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(54) Sewing machine controller and sewing machine

(57) Disclosed is a sewing machine controller manipulated by a user to output a sewing-related signal, including: a base body (7); a manipulation portion (15) that is provided in the base body (7) such that a part thereof is exposed from the base body (7) so as to allow a user to perform manipulation, moves in a predetermined manipulation direction (C1) through user manipulation to directly or indirectly output a sewing-related signal, and is movable in a locking direction (B2) and an unlocking direction (B1) unidentical to the manipulation direction (C1); a locking portion (12b) provided in the base body (7) to define a locking position for restricting movement of the manipulation portion (15) in the manipulation direction (C1); an unlocking portion provided in the base body (7) to release the locking of the locking portion (12b) and enables user manipulation for moving the manipulation portion (15) in the unlocking direction (B1) unidentical to the manipulation direction (C1); and a lock spring (8) provided in the base body (7) to exert a biasing force for automatically recovering the manipulation portion (15) to the locking position when the user manipulation for the manipulation portion (15) is released.

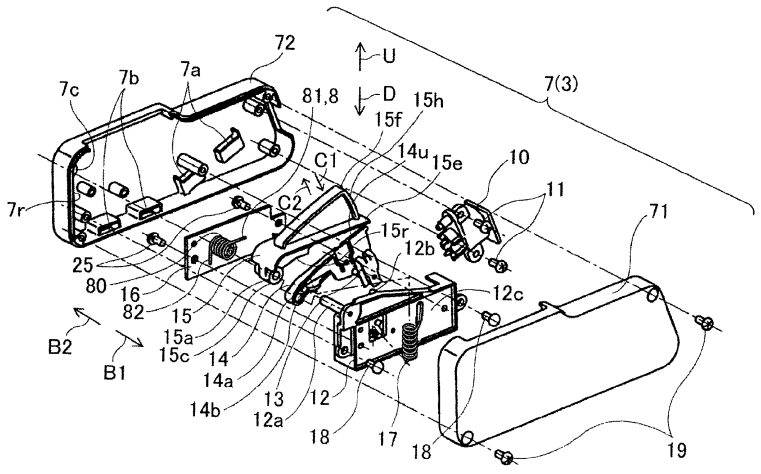

FIG. 2

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Description

TECHNICAL FIELD

[0001] This disclosure relates to a sewing machine controller having a manipulation portion that can be manipulated by a user and a sewing machine.

BACKGROUND DISCUSSION

[0002] JP2002-28390A (hereinafter referred to as Reference 1) discloses a finger ring-shaped controller having a manipulation switch that can be manipulated by a user's fingertip. In this document, operation start/stop manipulation can be made while a user sends a cloth with both hands during needlework. In order to prevent the controller from slipping or being strongly fitted when a user puts on the controller on her/his finger, the finger ring portion is made of an elastic body.

[0003] JP4571832A (hereinafter referred to as Reference 2) discloses a safety device capable of preventing an erroneous operation of a sewing machine having a wireless controller to protect a user. In this document, a sewing machine body is provided with an activation/deactivation switching device capable of deactivating an instruction signal from the wireless controller, and a user switches the activation/inactivation switching device into a deactivation side when the sewing machine is not operated.

[0004] JP2004-275388A (hereinafter referred to as Reference 3) discloses a safety control device of the sewing machine for protecting a user by suppressing driving of a motor even when a user turns on the power switch to supply power while the operation start/stop signal generating means is set to a motor operation state.

[0005] In the technique disclosed in Reference 1, the manipulation portion may be mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion of the sewing machine controller, and the like) even when a user does not intend to operate the sewing machine during sewing preparation and the like. In this case, the sewing machine controller may be erroneously manipulated regardless of a user's intention, and the sewing machine may be suddenly operated so as to astonish a user.

[0006] In the technique disclosed in Reference 2, since a user is required to manipulate the activation/deactivation switching device, there is no function of the safety device when a user forgets the manipulation. In addition, when a user sets the activation/deactivation switching device to deactivation, and this state is maintained for a while, a user may misunderstand, in the next use time, that the controller or the sewing machine is malfunctioned.

[0007] In the technique disclosed in Reference 3, it is possible to obtain an advantage of preventing an erroneous operation when power is on while the controller is manipulated. However, the manipulation portion may be mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion, and the like) even when a user does not intend to operate the sewing machine during sewing preparation and the like. In this case, the sewing machine may be suddenly operated regardless of user's intention so as to astonish a user.

[0008] Thus, a need exists for a sewing machine controller and a sewing machine advantageously capable of removing a problem that the manipulation portion is mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion, and the like) even when a user does not intend to operate the sewing machine.

SUMMARY

[0009] According to an aspect of this disclosure, there is provided a sewing machine controller manipulated by a user to output a sewing-related signal, including: a base body; a manipulation portion that is provided in the based body such that a part thereof is exposed from the base body so as to allow a user to perform manipulation, moves in a predetermined manipulation direction through user manipulation to directly or indirectly output a sewing-related signal, and is movable in an unlocking direction and a locking direction unidentical to the manipulation direction; a locking portion provided in the base body to define a locking position for restricting movement of the manipulation portion in the manipulation direction; an unlocking portion provided in the base body to release the locking of the locking portion and enables user manipulation for moving the manipulation portion in the unlocking direction unidentical to the manipulation direction; and a lock spring provided in the base body to exert a biasing force for automatically recovering the manipulation portion to the locking position when the user manipulation for the manipulation portion is released.

[0010] The locking portion defines a locking position for restricting movement of the manipulation portion in the manipulation direction. For this reason, even when the manipulation portion is mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion, and the like), the manipulation portion is not allowed to output the sewing-related signal to the sewing machine side because the manipulation portion is locked to the locking position. Therefore, unlike the related art, it is possible to suppress a sudden operation of the sewing machine regardless of a user's intention and suppress user's astonishment.

[0011] However, the manipulation portion is unlocked if a user moves the manipulation portion in the unlocking direction unidentical to the manipulation direction of the manipulation portion based on a user's positive intention. If the manipulation portion is manipulated by a user in

the manipulation direction while the manipulation portion is unlocked, the sewing-related signal is directly or indirectly output to the sewing machine side.

[0012] As the user manipulation for the manipulation portion is released, the lock spring automatically recovers the manipulation portion to the locking position. At this moment, the manipulation portion is not allowed to move in the manipulation direction. In this case, even when the manipulation portion is mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion of the sewing machine controller, and the like), the sewing-related signal is not output because the manipulation portion is recovered to the locking position and locked. Therefore, unlike the related art, it is possible to suppress a sudden operation of the sewing machine regardless of a user's intention and suppress user's astonishment.

[0013] In the sewing machine controller described above, the lock spring may exert a first biasing force for automatically recovering the manipulation portion to the locking position when the user manipulation for the manipulation portion is released and a second biasing force for automatically recovering the manipulation portion to an initial position of the manipulation portion before the user manipulation by biasing the manipulation portion to a direction opposite to the manipulation direction. In this case, as the user manipulation for the manipulation portion is released, the manipulation portion is automatically recovered to the locking position due to the first biasing force of the lock spring. In addition, it is possible to automatically recover the manipulation portion to the initial position of the manipulation portion before the user manipulation by biasing the manipulation portion in a direction opposite to the manipulation direction by the second biasing force of the lock spring.

[0014] In the sewing machine controller described above, the lock spring may include a coil spring portion that is formed by winding a coil wire in a coil shape, has a gap between neighboring coil wires, and is compressible in an axial direction, a first arm portion extending from one end of the coil spring portion, and a second arm portion extending from the other end of the coil spring portion, the coil spring portion may exert the first biasing force, and the first and second arm portions may exert the second biasing force. In this configuration, regardless of whether or not the locking spring is a single component, the coil spring portion of the lock spring can exert the first biasing force, and the first and second arm portions of the lock spring can exert the second biasing force. Therefore, it is possible to reduce the number of components and cost and achieve small space occupation.

[0015] In the sewing machine controller described above, the base body may be provided with a movable lever pressed by the manipulation portion when the manipulation portion is manipulated in the manipulation direction, and a switch base having a switch for outputting, to a sewing machine side, a signal corresponding to a manipulation amount of the manipulation portion in the manipulation direction by sensing a movement position of the movable lever, and a lever recovery spring may be provided for recovering the movable lever to the corresponding initial position when manipulation of the manipulation portion is released. In this configuration, the movable lever is pressed by the manipulation portion, and the movable lever moves depending on the manipulation amount of the manipulation portion when the manipulation portion is manipulated in the manipulation direction. The switch outputs a signal corresponding to the manipulation amount of the manipulation portion in the manipulation direction to the sewing machine side by sensing a movement position of the movable lever.

[0016] The manipulation portion is movable in the unlocking direction and the locking direction unidentical to the manipulation direction as well as the manipulation direction. It is preferable that the movable lever also be recovered to the corresponding initial position when the manipulation portion is recovered to the corresponding initial position. However, the manipulation portion moves to a plurality of directions. Therefore, if both the manipulation portion and the movable lever are recovered by the same spring, the movable lever moves in the same direction in synchronization when the manipulation portion moves in the locking direction, so that a relationship between the movable lever and the switch may be influenced. This may influence the output of the signal. In this regard, a lever recovery spring for recovering the movable lever to the corresponding initial position as the movable lever is independent from the movement of the manipulation portion when the manipulation of the manipulation portion is released is provided separately from the lock spring.

[0017] The sewing machine controller may further include: a housing that forms a chamber for storing the base body having the manipulation portion, includes first and second housing portions that are relatively movable, and is capable of foot-stepping with a user's foot; and a movement guide formed in the first and second housing portions to move the manipulation portion of the base body in an unlocking direction against the biasing force of the lock spring while the base body is stored in the chamber of the housing, wherein the manipulation portion moves in the manipulation direction by the relative movement between the first and second housing portions, and a sewing-related signal is output to a sewing machine side.

[0018] In this configuration, the movement guide formed in the first or second housing portion unlocks the manipulation portion of the base body by moving the manipulation portion in the unlocking direction while the base body is stored in the chamber of the housing. For this reason, as the first and second housing portions move relatively, the manipulation portion moves in the manipulation direction, so that the sewing machine controller can output a sewing-related signal. The relative movement between the first and second housing portions

may be achieved by moving at least one of the first and second housing portions. The relative movement between the first and second housing portions may be performed with a user's hand or user's foot-stepping. In the latter case, a foot controller manipulated by user's foot-stepping is provided.

[0019] According to another aspect of this disclosure, there is provided a sewing machine including a main body and a sewing machine controller manipulated by a user to output a sewing-related signal, the sewing machine controller including: a base body; a manipulation portion that is provided in the based body such that at least a part thereof is exposed from the base body so as to allow a user to perform manipulation, moves in a predetermined manipulation direction through user manipulation to directly or indirectly output a sewing-related signal, and is movable in a locking direction and an unlocking direction unidentical to the manipulation direction; a locking portion provided in the base body to define a locking position for restricting movement of the manipulation portion in the manipulation direction; an unlocking portion provided in the base body to release the locking of the locking portion and enables user manipulation for moving the manipulation portion in the unlocking direction unidentical to the manipulation direction; and a lock spring provided in the base body to exert a biasing force for automatically recovering the manipulation portion to the locking position when the user manipulation for the manipulation portion is released. In this configuration of the sewing machine, it is possible to obtain the same effects and advantages as those of the first aspect.

[0020] As described above, according to this disclosure, it is possible to provide a sewing machine controller advantageously capable of addressing a problem that the manipulation portion is mistakenly manipulated for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion, and the like) even when a user does not intend to operate the sewing machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] 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:

[0022] Fig. 1 is a perspective view illustrating a sewing machine according to a first embodiment;

[0023] Fig. 2 is an exploded perspective view illustrating a hand controller;

[0024] Fig. 3 is a diagram illustrating an internal structure of the hand controller;

[0025] Fig. 4 is a cross-sectional view illustrating an inner side of the hand controller where a manipulation portion is locked;

[0026] Fig. 5 is a cross-sectional view illustrating an inner side of the hand controller where the manipulation portion is unlocked;

[0027] Fig. 6 is a perspective view illustrating a main part of the hand controller where the manipulation portion is locked;

[0028] Fig. 7 is a perspective view illustrating an inner side of the hand controller where the manipulation portion is unlocked;

[0029] Fig. 8 is a perspective view illustrating a state before the hand controller is stored in a housing; and

[0030] Fig. 9 is a cross-sectional view illustrating a state that the hand controller is stored in the housing and is used as a foot controller.

DETAILED DESCRIPTION

[0031] The base body is provided with a manipulation portion, a locking portion, an unlocking portion, and a lock spring, and may have a box shape or a non-box shape. The manipulation portion is provided in the base body such that at least a part thereof is exposed from the base body to allow user manipulation. The manipulation portion moves in a predetermined manipulation direction based on the user manipulation so as to directly or indirectly output a sewing-related signal. "Signal is directly output" means that a signal is output by moving the manipulation portion. "Signal is indirectly output" means that another member moves as the manipulation portion moves to output a signal from a switch. The locking portion defines a locking position for restricting movement of the manipulation portion in the manipulation direction. The unlocking portion is said to unlock the locking portion and enable user manipulation for moving the manipulation portion in the unlocking direction unidentical to the manipulation direction. By way of example, the unlocking portion has a structure including a pivot shaft capable of sliding the manipulation portion in a direction intersecting the manipulation portion while the manipulation portion pivots in the manipulation direction, and a pivot hole where the pivot shaft is fitted.

[0032] The direction unidentical to the manipulation direction means a direction different from the manipulation direction of the manipulation portion. For example, the unidentical direction means that a direction has an inclination angle θ with respect to the manipulation direction of the manipulation portion. The angle θ may be arbitrarily set to a range of 20 to 330°. Specifically, the angle θ may be set to 30 to 180°, 60 to 150°, or 90°. The lock spring refers to a biasing member that exerts a biasing force for automatically recovering the manipulation portion to the locking position when the user manipulation for the manipulation portion is released. The lock spring may include a spring known in the art such as a twisted coil spring, a coil spring, and a plate spring is explained with an example.

(First Embodiment)

[0033] Fig. 1 illustrates a concept of the first embodiment.

Fig. 1 illustrates a use condition of the sewing machine according to an exemplary embodiment. According to an exemplary embodiment, in a sewing machine having a free-hand embroidery function for allowing a user to freely move a ring-shaped embroidery frame 4 with a hand, a hand controller 3 serving as a sewing machine controller is provided. The hand controller 3 is a controller manipulated by a user with a hand and is used to output a sewing-related signal such as a sewing speed, a sewing width, and the like to the control unit of the sewing machine body 1 to perform adjustment manipulation for a variable mechanism of the sewing machine. In order to perform embroidery smoothly, the sewing machine body 1 is preferably provided with an extension table 2. The sewing machine body 1 includes a bed portion 1c, a vertical arm portion 1d, a horizontal arm portion 1e, a vertically-movable presser bar 1f, and a vertically-movable needle 1h.

[0034] As illustrated in Fig. 1, the hand controller 3 is indirectly integrated with the embroidery frame 4 by a mount 6. Alternatively, the hand controller 3 may be directly integrated with the embroidery frame 4. In the embroidery frame 4, a workpiece cloth (sewing subject) is interposed between inner and outer rings. The workpiece cloth is interposed between the inner and outer rings in a stretched state and is fixed by a fixing screw (not illustrated). Therefore, when a user holds the embroidery frame 4 and moves it on the extension table 2 in order to send the workpiece cloth during embroidery, the hand controller 3 connected to the embroidery frame 4 moves in the same direction at the same time. Alternatively, the hand controller 3 may be used separately from the embroidery frame 4.

[0035] As illustrated in Fig. 1, the hand controller 3 and the controller jack 1a of the sewing machine body 1 are electrically connected to each other with a harness (connection cable) 5. When a user pressedly manipulates the manipulation portion 15 of the hand controller 3 with a hand in the manipulation direction (arrow direction C1), the adjustment manipulation for start/stop of the sewing, a sewing speed, or a sewing width is signalized in response to the manipulation, and the signal is output from the hand controller 3 to the control unit of the sewing machine body 1 through the harness 5, so that the sewing machine body 1 is controlled by a microcomputer of the control unit. Although the harness 5 is used as a connection cable for connecting the hand controller 3 and the sewing machine body 1 according to this embodiment, the signal output from the hand controller 3 may be transmitted to the sewing machine body 1 via a wireless transmission means.

[0036] While the manipulation portion 15 of the hand controller 3 is not pressedly manipulated in the manipulation direction (arrow direction C1), the manipulation portion 15 is automatically locked to the locking position as described below. If the manipulation portion 15 is locked in this manner, the manipulation portion 15 is not allowed to move in the manipulation direction (arrow direction C1) because the manipulation portion 15 is locked to the locking position even when the manipulation portion 15 is mistakenly pressedly manipulated in the manipulation direction (arrow direction C1) for some reason (a user, a body of a third party, or other obj ects may unintentionally touch the manipulation portion 15, and the like). Therefore, the hand controller 3 is not allowed to output the sewing-related signal to the sewing machine body 1. Therefore, unlike the related art, it is possible to suppress a sudden operation of the sewing machine regardless of a user' s intension and suppress user's astonishment.

[0037] Fig. 2 is an exploded view illustrating a casing 7 as the base body. As illustrated in Fig. 2, the casing 7 includes a first casing 71 and a second casing 72. After various components are assembled in the second casing 72, the first and second casings 71 and 72 are integrated with each other by an installation screw 19 to form the casing 7.

[0038] As recognized from Fig. 2, the casing 7 is provided with a switch base 12, a resistance board 16, and a movable lever 14 in addition to the manipulation portion 15. The manipulation portion 15 includes a pivot shaft 15c having a pivot hole 15a serving as a pivot point and a manipulation protrusion 15h having a base 15e and a manipulation surface 15f integrated with the base 15e and manipulated by a user with a fingertip. The switch base 12 is fixed in the casing 7 and outputs a signal corresponding to a manipulation amount of the manipulation portion 15 to the control unit of the sewing machine body 1. The switch base 12 includes a base 12c having a pivot shaft 12a and a locking pin 12b (locking portion).

[0039] The movable lever 14 is provided pivotably in synchronization with manipulation of the manipulation portion 15 in the manipulation direction (arrow direction C1) in the casing 7. The pivot shaft 12a of the switch base 12 is pivotably assembled with the pivot hole 14b serving as a pivot point 14a of the movable lever 14. As a result, the movable lever 14 can pivot with respect to the pivot shaft 12a of the switch base 12 in the arrow directions C1 and C2. In addition, the resistance board 16 is fixed to the switch base 12 by an installation screw 25. The movable lever 14 is upwardly (arrow direction U) biased to the switch base 12 by the biasing force of the lever recovery spring 17 at all times and is held in a stop position by a function of a stopper (not illustrated) of the switch base 12. If the movable lever 14 is upwardly (arrow direction U in Fig. 2) biased by the biasing force of the lever recovery spring 17 at all times in this manner, the manipulation portion 15 located over the movable lever 14 is biased in the same direction. In this case, if a pressing force greater than the biasing force of the lever recovery spring 17 is downward (arrow direction D in Fig. 2) applied to the movable lever 14, the movable lever 14 pivots downward (arrow direction D) on the pivot point 14a. However, if such a force is removed, the movable lever 14 and the manipulation portion 15 pivot upwardly (arrow direction U) by the biasing force of the lever re-

covery spring 17 so as to be recovered to an original position.

[0040] As recognized from Fig. 2, the switch base 12 obtained by assembling the aforementioned components (such as the movable lever 14) is fixed to the second casing 72 by an installation screw 18. In addition, the connector 10 is also fixed to the second casing 72 by a plurality of lock screws 11. In this case, the connector 10 and the resistance board 16 are electrically connected to each other by the harness 24 (see Fig. 4).

[0041] As recognized from Fig. 2, the pivot shaft 7c (engagement portion) of the second casing 72 obtained by assembling the aforementioned components pivotably supports the pivot hole 15a (engagement target portion) serving as a pivot center of the manipulation portion 15. As a result, the manipulation portion 15 is pivotable in the arrow direction C1 (manipulation direction or downward) or in the arrow direction C2 (opposite to the manipulation direction or upwardly) with respect to the casing 7. In addition, the manipulation portion 15 can slide along a horizontal direction (axial direction of the pivot shaft 7c), that is, in the arrow direction B1 (unlocking direction) or B2 (locking direction) of Fig. 5 with respect to the casing 7. Therefore, the pivot shaft 7c of the second casing 72 and the pivot hole 15a of the manipulation portion 15 constitute the unlocking portion capable of pivoting the manipulation portion 15 in the manipulation direction (arrow direction C1) and sliding the manipulation portion 15 in a direction (unidentical direction, arrow direction B1 (unlocking direction), or arrow direction B2 (locking direction)) intersecting with the manipulation direction (arrow direction C1).

[0042] As illustrated in Fig. 2, the lock spring 8 includes a coil spring portion 80, a first arm portion 81 extending from one end of the coil spring portion 80, and a second arm portion 82 extending from the other end of the coil spring portion 80. As illustrated in Fig. 3, the first arm portion 81 abuts on a part 15r of the manipulation portion 15, and the second arm portion 82 abuts on a part 7r of the casing 7. As a result, the manipulation portion 15 is biased in the arrow direction C2 (opposite to the arrow direction C1 which is the manipulation direction) at all times. In this manner, the manipulation portion 15 is biased to the corresponding initial position F1 (see Fig. 3) along the arrow direction C2 by virtue of the first and second arm portions 81 and 82. In this case, as illustrated in Fig. 3, the engagement portion 15W of the base 15e of the manipulation portion 15 abuts on the stopper 7s of the casing 7. Therefore, the manipulation portion 15 is held in the initial position F1 (position where the manipulation portion 15 is most protruded in the arrow direction C2) (see Fig. 3). In this case, since the movable lever 14 is upwardly (arrow direction U) biased by virtue of the biasing force of the lever recovery spring 17 at all times as described above, the upper surface 14u of the movable lever 14 makes contact with the contact portion 15i having a convex shape on the lower surface of the base 15e of the manipulation portion 15 (see Fig. 3). In this manner, the manipulation portion 15 is reliably held in the corresponding initial position F1 (manipulation amount of arrow direction C1 = 0) by virtue of the upward biasing force of the lock spring 8 and the upward biasing force of the lever recovery spring 17.

[0043] Description will be made in more detail. According to this embodiment, the manipulation portion 15 is upwardly (arrow directions C2 and U) biased by the helical torsion coil spring effect (second biasing force) caused by the first and second arm portions 81 and 82 of the lock spring 8 as described above. In addition, as illustrated in Figs. 4 and 5, the coil spring portion 80 of the lock spring 8 is formed by winding the coil wire in a coil shape, and a gap84 is formed between neighboring coil wires (see Fig. 4). The coil spring portion 80 is compressible in the axial direction (arrow directions E1 and E2) in order to allow adjustment of the width of the gap 84. For this reason, as illustrated in Fig. 4, a seat portion 15y of the manipulation portion 15 is biased to the second casing 72 in the arrow direction E2 (locking direction) by virtue of the compression spring effect (first biasing force) of the coil spring portion 80 of the lock spring 8 at all times. However, as recognized from Fig. 5, if a user moves the manipulation portion 15 in the arrow direction B1 (unlocking direction) with a hand, the seat portion 15y of the manipulation portion 15 may move the coil spring portion 80 in the arrow direction E1 (unlocking direction) while compressively deforming the coil spring portion 80 in its axial direction. In this case, the width of the gap 84 of the coil spring portion 80 is narrowed so that the coil spring portion 80 accumulates the compressive load (biasing force to the arrow direction E2). This is one of the differences from the related art.

[0044] In other words, although the lock spring 8 is physically a single component, it provides both the compression spring effect in the axial direction (arrow direction E2) caused by the coil spring portion 80 and the twisted coil spring effect caused by the first and second arm portions 81 and 82. Since the width of the gap 84 of the coil spring portion 80 of the lock spring 8 may vary due to such a compression spring effect, the manipulation portion 15 is slidable along the arrow directions E1 (unlocking direction) and E2 (locking direction) so as to move to each of the locking and unlocking positions. This is one of the differences from the related art. The arrow directions E1 and E2 refer to the thickness direction of the casing 7.

[0045] That is, according to this embodiment, the coil spring portion 80 of the lock spring 8 can exert a second biasing force for automatically recovering the manipulation portion 15 to the initial position F1 of the manipulation portion 15, which is a position before a user manipulates the manipulation portion 15, as a user releases the pressing manipulation in the arrow direction C1 for the manipulation portion 15, because the first and second arm portions 81 and 82 of the lock spring 8 bias the manipulation portion 15 in the manipulation direction (arrow direction C1) and the opposite direction (arrow direction C2). In

addition, the coil spring portion 80 of the lock spring 8 exerts a first biasing force for automatically recovering the manipulation portion 15 to the locking position by moving the manipulation portion 15 in the arrow direction E2 (locking direction). In this manner, by virtue of the second biasing force caused by the first and second arm portions 81 and 82 of the lock spring 8, the manipulation portion 15 is biased in a direction (arrow direction C2) opposite to the user manipulation direction so that the manipulation portion 15 can be automatically and easily recovered to the initial position F1 of the manipulation portion 15, which is a position before a user performs manipulation.

[0046] In this manner, regardless of whether or not the lock spring 8 is a single component, the first and second arm portions 81 and 82 of the lock spring 8 can exert the second biasing force for recovering the manipulation portion 15 to the corresponding initial position F1, and the coil spring portion 80 of the lock spring 8 can exert the first biasing force for moving the manipulation portion 15 in the locking direction (arrow directions E2 and B2). In this manner, since even a single lock spring 8 can be used as both types of springs, it is possible to reduce the number of components, reduce cost, and achieve small space occupation. In addition, in Fig. 2, mount holes 7a and 7b provided in the second casing 72 are used to fix the mount 6 for the hand controller 3.

[0047] According to this embodiment, as illustrated in Fig. 3, a resistor 23 serving as a switch for sensing a user manipulation amount of the manipulation portion 15 in the pressing manipulation direction (arrow direction C1) is used. The resistor 23 is provided in the resistance board 16. The resistor 23 includes a resistance pattern 16a and a resistance pattern 16b in which a plurality of resistors are arranged side by side in series. The contact point 13a of the contact point clasp 13 provided in the movable lever 14 short-circuits the resistance patterns 16a and 16b. Here, as a user pressedly manipulates the manipulation portion 15 in the manipulation direction (arrow direction C1), the manipulation operation of the manipulation portion 15 is tranmitted to the movable lever 14 through the contact portion 15i of the manipulation portion 15 and the upper surface 14u (see Fig. 3). Furthermore, the movable lever 14 is pressedly manipulated in a downward direction (arrow direction D) by by the pivot shaft 12a of the switch base 12 as a rotational center. In this case, the movable lever 14 making contact with the manipulation portion 15 also pivots in the same direction (arrow direction D) depending on the pressing manipulation amount of the manipulation portion 15. This changes the short-circuit position of the contact point 13a of the contact point clasp 13 changes the resistance patterns 16a and 16b. For this reason, an internal resistance value of the resistor 23 of the resistance board 16 changes. As a result, as a user pressedly manipulates the manipulation portion 15 in the manipulation direction (arrow direction C1), the adjustment manipulation for start/stop of the sewing, a sewing speed, or a sewing width is signalized based on the pressing manipulation amount of the manipulation portion 15, and the signal is output to the control unit of the sewing machine body 1 through the harness 5 (see Fig. 1), so that control is executed by a microcomputer internally provided in the sewing machine. In addition, without limiting to the embodiment by the resistor 23, other sensors may be used to sense the pressing amount of the manipulation portion 15 in the manipulation direction (arrow direction C1) performed by a user in the manipulation direction.

[0048] A sequence for manipulating the manipulation portion 15 from the locking position in the aforementioned description will be described in more detail. As illustrated in Figs. 4 and 6, in a normal state, that is, when any pressing manipulation is not performed in the manipulation direction (arrow direction C1) by the manipulation portion 15, the pin contact portion 15u in the base 15e side of the manipulation portion 15 makes contact with the locking pin 12b (locking portion) of the switch base 12 by a distance A as illustrated in Figs. 4 and 6. The locking pin 12b is fixed to the switch base 12. In this case, the locking pin 12b serves as a locking portion for restricting the movement of the manipulation portion 15 in the manipulation direction (arrow direction C1). Therefore, even when a user pressedly manipulates the manipulation portion 15 in the manipulation direction (arrow direction C1), or even when other objects touch the manipulation portion 15 while the manipulation portion 15 is locked by the locking pin 12b, the manipulation portion 15 does not pivot any more in the manipulation direction (arrow direction C1). Therefore, the hand controller 3 does not output a sewing-related signal to the sewing machine body 1, and the sewing machine does not operate. That is, the manipulation portion 15 remains in the locking state in the locking position.

[0049] However, as illustrated in Figs. 5 and 7, if a user slides the manipulation portion 15 by a distance A or more in the arrow direction B1 (unlocking direction or axial direction of the locking pin 12b), the contact (lock) between the pin contact portion 15u on the lower surface of the base 15e of the manipulation portion 15 and the locking pin 12b of the switch base 12 is released. That is, the manipulation portion 15 is unlocked from the locking position. In this manner, a user is allowed to further pressedly manipulate the manipulation portion 15 in the manipulation direction (arrow direction C1) with a hand from the unlocking state of the manipulation portion 15. Therefore, a user presses the movable lever 14 in the same direction by further pressedly manipulating the manipulation portion 15 in the manipulation direction (arrow direction C1) so as to change the short-circuit position of the contact point 13a of the contact point clasp 13 on the resistance patterns 16a and 16b as described above. For this reason, the internal resistance value in the resistor 23 of the resistance board 16 changes as described above. If a user pressedly manipulates the unlocked manipulation portion 15 in the manipulation direction (arrow direction C1) in this manner, the adjustment manipulation

for start/stop of the sewing, a sewing speed, or a sewing width is signalized, and the signal is output to the control unit of the sewing machine body 1 through the harness 5 (see Fig. 1), so that it is possible to operate the sewing machine by a microcomputer internally provided in the sewing machine. This is one of the differences from the related art.

[0050] In addition, as a user removes a finger from the manipulation portion 15 after a user presses the manipulation portion 15 in the arrow direction C1, the manipulation portion 15 is lifted to a direction (arrow direction C2) opposite to the manipulation direction by virtue of the biasing force of the first and second arm portions 81 and 82 of the lock spring 8, and then, the manipulation portion 15 moves in the locking direction (arrow direction B2) by virtue of the biasing force of the coil spring portion 80 of the lock spring 8 in the locking direction (arrow direction E2), so that the manipulation portion 15 is automatically recovered to the locking position, and the manipulation portion 15 is maintained in the locking state (see Fig. 4). In this manner, while the manipulation portion 15 is locked to the locking position, the manipulation portion 15 is not allowed to move in the manipulation direction (arrow direction C1). In this case, even when the manipulation portion 15 is mistakenly manipulated in the manipulation direction (arrow direction C1) for some reason (for example, a user, a body of a third party, or other objects may unintentionally touch the manipulation portion 15, and the like), the manipulation portion 15 is not allowed to move because the manipulation portion 15 is locked to the locking position. Therefore, the hand controller 3 is not allowed to output the sewing-related signal to the sewing machine body 1. Therefore, unlike the related art, it is possible to suppress the sewing machine from being suddenly operated regardless of a user's intention and suppress user's astonishment.

[0051] According to this embodiment, the hand controller 3 is provided with the movable lever 14 pressed by the manipulation portion 15 when the manipulation portion 15 is manipulated in the manipulation direction (arrow direction C1) and a switch base 12 having a resistor 23 (switch) that outputs the signal corresponding to the manipulation amount of the manipulation portion 15 in the manipulation direction (arrow direction C1) by sensing the movement position of the movable lever 14 as described above. In addition, the hand controller 3 is provided with the lever recovery spring 17 for recovering the movable lever 14 to the corresponding initial position F2 when manipulation of the manipulation portion 15 is released. According to this embodiment, when the manipulation portion 15 is manipulated in the manipulation direction (arrow direction C1), the movable lever 14 is pressed by the manipulation portion 15, and the movable lever 14 moves depending on the manipulation amount of the manipulation portion 15. The resistor 23 (switch) outputs the signal corresponding to the manipulation amount of the manipulation portion 15 in the manipulation direction (arrow direction C1) to the control unit side of the sewing machine body 1 by sensing the movement position of the movable lever 14.

[0052] According to this embodiment, the manipulation portion 15 is movable in the locking direction (arrow directions B2 and E2) and the unlocking direction (arrow directions B1 and E1) unidentical to the manipulation direction as well as in the manipulation direction (arrow direction C1). For this reason, when the manipulation portion 15 is recovered to the corresponding initial position F1 (see Fig. 4), it is preferable that the movable lever 14 also be recovered to the corresponding initial position F2 (see Fig. 4). However, as described above, the manipulation portion 15 also slides in a direction intersecting the manipulation direction. For this reason, if both the manipulation portion 15 and the movable lever 14 are recovered by the same spring, the movable lever 14 may also move in the same direction in synchronization when the manipulation portion 15 moves in the locking direction (arrow directions B2 and E2). In this case, a slide magnitude between the resistor 23 and the contact point 13a of the movable lever 14 may be influenced. In this regard, the lever recovery spring 17 for recovering the movable lever 14 to the corresponding initial position F2 when the manipulation of the manipulation portion 15 in the manipulation direction is released is provided separately from the lock spring 8. The lever recovery spring 17 is a spring dedicated to the movable lever 14. The lock spring 8 is a spring dedicated to the manipulation portion 15.

(Second Embodiment)

[0053] Figs. 8 and 9 illustrate a second embodiment. Basically, a configuration and effects and advantages of this embodiment are similar to those of the aforementioned embodiment, and Figs. 1 to 7 will be correspondingly applied. A box-shaped housing 100 is provided to store the hand controller 3. The housing 100 includes first and second housing portions 101 and 102. The first housing portion 101 includes a bottom wall 101a, a side face wall 101b, and a side face wall 101c. The second housing portion 102 includes a ceiling wall 102a, a side face wall 102b, and a side face wall 102c. The housing 100 has a box shape and provides a chamber 104 for detachably storing the hand controller 3. One end portions 101e and 102e of the first and second housing portions 101 and 102, respectively, are provided with a pivot support portion 105 for pivoting. The other end portions 101f and 102f of the first and second housing portions 101 and 102, respectively, can relatively pivotable and openable (movable) through the pivot support portion 105. The first housing portion 101 forms a lower casing. The second housing portion 102 forms a cover. As illustrated in Fig. 9, the ceiling wall 102a of the second housing portion 102 is provided with a movement guide 110 directed to the bottom wall 101a of the first housing portion 101. The movement guide 110 includes a cam surface 111 inclined relative to a vertical line while the housing 100 is closed, a first surface 112 extending in a vertical

direction, and a second surface 113 extending in a horizontal direction.

[0054] As recognized from Fig. 8, the hand controller 3 is detachably stored in the chamber 104 of the housing 100 when it is used. In this case, the hand controller 3 is stored in the chamber 104 of the housing 100 in a positioned state by the positioning portion 107 of the first housing portion 101. In this state, as illustrated in Fig. 9, the positioning surface 107c of the positioning portion 107 makes contact with the side surface 7s of the hand controller 3 to set a position of the hand controller 3. The manipulation portion 15 of the hand controller 3 is upwardly projected more than the upper surface 107u of the positioning portion 107. However, without limiting thereto, the manipulation surface 15f of the manipulation portion 15 may face the ceiling wall 102a of the second housing portion 102.

[0055] If the chamber 104 becomes a closed space by closing the first and second housing portions 101 and 102, as recognized from Fig. 9, the movement guide 110 of the second housing portion 102 is lowered in the arrow direction D5, and the movement guide 110 slides the manipulation portion 15 of the hand controller 3 in the arrow direction B1 (unlocking direction) and then, moves the manipulation portion 15 of the hand controller 3 in the manipulation direction (arrow direction C1). In this case, since the movement guide 110 has an inclined cam surface 111, the manipulation portion 15 can automatically move in the arrow direction B1 (unlocking direction) as the cam surface 111 presses the manipulation portion 15. For this reason, by the hand controller 3, the manipulation portion 15 automatically moves from the locking position to the unlocking direction (arrow direction B1). In this manner, while the manipulation portion 15 is in the unlocked state, the side surface 15s of the manipulation portion 15 faces the first surface 112 of the movement guide 110. Therefore, the manipulation portion 15 is not allowed to move in the arrow direction B2 (locking direction). In addition, since the manipulation surface 15f of the upper surface of the manipulation portion 15 faces the second surface 113 of the movement guide 111, the pressing manipulation can be made for the manipulation portion 15 in the arrow direction C1 (manipulation direction) by the second housing portion 102. In this state, as a user pressedly manipulates the second housing portion 102 in the manipulation direction (arrow direction C1) with a hand or a foot, the manipulation portion 15 of the hand controller 3 is operated in synchronization. For this reason, as described above in the first embodiment, the adjustment manipulation for start/stop of the sewing, a sewing speed, or a sewing width from the hand controller 3 is signalized, and the signal is output to the sewing machine body 1 through the harness or wirelessly. Accordingly, control is executed by a microcomputer internally provided in the sewing machine.

[0056] If the second housing portion 102 moves to be separated from the first housing portion 101, that is, if the first and second housing portions 101 and 102 are opened, the cam surface 111 of the movement guide 110 and the manipulation surface 15f of the manipulation portion 15 are separated from each other. Therefore, the manipulation portion 15 moves in the arrow direction B2 (locking direction) so as to be automatically recovered to the locking position and locked. In addition, the relative movement between the first and second housing portions 101 and 102 may be achieved by moving at least one of the first and second housing portions 101 and 102.

[0057] When the hand controller 3 is used, the relative movement between the first and second housing portions 101 and 102 may be performed with a user's hand. Alternatively, a user's foot may be used like the foot stepping or the like. In the latter case, a foot controller 3F for performing a stepping manipulation with a user's foot is provided.

[0058] When the foot controller 3F having such a structure is used, the manipulation portion 15 is unlocked by the movement guide 110 of the second housing portion 102 at all times, so that the foot controller 3F can be used as a stepping type foot controller. For this reason, compared to a case where a user uses two types of controllers, it is possible to advantageously obtain each function with low cost if a user uses an inexpensive box-shaped housing 100.

[0059] According to this embodiment, even when a force is mistakenly applied to the manipulation portion 15 for some reason (for example, a user, a body of a third party, or other objects may unintentionally make touch, and the like) when a user does not intend to operate the sewing machine during the sewing preparation and the like, the manipulation portion 15 is locked, and the signal for operating the sewing machine is not output, so that safety is guaranteed for a user. When a user removes a hand from the manipulation portion 15, the manipulation portion 15 is automatically recovered to the locking state. Therefore, especial manipulation is not required for a user, and it is possible to reliably operate the safety function.

(Other Embodiments)

[0060] Although the manipulation portion 15 and the movable lever 14 are separate components in the aforementioned embodiments, the manipulation portion 15 and the movable lever 14 may be integrated with each other depending on a structure of the switch for sensing the movement position of the movable lever 14. In this case, since a biasing force of the lock spring 8 is utilized, the lever recovery spring 17 may be removed. Although a user performs unlocking by moving the manipulation portion 15 in the arrow direction B1 and then moves it in the arrow direction C1, the invention is not limited thereto. Instead, unlocking may be performed by slightly moving the manipulation portion 15 in the arrow direction C1 and then moving it in the arrow direction B1, and then the manipulation portion 15 may move in the arrow direction C1. A user may also manipulate the manipulation portion 15 in a combined direction between the arrow directions

B1 and C1 with a finger. The invention is not limited to the embodiments described above in conjunction with the appended drawings, and may be appropriately modified without departing from the spirit and scope of this disclosure.

Claims

1. A sewing machine controller manipulated by a user to output a sewing-related signal, **characterized by** comprising:

   a base body (7);
   a manipulation portion (15) that is provided in the base body (7) such that a part thereof is exposed from the base body (7) so as to allow a user to perform manipulation, moves in a predetermined manipulation direction (C1) through user manipulation to directly or indirectly output a sewing-related signal, and is movable in a locking direction (B2) and an unlocking direction (B1) unidentical to the manipulation direction (C1);
   a locking portion (12b) provided in the base body (7) to define a locking position for restricting movement of the manipulation portion (15) in the manipulation direction (C1);
   an unlocking portion provided in the base body (7) to release the locking of the locking portion (12b) and enables user manipulation for moving the manipulation portion (15) in the unlocking direction (B1) unidentical to the manipulation direction (C1); and
   a lock spring (8) provided in the base body (7) to exert a biasing force for automatically recovering the manipulation portion (15) to the locking position when the user manipulation for the manipulation portion (15) is released.

2. The sewing machine controller according to claim 1, wherein the lock spring (8) exerts a first biasing force for automatically recovering the manipulation portion (15) to the locking position when the user manipulation for the manipulation portion (15) is released and a second biasing force for automatically recovering the manipulation portion (15) to an initial position of the manipulation portion (15) before the user manipulation by biasing the manipulation portion (15) to a direction (C2) opposite to the manipulation direction (C1).

3. The sewing machine controller according to claim 2, wherein the lock spring (8) includes a coil spring portion (80) that is formed by winding a coil wire in a coil shape, has a gap (84) between neighboring coil wires, and is compressible in an axial direction, a first arm portion (81) extending from one end of the coil spring portion (80), and a second arm portion (82) extending from the other end of the coil spring portion (80), and
   wherein the coil spring portion (80) exerts the first biasing force, and the first and second arm portions (81, 82) exert the second biasing force.

4. The sewing machine controller according to any one of claims 1 to 3, wherein the base body (7) is provided with a movable lever (14) pressed by the manipulation portion (15) when the manipulation portion (15) is manipulated in the manipulation direction (C1), and a switch base (12) having a switch for outputting, to a sewing machine side, a signal corresponding to a manipulation amount of the manipulation portion (15) in the manipulation direction (C1) by sensing a movement position of the movable lever (14), and a lever recovery spring (17) is provided for recovering the movable lever (14) to a corresponding initial position (F2) when a manipulation of the manipulation portion (15) is released.

5. The sewing machine controller according to any one of claims 1 to 4, further comprising: a housing (100) that forms a chamber (104) for storing the base body (7) having the manipulation portion (15), includes first and second housing portions (101, 102) that are relatively movable, and is capable of foot-stepping with a user's foot; and a movement guide (110) formed in the first or second housing portions (101, 102) to move the manipulation portion (15) of the base body (7) in an unlocking direction (B1) against the biasing force of the lock spring (8) while the base body (7) is stored in the chamber (104) of the housing (100),
   wherein the manipulation portion (15) moves in the manipulation direction (C1) by the relative movement between the first and second housing portions (101, 102), and a sewing-related signal is output to a sewing machine side.

6. A sewing machine, **characterized by** comprising the sewing machine controller according to claim any one of claims 1 to 5.

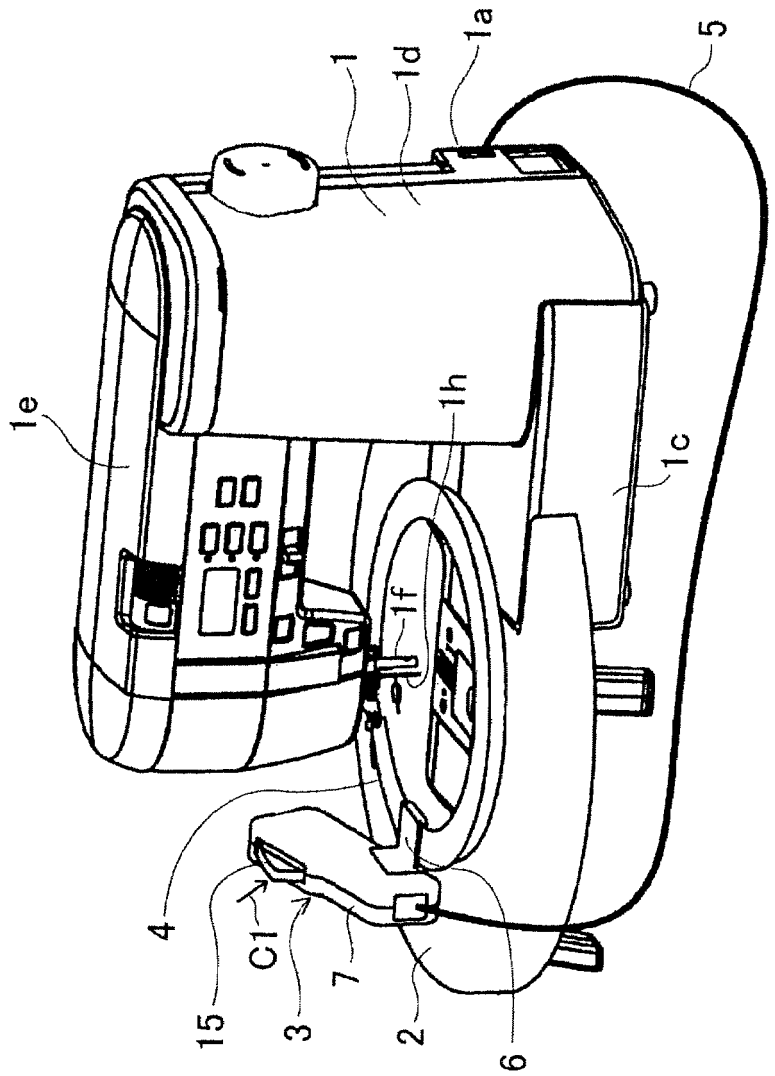

FIG. 1

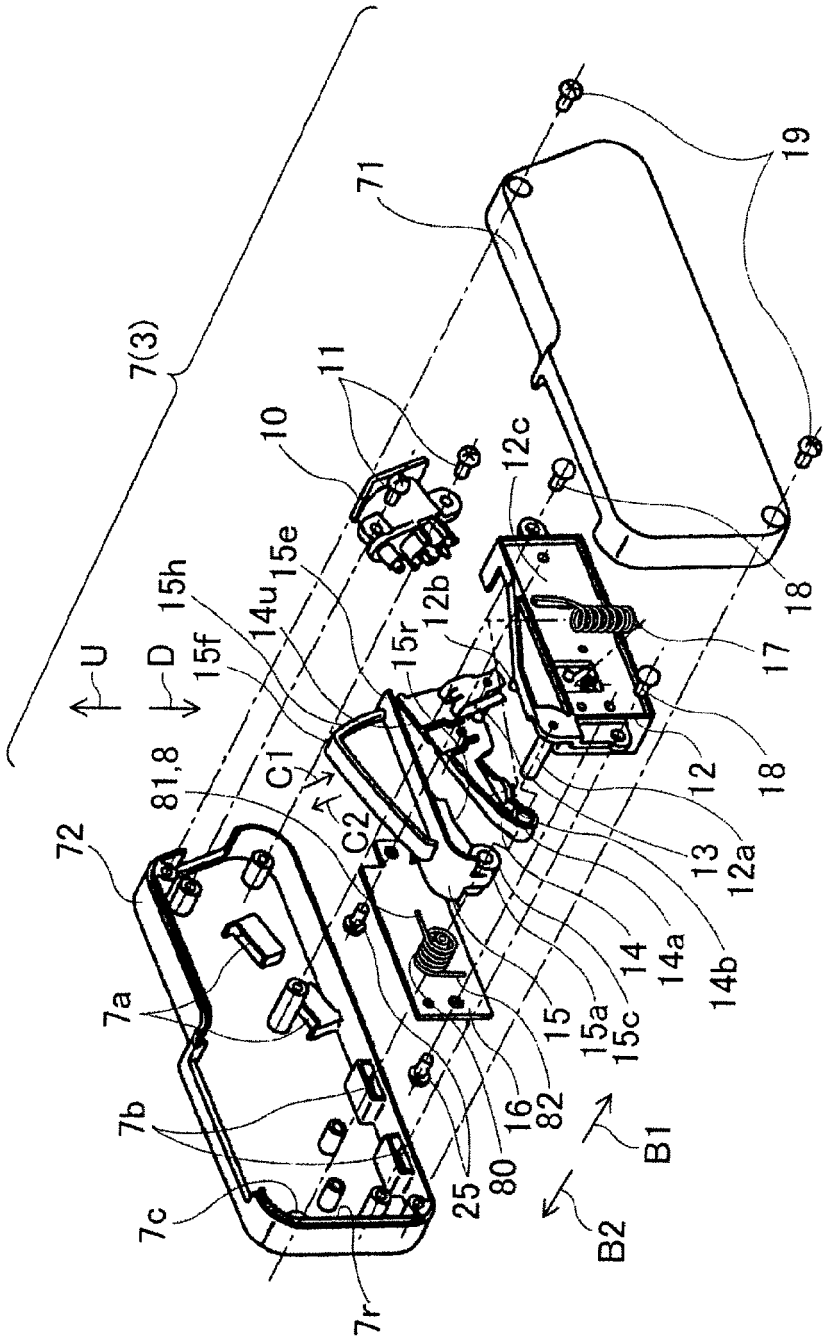
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FIG. 2

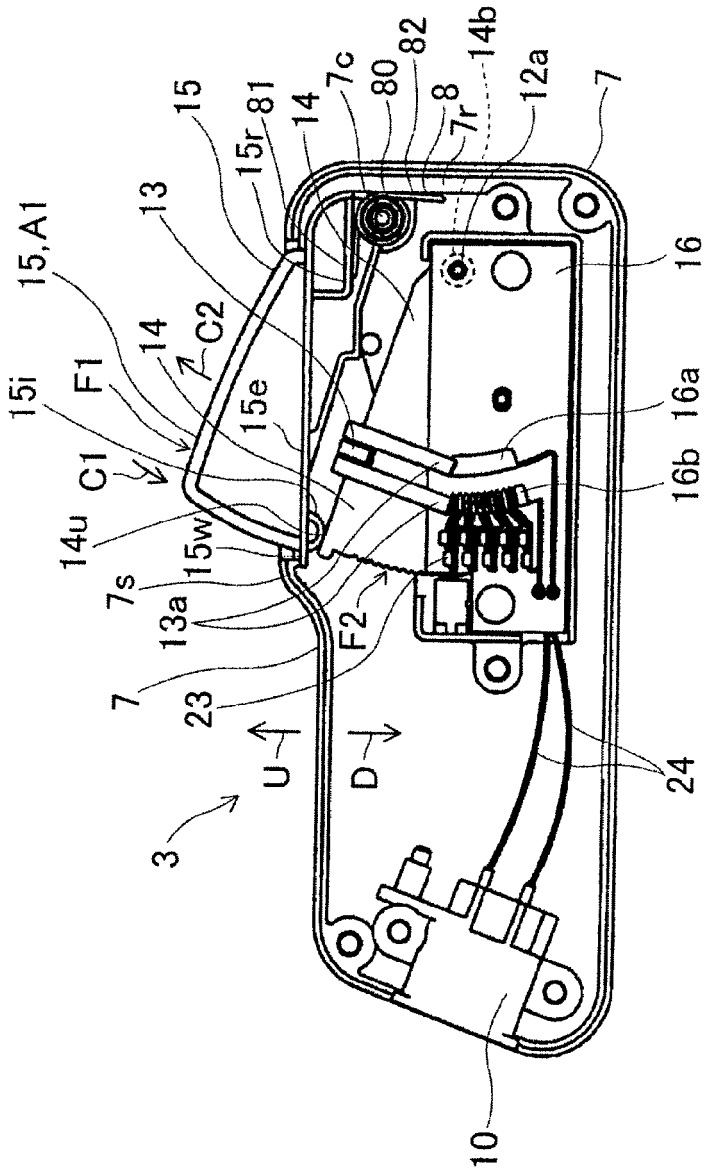
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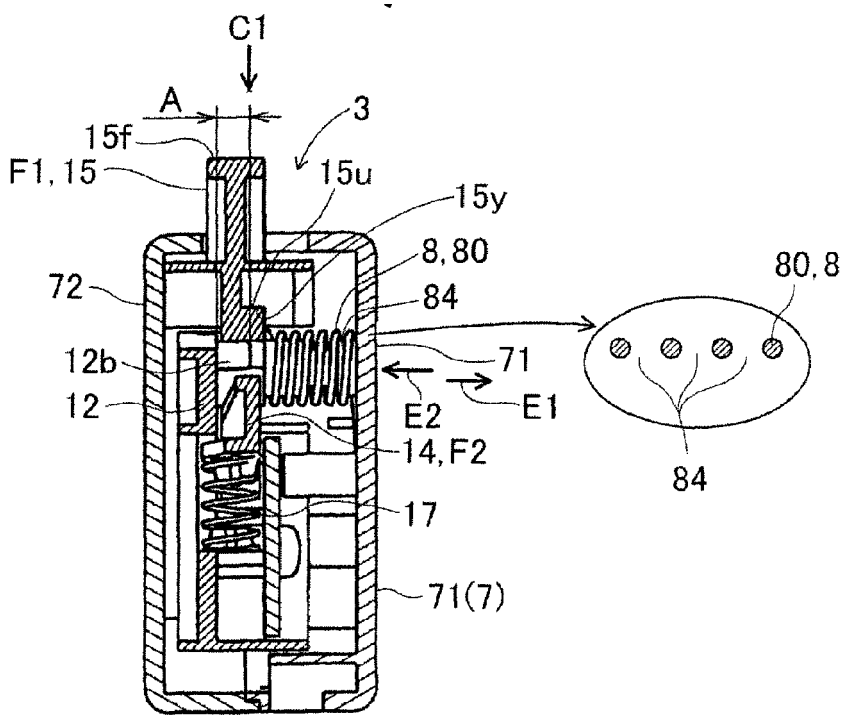
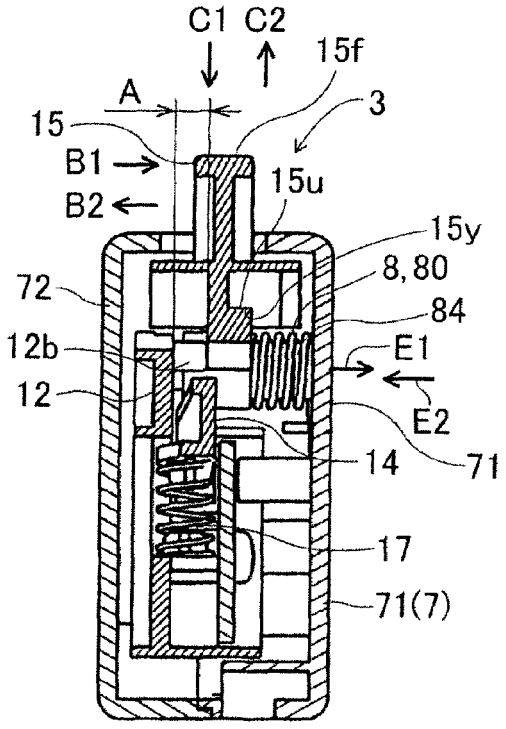
FIG. 3



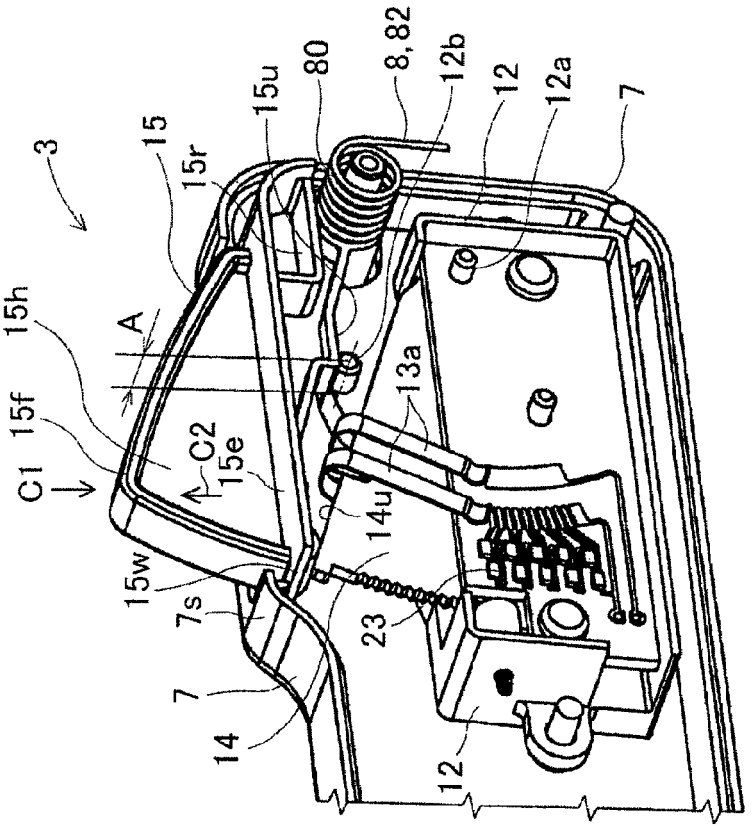
LOCKING STATE OF MANIPULATION PORTION

FIG. 4



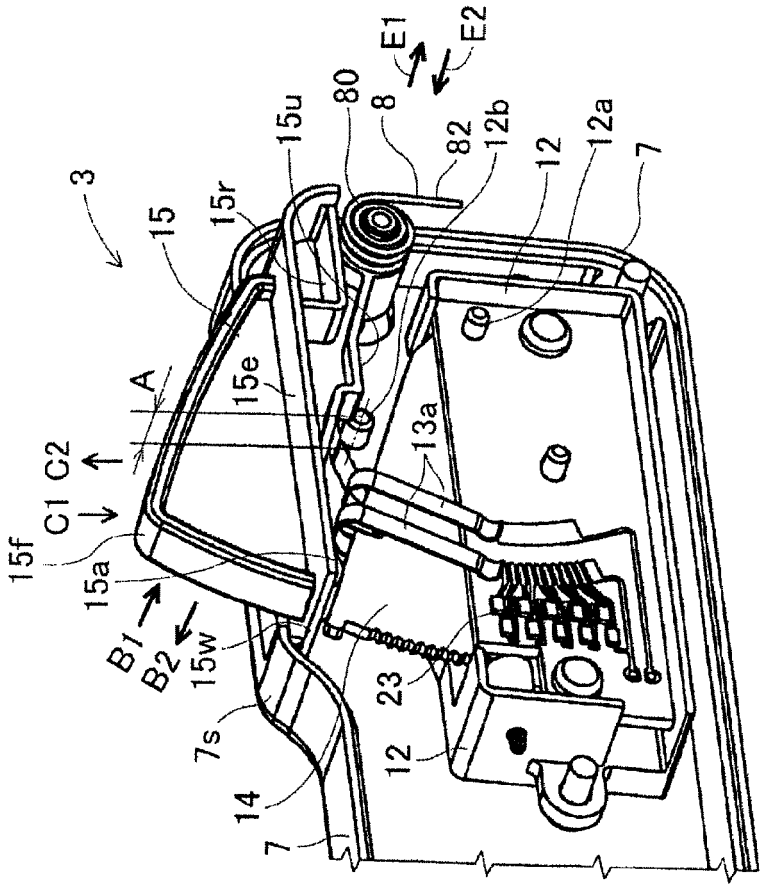
UNLOCKING STATE OF MANIPULATION PORTION

FIG. 5



LOCKING STATE OF MANIPULATION PORTION

FIG. 6



UNLOCKING STATE OF MANIPULATION PORTION

FIG. 7

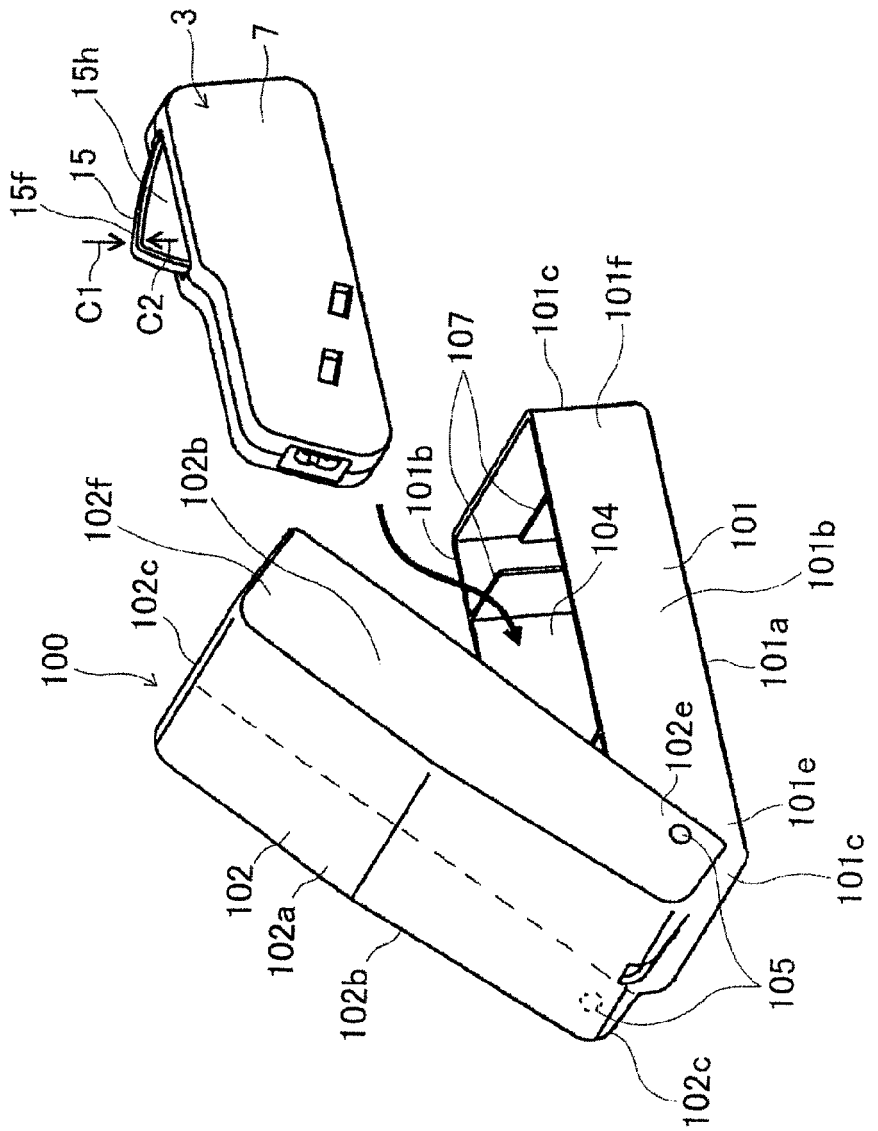

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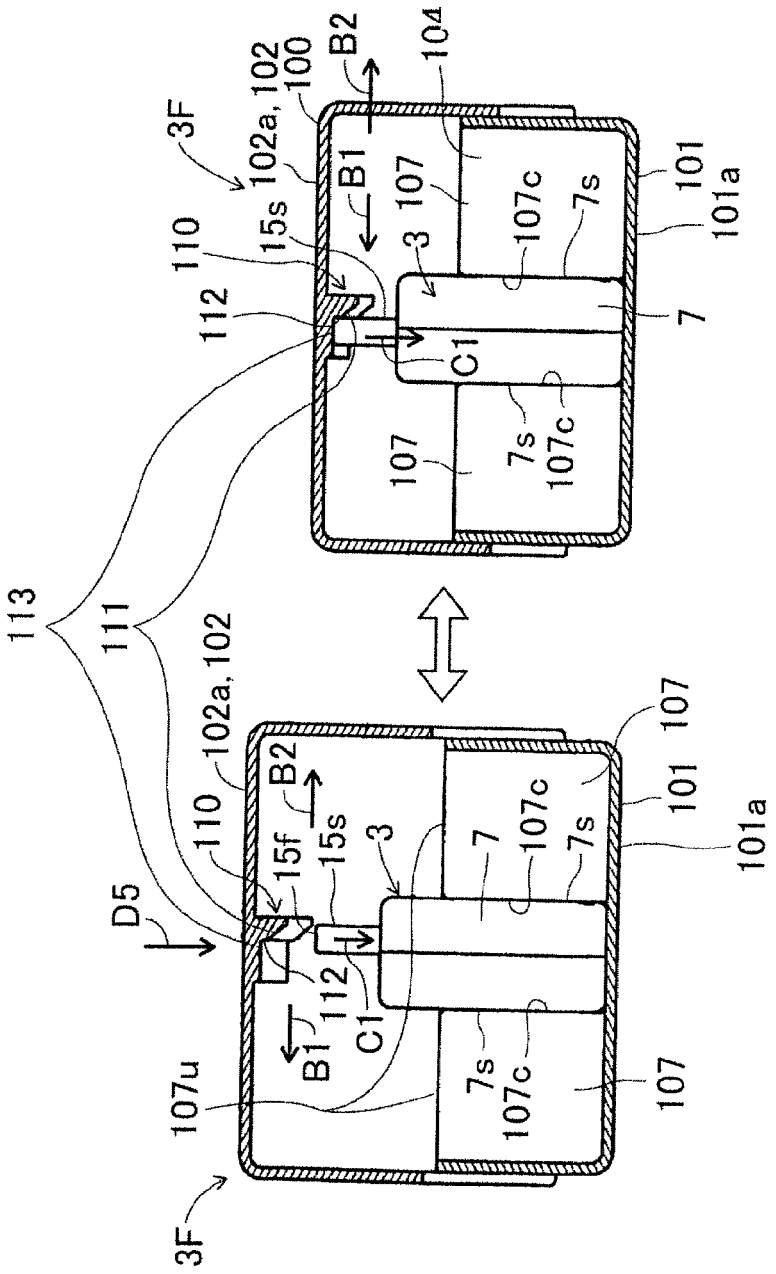
FIG. 8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3F

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 8534

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	DE 299 07 407 U1 (PFAFF AG G M [DE]) 12 August 1999 (1999-08-12) * page 2, line 12 - page 4, line 21; figures 1-3 * -----	1-6	INV. D05B69/36
A	US 2010/313805 A1 (KISHI MOTOSHI [JP]) 16 December 2010 (2010-12-16) * paragraph [0024] - paragraph [0091]; figures 1-15 * -----	1-6	
A	US 3 665 878 A (KOSCHOFF JOHN ET AL) 30 May 1972 (1972-05-30) * column 2, line 21 - column 6, line 39; figures 1-8 * -----	1-6	

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	13 September 2012	Herry-Martin, D

CATEGORY OF CITED DOCUMENTS

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1

EPO FORM 1503 03.82 (P04C01)

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13-09-2012

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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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- JP 4571832 A **[0003]**
- JP 2004275388 A **[0004]**