

[54] LOCK FOR A DOOR OR THE LIKE
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[58] Field of Search 70/143; 292/167, 169.13,
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[57] ABSTRACT
A door lock is disclosed as including a spring loaded bolt displaceable in a casing between normal and retracted positions, an actuating motor for affecting movement of the bolt by a connecting rod therebetween, and a pawl blocking movement of the bolt relative to the casing to define the normal position, and a reset slide for freeing the pawl whereby the bolt is biased to its locked position. In its locked position the bolt extends farther out of the casing so as to prevent a forced opening of the door as by a tool and/or deformation of the door frame.

8 Claims, 6 Drawing Figures

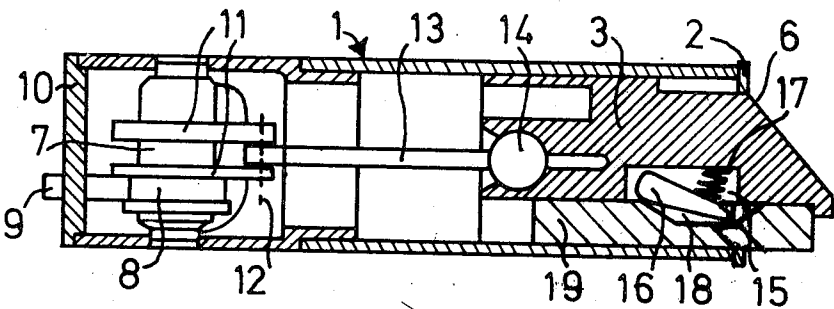


FIG. 1

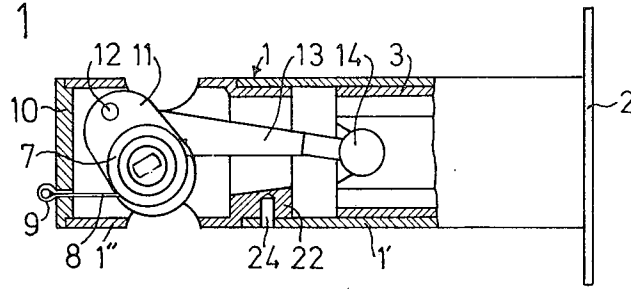


FIG. 2

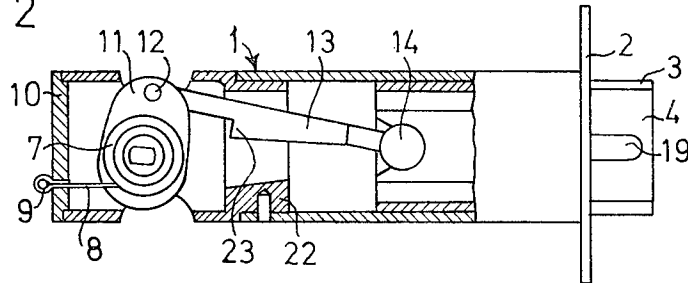


FIG. 3

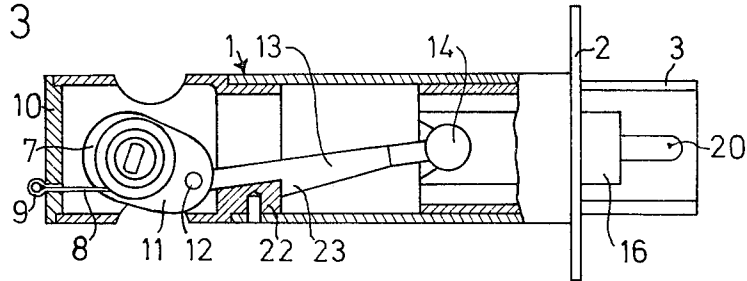


FIG. 4

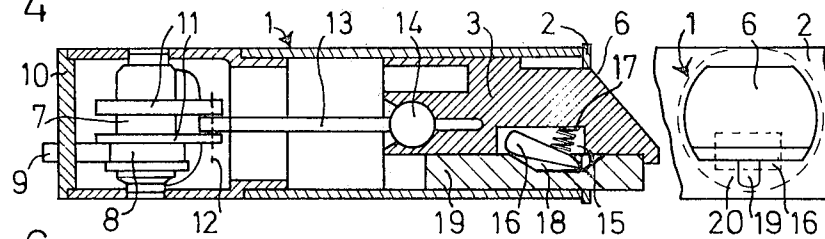


FIG. 6

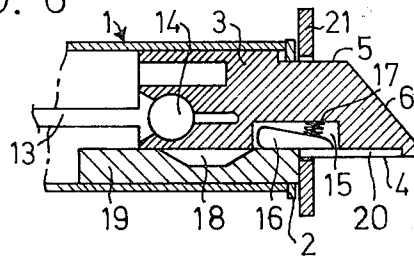
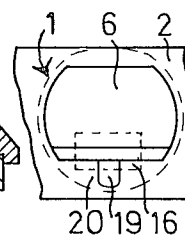


FIG. 5



LOCK FOR A DOOR OR THE LIKE**BACKGROUND OF THE INVENTION****1. Field of the Invention:**

The present invention relates to a lock for a door or the like and, in particular, to such a lock of the type having a spring biased bolt which is released or actuated manually as by a knob, key, etc.

2. Description of the Prior Art:

Conventional door locks of the biased bolt type generally include a first bolt which has a beveled front edge and which is actuated by a door knob, and a second bolt which is rectangular in cross section having flat front face and which is actuated as by a key. The purpose of the first bolt is to permit the door to be opened and closed without a key as by door knobs or the like. The purpose of the second bolt is to provide an independent lock for the door which requires separate opening as by a key.

Other conventional door locks have incorporated a latching and a locking feature into a single bolt wherein the locking feature is accomplished by a mechanism that frees or locks the single bolt in its latching position and then requires a separate key operation for opening purposes.

SUMMARY OF THE INVENTION

The present invention is summarized in the combination of a lock for a door or the like is constructed to include a casing, a bolt slidably disposed in the casing and being movable between a plurality of positions such as latched, locked and retracted positions, actuator means operable for moving the bolt from the latched position to the retracted position, means urging the bolt toward its latched and locked positions, releasable blocking means disposed between the casing and the bolt limiting movement thereof relative to the casing to define the latched position, and reset means slidably disposed relative to the casing and the bolt for releasing the blocking means whereby the bolt is automatically moved to its locked position.

An object of the present invention is to construct a door lock in a relatively simple design capable of being economically manufactured while at the same time being extremely reliable.

This invention has another object in that the latching and locking functions of a door lock bolt are retained in a door lock having a single bolt which is automatically moved between latched and locked positions.

Another object of this invention is to extend the bolt of a door lock from its latching position to a locking position whereby the bolt provides a safety lock to preclude forced opening of a door as by a tool or deformation of the door frame.

It is a further object of the present invention to construct a door lock with an actuator in the form of a crank mechanism having a connecting rod connected to the door bolt by means of a ball and socket joint.

The present invention has yet another object in that the bolt of a door lock has a safety lock position wherein movement in one direction is prevented by a casing abutment and wherein movement in an opposite direction is prevented by a connecting rod stop which is freed by movement of a crank mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation with parts in section of a

door lock embodying the present invention and showing the components in a bolt retracted position;

FIG. 2 is a view similar to FIG. 1 showing the components in a bolt latched position;

FIG. 3 is a view similar to FIGS. 1 and 2 but showing the components in a blocking or locked position;

FIG. 4 is a longitudinal section taken at right angles through FIG. 2;

FIG. 5 is a partial end elevation as viewed from the right of FIG. 4; and

FIG. 6 is a partial view of FIG. 4 but showing the bolt in the advanced locked position of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the embodiment shown in the drawing the lock for a door includes a bar-shaped, cylindrical bolt casing 1 which can be inserted into a hole or mortise bored in the front edge of a door, not shown, and which has a front plate 2 that, when the lock is mounted, lies flush with and is secured as by screws to the edge of the door. The front plate 2 has a guiding hole for the bolt 3 of the lock, which bolt 3 is substantially cylindrical with a diameter corresponding to the internal diameter of the casing 1. At its foremost end, the bolt 3 has a pair of side flat surfaces in the form of a plane front 4 and a back 5 parallel thereto with a beveled end surface 6 inclined therebetween; as is shown in FIGS. 4 and 6, the inclined end face 6 extends between such side surfaces 4 and 5.

An actuator mechanism includes a rotor 7 which is journaled in on an axis which is at right angles to the longitudinal axis of the casing 1 and which is provided with a non-round hole for the shaft of any suitable manual handle or door knob (not shown). U.S. Pat. application Ser. No. 340,583 filed Mar. 12, 1973, abandoned in favor of Continuation application Ser. No. 441,601 filed Feb. 11, 1974 which is now U.S. Pat. No. 3,853,340 dated Dec. 10, 1974 relates to a press-button-operated door lock in which, in some embodiments, a crank mechanism is incorporated in the movement-transmitting connection between the press button and the bolt. In the lock according to the present invention it is also possible to employ a press button for operating the rotor, but it is equally possible to use the lock when it is provided with an operating grip of some other kind, particularly ordinary, bar-shaped door handles or rotatable knobs.

A spiral spring 8 is fitted around the actuator rotor 7 and is with its free end 9 led out through and secured in a hole in an end cover 10 in the bolt casing 1. This spiral spring 8 constantly urges the actuator rotor 7 to rotate clockwise as viewed in FIGS. 1-3. The actuator rotor 7 is designed with a pair of flanges 11 serving as crank arms with a crank 12 which is connected to the bolt 3 by a rigid connecting rod 13 having a ball head 14 accommodated in a corresponding ball seat in the rearmost end of the bolt 3.

As is illustrated in FIGS. 4 and 6, a pocket 15 in the front surface 4 of the bolt 3 is fitted with a pawl 16 that is normally biased outwardly by a compression coil spring 17. The toe of the panel 16 projects slightly in relation to the front surface 4 of the bolt and thereby can enter into engagement with the inside of the front plate 2 of the bolt casing, by which means the bolt 3 is prevented from advancing further in relation to the bolt casing. In this position the pawl 16 enters a recess 18

in a reset slide member 19 which is accommodated displaceably in a surface track 20 in the front surface 4 of the bolt 3. The frictional conditions are so adapted that the reset slide member 19 normally reciprocates together with the bolt 3, but it may be spring-loaded in the forward direction, that is to say towards its extreme end position in the guiding track 20.

From its normal position, FIGS. 2 and 4, the bolt 3 can slide inwards in the casing 1, either by the actuator rotor 7 being rotated counter-clockwise from the position of FIG. 2 into the position of FIG. 1 by means of a handle (not shown) or by a pressure being exerted on the inclined end face 6 of the bolt when the door is closed without the handle being used. During this movement of the bolt, the reset slide member 19 accompanies the bolt, and such two parts as well as the pawl 16 consequently remain in the position in relation to each other which they take up in FIG. 4.

When the bolt 3 is brought into engagement with a striking plate 21, FIG. 6, the latter will retain the slide member 19 in the bolt casing 1, so that the pawl 16 slides up out of the recess 18 and is by the front part of the slide member forced into the pocket 15. In this position the pawl 16 can pass out through the hole in the front plate 2 of the bolt casing and consequently permits the bolt 3 to jump forwards from the position in FIGS. 2 and 4 into the position in FIGS. 3 and 6. The further advance of the bolt 3 is now limited by the connecting rod 13 entering into engagement with a stop 22 located in the bolt casing, and, as will appear from FIG. 3, a tooth 23 on the connecting rod will engage the stop 22 and prevent a backwardly-directed movement of the connecting rod 13 and thereby also of the bolt 3. The bolt 3 is thus held blocked in the additionally advanced position, but the blocking is eliminated immediately upon commencing rotation of the rotor 7 counter-clockwise as viewed in FIG. 3.

The construction is preferably so adapted that the releasable stop or the pawl 16 secures the rotor 7 in the position of FIG. 2, in which the crank 12 is located at a short distance from and on the right-hand side of the vertical plane through the axis of the rotor, while the second stop 22 limits the further rotation of the rotor into the position of FIG. 3, in which the crank 12 is located at a short distance below the horizontal plane through the axis of the rotor. With such an arrangement, the travel of the bolt 3 from the normal, latched position, FIGS. 2 and 4, into the additionally advanced blocked or extended locked position, FIG. 3, can be of almost the same order of magnitude as the travel from the retracted position, FIG. 1, into the normal, latched position.

The casing 1 may be made of a simple length of tube, but in the embodiment shown in the drawing it is constructed of two parts, viz. a front part 1' and a rear part 1'' (FIG. 1), which can rotate 180° in relation to each other around the longitudinal axis of the casing. The two parts 1' and 1'' are interconnected by means of a pin 24 which is located in the casing part 1' and engages a slot, not visible in the illustrated cross-section, which extends for a circular arc of 180° in the part 1''. With the pin 24 located at one end of the slot the lock is intended to be used with a right-handed door, while with the pin located at the other end of the 180° slot the lock can be used with a left-handed door. It should be pointed out in this connection that the bolt 3 is prevented from rotating in relation too the casing part 1',

but due to the ball head 14 it can be rotated in relation to the connecting rod 13.

The largest dimension at right angles to the axis of the actuator rotor constructed as a crank mechanism may be smaller than the largest cross-sectional dimension of the bolt proper, and it will therefore be possible to incorporate the actuator rotor with the urging spring in a bar-shaped, cylindrical casing, the outer dimensions of which are only slightly larger than the largest diameter of the bolt. In such a case, the door lock can be mounted in a particularly simple way, viz. by being simply inserted into a hole or mortise which is bored in the front edge of the door and which has a diameter corresponding to the external diameter of the bolt casing. According to the present invention it is preferred that in the latched and retracted positions of the bolt 3, the crank 12 of the rotor 7 is located on one and the same side of a first plane which contains the axis of the rotor and which is parallel to the direction of displacement of the bolt 3, and is located on the sides respectively facing towards and away from the bolt of a second plane which contains the axis of the rotor 7 and is at right angles to the first plane. Such first plane may be viewed as a horizontal plane including the axis of rotor 7 and the longitudinal axis of the casing 1; the second plane may be viewed as a vertical plane including the axis of rotor 7 and a vertical axis of the casing intersecting the rotor axis. In the position corresponding to the latched position of the bolt, the rotor 7 is secured by a releasable stop 16 which upon release permits a further, spring-actuated turning, by which the crank 12 passes the said first plane, but remains on the same side of the said second plane.

As long as the stop 16 is not released, that is to say when it is in its active position, it will prevent the bolt 3 from advancing further from its latched position, and the inclined face 6 of the bolt 3 will, when the door is closed, without being actuated by the rotor 7 cause the bolt 3 to be displaced backwards in the casing 1 while overcoming the load of the spring 8. Consequently, the door is able to latch in the normal manner. However, this should not be the case when the bolt is in its safety or extended locked position, and the stop 16 would therefore not be released until the door is closed. In the preferred embodiment of the lock according to this invention, such release can be ensured automatically by the releasable stop being constituted by the pawl 16 which is located in the bolt 3 and which is spring-loaded towards its active position (FIG. 4) in which, by abutting against the plate 2 of the casing 1, it prevents a further advance of the bolt 3 from its latched position; the pawl 16 is movable into a released position against the bias of spring 17 so that it clears the casing plate 2, and such pawl is guided by the reset slide member 19 which is displaceable in a surface track 20 in the bolt 3. In its latched position, the bolt 3 extends out of the casing 1 and includes the recess 15 making room for the advance of the pawl when the reset slide abuts the striking plate 21 upon closure of the door. The reset slide member 19 will during the closing of the door accompany the bolt during its backward movement, that is, movement inwardly in the casing, but when the bolt 3 is again advanced under the spring load and thereby the associated striking plate 21, the latter will retain the reset slide member 19 in the casing and thereby cause the pawl 16 to be retained in the bolt, so that the bolt 3 can advance a further extended distance in relation

to the casing 1 and the striking plate 21. In this situation, viz. when the stop formed by the pawl has been released, that is, is in its inactive position, the second stop 22 limits the further rotation of the rotor 7, and this second stop expediently co-operates with the tooth 23 on connecting rod 13 in such a way that is prevents a backward displacement of the connecting rod and thereby of the bolt 3. Consequently, the bolt 3 is secured effectively in the additionally advanced position or extended locked position until the connecting rod 13 once more clears the second stop 22 as by actuation of the rotor 7.

The present invention has the particular advantage of accomplishing an automatic locking operation by the simple and economical construction of the reset slide member 19. As shown in FIGS. 1, 2, 4 and 5, the reset slide member 19 slides with the bolt 3 relative to the casing 1. As is shown in FIG. 6, the reset slide member 19 abuts the striking plate 21 and causes the pawl 16 to be reset from the recess 18 into the pocket 15 whereby the bolt 3 moves relative to the reset slide member 19 to its extended locked position. A suitable handle, bar, key or shaft is then utilized to turn the rotor 7 counterclockwise as viewed in FIG. 3 whereupon the connecting rod tooth 23 is moved slightly forward of the stop 22 to be released therefrom and the connecting rod 13 is moved rearwardly causing the bolt 3 to follow. When the bolt 3 is thus moved to its retracted position (FIG. 1), the pawl 16 will be automatically reset into the recess 18 by the bias of the coil spring 17. Upon release of the handle, the flat spring 8 will cause rotation of the rotor 7 whereby the components are automatically returned to the normal or latched position of FIGS. 2 and 4.

Inasmuch as the present invention is subject to many modifications, reversal of parts and changes in details, it is intended that all matter contained in the foregoing description or shown on the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A lock for a door or the like, comprising in combination
 - a casing,
 - a bolt slidably disposed in said casing and being movable between a plurality of positions including a latched position, an extended locked position and a retracted position,
 - actuator means operable for moving said bolt from the latched position to the retracted position,
 - means urging said bolt toward its latched and locked

- positions,
 - releasable blocking means disposed between said casing and said bolt limiting movement of said bolt relative to said casing to define said latched position, and
 - reset means slidably disposed relative to said casing and said bolt for releasing said blocking means whereby said bolt is automatically moved to its locked position,
 - said bolt having a beveled end surface inclined between a pair of flat surfaces, one of said flat surfaces projecting out of said casing when said bolt is in its latched position, and both of said flat surfaces projecting out of said casing when said bolt is in its locked position, and
 - socket means located in the said one flat surface of said bolt and wherein said releasable blocking means includes a pawl element operatively disposed in said pocket means.
2. A lock as claimed in claim 1 wherein said bolt has abutment means adjacent one of said flat surfaces for engaging said casing to limit movement of said bolt outwardly of said casing and define the locked position of said bolt.
 3. A lock as defined in claim 1 wherein a coil spring is mounted in compression in said pocket means and normally biases said pawl element out of said pocket.
 4. A lock as defined in claim 3 wherein said reset means includes a slide element having a recess and wherein said pawl element has an abutment end disposed in said recess when said bolt is in its latched and locked positions, said abutment end of said pawl element being moved out of said recess in response to movement of said bolt relative to said slide element whereby said bolt is extended to its locked position.
 5. A lock as claimed in claim 4 wherein said actuator means includes a rotor having a crank element, a connecting rod having one end pivoted to said crank element, a ball and socket connecting the other end of said rod to said bolt.
 6. A lock as claimed in claim 5 wherein said urging means comprises a flat spring having a fixed portion and a coil portion coiled in tension around said rotor.
 7. A lock as claimed in claim 6 wherein stop means between said connecting rod and said casing defines the extended locked position of said bolt.
 8. A lock as claimed in claim 7 wherein said stop means comprises a stop member fixed in said casing and a tooth element on said connecting rod cooperates with said stop member.

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