

MORTICE LOCK ACTUATOR

This invention relates to an actuator assembly for use with a mortice lock assembly and a mortice lock assembly incorporating the actuator assembly . The actuator assembly has been designed to provide an interface between the mortice lock assembly and a cylinder lock, turn snib or the like, and it will be convenient to hereinafter describe the invention with reference to this application. It should be appreciated that the actuator assembly may have applications for use with other forms of lock assemblies.

A mortice lock assembly is one form of lock assembly that is located in a mortice cavity formed through a side edge of a door. The assembly generally includes an inner and outer hub operable from an inner and outer side of the door via a handle, door knob or the like, for retracting a bolt from an extended position. The assembly also includes a detent means that when in an active condition locks the inner and/or outer hub.

The detent means can be is controlled by a cylinder lock assembly or a turn snib or the like. The cylinder lock or turn snib however may alternatively be operable to retract the bolt independently of the inner or outer hub. A cam is generally attached to the cylinder lock or turn snib so that its rotation engages the elements of the mortice lock assembly. Normally it is the shape of the cam that dictates which elements it engages. The installer will generally have a variety of cams, or the mortice lock assembly is provided with a variety of cams, so that the installer can choose for the cylinder lock or turn snib to act on the detent means on the bolt.

A mortice lock assembly will generally include a number of small components that are difficult to assemble even in a controlled environment of a factory. The attachment of the cam to the cylinder lock or turn snib is no different and generally includes small screws that are quite fiddley to fit. This can be problematic particularly as the cam tends to be attached on site, and the screws can be dropped or lost.

It is generally desirable for lock distributors, locksmiths and installers to be provided with flexibility in adjustment of the function of their locks, while still maintaining a low inventory. It is also desirable for the locks to easy to install.

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.

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According to a first aspect of this invention there is provided an actuator assembly for use in a mortice lock assembly having a bolt, a biasing means for biasing the bolt towards an extended position, an inner hub and an outer hub each being operable to move the bolt from the extended position, a detent means for
10 interaction with the inner and outer hub that when in an active condition renders the inner hub and or outer hub inoperable, the actuator assembly including a housing, an inner cam and an outer cam rotatable from an inner and outer side of the mortice lock assembly, each cam being selectively operable in at least a latching mode whereby rotation of either the inner cam or outer cam moves the latchbolt relative to the
15 extended position either directly or indirectly of the operation of the inner hub or outer hub, or a locking mode whereby rotation of either the inner cam or outer cam adjusts the condition of the detent means.

It is preferred that the actuator assembly include a bi-stable means for
20 interaction with the inner cam and or outer cam when in the locking mode, the bi-stable means being operable to urge the inner cam or outer cam to adopt a first position or a second position which corresponds to the detent adopting the active condition or inactive condition respectively. The bi-stable means preferably includes a lever that pivots when either of the inner cam or outer cam adjusts between the first
25 position and the second position. It is preferred that the actuator assembly include a biasing means for urging the inner cam or outer cam to adopt the first position or the second position. The biasing means preferably acts on the lever to indirectly urge the inner cam or outer cam. It is preferred that the lever has a fulcrum that is off centre. It is further preferred that the actuator include a follower for interacting between the
30 lever and the inner cam and outer cam, the follower being movable in a liner direction in response to movement of the inner cam or outer cam between the first position and the second position.

It is preferred that the actuator assembly include a stop which in an active condition prevents the inner cam or outer cam from adjusting between the locking mode and the latching mode. It is further preferred that the stop is adjustable from the active condition to an inactive condition whereby either of the inner cam or outer cam is adjustable between the locking mode and the latching mode. It is still further preferred that when the stop is in the inactive condition the other of the inner cam or outer cam is prevented from adjustment between the locking mode and the latching mode. It is further preferred that the stop includes a movable member that is movable in a direction that is substantially perpendicular to the axis of rotation of the inner cam and the outer cam when adjusting the condition of the stop member between the active condition and the inactive condition. It is further preferred that the movable member is pivotable. It is further preferred that the movable member is urged to adopt the active condition. It is further preferred that the stop include a biasing means for urging the movable member to adopt the active condition. The stop is preferably formed from a resiliently deformable material so that it deforms when the stop adjusts from the active condition to the inactive condition and urges the stop to adopt the active condition when in the inactive condition.

It is preferred that the inner cam and or the outer cam is rotatable to adopt a neutral mode in which mode the inner cam and or outer cam is neither operable to retract the latchbolt or adjust the condition of the detent, whereby the movable member is shaped to mesh with the inner cam and or outer cam when the stop is in the active condition and the inner cam and or outer cam is in the neutral mode. The movable member, inner cam and outer cam are preferably shaped with teeth that engage each other in the neutral mode, the teeth being shaped so that rotation of the cam from the neutral mode urges the stop to adjust from the active condition towards the inactive condition. The inner cam and outer cam are preferably shaped with teeth to engage at least the moveable member, the movable member being shaped with chamfered teeth so that rotation of the inner cam or outer cam from the neutral condition urges the movable member to move in a direction substantially perpendicular to the direction of rotation.

It is preferred that the housing includes at least one aperture through which the condition of the stop member is adjusted. It is further preferred that each of the inner

cam and the outer cam include an aperture to accommodate a tail bar, each aperture being configured to allow for lost motion between the inner cam, outer cam and the tail bar. It is further preferred that each aperture is configured to allow for 90° of lost motion.

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It is preferred that each of the inner cam and the outer cam include a visual indicator to indicate a rotational position of the cam relative to the housing.

It is preferred that the housing includes at least one formation to receive at least one fastener for fastening a cylinder lock, snib or the like relative to the housing.

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According to another aspect of this invention there is provided a mortice lock assembly including an actuator assembly according to any one of the preceding claims.

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It is convenient in this specification to use the term such as “inner” and “outer” for the purpose of describing an installed orientation of the mortice lock. The orientation of the lock can change, and consequential changes in the interpretation of such terms need to be made for a proper understanding of the invention. In particular, the terms “inner” and “outer” have been used to describe various elements of the actuator assembly, and for ease of explanation the inner side is the near side of the assembly shown in Figure 1.

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It will be convenient to hereinafter describe the invention in greater detail by reference to the accompanying drawings showing various preferred embodiments 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 isometric view of a mortice lock assembly incorporating a preferred embodiment of the actuator assembly according to one aspect of the invention.

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Figure 2 is a detailed view of the actuator assembly 18 of Figure 1.

Figure 3 is side elevation view from an inner side of the actuator assembly.

Figure 4 is a part side elevation view from an inner side of the mortice lock assembly with the inner cam in a neutral mode.

Figure 5 is an end elevation view illustrating the moveable member in a pivoted position corresponding to the stop being in an inactive condition.

5 Figure 6 is a side elevation view of the mortice lock assembly with the inner cam in a locking mode and the inner detent member in an unlocked condition.

Figure 7 is a side elevation view of the mortice lock assembly from Figure 6 with the inner detent member in the locked condition.

10 Figure 8 is a side elevation view of a mortice lock assembly from Figure 6 with the inner cam in a latching mode.

Figure 9 is a side elevation view of the mortice lock assembly from Figure 8 with the bolt assembly in a retracted position.

Figure 10 is an alternate preferred embodiment of the moveable member.

15 Figure 1 illustrates an exploded view of a mortice lock assembly 1 according to one aspect of this invention. The mortice lock assembly 1 includes a lock housing 2 including an inner part 3 and an outer part 4. Figure 1 illustrates a front wall 5 of the housing 2 being formed with the outer part 4 however this is not essential as the front wall 5 may just as easily be formed with the inner part 3. The front wall 5 includes an aperture 6 through which a head 7 of a latch bolt assembly 8 extends under the
20 influence of a spring 13. The latch bolt assembly 8 includes a draw bar 9 that interacts with a long arm 10 of a follower 11 of a hub sub-assembly 12. The hub sub-assembly 12 is operable to control retraction of the latch bolt assembly 8 from the extended position against the influence of the spring 13. The hub sub-assembly 12 includes an inner hub 14 and an outer hub 15 which are rotatable about an axis XX
25 for each independently rotating the follower 11. The inner and outer hub 14, 15 interact with an inner and outer handle spindle (not shown) from the inner and outer side of the door respectively. A biasing means 16 acts directly on the inner and outer hub 14, 15 to in turn urge the return of the follower 11 to an at rest position which corresponds to the latch bolt assembly 8 being in the extended position.

The hub sub-assembly 12 also includes a detent means for interaction with the inner and outer hub 14, 15. The detent means includes a detent slide 17 which is linearly moveable via operation of an actuator assembly 18. The actuator assembly 18 will be described in greater detail with reference to later illustrations. The detent means also includes an inner and outer detent member 19, 20 that can be rotated about an axis YY, relative to a locking position with respect to each of the inner and outer hubs 14, 15. The detent members 19, 20 interact with the detent slide 17 side so that linear movement of the slide 17 in the direction of the arrow A rotates the detents members 19, 20. The locking position corresponds to the detent members 19, 20 being rotated in an anti-clockwise direction to angle each of the hubs 14, 15 and prevent them from rotating about the axis XX. The inner and outer detent members 19, 20 can be moved to an unlocked position by rotation of those detents in a clockwise direction as a result of movement of the detent slide 17 in the direction of the arrow B.

The mortice lock assembly 1 also includes a latching slide 2 which interacts with a short arm 22 of the follower 11 to retract the latch bolt assembly independently of rotation of the inner or outer hubs 14, 15. The latching slide 21 is moved in the direction of the arrow B by operation of the actuator assembly 18, and the operation of the actuator assembly 18 in this regard will be described in greater detail by reference to later illustrations. The latching slide 21 is moveable in the direction of the arrow B to engage and cause rotation of the follower 11 about the axis XX. The biasing spring 13 acts on the latch bolt assembly 8 to urge the latch bolt back to the extended position, which in turn causes rotation of the follower 11 about the axis XX and movement of latching slide in the direction of the arrow A. It should be noted that the parts of the mortice lock assembly urge the latching slide to move in the direction of the arrow A, whereas the detent slide 17 preferably adopts a position whereby the detent members 19, 20 are in the locked or unlocked positions respectively.

Referring now to Figure 2 which illustrates the actuator assembly 18 in greater detail as including a housing formed by an inner part 23 and an outer part 24. The housing houses an inner cam 25 and an outer cam 25 each formed with a boss for location in a cylindrical aperture 28 formed in the respective inner 23 and outer housing 24. A flange 29 extends from the boss 27 on each of the inner 25 and outer cams 26 which abuts against an inner surface of the inner 23 and outer housing 24.

The boss 27 and flange 29 arrangement may be configured relative to the aperture 29 so that the inner 25 and outer cams 26 snap engage their respective housing 23, 24 however this is not essential. Instead the space between the inner 23 and outer housing 24 may be limited to locate the flange 29 of the inner cam 25 up against the
5 flange 29 of the outer cam 26 so that the boss 27 remains located within the aperture 28.

The inner cam 25 and outer cam 26 both include a pair of teeth 30 which extend in a radial direction from the flange 29. The teeth 30 on each flange 29 mate with other elements of the mortice lock assembly in a manner that will be described in
10 greater detail with reference to later illustrations.

The actuator assembly 18 also includes a lever 31 which locates its fulcrum on a shaft 32 extending from the outer housing 24. The lever 31 is retained on the shaft 32 by a retainer 33 which in the embodiment illustrated is in the form of a push on fastener, however other forms of fastener are clearly possible. Another alternative is
15 that the lever 31 may be formed with a boss to capture the shaft 37. One end of the lever 31 has teeth 34 which engages with the tooth at the bottom end of a follower 36, whilst an opposing end interacts with the detent slide 17 in a manner that will be described in greater detail with reference to later illustrations. The actuator assembly 18 also includes a biasing means 37 which combines with the lever to form a bi-stable
20 means. The biasing means illustrated is a torsion spring whereby one arm of the torsion spring locates in an aperture formed in the lever 31 whilst the other arm of the torsion spring 37 is located in a recess formed in the outer housing 24. The manner in which the torsion spring 37 combines with the lever 31 to act as a bi-stable means will be described in greater detail with reference to later illustrations.

25 The actuator assembly 18 also includes a stop 38 which interacts with the inner and outer cam 25, 26. The stop 38 illustrated is in the form of a molded plastic piece. The stop 38 illustrated includes a flap which forms a moveable member which is moveable relative to a pair of legs 40 on either side of the flap 39. The flap 39 interacts with the cam 25, 26. Via its lower edge that is configured to engage with the
30 teeth 30 on the inner and outer cam 25, 26 when in a neutral mode. The moveable member 39 is moveable, so as to disengage from the teeth 30 of either the inner or outer cam 25, 26. The stop 38 illustrated preferably deforms so as to allow the

moveable member to move. However, the stop may be designed so that the flap 39 rotates about a shaft (not shown), and a spring (not shown) is employed to urge the flap 39 to adopt a central orientation. Accordingly, the stop 38 of the invention is not limited to the stop illustrated in the figures.

5 Referring still to Figure 2 which illustrates on an outer surface of the inner housing 23 a semi cylindrical formation 41 which in use receives a pin fastener (not shown) for fastening the cylinder lock (not shown) to the mortice lock housing 2. The pin extends through an aperture 42 (see Figure 1) formed in the front wall 5 of the housing 2 and locates in a bore (not shown) formed in the housing of the cylinder
10 lock. The formation 41 in the housing 23 of the actuator assembly 18 enables the cylinder lock to be indirectly connected to the housing 23 so as to be retained adjacent the housing 23. The same formation 42 is formed on the outer surface of the outer housing 24.

Referring now to Figure 3 which illustrates a front elevation view of the
15 assembled actuator assembly 18 which illustrates the inner cam in the neutral mode. In the mode the teeth 30 of the inner cam 25 engages the teeth formation 43 in the lower edge of the flap 39 so as to mesh therewith. The meshing of the teeth 30, 43 passively retains the cam 25 in the neutral mode. The boss 27 of the inner cam 25 illustrated includes a visual indicator 44 which indicates the orientation of the cam 25
20 relative to the housing 23. In particular, the indicator 44 indicates the position of the teeth 30 of the cam 25. This is not particularly necessary when the cam 25 is in the neutral position as the teeth 30 are visible through a square aperture 45 formed in the housing 23. However, as will be explained later in the specification, the cam 25 is rotatable from that position so that the location of the teeth 30 are obscured by the
25 housing 23 and not readily apparent.

Referring still to Figure 3 the boss 27 of the inner cam 25 includes a central aperture 46 which is designed to accommodate a tail bar (not shown) associated with a cylinder lock, turn snib or the like. The aperture 46 illustrated allows for lost motion between the tail bar and the cam 25, and in particular allowing for 90° of lost motion
30 when the tail bar is in the form of a flat bar. The provision of 90° of lost motion allows for rotation of the barrel (not shown) in a cylinder lock housing to return the key to a

vertical orientation allowing for extraction of the key. Apertures of other shape are clearly possible.

Whilst the preceding paragraphs describe in detail the features of the actuator assembly appreciable from Figure 3, it ought to be appreciated that the same or substantially similar features would be visible from an outer side of the actuator assembly.

Referring now to Figure 4 which illustrates the inner cam 25 still in the neutral mode but with the inner housing 23 removed and the detent slide 17 and latching slide 21 interacting with the actuator assembly 18. The latching slide 21 interacts with the actuator assembly 18 in a position adjacent the cams 25, whereas the detent slide 17 interacts with the actuator assembly 18 in a location adjacent the other end of the lever 31. The detent slide 17 is illustrated in a position whereby the detent means is in an inactive condition. More specifically, in the inactive condition the inner hub 14 is free to rotate in the direction of the arrow M, so as to rotate the follower 11 and retract the latch bolt. The flap 39 can be depressed to move it to a position whereby it does not engage the inner cam 25. In this position it is considered that the stop is in an inactive condition and allows for adjustment of the inner cam 25 between the neutral mode, a locking mode or a latching mode. Figure 5 illustrates the flap 39 member having been moved to disengage from the inner cam 25. In this position the inner cam 25 is rotatable in an anti-clockwise direction to adopt the locking mode as illustrated in Figure 6. It ought to be appreciated from Figure 5 that the flap 39 is also moveable in the opposite direction to disengage from the outer cam 26.

It can be appreciated from Figure 6 that the teeth 30 on the cam 25 engage the upper teeth 47 on the follower 36 so that further rotation of the inner cam 25 results in linear movement of the follower 26 in the direction of the arrow B. This in turn causes rotation of the lever 31 about its fulcrum so as to move the detent slide 17 in the direction of the arrow A. It ought to be appreciated that Figure 6 illustrates the inner detent 19 disengaged from the inner hub 14 whilst Figure 7 illustrates the inner detent 19 in a position where it prevents rotation of the inner hub 14.

The bi-stable means operates to urge the inner 25 and/or outer cam 26 to adopt either a first position or a second position, which corresponds to the detent

adopting the active condition or inactive condition respectively. It ought to be appreciated that Figure 6 illustrates the inner cam in the second position whilst Figure 7 illustrates the inner cam in the first position. The biasing means illustrated is in the form of a torsion spring 37 which stores potential energy when the inner cam 25 is moved between the first and second position, and releases that energy as the inner cam approaches 25 the first or second position. The form of bi-stable means illustrated is merely preferred, and clearly other forms of bi-stable means are possible.

It ought to be appreciated from at least Figures 6 and 7 that the fulcrum of the lever 31 is off centre. This provides a mechanical advantage to the actuator assembly 18 making it easier to rotate, for example, the barrel of the cylinder lock to operate the detent means. It also compensates for the inertia created by the biasing means 37 of moving the inner cam or outer cam away from the first or second position.

The inner cam 25 and outer cam 26 are also operable in a latching mode, and Figures 8 and 9 illustrates the inner cam 25 in the latching mode. Again the flap 39 has been moved to a position whereby the teeth 30 of the inner cam 25 can disengage from the teeth 43 formations formed on the lower edge of the flap 39, and rotate in a clockwise direction. Further rotation of the inner cam 25 from the position illustrated in Figure 8 would result in the teeth 30 of the inner cam 25 engaging the latching slide 21 and moving it in the direction of the arrow B. Movement of the latching slide 21 in the direction of the arrow B causes engagement with the short arm 22 of the follower 11, rotation of the follower 11 about the axis XX and retraction of the latch bolt assembly. This rotation can be appreciated from Figure 9.

It ought to be appreciated from Figure 8 at least that once the inner 25 or outer cam 26 has been moved from the neutral mode, and the flap 39 returned so that the stop 38 is in an active condition, the stop prevents rotation of the inner 25 or outer cam 26 to adjust the condition of the inner or outer cam between the locking mode and the latching mode.

Referring now to Figure 10 which illustrates the teeth 43 of the flap 39 in greater detail. It ought to be appreciated from Figure 10 that the teeth 43 include chamfered edges which interact with the teeth 30 (see Figure 2) of the inner 25 or

outer cam 26 in such a way that rotation of the inner 25 or outer cam 26 by itself urges the flap 39 to move in a direction substantially perpendicular to the direction of movement of the cam 25, 26. The chamfered edges remove the requirement of having to force the flap 39 directly to disengage from the inner or outer cam 25, 26.

5 It ought to be appreciated from the foregoing that the actuator assembly as hereinbefore described provides for flexibility and adjustment of the functions of the mortice lock assembly. The actuator assembly also facilitates the connection of the cylinder lock to the mortice lock assembly as the installer is not required to attach a different cam to the barrel of the cylinder lock to achieve different functions.

10 Future patent applications may be filed in Australia or overseas on the basis of or claiming priority from the present application. It is to be understood that the following provisional claims are provided by way of example only, and are not intended to limit the scope of what may be claimed in any such future application. Features may be added to or omitted from the provisional claims at a later date so as
15 to further define or re-define the invention or inventions.

 Various alterations and/or additions may be made to the actuator assembly without departing from the spirit or ambit of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An actuator assembly for use in a mortice lock assembly having a bolt, a
5 biasing means for biasing the bolt towards an extended position, an inner hub and an
outer hub each being operable to move the bolt from the extended position, a detent
means for interaction with the inner and outer hub that when in an active condition
renders the inner hub and or outer hub inoperable, the actuator assembly including a
housing, an inner cam and an outer cam rotatable from an inner and outer side of the
10 mortice lock assembly, each cam being selectively operable in at least a latching
mode whereby rotation of either the inner cam or outer cam moves the latchbolt
relative to the extended position either directly or indirectly of the operation of the
inner hub or outer hub, or a locking mode whereby rotation of either the inner cam or
outer cam adjusts the condition of the detent means.
- 15 2. An actuator assembly according to claim 1 including a bi-stable means for
interaction with the inner cam and or outer cam when in the locking mode, the bi-
stable means being operable to urge the inner cam or outer cam to adopt a first
position or a second position which corresponds to the detent adopting the active
condition or inactive condition respectively.
- 20 3. An actuator assembly according to claim 2 wherein the bi-stable means
including a lever that pivots when either of the inner cam or outer cam adjusts
between the first position and the second position.
- 25 4. An actuator assembly according to claim 3 including a biasing means for
urging the inner cam or outer cam to adopt the first position or the second position.
5. An actuator assembly according to claim 4 wherein the biasing means acts on
the lever to indirectly urge the inner cam or outer cam.
- 30 6. An actuator assembly according to any one of claims 3 to 5 wherein the lever
has a fulcrum that is off centre.

7. An actuator assembly according to any one of claims 3 to 5 including a follower for interacting between the lever and the inner cam and outer cam, the follower being movable in a linear direction in response to movement of the inner cam or outer cam between the first position and the second position.

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8. An actuator assembly according to any one of the preceding claims including a stop which in an active condition prevents the inner cam or outer cam from adjusting between the locking mode and the latching mode.

10 9. An actuator assembly according to claim 8 wherein the stop is adjustable from the active condition to an inactive condition whereby either of the inner cam or outer cam is adjustable between the locking mode and the latching mode.

15 10. An actuator assembly according to claim 9 wherein when the stop is in the inactive condition the other of the inner cam or outer cam is prevented from adjustment between the locking mode and the latching mode.

20 11. An actuator assembly according to any one of claims 8 to 10 wherein the stop includes a movable member that is movable in a direction that is substantially perpendicular to the axis of rotation of the inner cam and the outer cam when adjusting the condition of the stop member between the active condition and the inactive condition.

25 12. An actuator assembly according to claim 11 wherein the movable member is pivotable.

13. An actuator assembly according to claim 12 wherein the movable member is urged to adopt the active condition.

30 14. An actuator assembly according to claim 13 including a biasing means for urging the movable member to adopt the active condition.

15. An actuator assembly according to claim 14 wherein the stop is formed from a resiliently deformable material so that it deforms when the stop adjusts from the active

condition to the inactive condition and urges the stop to adopt the active condition when in the inactive condition.

16. An actuator assembly according to any one of claims 11 to 15 wherein the inner cam and or the outer cam is rotatable to adopt a neutral mode in which mode the inner cam and or outer cam is neither operable to retract the latchbolt or adjust the condition of the detent, whereby the movable member is shaped to mesh with the inner cam and or outer cam when the stop is in the active condition and the inner cam and or outer cam is in the neutral mode.

17. An actuator assembly according to claim 16 wherein the movable member, inner cam and outer cam are shaped with teeth that engage each other in the neutral mode, the teeth being shaped so that rotation of the cam from the neutral mode urges the stop to adjust from the active condition towards the inactive condition.

18. An actuator assembly according to claim 17 wherein the inner cam and outer cam are shaped with teeth to engage at least the moveable member, the movable member being shaped with chamfered teeth so that rotation of the inner cam or outer cam from the neutral condition urges the movable member to move in a direction substantially perpendicular to the direction of rotation.

19. An actuator assembly according to any one of claims 8 to 18 wherein the housing includes at least one aperture through which the condition of the stop member is adjusted.

20. An actuator assembly according to any one of the preceding claims wherein each of the inner cam and the outer cam include an aperture to accommodate a tail bar, each aperture being configured to allow for lost motion between the inner cam, outer cam and the tail bar.

21. An actuator assembly according to claim 20 wherein each aperture is configured to allow for 90° of lost motion.

22. An actuator assembly according to any one of the preceding claims wherein each of the inner cam and the outer cam include a visual indicator to indicate a rotational position of the cam relative to the housing.

5 23. An actuator assembly according to any one of the preceding claims wherein the housing includes at least one formation to receive at least one fastener for fastening a cylinder lock, snib or the like relative to the housing.

10 24. A mortice lock assembly including an actuator assembly according to any one of the preceding claims.