

LOCK DEVICE AND FITTING

CROSS-REFERENCE TO RELATED APPLICATIONS

The application is based on and claims the benefit of priority from Japanese Patent Application No. 2010-262619, filed in Japan on November 25, 2010, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a lock device and fittings to which the lock device is applied.

2. Description of the Related Art

Some fittings, in which a sliding screen such as a glass window or a door is supported with respect to an opening frame so as to be opened and closed, include a plurality of engagement units between the opening frame and the sliding screen. The fittings also include a lock device that switches the engagement units simultaneously between an engaged state and a non-engaged state, by operating a handle provided with a stile of the sliding screen.

For example, in a lock device including two engagement units at upper and lower sides between a longitudinal stile

located at a door end side of a sliding screen and an opening frame, an operation mechanism is provided inside the longitudinal stile located at the door end side. The operation mechanism is operated by a handle provided with the longitudinal stile and is arranged between the two engagement units. A gear and a slider are provided with the operation mechanism.

The gear is formed in a circular plate shape, and teeth are formed on a circumferential end of the gear. A square-shaped through-hole is formed at the center of the gear. A square shaft coupled to the handle penetrates through the through-hole. The square shaft rotates about its center axis in accordance with an operation of the handle, so that the gear also rotates together with the square shaft.

The slider meshes with a portion of the teeth formed on the gear and is slidingly moved along the vertical direction with respect to the longitudinal stile in accordance with the rotation of the gear, that is, the operation of the handle. The slider is linked to each of the engagement units. If the slider is slidingly moved in the vertical direction, the engagement units can be simultaneously switched.

In the lock device configured as described above, if the handle is operated to one side from a state where the

sliding screen is closed with respect to the opening frame, the gear is rotated together with the square shaft to cause the slider to be slidingly moved to, for example, the upper side with respect to the longitudinal stile. Each of the two engagement units is engaged with the opening frame, i.e. the engaged state, so that the sliding screen can be maintained to be in a state of being closed with respect to the opening frame. On the other hand, if the handle is operated to the other side from the above state, the gear is rotated together with the square shaft to cause the slider to be slidingly moved to, for example, the lower side with respect to the longitudinal stile. Each of the two engagement units is released from the opening frame, i.e., the non-engaged state. Accordingly, if the sliding screen is moved in an opening direction, the sliding screen will be able to be opened with respect to the opening frame.

According to the fittings including the lock device of this type, the sliding door becomes engaged with the opening frame at a plurality of positions. Therefore, not only can robustness be enhanced but also airtightness of a structure to which the fittings are applied can be improved.

In the above lock device, the handle as an operation portion is attached to a width face of the longitudinal stile on an indoor side, while the slider constituting an operation mechanism is provided on an outer side of a depth

face of the longitudinal stile. Such conventional technique is disclosed in, for example, Japanese Patent Application Laid-open No. 2008-231832.

Unlike the lock device as described above, another lock device, in which a handle as an operation portion is attached to an inner side of a depth face of a longitudinal stile (door end stile) located on the door end side, has been known.

In this type of lock device, the configuration described in Japanese Patent Application Laid-open No. 2008-231832 cannot be employed, and the handle, a gear, and a slider are arranged on a substantially straight line from the inner side (inner side in an in-plane direction) of the longitudinal stile to the outer side (outer side in the in-plane direction) thereof. A square shaft has the following characteristics. From a manufacturing viewpoint, the dimension accuracy at a center portion and a base end of the square shaft is higher than that at a front end; from a view point of assembly when the square shaft is to be inserted into the gear, chamfer processing is performed on the front end of the square shaft. Therefore, the gear through which the square shaft penetrates is located at the sides of the center portion and the base end of the square shaft, so that the gear can preferably rotate about the center axis of the square shaft together with the square

shaft by operating the handle. Accordingly, a sufficient space is required between the gear and the slider such that the front end of the square shaft penetrating through the gear does not interfere with the slider.

Accordingly, in the lock device in which the handle is attached to the inner side of the depth face of the door end stile, a sufficient space is required between the gear and the slider. As a result, this causes a problem that the thickness of the entire device is undesirably increased, and also causes another problem that if the thickness of a pedestal portion of the handle is increased for ensuring sufficient space, a design property is deteriorated.

SUMMARY OF THE INVENTION

In consideration of the above circumstances, an object of the invention is to provide a lock device whose entire thickness from an inner side of a stile in an in-plane direction to an outer side thereof in the in-plane direction can be made smaller, where the inner side of the stile is to be attached. Another object of the invention is to provide a lock device whose design property can be improved. Still another object of the invention is to provide fittings including the lock device.

The invention is directed to a lock device and fittings that incorporate the lock device.

A first aspect of the invention relates to a lock device. The lock device includes a cover that is attached to a depth face of a stile by a cover attachment screw; a gear that is provided such that a square shaft rotating about a center axis in accordance with an operation of an operation portion penetrates through a through-hole thereof and rotates together with the square shaft; and a slider that meshes with a portion of teeth formed on a circumferential end of the gear and slidingly moves in accordance with rotation of the gear. The slider contains an insertion hole through which a front end of the square shaft penetrating through the gear is inserted. Moreover, the lock device includes a restriction portion that is interposed between the gear and the slider to restrict the gear and the slider from making contact with each other. The lock device is switched between an engaged state and a non-engaged state with respect to an opening frame based on the sliding movement of the slider.

According to the structure, since the slider has the insertion hole through which a front end of the square shaft penetrating through the gear is inserted, the gear and the slider can be arranged to be closer to each other. In addition, since the restriction portions, which are interposed between the gear and the slider, control the gear and the slider not to make contact with each other,

the teeth of the gear can be prevented from interfering with the insertion hole of the slider.

A second aspect of the invention relates to the lock device that further includes a base attached to the cover, wherein the restriction portion is integrally provided with the base.

According to the structure, too, since the restriction portions, which are interposed between the gear and the slider, control the gear and the slider not to make contact with each other, the teeth of the gear can be prevented from interfering with the insertion hole of the slider.

A third aspect of the invention relates to the lock device, wherein the insertion hole has a long hole elongated in a sliding movement direction of the slider, and the restriction portion constitutes an accommodation portion that accommodates therein the gear on the base and is provided so as to project to one direction and the other direction in the sliding movement directions of the slider.

According to the structure, when the slider slidably moves relatively to the square shaft and the gear, the front end of the square shaft and an edge of the gear can be reliably prevented from interfering with the slider.

A fourth aspect of the invention relates to fittings. The fittings include the lock device according to one of the first to third aspects applied between an opening frame

and a stile.

According to the structure, since the slider has the insertion hole through which a front end of the square shaft penetrating through the gear is inserted, the gear and the slider can be arranged to be closer to each other. In addition, since the restriction portions, which are interposed between the gear and the slider, control the gear and the slider not to make contact with each other, the teeth of the gear can be prevented from interfering with the insertion hole of the slider. Therefore, the size of the lock device from the inner side thereof in the in-plane direction to the outer side thereof in the in-plane direction can be made smaller, which leads a pedestal portion and the like of the operation portion not to be made larger.

According to the invention, since the gear and the slider can be arranged to be closer to each other and the teeth of the gear do not interfere with the insertion hole of the slider, the size of the lock device can be reduced and the pedestal portion and the like of the operation portion are not required to be made larger. Accordingly, the thickness of the entire device can be made smaller and the design property can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a descriptive view illustrating fittings to which a lock device according to an embodiment of the invention is applied, that is, the fittings according to the embodiment seen from an indoor side.

Fig. 2 is a descriptive view illustrating an outer side of a longitudinal stile illustrated in Fig. 1 in a depth face in-plane direction.

Fig. 3 is a cross-sectional view taken along a line A-A in Fig. 2.

Fig. 4 is an exploded perspective view illustrating a configuration illustrated in Fig. 3.

Fig. 5 is an exploded perspective view illustrating a handle mechanism illustrated in Fig. 4.

Fig. 6 is a descriptive view illustrating assembling procedures of a handle unit constituting the handle mechanism illustrated in Fig. 5, before a pin member is inserted.

Fig. 7 is a descriptive view illustrating the assembling procedures of the handle unit constituting the handle mechanism illustrated in Fig. 5, when the inserted pin member is covered by a disengagement prevention piece.

Fig. 8 is a descriptive view illustrating the assembling procedures of the handle unit constituting the handle mechanism as illustrated in Fig. 5, where a positional relationship is shown in which a square shaft is

to be inserted into a second washer and a square shaft base.

Fig. 9 is a descriptive view illustrating the assembling procedures of the handle unit constituting the handle mechanism as illustrated in Fig. 5, where the second washer and the square shaft base are fit into the square shaft.

Fig. 10 is an exploded perspective view illustrating an operation mechanism illustrated in Fig. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, a preferred embodiment of a lock device and fittings according to the invention is described in detail with reference to accompanying drawings.

Fig. 1 is a descriptive view illustrating fittings to which a lock device according to an embodiment of the invention is applied, that is, the fittings according to the embodiment seen from an indoor side. The fittings illustrated in Fig. 1 include an opening frame 10 and a sliding screen 20.

The opening frame 10 is constituted by assembling an upper frame 11, a lower frame 12 and a pair of longitudinal frames 13a and 13b as extruded materials made of aluminum at four sides, and has a rectangular shape. The sliding screen 20 is constituted by assembling an upper stile 21, a lower stile 22, and a pair of longitudinal stiles 23a and

23b as extruded materials made of aluminum at four sides and by arranging a face material 24 such as a glass plate on a portion surrounded by the upper stile 21, the lower stile 22, and the pair of longitudinal stiles 23a and 23b.

The sliding screen 20 is constituted to have such a size that the sliding screen 20 can close an opening of the opening frame 10 when the sliding screen 20 is arranged in the opening frame 10. The sliding screen 20 according to the embodiment is supported on the opening frame 10 by a hinge 1 interposed between the longitudinal stile 23a and the longitudinal frame 13a. The sliding screen 20 rotates about an axis of the hinge 1 along the vertical direction so as to open and close the opening of the opening frame 10.

Fig. 2 is a descriptive view illustrating an outer side of the longitudinal stile illustrated in Fig. 1 in a depth face in-plane direction. Fig. 3 is a cross-sectional view taken along a line A-A in Fig. 2. Fig. 4 is an exploded perspective view illustrating a configuration illustrated in Fig. 3.

As illustrated in Fig. 1 to Fig. 4, with respect to the sliding screen 20, a slide guide 25 is provided with a depth face at an outer side (hereinafter, also referred to as a door end face) 23b1 of the longitudinal stile (hereinafter, referred to as a door end stile) 23b located at the door end side, where the depth face at the outer

side 23b1 is opposed to the longitudinal frame 13b of the opening frame 10. Furthermore, a handle attachment recess 26 and a button attachment recess 27 are provided with a depth face at the inner side (hereinafter, referred to as an inner-side depth face) 23b2 of the door end stile 23b. It is to be noted that in the embodiment, a description is made while the side of the face material 24 on the door end stile 23b is appropriately referred as an inner side in the in-plane direction and the side of the longitudinal frame 13b on the door end stile 23b is appropriately referred as an outer side in the in-plane direction.

The slide guide 25 is provided with a region located on the indoor side on the door front face 23b1 of the door front stile 23b, along the lengthwise direction thereof. The slide guide 25 is integrated with the door end stile 23b and is molded simultaneously when the door end stile 23b is molded by extrusion.

The handle attachment recess 26 is provided on the side opposite to the slide guide 25 on the inner-side depth face 23b2. A through hole 26a is formed on a bottom of the handle attachment recess 26. The button attachment recess 27 is provided on the lower side of the handle attachment recess 26.

Furthermore, on the sliding screen 20, as illustrated in Fig. 1 to Fig. 4, a lock device 30 is provided with the

door end stile 23b and includes a handle mechanism 40 and an operation mechanism 60. The lock device 30 is switched between an engaged state and a non-engaged state, where the lock device 30 is engaged and not engaged with a lock reception portion (not illustrated) attached to the longitudinal frame 13b of the opening frame 10. The lock device 30, when in the engaged state, maintains a state where the sliding screen 20 is closed with respect to the opening frame 10.

Fig. 5 is an exploded perspective view illustrating a handle mechanism illustrated in Fig. 4. The handle mechanism 40 is referred as a so-called flip handle and includes a handle unit 40a and a button unit 50a. The handle mechanism 40 is attached to the inner-side depth face 23b2 of the door end stile 23b through a handle base 31. The handle base 31 is a long member whose vertical direction corresponds to the lengthwise direction. The handle base 31 forms openings through which the handle unit 40a and the button unit 50a penetrate, respectively.

The handle unit 40a includes an operation handle (operation portion) 41, a square shaft constituting portion 42, and a pair of washers 43a and 43b. The operation handle 41 has a gripping portion 41a that an operator grips, and two handle attachment pieces 41b, at a base end, projecting to an outer side in the in-plane direction (to a

side of the square shaft constituting portion 42). Each of these handle attachment pieces 41b forms an attachment hole 41c thereon.

The square shaft constituting portion 42 has a flat plate-shaped base portion 42a, a quadrangular prism-shaped square shaft 42b, and two square shaft attachment pieces 42c. The square shaft 42b projects from the base portion 42a to the outer side in the in-plane direction. The square shaft attachment pieces 42c project from the base portion 42a to the inner side in the in-plane direction (to the side of the operation handle 41). These square shaft attachment pieces 42c are formed to be narrower in width than the handle attachment pieces 41b, and form an attachment hole 42d thereon, respectively. A restriction projection 42a1 projecting outside of a diameter is formed on the base portion 42a. The restriction projection 42a1 stops rotating the operation handle 41 at approximately 90°.

Each of the pair of washers 43a and 43b is formed by an elastic material, and is provided so as to sandwich the square shaft constituting portion 42 from the inner side in the in-plane direction and the outer side in the in-plane direction (sandwich in the thickness direction of the lock device 30). The pair of washers 43a and 43b includes concaves and convexes so that they can be fitted into each other.

The washer (hereinafter, also referred as a first washer) 43a on the inner side in the in-plane direction of the pair of washers 43a and 43b includes a disengagement prevention piece 43a1 projecting to the inner side in the in-plane direction, while the washer (hereinafter, also referred to as a second washer) 43b on the outer side in the in-plane direction includes a square hole 43b1 through which the square shaft 42b can penetrate. Reference numerals 44 and 45 in Fig. 5 indicate a square shaft base and a square shaft cover, respectively. A hole through which the square shaft 42b can penetrate is formed on the square shaft base 44. Holes through which the disengagement prevention piece 43a1 of the first washer 43a and the square shaft attachment pieces 42c of the square shaft constituting portion 42 can penetrate are formed on the square shaft cover 45. Furthermore, a locking projection 44a projecting to the upper side is provided with the square shaft base 44.

Fig. 6 to Fig. 9 are descriptive views illustrating assembling procedures of the handle unit constituting the handle mechanism as illustrated in Fig. 5. The assembling procedures of the handle unit are described with reference to Fig. 6 to Fig. 9 appropriately. It is to be noted that in Fig. 6 to Fig. 9, the handle base 31 is not illustrated.

As illustrated in Fig. 6, from the state illustrated in Fig. 5 in which the handle mechanism is disassembled,

the square shaft constituting portion 42, the first washer 43a, the square shaft cover 45 and the operation handle 41 are overlapped with each other. At this time, the square shaft attachment pieces 42c of the square shaft constituting portion 42 and the disengagement prevention piece 43a1 of the first washer 43a penetrate through the hole of the square shaft covers 45. The square shaft attachment pieces 42c are moved such that the attachment holes 41c and 42d match with each other between the handle attachment pieces 41b on the inner side of the square shaft cover 45 in the in-plane direction. It is to be noted that the first washer 43a is rotated about the center axis of the square shaft 42b such that the attachment holes 42d, through which a pin member 47 passes first, and the disengagement prevention piece 43a1 of the first washer 43a are not opposed to each other. The pin member 47 will be described later. A torsion coil spring 46 is inserted between the square shaft attachment pieces 42c. It is to be noted that although not illustrated in Fig. 6, the operation handle 41 is overlapped with each other from the inner side of the handle base 31 in the in-plane direction and the handle base 31 is interposed between the operation handle 41 and the square shaft cover 45.

From the state as illustrated in Fig. 6, the pin member 47 is made to be inserted through the attachment

holes 41c and 42d of the handle attachment pieces 41b and the square shaft attachment pieces 42c, both of which are overlapped with each other. In this case, the pin member 47 is also inserted through a winding portion of the torsion coil spring 46. The diameter of a head portion of the pin member 47 is enlarged, so that the pin member 47 does not penetrate through the attachment holes 41c and 42d completely. That is to say, when the pin member 47 is inserted, the head portion of the pin member 47 is locked to the attachment hole 41c through which the pin member 47 passes first. Therefore, the head portion of the pin member 47 is exposed when the insertion of the pin member 47 has been completed.

In this way, the pin member 47 is inserted through the attachment holes 41c and 42d of the handle attachment pieces 41b and the square shaft attachment pieces 42c and is inserted through the winding portion of the torsion coil spring 46 inserted between the square shaft attachment pieces 42c. As a result, the operation handle 41 is biased about the center axis of the pin member 47 so as to be separated from the square shaft constituting portion 42.

Thereafter, as illustrated in Fig. 7, the first washer 43a is rotated about the center axis of the square shaft 42b on the square shaft constituting portion 42 and the first washer 43a is made to be opposed to the head portion

of the pin member 47, so that the disengagement prevention piece 43a1 can cover the head portion of the pin member 47. Therefore, the pin member 47 can be prevented from being disengaged due to an operation of the operation handle 41, and the like.

As illustrated in Fig. 8, from the state illustrated in Fig. 7, the second washer 43b and the square shaft base 44 are assembled such that the square shaft 42b of the square shaft constituting portion 42 relatively enter each of the square hole 43b1 of the second washer 43b and the hole of the square shaft base 44. As illustrated in Fig. 9, while the second washer 43b is being fitted into the first washer 43a, the square shaft cover 45 is fitted into the square shaft base 44. Thereafter, as illustrated in Fig. 5, the square shaft base 44 and the square shaft cover 45, which are fitted into each other by handle unit attachment screws 48, are attached to the handle base 31.

In the handle unit 40a having the above configuration, the square shaft 42b of the square shaft constituting portion 42 can rotate about its center axis in a range of predetermined angles (0° to 90°) by operating the operation handle 41.

The button unit 50a includes an operation button 51 and a button base 52. With respect to the operation button 51, an inner face thereof in the in-plane direction serves

as an operation face that an operator operates, and two button attachment pieces 51a projecting to the outer side in the in-plane direction are provided. An attachment hole 51b is formed on each of the button attachment pieces 51a, and a stop piece 51c projecting to the upper side is formed. The stop pieces 51c are ones for positioning the buttons.

The button base 52 includes an opening through which the button attachment pieces 51a of the operation button 51 can enter is provided with the center thereof, and two base attachment pieces 52a projecting to the inner side in the in-plane direction. These base attachment pieces 52a are formed to be larger in width than the button attachment pieces 51a, and include an attachment hole 52b, respectively.

The button unit 50a having the above configuration is constituted by overlapping the button base 52 and the operation button 51, with the handle base 31 interposed therebetween. At this time, the base attachment pieces 52a of the button base 52 are moved to penetrate through an opening of the handle base 31, and the button attachment pieces 51a are moved such that the attachment holes 51b and 52b match with each other between the base attachment pieces 52a on the inner side of the handle base 31 in the in-plane direction. A torsion coil spring 53 is inserted between the button attachment pieces 51a. Then, a pin

member 54 is inserted through the attachment holes 51b and 52b of the button attachment pieces 51a and the base attachment pieces 52a, which are overlapped mutually. In this case, the pin member 54 is also inserted through a winding portion of the torsion coil spring 53. Since the diameter of a head portion of the pin member 54 is enlarged, the pin member 54 does not penetrate through the attachment holes 51b and 52b completely. Thereafter, the button base 52 is attached to the handle base 31 by button base attachment screws 55.

With respect to the button unit 50a, which will not be described in detail, the operation button 51 is biased to the inner side in the in-plane direction about the center axis of the pin member 54, by the torsion coil spring 53. Accordingly, when an upper end of the operation button 51 fits into a lower end of the operation handle 41, the operation button 51 is prevented from rotating about the center axis of the pin member 54 by the biasing force of the torsion coil spring 53. Thereafter, when the operation face of the operation button 51 is pressed by the operator and the operation button 51 rotates to the outer side in the in-plane direction about the center axis of the pin member 54, against the biasing force of the torsion coil spring 53, the fit-into state between the upper end of the operation button 51 and the lower end of the operation

handle 41 is released. With this, the operation handle 41 is made into a free state and is biased by the torsion coil spring 46 to rotate to the inner side in the in-plane direction about the center axis of the pin member 47. This enables the operator to grip the gripping portion 41a so as to operate the operation handle 41.

The handle base 31, to which the handle unit 40a and the button unit 50a are attached, is attached to the inner depth face 23b2 of the door end stile 23b by a screw (not illustrated) so as to cover the handle attachment recess 26 and the button attachment recess 27, as illustrated in Fig. 4. At this time, the square shaft 42b constituting the handle unit 40a penetrates through the opening 26a of the handle attachment recess 26. Furthermore, the locking projection 44a of the square shaft base 44 is locked to an upper edge of the handle attachment recess 26 of the door end stile 23b.

The operation mechanism 60 is attached to the slide guide 25 on the door end face 23b1 of the door end stile 23b, as illustrated in Fig. 3 and Fig. 4. The operation mechanism 60 includes a cover 61, a base 62, a gear 63, and a slider 64, as illustrated in Fig. 10.

The cover 61 is attached to the slide guide 25 of the door end stile 23b by cover attachment screws 61a (see Fig. 2) and ensures a movement space between the door front

stile 23b and itself.

The base 62 is attached to the cover 61 by base attachment screws 62a in order to ensure a movement space. A circular hole 62b that allows the square shaft 42b constituting the handle mechanism 40 to penetrate therethrough is formed at the center of the base 62. An accommodation portion 62d is formed on the base 62 at the outer side of a portion on which the circular hole 62b is formed in the in-plane direction, that is, at the side of the cover 61. The accommodation portion 62d accommodates therein the gear 63.

The accommodation portion 62d allows the gear 63 to enter from the outdoor side (one side in the indoor-outdoor direction). Restriction pieces 62d1 and 62d2 are integrally provided with an upper end and a lower end of the accommodation portion 62d at an outer end thereof in the in-plane direction. The restriction pieces 62d1 and 62d2 project to the lower side and the upper side, respectively.

The gear 63 is formed in a circular plate shape, with teeth formed on a circumferential end face thereof. A square shaped through-hole 63a is formed at the center of the gear 63. The through-hole 63a has such a size that the through-hole 63a matches with the square shaft 42b of the handle mechanism 40 that penetrates through the circular

hole 62b of the base 62. The gear 63 rotates integrally with the square shaft 42b when the square shaft 42b rotates about the center axis thereof. Since the square shaft 42b rotates in a range of predetermined angles by operating the operation handle 41 as described above, the gear 63 also rotates together with the square shaft 42b by operating the operation handle 41.

The slider 64 is a long member whose lengthwise direction corresponds to the vertical direction (slide movement direction). The slider 64 is subjected to bending processing appropriately. The slider 64 forms a bending piece 64a whose outdoor side end (one side end in the indoor-outdoor direction) is bent to the inner side in the in-plane direction. A plurality of locking holes 64a1 that can mesh with a portion of the teeth of the gear 63 are formed on the bending piece 64a along the vertical direction (slide movement direction).

The locking holes 64a1 of the bending piece 64a on the slider 64 mesh with a portion of the teeth of the gear 63. Therefore, if the gear 63 rotates about the center axis of the square shaft 42b in a range of predetermined angles, the slider 64 slidably moves along the vertical direction. Furthermore, the slider 64 has locking bars 66 coupled to an upper end and a lower end thereof through pins 65, respectively. The locking bars 66 include lock pins 67

fixed, respectively, and are mounted so as to be inserted through bar guides 68 fixed to the door end stile 23b (see Fig. 4). The locking bars 66 and the bar guides 68, which are conventionally known, allow the lock pins 67 to enter or withdraw from, or prevent lock pins 67 from entering or withdrawing from, lock reception portions (not illustrated) provided with the longitudinal frame 13b in accordance with opening or closing of the sliding screen 20.

An insertion hole 64b whose lengthwise direction corresponds to the vertical direction (slide movement direction of the slider 64) is formed at the center of the slider 64. The insertion hole 64b is a hole through which a front end of the square shaft 42b penetrating through the through-hole 63a of the gear 63 is inserted. The reason why the lengthwise direction of the insertion hole 64b corresponds to the vertical direction is that the slider 64 can slidably move along the vertical direction, with the front end of the square shaft 42b inserting through the insertion hole 64b.

In the lock device 30 having the above configuration, when the operation handle 41 is operated to the lower side at approximately 90° from a state where the sliding screen 20 is closed with respect to the opening frame 10, the gear 63 rotates together with the square shaft 42b to slidably move the slider 64 to, for example, the upper side with

respect to the longitudinal stile (door front stile) 23b. With this, the locking bars 66 also slidingly move to the upper side and prevent the lock pins 67 from withdrawing from the lock reception portions provided with the longitudinal frame 13b of the opening frame 10. Therefore, the sliding screen 20 is engaged with the opening frame 10 to establish an engaged state. This can maintain the sliding screen 20 to be closed with respect to the opening frame 10.

On the other hand, when the operation handle 41 is operated to the upper side at approximately 90° from the above-mentioned state, the gear 63 rotates together with the square shaft 42b to slidingly move the slider 64 to, for example, the lower side with respect to the longitudinal stile 23b. With this, the locking bars 66 also slidingly move to the lower side and allow the lock pins 67 to withdraw from the lock reception portions. Therefore, the sliding screen 20 is released from the opening frame 10 to establish a non-engaged state. Accordingly, if the sliding screen 20 is moved in the opening direction, the sliding screen 20 can be opened with respect to the opening frame 10.

In the above-described lock device 30, since the insertion hole 64b is formed on the slider 64, the front end of the square shaft 42b penetrating through the

through-hole 63a of the gear 63 can be inserted through the insertion hole 64b. This makes it possible to make the gear 63 and the slider 64 closer to each other. In addition, since the restriction pieces 62d1 and 62d2 are provided with the accommodation portion 62d of the base 62, the restriction pieces 62d1 and 62d2 are interposed between the gear 63 and the slider 64 to prevent the gear 63 and the slider 64 from making contact with each other. Accordingly, for example, the teeth of the gear 63 can be prevented from interfering with the insertion hole 64b of the slider 64.

Accordingly, according to the lock device 30 as the embodiment, the gear 63 and the slider 64 can be made closer to each other, and in addition, the teeth of the gear 63 do not interfere with the insertion hole 64b of the slider 64. Therefore, a size from the inner side of the door end stile 23b in the in-plane direction to the outer side thereof in the in-plane direction can be made smaller, and thus, a pedestal portion of the operation handle 41 does not have to large. Accordingly, the thickness of the entire device from the inner side of the door end stile 23b in the in-plane direction to the outer side thereof in the in-plane direction can be made smaller, and a design property can be improved.

The preferred embodiment of the invention is described

above. However, the invention is not limited to the embodiment and various changes can be made. That is to say, in the above embodiment, the restriction pieces 62d1 and 62d2, which are interposed between the gear 63 and the slider 64 and restrict the gear 63 and the slider 64 from making contact with each other, are provided with the base 62. However, in the invention, the restriction pieces are not required to be provided with the base 62, and can be provided with various portions.

Although the invention has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

What is claimed is:

1. A lock device comprising:

a cover that is attached to a depth face of a stile by a cover attachment screw;

a gear that is provided such that a square shaft rotating about a center axis in accordance with an operation of an operation portion penetrates through a through-hole thereof and rotates together with the square shaft;

a slider that meshes with a portion of teeth formed on a circumferential end of the gear and slidingly moves in accordance with rotation of the gear, the slider including an insertion hole through which a front end of the square shaft penetrating through the gear is inserted; and

a restriction portion that is interposed between the gear and the slider to restrict the gear and the slider from making contact with each other,

wherein the lock device is switched between an engaged state and a non-engaged state with respect to an opening frame based on the sliding movement of the slider.

2. The lock device according to claim 1,

further comprising a base attached to the cover,

wherein the restriction portion is integrally provided with the base.

3. The lock device according to claim 2, wherein
the insertion hole has a long hole elongated in a
sliding movement direction of the slider, and
the restriction portion constitutes an accommodation
portion that accommodates therein the gear on the base and
is provided so as to project to one direction and the other
direction in the sliding movement directions of the slider.
4. Fittings to which the lock device according to any one
of claims 1 to 3 is applied between an opening frame and a
stile.