

ELECTRIC LOCK SYSTEM

5 This invention relates to electric lock systems of the kind that utilise an antenna to receive a signal from a user's key tag. Such locks are often used to secure doors and the like in a closed position. It will be convenient to hereinafter describe the invention with reference to door locks, but it is to be understood that the invention has other uses.

10 A key tag for the purposes of this specification includes a device having means to send a signal which may be received by an antenna. The signal may be a radio frequency signal (RF), electro magnetic or like signal. The signal may be sent passively by the tag or may require user activation. One form of key tag known to the applicant is referred to by those in the electric lock industry in
15 Australia as a proximity card. It should be understood that the term key tag includes but is not limited to a proximity card.

Lock assemblies that include a bolt which is moveable between lock and unlock conditions often have an actuator, connected to a handle or turn knob
20 which a user rotates for moving the bolt. With a mechanical lock assembly, a mechanical control means including a lock cylinder is used to render the actuator operable or inoperable. The handle or turn knob and lock cylinder are often located adjacent each other. As an example a mortice lock will normally have a furniture plate adapted to accommodate both the handle and a front
25 portion of the lock cylinder. The process of fitting the mechanical lock to a door involves locating the lock assembly in a mortice cavity formed through an edge of the door. Thereafter furniture plates are fitted to a front and a rear surface of the door adjacent the cavity.

30 An electric lock assembly may also include a bolt which is moveable between a lock and unlock condition by operation of an actuator. An electric lock will normally use an electric control device, possibly including a solenoid to render the actuator operable or inoperable. An electric lock system will also include a reader which needs a user signal from a key tag and sends the user

signal to a remote processor which is located remote from the door. Where the user signal received by the remote processor indicates an authorised user, an access signal will be sent from the remote processor to the solenoid to render the actuator operable.

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Fitting an electric lock system has at least one added step when compared to fitting a mechanical mortice lock, which is locating and wiring the reader. The reader is often located on the front surface of a wall adjacent the door, and wired to the remote processor. The remote processor must also be
10 wired to the lock assembly to enable access signals to be sent to the solenoid of the lock assembly.

The applicant has assessed the method of installing electric locks systems and is of the opinion that the lock system could be improved to simplify
15 the installation method. It is therefore an object of this invention to provide an improved electric lock system. It would be particularly advantageous for the improved electric lock system to be simpler to install than existing electric locks.

The above discussion of documents, acts, materials, devices, articles
20 and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any of these matters formed part of the prior art base 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.

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According to one aspect of this invention there is provided a lock system including a remote processor connected to a lock assembly to transmit an access signal to the lock assembly, the lock assembly includes a housing, a lock bolt mounted on the housing for relative movement between an extended
30 latching position and a retracted release position, at least one actuator operable from an outer side of the assembly operable to cause movement of the bolt towards the release position, electric control means which when active renders the actuator inoperable, the electric control means is rendered inactive upon receipt of the access signal to render the at least one actuator operable,

wherein the system also includes a key tag reader connectable to the lock assembly for reading a user signal from a user's key tag and transmitting the user signal to the remote processor via the connection between the lock assembly and the remote processor.

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It ought to be appreciated that by the reader utilising the connection between the remote processor and the lock assembly, it is not necessary to establish an additional connection between the reader and the remote processor. This will naturally simplify the installation process.

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It is preferred that the key tag reader is an assembly including an antenna connected to a local processor for reading the user signal and transmitting the user signal to the remote processor. The local processor preferably includes a PCB. It is preferred that the antenna is associated with a furniture plate configured to receive a handle operatively connected to the at least one actuator. It is further preferred that the reader is associated with a furniture plate configured to receive a handle operatively connected to the at least one actuator. The furniture plate preferably includes an aperture through which the user signals can pass to the antenna. It is preferred that the key tag reader includes a cover which covers at least part of the antenna and is located adjacent the aperture in the furniture plate. The preferred cover is in the form of a nylon moulding.

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It is preferred that the reader also includes a visual indication means to provide the user with a visual indication that the user signal has been received by the reader. The visual indication means may also provides a visual indication as to whether the at least one actuator is operable or inoperable. It is preferred that the visual indication means includes an LED. The reader may also include an audible indication means to indicate that the user signal has been received.

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The preferred form of lock assembly is a mortice lock assembly, or a rim lock assembly.

It is preferred that the lock assembly includes a mechanical key override means that is operable from an outer side of the assembly by a mechanical key to cause movement of the bolt towards the release position. The mechanical key override means may also render the actuator operable. It is preferred that the mechanical key override means includes a lock cylinder. It is further preferred that a front face of the lock cylinder is accessible through the aperture formed in the furniture plate.

It is preferred that the lock assembly includes a detent that is moveable by operation of the electric control means from an active position where it renders the actuator inoperable to an inactive position where it renders the actuator operable. The detent may also be movable by operation of the mechanical key override means.

It is preferred that the lock assembly and the key tag reader include a connection means for facilitating connection of the key tag reader with the lock assembly. It is also preferred that the lock assembly and remote processor include a connection means for facilitating connection of the remote processor with the lock assembly. It is preferred that the connection means is in the form of a plug and socket arrangement.

According to another aspect of this invention there is provided a reader assembly for use with an electric lock assembly having a bolt that is retracted by operation of an actuator, the lock assembly being connected to a remote processor which controls operation of an electric control means of the lock assembly which when operable renders the actuator inoperable, the lock assembly having a mechanical key override to override operation of the electric control means, the reader assembly including

an antenna for receiving a user signal from a key tag, a local processor connected to the antenna and connectable to the lock assembly for processing the user signal and transmitting the user signal to the remote processor, a furniture plate formed to accommodate a handle connected to the actuator and formed to accommodate the antenna so the user signals from the key tag can

be received by the antenna, the furniture plate also formed to accommodate operation a lock cylinder of the mechanical key override means.

5 It is preferred that the moulding at least partly covers the antenna, the moulding be formed from a non metallic material such as nylon.

It is preferred that the furniture plate is formed with an aperture to accommodate the moulding, and a front face of the lock cylinder.

10 The reader assembly preferably includes a visual indication means for indicating the user signal has been received by the local processor. It is preferred that the visual indication means is an LED, which is accommodated by the furniture plate.

15 It would be convenient to hereinafter describe the invention with reference to the attached drawings which illustrate the preferred embodiment of an electric lock system to which this invention applies. The drawings and related description are merely illustrative of how the invention might be put into effect, so that the specific form and arrangement of the various features as shown is
20 not to be understood as limiting the invention. In particular whilst the drawings illustrate a mortice style lock assembly, it is to be understood that the invention is not limited to mortice style lock assemblies. For example the invention also applies to rim lock assemblies.

25 Figure 1 is a diagrammatic illustration of a plan view of one form of electric lock system to which the invention applies.

Figure 2 is a front elevation view of a preferred embodiment of an electric lock assembly according to the invention.

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Figure 3 is a side view of a cross section of a preferred embodiment of a reader assembly according to another aspect of this invention.

Figure 4 is an exploded view shown from the rear of the antenna and local processor of the reader assembly.

5 The electric lock system shown diagrammatically in Figure 1 includes in summary a remote processor 1, an electric lock assembly 2 and a reader assembly 3. A user may approach an antenna (not shown) of the reader assembly 3 with a key tag 4 emitting a user signal. The user signal is received by the antenna and transmitted to the remote processor 1 to process the user signal. The remote processor 1 will ascertain whether the user has authorisation
10 to operate an actuator (shown in Figures 3 and 4) to retract the latch bolt 5. If the user has authorisation the remote processor 1 will send an access signal to an electric control means 6 of the lock assembly 2 to render the actuator operable. The lock assembly 2 also has a mechanical key over-ride function to over-ride the electric control means 6. The various components of the electric
15 lock system will be hereinafter described in greater detail with reference to Figures 2, 3 and 4.

The electric lock assembly 2 as illustrated in Figure 2 is a typical latch assembly of a kind commonly used with swinging doors. As previously stated it
20 is not the only form of electric lock assembly to which the invention is applicable.

Figure 2 illustrates the latch bolt 5 mounted on a housing 7 so as to movable between an extended lock position (being the position illustrated), and
25 a retracted release position in which the head 8 of the bolt is substantially contained within the housing (this arrangement of the latch bolt is not shown in Figure 2). A biasing spring (not shown) normally urges the bolt 5 towards the extended position. Retraction of the bolt 5 is effected through a rotatable actuator 9 which is rotated by manipulation of the handle 10 (shown in Figure
30 1). A drive shaft linking the handle to the actuator is not shown in Figure 2, but in use the shaft is received in the bore 11 of square cross sectional shape which extends through the actuator 9.

A preferred form of locking mechanism is also shown in Figure 2 which includes a detent in the form of a bar 12 and the electric control means 6 connected to the bar 12. In the particular arrangement shown in Figure 2, the electric control means 6 includes an electrically operable solenoid 13 and a
5 biasing spring 4. The solenoid 13 includes a coil body and a shaft which is axially movable within the body. The coil is energised by connection to a source of electrical current and thereby generates magnetic flux which influences the shaft to move in one direction. When the coil is de-energised the spring operates to move the shaft in the reverse direction. In the present case the
10 source of electrical current is the access signal transmitted by the remote processor 1.

When the lock mechanism is activated a bar head 15 is operative to prevent operation of the actuator 5. In the arrangement shown that is achieved
15 by placement of the head 15 adjacent an abutment surface 16 of the actuator as shown in Figure 2. When the locking mechanism is deactivated, the bar head 15 is lifted clear (not shown) of the abutment surface 16 so that the actuator 9 can be rotated as required.

20 A mechanical key over-ride facility has been incorporated into the lock assembly shown in Figure 2. In the particular arrangement shown that facility includes a micro switch 17 or similar device which is responsive to operation of the cylinder lock 18. That is a member 19 attached to the barrel 20 of the cylinder lock 18 is operable to strike and actuate the switch 17 when the barrel
25 is rotated by an authorised mechanical key. Actuation of the switch 17 may have any desired result. For example it may result in deactivation of the solenoid 13. Alternatively the member 19 connected to the barrel 20 may move the detent bar 12 away from the actuator surface 16, or alternatively it may result in retraction of the latch bolt.

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The lock assembly illustrated in Figure 2 includes a socket 21 mounted on the housing 7 to receive a plug (shown in Figure 4) associated with the reader assembly 3. The lock assembly also includes a socket 23 to receive a plug 24 providing a wired connection to the remote processor 1. It ought to be

appreciated that the use of plugs and sockets facilitates these of attachment and detachment of the lock assembly 2 from the remote processor 1 and reader assembly 3. Clearly other forms of connection to these components are possible.

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Turning now to Figure 3 which illustrates in cross section a preferred embodiment of reader assembly 3 including in summary a furniture plate 25, an antenna 26 and a local processor 27. Figure 3 illustrates the furniture plate being formed with an aperture to receive at least a moulding 28 surrounding the antenna so that the user signal from the key tag 4 can pass to the antenna 26
10 uninterrupted by the furniture plate 25. This reduces the likelihood of distortion of the user signal.

The furniture plate 25 is also adapted to accommodate the handle 10 for
15 operation of the actuator. It ought to be appreciated that the handle 10 could be replaced by a turn-knob.

The reader assembly also includes a visual indication means which in the preferred embodiment illustrated in Figure 3 is in form of a LED 29. It is
20 intended that the LED 29 provide a visual indication when for example a user signal has been received by the local processor 27. The LED 29 may also provide a visual indication when the actuator 9 is operable. The LED 29 may also provide a visual indication when the actuator 9 is inoperable.

25 It is also intended for the local processor 27 to provide an audible indication when a user signal has been received.

Referring now to Figure 4 which shows the moulding 28, antenna 26, LED 29 and local processor 27 in an exploded view. The remote processor 27
30 shown includes the plug 22 that is intended to be located within the socket 21 on the electric lock assembly shown in Figure 2. This enables the local processor to communicate with the remote processor 1 via the electric lock assembly 2.

The aperture 30 formed in the moulding is designed to receive the lock cylinder 18 of the kind shown in Figure 2. It ought to be appreciated that the shape of that aperture in the moulding may change depending upon the shape of the lock cylinder 18.

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It is preferred that the moulding 28 be formed from a non-metallic material such as nylon to permit the user signal to transfer from the key tag 4 to the antenna 26. Clearly materials other than nylon may also be suitable.

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It will be apparent from the foregoing description that the invention provides a significant improvement over existing electric lock systems. Utilisation of the lock assembly 2 to remote processor 1 wiring to communicate the user signal is a particular advantage. Furthermore associating the antenna 26 with the furniture plate 25 having the actuator handle and lock cylinder also reduces the number of fittings that must be installed when compared with existing electric lock systems.

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Various alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the spirit of ambit of the invention as defined in the following claims.

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Claims

1. A lock system for controlling opening of a door including:
a remote processor located in use remote from the door,
5 a lock assembly connected in use to the remote processor so as to enable the remote processor to transmit an access signal to the lock assembly via the connection, the lock assembly includes a housing, a lock bolt mounted on the housing for relative movement between an extended latching position and a retracted release position, at least one actuator operable from an outer side of
10 the assembly operable to cause movement of the bolt towards the release position, electric control means which when active renders the actuator inoperable, the electric control means is rendered inactive upon receipt of the access signal to render the at least one actuator operable, and
a key tag reader for reading a user signal from a user's key tag, the key
15 tag reader being connected in use to the lock assembly so that the user signal is transmitted to the remote processor via the connection between the lock assembly and the remote processor.
2. A lock system according to claim 1 wherein the key tag reader is an
20 assembly including an antenna connected to a local processor for reading the user signal and transmitting the user signal to the remote processor.
3. A lock system according to claim 2 wherein the local processor includes
25 a PCB.
4. A lock system according to claim 2 or 3 wherein the antenna is associated with a furniture plate configured to receive a handle operatively connected to the at least one actuator.
- 30 5. A lock system according to claim 2 or 3 wherein the reader is associated with a furniture plate configured to receive a handle operatively connected to the at least one actuator.

6. A lock system according to claim 4 or 5 wherein the furniture plate includes an aperture through which the user signals can pass to the antenna.
7. A lock system according to claim 6 wherein the key tag reader includes
5 a cover which covers at least part of the antenna and is located adjacent the aperture in the furniture plate.
8. A lock system according to claim 7 wherein the cover is in the form of a nylon moulding.
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9. A lock system according to any one of the preceding claims wherein the reader also includes a visual indication means to provide the user with a visual indication that the user signal has been received by the reader.
- 15 10. A lock system according to claim 9 wherein the visual indication means also provides a visual indication as to whether the at least one actuator is operable or inoperable.
11. A lock system according to claim 9 or 10 wherein the visual indication
20 means includes an LED.
12. A lock system according to any one of the preceding claims wherein the reader includes an audible indication means to indicate that the user signal has been received.
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13. A lock system according to any one of the preceding claims wherein the lock assembly is a mortice lock assembly.
14. A lock system according to any one of claims 1 to 12 wherein the lock
30 assembly is a rim lock assembly.
15. A lock system according to any one of the preceding claims wherein the lock assembly includes a mechanical key override means that is operable from

an outer side of the assembly by a mechanical key to cause movement of the bolt towards the release position.

5 16. A lock system according to any one of the preceding claims wherein the lock assembly includes a mechanical key override means that is operable from an outer side of the assembly by a mechanical key to render the actuator operable.

10 17. A lock system according to claim 15 or 16 wherein the mechanical key override means includes a lock cylinder.

15 18. A lock system according to claim 17 when dependant upon claim 6 wherein a front face of the lock cylinder is accessible through the aperture formed in the furniture plate.

19. A lock system according to any one of the preceding claims wherein the lock assembly includes a detent that is moveable by operation of the electric control means from an active position where it renders the actuator inoperable to an inactive position where it renders the actuator operable.

20 20. A lock system according to claim 19 when dependant upon claim 17 wherein the detent is movable by operation of the mechanical key override means.

25 21. A lock system according to any one of the preceding claims wherein the lock assembly and the key tag reader include a connection means for facilitating connection of the key tag reader with the lock assembly.

30 22. A lock system according to claim 21 wherein the lock assembly and remote processor include a connection means for facilitating connection of the remote processor with the lock assembly.

23. A lock system according to claim 21 or 22 wherein the connection means is in the form of a plug and socket arrangement.

24. A reader assembly for use with an electric lock assembly for controlling the opening of a door the electric lock assembly having a bolt that is retracted by operation of an actuator, the lock assembly being connected to a remote processor which is located remote from the door, the remote processor controls operation of an electric control means of the lock assembly which when operable renders the actuator inoperable, the lock assembly having a mechanical key override to override operation of the electric control means, the reader assembly including:
- 10 an antenna for receiving a user signal from a key tag, a local processor connected to the antenna for processing the user signal the local processor being detachably connected in use to the lock assembly so as to enable transmission of the user signal to the remote processor via the connection between the remote processor and the electric lock assembly, a furniture plate
- 15 formed to accommodate a handle connected to the actuator and formed to accommodate the antenna so the user signal from the key tag can be received by the antenna, the furniture plate also formed to accommodate operation of a lock cylinder for the mechanical key override means.
- 20 25. A reader assembly according to claim 24 including a moulding that at least partly covers the antenna, the moulding being formed from a non metallic material such as nylon.
- 25 26. A reader assembly according to claim 25 wherein the furniture plate is formed with an aperture to accommodate the moulding, and a front face of the lock cylinder.
- 30 27. A reader assembly according to any one of claims 25 to 26 including a visual indication means for indicating the user signal has been received by the local processor.
28. A reader assembly according to claim 27 wherein the visual indication means is an LED, which is accommodated by the furniture plate.