

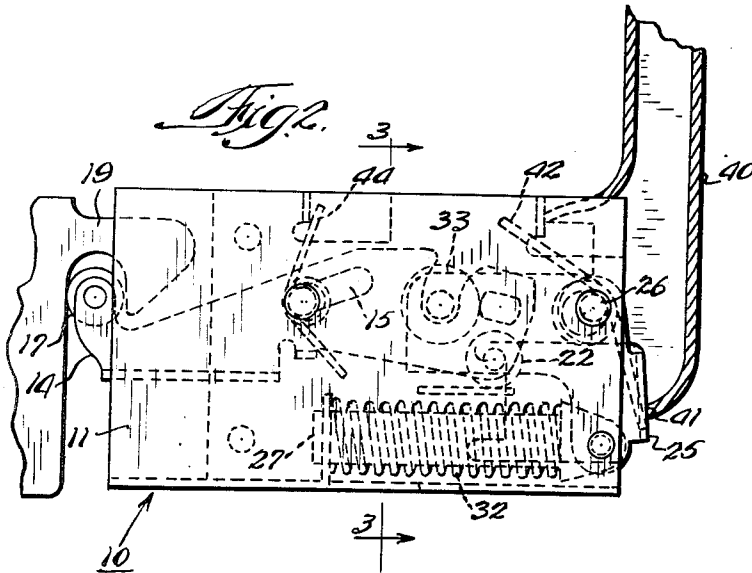
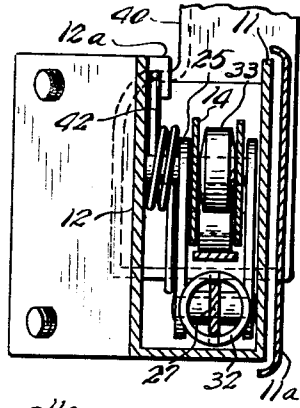
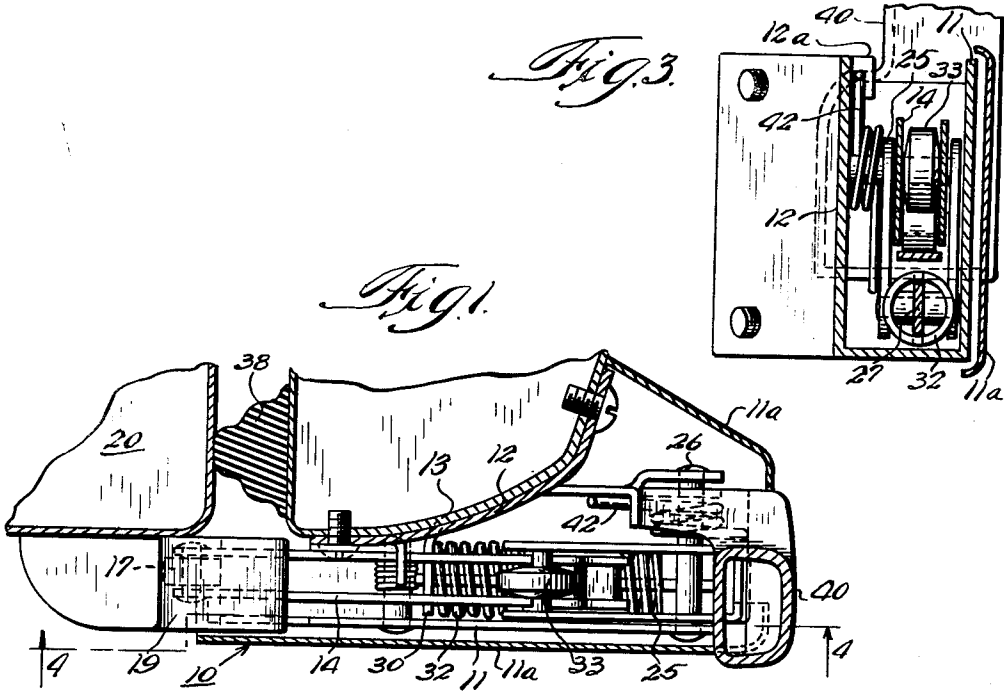
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R. E. JOHNSON
LATCH MECHANISM

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

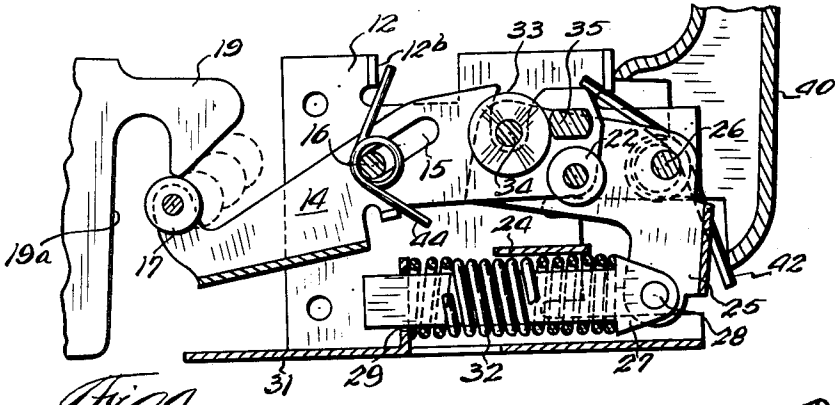


Fig. 4.

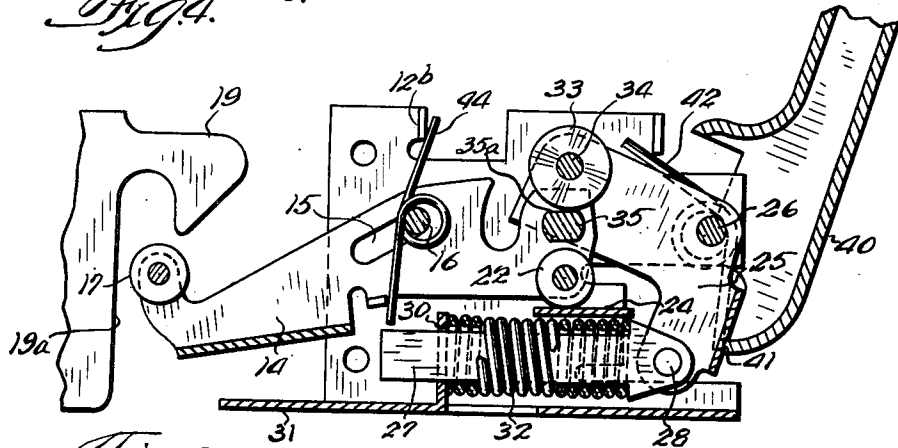


Fig. 5.

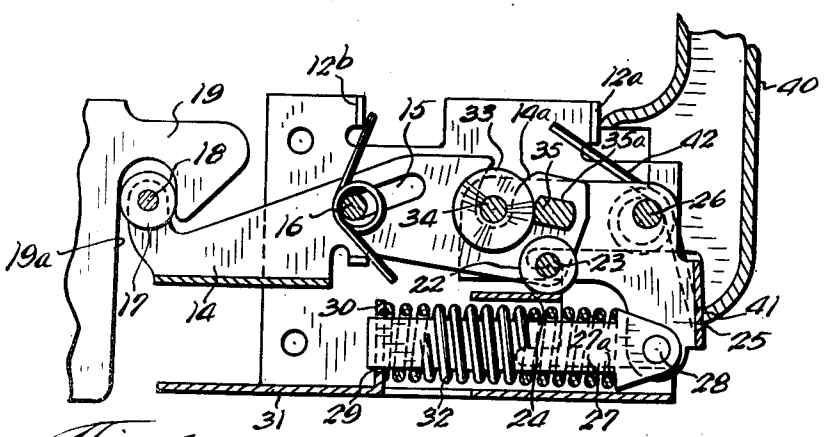


Fig. 6.

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LATCH MECHANISM

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Application February 18, 1952, Serial No. 272,186

4 Claims. (Cl. 292—332)

1

This invention relates to a latch mechanism and it is an object of the invention to provide improved apparatus of that character.

In latch mechanisms for refrigerators and various other applications, it is desirable that a bolt member be urged forcefully toward a keeper engaging position in order that the latch mechanism may serve to compress a gasket between a door and a cabinet in the event that the operator does not close the door with sufficient force to compress the gasket. It is also desirable, when the latch is released to permit opening of the door, that the latch bolt be toggled or cocked in an open position, from which position it may readily be tripped by a relatively light, properly directed force. This enables the door to be closed with a minimum force.

With such a latch mechanism it is not an uncommon occurrence that the latch bolt is inadvertently tripped from its cocked position while the door is open. Accordingly, it is desirable also that the latch bolt be movable from its keeper engaging position to a keeper by-passing position merely by slamming the door shut. Where this feature is not present, if the latch mechanism becomes uncocked while the door is open it is necessary to operate the latch handle before the door can again be closed.

It is another object of the invention to provide an improved cocking latch mechanism.

It is another object of the invention to provide an improved cocking latch mechanism for mounting on a door and cabinet, for example, which latch mechanism permits the door to be slammed shut even though the latch mechanism may have been tripped from its cocked position while the door was open.

It is another object of the invention to provide an improved latch mechanism having the features described above and in which the various movements necessary to effect these features are accompanied by a minimum of friction.

It is another object of the invention to provide an improved latch mechanism having the various features described above while being simple, reliable and economical to manufacture.

This invention, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings, in which like parts are designated by like reference numerals,

Fig. 1 is a cross-sectional plan view of a latch

2

mechanism illustrating one embodiment of the invention, the mechanism being shown in connection with a refrigerator door and cabinet;

Fig. 2 is an elevational view of the same latch mechanism, the refrigerator door and cabinet being omitted in the interest of clarity;

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 2 but omitting the refrigerator door and cabinet;

Fig. 4 is a cross-sectional view taken along the line 4—4 of Fig. 2 but showing the latch mechanism in a different operating position; and

Figs. 5 and 6 are views similar to Fig. 4 but showing the latch mechanism in different operating positions.

The latch mechanism disclosed in the drawings is particularly adapted for application to the edge of an otherwise complete door, in which case certain portions of the housing of the latch mechanism are preferably of chrome plated metal and attractive in contour. It is to be understood, however, that the invention is not limited to such an application but may be employed in a latch mechanism mounted within a door, as is more common in the case of refrigerators.

A supporting frame 10 is provided having an outer wall 11 and an inner wall 12. It will be noted by reference to Figs. 1 and 3 that a third wall 11a is also provided which lies alongside the outer wall 11 and extends around the right-hand end of the structure and doubles back to complete the closure. The wall 11a is exposed to view in the illustrated embodiment of the invention, and serves no function other than to provide an ornamental exterior surface. It may be secured to the frame 10 by any suitable means, not illustrated in the drawing.

The inner wall 12 has portions thereof formed to fit the edge of a refrigerator door since the latch mechanism illustrated in the drawings is intended to be secured to the edge of a door 13. Certain portions of the inner wall 12, however, extend outwardly of the refrigerator door to form brackets for supporting various operating parts of the latch mechanism.

The latch mechanism includes a latch bolt 14 preferably channel shaped in cross section over a part of its length in the interest of rigidity and strength. The opposed walls of the latch bolt have matching slots 15 intermediate their ends and extending substantially longitudinally of the latch bolt. A pivot pin 16 extends through these slots and is secured to the inner and outer walls 11 and 12 of the supporting frame 10. This structure permits both a sliding movement and

3

a pivotal movement of the latch bolt with respect to the supporting frame.

At the left-hand end of the latch bolt is a keeper engaging roller 17 mounted on a pin 18 which extends through and is secured to both walls of the bolt member. The roller 17 is adapted to engage a keeper 19 which is secured to the side of a cabinet 20 with which the door 13 cooperates.

At the right-hand end of the latch bolt 14 there is another roller 22 rotatably secured to the latch bolt by a pin 23. The roller 22 is adapted to engage and roll along one surface of a fixed member 24 which forms a part of the supporting frame 10. The member 24 may be struck from the inner wall 12 of the supporting frame but in the illustrated embodiment constitutes a separate plate which is secured at its opposite ends to the supporting frame walls 11 and 12.

A bolt actuator 25 is pivotally mounted on the supporting frame 10 by a pivot pin 26. In the illustrated embodiment the bolt actuator is in the form of a bell crank, the lower end of which is pivotally secured to one end of a spring bar 27 through a pin 28. The other end of the spring bar 27 is engaged in a slot 29 formed in a bracket 30 which is struck from the lower wall 31 of the supporting frame 10. A compression spring 32 is wound around the body of the spring bar and is compressed between the bracket 30 and a shoulder 27a near the right-hand end of the spring bar 27.

The spring 32 being in compression, urges the lower end of the actuator 25 to the right and tends to rotate the entire actuator around the pivot pin 26 in a counterclockwise direction as viewed in Figs. 2-6.

A cam roller 33 is rotatably mounted at the left-hand or free end of the actuator 25 by a pin 34. This cam roller cooperates with a cam pin 35 secured to the latch bolt near its right-hand end. The cam pin 35 disclosed in the drawings is also disclosed and is claimed in application Serial No. 58,953, entitled "Refrigerator Latch," filed November 8, 1948, by Lloyd L. Anderson, and assigned to the same assignee as the present invention.

The actuator 25, like the latch bolt 14, is preferably channel shaped in cross section over at least a portion of its length, and the opposed walls thereof are so spaced that they may lie immediately outwardly of the two walls of the latch bolt, all as best seen in Fig. 3. The pin 34 on which the cam roller 33 is mounted is secured to both walls of the actuator 25 and slots 14a are provided in the walls of the latch bolt 14 for freely receiving the pin 34 in order that the cam roller 33 may enter the space between the walls of the latch bolt to the position illustrated in Fig. 6.

With the latch mechanism in the position illustrated in Fig. 6, the cam roller 33, being pressed downwardly under the influence of the spring 32, exerts a force against the cam pin 33 tending to drive the latch bolt 14 toward the right, the force being greatly magnified through the mechanical advantage provided by the arrangement of the cam roller 33 and the cam pin 35. Also, the pin 34, on which the cam roller 33 is mounted, may engage the bottom of the slots 14a and thereby urge the latch bolt 14 to rotate in a clockwise or door locking direction. The roller 22 is thereby maintained forcefully against the plate 24.

This is the keeper engaging position of the

4

latch bolt, the roller 17 being maintained upwardly, as viewed in Fig. 6, in the recess of the keeper 19, and being urged to the right (by pressure of 33 against pin 35 which latter is mounted on latch bolt 14) whereby the supporting frame of the latch mechanism, and hence the door 13, are urged forcefully to the left with respect to the keeper 19. This arrangement is particularly desirable in a refrigerator application since this force may be employed to compress a gasket 38 between the facing surfaces of the door 13 and the cabinet 20.

A handle 40 is provided for controlling the latch mechanism, and more particularly for moving the latch mechanism to a cocked or open position. The handle 40 is pivotally mounted on the same pin 26, about which the actuator 25 rotates, and the lower end of the handle 40 engages the actuator at a point 41. It will be apparent that when the handle 40 is moved in a clockwise direction the actuator 25 will also move in a clockwise direction, compressing the spring 32. A spring 42 is wound around the pivot pin 26, one end engaging a bracket 12a struck from the inner wall 12 of the supporting frame and the other end of the spring engaging the lower end of the handle 40. The spring 42 thus urges the handle 40 in a counterclockwise direction and exerts a sufficient force to move the handle 40 back to the position illustrated in Fig. 6 when it has been released.

The clockwise movement of the actuator 25 caused by operation of the handle 40 withdraws the cam roller 33 from its position to the left of the cam pin 35, illustrated in Fig. 6, to the position illustrated in Fig. 5. The opening force applied by an operator to the handle 40 also tends to draw the refrigerator door to the right, away from the cabinet 20. The latch bolt roller 17, however, remains temporarily engaged with the keeper 19 and hence the latch bolt 14 is drawn to the left with respect to the remainder of the latch mechanism such that it assumes the position illustrated in Fig. 5.

The latch bolt 14 is also urged toward the position illustrated in Fig. 5 by a relatively light spring 44 wound around the pin 15. One end of the spring 44 engages a bracket 12b, which is struck from the inner wall 12 of the supporting frame 10, and the other end of this spring engages the latch bolt 14 as shown. The force exerted by the relatively light spring 44 helps to insure movement of the latch bolt 14 from the position illustrated in Fig. 6 to the position illustrated in Fig. 5 when the handle 40 is operated.

In the position illustrated in Fig. 5 the cam pin 35 lies under the cam roller 33, the latter engaging a flattened surface 35a at one side of the cam pin 35. Since the point of contact between the cam roller 33 and the cam pin 35 is substantially in alignment with the pivotal axes of the roller 22 and the cam roller 33, and since the surface of the member 24 which the roller 22 contacts extends substantially at right angles to a line drawn between these pivotal axes, the latch bolt tends to remain in the position illustrated in Fig. 5. This is the cocked or open position of the latch mechanism, the bolt roller 17 being moved downwardly, in Fig. 5, to a position in which it may clear the nose of the keeper. The bolt member 14 tends to remain in this position as long as no external forces are applied thereto.

The downward movement of the bolt roller 17 as the bolt slides to the left results from the

fact that the slots 15 deviate by a substantial angle from the direction of opening and closing movement of the door when the latter is adjacent its closed position. Accordingly, as the latch bolt slides from right to left as in moving from the position of Fig. 6 to the position of Fig. 5, the bolt roller is moved downwardly such that it may clear the keeper 19. In the illustrated embodiment of the invention the slots 15 also deviate by a substantial angle from the surface of the plate 24 which the roller 22 contacts, with the result that as the latch bolt slides between the positions illustrated in Figs. 5 and 6, it also pivots through a small angle about the axis of the roller 22. This increases the vertical movement of the latch bolt roller 17 corresponding to a given length of sliding movement of the latch bolt.

The combined sliding and pivotal movement of the latch bolt between the positions illustrated in Figs. 5 and 6 is an optional feature of the invention, since the plate 24 might readily be made to extend parallel to the slots 15 whereby a pure sliding movement would be employed for the latch bolt as it moves between the positions illustrated in Figs. 5 and 6. Such a latch bolt would be workable and would still incorporate various features of the invention although it is not the preferred embodiment of the invention.

With the latch bolt in the position illustrated in Fig. 5, it will be apparent that a relatively small force applied to the latch bolt, tending to drive it to the right, will move the cam pin 35 to a position in which the cam roller 33 will forcefully urge the cam pin further to the right, whereupon the latch bolt will be moved into the position illustrated in Fig. 6. Such a tripping force is obtained when the door is moved toward its closed position by virtue of the fact that the latch bolt 14, and more specifically the latch bolt roller 17, strikes a tripping surface 19a on the keeper 19. Accordingly, the latch bolt is readily tripped from its cocked position illustrated in Fig. 5 merely by movement of the door toward its closed position. After the latch mechanism has been tripped the spring 32, acting through the cam elements 33 and 35, urges the latch bolt 14 to the right with respect to the main body of the latch mechanism, thereby drawing the door shut and compressing the gasket 38.

As previously indicated, if the latch bolt should be tripped from its cocked position while the door is open, it is desirable that the latch mechanism be so arranged that the door may be slammed shut. This means that the latch bolt must be movable from its keeper engaging position to a keeper by-passing position as a result of the force exerted thereagainst by the keeper.

When the latch mechanism is in the keeper engaging position illustrated in Fig. 6, it will be apparent that the latch bolt 14 cannot be slid to the left to its cocked position since the cam roller 33 is substantially in direct alignment with the cam pin 35. Movement of the latch bolt 14 to cocked position must be at least initiated by upward movement of the cam roller 33. Furthermore, when the latch bolt roller 17 strikes the keeper 19, with the latch bolt in its keeper engaging position and the door being manually moved toward its closed position, the force exerted by the keeper against the latch bolt roller is not properly directed to move the latch bolt toward its cocked position. Accordingly, another movement of the latch bolt must be provided for if the door is to be movable to its closed position without recocking the latch mechanism.

In the illustrated embodiment of the invention the latch bolt 14 is pivotable about the pin 16 from the position illustrated in Fig. 6 to the position illustrated in Fig. 4. This pivotal movement carries the roller 22 away from the plate 24, while the cam roller 33 remains substantially fixed with respect to the cam pin 35. The actuator 25 is thereby pivoted about the pin 26 in a clockwise direction and the spring 32 is compressed. This movement is therefore resisted by the spring 32 but the force required to slam the door shut may be relatively light depending upon the slope of the keeper 19.

It will be apparent that when the latch bolt roller 17 has passed over the nose of the keeper, it will enter the keeper slot forcibly under the influence of the spring 32 and the actuator 25.

It has been found that the sliding movement of the latch bolt 14 from its keeper engaging position to its cocked or open position results in a smooth operation and utilizes the operator's pull on the handle 40 to good advantage to move the latch bolt to its cocked position. More specifically, when the operator pulls on the handle 40, thereby pivoting the actuator 25 in the clockwise direction, the same pull urges the door 13 toward its open position. As long as the latch bolt roller 17 is still engaged by the keeper 19 this outward pull by the operator urges the latch bolt 14 to the left with respect to the other portions of the latch mechanism, and more particularly with respect to the cam roller 33. Also when the latch bolt is tripped from its cocked position by striking of the latch bolt roller 17 against the tripping face 19a of the keeper 19, the force applied to the latch bolt by the keeper is substantially in alignment with the direction of movement of the latch bolt as it moves from its cocked position to its keeper engaging position. Accordingly, the tripping force is efficiently applied to trip the latch bolt.

The roller 22 engaging a single track, namely plate 24, minimizes friction in the movement of the latch bolt between its keeper engaging position and its cocked position.

Still further the pivotal movement of the latch bolt from its keeper engaging position to its keeper by-passing position permits efficient application of the force required to effect such movement. More specifically, the force applied by the face of the keeper 19 against the latch bolt roller 17 may be substantially tangent to the path of the latch bolt roller as it pivots about the pin 16 from its keeper engaging position to its by-passing position. Accordingly, the door may be slammed shut, when the latch bolt has inadvertently been tripped while the door is open, with a minimum of force in view of the strength of the spring 32 provided for compressing the gasket 38 and maintaining the door in its closed position.

Incorporation of these features results in a latch mechanism having the basic characteristics of being cockable and of permitting slamming of the door when the latch mechanism has inadvertently been tripped, while being easily operable because of the minimizing of friction and the efficient transformation of operating forces. Such a latch mechanism is also simple in construction and is inherently dependable in operation.

It will be apparent that the invention may be varied in its physical embodiment without departing from the spirit of the invention, and it is desired, therefore, that the invention be limited only by the scope of the appended claims.

7

The invention having thus been described, what is claimed and desired to be secured by Letters Patent is:

1. A latch mechanism for mounting on a door, movable between open and closed positions with respect to a cabinet and for cooperating with a keeper mounted on such cabinet, said latch mechanism including an elongated bolt member extending generally in the direction of movement of said door, keeper engaging means associated with one end of said bolt member, roller and track means associated with the other end of said bolt member for guiding said other end of said bolt member in linear movement thereof in the general direction of movement of said door, pin and slot means associated with said bolt member intermediate its ends for permitting unrestricted pivotal movement and limited linear movement of said bolt member, the slot of said pin and slot means extending in a direction forming a substantial angle to the direction of movement of said door whereby linear movement of said other end of said bolt member toward said one end thereof causes said bolt member to pivot about said other end from a keeper engaging position to a disengaged position, an actuator member, a cam element mounted on said actuator, a cam element mounted on said bolt member adjacent said other end thereof, and spring means operating on said actuator to urge said actuator cam element toward said bolt member in a direction substantially perpendicular to said bolt member, said actuator cam element engaging and lying in the path of said bolt member cam element when said bolt member is in said keeper engaging position, said bolt member cam element engaging and lying in the path of said actuator cam element when said bolt member is in said disengaged position, said roller and track means restraining said other end of said bolt member against lateral movement by the force of said spring operated actuator acting through said cam elements when said bolt member is in said disengaged position.

2. A latch mechanism for mounting on a door, movable between open and closed positions with respect to a cabinet, and for cooperating with a keeper mounted on such cabinet, said latch mechanism including an elongated bolt member extending generally in the direction of movement of said door, keeper engaging means associated with one end of said bolt member, roller and track means associated with the other end of said bolt member for guiding said other end of said bolt member in linear movement thereof in the general direction of movement of said door, pin and slot means associated with said bolt member intermediate its ends for permitting unrestricted pivotal movement and limited linear movement of said bolt member, the slot of said pin and slot means extending in a direction forming a substantial angle to the direction of movement of said door whereby linear movement of said other end of said bolt member toward said one end thereof causes said bolt member to pivot about said other end from a keeper engaging position to a disengaged position, an actuator member, a cam element mounted on said actuator, a cam element mounted on said bolt member adjacent said other end thereof, and spring means operating on said actuator to urge said actuator cam element toward said bolt member in a direction substantially perpendicular to said bolt member, said actuator cam element engaging and lying in the path of said bolt mem-

ber cam element when said bolt member is in said keeper engaging position, said bolt member cam element engaging and lying in the path of said actuator cam element when said bolt member is in said disengaged position, said roller and track means restraining said other end of said bolt member against lateral movement by the force of said spring operated actuator acting through said cam elements when said bolt member is in said disengaged position, one of said cam elements comprising a cam roller, the other of said cam elements having a flattened surface extending substantially in the direction of movement of said door and being engaged by the said cam roller when said bolt member is in said disengaged position.

3. A latch mechanism for mounting on a door, movable between open and closed positions with respect to a cabinet, and for cooperating with a keeper mounted on such cabinet, said latch mechanism including an elongated bolt member extending generally in the direction of movement of said door, keeper engaging means associated with one end of said bolt member, roller and track means associated with the other end of said bolt member for guiding said other end of said bolt member in linear movement thereof in the general direction of movement of said door, pin and slot means associated with said bolt member intermediate its ends for permitting unrestricted pivotal movement and limited linear movement of said bolt member, the slot of said pin and slot means extending in a direction forming a substantial angle to the direction of movement of said door whereby linear movement of said other end of said bolt member toward said one end thereof causes said bolt member to pivot about said other end from a keeper engaging position to a disengaged position, an actuator member, a cam element mounted on said actuator, a cam element mounted on said bolt member adjacent said other end thereof, and spring means operating on said actuator to urge said actuator cam element toward said bolt member in a direction substantially perpendicular to said bolt member, said actuator cam element engaging and lying in the path of said bolt member cam element when said bolt member is in said keeper engaging position, said bolt member cam element engaging and lying in the path of said actuator cam element when said bolt member is in said disengaged position, said roller and track means restraining said other end of said bolt member against lateral movement by the force of said spring operated actuator acting through said cam elements when said bolt member is in said disengaged position, one of said cam elements comprising a cam roller, the other of said cam elements being a pin having a flattened surface extending substantially in the direction of movement of said door and being engaged by the said cam roller when said bolt member is in said disengaged position.

4. A latch mechanism for mounting on a door, movable between open and closed positions with respect to a cabinet and for cooperating with a keeper mounted on such cabinet, said latch mechanism including an elongated bolt member extending generally in the direction of movement of said door, keeper engaging means associated with one end of said bolt member, roller and track means associated with the other end of said bolt member for guiding said other end of said bolt member in linear movement thereof in the general direction of movement of said

9

door, pin and slot means associated with said bolt member intermediate its ends for permitting unrestricted pivotal movement and limited linear movement of said bolt member, the slot of said pin and slot means extending in a direction forming a substantial angle to the direction of movement of said door whereby linear movement of said other end of said bolt member toward said one end thereof causes said bolt member to pivot about said other end from a keeper engaging position to a disengaged position, an actuator member, a cam element mounted on said actuator, a cam element mounted on said bolt member adjacent said other end thereof, and spring means operating on said actuator to urge said actuator cam element toward said bolt member in a direction substantially perpendicular to said bolt member, said actuator cam element engaging and lying in the path of said bolt member cam element when said bolt member is in said keeper engaging position, said bolt member cam element engaging and lying in the path

10

of said actuator cam element when said bolt member is in said disengaged position, said roller and track means restraining said other end of said bolt member against lateral movement by the force of said spring operated actuator acting through said cam elements when said bolt member is in said disengaged position, said actuator member comprising a bell crank pivotally mounted near its center, said actuator cam element being mounted on one arm of said bell crank, and said spring means extending alongside said bolt member and operating against the other arm of said bell crank.

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