Dec. 12, 1967 S. T. HEIFETZ 3,357,733

DOOR LOCK HARDWARE

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FIG. 1.

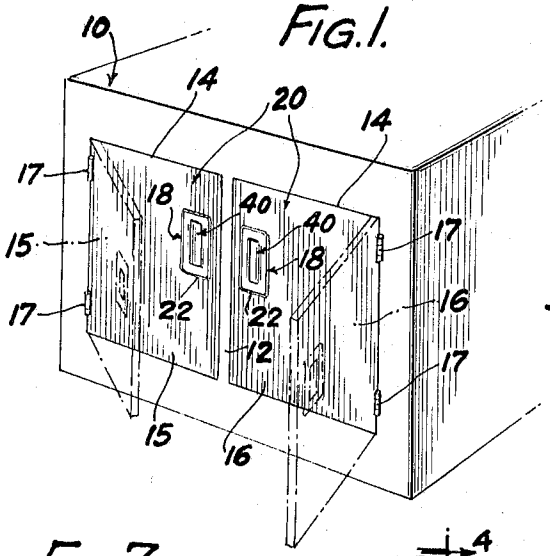


FIG. 2.

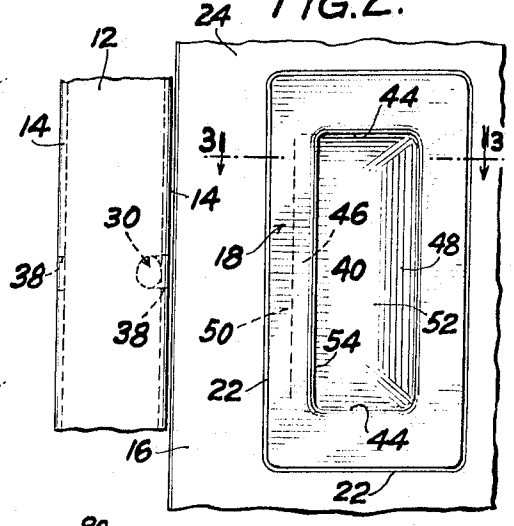


FIG. 7.

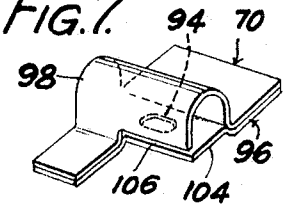


FIG. 3.

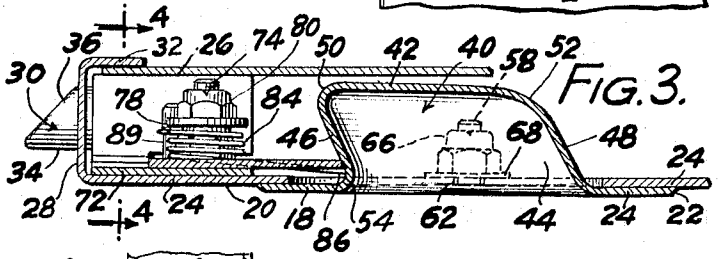


FIG. 5.

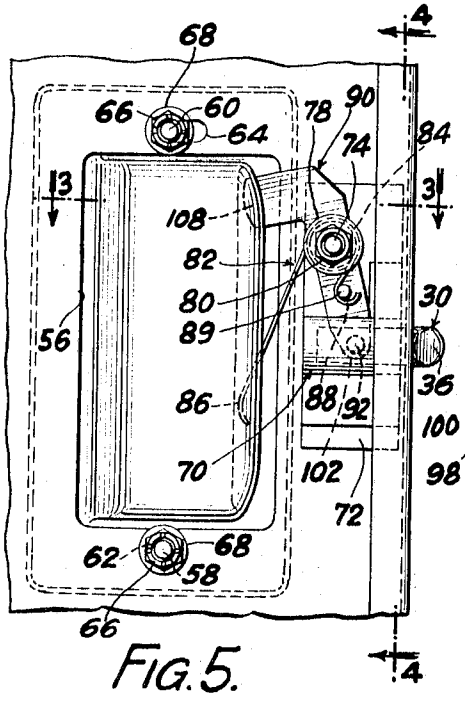


FIG. 4.

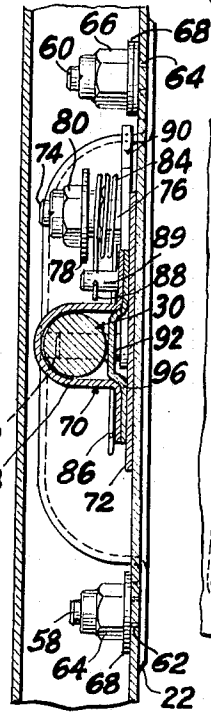
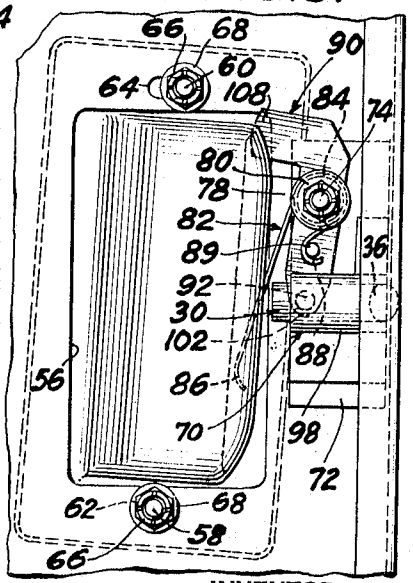


FIG. 6.



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DOOR LOCK HARDWARE

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FIG. 9.

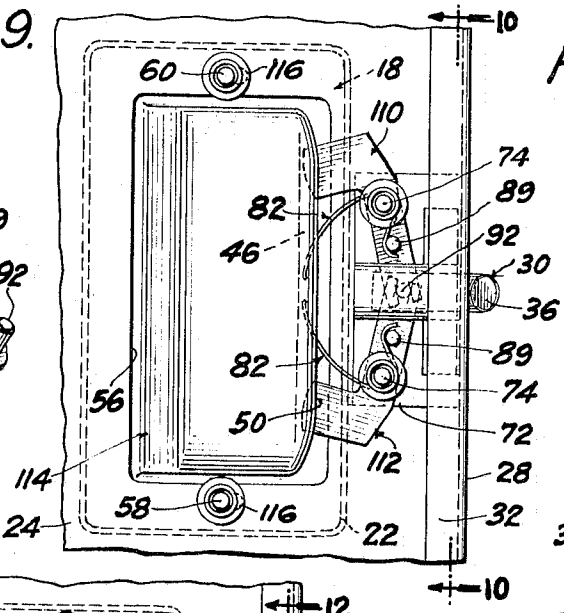


FIG. 8.

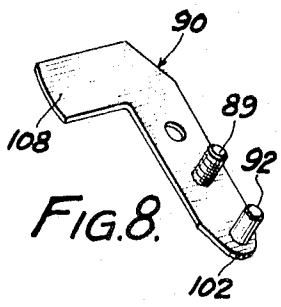


FIG. 10.

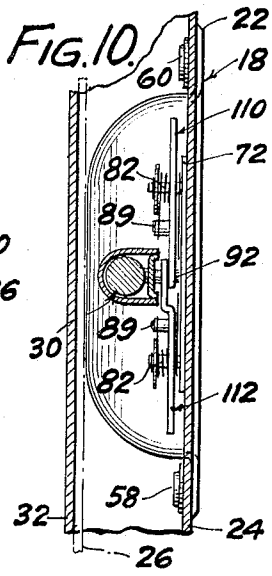


FIG. 11.

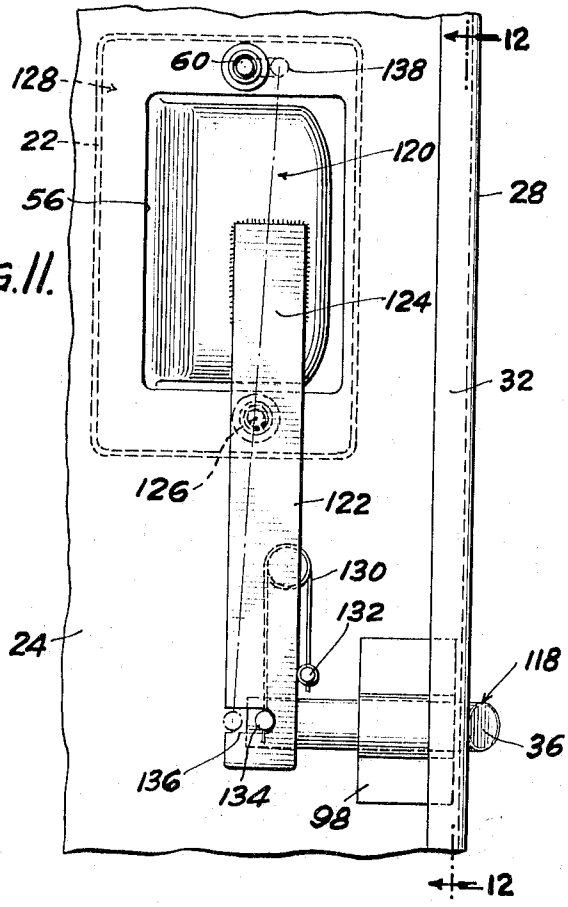
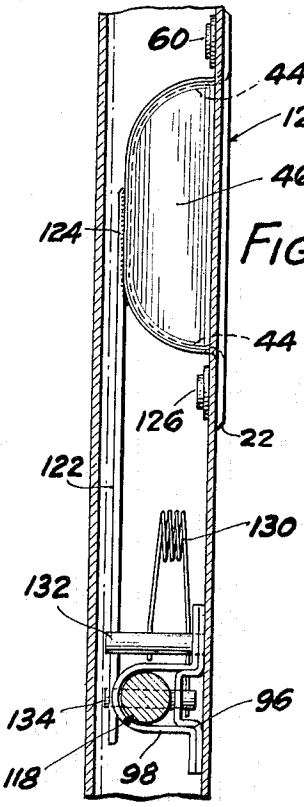


FIG. 12.



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3,357,733

DOOR LOCK HARDWARE

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Filed Sept. 22, 1964, Ser. No. 398,309
4 Claims. (Cl. 292—165)

This invention relates to improvements in door lock hardware and particularly to flush type manually-operable door-pull mechanisms for hinged, bolt-locked doors.

Still more particularly, this invention relates to a combination door-pull and latch bolt mechanism of the above character, the manual engageable element is of the recess-grip type, only the fingertips are employable in the recess, and wherein, pulling intent is by fingertip, in the normal and natural procedural requirement for opening the door.

One of the principal objects of the invention is the provision of such above mentioned door-unbolting and door-opening mechanism, of high simplicity in construction and appearance, having no protuberances or forward projecting or projectable parts, no moving parts in or within the recess, and requiring a minimum of manual action and effort in its operation including an involuntary effort resulting in an unintentional effect in the course of opening events.

Another object of the invention is the provision of a piece of door hardware of the above character wherein only one single unitary part of the mechanism is visibly available for operation, and which is manually contactable for pulling engagement when the door is closed.

Still another object of the invention is the provision of a flush type latchable-bolt door-pull mechanism that is of highly sanitary construction, efficient in use, with a minimum of parts, and inexpensive to manufacture and install.

Further objects and advantages will be pointed out and still others will appear in the following description having reference to the accompanying drawings illustrating a preferred form and modifications of the invention.

In the drawings:

FIG. 1 is a front perspective view of a portion of a cabinet having doors provided with hardware of one principal form of the invention.

FIG. 2 is an enlarged front view of a portion of the structure shown in FIG. 1.

FIG. 3 is an enlarged section on the line 3—3 of FIG. 2.

FIG. 4 is an enlarged view on the line 4—4 of FIG. 3.

FIG. 5 is a rear view of the parts shown in FIG. 2.

FIG. 6 is a view similar to FIG. 5 but with the parts shown in an intermediate position, in the course of opening the door.

FIG. 7 is a perspective view of a bolt cage used in this form of the invention.

FIG. 8 is a perspective view of a particular bell-crank part employed in the above form of the invention.

FIG. 9 is a view similar to FIG. 5 but of another form of the invention.

FIG. 10 is a section taken on the line 10—10 of FIG. 9.

FIG. 11 is a view similar to FIG. 5 but of still another form of the invention.

FIG. 12 is a sectional view on the line 12—12 of FIG. 11.

In flush type door-handle devices having manually engaging and manipulative operating requirements, the action and efforts required to open the door are generally suggested by the nature and appearance of the manually engageable parts of the particular device. Its physical presentments, the nature of its appurtenances, the size, orientation and disposition of its protuberances or recesses

all influence the determination of the nature of manual contact, by finger or hand, and influence the manner of procedural action and efforts required of one about to open the door.

In the present invention the operating means for opening the door is a flush plate with a fingertip recess engageable only along one edge or re-entrant side of the recess which, by all logical means of determination for opening operational action calls for pulling and pulling only. Nothing else is suggested or even implied.

Heretofore, flush type pull handle devices that responded to pull only were held closed by frictional grips, snaps or yieldable frictional latches or frictionally yieldable latch keepers. Where bolts were employed to keep the door closed, prior devices of the flush type and pull-to-open character, specially employed some visible means, sign or expedient, in addition to the recess grip, to indicate preliminary procedural action necessary prior to pulling, to open the door.

In the present invention with only a recess showing, normally the operational procedure calls for only a pull, yet, upon normal physical engagement for this purpose the shallow, scant finger-tip purchase or grip of the recess is made purposely inadequate and the operator's fingers begin to slip under pure pull upon the said side of the recess, whereupon, and almost immediately, an automatic reaction of increased purchase pressure of the finger tips upon the side of the recess, in a direction at right angles to the direction of pull is involuntarily induced while the pulling effort is still in force. The combination of such "pull" and "press" is necessary, the latter being involuntarily induced by the inadequacy of the former against a positively bolted closed door. As the purchase pressure is increased, the bolt become involuntary undone and the concurrent pulling force, still in effect, is quite sufficient to swing the now unbolted door, open.

From the closed position the initial pull is manifestly referred to as being in the forward direction, that is, at right angles to the plane of the door, and any involuntary yielding of the plate handle is referred to as being in the transverse or lateral direction, in the plane of the door, or in a direction other than the direction of pull as initially applied.

With reference to the form of the invention shown in FIGS. 1 to 8, the mechanism is applied in an accommodating manner to a pair of opposed, vertically hinged, panel doors disposed in a vertical plane in a suitable cabinet 10, of sheet metal construction. The front opening of the cabinet is provided with a center post 12, forming openings 14, fitted with doors 15 and 16, hinged as at 17, and adapted to swing forwardly and outwardly as shown by the dot and dash lines in their partly open position as seen in FIG. 1.

Along the inner edge and along the marginal boundary thereof, each of the doors is provided with a recessed escutcheon-like plate 18. These plates are adapted to lay flat against the front face 20 of the panel doors and to project therefrom only the barest minimum, which is no greater than the thickness of the sheet metal of which the plate is fabricated. To further reduce the obtrusiveness of this plate, the perimetrical edges thereof as at 22, are bevelled, thus providing in addition, an easy-to-clean edge.

Referring to FIGS. 2 to 8, showing only the right hand door 16, the associated recess plate 18, and its associated parts, the panel type door on which these parts are carried is of hollow construction and comprised in part, mainly, of a front sheet 24, and a back sheet 26. These sheets are suitably spaced from each other and between which, some of the mechanism and the bulge of the recess of the escutcheon-like plate is disposed.

Integrally formed with the front sheet **24**, is a rearwardly extending portion **28**, forming an edge wall for the panel, and through which, a latch-bolt **30** is adapted project. A lip-like flange **32**, contiguous and at right angles to the edge wall **28**, and integral therewith, is adapted to engage the rear wall or sheet **26**, to form part of the enclosing structure for the hollow panel type door. The bolting surface of the latch-bolt **30**, is designated as **34**, and is disposed forward, in the plane parallel to the plane of the escutcheon plate **18**. The latching surface **36**, of the bolt **30**, is rearwardly and angularly biased to the right as clearly seen in FIG. 3, so that during closing its inclined latching surface comes into cammed contact with the center post and is caused to move inward to the right to a retracted position, as the panel moves rearwardly to its final closed position. As will be more fully described later, the latch-bolt is normally, yieldably retained in its projected position, outward of the edge wall **28**, as shown is FIGS. 3 and 5. At the final closed position of the door the latch-bolt **30** is caused to project into a hole **38**, in the post **12** or into a suitable bolt keeper, thus placing the door in closed and bolt-locked condition.

It is therefore seen that the latch-bolt serves as a latch upon closing and as a positive locking bolt when the door is fully closed. Under such circumstances the door cannot be opened until the bolt is fully withdrawn. However, there is nothing on the escutcheon plate to indicate or even suggest that a bolt is to be withdrawn before the door can be opened, yet, without this knowledge, actions incident or coincident with mere pulling will affectuate the door opening, as will appear later herein.

A finger engaging recess integrally formed in the escutcheon plate **18**, is generally designated as **40**, and is of recession depression character, substantially oblong in frontal appearance with rounded cove corners and with rounded frontal edges that may come in contact with the fingers of an operator. The recession depression per se, referred to herein as the recess **40**, is depressed in the escutcheon plate in a biased or askewed manner, that is, on the right hand door for example, the recess in the right hand plate skews from right to left as it extends rearwardly. Likewise, but in opposite hand manner, the recess in the left hand plate is skewed from left to right as it extends from front to the rear. Inwardly opposed gripping ledges are thus formed and disposed for engagement by respective hands of an operator. The recesses **40** are subtantially shallow; so shallow that only fingertip grip or application, is had.

Referring now to FIG. 3, the recess **40** for the right hand is seen in plan section. The rear wall **42** of the recess is integrally formed with the frame-like walls and front flanges **43**. The recess **40** is of substantially upright oblong formation and together with the side walls surrounding the mouth of the recess, and the frame flanges comprising the escutcheon plate **18**. The upper and lower side walls **44**, are parallel and join the front frame flanges to the rear wall **42** of the recess. The vertical side wall portions **46** and **48** are substantially parallel and are biased or askewed inwardly toward the edge **28** of the door. The said wall portion **46** is thus joined to the rear wall portion **42** by an acute cove corner portion **50**, while the side wall portion **48** is joined to the rear wall portion **42** by an obtuse cove corner portion **52**. At the front, the side wall portion **46** is joined to the front flange along the edge **52** of acute formation. The side wall construction thus forms a re-entrant declining ledge adapted for engagement by the fingertips of the right hand for pulling upon the door. The finger contactable surface **48** of the side wall portion of the recess is unsuited for the purpose of applying a pulling force upon the door toward opening inasmuch as this wall surface is adversely inclined for attainment of finger purchase thereat. The upper and lower horizontally disposed wall surfaces **44** are also unsuited for proper or sufficient finger purchase for applying a pulling force upon the door. Such ledges do not suggest or invite their use for door opening pulling action. The only available side of the recess **40** where pulling purchase is, and could be had, is behind the edge **54** and along the re-entrant side wall **46**, where a fingertip grip could be taken for the purpose of exerting an intentional pull.

An opening **56** is provided in the front wall **24** of the door. This opening is slightly larger than the bulge formed by the recess **40** rearward of the escutcheon plate **18**. Through this opening which is oblong in outline, the bulge of the recess is adapted to swingingly move laterally and freely, and only in a plane parallel to the front face of the door. The opening **56** is not visible from the front inasmuch as it is covered completely by the continuous frame-like flanges surrounding the recess at the front surface of the escutcheon plate. Threaded studs **58** and **60** are butt welded or otherwise secured to the rear of the escutcheon plate **18**, at the top and bottom flanges thereof and substantially midway horizontally along these flanges. These studs project rearwardly and pass through respective holes **62** and **64** in the wall **24** of the door. The hole **62**, adapted to receive the stud **58**, is of such size to closely yet freely fit the stud. The hole **64** is substantially slotted as to permit a limited horizontal movement of the stud **60**.

Elastic stop nuts **66** and bowed washers **68** thereunder are adapted in their usual well known manner to keep the escutcheon plate frictionally but lightly snug up against the front wall **24** of the door, without binding or otherwise impeding the required operational movements above mentioned, as will be more fully explained hereinafter. The pair of opposed and oppositely disposed recess plates **18** are made identical. In installation at assembly the studs of one are inverted and inserted into the holes **62** and **64** in a selectively opposed manner, so that a pair of recesses are askewed inwardly and toward each other for proper fingertip reception of the respective right and left hands.

The fingertip contactable or re-entrant surface of the said side wall **46** of the recess is relatively steep and shallow, and the forcefulness of the grip is thus limited to, and naturally induces or auto-suggests, gentle pulling in continuous manner to effectuate the opening of the door. Mere pulling however, is almost immediately felt to be insufficient as the fingertips feel their slippage. No amount of mere pull could possibly produce any opening motion of the door that is held closed by a positively locked and bolted door. Therefore, and immediately, almost instantaneously, even while the initial pulling motion is still in progress, an automatic involuntary response of increase in lateral pressure is induced and naturally applied, to overcome this slippage, and to fortify the pulling effect of the actions initially intended, and applied.

This involuntary and induced increase of lateral pressure response is concurrent with the pulling effort initially and solely intended until all resistance to the bolt's withdrawal is overcome, whereupon the effect of the initially applied action of mere pull becomes effective, the pulling energy being kinetically stored during the build-up of the involuntary lateral pressure.

As best seen in FIGS. 4 and 7, the latch-bolt is adapted to freely slide longitudinally in a latch cage **70** which is adapted to be fixed as by welding to a mounting plate **72**. This mounting plate is adapted to be positionally set with respect to the bolt keeper hole in the post **12**. In proper position at assembly the mounting plate **72** is spot welded in place to the rear face of the front sheet of the door **24**. A threaded stud **74** is end-butt welded to the plate **72** to project rearwardly therefrom. This stud **74** is provided with a spacer nut member **76**, a washer **78**, and a lock nut **80**, adapted to hold captive, the helical portion of a wire hairpin type spring designated in general as **82**. The helical portion of the spring surrounds the spacer nut **76**, one free end of the spring is urged against the bulge of the recess **40** and against the outer surface of the re-

entrant side wall 46, while the other end of the hairpin spring is hooked around and urged against a pin 89 in a bell crank 90, and urging the latch-bolt 30 and the escutcheon plate 18 apart.

This bell crank lever 90 is pivotally mounted on the stud 74 and is provided with a rearwardly projecting pin 92 adapted to pass freely through a slot 94 in a suitably bent front-plate element 96 forming part of the latch-bolt cage unit 70. A suitably bent and formed rear-plate element 98 is adapted to be nestingly positioned and joined as by spot welding to the front-plate element. This rear-plate element 98 is adapted as a tunnel-like drape around the latch-bolt pin 30 and, together with the front-plate element 96 provides a slidable retaining means for the latch-bolt 30. A hole 100, horizontally disposed in the latch-bolt 30 is adapted to receive the pin 92 of the bell crank with a free fit. In assembled relationship as illustrated best in FIGS. 5 and 7, it is seen that the pin 92 is urged against the right end of the slot 94 thus projecting the latch-bolt a predetermined distance, the amount of projection of the latch-bolt from the edge 28 of the door is positionally determined by the setting of the mounting plate 72, which is accommodated by the relatively adjustable disposition of the escutcheon plate and the yieldably accommodating disposition of the bell crank. The hairpin spring urges the latch-bolt in one direction and projecting from the edge 28 of the door and in a direction toward the keeper post 12, and the escutcheon plate is urged in the direction away from the center post or latch keeper as the case may be. It is understood that with a single door construction there will be no center post but only a keeper for the latch-bolt.

The latch-bolt end 102 of the bell crank lever is adapted to pass between the bent back portion 104 of the front-plate element 96 (see FIG. 7) and the mounting plate 72 along a cut-away portion 106 of the cage elegent 98. The other end of the bell crank overlies the opening 56 in the front sheet 24 of the door and is, in normal position, in contact, or close to contact, with the re-entrant wall 46 of the recess and along bulge as indicated at 108, and lies in the path of movement of this re-entrant wall as it swings on its pivot stud 58. The motion at the zones of contact of the end 108 and the wall 46 are chordally different thereby creating a frictional sliding and resistance which contributes to the modular of increasing lateral involuntary pressure necessary to cause withdrawal of the bolt upon opening.

In the above described form of the invention the sequence of actions and events are most characteristically described as on the basis of the operator being unfamiliar with the internal mechanism its performing actions and who proceeds in accordance with natural and logical responses and reactions. With intention to open the door, the approach to the closed door is with ordinary light contact of the fingertips only, which find grippable but shallow, purchase along the surface of the recess opposing the fingertips. After making such contact with the surface of the recess along its re-entrantly inclined wall, the ensuing action by the operator, is to pull in the forward direction. No forward movement of the door is accomplished but instead, a feeling of hindrance to the movement and slippage of the fingers, is manifest, to a degree dependent upon the locking components as well as the frictional resistance set up by the pulling force in the forward direction against an inclined surface in a direction other than forward. This inevitable slippage is naturally, automatically and involuntarily counteracted to, by increased pressure of the fingertips to prevent continued slippage and loss of fingertip purchase. This involuntary lateral pressure increase is concurrently applied with the pulling effort as initially applied together with increased or decreased pulling force in the forward direction. The pressure increase in the lateral direction is gradual and in response to natural reflex reaction. The lateral pressure is thus increased to the point where the recess plate yields laterally and the door quickly opens under the force of the forward pull which is continually present as would naturally occur when all restraints are suddenly removed.

Upon release of the grip the recess plate returns to its normal position as shown in FIG. 4, as does the latch-bolt return to its projected position, all under the influence of the spring 82. In this normal condition, to close the door, all that is required is to swing same in the closing direction until the inclined surface of latch-bolt is cam latched past the post 12 or keeper plate (not shown) until the bolt springs into the keeper hole 38, whereupon the door is positively bolt locked.

Once familiar with the working feel of the mechanism it can be operated with entirely voluntary and distinctly independent sequential actions deliberately applied, but the usually natural and convenient way to open the door is as described.

In the form just described, a single bell crank and pivoted recess plate are employed. In the modification shown in FIGS. 9 and 10, two bell cranks 110 and 112 are employed with a sliding escutcheon plate 114. The pins 58 and 60 are slidably borne in slots 116 in the front sheet 24 of the door while the pin 92 of the latch-bolt is engaged by slots in the ends of the symmetrical but invertedly disposed bell cranks 110 and 112.

In the previous forms described the latch-bolt is disposed within the lateral proximity of the escutcheon plate. In the modified form of the invention shown in FIGS. 11 and 12, the latch-bolt 118 is remote from the lateral proximity of the recessed escutcheon plate 120 and an extension lever 122 is attached to the bulge of the recess as at 124 and is thus adapted to move about pivot on the axis of the stud 126 which is adapted as the direct pivot for the escutcheon plate 128.

Where the latch-bolt, preferably vertically located in the middle of the door edge, is to be disposed above or below the level of the escutcheon plate, such form as in FIGS. 11 and 12 of the invention, provides such spaced relationship. A hairpin type spring 130 has one end fastened to a pin 132 anchored in the front sheet 24 of the door while its other end is connected to a pin 134 in the end of the latch-bolt 118. A slot 136 at the end of the lever 122 hooks onto the pin 134 in the latch bolt. The spring 130 urges the pin to bottom in the slot, thus causing the escutcheon plate to pivot counterclockwise up to where the end of the slot 138 coincides with the pin 60 in the normal position of the mechanism as shown. The projected position of the latch-bolt is determined by the stopping engagement of the lever against the pin 132, under the influence of the spring 130.

While the invention has been shown and described as applied to a door or doors in a vertical plane, with hinges disposed in the vertical and along an edge opposite the latch-bolt edge, the hinges may be disposed along an edge adjacent to the edge where the latch-bolt projects. In doors that are inclined in planes other than vertical the term of reference to pulling is in all cases in the direction normal to the plane of the door and the term of reference to the application of "involuntary increased lateral pressure" is in or parallel to the plane of the door, and in the direction away from the hinge or hinges.

Having thus described the invention and its principles in several embodiments, it is understood that other forms and modifications thereof may be had without departing from the spirit of the invention as embraced in the following claims.

I claim:

1. A hinged door of the character described having a flush type movable door-pulling plate-like member having a manually engageable door-pulling recess at the front face thereof, a yieldably retractive latch-bolt carried by said door and operatively connected to said door pulling member, said latch-bolt normally projecting edgewise from said door to engage means external of the door to hold same locked against pulling in the direction normal

to the plane of the plate-like member in closed position of the door, said pulling recess extending rearwardly from the front face of said door-pulling member and having an inclined side surface between said front and rear surfaces of said recess, said inclined side surface sloping rearwardly and away from the hinged edge of the door and being of such depth as to permit only fingertip engagement and of such inclination with respect to frictional purchase of operating fingertips as to require sidewise pressure to attain effective pulling purchase upon the closed and bolted door, whereby, upon manual contact and pressure sufficient for pulling purchase the said latch-bolt is first involuntarily withdrawn.

2. In a hinged door construction of the character described having a recessed type escutcheon plate only, visibly and presented and adapted solely for pulling purposes in the course of opening the door, the combination of a normally projecting and yieldably retractive latch-bolt carried by the door and projecting from one lateral edge thereof, latch-bolt keeper means external of the door and adjacent said lateral edge and adapted to receive the latch-bolt in closed position of the door and to hold same in positively locked condition against pulling, and linkage means operatively connecting said escutcheon plate and said latch-bolt whereby only lateral motion of the escutcheon plate is transmittable to the latch-bolt, said recess in said escutcheon plate extending rearwardly askewed and having a fingertip engaging surface sloping rearwardly and away from the hinged edge of the door and of such steep inclination and affording such shallow fingertip purchase as to induce the requirement of increasing lateral pressure to effectuate pulling results, whereby the escutcheon plate yields laterally, withdrawing the latch-bolt while the pulling force is still effectively applied.

3. In a hinged door construction of the character described having only a recessed flush type escutcheon plate visibly presented for pulling in a plane normal to the plane of the door, the combination of a yieldably retractive latch-bolt carried by the door and projecting from an edge thereof other than the hinged edge of the door, latch-bolt keeper means external of the door and adapted to receive the latch-bolt in closed position of the door and to hold same in positively locked condition against pulling open, and linkage means operatively connecting said escutcheon plate and said latch-bolt whereby only lateral motion of the escutcheon is effective to withdraw the said

latch-bolt, said recess in said escutcheon plate extending rearwardly and eskewed and having an inclined fingertip-engaging surface sloping rearwardly and away from the hinged edge of the door, said fingertip-engaging surface being of such steep inclination and affording such shallow fingertip purchase as to require increasing lateral pressure against said fingertip-engaging surface to avoid finger slippage during pulling attempts to open said positively locked door, whereby the escutcheon plate ultimately yields to said increasing pressure while pulling purchase is sought against said inclined fingertip-engaging surface.

4. In a hinged door construction of the character described having only a flush type escutcheon plate visible presented for pulling in a plane normal to the plane of the door, the combination of a yieldably retractive latch-bolt carried by the door and projecting from an edge other than the hinged edge of the door, latch-bolt keeper means external of the door and adapted to receive the latch-bolt in closed position of the door and to hold same in a positively locked position against pulling open, and linkage means operatively connecting said escutcheon plate and said latch-bolt whereby only lateral motion of the escutcheon plate is effective to withdraw the said latch-bolt, said recess in said escutcheon plate extending rearwardly and askewed and having an inclined fingertip-engaging surface sloping rearwardly and toward an unhinged edge of the door, said fingertip-engaging surface being of such steep inclination and affording such shallow fingertip purchase as to require increasing lateral pressure to maintain pulling purchase against said positively locked door, whereby the escutcheon plate is caused to yield under said increasing pressure while pulling purchase and resulting pulling open of the door is effectuated by the fingertips.

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