

ADJUSTABLE MORTICE LOCK ASSEMBLY

This invention relates to a mortice lock assembly for location in a mortice cavity formed in an edge of a door. Locks of this kind are often used for securing doors and the like in a closed position and it will be convenient to hereinafter describe the invention with reference to this application. It should be appreciated however that the invention may have other applications.

A mortice lock assembly includes a bolt that when the lock assembly is installed, projects from an edge of the door when the bolt is in an extended position. The bolt engages a strike on the door frame for securing the door in a closed position. Door furniture is located on opposing faces of the door panel, on the inner and outer side, and generally includes hand engagable member such as a turn knob or lever handle. Each knob or handle (hereinafter referred to generally as handle) interacts with a rotatable hub whereby rotation of either hub results in retraction of the bolt from the extended position. The lock assembly also includes a lock means, often controlled by a key operated cylinder lock, that in a locked condition renders the hubs inoperable.

The way in which a mortice lock needs to function can vary from one installation to the next. As an example it may be desirable for the lock means to be inoperable on the inner hub providing what is generally referred to as an escape function. However the inner hub on a lock assembly installed in the right hand edge of the door will be the outer hub on a lock assembly installed on the left hand edge of the door. While it is possible to provide two different types of mortice lock assembly for installation in the right and left hand side, it is preferable for a single mortice lock assembly to be adjustable to accommodate these different requirements. This type of adjustment is desirable in a range of other functions of a mortice lock assembly to suit the requirements of the environment in which it is used.

It is generally desirable for the adjustments to be easy to make by those installing the lock, once it has been explained how to make those adjustments. It is however also preferred that the lock, when installed, does not present itself as a lock that can be easily tampered with. It is therefore preferred that the lock be easy but not immediately obvious to adjust.

The above discussion of devices is included in the specification solely for the purpose of providing context for the present invention. It is not suggested or represented that any of these matters formed part of the prior art or were common general knowledge in the field relevant to the present invention as it existed in Australia before the priority date of this invention.

It is convenient in this specification to use the terms such as "inner" and "outer", for the purpose of describing an installed orientation of the mortice lock. The orientation of the lock can change, as explained in the previous paragraphs, and consequential changes in the interpretation of such terms needs to be made for a proper understanding of the invention. In particular, the terms "inner" and "outer" have been used to describe the hubs, and for ease of explanation the inner hub is that hub shown on the near side of the mortice lock assembly in Figure 3. Naturally if the mortice lock of the figures was pivoted the inner hub would then be the outer hub.

According to this invention there is provided a mortice lock assembly for use with a door, including a housing for location at least partly within a cavity formed in the door, a bolt movable relative to an extended position whereby it extends out a front face of the housing, an inner hub and an outer hub with each inner hub and outer hub for interaction with a hand engagable member from the inner and outer sides of the door respectively, each inner hub and outer hub being operable to retract the bolt from the extended position, a lock means

including an inner detent and an outer detent that are associated with the inner hub and outer hub respectively, a selector being operable from the front face of the housing for selecting the condition of the inner detent and outer detent as either active or inactive respectively whereby
5 in an active condition the inner detent and or the outer detent are adjustable between a locked position in which the respective inner hub and outer hub is rendered inoperable and an unlocked position in which the respective inner hub and outer hub is operable and in an inactive condition the lock means is incapable of adjusting the inner detent and
10 or outer detent to adopt the locked position, a lock release means that when in an active condition movement of the bolt from the extended position adjusts the position of the inner detent and or outer detent from the locked position to the unlocked position, the selector also being operable to select the condition of the lock release means as either
15 active or inactive.

It is preferred that the bolt includes a biasing means for biasing the bolt toward the extended position. The bolt preferably includes a head with a bevelled leading face for engagement in use with a strike
20 located in a door frame whereby the bolt is moved from the extended position when the bolt head is slid across the strike when closing the door. It is further preferred that the mortice lock assembly include a follower interacting between each of the inner hub and the outer hub and the bolt so that rotation either the inner hub or outer hub moves the
25 follower which retracts the bolt from the extended position. It is further preferred that the follower interacts with the lock release means so that movement of the follower while the lock release means is in the active condition results in movement of the inner detent or outer detent from the locked position. It is further preferred that the follower interacts with
30 the bolt so that movement of the bolt independently from the inner or outer hub moves the follower.

It is preferred that the lock release means includes a biasing means to bias the lock release means towards adopting the active condition. It is also preferred that the lock means includes a biasing means to bias the lock means towards adopting the active condition. It is
5 preferred that the lock release means includes a lever that is rotatable about an axis substantially perpendicular to a direction in which the bolt is moved when the lock release means is adjusted between an active condition and an inactive condition.

10 It is preferred that the selector includes an adjustable member that is located at the front of the housing for adjusting the condition of the inner detent or outer detent or lock release means. It is further preferred that the adjustable member is fastened relative to the housing so as to allow for adjustment of the condition of the inner detent or outer
15 detent or lock release means without requiring detachment from the housing. It is further preferred that the selector includes a retainer member interacting with the housing and the adjustable member and a fastener fastening the adjustable member to the retainer member. It is further preferred that the retainer member snap engages the fastener. It
20 is further preferred that the housing includes a flange located behind the front of the housing which includes an aperture to accommodate the fastener.

It is preferred that the adjustable member is rotatable about an
25 axis which is substantially parallel to a direction in which the bolt moves so as to adjust the selection of the condition of the inner detent, the outer detent and or the lock release means. It is further preferred that the selector includes a link means linking the adjustable member with the inner detent, the outer detent and the lock release means. It is
30 further preferred that the link means includes a plurality of elongate members each being movable in a direction which is substantially parallel to a direction in which the bolt moves when the selector is adjusting the condition of the inner detent, the outer detent and or the

lock release means. It is further preferred that a distal end of each elongate member engages its respective inner detent, outer detent and or lock release means, while a proximal end of each elongate member engages the adjustable member. It is still further preferred that the adjustable member includes a surface that interacts with the proximal end of each of the elongate members, the surface including formations so that an axial position of each elongate member differs depending upon the portion of the surface that proximal end engages, whereby the adjustable member is axially rotated to adjust the portion of the surface that engages the proximal end of each elongate member. It is still further preferred that the mortice lock assembly include a face plate attachable to the front of the housing which obscures access to the adjustable member.

It will be convenient to hereinafter describe the invention in greater detail by reference to the accompanying drawings which show an example embodiment of a mortice lock assembly according to 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.

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

Figure 2 is an exploded view of the mortice lock assembly from Figure 1.

Figure 3 is a partly exploded view of the mortice lock assembly from Figure 1 with an inner housing component and inner hub removed.

Figure 4 is an isometric view of a portion of the mortice lock assembly from Figure 1 illustrating the face plate.

Figure 5 is a side elevation view of the mortice lock assembly from Figure 1 with the inner housing component removed and the inner detent in an unlocked position.

5 Figure 6 illustrates a sectional view through VI-VI from Figure 5.

Figure 7 illustrates a sectional view through VII-VII from Figure 8.

10 Figure 8 is a side elevation view of the mortice lock assembly from Figure 5 with the inner detent in a locked position.

Figure 9 is a side elevation view of the mortice lock assembly from Figure 5 with the inner detent in an inactive condition.

15 Figure 10 is a side elevation view of the mortice lock assembly with the lock release lever in an inactive condition.

Figure 11 is a side elevation view of the lock assembly from Figure 10 with the lock release lever in an active condition.

20 Figure 12 is a side elevation view of the lock assembly from Figure 11 with the lock release means lever in an active position and the outer detent in a locked position.

25 Figure 13 is a side elevation view of the lock assembly from Figure 12 with the lock release means lever in an active condition, the latch bolt assembly in a retracted position and the outer detent in an unlocked position.

30 Referring firstly to Figure 1 which illustrates a mortice lock assembly 1 for use with a door (not shown). The mortice lock assembly 1 includes a housing 2 with a faceplate 3 attached to a front wall of the housing 2. The housing 2 includes an aperture 4 in an upper portion

thereof to permit a cylinder lock, snib or the like (not shown) to interact with a cam sub-assembly 5 of a lock means. The housing 2 also includes an aperture 6 in a lower portion thereof for permitting interaction between door furniture (not shown) located on the inner and outer side of the door to interact with a hub sub-assembly. Figure 2 illustrates the housing being formed by a pair of inner 8 and outer 9 component parts which are fastened together by fasteners in the form of screws 10 (see Figure 1). Figure 2 also illustrates the faceplate being attached to the housing by a pair of fastener members in the form of screws 11. Clearly other forms of fastener members are possible.

Figure 2 illustrates the front wall of the housing 2 and the faceplate 3, each including an aperture 14, 13 respectively through which a head 15 of the bolt assembly 16 can extend to adopt an extended position. The preferred latch bolt assembly 16 illustrated includes a draw bar 17 mounted to the rear of the head 15. A compression spring 18 acts on the head 15 and urges the head 15 to adopt the extended position (see Figure 3). The draw bar 17 interacts with a follower 19 of the hub sub-assembly 7, so as to retract the latch bolt 16. The retraction of the latch bolt 16 will be explained in further detail with reference to latter illustrations.

The hub sub-assembly is illustrated in exploded view in Figure 2 so as to reveal an inner housing component 8 and an outer housing component 9. An inner hub 29 and an outer hub 30 are rotatable about an axis XX for rotating the follower 19. A compression spring 31 acts against rotation of the inner 29 and outer hub 30 via a block 32 so as to return the inner 29 and outer hub 30 and follower 19 to an at rest position as shown in Figure 3.

Figure 2 also illustrates an inner and outer detent which interacts with the inner 29 and outer hubs 30 respectively. The detents 33, 34 are movable when they are engaged with a detent slide 36 which is controlled by the operation of the cam sub-assembly 5. The cam sub-

assembly 5 also operates to move a latch bolt retraction slide 37 which interacts with a lever formed integrally with the follower 19. The lever may be formed separately from the follower 19, so long as there is driving engagement between the lever and the follower. The operation of the slider 36, 37 will be described in greater detail with reference to later illustrations.

Figure 2 illustrates a preferred embodiment of one form of the selector means 20 according to the invention. The selector means operates to select the way various elements of the mortice lock assembly 1 will function, and the operation of the selector will be described in greater detail with reference to latter illustrations. The selector means illustrated includes an adjustable member 21 in the shape of a pentagon. The shape of this adjustable member 21 is not essential however when combined with a complementary aperture 22 in the front wall of the housing 9 it assists with the accurate positioning of the adjustable member 21 relative to the housing 9. A rear surface of the adjustable member 21 is formed with a plurality of projections 23. The projections 23 extend through apertures formed in a retainer plate 24 and interact with elongate members 25 linking the adjustable member 21 with the hub sub-assembly 7. A flange 26 is also provided and located behind the front of the housing component 9 for fixing the position of the adjustable member 21 relative to the housing 2. The flange includes a plurality of bores to accommodate each of the elongate members. The elongate members is one form of a link between the adjustable member 21 and the detents 33 34, and clearly other forms of a link are possible.

Figure 2 also illustrates a dead latching sub-assembly 43 which in summary interacts with the draw bar 17 for retaining the latch bolt assembly 16 in a dead latched position. It would be understood by those in the industry that the interaction between the dead latch sub-assembly 43 and the latch bolt assembly 16 is one that resists

movement of the latch bolt assembly 16 from the extended position by applying a force to the head 15 of the latch bolt assembly 16, when the tongue 44 of the dead latch sub-assembly 44 is in an extended position (see Figure 9).

5 Referring now to Figure 3 which illustrates a partly assembled view of the mortice lock assembly 1 with the inner component part 8 of the lock housing 2 removed. The inner part of the housing 27 of the hub sub-assembly 7 is also removed to reveal the inner components of the hub sub-assembly. Furthermore, it should be noted that an inner hub 29
10 of the hub sub-assembly 7 is also removed, however the shape of the inner hub can be appreciated from at least Figures 2 and 4.

A preferred form of locking means is illustrated in Figure 3 and includes the inner detent 33 and an outer detent 34 which interact with the inner hub (not shown) and outer hub 30 respectively. The inner
15 detent 33 and outer detent 34 are rotatable about an axis YY which is parallel with the axis XX. The inner detent 33 and outer detent 34 are rotatable in response to movement of the slide member 36 which also interacts with the cam sub-assembly 5. The slide member 36 is movable in the direction of the arrow B when adjusting the inner detent
20 33 and outer detent 34 between the locked position and the unlocked position. This movement of the slide member 36 will be described in further detail with reference to later illustrations.

The hub sub-assembly illustrated in Figure 3 includes a leaf spring 38 for biasing at least the inner detent 33 and outer detent 34 so that the
25 locking means is urged to adopt an active condition. In the active condition the movement of the slide member 36 adjusts the position of the inner detent 33 and/or outer detent 34 between the locked position and the unlocked position. The leaf spring is only one form of biasing means that may be suitable for urging the lock means to adopt the active
30 condition and other forms of biasing means such as helical springs acting around the rotational axis YY may also be suitable.

Figure 3 illustrates the elongate members 25 located in the bores formed in the flange 26. Figure 3 also illustrates the projections 23 on the rear surface of the adjustable member 21 engaging the elongate members 25 through apertures spaced radially from the axis of the retaining member 24. The particular orientation of the adjustable member 21 relative to the housing 2 illustrated in Figure 3 aligns two of the three elongate members 25 with the projections 23 so that those two elongate members 25 can extend further into the hub sub-assembly 7. The arrangement of projections 23 on the rear surface is such that different orientations of the adjustable member 21 result in other combinations of elongate members 25 extending into the hub subassembly 7. It should also be appreciated that the rear surface of the adjustable member 21 may be configured in some other way, other than with projections 23, to adjust the position of the elongate members 25 within the flange.

The selector means 20 includes a fastener 39 for fastening the position of the adjustable member to the housing 2. The fastener 39 illustrated in Figure 3 is in the form of a screw 39 which extends through a central threaded aperture formed in the adjustable member 21 and the retainer member 24 and fastened to the housing 2 by locating in a threaded aperture formed in a flange adjacent the aperture 22. This fastening arrangement allows for the adjustable member 21 and retaining member 24 to be fastened to the housing 2, while still allowing rotation of the adjustable member 21 and the retaining member 24 about the axis ZZ. This provides for adjustment of the selection of the selector means 20. When the preferred position for this adjustable member 21 is selected, the fastener 39 is tightened so that the adjustable member 21 is flush with the front wall of the housing 9, as can be seen in Figure 4.

When the fastener 39 is loosened the adjustment member 21 is moved in the axial direction ZZ away from the flange until it reaches a position whereby it can rotate about the axis ZZ over the front wall of the

housing 9. The fastener 39 remains engaged with a central aperture in the retainer plate 24, and the projections 23 remain in engagement with the radial apertures in the retainer plate 24 so that the adjustable member can rotate with the retainer member 24 when adjusting the selection of the selector means.

It ought to be appreciated from Figure 4 that the adjustable member 21 illustrated is rotatable to five positions which correspond to the mortice lock assembly functioning in five different ways. Naturally this number may vary.

Referring now to Figure 5 which illustrates the inner detent 33 in an active condition, and in an unlocked position. While the detent remains in the unlocked position, the inner hub can be rotated by a user in the direction of the arrow A to retract the bolt assembly 16. The inner detent 33 is linked to the detent slide 36 by a lug 41a which locates in an aperture 42 formed in the detent slide which can be more appreciated from Figure 3 and 6. Movement of the detent slide 31 in the direction of the arrow C as seen in Figure 7 will result in rotation of at least the inner detent 33 about the axis YY. When the inner detent 33 is in this position, it obstructs rotation of the inner hub 29 in the direction of the arrow as seen in Figure 8. The inner detent 33 is considered in a locked position when it adopts the position illustrated in Figure 8.

The lock means insofar as it relates to the inner detent is considered to be in an active condition when the inner detent 33 is free to rotate between the locked position and unlocked position as illustrated in at least Figures 8 and 5 respectively. Figures 5 and 3 illustrate the leaf spring 38 including a tine 38a that is aligned with the inner detent 33. The tine 38a bias the inner detent 33 towards adopting the active condition. In contrast, the inner detent 33 is illustrated in an inactive condition in Figure 9. The lug 41a of the inner detent 33 disengages from the detent slide 36 so that movement of the detent slide 36 in the direction of the arrow C does not result in movement of the inner detent

33. Adoption of the inactive condition for the inner detent 33 is achieved by selection of escape from the inner detent 33 on the selector means. This includes orienting the adjustable member 21 to select escape with the arrow pointing to the inner side (not the outer side as seen in Figure 4). This aligns one of the projections on the inner surface of the adjustable member 21 with the elongate member 25a associated with the inner detent 33. This forces the inner detent 33 to rotate clockwise about the axis YY against the action of the tine 38a. The above discussion with reference to the illustrations of adjustment of the inner detent between the active and inactive conditions and the locked and unlocked positions is also applicable to the outer detent 34.

The mortice lock assembly according to the invention also includes a lock release means that in an active condition adjusts the position of the inner detent 33 and the outer detent 34 from the locked position, if in that position to the unlocked position, on movement of the bolt assembly 16 from the extended position to the retracted position. The lock release means functions to avoid the situation of the outer detent for example being in a locked position and the door inadvertently moving to a closed position thereby locking the occupant out. The outer detent can still be locked by the occupant by operation of the cam sub-assembly when the door is in a closed position. The preferred form of lock release means is illustrated in Figure 10. It should be noted that Figure 10 has the inner detent 33 removed to illustrate the lock release means and including the lever 35 which is normally positioned between the inner detent and the outer detent 34. This positioning can be appreciated from Figure 3. It can also be appreciated from Figure 2 or 3 that the lever 35 interacts with the middle elongate member 25a, and also interacts with the middle tine 38c of the leaf spring 38.

Referring again to Figure 10 which illustrates the lock release means in the inactive position whereby a lug 41c on the lever 35 is disengaged from the detent slide 36. Adjustment of the adjustable

member 21 so that the middle elongate member 25c is not aligned with a protrusion 23 of the rear surface of the adjustable member 21, allows the lever 35 to rotate under the influence of the middle tine 38c. This rotation of the lever 35 enables the lug 41c to engage the detent slide 36 as can be appreciated from Figure 11. The lock release means is considered to be in an active condition in Figure 11.

Figure 12 illustrates the outer detent 34 in a locked position as a result of the detent slide 36 having been moved in the direction of the arrow C. The detent slide 36 also draws up the lever 35 so as to be in an engagement position with a shuttle 42 which can be more easily appreciated from Figure 3. The shuttle 42 interacts with the follower 19 which acts as a lever when it is rotated about the axis XX. When the door is moved to a closed position this causes the latch bolt assembly 16 to move from the extended position to the retracted position as illustrated in Figure 13. Retraction of the latch bolt assembly 16 causes rotation of the follower 19 which causes movement of the shuttle member in the direction of the arrow B. The shuttle 42 engages the lever 35 so that movement of the shuttle 42 in the direction of the arrow B also causes movement of the detent slide 36 to move in the direction of the arrow B. This in turn causes rotation of the outer detent 34 at least from the locked position illustrated in Figure 12 to the unlocked position as illustrated in Figure 13.

It ought to be appreciated from the foregoing description that the mortice lock assembly 1 according to the invention is relatively easy to adjust. However hiding the adjustable member 21 behind a faceplate 3 reduces the likelihood that the selector will be adjusted by an unauthorised person. Furthermore, the ease with which the escape and lock release functions can be selected from the front of the housing 2 while the lock assembly housing is located in the mortice cavity of the door, is a further surprising advantage.

Various alterations and/or additions may be introduced into the mortice lock assembly as hereinbefore described without departing from the spirit or ambit of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A mortice lock assembly for use with a door, including a housing for location at least partly within a cavity formed in the door, a bolt
5 movable relative to an extended position whereby it extends out a front face of the housing, an inner hub and an outer hub with each inner hub and outer hub for interaction with a hand engagable member from the inner and outer sides of the door respectively, each inner hub and outer hub being operable to retract the bolt from the extended position, a lock
10 means including an inner detent and an outer detent that are associated with the inner hub and outer hub respectively, a selector being operable from the front face of the housing for selecting the condition of the inner detent and outer detent as either active or inactive respectively whereby in an active condition the inner detent and or the outer detent are
15 adjustable by operation of the lock means between a locked position in which the respective inner hub and outer hub is rendered inoperable and an unlocked position in which the respective inner hub and outer hub is operable and in an inactive condition the lock means is incapable of adjusting the inner detent and or outer detent to adopt the locked
20 position, a lock release means that when in an active condition movement of the bolt from the extended position adjusts the position of the inner detent and or outer detent from the locked position to the unlocked position, the selector also being operable to select the condition of the lock release means as either active or inactive.
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2. A mortice lock assembly according to claim 1 wherein the bolt includes a biasing means for biasing the bolt toward the extended position.
- 30 3. A mortice lock according to any one of the preceding claims wherein the bolt includes a head with a bevelled leading face for engagement in use with a strike located in a door frame whereby the bolt

is moved from the extended position when the bolt head is slid across the strike when closing the door.

4. A mortice lock assembly according to any one of the preceding
5 claims including a follower interacting between each of the inner hub and the outer hub and the bolt so that rotation of either the inner hub or outer hub moves the follower which retracts the bolt from the extended position.
- 10 5. A mortice lock assembly according to claim 4 wherein the follower interacts with the lock release means so that movement of the follower while the lock release means is in the active condition results in movement of the inner detent or outer detent from the locked position.
- 15 6. A mortice lock assembly according to claim 5 wherein the follower interacts with the bolt so that movement of the bolt independently from the inner or outer hub moves the follower.
- 20 7. A mortice lock assembly according to any one of the preceding claims wherein the lock release means includes a biasing means to bias the lock release means towards adopting the active condition.
- 25 8. A mortice lock assembly according to any one of the preceding claims wherein the lock means includes a biasing means to bias the lock means towards adopting the active condition.
- 30 9. A mortice lock assembly according to any one of the preceding claims wherein the lock release means includes a lever that is rotatable about an axis substantially perpendicular to a direction in which the bolt is moved when the lock release means is adjusted between an active condition and an inactive condition.

10. A mortice lock assembly according to any one of the preceding claims wherein the selector includes an adjustable member that is located at the front of the housing for adjusting the condition of the inner detent or outer detent or lock release means.

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11. A mortice lock assembly according to claim 10 wherein the adjustable member is fastened relative to the housing so as to allow for adjustment of the condition of the inner detent or outer detent or lock release means without requiring detachment from the housing.

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12. A mortice lock assembly according to claim 11 wherein the selector includes a retainer member interacting with the housing and the adjustable member and a fastener fastening the adjustable member to the retainer member.

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13. A mortice lock assembly according to claim 12 wherein the retainer member snap engages the fastener.

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14. A mortice lock assembly according to claim 13 wherein the housing includes a flange located behind the front of the housing which includes an aperture to accommodate the fastener.

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15. A mortice lock assembly according to any one of claims 10 to 14 wherein the adjustable member is rotatable about an axis which is substantially parallel to a direction in which the bolt moves so as to adjust the selection of the condition of the inner detent, the outer detent and or the lock release means.

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16. A mortice lock assembly according to any one of claims 10 to 14 wherein the selector includes a link means linking the adjustable member with the inner detent, the outer detent and the lock release means.

17. A mortice lock assembly according to claim 16 wherein the link means includes a plurality of elongate members each being movable in a direction which is substantially parallel to a direction in which the bolt moves when the selector is adjusting the condition of the inner detent, the outer detent and or the lock release means.

18. A mortice lock assembly according to claim 17 wherein a distal end of each elongate member engages its respective inner detent, outer detent and or lock release means, while a proximal end of each elongate member engages the adjustable member.

19. A mortice lock assembly according to claim 18 wherein the adjustable member includes a surface that interacts with the proximal end of each of the elongate members, the surface including formations so that an axial position of each elongate member differs depending upon the portion of the surface that proximal end engages, whereby the adjustable member is axially rotated to adjust the portion of the surface that engages the proximal end of each elongate member.

20. A mortice lock assembly according to any one of claims 10 to 19 including a face plate attachable to the front of the housing which obscures access to the adjustable member.

21. A mortice lock assembly substantially as hereinbefore described with reference to the illustrations.