

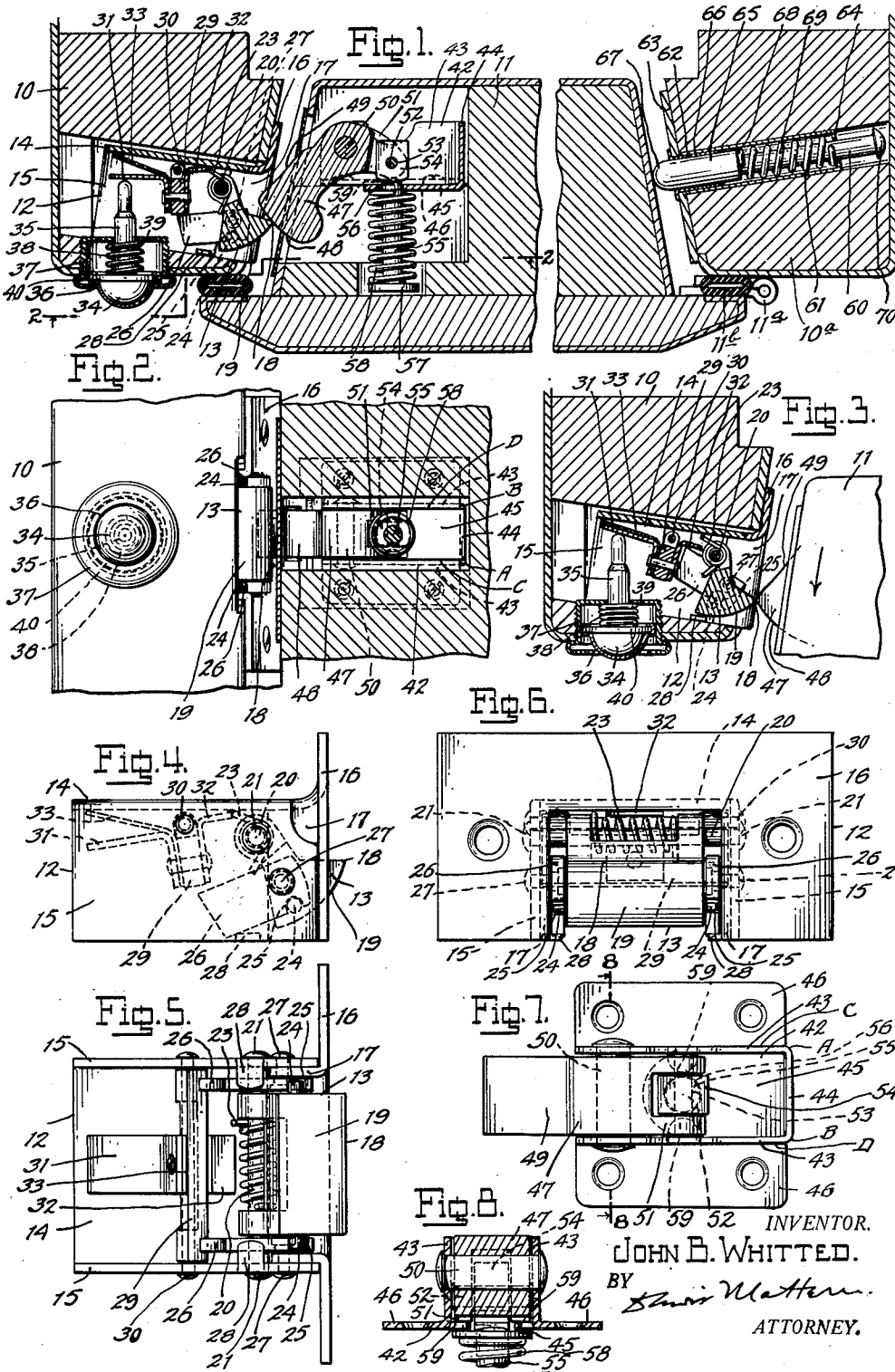
July 14, 1936.

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2,047,401

DOOR LATCH AND OPENING MECHANISM

Filed Oct. 31, 1933



UNITED STATES PATENT OFFICE

2,047,401

DOOR LATCH AND OPENING MECHANISM

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Application October 31, 1933, Serial No. 696,009

9 Claims. (Cl. 292—220)

My invention relates to a door latch and opening mechanism and particularly to a door opening mechanism for refrigerators. It is designed to provide a means whereby a door may be held tightly closed but will nevertheless be released by a very slight pressure on the releasing mechanism.

In the past, latches have been provided for refrigerator doors which have been capable of holding the door tightly shut against its gasket so that there will be very little escape of cold or warm air past the door, as is desirable, but these latches have been cumbersome to operate, demanding considerable effort and movement to release them and open the doors. This is undesirable because both hands are often needed to hold food and the like which is to be placed in the refrigerator, and the manipulation of a cumbersome latch necessitates an inconvenient setting aside of the food or whatever to avoid the danger of spilling.

If a door opener is made which operates with a sufficiently light touch this difficulty can be overcome because the user will be enabled to cause the refrigerator door to open by touching the opening button with an elbow or a protruding finger or knuckle.

It is an object of my invention to make such a latch and opener which, while firm and strong, may yet be released by a very slight touch of the user.

Another object of my invention is to make a door latch and opening mechanism which will release the door and cause it to swing into an open position when the operating button is depressed.

A further object of my invention is to provide a door latch and opening mechanism which when the door is shut will tend to draw the door into a more tightly shut position.

Still another object of my invention is to provide a door latch and opening mechanism which will have no handles, hooks, or catches protruding from the front of the cabinet on which it is used, thus avoiding the danger of painful bumps and of torn or caught clothing.

Moreover it is a purpose of my invention to provide a door latch and opener which will have no sharp latches, bolts, etc. protruding from the door throat or the door when the door is in open position, again effecting a device of this kind which is safer and more convenient.

It is an object to provide a device of this kind which, when applied to a cabinet, is decorative rather than unsightly.

And it is my purpose to accomplish these above mentioned objects by a device which is neat, simple and inexpensive to manufacture.

Other objects of my invention will appear from the description which follows:

In general my door latch and opener comprises three main elements, a pivoted spring-held combined strike and keeper member in a fixed door post, a movable latch in the door co-operating with the strike in the door post, and a spring plunger at the opposite or hinged edge of the door tending to urge the door into an open position. Normally the strike and keeper member is held by its spring in such a position that the latch on the door will be engaged and the door held closed. A trigger mechanism is provided which secures the strike and keeper in the latch-engaging position and prevents it from turning against its spring to a position where it would disengage the latch and allow the door to open. To operate this trigger mechanism a button is provided on the front of the door post. Pushing this button releases the trigger mechanism and the strike and keeper will be forced by the door-opening spring on the opposite side or hinged edge of the door to turn on its pivot against its spring. This turning of the strike releases the latch and the door will open.

For a more detailed disclosure and description of a preferred embodiment of my invention reference will be had to the drawing made a part of this application, and in which:—

Fig. 1 is a horizontal section of a refrigerator door, and adjacent portions of the casing, the intermediate portion of the door being broken away, and showing the latch parts in their operative position when the door is closed.

Fig. 2 is a view, partially in elevation, and showing the door post, and partially in section, taken along the line 2—2 of Fig. 1, and showing the adjacent portion of the door.

Fig. 3 is a horizontal section of the door post, and an adjacent portion of the door, and showing the latch parts in the post in their position to release the door, the latter being shown partially open.

Fig. 4 is a side elevation, enlarged, of the latch member carried by the door post.

Fig. 5 is a plan view thereof.

Fig. 6 is a front elevation.

Fig. 7 is a plan view, enlarged, of the latch member carried by the door.

Fig. 8 is a sectional view, taken along the line 8—8 of Fig. 7.

Similar reference characters indicate corre-

sponding parts throughout the several figures of the drawing.

Strike and keeper mechanism

Referring to Figure 1, strike casing 12 is fitted and fastened into a suitable recess in the door post 10 so that the strike and keeper member 13 is toward the vertical swinging edge of the door 11, the other vertical edge being hinged, as at 11^a, to the opposite door post 10^a. The strike casing 12 is formed of one piece of metal stamped or formed to include a back plate 14 and side plates 15. A face plate 16 is mounted on the door post leaving an opening for strike and keeper member 13 and with depressed portions 17 entering the recesses and riveted to the side plates 13.

Within the casing, a combined strike and keeper member 13 of metal having a latch engaging edge 18 and a substantially cylindrical striking surface 19 is pivoted on pivot pin 20 which passes through the casing side plates 15 and is riveted over at its ends 21. A spiral spring 23 is provided around the pin 20 which presses against the strike and keeper member 13 and the back plate 14 urging the strike and keeper member toward the positions shown in Figures 1 and 4.

The strike and keeper member 13 is provided with lugs 24 extending from its ends which engage notches 25 in locking levers 26 which are pivoted on pivot pins 27 fastened to the strike casing 12.

A trigger mechanism engages the lower edges of the free ends of the locking levers 26. The locking levers 26 are stopped from excessive upward movement by lugs 28 struck in from side plates 15. A rocker detent member 29 to engage the free ends of locking levers 26 is pivoted on pin 30 which extends through the strike casing 12 and is fastened to the side plates 15. Riveted to the rocker detent member 29 are angle plates 31 and 32 and a flat spring 33 which spring seats against the back plate 14 of the strike casing 12 and urges the rocker member into engaging position with the locking levers 26 (shown in Figure 1) where it is stopped by the abutment of angle plate 32 against the back plate 14 of the strike casing 12.

An operating button 34 connected with a plunger 35 projects through an opening 36 in the outer end of a metal housing 37. The housing 37 is fixed to the door post by screw threads or the like, or may be imbedded in the door post, and surrounds a spring 38 coiled around the plunger 35 which spring is seated against a flange 39 spun inwardly from housing 36 and thrusts against a collar 40 fixed to the plunger 35. This collar 40, being larger than the opening 36, also serves as a stop against outward movement for the plunger.

The inner end of the plunger 35, when operated, pushes against the angle plate 31 to move the rocker detent member 29 into releasing position, as shown in Fig. 3.

Movable latch mechanism

Within the door 11 a movable latch of a usual form is provided. The latch casing 42 is fitted and fastened into a suitable recess in the door. The latch casing 42 may be stamped from one piece of metal as shown in Figures 1, 7 and 8. Side plates 43 are bent up through angles of 90 degrees along the lines A, B forming with back plate 44 a U-shaped enclosure. Tongue 45 is bent up through an angle of 90 degrees over the U-shaped enclosure along the base line of the

back plate 44, and flange plates 46 are bent upwardly to angle of 90 degrees along the lines C, D. Flange plates 46 are provided with screw holes through which screws may be passed to a portion of the inner door structure affixing the flange plates to the door in a plane parallel to the front surface of the door.

The latch member 47, having a slightly convex latching face 48 inclined with respect to the plane of the door member and a slightly concave striking face 49 also inclined with respect to the plane of the door member, is pivoted on pintle 50 which passes through the side plates 43 and is riveted over at its ends. The latching face 48 is slightly eccentric with respect to the pivotal axis being of increasing radius toward its inner end or heel, so that it wedges more tightly against the edge 18 of the keeper as its projection increases. Inwardly toward the casing a yoke 51, formed integrally with the latch member 47, holds a pin 52 20 which passes through the yoke and is riveted over at its ends. Intermediate its ends pin 52 passes through a hole 53 in a flattened portion 54 of a plunger 55. This plunger passes loosely through a hole 56 in tongue 45 and carries near its outer 25 extremity a collar 57. Between the tongue 45 and the collar 57 of the plunger 54 a coil spring 58 is located around plunger 54 pressing against tongue 45 and collar 57 and urging the plunger outwardly from the casing. Lugs 59 struck in 30 from the upper edges of the side plates 43 near the flange plates 46 provide stops against which the arms of yoke 51 will normally be pressed by the action of spring 58. These lugs serve also to support the tongue 45 against downward pres- 35 sure of spring 58.

Opening plunger mechanism

In a recess in the door post of the hinged edge of the door and rearwardly from the hinge pivot center a plunger 60 in a cylindrical guide 61 presses outwardly against the frame of the door 11. This guide is held in position by a tight fitting flanged bushing 62 which is driven into the guide and clamps the breaker strip 63 against the edge of the guide. At its inner end the guide 61 has an opening 64 through which the plunger 60 may slide. The plunger carries an enlarged portion 65 which extends through opening 66 in the guide and terminates in a rounded portion 67 which presses against the frame of the door 11.

The enlarged portion 65 forms a shoulder 68 against which a spring 69 coiled around the plunger presses. The other end of the spring presses against the inwardly turned end of the guide 61. A stop is provided against excessive outward movement of the plunger 60 by the head 70 on the end of the plunger 60. The spring 69 is of sufficient dimensions that it exerts a pressure on the plunger capable of forcing the door to open against the spring-held strike and keeper member 13 when the trigger locking mechanism is released by pressure on the button 34.

Operation

When the door is in closed position the spring 69 is compressed and is tending to force the plunger 60 outwardly and to cause the door to open. This pressure is transmitted through the door 11 and latch 47 to the strike member 13 which is urged by this pressure toward the position shown in Fig. 3 where it would release the door. Against this movement the strike member 13 is held by its lugs 24 pressing against the

locking levers 26 which in turn are held in position by the rocker detent member 29.

But when the button 34 is pressed the rocker detent member 29 disengages the locking levers 26 and the strike and keeper member 13 is rotated on its pivot pin 20 back into its casing 12 and the door opens as shown in Fig. 3. Because of the effective linkage provided, the pressure of the lever ends 26 against the detent member 29 will be comparatively small and only a slight pressure on the button 34 will be needed to release the strike and keeper member.

As the door frame passes beyond the strike and keeper member 13 the spring 23 again forces the strike and keeper member 13 outwardly into locking position and levers 26 are moved by lugs 24 into their locking position in relation to the rocker detent member 29 which is forced into engaging position by its spring 33.

When the door is being closed, the latch member 47 recedes against its spring 58, being pressed inwardly by its camming action against the striking face 19 of the strike and keeper member 13. As the latch member 47 passes beyond the strike and keeper member it is again forced outwardly by the pressure of its spring 58 and it assumes a latching position and at the same time exerts a camming action against the latch engaging edge 18 of the strike and keeper member 13 tending to force the door more tightly shut.

This camming action is considerably aided by the fact that the strike and keeper member 13 turns slightly as the latch member 47 passes the latch engaging edge 18. Normally the spring 23 holds the strike and keeper member outwardly so that the locking levers are held against the fixed lugs 28, as shown in Fig. 4, but under the pressure of the latch member 47 when it cams against the latch engaging edge 18, the latch strike and keeper member 13 is snapped inwardly slightly as the locking levers 26 move to rest against the rocker detent member 29. This snapping action allows the latch member 47 to move outwardly so suddenly and rapidly that when the strike and keeper latching member 13 reaches locking position the latch 47 drives on by its momentum to force the door more tightly shut. It has been found that this results in a much more tightly shut door than is the case where the camming action of the latch is not aided by the momentum effect caused by the snap action in the lost motion of the strike and keeper member 13.

While the door is being closed the opening plunger 60 is being forced inwardly, compressing its spring 69 and making the door ready to open when the button 34 is again depressed.

The tubular rubber gasket 11^b usually provided between the door and frame for sealing purposes, is compressed in the closed position of the door and its tendency to force the door upon release will assist the spring plunger 60 in the initial opening of the door.

From this disclosure it will be seen that I have provided a latch which is positive, firm and strong in latching position, but which because of the trigger release mechanism may be unlatched by a very slight pressure. I have provided at the same time an inexpensive, compact and attractive means for carrying my invention into effect.

I do not, of course, limit myself to the particular structure disclosed in the specification.

I claim:

1. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching

means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having a camming surface inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released through retraction of said strike and keeper element.

2. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having a convex camming surface inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released through retraction of said strike and keeper element.

3. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having an inclined camming surface adapted during closing of the door to engage said strike and keeper element to retract said latching member and a camming surface inclined with respect to the path of movement of said latching means, said in-

clined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released through retraction of said strike and keeper element.

4. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having an inclined concave camming surface adapted during closing of the door to engage said strike and keeper element to retract said latching member and a camming surface inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released through retraction of said strike and keeper element.

5. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, a spring pressed releasable strike and keeper element carried by the other of said members normally projected under spring pressure and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, detent means arranged to obstruct the full retraction of said strike and keeper element while permitting limited retraction movement, manually operable means for moving said detent means to non-obstructing position to permit the full retraction of said strike and keeper element, said latching means comprising a spring pressed latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having an inclined camming surface adapted during closing of the door to engage said strike and keeper element to retract said latching member and a second camming surface inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said

strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said limited retraction movement of said strike and keeper element causing said strike and keeper element to engage said second camming surface with a snap action as it leaves said first camming surface in the closing movement of the door, said door being released through retraction of said strike and keeper element.

6. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed pivotally mounted latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having a camming surface adapted during closing of the door to engage said strike and keeper element to retract said latching member and a camming surface inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released through retraction of said strike and keeper element.

7. In a latching and releasing mechanism for tightly retaining and for releasing a door member in relation to its frame member, latching means carried by one of said members, and a manually releasable strike and keeper element carried by the other of said members normally projected and movable from projected to retracted position upon release, manually releasable means cooperating with said strike and keeper element to obstruct retraction of said strike and keeper element until release, said latching means comprising a spring pressed pivotally mounted latch member movable between projected and retracted positions adapted to cooperate with said strike and keeper element to retain the door closed and having a camming surface adapted during closing of the door to engage said strike and keeper element to retract said latching member and a camming surface eccentric to the pivotal axis inclined with respect to the path of movement of said latching means, said inclined camming surface adapted to engage said strike and keeper element in the closed position of the door to retain it, projecting movement of said latching means exerting a pressure in retracting direction on said strike and keeper element, said camming surface adapted through projecting movement of said latching means to engage the projected strike and keeper element with gradually increasing tightening effect as said latching means is projected, said door being released

through retraction of said strike and keeper element.

8. In a latching and releasing mechanism for
5 in relation to its frame member, latching means
carried by one of said members, a spring pressed
releasable strike and keeper element carried by
the other of said members normally projected
10 under spring pressure and movable from pro-
jected to retracted position upon release, detent
means arranged to obstruct the full retraction of
said strike and keeper element while permitting
limited retraction movement, and manually op-
15 erable means for moving said detent means to
non-obstructing position to permit the full re-
traction of said strike and keeper element, said
latching means comprising a spring pressed piv-
otally mounted latch member movable between
20 projected and retracted positions adapted to co-
operate with said strike and keeper element to
retain the door closed and having a camming
surface adapted during closing of the door to
engage said strike and keeper element to retract
25 said latching member and an inclined convex
camming surface eccentric to the pivotal axis
adapted to engage said strike and keeper element
in the closed position of the door to retain it,
said limited retraction movement of said strike
30 and keeper element causing said strike and keeper
element to engage said second camming surface
with a snap action as it leaves said first camming
surface in the closing movement of the door, said
door being released through retraction of said
35 strike and keeper element.

9. In a latching and releasing mechanism for

tightly retaining and for releasing a door mem-
ber in relation to its frame member, latching
means carried by one of said members, a spring
pressed releasable strike and keeper element car-
5 ried by the other of said members normally pro-
jected under spring pressure and movable from
projected to retracted position upon release, de-
tent means arranged to obstruct the retraction
movement of said strike and keeper element,
10 manually operable means for moving said detent
means to non-obstructing position to permit the
retraction of said strike and keeper element, said
latching means comprising a spring pressed latch
member movable between projected and retract-
15 ed positions adapted to cooperate with said strike
and keeper element to retain the door closed and
having a camming surface adapted during closing
of the door to engage said strike and keeper ele-
ment to retract said latching means, and a cam-
20 ming surface inclined to the path of movement
of said latching means, said second mentioned
camming surface adapted to engage said strike
and keeper element in the closed position of the
door to retain it, projecting movement of said
25 latching means exerting a pressure in retracting
direction on said strike and keeper element, said
camming surface adapted through projecting
movement of said latching means to engage the
projected strike and keeper element with grad-
30 ually increasing tightening effect as said latching
means is projected, said door being released
through retraction of said strike and keeper ele-
ment.

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