United States Patent

Glass

[15] **3,661,001**

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[54] KEY EJECTOR LOCK

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[73] Assignee: **Keystone Consolidated Industries, Inc.**, Peoria, Ill.

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[52] **U.S. Cl.** **70/388**, 70/363

[51] **Int. Cl.** **E05b 17/00**, E05b 27/08

[58] **Field of Search** 70/388, 414, 363, 360, 346, 70/347, 349, 356

[56] **References Cited**

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[57] **ABSTRACT**

A lock assembly for the door of a cabinet or other enclosure which will eject the actuating key for the lock in either the locked or unlocked position or in any radial position if the key is released and includes a lock cylinder housing a stationary bushing, a reciprocable spring-biased stripper, a reciprocable and rotatable driver, and a rotatable plug. Insertion of a proper key depresses the stripper and reciprocates the driver from a first position in engagement with the bushing to a second position in engagement with the plug, thus freeing the driver from the bushing for rotation with the plug within the cylinder and relative to the bushing. The stripper will eject the key in any position of rotation of the driver.

11 Claims, 17 Drawing Figures

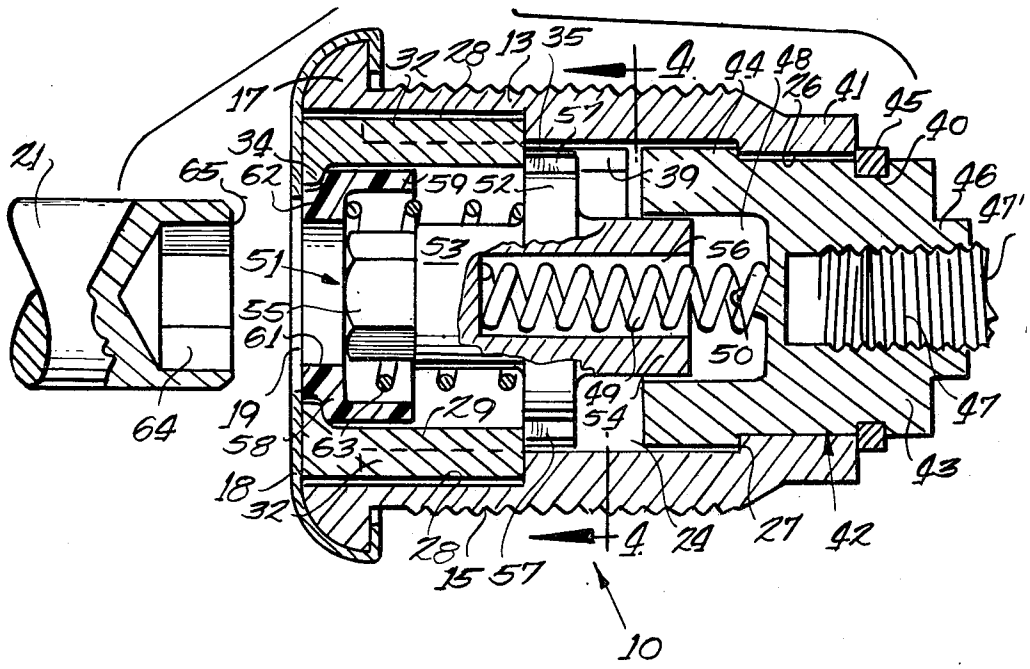

Fig. 1

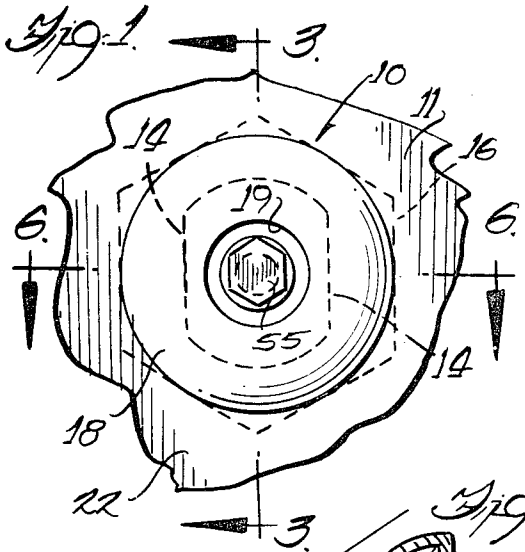

Fig. 2

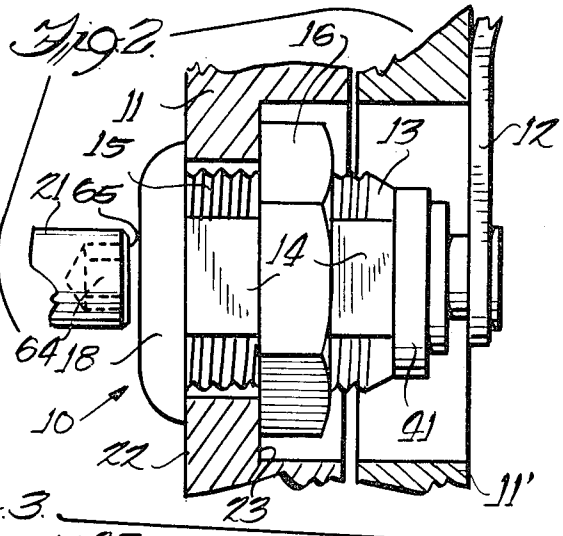

Fig. 3

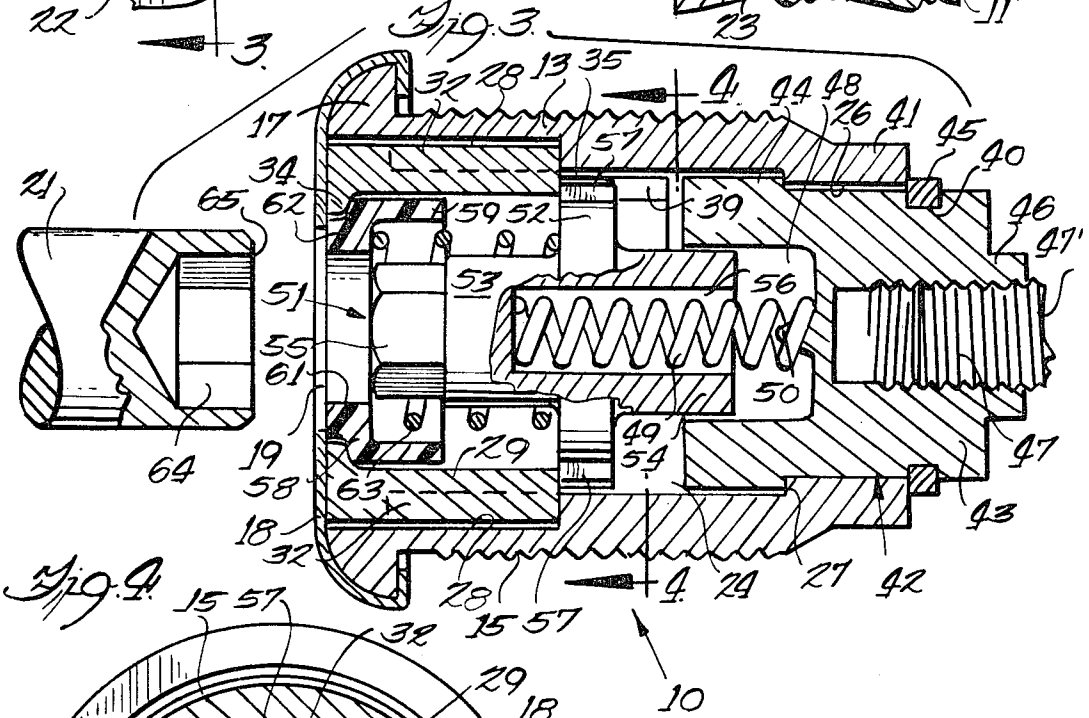

Fig. 4

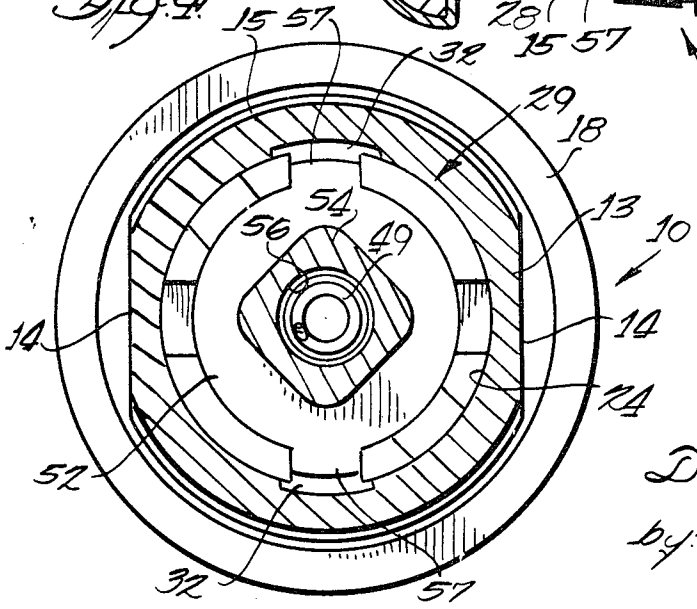

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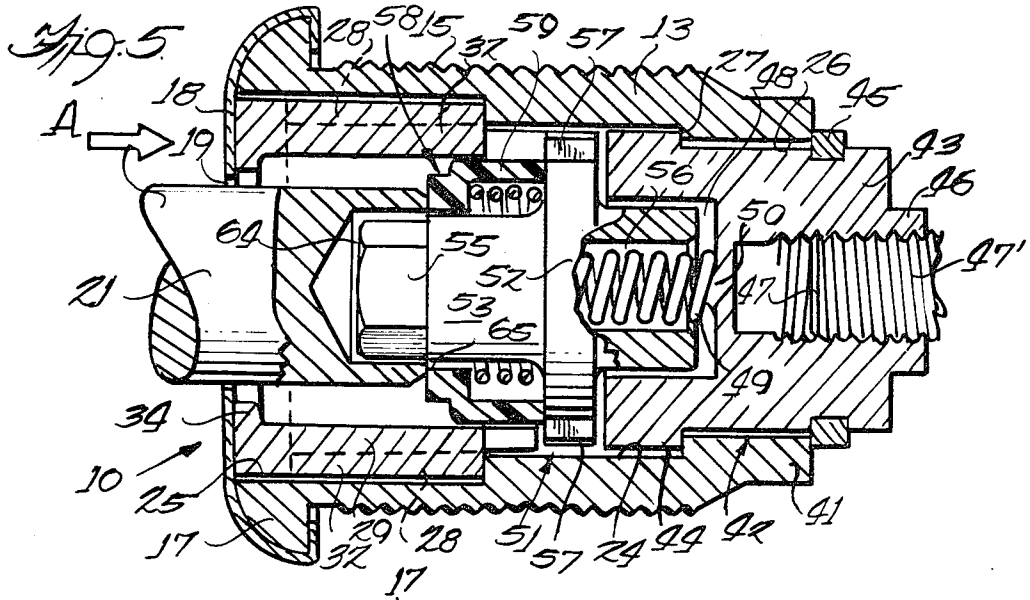
Fig. 5.



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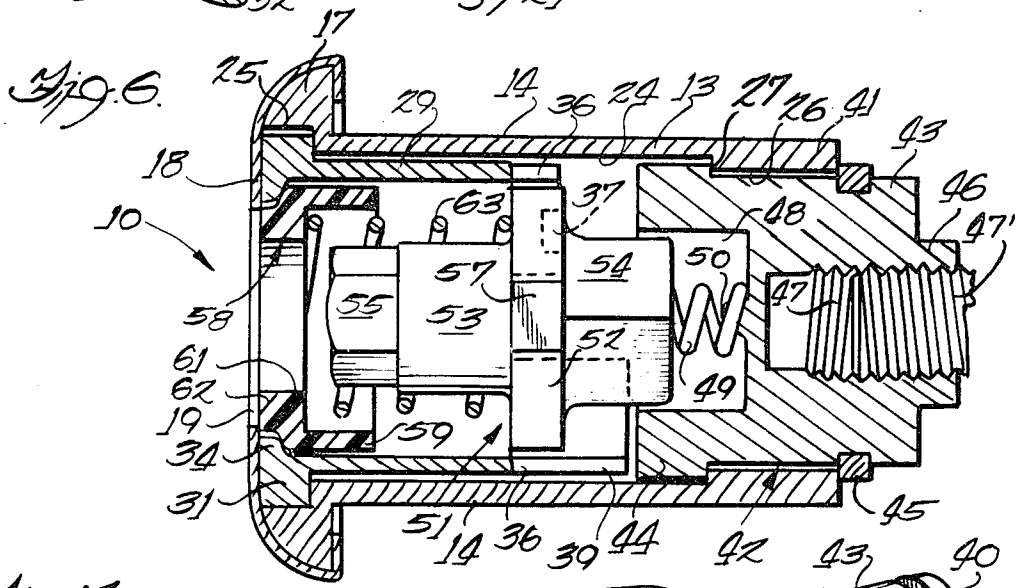

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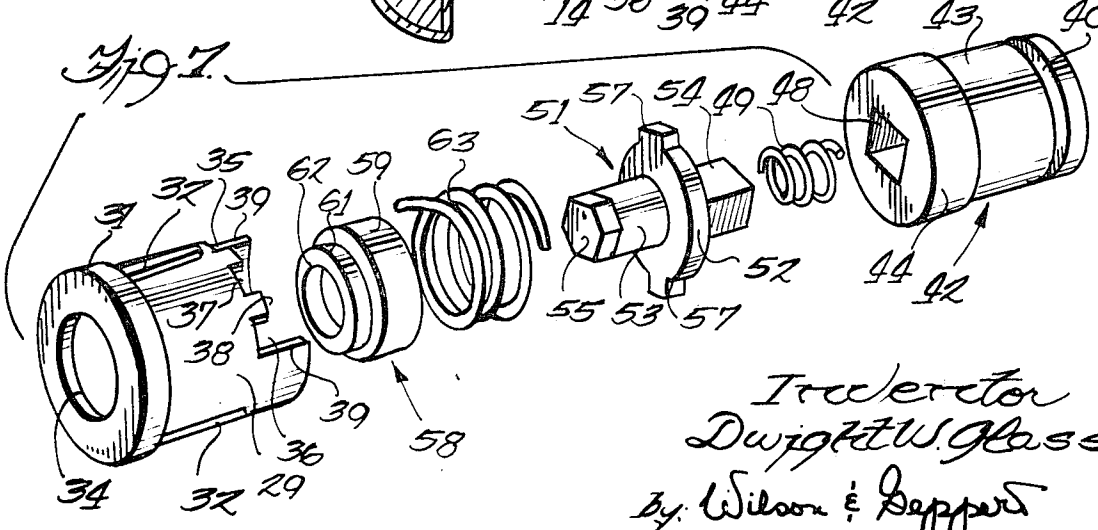

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Fig. 8.

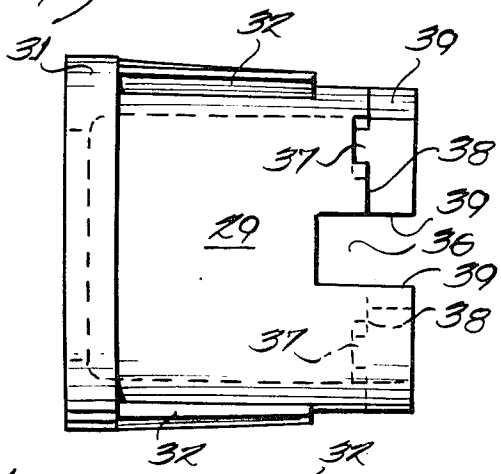
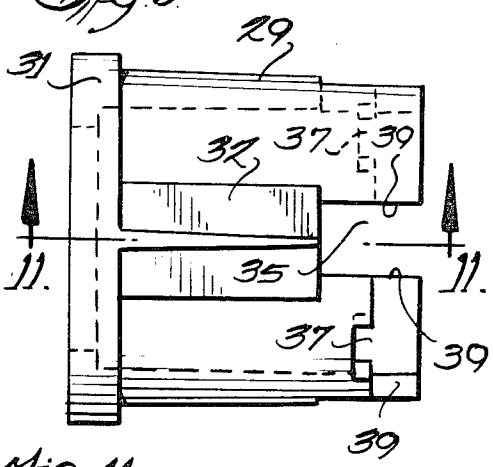


Fig. 9



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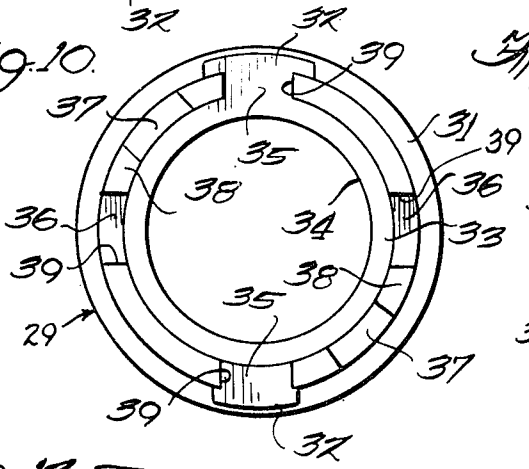

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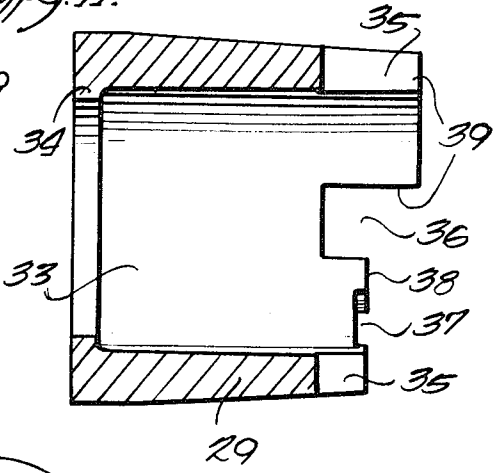

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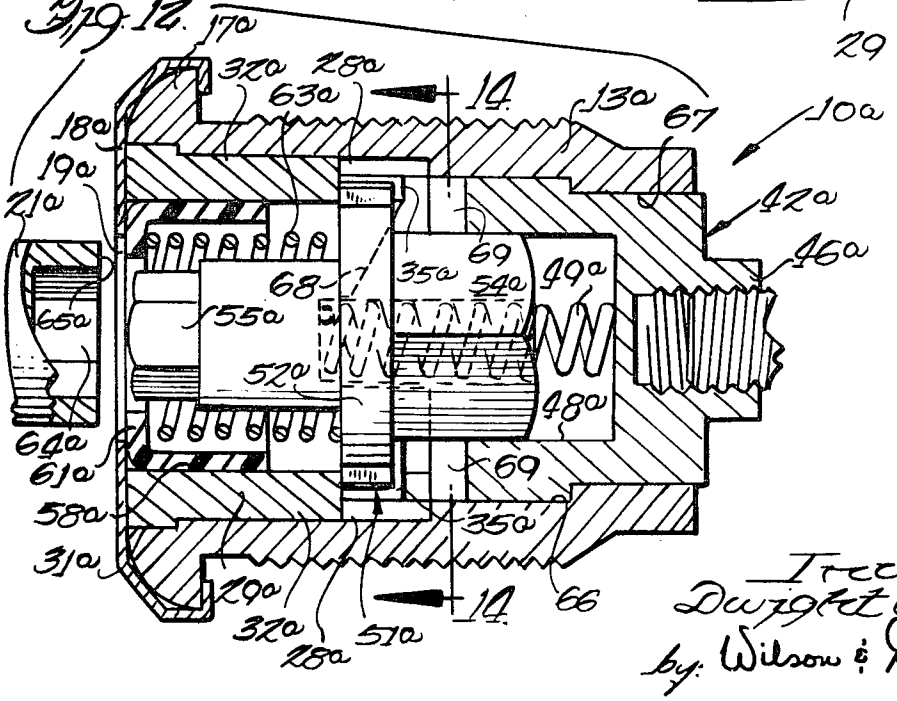

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Fig. 13

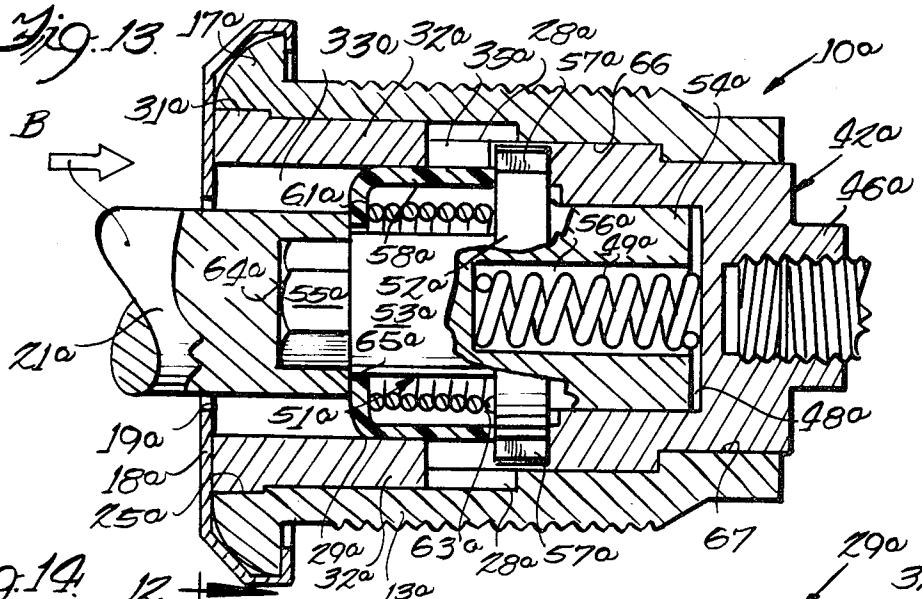


Fig. 14

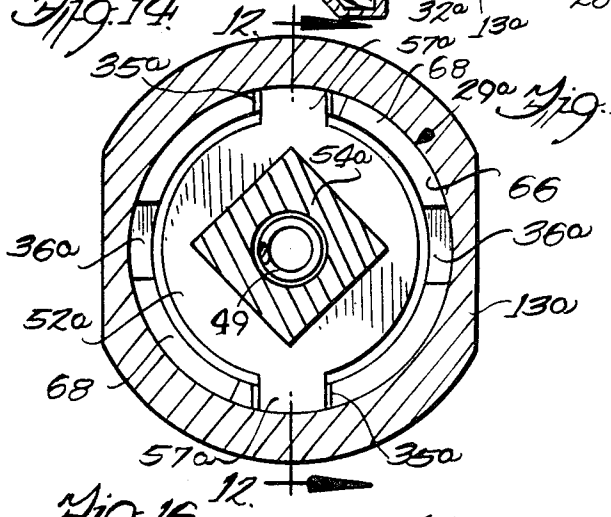


Fig. 15

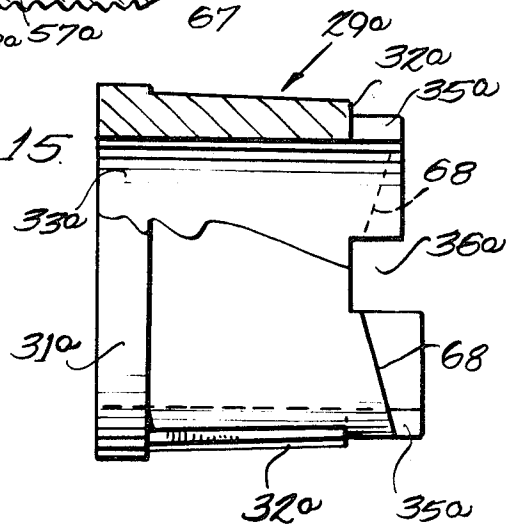


Fig. 16

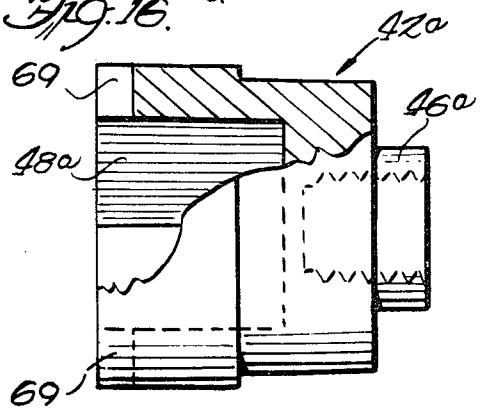
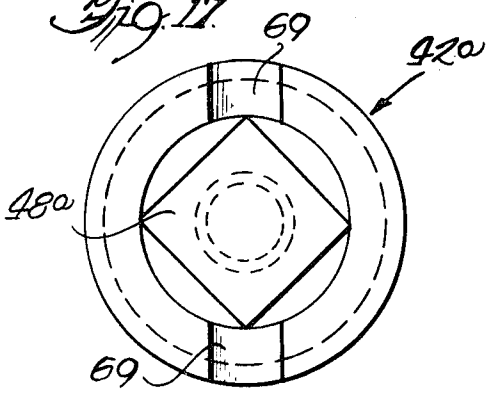


Fig. 17



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KEY EJECTOR LOCK

The present invention relates to a novel lock assembly for the door of an enclosure, such as a refrigerator or a freezer, and more particularly to a lock assembly which will eject the actuating key in locked or unlocked position or in any radial position if the key is released.

Substantially all of the presently available lock assemblies having a key ejecting feature will only eject the key when the lock is moved to one predetermined position, and in any other position of the key and plug, the ejecting mechanism is inactivated. However, in certain lock installations it is desirable that the key be ejected from the lock assembly in any radial position, and the present invention accomplishes this desired function.

Among the objects of the present invention is the provision of a novel lock assembly having a key ejecting mechanism which will operate in any radial position of the key and plug. The lock assembly includes a cylinder, a stationary bushing and a spaced rotatable plug within the cylinder, a reciprocable and rotatable driver engaged by a key, and a spring-biased stripper in the bushing and engaged by the key and urged rearwardly to engage the key onto the driver. The stripper is under constant spring force and will eject the key upon release thereof in any position of rotation of the driver and the plug.

Another object of the present invention is the provision of a lock assembly having a key ejecting function where a reciprocable and rotatable driver has a central flange with oppositely extending ears that are received in one of two pairs of oppositely disposed notches formed in the rear edge of the bushing; one pair of opposed notches providing a locked position and the other pair of notches providing an unlocked position for a bolt secured to the plug. The driver is always interengaged with the plug to rotate simultaneously therewith, and the insertion of the key urges the driver rearwardly against the force of a spring to release the ears of the driver from the notches of the bushing to allow rotation of the driver and the plug relative to the bushing between locked and unlocked position.

A further object of the present invention is the provision of a lock assembly having means to prevent the driver from being rotated to locked position where the driver has been released from the bushing but only partially rotated relative thereto. This means comprises a pair of oppositely disposed shallower notches on the rear edge of the bushing and positioned in the path of travel of the driver ears between locked and unlocked positions. Thus, if the key is released and ejected with the driver ears out of the notches at either the locked or unlocked position and the driver only partially rotated, any additional unauthorized rotation of the driver will cause the ears to fall into the anti-latching notches.

The present invention also comprehends the provision of a novel lock assembly where the lock bolt can be thrown to the unlocked position from the locked position from the inside of a locked enclosure. In this embodiment, the rear edge of the bushing is provided with a pair of oppositely disposed camming surfaces extending between the locked position notches and the unlocked position notches. Each cam surface has its low point at the corresponding locked notch and its high point at the edge of the corresponding unlocked notch. Thus, rotation of the bolt and plug will cause rotation of the driver with the driver ears riding on the camming surfaces from the locked position notches to the unlocked position notches.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings

FIG. 1 is a front elevational view of one embodiment of lock assembly having a key ejector therein.

FIG. 2 is a side elevational view of the lock assembly mounted in a door.

FIG. 3 is a vertical cross sectional view taken on the line 3—3 of FIG. 1.

FIG. 4 is a vertical cross sectional view taken on the line 4—4 of FIG. 3.

FIG. 5 is a vertical cross sectional view similar to FIG. 3 but with a key inserted in the lock.

FIG. 6 is a horizontal cross sectional view of the lock taken on the line 6—6 of FIG. 1.

FIG. 7 is an exploded perspective view of the lock assembly with the cylinder omitted.

FIG. 8 is a side elevational view of the bushing.

FIG. 9 is a top plan view of the bushing.

FIG. 10 is a rear elevational view of the bushing.

FIG. 11 is a vertical cross sectional view of the bushing taken on the line 11—11 of FIG. 9.

FIG. 12 is a vertical cross sectional view of a second embodiment of lock assembly taken on the line 12—12 of FIG. 14.

FIG. 13 is a cross sectional view similar to FIG. 12 but showing the key inserted in the lock.

FIG. 14 is a vertical cross sectional view taken on the line 14—14 of FIG. 12.

FIG. 15 is a side elevational view, partially broken away, of the bushing of the embodiment of FIG. 12.

FIG. 16 is a side elevational view, partly broken away, of the plug of the embodiment of FIG. 12.

FIG. 17 is a rear elevational view of the plug of FIG. 16.

Referring more particularly to the disclosure in the drawings where are shown two illustrative embodiments of the present invention, FIGS. 1 to 11, inclusive, disclose one embodiment of a lock assembly **10** utilized for the door **11** of an enclosure **11'**, such as a refrigerator or freezer, provided with a lock bolt **12** at the rear end thereof adapted to be rotated between a locked position (shown in FIG. 2) and an unlocked position. The lock assembly **10** includes a lock cylinder **13** having a conventional cylindrical exterior surface with oppositely disposed flattened surfaces **14** interrupting an exterior thread **15** for mounting in the door with a nut **16**. The cylinder has an enlarged face or flange **17** with a sheet metal escutcheon **18** secured thereon and having a central opening **19** forming a keyway for a suitable tubular key **21**.

The lock cylinder **13** is inserted in a complementary opening in the door **11** with the flange **17** and rear edge of the escutcheon **18** abutting the exterior door surface **22** and the mounting nut **16** threadingly engaging the threads **15** to abut an interior surface **23** of the door **11**; the flattened surfaces **14,14** acting with the complementary door opening to prevent rotation of the lock cylinder **13** therein.

The cylinder **13** has a generally cylindrical passage **32,32** therethrough counterbored at **25** (see FIG. 6) and reduced in diameter at **26** to form an annular shoulder **27**. The escutcheon **18** covers a substantial portion of the counterbore **25** at the face of the cylinder. A pair of oppositely disposed longitudinal channels or grooves **28,28** are formed in the passage **24** and terminate short of the shoulder **27**. Received within the cylinder **13** is a bushing **29** having a flange **31** at the forward end received in the counterbore **25** and a generally cylindrical body press-fitted in the passage **24**. A pair of oppositely disposed longitudinal ribs **3232** extending rearwardly from the flange **31** are conformably received in the grooves **28,28** to accurately position the bushing in and stationary to the cylinder.

The bushing **29** has a central generally cylindrical passage **33** therethrough reduced by an inwardly extending flange **34** at the forward end. At the rear edge, the bushing is formed with a pair of oppositely disposed unlocked position notches **35,35**, a pair of oppositely disposed locked position notches **36,36** removed 90° from the notches **35,35**, and a pair of oppositely disposed anti-locking notches **37,37** therebetween. The rear edge of the bushing is cut away at oppositely disposed arcs **38,38** to define the path of travel for a driver to be later described. The cut-away portion also provides pairs of stop edges or shoulders **39,39** limiting travel of the driver between oppositely disposed adjacent pairs of notches **35** and **36**.

Mounted within the rear end 41 of the cylinder 13 is a rotatable plug 42 having a generally cylindrical body 43 and an enlarged flange 44 cooperating with the shoulder 27 to prevent axial movement of the plug in the cylinder 13. An annular groove 40 in the plug adjacent the rear end 41 of the cylinder 13 receives a locking ring 45 to further retain the plug in the cylinder. The rear end 46 of the plug 42 has a threaded opening 47 receiving suitable securing means 47' for and is polygonal so as to be received in a complementary opening in the swingable lock bolt 12. The forward end of the plug 42 defined by the enlarged flange 44 is provided with a recess 48, of a polygonal or other suitable configuration, receiving a relatively small compression spring 49 on a positioning nub 50 adapted to resiliently urge a driver 51 toward the bushing 29.

The driver 51 includes a generally central radial flange 52 separating a forward cylindrical shaft 53 from a rearward end 54 of a polygonal or other suitable configuration. The forward shaft 53 extends into the passage 33 in the bushing 29 and terminates in a slightly reduced key-engaging end 55 of a polygonal or other suitable configuration. The rearward end 54 is conformably received in the complementary recess 48 in the plug 42, so that the driver 51 and the plug 42 are constantly interengaged to rotate together. Also, the end 54 has a central recess 56 receiving one end of the compression spring 49.

The central flange 52 is provided with a pair of oppositely disposed outwardly extending tabs or ears 57,57 adapted to cooperate with the sets of notches 35,36,37 formed on the rear edge of the bushing 29. Encompassing the cylindrical shaft 53 of the driver 51 is a stripper 58, preferably formed of a plastic material, having a cylindrical wall 59 closely conforming to the interior surface of the passage 33 of the bushing 29 and terminating in an inwardly extending flange 61 closely conforming to the surface of the shaft 53. The flange 61 also extends forwardly of the wall to provide an annular projection or surface 62 fitting within the opening defined by the flange 34 of the bushing 29. A stripper compression spring 63 is positioned to encompass the shank 53 and be located within the encompassing wall 59 of the stripper 58 and bear against the flange 61 and constantly urge the stripper forwardly to abut the flange 34 of the bushing.

A generally tubular key 21 has a flat key bow (not shown) and a polygonal recess 64 within the key 21 to conformably receive the end 55 of the driver 51. In operation with the tabs 57 of the driver received in the unlocked position notches 35 and the bolt 12 in unlocked position, the tubular key 21 is inserted into the lock cylinder 13 and escutcheon 18 through the opening 19 in the direction of the arrow A (FIG. 5). The end 65 of the key 21 initially engages the annular surface 62 of the stripper 58 to urge it rearwardly against the force of the compression spring 63; the stripper moving rearwardly until the wall 59 abuts the central flange 52 of the driver 51 and the stripper uncovers the end 55 of the driver. As the stripper is retracted, the end 55 is received in the complementary recess 64 in the end 65 of the tubular key 21.

Further movement of the key 21 causes the driver 51 to move rearwardly against the force of the compression spring 49 with the end 54 moving further into the complementary recess 48 in the plug 42 until the flange 52 lies closely adjacent to or abuts the flange 44 of the plug and the tabs 57 are beyond the cut-away arcs 38 of the bushing 29. Then the key 21 is rotated clockwise for approximately 90° to simultaneously rotate the driver 51, the plug 42 and the lock bolt 12; the lock bolt moving from unlocked to locked position (see FIG. 2). As the driver is rotated, the tabs 57 are moved in an arc to a point opposite the locked position notches 36. Movement of the tabs 57 is terminated by engagement with the stop edges 39 adjacent the notches 36. Release of the key 21 will allow the compression spring 49 to move the driver 51 forwardly until the tabs 57 enter the notches 36, and the second compression spring 63 moves the stripper 58 forwardly until it abuts the flange 34 of the bushing 29 to thus fully eject the key 21 from the lock 10.

It should be noted that the stripper 58 is effective at any point of rotation of the driver 51 between and at the locked and unlocked positions thereof to eject the key 21 upon release thereof; the spring 63 constantly urging the stripper 58 forwardly in the key ejecting function. To return the bolt 12 to its unlocked position, the above operations are repeated with the key 21 being rotated in a counterclockwise direction.

Also, if the driver 51 is positioned with the bolt in unlocked position and the key 21 actuates the driver rearwardly and into partial rotation, and the key is then released and ejected, the anti-locking notches 37 prevent the unauthorized rotation of the bolt 12 to its locked position. Thus, by grasping the bolt 12 and turning toward the locked position, the bolt will rotate the plug 42 and the driver 51 until the tabs 57 are aligned with the notches 37 where, under the impetus of the spring 43, the driver 51 moves forward so that the tabs 57 snap into the notches 37. In this position, the bolt 12 cannot engage the edge or strike of the enclosure to lock the door so as to bend or otherwise damage the bolt or the strike upon closing movement of the door. The tabs 57 will remain in the notches 37 until released by actuation of the driver 51 by a proper key 21.

FIGS. 12 to 17 disclose a second embodiment of lock assembly 10^a where parts identical to the first embodiment will be denoted by the same numeral with a superscript a. This lock assembly is utilized in a door of an enclosure and actuates a lock bolt (not shown) between locked and unlocked positions. This assembly includes a lock cylinder 13^a adapted to be stationarily mounted in a door, and having a radially outwardly extending flange 17^a covered by a sheet metal escutcheon 18^a having a central opening 19^a defining a keyway.

The cylinder has a central passage therethrough with a front counterbore at 25^a and provided with a rearward reduced portion 66 and a second reduced portion 67. A pair of longitudinally extending channels or grooves 28^a,28^a are formed in the central passage and open into the counterbore 25^a; the grooves terminating at the shoulder defined by the reduced portion 66 of the passage. A bushing 29^a having a flange 31^a and oppositely disposed longitudinal ribs 32^a is conformably received in the cylinder 13^a, with the bushing forming a central passage 33^a therethrough.

The rear edge of the bushing 29^a rearwardly of the inner ends of the ribs 32^a is provided with a pair of oppositely disposed unlocked position notches 35^a,35^a and a pair of oppositely disposed locked position notches 36^a, 36^a removed 90° from the notches 35^a, 35^a. A pair of oppositely disposed camming surfaces 68,68 extend between adjacent notches 35^a,36^a for a purpose to be later described. Each camming surface 68 has a low end generally merging into the base of a notch 36^a and a high end at adjacent the edge or lip of a notch 35^a.

A plug 42^a is rotatable mounted within the reduced portions 66 and 67 of the cylinder 13^a and has an internally threaded polygonal rear end 46^a to which a lock bolt is secured. The forward end of the plug 42^a has a central recess 48^a of a polygonal or other configuration housing a compression spring 49^a and conformably receiving the rear end 54^a of a driver 51^a. The front end of the plug 42^a lies closely adjacent to the rear edge of the bushing 29^a and is provided with a pair of oppositely disposed radially extending notches or channels 69,69 for a purpose to be later described.

The driver 51^a has the central flange 52^a with the oppositely disposed tabs or ears 57^a thereon, the rear end 54^a constantly interengaged within the recess 48^a of the rotatable plug 42^a and has a recess 56^a receiving the spring 49^a, and the cylindrical shaft 53^a terminates in a key-engaging end 55^a of a polygonal or other configuration. A stripper 58^a, formed of a plastic material, has a front inwardly extending flange 61^a and encompasses the shaft 53^a and is biased forwardly by a second compression spring 63^a.

A generally tubular key 21^a actuates the lock to rotate the bolt 12^a between unlocked and locked positions and, as in the first embodiment, insertion of the key into the cylinder 13^a

and the escutcheon 18^a in the direction of the arrow B (FIG. 13), causes retraction of the stripper 58^a to uncover the end 55^a of the driver 51^a which is received in the complementary recess 64^a in the end 65^a of the key. Further movement of the key 21^a causes rearward movement of the driver 51^a so that the tabs 57^a move out of the notches 35^a and into the channels 69 in the plug 42^a to free the driver from the bushing 29^a. Then the key 21^a, the driver 51^a, the plug 42^a and the lock bolt can be rotated counterclockwise from the unlocked to the locked position. Release of the key 21^a allows the spring 49^a to bias the driver 51^a toward the bushing 29^a with the tabs 57^a entering the locked position notches 36^a therein, and the spring 63^a biases the stripper 58^a forwardly to eject the key 21^a.

Reversing the above operations will actuate the lock bolt to return to its unlocked position. However, when the door 11^a is closed and locked on the enclosure, either deliberately or by accident, a person within the enclosure can manually rotate the bolt to unlocked position without using a key. This is accomplished through the camming surfaces 68,68 on the rear edge of the bushing 29^a. Manual rotation of the bolt causes rotation of the plug 42^a and the driver 51^a, with the tabs 57^a riding up out of the notches 36^a,36^a onto the camming surfaces 68,68 and along the camming surfaces until the tabs 57^a,57^a snap into the notches 35^a,35^a under the impetus of the compression spring 49^a. The lock and bolt are then in the unlocked position, and the bolt cannot be moved to the locked position except by actuation of the lock by the key 21^a from the exterior of the door.

While a lock assembly of a particular and effective structure has been shown and described by way of illustration, it is not my intent or desire to unnecessarily restrict the scope or the utility of this improvement by virtue of this limited showing.

I claim:

1. A key ejector lock assembly, comprising a lock cylinder, a rotatable plug in the rear end of said cylinder and secured to a lock bolt, a reciprocable and rotatable driver in said cylinder in constant interengagement with said plug actuated by a suitable key and including a central flange, a forward cylindrical shaft terminating in a key-engaging end and a rearwardly extending end, said plug having a recess conformably receiving the rearwardly extending end of the driver to provide a driving connection therebetween for simultaneous rotation thereof, a stationary bushing in the front end of the cylinder receiving the forward cylindrical shaft of the driver and having rearwardly opening notches in the inner edge thereof to provide a locked position and an unlocked position for the driver, at least one outwardly extending tab on the central flange cooperating with said notches to retain the driver in the locked and unlocked positions of rotation, and a resiliently biased substantially annular stripper in said cylinder encompassing the forward shaft of the driver and acting to constantly eject the key out of the cylinder in all positions of rotation of the key.

2. A key ejector lock assembly, comprising a lock cylinder, a rotatable plug in said cylinder and secured to a lock bolt, a reciprocable and rotatable driver actuated by a suitable key, said driver being in constant interengagement with said plug and including a central flange, a forward cylindrical shaft terminating in a key-engaging end and a rearwardly extending end, said plug having a complementary recess receiving the rearwardly extending end of said driver to provide simultaneous rotation of said driver and said plug, means in said cylinder cooperating with said driver to provide a locked position and an unlocked position,means on said flange cooperating with said first mentioned means to retain the driver in its locked and unlocked positions of rotation, a resiliently biased stripper in said cylinder acting to constantly eject the key out of the cylinder, said stripper encompassing the cylindrical shaft of the driver to normally cover the key-engaging end thereof, a first compression spring between the plug and the driver, and a second compression spring between the central flange and the stripper.

3. A key ejector lock assembly as set forth in claim 2, in which said first mentioned means includes providing the cylinder with a pair of oppositely disposed unlocked position notches and a pair of oppositely disposed locked position notches spaced approximately 90° from the first mentioned notches, and said central flange has a pair of oppositely disposed outwardly extending tabs thereon adapted to be received in either pair of said notches.

4. A key ejector lock assembly as set forth in claim 3, in which engagement of the driver by a suitable key retracts said stripper and moves the driver rearwardly to move said tabs out of either pair of notches to free the driver for rotation within said cylinder and cause simultaneous rotation of said plug and a lock bolt between locked and unlocked positions.

5. A key ejector lock assembly as set forth in claim 3, including a stationary bushing in the forward end of said cylinder having a central passage receiving said cylindrical shaft and provided with said pairs of notches in the rear edge thereof.

6. A key ejector lock assembly as set forth in claim 5, in which the rear bushing edge is cut away on oppositely disposed arcuate surfaces between the locked position notches and the unlocked position notches, said cut away surfaces allowing movement of said tabs, and the edges of said non-cut away surfaces providing stops limiting the arc of movement of said tabs to approximately 90°.

7. A key ejector lock assembly as set forth in claim 5 in which said stripper closely conforms to and reciprocates in the passage in said bushing.

8. A key ejector lock assembly as set forth in claim 6, in which said rear edge of the bushing has a pair of oppositely disposed anti-lock notches in the cut away arcuate surfaces intermediate the unlocked position notches and the locked position notches.

9. A key ejector lock assembly as set forth in claim 5, in which said bushing has a pair of oppositely disposed inclined camming surfaces extending between adjacent locked position notches and unlocked position notches, each camming surface having a low point at the base of a locked position notch and a high point at the outer edge of an unlocked position notch.

10. A key ejector lock assembly as set forth in claim 10, in which when the bolt is in locked position, said bolt can be manually rotated to unlocked position through the camming surfaces without the use of a key.

11. A key ejector lock as set forth in claim 4, in which said plug has a pair of oppositely disposed channels to receive said tabs and free the tabs from either pair of notches to allow rotation of said driver, said plug and said bolt.

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