating hook 2, and the like.

[0006] The rotating hook 2 and the rotating hook bobbin case holder 3 are relatively-rotatably engaged with each other by engagement between a ring-shaped groove (not shown) formed on an inner peripheral surface of the rotating hook bobbin case holder accommodation unit and a ring-shaped rail (not shown) formed on the outer periphery of the rotating hook bobbin case holder 3. A drive shaft 5 is connected to a bottom lower surface of the rotating hook 2.

[0007] Upon sewing in a state where the horizontal rotating shuttle 1 is attached to a sewing machine main body, a driving force is transmitted to the horizontal rotating shuttle 1 via the drive shaft 5. As the driving force is transmitted via the drive shaft 5, the horizontal rotating shuttle 1 is rotated about the drive shaft 5. Note that upon sewing, a bobbin 4 around which a bobbin thread is wound is set inside the rotating hook bobbin case holder 3.

[0008] The horizontal rotating shuttle 1 has a shuttle hook point 6 and a needle guard 7 provided on the outer periphery of the rotating hook 2. The shuttle hook point 6 is integrally formed with the rotating hook 2.

[0009] Further, in the horizontal rotating shuttle 1, the needle guard 7 is formed in an arc shape along the outer periphery of the rotating hook 2. The needle guard 7 has one end fixed to the rotating hook 2 with an adjusting screw, and the other end as a free end.

[0010] This horizontal rotating shuttle 1 having the above structure is attached to the sewing machine main body (not shown) provided with a needle 8 having a through hole 8b through which the needle thread 9 passes and used there (See Fig. 10). Upon sewing, the needle 8 is moved upward/downward along the horizontal rotating shuttle 1. Further, in the needle 8, a hollow 8a is formed in a direction departing from the horizontal rotating shuttle 1 for assistance in hooking of a loop of the needle thread 9 by the shuttle hook point 6.

[0011] At this time, the horizontal rotating shuttle 1 is attached such that the needle 8 of the sewing machine main body, moved upward/downward upon sewing, is positioned on the outer peripheral side of the needle guard 7.

[0012] In the sewing machine main body to which the above-described horizontal rotating shuttle 1 is attached, upon sewing, every time the rotating hook 2 rotates once by a driving force received via the drive shaft 5, the shuttle hook point 6 rotates once integrally with the rotating hook 2. At the same time of the rotation of the rotating hook 2, in the sewing machine main body, the needle 8 through which the needle thread 9 passes is moved upward/downward, thereby a loop of the needle thread 9 held with the needle 8 (See Fig. 10) is hooked by the shuttle hook point 6, and the needle thread 9 hooked on the shuttle hook point 6 is moved along an outer peripheral surface of the rotating hook bobbin case holder 3, thereby the needle thread 9 and the bobbin thread (not shown) wound around the bobbin 4 are seized together and a seam is formed.

[0013] At this time, as described above, as the needle 8 moving upward/downward is positioned with the needle guard 7 on its outer peripheral side, the clearance between the shuttle hook point 6 and the needle 8 can be adjusted within an appropriate range.

[0014] Fig. 10 shows an example where the clearance between the needle 8 and the needle guard 7 is within an appropriate range. In the status shown in Fig. 10, the clearance between the shuttle hook point 6 and the needle 8 is also maintained within the appropriate range. In

this manner, in a case where the clearance between the shuttle hook point 6 and the needle 8 is maintained within an appropriate range, the shuttle hook point 6 enters the hollow 8a formed in the needle 8 and hooks the loop of the needle thread 9.

[0015] However, as shown in Fig. 10, upon sewing work in a state where the needle 8 and the needle guard 7 are greatly away from each other because, e.g., a thick needle 8 has been replaced with a thin needle or the needle guard 7 is distorted by some external force, the needle 8 may receive a tension from the needle thread 9 and/or fabric and greatly distorted as indicated with a broken line. If the needle 8 is distorted as indicated with the broken line, the shuttle hook point 6 and the needle 8 collide with each other and may be broken.

[0016] As a countermeasure against this inconvenience, conventionally, in a case where the needle 8 and the needle guard 7 are greatly away from each other as shown in Fig. 11, the needle guard 7 is distorted by using a tool such as a driver so as to adjust the clearance between the needle 8 and the needle guard 7.

[0017] However, in the case where the clearance between the needle 8 and the needle guard 7 is outside the appropriate range since the needle 8 and the needle guard 7 are greatly away from each other, the needle guard 7 is distorted by using a tool such as a driver, this adjustment requires skilled work, and further, the adjustment is troublesome.

[0018] Further, upon such adjustment by distorting the needle guard 7 by using a tool such as a driver, the needle guard 7 may be damaged and the durability of the needle guard 7 may be degraded.

[0019] As conventional methods for adjustment of the clearance between needle and needle guard, positional adjustment of the needle guard by changing fastening amount of an adjusting bolt, positional adjustment of the needle guard by an eccentric cam, and the like, have been proposed.

[0020] However, in the positional adjustment of the needle guard by changing the fastening amount of adjusting bolt, as the position of the adjusting bolt is away from the position of the opposing needle and needle guard, and further, the needle guard is in one-end fixed state, high adjustment accuracy cannot be achieved without difficulty. Further, as the needle guard is in one-end fixed state, the needle guard may be easily distorted again by an external force during sewing.

[0021] Further, in the positional adjustment of the needle guard by rotating the eccentric cam, a complicated mechanism is required for the adjustment and the cost is high, in addition, upon adjustment, the bobbin, the rotating hook bobbin case holder and the like set inside the rotating hook must be removed. Thus the adjustment work becomes complicated.

SUMMARY OF THE INVENTION

[0022] Accordingly, an object of the present invention is to obtain a horizontal rotating shuttle of sewing machine which enables adjustment of clearance between a needle and a needle guard accurately in a simple and quick manner, and prevents breakage due to collision between a shuttle hook point of a rotating hook and the needle.

[0023] The object of the present invention can be attained by a novel horizontal rotating shuttle of sewing machine of the present invention.

[0024] According to the novel horizontal rotating shuttle of sewing machine of the present invention, in a case where the horizontal rotating shuttle is mounted on a sewing machine and if the clearance between a needle which reciprocates in a vertical direction while holding a needle thread and a needle guard of a rotating hook is outside an appropriate range, adjustment means displaces the needle guard in a direction to expand the outer diameter of the rotating hook, or displaces the needle guard in a direction to reduce the outer diameter of the rotating hook, thereby adjusts the clearance between the needle and the needle guard to a value within the appropriate range.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] A more complete appreciation of the present invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a front view of a horizontal rotating shuttle of sewing machine according to an embodiment of the present invention;

Fig. 2 is a plan view of the horizontal rotating shuttle according to the embodiment;

Fig. 3 is a horizontal cross sectional view of a part of the horizontal rotating shuttle cut along a direction passing through an adjusting concave part and orthogonal to an axial direction of a drive shaft;

Fig. 4 s a vertical cross sectional view of a part of the horizontal rotating shuttle cut along a direction passing through a screw hole and along the axial direction of the drive shaft;

Fig. 5 is a cross sectional view of an enlarged part of the horizontal rotating shuttle according to the embodiment;

Figs. 6A and 6B are explanatory views of adjustment between a needle and a needle guard in the horizontal rotating shuttle according to the embodiment;

Fig. 7 is a front view of the horizontal rotating shuttle according to another embodiment of the present invention;

Fig. 8 is a front view of the conventional horizontal rotating shuttle;

Fig. 9 is a plan view of the conventional horizontal

rotating shuttle;

Fig. 10 is an explanatory view showing the status of the conventional horizontal rotating shuttle where the clearance between the needle and the needle guard is within the appropriate range; and

Fig. 11 is an explanatory view showing the status of the conventional horizontal rotating shuttle where the needle and the needle guard are greatly away from each other.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] An embodiment of the present invention will be described with reference to Figs. 1 to 6. Note that as the basic structure of a horizontal rotating shuttle according to the embodiment of the present invention is the same as that of the conventional art described in Figs. 8 to 11, elements corresponding to those described in Figs. 8 to 11 have the same reference numerals and explanations of the elements will be omitted.

[0027] Fig. 1 is a front view of a horizontal rotating shuttle of sewing machine according to the embodiment of the present invention, and Fig. 2 is a plan view of the horizontal rotating shuttle. A horizontal rotating shuttle 11 has the rotating hook 2, the rotating hook bobbin case holder 3 accommodated in a rotating hook bobbin case holder accommodation unit 12 formed inside the rotating hook 2, and the like. A bobbin 4 around which a bobbin thread is wound is set inside the rotating hook bobbin case holder 3.

[0028] A ring-shaped grove 13 is formed on the inner peripheral surface of the rotating hook bobbin case holder accommodation unit 12 in the rotating hook 2. A ring-shaped rail 14 is formed on the outer periphery of the rotating hook bobbin case holder 3. The rotating hook 2 and the rotating hook bobbin case holder 3 are relatively-rotatably engaged with each other by engagement between the groove 13 and the rail 14.

[0029] The drive shaft 5 to transmit a driving force to rotate the rotating hook 2 about a rotational axis is connected to a bottom outer peripheral surface of the rotating hook 2.

[0030] The shuttle hook point 6 and the needle guard 7 are provided on the outer periphery of the rotating hook 2. The shuttle hook point 6 is integrally formed with the rotating hook 2. Every time the rotating hook 2 rotates once by the driving force received via the drive shaft 5, the shuttle hook point 6 rotates once in accordance with the rotation of the rotating hook 2. Upon sewing, the shuttle hook point 6 moves the needle 8 provided in the sewing machine main body (not shown) on which the horizontal rotating shuttle 11 is mounted upward/downward in correspondence with the rotation of the rotating hook 2, and hooks the loop of the needle thread 9 passing through the through hole 8b formed in the needle 8 (See Fig. 10).

[0031] The needle guard 7 has a shape curved along an axial rotational direction, and has one end in the curve direction fixed to the rotating hook 2 with a screw. The other end of the needle guard 7 is a free end. Although not particularly illustrated, when the horizontal rotating shuttle 11 is mounted on the sewing machine main body, the needle guard 7 is positioned such that the locus of the reciprocating motion of the needle 8 is on the outer peripheral side of the needle guard 7.

[0032] Further, an adjusting concave part 15 having an opening 15a (See Fig. 3) opposite to the free end of the needle guard 7 is formed in a base 2a on the bottom side of the rotating hook 2 of the horizontal rotating shuttle 11.

[0033] Fig. 3 is a horizontal cross sectional view showing a part of the horizontal rotating shuttle 11 cut along a direction passing through the adjusting concave part 15 and orthogonal to the axial direction of the drive shaft 5. As shown in Fig. 3, a spherical member 16 and a movable pin 17 as a movable member are accommodated in the adjusting concave part 15. In the adjusting concave part 15, the spherical member 16 is positioned farther from the opening 15a than the movable pin 17. The spherical member 16 is rotatable and movable in the adjusting concave part 15. The movable pin 17 is slidable along the adjusting concave part 15 inside the adjusting concave part 15. Assuming that in the adjusting concave part 15, the opening 15a side corresponds to a front end of the movable pin 17 while the side departing from the opening 15a (back side), to a rear end of the movable pin 17, the front end of the movable pin 17 is projected outside the adjusting concave part 15, and the rear end is in contact with the spherical member 16. The front end of the movable pin 17 projected outside the adjusting concave part 15 is in contact with the free end of the needle guard 7 having an arc shape from the inner side. In this arrangement, a biasing force to withdraw the movable pin 17 from the free end of the needle guard 7 acts on the movable pin 17 by an elastic force of the needle guard 7.

[0034] The base 2a of the rotating hook 2 has a screw hole 18 communicating with the adjusting concave part 15 and non-parallel to a longitudinal direction of the adjusting concave part 15 (See Fig. 4). Fig. 4 is a vertical cross sectional view showing a part of the horizontal rotating shuttle 11 cut along a direction passing through the screw hole 18 and along the axial direction of the drive shaft 5. In Fig. 4, the screw hole 18 is provided with its longitudinal direction orthogonal to the drawing sheet. In the present embodiment, as shown in Fig. 5, the screw hole 18 is set with its longitudinal direction at the right angle to the longitudinal direction of the adjusting concave part 15. Note that the angle of the longitudinal direction of the screw hole 18 to the longitudinal direction of the adjusting concave part 15 is not limited to the right angle, but it may be set at any angle as long as the screw hole 18 communicates with the adjusting concave part 15 from the rear end side of the movable pin 17 and the longitudinal direction of the screw hole is

not parallel to the longitudinal direction of the adjusting concave part 15.

[0035] The screw hole 18 is engaged with an adjusting screw 19 as a screw forward/backward movable with a driver or the like. The adjusting screw 19 is turned in a traveling direction (fastening direction) or a withdrawing direction (loosening direction) by using a driver or the like, thereby moved in a direction departing from or approaching to the spherical member 16.

[0036] The adjusting screw 19 has a tapered portion 20 at its end. The tapered portion 20 is in contact with the spherical member 16 from a position on the opposite side to the position where the rear end of the movable pin 17 is in contact with the spherical member 16. In the present embodiment, the adjusting concave part 15, the spherical member 16, the movable pin 17, the screw hole 18 and the adjusting screw 19 realize adjustment means 21. Further, the spherical member 16, the screw hole 18 and the adjusting screw 19 realize positioning means 22.

[0037] In the sewing machine main body (not shown) having the needle 8, with a through hole 8b through which the needle thread 9 passes, which is moved upward/downward upon sewing, the horizontal rotating shuttle 11 having the above structure is attached in a position such that the needle 8 is positioned on the outer peripheral side of the needle guard 7 and is moved upward/downward along the horizontal rotating shuttle 11 (See Fig. 10).

[0038] Although an explanation of sewing will be omitted since it is a well-known technique, upon sewing, by the rotation of the shuttle hook point 6 accompanying the rotation of the rotating hook 2 by the driving force transmitted via the drive shaft 5 and the upward/downward reciprocating motion of the needle 8 where the thread passes through the through hole 8b, a seam is formed by hooking the loop of the needle thread 9 held with the needle 8 (See Fig. 9) on the shuttle hook point 6, moving the needle thread 9 hooked on the shuttle hook point 6 along the outer peripheral surface of the rotating hook bobbin case holder 3, and seizing the needle thread 9 and the bobbin thread (not shown) wound around the bobbin 4 together.

[0039] In a case where a thick needle 8 is replaced with a thin needle or the needle 8 in a position indicated with an alphabet "X" in Fig. 6A is moved to a position indicated with an alphabet "Y" in the figure and the clearance between the needle 8 and the needle guard 7 is increased for some reason, adjustment must be performed such that the clearance between the needle 8 and the needle guard 7 is inside an appropriate range.

[0040] In the horizontal rotating shuttle 11 of the present embodiment, if the clearance between the needle 8 and the needle guard 7 is increased, adjustment can be performed such that the clearance between the needle 8 and the needle guard 7 is inside an appropriate range by the following operation.

[0041] More particularly, when the clearance between the needle 8 and the needle guard 7 is increased, the adjusting screw 19 engaged with the screw hole 18 is turned in the traveling direction (fastening direction).

[0042] When the adjusting screw 19 is turned in the traveling direction (fastening direction), the tapered portion 20 of the adjusting screw 19 is moved toward the spherical member 16, then by this movement, the spherical member 16 is pushed by the tapered portion 20, and the movable pin 17 is slided to the needle guard 7 side by the spherical member 16 pushed by the tapered portion 20.

[0043] As the one end of the needle guard 7 is fixed to the rotating hook 2, when the movable pin 17 is slided to the needle guard 7 side, the curvature of the arc shape of the needle guard 7 becomes greater and the outside surface is displaced toward the outer peripheral direction, as indicated with a solid line in Fig. 6B. By this displacement, the clearance between the needle 8 and the needle guard 7 is reduced, and the clearance between the needle 8 and the needle guard 7 can be within the appropriate range.

[0044] Note that at this time, as the curvature of the arc shape of the needle guard 7 is greater than that shown in Fig. 6A, the needle guard 7 applies a biasing force greater than that before the displacement of the outside surface toward the outer peripheral direction to the movable pin 17.

[0045] On the other hand, although illustration is omitted, in a case where a thick needle 8 is replaced with a thin needle or the clearance between the needle 8 and the needle guard 7 becomes too small for some reason, the adjusting screw 19 engaged with the screw hole 18 is turned in the withdrawing direction (loosening direction).

[0046] When the adjusting screw 19 is turned in the withdrawing direction (loosening direction), the tapered portion 20 of the adjusting screw 19 is moved in a direction departing from the spherical member 16. At this time, as the biasing force from the needle guard 7 acts on the movable pin 17, the movable pin 17 and the spherical member 16 are slided in a withdrawing direction from the needle guard 7 in accordance with the movement of the tapered portion 20 in the direction departing from the spherical member 16. In accordance with the slide movement of the movable pin 17 and the spherical member 16, the needle guard 7 displaces the outside surface to an inner peripheral direction. By the displacement, the clearance between the needle 8 and the needle guard 7 is increased, and the clearance between the needle 8 and the needle guard 7 can be within the appropriate range.

[0047] As described above, the horizontal rotating shuttle 11 according to the embodiment of the present invention comprises the rotating hook 2 accommodating the rotating hook bobbin case holder rotatably about the axis, the shuttle hook point 6 provided on the rotating hook 2 and having a tapered shape along the axial rotational direction, the needle guard 7 having a shape

curved along the axial rotational direction, and having one end in the curve direction fixed to the rotating hook 2 and the other end as a free end, and the adjustment means 21 for adjustably displacing the needle guard 7 in a direction to change the outer diameter of the rotating hook 2. In a case where the clearance between the needle 8 which reciprocates in the vertical direction while holding the needle thread 9 and the needle guard 7 of the rotating hook 2 becomes outside the appropriate range, the needle guard 7 is displaced by the adjustment means 21 in a direction to increase the outer diameter of the rotating hook 2 (See Fig. 6B), or in a direction to reduce the outer diameter of the rotating hook 2 (See Fig. 6A), thereby the clearance between the needle 8 and the needle guard 7 can be adjusted to a value within the appropriate range.

[0048] Further, the horizontal rotating shuttle 11 according to the embodiment of the present invention comprises the adjustment means 21 including: the adjusting concave part 15 formed in the rotating hook 2, having an opening 15a opposite to the free end of the needle guard 7; the movable pin 17 movable in the adjusting concave part 15, with its front end in contact with the free end of the needle guard 7; and the positioning means 22 for positioning the movable pin 17 in an arbitrary position in the adjusting concave part 15. Even in a case where an external force during sewing acts on the needle guard 7, as the movable pin 17 is in contact with the free end of the needle guard 7, the needle guard 7 can be prevented from being distorted to the inner peripheral side of the rotating hook 2.

[0049] Further, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, as the position of the needle guard 7 is adjusted by the movable pin 17 in contact with the free end of the needle guard 7, the adjustment can be performed in a state where substantially the both ends of the needle guard 7 are supported. Thus accurate adjustment can be performed.

[0050] Similarly, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, as the end of the movable pin 17 is in contact with the free end of the needle guard 7, the arrangement prevents the occurrence of trouble that the needle thread 9, not hooked on the shuttle hook point 6, passes between the needle guard 7 and the shuttle hook point 6 and enwinds the drive shaft 5.

[0051] Further, the horizontal rotating shuttle 11 according to the embodiment of the present invention comprises the screw hole 18 non-parallel to the adjusting concave part 15, the adjusting screw 19 engaged with the screw hole 18, the tapered portion 20 formed at the end of the adjusting screw 19, the spherical member 16 positioned between the rear end of the movable pin 17 and the tapered portion 20 and in contact with the rear end of the movable pin 17 and the tapered portion 20, and the positioning means 22 for positioning the movable pin 17 in an arbitrary position in the adjusting concave part 15 by changing the position of contact between the tapered portion 20 and the spherical member 16 by the forward/backward movement of the adjusting screw 19 in the screw hole 18. As an operator can adjust the clearance between the needle 8 and the needle guard 7 to a value within the appropriate range only by turning the adjusting screw 19, skilled work is not required in the adjustment work, and the adjustment can be performed easily and quickly.

[0052] Further, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, as the clearance between the needle 8 and the needle guard 7 can be adjusted to a value within the appropriate range by turning the adjusting screw 19, management of the amount of displacement of the needle guard 7, for example, can be performed by the number of revolutions of the adjusting screw 19 or the like. Thus high accuracy adjustment can be performed.

[0053] In addition, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, as the spherical member 16 is provided between the adjusting screw 19 and the movable pin 17, the displacement of the movable pin 17 by the forward/backward movement of the adjusting screw 19 can be performed only by the arrangement where the screw hole 18 and the adjusting concave part 15 are not parallel to each other, without particularly strict management of the mounting angle of the positioning means 22 to the movable pin 17. In this arrangement, the displacement of the needle guard 7 can be substantially easily realized.

[0054] Further, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, the position of the needle guard 7 can be adjusted by the movable pin 17 in contact with the free end of the needle guard 7, only by forming the adjusting concave part 15 and the screw hole 18 in the conventional horizontal rotating shuttle and providing as new parts the adjusting screw 19, the spherical member 16 and the movable pin 17. Accordingly, the needle guard 7 can be displaced in the outer peripheral direction of the rotating hook without any change in the needle guard 7 having the same structure as that used in the conventional art. Thus the above advantages can be realized without great designing change and with a small number of additional parts.

[0055] Further, in the present embodiment, the screw hole 18 is formed in the base 2a on the bottom side of the rotating hook 2, however, as the base 2a of the bottom side of the rotating hook 2 is generally thicker than other parts of the rotating hook 2, the diameter of the screw hole 18 can be large, and a large-diameter adjusting screw 19 can be used. Thus the durability of the adjusting screw 19 can be improved.

[0056] Further, in the horizontal rotating shuttle 11 according to the embodiment of the present invention, the tapering direction of the shuttle hook point 6 is fixed, and the end of the needle guard 7 on the root side of the shuttle hook point 6 is a free end. Even in a case where the horizontal rotating shuttle 11 is rotated with the ta-

pering direction of the shuttle hook point 6 as the traveling direction while the needle guard 7 is deformed toward the outer peripheral side, damage to the needle guard 7 by being hooked on another part due to the deformation can be prevented.

[0057] Next, another embodiment of the present invention will be described with reference to Fig. 7. Note that the elements corresponding to those described in the above embodiment have the same reference numerals and explanations of the elements will be omitted.

[0058] Fig. 7 is a cross sectional view of a part of the horizontal rotating shuttle 11 according to the other embodiment of the present invention. As shown in Fig. 7, the horizontal rotating shuttle 11 does not have the spherical member 16 described in the above embodiment, but has a movable pin 17' having a spherical-shaped rear end on the adjusting screw 19 side. The rear end of the movable pin 17' having a spherical shape is in directly contact with the tapered portion 20 of the adjusting screw 19. In the present embodiment, the adjusting concave part 15, the movable pin 17', the screw hole 18 and the adjusting screw 19 realize adjustment means 21'. Further, in the present embodiment, the screw hole 18 and the adjusting screw 19 realize positioning means 22'.

[0059] In the horizontal rotating shuttle 11 of the present embodiment, when the clearance between the needle 8 and the needle guard 7 is adjusted, the adjusting screw 19 is turned in the traveling direction (fastening direction) or the withdrawing (loosening direction) direction thereby the adjusting screw 19 is moved in a direction in which the tapered portion 20 of the adjusting screw 19 becomes in contact with/away from the movable pin 17'.

[0060] As the movable pin 17' is slided toward or away from the needle guard 7 by changing the pressing force applied from the adjusting screw 19 on the movable pin 17', the clearance between the needle 8 and the needle guard 7 can be adjusted by changing the amount of distortion of the needle guard 7 in accordance with the slide movement of the movable pin 17' as in the case of the above-described embodiment.

[0061] In this manner, the horizontal rotating shuttle 11 according to the present embodiment of the present invention comprises the movable pin 17' having a spherical-shaped rear end, the screw hole 18 non parallel to the adjusting concave part 15, the adjusting screw 19 engaged with the screw hole 18, the tapered portion 20 provided at the end of the adjusting screw 19 and in contact with the rear end side of the movable pin 17', and the positioning means 22' for positioning the movable pin 17' in an arbitrary position within the adjusting concave part 15 by changing the position of contact between the tapered portion 20 and the rear end of the movable pin 17' by the forward/backward movement of the adjusting screw 19 in the screw hole 18. The displacement of the movable pin 17' by the forward/backward movement of the adjusting screw 19 can be performed only by setting the screw hole 18 in non-parallel to the adjusting concave part 15 without particularly strictly managing the mounting angle of attachment of the positioning means 22' to the movable pin 17'. Further, in the positioning means 22' according to the present embodiment of the present invention, the number of parts can be reduced even in comparison with the above-described embodiment. Thus horizontal rotating shuttle 11 can be easily manufactured.

Claims

1. A horizontal rotating shuttle (11) of sewing machine, including: a rotating hook (2) accommodating a rotating hook bobbin case holder (3) rotatably about an axis; a shuttle hook point (6) provided in said rotating hook and having a shape tapered along an axial rotational direction of the rotating hook bobbin case holder; and a needle guard (7) having a shape curved along the axial rotational direction of the rotating hook bobbin case holder and having one end in a curve direction fixed to the rotating hook and the other end being a free end,
   characterized by comprising:

   adjustment means (21) for adjustably displacing the needle guard in a direction to change an outer diameter of the rotating hook.

2. The horizontal rotating shuttle according to claim 1, wherein the adjustment means includes:

   an adjusting concave part (15) formed in the rotating hook and having an opening (15a) opening to be opposite to the free end of the needle guard;
   a movable member (17) movable in the adjusting concave part, with an end in contact with the free end of the needle guard; and
   positioning means (22) for positioning the movable member to an arbitrary position in the adjusting concave part.

3. The horizontal rotating shuttle according to claim 2, wherein the positioning means includes:

   a screw hole (18) non-parallel to the adjusting concave part;
   a screw (19) engaged with the screw hole;
   a tapered portion (20) formed at an end of the screw; and
   a spherical member (16) positioned between a rear end of the movable member and the tapered portion, in contact with the rear end of the movable member and the tapered portion, said positioning means positioning the movable member to an arbitrary position in the adjusting

concave part by changing a contact position between the tapered portion and the spherical member through forward/backward movement of the screw in the screw hole.

4. The horizontal rotating shuttle according to claim 2, wherein the rear end of the movable member has a spherical shape,
said positioning means including:

a screw hole non-parallel to the adjusting concave part;
a screw engaged with the screw hole; and
a tapered portion formed at an end of the screw and in contact with the rear end of the movable member,
the positioning means positioning the movable member to an arbitrary position in the adjusting concave part by changing a contact position between the tapered portion and the rear end of the movable member through forward/backward movement of the screw in the screw hole.

5. The horizontal rotating shuttle according to claim 3 or 4, wherein the screw hole is formed on the bottom side of the rotating hook.

6. The horizontal rotating shuttle according to claim 1, wherein in the needle guard, the fixed end corresponds to a tapered side of the shuttle hook point along a tapering direction of the shuttle hook point and the free other end corresponds to a root side of the shuttle hook point.

Fig. 1

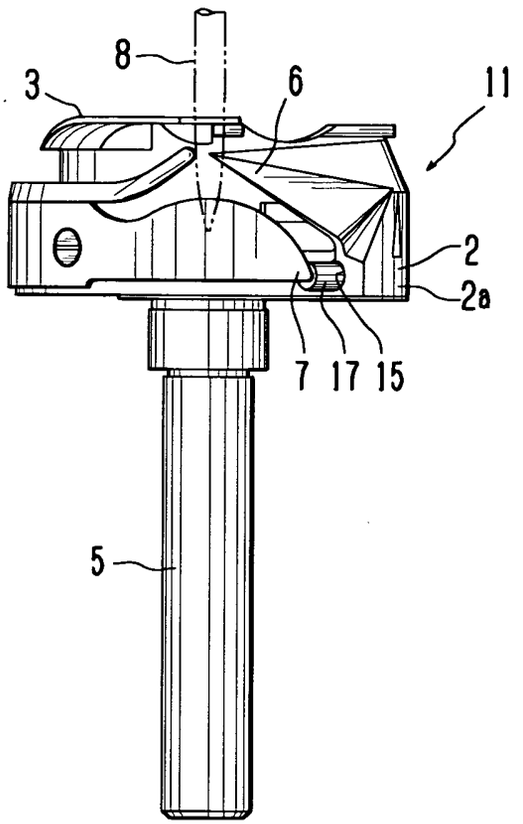


Fig. 2

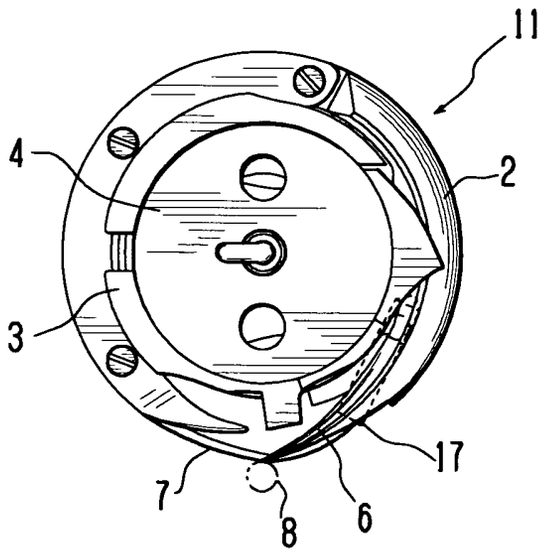


Fig. 3

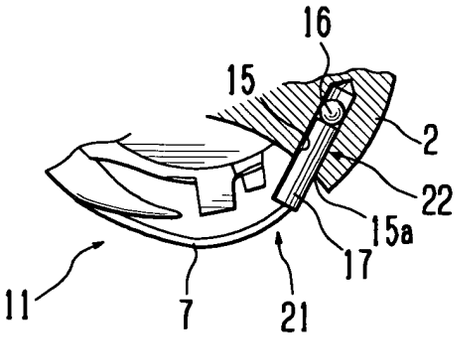


Fig. 4

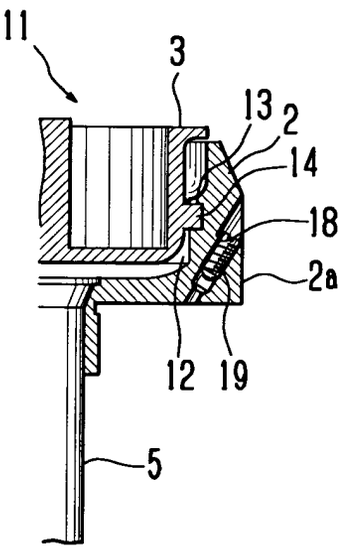


Fig. 5

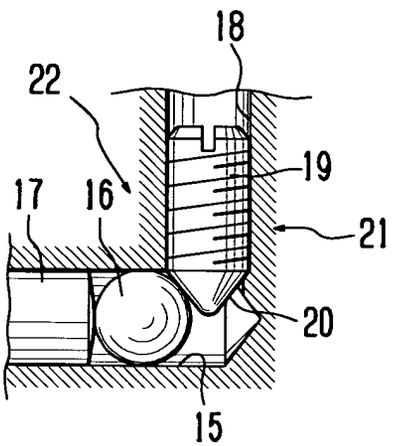


Fig. 6A

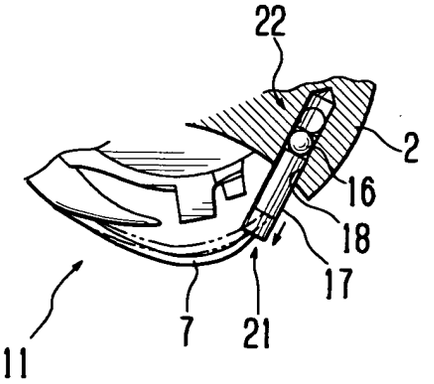


Fig. 6B

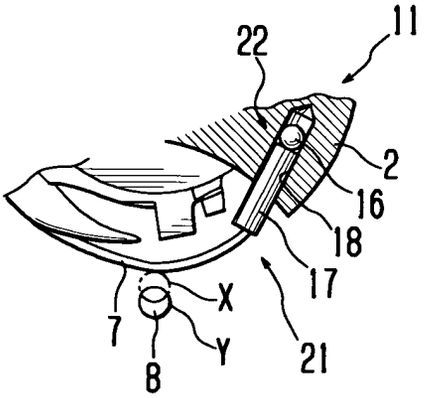


Fig. 7

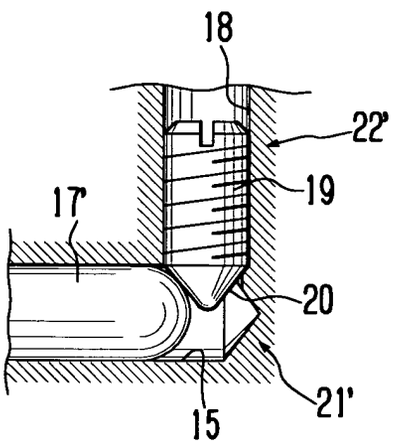


Fig. 8

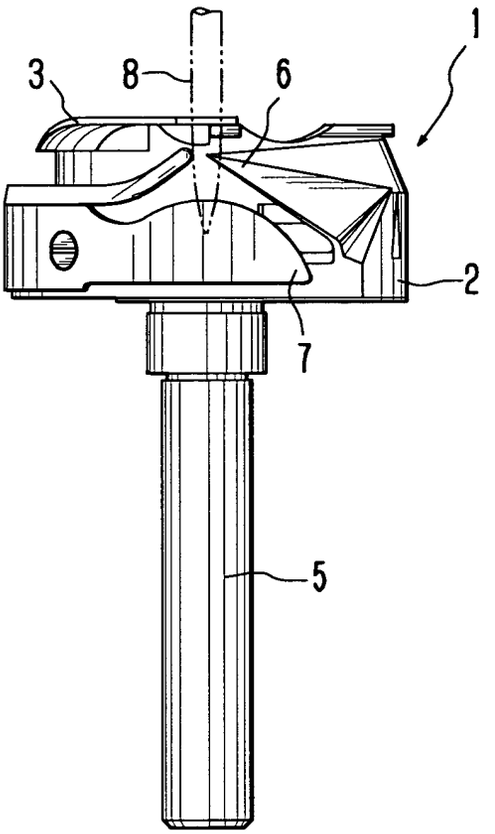


Fig. 9

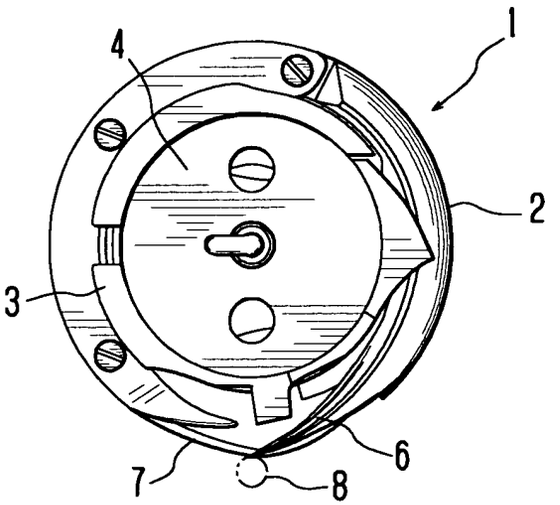


Fig. 10

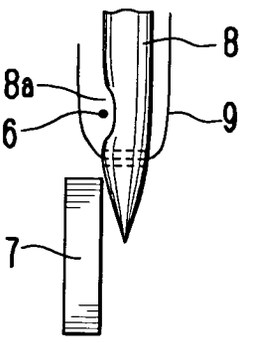
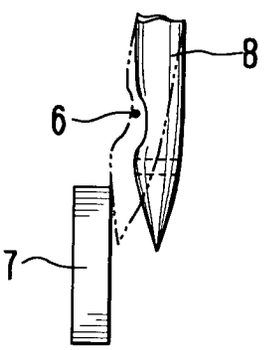


Fig. 11



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Application Number
EP 03 25 8190

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	13 May 2004	Herry-Martin, D

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