Oct. 22, 1963 R. LEE 3,107,934

SAFETY DOOR BOLT

Filed Nov. 4, 1960

FIG. 1

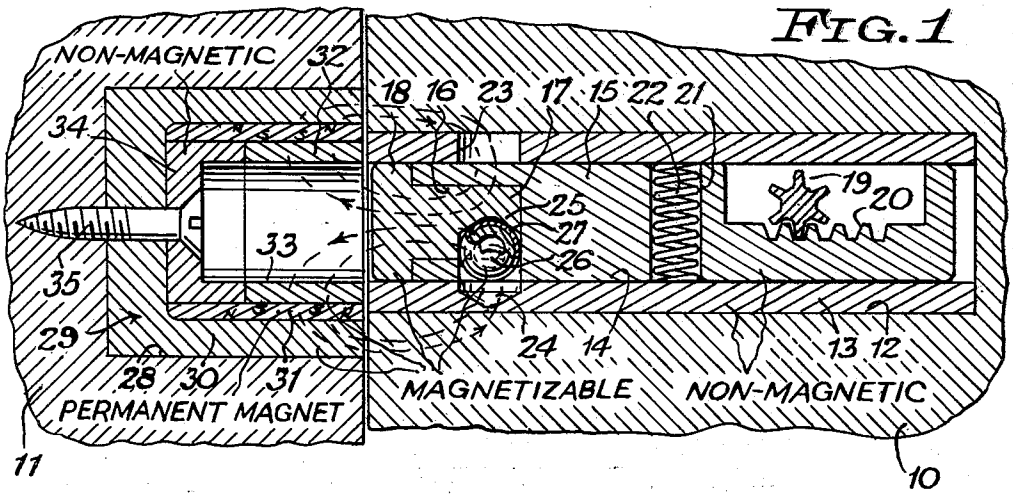


FIG. 2

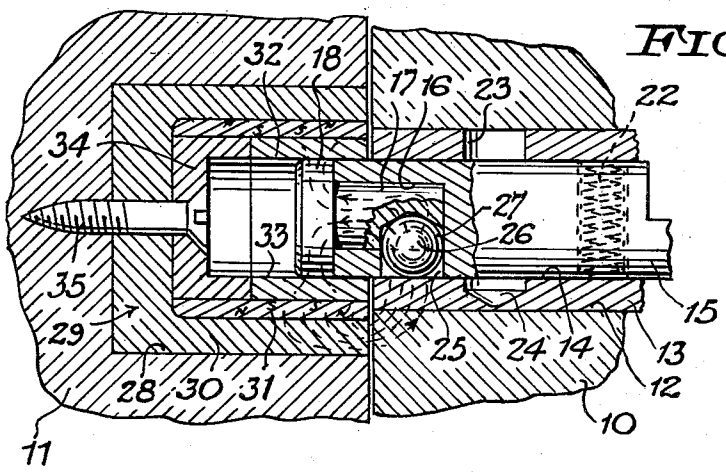
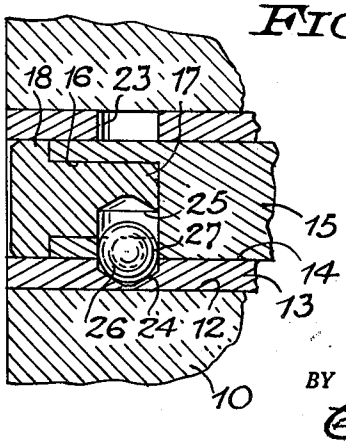


FIG. 3



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SAFETY DOOR BOLT

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This invention relates to door locks and more particularly to a lock including a locking bolt which cannot be projected from retracted position unless the door is in closed position.

If the locking bolt of a conventional door lock is partly or fully projected from retracted position while the door is in open position, subsequent attempted closing of the door may result in damage to the lock and door, particularly if the door is slammed toward closed position. In the case of a safe door, if the bolt is projected while the door is open and the combination inadvertently turned, operation of the combination will be required before the door can be closed.

An object of the invention is to provide an improved door lock including a locking bolt and retaining means therefor which will hold the bolt in retracted position while the door is in open position, and which will be magnetically released when the door is in closed position to permit projection of the bolt to locking position.

Another object is to provide a door lock of this character in which the releasable bolt-retaining means is of simple and inexpensive construction and requires but relatively few parts.

The invention further consists in the several features hereinafter disclosed and claimed.

In the accompanying drawing,

FIG. 1 is a fragmentary vertical sectional view of a door and associated door jamb or frame provided with a lock including a safety bolt of the invention, the door being shown in closed position ready for projection of the bolt to locking position;

FIG. 2 is a fragmentary vertical sectional view of the door in closed and locked position, and

FIG. 3 is a fragmentary vertical sectional view of the door when in open position.

In the drawing, **10** designates a swingable door or closure, such as the entrance door of a hotel or motel room, or a safe door, and **11** designates a cooperating door jamb or frame. The door is provided with a horizontal bore **12** which extends inwardly from an edge face of the door and has fixed therein a tubular bolt guide **13**. The bolt guide has a coaxial bore **14** therethrough and is formed of brass or other non-magnetic metal. Slidably mounted in the bolt guide is a cylindrical locking bolt **15** formed of non-magnetic metal, such as brass, and having in its outer or front end a central bore **16** in which is pressed or otherwise fixed a magnetizable insert or plug **17**, such as of mild steel, the insert forming a pole piece and having a chamfered cylindrical head **18** abutting against the outer end of the bolt. The bolt, which is a dead bolt, is projected and retracted by any suitable mechanism of conventional type, here shown to include a rotatable pinion **19** meshing with a toothed rack **20** formed on and extending longitudinally of the inner end portion of the bolt. Between the rack **20** and end insert **17** the bolt is provided with a transverse bore **21** receiving therein a compressed coiled spring **22** which bears at opposite ends on the inner walls of the tubular bolt guide **13** to impose a frictional drag on the bolt. A vertical transverse bore **23** is formed in the tubular bolt guide near the outer end thereof, the lower end of this bore constituting a pocket or recess **24**. A pocket-forming bore or recess **25** extends radially upwardly from the lower side of the bolt into the inner portion of the magnetizable bolt insert **17**

and is adapted to register with the pocket or recess **24** when the bolt is in fully retracted position, as seen in FIGS. 1 and 3. A magnetizable ball **26** forming a dogging member is vertically movable in the bolt bore **25** and guide tube pocket **24** and is slightly smaller in diameter than these bores. The depth of the pocket **24** is about one-half the diameter of the ball, and the length of the bolt bore **25** is slightly greater than the diameter of the ball. The ball is formed of steel of low retentivity and is preferably provided with a hard non-magnetic wear-resistant surface, such as a plated layer of chromium **27**. If desired, the ball may be hollow, as shown. When the door is open, FIG. 3, the ball rests by gravity in the pocket **24** of the bolt guide and extends partially into the bolt bore **25**, thus bridging the recess-forming pocket and bore and blocking projection of the bolt from its fully retracted position.

The door jamb or frame **11** is provided with a horizontal bore **28** opening at the edge of the jamb and aligned with the bolt guide **13** when the door is in closed position, the jamb bore **28** being somewhat larger in diameter than the guide bore **14**. A keeper assembly **29** is secured in the jamb bore **28** and includes a cup-like shell **30** of mild steel fitting in this bore, the outer end of the shell being flush with the jamb edge. A tubular permanent magnet **31**, such as of Alnico V, is secured coaxially in the shell **30**, and has its outer end flush with the outer end of the shell. The magnet is suitably polarized, and by way of example the outer periphery may be of one polarity and the inner periphery of the opposite polarity. A tubular keeper insert **32** of magnetizable metal, such as mild steel, is secured within the magnet, the keeper insert being shorter than the magnet and having its outer end flush with the outer end of the magnet. The tubular keeper insert **32** has a coaxial bore **33** slightly larger in diameter than the bolt. A cup-like member **34** of non-magnetic metal, such as aluminum, fits within the shell **30** and is interposed between the inner end of the keeper insert **32** and the base wall of the shell. The keeper assembly **29** is secured in the jamb by a headed screw **35** passing axially through the inner ends of the cup-like members **30** and **34**. The tubular keeper insert **32** forms a socket adapted to receive the projected end of the bolt when the door is in closed position, as seen in FIG. 2. In the case of a steel door frame, such as in a safe, the cup-like shell **30**, or at least the peripheral portion thereof, is formed of non-magnetic metal.

When the door is in open position, as shown in FIG. 3 the bolt **15** is in retracted position and the ball **26** rests by gravity in the recess or pocket **24** of the bolt guide **13**, thus preventing projection of the bolt. Upon closing of the door to the position shown in FIG. 1, the magnetic flux of the keeper magnet **31** passes through the then adjacent magnetizable end insert **17** of the bolt and exerts an upward tractive force on the ball, lifting the ball out of the bolt guide pocket **24**, as seen in this view, and thus permitting subsequent projection of the bolt into the keeper, as shown in FIG. 2. The magnetic flux also tends to pull the bolt into the keeper recess, but this pull is frictionally resisted, as by the friction spring **22**.

By means of the invention, the locking bolt cannot be projected from its retracted position when the door is open, thus avoiding possible damage to the lock and door when the door is swung toward closed position.

I claim:

1. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, a permanent magnet carried by one of said members, a locking bolt movably carried by the other of said members and shiftable between retracted and projected positions, said bolt being projectable to locking position when the closure member is in closed

position, dogging means carried by said bolt-carrying member for preventing projection of said bolt and including a movable magnetizable dogging member interengageable with said bolt only when said bolt is in retracted position and said closure member is in open position to retain said bolt against projection, said dogging member being disposed in the magnetic flux of said permanent magnet only when the closure member is in closed position and being urged and released by said flux out of dogging position with respect to said bolt to permit projection of said bolt to locking position.

2. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, a locking bolt carried by one of said members and movable between projected and retracted positions, dogging means interengageable with said bolt in the retracted position of said bolt to prevent projection of said bolt when the closure member is in open position, and magnetic means cooperating with said dogging means and responsive to placement of the closure member in closed position to release said dogging means only when the closure member is in closed position so as to permit projection of said bolt to locking position.

3. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, a permanent magnet fixedly carried by one of said members, a bolt guide fixedly carried by the other member and having a bore, a locking bolt slidable in said bore and shiftable between retracted and projected positions, said bolt being projectable from said guide to locking position when the closure member is in closed position, said bolt having a magnetizable front end portion and having a transversely extending recess, said guide having a recess registrable with said bolt recess when said bolt is in retracted position, a magnetizable dogging member movable in said registrable recesses transversely of said bolt and normally bridging said recesses when the bolt is in retracted position and the closure member is in open position so as to prevent projection of the bolt, said permanent magnet being adjacent to said magntizable bolt end portion when the closure member is in closed position, said magnetizable dogging member being urged out of the guide recess and into the bolt recess by the tractive flux of said permanent magnet when the clousre member is in closed position, whereby to permit projection of the bolt to locking position.

4. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, magnetic means including a permanent magnet carried by one of said members, a locking bolt movably carried by the other of said members and shiftable between retracted and projected positions, a guide member for said bolt, said bolt being projectable from said guide member to locking position when the closure member is in closed position, dogging means for preventing projection of said bolt and including a movable magnetizable ball cooperating with said magnetic means,

said bolt and guide member having registrable recesses in which said ball is movable transversely of said bolt, said ball normally bridging said recesses when said bolt is in retracted position and said closure member is in open position to block projection of said bolt, and said ball being urged out of one of said recesses by the tractive flux of said permanent magnet when said closure member is in closed position, whereby to permit projection of the bolt to locking position.

5. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, permanent magnet means carried by one of said members, a bolt guide carried by the other of said members, a bolt slidable in said guide and shiftable between retracted and projected positions, said bolt being projectable to locking position when the closure member is in closed position, said bolt having a magnetizable front end portion and a laterally opening recess extending into said magnetizable portion, said guide having a recess registrable with said bolt recess when the bolt is in retracted position, and a magnetizable ball movable in said recesses transversely of the bolt and normally urged to a dogging position bridging said recesses when the bolt is in retracted position and the closure member is in open position so as to prevent projection of the bolt, said magnetizable bolt portion being adjacent to said permanent magnet means when the closure is in closed position to effect passage of magnetic flux through said ball and thereby exert a tractive force on said ball to urge said ball out of said guide recess, whereby to permit projection of the bolt to locking position.

6. In a lock for use with a closure member movable to open and closed positions with respect to a closure frame member, a locking bolt and guide means therefor carried by one of said members, said bolt being movable between projected and retracted positions, said bolt and guide means having lateral recesses registrable with each other when said bolt is in retracted position, a magnetizable ball movable in said recesses and gravitationally urged to a bolt-dogging position in said registrable recesses when said bolt is in retracted position to prevent projection of said bolt when the closure member is in open position, and magnetic means cooperable with said magnetizable ball to magnetically lift said ball out of dogging position when the closure member is in closed position, whereby to permit projection of said bolt to locking position.

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