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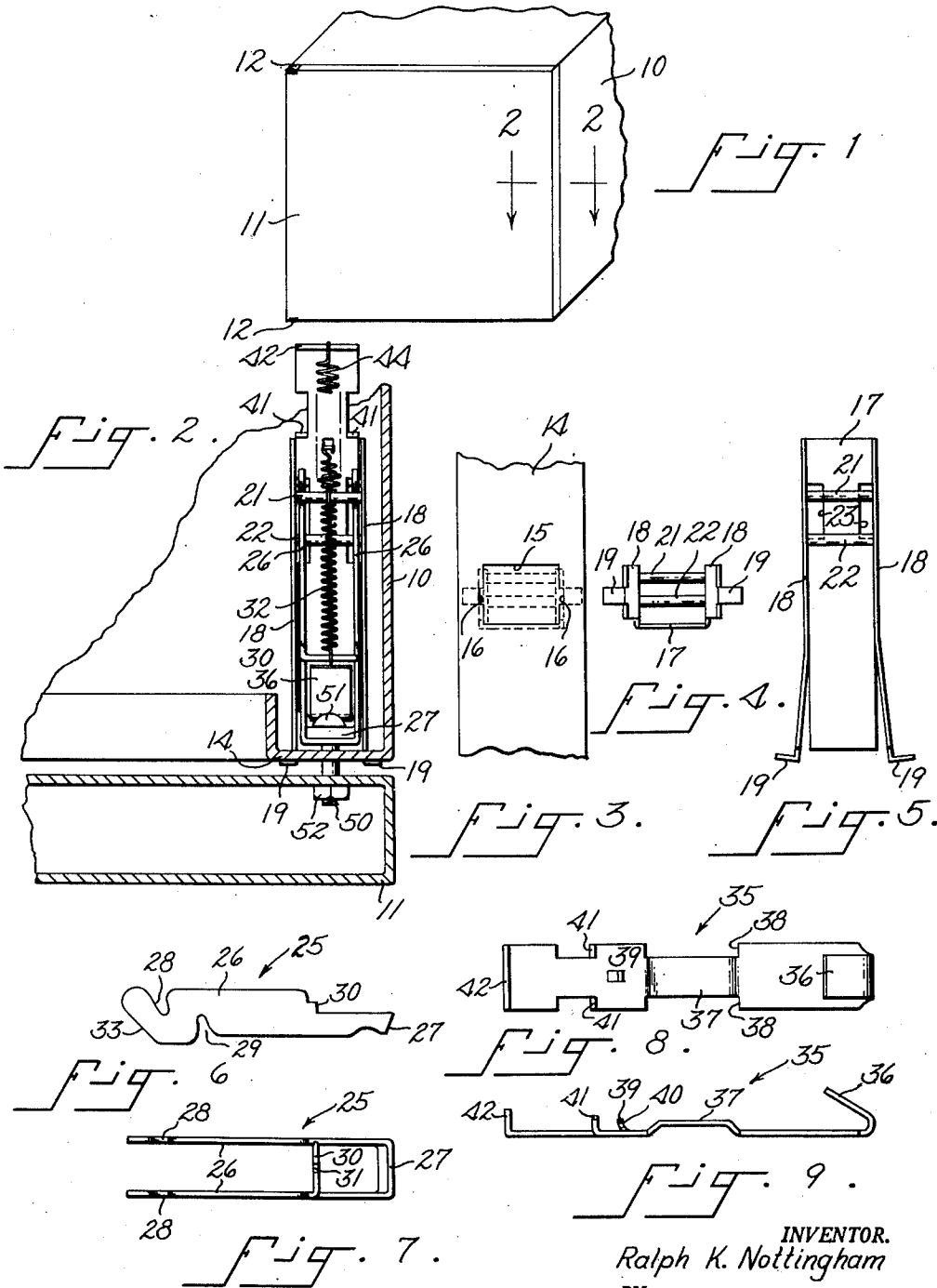
R. K. NOTTINGHAM

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AUTOMATIC LATCH FOR TWO RELATIVELY MOVABLE MEMBERS

Filed July 25, 1949

4 Sheets-Sheet 1



INVENTOR.
Ralph K. Nottingham
BY
Buckham and Cheatham
Attorneys

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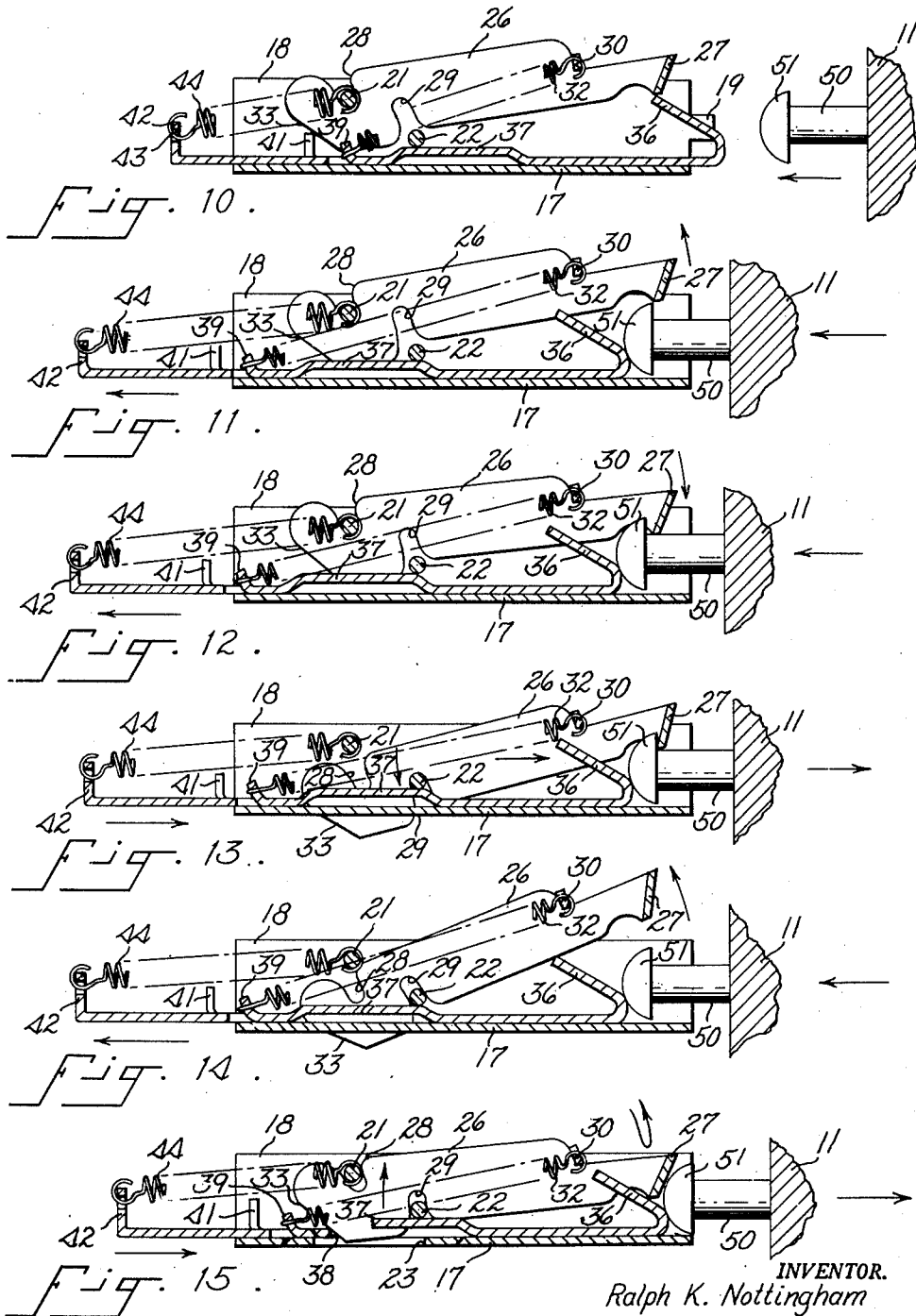
R. K. NOTTINGHAM

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AUTOMATIC LATCH FOR TWO RELATIVELY MOVABLE MEMBERS

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4 Sheets-Sheet 2



INVENTOR.
Ralph K. Nottingham
BY *Anakham and Cheatham*
Attorneys

May 5, 1953

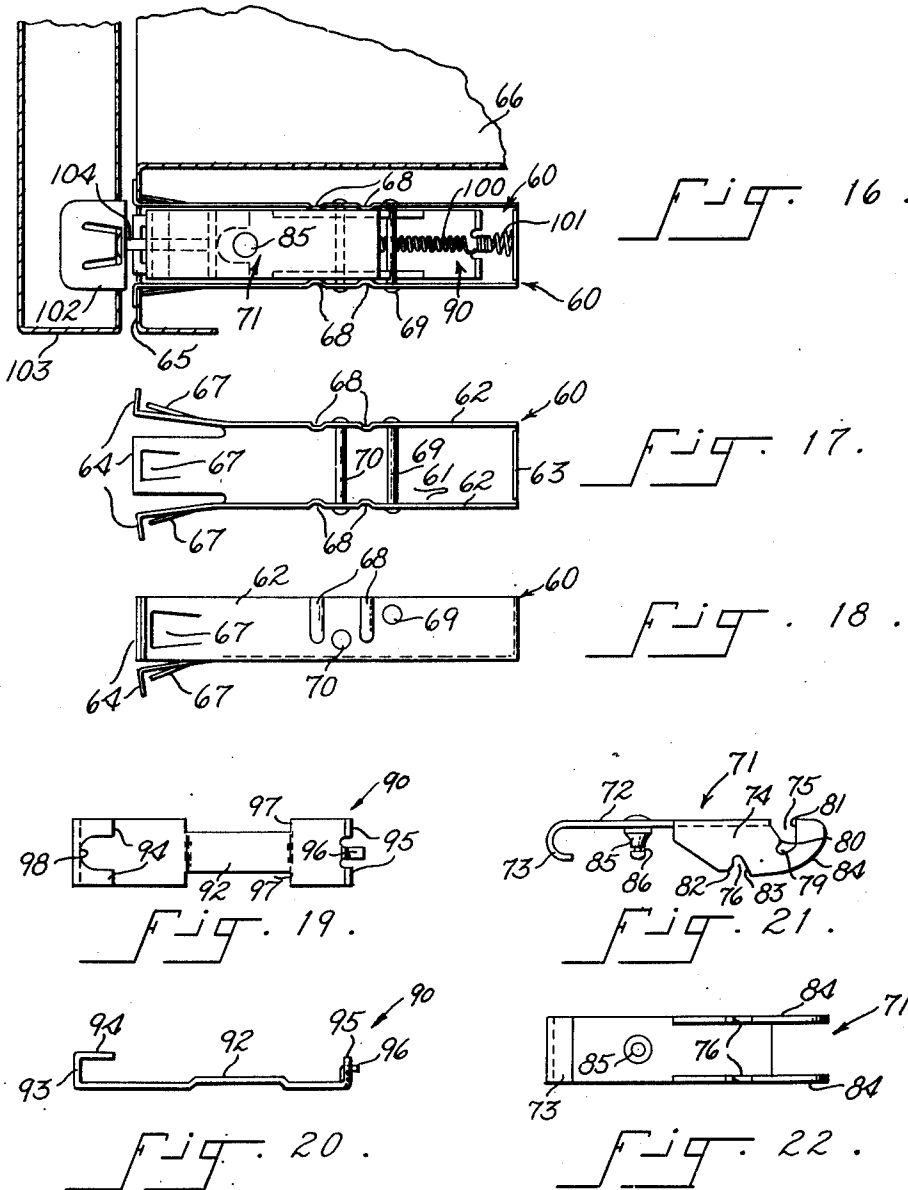
R. K. NOTTINGHAM

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AUTOMATIC LATCH FOR TWO RELATIVELY MOVABLE MEMBERS

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4 Sheets-Sheet 3



INVENTOR.
Ralph K. Nottingham
BY
Buckhorn and Cheatham
Attorneys

May 5, 1953

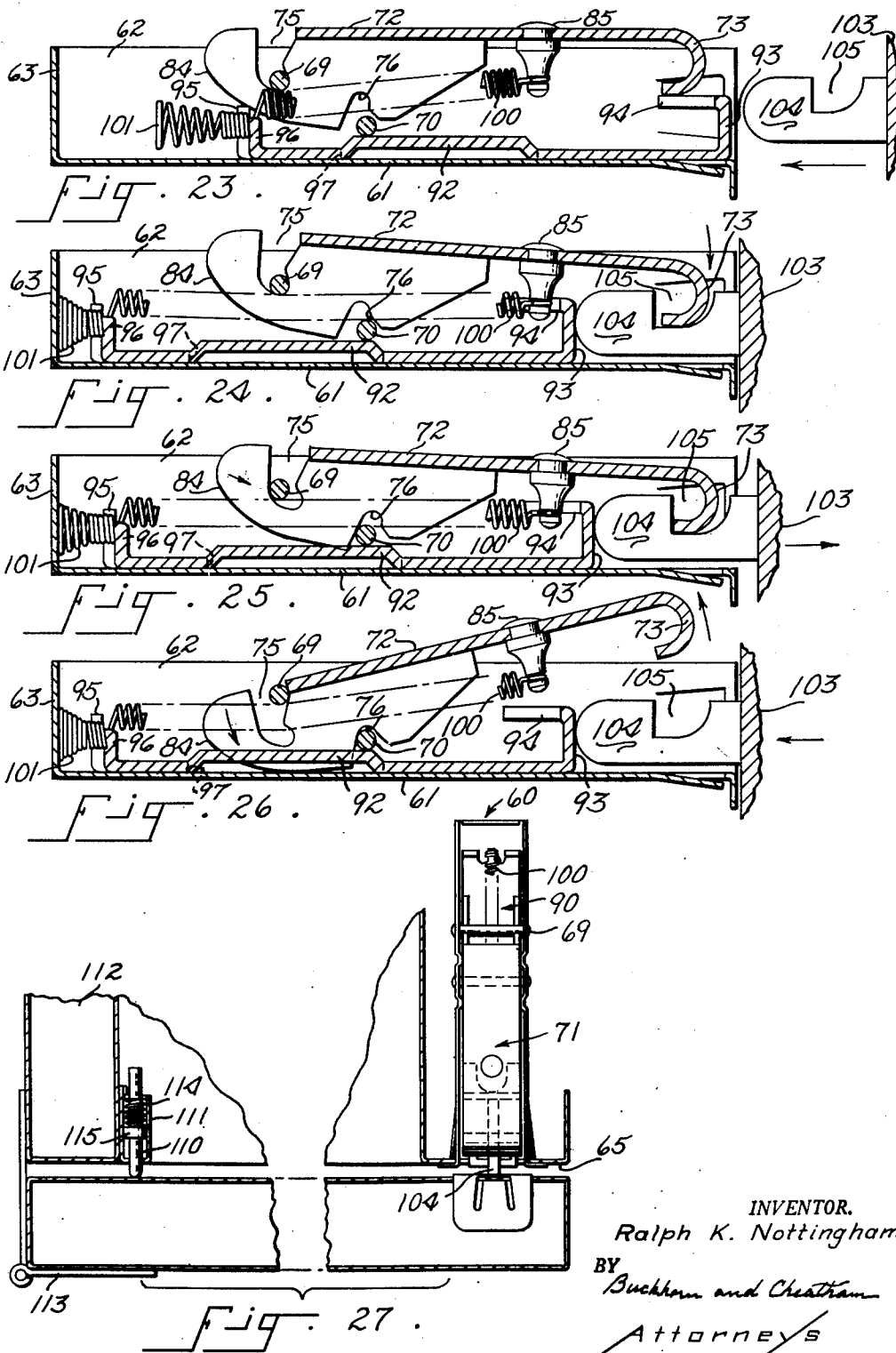
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INVENTOR.
Ralph K. Nottingham
BY
Buckham and Cheatham
Attorneys

UNITED STATES PATENT OFFICE

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AUTOMATIC LATCH FOR TWO RELATIVELY
MOVABLE MEMBERS

Ralph K. Nottingham, Portland, Oreg., assignor
to Phillips Tutch Latch Co., New York, N. Y.,
a corporation of Delaware.

Application July 25, 1949, Serial No. 106,648

5 Claims. (Cl. 292—99)

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The present application is a continuation-in-part of my prior application, Serial No. 46,653, filed August 28, 1948, now abandoned.

The present invention comprises an automatic latching device to hold one of two relatively movable members in latched relationship to each other, such members being, for example, a door and a cabinet, a door into a room and its casing, or a desk and a drawer. The invention is of particular utility in the manufacturing of sheet metal cabinets such as wall or floor cabinets for kitchen, bedroom or bathroom use. The principal object of the present invention is to provide a simplified form of latching device for accomplishing the latching function, and one which may be easily fabricated and easily assembled with the members.

A further object of the present invention is to provide a latching unit for a latching device of the above type having the desirable characteristics outlined above and which may be entirely concealed within a cabinet or other structure so that no unsightly or dangerous projections protrude from the outer surface of the cabinet or other structure. The only projection is a catch member on the other of the relatively movable members, which is concealed from view when in latched position.

A further object of the present invention is to provide a latching device of the foregoing type having the further characteristic that no handle or lever need be turned, or button or the like be pressed or moved, in order to operate the device. The device is so constructed that the members will be retained in closed position upon being brought into the closed position. Thereafter the members may be separated upon being pressed slightly together. The provision of the latching means of my invention permits a busy housewife with both hands full to approach a closed cabinet and open it by simply pressing against the door with her shoulder, elbow or knee.

A further object of the present invention is to provide an automatic latching device for two relatively movable members in which resilient means are incorporated to provide the force to separate the two members when the latching device is unlatched, thus eliminating the separate spring pusher heretofore found necessary in constructions of this character.

The foregoing and other objects and advantages of the present invention will be more readily ascertained from inspection of the following specification taken in connection with the accompanying drawing wherein like numerals refer

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to like parts throughout, while the features of novelty will be more distinctly pointed out in the appended claims.

In the drawing,

Fig. 1 is a partial, isometric view of a cabinet having a door held in closed position by a modification of the present invention;

Fig. 2 is a partial, horizontal section, on an enlarged scale, taken substantially along line 2—2 of Fig. 1;

Fig. 3 is a view in elevation of the forward surface of a portion of a cabinet in which the latching unit is adapted to be mounted;

Fig. 4 is a front view of the housing of the latching unit with the operating parts removed;

Fig. 5 is a plan view of the housing;

Fig. 6 is a side elevation of the latch of the present invention;

Fig. 7 is a plan view of the latch;

Fig. 8 is a plan view of the resetting plunger of the present invention;

Fig. 9 is a side elevation of the plunger;

Fig. 10 is a longitudinal vertical section through the latching unit and a portion of a door at the moment when the door is about to reach closed position, the latching unit being in normal condition with the latch in cocked position;

Fig. 11 is a similar view showing the catch in the process of raising the hook portion of the latch during the closing movement of the door;

Fig. 12 is a similar view showing the parts at the moment when the door has moved inwardly to the fullest extent possible and the latch is in catch engaging position;

Fig. 13 is a similar view showing all parts at rest with the latch in latching position retaining the separable members in latched relationship;

Fig. 14 is a similar view showing the latch in the releasing position automatically assumed upon pressing the door inwardly to initiate opening thereof;

Fig. 15 shows a subsequent stage in the operation of the device when the door has been released from inward pressure and is being propelled toward its open position by the resilient means of the latching device;

Fig. 16 is a view similar to Fig. 2 showing a second modification of the present invention;

Fig. 17 is a plan view of the housing of the second modification;

Fig. 18 is a side elevation of the housing of the second modification;

Fig. 19 is a plan view of the resetting plunger for the second modification;

Fig. 20 is a side elevation of the plunger for the second modification;

Fig. 21 is a side elevation of the latch of the second modification;

Fig. 22 is a bottom view of the latch of the second modification;

Fig. 23 is a longitudinal, vertical section of the second modification and a portion of a door when the latch is in normal, cocked position, the view being similar to Fig. 10;

Fig. 24 is a similar view showing the parts when the door has been pushed as far closed as possible, and the latch is in catch engaging position, the view being similar to Fig. 12;

Fig. 25 is a similar view showing the parts when the door is being retained in closed position and the latch is in latching position, the view being similar to Fig. 13;

Fig. 26 is a similar view showing the parts when the door has been pushed inwardly to initiate opening thereof and the latch is in releasing position, the view being similar to Fig. 14; and

Fig. 27 is a horizontal section through a cabinet having a third modification of the present invention thereon.

Description of first modification

In Figs. 1, 2 and 3, a cabinet comprising a side wall 10 is shown as having a door 11 hinged thereto by hinges 12. As is common in sheet metal cabinet construction, the forward edges of the side walls are reinforced by bending a portion inwardly and then rearwardly to form a flange 14 around the door opening. In order to mount the latching unit in the cabinet the flange 14 is preferably provided with a rectangular opening 15 having a pair of rectangular notches 16 in the vertical edges thereof. The latching device preferably comprises an elongated, trough-shaped housing including a bottom wall 17 and opposed side walls 18 of slightly less height than the vertical edges of opening 15. The corners of the trough are slit rearwardly from the front end for a substantial distance and the side walls are sprung outwardly, the material of the trough-shaped member being resilient so that the separated forward portions of the side walls tend to remain spread open as seen in Fig. 5, but may be sprung inwardly. Each side wall 18 is provided with a tongue 19 which extends forwardly and then laterally outward. As seen in dotted lines in Fig. 3, the housing may be slid longitudinally through the opening 15 until the tongues 19 snap into the notches 16. The remaining portions of the end edges of the side walls 18 and the end edge of the bottom wall 17 will underlie the surface of the flange 14 and the housing will thus be retained in position. If it is desired to remove the latching unit, the tongues 19 may be pressed toward each other until the housing may be raised slightly and withdrawn through the opening 15. The housing mounts a pair of spaced-apart latch pivots, which are preferably in the form of longitudinally and vertically spaced crossbars 21 and 22, which not only pivotally cooperate with the latch but hold the walls 18 from spreading. The bottom wall 17 is provided with a pair of longitudinally extending slots 23 at its sides below the pivots 21 and 22.

The working parts of the latching device comprise an elongated latch 25 seen in Figs. 6 and 7 and an elongated plunger 35 seen in Figs. 8 and 9. The latch comprises a U-shaped member having a pair of vertical side portions 26 so spaced

as to slide within the side walls 18 of the housing and a rearwardly inclined bight portion 27 at the forward end thereof which provides the latch hook. Each side portion 26 is provided with an upwardly facing, rearwardly inclined notch 28 adjacent its rear end and a downwardly facing, rearwardly inclined notch 29 spaced forwardly therefrom. A forward portion of one of the side portions 26 is slit longitudinally and the tongue 30 so formed is bent laterally to provide an anchoring crosspiece which is provided with a notch 31 in which one end of a tension spring 32 may be anchored. The spring extends diagonally downward and rearward between the pivots 21 and 22 and its rear end is suitably anchored so that the spring is always tensioned. The rear edges of the side portions 26 are inclined upwardly and rearwardly to provide cam surfaces 33 for a purpose to be explained.

The plunger 35 comprises a flat bar having an upwardly and rearwardly extending striker portion 36 at its forward end. The bar is of such width as to slidably fit between the side walls 18 of the housing throughout the greater portion of its length. A central portion 37 is reduced in width and bent upwardly from the plane of the remainder thereof so as to provide a guiding surface engaging the lower surface of the lower crossbar 22 to retain the plunger in sliding contact with the bottom wall 17. The portion 37 is defined by a pair of edge notches 38 having a function to be described later. Immediately to the rear thereof a small tongue 39 is struck upwardly from the central portion of the plunger, the side edges thereof being provided with notches 40 in which to anchor the opposite end of the latch spring 32. Immediately to the rear thereof a pair of cam tongues 41 are struck upwardly from the side edge portions of the plunger for a purpose to be described. The plunger is of greater length than the housing and the extreme rear end thereof is bent upwardly to provide a terminal flange 42 which is provided with a central opening 43 (Fig. 10) in which one end of an auxiliary tension spring 44 is retained. The opposite end of spring 44 is hooked over the central portion of the upper crossbar 21. The spring 32 is initially tensioned and is placed under greater tension at various times during the operation of the device, as will appear, and the spring 44 is tensioned at least when the plunger is rearwardly within the housing.

The other part with which the latching unit cooperates to retain the door in closed position is a catch member which in the present illustration comprises a stem 50 having a head 51 provided with a rounded forward surface, the rear surface of the head providing an abutment to retain the hook 27 of the latch. The stem 50 may be attached to the door 11 in any suitable fashion as, for example, by threading the inner end thereof and screwing it into a nut 52 (Fig. 2) fastened to the inner surface of the inner panel of a hollow door.

It is to be appreciated that the present invention may assume other shapes and forms and may have various details thereof modified. For example, the catch member may comprise a screw or stud which may be screwed into or otherwise fastened to a solid door member. The angle at which the striker tongue 36 extends rearwardly and the extent to which it extends may be varied in accordance with changes in the shape of the head 51.

Operation of first modification

In Fig. 10 the operating parts of the latching device are shown at rest when the door is open. The latch is in cocked position, in which position the upper notch 28 of the latch is fully engaged with the upper pivot 21, this being assured by the cam tongues 41 cooperatively engaging beneath the cam edges 33 of the portions 26 to force the rear end of the latch upwardly. This action has been accomplished by the spring 44 contracting and sliding the plunger forward as far as it will go while the hook latch is held against longitudinal movement by the pivot 21 engaging the notches 28. The spring 32 now exerts a downward force on the forward end of the latch, holding the hook portion 27 against the tip of the striker tongue 36.

In Fig. 11 the door is being pushed closed with the result that the plunger 35 is being moved rearwardly by the catch head 51 pushing against the striker tongue 36, and the springs 32 and 44 are thus being increasingly tensioned. The head 51 has slightly raised the hook portion 27 against the increasing tension of the spring 32. The latch is floatingly mounted in the housing and the rear end thereof is no longer engaged by the tongues 41, but the force exerted by spring 32 keeps the rearwardly inclined notch 28 fully engaged with the upper pivot 21.

In Fig. 12 the door has reached the inner limit to which it may be pushed and all parts remain in the same positions except that the forward end of the latch is drawn downwardly by spring 32 to snap the hook portion 27 against the stem 50 behind the head 51 of the catch. The latch is now in catch engaging position and will remain in that position as long as inward pressure against the door is maintained. At this point, manual pressure against the door prevents any effect of spring 44 being brought to bear upon the operating parts, and the spring 32 is exerting a downward pull on the front end of the latch hook and a rearward pull on the latch as a whole sufficient to keep the notches 28 fully engaged with the upper pivot 21.

Upon the release of pressure from the outer surface of the door, the door moves outwardly to a slight extent as permitted by the pivots and notches on the latch, as seen in Fig. 13, this outward action being accomplished by spring 44 acting through the plunger pressing against the catch head 51. As soon as the abutment surface of the head 51 engages the hook 27 the force of spring 44 moves the latch slightly forwardly in unison with the plunger, thus transferring the fulcrum point from the upper pivot 21 to the stem 50 of the catch. Since this point is forwardly of and below the spring anchor 30, the rear end of the hook latch is forced downwardly by spring 32 until the notches 29 engage the lower pivot 22 to condition the latch for releasing movement. The door is now latched against further outward movement by the latch extending in latching position between the catch abutment and the lower pivot.

It will be apparent from the foregoing that the door, when latched, rests slightly outwardly from its innermost position as, for example, a sixteenth or a thirty-second of an inch. When the parts are at rest the rear lower edges of the portions 26 of the latch are projected downwardly through the slots 23 in the lower wall of the housing so that the rear edges of the notches 38 are adjacent the upper portions of the cam surfaces 33 (Fig. 15) in position to commence the

resetting action of the automatic latching device upon the initiation of outward movement of the door.

When it is desired to open the door, slight inward pressure on the door releases the hook portion 27 from the head 51 and permits the spring 32 to snap the front end of the latch hook upwardly and to complete the downward movement of its rear end in the event the lower pivot has not been fully seated prior thereto. Since the pivot point has been transferred from pivot 21 to pivot 22, which is below the spring 32, the hook portion snaps upwardly until the forward edges of the notches 28 engage the upper pivot 21 to bring the latch to rest in the releasing position shown in Fig. 14. During this movement the surfaces 33 of the latch strike the rear ends of notches 38 which unseats the lower pivot 22 from the bottoms of notches 29, but the fulcrum point of the latch still remains below spring 32 so that the movement of hook 27 is still upward. The latch will remain at its releasing position as long as inward pressure against the door is maintained. Upon release of inward pressure from the door the springs 32 and 44 both propel the door outwardly since both force the plunger forwardly. While the plunger moves forwardly the rear edges of the notches 38 engage the cam faces 33 and commence raising the rear end of the latch hook upwardly, as seen in Fig. 15. The forward surfaces of the notches 28 frictionally engage the lower or forward surface of the pivot 21 so that the front end of the latch is moved downwardly while the rear end thereof is being cammed upwardly. When the plunger has moved forwardly to the extent that the cooperating cam tongues 41 thereon engage the cam surfaces 33 on the latch, the rear end of the latch is snapped upwardly with the tongues 41 forcing the bottoms of the upper notches 28 against the pivot 21. Since the fulcrum of spring 32 has now been transferred back to the upper pivot 21, the vertical component of force of the spring 32 is exerted in a downward direction on the forward portion of the latch and the hook 27 is snapped into engagement with the sloping surfaces of the striker tongue 36 behind the receding catch head 51 (Fig. 15). As the plunger moves outwardly to its limit, the hook 27 is raised by the sloping surface of the tongue 36 until the parts come to rest in cocked position again, as seen in Fig. 10.

It is to be appreciated that the latch spring 32 is always under tension and is hooked to a forward part of the latch and extends rearwardly between the pivots 21 and 22. Since its primary function is to move the floating latch from position to position, its rear end could be anchored to a stationary part, but it is an advantage to hook its rear end to the plunger so as to accomplish a dual function by the one spring. The spring 44, in either event, is necessary in order that a force other than any force which could be exerted by spring 32 is provided to move the rear end of the latch downwardly to disengage pivot 21 from notches 28 when the fulcrum point of the latch is the upper surface of the stem 50 of the catch. If it were not for spring 44 or equivalent means exerting a forward force on the latch independently of the spring 32, the catch could be continuously reciprocated between the position illustrated in Fig. 12 and the position illustrated in Fig. 13 without the latching mechanism being released, since the force of spring 32 at this point is exerted to keep the upper pivot 21 in the upper notches. There-

fore, spring 44 provides an auxiliary force to move the latch and the plunger forwardly in unison to the extent required to withdraw the overhanging forward edge of notches 28 from engagement with the upper pivot 21 to condition the latch for subsequent resetting action.

Description of second modification

A number of refinements have been incorporated in the modification of the invention disclosed in Figs. 16 to 26 inclusive whereby the sizes of the various parts are reduced, various parts are made sturdier, the action of the latching device is made more positive, and other advantages achieved. In this modification a channel-shaped housing 60 is employed, the housing having a bottom wall 61, a pair of spaced side walls 62, and a rear wall 63. The forward edges of the side walls and of the bottom wall are provided with flanges 64 adapted to engage the edges of an opening in a surface portion 65 of a structure such as a sheet metal cabinet 66, behind which are provided stamped-out tongues 67 which snap behind the surface portion 65 to hold the housing in position as illustrated in Fig. 16. The side walls 62 are preferably provided with a pair of inwardly embossed, vertical ribs 68 located near the upper and lower pivots, 69 and 70 respectively, which span the interior of the housing, the upper pivot being located rearwardly of the lower pivot as in the previous modification.

A latch 71 is floatingly mounted in the housing, the latch comprising a sheet metal member including an elongated body portion 72 terminating at its front end in a rounded, inwardly extending latch hook 73. At its rear portion the latch is provided with a pair of side portions 74, each of which is provided with an upwardly facing notch 75 for engagement with the upper pivot 69 and a downwardly facing notch 76 for engagement with the lower pivot 70. The notches 75 have their forward edges terminating adjacent the rear edge 77 of the body portion 72. The forward edge of each of the notches 75 inclines rearwardly as indicated at 78, then forwardly to provide a pivot recess 79, the upper edge of the recess 79 and the sloping surface 78 defining a nose 80. The rear wall 81 of each notch 75 is substantially normal to the plane of the body 72. The front wall of each notch 76 is defined by a rounded lower corner 82 above which is a small, substantially vertical portion, and the rear wall 83 of the notch 76 is rearwardly inclined. From the rear limit of notches 76 the portions 74 are upwardly rounded to provide cam surfaces 84. A pin 85 is riveted to the body portion 72 and projects downwardly therefrom, being provided with a spring-retaining groove 86 which is substantially in line with the tip of the hook 73 and the bottoms of the recesses 75 and 76. The outer surfaces of the portions 74 are spaced so as to slidably engage the inner surfaces of the ridges 68, friction between the latch and the housing being thus reduced to a minimum.

A resetting plunger 90 is slidably mounted in the housing and rests upon the bottom wall 61. The plunger is of substantially the same width as the width of the interior of the housing and is provided with a raised portion 92 which bears against the lower pivot 70 to retain the plunger in sliding contact with the bottom wall. The forward end of the plunger is bent upward at right angles to provide a striker surface 93, and then bent rearwardly at right angles to provide

a striker tongue 94 which normally underlies the hook 73 as seen in Fig. 23. The rearward portion of the actuator plunger is bent upwardly to provide a pair of laterally spaced cam-engaging tongues 95 adapted to engage the cam surfaces 84 of the latch when the latch is cocked as seen in Fig. 23. A central spring anchor 96 is provided between the tongues 95, the same comprising a tab which is bent upwardly, then rearwardly. The portion 92 is defined by longitudinally extending edge notches 97 into which the lower portions of the cam surfaces 84 may project when the latch is in releasing position as seen in Fig. 26. In this modification the lower wall of the housing is not slotted and the portions 74 of the latch cannot project through the lower wall, thus permitting the mounting of the housing closely adjacent a portion of a cabinet or the like on the three sides defined by the side walls 62 and the bottom wall 61. The striker tongue 94 is centrally notched at 98 to provide an opening into which the tip of the pin 85 may project when the plunger is forced inwardly as seen in Figs. 24 and 25.

A latch spring 100 is tensioned between the tip of pin 85 on the forward end of the latch 71 and the anchor 96 on the rear end of the plunger 90, the spring being always under tension and extending rearwardly from a forward part of the latch between the pivots 69 and 70 to a rearward portion of the plunger. The rearward end of the spring 100 is tightly coiled about the spring anchor 96 for several turns and then continues to provide a conical auxiliary spring 101 projecting rearwardly from the rear end of the plunger, the spring normally projecting loosely into the clear space of the housing. The parts are so proportioned that when the plunger is forced rearwardly to the positions shown in Figs. 24 and 25 the spring 101 is compressed between the upright portion of the spring anchor 96 and the rear wall 63 of the housing. The auxiliary spring functions to provide a forward thrust against the plunger and latch to disengage the recesses 79 from the upper pivot in order to condition the latch for subsequent opening movement. The auxiliary spring in this modification exerts a forward force on the plunger only when the plunger is near the inner limit of its movement, thereby permitting the use of less sturdy cabinet and door parts since less force is required to cause the catch to force the plunger rearwardly during most of its travel.

The latch in housing 60 cooperates with a catch mounted upon the other of the two separable members in any convenient manner, the same being illustrated in Fig. 16 as comprising a mounting member 102 conveniently associated with the inner wall of a hollow door 103. The catch itself comprises a flat stem portion 104 having a notch 105 in its upper edge, the forward edge of the notch being normal to the direction of movement of the door to provide a hook-engaging abutment. The forward tip of the catch is rounded so that in the event the door should sag slightly the catch will lift the door upwardly as the lower edge thereof is cammed upwardly by the bottom wall 61, or so that it may raise the hook 73 if the parts are misaligned in the other direction. The height of the catch is substantially the same as that of the striker surface 93 so that as the plunger is moved inwardly the tip of hook 73 will rest upon the upper edge of the catch under the downward tension of spring 100.

A feature of minor importance is that the tip of the hook 73 is in longitudinal alignment with the groove 86 in the pin 85 and the tip of the nose 80 at the forward edge of the upper notch 75. It is in order to make certain that the spring anchoring groove 86 is held in this position of alignment that the separate pin 85 is utilized, since the distance between the shoulder of the pin and the groove 86 may be held within very close tolerances. It is by reason of this alignment that a function of the device occurs as will appear in the description of the operation.

Operation of second modification

In order to assemble the latching unit with a cabinet or the like having a rectangular opening adapted snugly to receive the housing, it is necessary to collapse the latch into the housing. Such may be accomplished by pushing the plunger rearwardly to the position illustrated in Fig. 25, whereupon the spring 100 pulls the hook portion of the latch downwardly to the extent illustrated in Fig. 25. The rear end of the latch may now be moved downwardly by the fingers and held in a position intermediate between the positions illustrated in Figs. 25 and 26 so that the housing may be slid longitudinally into an opening until the portions 87 snap into position, whereupon the latch may be released from manual confinement and the plunger permitted to slip forwardly under the tension of spring 100 until the parts come to rest with the latch being held in cocked position by the plunger, as illustrated in Fig. 23.

When the latching mechanism is cocked and at rest, as seen in Fig. 23, the tongues 95 and cam surfaces 84 are in firm engagement, forcing the rear end of the hook latch upwardly with the pivot 69 engaged in the bottoms of notches 75. The spring 100 forces the hook latch rearwardly with the pivot 69 engaged in the pivot recesses 79 beneath the noses 80.

When the door or other movable part has been pushed inwardly beyond a certain point near its limit of closing movement, the hook 73 is snapped downwardly into the notch 105 by spring 100 until it rests upon the stem 104 of the catch, the latch now being in catch engaging position as seen in Fig. 24. The spring 100 is further tensioned during this movement and toward the end of the movement the auxiliary spring 101 is compressed. It will be noted that the pin 85 projects into the notch 93 in the striker tongue 94, this construction enabling the housing to be slightly shorter than would otherwise be necessary.

When inward pressure is released the spring 101 forces the plunger and the catch outwardly. Since the hook 73 is engaged with the abutment face of the catch, the hook latch 71 is drawn forwardly to the slight extent required to withdraw the upper pivot from the pivot recesses 79 and condition the latch hook for pivoting about lower pivot 70. Due to the transfer of the fulcrum point of the hook latch to its forward end, the rear end of the hook latch is drawn slightly downwardly so that the noses 80 are opposite or slightly below the upper pivot 69, as seen in Fig. 25, and the rear vertical walls 81 of the upper notches are drawn against the upper pivot 69. The members are now held in latched position with the spring 101 preventing rattling of the door against the cabinet.

When it is desired to open the door it is pushed inwardly, thus releasing the hook from the catch

and permitting the spring 100 to pivot the forward end of the hook latch upwardly about the lower pivot 70 to its releasing position, as seen in Fig. 23. In so doing the noses 80 pass beneath the upper pivot 69 and the inclined surfaces 78 cam the rear end of the hook latch downwardly until the latch comes to rest, as seen in Fig. 26. The parts are so proportioned that the lower pivot 70 is now fully seated in the lower notches 76 and further upward movement of the front end of the latch is prevented by the upper pivot 69 engaging the rear end edge 77 of the body portion 72 of the latch, or by the cam surfaces 84 of the latch resting against the bottom wall 61 of the housing, or by both of such actions occurring, depending upon slight differences in manufacturing tolerances.

At this point the spring 100 is tensioned to the maximum and the spring 101 compressed to the maximum so that, upon release of inward pressure from the door, the door is propelled outwardly by the plunger forcing the catch outwardly under the force of both springs. After delivering its initial thrust the compression spring 101 is merely carried along with the plunger and all force is exerted by spring 100. As the plunger nears the end of its outward movement the rear edges of the notches 97 therein engage the cam surfaces 84 of the latch and begin to raise the rear end of the latch from the position illustrated in Fig. 26 to a point such that the tongues 95 may engage the cam surfaces 84 to continue camming the rear end of the latch upwardly, thus shifting the pivot point from the lower notches to the upper notches, as seen in Fig. 23. During this upward camming action the vertical component of force exerted by the spring 100 on the front end of the latch shifts from an upward direction to a downward direction so as to draw the hook 73 downwardly behind the receding catch and hold it against the striker tongues 94. The parts are now at rest in cocked position in readiness automatically to engage the catch upon the next inward movement of the door.

A complete cycle of operation of the latching device has been described, but in order to prevent accidental reopening of the door if it should be slammed shut it has been found that it is advisable to align the tip of the hook 73 with the groove 86 in the pin 85 and the noses 80 of the notches 75. It is by reason of this alignment that rebounding of the door when it is slammed shut does not result in the unlatching of the relatively movable parts since the noses 80 will slide back over the rear pivot 69 if the latch is rapidly retracted as would be the case with a door rebounding upon being slammed shut. The door will therefore remain closed regardless of the force and speed with which it is moved toward its closed position upon the first closing movement, but it will open after the second closing movement only if the closing pressure is gently applied. The spring 101 is of sufficient force to prevent the door from rattling open as a result of any vibrations such as created by nearby machinery, or from being moved by gusts of wind or the like. The latching device is therefore incapable of being released except by the application of an intentionally applied, gentle pressure.

Description of third modification

In Fig. 27 there is illustrated a portion of a cabinet having a modification of the present invention incorporated therein. In this modification

a cabinet including a flange 55 has a housing 60 associated therewith as illustrated in Fig. 16. A latch and plunger are mounted in the housing 60 and interconnected by a spring 100, all parts of the latching unit being identical with the parts illustrated in Fig. 16, with the exception that the spring 100 terminates at the end of the plunger 90 and there is no auxiliary spring in the housing 60. A cabinet door 103, as illustrated in Fig. 16, has a catch 104 associated therewith for cooperation with the latching device as previously described. The function of the auxiliary spring is performed by external means such as a spring-urged buffer 110 mounted in a barrel 111 adapted to be mounted upon the wall 112 of the cabinet on which the door is mounted as by means of hinges 113. When the door is in closed position a spring 114 mounted in the cylinder 111 between the rear wall of the cylinder and a flange 115 on the buffer 110 is compressed, the spring 114 thereby exerting an outward thrust tending to open the door. This thrust is transmitted through the abutment face 105 to the hook 73 to pull the floating latch forwardly and unseat the upper pivot 69 from the pivot recesses 79 in the upper notches when the door and cabinet are being held in latched position, as seen in Fig. 25. This action, as previously explained, conditions the latch so that the spring 100 may shift the pivot point of the latch hook from the upper to the lower pivot when the door is subsequently pressed inwardly, thereby permitting the latch hook to be swung upwardly by spring 100, as seen in Fig. 26.

Summary

In all three modifications there is provided a latching device for automatically latching and releasing two relatively movable members, each form comprising a latching unit adapted to be mounted upon one of the relatively movable members and a cooperating catch adapted to be mounted upon the other. The latching unit comprises a housing having an upper and a lower pivot therein and in which are mounted a floating latch and a reciprocating resetting plunger. The latch in all cases is restrained against substantial longitudinal movement by the upper and lower pivots engaging upper and lower notches respectively in the latch. First spring means are provided in the housing tending to force the latch rearwardly and the plunger forwardly. When the parts are at rest the upper pivot is seated in the upper notch and the first spring means exerts a downward pull on the forward end of the latch, causing it to rest against the forward end of the plunger in cocked position. The plunger is moved rearwardly by the catch when the movable members are brought together, and the first spring means thereupon snaps the hook end of the latch downwardly to engage the catch. Upon the first release of closing pressure against the relatively movable members, auxiliary spring means aids the first spring means in forcing the plunger forwardly and the auxiliary spring means at this instant is in effect to move the plunger and the latch forwardly in unison to a slight extent sufficient to release the upper notches from engagement with the upper pivot and condition the hook latch for opening movement. Upon subsequent closing pressure upon the relatively movable members, the first spring means snaps the hook latch to releasing position whereupon the first spring means, either with or without aid from

the auxiliary spring means, may return the plunger to its initial position, thereby propelling the catch from the housing and thus separating the relatively movable members. At the termination of the forward movement of the plunger, cooperating cam means on the plunger and the rear end of the latch shift the rear end of the latch from engagement with the lower pivot to engagement with the upper pivot, thereby causing the first spring means to return the latch to its cocked initial position. In each modification there is an auxiliary spring exerting outward force on the latch when the parts are latched together to shift the latch longitudinally forward to the slight amount permitted by the pivots and notches in order to condition the latch for opening movement upon subsequent closing of the relatively movable members. In the first case the auxiliary spring means comprises a tension spring connected between the plunger 33 and a relatively stationary part represented by the upper pivot 21. This arrangement causes the auxiliary spring means to forwardly shift the latch through the medium of the plunger 33 and the interengaged abutment face of the catch head 51 and the hook 27. In the second modification the auxiliary spring means comprises the compression spring 131 which is adapted to be compressed between the anchoring tongue 96 on the plunger 90 and the rear wall 63 of the housing. The longitudinal forward shifting of the latch is accomplished by this spring exerting forward pressure through the plunger 90 and the interengaged abutment face of the catch and of the cooperating hook 73. In the third modification the auxiliary spring means comprises the spring-urged buffer 110 which exerts an outward pull on the latch 71 through the intervening door 103 and the engaged catch. In this third modification the auxiliary spring means does not pull or push the plunger forwardly, but the plunger and the latch move forwardly as a unit due to the tension of spring 100 holding the two parts together just as in the previous modifications. In the first two modifications the plunger is acted on by the auxiliary spring to cause the latch to move forwardly, and in the third modification the latch is acted upon by the auxiliary spring and the plunger moves forwardly therewith. In all three modifications movement of the plunger and latch forwardly as a unit is accomplished since the first spring means holds the tip of the catch against the striker face of the plunger and the tip of the hook against the abutment face of the catch, the entire longitudinal force of the first spring means being so exerted in holding the three members firmly together and the force of the auxiliary spring being brought into play to shift the three interlocked members forwardly to condition the latch for subsequent opening movement.

In all three modifications the relatively movable members are capable of movement toward each other to a limit relationship and are held slightly apart by the auxiliary spring when in latched relationship. The latch moves from its normal cocked position to a catch engaging position upon first closing movement of said members to a relationship between said limit relationship and said latched relationship whereupon the auxiliary spring forces the latch to its latching position. The latch moves to releasing position upon subsequent movement of said members toward said limit relationship, and is reset upon separation of the members.

While I have herein illustrated the invention as applied to a cabinet and its door, it is to be appreciated that the present invention may be utilized in any construction wherein two relatively movable parts are desired to be held together or released from engagement. For example, the invention may be applied to a drawer in a cabinet, and the auxiliary spring may be so proportioned as to eject the drawer to any desired extent after it has been pushed slightly inward and released.

Having illustrated and described preferred embodiments of the invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the appended claims.

I claim:

1. In a latching device for two members relatively movable toward each other to a limit relationship, a catch element adapted to be carried by one of said members, a latching unit adapted to be carried by the other of said members, said latching unit including an elongated housing having opposed side walls, an elongated latch element in said housing, said latch element being slidably guided between said opposed side walls, said latch element comprising means defining a shoulder adapted to engage said catch element to retain said members in latched relationship spaced slightly apart from said limit relationship upon a first movement of said members relatively together toward said limit relationship beyond said latched relationship, a plunger slidably mounted in said housing in position to be moved rearwardly therein by said catch element upon movement of said members to said limit relationship, first pivot means on said housing, second pivot means on said housing, cooperative means on said plunger and said latch element normally holding said latch element in a cocked position, first spring means operatively engaged with said latch element and said plunger normally to hold said latch element in pivotal engagement with said first pivot means and said plunger in a normal position forwardly in said housing, said first spring means being biased when said latch element is so engaged with said first pivot means to urge said shoulder toward said plunger whereby said latch element pivots about said first pivot means to a catch engaging position upon a first relative movement of said members to said limit relationship, other spring means operatively associated with said members to urge said members apart to said latched relationship, cooperative means on said catch element and said latch element to shift said latch element from pivotal engagement with said first pivot means into pivotal engagement with said second pivot means and thus assume a latching position upon such movement of the members to said latched relationship, said first spring means being thereby relatively shifted to a position in which it biases said shoulder away from said plunger whereby upon a second relative movement of said members to said limit relationship said latch element pivots about said second pivot means to a releasing position, and cooperative means on said latch element and said plunger effective upon return of said plunger to its normal position by said first spring means to shift said latch element back into pivotal engagement with said first pivot means whereupon said first spring means may return said latch element to its cocked position.

2. In a latching device for a pair of relatively movable members, which device is of the type wherein the latched members are held in a slightly spaced apart condition and unlatching is effected by a slight further movement of said members together beyond the latched position, said device including a catch element adapted to be mounted on one of said members and having a forwardly extending head and a rearwardly facing abutment, a latching unit including an elongated housing, said latching unit adapted to be mounted on the other of said members for cooperative engagement by said catch element and mounted in longitudinal alignment with the path of travel thereof, said latching unit including an elongated latch means having a hook end portion adjacent the forward end of said housing adapted for cooperatively engaging said catch abutment, means pivotally mounting said latch means in said housing for movement of the hook end portion toward and away from said path of travel, an elongated control plunger for controlling said latch means mounted for slidable movement longitudinally in said housing and having a forward end portion normally extending adjacent the forward end of said housing for engagement by the head of said catch element, and means including a spring operatively interconnecting said plunger and said latch means whereby longitudinal sliding movements of said plunger by said catch element control latching and unlatching movements of said latch means.

3. A latching device for a pair of relatively movable members, said device being of the type wherein the members are latched in a slightly spaced apart condition upon closure of said members and unlatched upon a slight further movement of said members together beyond the latched position, said device including a catch element adapted to be mounted on one of said members and having a forwardly extending head and a rearwardly facing abutment, a latching unit including an elongated housing, said latching unit adapted to be mounted on the other of said members, said latching unit including an elongated latch element having a hook end portion adjacent the forward end of said housing adapted for cooperatively engaging said catch abutment, an elongated control plunger for controlling said latch element mounted for slidable movement longitudinally in said housing, the forward end of said plunger normally extending adjacent the forward end of said housing for engagement by the head of said catch element to effect longitudinal sliding movement of said plunger, means pivotally mounting said latch element in said housing for movement of said hook end portion thereof toward and away from a catch abutment engaging position in front of the forward end portion of said plunger, and means including a spring operatively interconnecting said plunger and said latch element whereby longitudinal sliding movements of said plunger by said catch element control latching and unlatching movements of said latch element.

4. In a latching device for a pair of relatively movable members, which device is of the type wherein the latched members are held in a slightly spaced apart condition and unlatching is effected by a slight further movement of said members together beyond the latched position, said device including an elongated catch element adapted to be mounted on one of said members and having a forwardly extending head and a rearwardly facing abutment behind said head, a

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latching unit including an elongated housing, said latching unit adapted to be mounted on the other of said members for cooperative engagement by said catch element, said latching unit including an elongated latch means pivotally mounted in said housing and having a hook end portion adjacent the forward end of said housing for cooperatively engaging said catch abutment, an elongated plunger means for controlling said latch means slidably mounted within said housing, means interconnecting said plunger and said latch means whereby latching and unlatching movements of said latch means are effected in response to corresponding movements of said plunger means, the forward end of said plunger means extending adjacent the forward end of said housing for engagement and actuation by the head of said catch element.

5. In a latching device for a pair of relatively movable members, said device including a catch element adapted to be mounted on one of said members and having a forwardly extending head and a rearwardly facing abutment behind said head, a latching unit including an elongated housing, said latching unit adapted to be mounted on the other of said members for cooperative engagement by said catch element, said latching unit including an elongated latch means pivotally

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mounted in said housing and having a hook end portion adjacent the forward end of said housing for cooperatively engaging said catch element abutment, an elongated plunger means slidably mounted within said housing immediately adjacent said latch means, means including a spring interconnecting said plunger means and said latch means for controlling latching and unlatching movements of said latch means in response to movements of said plunger means, said hook end portion normally engaging and supported by the forward end portion of said plunger means out of the path of travel of said catch element, said hook end portion engaging said catch element abutment upon depression of said plunger means within said housing a predetermined distance by engagement of the forward end thereof by the head of said catch element.

RALPH K. NOTTINGHAM.

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