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LATCH MECHANISM FOR COLD STORAGE DOORS AND THE LIKE

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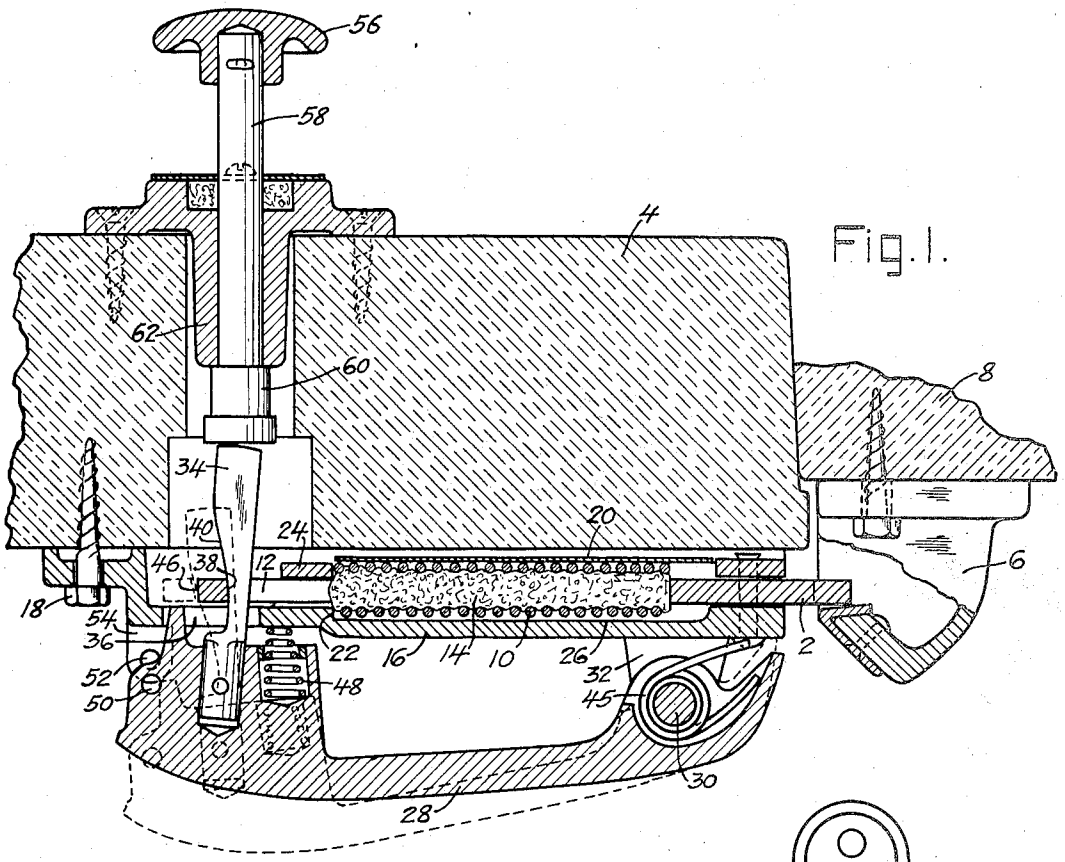


Fig. 1.

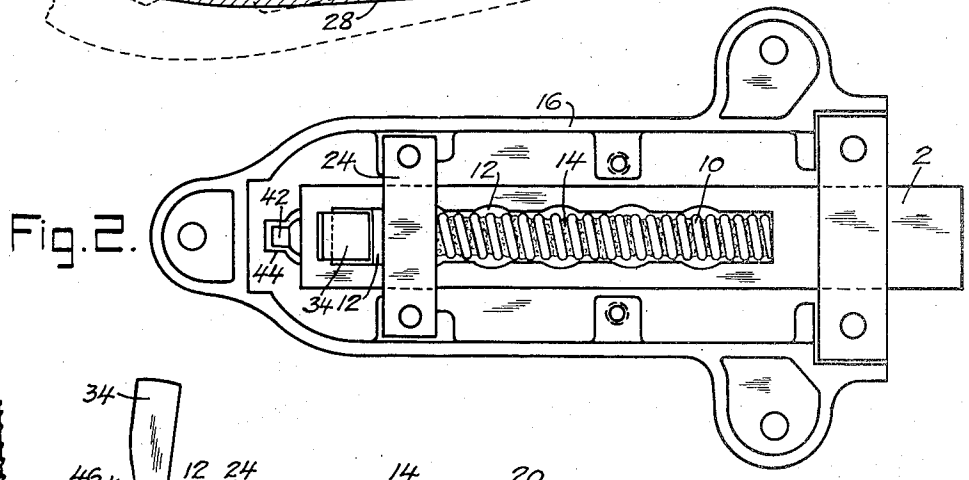


Fig. 2.

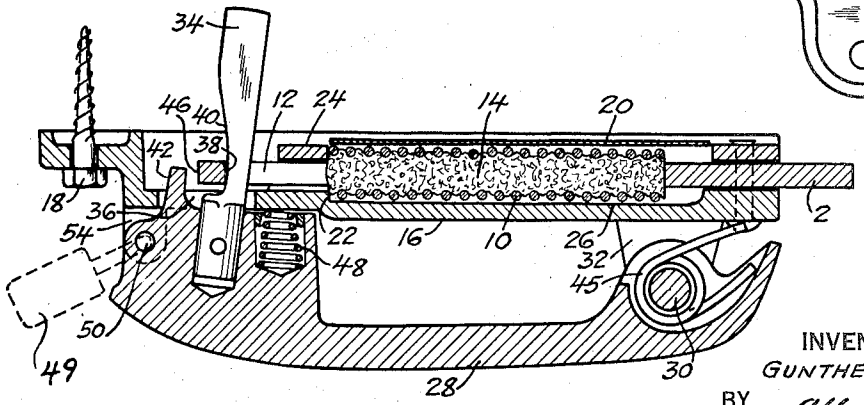


Fig. 3.

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LATCH MECHANISM FOR COLD STORAGE DOORS AND THE LIKE

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6 Claims. (Cl. 292—169)

My invention relates to latch mechanism for cold storage doors, refrigerators and the like and particularly to constructions which operate easily and quietly on relatively small movement of an operating handle and are "jimmy-proof" when in locking position.

In latch mechanism of the type used on cold storage doors it is generally necessary to move the bolt actuating handle a substantial distance to retract the bolt. Such movement is made necessary because considerable force is required to initiate movement of the bolt and the operating means employed therefore have cams or other elements movable a distance proportional to the factor needed to multiply the force applied. After the bolt has begun to move the force needed to effect complete retraction thereof is greatly reduced but the actuating mechanism naturally is designed to meet the initial conditions of operation and has not heretofore been designed to meet both the initial and subsequent conditions as they take place.

Furthermore the operating means heretofore used have been noisy in operation due to the use of heavy springs for projecting the bolts with the resulting forceful projection of the bolt and return of the handle on release thereof. Moreover, it has been the practice heretofore to lock the latch mechanism by the use of means which prevent movement of the operating handle but such locks do not prevent retraction of the latch bolt by means of a "jimmy" or other tool.

In accordance with my invention these objections to constructions of the prior art are overcome by the provision of latch operating means which exert greater force on the latch bolt during initial movement thereof than during its subsequent movement and require but little movement to effect complete retraction of the bolt. Further the mechanism embodies means for reducing the noise incident to return of the handle to its normal position together with means for locking the elements in such position that neither the operating means nor the bolt may be moved to permit opening of the door.

In the preferred form of my invention illustrated in the figures of the accompanying drawing and hereinafter described these results are attained by providing a latch bolt and an operating handle with a cam element actuated by the handle so as to vary the direction of movement of the cam element with respect to the bolt whereby the force with which the bolt is moved initially is relatively great and thereafter is reduced to move the bolt a greater distance on limited movement of the handle.

The handle is also provided with means which normally serve to hold the same in an operative position from which it is movable in one direction to retract the latch bolt and movable in the opposite direction to a locking position in which it limits retraction of the bolt. The positioning means also serve as a shock absorbing element which reduces the noise incident to the return of the operating handle and latch bolt to their normal latching positions.

One of the objects of my invention is to provide novel latch operating means movable a relatively short distance to retract a latch bolt.

Another object of my invention is to provide a latch bolt with operating means movable in one direction to retract the bolt and in the opposite direction to limit movement of the bolt so that it cannot be forceably retracted.

A further object of my invention is to provide a simple form of latch bolt and operating means therefore which is relatively quiet in operation, economical to produce and easy to manipulate.

These and other objects and features of my invention will appear from the following description thereof in which reference is made to the figures of the accompanying drawing.

In the drawing:

Fig. 1 is a horizontal sectional view of one form of latch mechanism embodying my invention,

Fig. 2 is a view of the construction shown in Fig. 1 as seen from the rear thereof with the inner cover plate removed, and

Fig. 3 is a view similar to Fig. 1 illustrating a portion of the construction with the handle in its locking position.

In that form of my invention illustrated in the drawing a latch bolt 2 carried by a door 4 is movable into engagement with a keeper 6 on the door frame 8 under the action of a spring 10. The latch bolt is provided with a central elongated opening 12 within which the spring 10 is located and a lubricant carrying wick 14 is located within the spring so as to be compressed when the bolt is retracted causing lubricant to be applied to moving parts of the combination.

The latch bolt and spring are enclosed by a housing 16 which is secured to the door by bolts 18 and provided with an inner cover plate 20. One end of the spring 10 bears against the end of the opening 12 in the latch bolt whereas the other end thereof engages a shoulder 22 on the housing below the latch bolt and a plate 24 which extends over the latch bolt. For this purpose the

spring 10 is greater in diameter than the thickness of the latch bolt and lies in part in a recess 26 in the housing.

A bolt actuating handle 28 is pivotally mounted on the housing 16 by means of a pintle 30 passing through lugs 32 located on that portion of the housing adjacent the edge of door 4 and near the keeper 6. The handle is thus movable about pintle 30 as a pivot from the full line to the dotted line position of Fig. 1. A bolt actuating cam 34 is carried by the handle adjacent that end thereof remote from the pivot and extends inward through an opening 36 in the housing and through the slot 12 in bolt 2 adjacent the end 38 of the slot. The surface of the cam 34 which faces toward the end 38 of the slot is inclined or curved rearwardly at 40 so that the slope of the portion of the cam which is in contact with the end of the slot when the handle is in its normal operative position shown in full lines in Fig. 1, is very slight and the force exerted on the latch bolt to initiate retracting movement thereof is greatly multiplied. However, the angular movement of the cam element upon pivotal movement of the handle and the increase in slope of the surface 40 which engages the end 38 of the slot in the latch bolt as the handle is moved toward its dotted line position serve to change the direction of movement of the cam surface with respect to the bolt as the end of the handle is swung away from the housing 16. In this way the actuating cam is given an initial sliding movement transverse to the bolt and thereafter has both swinging and sliding movement with respect thereto and the effective inclination of the cam with respect to the bolt is increased rapidly as the handle 28 is moved toward the dotted line position of Fig. 1. The distance the bolt is moved during the latter periods of movement of the handle is thus increased and the total movement of the handle required to retract the bolt is reduced materially without increasing the force necessary to actuate the same.

By the use of a slot and cam arrangement as shown the bolt can move inward independently of the cam element so that on closing the door engagement of the bolt with the keeper and inward movement of the bolt thereby does not cause the handle to be moved. This is of importance because in closing heavy doors the operator usually leans on the handle and any "kick back" of the handle by the bolt when it engages the keeper may injure the operator's hand or wrist. The slot and cam arrangement overcomes this difficulty but has heretofore permitted "jimmying" of the bolt. In the present construction this is avoided by providing the free end of handle 28 with a stud 42 which extends through an opening 44 in the latch housing 16 and is located so as to be moved inward into a position adjacent the end 46 of the latch bolt 2 as shown in Fig. 3.

The handle 28 and stud 42 are normally held in an operative position by means of a spring 45 coiled about the pintle 30 and arranged to urge the handle toward the housing. A cushioning and positioning spring 48 is carried by the handle and engages the outer surface of the housing 16 to prevent the spring 45 from urging the handle 28 inward to its bolt locking position. However, when spring 48 is compressed by manually forcing the handle inward from its operative position to the locking position of Fig. 3 the stud 42 is moved to its bolt locking position. The handle may be held in its locking position by any suitable form of locking element such as a padlock 49 and for this purpose the handle 28 is provided with an opening 50 positioned to register with an opening 52 in a lug 54 formed on the latch housing.

In this way the springs 45 and 48 serve to maintain the handle 28 in a normal operative position from which it may be moved in one direction to retract the bolt 2 and in the opposite direction to lock the bolt in its projected position and render it "jimmy-proof." The spring 48 also serves as a shock absorbing element which takes up the shock of the handle when retracted to its operative position by spring 45 after release of the handle. The noise and strain upon the elements on return movement thereof is thus reduced without interfering with the action thereof.

In order that the latch mechanism may be operated from either side of the door, as from the interior of a cold storage room as well as from the exterior thereof, the door is provided with an inner handle 56 carried by a shaft 58 which has an insulating head 60 thereon. The shaft is loosely slidable in a collar 62 mounted on the door and is so positioned that on pushing the handle 56 toward the door the head 60 of the shaft will engage the end of cam element 34 and move the same transversely of the latch bolt. In this way the latch bolt may be retracted either by pulling on the handle 28 or pushing on handle 56. The shaft 58 and handle 56 are freely movable in either direction and the head 60 is sufficiently large so that on pulling on handle 56 the head will engage collar 62 to close the door. There is no connection between handle 56 and the latch bolt so that it may ride over the keeper and spring back to its projected position without the aid of the handle.

Since the head 60 of shaft 58 is formed of heat insulating material and there is no other contact between the inner handle and the outer handle and mechanism no appreciable heat transfer takes place through the handle.

The operation of the construction described will be obvious from the foregoing description thereof but may be summarized as follows:

When the door is closed the parts assume the positions illustrated in full lines in Fig. 1 wherein the handle 28 is urged toward its normal operative position by the spring 45 and is held from movement to its locking position by the cushioning spring 48. The bolt is fully projected by spring 10 so that the end of slot 12 in the bolt engages the cam element 34.

In order to retract the latch bolt the handle 28 is moved about the pivot 30 against the action of spring 45 to the dotted line position of Fig. 1. In so doing the cam element 34 first is moved transversely of the latch bolt in a direction substantially at right angles to the bolt. The relatively slight inclination of the surface of the cam element engaging the latch bolt during such initial movement of the handle serves to multiply the force applied to the bolt to retract it so that even though it should tend to stick the bolt may be withdrawn easily. As the handle continues to swing away from the housing the direction of movement of the cam element with respect to the bolt becomes more inclined and the increased inclination of the portion 40 of the cam surface also is more inclined so that the distance the bolt is moved on like angular movement of the handle is greatly increased. It there-

fore requires but little further movement of the handle after the bolt first starts to move in order to effect complete retraction of the bolt.

On reaching the dotted line position of Fig. 1 the bolt is fully retracted so that the door may be swung open. Thereafter on release of the handle 28 the spring 45, and to some extent the spring 10 which projects the latch bolt, urge the handle back toward its operative position. However, the spring 48 receives the shock of the handle so that the clatter and noise ordinarily produced on release of the handle are eliminated and the parts are not subjected to the strains and injury of any sudden impacts.

When the door is closed by pushing on the handle 28 the spring 48 still serves to hold the handle in its operative position. Furthermore since the latch bolt is free to move inward independently of the actuating means the handle does not receive any shock or "kick-back" when the bolt engages the keeper and is forced inward. On passing the keeper the spring 10 again projects the latch bolt to hold the door closed.

Operation of the door by pushing on the inner handle 56 to release the bolt serves to actuate the cam element 34 in the same manner as when pulling on handle 28, whereas release of the inner handle permits it to be moved by the cam element and handle 28 under the action of spring 45 so that it is returned to an operative or inwardly projected position. The insulating head 60 on the shaft 58 also serves to prevent heat transfer from the inner to the outer handle.

When it is desired to lock the door the handle 28 is pressed inward from the operative position of Fig. 1 against the action of spring 48 until the handle assumes the position shown in Fig. 3 wherein the opening 50 in the handle registers with the opening 52 in the lug 54 on the housing for the latch bolt. This movement of the handle also serves to move the stud 42 into bolt locking position adjacent the end of the latch bolt. By insertion of a padlock through the openings 50 and 52 or by otherwise locking the handle 28 in the position of Fig. 3 the handle 28 is held in the position of Fig. 3 and the bolt 2 is held against movement so that it cannot be "jimmied" by the insertion of a tool between the bolt housing and keeper. Thus movement of the handle in one direction from its operative position serves to retract the bolt and movement in the opposite direction from said position serves to lock the bolt.

The form of the invention illustrated in the drawing is typical of constructions embodying my invention but numerous changes and modifications may be made in the form and arrangement of the elements, particularly when applied to structures other than cold storage or refrigerator doors. In view thereof it should be understood that the embodiment of my invention herein described and shown in the drawing is intended to be illustrative of my invention and is not intended to limit the scope thereof.

I claim:

1. Latch mechanism for cold storage doors, refrigerators and the like having in combination a housing mounted on the door, a latch bolt extending into said housing and movable with respect thereto in a straight line into and out of engagement with a keeper, a spring in said housing urging said bolt toward said keeper, and mechanism for actuating said latch bolt including a handle, a pivot about which said handle is movable with respect to said housing and a cam element carried by said handle and located adjacent the end thereof remote from said pivot, said cam element having a face thereof directed away from said pivot engaged by said latch bolt and movable by said handle transversely of said latch bolt and about said pivot to decrease the inclination of said face with respect to the line in which said bolt is moved on movement of said handle away from said housing.

2. Latch mechanism for cold storage doors, refrigerators and the like having in combination a housing mounted on the door, a latch bolt extending into said housing and movable with respect thereto in a straight line into and out of engagement with a keeper, a spring in said housing urging said bolt toward said keeper, and mechanism for actuating said latch bolt including a handle, a pivot about which said handle is movable with respect to said housing and a cam element carried by said handle and located adjacent the end thereof remote from said pivot, said bolt having a longitudinally extending slot therein and said cam element having a face thereof directed away from said pivot engaging the end of said slot and movable by said handle transversely of said latch bolt and about said pivot to decrease the inclination of said face with respect to the line in which said bolt is moved on movement of said handle away from said housing.

3. Latch mechanism for cold storage doors, refrigerators and the like having in combination a housing, a slotted latch bolt extending into said housing and movable with respect thereto into and out of engagement with a keeper, a spring in said housing urging the bolt toward the keeper, an actuating handle pivotally mounted on said housing, spring means serving to maintain the handle in an operative position and a cam element carried by said handle and extending into the slot in said bolt and having a surface thereof engaging the end of said slot, that portion of said surface engaging the end of the slot when said handle is in said operative position being so inclined with respect to said bolt as to produce limited retracting movement of the latch bolt on movement of the handle away from the housing and that portion of said surface brought into engagement with the end of the slot in the bolt on movement of the handle away from said housing being so inclined with respect to said bolt as to produce greater retracting movement of the latch bolt on continued movement of the handle away from the housing.

4. Latch mechanism for cold storage doors having in combination a housing, a latch bolt extending into said housing and movable into and out of engagement with a keeper, a bolt projecting spring urging the bolt toward the keeper, a bolt actuating handle having means thereon for retracting said bolt, a locking stud carried by said handle and movable therewith to engage said bolt and prevent retraction thereof, a spring engaging said handle to urge the handle toward said housing and a cushioning and positioning spring located between the handle and housing and yieldably opposing movement of the handle toward the housing and into position to cause said stud to lock said bolt.

5. Latch mechanism for cold storage doors, refrigerators and the like comprising a latch bolt having a slot therein, spring means urging the bolt toward a keeper, a latch operating handle having a cam element extending into said slot

and movable by said handle to retract said bolt against the action of said spring, said slot being sufficiently elongated to permit said bolt to move inward on engaging said keeper without moving said cam element or handle and locking means on said handle movable therewith into a locking position adjacent the end of said bolt when the bolt is projected to prevent retraction of said bolt while said handle is retained in said locking position and means engaging said handle yieldably opposing movement of said locking means into position to engage said bolt.

6. Latch mechanism for cold storage doors, refrigerators and the like comprising a housing, a latch bolt extending into said housing and movable into and out of engagement with a keeper, a latch operating handle, opposing elements urging said handle toward a predetermined position, means operatively connected to said handle and movable thereby to retract said bolt on movement of said handle in one direction from said predetermined position against the action of one of said elements and locking means operatively connected to said handle and movable thereby to engage said bolt and lock it in a projected position on movement of said handle in the opposite direction from said predetermined position against the action of the other of said elements.

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