

SPECIFICATION

FASTENING LOCKS FOR SLIDING DOORS

The present invention relates to fastening locks of a type having a lock bolt which is useful for sliding doors.

In the fastening locks of the prior art conventionally applied to sliding doors, it is necessary to move an operation lever, for example, a locking lever, over a definite range in order to have the lock bolt held and fixed in the protruding position. Therefore it tends to frequently occur that the locking effect is not reliably attained when the bolt receptacle put on a sash frame is out of position in direct conjunction with the protruding lock or when the working of the door is in disorder so that the lock bolt is driven into the bolt receptacle to a depth necessary to be fixed in the desired position.

According to the present invention there is provided a fastening lock comprising:— (a) a casing having a substantially U-shaped cross-section as viewed from above and provided with a first vertical slot in a front wall and a second vertical slot in a first one of two side walls, (b) a lock bolt extending vertically and supported by a guide pin fixed thereto penetrating said first vertical slot in the front wall and capable of moving up and down, guided by the guide pin along said first slot, (c) a locking lever extending into the casing through the second vertical slot in the first side wall, with a handle thereof extending out of the casing, supported pivotally at the middle of the locking lever by a pin fixed in the casing, and provided near the end opposite to the handle end with an oblong aperture which extends in the longitudinal direction of the locking lever and into which the guide pin penetrates, whereby the locking lever rotatively moves around the fixed pin linked with the up-and-down movement of the lock bolt, (d) an unlocking lever connected to the lock bolt pivotally with a movable pin and having a pointed corner coming into contact with the second side wall of the casing opposite to the first side wall (which has the second vertical slot) when the lock bolt is in the lifted position, and (e) a spring exerting a force on the unlocking lever whereby the pointed corner of the unlocking lever is urged into contact with said second side wall of the casing.

In a preferred embodiment of the invention, the unlocking lever is divided into a latch lever having a pointed corner and a handle member having a contact point and connected to the latch lever with a second movable pin permitting the handle member to rotate therearound, a tension spring being connected between the latch lever and the handle member to exert a force on the handle member in such a direction that the contact point is urged away from said second side wall, the latch lever being linked to the lock bolt by a guide pin and urged by the first-mentioned spring to have the pointed corner engaged with the side wall of the casing, and the contact point of the handle

member not being in contact with the side wall of the casing when the unlocking lever is not pulled but coming into contact with the side wall of the casing when the unlocking lever is pulled for unlocking.

The present invention will be described by way of examples with reference to the accompanying drawings, in which:

Fig. 1 is a pictorial view illustrating the disposition of either one of two fastening locks embodying the present invention, wherein the fastening lock is fixed to a sliding door at the upper end thereof with the lock bolt to be inserted into the bolt receptacle put on the upper frame of the door sash;

Fig. 2 is a perspective view of one of the two fastening locks embodying the invention;

Fig. 3 is an elevational view of the fastening lock shown in Fig. 2 as viewed from backside with the lock bolt in the retracted position;

Fig. 4 is an elevational view of the fastening lock shown in Fig. 3 as viewed from a lateral side with partially broken side wall of the casing;

Fig. 5 is an elevational backside view of the same fastening lock as shown in Fig. 3 with the lock bolt protruded;

Fig. 6 is a similar elevational backside view of the fastening lock of Fig. 2 with a rugged side wall of the casing and with the lock bolt protruded;

Fig. 7 is a perspective view of the other one of the two fastening locks embodying the present invention;

Fig. 8 is an elevational backside view of the fastening lock as shown in Fig. 7 with the lock in the retracted position;

Fig. 9 is an elevational backside view of the same fastening lock as shown in Fig. 8 with the lock bolt protruded;

Fig. 10 is an elevational view of the fastening lock as shown in Fig. 7 as viewed from the right of Fig. 7;

Fig. 11 is an elevational view of the fastening lock as shown in Fig. 7 with partially broken side wall as viewed from the right of Fig. 7;

Fig. 12 is a perspective view of a facing plate for adjustment; and

Fig. 13 is an elevational view of the same fastening lock as shown in Fig. 8 with the unlocking lever about to be pulled.

Referring to Fig. 1, a fastening lock A is fixed to the upper end of a sliding door 18 with a locking lever 7 which is adapted to be pulled down by a cord 21 connected to the handle of the locking lever 7 for locking the door and an unlocking lever 13 which is adapted to be pulled down by another cord 22 connected to the lower end of the unlocking lever 13 for unlocking the door. When the locking lever 7 is pulled downwards, a lock bolt 3 protrudes upwards from the casing of the fastening lock A to enter a bolt receptacle 20 provided in an upper frame 19 of the door sash with concurrent lifting of the unlocking lever 13, thus bringing the sliding door 18 in the position to engage with the frame 19. When the fastening lock A is to be unlocked, the unlocking lever 13 is

pulled downwards so that the lock bolt 13 is retracted out of the bolt receptacle into the casing, resulting in the disengagement of the sliding door 18 from the upper frame 19 of the door sash.

5 Referring to Figs. 2 to 6, a casing 1 of the fastening lock has a U-shaped cross section as viewed from above with right and left side walls 2, 2', inside of which the flat rod-like lock bolt 3 is arranged in a manner such that it can move up and down with its upper end protruding out of or retracted into the casing 1. In the front wall 4 of the casing 1 are provided a vertical slot 5 extending in the direction of the up-and-down movements of the lock bolt 3 and a fixed pin 23 with its head on the outside of the front wall 4. This pin 23 supports the locking lever 7 pivotally at the middle, the lever 7 being movable in a long slot 6 which is provided in the side wall 2 with one vertical side of the slot 6 adjoining one vertical edge of the front wall 4. When cord 21, connected to the handle of the locking lever 7, is pulled down, it operates lever 7 to move the lock bolt upwards for locking. Near the end opposite to the handle end of the locking lever 7 there is provided an oblong aperture 8, extending in the longitudinal direction of the lever 7.

The lock bolt 3 is engaged with the casing 1 by a guide pin 9 fixed thereto penetrating both the vertical slot 5 in the front wall 4 and the oblong aperture 8 in the lock lever 7, with the pin head 9a on the outside of the front wall 4, so that the up-and-down sliding movement of the lock bolt 3 is linked to the pivotal rotation of the locking lever 7 around the pin 23. The movement of the lock bolt 3 is auxiliarily guided by a guide notch 11 provided in the upper wall 10 of the casing 1 and also by a pair of protrusions 12, 12 provided in the lower part of the casing 1.

An unlocking lever 13, which has a dog-legged shape with a part below the bend extending downwards near the side wall 2' within the casing 1, is connected pivotally to the lock bolt 3 at the upper end with a pin 14. This pin 14 is, optionally, integral with the guide pin 9. One of the legs of a spring 15 lying between the lock bolt 3 and the front wall 4 is engaged with the dog-legged unlocking lever 13 at a point a little below the inflection point of the same spring, the other leg being engaged with the side wall 2, so that a rotational pushing force is exerted on the unlocking lever 13 around the pin 14 in a direction such that a point corner 16 at the bend of the unlocking lever 13 is urged into frictional contact with the inside surface of the side wall 2' when the lock bolt 3 is extended, as shown in Fig. 5, whereby the lock bolt 3 is prevented from retracting. The prevention of the lock bolt 3 from retracting can further be effected when the surface of the side wall 2' where the pointed corner 16 of the unlocking lever 13 is urged into contact is made uneven or ribbed, as shown by a surface 17 in Fig. 6.

The dog-legged unlocking lever 13 extending from the pin 14 toward the side wall 2' can easily be operated, that is, pivoted by a pull on the rope

22 against the spring 15, rotational operation to have the pointed portion of the pointed corner 16, the further extending part of the unlocking lever 13 becomes to lie in parallel with the side wall 2'.

70 When the fastening lock A fixed to the sliding door 18 as shown in Fig. 1 is to be operated to lock the door, the handle end of the locking lever 7 is pulled down by the cord 21, whereby the lock bolt 3 is pushed upwards, guided by the guide pin 9 which slides simultaneously in the vertical slot 5 in the front wall 4 and the oblong aperture 8. In this case, the unlocking lever 13 also moves upwards, the pointed corner 16 which remaining in contact with the surface of the side wall 2' by virtue of pushing force of the spring 15, making no obstacle to the upward movement of the unlocking lever 13.

When the lock bolt 3 has attained its maximum position, the cord 21 is released, while the lock bolt 3 remains in the locking position, by means of the unlocking lever 13 which is urged by spring 15 into contact with the surface of the side wall 2' at the pointed corner 16 as shown in Fig. 5 or 6. In the case where the maximum position of the lock bolt 3 is low or the protruded part of the lock bolt 3 over the upper wall 10 of the casing 1 is small, due to the position of the lock bolt 3 relative to that of the bolt receptacle 20 in the upper frame 19 of the door sash or the depth of the bolt receptacle 20, the lock bolt 3 is fixed at its intermediate position to attain a reliable locking effect.

The unlocking of the fastening lock A in the locked state is carried out by pulling the unlocking lever 13 using the cord 22 connected to the lower end thereof to cause the pointed corner 16 to become disengaged from the surface of the side wall 2', permitting the lock bolt 3 to freely move downwards and by further pulling the rope 22 to sufficiently lower the lock bolt 3 through the connection at the pin 14. In this unlocking operation, the locking lever 7 rotates in the reversed direction to regain its initial position before the locking operation.

Any decrease occurring in the contacting pressure between the pointed corner 16 and the surface of the side wall 2', possibly after a long period of use of the fastening lock may be remedied by having the side wall 2' slightly bent toward inside.

Next, a further improved embodiment of the fastening lock will be illustrated by way of Figs. 7 to 13. According to the improvements, the unlocking lever is divided into a latch lever and handle member, so as to avoid some disadvantages encountered in the above-described embodiment of Figs. 2 to 6. One example of such disadvantages is that when an excessive force is applied to lever 7 via cord 21 with the intention of obtaining close contact between the pointed corner 16 and the side wall 2' and thereby (with the intention of) ensuring prevention of the retraction of the lock bolt 3, the unlocking lever 13 tends to slide, nullifying the contact pressure between the pointed corner 16

and the side wall 2', resulting eventually in unintentionally unlocking the fastening lock.

In Figs. 7 to 13, a casing 31 of a fastening lock is U-shaped as viewed from above, having right and left side walls 32, 32'. A flat, rod-like lock bolt 33 extends vertically inside the casing 31 in the direction parallel to the side walls 32, 32', and is capable of sliding up and down, guided by a vertical slot 35 in the front wall 34 of the casing 31, to which the lock bolt 33 is engaged with a guide pin 39 fixed at the lower end of bolt 33. A vertical slot 36 is provided in the side wall 32, adjacent the edge of the front wall 34.

Through this vertical slot 36 a locking lever 37, extends, pivotally supported at the middle of lever 37 by a pin 42 fixed to the front wall 34. The locking lever 37 has an oblong aperture 38 extending longitudinally of lever 37 at the end of lever 37 inside the casing 31.

The lock bolt 33 is engaged with the casing 31 by a guide pin 39 with a head 39a in a manner such that the lock bolt 33 can slide up and down, guided by the vertical slot 35 and by a guide opening 41 provided in a top wall 40 of the casing 31, linked to the rotation of the locking lever 37.

To the guide pin 39 is pivotally connected a latch lever 43 lying between the lock bolt 33 and the locking lever 37. The latch lever 43 is pushed by a spring 44 with one leg engaged with the latch lever 43 and the other leg engaged with the side wall 32 in the direction that a pointed corner 45 of the latch lever 43 is urged into frictional contact with the side wall 32' by rotation around the guide pin 39. The side wall 32' has several regularly spaced apart engagement holes 46 aligned in a vertical row. The pointed corner 45 of the latch lever 43 can be engaged with any hole 46 so that retraction of the lock bolt 33 is prevented to maintain the upper end of the lock bolt 33 at any desired position. The engagement holes 46 may conveniently be provided by fixing a facing plate 48 with such holes on the surface of the side wall 32' by a screw 49, the lower stepped end 47 (see Fig. 12) of the facing plate 48 being interconnected with the opening in the side wall 32' as shown in Fig. 10.

At the end of the latch lever 43 remote from the pin 39 is provided another pin 50 with which a handle member 51 is pivotally connected to the latch lever 43. A coiled tension spring 54 extends between a lug 52 of the latch lever 43, on the far side of lever 43 from the pointed corner 45, and a lug 53 at the upper end of the handle member 51 on the side nearest to the corner 52. The spring 54 exerts a pulling force on the handle member 51 and the latch lever 43, so that the pin 50, the lug 52 and the lug 53 are aligned in a straight line whereby the handle member 51 can be held in the position, capable of returning to the original position after the unlocking operation by pulling the handle member 51 downwards.

The handle member 51 has a contact point 55 in a position opposite to the lug 53 above the pin 50 and, when the lock bolt 33 is to be retracted to effect unlocking as shown in Fig. 13, the handle

member 51 is pulled at the lower end thereof by a cord 56 in the direction shown by the arrow P, rotating around the pin 50 in the direction shown by the arrow P'. Consequently, contact point 55 first comes into contact with the side wall 32', or rather with the facing plate 48, and then the handle member 51 is rotated around the contact point 55 with the side wall 32' as the reaction wall, so that the latch lever 43 is rotated, urged by the pin 50 around the pin 39 in the direction shown by the arrow Q to release the engagement of the pointed corner 45 with the engagement hole 46. By further pulling of the cord 56, the lock bolt 33 is pulled down via the pins 50 and 39 to retract, while maintaining the released engagement between the pointed corner 45 and the engagement hole 46. The handle member 51 is L-shaped with a downside branch extending outwards from the side wall 32' in order to facilitate the unlocking operation by pulling the cord 56 downwards.

The fastening lock of Figs. 7 to 13 is installed on the upper end 19 of the sliding door 18 as shown in Fig. 1 with the front wall 34 facing inside of a room by means of screws 59, 59 penetrating a pair of ears 60, 60 provided on the upper ends of the side walls 32, 32', as shown in Fig. 7. The locking lever 37 is cranked or stepped so that the nearby screw 59 can easily be screwed by a screw driver.

When the lock bolt 33 is required to be lifted to protrude out of the casing 31 to lock the sliding door 18, the locking lever 37 is pulled down by the cord 62 connected to its handle end whereby the lock bolt 33 is pushed up by the pin 39. In this case, the latch lever 43 is lifted together with the lock bolt 33 because it is connected to the lock bolt 33 and the locking lever 37 by the pin 39, with the pointed corner 45 repeatedly becoming released from one of the engagement holes 46 and then becoming engaged to the next upper one pushed by the spring 44, whereby the downward movement or retraction of the lock bolt 33 is always prevented.

When the lifting lock bolt 33 is stopped at its uppermost position and the cord 62 is released, the lock bolt 33 is held at this position and prevented from downward movement by the engagement of the pointed corner 45 in the nearest lower one of the engagement holes 46 on the side wall 32' or facing plate 48 to prevent a further rotation of the latch lever 43. Even in the case where the lock bolt 33 is not lifted to its extreme uppermost protruded position due to discrepancy between the positions of the fastening lock and the bolt receptacle 20 in the upper frame 19 of the door sash to give larger resistance to the lock bolt 33 entering the bolt receptacle 20, the downward movement of the lock bolt 33 at an intermediate position can be effectively prevented, leading to secured locking of the sliding door 18.

When the fastening lock of Figs. 7 to 13 is to be unlocked, the handle member 51 is pulled by the cord 56 connected to the lower end of the handle member 51 in the direction shown by the arrow P,

so that the handle member 51 is first rotated around the pin 50 in the direction shown by the arrow P' and then pushes the corner of the latch lever 43 via the pin 50 with the contact point 55, which works as a fulcrum, to rotate the latch lever 43 around the pin 39 in the direction shown by the arrow Q, whereby the pointed corner 45 is disengaged from the engagement hole 46 to permit the downward movement of the lock bolt 33 (see Fig. 13). As the cord 56 is further pulled, the lock bolt 33 is pulled down through the latch lever 43 and the pin 50 being guided by the guide pin 39 along the vertical slot 35 with simultaneous rotation of the locking lever 37 in the reverse direction as in the locking operation to return to its position before locking and to be ready for the next locking operation.

As has been described above, the fastening locks of Figs. 2 to 6 and Figs. 7 to 13 are so designed that unintended retraction of the lock bolt is effectively prevented regardless of its position without giving any obstacle to the protruding movement of the lock bolt by providing an unlocking lever separately from the locking lever. Further, unintended retraction of the lock bolt is more effectively prevented in the second embodiment (that of Figs. 7 to 13) in which the unlocking lever is divided into the latch lever and the handle member so that a more reliable press-contact is obtained between the pointed corner of the latch lever and the engagement hole in the side wall, eliminating the danger of unintended unlocking by an excessively strong force in the direction of retraction of the lock bolt. Thus the fastening locks of Figs. 2 to 6 and Figs. 7 to 13 are advantageous not only in versatility in use but also in the reliable locked state of the sliding door in each case.

CLAIMS

1. A fastening lock for a sliding door comprising:

(a) a casing having a substantially U-shaped cross-section as viewed from above and provided with a first vertical slot in a front wall and a second vertical slot in a first one of two side walls,

(b) a lock bolt extending vertically and supported by a guide pin fixed thereto penetrating said first vertical slot in the front wall and capable of moving up and down, guided by the guide pin along said first slot,

(c) a locking lever extending into the casing through the second vertical slot in the first side wall, with a handle thereof extending out of the casing, supported pivotally at the middle of the locking lever by a pin fixed in the casing, and provided near the end opposite to the handle end with an oblong aperture which extends in the longitudinal direction of the locking lever and into which the guide pin penetrates, whereby the locking lever rotatively moves around the fixed pin linked with the up-and-down movement of the lock bolt,

(d) an unlocking lever connected to the lock bolt pivotally with a movable pin and having a pointed corner coming into contact with the second side wall of the casing opposite to the first side wall (which has the second vertical slot) when the lock bolt is in the lifted position, and

(e) a spring exerting a force on the unlocking lever whereby the pointed corner of the unlocking lever is urged into contact with said second side wall of the casing.

2. A fastening lock as claimed in claim 1 wherein the unlocking lever is divided into a latch lever having a pointed corner and a handle member having a contact point and connected to the latch lever with a second movable pin permitting the handle member to rotate therearound, a tension spring being connected between the latch lever and the handle member to exert a force on the handle member in such a direction that the contact point is urged away from said second side wall, the latch lever being linked to the lock bolt by a guide pin and urged by the spring to have its pointed corner engaged with the side wall, and the contact point of the handle member coming into contact with the side wall of the casing when the handle member is pulled for unlocking and being kept apart when the handle member is not pulled.

3. A fastening lock as claimed in claim 2 wherein the surface of said second side wall of the casing where the pointed corner of the latch lever comes into contact has a plurality of engagement holes aligned at intervals in a vertical row, so as to engage with the pointed corner.

4. A fastening lock as claimed in claim 3 wherein the engagement holes are provided by fixing a facing plate having the engagement holes onto the surface of said second side wall of the casing.

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so that the handle member 51 is first rotated around the pin 50 in the direction shown by the arrow P' and then pushes the corner of the latch lever 43 via the pin 50 with the contact point 55, which works as a fulcrum, to rotate the latch lever 43 around the pin 39 in the direction shown by the arrow Q, whereby the pointed corner 45 is disengaged from the engagement hole 46 to permit the downward movement of the lock bolt 33 (see Fig. 13). As the cord 56 is further pulled, the lock bolt 33 is pulled down through the latch lever 43 and the pin 50 being guided by the guide pin 39 along the vertical slot 35 with simultaneous rotation of the locking lever 37 in the reverse direction as in the locking operation to return to its position before locking and to be ready for the next locking operation.

As has been described above, the fastening locks of Figs. 2 to 6 and Figs. 7 to 13 are so designed that unintended retraction of the lock bolt is effectively prevented regardless of its position without giving any obstacle to the protruding movement of the lock bolt by providing an unlocking lever separately from the locking lever. Further, unintended retraction of the lock bolt is more effectively prevented in the second embodiment (that of Figs. 7 to 13) in which the unlocking lever is divided into the latch lever and the handle member so that a more reliable press-contact is obtained between the pointed corner of the latch lever and the engagement hole in the side wall, eliminating the danger of unintended unlocking by an excessively strong force in the direction of retraction of the lock bolt. Thus the fastening locks of Figs. 2 to 6 and Figs. 7 to 13 are advantageous not only in versatility in use but also in the reliable locked state of the sliding door in each case.

CLAIMS

1. A fastening lock for a sliding door comprising:

(a) a casing having a substantially U-shaped cross-section as viewed from above and provided with a first vertical slot in a front wall and a second vertical slot in a first one of two side walls,

(b) a lock bolt extending vertically and supported by a guide pin fixed thereto penetrating said first vertical slot in the front wall and capable of moving up and down, guided by the guide pin along said first slot,

(c) a locking lever extending into the casing through the second vertical slot in the first side wall, with a handle thereof extending out of the casing, supported pivotally at the middle of the locking lever by a pin fixed in the casing, and provided near the end opposite to the handle end with an oblong aperture which extends in the longitudinal direction of the locking lever and into which the guide pin penetrates, whereby the locking lever rotatively moves around the fixed pin linked with the up-and-down movement of the lock bolt,

(d) an unlocking lever connected to the lock bolt pivotally with a movable pin and having a pointed corner coming into contact with the second side wall of the casing opposite to the first side wall (which has the second vertical slot) when the lock bolt is in the lifted position, and

(e) a spring exerting a force on the unlocking lever whereby the pointed corner of the unlocking lever is urged into contact with said second side wall of the casing.

2. A fastening lock as claimed in claim 1 wherein the unlocking lever is divided into a latch lever having a pointed corner and a handle member having a contact point and connected to the latch lever with a second movable pin permitting the handle member to rotate therearound, a tension spring being connected between the latch lever and the handle member to exert a force on the handle member in such a direction that the contact point is urged away from said second side wall, the latch lever being linked to the lock bolt by a guide pin and urged by the spring to have its pointed corner engaged with the side wall, and the contact point of the handle member coming into contact with the side wall of the casing when the handle member is pulled for unlocking and being kept apart when the handle member is not pulled.

3. A fastening lock as claimed in claim 2 wherein the surface of said second side wall of the casing where the pointed corner of the latch lever comes into contact has a plurality of engagement holes aligned at intervals in a vertical row, so as to engage with the pointed corner.

4. A fastening lock as claimed in claim 3 wherein the engagement holes are provided by fixing a facing plate having the engagement holes onto the surface of said second side wall of the casing.