

## MORTICE LOCK ASSEMBLY

This invention relates to a mortice lock assembly having a bolt being  
5 movable between an operative position and an inoperative position. More preferably the bolt is of the kind that is mounted on a housing for pivotal movement between the inoperative position whereby the bolt is substantially within the housing and the operative position whereby the bolt projects from the housing. A bolt assembly of the foregoing kind is often referred to as swing bolt.  
10 It will be convenient to hereinafter describe the invention with reference to swing bolts.

A mortice lock assembly can be located within a mortice cavity formed in a hinged door panel or a sliding door panel so that the bolt can project into a  
15 strike or similar member located in an associated door jamb when the bolt is in the operative position. Where the door is a timber door the mortice cavity may be chiselled or routed out of the leading edge of the door. Alternatively the door may be formed from a hollow metal frame, in which case the mortice cavity is created by forming a hole in the leading edge of the door frame.

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A swing bolt will normally have a pivoting end, pivotally mounted on the housing, and a free end for location in the strike when in the operative position. Where the swing bolt is for use with a hinged door, the door is stopped from moving from a closed position by a vertical face of the free end of the swing bolt  
25 locating adjacent a vertical face of the strike. Where the lock assembly is for use with a sliding door, the swing bolt is normally formed with a hook or beak at its free end for location behind a catch element formed in the strike to stop the door from moving from a closed position. The lock assembly may also have deadlocking means for retaining the swing bolt in the operative position so as to  
30 resist an unauthorised force moving it from the operative position.

A problem with lock assemblies with swing bolts is that security can be compromised if the free end of the swing bolt fails to locate in the strike. The free end of the bolt will fail to locate in the strike if the swing bolt does not reach

the operative position. The bolt is often moved by operation of a key operated cylinder lock the cam of which engages the swing bolt through a lost motion means. This lost motion means allows the key to rotate approximately 180° while moving the swing bolt only 90 degrees to the operational position.

- 5 The key must be rotated through from 0° to 180° to move the bolt to the operational position, and back to 0° so that the key can be removed from cylinder lock. However this type of lost motion means can allow the key to be removed from the cylinder lock without the bolt reaching the operative position. While this may still provide limited security when installed in a hinged door,
- 10 when installed in a sliding door unless the hook is located behind the catch in the strike, the lock assembly can not hold the door in the closed position. Furthermore the deadlocking function can also be compromised if the bolt fails to reach the operative position, allowing for forced movement of the swing bolt back to the inoperative position.

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- The applicant has previously made attempts to provide a lock assembly that addresses these problems by utilising a biasing means in the form of a torsion spring acting between the bolt and a drive means to urge the bolt towards either the operative or inoperative position. The details of that assembly
- 20 are described in AU 55664/80. The lock assembly described in that specification utilised a lost motion system that required the key to rotate through 360° to move the bolt to the operative position. This allowed the key to be removed from the cylinder lock without having to rotate the key back from an intermediate position. It has been appreciated by the Applicant that the lock
- 25 assembly could be improved, and in particular the biasing means could be improved. The location of the biasing means within the housing can leave it vulnerable to tampering. Furthermore it is difficult to assemble and can have a tendency to fail over time.

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The free end of the bolt may also fail to remain securely in the strike if the housing is not located correctly in the mortice cavity. A problem with mortice locks in general is that the size of the cavity formed in the door can exceed the size of the lock assembly housing. This can allow the housing to be forced deeper into the cavity to such an extent that the free end of the bolt is no longer

located in the strike when in the operative position. Naturally this can compromise the security of the lock assembly.

5 A reference herein to a patent document or other matter which is given as prior art is not to be taken as an admission that that document or matter was, in Australia, known or that the information it contains was part of the common general knowledge as at the priority date of any of the claims.

10 It is an object of this invention to provide an alternate mortice lock assembly that addresses at least one of the problems with existing mortice lock assemblies.

According to one aspect of this invention there is provided there is provided a mortice lock assembly including a housing, a bolt mounted on the housing for pivoting movement relative to the housing between an operative position whereby it projects from the housing and an inoperative position whereby it is located substantially within the housing, a drive means being associated with the bolt and mounted on the housing for pivoting movement relative to the housing between a first position which deadlocks the bolt in the operative position and a second position which renders the bolt in the inoperative position, a key operated actuator being operable from an outer side of the lock assembly by an authorised key to pivot the drive means, biasing means acting on the drive means to urge the drive means towards either the first or second position, the biasing means including a resilient element having an axial dimension which varies when the drive means moves between the first and second position.

It is preferred that the resilient element be a helical spring having an axial length dimension which varies when the drive means moves between the first and second position. It is further preferred that the helical spring is a compression spring. It is further preferred that the biasing means includes a column element connected to the drive means which acts between the drive means and the resilient element. It is still further preferred that the resilient element surrounds the column element at least in part to provide the resilient

element with lateral stability. It is still further preferred that the resilient element acts between the column element and the housing. The resilient element preferably engages a shoulder formed on the column element and a wall of the housing.

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It is preferred that the drive means include a drive arm that pivots about a drive axis in response to operation of the actuator, the drive arm has a free end located remote from the drive axis that operatively engages the bolt when moving between the operative and inoperative positions, whereby the drive means deadlocks the bolt in the operative position by locating the free end of the drive arm in line with the drive axis to resist a force from the bolt directed through the drive axis and the free end when in the operative position. The drive means preferably deadlocks the bolt in the inoperative position by locating the free end of the drive arm in line with the drive axis to resist a force from the bolt directed through the drive axis and the free end when in the inoperative position. The drive means also preferably includes at least one gear for engagement by a gear associated with a cam of the actuator. It is further preferred that the drive means includes a mount for mounting the drive means on the housing, the mount being connected to the drive arm for rotation therewith relative to the housing, the mount having at least one gear for engagement by a gear associated with a hand engagable actuator operable from an inner side of the lock assembly for moving the lock bolt between the operative and inoperative positions.

25 It is preferred that the mortice lock include an adjustable spacer strut which in use extends from the housing so as to engage a rear wall of the mortice cavity for securely locating the housing within the cavity.

It is preferred that the strut includes a movable member, the moveable member having an engaging end which is rectilinearly movable relative of the housing to engage the rear wall of the mortice cavity. The movable member preferably has a drive end which is rotated relative to the housing to move the engaging end relative to the housing. The movable member preferably also includes a threaded shaft for location in a threaded bore associated with the

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lock assembly housing whereby rotation of the shaft relative to the bore moves the movable element relative to the housing. It is preferred that the threaded bore is formed in a nut that is fixed in position relative to the housing so as to resist rotation relative to the housing when the shaft is rotated.

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According to another aspect of this invention there is provided a mortice lock assembly for location in a mortice cavity formed in a door, the lock assembly including a housing, a bolt mounted on the housing for pivoting movement relative to the housing between an operative position whereby it projects from the housing and an inoperative position whereby it is located substantially within the housing, a drive means being associated with the bolt and mounted on the housing for pivoting movement relative to the housing between a first position which deadlocks the bolt in the operative position and a second position which renders the bolt in the inoperative position, a key operated actuator being operable from an outer side of the lock assembly by an authorised key to pivot the drive means, and an adjustable strut which in use extends from the housing so as to engage a rear wall of the mortice cavity for securely locating the housing within the cavity.

It will be convenient to hereinafter describe the invention in greater detail by reference to the accompanying drawings showing one example embodiment of the invention. The particularity of the drawings and the related detailed description is not to be understood as superseding the generality of the preceding broad description of the invention.

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Figure 1 is an exploded view of the preferred embodiment of the mortice lock assembly according to the invention.

Figure 2 illustrates a front elevation view of the lock assembly with a front portion of the housing removed and the bolt in an inoperative position.

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Figure 3 shows a rear elevation view of the lock assembly with a rear portion of the housing removed with the bolt in the inoperative position.

Figure 4 illustrates a front elevation view of the lock assembly with a front portion of the housing removed and the bolt being between the inoperative and operative position.

- 5            Figure 5 shows a rear elevation view of the lock assembly with a rear portion of the housing removed with the bolt being between the inoperative and operative position.

- 10           Figure 6 illustrates a front elevation view of the lock assembly with a front portion of the housing removed and the bolt in the operative position.

Figure 7 shows a rear elevation view of the lock assembly with a rear portion of the housing removed with the bolt in the operative position.

- 15           Referring firstly to Figure 1 which shows a housing having a front part 1 and a rear part 2, the rear part 2 being formed with a top wall 3, a bottom wall 4, a rear wall 5 and a front wall 6. A gap 7 is provided in the front wall 6 to allow a bolt 8 to extend there through when in the operative position. The bolt 8 is mounted on a spindle 59 which is mounted to the front 1 and rear 2 parts of the housing. The housing is preferably formed as a zinc diecast as this allows for the formation of relatively intricate features.
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- The mortice lock assembly illustrated in Figure 1 also includes a cylinder lock 9 having a casing 10 which extends through an aperture 11 formed in the front part 1 of the housing for operation from an outer side of the lock assembly. The cylinder lock 9 includes a barrel 12 that is rotatable relative to the casing 10 with a cam 13 which is connected to the barrel 12 for rotation therewith. Whilst the cylinder lock 9 illustrated is a pin tumbler type cylinder lock, this may be substituted by another form of cylinder lock such as a disk or wafer tumbler lock.
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The mortice lock assembly preferably includes a hand operable actuator assembly operable from an inner side of the lock assembly. The lock assembly illustrated in Figure 1 has the hand operable actuator assembly including a

mount 14 for location in an aperture 15 formed in the rear part 2 of the housing for operation from an inner side of the lock assembly. The hand operable actuator assembly includes a barrel 16 that is rotatable relative to the mount 14 and a cam 17 which engages the barrel 16 for rotation therewith. The barrel 16 is formed with a square cross sectioned bore 18 which can receive a spindle of a hand engagable element such as a turn-snib or lever handle (not shown) for rotating the barrel 16. Alternatively the spindle of the hand engagable element can locate in the square cross sectioned bore 62 of a mount 20 (see figure 3). It should be appreciated that the hand operable actuator assembly could be replaced by a further key operated cylinder lock so that operation of the mortice lock assembly is controlled by a key operated cylinder lock on both the inner and outer sides.

The mortice lock assembly illustrated in Figure 1 also includes a drive means. The drive means illustrated includes an operating lever 19 and the mount 20 for mounting the operating lever on the housing. The operating lever 19 illustrated is formed with a gear teeth 21 for engagement by gear teeth 22 of the cam 13 of a key operated actuator. The mount 20 illustrated is also formed with a gear 51 for engagement by the cam 17 of the hand operable actuator assembly.

The operating lever 19 is connected to the mount 20 so that rotation of either cam 13, 17 results in rotation of the operating lever 19 about a drive axis XX. Referring briefly to Figure 3 which shows the preferred embodiment of the connection between the operating lever 19 and the mount 20. Whilst there may be a range of suitable connections the preferred connection illustrated involves keying of the operating lever into the mount which provides engaging surfaces 23,52 on the operating lever and the mount with extend in a direction parallel to a drive axis XX of the drive means. The drive means is rotatable about the drive axis XX between a first and second position.

The operating lever 19 illustrated in Figure 1 also includes a drive arm 24 extending radially from the drive axis XX which engages the bolt 8. The bolt 8 is formed with a cavity 25 defined at least in part by a pair of opposing surfaces

27,28 formed at a drive end of the bolt 19. A free end 26 of the drive arm 24 cooperates with either one of these surfaces 27,28 to retain the bolt 19 in an operative or inoperative position in a manner that will be described later in the specification with reference to Figures 2 to 7.

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The mortice lock assembly illustrated in Figure 1 also includes a biasing means 29. The biasing means 29 cooperates with the drive means to urge the drive means towards either a first or second position which corresponds to locating the bolt in either the operative or inoperative positions. The biasing means 29 illustrated includes a column element 30 having a end 81 for location in a recess 82 formed in the mount 20. The end 81 is shaped relative to the recess 82 so as to allow the end 81 to pivot within the recess 82 as the drive means moves between the first and second position.

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The biasing means 29 includes a resilient element 32 located at an end 33 of the column element 30 being remote from the end 81. The resilient element urges the end 81 to seat within the recess 82. The resilient element 32 illustrated is a helical compression spring. It should be understood that while the helical compression spring is preferred, it may be substituted by another form of suitable resilient element. The compression spring 32 is positioned between a pair of shoulders 34,35 formed on the end 33 of the column element 30 and a pair of shoulders 36,37 formed adjacent the top wall 3 of the rear part 2 of the housing.

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The column element 30 illustrated is secured to the drive means by way of a projection 31 formed on the mount 20. It ought to be appreciated that the projection 31 could alternatively be located on the operating lever 19 or that the projection 31 could extend between the operating lever 19 and the mount 20. The column element 30 illustrated includes a free end 81 having an aperture formed therein to receive the projection 31. This arrangement is provided to reduce the likelihood of the of the end 81 becoming unseated from the recess 82.

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The mortice lock assembly illustrated in Figure 1 also includes an adjustable strut 39 in the form of a nut 40 and bolt 41 assembly associated with the rear wall 5 of the rear part 2 of the housing. The nut is located in a cavity 38 formed in the rear wall 5 so that rotation of the bolt 41 relative to the nut 40 causes a free end 42 of the bolt 41 to move relative to the rear wall 5 of the housing. Whilst only a nut 40 and bolt 41 arrangement is illustrated, it ought to be appreciated that other means may be substituted for the nut and bolt to achieve a similar function. It is intended that in use the free end 42 of the bolt 41 engage a rear wall of a mortice cavity in which the mortice lock assembly is located so as to enable the strut 39 to resist the mortice lock assembly from being forced deeper into the cavity.

Referring now to Figure 2 which illustrates the drive means in the second position and the bolt 8 in the inoperative position. It ought to be noted that the compression spring 32 is in a relatively relaxed state. It should also be noted that the free end 26 of the drive arm 24 is positioned between the drive axis XX of the drive means and the surface 28 defined in the cavity 25 in the drive end of the bolt 8 so as to resist any force created by an unauthorised user attempting to manipulate the bolt 8 from the inoperative position. It is preferred that the position of the free end 36 relative the surface 28 and the axis XX is slightly over centre so that unauthorised manipulation of the bolt 8 results in urging of the drive means further away from the first position.

Referring now to Figure 3 which illustrates both cams 13,17 engaging the gears 51,21 of the mount 20 and operating lever 19 so that rotation of either barrel 12,16 will result in rotation of the operating lever 19 about the drive axis XX. It should also be noted that the cam 13 of the key operated actuator is not directly connected to the cam 17 of the hand engagable actuator so that each cam 13,17 operates independently of the other. More specifically while rotation of the key operated cam 13 will rotate the hand operated cam 17, rotation of the hand operated cam 17 will not rotate the key operated cam 13. This is because the key operated cam 13 will be rotated to disengage from the gear 21 of the operating lever 19 to enable the key to be removed from the cylinder lock 9.

Referring now to Figures 4 and 5 which illustrates the bolt 8 located between the operative and inoperative positions. It is important to note that the spring 32 is in a relatively compressed state as the drive means is between the first and second position. It will be appreciated that in the compressed state the  
5 spring 32 will urge the column element 30 to act on the drive means to move the drive means towards either the first or second position. This will in turn encourage the bolt 8 to move towards either the operative or inoperative position.

10 Figures 6 and 7 illustrate the drive means in the first position and the bolt 8 in the operative position. Figure 6 in particular illustrates the bolt 8 extending out through the gap 7 in the front wall 6 of the rear part 2 of the housing. In this position the free end 26 of the drive arm 24 is positioned between the drive axis XX of the drive means and the surface 27 of the cavity 25 formed at the drive  
15 end of the bolt 8 so as to resist a force applied to the free end of the bolt 8 attempting to move the bolt away from the operative position. It is preferred that the position of the free end 36 relative the surface 28 and the axis XX is slightly over centre so that unauthorised manipulation of the bolt 8 results in urging of the drive means further away from the second position.

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The bolt illustrated in the Figures is formed with a beak or hook at its free end for engaging a catch formed in the strike element (not shown). It ought to be appreciated that the invention is also applicable to a cuboid style bolt without a hook at the free end.

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The biasing means of the invention provides the lock assembly with various advantages over the prior art. The location of the resilient element or spring remote from the bolt and drive means makes it less susceptible to damage by, or interference with the moving parts of the lock assembly.  
30 Furthermore the use of the helical compression spring as shown is considered to be more robust than the resilient elements of the prior art. A further advantage of the lock assembly is the ability to positively space the rear wall of the housing from the rear wall of the mortice cavity within which the lock assembly is located.

Finally it is to be understood that various alterations, modifications and/or additions may be introduced to the parts previously described without departing from the spirit or ambit of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A mortice lock assembly including a housing, a bolt mounted on the housing for pivoting movement relative to the housing between an operative position whereby it projects from the housing and an inoperative position whereby it is located substantially within the housing, a drive means being associated with the bolt and mounted on the housing for pivoting movement relative to the housing between a first position which deadlocks the bolt in the operative position and a second position which renders the bolt in the inoperative position, a key operated actuator being operable from an outer side of the lock assembly by an authorised key to pivot the drive means, biasing means acting on the drive means to urge the drive means towards either the first or second position, the biasing means including a resilient element having an axial dimension which varies when the drive means moves between the first and second position.
2. A mortice lock assembly according to claim 1 wherein the resilient element is a helical spring having an axial length dimension which varies when the drive means moves between the first and second position.
3. A mortice lock assembly according to claim 1 wherein the helical spring is a compression spring.
4. A mortice lock assembly according to claim 1 or 2 wherein the biasing means includes a column element connected to the drive means which acts between the drive means and the resilient element.
5. A mortice lock assembly according to claim 4 wherein the resilient element surrounds the column element at least in part to provide the resilient element with lateral stability.
6. A mortice lock assembly according to claim 5 wherein the resilient element acts between the column element and the housing.

7. A mortice lock assembly according to claim 6 wherein the resilient element engages a shoulder formed on the column element and a wall of the housing.
- 5 8. A mortice lock assembly according to any one of the preceding claims wherein the drive means includes a drive arm that pivots about a drive axis in response to operation of the key operated actuator, the drive arm has a free end located remote from the drive axis that operatively engages the bolt when moving between the operative and inoperative positions, whereby the drive  
10 means deadlocks the bolt in the operative position by locating the free end of the drive arm in line with the drive axis to resist a force from the bolt directed through the drive axis and the free end when in the operative position.
9. A mortice lock assembly according to claim 8 wherein the drive means  
15 deadlocks the bolt in the inoperative position by locating the free end of the drive arm in line with the drive axis to resist a force from the bolt directed through the drive axis and the free end when in the inoperative position.
10. A mortice lock assembly according to claim 8 or 9 wherein the drive  
20 means includes at least one gear for engagement by a gear associated with a cam of the actuator.
11. A mortice lock assembly according to any one of claims 8 to 10 wherein the drive means includes a mount for mounting the drive means on the housing, the mount being connected to the drive arm for rotation therewith relative to the  
25 housing, the mount being associated with a hand engagable actuator operable from an inner side of the lock assembly for moving the lock bolt between the operative and inoperative positions.
- 30 12. A mortice lock assembly according to claim 11 wherein the mount is associated with the hand engagable actuator by way of a gear train.
13. A mortice lock assembly according to claim 12 wherein the hand engagable actuator is connected to the mount through a spindle.

14. A mortice lock assembly according to any one of the preceding claims including an adjustable strut which in use extends from the housing so as to engage a rear wall of the mortice cavity for securely locating the housing within  
5 the cavity.

15. A mortice lock assembly according to claim 14 wherein the adjustable strut includes a movable member, the moveable member having an engaging end which is rectilinearly movable relative of the housing to engage the rear wall  
10 of the mortice cavity.

16. A mortice lock assembly according to claim 15 wherein the movable member has a drive end which is rotated relative to the housing to move the engaging end relative to the housing.  
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17. A mortice lock assembly according to claim 16 wherein the movable member includes a threaded shaft for location in a threaded bore associated with the lock assembly housing whereby rotation of the shaft relative to the bore moves the movable element relative to the housing.  
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18. A mortice lock assembly according to claim 17 wherein the threaded bore is formed in a nut that is fixed in position relative to the housing so as to resist rotation relative to the housing when the shaft is rotated.

25 19. A mortice lock assembly for location in a mortice cavity formed in a door, the lock assembly including a housing, a bolt mounted on the housing for pivoting movement relative to the housing between an operative position whereby it projects from the housing and an inoperative position whereby it is located substantially within the housing, a drive means being associated with  
30 the bolt and mounted on the housing for pivoting movement relative to the housing between a first position which deadlocks the bolt in the operative position and a second position which renders the bolt in the inoperative position, a key operated actuator being operable from an outer side of the lock assembly by an authorised key to pivot the drive means, and an adjustable strut which in

use extends from the housing so as to engage a rear wall of the mortice cavity for securely locating the housing within the cavity.

20. A mortice lock assembly according to claim 19 wherein the adjustable  
5 strut includes a movable member, the moveable member having an engaging end which is rectilinearly movable relative of the housing to engage the rear wall of the mortice cavity.

21. A mortice lock assembly according to claim 20 wherein the movable  
10 member has a drive end which is rotated relative to the housing to move the engaging end relative to the housing.

22. A mortice lock assembly according to claim 20 wherein the movable  
15 member includes a threaded shaft for location in a threaded bore associated with the lock assembly housing whereby rotation of the shaft relative to the bore moves the movable element relative to the housing.

23. A mortice lock assembly according to claim 22 wherein the threaded  
20 bore is formed in a nut that is fixed in position relative to the housing so as to resist rotation relative to the housing when the shaft is rotated.