(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 357 273 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.08.2011 Bulletin 2011/33

(51) Int Cl.:
D05B 59/00 *(2006.01)*

(21) Application number: **11001023.8**

(22) Date of filing: **08.02.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **12.02.2010 JP 2010028450**

(71) Applicant: **Aisin Seiki Kabushiki Kaisha**
Aichi-ken 448-8650 (JP)

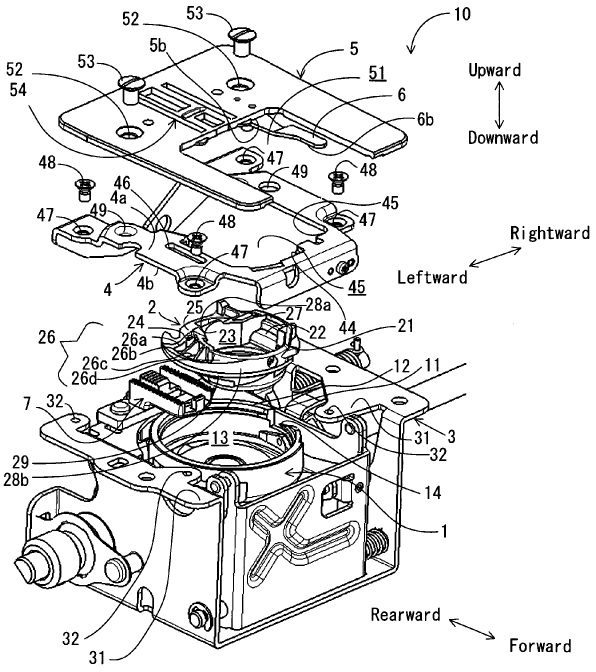
(72) Inventors:
- **YAMAOKA, Atsuo**
  Kariya-shi
  Aichi-ken,448-8650 (JP)
- **KAI, Akihiro**
  Kariya-shi
  Aichi-ken,448-8650 (JP)

(74) Representative: **Marshall, John Grahame**
SERJEANTS
25 The Crescent
King Street
Leicester LE1 6RX (GB)

(54) Bobbin case removing and attaching mechanism for loop taker

(57) A bobbin case removing and attaching mechanism for a loop taker includes a loop taker (1), a bobbin case (2) inserted into a bobbin case accommodating portion (13) of the loop taker and upwardly opening, a bracket (4) mounted at a fixing member (3), and a needle plate (5) including a bobbin case stopper piece (6). The bobbin case (2) inserted into the bobbin case accommodating portion (13) is retained at an operating position while a movement of the bobbin case (2) is restricted by the bracket (4) and the bobbin case stopper piece (6) in a state where the needle plate (5) is attached to the bracket (4). The bobbin case (2) is removed from or attached to the bobbin case accommodating portion (13) in a state where the needle plate (5) is removed from the bracket (4) and the bracket (4) is fixed to the fixing member (3).

FIG. 1



EP 2 357 273 A1

Description

TECHNICAL FIELD

[0001] This disclosure relates to a bobbin case removing and attaching mechanism for a loop taker mounted at a sewing apparatus.

BACKGROUND DISCUSSION

[0002] A known bobbin case removing and attaching mechanism for a loop taker mounted at a sewing apparatus is disclosed in JPS57-38278B (hereinafter referred to as Reference 1). The loop taker disclosed in Reference 1 includes a movable rotation stopper having two engagement pieces, at least one of which engages with a bobbin case. The loop taker also includes an operation member rotatably connected to a pin that is fixed to a sewing machine bed. One end of the operation member is normally positioned to be slightly away from the movable rotation stopper. The operation member includes an operation portion that is operated by a protrusion formed at a position restricting member of the bobbin case in a case where the position restricting member moves to a release position. The operation member releases the engagement between one of the engagement pieces of the movable rotation stopper and the bobbin case by means of the operation portion regardless of a rotational phase of the loop taker. In addition, the operation member causes the other of the engagement pieces of the movable rotation stopper to be positioned at an upper side of a release portion of the bobbin case. According to the aforementioned bobbin case removing and attaching mechanism, in a case where the position restricting member is slid to a position where the protrusion of the position restricting member makes contact with the operation portion, a bobbin is removable from the bobbin case. However, the bobbin case is not removable from the loop taker. In a case where the position restricting member is further slid in the aforementioned direction from the position where the protrusion of the position restricting member makes contact with the operation portion, the bobbin case removing and attaching mechanism is activated, thereby engaging the protrusion with the operation portion and pressing the operation portion. Because the operation portion is pressed, the movable rotation stopper rotates to release the engagement between the bobbin case and the movable rotation stopper. As a result, the bobbin case is removable from the loop taker. On the other hand, in a case where the bobbin case is inserted to the loop taker so as to be attached thereto, one of the engagement pieces is inserted into a groove formed at the bobbin case. Thus, a failure of the arrangement position of the bobbin case at the loop taker is unlikely to occur.

[0003] In addition, a known sewing machine is disclosed in JPH03-14478B (hereinafter referred to as Reference 2). The sewing machine includes a sewing machine bed, a loop taker arranged for rotation about a vertical axis and accommodated within the bed, the loop taker having a rim that extends in a direction perpendicular to the vertical axis and an open ended hollow cavity of which an end opens towards the rim, and a bobbin case arranged within the loop taker and having a flange. The sewing machine also includes a bracket removably attached to the bed and having an opening at a center, the bracket restraining a movement of the bobbin case within the cavity and providing a clearance for a passage of a thread relative to the bobbin case. The bracket is placed on one end surface of the flange of the bobbin case at two portions. The sewing machine further includes a first support portion provided at the bracket and positioned on one side of a plane containing the vertical axis of the loop taker, and a second support portion positioned on the rim and having less than 180° of angular displacement, the second support portion being positioned on the other side of the plane together with the two portions of the bracket. The sewing machine still further includes a vertical wall provided at the first support portion so as to make contact with the bobbin case. According to the aforementioned sewing machine, the bobbin case is retained in operational engagement with the rim. The bobbin case is removed from an operating position at the loop taker after the bracket is removed therefrom. A recess is formed at one of the two portions of the bracket that is placed on the end surface of the flange of the bobbin case. A tab is formed at the flange of the bobbin case so as to engage with the recess. As a result, the rotational movement of the bobbin case is restricted.

[0004] According to Reference 1, although the bobbin case is unlikely to be arranged at a wrong position at the loop taker when the bobbin case is inserted into the loop taker, it is difficult to observe one of the engagement pieces because the engagement piece is arranged below a needle plate. Therefore, it is difficult to insert the engagement piece into the groove of the bobbin case, which may hinder the arrangement of the bobbin case at the loop taker. In addition, in order to remove or attach the bobbin case relative to the loop taker, a number of components constituting a complex link mechanism are provided around the loop taker. As a result, accurate positioning of the components is difficult because of manufacturing tolerances of the components. Further, a cost of the bobbin case removing and attaching mechanism may increase due to the complex structure thereof.

[0005] According to Reference 2, it is difficult for a user to arrange the bobbin case at the loop taker because with reference to what the bracket is positioned is unclear. In a case where the user fixes the bobbin case by a screw at a wrong position in the loop taker, an appropriate sewing may not be obtained because of the wrong arrangement of the bobbin case at the loop taker. Further, in order to clear up lint or waste accumulated in the loop taker, the needle plate, the bracket, and then the bobbin case are removed. The removal of the three components may lead to a complicated operation for removing the

bobbin case.

[0006] A need thus exists for a bobbin case removing and attaching mechanism for a loop taker which achieves easy removal and attachment of a bobbin case by removing only a needle plate. In addition, the bobbin case is inserted into a predetermined operating position at a loop taker when the bobbin case is attached to the loop taker, and the bobbin case is retained at the predetermined operating position even under a vibration or other forces generated upon sewing (for example, a force generated when a sewing apparatus is carried or transferred, and the like). Further, the bobbin case removing and attaching mechanism for the loop taker is obtained at low costs.

SUMMARY

[0007] According to an aspect of this disclosure, a bobbin case removing and attaching mechanism for a loop taker includes a loop taker arranged within a work supporting bed for a sewing apparatus and rotatable about an axis of the loop taker, a bobbin case inserted into a bobbin case accommodating portion formed at the loop taker, the bobbin case accommodating portion upwardly opening, a bracket mounted at a fixing member that is arranged at the work supporting bed and including an opening where the bobbin case passes through when the bobbin case is inserted to or removed from the bobbin case accommodating portion, and a needle plate attached at an upper portion of the bracket and closing at least a portion of the opening of the bracket, the needle plate including a bobbin case stopper piece restricting an upward movement of the bobbin case that is inserted into the bobbin case accommodating portion and arranged at an operating position thereof. The bobbin case that is inserted into the bobbin case accommodating portion is retained at the operating position while a movement of the bobbin case is restricted by the bracket and the bobbin case stopper piece in a state where the needle plate is attached to the bracket. In addition, the bobbin case is removed from or attached to the bobbin case accommodating portion in a state where the needle plate is removed from the bracket and the bracket is fixed to the fixing member.

[0008] According to the aforementioned disclosure, the needle plate is removed in a state where the bracket is fixed to the fixing member to thereby remove or attach the bobbin case relative to the bobbin case accommodating portion of the loop taker. Therefore, the removing and attaching of the bobbin case is simply performed and operability thereof may increase.

[0009] In addition, during a sewing operation, a vibration is constantly generated so as to dislocate the bobbin case from the operating position at the loop taker. In addition, when the sewing apparatus is carried or transferred, a force for dislocating the bobbin case from the operating position may occur because of the vibration, and the like. In a case where the aforementioned vibration or the force is generated, the bobbin case is retained at the predetermined operating position in the loop taker because the bobbin case is restrained from moving by the bracket and the bobbin case stopper piece. As a result, the bobbin case is restrained from moving so as to be positioned on an upper surface of the loop taker. Appropriate stitches may be obtained according to the aforementioned bobbin case removing and attaching mechanism.

[0010] Further, according to the aforementioned bobbin case removing and attaching mechanism, the operating position of the bobbin case is restricted by the bracket and the bobbin case stopper piece, thereby simplifying the configuration of the mechanism and obtaining a reduced manufacturing cost.

[0011] The bracket includes a rotation restricting portion restricting an insertion direction of the bobbin case and restricting a rotation of the bobbin case, and a guide portion making contact with a portion of an upper side surface of the bobbin case in a case where the bobbin case is inserted into the bobbin case accommodating portion and restricting an upward movement of the bobbin case, and wherein clearances through each of which a needle thread passes are formed between the rotation restricting portion and the bobbin case and between the guide portion and the bobbin case respectively.

[0012] Accordingly, in a case where the bobbin case is inserted into the bobbin case accommodating portion of the loop taker in a state where the needle plate is removed therefrom, the position of the bobbin case in the rotational direction is restricted by the rotation restricting portion while the insertion position of the bobbin case in the upward direction is restricted by the guide portion. As a result, the bobbin case is insertable only in a predetermined direction to the predetermined operating position in the bobbin case accommodating portion of the loop taker. The bobbin case that is inserted into the bobbin case accommodating portion is removable only from a direction opposite from the aforementioned predetermined direction. Thus, a user easily inserts the bobbin case to the predetermined operating position in the loop taker and easily removes the bobbin case from the loop taker. A broken thread because of a blocking of a path of a needle thread, and the like, that occurs in a case where the bobbin case is dislocated from the predetermined operating position, may be restrained to thereby achieve appropriate stitches.

[0013] Further, the movement of the bobbin case in the rotational direction is restricted by the rotation restricting portion under a vibration force generated in the sewing apparatus during the sewing operation or the force generated when the sewing apparatus is carried or transferred. The upward movement of the bobbin case is restricted by the guide portion and the bobbin case stopper piece. Therefore, the bobbin case is retained at the predetermined operating position in the bobbin case accommodating portion of the loop taker. As a result, the bobbin case is restrained from moving so as to be positioned on

the upper surface of the lop taker, thereby achieving the appropriate stitches.

[0014] The guide portion is formed by a downward bending of a portion at an edge of the opening of the bracket.

[0015] Accordingly, the simple structured and low cost bobbin case removing and attaching mechanism for the loop taker is obtained.

[0016] The bobbin case stopper piece includes elasticity to press the bobbin case.

[0017] Accordingly, a dimensional tolerance between the needle plate and the bobbin case may be absorbed by means of the elasticity.

[0018] The bobbin case stopper piece is formed separately from the needle plate and is removably fixed to a lower surface of the needle plate.

[0019] Accordingly, a structure of the needle plate may be simplified as compared to a case where the bobbin case stopper piece is integrally formed with the needle plate.

[0020] The bobbin case stopper piece is an elongated member made of metal and fixed to the lower surface of the needle plate in a cantilever manner.

[0021] Accordingly, the elasticity of the bobbin case stopper piece is adjustable by changing a length of the bobbin case stopper piece. In a case where the bobbin case stopper piece is made of metal, an increase of dimensions of the bobbin case stopper piece is avoidable as compared to a case where the bobbin case stopper piece is formed by a resin molding.

[0022] The bobbin case stopper piece is formed separately from the needle plate, the bobbin case stopper piece including a base portion fixed to the lower surface of the needle plate and a free end portion being apart from the lower surface of the needle plate by a predetermined distance.

[0023] That structure of the needle plate may be simplified as compared to a case where the bobbin case stopper piece is integrally formed with the needle plate. An appropriate change of a length between the free end portion and the lower surface of the needle plate may adjust a magnitude of the elasticity of the bobbin case stopper piece.

[0024] The bobbin case stopper piece is made of metal.

[0025] In a case where the bobbin case stopper piece is made of metal, the increase of dimensions of the bobbin case stopper piece is avoidable as compared to the case where the bobbin case stopper piece is formed by the resin molding.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The foregoing and additional features and characteristics of this disclosure will become more apparent from the following detailed description considered with the reference to the accompanying drawings, wherein:

[0027] Fig. 1 is an exploded perspective view of a bobbin case removing and attaching mechanism for a loop taker according to an embodiment;

[0028] Fig. 2 is a perspective view of a bracket illustrated in Fig. 1 when viewed from a lower side of Fig. 1;

[0029] Fig. 3 is a plan view in a state where a needle plate is removed from the bobbin case removing and attaching mechanism;

[0030] Fig. 4 is a plan view of the bobbin case removing and attaching mechanism;

[0031] Fig. 5 is a cross-sectional view taken along the line V-V illustrated in Fig. 4; and

[0032] Fig. 6 is a perspective view illustrating a positional relationship between a bobbin case, the bracket, and a bobbin case stopper piece.

DETAILED DESCRIPTION

[0033] An embodiment will be explained with reference to the attached drawings.

[0034] As illustrated in Fig. 1, a bobbin case removing and attaching mechanism 10 (a bobbin case removing and attaching mechanism for a loop taker) includes a loop taker 1 mounted at an inner side of a carrier plate 3 (fixing member) that is attached to a sewing machine bed (a work supporting bed) of a sewing machine (a sewing apparatus), a bracket 4 fixed to a flange 31 of the carrier plate 3, a bobbin case 2 inserted into the loop taker 1, and a needle plate 5 fixed to an upper surface 4a of the bracket 4.

[0035] The loop taker 1 is formed substantially into a cylindrical shape constituted by a cylindrical portion which is partially cut out and a bottom portion. The loop taker 1 includes a bobbin case accommodating portion 13 of which an upper side in Fig. 1 opens, a notch end 14 formed at a portion of the cylindrical portion, an upper surface 12, and a race surface 11 I formed at an upper side of the cylindrical portion. In a case where the loop taker 1 rotates about a rotational axis Z (an axis) (see Fig. 5) thereof in a counterclockwise direction when viewed from an upper side in Fig. 5, the notch end 14 catches a needle thread, thereby forming stitches.

[0036] The bobbin case 2 includes a bobbin accommodating portion 23 of which an upper side in Fig. 1 opens so as to accommodate a bobbin on which a bobbin thread is wound. A portion of an upper side wall of the bobbin accommodating portion 23 is cut to form into a thin shape to thereby obtain a bobbin removing portion 22. A flange surface 29 that makes contact with the race surface 11 of the loop taker 1 is formed at an outer peripheral surface 28b of the bobbin case 2. The outer peripheral surface 28b is formed to be perpendicular to an inner peripheral surface 28a of the bobbin case 2. The bobbin is accommodated at the inner peripheral surface 28a at an axially intermediate portion of the bobbin case 2. A protruding portion 21 is formed at a portion of the outer peripheral surface 28b that faces a connecting portion between the bobbin removing portion 22 and the bobbin accommodating portion 23. Then, an inclination portion 26 includ-

ing ribs 26a, 26b, 26c, and 26d (see Figs. 1 and 3) is formed at a portion of the outer peripheral surface 28b at substantially 90° relative to the protruding portion 21 in a clockwise direction as seen in Fig. 1. A radially outer surface of the rib 26a forms a reverse rotation stopper surface 24 (see Figs. 1, 3 and 6) that is parallel to an axis of the inner peripheral surface 28a and is perpendicular to a feeding direction of a feed dog 7. The reverse rotation stopper surface 24 is parallel to an arrow A in Fig. 3. In addition, a plane surface portion 25 (i.e., a portion of an upper side surface of the bobbin case 2) is formed to be perpendicular to the reverse rotation stopper surface 24. The plane surface portion 25 is positioned to be lower than an upper-right portion (an upper-right surface portion) 27 of the bobbin case 2 formed at the bobbin removing portion 22. At this time, the plane surface portion 25, the inclination portion 26, and the upper-right portion 27 constitute the upper side surface of the bobbin case 2.

[0037] The carrier plate 3 is formed into a channel shape by a bending of a plate member. The carrier plate 3 includes the flanges 31 at upper left and right sides in Fig. 1. Internal threads 32 are formed at the flanges 31 so as to secure the bracket 4.

[0038] As illustrated in Fig. 2, the bracket 4 is formed by a plate member that is bent. The bracket 4 includes an opening 45 at a center. A thread release portion 44 serving as a rotation restricting portion and a support portion 40 serving as a portion of an opening edge are formed at a rear surface 4b of the bracket 4. The support portion 40 is bent to be substantially perpendicular to the rear surface 4b. The support portion 40 includes a rotation direction support portion 42 serving as the rotation restricting portion and a vertical direction support portion 41 serving as a guide portion. The rotation direction support portion 42 is provided at a right side in the support portion 40 in Fig. 2 (i.e., a side surface at a front side of the sewing apparatus) so as to be perpendicular to the rear surface 4b. The vertical direction support portion 41 is formed at a lower surface of the bracket 4 perpendicular to the rotation direction support portion 42 (i.e., a lower surface parallel to the rear surface 4b). In addition, an elongated bore 46 opens at the rear surface 4b in the vicinity of the rotation direction support portion 42. Then, a vertical direction sub-support portion 43 (see a shaded portion in Fig. 2) is formed at an edge of the rear surface 4b along a longitudinal direction of the elongated bore 46.

[0039] The vertical direction support portion 41 is formed and positioned in such a manner that the plane surface portion 25 of the bobbin case 2 can be inserted into a space formed between the vertical direction support portion 41 and the race surface 11 of the loop taker 1 from an obliquely upward side of the opening 45 to an obliquely downward side thereof in the arrow A direction (see Fig. 3). That is, according to the present embodiment, the vertical direction support portion 41 is formed at a distant portion of a peripheral edge of the opening 45 in a direction from which the bobbin case 2 is inserted.

[0040] The vertical direction sub-support portion 43 is formed and positioned in such a manner that the inclination portion 26 of the bobbin case 2 can be inserted into a space formed between the vertical direction sub-support portion 43 and the race surface 11 of the loop taker 1 from the obliquely upward side of the opening 45 to the obliquely downward side thereof in the arrow A direction (see Fig. 3). That is, according to the present embodiment, the vertical direction sub-support portion 43 is formed at a closer portion of the peripheral edge of the opening 45 in the direction from which the bobbin case 2 is inserted.

[0041] The bracket 4 includes four bores 47 into which bracket stopper screws 48 (see Fig. 1) are inserted and two internal threads 49 with which needle plate fixing screws 53 (see Fig. 1) are meshed.

[0042] As illustrated in Fig. 1, the needle plate 5 includes an opening 51 having substantially a U-shape, bores 52 into which the needle plate fixing screws 53 are inserted, and multiple opening grooves 54 for the feed dog 7. The needle plate 5 also includes a bobbin case stopper piece 6. One end (i.e., a base portion) of the bobbin case stopper piece 6 is attached or fixed to a rear surface 5b (lower surface) of the needle plate 5 in Fig. 1 while the other end (i.e., a free end portion, which is apart from the rear surface 5b of the needle plate 5 by a predetermined distance) of the bobbin case stopper piece 6 is positioned within the opening 51. In a case where the needle plate 5 is mounted at the bracket 4, the other end of the bobbin case stopper piece 6 extends over the upper-right portion 27 of the bobbin case 2. At this time, the other end of the bobbin case stopper piece 6 desirably extends beyond an outer edge of the upper-right portion 27 that is positioned in the vicinity of an inner side surface 45a of the opening 45 formed at a front side thereof as illustrated in Fig. 6. The bobbin case stopper piece 6 is provided to restrict an upward movement of the bobbin case 2 that is inserted into the bobbin case accommodating portion 13 of the loop taker 1. In addition, the bobbin case stopper piece 6 includes elasticity to press the bobbin case 2. Further, the bobbin case stopper piece 6 may be formed separately from the needle plate 5 and be removably fixed to the rear surface 5b of the needle plate 5. The bobbin case stopper piece 6 may be an elongated member made of metal and fixed to the rear surface 5b of the needle plate 5 in a cantilever manner.

[0043] Next, an assembly procedure of the bobbin case removing and attaching mechanism 10 will be explained with reference to Figs. 1, 3, 5, and 6.

[0044] As illustrated in Fig. 1, the loop taker 1 is mounted at the carrier plate 3 fixed to the sewing machine bed of the sewing apparatus and is connected to a main shaft thereof that rotates the loop taker 1 in a counterclockwise direction when viewed from an upper side in Fig. 1. Then, the bracket stopper screws 48 inserted into the bores 47 of the bracket 4 are meshed with the internal threads 32 formed at the flanges 31 of the carrier plate 3, thereby fixing the bracket 4 to the flanges 31.

[0045] Afterwards, as illustrated in Figs. 1 and 3, the

bobbin case 2 is moved from the obliquely upward side (according to the embodiment, from the obliquely rightward and upward side) of the opening 45 of the bracket 4 in the arrow A direction towards the obliquely downward side (according to the embodiment, towards the obliquely leftward and downward side) of the opening 45 in a state where the reverse rotation stopper surface 24 of the bobbin case 2 is positioned to be substantially parallel to the arrow A, so that the bobbin case 2 is inserted into the bobbin case accommodating portion 13 of the loop taker 1. At this time, the bobbin case 2 is inserted into the loop taker 1 only in the arrow A direction in Fig. 3, i.e., from the obliquely upward side to the obliquely downward side of the opening 45, which will be explained later in details.

[0046] After the bobbin case 2 is inserted into the loop taker 1, the needle plate 5 is attached to the upper surface 4a of the bracket 4 as illustrated in Figs. 1 and 4. The needle plate fixing screws 53 inserted into the bores 52 of the needle plate 5 are meshed with the internal threads 49 (see Figs. 1 and 2) to thereby fix the needle plate 5 to the bracket 4. Consequently, the assembly of the bobbin case removing and attaching mechanism 10 is completed. The bobbin case 2 is removable from the bobbin case accommodating portion 13 of the loop taker 1 by being pulled to the obliquely upward side (according to the embodiment, to the obliquely rightward and upward side) of the opening 45, specifically, in a direction of an arrow B (see Fig. 3) opposite from the arrow A, after the needle plate 5 is removed from the bracket 4, which will be explained later.

[0047] A positional relationship between the bobbin case 2 mounted at the bobbin case accommodating portion 13 of the loop taker 1 and the bobbin case stopper piece 6 provided at the loop taker 1 and the needle plate 5 is as follows. As illustrated in Figs. 1 and 5, the flange surface 29 of the bobbin case 2 is seated on or contactable with an upper portion of the race surface 11 of the loop taker 1. At this time, a clearance is formed between the upper-right portion 27 of the bobbin case 2 and a bottom surface 6b of the bobbin case stopper piece 6 so that the needle thread easily passes through the clearance. In the vicinity of a portion where the upper-right portion 27 of the bobbin case 2 is contactable with the bottom surface 6b of the bobbin case stopper piece 6, the vertical movement of the bobbin case 2 is limited to an extent of the size of the clearance through which the needle thread passes, thereby restricting the vertical movement of the bobbin case 2. In addition, because of a contact between the flange surface 29 of the bobbin case 2 and the race surface 11 of the loop taker 1, the downward movement of the bobbin case 2 is restricted by the race surface 11.

[0048] As illustrated in Figs. 3, 4, and 6, a clearance through which the needle thread passes is formed between the protruding portion 21 of the bobbin case 2 and the thread release portion 44 of the bracket 4. Thus, in a case where the protruding portion 21 of the bobbin case 2 makes contact with the thread release portion 44, the rotational movement of the bobbin case 2 in the counterclockwise direction when viewed from the upper side of the bobbin case 2 is limited to the size of the clearance through which the needle thread passes, thereby restricting the rotational movement of the bobbin case 2 in the counterclockwise direction.

[0049] As illustrated in Figs. 3 and 6, a clearance through which the needle thread passes is formed between the reverse rotation stopper surface 24 of the bobbin case 2 and the rotation direction support portion 42 of the bracket 4. Thus, in a case where the reverse rotation stopper surface 24 of the bobbin case 2 makes contact with the rotation direction support portion 42, the rotational movement of the bobbin case 2 in the clockwise direction when viewed from the upper side of the bobbin case 2 is limited to the size of the clearance through which the needle thread passes, thereby restricting the rotational movement of the bobbin case 2 in the clockwise direction.

[0050] As illustrated in Figs. 1 and 6, a clearance through which the needle thread passes is formed between the plane surface portion 25 of the bobbin case 2 and the vertical direction support portion 41 of the bracket 4. Thus, in a case where the plane surface portion 25 of the bobbin case 2 makes contact with the vertical direction support portion 41 (i.e., the vertical direction support portion 41 is in contact with a portion of an upper side surface of the bobbin case 2), the upward movement of the bobbin case 2 in the vicinity of the vertical direction support portion 41 is limited to an extent of the size of the clearance, thereby restricting the upward movement of the bobbin case 2.

[0051] As illustrated in Figs. 1 and 6, a clearance through which the needle thread passes is formed between the inclination portion 26 of the bobbin case 2 and the vertical direction sub-support portion 43 of the bracket 4. Thus, in a case where the inclination portion 26 of the bobbin case 2 makes contact with the vertical direction sub-support portion 43, the upward movement of the bobbin case 2 in the vicinity of the vertical direction sub-support portion 43 is limited to the size of the clearance, thereby restricting the upward movement of the bobbin case 2.

[0052] Accordingly, an operating position of the bobbin case 2 in the upward direction is retained by the contact of the bottom surface 6b of the bobbin case stopper piece 6, the vertical direction support portion 41 of the bracket 4, and the vertical direction sub-support portion 43 of the bracket 4 with three portions of the bobbin case 2 respectively. An operating position of the bobbin case 2 in the downward direction is retained by the contact between the flange surface 29 of the bobbin case 2 and the race surface 11 of the loop taker 1. An operating position of the bobbin case 2 in the rotational direction is retained by the contact between the reverse rotation stopper surface 24 and the rotation direction support portion 42, and the contact between the protruding portion 21 and the thread release portion 44.

[0053] Normally in the sewing apparatus having the loop taker, the bobbin case is first positioned relative to the loop taker. The position of the bobbin case in the rotational direction is defined by a positioning member, thereby arranging the bobbin case at the operating position appropriate to form stitches. In case of removing lint or waste accumulated in the loop taker, the bobbin case is removed from the loop taker so that the lint or waste can be cleared away. After the removal of the lint or waste, the bobbin case is again reattached to a predetermined position at the loop taker. According to the bobbin case removing and attaching mechanism 10 of the present embodiment, in the same way as a known loop taker, the bobbin case 2 is removed from the bobbin case accommodating portion 13 of the loop taker 1 so as to clear away the lint or waste within the bobbin case accommodating portion 13 of the loop taker 1. After the bobbin case accommodating portion 13 is cleaned, the bobbin case 2 that is removed should be reattached to the predetermined operating position of the loop taker 1. The removal and attachment of the bobbin case 2 is conducted as follows.

[0054] In order to clean the bobbin case accommodating portion 13 of the loop taker 1, the needle plate fixing screws 53 are unscrewed by a screw driver attached to the sewing apparatus so as to remove the needle plate 5 from the bracket 4. Once the needle plate 5 is removed, substantially a full upper portion of the bobbin case 2 that is half covered by the needle plate 5 is visually confirmable as illustrated in Fig. 3. The bobbin case 2 is pulled out to the obliquely upward side of the opening 45, i.e., in the arrow B direction, so as to remove the bobbin case 2 from the bobbin case accommodating portion 13. The lint or waste within the loop taker 1 is removed to thereby complete the cleaning. The removal of the bobbin case 2 is achievable only in the aforementioned direction (i.e., the arrow B direction).

[0055] After the cleaning of the bobbin case accommodating portion 13, the bobbin case 2 is reattached to the predetermined position at the loop taker 1 and thereafter the needle plate 5 is attached to the bracket 4. In case of reattaching the bobbin case 2 to the predetermined position of the loop taker 1, the bobbin case 2 is moved from the obliquely upward side of the opening 45 to the obliquely downward side thereof in the arrow A direction to thereby insert the bobbin case 2 to the bobbin case accommodating portion 13 of the loop taker 1. Such insertion is achievable because of the shapes of the protruding portion 21, the reverse rotation stopper surface 24, and the plane surface portion 25 of the bobbin case 2 and the shapes of the vertical direction support portion 41 and the rotation direction support portion 42 of the bracket 4. Accordingly, the bobbin case 2 is reattached to the previous position before being removed, i.e., the predetermined operating position at the bobbin case accommodating portion 13. The insertion (attachment) of the bobbin case 2 is achievable only in the aforementioned direction (i.e., the arrow A direction). Specifically, the insertion direction and the removal direction of the bobbin case 2 relative to the loop taker 1 is limited in the arrow A direction from the obliquely upward side of the opening 45 and in the arrow B direction to the obliquely upward side of the opening 45 respectively.

[0056] That is, according to a first restriction manner, the clearance through which the needle thread easily passes is formed between the projecting portion 21 of the bobbin case 2 and the thread release portion 44 of the bracket 4. The rotation of the bobbin case 2 is restricted within the size of the clearance through which the needle thread passes. The rotation of the bobbin case 2 in the counterclockwise direction when viewed from the upper side of the bobbin case 2 is restricted by the contact between the protruding portion 21 of the bobbin case 2 with the thread release portion 44 of the bracket 4.

[0057] According to a second restriction manner, the clearance through which the needle thread easily passes is formed between the reverse rotation stopper surface 24 of the bobbin case 2 and the rotation direction support portion 42 of the support portion 40 of the bracket 4. The rotation of the bobbin case 2 is restricted within the size of the clearance through which the needle thread passes. The rotation of the bobbin case 2 in the clockwise direction when viewed from the upper side of the bobbin case 2 is restricted by the contact between the reverse rotation stopper surface 24 of the bobbin case 2 with the rotation direction support portion 42 of the support portion 40 of the bracket 4. According to the first and second restriction manners, the position of the bobbin case 2 in the rotational direction is restricted and thus the direction where the bobbin case 2 is inserted into the bobbin case accommodating portion 13 of the loop taker 1 is limited to the arrow A direction.

[0058] According to a third restriction manner, the plane surface portion 25 of the bobbin case 2 is specified so that the clearance through which the needle thread easily passes is formed relative to the vertical direction support portion 41 of the support portion 40 of the bracket 4. Thus, the upward movement of the bobbin case 2 in the vicinity of the vertical direction support portion 41 is limited to the size of the clearance through which the needle thread passes. The plane surface portion 25 of the bobbin case 2 makes contact with the vertical direction support portion 41 of the support portion 40 of the bracket 4, and the direction where the bobbin case 2 is removed from and attached to the bobbin case accommodating portion 13 is restricted to the obliquely upward side of the opening 45 as illustrated in Figs. 1 and 6. As a result, the plane surface portion 25 is inserted into the space formed between the vertical direction support portion 41 and the race surface 11 of the loop taker 1.

[0059] According to a fourth restriction manner, the inclination portion 26 of the bobbin case 2 is specified so that the clearance through which the needle thread easily passes is formed relative to the vertical direction subsupport portion 43 of the bracket 4. The upward movement of the bobbin case 2 in the vicinity of the vertical

direction sub-support portion 43 is limited to the size of the clearance. The inclination portion 26 makes contact with the vertical direction sub-support portion 43 of the bracket 4, and the direction where the bobbin case 2 is removed from and attached to the bobbin case accommodating portion 13 is restricted to the obliquely upward side of the opening 45. As a result, the inclination portion 26 is inserted into the space formed between the vertical direction sub-support portion 43 and the race surface 11 of the loop taker 1. According to the third and fourth restriction manners, in a case where the bobbin case 2 is inserted into the bobbin case accommodating portion 13 of the loop taker 1, the insertion direction of the bobbin case 2 in the vertical direction is limited from the obliquely upward side of the opening 45 to the obliquely downside thereof. According to the first to fourth restriction manners, the insertion of the bobbin case 2 to the loop taker 1 is restricted in the arrow A direction from the obliquely upward side of the opening 45 to the obliquely downward side thereof. In the same way, the removal direction of the bobbin case 2 is restricted in the arrow B direction from the obliquely downward side of the opening 45 to the obliquely upward side thereof.

[0060] According to the present embodiment, either the third restriction manner or the fourth restriction manner may be applied. In a case where one of the third and fourth restriction manners is selected, the third restriction manner is more desirable than the fourth restriction manner because the contact is obtained by the two surfaces parallel to each other according to the third restriction manner while the contact is obtained by the two surfaces intersecting with each other according to the forth restriction manner. However, a further secure retention of the operating position of the bobbin case 2 in the upward direction is obtained by the addition of the vertical direction sub-support portion 43. In a case where the fourth restriction manner is selected among the third and fourth restriction manners, the vertical direction sub-support portion 43 serves as the guide portion instead of the vertical direction support portion 41.

[0061] According to the aforementioned first to fourth restriction manners, the bobbin case removing and attaching mechanism 10 is obtained while the bobbin case 2 that is inserted into the bobbin case accommodating portion 13 of the loop taker 1 is removable therefrom in a state where the needle plate 5 is removed from the loop taker 1. In addition, the bobbin case 2 is insertable into the predetermined operating position at the bobbin case accommodating portion 13. Accordingly, the user easily inserts or attaches the bobbin case 2 at the predetermined operating position in the loop taker 1 and removes the bobbin case 2 from the loop taker 1. As a result, according to the bobbin case removing and attaching mechanism 10 of the embodiment, a broken thread because of a blocking of a path of the needle thread, and the like that occurs in a case where the bobbin case 2 is dislocated from the predetermined operating position, may be restrained to thereby achieve appropriate stitches.

[0062] During the sewing operation, a vibration is constantly generated so as to dislocate the bobbin case 2 from the predetermined operating position. In addition, when the sewing apparatus is carried or transferred, a force for dislocating the bobbin case 2 from the predetermined operating position may occur because of the vibration, and the like. In a case where the aforementioned vibration or the force is generated, the movement of the bobbin case 2 in the vertical direction is restricted, within the size of the clearance through which the needle thread passes, because of the bottom surface 6b of the bobbin case stopper piece 6, the vertical direction support portion 41 and the vertical direction sub-support portion 43 of the support portion 40 of the bracket 4, and the race surface 11 of the loop taker 1. Thus, the bobbin case 2 is restrained to move so as to be positioned on the upper surface 12 from the race surface 11 with which the bobbin case 2 is seated on, and the protruding portion 21 is restrained from forcibly engaging with an upper portion of the thread release portion 44.

[0063] Further, because of the restriction of the upward movement by the bobbin case stopper piece 6 and the aforementioned first to fourth restriction manners, the bobbin case 2 that is inserted into the loop taker 1 is retained at the predetermined operating position while the clearances through which the needle thread passes are secured. Consequently, according to the bobbin case removing and attaching mechanism 10 of the embodiment, a sewing malfunction such as the broken thread that may be caused by the reduced clearance is restrained, thereby forming the appropriate stitches.

[0064] The insertion and attachment of the bobbin case 2 relative to the loop taker 1 is obtained by removing the needle plate 5 from the bracket 4 in a state where the bracket 4 is fixed to the carrier plate 3. Thus, the removal and attachment of the bobbin case 2 is easily performed, which may lead to an increase of operability.

[0065] Furthermore, the vertical direction support portion 41 and the rotation direction support portion 42 are formed by a downward bending of a portion of the support portion 40 at the opening edge of the bracket 4. The thread release portion 44 is formed by a block member that is fixed to the rear surface 4b of the bracket 4. The plane surface portion 25, the reverse rotation stopper surface 24, and the protruding portion 21 are formed at the bobbin case 2 in such a manner to be contactable with the vertical direction support portion 41, the rotation direction support portion 42, and the thread release portion 44 respectively. In addition, the upper-right surface portion 37 is formed at the bobbin case 2 so as to make contact with the bobbin case stopper piece 6 that is fixed to the needle plate 5. Accordingly, the configuration of the bobbin case removing and attaching mechanism 10 is simplified to thereby achieve a cost reduction.

Claims

1. A bobbin case removing and attaching mechanism (10), comprising:

   a loop taker (1) arranged within a work supporting bed for a sewing apparatus and rotatable about an axis (Z) of the loop taker (1);
   a bobbin case (2) inserted into an upwardly opening bobbin case accommodating portion (13) formed in the loop taker (1);
   a bracket (4) mounted on a fixing member (3) on the work supporting bed, the said bracket (4) including an opening (45) through which the bobbin case (2) passes when the bobbin case (2) is inserted into or removed from the bobbin case accommodating portion (13); and
   a needle plate (5) attached to an upper portion of the bracket (4) and closing at least a portion of the opening (45) of the bracket (4), the needle plate (5) including a bobbin case stopper piece (6) which restricts an upward movement of the bobbin case (2) when the bobbin case is inserted into the bobbin case accommodating portion (13) and arranged at an operating position thereof, wherein
   when the needle plate (5) is attached to the bracket (4) with the bobbin case (2) in the bobbin case accommodating portion (13), the bobbin case (2) is retained at the operating position with movement of the bobbin case (2) being restricted by the bracket (4) and the bobbin case stopper piece (6), and
   when the needle plate (5) is removed from the bracket (4) and the bracket (4) remains fixed to the fixing member (3), the bobbin case (2) may be removed from or attached to the bobbin case accommodating portion (13).

2. A bobbin case removing and attaching mechanism (10) according to claim 1, wherein the bracket (4) includes a rotation restricting portion (42, 44) restricting an insertion direction of the bobbin case (2) and restricting a rotation of the bobbin case (2), and a guide portion (41) making contact with a portion of an upper side surface of the bobbin case (2) when the bobbin case (2) is inserted into the bobbin case accommodating portion (13) and restricting an upward movement of the bobbin case (2), and wherein clearances through each of which a needle thread passes are formed between the rotation restricting portion (42, 44) and the bobbin case (2) and between the guide portion (41) and the bobbin case (2) respectively.

3. A bobbin case removing and attaching mechanism (10) according to claim 2, wherein the guide portion (41) is formed by a downward bending of a portion at an edge of the opening (45) of the bracket (4).

4. A bobbin case removing and attaching mechanism (10) according to claim 1, wherein the bobbin case stopper piece (6) includes elasticity to press the bobbin case (2).

5. A bobbin case removing and attaching mechanism (10) according to claim 4, wherein the bobbin case stopper piece (6) is formed separately from the needle plate (5) and is removably fixed to a lower surface (5b) of the needle plate (5).

6. A bobbin case removing and attaching mechanism (10) according to claim 5, wherein the bobbin case stopper piece (6) is an elongated member made of metal and fixed to the lower surface (5b) of the needle plate (5) in a cantilever manner.

7. A bobbin case removing and attaching mechanism (10) according to claim 4, wherein the bobbin case stopper piece (6) is formed separately from the needle plate (5), the bobbin case stopper piece (6) including a base portion fixed to the lower surface (5b) of the needle plate (5) and a free end portion being apart from the lower surface (5b) of the needle plate (5) by a predetermined distance.

8. A bobbin case removing and attaching mechanism (10) according to claim 7, wherein the bobbin case stopper piece (6) is made of metal.

FIG. 1

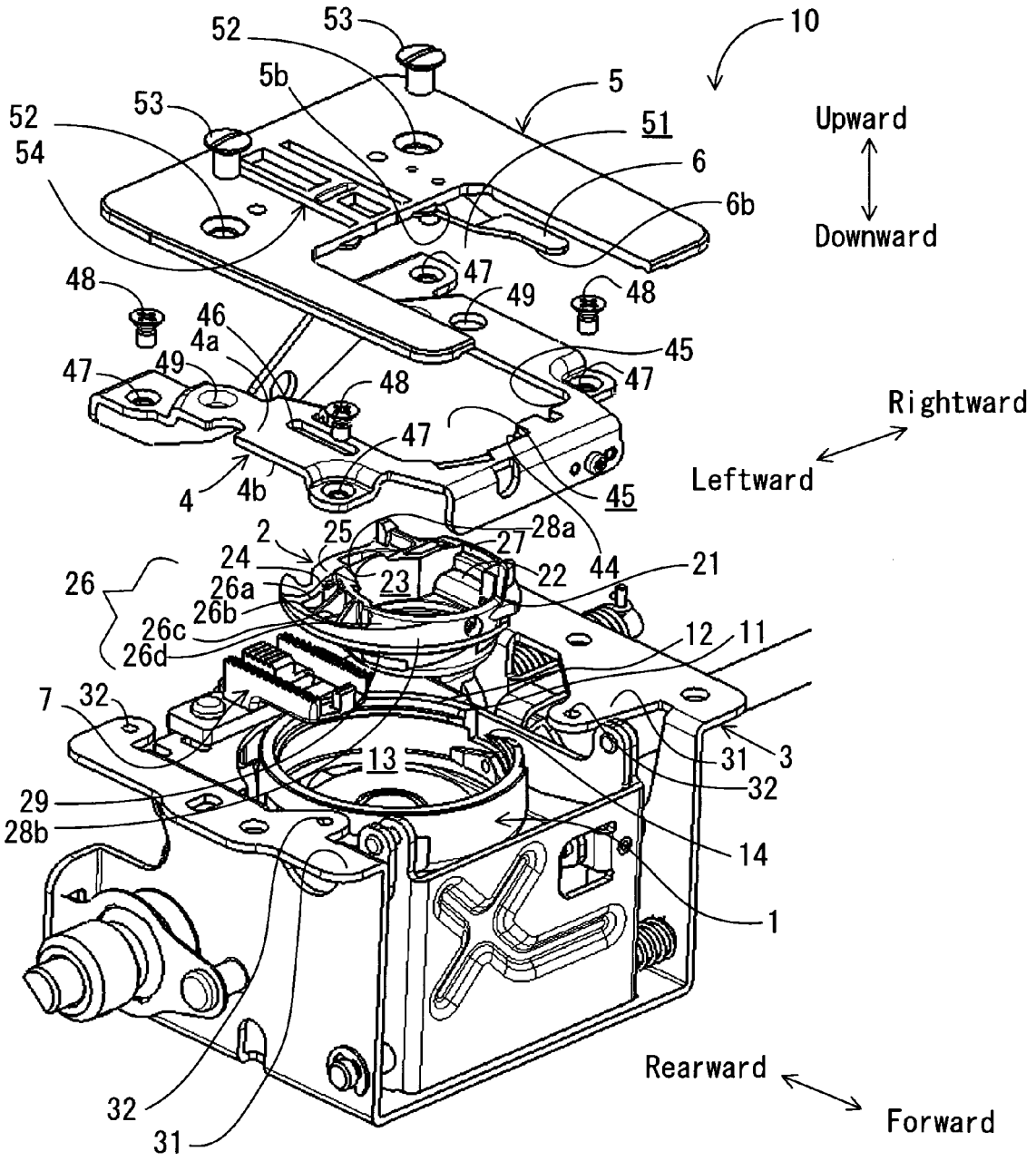

10
52
53
5b
5
51
6
6b
54
Upward
Downward
48
46
4a
49
47
45
Rightward
Leftward
4
4b
2
25
27
28a
24
23
22
44
21
26
26a
26b
26c
26d
12
11
7
32
13
31
3
29
28b
14
1
Rearward
Forward

FIG. 2

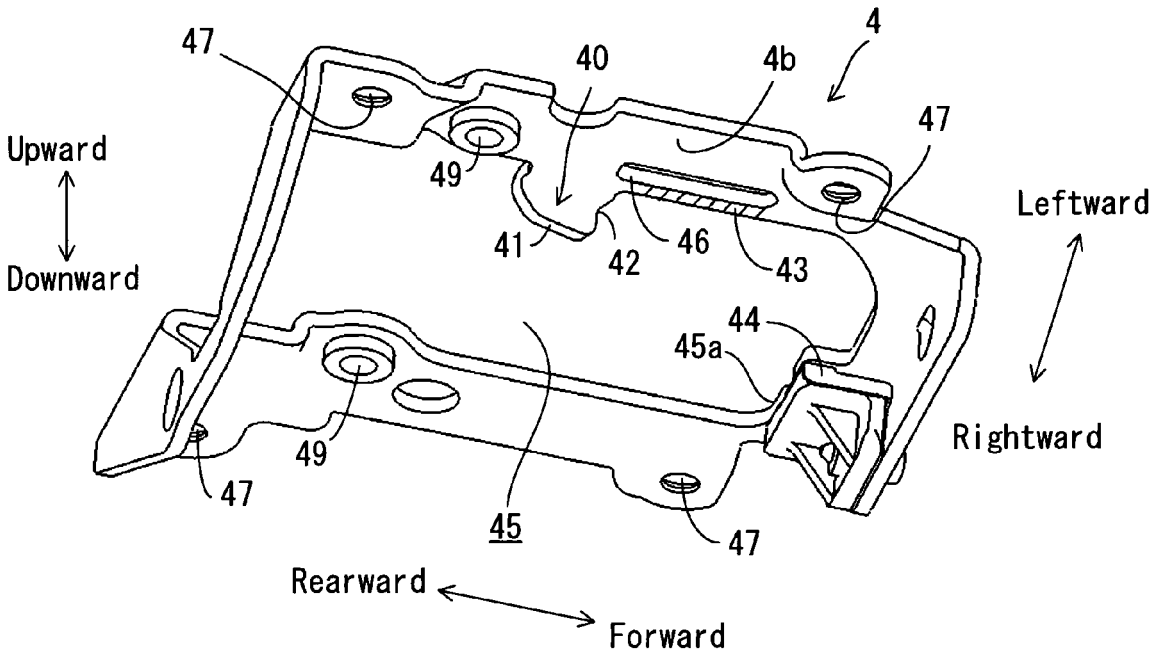

47
40
4b
4
47
Upward
Downward
49
41
42
46
43
Leftward
44
45a
Rightward
49
47
45
47
Rearward
Forward

FIG. 3

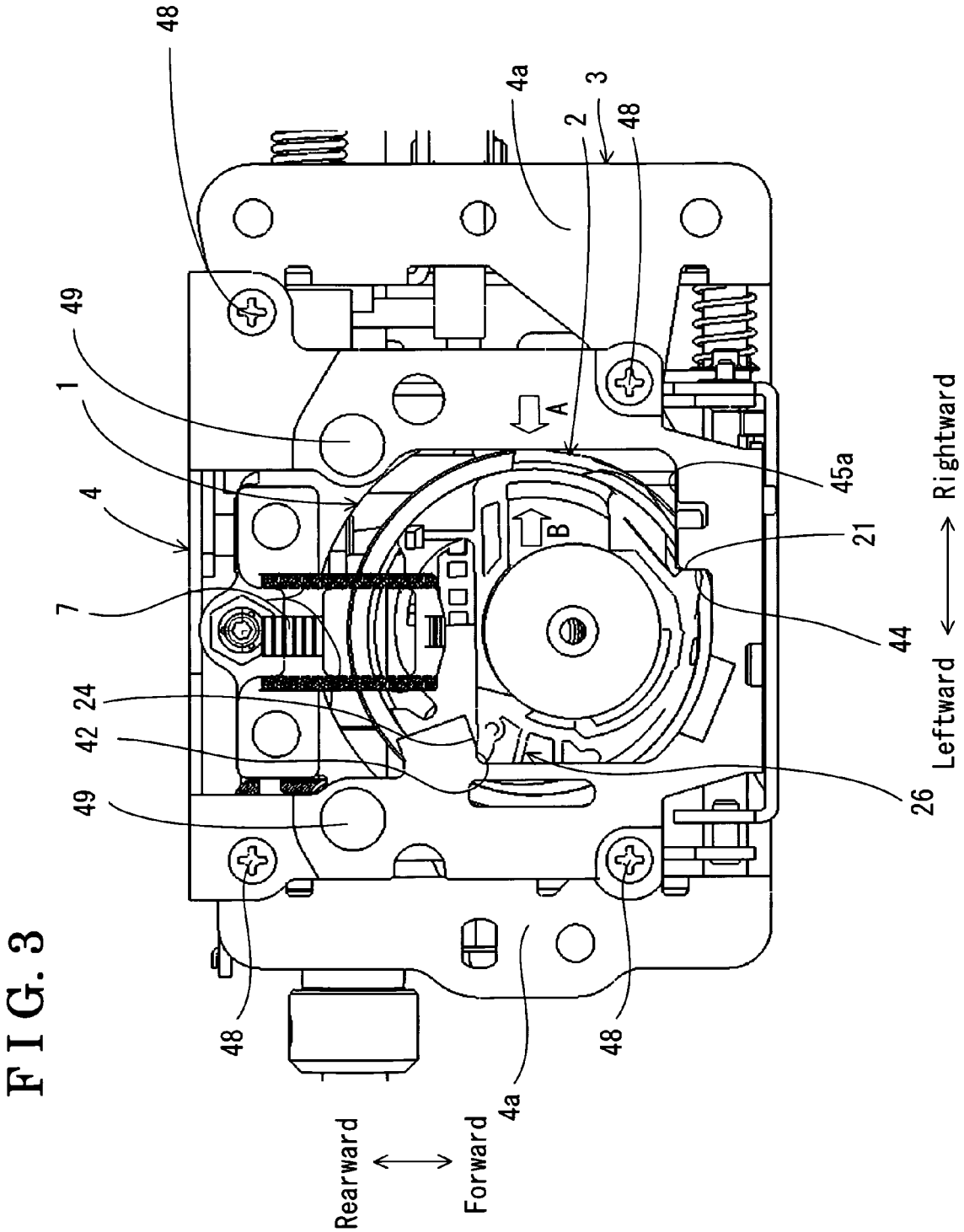

48
4a
3
2
48
49
1
A
4
45a
B
21
7
44
24
42
26
49
Leftward
Rightward
48
48
4a
Rearward
Forward

FIG. 4

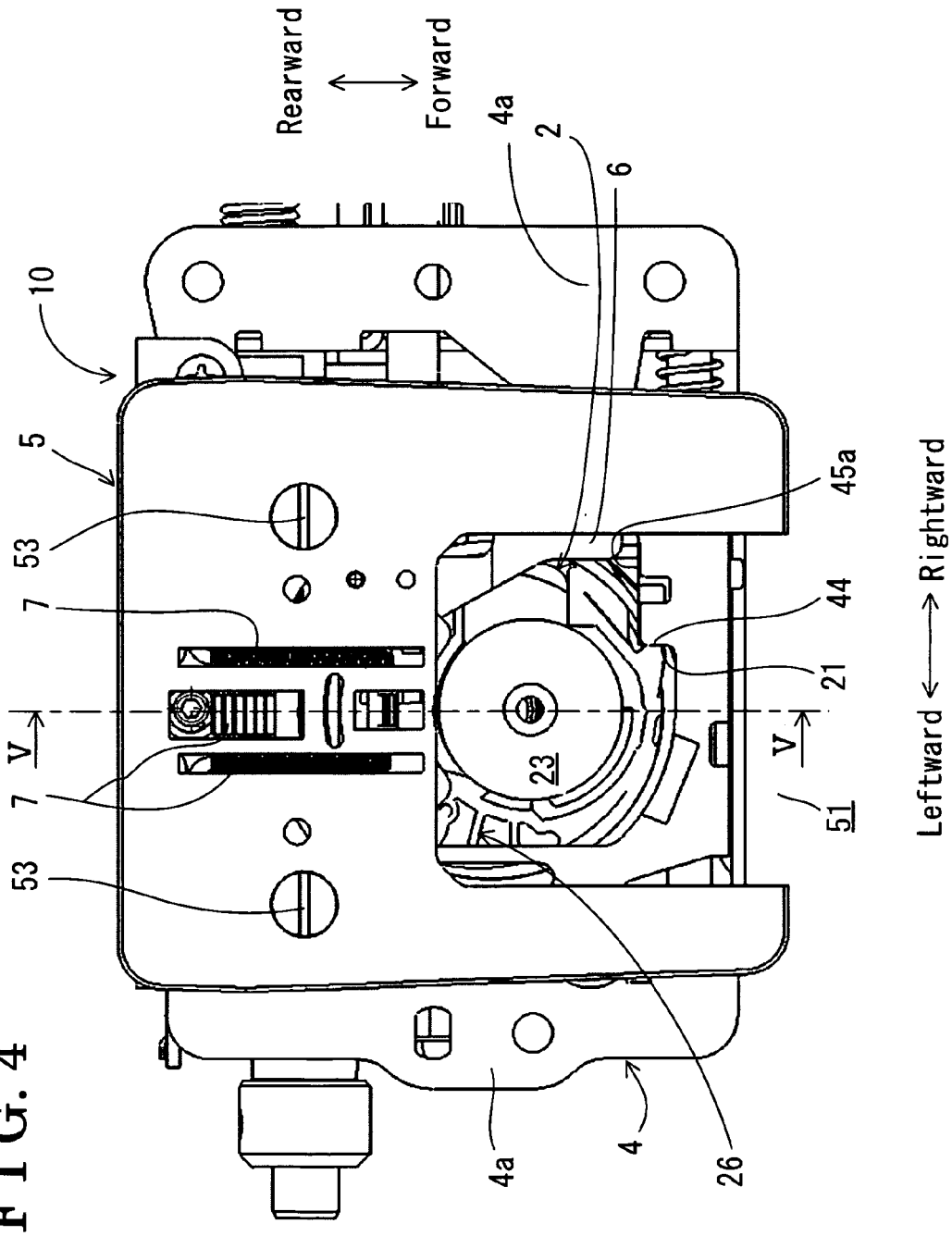

Rearward
Forward
4a
2
6
10
5
53
7
V
7
53
45a
44
21
23
V
51
Leftward
Rightward
4a
4
26

FIG. 5

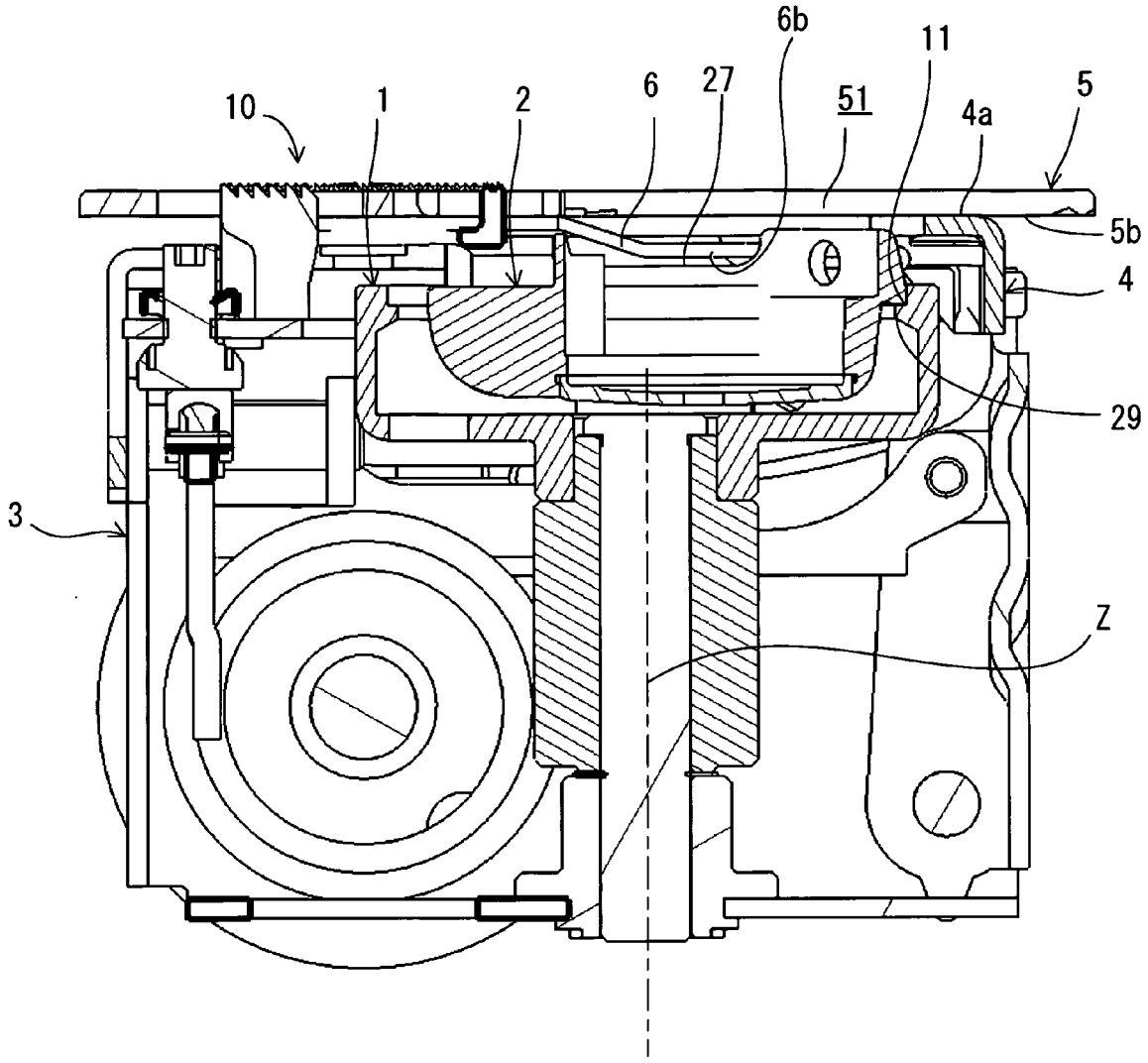
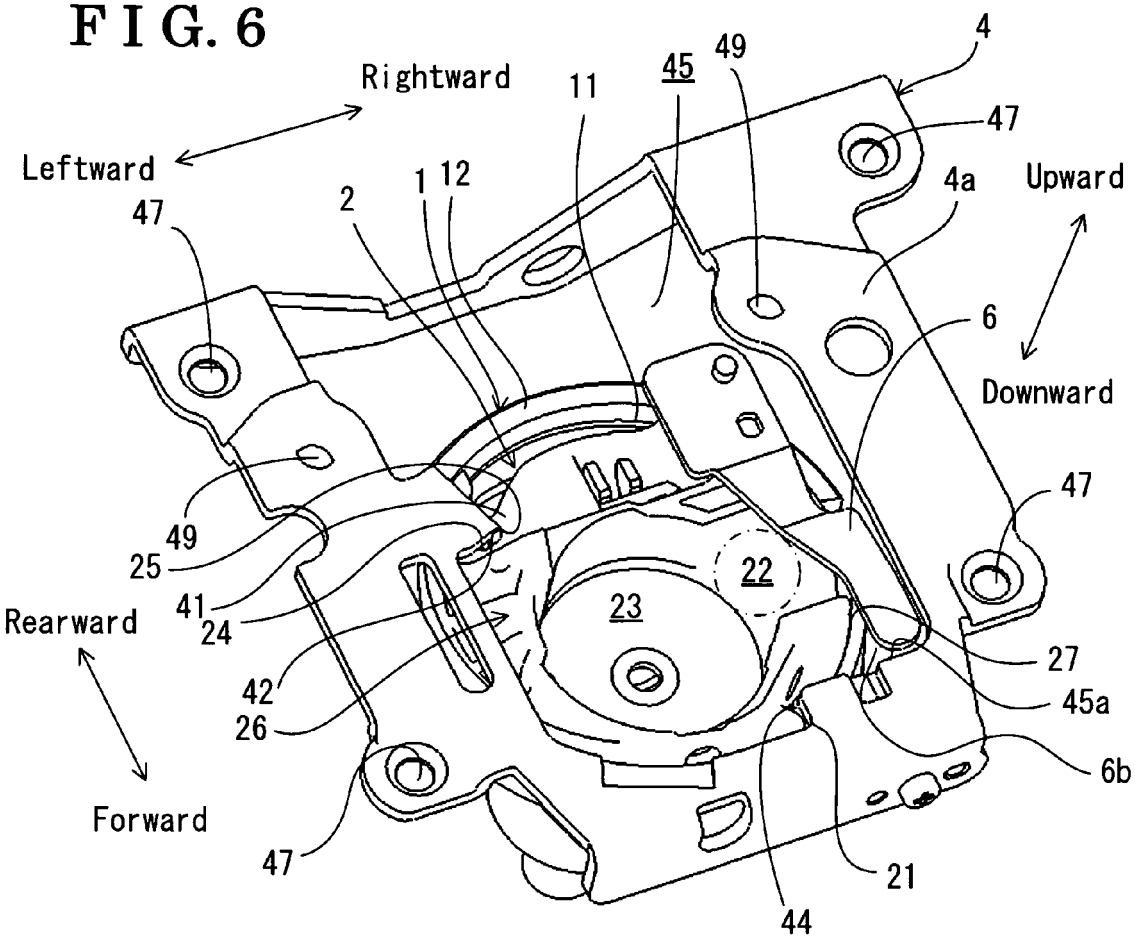


FIG. 6


Rightward
Leftward
Upward
Downward
Rearward
Forward
4
47
45
49
11
2
1
12
4a
6
47
49
25
41
24
42
26
47
22
23
27
45a
6b
21
44

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 00 1023

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 693 565 A (KETTERER STANLEY J) 26 September 1972 (1972-09-26) * column 2, line 37 - column 7, line 34; figures 1-6 * -----	1-8	INV. D05B59/00
A	US 3 587 494 A (IVANKO MICHAEL F) 28 June 1971 (1971-06-28) * column 1, line 67 - column 4, line 3; figures 1-4 * -----	1-8	
A	US 3 416 472 A (JOHNSON RALPH E) 17 December 1968 (1968-12-17) * column 2, line 51 - column 6, line 13; figures 1-3 * -----	1-8	
A	US 4 380 961 A (REINERT GERHARD ET AL) 26 April 1983 (1983-04-26) * column 2, line 47 - column 6, line 5; figures 1-11 * -----	1-8	
A	US 4 355 590 A (KETTERER STANLEY J) 26 October 1982 (1982-10-26) * column 4, line 18 - column 9, line 6; figures 1-4 * -----	1-8	TECHNICAL FIELDS SEARCHED (IPC) D05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 May 2011	Herry-Martin, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
.....
& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 00 1023

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-05-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3693565 A	26-09-1972	CH 551522 A	15-07-1974
		DE 2218859 A1	09-11-1972
		FR 2133842 A1	01-12-1972
		GB 1384123 A	19-02-1975
		IT 950995 B	20-06-1973
		JP 55036355 B	19-09-1980
		SE 375344 B	14-04-1975
US 3587494 A	28-06-1971	CH 533710 A	15-02-1973
		DE 2108986 A1	23-09-1971
		FR 2083923 A5	17-12-1971
		GB 1296188 A	15-11-1972
US 3416472 A	17-12-1968	NONE	
US 4380961 A	26-04-1983	JP 57156792 A	28-09-1982
US 4355590 A	26-10-1982	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82