Dec. 6, 1966 S. B. McKENZIE 3,290,079

DOOR LOCK AND KEEPER

Filed March 22, 1965 2 Sheets-Sheet 1

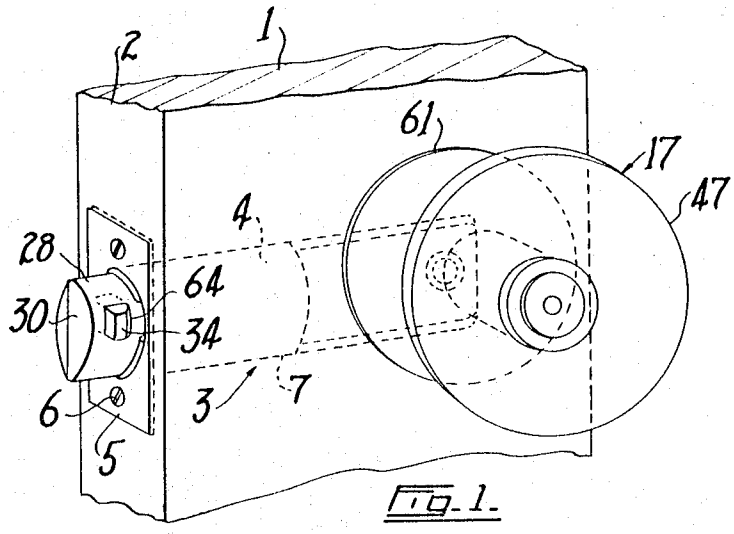


FIG. 1.

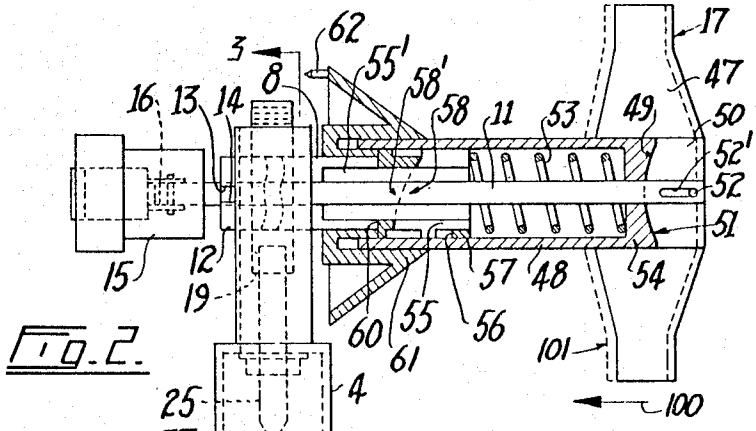


FIG. 2.

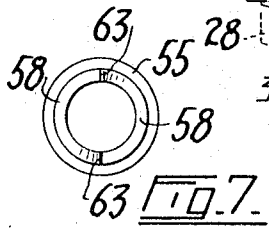


FIG. 7.

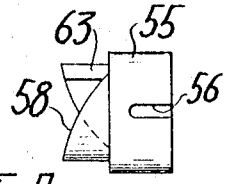


FIG. 8.

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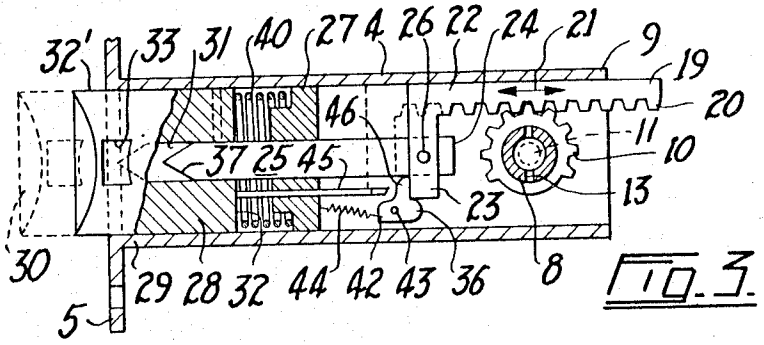


FIG. 3.

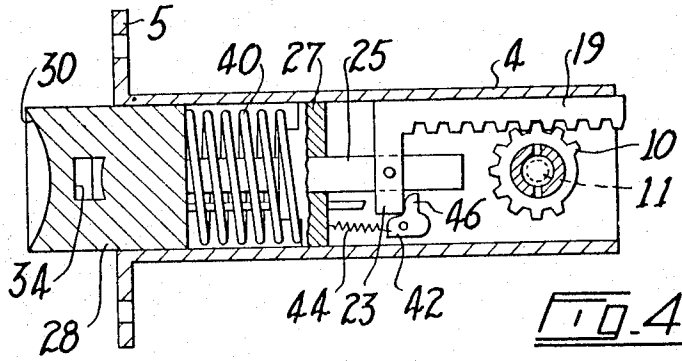


FIG. 4.

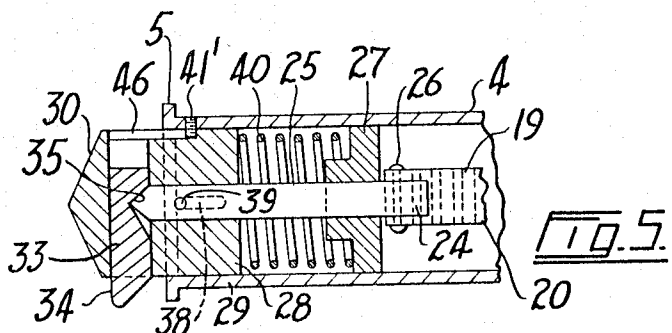


FIG. 5.

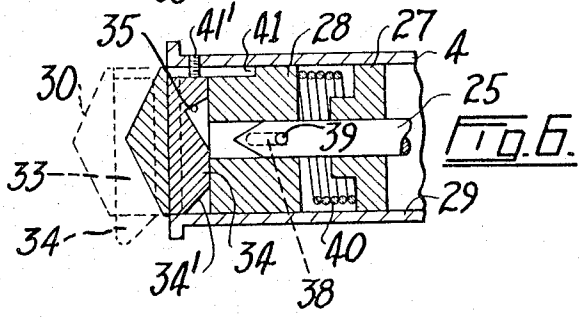


FIG. 6.

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3,290,079
DOOR LOCK AND KEEPER

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Filed Mar. 22, 1965, Ser. No. 441,742
3 Claims. (Cl. 292—172)

This application is a continuation-in-part of my co-pending application Serial No. 235,279 filed November 5, 1962 and now abandoned.

My invention relates to new and useful improvements in self-adjusting door bolt devices particularly suitable for use in ships, planes, aircraft and any mobile vehicles and transportation units.

I have prevented inadvertent opening by providing a door lock which includes a sliding bolt operated by a rack and pinion which, in turn, is connected to the conventional handle, said bolt including a transversely situated dead lock cross bar in the extending end of said bolt which is adapted to extend at right angles when the bolt is extended and engage behind a conventional keeper plate, thus giving a bolting action in two directions, namely, in the longitudinal direction by the engagement of the bolt with the keeper plate and at right angles thereto by the engagement of the dead lock cross bar behind the keeper plate.

The principal object of my invention is, therefore, to provide a door lock or latch which engages the door frame and keeper plate in two directions.

A further object of my invention is to provide a device of the character herein described which, when bolted, is unable to be forced by the conventional method of sliding a thin blade between the door frame and the bolt.

Another object of my invention is to provide a device of the character herein described which includes means to maintain the door bolt in the retracted position without the use of special plungers, catches or other impediments.

A still further object of my invention is to provide a device of the character herein described which is assembled without the usual screws, bolts, etc., which often become loose and disengaged due to the continuous vibration usually encountered in the vehicle and transportation units above referred to.

Another object of my invention is to provide a device of the character herein described which is readily adapted for use with a conventional key-operated lock upon one side thereof.

Another object of my invention is to provide a device of the character herein described which is adaptable for use in conventional doors and can be installed therein readily and easily.

Other objects of the invention will become apparent from the following description in conjunction with the accompanying drawings wherein:

FIGURE 1 is a fragmentary perspective view of the edge of a door showing the bolting device in situ and being viewed from the inside or handle-operated side,

FIGURE 2 is a top plan view of the bolting device with the handled sectioned to show the interior thereof,

FIGURE 3 is a side cross section view of the bolting mechanism in semi-retracted position, and is a view along the line 3—3 of FIGURE 2,

FIGURE 4 is a side cross section view of the bolting mechanism in fully extended position,

FIGURE 5 is a top cross section view of the bolting mechanism illustrating the bolt in fully extended position,

FIGURE 6 is a top cross section view of the bolting mechanism illustrating the bolt in semi-retracted position,

FIGURE 7 is an end view of one of the clutch members in the handle, and

FIGURE 8 is a view of FIGURE 7 but at right angles thereto.

The invention will now be more fully described with reference to the accompanying drawings.

In FIGURE 1, numeral **1** represents a portion of a door, and including a vertical side or edge **2**. The bolt which is generally designated by numeral **3**, includes a cylindrical chamber **4** (see also FIGURES 2, 3, 4, 5 and 6) having a retaining plate **5** secured to one end thereof by means of which the bolt assembly is held in position by screws **6** passing through the plate **5** and into the side **2** of the door. With this construction the bolt assembly can be mounted in a door by drilling a cylindrical hole **7** inwardly from the edge **2**, and by providing a second drill hole at right angles to the first hole, and through which a spindle passes.

A hollow sleeve **8** is journaled for rotation transversely across inner end **9** (see FIGURE 3) of the cylinder **4** and is fixedly secured to a pinion **10** which is positioned within the end **9** of the chamber **4**. A main shaft or spindle **11** passes through the sleeve **8** and extends upon either side (see also FIGURE 2). With reference to FIGURE 2 it will be seen that one end **12** of the sleeve **8** is provided with diametrically opposed slots **13** (see also FIGURE 4). Spindle **11** is provided with a drill hole to accommodate a pin **14**, so that when pin **14** is positioned within slots **13** and through the hole provided in spindle **11**, rotation of spindle **11** results in corresponding rotation in sleeve **8** and attached pinion **10**.

With reference, now, to the left hand side of FIGURE 2, a conventional lock barrel **15** mounted upon one side of the door **1** is connected to one end of spindle **11** by means of a conventional universal joint **16**. This arrangement thus permits slight misalignment of the parts in mounting.

A handle assembly collectively designated at **17** is mounted upon the opposite end of the spindle **11**. A rotatable handle element **47** is provided with an axially located tubular barrel **48** which is rotatable within handle **47**. The outermost end of the barrel **48** is machined to form a plug **54** (see FIGURE 2), which plug **54** is provided with a concave sloping profile **49**. A cylindrical plug **50** having a profile **51** corresponding to profile **49**, upon the innermost end thereof, is adapted to slip over the extremity of the spindle **11** and be secured thereto by means of a transverse pin **52** extending through slot **52'** in spindle **11**. Handle **47** is then fixedly secured to cylindrical plug **50**.

A compression spring **53** surrounds the spindle **11** and reacts between plug **54** in the outermost end of barrel **48** and a cylindrical clutch member **55** positioned within the innermost end of barrel **48**, around cylindrical sleeve **55'** and hence around spindle **11**. FIGURES 7 and 8 show the construction of this clutch member **55**, and it will be seen from FIGURE 8 that the member **55** is provided with a groove **56**. This groove is adapted to engage a ridge **57** provided within the barrel **48**, so that the clutch member **55** will rotate upon rotation of the barrel **48** and handle **47** due to the contact of sloping faces **49** and **51** with each other. As will be seen from FIGURES 7 and

8, the clutch member **55** is provided with two sloping or cam faces **58** and two right angular faces **63**. A second clutch member **60** is provided with sloping surfaces **58'** and right angle faces (not shown) which are the reverse of the faces **58** and **63** on clutch member **55**. The second clutch member **60** is fixedly secured within an escutcheon plate **61**, which plate **61** is prevented from rotation by the provision of a pin **62** which engages the face of the door **1**. With this construction, with clutch member **60** secured to escutcheon plate **61** which is held from rotation by pin **62**, and with clutch member **55** held from independent rotation from barrel **48** and handle **47** by ridge **57** and groove **56**, it will be seen that as right angle clutch faces **63** on clutch member **55** oppose the right angle clutch faces (not shown) on clutch member **56**, rotation of handle **47** in a counter-clockwise direction is resisted.

Spring **53** acting between the escutcheon plate **61** (through the clutch members **55** and **60**) and the plug **54** in barrel **48**, maintains the handle in outermost position and maintains tension on the spindle **11** and engagement of the pin **14** within slot **13** in sleeve **8**. When the complete bolt assembly is mounted in a door the escutcheon plate is rotated until the clutch faces of both clutch members **55** and **60** are in complete engagement, and the bolt **28** is fully extended from cylinder **4** and dead lock cross bar **34** is in its fully extended position (as shown also in FIGURE 5), at which time escutcheon plate is fixed from further rotation by driving pin **62** into the face of the door.

By turning the handle **47** in a clockwise direction to withdraw bolt **28** within cylinder **4**, spring resistance will be felt due to cam faces **58** of clutch member **55** riding up on cam faces **58'** by clutch member **60** against the tension of spring **53**. Due to this spring tension, the handle will tend to return to its original position after the door is opened and the handle released.

From FIGURE 2 it will be noted that barrel **48** may be displaced further within escutcheon plate **61**, and against the action of spring **53** by the application of pressure in the direction of arrow **100**, in FIGURE 2. By applying pressure in the direction of arrow **100**, handle **47** will assume the position illustrated in broken lines at **101** in FIGURE 2. The handle may be pushed in due to the provision of slot **52'** through which pin **52** passes. The purpose for this, and the relationship between the handle and the bolt mechanism, will be explained in more detail hereinafter.

Referring, now, to FIGURES 3 and 4, it will be noted that rack member **19**, having teeth **20** upon the underside thereof, is mounted for axial movement within chamber **4**, and the inner wall of the chamber **4** is grooved (not shown) at this point to maintain alignment of the rack **19**. The rack **19** engages the pinion **10** and is adapted for reciprocal movement in the direction of the double-headed arrow **21** in FIGURE 3, by rotation of the spindle **11**.

Secured to inner end **22** of the rack **19** and depending downwardly therefrom is a head piece **23** which surrounds rear or inner end **24** of a bolt draw bar **25**, and the head-piece is secured to the bolt draw bar by means of pin **26** so that by the aforementioned reciprocal movement of the rack **19** corresponding reciprocal movement of the bolt draw bar **25** is initiated. The bolt draw bar **25** is supported substantially centrally within the chamber **4**, by means of bearing partition **27** secured within the chamber substantially medially the ends thereof. A cylindrical bolt **28** is journaled for axial movement within outer end **29** of the chamber **4** and is adapted to extend beyond the plate **5** and to be retracted substantially flush therewith. This bolt **28** is beveled on the outer end, as illustrated by numeral **30**, to facilitate the engagement thereof with the conventional keeper plate in the door frame (not shown).

The bolt **28** is provided with an axially located longitudinal drilling **31** leading from the rear face **32** thereof,

and the drilling communicates with a transverse drilling or recess **33** formed through the side of the bolt adjacent outer end **32'** thereof. In this embodiment, the drilling or recess **33** is substantially square when viewed in FIGURE 3, and is adapted to slidably receive a dead lock cross bar **34** (FIGURES 1 and 5). This dead lock cross bar is adapted to be moved endwise within the recess **33** so that it extends as shown in FIGURE 1 or, alternatively, be retracted flush with the surface of the bolt as shown, for example, in FIGURE 6.

The dead lock cross bar **34** is provided with a coned aperture **35** (see FIGURES 5 and 6) upon the inner surface thereof, engageable by a corresponding coned end **37** formed on the outer end of the bolt draw bar **25**, so that when the end **37** engages the recess **35** the cam action provided by the coned surfaces extends the dead lock cross bar **34** at right angles from the bolt.

A longitudinal recess **38** (FIGURES 5 and 6) is formed in the wall of the drilling in the bolt **28** and a pin **39** secured to the draw bar **25** extends perpendicularly therefrom, with the end of the pin engaging the recess **38**. This connects the bolt draw bar **25** with the bolt **28** but permits slight independent movement between the two. A coil spring **40** surrounds the draw bar **25** and reacts between the bearing partition **27** and the inner or rear surface **32** of the bolt, thus normally extending the bolt unless otherwise prevented by means to be described hereinafter.

Finally, before leaving the description of the bolt, it will be observed that there is a small recess **41** (FIGURE 6) formed upon the side surface of the bolt and towards the end **32** thereof, engageable by a small pin **41'** secured to the forward end of the chamber wall **4**, thus limiting the outward movement of the bolt and preventing rotation thereof within the chamber.

Means are provided to maintain the bolt **28** in either the extended position (see broken lines in FIGURES 3 and 6) or in semi-retracted position (see full lines in FIGURES 3 and 6).

With reference to FIGURES 3 and 4, a round nosed cam **42** is pivoted within the chamber upon pin **43** and is maintained normally in the position shown in FIGURE 4 by a small spring **44** extending between the tail of the cam and the partition **27**.

A pin **45** is mounted for a sliding or loose fit in an aperture within the bearing partition **27** and is situated parallel to the draw bar **25**. This pin **45** freely engages the rear end wall **32** of the bolt **28** and the front side of the cam lobe **46**. From the showing in FIGURE 3 it will be appreciated that cam **42** cannot be rotated in a counter-clockwise direction and hence bolt **28** cannot move from the semi-retracted position to the fully extended position shown in dotted lines in FIGURE 3, because of the binding action between shoulder **36** of cam **42** and the lowermost end of head piece **23**. To achieve the result of having bolt **28** extend to its fully extended position from the position shown in full lines in FIGURE 4 it is necessary first to pivot cam **42** in a clockwise direction to allow the head piece **23** to pass over the cam **42** and to assume the position shown in FIGURE 4. This may be accomplished in one of two ways: (1) by turning handle **47** in a clockwise direction, rack **19** will move to the right in FIGURE 4 and, by means of head piece **23** and draw bar **25**, will also draw bolt **28** to the right. Bolt **28** contacts pin **45** and moves pin **45** to the right, and pin **45** contacts cam **42** and pivots same in a clockwise direction to allow head piece **23** to pass over cam **42**, and the various components will assume the position shown in FIGURE 4; (2) when the door is in open position the bolt **28** is in the position shown in FIGURE 3. When the door is being closed the bevelled portion **30** on the end of bolt **28** strikes against the keeper plate (not shown) on the door frame, and due to the action of the keeper plate on the bevelled end **30** of bolt **28** the bolt

is moved to the right in FIGURE 4, and the bolt is then free to assume its fully extended position as shown in FIGURE 4 for the reasons outlined above.

As head piece **23** overrides cam **42** the action of spring **40** causes bolt **28** to assume its fully extended position, and this outward extension of bolt **28** is limited only by the stopping action of pin **41'** which rides within slot **41** provided in bolt **28** (see FIGURE 6).

When bolt **28** reaches its fully extended position and is prevented from further extension by pin **41'**, draw bar **25** is urged further to the left due to the action of cam faces **58** and **59** on each other under the action of spring **53**. As draw bar **25** moves to the left after bolt **28** is stopped by pin **41'**, the cone-shaped end **37** (see FIGURE 4) of draw bar **25** engages the cammed recess **35** of dead lock cross bar **34**, and urges the dead lock cross bar **34** to its extended position (at right angles to the extended position of bolt **28**) as shown in FIGURES 1, 5 and 6.

The lock is then in the "door closed position," and the bolt **28** and bar **34** may be returned to their position within chamber **4** only by rotating either of the door handles. Pressure applied against the ends of bolt **28** or bar **34** is of no avail, and the bolt may be retracted only by rotating the door handles.

To retract the bolt and open the door the door handle **47** is rotated clockwise as viewed in FIGURE 1. By rotating handle **47** clockwise rack **19** and head piece **23** are moved to the right. Draw bar **25** also moves to the right and its cone-shaped end **37** is withdrawn from the cammed recess provided in dead lock cross bar **34**, and pin **39** on draw bar contacts the innermost end of longitudinal slot **38** provided in the bolt **28**, and bolt **28** is also withdrawn to the right. In FIGURE 6 it will be noted that the end of the dead lock cross bar is bevelled as at **34'**. As cone **37** has been withdrawn from cross bar **34**, and as bolt **28** is being withdrawn within cylinder **4**, the action of the edge of plate **5** against the bevelled surface **34'** of cross bolt **34** urges the cross bar **34** within bolt **28** as shown in solid lines in FIGURE 6.

As head piece **23** moves to the right it rides over cam **42** and against the action of spring **44**, and when the door is opened and the handle **47** released, the bolt **28** is maintained in the position shown in FIGURE 4 due to the binding action of cam shoulder **36** against head piece **23**.

The bolt **28** assumes the semi-extended position illustrated in FIGURE 3 when the door is in open position. When the door is being closed the tapered part **30** of bolt **28** strikes against the keeper plate on the door frame and the bolt **28** is urged to the right (when viewed in FIGURE 3) and against the tension of spring **40**. This movement to the right of bolt **28** to the ring also moves pin **45** to the right and against cam lobe **46** of cam **42**. This results in pivoting cam **42** clockwise on pivot pin **43** and against the action of spring **44**. The pivoting action of cam **42** in a clockwise direction results in moving head piece **23** to the right. When cam **42** is pivoted to a degree sufficient to allow head piece **23** to pass over cam lobe **46**, the bolt **28** (and attached members **25**, **23** and **19**) will assume the fully extended (door-closed) position illustrated in FIGURE 4, due to the action of spring **40**. In this position the bolt **28** is fully extended into the keeper plate on the door frame and at the same time transverse dead lock cross bar **34** is in the fully extended position as shown in FIGURE 5, due to the action of cam surface **37** of latch draw bar **25**, on recessed cam **35** surface in dead lock cross bar **34**. In this fully extended position the bolt *cannot* be forcibly pressed back into cylinder **4**, nor can dead lock cross bar **34** forcibly be pressed back into bolt **28**, and the *only* possible way that the bolt can be withdrawn into cylinder **4** is by turning the door handle **47**.

To open the door, the handle **47** and attached pinion are turned clockwise (see FIGURE 4) and the rack **19**, head piece **23**, bolt draw bar **25** and attached bolt **28** are moved to the right. As head piece **23** moves to the right it will slide over cam **42** and assume the position shown in FIGURE 3, and when handle **47** is released the lock will maintain the position shown in FIGURE 3 due to a binding action between cam **42** and head piece **23**.

What is claimed is:

1. A door lock and keeper comprising in combination a containing chamber adapted to be inserted in the edge of a door, a spring loaded bolt slidable in the chamber and adapted to extend and retract from one end thereof, a bolt draw bar having opposite ends mounted for longitudinal sliding movement in said chamber and being operatively connected adjacent one end thereof to said bolt, a rack secured to the other end of said bolt draw bar, a pinion journalled for rotation within said chamber and engaging said rack, handle means mounted at right angles to said chamber and externally thereof, a spindle secured to said pinion and extending through said chamber to mount said handle, means in said chamber cooperating between said bolt and draw bar for maintaining said bolt in either the extended or retracted position, a dead lock cross bar, said bolt having a transverse bore in which said dead lock cross bar is mounted for movement, the inner end of said bolt having a longitudinal bore communicating with said transverse bore, said dead lock cross bar having a conical aperture, and said one end of the draw bar being of conical configuration and engaging the longitudinal bore in the bolt, said conical end selectively engaging the conical aperture thereby being adapted to eject said dead lock cross bar by said engagement.

2. The device according to claim **1** in which the means in said chamber cooperating between said bolt and said draw bar includes a head piece secured to the inner end of said rack and depending downwardly therefrom, the lower end of said head piece surrounding and being secured to the inner end of said draw bar, a spring loaded cam pivotally mounted in said chamber and being engageable by said head piece, said head piece being adapted to pass over said cam in either direction as said draw bar is moved longitudinally in said chamber, a pin freely mounted for longitudinal movement in said chamber parallel to said draw bar and extending freely between the rear side of said bolt and the front side of said cam and movable in one direction by said cam and in the other direction by said bolt, said pin, when said bolt is retracted, assisting in holding said spring loaded cam against said head piece thereby preventing said spring loaded bolt from extending until said handle is rotated.

3. A door lock and keeper comprising in combination a containing chamber, adapted to be inserted in the edge of a door, a spring loaded bolt slidable in said chamber and adapted to extend and retract from one end thereof, a bolt draw bar having opposite ends mounted for longitudinal sliding movement in said chamber and being operatively connected adjacent one end thereof to said bolt, a rack secured to the other end of said draw bar, a pinion journalled for rotation within said chamber and engaging said rack, handle means mounted at right angles to said chamber and externally thereof, a spindle secured to said pinion and extending through said chamber to mount said handle, means in said chamber cooperating between said bolt and draw bar for maintaining said bolt in either the extended or retracted position, said cooperating means including a head piece secured to the inner end of said rack and depending downwardly therefrom, the lower end of said head piece surrounding and being secured to the inner end of said bolt draw bar, a spring loaded cam pivotally mounted in said chamber and being engageable by said head piece, said head piece being adapted to pass over said cam in either direction as said draw bar is moved longitudinally in said chamber, a pin freely mounted for longitudinal movement in said chamber parallel to said draw bar and extending freely between the rear side of said bolt and the front side of said

cam and movable in one direction by said cam and in the other direction by said bolt, said pin, when said bolt is retracted, assisting in holding said spring loaded cam against said head piece thereby preventing said spring loaded bolt from extending until said handle is rotated, a dead lock cross bar mounted transversely for movement in the extending end of said bolt, and means cooperating between said bolt draw bar and said dead lock cross bar adapted to eject one end of said dead lock cross bar when said bolt is extended and to permit the retraction of said dead lock cross bar when said bolt is retracted.

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