Aug. 24, 1965 B. H. YEAGER 3,201,959

SAFETY LOCK

Filed Sept. 4, 1962 2 Sheets-Sheet 1

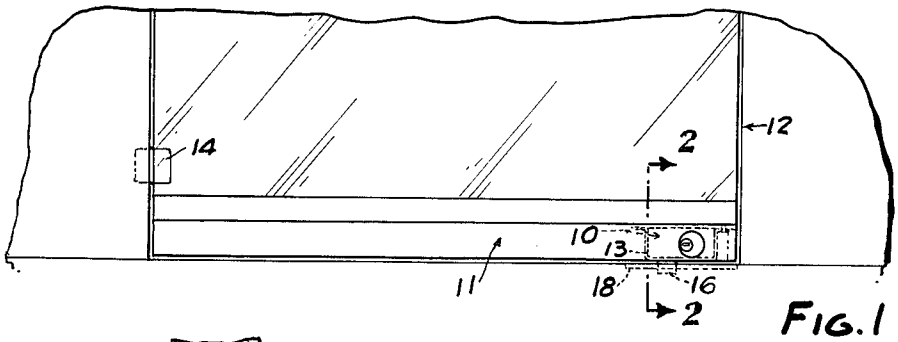

FIG. 1

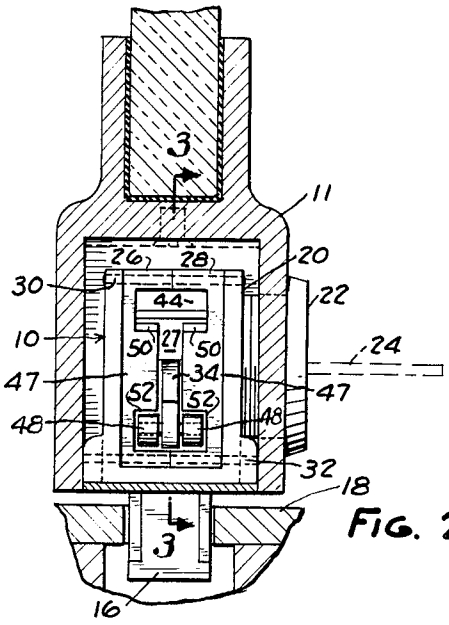

FIG. 2

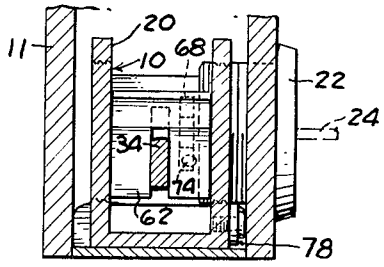

FIG. 4

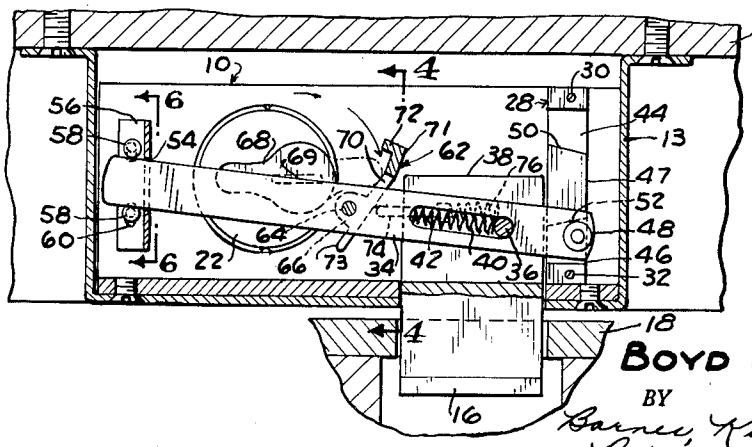

FIG. 3

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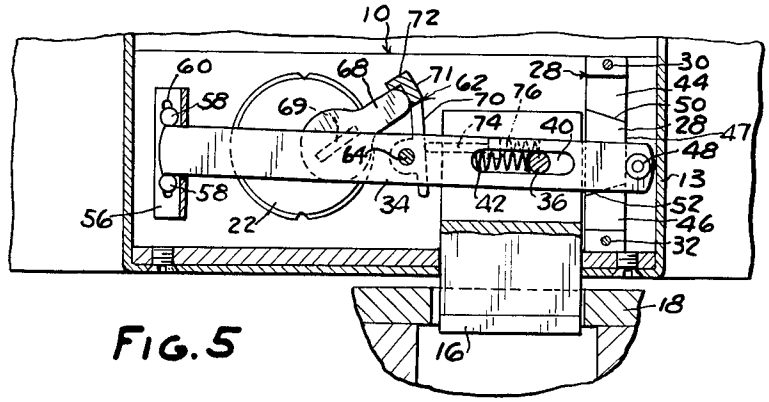

FIG. 5

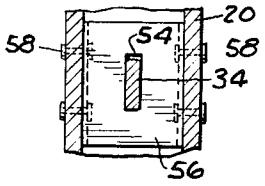

FIG. 6

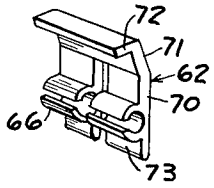

FIG. 8

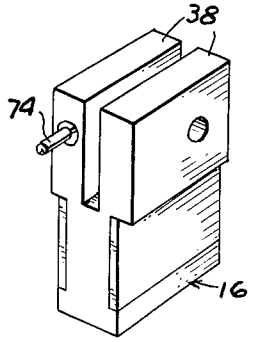

FIG. 7

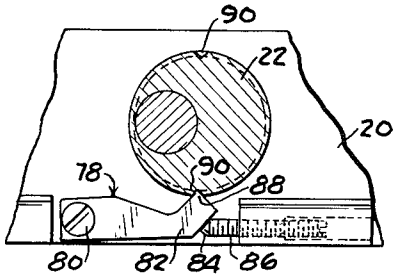

FIG. 9

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SAFETY LOCK

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11 Claims. (Cl. 70—134)

This invention relates to locking mechanisms and in particular to a key actuated safety lock.

In prior art locking mechanisms of the type having a lock bolt that engages a keeper, when the lock bolt is only partially extended within the keeper the bolt can be jimmied easier than when the bolt is positively retained in a fully extended locked position within the keeper.

Therefore, the primary objects of this invention are to provide a safety lock that has positive lock and unlock positions and that prevents withdrawing a key from the lock once the locking operation has been initiated until the locking operation has been completed or the lock is returned to an unlocked condition.

In the drawings:

FIG. 1 is a fragmentary view showing an exemplary use of the lock on a door with the lock bolt fully extended into engagement with a keeper.

FIG. 2 is a cross section taken along the lines 2—2 of FIG. 1 and shows a portion of the locking mechanism that provides positive locked and unlocked positions for the mechanism.

FIG. 3 is a cross section taken along the lines 3—3 of FIG. 2 to illustrate the condition of the mechanism at the completion of a locking operation.

FIG. 4 is a cross section taken along the lines 4—4 of FIG. 3.

FIG. 5 is similar to FIG. 3 but shows the locking mechanism when the key is moved toward the withdrawal position before the locking operation has been completed.

FIG. 6 shows a view taken along lines 6—6 of FIG. 3 to illustrate a slidable fulcrum that is incorporated in the instant locking mechanism.

FIG. 7 is a perspective view showing the details of the lock bolt.

FIG. 8 is a perspective view of a safety hinge included in the actuating mechanism for the lock bolt.

FIG. 9 is a view showing an arrangement for locking the tumbler cylinder against rotation.

As shown in FIG. 1, lock 10 may be positioned at the bottom edge of glass door 12 on metal door frame 11 at a point remote from hinge 14 by bracket 13 as is common in commercial installations. Lock 10 has a lock bolt 16, a case 20, and a tumbler cylinder 22 threaded in the case. Lock bolt 16 extends vertically downward to register with a slot in a keeper 18. Tumbler cylinder 22 is operated by a key 24.

The mechanism for shifting lock bolt 16 to and from locked and unlocked positions generally comprises guide blocks 26, 28, a pivotal and axially shiftable lever 34, fulcrum block 56, pivotal dog 68 and safety hinge 62.

Lever 34 is operatively connected to lock bolt 16 by a pin 36 which is secured between the branches of the bifurcate end 38 of lock bolt 16 (FIG. 7) and passes through an axial camming slot 40 in lever 34. A compression spring 42 is positioned in slot 40, between one end thereof and pin 36 so as to urge lever 34 toward the left as viewed in FIGS. 3 and 5. Lever 34 has rollers 48 rotatably supported on one end thereof, the other end passing through a slot 54 of fulcrum block 56 (FIG. 6) so as to be fulcrumed at the ends of slot 54 and axially slidable within the slot. Fulcrum block 56 is supported

for limited movement on case 20 by a pin 58 and slot 60 arrangement to change the fulcrum point of the lever during locking and unlocking operations.

Lock bolt 16 is axially slidable on guide blocks 26, 28 which are secured to case 20 by pins 30, 32. Guide blocks 26, 28 are suitably apertured longitudinally at 27 to accommodate one end of lever 34 for movement therein. Transverse grooves 44, 46 in guide blocks 26, 28 are adapted to receive rollers 48 and serve as stop positions for the pivotal movement of lever 34 corresponding to locked and unlocked positions, respectively, of lock bolt 16. Grooves 44, 46 have inclined side walls 50, 52 that cam rollers 48 out of grooves 44, 46 onto shoulders 47 of guide blocks 26, 28 to shift lever 34 axially when lever 34 is pivoted by rotating dog 68 against safety hinge 62. Dog 68 rotates about axis 69 in response to rotation of key 24. Key 24 can be inserted into and withdrawn from tumbler cylinder 22 only when dog 68 is positioned as shown in full lines in FIG. 3. Hinge 62 includes boss 66, flat locking extension 70, inclined locking extension 71, upturned flange 72 and unlocking extension 73 (FIG. 8). One end of hinge 62 is bifurcated to accommodate lever 34 between the branches thereof. Pin 64 is journalled through boss 66 and passes through lever 34 to pivotally connect hinge 62 to lever 34. Flat locking extension 70 is inclined to inclined locking extension 71 at about 15 degrees, flange 72 being bent at a right angle to inclined locking extension 71. When dog 68 is rotated clockwise, from the position shown in full lines in the direction of the arrows in FIG. 3, the dog engages the boss 66 and flat extension 70 of hinge 62 to pivot lever 34 clockwise as viewed in FIG. 3 about the end of slot 54 in the fulcrum block 56.

Lock bolt 16 has a spring biased detent 74 urged outwardly from the lock bolt by compression spring 76. When lever 34 is shifted to the right as shown in FIG. 5, rollers 48 resting on shoulders 47, detent 74 engages extensions 70, 71 of hinge 62 to pivot hinge 62 counterclockwise about pin 64. So long as rollers 48 rest on shoulders 47, detent 74 yieldably maintains hinge 62 positioned so that flange 72 will engage dog 68 if it is rotated counterclockwise by movement of the key toward its withdrawal position. However, when rollers 48 rest in either groove 44 or 46 so that lever 34 is shifted to the left, detent 74 does not maintain flange 72 in a position to engage dog 68.

FIG. 9 shows another safety feature of the lock for preventing removal of the tumbler cylinder 22 after the safety lock has been enclosed within the metal door frame 11. A latch lever 78 is pivotally connected to case 20 by a screw 80 and has an elbow 82 having an inclined edge 84 engaged by set screw 86 to lock right angle corner 88 into one of the V-shaped grooves 90 on the tumbler cylinder 22.

With the locking mechanism in its unlocked condition, key 24 may be inserted into and withdrawn from tumbler cylinder 22 when pivotal dog 68 is positioned in a neutral or withdrawal position as shown in full lines in FIG. 3. Rollers 48 are positioned in groove 44 so that lever 34 is shifted to the left as viewed in FIGS. 3 and 5 and lock bolt 16 is fully withdrawn into case 20. The locking operation is initiated by inserting key 24 into tumbler cylinder 22 and rotating the key so that dog 68 rotates clockwise, in the direction of the arrows in FIG. 3, into engagement with boss 66 and flat locking extension 70 of safety hinge 62. During this initial rotation detent 74 does not engage hinge 62, lever 34 being shifted to the left, so that dog 68 is free to rotate past flange 72 or if it engages flange 72, flange 72 will pivot so that

dog 68 can move into the aforementioned engagement with boss 66 and flat locking extension 70. After dog 68 engages hinge 62, continued clockwise rotation of the dog shifts fulcrum block 56 downward as viewed in FIG. 3 and lever 34 begins to pivot clockwise about the lower end of slot 54. Pivotal movement of lever 34 cams rollers 48 out of groove 44 on inclined side wall 50 against the action of spring 42. When rollers 48 have moved out of groove 44 and rest on shoulder 47, lever 34 has shifted to the right as shown in FIG. 5. With lever 34 shifted to the right, detent 74 pivots safety hinge 62 counterclockwise about pin 64, moving flange 72 into a position to positively engage dog 68 if one attempts to rotate the key counterclockwise to the key withdrawal position while the mechanism is in a partially locked position. Detent 74 will yieldably maintain flange 72 in this position relative to dog 68 until lever 34 is shifted to the right as rollers 48 drop into groove 46. FIG. 5 shows the locking mechanism in an intermediate position, dog 68 having been rotated counterclockwise toward the key withdrawal position without having first completed the locking operation. With flange 72 engaging dog 68 the locking mechanism must be returned to its unlocked condition before the key can be withdrawn from the tumbler cylinder 22.

Referring again to the locking operation, after rollers 48 have moved out of groove 44 against the action of spring 42, continued clockwise rotation of dog 68 pivots lever 34 clockwise until rollers 48 reach transverse groove 46 which corresponds to the locked position of lock bolt 16. Spring 42 moves lever 34 axially to the left, pulling rollers 48 into groove 46 as lever 34 shifts to the left. As lever 34 shifts to the left, hinge 62 moves out of engagement with detent 74 and hinge 62 is pivoted clockwise by the outermost portion of the dog 68, positioned as shown in broken lines in FIG. 3, to retract upturned flange 72 so that dog 68 may be rotated freely to the key withdrawal. The unlocking operation is similar to the locking operation in that counterclockwise rotation of dog 68 as viewed in FIG. 3 causes the dog to engage unlocking extension 73 and boss 66 to shift fulcrum block 56 upward as viewed in FIG. 3, pivot lever 34 counterclockwise and move rollers 48 out of groove 46 into groove 44.

I claim:

1. A locking mechanism comprising a lock bolt movable from an unlocked position to a locked position, a pivotal and axially shiftable lever operatively connected to said lock bolt to move said bolt from said unlocked position to said locked position, rotatable actuating means for pivoting said lever when said actuating means is rotated from a neutral position toward a locked position, means responsive to pivotal movement of the lever for shifting said lever axially and maintaining said lever in said shifted position when said lock bolt is intermediate its locked and unlocked positions, and safety means responsive to the axial shifting of said lever and adapted to engage said rotatable actuating means when said actuating means is rotated in a direction towards said neutral position from said locked position and said lock bolt is positioned intermediate said locked and unlocked positions whereby once the locking operation has been initiated said bolt must be shifted by said lever to a locked position before said actuating means can be rotated freely to said neutral position.

2. A locking mechanism as set forth in claim 1 wherein said safety means comprises a safety hinge and yieldable means, said hinge being pivoted on said lever and said yieldable means being adapted to engage said hinge when said lever is shifted axially whereby when said lever is shifted axially said yieldable means pivots said safety hinge so that said hinge engages said actuating means if said actuating means is rotated towards said neutral position when said lock bolt is intermediate said locked and unlocked positions.

3. A locking mechanism as set forth in claim 2 wherein said yieldable means is a spring biased detent carried by said lock bolt so as to contact said safety hinge when said lock bolt is intermediate its locked and unlocked positions.

4. A locking mechanism as set forth in claim 2 wherein said actuating means is a rotatable dog and said hinge comprises a boss and a locking extension, said boss being pivoted to said lever, said extension having an upturned flange remote from said boss, said dog being adapted to engage said boss to pivot and thereby axially shift said lever, and said yieldable means being adapted to engage said locking extension when said lever is shifted axially.

5. A locking mechanism having locked and unlocked positions comprising a frame, an axially shiftable lock bolt, a lever operatively connected to said bolt to shift said bolt to and from said locked and unlocked positions, said lever being pivotable and axially shiftable, stop means for limiting pivotal movement of said lever when said bolt is in a locked or unlocked position, said stop means comprising a pair of grooves in said frame, said grooves corresponding to said locked and unlocked position, said lever having an abutment at one end thereof positionable within said grooves, actuating means for pivoting said lever to move said lock bolt between said locked and unlocked positions, and means responsive to pivoting of said lever for shifting said lever axially into and out of said grooves.

6. A locking mechanism as set forth in claim 5 wherein said lever shifting means comprises a side wall of each of said grooves, said side walls being inclined toward the other of said grooves whereby when said lever is pivoted said inclined side walls cam said abutment out of said grooves to shift said lever axially.

7. A locking mechanism as set forth in claim 5 further comprising spring means for urging said abutment in a direction toward the bottom of said grooves.

8. A locking mechanism as set forth in claim 5 wherein said lock bolt has a bifurcate end for accommodating said lever between the branches thereof, said lever has an axial slot, said bifurcate end being operatively connected to said lever by a pin extending between said branches and through said slot, and a spring carried in said slot between one end of said slot and said pin to urge said abutment in a direction toward the bottom of said grooves.

9. A locking mechanism as set forth in claim 5 wherein said frame includes a guide block, said lock bolt being axially slidable on one surface of said block, said block having an aperture therethrough to accommodate one end of said lever for movement in said block when said lever is pivoted, said aperture communicating between said one surface and an opposite surface of said block, said grooves extending inwardly of said block from said opposite surface, said grooves further being transverse to and spaced along said aperture.

10. A locking mechanism having locked and unlocked positions comprising a frame, an axially shiftable lock bolt, a lever operatively connected adjacent one end thereof to said bolt, said lever being pivotable and axially shiftable, a fulcrum block carried by said frame for limited shiftable movement with respect thereto, said fulcrum block having a slot to accommodate the other end of said lever for movement therein, each end of said slot comprising a fulcrum point for pivotal movement of said lever, and actuating means for pivoting said lever and shifting said lever axially, whereby when said lever is pivoted by said actuating means said fulcrum block shifts to change the fulcrum point during locking and unlocking operations.

11. In combination a key, a key actuated lock, said key being removable from said lock when said key is in a predetermined position with respect to said lock, a lock bolt, lock bolt actuating means for moving said bolt from an unlocked to a locked position in response to rotation of said key in a first direction from said prede-

termined position to a second position corresponding to said locked position of said bolt, and means operable once a locking operation has been initiated for preventing said lock bolt from being positioned intermediate its locked and unlocked positions when said key is rotated in an opposite direction without having first completed said locking operation, said key being freely rotatable in said opposite direction to said predetermined position after a locking operation has been completed while said lock bolt remains in said locked position.

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