



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
31.10.2012 Bulletin 2012/44

(51) Int Cl.:
D05B 29/12 (2006.01) D05C 7/02 (2006.01)

(21) Application number: **12165469.3**

(22) Date of filing: **25.04.2012**

(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

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(30) Priority: **27.04.2011 JP 2011099544**

(54) **Sewing machine embroidery presser and sewing machine**

(57) Disclosed is a sewing machine embroidery presser attached to a presser bar, in a sewing machine including a needle bar that has a needle holder for holding a needle and is vertically movable in the height direction, a presser bar vertically movable in the height direction, and a presser lifting lever for vertically moving the presser bar, the sewing machine embroidery presser including: a presser holder attached to a lower portion of the presser bar using a fixture; an operational arm that is attached to the presser holder and moved vertically by the needle bar or the needle holder to vertically move in the height direction; a presser foot that is vertically movably held by the presser holder to move in synchronization with the operational arm, faces a needle plate of the sewing machine, and presses a target workpiece; a presser spring that is provided in the presser holder and has a biasing force for biasing the presser foot toward the needle plate; and a subsidiary lever pivotably provided in the presser holder, the subsidiary lever including a cam surface having a cam profile for vertically moving the operational arm in response to pivoting, a fixing trench that engages with the operational arm to move the presser foot to the presser holder side and temporarily set the presser foot in a first height position raised from the needle plate, and an operating portion operated by the user's finger.

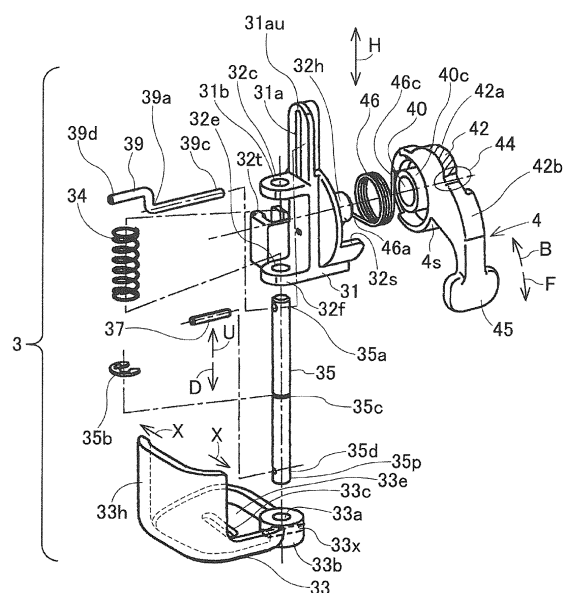


FIG. 3

Description

TECHNICAL FIELD

[0001] This disclosure relates to an embroidery presser attached to a vertically-movable presser bar in a sewing machine and a sewing machine.

BACKGROUND DISCUSSION

[0002] JP2005-58360A (hereinafter referred to as Reference 1) discloses a cloth pressing mechanism of an embroidery sewing machine. This cloth presser includes a presser bar, a support member fixed to the presser bar, a presser foot member having a guide target shaft vertically movably supported by the support member and a presser foot, a vertical driving lever swingably supported by the support member through a pivot pin, and a compression coil spring fitted to an outer edge side of the guide target shaft to bias the vertical driving lever downward. The vertical movement of the needle holder during embroidery is controlled by the vertical driving lever.

[0003] JP2006-263170A (hereinafter referred to as Reference 2) discloses an embroidery presser of an embroidery sewing machine. The presser bar is lifted by manually operating the presser lifting lever to vertically move the presser bar. In addition, there is also provided a presser lifting mechanism that lifts a presser foot member having a cloth pressing portion relatively with respect to a holder member by causing an abutting portion of the pivot lever for vertically moving the presser to abut on a frame of the sewing machine. In this technique, it is possible to enlarge an upward stroke of the cloth pressing portion when the presser bar is lifted by operating the presser lifting lever.

[0004] JP2006-263272A (hereinafter referred to as Reference 3) discloses a safety cover provided to envelope a needle of a sewing machine. In this technique, the safety cover is attached to a bed portion of the sewing machine so as to prevent the user's finger from contacting the needle.

[0005] In the techniques disclosed in the aforementioned literatures of the related art, since the presser foot is significantly projected toward the needle plate side, and a height of the embroidery presser is large, work is not easy when an embroidery presser is attached to or removed from the presser bar of the sewing machine.

[0006] In Reference 1, to allow the user to pass through the embroidery frame, operations such as operation of the presser lifting lever and operation of the embroidery presser lever are necessary. This degrades efficiency. In Reference 2, when the presser bar is positioned in a first level, a lever for lifting the presser foot of the embroidery presser touches the frame of the sewing machine. Therefore, attachment is to be made while the user presses the lever with a hand. This degrades efficiency. In addition, when the presser bar is positioned in a zeroth level, the presser foot of the embroidery presser contacts

the needle plate. Therefore, the user is required to press the presser foot of the embroidery presser with a hand in order to prevent the presser foot from contacting the needle plate. This degrades efficiency.

[0007] Thus, a need exists for a sewing machine embroidery presser and a sewing machine capable of facilitating work for attaching or removing the embroidery presser to or from the presser bar.

10 SUMMARY

[0008] According to an aspect of this disclosure, there is provided a sewing machine embroidery presser attached to a presser bar, in a sewing machine including a needle bar that has a needle holder for holding a needle and is vertically movable in a height direction, a presser bar vertically movable in the height direction, and a presser lifting lever for vertically moving the presser bar, the sewing machine embroidery presser including: a presser holder attached to a lower portion of the presser bar using a fixture; an operational arm that is attached to the presser holder and moved vertically by the needle bar or the needle holder to vertically move in the height direction; a presser foot that is vertically movably held by the presser holder to move in synchronization with the operational arm, faces a needle plate of the sewing machine, and presses a target workpiece; a presser spring that is provided in the presser holder and has a biasing force for biasing the presser foot toward the needle plate; and a subsidiary lever pivotably provided in the presser holder, the subsidiary lever including a cam surface having a cam profile for vertically moving the operational arm in response to pivoting, a fixing trench that engages with the operational arm to move the presser foot to the presser holder side and temporarily set the presser foot in a first height position raised from the needle plate, and an operating portion operated by the user's finger.

[0009] If the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set when the embroidery presser is attached to the presser bar, the presser foot is moved toward the presser holder side, and a height dimension of the entire embroidery presser is reduced. That is, the presser foot is temporarily set while it is moved toward the presser holder side so as not to be significantly projected toward the needle plate side. As a result, it is possible to improve the efficiency of attachment when the embroidery presser is attached to the presser bar. In addition, if the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set, the pivoting position of the subsidiary lever is held in the presser holder to prevent free pivoting, and free pivoting of the subsidiary lever is prevented when the embroidery presser is attached to the presser bar. Therefore, it is possible to further facilitate an attachment work for attaching the embroidery presser in the presser bar.

[0010] In addition, if the embroidery presser having a

reduced height dimension is attached to the presser bar, a wide gap is automatically formed between the embroidery presser and the needle plate. Therefore, the user is not required to cumbersomely manually lift the embroidery presser, and an embroidery frame can be easily set by passing the embroidery frame through the gap.

[0011] When the embroidery presser attached to the presser bar is removed, the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set. Therefore, the presser foot is moved to the presser holder side, and the height dimension of the entire embroidery presser is reduced. That is, the presser foot is moved to the presser holder side so as not to be significantly projected toward the needle plate side. For this reason, it is possible to improve efficiency when the presser bar is removed from the embroidery presser. Furthermore, if the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set, the pivoting position of the subsidiary lever is held in the presser holder without free pivoting so that it is possible to further improve efficiency when the embroidery presser is removed from the presser bar.

[0012] In the sewing machine embroidery presser described above, the operational arm of the embroidery presser may be mounted on the needle holder and be vertically movable in the height direction in synchronization with a vertical movement of the needle bar along with the needle holder when the needle bar is moved vertically along with the needle holder, and the presser foot may be vertically movable in the height direction in synchronization with the operational arm. In this case, as the needle bar is vertically moved, the needle holder is vertically moved, and furthermore, the embroidery presser is vertically moved. It is possible to obtain movability of the target workpiece such as a cloth on the needle plate by virtue of the vertical movement of the embroidery presser.

[0013] In the sewing machine embroidery presser described above, the operational arm may be located a predetermined distance ΔH below the top dead point of the needle holder that moves vertically, and the lifting distance of the operational arm may be set smaller than the lifting distance from the bottom dead point to the top dead point of the needle holder. Even when the needle holder is moved vertically in the height direction (arrow direction H) along with the needle bar during embroidery, the lifting distance of the embroidery presser lifted by the needle holder is set smaller than the vertical movement distance of the needle holder. For this reason, it is possible to prevent the vertical movement of the embroidery presser from hindering the user's view during sewing such as embroidery.

[0014] The sewing machine embroidery presser described above may further include a first spring for biasing the subsidiary lever to an embroiderable position by pivoting the presser foot downward toward the needle plate of a sewing machine bed. If the temporary setting be-

tween the operational arm and the fixing trench is released, the subsidiary lever is automatically set in the embroiderable position by the first spring. Therefore, it is possible to provide excellent operation.

[0015] In the sewing machine embroidery presser described above, the presser foot of the embroidery presser may be vertically movable by pivoting operation of the subsidiary lever to an embroidery height position where embroidery is performed, a first height position higher than the embroidery height position, where the presser foot is raised from the needle plate, and a second height position higher than the first height position, where the presser foot is raised from the needle plate, and a cam profile of the cam surface of the subsidiary lever may be formed to sequentially lift the presser foot to the embroidery height position, the first height position, and the second height position in response to rotation operation of the subsidiary lever by the user, and lower the operational arm toward the needle plate as the rotation operation of the subsidiary lever by the user is released. In this example, as the subsidiary lever is pivotably operated, the cam profile of the cam surface of the subsidiary lever can sequentially lift the presser foot to the embroidery height position, the first height position, and the second height position. In addition, as the rotation operation of the subsidiary lever by the user is released, the operational arm is lowered toward the needle plate.

[0016] In the sewing machine embroidery presser described above, the presser foot may have a transparent cover wall erected to face the user who operates the sewing machine. Since the embroidery presser has a transparent cover wall, it is possible to prevent the user's finger from erroneously contacting the needle when needlework such as embroidery is performed. It is possible to improve user protection. In addition, even when the needle breaks during embroidery, it is possible to improve a barrier effect for the broken and scattered needle fragments and prevent the broken needle from being scattered toward the user by means of the cover wall. In this sense, it is possible to improve user protection. As in Reference 3, the cover wall may be attached to the sewing machine bed side. However, in this case, both work for attaching the embroidery presser and work for attaching the cover wall are necessary. However, in this example, the transparent cover wall is integrated with the embroidery presser as a single body. Therefore, if the embroidery presser is attached to the presser bar, the transparent cover wall for protecting the user can be automatically attached. Therefore, it is possible to obtain excellent efficiency.

[0017] According to another aspect of this disclosure, there is provided a sewing machine including a needle bar that has a needle holder for holding a needle and is vertically movable in the height direction, a presser bar vertically movable in the height direction, and a presser lifting lever for vertically moving the presser bar, and a sewing machine embroidery presser attached to a presser bar, the sewing machine embroidery presser including:

a presser holder attached to a lower portion of the presser bar using a fixture; an operational arm that is attached to the presser holder and moved vertically by the needle bar or the needle holder to vertically move in the height direction; a presser foot that is vertically movably held by the presser holder to move in synchronization with the operational arm, faces a needle plate of the sewing machine, and presses a target workpiece; a presser spring that is provided in the presser holder and has a biasing force for biasing the presser foot toward the needle plate; and a subsidiary lever pivotably provided in the presser holder, the subsidiary lever including a fixing trench that temporarily sets the presser foot in a first height position raised from the needle plate by engaging the operational arm with a cam surface having a cam profile for vertically moving the operational arm in response to pivoting and moving the presser foot to the presser holder side and an operating portion operated by the user's finger.

[0018] If the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set when the embroidery presser is attached to the presser bar, the presser foot is moved toward the presser holder side, and a height dimension of the entire embroidery presser is reduced. That is, the presser foot is temporarily set while it is moved toward the presser holder side so as not to be significantly projected toward the needle plate side. As a result, it is possible to improve the efficiency of attachment when the embroidery presser is attached to the presser bar. In addition, if the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set, the pivoting position of the subsidiary lever is held in the presser holder to prevent free pivoting, and free pivoting of the subsidiary lever is prevented when the embroidery presser is attached to the presser bar. Therefore, it is possible to further facilitate an attachment work for attaching the embroidery presser in the presser bar.

[0019] In addition, if the embroidery presser having a reduced height dimension is attached to the presser bar, a wide gap is automatically formed between the embroidery presser and the needle plate. Therefore, the user is not required to cumbersomely manually lift the embroidery presser, and an embroidery frame can be easily set by passing the embroidery frame through the gap.

[0020] When the embroidery presser attached to the presser bar is removed, the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set. Therefore, the presser foot is moved to the presser holder side, and the height dimension of the entire embroidery presser is reduced. That is, the presser foot is moved to the presser holder side so as not to be significantly projected toward the needle plate side. For this reason, it is possible to improve efficiency when the presser bar is removed from the embroidery presser. Furthermore, if the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set, the

pivoting position of the subsidiary lever is held in the presser holder without free pivoting so that it is possible to further improve efficiency when the embroidery presser is removed from the presser bar.

[0021] According to this disclosure, if the operational arm of the embroidery presser is engaged with the fixing trench of the subsidiary lever and is temporarily set when the embroidery presser is attached to or removed from the presser bar, the presser foot of the embroidery presser is moved to the presser holder side, and the height dimension of the entire embroidery presser is reduced. As a result, it is possible to facilitate an attachment or removal work of the embroidery presser.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] 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:

[0023] Fig. 1 is a perspective view illustrating a state that the embroidery presser is attached to the presser bar as seen from the front side of the sewing machine;

[0024] Fig. 2 is a perspective view illustrating a state that the embroidery presser is attached to the presser bar as seen from the rear side of the sewing machine;

[0025] Fig. 3 is a perspective view illustrating a state that the embroidery presser is exploded;

[0026] Fig. 4 is a perspective view illustrating a state that the embroidery presser is assembled;

[0027] Fig. 5A is a front view illustrating a state of the embroidery needlework;

[0028] Fig. 5B is a side view illustrating a state of the embroidery needlework;

[0029] Fig. 6A is a front view illustrating a state when the embroidery presser is attached or removed;

[0030] Fig. 6B is a side view illustrating a state when the embroidery presser is attached or removed;

[0031] Fig. 7A is a front view illustrating a state when the embroidery frame passes;

[0032] Fig. 7B is a side view illustrating a state when the embroidery frame passes;

[0033] Fig. 8A is a side view illustrating a state that the presser lifting lever having a state of Figs. 6A and 6B is lowered from the second level to the first level due to the user's error; and

[0034] Fig. 8B is a side view illustrating a state that the presser lifting lever having a state of Figs. 6A and 6B is lowered from the second level to the zeroth level due to the user's error.

DETAILED DESCRIPTION

[0035] A presser holder is attached to a lower portion of the presser bar using a fixture. The operational arm is attached to the presser holder and is lifted by a part of the needle bar or the needle holder to vertically move in the height direction. The presser foot is vertically movably

held in the presser holder in synchronization with the operational arm, faces the needle plate of the sewing machine, and presses the target workpiece. The presser spring is attached to the presser holder and has a biasing force for biasing the presser foot toward the needle plate. The subsidiary lever is pivotably attached to the presser holder. The subsidiary lever includes a cam surface having a cam profile for vertically moving the operational arm in response to pivoting, a fixing trench engaged with the operational arm to move the presser foot to the presser holder side and temporarily set the presser foot in the first height position raised from the needle plate, and an operating portion operated by the user's finger.

(Embodiments)

[0036] Hereinafter, embodiments of this disclosure will be described with reference to the accompanying drawings. Fig. 1 is a front view illustrating a state that the embroidery presser 3 is attached to a lower end portion 13d of the presser bar 13 of a sewing machine. Fig. 2 is a rear view illustrating the same state. The sewing machine is provided with a microcomputer. As shown in Figs. 1 and 2, the sewing machine includes: a needle bar 1 that holds a needle holder 11 for holding the needle 10 using a stopper 12 and can vertically move along the height direction (arrow direction H); a presser bar 13 that can vertically move in the height direction; a presser lifting lever 14 rotatably operated by the user's fingertip in order to move the presser bar 13 vertically in the arrow direction H; a sewing machine body 2 that holds the needle bar 1, the presser bar 13, and the presser lifting bar 14; and an embroidery presser 3 detachably attached to a lower end portion 13d of the presser bar 13 using a fixture (screw) 30. The embroidery presser 3 is to appropriately press a cloth as target workpiece for performing embroidery and embroidery formed in the cloth during the embroidery.

[0037] As shown in Fig. 1, the main spring 15 is seated on a seat portion 21a of the sewing machine frame 21 of the sewing machine body 2 and exerts a biasing force for biasing the presser bar 13 downward at all times (in the arrow direction D). Meanwhile, as shown in Fig. 1, the operational arm 39 as an element of the embroidery presser 3 is located above the needle holder 11 and is lifted when the needle holder 11 vertically moving along with the needle bar 1 is moved vertically in the arrow direction U. When the needle bar 1 moves vertically, the operational arm 39 is mounted on the needle holder 11 and is configured to vertically move in the height direction (arrow direction H) in synchronization with the needle bar 1 along with the needle holder 11. Therefore, the embroidery presser 3 having the presser foot 33 moves vertically in the height direction in synchronization with vertical movement of the operational arm 39. The vertical movement of the needle bar 1 is detected by the detector 20, and the detection signal is input to the microcomputer.

[0038] As the user operates the presser lifting lever 14, the presser bar 13 is moved vertically in synchroni-

zation with this operation in the arrow direction H. As the user operates the presser lifting lever 14, the presser bar 13 can be fixedly and temporarily set in a zeroth level which is a typical needlework position, a first level higher than the zeroth level, and a second level higher than the first level in the arrow direction H, by means of the presser lifting lever 14. An upper thread tension adjuster (not shown) is mounted in the sewing machine body 2. At the zeroth level, in order to perform a typical needlework, the upper thread is activated (tensioned). At the first level, the upper thread is inactivated (distensioned). At the second level, the upper thread is activated (tensioned). In this manner, when the presser lifting lever 14 and the presser bar 13 are at the zeroth level, the presser bar 13 is located lower than the first level so that a typical needlework can be performed. When the presser lifting lever 14 and the presser bar 13 are at the first level, the upper thread is inactivated and distensioned so that the user is allowed to arbitrarily move a cloth as a target workpiece on the needle plate 23. When the presser lifting lever 14 and the presser bar 13 are at the second level, the presser bar 13 is lifted above the first level. Therefore, the lower end portion of the presser bar 13 is lifted so that the user does not have to care about contact between the embroidery frame and the lower end portion of the presser bar 13, and the user can perform free-hand embroidery (a mode in which the user does embroidery by moving the embroidery frame with a hand) by arbitrarily moving the embroidery frame on the needle plate 23. In the sewing machine having such a function, when the embroidery is performed, the embroidery presser 3 according to the present embodiment is detachably provided in the lower end portion of the presser bar 13. According to the present embodiment, in general, when the embroidery presser 3 according to the present embodiment is attached to the lower end portion 13d of the presser bar 13 using a fixture 30, the presser lifting lever 14 is set in the second level S2, and the presser bar 13 is lifted to the second level in the arrow direction H (see Figs. 5A and 5B). The main reason of that is to set the presser lifting lever 14 to the second level S2 during embroidery and facilitate the attachment work by increasing a space between the lower end portion of the presser bar 13 and the needle plate 23.

[0039] Fig. 3 illustrates a state that the embroidery presser 3 is exploded. Fig. 4 illustrates a state that the embroidery presser 3 is assembled. The embroidery presser 3 includes: a presser holder 31 attached to the lower end portion 3d of the presser bar 13 using a fixture 30; an operational arm 39 attached to the presser holder 31 to vertically move in the height direction (arrow direction H) along with the needle bar 1 and the needle holder 11; a presser foot 33 vertically movably held in the presser holder 31 to press a target workpiece; a coil-shaped presser spring 34 attached to the presser holder 31; and a subsidiary lever 4 pivotably attached to the presser holder 31 and pivotably operated by the user's finger.

[0040] As shown in Fig. 3, the presser holder 31 in-

cludes: a long hole 31a extending in the height direction (arrow direction H); an upper guard portion 31c having an upper through-hole 31b; a lower guard portion 31f having a lower through-hole 31e, a pivot axis 32h, a stopper 32s, and a fixing portion 32t where the fixture 30 is screwably attached. As shown in Fig. 3, the subsidiary lever 4 includes: a cylindrical portion 40c which forms a pivot hole 40 serving as a rotation center of the subsidiary lever 4; a cam surface 42 having a cam profile for vertically moving the operational arm 39 in response to pivoting; a fixing trench 44 formed on the cam surface 42, and an operating portion 45 operated by the user's finger. The cam surface 42 includes cam surfaces 42a and 42b in both sides of the fixing trench 44.

[0041] The pivot hole 40 and the pivot axis 32h are rotatably fitted together such that the first spring 46 is interposed between the holder 31 and the subsidiary lever 4 to attach the subsidiary lever 4 in the holder 31. The first spring 46 is a torsion coil spring and includes an arm 46a latched to the holder 31 and an arm 46c latched to the subsidiary lever 4. The first spring 46 exerts a biasing force for biasing the operating portion 45 of the subsidiary lever 4 downward (in the arrow direction F of Fig. 4). As a result, the first spring 46 exerts a biasing force for biasing the presser foot 33 to the needle plate 23 downward (in the arrow direction D) at all times (see Figs. 5 to 8). Meanwhile, the subsidiary lever 4 biased by the first spring 46 is pivoted downward (arrow direction F) until a stopper target 4s thereof abuts on the stopper 32s.

[0042] The presser foot 33 is made of a transparent material (such as transparent resin, preferably, having high transparency). As shown in Fig. 3, the presser foot 33 includes: a shaft portion 33b having a shaft hole 33a where the lower end portion 35p of the presser shaft 35 is fitted; a bottom portion 33e having a needle hole 33c where a needle is inserted; and a transparent cover wall 33h erected above the bottom portion 33e to face the user. Since the cover wall 33h is transparent, it is possible to obtain visibility of a needle tip. Furthermore, the cover wall 33h prevents the user's finger from touching the needle and the like. Moreover, when the needle breaks, it prevents the needle from being scattered to the user. The cover wall 33h faces the user positioned in front of the sewing machine but is not formed in the lateral direction (arrow direction X in Fig. 4). Therefore, the cover wall 33h does not hinder work for threading the needle 10.

[0043] As shown in Fig. 3, the presser shaft 35 is provided to extend in the height direction and includes an upper hole 35a, a latch groove 35c where a snap ring 35b is fitted, and a lower hole 35d in order from the upper end to the lower end of the presser shaft 35. The spring pin 37 is inserted into the attachment hole 33x of the presser foot 33 and the lower hole 35d of the presser shaft 35, and as a result, the presser foot 33 is attached to the lower end portion 35p of the presser shaft 35. In addition, the presser foot 33 and the presser shaft 35 may be integrated into a single body. An upper portion

of the presser shaft 35 is fitted to the lower through-hole 32e and the upper through-hole 31b while the coil-shaped presser spring 34 is interposed between the upper guard portion 31c and the lower guard portion 31f. The presser spring 34 is formed from a coil spring and is elastically contractably compressed between the snap ring 35b and the upper guard portion 31c to exert a biasing force for biasing the presser bar 13 and the presser foot 33 downward (in the arrow direction D), that is, toward the needle plate.

[0044] As shown in Fig. 3, the operational arm 39 is bent in a crank shape by the bent portion 39a and includes a leading end portion 39c and a base end portion 39d. The operational arm 39 may not be bent necessarily. The leading end portion 39c of the operational arm 39 is inserted into the upper hole 35a of the presser shaft 35 and penetrates the long hole 31a toward the subsidiary lever 4 side. Since the leading end portion 39c is fitted to the long hole 31a, it can be moved vertically in the height direction (arrow direction H) along the long hole 31a. However, displacement in a horizontal direction is prevented, and the presser shaft 35 is not pivoted in the central axis direction.

[0045] As shown in Fig. 4, while the embroidery presser 3 is assembled and attached, the leading end portion 39c of the operational arm 39 is exposed upward from the upper guard portion 31c, along with the upper end portion 35u of the presser shaft 35. In addition, the leading end portion 39c of the operational arm 39 faces the cam surface 42 while it is located above the cam surface 42 of the subsidiary lever 4. In this case, as recognized from Fig. 4, since a biasing force of the coil-shaped presser spring 34 is applied downward (in the arrow direction D), the snap ring 35b of the presser shaft 35 contacts the upper surface of the lower guard portion 31f, and the leading end portion 39c of the operating portion 45 contacts the surface of the upper guard portion 31c. In this state, the leading end portion 39c faces the cam surface 42 of the subsidiary lever 4 (see Fig. 4).

[0046] For this reason, when the subsidiary lever 4 is pivoted in the arrow direction B and the arrow direction F with respect to the pivot hole 40, the cam surface 42 can vertically move the leading end portion 39c of the operating portion 45 in the height direction (arrow direction H) along the long hole 31a. As the leading end portion 39c of the operating portion 45 is vertically moved along the long hole 31a, the presser shaft 35 and the presser foot 33 are vertically moved in synchronization in the same direction. The leading end portion 39c of the operational arm 39 is engaged with the fixing trench 44 while it moves along the cam surface 42 so that it can be temporarily set in the fixing trench 44. As described below, the fixing trench 44 is engaged with the leading end portion 39c of the operational arm 39 so as to temporarily set the presser foot 33 in the first height position M1 thereof. In the first height position M1, the bottom portion 33e of the presser foot 33 is maintained in a raised state from the needle plate 23 by a gap dimension B5 (see Fig. 6A

and Fig. 6B).

[0047] Next, how to attach and use the embroidery presser 3 will be described with reference to Figs. 5 to 7. In any of Figs. 5 to 7, the presser lifting lever 14 is set in the second level S2, and the presser bar 13 is held in the second level position and is raised from the needle plate 23.

[0048] Figs. 5A and 5B illustrate a state that the subsidiary lever 4 is lowered by the first spring 46 and is set in the embroiderable position P1. When the subsidiary lever 4 is set in the embroiderable position P1, the bottom portion 33e of the presser foot 33 is biased downward (in the arrow direction D) by the biasing force of the presser spring 34 so as to press the needle plate 23. Therefore, a cloth (target workpiece) is interposed and fixed between the needle plate 23 and the bottom portion 33e of the presser foot 33. As shown in Figs. 5A and 5B, when the subsidiary lever 4 is set in the embroiderable position P1, a gap dimension A3 (see Fig. 5B) is generated between the cam surface 42 of the subsidiary lever 4 and the leading end portion 39c of the operational arm 39. Therefore, the leading end portion 39c is located above the cam surface 42 and does not contact the cam surface 42. In this manner, when the subsidiary lever 4 is set in the embroiderable position P1 (see Fig. 5B), a distance W1 (see Fig. 5B) is formed between the leading end portion 39c of the operational arm 39 and the upper end 31au of the long hole 31a. For this reason, since the operational arm 39 can be further lifted along the long hole 31a of the holder 31, the presser foot 33 can be further lifted relatively. As shown in Figs. 5A and 5B, if the sewing machine is activated when the subsidiary lever 4 is set in the embroiderable position P1, similar to the related art, the presser foot 33 is lifted once in one cycle of the vertical movement of the needle bar 1, and the pressing force of a cloth on the needle plate 23 is lost. Therefore, the user can freely move a cloth on the needle plate 23 while the user does embroidery on the cloth so as to perform needlework such as embroidery.

[0049] As shown in Figs. 5A and 5B, if the vertical movement distance of the presser foot 33 is large in the needlework such as embroidery when the subsidiary lever 4 is set in the embroiderable position P1, the presser foot 33 significantly and moves vertically in the arrow direction H, and this may hinder the user's view. In this regard, according to the present embodiment, as shown in Fig. 1, the needle holder 11 is vertically moved in the arrow direction H between the bottom dead point and the top dead point thereof, but the operational arm 39 is located a small distance ΔH (for example, 0.2 to 2.0 millimeters) lower than the top dead point of the needle holder 11. For this reason, even when the needle holder 11 is lifted in the height direction (arrow direction H) along with the needle bar 1 during embroidery, the vertical movement distance of the operational arm 39 lifted by the needle holder 11 is a small distance ΔH relative to the vertical movement distance of the needle holder 11. Furthermore, the lifting distance of the presser foot 33 of

the embroidery presser 3 is also insignificant, and particularly, it does not hinder the user's view. In addition, although the operational arm 39 is also lowered when the needle holder 11 is lowered to the bottom dead point, the presser foot 33 reaches the needle plate 23, so that it is not further lowered beyond ΔH .

[0050] In addition, during needlework such as embroidery, as recognized from Fig. 1, the needle bar 1 is vertically moved between the top dead point and the bottom dead point thereof in the arrow direction H. Similarly, the needle holder 11 held in the needle bar 1 to fix the needle 10 is also vertically moved between the top dead point and the bottom dead point thereof. Even when the needle holder 11 is lowered to the bottom dead point thereof, the needle holder 11 does not collide with the presser foot 33 of the embroidery presser 3 on the needle plate 23. In addition, the needle holder 11 includes a needle holding body 11a and a needle holding screw 11c (see Fig. 1).

[0051] If the user moves the subsidiary lever 4 further upward (in the arrow direction B) with a finger from the embroiderable position P1 by an angle B1 (see Fig. 6B) in the state of Figs. 5A and 5B, the subsidiary lever 4 is set in the temporarily setting position P2. In this process, the operational arm 39 is moved along the cam surface 42a of the subsidiary lever 4 and is lifted upward (in the arrow direction U), and the leading end portion 39c of the operational arm 39 is lifted along the long hole 31a. As a result, the presser foot 33 vertically moving in synchronization with the operational arm 39 is also lifted in the arrow direction U, and the leading end portion 39c of the operational arm 39 is engaged with the fixing trench 44 and is temporarily set (see Fig. 6B). That is, the subsidiary lever 4 is set in the temporary setting position P2. In this case, the bottom portion 33e of the presser foot 33 is temporarily set in the first height position M1 thereof (see Fig. 6B).

[0052] In this manner, while the subsidiary lever 4 is set in the temporary setting position P2, an engagement dimension B4 (see Fig. 6B) corresponds to the engagement amount between the leading end portion 39c of the operational arm 39 and the trench bottom surface of the fixing trench 44. In this manner, while the subsidiary lever 4 is set in the temporary setting position P2, the subsidiary lever 4 is not pivoted downward (arrow direction F), in spite of the biasing force of the presser spring 34 and the first spring 46, even when the user removes a finger from the operating portion 45 of the subsidiary lever 4. Therefore, the subsidiary lever 4 is temporarily set in the temporary setting position P2 pivoted upward by an angle B1 from the embroiderable position P1.

[0053] In this manner, in the process of lifting the operational arm 39, the presser shaft 35 and the presser foot 33 integrated with the operational arm 39 are lifted in the arrow direction U and are raised from the needle plate 23, against the biasing force directed to the arrow direction D of the presser spring 34. As a result, the bottom portion 33e of the presser foot 33 is set in the first

height position M1 (see Figs. 6A and 6B), and a gap dimension B5 is formed between the bottom portion 33e of the presser foot 33 and the needle plate 23 (see Fig. 6A and Fig. 6B). In this manner, when the subsidiary lever 4 is set in the temporary setting position P2, the gap dimension B5 is formed. For this reason, the user can cause the embroidery frame which tightens the embroidery cloth to pass through a space under the bottom portion 33e of the presser foot 33 on the needle plate 23 without lifting the subsidiary lever 4 or the presser foot 33 with a finger. Therefore, it is possible to set the embroidery frame on a sewing machine bed in a simple manner.

[0054] In other words, as shown in Figs. 6A and 6B, while the subsidiary lever 4 is set in the temporary setting position P2, the leading end portion 39c of the operational arm 39 is engaged with the fixing trench 44 and is temporarily set, and the subsidiary lever 4 is not pivoted downward (arrow direction F) even when the user removes a finger from the operating portion 45 of the subsidiary lever 4 of the embroidery presser 3. In addition, a gap dimension B5 is formed between the bottom portion 33e of the presser foot 33 and the needle plate 23. As a result, it is possible to facilitate work for attaching or removing the embroidery presser 3 to or from the lower end portion 13d of the presser bar 13. It is preferable to perform the attachment/removal work of the embroidery presser 3 while the subsidiary lever 4 is temporarily set as shown in Figs. 6A and 6B because it provides best efficiency.

[0055] In addition, sometimes, an embroidery frame having a height dimension equal to or greater than the gap dimension B5 may be used. In this case, if the user further upward (in the arrow direction B) pivots the operating portion 45 of the subsidiary lever 4 with a finger in the state of Figs. 6A and 6B, that is, if the subsidiary lever 4 is further lifted from the embroiderable position P1 thereof by an angle C1, the operational arm 39 is further lifted along the cam surface 42b of the subsidiary lever 4. In this case, the presser foot 33 and the presser shaft 35 integrated with the operational arm 39 are also lifted in synchronization in the arrow direction U. As a result, as shown in Figs. 7A and 7B, the presser foot 33 is further raised from the needle plate 23 and is set in the second height position M2. In this case, a wider gap dimension C2 ($C2 > B5$) is formed between the bottom portion 33e of the presser foot 33 and the needle plate 23. In this manner, since a wide gap dimension C2 is formed, even a thick embroidery frame can pass through a space under the bottom portion 33e of the presser foot 33 on the needle plate 23. Therefore, it is possible to also facilitate setting of a thick embroidery frame.

[0056] However, while the presser foot 33 is set in the second height position M2 as shown in Figs. 7A and 7B, the operational arm 39 and the fixing trench 44 are not engaged. As a result, as the user removes a finger from the operating portion 45 of the subsidiary lever 4 of the embroidery presser 3, the subsidiary lever 4 is automati-

cally pivoted downward (arrow direction F) by virtue of the biasing force of the first spring 46, and the subsidiary lever 4 is set in a temporary setting position P2 (see Fig. 6B) so that the presser foot 33 is projected downward by virtue of the biasing force of the presser spring 34.

[0057] In this manner, the reason the subsidiary lever 4 is returned downward to the temporary setting position P2 is as follows. That is, this is to prevent contact between the embroidery presser 3 and the needle holder 11 held in the needle bar 1 and prevent damage even when the needle bar 1 is lowered and reaches the bottom dead point. Therefore, the gap dimension B5 is previously set to a size capable of preventing contact between the needle holder 11 and the embroidery presser 3 even when the needle bar 1 is lowered and reaches the bottom dead point. In this manner, since the operational arm 39 and the fixing trench 44 are not engaged in the state of Figs. 7A and 7B, the subsidiary lever 4 is pivoted downward (arrow direction F) by virtue of the biasing force of the first spring 46 and is returned to the state of Figs. 6A and 6B as the user removes a finger from the presser foot 33 or the operating portion 45 of the subsidiary lever 4 of the embroidery presser 3. For this reason, even when the user erroneously lowers the needle bar 1 by activating the sewing machine, the needle holder 11 attached to the needle bar 1 and the bottom portion 33e of the presser foot 33 do not contact each other, and it is possible to prevent damage of the needle holder 11 or the presser foot 33 caused by contact.

[0058] According to the present embodiment, when the user prepares embroidery such as free-hand embroidery, the embroidery presser 3 is attached to the lower end portion 13d of the presser bar 13 using a fixture 30 (see Fig. 1) while the presser bar 13 is set in the second level by holding the presser lifting lever 14 in the second level S2 as described above. As a result, the state of Figs. 6A, 6B, 7A, or 7B is obtained. In the state of Figs. 6A and 6B, since the gap dimension B5 is formed between the needle plate 23 and the bottom portion 33e of the presser foot 33, the embroidery frame can pass through a space between the presser foot 33 and the needle plate 23 and can be set. As the subsidiary lever 4 is lowered from the temporary setting position P2 in the arrow direction F by an angle B1 after the passage, the subsidiary lever 4 is set in the embroiderable position P1 (see Figs. 5A and 5B), and embroidery can be performed.

[0059] In addition, in the state of Figs. 7A and 7B, since a wider gap dimension C2 ($C2 > B5$) is formed between the bottom portion 33e of the presser foot 33 and the needle plate 23, a thick embroidery frame can pass through a space between the presser foot 33 and the needle plate 23 and can be set. Therefore, as the user lowers the subsidiary lever 4 in the arrow direction F after the passage, the subsidiary lever 4 can be set in the embroiderable position P1 (see Figs. 5A and 5B), and embroidery can be performed.

[0060] Meanwhile, in the user's actual operation, it is preferable to prepare a counter measure in advance by

anticipating the user's error. In actual operation, it is anticipated that the user does not lower the subsidiary lever 4 for lowering the embroidery presser 3, but may carelessly operate the lifting lever 14 to be lowered. This case is shown in Figs. 8A and 8B. Fig. 8A illustrates a state that the user pivotes the presser lifting lever 14 from the second level S2 by an angle D1 and erroneously lowers the presser lifting lever 14 to the first level S1. In this state, although the presser bar 13 is also slightly lowered as the presser lifting lever 14 is operated, the presser foot 33 of the embroidery presser 3 is also lowered accordingly. However, as shown in Fig. 8A, the bottom portion 33e of the presser foot 33 does not abut on the needle plate 23, and a gap dimension D5 ($D5 < B5$) is formed between the presser foot 33 and the needle plate 23. For this reason, a force that separates the leading end portion 39c of the operational arm 39 from the fixing trench 44 is not generated. Therefore, the operational arm 39 is still engaged with the fixing trench 44 (see Fig. 8A).

[0061] In comparison, Fig. 8B illustrates a state that the user erroneously lowers the presser lifting lever 14 to the zeroth level S0 by pivoting the presser lifting lever 14 from the second level S2 by an angle E1. In this state, although the presser bar 13 is considerably lowered in synchronization with the downward operation of the presser lifting lever 14, the bottom portion 33e of the presser foot 33 contacts the needle plate 23 accordingly. Therefore, presser bar 13 is lifted relatively in the arrow direction U against the biasing force of the presser spring 34. Furthermore, the presser foot 33, the presser shaft 35, and the operational arm 39 are lifted relatively in the arrow direction U with respect to the presser holder 31. Consequently, the leading end portion 39c of the operational arm 39 is separated from the fixing trench 44 and approaches the upper end 31au of the long hole 31a (see Fig. 8B). Since the lifting distance in this case is greater than the engagement dimension B4 of the operational arm 39 shown in Fig. 6A and Fig. 6B, the leading end portion 39c of the operational arm 39 is separated from the fixing trench 44 of the cam surface 42 as described above. In this manner, as the operational arm 39 is separated from the fixing trench 44, the subsidiary lever 4 is automatically pivoted downward (arrow direction F) by virtue of the biasing force of the first spring 46 and the presser spring 34 so that the subsidiary lever 4 is automatically switched to the embroiderable position P1 (see Fig. 8B), and the presser foot 33 is projected downward. As a result, as the user returns the presser lifting lever 14 to the second level S2 (in the embroidery mode, a tension of the upper thread is activated) again, the presser bar 13 is lifted to the second level in the arrow direction U and automatically becomes the state of Figs. 5A and 5B (embroiderable state). Therefore, the user can immediately perform embroidery.

[0062] As described above, according to the present embodiment, when embroidery such as free-hand embroidery is performed, as a preparation thereof, the presser lifting lever 14 is pivotably operated and tempo-

rarily set in order to prevent the presser bar 13 from falling. This is because, in this sewing machine, the embroidery mode is set when the presser bar 13 is temporarily set in the second level as described above. In this manner, the user can manually attach the embroidery presser 3 in the lower end portion 13d of the presser bar 13 while the presser bar 13 is temporarily set in a high position.

[0063] In this case, the operational arm 39 of the embroidery presser 3 is engaged with the fixing trench 44 of the cam surface 42 of the subsidiary lever 4 and is temporarily set. In this state, the presser foot 33 is moved to the presser holder 31 side against the biasing force of the presser spring 34 and the presser spring 34. As a result, a height dimension HA (see Figs. 6A and 6B) of the embroidery presser 3 is reduced. In this case, the bottom portion 33e of the presser foot 33 is prevented from moving so as to be significantly projected from the presser holder 31 by the biasing force of the presser spring 34. As a result, it is possible to abolish work for reducing a height dimension HA of the embroidery presser 3 by manually moving the presser foot 33 of the embroidery presser 3 toward the presser holder 31 side in order to attach and remove the embroidery presser 3. Therefore, it is possible to obtain freedom in user's hand operation and improve efficiency.

[0064] In addition, as long as the operational arm 39 of the embroidery presser 3 is fitted to the fixing trench 44 of the subsidiary lever 4 and is temporarily set, free pivoting of the subsidiary lever 4 is prevented. Therefore, it is possible to further improve efficiency. Furthermore, if the operational arm 39 is engaged with the fixing trench 44 of the cam surface 42 of the subsidiary lever 4 and is temporarily set, the subsidiary lever 4 is moved upward to be separated from the needle plate 23 to increase a space HE between the needle plate 23 and the operating portion 45 of the subsidiary lever 4 as recognized from Fig. 6B. Therefore, it is possible to easily attach the embroidery presser 3 in the presser bar 13 with excellent efficiency.

[0065] While the user attaches the embroidery presser 3 in the presser bar 13, as shown in Figs. 6A and 6B, the presser foot 33 is maintained in the second height position M2, and a gap dimension B5 between the presser foot 33 and the needle plate 23 is also held. As a result, it is not necessary for the user to perform a cumbersome work for lifting the presser foot 33 attached to the presser bar 13 from the needle plate 23, and this facilitates setting of the embroidery frame by immediately passing the embroidery frame through the gap dimension B5. In this sense, it is possible to further improve efficiency. In the case of a thick embroidery frame, a wider gap dimension C2 (see Figs. 7A and 7B) is formed by pivoting the subsidiary lever 4 upward, as described above.

[0066] In addition, according to the present embodiment, since the embroidery presser 3 has a transparent cover wall 33h facing the user who operates the sewing machine, it is possible to prevent the user's finger from erroneously touching the needle 10 during needlework

such as embroidery and improve user protection. Furthermore, even when the needle breaks during embroidery, it is possible to improve a barrier effect for the broken and scattered needle fragments and prevent the broken needle from being scattered toward the user by means of the cover wall 33h. As in Reference 3, the cover wall 33h may be attached to the sewing machine bed side. However, in this case, both work for attaching the embroidery presser 3 and work for attaching the cover wall 33h are necessary. However, according to the present embodiment, the transparent cover wall 33h is integrated with the embroidery presser 3 as a single body as described above. Therefore, if the embroidery presser 3 is attached to the lower end portion 13d of the presser bar 13, the transparent cover wall 33h for protecting the user can be automatically attached. Therefore, it is possible to obtain excellent efficiency.

[0067] As described above, according to the present embodiment, even when the needle holder 11 is moved vertically in the height direction (arrow direction H) along with the needle bar 1 during embroidery, the lifting distance of the embroidery presser 3 lifted by the needle holder 11 is a small distance ΔH , compared to the vertical movement distance of the needle holder 11. In addition, the vertical movement distance of the cover wall 33h is also insignificant, and it does not hinder the user's view. As a result, it is possible to increase a size of the cover wall 33h and improve user protection in this sense.

(Other Embodiments)

[0068] Although the presser bar 13 is lifted to the second level when the embroidery presser 3 is attached to the lower end portion of the presser bar 13 using a fixture according to the aforementioned embodiment, this disclosure is not limited thereto. Instead, the presser bar 13 may be lifted to the first level. Although the presser spring 34 is a coil spring, other springs such as a torsion coil spring and a plate spring may be used. Although the presser foot 33 has a transparent cover wall 33h, the cover wall 33h may not be provided. According to the aforementioned embodiment, the presser bar 13 can be fixedly and temporarily set in the zeroth level which is a typical needlework position (upper thread is tensioned), the first level (upper thread is distensioned) higher than the zeroth level, and the second level (upper thread is tensioned) higher than the first level using the presser lifting lever 14. However, such a sewing machine is by no means limiting, and this disclosure may be applied to other types of sewing machines, for example, if it can temporarily set the presser bar 13 in a predetermined height position in order to attach the embroidery presser 3. Although the operational arm 39 is moved vertically using the needle holder 11 of the needle bar 1, the operational arm 39 may be directly moved vertically using the needle bar 1 without the needle holder 11. This disclosure is not limited to the embodiments and the drawings described above, but may be changed or modified

appropriately without departing from the spirit and scope of this disclosure.

5 Claims

1. A sewing machine embroidery presser attached to a presser bar, in a sewing machine including a needle bar that has a needle holder for holding a needle and is vertically movable in the height direction, a presser bar vertically movable in the height direction, and a presser lifting lever for vertically moving the presser bar, the sewing machine embroidery presser comprising:

a presser holder attached to a lower portion of the presser bar using a fixture;
an operational arm that is attached to the presser holder and moved vertically by the needle bar or the needle holder to vertically move in the height direction;
a presser foot that is vertically movably held by the presser holder to move in synchronization with the operational arm, faces a needle plate of the sewing machine, and presses a target workpiece;
a presser spring that is provided in the presser holder and has a biasing force for biasing the presser foot toward the needle plate; and
a subsidiary lever pivotably provided in the presser holder, the subsidiary lever including a cam surface having a cam profile for vertically moving the operational arm in response to pivoting, a fixing trench that engages with the operational arm to move the presser foot to the presser holder side and temporarily set the presser foot in a first height position raised from the needle plate, and an operating portion operated by the user's finger.

2. The sewing machine embroidery presser according to claim 1, wherein the operational arm is mounted on the needle holder and is vertically movable in the height direction in synchronization with a vertical movement of the needle bar along with the needle holder, when the needle bar is moved vertically along with the needle holder, and the presser foot is vertically movable in the height direction in synchronization with the operational arm.

3. The sewing machine embroidery presser according to claim 1 or claim 2, wherein the operational arm is located a predetermined distance ΔH below the top dead point of the needle holder that moves vertically, and the lifting distance of the operational arm is set smaller than the lifting distance from the bottom dead point to the top dead point of the needle holder.

4. The sewing machine embroidery presser according to any one of claims 1 to 3, further comprising a first spring for biasing the subsidiary lever to an embroidery height position by pivoting the presser foot downward toward the needle plate of a sewing machine bed. 5
5. The sewing machine embroidery presser according to any one of claims 1 to 4, wherein: 10
- the presser foot is vertically movable by pivoting operation of the subsidiary lever to an embroidery height position where embroidery is performed, a first height position higher than the embroidery height position, where the presser foot is raised from the needle plate, and a second height position higher than the first height position, where the presser foot is raised from the needle plate; and 15
- a cam profile of the cam surface of the subsidiary lever is formed to sequentially lift the presser foot to the embroidery height position, the first height position, and the second height position in response to rotation operation of the subsidiary lever by the user, and lower the operational arm toward the needle plate as the rotation operation of the subsidiary lever by the user is released. 20 25
6. The sewing machine embroidery presser according to any one of claims 1 to 5, wherein the presser foot has a transparent cover wall erected to face the user who operates the sewing machine. 30
7. A sewing machine comprising the sewing machine embroidery presser according to any one of claims 1 to 6. 35

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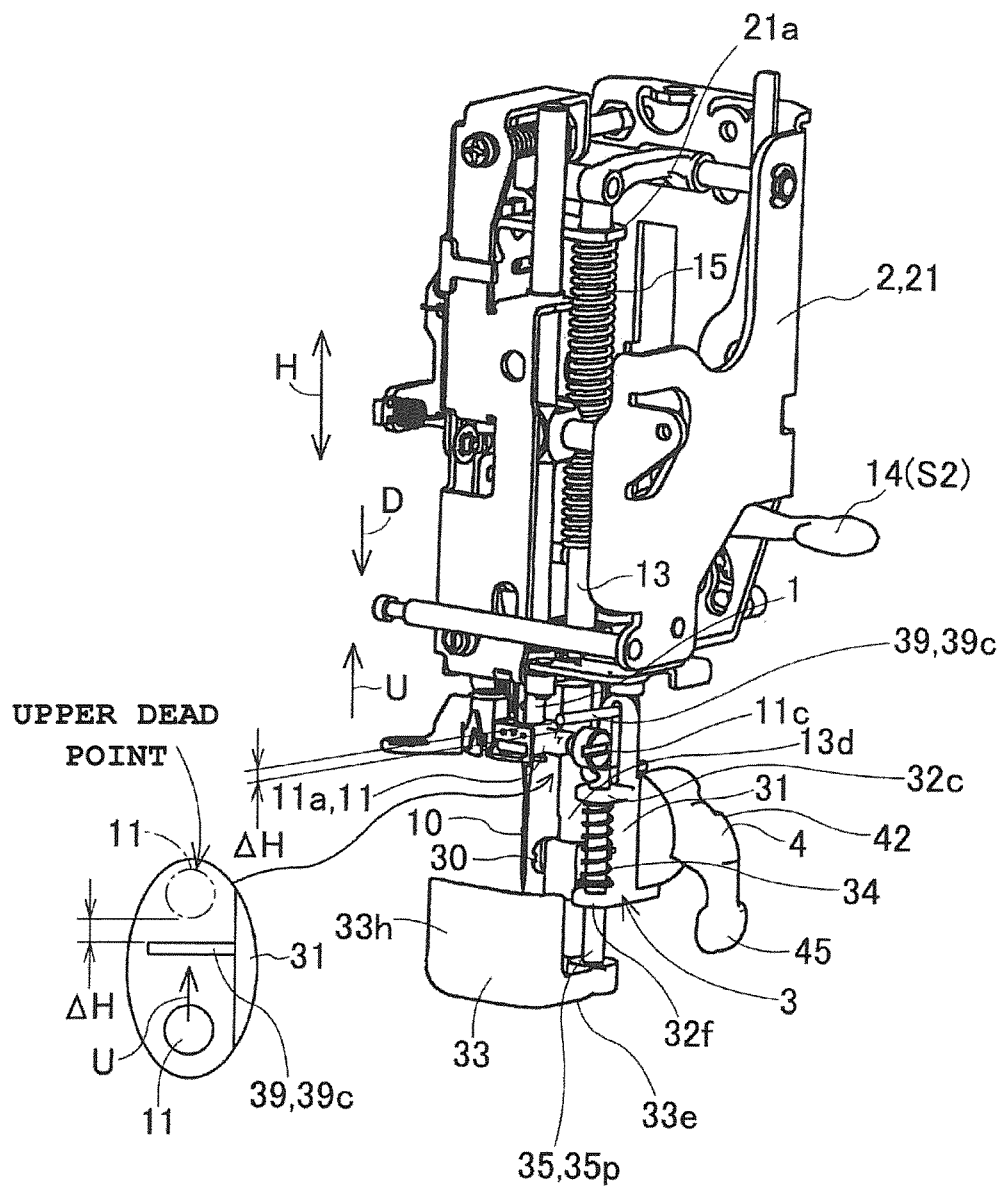


FIG. 1

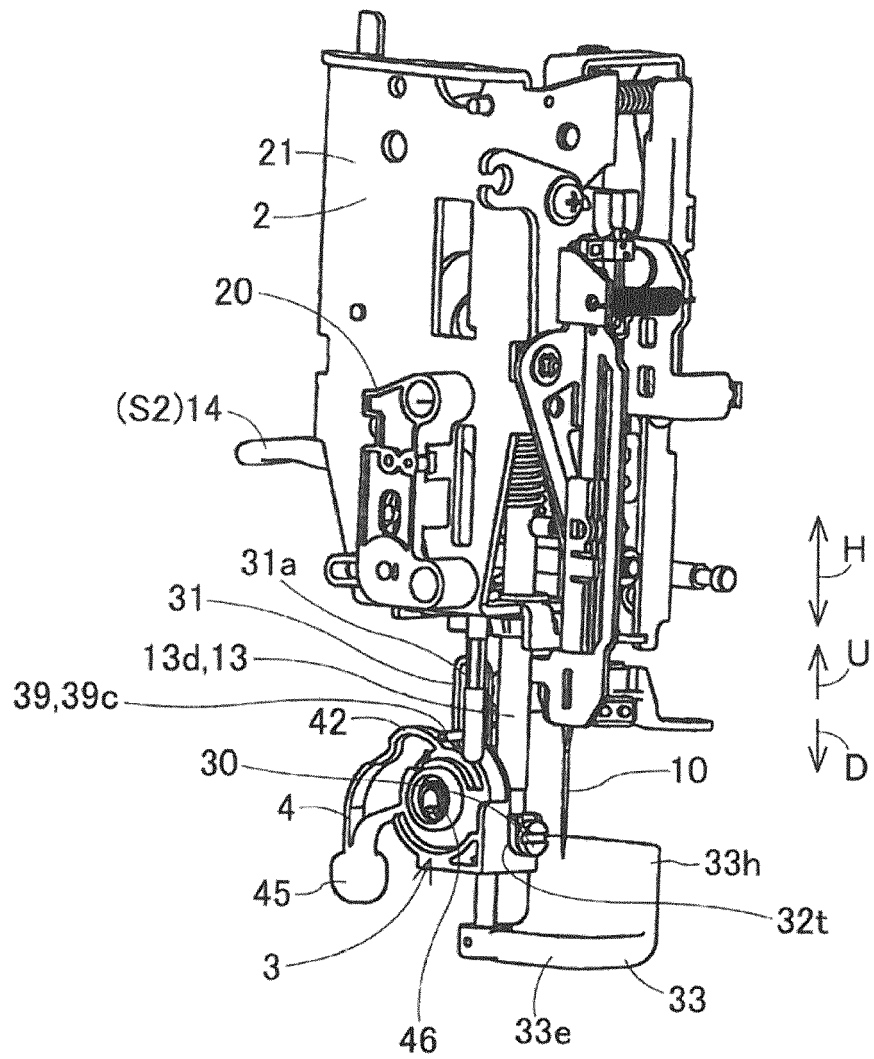


FIG. 2

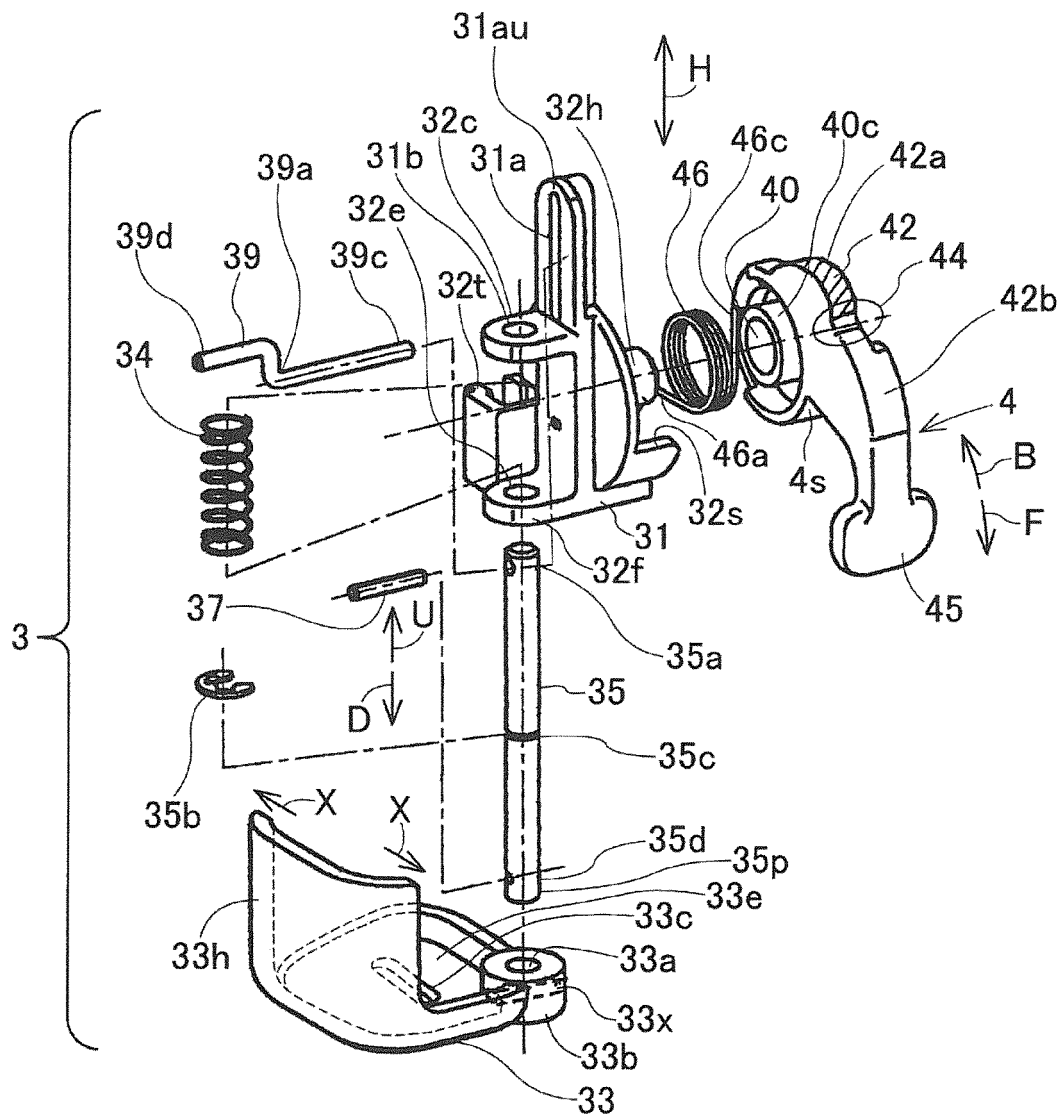


FIG. 3

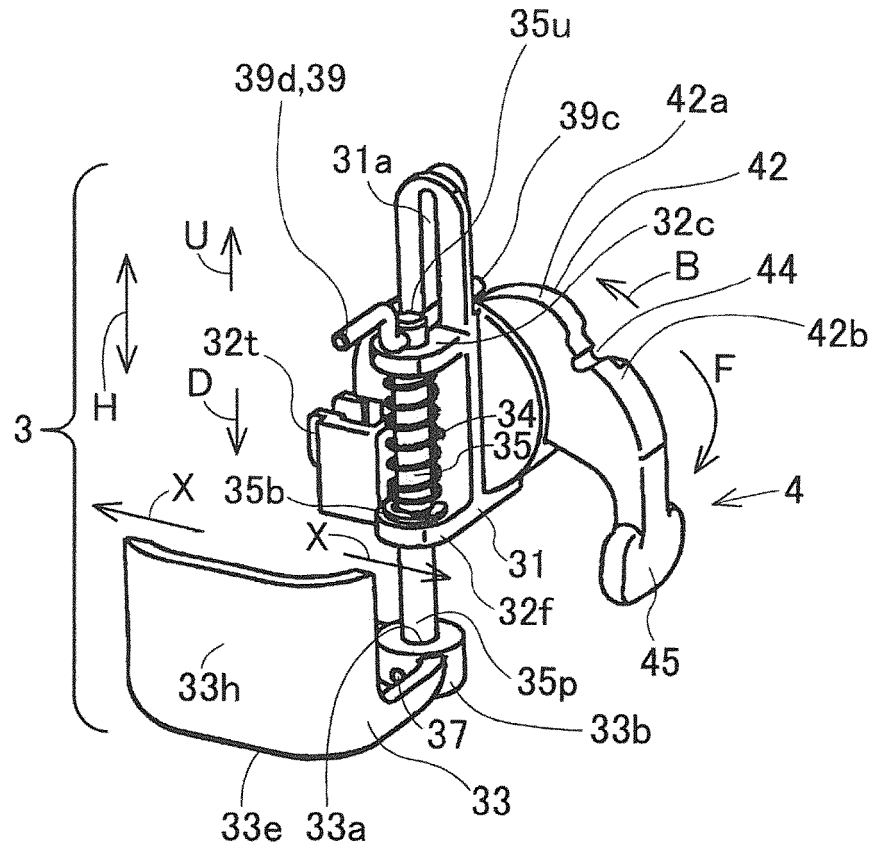


FIG. 4

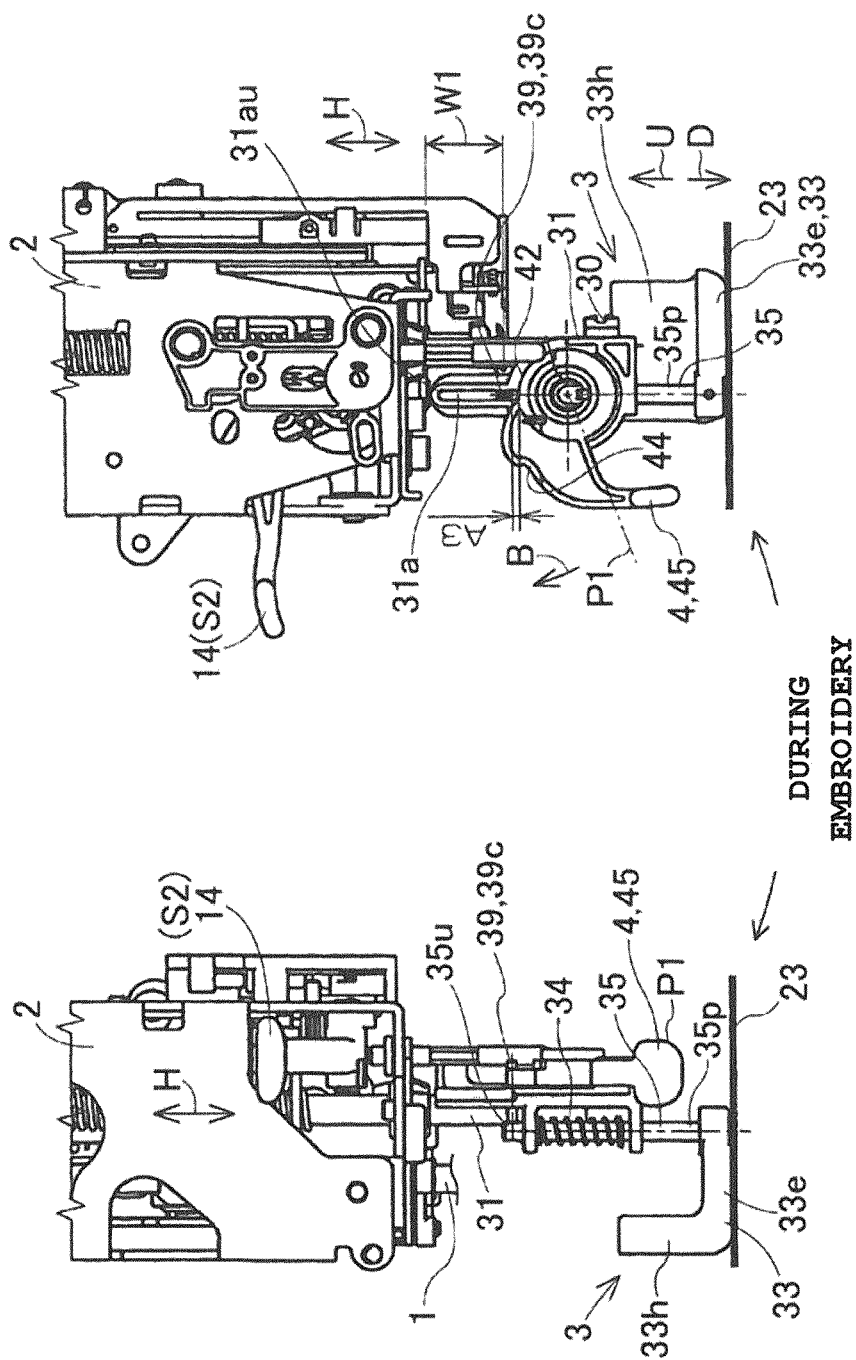
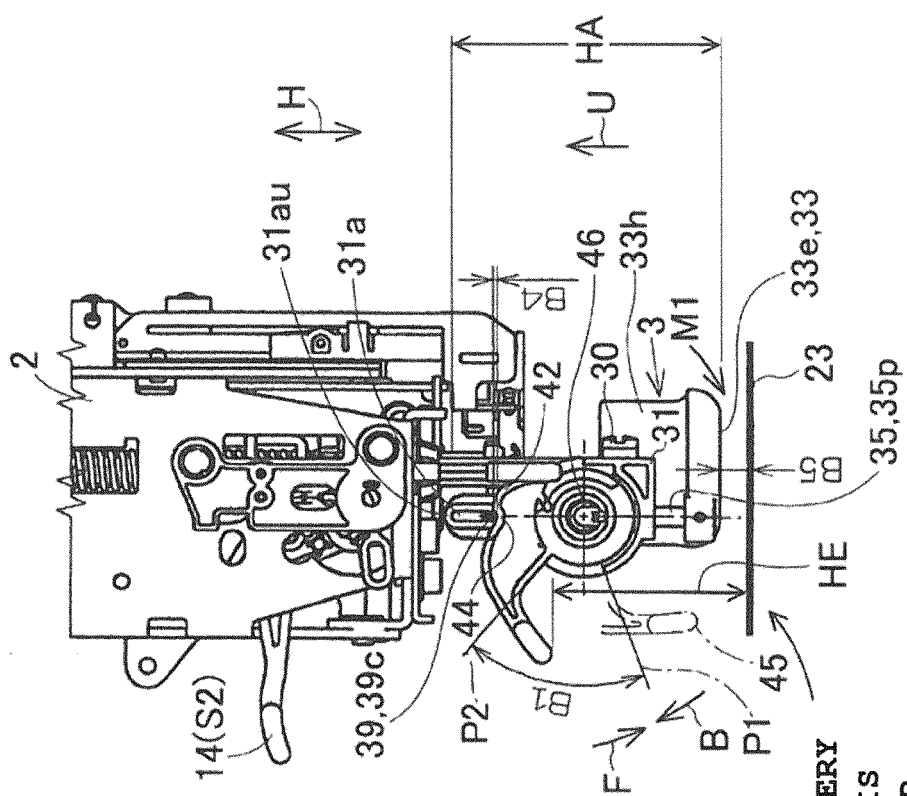
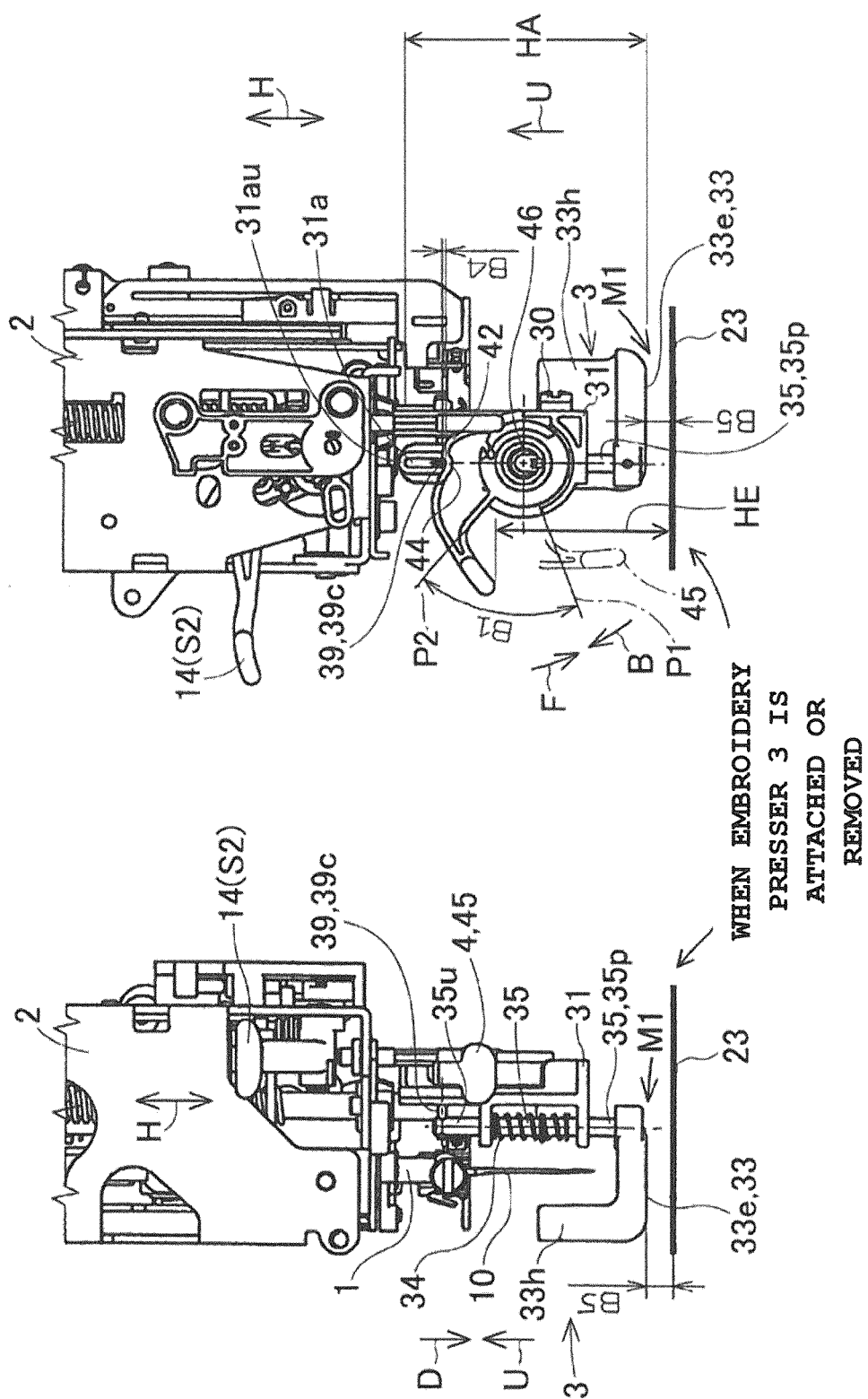


FIG. 5A

FIG. 5B



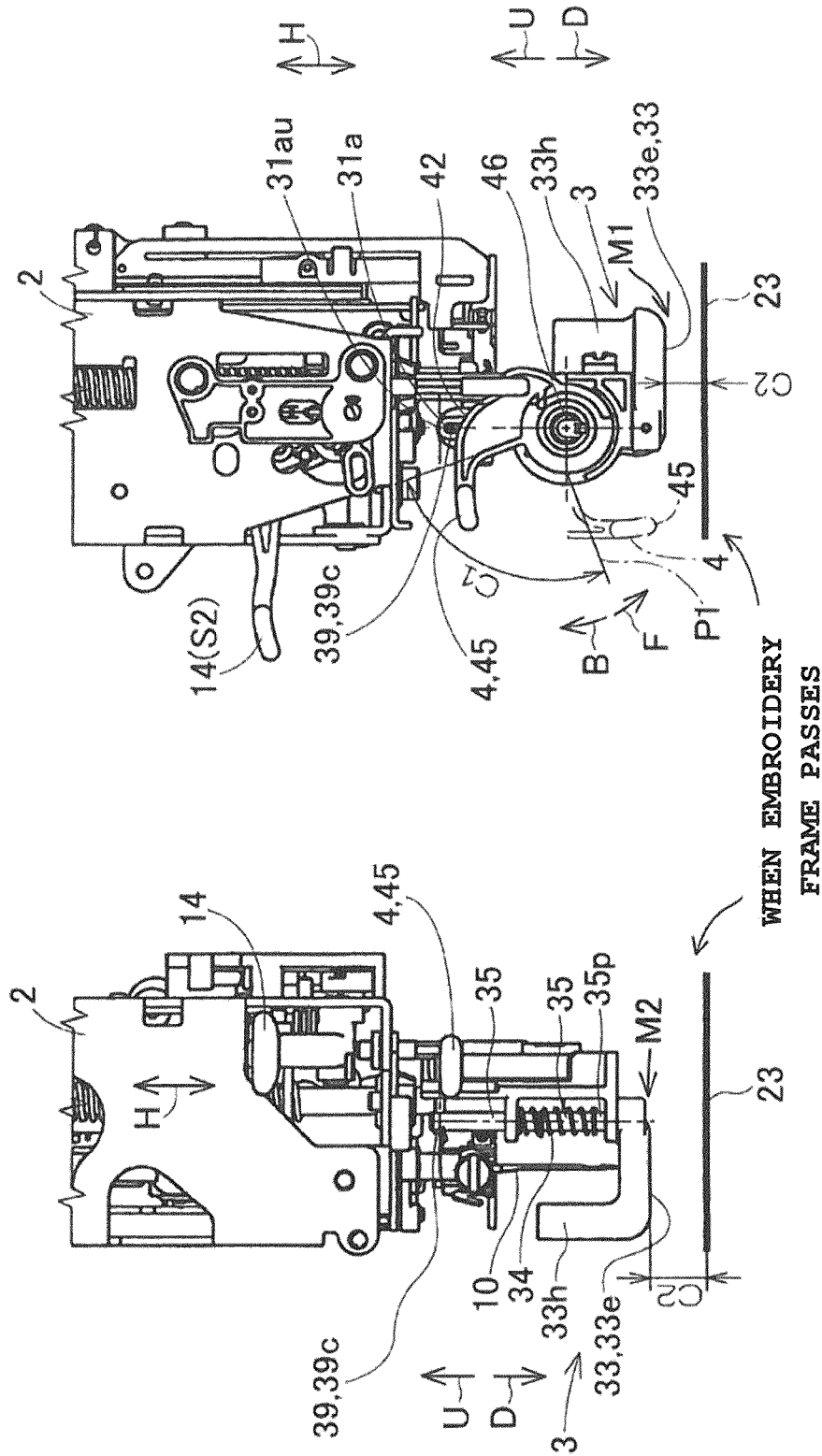


FIG. 7A

FIG. 7B

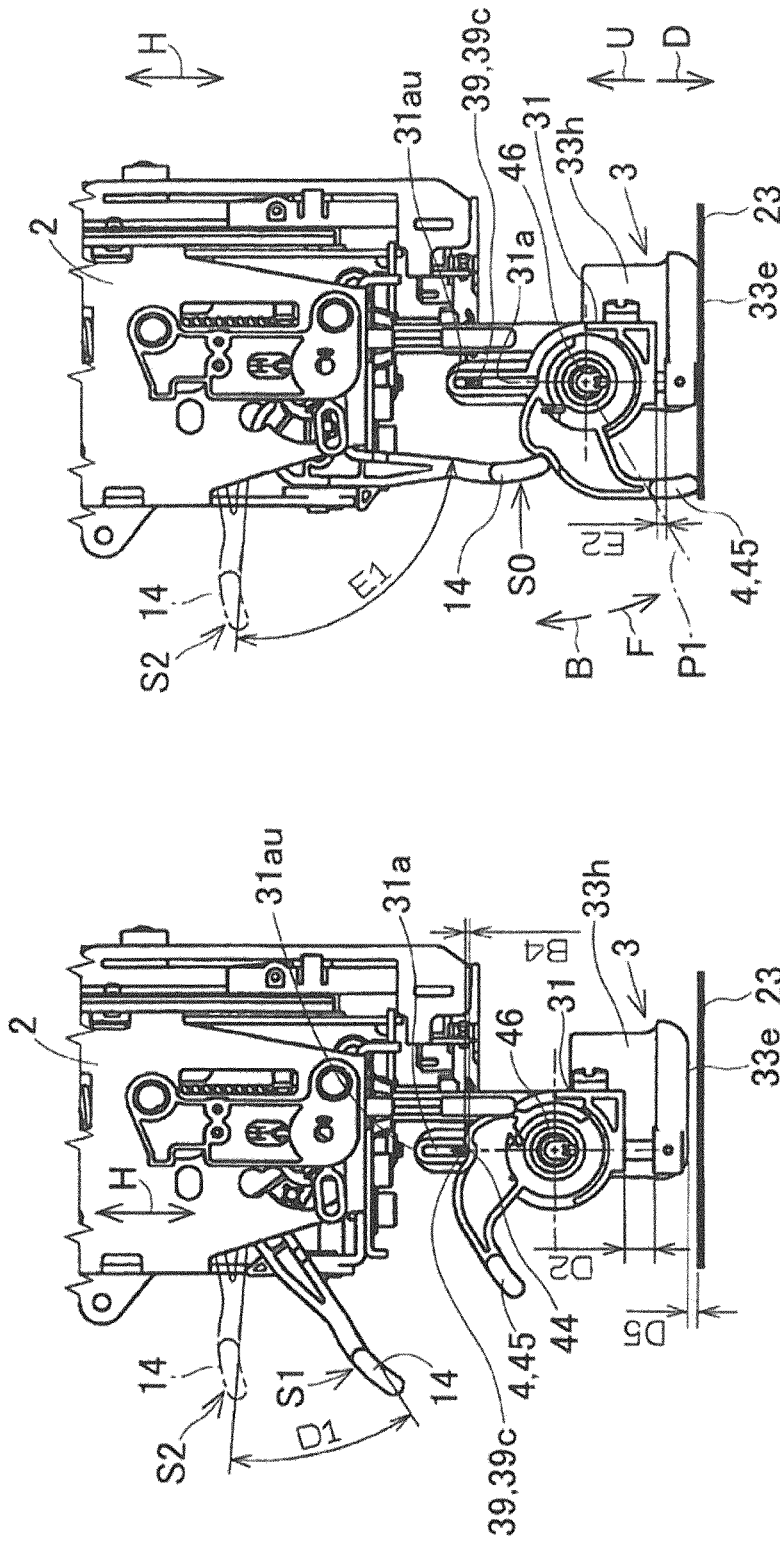


FIG. 8B

FIG. 8A

REFERENCES CITED IN THE DESCRIPTION

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