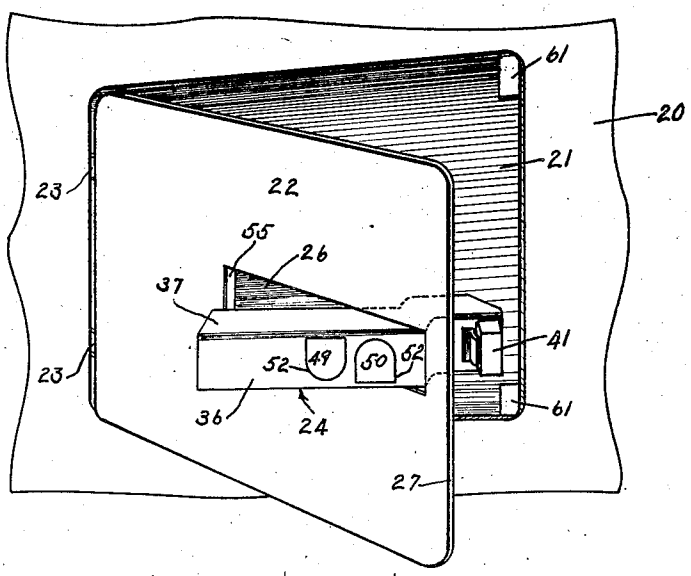
Aug. 5, 1947. F. A. BEST 2,424,962

LATCH MECHANISM

Filed April 25, 1945

FIG. 1.



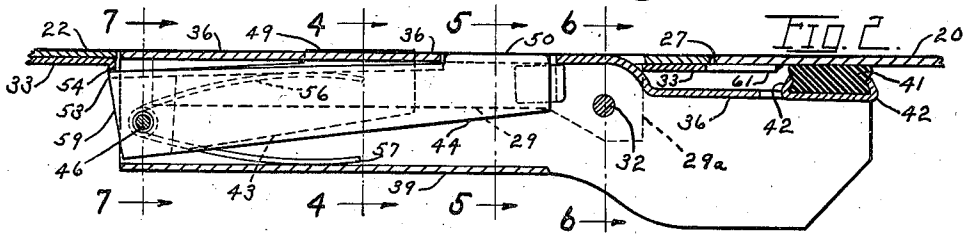


FIG. 3.

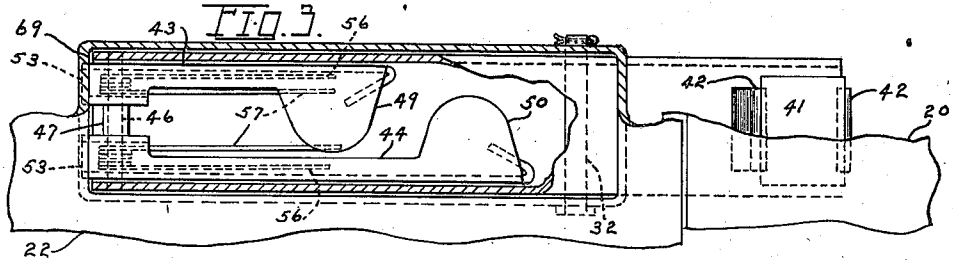


FIG. 4.

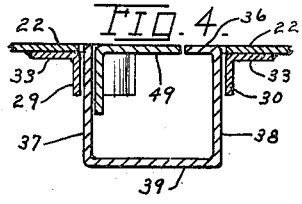


FIG. 5.

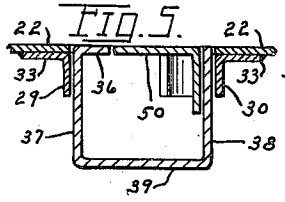
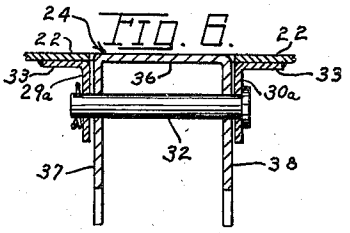


FIG. 6.



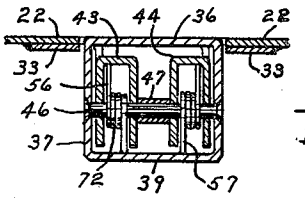


FIG. 7.

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LATCH MECHANISM

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18 Claims. (Cl. 292—229)

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This invention relates to improvements in latch mechanisms for closures such as doors and the like. More particularly, the invention relates to a latch mechanism requiring for its release the operation of two spaced parts, the closure with which such latch mechanism is used remaining closed and latched if but one of said parts is operated.

The present invention has for its primary object the provision of a latch mechanism of the foregoing nature which is characterized by its structural simplicity, its economy of manufacture and its operating performance.

A more specific object of the present invention is the provision of a latch member having a plurality of spaced push buttons or equivalent parts which must be depressed or equivalently operated to effect the release of the latch mechanism and the consequent opening of the closure with which such mechanism is used, the push buttons or equivalent parts being operable either simultaneously or in sequence for latch release purposes.

A further object of the present invention is the provision of a latch mechanism which includes a pivoted latching lever which serves, upon the release of the latch mechanism, as a convenient pull member for opening the closure with which the latch mechanism is used. As a result, it is unnecessary to provide such closure with a separate handle or the like for door-opening purposes.

A further object of the present invention is the provision of a latch mechanism which requires, for the swinging movement of its pivoted latching lever, an opening or cavity in the closure with which the mechanism is used, but which opening or cavity is closed by said lever, with the closure having a substantially smooth external surface, when the latching lever is in latching position.

A further object of the present invention is the provision of a latch mechanism in which the spaced release buttons are carried by one end portion of the pivoted latching lever of such mechanism, the said push buttons and said lever end portion being substantially flush with the outer surface of the closure with which the mechanism is used when said latching lever is in latching position.

A further object of the present invention is the provision of a latch mechanism which inciudes a latching lever pivotally mounted on the closure with which the mechanism is used, said lever when in latching position having one end portion thereof projecting beyond the closure for

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closure-latching purposes, the other end portion of said lever carrying detent means for releasable detention by said closure to thereby releasably retain the lever in latching position, and which mechanism includes means operable to release the detent means from such detention to thereby permit the latching lever to be swung out of latching position and the closure thereby opened.

Further objects of the present invention and many of its practical advantages will be referred to in or will be evident from the following description of one embodiment of the invention, as illustrated in the accompanying drawings, in which

Fig. 1 is a perspective view of a fragmentary portion of a wall structure having an opening normally closed by a hinged door, the door being provided with a latch mechanism embodying the present invention and being shown in unlatched and partly open position;

Fig. 2 is a longitudinal sectional view of the parts of Fig. 1, the door being latched in closed position by the present latch mechanism;

Fig. 3 is a side elevational view, with portions broken away and in section, and with the door closed and latched; and

Figs. 4 to 7 inclusive are detail vertical sectional views, on the lines 4—4, 5—5, 6—6 and 7—7, respectively, of Fig. 2.

Before the latch mechanism here illustrated is specifically described, it is to be understood that the invention here involved is not limited to the structural details or arrangement of parts here shown, as latch mechanisms embodying the present invention may take various forms. It also is to be understood that the phraseology or terminology herein employed is for purposes of description and not of limitation, the scope of the present invention being denoted by the subjoined claims.

Although latch mechanisms embodying the present invention may be used with various doors or other closures, such mechanisms are particularly useful with doors which must or should not have, when closed, any protruding parts, and where it is necessary or desirable to prevent opening of the door by the actuation of a single release part. One example of such a door is the inspection door in the wing or in the fuselage of an aeroplane or the like, it there being necessary or desirable to avoid any protruding door parts and to have for the release of such door two spaced parts requiring simultaneous or sequence depression. Thus, should a projectile or the like strike and depress one of the release parts, the

door would remain closed and latched. For purposes of illustration, therefore, the latch mechanism here shown is applied to such an inspection door.

In the accompanying drawings, 20 designates a wall structure having an opening 21 normally closed by an inspection door 22, the door being hinged at 23 for forward (outward) swinging movement. To normally maintain the door in closed and latched position, the door has associated therewith a latching lever 24 which is pivotally mounted, intermediate its ends, on the door for swinging movement through an elongated opening or slot 26 with which the door is provided. As here shown (see Fig. 1), the outer end of the door slot 26 is adjacent the free swinging edge 27 of the door, the longitudinal axis of the slot preferably and here being substantially normal to such edge. In the present embodiment of the invention, the latching lever 24 is pivotally mounted on the door 22 at the outer end of the door slot 26. For such mounting, the door is provided at the top and bottom of the outer end of its slot 26 with rearwardly projecting ears 29*a* and 30*a* (see Fig. 6) which are suitably apertured to receive and retain the end portions of a pivot pin 32 for the latching lever 24. As here shown, the ears 29*a* and 30*a* are the enlarged outer end portions of rearwardly extending flanges 29 and 30 of a separate metal plate 33, which is welded or otherwise rigidly secured to the rear surface of the door 22 and which is provided with a slot corresponding to and in registry with the door slot 26.

As here shown, the latching lever 24 is a simple sheet metal member, with a front wall 36 and top and bottom walls 37 and 38, the latter two walls being suitably apertured (Fig. 6) for the extension therethrough of the pivot pin 32. For increased strength and rigidity and to provide abutments for springs hereinafter described, the inner end portion of the latching lever, namely, that portion thereof which lies to the left of the pivot pin 32 in Figs. 1 to 3 inclusive, is here provided with a rear wall 39, thereby giving such portion a sturdy box-like form in cross-section, as best shown in Figs. 4, 5 and 7. If desired, of course, the outer end portion of the latching lever, namely, that portion thereof lying to the right of the pivot pin 32 in Figs. 1 to 3 inclusive, also may have a rear wall to give it a box-like form in cross section, although such portion is here shown as of channel form.

The outer or right end portion of the latching lever 24 is of such length as to extend behind, when the lever is in latching position, that portion of the wall structure 20 which is adjacent the free edge 27 of the door 22. This outer end portion of the lever constitutes, therefore, its latching head, inasmuch as it cooperates with the wall structure 20 in the latching of the door, as will hereinafter more fully appear. To enable the front wall 36 of the lever's inner or left end portion to be substantially flush with the door's outer surface, when the lever is in latching position, the latching head of the lever is rearwardly offset, as best shown in Figs. 1 and 2, and to enable such latching head to resiliently engage the rear surface of the wall structure 20, said head is provided with a resilient compressible bumper 41. For the retention of said bumper, the front wall 36 of the lever's latching head is here provided with a pair of opposed tongues or flanges 42, between which the bumper is confined, the tongues or flanges being convergently disposed, if desired and as here shown.

When the door 22 is in closed and latched position, as in all views except Fig. 1, the rearwardly offset latching head of the lever 24 lies behind the wall structure 20 and the front wall 36 of the lever's inner end portion substantially fills the door slot 26, the length and the width of the front wall 36 of the lever's inner end portion being substantially the same as those of said slot.

To releasably retain the latching lever 24 in such latching position, the lever is provided with suitable detent means for releasable detention by the door 22 adjacent the inner end of its slot 26. In order that said detent means will require for the release thereof the operation of two spaced push buttons or equivalent parts, the detent means of the present latch mechanism comprises two separate and independently mounted levers 43 and 44, each of channel-shaped cross section and longitudinally disposed within the box-like inner end portion of the latching lever 24, as best shown in Figs. 3 and 7. As will be evident from those views, the two detent levers 43 and 44 are pivotally mounted at their inner ends on the inner end of the inner end portion of the latching lever 24, the pivotal mounting of said detent levers being here effected by the use of a pin 46 (Figs. 3 and 7) extending through suitable apertures in the side walls of the detent levers and into or through suitable apertures in the top and bottom walls 37 and 38 of the latching lever 24. To maintain the detent levers in slightly spaced relationship, the pivot ends of the detent levers are separated by a sleeve 47 upon the pivot pin 46, as best shown in Fig. 7.

At their free or outer ends, the detent levers 43 and 44 are integrally or otherwise suitably provided with tabs which constitute push buttons for effecting release movement thereof, the push button 49 of the upper detent lever 43 extending downwardly, as in Figs. 1 and 3, and the push button 50 of the lower detent lever 44 extending upwardly. To conveniently effect the desired spacing of said push buttons, the two detent levers are here shown as of different lengths, the upper lever 43 being somewhat shorter than the lower lever 44. To afford access to said push buttons, the front wall 36 of the inner end portion of the latching lever 24 is provided with two apertures 52, one for the push button 49 of the detent lever 43, and the other for the push button 50 of the detent lever 44.

By the use of spring or equivalent means presently to be described, the two detent levers are normally caused to assume, within the box-like inner end portion of the latching lever 24, the forwardly inclined positions best shown in Fig. 2. In such positions of said detent levers, the push buttons thereof lie within and substantially completely close the apertures 52 of the latching lever 24, and the forward corner portions 53 of the inner ends of said detent levers project beyond the inner end of the latching lever 24 for individual, releasable detention by a rearwardly extending flange 54 at the inner edge of the door slot 26. The flange 54, which here constitutes an integral part of the mounting plate 33, is preferably of hard, wear-resistant material, and if a separate member, replacement of it can be readily effected, if that becomes necessary or desirable.

To normally maintain the detent levers in such forwardly inclined positions relative to the latching lever 24, wire springs are here utilized, there

being one for each detent lever. As best shown in Fig. 7, intermediate portions of these springs are coiled around the pin 46 upon which the detent levers are pivoted, the coils of one spring lying between the side walls of one of the detent levers and the coils of the other spring lying between the side walls of the other detent lever. Each of these springs has an end portion 56 engaging the front wall of the detent lever with which it is associated, and an end portion 57 engaging the rear wall 39 of the latching lever 24.

From the foregoing description and from the position of the parts in Fig. 2, it will be evident that the latching of the door 22 in closed position is effected by the engagement of the latching head or outer end portion of the latching lever 24 with that portion of the wall structure 20 which is adjacent the free edge 27 of the door and by the releasable detention of the forward corner portions 53 of the inner ends of the detent levers 43 and 44 by the rearwardly extending door flange 54 at the inner end of door slot 26.

In order to swing the inner end portion of the latching lever 24 rearwardly (when the door 22 is closed) a sufficient amount to enable the detent lever corner portions 53 to move back of the door flange 54, it is necessary to put under compression the bumper 41 on the latching head or outer end portion of the latching lever—the bumper being in engagement with the wall structure 20. As the result of such compression of said bumper, the inner end portion of the latching lever automatically swings forwardly upon release actuation of the detent levers, thereby enabling the inner end portion of the latching lever to serve as a handle in the manual opening of the door.

To release the detent levers from their detention by the door flange 54, the push buttons of said levers are depressed, the depression of such buttons swing the levers in a clockwise direction, Fig. 2, and freeing their corner portions 53 from detention by the door flange 54. The depression of the push buttons can be effected simultaneously or in sequence, the push button 50 of the detent lever 44 being first depressed in sequence operation.

To close and latch the door, the inner end portion of the latching lever 24 may be grasped and the door thereby swung to closed position, flush with the wall structure 20. The inner end portion of the latching lever is then swung rearwardly, to position the latching head or outer end portion thereof back of the wall structure 20 and to position the forward corner portions 53 of the detent levers back of the door flange 54, the front wall 36 of the inner end portion of the latching lever being thereby brought into flush relationship with the wall structure 20 and the door slot 26 closed.

Due to the springs associated with the detent levers, these levers have their normal forwardly inclined positions relative to the latching lever 24, positions which cause the inner edges 59 of the side walls of the detent levers to be normally inclined, as best shown in Fig. 2. In the swinging movement of the latching lever to latching position, the inclined edges 59 of the detent levers serve as cams, in their engagement with the side wall surface of the door flange 54, to rock the detent levers about their pivot and to thereby locate the forward corner portions 53 of the detent levers in non-projecting positions relative to the latching lever 24. When, however, the latching lever reaches latching position, the springs for the detent levers are able to automatically swing such detent levers to their normal inclined positions with consequent disposition of the corner portions 53 of such levers back of the door flange 54 for releasable detention thereby.

To open the door, it is merely necessary to depress, simultaneously or in sequence, the push buttons 49, 50 of the detent levers to release such levers from detention by the door flange 54. Upon release of the detent levers, the inner end portion of the latching lever 24 swings forwardly, as the result of the compression of the bumper 41, a sufficient distance to enable such end portion of the latching lever to be grasped and thereby used as a handle in opening the door.

To effectively limit rearward swinging movement of the free edge portion of the door 22, the wall structure 20 may be and here is provided with suitable stop portions 61 in the outer corners of the opening 21 normally closed by said door, thereby insuring that said door, when closed, will be substantially flush with the outer surface of said wall structure.

To those skilled in the art to which the present invention relates, further features and advantages of latch mechanisms embodying such invention will be evident from the foregoing description of one embodiment thereof.

What I claim is:

1. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, and means operable to release said detent means from detention by said closure and comprising a plurality of spaced parts each requiring operation to effect the release of said detent means.

2. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, and detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, said detent means having a plurality of spaced parts each requiring operation to effect the release of said detent means.

3. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, and a pair of detent members carried by the other end portion of said lever for individual releasable detention by said closure when said lever is in latching position, said detent mem-

bers being separately operable to effect their release from detention by said closure.

4. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, and a pair of pivotally mounted detent members carried by the other end portion of said lever for individual releasable detention by said closure when said lever is in latching position, each of said detent members having a part operable to effect its release, whereby the operation of both of such parts is necessary to effect the release of said detent members from detention by said closure.

5. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure, for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, said detent means being automatically detained by said closure upon the movement of said lever into latching position, and means operable to release said detent means from detention by said closure and comprising a plurality of spaced parts each requiring operation to effect the release of said detent means.

6. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, a pair of detent levers each pivotally mounted adjacent one end thereof to the other end portion of said latching lever for individual releasable detention by said closure when the said lever is in latching position, and means on the free end portion of each of said detent levers operable to effect the release of such lever from detention by said closure, whereby the operation of both of said operable means is necessary to effect the release of the two detent levers from detention by said closure.

7. Latch mechanism for an apertured closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechainsm comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof, for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure and having the other end portion thereof lying within the aperture of said closure, detent means carried by the last mentioned end portion of said lever for releasable detention by said closure when said lever is in latching position, and means operable to release said detent means from detention by said closure and comprising a plurality of spaced parts each requiring operation to effect the release of said detent means.

8. Latch mechanism for an apertured closure which is hingedly mounted on a wall structure for normally closing a opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure and having the other end portion thereof lying within and substantially closing the aperture of said closure, detent means carried by the last mentioned end portion of said lever for releasable detention by said closure when said lever is in latching position, and means carried by said detent means and operable to effect the release thereof from detention by said closure, the release means for said detent means comprising a plurality of depressible spaced parts each requiring depression to effect the release of said detent means.

9. Latch mechanism for a closure having an apertured front surface and which closure is hingedly mounted on a wall structure for normally closing an opening therein, the closure when in closing position being substantially flush with said wall structure, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure and having the other end portion thereof lying within the aperture of said closure and substantially flush with the front surface of the closure, detent means carried by and movable relative to the last mentioned end portion of said lever for releasable detention by said closure when said lever is in latching position, and means operable to release said detent means from detention by said closure, said release means for said detent means normally being substantially flush with the front surface of said closure.

10. Latch mechanism for an apertured closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure and having the other end portion thereof lying within the aperture of said closure, the last mentioned end portion of said lever serving as a pull handle for the closure when the lever is out of latching position, pivoted detent means carried by the last mentioned end portion of said lever for releasable detention by said closure when said lever is in latching position, and means operable to effect the release of said detent means from detention by said closure, and comprising a plurality of spaced parts carried by said detent means and each such part requiring operation to effect the release of said detent means.

11. Latch mechanism for an apertured closure which is hingedly mounted on a wall structure for normally closing an opening therein, said

latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof rearwardly offset and projecting beyond said closure for latching cooperation with and rearwardly of said wall structure and having the other end portion thereof lying within the aperture of said closure in substantially the plane of the closure, detent means carried by the last mentioned end portion of said lever in the general plane of such end portion for releasable detention by said closure when said lever is in latching position, and means operable to effect the release of said detent means from detention by said closure, said release means comprising a plurality of spaced parts each requiring operation to effect the release of said detent means and each being located in the general plane of the last mentioned end portion of said lever.

12. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, resilient means normally urging said detent means into position for detention by said closure, said detent means being movable out of such position by engagement with said closure upon swinging movement of said lever toward latching position and said resilient means automatically returning said detent means to such position, for the releasable detention of said detent means by said closure, when said lever is in latching position, and means operable to effect the release of said detent means from detention by said closure when the latching lever is in latching position to thereby enable the latching lever to be swung out of latching position and the closure thereby opened.

13. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, resilient means normally urging said detent means into position for detention by said closure, said detent means being movable out of such position by the engagement of said closure with a cam-like part of said detent means upon swinging movement of the latching lever toward latching position and said resilient means automatically returning said detent means to such position, for the releasable detention of said detent means by said closure, when said lever is in latching position, and means operable to effect the release of said detent means from detention by said closure when the latching lever is in latching position to thereby enable the latching lever to be swung out of latching position and the closure thereby opened.

14. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, the last mentioned end portion of said lever having a front wall behind which said detent means is carried, and means carried by said detent means and operable to effect the release of said detent means from detention by said closure, the front wall of the last mentioned end portion of said lever being apertured to afford access to the means operable to release said detent means from detention by said closure.

15. Latch mechanism for a closure having an apertured front wall and which closure is hingedly mounted on a wall structure for normally closing an opening therein, the closure when in closing position being substantially flush with said wall structure, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure adjacent the aperture thereof for swinging movement into and out of latching position, said lever when in latching position having an end portion projecting beyond said closure for latching cooperation with said wall structure and having the other end portion thereof lying within the aperture of said closure and substantially flush with the front wall of the closure, detent means carried by the last mentioned end portion of said lever for releasable detention by said closure when said lever is in latching position, said last mentioned lever end portion having a front wall behind which said detent means is carried, and a push button on said detent means depressible to effect the release of said detent means from detention by said closure, said lever front wall having an opening to afford access to said push button and said push button being normally flush with said lever front wall.

16. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having an end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, means operable to release said detent means from detention by said closure, and resilient means carried by the first mentioned end portion of said lever and effective, by its engagement with said wall structure, to swing said lever out of latching position upon the release of said detent means from detention by said closure.

17. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching posi-

tion, said lever when in latching position having an end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, means operable to release said detent means from detention by said closure, and compressible resilient means carried by the first mentioned end portion of said lever and effective, as the result of its compression between said lever end portion and said wall structure when the lever is in latching position, to swing said lever out of latching position upon the release of said detent means from detention by said closure.

18. Latch mechanism for a closure which is hingedly mounted on a wall structure for normally closing an opening therein, said latch mechanism comprising a latching lever pivotally mounted intermediate its ends on said closure for swinging movement into and out of latching position, said lever when in latching position having one end portion thereof projecting beyond said closure for latching cooperation with said wall structure, detent means carried by the other end portion of said lever for releasable detention by said closure when said lever is in latching position, and means operable to release said detent means from detention by said closure and comprising a plurality of spaced parts each requiring operation to effect the release of said detent means, said parts being operable simultaneously or in sequence.

FRANK A. BEST.

REFERENCES CITED

The following references are of record in the file of this patent:

Flugsport (German publication) Nov. 23, 1939, page 552. (Copy in Div. 20, under Class 292—229.)