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United States Patent	12392166
Kind Code	B2
Date of Patent	August 19, 2025
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Latch assembly with removable battery

Abstract

A vertical door latch assembly includes a housing and a bolt movably attached to the housing having a catch portion. A drive motor is located within the housing and is configured to selectively move a lock assembly between a locked position preventing movement of the bolt and an unlocked position allowing movement of the bolt. A controller is in electrical communication with the drive motor and is configured to direct the actuator lock assembly between the locked position and the unlocked position.

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Appl. No.: **18/378875**

Filed: **October 11, 2023**

Prior Publication Data

Document Identifier	Publication Date
US 20240035309 A1	Feb. 01, 2024

Related U.S. Application Data

continuation parent-doc US 16999715 20200821 US 11859410 child-doc US 18378875
us-provisional-application US 62890233 20190822

Publication Classification

Int. Cl.: **E05B47/00** (20060101); **E05B65/00** (20060101)

U.S. Cl.:

CPC **E05B47/0012** (20130101); **E05B65/0021** (20130101); E05B2047/0018 (20130101); E05B2047/0054 (20130101); E05B2047/0067 (20130101); E05B2047/0069 (20130101); E05B2047/0072 (20130101); E05Y2201/434 (20130101); E05Y2201/474 (20130101); E05Y2201/70 (20130101); E05Y2201/702 (20130101); E05Y2400/612 (20130101); E05Y2400/66 (20130101); E05Y2400/85 (20130101); E05Y2600/46 (20130101); E05Y2900/106 (20130101)

Field of Classification Search

CPC: E05B (47/0012); E05B (65/0021); E05B (2047/0018); E05B (2047/0054); E05B (2047/0067); E05B (2047/0069); E05B (2047/0072)

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) This application is a continuation of U.S. patent application Ser. No. 16/999,715 filed on Aug. 21, 2020, which claims priority to U.S. provisional application No. 62/890,233 filed on Aug. 22, 2019.

BACKGROUND

(1) The present disclosure relates to locks for doors that open vertically, such as rollup doors or overhead doors. More specifically, the present disclosure relates to a lock and control system for selectively granting access through rollup or overhead doors.

(2) Self-storage centers typically provide multiple individual storage areas, each of which is accessible through a lockable, vertically opening, rollup door. In existing installations, each customer is provided a traditional keyed lock or provides their own traditional keyed lock to control access to an assigned storage area.

SUMMARY

(3) In one exemplary embodiment, a vertical door latch assembly includes a housing and a bolt movably attached to the housing having a catch portion. A drive motor is located within the housing and is configured to selectively move a lock assembly between a locked position preventing movement of the bolt and an unlocked position allowing movement of the bolt. A controller is in electrical communication with the drive motor and is configured to direct the actuator lock assembly between the locked position and the unlocked position.

(4) In a further embodiment of any of the above, the lock assembly includes a pin that selectively engages a pin opening in the bolt.

(5) In a further embodiment of any of the above, the lock assembly includes a blocker plate moveable relative to the housing.

(6) In a further embodiment of any of the above, the blocker plate is located on an opposite side of a portion of the housing from the bolt.

(7) In a further embodiment of any of the above, the lock assembly includes a lead screw in driving engagement with the drive motor.

(8) In a further embodiment of any of the above, the blocker plate slideably engages the lead screw.

(9) In a further embodiment of any of the above, the lock assembly includes a sliding nut in engagement with the lead screw.

(10) In a further embodiment of any of the above, the lead screw includes a threaded surface in engagement with a threaded surface on the sliding nut.

(11) In a further embodiment of any of the above, the sliding nut includes a first end that has a first lead screw opening and a second end that has a second lead screw opening. The blocker plate includes a first end that has a first lead screw opening and a second end that has a second lead screw opening.

(12) In a further embodiment of any of the above, the first end of the blocker plate is located between the first end and the second end of the sliding nut along the lead screw.

(13) In a further embodiment of any of the above, the lock assembly includes a spring surrounding the lead screw in engagement with the first end of the sliding nut and the first end of the blocker plate.

(14) In a further embodiment of any of the above, the sliding nut includes a connecting portion connecting the first end and the second end of the sliding nut that only partially surrounds the lead screw.

(15) In a further embodiment of any of the above, the blocker plate includes a connecting portion connecting the first and the second end of the blocker plate and the connecting portion includes a recess for accepting at least a portion of the pin.

(16) In a further embodiment of any of the above, the housing includes a pin opening aligned with the pin opening in the bolt to accept the pin when the bolt is in the locked position.

(17) In a further embodiment of any of the above, the housing includes a cover portion and a back portion with at least one fastener opening in each of the cover portion and the back portion for accepting a door fastener.

(18) In a further embodiment of any of the above, at least one spacer includes a housing contact

side attached to the housing and a door contact side spaced from the housing contact side.
(19) In another exemplary embodiment, a method of operating a vertical door latch assembly includes receiving a wireless signal in an electronic control module corresponding to one of a locked position of an unlocked position of the vertical door latch. A signal is sent from the electronic control module to a drive motor to selectively drive a lock assembly. The lock assembly is drove along a lead screw between one of the locked position or the unlocked position.
(20) In a further embodiment of any of the above, driving the lock assembly includes selectively moving a pin into and out of engagement with a bolt of the vertical door latch assembly.
(21) In a further embodiment of any of the above, the lock assembly includes a blocker plate configured to allow the pin to move into and out of engagement with a pin opening the bolt.
(22) In a further embodiment of any of the above, driving the lock assembly to the locked position includes biasing the blocker plate with a spring towards the locked position with a sliding nut in engagement with the lead screw.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** illustrates an interior view of an example vertical door.
(2) FIG. **2** illustrates an exterior view of the example vertical door of FIG. **1**.
(3) FIG. **3** is a front view of an example bolt assembly.
(4) FIG. **4** is a rear view of the example bolt assembly of FIG. **3**.
(5) FIG. **5** illustrates the bolt assembly with a front portion removed.
(6) FIG. **6** illustrates an example set of slats for the example vertical door.
(7) FIG. **7** illustrates a side view of the example bolt assembly on the example set of slats of FIG. **6**.
(8) FIG. **8** illustrates another example set of slats for the example vertical door.
(9) FIG. **9** illustrates a side view of the example bolt assembly on the example set of slats of FIG. **8**.
(10) FIG. **10** is a front view of an example door spacer.
(11) FIG. **11** is a perspective view of the example door spacer of FIG. **10**.
(12) FIG. **12** illustrates the bolt assembly in a locked position.
(13) FIG. **13** illustrates the bolt assembly in a ready to unlock position.
(14) FIG. **14** illustrates the bolt assembly in a fully unlocked position.
(15) FIG. **15** illustrates the bolt assembly in a ready to lock position.
DETAILED DESCRIPTION
(16) FIGS. **1** and **2** illustrate an example vertical door assembly **20**, such as a rollup or overhead style door. The vertical door assembly **20** includes a plurality of slats **22** that are rotatably connected to each other along their length and slideably connected to a first vertical guide rail **24** and a second vertical guide rail **26** along respective opposite ends of the slats **22**. In the illustrated example, the vertical door assembly **20** is used to selectively enclose an opening in a wall **28** and secure the opening in the wall through the use of a bolt assembly **60**. The plurality of slats **22** include an interior surface **36** (FIG. **1**) that faces towards an enclosed space and an exterior surface **38** (FIG. **2**) that faces away from the enclosed space. The wall **28** could be a wall locating a building, a shipping container, a trailer, or any other type of arrangement where it is desirable to selectively enclose an opening in a structure.
(17) The vertical door assembly **20** includes a tension wheel assembly **30** having a drum **31** supported by an axle **34** to allow the plurality of slats **22** to move through the first and second guide rails **24**, **26** and collapse into a closed position. The tension wheel assembly **30** allows the plurality of slats **22** to roll around the axle **34** about an axis of rotation A to store the plurality of slats **22** above the opening in the wall **28**. Additionally, the tension wheel assembly **30** could be spring loaded to reduce the force needed to raise the plurality of slats **22**. In the illustrated example, the

axle **34** is supported relative to the wall **28** through a bracket **32** located adjacent opposite ends of the axle **34** and fixed relative to the wall **28**.

(18) FIGS. **3-5** illustrate an enlarged views of the example bolt assembly **60**. In the illustrated example, the bolt assembly **60** includes a bolt housing **62** formed from a cover or first portion **62**A and a back or second portion **62**B that both at least partially define an interior cavity **63** (FIG. **5**) within the bolt assembly **60**. The back portion **62**B includes a back surface that is at least partially in engagement with the exterior surface **38** one of the slats **22** as shown in FIG. **2**. The front portion **62**A also includes a front flange **72**A that at least partially engages a back flange **72**B on the back portion **62**B. The front and back flanges **72**A, **72**B also completely surround the cavity **63** and each include corresponding fastener openings **74**A, **74**B that are used to secure the front and back portions **62**A, **62**B to each other and to one of the slats **22** (FIGS. **3-6**).

(19) The bolt assembly **60** also includes a bolt **64**, which is slidable relative to the bolt housing **62** to allow the bolt **64** to engage an aperture **58** (FIG. **1**) in the first vertical guide rail **24** to prevent the plurality of slats **22** from moving relative to the first and second vertical guide rails **24**, **26**. In the illustrated example, the bolt **64** includes a bolt handle **66** that allows a user to manually move a distal end or catch portion of the bolt **64** horizontally into and out of the aperture **58** in the first vertical guide rail **24**. The handle **66** also extends from the bolt **64** in the cavity **63** through a handle aperture **67** defined the first portion **62**A. The bolt **64** also extends through a bolt sleeve **65** on the back portion **62**B. The sleeve **65** provides additional protection to the bolt **64** to prevent unwanted tampering with the bolt assembly **60**.

(20) Additionally, the handle **66** is attached to the bolt **64** through the use of a fastener **69** (FIG. **4**), such as a screw. A strength of the fastener **69** is chosen to allow the handle **66** to separate from the bolt **64** if excessive force is applied to the bolt **64** that would indicate that the bolt assembly **60** is being forced open. Furthermore, if the handle **66** is separated from the bolt **64**, the bolt assembly **60** can be serviced to allow the new handle **66** to be attached to the old bolt **64** with a new fastener **69** or to allow the bolt **64** and handle **66** to be replaced entirely.

(21) Furthermore, this disclosure also applies to the bolt assembly **60** being located adjacent the second vertical guide rail **26**. The aperture **58** could be located separate from one of the first or second vertical guide rails **24**, **26** and be located in the wall **28** or another structure that is fixed relative to the wall **28**.

(22) As shown in FIG. **5**, the bolt assembly **60** includes an electronic control module **70** in electrical communication with an actuator lock assembly **68** (FIG. **12**) to selectively secure the bolt **64** when in a locking position or release the bolt **64** when in a non-locking position as will be described further below. In the illustrated example, the electronic control module **70** includes a printed circuit board in communication with memory **70**A, a processor **70**B, a wireless communications device **70**C, and at least one indicator light **70**D. The memory **70**A is preprogrammed and in communication with the processor **70**B, such as a controller, to perform the operations described below.

(23) In one example, the wireless communications device **70**C is capable of forming a Wi-Fi or Bluetooth connection to transfer a desired locked or unlocked request from a user wirelessly to the wireless communications device **70**C to change an operating state of the actuator lock assembly **68**. The electronic control module **70** may also utilize the at least one indicator light **70**D to display a connection status with the user formed with the wireless communications device **70**C and/or a locked status of the bolt **64** relative to the bolt housing **62**. The electronic control module **70** is in electrical communication with a battery assembly **82** to provide power to the electronic control module **70**.

(24) The electronic control module **70** also monitors a position of the bolt **64**, battery assembly **82** and, and vertical door assembly **20**. To monitor a position of the bolt **64**, the electronic control module **70** includes a first bolt sensor **70**F and a second bolt sensor **70**E. When the sensor **70**F is active, the bolt **64** is in the locked position and when the sensor **70**E is active, the bolt **64** is in the

unlocked position. Alternatively, only one of the first and second bolt sensors **70**F, **70**E are used to confirm that the bolt **64** is locked or in another position. The electronic control module **70** can utilize the wireless communications device **70**C to transmit to a remote location the status of the bolt **64**. This allows a user at a remote location to be notified if the bolt assembly **60** is unlocked for a greater than expected time indicating that the vertical door assembly **20** may not be secured or that the vertical door assembly **20** may no longer be in use by an occupant of storage space. The electronic control module **70** is also includes a sensor **70**I, such as an accelerometer, that can determine when the vertical door assembly **20** is in an open or closed position and communicate this information to a user as the remote location **80** if the vertical door assembly **20** is in an open location beyond a predetermined length of time.

(25) Regarding the battery assembly **82**, the first battery sensor **70**G is active when the battery assembly **82** is removed from the housing **62** and the second battery sensor **70**H is active when the battery assembly is locked. This information can also be communicated to the remote location **80** through the wireless communications device **70**C. Information regarding the position of the battery assembly, opening of the vertical door assembly, and position of the bolt **64** can be logged by the remote location to maintain a history of activity at the vertical door assembly and with the bolt assembly **60**. In addition, information regarding a lever of battery charge can be transmitted to the remote location to determine when the battery assembly **82** needs to be charged or replaced.

(26) FIGS. **6** and **7** illustrate the bolt assembly **60** attached to a plurality of slats **22**A. In the illustrated example, the plurality of slats **22**A include four fastener openings **75**A that correspond to the fastener openings **74**A, **74**B in the bolt assembly **60**. When the back portion **62**B is located within a recessed portion of the slats **22**, an upper and lower portion of the back flange **72**B sits flush against and in directed contact with the portion of the slats **22**A having the fastener openings **75**A. Fasteners **77** can then secure the bolt assembly **60** to the slats **22**A and extend through a backer plate **88**A in contact with an interior surface **36**A of the slats **22**A. One feature of the backer plate **88**A is to provide an engagement surface for the fasteners **77** that distributes the load of the fasteners **77** over a larger area of the slats **22** to prevent the fasteners **77** from pulling through the slats **22**A and separating the bolt assembly **60** from the vertical door assembly **20**.

(27) Alternatively, as shown in FIGS. **8-11**, when the bolt assembly **60** is used with a plurality of slats **22**B having a two-hole configuration with a pair of spacers **90** to position the bolt assembly **60** relative to the slats **22**B. The spacers **90** includes a bolt assembly contact side **91** and a slat contact side **92** opposite the bolt assembly contact side **91**. The bolt assembly contact side **91** of the spacer **90** includes a surface that contacts both a portion of back flange **72**B and a central region of the back portion **62**B that fits within a recessed area of the slats **22**B. The slat contact side **92** includes a surface that contacts the slat **22**B and an end wall **93** at each opposing end of a first wall **96** and a second wall **97**. The end walls **93** and the first and second walls **96**, **97** form a cavity **94** with the slats **22**B. The first wall **96** includes a lip **98** along an outer edge that extends between the end walls **93** that directly contacts the slats **22**B. The spacer **90** also includes fastener openings **95** that accept fasteners **77** extending through fastener openings **74**A, **74**B in the bolt assembly **60**. Therefore, the fasteners **77** secure the bolt assembly **60** to the spacers **90** and not the slats **22**B.

(28) Fasteners **79** secure the bolt assembly **60** to the slats **22**B by extending through fastener openings **74**C (FIG. **4**) in the back portion **62**B of the bolt assembly **60** into a backer plate **88**B in contact with an interior surface **36**B of the slats **22**B. One feature of the backer plate **88**B is to provide an engagement surface for the fasteners **79** that distributes the load of the fasteners **79** over a larger area of the slats **22**B to prevent the fasteners **79** from pulling through the slats **22**B and separating the bolt assembly **60** from the vertical door assembly **20**.

(29) FIGS. **12-15** illustrate a method of locking and unlocking the bolt **64** with the actuator lock assembly **68**. In the illustrated example, the actuator lock assembly **68** includes a lead screw **102** driven by the drive motor **100**, a blocker plate **104** configured to selectively allow movement of a pin **106** into and out of locking engagement with the bolt **64**, and a spring **108** engaging a slider nut

110 at a first end of the spring and the blocker plate **104** at a second end of the spring.
(30) As shown in FIG. **12**, when the bolt **64** is in a locked position relative to the back portion **62**B, the blocker plate **104** is positioned such that the pin **106** is located in a pin opening **112** in the back portion **62**B and a pin opening **114** in the bolt **64**.
(31) To allow the bolt **64** to move relative to the back portion **62**B, the motor **100** rotates the lead screw **102** in a first direction to draw the sliding nut **110** and the blocker plate **104** towards the motor **100**. The lead screw **102** extends through both first and second ends **110**A, **110**B of the sliding nut **110** and first and second ends **104**A, **104**B of the blocker plate **104**, respectively. Additionally, the second end **110**B of the sliding nut **110** is in an overlapping relationship with the first end **104**A of the blocker plate **104** along the lead screw **102** such that the second end **110**B of the sliding nut **110** pulls the blocker plate **104** towards the motor **100** when the lead screw rotates in the first direction.
(32) Furthermore, the first and second ends **104**A, **104**B of the blocker plate **104** slidably engages the lead screw **102** while at least one of the first or second ends **110**A, **110**B of the sliding nut threadably engage threads on the lead screw **102**.
(33) The blocker plate **104** includes a connecting portion **104**C connecting the first and second ends **104**A, **104**B. The sliding nut **110** also includes a connecting portion **110**C that extends between the first and second ends **110**A, **110**B and engages the back portion **62**B to prevent the sliding nut **110** from rotating relative to the back portion **62**B. However, the sliding nut **110** could travel through a track in the back portion **62**B or engage another structure to prevent it from rotating with the lead screw **102**.
(34) To release the bolt **64** relative to the back portion **62**B, the pin **106** must align with a pin recess **116** in the connecting portion **104**C of the blocker plate **104**. In the illustrated example, the pin recess **116** is defined by the connecting portion **104**C of the blocker plate **104** and an arm **118** extending from the blocker plate **104**. The arm **118** creates sufficient space for the pin **106** to fit between the bolt **64** on a first side and the arm **118** on a second opposite side. The pin **106** is at least partially located in the pin opening **112** in the back portion **62**B in both the locked or unlocked position. Furthermore, the configuration in the illustrated example allows the blocker plate **104** to be manufactured by stamping from a single piece of material.
(35) To lock the bolt **64** relative to the back portion **62**B while the bolt **64** is still in a retracted position, the motor **100** drives the lead screw **102** in a second or opposite direction to move the sliding nut **110** and the blocker plate **104** away form the motor **100**. Because the bolt **64** is still in a reacted position in FIG. **14**, the pin **106** prevents the blocker plate **104** from moving to a fully extending position by engaging the arm **118**.
(36) Because the sliding nut **110** and the blocker plate **104** are in an overlapping relationship with the spring **108**, the sliding nut **110** compresses the spring **108** against the blocker plate **104**. The compressed spring provides a biasing effect on the blocker plate **104** such that the blocker plate **104** will push the pin **106** back into the pin opening **114** in the bolt **64** when the bolt is moved to an extended position. As shown in FIG. **15**, the spring loaded or biased position of the blocker plate **104** creates a gap or spacing between the second end **110**B of the sliding nut **110** and the first end **104**A of the blocker plate **104**.
(37) Once the bolt **64** is moved to an extended position, the pin **106** engages both the pin opening **114** in the bolt **64** and the pin opening **112** in the back portion **62**B to lock the bolt **64** as shown in FIG. **12**. The spring **108** also expands in axial length such that the second end **110**B of the sliding nut **110** engages the first end **104**A of the blocker plate **104**. The control module **70** can selectively drive the motor **100** to varying positions as described above based on signals from a user or remote location **80** (FIG. **5**).
(38) During operation of the bolt assembly **60**, a user communicates with the electronic control module **70** through the wireless communications device **70**C to position the bolt assembly **60** in a locked or unlocked position. Additionally, the electronic control module **70** can move the bolt

assembly into a locked position or a ready to be locked position after a predetermined length of time to prevent a user from inadvertently leaving the bolt assembly unlocked. The communication between the user and the wireless communications device **70**C may occur through an application or web interface on a user's mobile device through a Bluetooth or other type of wireless connection.
(39) Additionally, the electronic control module **70** can store a record of the user that accessed the wireless communications device **70**C on the memory **70**A on the electronic control module **70**. The record can include the identity of the user based on the device used to access the wireless communications device **70**C and the time of the request. Alternatively, the electronic control module **70** can send the record to a remote location **80** (FIG. **5**) through use of the wireless communications device **70**C to monitor access through the vertical door assembly **20**. Additionally, the remote location **80** can send a signal to the electronic control module **70** through the wireless communications device **70**C to direct the actuator lock assembly **68** to move between one of the locked or unlocked position.
(40) Additionally, the wireless communications device **70**C can form a wireless connection with a gateway **81** that communicates to the cloud **83** through another wireless connection. The wireless connection in communication with the cloud **83** might include a wireless communication method such as Wi-Fi, Long Range BRLE, LoRaWAN, sub-gig hz, SIG-FOX, or NBIOT. One feature of these wireless communication methods is the ability to transmit information over long distances which is helpful in areas with poor cellular service. Additionally, the wireless communication method might be a one-way communication or a two-way communication such that the wireless communication device **70**C with receive messages or information from the wireless communication method.
(41) The wireless communications device **70**C could communicate information including who unlocked the bolt assembly **60**, when and how long the bolt assembly **60** was left unlocked, if the bolt assembly **60** is still left unlocked such that this information could be stored in the cloud **83** to monitor operation of the bolt assembly **60**. If any of the information obtained from the wireless communication device **70**C is outside of predetermined parameters, a message could be sent through the cloud to a person responsible to manage access through the vertical door into the storage space.
(42) Although the different non-limiting examples are illustrated as having specific components, the examples of this disclosure are not limited to those particular combinations. It is possible to use some of the components or features from any of the non-limiting examples in combination with features or components from any of the other non-limiting examples.
(43) It should be understood that like reference numerals identify corresponding or similar elements throughout the several drawings. It should also be understood that although a particular component arrangement is disclosed and illustrated in these exemplary embodiments, other arrangements could also benefit from the teachings of this disclosure.
(44) The foregoing description shall be interpreted as illustrative and not in any limiting sense. A worker of ordinary skill in the art would understand that certain modifications could come within the scope of this disclosure. For these reasons, the following claim should be studied to determine the true scope and content of this disclosure.

Claims

1. A vertical door latch assembly comprising: a housing configured to be attached to a door; a bolt assembly comprising a bolt which is positioned at least partially within the housing and is slidable relative to the housing to allow the bolt to be extended from the housing and to an extended position configured to engage the bolt with an aperture in a guide rail of the door. wherein the bolt is configured to prevent movement of the door relative to the guide rail when the bolt is engaged with the aperture; a lock member comprising a pin positioned within the housing and moveable

between a lock position where a portion of the pin is received within a pin opening in the bolt, and an unlock position wherein no portion of the pin is received within the pin opening, wherein when in the lock position the pin locks the bolt in the extended position relative to the housing; a slider having at least one abutment surface that engages the pin when the pin is in the lock position and retains the pin in the engaged position relative to the pin opening in the bolt; a driver that rotates a drive member to move the slider along a linear path between at least a first position wherein the at least one abutment surface of the slider engages the lock member and retains the portion of the pin within the pin opening in the bolt, and a second position wherein the at least one abutment surface moves out of engagement with the lock member, the second position configured to allow the pin to move to a position where no portion of the pin is received in the pin opening in the bolt; and wherein, once no portion of the pin is received within the pin opening, the bolt is moveable to retract further into the housing in order to allow the bolt to be disengaged from the aperture in the guide rail of the door and thereby allow movement of the door relative to the guide rail.

2. The vertical door latch assembly of claim 1, wherein the slider includes an outwardly extending arm that cooperates with the drive member to move the slider between at least the first position and the second position.

3. The vertical door latch assembly of claim 1, wherein the driver comprises a motor.

4. The vertical door latch assembly of claim 1, wherein the drive member comprises a lead screw.

5. The vertical door latch assembly of claim 1, including a controller in electrical communication with the driver and configured to direct the drive member between the first position and the second position.

6. The vertical door latch assembly of claim 1, wherein the lock member comprises a pin.

7. The vertical door latch assembly of claim 1, wherein the slider comprises a blocker plate and a slider nut.

8. The vertical door latch assembly of claim 7, wherein blocker plate is slidable along the drive member.

9. The vertical door latch assembly of claim 8, wherein the slider nut is threadably engaged with the drive member.

10. The vertical door latch assembly of claim 1, wherein the slider is located on an opposite side of a portion of the housing from the bolt.

11. The vertical door latch assembly of claim 1, including a spring engaging the slider.

12. The vertical door latch assembly of claim 1, wherein the slider includes a recess that receives the lock member when in the second position.

13. The vertical door latch assembly of claim 12, wherein the slider includes an arm portion that aligns with the lock member when in the unlock position.

14. The vertical door latch assembly of claim 1, wherein the housing comprises a cover portion and a back portion that are secured together to provide an internal cavity that receives the lock member, bolt, and the slider, and wherein the housing is mounted to a door surface of the door comprised of a plurality of slats.

15. The vertical door latch assembly of claim 14, wherein the bolt includes a catch portion for engaging the aperture in the guide rail that extends along one side of the plurality of slats.