SLIDING DOOR LOCK

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INVENTOR
CHARLES C. MOLER

BY

Attys.
This invention relates to sliding door locks and more particularly to a mechanism which will automatically lock a sliding door against opening when it is closed and which can be released by operating means operable from a remote point such, for example, as an electric solenoid.

Many types of vertical sliding doors on garages, industrial buildings and the like are equipped with operators of a type which raises the door through cables and which permits the door to close at its own weight. When doors of this type are closed, they are held only by their own weight and can be opened only by their own weight and can be opened only by force sufficient to overcome the weight of the door. It may also be desirable for sliding doors of other specific types to be automatically locked when closed and to be unlocked from a remote point.

It is accordingly an object of the present invention to provide a sliding door lock which will automatically lock a sliding door each time it is closed and in which the lock can be released by operating mechanism controllable either directly or from a remote point.

Another object is to provide a sliding door lock in which a latch part on the door moves a latch jaw structure to its operating position when the door is closed and in which the structure is held in its operating position by a latching bolt which can be released by an operating mechanism.

According to a feature of the invention, the latch jaw structure includes two relatively movable latch jaws connected by spring means, one of which latch jaws holds the door against opening and the other of which moves the first latch jaw to its operating position when engaged by a latch part on the door during door-closing movement. The spring means insures operation of the latch even though the door may not be fully closed while preventing damage to the parts due to excessive movement of the door.

According to another feature of the invention, the operating means, such as an electric solenoid, is connected to the latch bolt through a lost motion connection which is arranged to provide a limited free movement of the operating means before the bolt starts to move so that it will strike the bolt a relatively sharp blow to loosen it. The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which:

FIGURE 1 is a partial perspective view illustrating a portion of a door and the locking mechanism of the present invention;

FIGURE 2 is a partial sectional view on the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view inside the supporting cover of the sliding door lock showing the operating parts in elevation; and

FIGURE 4 is a section on the line 4—4 of FIGURE 3.

The door lock of the present invention can be applied to any type of sliding door which is movable on a guide track and is partly illustrated in connection with a conventional sectional garage door. As shown, the garage door includes a series of sections or panels which are hinged together along horizontal hinge lines and which are guided for vertical movement relative to a door opening in a garage or similar building structure by channel-shaped tracks fixedly mounted at the sides of the opening. The tracks may curve at the upper end thereof to a generally horizontal position so that when the door is raised it can be moved to a generally horizontal position beneath the ceiling of the building although, of course, the invention could be applied equally well to a structure in which the door moves only vertically. In either case, the door sections are guided by the tracks for vertical movement through rollers carried by the door sections and riding in the tracks.

The locking mechanism of the present invention comprises a support which may be in the form of a housing fixedly secured relative to the track. Conveniently, the housing may be bolted directly to the track although it could, of course, be mounted on the building structure closely adjacent to the track. Preferably, the locking mechanism is mounted well above the floor of the building where it will not be accidentally damaged and will not be subject to unauthorized mishandling although its exact location is not material.

The locking mechanism comprises a first upper latch jaw pivoted on a shaft which is carried by the housing adjacent to its lower end and which is normally urged to a retracted position within the housing as shown in FIG. 4. The upper jaw may be swung to an operative position in which it projects through an opening in the housing as shown in FIG. 1.

In its operative position thejaw will extend over and engage a latch part carried by one of the door sections. As shown, the latch part is formed of sheet metal and is shaped to overlie one edge of a door section with a flange thereon fitting over the face of the door and secured thereto by screws or the like. At its opposite end the latch part is formed with projections extending inwardly from the plane of the door and passing closely adjacent to the face of the housing through which the jaw projects.

A second latch jaw is pivoted on the shaft for movement relative to the first latch jaw. The first latch jaw is provided with an upstanding ear and the second latch jaw is provided with a similar ear. A compression spring acts between the ears and normally tending to turn the second latch jaw clockwise relative to the first latch jaw. This relative movement is limited by engagement of the upper end of the second latch jaw with the ear, as seen in FIG. 4. However, the second latch jaw can move counterclockwise relative to the first latch jaw by compressing the spring for a purpose to appear more fully hereinafter. The latch jaws are normally urged to the position shown in FIG. 4 by a spring formed between an ear on the upper end of the second latch jaw and the side of the housing.

To hold the latch jaws in operative position, a latching bolt is slidably mounted in the housing in a guide for vertical movement. When in its lowered position with the upper latch jaw in its operative position, the bolt will rest on the ear and will engage the right-hand upper surface of the upper latch jaw to prevent it from returning to its retracted or inoperative position.

To raise the bolt thereby to release the lock it is formed in its upper end with an elongated slot which may extend completely to the end of the bolt and which may be closed by a machine bolt extending through the bolt and across the slot therein. A solenoid is mounted in the upper part of the housing and is provided with a vertically movable plunger. The plunger is secured to the bolt by means of side plates and is extended by means of side plates overlying the sides of the bolt. A pin 36 carried by the side plates extends through the slot and for free vertical movement therein limited by the lower end of the slot and by the machine bolt which closes the upper end of the slot.
In operation, when the door is raised to its open position, the latch jaws will occupy the position shown in FIG. 3 with the upper jaw 14 being retracted to its inoperative position and with the lower jaw 22 projecting through an opening 37 in the housing 13. When the door is lowered to its closed position, the latch part 21 carried by the door will engage the projecting lower jaw 22 and turn both of the jaws 21 and 22 clockwise as seen in FIG. 4 and extend the upper jaw 14 to its operative position. When the upper jaw 14 reaches its operative position, the bolt 27 will drop by gravity until its lower end engages the ear 23 in which position it holds the upper jaw against clockwise movement. Preferably, the parts are so adjusted that the upper jaw will reach its operative position before the door is completely closed so that if there should be foreign material beneath the door preventing complete closure thereof the lock will still function. Any movement of the door which will be relatively small, for example on the order of 1/4" after movement of the upper latch jaw to its operative position will be accommodated by additional movement of the lower latch jaw relative to the upper latch jaw through compression of the spring 25. In this way the door will automatically be locked in its closed position.

Each time it is desired to open the door it is necessary to retract the bolt 27 to permit the upper latch jaw to swing to its inoperative position as shown in FIG. 4. For this purpose the solenoid 32 may be energized to raise the latching bolt 27, thereby releasing the upper latch jaw. It will be noted that the length of the slot 29 and the positioning of the coil 31 so that the pin 36 will normally lie an appreciable distance below the bolt 31 when the latch is in its engaged position. Therefore, when the solenoid is energized it will initially have a limited degree of free movement and will strike the bolt 27 a relatively sharp blow to insure that it will be moved upward rapidly when the solenoid is energized. Therefore, the locking mechanism will be positively released whenever the operating mechanism is energized for this purpose. While a solenoid has been illustrated, it will be apparent that other types of power devices could be employed or that manual operation could be used when desired.

While one embodiment of the invention has been shown and described in detail, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

I claim:

1. A sliding door lock in combination with a door structure slidable in a guide track comprising a support fixedly mounted relative to the track, a latch jaw movably mounted on the support, a latch part carried by the door structure and engageable with the latch jaw in the latch engaging position to prevent opening of the door, means urging the latch jaw from its latching position to a release position, a bolt engageable with the latch jaw to hold it in its latching position, operating means connected to the bolt to move it out of engagement with the latch jaw, a second part connected to the latch jaw and engaged by the latch part when the door is moved to its closed position to move the latch jaw to its latching position, said second part being movably connected to the latch jaw and including spring means yieldingly connecting the latch jaw and said second part.

2. A sliding door lock in combination with a door structure slidable in a guide track comprising a support fixedly mounted relative to the track adjacent to one side of the door, a latch part carried by the door and projecting from said one side thereof being movably engageable with a first named latch jaw and movably connected to the support as the door is opened and closed, a latch jaw pivotable on the support and engageable with the latch part when the door is closed to hold it against opening, means normally biasing the latch jaw to inoperative position, a second latch jaw operatively connected to the first named latch jaw and engaged and movably connected to the support as the door is opened and closed, a vertically movable bolt movable downward by gravity to engage with the latch jaw to hold it in its operative position, and operating means connected to the bolt to move it upwardly out of engagement with the latch jaw.

3. The door lock of claim 2 in which the second latch jaw is pivotable relative to the first latch jaw and including spring means connecting the latch jaws.

4. A door lock for a vertically sliding door comprising a support adapted to be fixedly mounted adjacent to the path of movement of one edge of the door, a latch part carried by the door and movably adjacent to the support, a first latch jaw pivotable on the support on a horizontal axis and engageable with the latch part to prevent raising of the door, means biasing the first latch jaw to an inoperative position, a second latch jaw pivotable on said axis, spring means yieldingly connecting the latch jaws for simultaneous movement, the latch part engaging the second latch jaw when the door is lowered to move the first latch jaw to operative position, a vertically slidable bolt which in a lowered position engages the first latch jaw to hold it in operative position, and operating means to raise the bolt.

5. The door lock of claim 4 in which the operating means is an electric solenoid having a lost motion connection with the bolt which provides limited free upward movement of the solenoid before it starts raising the bolt.

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MARVIN A. CHAMPION, Primary Examiner.
RICHARD E. MOORE, Examiner.