ABSTRACT

A bolt is moved by a driving lever pivoted on the bolt and through a transverse pin to a slotted rotatable driving member, the driving lever pin being guided in movement in the driving member slot by extension thereof transversely through an inverted U-shaped guide slot in the latch frame. The forward downward end portion of the guide slot is rearwardly undercut in its downward extension. The operating lever is rotatable through a transverse driving shaft transversely slidably engaged therewith, the driving shaft being, in turn, rotated through a key operated lock cylinder connected to the shaft through a usual lost motion arrangement. The driving shaft is D-shaped cross section engageable in a D-shaped cross section opening of the driving member. Anti-violation plates of unique form are positioned beneath usual rosette and cover plates resisting shearing of the lock cylinder frame.

20 Claims, 13 Drawing Figures
LATCH CONSTRUCTION INCLUDING ASSEMBLY, ANTI-VIOLATION AND DEAD BOLT FEATURES

BACKGROUND OF THE INVENTION:

This invention relates to an improved latch construction including assembly, anti-violation and dead bolt features, and more particularly, to a latch construction having maximum relative simplicity, yet which may include a novel dead bolt arrangement positively assuring the retention of the bolt in extended position and against an exterior force being applied thereagainst in an attempt to move the bolt toward retracted position, as well as novel assembly and anti-violation arrangements which prevent improper assembly of the latch construction when the latch is used with a lock cylinder operating mechanism and prevent shearing in violation attempts of the lock cylinder frame. In the latch construction with the novel dead bolt arrangement, a normal, single dead bolt is used, not requiring the additional auxiliary dogging heretofore necessary, and the dogging is produced inherently in the interior operating mechanism by relatively inexpensive additions. Furthermore, certain of the internal latch operating mechanism elements are of improved form and when the novel dead bolt feature is included, will operate therewith to produce maximum dead bolt dogging characteristics. Still further, the novel assembly arrangement is also internally of the latch operating mechanism assuring that important operational parts can only be assembled in a proper relationship, but still requiring merely conventional assembly procedures, and the anti-violation means resists shearing and other attacks of the lock cylinder frame, common in violation attempts.

Various prior latch constructions have been provided having dogging mechanisms integrated therein. The most common form includes a main reciprocal biased bolt retracted by operation of the latch mechanism through various forms of lock cylinders and operating knobs along with an auxiliary dogging lever positioned adjacent the main bolt and normally reciprocal therewith, but additionally independently reciprocal relative to the main bolt. The auxiliary dogging lever is, in turn, connected to a main bolt locking mechanism which either through direct main bolt engagement or latch operating element engagement locks the main bolt in extended position when the auxiliary dogging lever is in a retracted position.

Still in this auxiliary dogging lever arrangement, the latch construction is mounted properly positioned so that the auxiliary dogging lever is at the side of the main bolt facing, say, the interior side of a door in which the latch construction is installed so that the auxiliary dogging lever is sheltered from access from the exterior side of the door, particularly when the main bolt is in extended position at the line of separation between the door and the door jamb. The usual strike plate installed in the door jamb has the usual bolt opening therein for receiving the main bolt when the main bolt is biased outwardly to extended position for retaining the door closed, and when the auxiliary dogging lever form of latch construction is used, the strike plate bolt opening remains the same size so as to receive the main bolt therein in extended position in usual manner, but not receiving the auxiliary dogging lever therein, placing it in a main bolt dogging position. This usual form of main bolt dogging, although satisfactory, is quite expensive to provide.

A still further problem encountered in the modern society is one involved with the increase in attempts to illegally violate the keyed exterior operators, the lock cylinders and lock cylinder frames, of latch constructions in order to gain illegal entry to areas guarded thereby. The more common methods applied are to exert transverse pounding to the lock cylinder frames to destroy the same or shearing off the lock cylinder frame and lock cylinder by large shearing means. In either case, the principal area of attack is in a transverse plane directly between the latch construction exterior rosette plate and the exterior surface of the door upon which the latch construction is mounted. Thus increased rigidity and guarding of this area of the latch constructions is vitally needed.

OBJECTS AND SUMMARY OF THE INVENTION:

It is, therefore, an object of this invention to provide an improved latch construction including assembly, anti-violation and dead bolt features wherein merely a conventional bolt is required, yet with relatively minor, but novel, changes in the latch operating mechanism improved dogging qualities are integrated therein which assure that when the bolt is placed in extended position, whether engaged with a door jamb strike plate or otherwise, it cannot be moved toward disengaged position from an exterior force without a virtual destruction of the latch operating mechanism. In the improved latch construction of the present invention, the latch operating mechanism includes an operating or driving lever forwardly pivotally connected to the bolt and rearwardly connected to a slotted, rotatable, operating or driving member through a driving pin which also extends through a unique guide slot of the latch stationary frame. During the main part of the bolt movement by the latch operating mechanism, this driving pin moves forwardly and rearwardly in the guide slot while transferring the rotatable motion of the driving member to the driving lever and bolt, but at either extremity of such forward and rearward movement, the driving pin moves into an offset of the guide slot positively finally positioning the bolt in its extended and retracted positions.

Although the mere end extremity offsets of the guide slot do tend to retain the bolt through the driving lever and driving pin in its particular extended or retracted position until purposely moved therefrom by the latch operating mechanism, true bolt dogging features in the bolt extended position are not present if the exterior force against the bolt tending to move it to retracted position is of any magnitude, particularly of the impacting type. The novel bolt dogging arrangement is, therefore, completed by forming the end extremity offset of the guide slot receiving the driving pin when the bolt is in extended position having an undercut therein receiving the driving pin and retaining the same therein unless purposely moved therefrom by the usual actuation of the latch operating mechanism. Thus, with the bolt in extended position and the driving pin within the undercut of the end extremity offset in the guide slot, any outside force directly against the extended bolt tending to move such bolt toward retracted position will only
tend to move the driving pin deeper into the overhang and against movement from the end extremity offset of the guide slot so as to provide dogging protection for the bolt.

It is a further object of this invention to provide an improved latch construction including assembly, anti-violation and dead bolt features wherein a novel spring arrangement in the latch operating mechanism combines with the previously described driving lever of such latch operating mechanism to assure that proper and complete bolt extension and retraction can take place whether or not the latch construction includes the foregoing bolt dogging features, but where the dead bolt improvements are included, this novel spring arrangement additionally acts to greatly augment the positive action of the bolt dogging improvements. In the preferred embodiment of the present invention, the spring is arranged to continuously resiliently urge the driving lever into proper sliding surface contact with the guide slot and particularly resiliently urging the driving pin into the end extremity offsets of the guide slot when the bolt reaches either of its extended and retracted positions. The spring, thereby, constantly resiliently urges retention of the driving pin guide slot offset positioning and with the bolt dogging feature will always assure that the driving pin is received securely within the overhang of the guide slot extremity when the bolt is in its extended position.

It is still a further object of this invention to provide an improved latch construction including assembly, anti-violation and dead bolt features in which, when the latch construction includes a key actuated lock cylinder for operation thereof, a novel single position, assembly connection between the lock cylinder connected driving shaft and the driving member of the latch construction assures that the latch construction can only be assembled during installation thereof in a proper manner. As heretofore discussed, with lock cylinders of the type wherein the operating keys thereof are only removable in a neutral position, proper escapements in key movements must be included by use of lost motion connections between the lock cylinder and the latch operating or driving shaft. The single position connection between the driving shaft and driving member thereby prevents improper assembly since the driving lever and driving member can only be assembled in the single position proper relationship.

It is also an object of this invention to provide an improved latch construction including assembly, anti-violation and dead bolt features wherein specifically shaped, relatively shear resistant and relatively rigid, anti-violation guards may be added to the prior latch assemblies without other alteration thereto and will resist the more common forms of illegal violation of latch constructions. According to a preferred embodiment of the present invention, a specifically formed, thick and rigid, guard plate is positioned beneath the usual exterior or latch rosette and lock cylinder cover plates, telescoping the lock cylinder assembly and projecting inwardly of the exterior latch mounting surface, usually an exterior door surface. A specifically formed, thick and rigid, guard plate is also installed beneath the interior rosette and cover plates, particularly supporting the latch securing screws. As a result, the exterior guard plate resists transverse shearing and transverse impacts in attempts to sever the lock cylinder frame and lock cylinder from the latch assembly, particularly guarding the plane of the exterior latch mounting surface or exterior door surface, while the interior guard plate resists latch construction deformation around the latch supporting screws which could, in turn, loosen the latch construction mounting and expose the lock cylinder frame and lock cylinder at the plane of the interior latch mounting surface.

It is an additional object of this invention to provide an improved latch construction including assembly, anti-violation and dead bolt features which satisfies all of the foregoing objects in a relatively simple manner adding the described new and novel advantageous improvements, yet at only nominal added cost over similar latch constructions not including such improvements. In the case of the bolt dogging features, the greater security of the relatively expensive bolt dogging type of latch constructions is provided, yet at a minimum increase cost over latch constructions not including any bolt dogging features. Furthermore, the assembly features provide greater assembly convenience absolutely demanding correct assembly of the latch construction, but yet the assembly may take place still using conventional assembly procedures and without any increased assembly labor costs. As to the anti-violation features, the same are simply shaped, added parts interfitting in the previous assemblies without alteration thereto, again minimizing manufacturing costs.

Other objects and advantages of the invention will be apparent from the following specification and the accompanying drawings which are for the purpose of illustration only.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a horizontal sectional view of a first embodiment of the latch construction of the present invention installed in a door, the door being shown in fragmentary horizontal section, and the latch construction being shown with the bolt thereof in retracted position;

FIG. 2 is a side elevational view of the latch construction of FIG. 1 removed from the door, the bolt thereof in the full line showing being in retracted position within the latch frame and the lock cylinder key being in neutral position, phantom lines showing the bolt extended with the relative rotative position of the key, all looking in the direction of the arrows 2–2 in FIG. 1;

FIG. 3 is a view similar to FIG. 2, but with the full line showing of the bolt in extended position with the key in neutral position, phantom lines showing the bolt approaching retracted position and the relative key positioning;

FIG. 4 is a vertical sectional view looking in the direction of the arrows 4–4 in FIG. 1, but with the latch construction again removed from the door;

FIG. 5 is a fragmentary, vertical sectional view similar to FIG. 4, with the bolt in extended position and parts removed for more clearly showing various operating elements of the latch construction;

FIG. 6 is a fragmentary top plan view of the latch construction as shown in FIG. 5;

FIG. 7 is a view similar to FIG. 5, but with the bolt in an intermediate position between extended and retracted positions;
FIG. 8 is an enlarged, vertical sectional view looking in the direction of the arrows 8—8 in FIG. 7;

FIG. 9 is an enlarged, fragmentary, horizontal sectional view looking in the direction of the arrows 9—9 in FIG. 7;

FIG. 10 is an enlarged, fragmentary, horizontal sectional view looking in the direction of the arrows 10—10 in FIG. 7;

FIG. 11 is a horizontal sectional view similar to FIG. 1 of a second embodiment of the latch construction of the present invention;

FIG. 12 is a vertical sectional view of the latch construction of FIG. 11 looking in the direction of the arrows 12—12 in FIG. 11; and

FIG. 13 is a vertical sectional view looking in the direction of the arrows 13—13 in FIG. 11.

DESCRIPTION OF THE BEST EMBODIMENT CONTEMPLATED:

Referring to the drawings, a first embodiment of the improved latch construction of the present invention is shown therein, in FIG. 1 as mounted in operative position in a door and in FIGS. 2 through 10 in the assembled position, but removed from the door. The latch construction illustrated may be formed of usual material and by usual manufacturing procedures. Furthermore, the particular construction of latch illustrated is broadly of a usual type constructed for exterior key operation and interior hand operation.

More particularly, the first embodiment latch construction includes a stationary latch frame generally indicated at 20 mounting a forwardly and rearwardly reciprocable bolt 22 movable forwardly to an extended position as shown, for instance, in FIGS. 3, 5 and 6, and movable rearwardly to a retracted position as shown, for instance, in FIGS. 1, 2 and 4. The forward and rearward movement of the bolt 22 toward and to its extended position and toward and to its retracted position in the longitudinally reciprocal movement is provided by a latch operating or driving mechanism generally indicated at 24 partially contained transversely between transversely spaced rearward extensions 26 of the latch frame 20 and partially extending transversely through said rearward extensions, the driving movement of the latch operating mechanism being supplied by a keyed exterior operator generally indicated at 28 and a hand interior operator generally indicated at 30. The latch construction is mounted in usual manner in a conventional door generally indicated at 32 with the keyed exterior operator at an exterior side 34 of the door, and hand interior operator at an interior side 36 of the door and the bolt 22 longitudinally extendable through an edge 38 of the door into a usual strike plate (not shown) of a usual door jamb (not shown).

As can be clearly seen in FIGS. 4, 5, and 7 through 10, the bolt 22 is formed at the rearward end thereof with transversely opposed and opening recesses 40 which also open rearwardly to a connecting lug 42 therebetween. The bolt recesses 40 are generally rectangular in side elevation as shown in FIGS. 5, and 7, although being slightly upwardly angularly relieved at rearward ends thereof for a purpose to be hereinafter pointed out. Thus, the rearward portion of the bolt 22 both underlies and overlies the recesses 40 despite the transverse and rearward opening of such recesses.

The latch operating or driving mechanism 24 includes a pair of transversely spaced and longitudinally forwardly and rearwardly extending operator or driving levers 44 having the forward ends thereof projecting forwardly into the bolt recesses 40 at opposite sides of the bolt connecting lug 42 and upwardly and downwardly pivotedly connected to the bolt connecting lug by a pivot pin 46. A unique, generally C-shaped, leaf-type spring 48 is slidably forwardly received within the bolt recesses 40 having a generally C-shaped side portions 50 lying transversely adjacent the forward ends of the driving levers 44 with said side portions being joined transversely beneath the forward ends of the driving levers 44 by a lower bar portion 52 and being joined above the driving lever forward ends by an overlying upper bar portion 54. Both of the spring lower and upper bar portions 52 and 54 are spaced rearwardly of the bolt connecting lug 42 with the spring side portions 50 lying against the walls of the bolt recesses 40 except at the previously mentioned angular relief of the recesses. The spring upper bar portion 54 bears resiliently downwardly against the forward ends of the driving levers 44 spaced rearwardly of the connecting pivot pin 46 so as to normally urge the driving levers 44 to pivot downwardly but permitting upward movement thereof within the confines of said recess angular relief.

The driving levers 44 of the latch driving mechanism 24 project longitudinally rearwardly transversely spaced apart and transversely between the rearward extensions 26 of the latch frame 20 with the driving lever rearward ends terminating rearwardly oppositely transversely adjacent a radial projection 56 of a transversely extending and rotatable operating or driving member 58. The radial projection of the driving member 58 has a radially extending driving slot formed transversely therethrough receiving a transverse driving pin 60 radially slidable, as well as relatively pivotal, therein. The driving pin 60 extends oppositely transversely through the rearward extremities of the driving levers 44 and continues oppositely transversely through guide slots 62 formed transversely through the opposite rearward extensions 26 of the latch frame 20.

The guide slots 62 of the latch frame rearward extensions 26 are, of course, transversely aligned receiving the driving pin 60 pivotal therein and slidable therethrough. Furthermore, these guide slots 62 include main longitudinally extending portions 64 extending generally straight forwardly and rearwardly terminating rearwardly in generally downwardly projecting rearward ends 66 and terminating forwardly in generally downwardly projecting forward ends 68. Particularly important to certain of the principles of the present invention is the fact that rear walls 70 of the guide slot forward ends 68 are downwardly rearwardly angled in the downward progression of the guide slot forward ends so that these rear walls progressively underlie the guide slot longitudinal portions 64 thereby forming forward end undergrads or overhangs as particularly shown in FIGS. 4, 5 and 7. At the same time, it will be noted that the guide slot rearward and forward ends 66 and 68 project sufficiently downwardly from the guide slot longitudinal portions 64 so that the driving pin 60 may be received fully downwardly therein when the bolt 22 and the driving
levers 44 are at either of their forward and rearward extremities of movement.

The driving member 58 of the latch driving mechanism 24 extends transversely through and between the latch frame rearward extensions 26 being rotatably mounted thereby and projects transversely opposedly outwardly of the latch frame rearward extensions. Furthermore, the driving member 58 has a D-shaped cross section opening 72 formed transversely therethrough, in the particularly relative relationships shown, this D-shaped opening showing an upright D-shape when the bolt 22 is in retracted position and an upwardly projecting D-shape when the bolt is in extended position as shown in FIGS. 4 and 5, respectively. Still further, the D-shaped opening 72 of the driving member 58 transversely slidably receives a mating D-shaped cross section, transversely extending driving shaft 74 therethrough during assembly of the latch driving mechanism 24 thereby providing the driving member 58 and the D-shaped driving shaft 74 exactly rotatably engaged in one predetermined relative relationship, important to certain of the principles of the present invention as will be hereinafter explained.

Spaced transversely from the driving member 58, the driving shaft 74 is particularly engaged at the side with the keyed exterior operator 28 and at the other side with the hand interior operator 30.

Referring particularly to FIG. 1, the keyed exterior operator 28 and the hand interior operator 30 are secured at the exterior and interior sides 34 and 36 of the door 32 transversely oppositely against similar rosette plates or covers 76 by threaded studs 78 projecting transversely from the keyed exterior operator and through the latch frame rearward extensions 26 free of interference with the driving levers 44 engaged by securing screws 80 from the hand interior operator 30. The keyed exterior operator 28 is generally of usual, well-known construction including an outer lock cylinder cover 82 telescoping a stationary lock cylinder frame 84 which, in turn, rotatably mounts a keyed lock cylinder 86. The lock cylinder 86, again, is of usual form having a diametrical key slot 88 receiving a particularly formed key 90 arranged for rotating the lock cylinder relative to the lock cylinder frame 84 in the usual manner, and the lock cylinder is further formed so that the key is captive in the key slot and cannot be removed therefrom in all rotative positions of the lock cylinder except a neutral position shown in full lines in FIGS. 2 and 3 wherein the key slot is exactly vertical. It should be pointed out that this vertical position of the key slot 88 in which the key 90 may be removed is a single vertical position and when the key slot is rotated 180° to be vertical, but upended, the key is still retained captive, only being removable in the single position.

The keyed lock cylinder 86 through a well-known construction thereof is connected to the D-shaped driving shaft 74 by a particular lost motion connection such that when the key 90 is in the neutral position, the key and lock cylinder must be moved a certain degree of rotation in either direction before rotating the D-shaped driving shaft 74 of the latch driving mechanism 24, the purpose thereof being to provide escapement for the key. This can be more clearly understood by first observing the particular positions of the D-shaped driving shaft 74 shown in FIGS. 4 and 5, it being noted that movement of the D-shaped driving shaft for, in turn, moving the bolt 22 from the retracted position of FIG. 4 to the extended position of FIG. 5 is essentially one-quarter turn. Now referring to FIG. 2, it is seen that the key 90 first moves approximately one-eighth turn counter-clockwise in lost motion and then one-quarter turn to move the bolt from retracted to extended positions as shown in phantom lines. Referring to FIG. 3, the key 90, with the bolt in extended position, must be moved from its neutral position first one-quarter turn in lost motion and then one-quarter turn rotating the D-shaped driving shaft 74 to fully retract the bolt, the bolt being shown partially retracted in phantom lines with the corresponding relative position of the key in phantom lines although final full bolt retraction will position the key rotated a full one-half turn.

The purpose of this lost motion connection between the lock cylinder 86 and the D-shaped driving shaft 74 is so that the bolt 22 may be moved fully between its extended and retracted positions, yet at the end of such bolt movement by the key, the key may be returned to its neutral position for removal from the lock cylinder. As shown in FIG. 2, after the key 90 has moved approximately three-eighths turn counter-clockwise to fully extend the bolt 22, the key must be freely movable back to its neutral position shown in full lines without disturbing the bolt positioning so that the key can be removed with the bolt remaining in its extended position. Likewise, as shown in FIG. 3, when the bolt 22 is moved from extended to fully retracted position by moving the key 90 one-half turn clockwise, the key must be movable back to its neutral position shown in full lines without disturbing the bolt positioning to permit removal of the key with the bolt in fully retracted position. This obviously requires a minimum 180° escapement for the key 90 which is the required movement of the key during the bolt retraction operation as shown in FIG. 3.

Although this lost motion connection between the lock cylinder 86 and the driving shaft 74 providing the minimum 180° escapement for the key 90 is old in the art, it has presented a major difficulty during the mounting and the assembly of the prior latch constructions which difficulty is eliminated by the improved D-shaped driving shaft 74 engaged with the D-shaped opening 72 of the driving member 58 of the present invention. With this lost motion connection between the lock cylinder 86 and the driving shaft 74, unless the driving shaft 74 is confined to only a single assembly position with the driving member 58, it is possible to wrongfully assemble the driving shaft with the driving member in view of the required minimum 180° escapement. In other words, with the minimum 180° escapement, the driving shaft 74 could be assembled 180° wrongly rotatably positioned with the driving member 58 requiring the latch construction to be disassembled after original assembly to correct such error. The D-shaped driving shaft 74 of the present invention, however, can only be assembled with the D-shaped opening 72 of the driving member 58 in a single correct position so that such construction constitutes a single position assembly and eliminates the difficulties of the prior construction.
To complete the description of the first embodiment of the latch construction herein illustrated and described, the hand interior operator 30 at the interior side 36 of the door 32 includes a mounting plate or cover 92 which outwardly partially telescopes the rosette plate or cover 76 and centrally rotatably mounts a hand knob 94 projecting transversely therethrough. The hand knob 94 has an interiorly opening, transversely extending, D-shaped cross section recess 96 formed therein receiving a free end of the D-shaped driving shaft 74 as such shaft passes from the D-shaped opening 72 of the driving member 58. Thus, by rotation of the hand knob 94, the latch driving mechanism 24 may be properly moved to, in turn, move the bolt 22 between its extended and retracted positions.

In overall operation of the first embodiment of latch construction including the improvements of the present invention, assume that the bolt 22 is in its fully retracted position shown in FIGS. 1, 2 and 4. In the retracted position of the bolt 22, the radial projection 56 of the driving member 58 is rearwardly angled with the driving pin 60 fully downwardly within the guide slot rearward ends 66 as urged by the spring 48 through the driving levers 44. Upon insertion and proper movement of the key 90, or the proper movement of the hand knob 94, the driving member 58 is moved through the driving shaft 74 to, in turn, move the radial projection 56 of the driving member forwardly along the guide slots 62, first moving the driving pin 60 upwardly from the guide slot rearward ends 66 flexing the spring 48 upwardly through upward movement of the rearward extremities of the driving levers 44. As the driving member radial projection 56 continues its forward movement, the driving pin 60 is moved along the longitudinal portions 64 of the guide slots 62 moving the driving levers 44 and the bolt 22 forwardly until the bolt ultimately reaches fully extended position at which, the driving pin 60 is forced downwardly fully within the guide slot forward ends 68 by the downward resilient urging of the spring 48 against the driving levers 44.

The retraction of the bolt 22 from the fully extended position as shown in FIGS. 3, 5 and 6 to the fully retracted position as shown in FIGS. 1, 3 and 5 is just the opposite of that hereinbefore described. Furthermore, it will be noted that throughout the bolt 22 movement, as well as the extended and retracted stationary positioning thereof, the spring 48 always exerts resilient pressure downwardly against the driving levers 44 so that the driving pin 60 is always forced to exactly follow the contours of the identical guide slots 62. Most important, this constant downward resilient urging of the spring 48 against the driving levers 44 assures that the driving pin 60 will always be fully received within the guide slot rearward and forward ends 66 and 68 at the termination of the movements of the bolt 22. The straight downward extension of the rearward ends 66 of the guide slot 62 tend to retain the driving pin 60 therein and against forward movement of the driving levers 44 and the bolt 22, this holding force being augmented by the downward resilient pressure exerted by the spring 48, thereby positively retaining the bolt 22 in its retracted position. The same conditions exist when the bolt 22 is fully extended with the driving levers 44 fully forward and the driving pin 60 engaged fully downwardly in the forward ends 68 of the guide slots 62 and even if the guide slot forward ends 68 extended straight downwardly similar to the guide slot rearward ends 66, a certain amount of bolt dogging protection would be provided, that is, resistance against rearward urging of the bolt 22 from an exterior force directed rearwardly on the bolt itself. It has been found, however, that if the forward ends 68 of the guide slot 62 are merely formed straight downwardly similar to the guide slot rearward ends 66, exteriorly applied impact blows against the bolt 22 can cause the driving pin 60 to jump upwardly out of the guide slot forward ends and thereby permit rearward driving of the bolt from such exterior force.

With the uniquely formed forward ends 68 of the guide slots 62 including the downwardly rearwardly angling of the rear walls 70 thereof as previously described forming the undercuts, any force against the bolt 22 tending to move the bolt rearwardly from its extended position, whether impact forces or otherwise, will only tend to force the driving pin 60 more deeply rearwardly into such undercut. Thus, complete bolt dogging protection for the bolt 22 is provided according to the improvements of the present invention and this bolt dogging protection is even further augmented by the downward resilient urging of the spring 48 against the driving levers 44 retaining the driving pin 60 within the forward ends 68 of the guide slots 62 and within the undercuts formed by the guide slot forward ends.

A second embodiment of the latch construction of the present invention is shown in FIGS. 11, 12 and 13, and is identical to the first embodiment latch construction of FIGS. 1 through 10, both as to construction and operation thereof, with the further addition of anti-violation means for resisting violation of the latch construction by either the usual form of attempted shear- ing or impact blows applied to exterior portions of the latch construction, all of which will be hereinafter explained more in detail. Thus, this second embodiment latch construction likewise includes the latch frame generally indicated at 20 reciprocally mounting the bolt (not shown) movable by the latch operating or driving mechanism generally indicated at 24, which is, in turn, selectively movable by the keyed exterior operator generally indicated at 28 or the hand interior operator generally indicated at 30, all operable in the same manner and for the same purposes as hereinbefore discussed.

Furthermore, the latch construction is mounted in the door generally indicated at 32 with the bolt (not shown) projectable from the door edge 38, the keyed exterior operator 28 extending outwardly from the door exterior side or face 34 and the hand interior operator 30 extending outwardly from the door interior side or face 36.

Still further as previously described, the keyed exterior operator 28 includes the annular rosette plate or cover 76 inwardly abutting the door exterior face 34 and the annular lock cylinder cover 82 inwardly abutting the rosette cover 76, both of which are circular in vertical cross-section, as shown in FIG. 13, and in combination telescope and substantially totally exteriorly surround the lock cylinder frame 84 and the keyed lock cylinder 86. Also, the hand interior operator 30 in-
cludes the annular rosette plate or cover 76 inwardly abutting the door interior face 36 and the annular mounting plate or cover 92 edgewise outwardly overlying the rosette cover 76 rotatably mounting the hand knob 94. The exterior and interior operators 28 and 30 are retained assembled with the latch construction and the latch construction is retained assembled in the door 32 by the threaded studs 78 of the exterior operator lock cylinder frame 84 projecting inwardly through the latch driving mechanism 24 and being threadably engaged by the securing screws 80 engaged inwardly through the interior operator mounting cover 92, all as well shown in FIG. 11.

More particularly to the additions of this second embodiment latch construction, a thickened, annular guard plate generally indicated at 96 is assembled in the exterior operator 28 telescoping and substantially totally surrounding the lock cylinder frame 84 and the keyed lock cylinder 86 between the lock cylinder frame and the combined cover formed by the rosette cover 76 and the lock cylinder cover 82. This exterior operator guard plate 96 which, like the lock cylinder cover 82, is circular in vertical cross section, as shown in FIG. 13, and is thickened in the respect that it is many times the thickness of the combined cover formed by the rosette cover 76 and the lock cylinder cover 82, and the guard plate 96 may be formed of steel and may be of hardened steel where shear resistance and impact resistance dictate. Furthermore, in addition to the guard plate 96 projecting outwardly substantially the entire distance of the lock cylinder frame 84 relatively closely surrounding this lock cylinder frame, this guard plate is of one piece including the exterior lip 98 inwardly abutting the door exterior side 34 and the increased thickness portion 100 projecting inwardly spaced inwardly of the door exterior side.

Still further, it is again pointed out as herebefore described and clearly shown in FIGS. 11, 12 and 13, that the exterior and interior operators 28 and 30 are retained assembled with the latch construction and the latch construction is retained assembled in the door 32 by the threaded studs 78 of the exterior operator lock cylinder frame 84 being threadably engaged by the securing screws 80 from the interior operator mounting cover 92 so that all of the rosette plate or cover 76, the lock cylinder cover 82 and the guard plate 96 are retained in the assembly of the keyed exterior operator 28 solely through their respective telescoping and abutments as described. Thus, with the circular cross-sections of these covers 76 and 82 and the guard plate 96, each of these cover and guard plate elements is rotatable relative to the lock cylinder 84 which they surround, that is, as clearly shown, except for the various telescoping and abutments, these covers 76 and 82 and the guard plate 96 are free to rotate relative to the door 32 and the lock cylinder frame 84 if a relatively slight rotative force is applied thereto which overcomes the friction of abutment of these elements in the overall exterior operator assembly.

As herebefore discussed, the principle means of attempted violation of latch constructions of the type herein involved is either by attempted shearing across the exterior operator 28 at the plane of the door exterior side 34, that is, along the door exterior side 34 inwardly of the abutment of the rosette cover 76 and across the lock cylinder frame 84, or by impact blows against the lock cylinder cover 82 and the lock cylinder frame 84, in either case to remove the exterior operator 28 from the remainder of the latch construction. Thus, as long as the guard plate 96 remains in place as described, the plane of the door exterior side 34 is securely guarded by the guard plate and particularly the inwardly projecting increased thickness portion 100, so that shearing can not take place at this point and the lock cylinder frame 84 will remain intact. Furthermore, with the outward projection of the guard plate 96 co-extensive with the lock cylinder frame 84, extreme rigidity and impact resistance is added to the lock cylinder frame and it is impossible to violate the latch construction by impact blows against this outer latch construction portion.

As herebefore indicated, for this shearing protection and impact protection of the latch construction by the guard plate 96, it is important that the same remains in place and that there is no loosening of the exterior operator 28 which could provide access along the plane of the door exterior side 34 inwardly of the guard plate 96. To further guard against this loosening of the exterior operator 28, which could only be caused by an inward deformation of the interior operator 30 in view of the lock cylinder frame studs 78 and the interior operator securing screws 80, a thickened, annular guard plate generally indicated at 102 is positioned in the interior operator 30 within the cover formed by the rosette plate or cover 76 and the mounting plate or cover 92. The interior operator guard plate 102 at peripheral portions thereof inwardly abuts the door interior side or face 36 closely outwardly underlying the rosette cover 76 and terminates at minimum diameter adjacent the interior operator securing screws 80 outwardly abutting portions of the mounting cover 92 directly inwardly underlying the securing screw head portions, thereby providing complete rigidity to the interior operator 30 and the securing screws 80 thereof to prevent any possibility of distortion which could result in the loosening of the exterior operator 28.

Still in addition, and also important in the frustration of attempted violations of latch constructions of the type herein involved, is the fact that all of the rosette cover 76, the lock cylinder cover 82 and the guard plate 96 are rotatable relative to the lock cylinder frame 84, each being circular in cross-section and each being unconnected to the lock cylinder frame 84 and door 32 other than by their respective telescoping and abutments. Not only does the fact that these outer covers 76 and 82 and the underlying guard plate 96 are rotatable as described aid in frustrating shearing and impact attempts through the fact that forces applied thereto tend to rotate the same rather than properly transfer the forces as intended, but such rotation of these elements likewise frustrates attempts to apply twisting violation forces and sawing violation forces. For instance, if a twisting force is applied to the lock cylinder cover 82, this lock cylinder cover will merely rotate with the twisting force and not effect the underlying guard plate 96 or lock cylinder frame 84, and if the lock cylinder cover 82 is gripped tightly enough to crush or collapse the same, this cover merely collapses against the strong guard plate 96 with the guard plate rotating from the twisting force and
producing the same result. A similar reaction takes place when there is attempted sawing, since such sawing necessarily requires that the outer covering elements, primarily the lock cylinder cover 82 and inwardly thereof the guard plate 96, remain stationary during such sawing and with these elements relatively freely rotatable, sawing progress is greatly inhibited, if not completely frustrated.

According to the principles of the present invention, therefore, a latch construction is provided having maximum relative simplicity, yet including the novel bolt dogging arrangement hereinbefore described, eliminating the greater expense of the conventional auxiliary dead bolt previously required for such protection in the prior constructions. Also according to the present invention, the novel spring 48 constantly resiliently downwardly engaging the driving levers 44 assures that proper operation of the latch construction will always take place and particularly augments the foregoing dead bolt arrangement to assure an even greater security thereof. Still further according to the present invention, the latch construction includes single position engageable driving member 58 and driving shaft 74 which can only be assembled in a proper relationship so as to eliminate the problems with assembly encountered with the prior constructions as hereinbefore discussed. Also, anti-violation guard plates 96 and 102 strengthen the exterior and interior operators 28 and 30 to prevent the shearing and impact forms of attempted violations of this or similar forms of latch constructions.

We claim:

1. In a latch construction of the type having a longitudinally slidable reciprocal bolt movable forwardly and rearwardly into extended and retracted positions by a generally longitudinally extending driving lever, a forward end of said driving lever being pivotally connected to said bolt pivotal upwardly and downwardly about a transverse axis, a driving member rotatable about a transverse axis having a generally radially extending and transversely opening driving slot formed therein, a transverse driving pin through a rearward end of said driving lever and through said driving member driving slot slidable along said driving slot, said driving pin also extending through and being slidable along a guide slot formed in and opening transversely of a latch frame member, said guide slot having a longitudinally extending portion terminating at least forwardly in a generally downwardly projecting end, said driving pin sliding along said guide slot longitudinally extending portion during reciprocal movement of said bolt by rotation of said driving member and moving downwardly into said guide slot forward end when said bolt is moved fully into its extended position; the improvements in combination therewith: said guide slot forward end including a rear wall undercut rearwardly from connection of said guide slot longitudinally extending portion dimensioned and located at least partially receiving said driving pin when said bolt is moved fully into its extended position resisting movement of said driving pin upwardly out of said guide slot forward end and rearwardly along said guide slot longitudinally extending portion when an outside rearward force is applied to said bolt tending to urge said bolt rearwardly from its fully extend position.

2. A latch construction as defined in claim 1 in which said rear wall undercut of said guide slot forward end is formed by said rear wall being rearwardly downwardly angled from said guide slot longitudinally extending portion.

3. A latch construction as defined in claim 1 in which said guide slot longitudinally extending portion terminates rearwardly in a generally downwardly projecting rearward end receiving said driving pin when said bolt is moved fully into its retracted position.

4. A latch construction as defined in claim 1 in which resilient means is operably connected to said driving lever for constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end when said bolt is moved into its fully extended position.

5. A latch construction as defined in claim 1 in which resilient means is at said driving lever forward end effective spaced rearwardly of said driving lever forward end pivotal connection to said bolt for constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end when said bolt is moved into its fully extended position.

6. A latch construction as defined in claim 1 in which resilient means overlies said driving lever forward end bearing downwardly spaced rearwardly of said driving lever forward end pivotal connection to said bolt for constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end when said bolt is moved into its fully extended position.

7. A latch construction as defined in claim 1 in which a leaf spring is mounted at said driving lever forward end extending rearwardly along said driving lever, said leaf spring including a transverse portion overlying said driving lever spaced rearwardly of said driving lever forward end pivotal connection to said bolt, said leaf spring at least through said transverse portion thereof constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end when said bolt is moved into its fully extended position.

8. A latch construction as defined in claim 1 in which said rear wall undercut of said guide slot forward end is formed by said rear wall being rearwardly downwardly angled from said guide slot longitudinally extending portion; and in which resilient means is operably connected to said driving lever constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end within said undercut formed by said rearwardly downwardly angling of said guide slot forward end when said bolt is moved into its fully extended position.

9. A latch construction as defined in claim 1 in which said rear wall undercut of said guide slot forward end is formed by said rear wall being rearwardly downwardly angled from said guide slot longitudinally extending portion; in which said guide slot longitudinally extending portion terminates rearwardly in a generally
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downwardly projecting end receiving said driving pin when said bolt is moved rearwardly to its fully retracted position; and in which resilient means is operably connected to said driving lever constantly resiliently urging said driving lever rearward end downwardly tendering to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end and within said undercut formed by said rearwardly downwardly angling of said rear wall of said guide slot forward end when said bolt is moved into its fully extended position, said resilient means through said constant resilient urging of said driving lever rearward end downwardly also tending to urge said driving pin downwardly into and retain said driving pin in said guide slot rearward end when said bolt is moved into its fully retracted position.

10. A latch construction as defined in claim 1 in which said rear wall undercut of said guide slot forward end is formed by said rear wall being rearwardly downwardly angled from said guide slot longitudinally extending portion; and in which resilient means is operably connected to said driving lever forward end effective spaced rearwardly of said driving lever forward end pivotal connection to said bolt for constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end received within said undercut formed by said rearwardly downwardly angling of said rear wall of said guide slot forward end when said bolt is moved into its fully extended position.

11. In a latch construction of the type having a longitudinally slidable reciprocal bolt movable forwardly and rearwardly into extended and retracted positions by a generally longitudinally extending driving lever, a forward end of said driving lever being pivotally connected to said bolt pivotal upwardly and downwardly about a transverse axis, a driving member rotatable about a transverse axis having a generally radially extending and transversely opening driving slot formed therein, a transverse driving pin through a rearward end of said driving lever and through said driving member driving slot slidable along said driving slot, said driving pin also extending through and being slidable along a guide slot formed in an opening transversely of a latch frame member, said guide slot having a longitudinally extending portion terminating at least forwardly in a generally downwardly projecting end, said driving pin sliding along said guide slot longitudinally extending portion during reciprocal movement of said bolt by rotation of said driving member and moving downwardly into said guide slot forward end when said bolt is moved fully into its extended position; the improvements in combination therewith; resilient means at said driving lever forward end effective spaced rearwardly of said driving lever forward end pivotal connection to said bolt for constantly resiliently urging said driving lever rearward end downwardly tending to urge said driving pin downwardly into and retain said driving pin in said guide slot forward end when said bolt is moved into its fully extended position.

12. A latch construction as defined in claim 11 in which said resilient means overlies and bears resiliently downwardly against said driving lever forward end.

13. A latch construction as defined in claim 11 in which said resilient means includes a leaf spring operably connected to said bolt and extending rearwardly adjacent said driving lever forward end, said leaf spring having at least a part thereof transversely overlying said driving lever forward end engaging said driving lever forward end spaced rearwardly of said driving lever forward end pivotal connection to said bolt.

14. A latch construction as defined in claim 11 in which said resilient means includes a leaf spring operably connected to said bolt having transversely spaced and longitudinally extending portions extending rearwardly transversely adjacent said driving lever, said leaf spring longitudinally extending portions terminating rearwardly in a transverse portion extending therebetween and overlying said driving lever spaced rearwardly of said driving lever forward end pivotal connection to said bolt.

15. A latch construction as defined in claim 11 in which said resilient means is a leaf spring including a lower portion underlying said driving lever forward end and extending forwardly into said bolt, a forward portion upwardly of said driving lever forward end and within said bolt, an upper portion extending rearwardly from within said bolt adjacent said driving lever forward end and having at least a part thereof overlying said driving lever forward end spaced rearwardly of said driving lever forward end pivotal connection to said bolt.

16. A latch construction as defined in claim 11 in which said resilient means is a leaf spring including a lower portion underlying said driving lever forward end and extending forwardly into said bolt, a forward portion upwardly of said driving lever forward end and within said bolt, an upper portion comprising of transversely spaced and longitudinally extending parts extending rearwardly from within said bolt transversely adjacent said driving lever forward end, said upper portions terminating rearwardly in a transversely extending part connected transversely therebetween and overlying said driving lever forward end spaced rearwardly of said driving lever forward end pivotal connection to said bolt.

17. In a latch construction of the type for mounting in doors and the like with a bolt extendable from a door edge, a latch driving mechanism mounted within the door operably connected to said bolt movable for moving said bolt between extended and retracted positions, an exterior operator projecting outwardly from an exterior door face including a lock frame mounting a lock cylinder telescoped by a surrounding annular cover inwardly abutting said exterior door face, an interior operator projecting outwardly from an interior door face including an annular cover inwardly abutting said interior door face, said exterior and interior operators being operably connected to said latch driving mechanism for selectively moving said latch driving mechanism, and fastening means engaged between said lock frame of said exterior door operator and said interior operator retaining assembly of said exterior and interior operator with said latch driving mechanism and said door; the improvements comprising: a thickened, hardened metal, annular guard plate in said exterior operator telescoping said lock frame between said lock frame and said cover totally exteriorly covered by said cover, said guard plate inwardly abutting said door ex-
terior face and projecting inwardly of said door to spaced inwardly of said door exterior face surrounding said lock frame and said fastening means both inwardly and outwardly of said door exterior face, said guard plate being free of connection to said lock frame and door other than said telescoping and abutment, said guard plate through said telescoping and abutment of said lock frame and door being rotatable relative thereto.

18. A latch construction as defined in claim 17 in which said guard plate extends outwardly substantially co-extensive with said exterior operator lock frame; and in which said exterior operator cover is free of connection to said lock frame and door other than said telescoping and abutment, said cover being rotatable relative to all of said guard plate, lock frame and door.

19. A latch construction as defined in claim 17, in which a thickened, annular guard plate is positioned in said interior operator inwardly of said interior operator cover inwardly abutting said interior door face, said interior operator guard plate extending across between said door interior face and said fastening means engagement with said interior operator to at least adjacent said fastening means inwardly supporting said interior operator cover and said fastening means at said interior operator.

20. A latch construction as defined in claim 17 in which said guard plate extends outwardly substantially co-extensive with said exterior operator lock frame; in which a thickened, annular guard plate is positioned in said interior operator inwardly of said interior operator cover inwardly abutting said interior door face, said interior operator guard plate extending across between said door interior face and said fastening means engagement with said interior operator to at least adjacent said fastening means inwardly supporting said interior operator cover and said fastening means at said interior operator; and in which said exterior operator cover is free of connection to said lock frame and door other than said telescoping and abutment, said cover being rotatable relative to all of said guard plate, lock frame and door.