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GB 2495016 A **US 4606203 A**
US 20020084656 A

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(54) Title of the Invention: **Lock handle assembly**
Abstract Title: **A lift to lock handle assembly**

(57) A lift-to-lock handle assembly 1 comprising a first shaft 7 rotating about a first axis and carrying a handle 9, a second shaft 19 rotating about a second axis parallel to, but spaced apart from, the first axis. An electric motor 41 rotates the second shaft 19, and a shaft sensor system 29 detects rotation of the first shaft 7. An electronic control unit receives a signal from the sensor 29 and causes rotation of the electric motor 41 in a direction determined by the direction of rotation of the first shaft 7. By lifting the handle, the second shaft is rotated by the motor which places the lock in a locked position. The sensor may include one or two light beam sensors (33 35 Fig 2) and beam breaker in the form of a flag (37 Fig 2). The sensors may be set either side of the flag to detect rotation in either direction. The light beams may be activated by a magnet and reed switch combination (39 Fig 2) to conserve battery life.

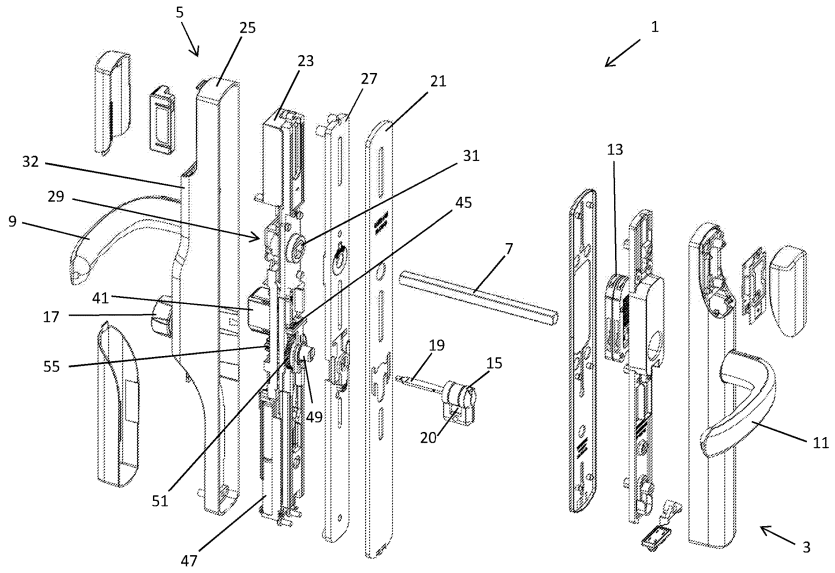

Fig. 1

GB 2552667 A

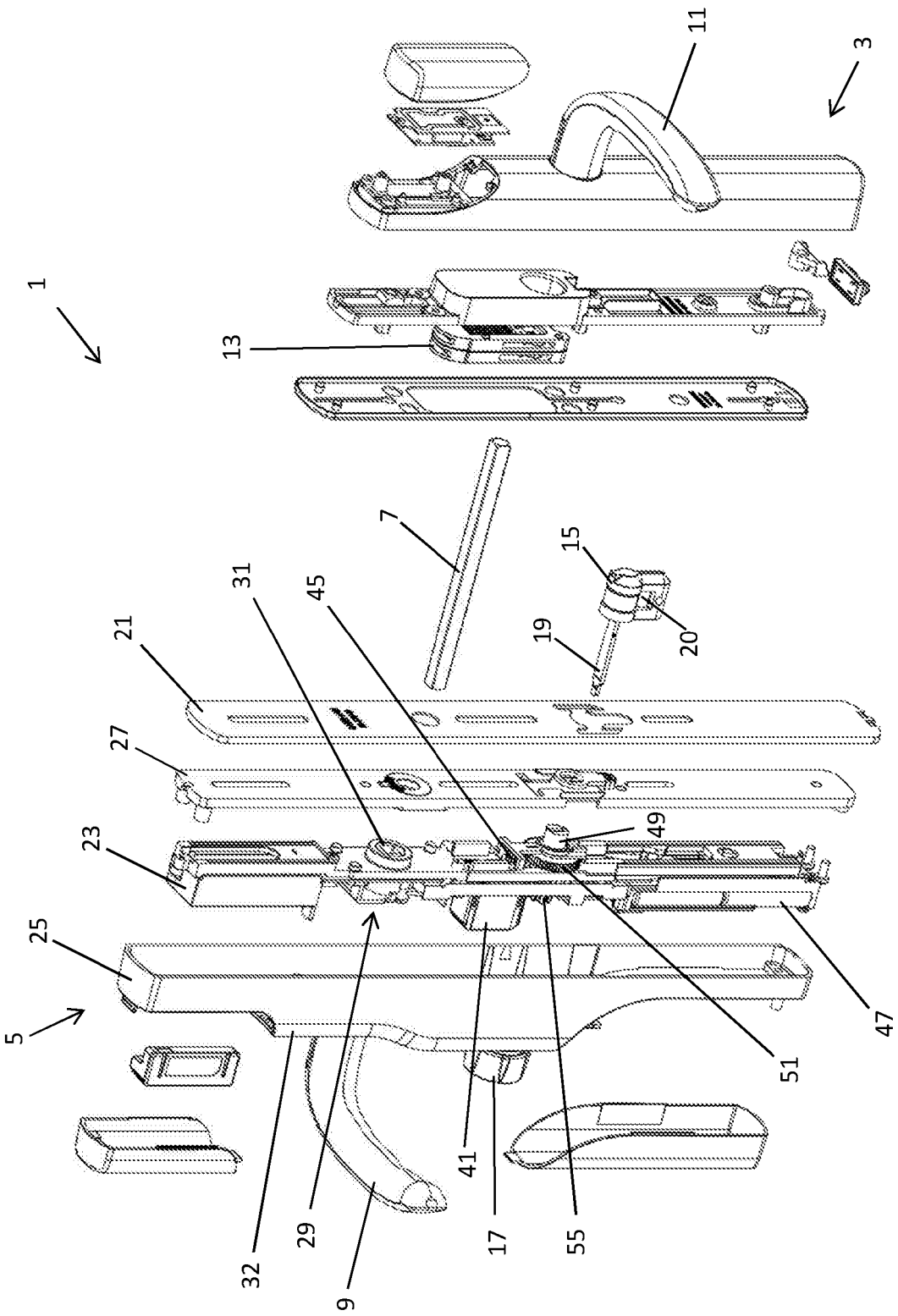

Fig. 1

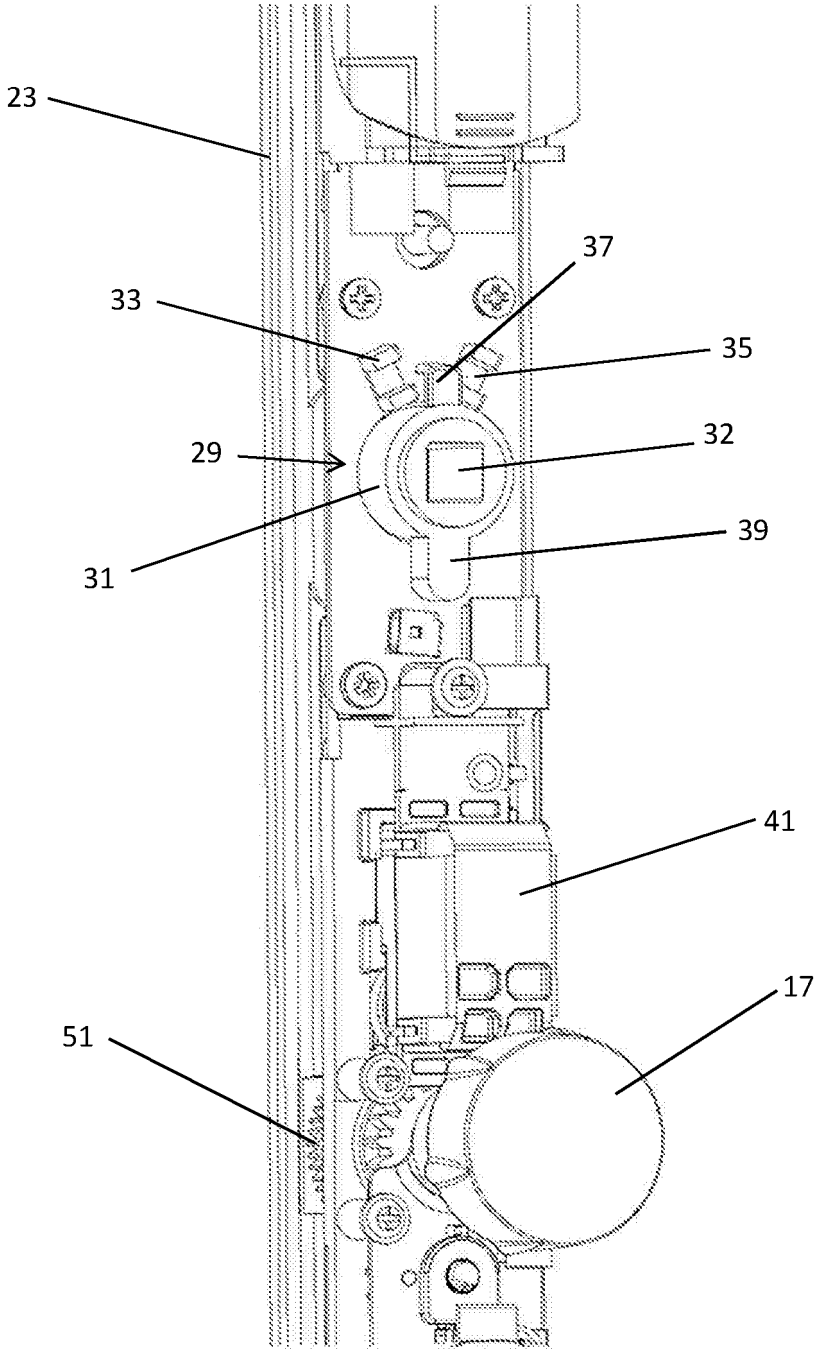

Fig. 2

Lock handle assembly

Field of the Invention

The present invention concerns lock handle assemblies. More particularly, but not exclusively, this invention concerns handle assemblies for lift-to-lock lock assemblies.

Background of the Invention

Lift-to-lock lock assemblies are widely used to secure the doors of domestic properties. Such lock assemblies generally comprise a handle arranged such that, when the lock assembly is mounted upon a door, lifting of the handle causes a plurality of locking members, for example hooks or bolts, situated within the door to move to a locking position in which they engage with the door frame, thereby securing the door within the door frame.

A known lift-to-lock assembly comprises a pair of handles mounted on opposite ends of a first spindle or shaft and a cylinder lock assembly operable, via a key, to operate a cam actuator rotatable about an axis parallel to, but displaced from, the axis of the first shaft. The cam actuator interacts with a lock mechanism to secure the locking members in the locking position, thereby locking the door. To lock a door, starting from an unlocked condition, the handle is lifted and that lifting moves the locking members into a locking position; after the handle has been so lifted, and only then, the cam actuator can be operated with a key to secure the locking members in the locked position.

Such a prior-art lift-to-lock assembly is manually actuated. In some cases it is desirable that the cam actuator should be able to be operated remotely but that is not straightforward: the cam actuator is only to be operated when the handle has been lifted to move the locking members into their locking positions. A further complication is that, according to which side of a door each part of a handle mechanism is fitted, the direction of rotation of the cam that is required to effect the locking is different and that makes it difficult to provide a single handle mechanism that can be used on any door.

The present invention seeks to mitigate the above-mentioned problems.

Summary of the Invention

The present invention provides, according to a first aspect, a lift-to-lock handle assembly comprising

a first shaft mounted for rotation about a first axis and carrying a handle on one end, the first shaft being biased into a first position and being rotatable from the first position in a first direction for moving a latching member from an extended position into a retracted position and being rotatable from the first position in a second direction, opposite to the first direction, to move a latching member from a retracted position into an extended position,

a second shaft mounted for rotation about a second axis substantially parallel to, but spaced apart from, the first axis, the second shaft being rotatable from a releasing position to a locking position for obstructing

movement of a latching member from an extended position into a retracted position,

an electric motor for rotating the second shaft,

an electronic control unit for controlling the electric motor to thereby control rotation of the motor, including control of the direction of rotation of the electric motor,

wherein a shaft sensor system associated with the first shaft for detecting rotation of the first shaft is provided, the electronic control unit is arranged to receive a signal from the sensor system and to cause rotation of the electric motor in a direction determined by the direction of rotation of the first shaft.

By providing a shaft sensor system on the first shaft which then serves to control rotation of the electric motor for driving the second shaft, it becomes possible to provide a remotely operable lift-to-lock handle assembly which can be arranged to replace a known assembly and can even be retro-fitted, if desired.

Whilst each of the first and second shafts are described as rotatable, it should be understood that they are not necessarily rotatable through a full revolution. In an embodiment of the invention described below rotation of the first shaft is restricted by a spring arrangement to less than 45 degrees in each direction away from a neutral position and against the spring bias, whilst rotation of the second shaft is not restricted.

The handle assembly of the invention is able to operate with many lift-to-lock mechanisms that in the past have been operated manually. According to the nature of the lift-to-lock mechanism, lifting of the handle may cause a hook to be rotatably driven into an extended, locking, position, and/or one or more linearly

movable locking members to be extended into locking positions. Similarly, rotation of the second shaft into a locking position may cause one or more already extended locking members to be deadlocked and/or may cause the first shaft to be prevented from being rotated out of its locking position. Thus it should be understood that the term latching member, when employed in this specification, refers to any kind of latching or locking member. Where reference is made above to a latching member being moved from a retracted position to an extended position and to a latching member being moved from an extended position to a retracted position, it should be understood that the same latching member may be moved or two different latching members may be moved. That will be a feature of the lock mechanism to which the handle assembly of the first aspect of the invention is connected, rather than a feature of the handle assembly itself.

The electronic control unit may be arranged to receive a locking signal from the sensor system when the first shaft is rotated in the second direction, and, in response to the locking signal, to cause the electric motor to rotate the second shaft from the releasing position to the locking positon.

Rotation of the first shaft may be effected by rotation of the handle on said one end of the shaft. Whilst it is within the scope of the invention for there to be a single handle on only said end of the first shaft (as could apply for example if a motor were provided for rotating the first shaft), it will generally be preferred for there to be a handle on each end of the first shaft. Whilst reference is made to a “handle” and a lever handle would typically be provided, it should be understood that

in a broad scope of the invention the handle may take any of a wide variety of forms, including, for example, being in the form of a thumb-turn.

Lifting the handle on said at least one end of the first shaft may be effective to rotate the first shaft in the second direction. This is the usual arrangement for a "lift-to-lock" handle assembly and therefore is an operation with which a user is familiar.

The sensor system may comprise a first light beam and first sensor, and a beam breaker, the beam breaker being moveable with the first shaft into a position in which the first light beam is prevented from reaching the first sensor. The sensor system may further comprise a second light beam and second sensor, and the beam breaker may be moveable with the first shaft into a position in which the second light beam is prevented from reaching the second sensor. The shaft may move in opposite directions to reach the respective positions in which the first and second light beams are broken. In an embodiment described below the same beam breaker breaks the beam of the first and second sensors but it is also possible to provide two separate members which break the beams.

In an embodiment of the invention described below, only one of the first and second sensors and light beams are used but both are provided to allow for the handle assembly being mounted on the door with either of the two possible handings. In an initial set up procedure, the first shaft may be rotated in a known direction, for example in the locking direction, and the sensor system may detect the direction of rotation through one of the two sensors. That then informs the system of the direction of rotation of the first and second shafts that

is locking and in operation the electric motor can be rotated in the appropriate direction.

In normal use, in response to the sensor system detecting the rotation of the first shaft in the locking direction, the electronic control system may cause rotation of the electric motor to rotate the second shaft to the locking positon. On the other hand, the assembly may be arranged not to cause any action in response to detecting rotation of the first shaft in the releasing direction. The beam breaker may be mounted on the first shaft for rotation therewith.

The sensor system may further comprise a magnetic switch arranged to activate the first light beam upon rotation of the first shaft. The magnetic switch may be a reed switch. This enables the first light beam to be activated and therefore consuming electrical power only when the handle mechanism is being operated. Energy may thus be conserved. Activation of the second light beam, when present, may also be controlled by the magnetic switch. The magnetic switch may be associated with a permanent magnet which may be mounted for rotation with the first shaft.

Whilst the motor may drive the second shaft directly, it is preferred that the motor comprises a drive shaft connected to the second shaft via a gear system. A first gear may be coaxially mounted upon the drive shaft and a second gear may be coaxially mounted upon the second shaft, the first and second gears being in meshing engagement with one another. The first and second gears may provide speed reduction gearing.

The handle assembly may comprise a control subassembly. The sensor system and motor may be mounted upon the control subassembly. The electric motor and the

first and second gears, when provided, may be mounted upon the control subassembly.

The handle assembly may further comprise a thumb-turn for manually rotating the second shaft. The thumb-turn may take any of a wide variety of forms and the term "thumb-turn" should be construed in the manner that a skilled reader would adopt rather than with any unduly literal inference from inclusion of the word "thumb". Alternatively, the thumb-turn may be some other actuator device, for example a key-operated cylinder assembly.

The assembly may further comprise a cam actuator mounted on the second shaft for interacting with a lock mechanism. The cam actuator may be of conventional design and may interact, in use, with a lock mechanism in a conventional manner. For example, the cam actuator may be the same as the cam actuator on a europrofile cylinder.

The sensor system and motor may be powered by a battery. A battery pack may be mounted upon the control subassembly. The battery pack may be contained within the inside housing.

According to a second aspect of the invention there is provided a lift-to-lock lock assembly comprising one or more latching members, a lift-to-lock handle assembly as defined above and a mechanism for operatively connecting the lift-to-lock handle assembly to the one or more latching members. There may be two or more latching members. The lock assembly may be a multipoint lock.

According to a third aspect of the invention there is provided a kit of parts for assembling into a lift-to-lock handle assembly as defined above.

According to a fourth aspect of the invention there is provided a door comprising a lift-to-lock lock assembly as defined above.

It will of course be appreciated that features described in relation to one aspect of the present invention may be incorporated into other aspects of the present invention.

Description of the Drawings

Embodiments of the present invention will now be described by way of example only with reference to the accompanying schematic drawings of which:

Figure 1 is an exploded view of a lift-to-lock handle assembly according to an embodiment of the invention; and

Figure 2 is a partly cut away isometric view of a part of the lift-to-lock handle assembly.

Detailed Description

Referring first to Figure 1, the lock handle assembly 1 has several features in common with prior-art lift-to-lock handle assemblies and those features will first be described. The handle assembly 1 comprises an outside part 3 for mounting upon the outside of a door, and an inside part 5 arranged for mounting upon the inside of the door. A handle shaft 7, which, when the lock assembly 1 is mounted upon a door, passes through the door and extends between an inside handle 9 mounted upon the inside part 5 with an outside handle 11, mounted

upon the outside part 3. When the handle assembly 1 is mounted upon a door, the handle shaft 7 is arranged such that when the inside handle 9 or the outside handle 11 is pushed downwards from its neutral position (the neutral position being that shown in Figure 1), against the force of a spring set 13 which biases the handle towards the neutral position, the handle shaft 7 is rotated and interacts with a lock mechanism (not shown) in the door to move a latch (not shown) from an extended to a retracted position. Furthermore, when the inside or outside handle 11 is moved upwards, again against the biasing force of the spring set 13, the handle shaft 7 is rotated in the opposite direction and drives one or more locking members, for example rotatable hooks and/or linearly movable bolts (not shown), into a locking position in which they are arranged to secure the door within the door frame. Such a configuration is well known.

A known lift-to-lock assembly has the features just described and comprises a key-operated cylinder assembly which is arranged to secure the locking of the door, once the one or more locking members have been moved to the locking position by lifting the handle. That may be achieved by deadlocking one or more of the locking members and/or from preventing rotation of the handle shaft. Such cylinder assemblies are mounted within the door and the door may be locked by using a key from either the inside side or the outside side of the door.

The lock handle assembly 1 of the presently described embodiment of the invention is designed to replace a known lock handle assembly as described immediately above, but not to require any modification of the locking mechanism in the door. The lock handle

assembly 1 comprises a lock actuator assembly 15, as described in United Kingdom patent application numbers GB1610637.9 and GB1610638.7, in place of a key-operated cylinder assembly. As can be seen from Figure 1, the lock actuator assembly 15 is manually operable to secure the handle shaft 7 from the inside of the door via rotation of a thumb-turn 17 which is engageable with an actuator shaft 19. Rotation of the actuator shaft 19 rotates a cam 20 which is equivalent to the cam actuator of a known cylinder assembly (for example a europrofile cylinder) and operates on the locking mechanism in the door in the same way. The lock actuator assembly 15 is not accessible from the outside of the door. As such, there is no means of manually actuating the actuator shaft 19, and therefore unlocking the door, from the outside of the door.

The inside part 5 of the lift-to-lock assembly 1 is arranged to be mounted upon a mounting plate 21, the mounting plate 21 being arranged to be mounted directly upon the inside of the door. The inside part 5 comprises a control subassembly 23 contained within a housing 25, the housing 25 being closed with a cover plate 27.

The control subassembly 23 is arranged to automatically control, via a control unit, rotation of the actuator shaft 19 in response to movement of the handle shaft 7 in the locking direction, the locking direction corresponding to the direction of rotation of the handle shaft 7 which moves the locking members to the locking position. The control subassembly 23 is also arranged to rotate the actuator shaft in the opposite direction in the event that it receives an unlocking signal passed to it by other means referred to below, and also to allow the actuator shaft 19 to be manually

rotated in that opposite direction via the thumb-turn 17 which is engageable with the distal end of the actuator shaft 19.

Rotation of the actuator shaft 19 in response to rotation of the handle shaft 7 caused by lifting of a handle when locking is achieved by a sensor system 29 which is arranged to sense rotation of the handle shaft 7 and send a locking signal to a motor 41 that is mechanically linked to the actuator shaft 19. Upon receiving the locking signal, the motor 41 rotates the actuator shaft 19 in a first direction to rotate the cam 20 and thereby lock the door.

The sensor system 29, shown in more detail in Figure 2, comprises a cylindrical sensor sleeve 31 which is rotatably mounted within the control subassembly 23, the sleeve 31 is arranged with a square channel 32 through which the handle shaft 7 passes, the sleeve 31 thereby being rotatably coupled to the handle shaft 7. A first light-beam break sensor 33 and a second light-beam break sensor 35 are positioned adjacent the sensor sleeve 31. A flag 37 projects in a radial direction from the circumference of the sensor sleeve 31 and, in the neutral position of the handle shaft 7, is positioned between the light beam breaks 33, 35. In Figure 2, the flag 37 may be regarded as shown at 12 o'clock with the light beam break 33 at 11 o'clock and the light beam break 35 at 1 o'clock. The flag 37 is arranged such that rotation of the sensor sleeve 31 in a first direction causes the flag 37 to move towards and break a light beam of the first light beam break 33, and movement of the sensor sleeve 31 in a second, opposite direction, causes the flag 37 to move towards and break a light beam of the second light beam break 35.

Lifting of a handle rotates the handle shaft 7 and breaks one of the light beams. Upon breaking of the light beam, a locking signal is sent via the control unit to the motor 41 to secure the handle shaft 7 and therefore lock the door. However, as will be appreciated, which light beam is broken when the door handle is lifted to move the locking members into the locked position will depend on which way around the handles are mounted upon the door. For example, with the door handles positioned as they are in Figure 1, lifting of either of the door handles corresponds to movement of the flag 37, as shown in Figure 2, in an anticlockwise direction. Therefore, during installation of the lock assembly 1, the sensor needs to be calibrated to account for the orientation of the door handles. In this case, calibration ensures that breaking of the light beam of the light beam break 33 to the left of the flag 37 sends a locking signal to the motor 41 and that breaking of the light beam of the light beam break 35 to the right of the flag 37 does not send such a signal ('left' and 'right' here are made with reference to Figure 2). Should the door handles be mounted the other way around, the sensor system 29 would need to be calibrated to send the locking signal upon breaking of the light beam of the light beam break 35 to the right of the flag 37, after clockwise movement of the flag 37. Calibration is achieved at the time of installation by lifting a handle so as to rotate the shaft 7 in a locking direction and recording which of the light beam breaks 33 and 35 is interrupted by the flag 37.

As will be explained below, the lock assembly 1 is battery powered. In order to maximise the battery life the sensor system 29 is arranged to active the light

beams only when necessary. This is achieved by using a magnet and reed switch combination 39, the magnet being positioned on the periphery of the sensor sleeve 31, diametrically opposite the flag 37 and the reed switch being fixedly mounted adjacent to the magnet when the shaft 7 is in its neutral position. The reed switch 39 is connected such that rotation of the sensor sleeve 31 to move the magnet away from the reed switch activates the light beams of the light beam breaks 33 and 35.

An electric motor 41 is mounted upon the control subassembly 23, adjacent the actuator shaft 19. A drive shaft 43 of the electric motor 41 projects in a direction towards the door, parallel with the axis of rotation of the actuator bar. A gear 45 is fixedly mounted upon the distal end of the drive shaft 43. The motor 41 and sensor system 29 are powered by four batteries which are mounted within a battery pack 47 located at the lower end of the control subassembly 23.

When the lift-to-lock handle assembly 1 is fully assembled, the actuator shaft 19 is received within a sleeve 49 which passes through and is rotatably mounted within the control subassembly 23, such that rotation of the sleeve 49 causes rotation of the actuator shaft 19. A gear 51 is coaxially mounted upon the outer surface of the sleeve 49 on a first side of the control sub-assembly 23, the first side of the control subassembly 23 being the side closest to the door when the control subassembly 23 is mounted upon the door. The sleeve 49 and motor 41 are arranged relative to one another with the motor gear 45 meshing with the sleeve gear 51. In this arrangement, upon receiving locking signal from the sensor system 29, the motor 41 drive-shaft is rotated,

thereby rotating the actuator shaft 19 and locking the door.

Also co-axially mounted upon the outside surface of the sleeve 49 is a thumb-turn clutch member 55, the thumb-turn clutch member 55 being mounted upon the second side (the opposite side to the first side) of the control subassembly 23. The thumb-turn 17 is rotatably mounted upon the subassembly housing 25, the axis of rotation of the thumb-turn 17 being coincident with the axis of rotation of the actuator shaft 19. The thumb-turn 17 is biased by a spring (not shown) towards a position in which it is spaced apart from the distal end of the actuator shaft 19 and must be pushed towards the actuator shaft 19 in order to engage with the shaft. The thumb-turn 17, which is substantially cylindrical in shape comprises a clutch face which is circumferentially arranged around the inner surface of the thumb-turn 17. The clutch face is arranged to engage with the thumb-turn clutch member 55 when the thumb-turn 17 is pushed, against the biasing force of the spring, towards the door. When the thumb-turn 17 clutch face and the clutch member 55 are engaged it is possible to manually rotate the actuator shaft 19, and therefore secure or release the locking members, by rotating the thumb-turn 17.

In addition to the possibility of releasing the lock from the inside by using the thumb turn, it is also possible to send a signal to the handle assembly to cause the motor 41 to rotate in the opposite direction to the locking direction and thereby rotate the actuator shaft 19 and the cam 20 to release the locking members. This provides a means of unlocking the lock from outside the door. Suitable remote signalling systems are known per se and will not be described further here.

Where in the foregoing description, integers or elements are mentioned which have known, obvious or foreseeable equivalents, then such equivalents are herein incorporated as if individually set forth. Reference should be made to the claims for determining the true scope of the present invention, which should be construed so as to encompass any such equivalents. It will also be appreciated by the reader that integers or features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims. Moreover, it is to be understood that such optional integers or features, whilst of possible benefit in some embodiments of the invention, may not be desirable, and may therefore be absent, in other embodiments.

Claims

1. A lift-to-lock handle assembly comprising

a first shaft mounted for rotation about a first axis and carrying a handle on one end, the first shaft being biased into a first position and being rotatable from the first position in a first direction for moving a latching member from an extended position into a retracted position and being rotatable from the first position in a second direction, opposite to the first direction, to move a latching member from a retracted position into an extended position,

a second shaft mounted for rotation about a second axis substantially parallel to, but spaced apart from, the first axis, the second shaft being rotatable from a releasing position to a locking position for obstructing movement of a latching member from an extended position into a retracted position,

an electric motor for rotating the second shaft,

an electronic control unit for controlling the electric motor to thereby control rotation of the motor, including control of the direction of rotation of the electric motor,

wherein a shaft sensor system associated with the first shaft for detecting rotation of the first shaft is provided, the electronic control unit is arranged to receive a signal from the sensor system and to cause rotation of the electric motor in a direction determined by the direction of rotation of the first shaft.

2. A lift-to-lock handle assembly according to claim 1, wherein the electronic control unit is arranged to receive a locking signal from the sensor system when the first

shaft is rotated in the second direction, and, in response to the locking signal, the electronic control system causes the electric motor to rotate the second shaft from the releasing position to the locking positon.

3. A lift-to-lock handle assembly according to claim 1 or 2, wherein lifting the handle on said at least one end of the first shaft is effective to rotate the first shaft in the second direction.

4. A lift-to-lock handle assembly according to any preceding claim, wherein the sensor system comprises a first light beam and first sensor, and a beam breaker, the beam breaker being moveable with the first shaft into a position in which the first light beam is prevented from reaching the first sensor.

5. A lift-to-lock handle assembly according to claim 4, wherein the sensor system further comprises a second light beam and second sensor, and the beam breaker is moveable with the first shaft into a position in which the second light beam is prevented from reaching the second sensor.

6. A lift-to-lock handle assembly according to claim 4 or 5, wherein the beam breaker is mounted on the first shaft for rotation therewith.

7. A lift-to-lock lock handle assembly according to any of claims 4 to 6, wherein the sensor system further comprises a magnetic switch arranged to activate the first light beam upon rotation of the first shaft.

8. A lift-to-lock handle assembly according to any preceding claim, wherein the motor comprises a drive shaft and the drive shaft is connected to the second shaft via a gear system.

9. A lift-to-lock lock assembly according to claim 8, wherein a first gear is coaxially mounted upon the drive shaft and a second gear is coaxially mounted upon the second shaft, the first and second gears being in meshing engagement with one another.

10. A lift-to-lock handle assembly according to any preceding claim, wherein the assembly comprises a control subassembly and wherein the sensor system and motor are mounted upon the control subassembly.

11. A lift-to-lock handle assembly according to any preceding claim, further comprising a thumb-turn for manually rotating the second shaft.

12. A lift-to-lock handle assembly according to any preceding claim, further comprising a cam actuator mounted on the second shaft for interacting with a lock mechanism.

13. A lift-to-lock handle assembly according to any preceding claim, wherein the sensor system and motor are powered by a battery.

14. A lift-to-lock handle assembly substantially as herein described with reference to the accompanying drawings.

15. A lift-to-lock lock assembly comprising one or more latching members, a lift-to-lock handle assembly according to any preceding claim and a mechanism for operatively connecting the lift-to-lock handle assembly to the one or more latching members.

16. A lift-to-lock lock assembly according to claim 15, in which there are two or more latching members.

17. A kit of parts for assembling into a lift-to-lock handle assembly according to any preceding claim.

18. A door comprising a lift-to-lock lock assembly according to claim 16 or 17.

Intellectual Property Office

Application No:	GB1613268.0	**Examiner:**	Mr Philip Lawrence
Claims searched:	1-18	**Date of search:**	13 February 2017

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	GB2495016 A (GAINSBOROUGH HARDWARE), see Abstract and Figure 2.
A	-	US2002/0084656 A (TUN LUNG), see Abstract, Figures and Paras [0018] & [0019].
A	-	US4606203 A (OGDEN INDUSTRIES), see Abstract, Figures and Col. 3 lines 1-51.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

E05B

The following online and other databases have been used in the preparation of this search report

EPODOC, TXTA, WPI

International Classification:

Subclass	Subgroup	Valid From
E05B	0047/00	01/01/2006
E05B	0001/00	01/01/2006