AUTOMATIC LATCHING FLUSH BOLT ASSEMBLY
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ABSTRACT OF THE DISCLOSURE
An automatic latching flush bolt assembly including a single member slide for moving a tie rod and bolt head into or out of locking position. The flush bolt assembly further includes a unique locking and holdback dog and locking bar arrangement in conjunction with a trip for the locking bar whereby the slide may be releasably locked in the position thereof in which the bolt head is disengaged and is locked in the position thereof wherein the bolt head is engaged with the doors to which the flush bolt is secured closed.

BACKGROUND OF THE INVENTION
Field of the invention
The invention relates to builders' hardware and refers more particularly to flush bolts of the automatic latching variety for use with doors having one normally active and one normally inactive leaf.

Description of the prior art
The closest known prior art to the present invention is Patent No. 3,183,027. The invention disclosed in Patent No. 3,183,027 and the present invention are the same in that they are both fail safe, that is neither of the structures would unlock in the case of fire weakening the springs therein. The structure of the present invention is, however, completely different from that of the prior invention and includes means for locking the flush bolt assembly in both a latched and unlocked position.

In the past automatic latching flush bolt assemblies of the type used for example to secure the inactive leaf of a pair of doors have often not been fail safe. That is for example, in the case of fire and the weakening of the springs thereof due to heat, the bolts have become unlatched permitting undesirable opening of the doors secured thereby. Further in the past automatic latching flush bolt assemblies have not always provided means for locking the bolt in a retracted or disengaged position or means for insuring the locking of the bolt in its extended or engaged position on closing of the active leaf of the doors secured thereby.

DESCRIPTION OF THE PREFERRED EMBODIMENT
The automatic latching flush bolt assembly 10 of the invention, as shown in FIGURE 1, is secured in the edge 12 of the inactive leaf 14 of a pair of doors including the active leaf 16. The doors 14 and 16, as shown in FIGURE 1, are mounted in the frame 18 by hinges 20 and 22.

As shown in FIGURE 1, the active door leaf 16 is provided with a panic bar 24 operating the bolt 26. A rub-strip 28 operable in conjunction with the trip 30 of the bolt assembly 10 is provided on the edge 32 of the door leaf 16.

The door leaf 14, as shown best in FIGURE 2, is of hollow metal construction and is provided with the standard cutout 34 having a backup member 36 secured at the ends thereof to which the face plate 38 of the bolt assembly 10 is secured by convenient means, such as the screws 40.

A bolt guide 42 is secured to the door 14 at the top thereof by convenient means (not shown). Similarly a top strike 44 and a top strike filler 46 are provided. A plate 47 for attachment of the filler 46 are provided in the frame 18 at the top thereof in alignment with the bolt guide 42 to receive the bolt head 48 in its extended position in the direction of the top of the door leaf 14 whereby the door leaf 14 is secured in its closed position illustrated in FIGURE 1.

The automatic latching flush bolt assembly 10 includes the face plate 38, the slide 50 and means for supporting the slide 50 on the face plate 38 for reciprocal movement
with respect thereto toward the opposite ends of the door, including a guide pin 52 riveted to the flange 54 of the face plate 38 and extending through the opening 56 in the bottom 58 of the slide 50. The coil spring 60 is positioned around the guide pin 52 to act between the flange 54 and the bottom 58 of the slide 50 to urge the slide into an extended position toward the upper end of the door in which position the bolt head 48 extends through the guide 42 and top strike 44, as shown.

The means for supporting the slide 50 on the face plate 38 for reciprocal movement with respect thereto toward the opposite ends of the door further includes the retainers 62 threaded into the flange 64 of the face plate. The retainers pin 62 extends through the opening 66 in the top 68 of the slide 50.

The slide 50 includes the vertically extending slide 70, the bottom 58 and the top 68. A partial other side 72 is provided on the slide 50 as shown, including the portion 74 engaging the face plate 38 to limit the extent of movement of the slide toward the upper end of the door 14. The slide 50 is further provided with the blade 76 extending through the opening 78 in the face plate 38 by which the slide 50 may be moved downwardly against the bias of the spring 60 on insertion of a finger over the top of the blade 76 and downward movement of the blade 76 and slide 50.

The tie rod 80 is threaded into the top 68 of the slide 50 and is secured to the bolt head 48 by convenient means, such as a threaded connection.

A locking dog 82 and a holdback dog 84 are provided on the slide 50, as shown best in FIGURE 7. The dog 84 is co-operable with the locking bar 86 which is pivotally mounted on the bifurcated flange 88 by pivot pin 90 to secure the slide in a downwardly extended position when the slide 50 has been moved to the disengaged position. Dog 82 is operable to lock the slide in an upwardly extended position when the action is closed in conjunction with the trip 30, spring 92 and ball 94 positioned in the recess 96 in the trip 30. Dog 84 acts against the lower end 100 of the lock bar 86. The lower end 100 of the lock bar 86 is urged in a clockwise direction as illustrated in FIGURE 2 by the spring 102 wrapped around the pivot pin 90.

In overall operation of the automatic latching flush bolt assembly 10, with the active leaf 16 of the doors open, the slide 50 may be moved downwardly by downward pressure on the blade 76 against the bias of the spring 60, since at this time the upper end 98 of the lock bar 86 has been pivoted clockwise about the pin 90 from its position, as shown in FIGURES 2 and 6, as shown in FIGURE 7. Clockwise movement of the end 98 of the lock bar 86 is permitted with the active leaf of the doors open. At this time the trip 30 extends through the opening 104 in the face plate 38, as shown in FIGURE 7. The trip 30 is forced out through the opening 104 due to the spring action of the spring 102. The trip is limited in this outward movement by the projections 106 thereon. On downward movement of the slide 50, the end 100 of the lock bar 86 is caused to come over the locking dog 82 and to come into engagement with the holdback dog 84, as shown best in FIGURE 8. In this downward extended position of the slide 50, the bolt head 48 is removed from the top strike 44, whereby the inactive leaf 14 of the doors may be opened if desired.

If it is desired to move the bolt head into an extended upward position, as in FIGURE 2, leaf 48 of the door leaf 14 in the open position, the trip 30 may be moved inwardly to pivot the lock bar 86 counterclockwise, as shown in FIGURE 6. Due to the greater strength of the spring 92, the spring 102 will be overcome so that the end 100 of the lock bar 86 will move out of engagement with the holdback dog 84 and the slide with the bolt head attached will return to its upward extended position under the bias of the spring 60.

The same releasing action will be accomplished on closing of the inactive leaf 14 of the door followed by closing of the active leaf 16 of the door. In this case the rub strip 28 moves the trip 30 inwardly to first move the end 100 of the lock bar 86 from the holdback dog 84 and to subsequently move the end 98 of the lock bar 86 into engagement with the locking dog 82. In this condition the trip is locked in its upper extended position to provide a security feature for the automatic locking flush bolt of the invention since with the structure provided, the flush bolt is not subject to picking by forcing the bolt head back through the top strike.

Thus, it will be seen that the automatic locking flush bolt of the invention is simple, economical to construct and efficient in use. In this latter regard, it will be noted that on engaging the end 98 of the lock bar 68 and the locking dog 82, since the spring 92 is substantially completely compressed with the trip 30 in its inner position, as shown in FIGURE 4, that the flush bolt assembly is still safe under fire conditions. That is to say, that regardless of what happens to the springs, the flush bolt assembly will not be unlocked by gravity.

While one embodiment of the invention has been considered in detail, it will be understood that other embodiments and modifications thereof are contemplated by the inventor. For example, it will be obvious to those skilled in the art that the automatic latching flush bolt of the invention could be used at the bottom of a door as well as the top of a door and that operation of bolt heads at both the top and bottom of a door by a single flush bolt assembly is possible if desired, as for example in the prior patent set forth above. It is therefore the intention to include all embodiments and modifications as are within the scope of the invention.

What I claim as my invention is:

1. An automatic latching flush bolt assembly comprising a single member slide, means mounting the slide in the edge of one leaf of a pair of doors for reciprocal movement in opposite directions toward and away from the opposite ends of the doors, a tie rod connected to the slide for movement therewith, a bolt head secured to the tie rod and adapted to extend through one end of the door and into a door strike to maintain the one leaf of the doors in a fixed position with the slide in a limiting position in one of said directions, means urging the slide in said one of said directions and means for releasably holding the slide in its limiting position in the other of said directions at any time the slide is moved to the limiting position of the other direction, said means including a holdback dog on the slide, a locking bar pivoted to the means for mounting the slide and spring means for urging the locking bar into engagement with the holdback dog when the slide is moved to its limiting position in said other direction.

2. An automatic latching flush bolt assembly comprising a single member slide, means mounting the slide in the edge of one leaf of a pair of doors for reciprocal movement in opposite directions toward and away from the opposite ends of the doors, a tie rod connected to the slide for movement therewith, a bolt head secured to the tie rod and adapted to extend through one end of the door and into a door strike to maintain the one leaf of the doors in a fixed position with the slide in a limiting position in one of said directions, means urging the slide in said one of said directions and means for locking the slide in the limiting position in said one direction any time the door is moved into the other direction, said means including a holdback dog on the slide, a leaf of the one leaf closed, including a locking dog on said slide, a locking bar pivotally mounted on the means for mounting the slide, a trip mounted in the means for mounting the slide operable to resiliently engage the locking bar to force the locking bar into engagement with the locking dog on closing of the other leaf of the door.

3. An automatic latching flush bolt assembly comprising a single member slide provided with a top, a bottom
and an inner side with respect to the edge of one leaf of a pair of doors, means mounting the slide in the edge of the one leaf of the pair of doors for reciprocal movement in opposite directions toward and away from the opposite ends of the doors, including a face plate secured at the opposite ends over an opening in the edge of the door, a retainer pin secured to the face plate and extending parallel thereto in spaced apart relation therefrom and extending through the top of the slide, a guide pin secured to the face plate and extending parallel thereto in spaced apart relation therefrom and extending through the bottom of the slide, a tie rod connected to the slide for movement therewith, a bolt head secured to the tie rod and adapted to extend through one end of the door and into a door strike to maintain the one leaf of the doors in a fixed position with the slide in a limiting position in one of said directions and means urging the slide in said one of said directions, including a coil spring positioned around the guide pin between the face plate and slide.

4. Structure as set forth in claim 3 wherein said slide is further provided with a partial outer side engageable with the face plate to determine the limiting position of the slide toward the one end of the door, an opening is provided in the face plate and a blade is secured to the slide extending through the opening in the face plate for movement of the slide.

5. Structure as set forth in claim 3 wherein the means for locking the slide in its extended position in said other direction comprises a holdback dog on the slide, a locking bar pivoted to the face plate and spring means for urging the locking bar into engagement with the holdback dog when the slide is moved to its limiting position in said other direction.

6. Structure as set forth in claim 3 wherein the means for locking the slide in its extended position in the one direction comprises a locking dog on the slide, a locking bar pivoted to the face plate, a trip slidably mounted on the face plate operable to resiliently engage the locking bar to force the locking bar into engagement with the locking dog on closing of the other leaf of the doors.

7. Structure as set forth in claim 4 and further including a pair of dogs on said slide in vertical spaced apart relation, a locking bar in the shape of a bell crank, means pivotally mounting the locking bar centrally to the face plate, a spring urging the one end of the locking bar into engagement with the lower dog on movement of the slide to its limiting position in said other direction, a trip extending through the face plate, means for restricting the movement of the trip outwardly of the edge of the door through the face plate, a recess in said trip, resilient means in the recess in the trip which is stronger than the spring and a ball positioned between the other end of the lock bar and resilient means for urging the locking bar into engagement with the upper dog when the trip is moved inwardly thereof with respect to the face plate.

8. An automatic latching flush bolt assembly comprising a single member slide, means mounting the slide in the edge of one leaf of a pair of doors for reciprocal movement in opposite directions toward and away from the opposite ends of the doors, a tie rod connected to the slide for movement therewith, a bolt head secured to the tie rod and adapted to extend through one end of the one leaf of the doors and into a door strike to maintain the one leaf of the doors in a fixed position with the slide in a limiting position in one of said directions, means urging the slide in said one of said directions, a pivotally mounted lock bar and means operable between the lock bar and slide for locking the slide in the limiting position in said one direction with the doors closed and for locking the slide in the other of its limiting positions with the door open on movement of the slide to the other of the limiting positions.

9. Structure as set forth in claim 8 wherein the means for locking the slide in the limiting position in said one direction includes a trip slidably mounted in the one leaf of the pair of doors engageable by the other leaf of the pair of doors with both leaves closed for movement toward the lock bar and resiliently biased means within the trip engageable with the lock bar for pivoting the lock bar in one direction into engagement with the slide.

10. Structure as set forth in claim 9 wherein the means for locking the slide in the other of said limiting positions comprises resilient means operably associated with the lock bar for pivoting the lock bar in the other direction into engagement with the slide in the other of its limiting positions when the trip is out of engagement with the other of the pair of doors.

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