MORITSE LOCK LOW FRICTION CASE LINER
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Door locks fall into various classifications, and the particular lock here under consideration consists of one usually identified as a mortise lock; namely, one which fits into a recess which has been cut into the door from the free edge of the door.

When a rugged, high quality type of lock is needed, mortise locks often are selected. Typical installations for a high quality mortise type lock are installations for homes, hotels, and schools.

There is a substantial range or variety of different mortise lock functional results; consequently, the mortise lock mechanisms are varied and involve many moving parts. Even after an installation has been made at a given door location, occasions may arise when a change is desired in the functional capabilities of the lock. On such occasions, the lock must be withdrawn, the case opened, and certain parts changed or readjusted. Moreover, because of the complexity of the mechanism in a mortise lock, sufficiently versatile to be capable of adjustment to many functions, there is often considerable friction to be overcome in the numerous moving parts. Those mortise locks heretofore commercially available have either been limited in their capabilities or, on occasions, so complex and poorly assembled as to require changes to be made in the shop when functions of the lock need to be altered and/or have been extensively lubricated by heavy lubricants.

It is, therefore, among the objects of the invention to provide a new and improved mortise type lock which makes use of a separate liner within the lock case to provide a mounting for virtually all of the various and sundry lock parts and mechanisms, such a liner being substantially independent of the lock case itself. An object of the invention is to provide a new and improved mortise lock casing liner which is substantially coextensive with the interior of the lock casing and wherein provision is made for virtually all parts and mechanisms which the lock is capable of containing, thereby making a substitution of parts and an interchange of parts an easy operation, with a minimum of disturbance to the arrangement of any of the other parts of the mechanism.

Still another object of the invention is to provide a new and improved mortise lock casing liner which is substantially coextensive with the interior of the lock casing and wherein provision is made for virtually all parts and mechanisms which the lock is capable of containing, thereby making a substitution of parts and an interchange of parts an easy operation, with a minimum of disturbance to the arrangement of any of the other parts of the mechanism.

Still another object of the invention is to provide a new and improved mortise type lock which, because of providing virtually a single sheet adapted to the mounting of all of the lock parts, makes a mortise type lock which is relatively inexpensive to construct and assemble, which promotes the employment of close tolerances and quiet operation, which substantially eliminates the need for lubrication, and which, at the same time, minimizes friction and wear to a substantial degree. With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is an end elevational view of a mortise type lock shown installed in a fragment of a door.

FIGURE 2 is a vertical side elevational view, showing the lock casing broken away to reveal substantially all of the interior working parts.

FIGURE 3 is a longitudinal sectional view on the line 3—3 of FIGURE 2.

FIGURE 4 is a longitudinal sectional view on the line 4—4 of FIGURE 2.

FIGURE 5 is a cross sectional view on the line 5—5 of FIGURE 2.

FIGURE 6 is a cross sectional view on the line 6—6 of FIGURE 2.

FIGURE 7 is a fragmentary longitudinal sectional view on the line 7—7 of FIGURE 2.

FIGURE 8 is an inside side elevational view of the liner alone.

FIGURE 9 is a front end elevational view of the liner alone.

FIGURE 10 is a rear end elevational view of the liner alone.

FIGURE 11 is a cross sectional view on the line 11—11 of FIGURE 8.

FIGURE 12 is a cross sectional view on the line 12—12 of FIGURE 8.

FIGURE 13 is a cross sectional view on the line 13—13 of FIGURE 8.

In order to appreciate the advantages inherent in the mortise lock casing liner, the operating parts of a typical mortise lock installation and their relationship when all are mounted for operation in an appropriate casing are disclosed. Since the advantages of the liner are directly related to the operation and function of the working parts, the disclosure with respect to these parts is given in some detail.

A lock construction especially well adapted to the invention here under consideration also is shown and described in co-pending applications Ser. Nos. 450,419; 450,445; 450,446; 450,447; 450,449; 450,460; 450,461; 450,462; and 450,472; all filed on Apr. 23, 1965.

In an embodiment of the invention which has been selected as one for showing a typical arrangement of structural parts involving the invention, there is shown a mortise type lock indicated generally by the reference character 16, substantially all of which is housed within a case 11. An inside wall 12 and an outside wall 13, forming part of the case 11, form a chamber 17 between them, one end of which is defined by a front end wall 14 and the other by a rear end wall 14'. A top wall 15 and bottom wall 15' complete the enclosure. A dead bolt 16 reciprocably mounted in the frame extends outwardly through a hole 16' in the front end wall 14. A latch mortise 18, also reciprocably mounted in the frame, extends outwardly through a hole 18' in the front end wall 14. A rectangular hole 19 in the front end wall 14 is for reception of an auxiliary bolt 20. As shown in FIGURE 1, an armored front plate 21, having holes similar to those of the front end wall 14, is adapted to overlie the front end wall 14 and to be attached thereto by screws 25 which extend through the armored front plate 21 into the front end wall 14.

The case 11 is shown mounted in a door 24, extending inwardly from an edge 25. Screws (not shown) attach the front end wall 14 to the door 24 to hold the case 11 in position in the door 24.

For reciprocably mounting the dead bolt 16 in its position in the case 11, there is provided a block 35, details of which will be described later. The dead bolt 16 slides in a slideway 37 in the block 35 and extends outwardly through the hole 16' in the front end wall 14 and an aligned opening 26 in the armored front plate 21.
For manipulating the dead bolt 16 between locked and unlocked positions, there is provided a drive linkage consisting of a rock arm 40 pivotally mounted in the case on a shaft 41 and a link 42 having a pivotal connection 43 and another pivotal connection (not shown) at the other end of the link 42 to the dead bolt 16.

On the inside wall 12 of the case 11 there is provided a turn mechanism indicated generally by the reference character 46. Opposite the turn mechanism 46 and mounted on the outside wall 13 of the case 11 is a key-actuated mechanism indicated generally by the reference character 47. Through an appropriate actuator 48, the dead bolt 16 can be turned by means of the turn mechanism 46 or the key-actuated mechanism 47. The turn mechanism 46 is provided with a handle 49. A housing 51 for the turn mechanism 46 has a threaded engagement 52 with the side structure of which the inside wall 12 is part. The turn mechanism 46 includes the actuator 48 rotatably mounted thereon. A rounded driver 54 on the free end of the actuator 48 is movably received in a somewhat pie-shaped pocket 55, so that as the actuator 48 is rotated by manipulation of the handle 49 in a clockwise direction, as viewed in FIGURE 2, the actuator 48 will rotate the rock arm 40 in a counterclockwise direction, through the arm 46, in turn, moving the link 42, which results in the turning of the dead bolt 16.

FIGURE 2, In order to open the door from the outside when it is locked, it is necessary for the occupant also to withdraw the latch bolt 18, which is also employed to lock the door from the outside. To accomplish this, a drive linkage is employed interconnecting the tail disk 60 with the latch bolt 18. The drive linkage includes an actuator link 70 pivotally secured to the case 11 by a pivot pin 71. A flange 72 on the actuator link 70 is positioned behind a flange 73 on a rollback link 74. A head 75 on a latch bolt rod 76 overlaps the flange 73, the latch bolt rod 76 being attached to the latch bolt 18 by a pivotal connection 77. A spring 79 normally holds the rollback link 74 in the position shown in FIGURE 2 and also urges the latch bolt 18 to the extended position shown in FIGURE 2, acting in a counterclockwise direction.

The circumference of the tail disk 60 serves as an arcuate cam 80, which is adapted to engage a cam plate 81 on the actuator link 70. Hence, when the tail disk 60 rotates eccentrically in a clockwise direction about the center point 61, as viewed in FIGURE 2, for example, the arcuate cam 80 is moved against the cam plate 81, causing the actuator link 70 to swing in a counterclockwise direction about the pivot pin 71, as viewed in FIGURE 2. This, in turn, causes the flange 72 to move in a direction from left to right, as viewed in FIGURE 2, against the flange 73 of rollback link 74, and this flange 73 is in, turn, moving against the head 75 of the latch bolt 16 and withdrawing the latch bolt.

Even though the dead bolt 16 is in locked position, the latch bolt 18 can be retracted by rotation of the key-actuated mechanism 47 and the lock mechanism entirely unlocked, because the dead bolt 16 will be withdrawn by operation of the boss 62 in the manner previously described, and continued rotation of the key-actuated mechanism 47 will withdraw the latch bolt 18 by the mechanism and operation just related.

The door 24 always is openable from the inside if the dead bolt 16 is withdrawn or is in withdrawn position. It then only is necessary to retract the latch bolt 18, by rotating the inside knob 85 in either direction. The inside knob 85 is nonrotatably attached to a spindle 86 which is rotatably mounted by substantially conventional construction in the case 11. Under these circumstances, an outside knob 87 may be fixed nonrotatably to the case 11, as shown and as will be subsequently described. An inside knob 85 is rotatably attached to a spindle 86. Rotation of the spindle 86 and inside knob 85 can be in either a clockwise or counterclockwise direction, so that either end 90 or 91 moves against a block 92 against tension of the spring 78, causing a cam 93 to push against the rollback link 74, in turn causing it to pivot about a pin 74b. The door 24 is always in the case 11. When this happens, the flange 73 will move in a direction from left to right against the head 75, as viewed in FIGURE 2, and, in this way, will withdraw the latch bolt 18.

When the outside rollback 88 is free, it can be similarly rotated in one direction or the other by a spindle 86' and the outside knob 87 to move either the end 90 or 91 against the block 92, thereby to withdraw the latch bolt 18 in the manner similar to that already described in connection with the rotation of the inside knob 85.

In this type of lock, there is always the likelihood that the occupant of the room might inadvertently extend the dead bolt 16 to locked position while the door 24 is open. If the door 24 then should be slammed shut for any reason, with the dead bolt 16 extended, damage to the strike plate or the door frame or even to the lock mechanism itself might easily occur. Consequently, it is desirable to have some means of unlocking the lock so that the dead bolt 16 cannot be extended when the door 24 is in open position. This is accomplished by operation of the auxiliary bolt 20 and a portion of the accompanying auxiliary bolt mechanism. Attached to the auxiliary bolt 20 is an auxiliary bolt lever 100. The auxiliary bolt lever 100 includes a diagonal arm 101, at the upper end of which is a horizontal arm 102. In extended posi-
tion of the auxiliary bolt 20, the horizontal arm 102 underlies a stop flange 104 of a vertically reciprocating strip 105. A vertical guide flange 106 extending forwardly, as viewed in FIGURE 2, is slidably received in a vertical slot 107 of the strip 105. At the upper end of the auxiliary bolt 20, located in a slot 108 extending through the strip 105 to the rock arm 40, Therefore, when the auxiliary bolt 20 is extended, the strip 105 cannot move downwardly because the movement is blocked by engagement of the stop flange 104 upon the extension 103 of the horizontal arm 102. Accordingly, the rock arm 40 cannot be moved either by the return mechanism 46 or the key-actuated mechanism 47 while the door 24 is open. When the door 24 is closed, the auxiliary bolt 20 is held depressed by a surface of a strike (not shown) which is mounted on a door frame (not shown). Movement of the auxiliary bolt 20 to depressed position shifts the horizontal arm 102 from the left-hand position of FIGURE 2 toward the right. The effect of this movement is to shift the horizontal arm 102 from a blocking position beneath the stop flange 104 to a position clear of the stop flange 104. A cutout (not shown) in the horizontal arm 102 may provide a clearance. As a consequence, the strip 105 is free to move downwardly, and the lock 35 may be rotated either by the turn mechanism 46 or the key-actuated mechanism 47, either mechanism can be turned freely, thereby to extend the dead bolt 16 to locked position.

For yieldingly holding the rock arm 40 in one position or another, there is provided a leaf spring 110 secured to the block 35 by anchoring elements 111 and 112, so that a free end 113 of the leaf spring 110 can engage one side of the other of a projection 114 on the rock arm 40, as shown respectively in FIGURE 2.

The auxiliary bolt 20 performs a double function in that it can also block pry-back of the latch bolt 18 by unauthorized means as, for example, by use of a pry when the door 24 is in closed position. To accomplish this, there is provided a bell crank 117 pivotally secured by a pivot pin 119. When the auxiliary bolt 20 moves from the extended position of FIGURE 2 along a slide-

way 37, which is to a large extent a substantially rectangular passageway through the block 35, is constructed of the same material as the liner 160 and its sheet 165. It is preferable to construct the liner 160 of an appropriate synthetic plastic resin, which in the present instance is relatively hard and of good tensile strength. Typical acceptable materials of this kind are known commercially as Delrin and nylon. Material of this kind has a very low friction surface characteristic, especially when an unlike material, such as metal, is moved in engagement with it. In the present construction, most of the moving lock parts, except for the rock arm 40, the block 92, and the lock- back slide member 140 are of metal.

To withdraw the locking bracket 133 from the slot 131, the set screw 134, with a left-hand thread, is rotated in a left-hand direction a sufficient withdrawal distance. When this is done, the housing 51 can be removed. When it is replaced, it is locked in position by manipulation of the set screw 134 by moving the locking bracket 133 so that it again engages the slot 131. To prevent inadvertent removal, the head of the set screw 134 is located below the level of the front end wall 14 and is normally covered by the armored front plate 21. Hence, it is necessary first to have the door 24 in open position and to remove the armored front plate 21 before the set screw 134 can be operated.

To lock the outside knob 87 against rotation, as shown in FIGURE 2, there is provided a hold-back slide member 140 slidably mounted for movement in a vertical direction in an opening 141 in the front end wall 14. A crank 143 pivotally mounted upon a pivot pin 144 has an arm 145 attached to the hold-back slide member 140 by means not shown. Another arm 147 of the crank 143 extends upwardly into an opening 148 in a horizontally reciprocatably mounted blocking slide 149. A tab 150 is slidably mounted in an appropriate horizontal slot 151 in the outside wall 13. On the opposite side of the blocking slide 149 is a tab 152 which is adapted to engage in appropriate horizontally extending slots 153 and 153'. The blocking slide 149 is also guided by an upwardly facing horizontal guide 154 and a downwardly facing horizontal guide 155, as shown in FIGURE 2. When the hold-back slide member 140 is in upward position, the right-hand end of the blocking slide 149 is received in a radially extending slot 157 of the outside rollerback 88 and in this way prevents the outside rollerback 88' from being rotated by operation of the outside knob 87. The outside knob 87 and its outside rollerback 88' can be unlocked by moving the hold-back slide member 140 downwardly, thereby to withdraw the blocking slide 149 from its position of engagement with the radially extending slot 157.

Substantially all of the operating parts heretofore described are mounted upon and carried by a liner 160, details of which are shown in FIGURES 8, 9, 10, 11, 12, and 13. The liner 160 is substantially coextensive with the surface of the inside wall 12 and is fastened in engagement with the inside wall 12 by appropriate fasten-

overview, as shown in FIGURE 2. When this happens, a block-

To withdraw the locking bracket 133 from the slot 131, the set screw 134, with a left-hand thread, is rotated in a left-hand direction a sufficient withdrawal distance. When this is done, the housing 51 can be removed. When it is replaced, it is locked in position by manipulation of the set screw 134 by moving the locking bracket 133 so that it again engages the slot 131. To prevent inadvertent removal, the head of the set screw 134 is located below the level of the front end wall 14 and is normally covered by the armored front plate 21. Hence, it is necessary first to have the door 24 in open position and to remove the armored front plate 21 before the set screw 134 can be operated.

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Substantially all of the operating parts heretofore described are mounted upon and carried by a liner 160, details of which are shown in FIGURES 8, 9, 10, 11, 12, and 13. The liner 160 is substantially coextensive with the surface of the inside wall 12 and is fastened in engagement with the inside wall 12 by appropriate fastening devices extending through spacers 161, 162, 163, and 164 at sundry locations upon a relatively thin sheet of the liner 160, which is the lock member associated with the inside wall 12. The block 35 and the block 153, forming the upper end of the block 35, are actually integral portions of the material of the sheet 165 and extend forwardly from the sheet. Accordingly, the slide-

way 37, which is to a large extent a substantially rectangu-
lar passageway through the block 35, is constructed of the same material as the liner 160 and its sheet 165. It is preferable to construct the liner 160 of an appropriate synthetic plastic resin, which in the present instance is relatively hard and of good tensile strength. Typical acceptable materials of this kind are known commercially as Delrin and nylon. Material of this kind has a very low friction surface characteristic, especially when an unlike material, such as metal, is moved in engagement with it. In the present construction, most of the moving lock parts, except for the rock arm 40, the block 92, and the lock-back slide member 140 are of metal.

Wells 166 and 167, also made of the same material as the liner 160, extend forwardly and provide the slide-

way 120, consisting of opposite faces which guide cor-
responding opposite sides of the auxiliary bolt 20 as it reciprocates in and out of the case 11. Similarly, a web 168 of the same material as the liner 160 provides the guide 154, and the web 164 in its walls contains a material of which the liner 160 is constructed. For the same purpose, a boss 169, having a passage 170 there-
through, slidably accommodates the latch bolt rod 76. Moreover, what has previously been identified as the pin 74 for pivotally mounting the rollback link 74 is, in fact, a sleeve-like extension of the spacer 164. Similarly, a stud 171 has on it the projection of smaller diameter, heretofore identified as the pivot pin 144, which rotatably slides through the sheet 143. The large identified pins, therefore, act as bearings for certain pivoting parts.

The sheet 165 also provides other bearings, as, for example, the bearing aperture 172 which accommodates a cylindrical projection 173 which is the opposite counterpart of a cylindrical projection 173 at the center of rotation 40 into which it extends the lock 41. Recesses 174 and 175, laterally spaced in parallel relationship, form sliding tracks for respective shoes 176 and 177 on the block 92, thereby to slidably mount the block 92 in position, as clearly shown in FIGURE 7. Moreover, a surface 178, for example, located between bosses 179 and 180 provides a low friction sliding surface against which the strip 105 can freely slide as it reciprocates in a vertical direction. An opening 181 mounts a bushing 182, threaded on the exterior, to receive the housing 51 of the turn mechanism 46, as shown to good advantage to FIGURE 5. Other surface areas of the sheet 165 provide low friction engagements for s sundry parts as they swing or slide during operation. Where additional stabilizing support is needed, a boss like the boss 183 may be provided, the inwardly facing surface 184 of which serves as a supporting guide for the rollback link 74.

When the sheet 165 of the liner 160 is fastened to the inside wall 12 in the manner shown, it forms a very firm, solid support and base for mounting virtually all of the moving parts of the lock mechanism. Therefore, the liner 160 serves to hold all of the parts in position when the outside wall 13, serving as a cover, is removed to gain access to the interior. Since all of the operating parts are thus held in position, any one or more of them can easily be removed without disturbing other working parts. In this way, rearrangement and substitution of parts is made a relatively easy task capable of being accomplished in a reasonably short time. Hence, the low friction advantages inherent in a liner of synthetic plastic material are increased by having the liner serve as a mounting and assembly liner for the interior of the case. This is an advantage separate and apart from the low friction advantage. Moreover, being of synthetic plastic resin material, the liner and all of its integral parts consisting of bosses, nests, spaces, and even openings, can be cast as a single piece and fitted to the assembled case, whereupon all of the moving parts can be mounted in position and guided.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein, but is to accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. In a mortise lock comprising a case which includes an inside wall, an outside wall and a lock mechanism located between said walls including at least one reciprocably mounted bolt assembly, at least one pivotally mounted bolt assembly, and at least one slidably mounted member, the combination of a liner for the case including a relatively hard synthetic plastic resin material having low friction surface characteristics, said liner comprising a relatively thin sheet anchored in engagement with at least one of said walls, said liner having transverse arcuate portions comprising a bearing for said pivotally mounted member, an integrally formed block on the inside face of said liner having surfaces thereon comprising a sideway for said bolt assembly, said liner having guides for said slidably mounted member, said liner comprising a mounting base which holds the lock mechanism in assembled relationship when the other of said walls is not mounted on said case.

2. In a mortise lock comprising a case which includes an inside wall, an outside wall, and a lock mechanism located between said walls including at least one reciprocably mounted bolt assembly, at least one pivotally mounted bolt assembly, and at least one slidably mounted member, the combination of a liner for the case of relatively hard synthetic plastic resin material having low friction surface characteristics, said liner including a relatively thin sheet anchored in engagement with at least one of said walls, said liner having transverse arcuate portions comprising a bearing for said pivotally mounted member, an integrally formed block on the inside face of said sideway, having surfaces thereon comprising a slideway for said bolt assembly, said liner having guides for said slidably mounted member, said liner comprising a mounting base which holds the lock mechanism in assembled relationship when the other of said walls is not mounted on said case.

3. In a mortise lock comprising a case which includes an inside wall, an outside wall, and a lock mechanism comprising reciprocably mounted bolt assemblies having actuating means therefor including pivotally mounted members and slidably mounted members, the combination of a liner for the case of relatively hard synthetic plastic resin material having low friction surface characteristics, said liner comprising a relatively thin sheet anchored in engagement with the inside surface of one of said side walls, said sheet having openings therethrough comprising low friction bearings for some of said rotatably mounted members, integrally formed blocks on the inside face of said sheet for others of said rotatably mounted members and elongated bosses having low friction transverse surfaces thereon, said bosses comprising reinforcing for said sheet, slideways for said bolt assemblies and low friction guides for said slidably mounted members.

4. In a mortise lock comprising a case which includes an inside wall, an outside wall and a lock mechanism located between said walls including at least one reciprocably mounted bolt assembly having actuating means therefor including pivotally mounted members and slidably mounted members, the combination of a liner for the case of relatively hard synthetic plastic resin material having low friction surface characteristics, said liner comprising a relatively thin sheet anchored in engagement with the inside surface of one of said side walls, said sheet having arcuate portions comprising low friction bearings for said rotatably mounted members, integrally formed blocks on the inside face of said sheet having low friction transverse surfaces thereon comprising slideways for said bolt assembly and low friction guides for said slidably mounted members, said liner comprising a mounting base which holds the lock mechanism in assembled relationship when the other of said walls is not mounted on said case.

5. In a mortise lock comprising a case which includes an inside wall, an outside wall, and a lock mechanism comprising at least one reciprocably mounted bolt assembly having actuating means therefor including pivotally mounted members and slidably mounted members, the combination of a liner for the case of relatively hard synthetic plastic resin material having low friction surface characteristics, said liner comprising a relatively thin sheet anchored in engagement with the inside surface of at least one of said side walls, said sheet having openings therethrough comprising low friction bearings for some of said rotatable members, integrally formed blocks on the inside face of said sheet and said bosses having low friction transverse surfaces thereon, said bosses comprising reinforcing for said sheet, slideways for said bolt assembly, and low friction guides for said slidably mounted members, and spaces forming part of said liner extending from said sheet to the wall opposite said one
wall, said liner comprising a mounting base which holds the lock mechanism in assembled relationship when the other of said walls is not mounted on the case.

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