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(54) ELECTRONICALLY OPERATED DOOR LOCK

(57) This disclosure relates to an electronically operated door lock (2) comprising - a lock case (3) comprising a through-hole (10) for a cylinder assembly (11), - a cylinder assembly (11) comprising a housing (15), a cylinder (16) rotatably mounted in the housing (15) and provided with a cam (19) to drive a bolt (8; 9) in the lock case (3), - an electromechanical actuator on one side of the lock case (3) to rotate the cylinder (16) and cam (19) to drive the bolt (8; 9), - an electronic module (33) on the other side of the lock case (3) for controlling the electromechanical actuator, and - door fittings (6, 7), wherein at least the door fitting (6) on the side of the module comprises an opening (32). The side (15A) of the housing (15) of the cylinder assembly (11) facing towards the module (33) is blind. Further, the lock comprises a mounting element (34) for mounting the module (33) in and/or over the opening (32) in the door fitting (6).

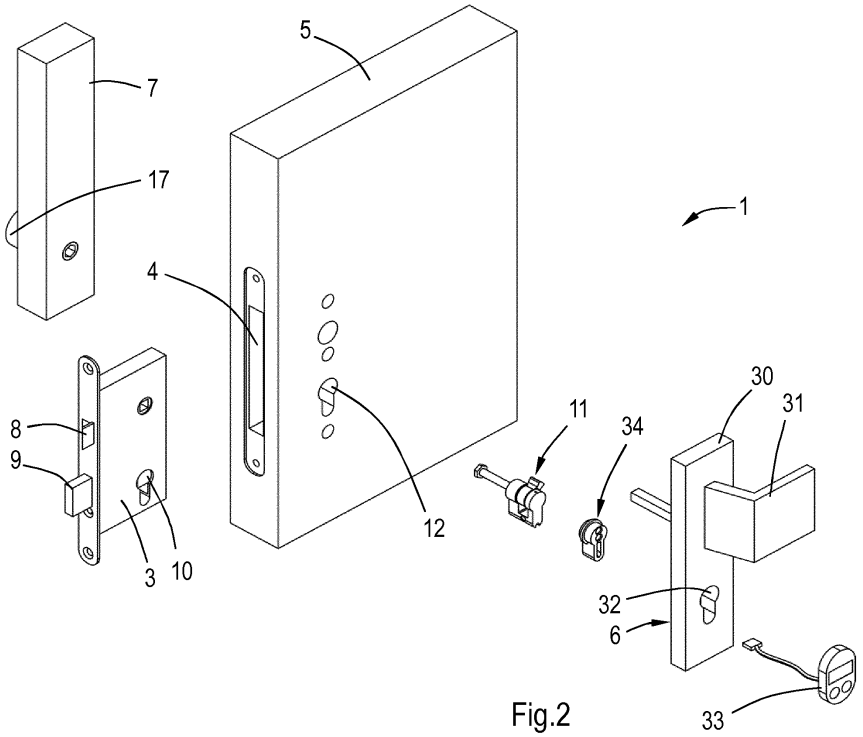

Fig.2

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Description

[0001] The present invention relates to an electronically operated door lock comprising: - a lock case, also known as bolt work, e.g. a mortice lock, comprising a through-hole for a cylinder assembly, - a cylinder assembly comprising a housing, a cylinder rotatably mounted in the housing and provided with a cam to drive a bolt, e.g. a dead bolt and/or a spring bolt, in the lock case, - an electromechanical actuator, such as an electric motor or solenoid, on one side of the lock case, once assembled on the inside of the door, also referred to as the interior side or the safe side, to rotate the cylinder and cam to drive the bolt, typically to move a locking bolt from the door into the door frame or backwards, thereby locking or unlocking the door, - an electronic module on the other side of the lock case for controlling the electromechanical actuator, e.g. in response to a code or signal, and - door fittings, also known as door hardware, wherein at least the door fitting on the side of the module comprises an opening.

[0002] Keyless entry systems conveniently allow a person to access an area, such as his home, without having to insert a key into a lock.

[0003] Modifying an existing, conventional lock so that it can be opened without the insertion of a key into the lock, i.e. to implement a "keyless functionality" into an existing lock typically requires replacement of all existing components, including all door fittings.

[0004] GB 2 524 718 relates to a lock assembly comprising an external handle coupled to an inner shaft (indicated by reference number 5A in the Figures of GB 2 524 718) rotatable within an outer sleeve (5F) that may be coupled to an interior handle. Rotation of the outer sleeve drives a lock bolt or latch, e.g. via cam (5E) of a cylinder lock. An electrically movable element selectively couples inner shaft and outer sleeve such that outer handle may be uncoupled from outer sleeve. Figures 1 and 2 of GB 2 524 718 show a "fixing screw 3 [that] screws into a fixing point 5C and so fixes the outer faceplate 2 to the cylinder assembly 5. Although not always required and not shown, for higher protection against vandalism a further fixing screw can be used to prevent forced rotation of the outer faceplate 2 though this would mark the door 4."

[0005] European patent application 18151732.7 (not prepublished) relates to a lock assembly comprising a lock case and a housing. The lock case comprises a through-hole. The housing accommodates a rotatable member. In an example, the housing is a cylinder housing accommodating a cylinder of a cylinder lock. Further, the housing is mated to and mounted in the through-hole. At least one of the housing and the through-hole provide a channel through the lock case. Figure 5 of EP18151732.7 "shows a housing 54 and cylinder 52 of a cylinder lock...., the front face of the housing is closed and does not comprise an opening for receiving a mechanical key."

[0006] It is an object of the present invention to provide an electronically operated door lock that, when it replaces an existing door lock, re-uses at least some components of the existing lock, in particular the door fitting or face plate on the locked side of the door, and/or requires no or limited changes to the door, and/or that provides improved protection from burglars.

[0007] To this this end, the side of the housing of the cylinder assembly facing towards the module is blind, in particular contains no keyhole or attachment for a knob or handle, and by a mounting element, e.g. a block or plate, for mounting the module in and/or over the opening in the door fitting.

[0008] In an embodiment, the side of the housing of the cylinder assembly facing towards the module covers the corresponding end of the cylinder, e.g. is solid i.e. contains no movable parts, such as the corresponding end of the cylinder.

[0009] Thus, the cylinder is separated from the module, the mounting of the module and the door fitting on the side of the module, which enables a compact design, typically such that the cylinder assembly and the mounting element fit within the existing door, mortice and (external) door fitting. Further, it enhances burglar resistance in that the cylinder is less accessible and/or it enables, when the lock replaces an existing mechanical lock, re-use of one or more components.

[0010] In an embodiment, at least one of the cylinder and the part of the housing that covers the end of the cylinder is made of hardened metal or is provided with at least one hardened element. The metal of hardened element preferably has a Rockwell hardness of at least 60 HRC.

[0011] In a refinement, the hardened element is a pin or plate. In a further refinement, the imaginary rotational axis of the cylinder extends through the hardened element.

[0012] To further enhance efficient use of limited space inside the door and to reduce costs, in an embodiment, the cylinder assembly comprises a half cylinder. Half cylinders are known in the art primarily for (internal) doors that are locked e.g. with just a knob, not a key.

[0013] In an embodiment, the mounting element fits at least partially in the opening in the door fitting.

[0014] In a refinement, the mounting element comprises a front end that fits at least partially in the opening in the door fitting and at least one section that, when the mounting element is fitted in the opening, abuts the wall of the door fitting (facing the lock case / door).

[0015] In a further refinement, the mounting element is attached to the module from within, i.e. from the side of the door fitting that, once fitted on the door, faces the door and lock case.

[0016] In an embodiment, the (external) door fitting is attached to the door from within, i.e. from the side of the internal door fitting.

[0017] In an embodiment, the mounting element fits at least partially in the through-hole in the lock case. It is preferred that at least one of the shape of the through-

hole in the lock case, the shape of the opening in the door fitting, and the cylinder is in accordance with the Euro Profile lock standard, an Oval lock standard, such as a UK Oval lock standard, Scandinavian Oval lock standard or Australian Oval lock standard, or the Swiss profile, Knobset, Rim or Screw-in standard, for example in accordance with one or more of the following standards: DIN 1303, NEN-EN 1303, DIN 18250, DIN 18251 and DIN 18252.

[0018] In an embodiment, an anti-plug pulling device is positioned in the opening in the external door fitting, e.g. between the mounting element and the module.

[0019] Typically, keyless lock systems require a wired electrical connection between a power supply or controller on one side of the door and a module, e.g. comprising an antenna for receiving wireless signals from a transponder, on another side of the door. Hence, if a home owner wants to implement a keyless functionality into an existing lock, he will have to drill a hole through the door for forming a passage through the door for electrical wiring. Thus, in an embodiment, at least one of the housing and the through-hole provides a channel through the lock case for accommodating at least one electric wire to the other side of the lock case and/or door. It is preferred that the housing comprises a recess running the length of the housing.

[0020] Aspects of this disclosure will be explained in greater detail by reference to exemplary embodiments shown in the drawings in which:

Figure 1 schematically show an electronic lock according to the present invention installed in an outside door.

Figure 2 is an exploded view of the electronic lock shown in Figure 1.

Figure 3 is a perspective view of the cylinder assembly of the lock shown in Figures 1 and 2.

Figure 4 is a perspective view of the mounting block used to of the lock shown in Figures 1 and 22 is an exploded view of the lock shown in Figure 1.

[0021] Figures 1 and 2 show a door 1 provided with an electronically operated lock 2. The lock comprises a lock case 3 accommodated in a mortice 4, i.e. a pocket, in the lock stile 5 of the door and external and internal door fittings 6, 7 on the external (E) and internal (I) sides of the door. The lock case 3 houses a spring bolt 8 or latch and a dead bolt 9 and has a through-hole 10 for accommodating a cylinder assembly 11, shown in more detail in Figure 3. The door comprises openings 12 that have the same shape as the through-hole 10 and that are in register with the through-hole when the lock case 3 is properly located in the mortice 4.

[0022] The cylinder assembly 11 has e.g. a Euro Profile and comprises a housing 15 and a cylinder 16 rotatably mounted in the housing. The cylinder 16 is provided with a knob 17 (Figures 1 and 2) on one end 18 and a cam 19 near its other (distal) end to drive a bolt 8, 9 in the lock case 3. The housing 15 comprises a recess 25 that enables the cam 19 to pass when the cylinder 16 is being rotated and, just below the recess 25, a threaded bore 26 for a retaining screw (not shown; known in itself).

[0023] The end 15A of the housing 15 opposite the knob 17 rotatably carries and covers the other (distal) end of the cylinder 16 but is otherwise solid. In this example, this part 15A of the housing 15, preferably the entire housing, is made of a hardened metal, e.g. hardened steel, and/or is provided with a hardened pin 27, positioned such that the imaginary rotational A axis of the cylinder 16 extends through the pin. The pin can be a composite pin or a pin having more of different sections. The pin in Figure 3 has a round cross-section, but can have other cross-sections, e.g. triangular or square. The hardened metal preferably has a Rockwell hardness of at least 60 HRC. Further, the housing 15 is provided, in its bottom side with a channel 28 running the length of the housing.

[0024] The internal door fitting 7 carries the rotary knob 17 for manually operating the lock and contains an electromagnetic actuator for automatically operating the lock.

[0025] The external door fitting 6 comprises a face plate 30 carrying a door handle 31 and is provided with an opening 32 shaped to accommodate a cylinder assembly having, in this example, a Euro Profile. An electronic module 33 for controlling the electromechanical actuator is mounted over the opening 32 by means of a metal block 34. The metal block 34 comprises a front end 35, that has the same shape as and fits snugly in the opening 32 in the face plate 30, and a collar 36 that, when the block is fitted in the opening, abuts the wall of the door fitting. Further, the module comprises threaded elements or snap fit connectors, such that the block 34 can be attached by means of screws 37 or snap fit counter-connectors to the module from within, i.e. from the side of the door fitting that, once fitted on the door, faces the door and lock case.

[0026] Finally, the electronic module can comprise a controller for the actuator or be wired to a controller located in e.g. the internal door fitting 7.

[0027] The lock according to the present invention can be installed in a relatively straightforward manner and e.g. be used to replace an existing mechanically operated lock while re-using some of the components of that existing lock. In an example, replacing a lock is performed as follows: removing the door fittings and cylinder assembly of the existing lock, placing the mounting element through the opening in the external (existing) door fitting, feeding the wire(s) of the module through an opening in the mounting element and through the recess in the cylinder assembly, fastening the module to the outside of the external door fitting from within, e.g. by means of one or more screws extending through the mounting element and screwed onto or into the module, placing and fastening, by means of the retaining screw, the cylinder assembly according to the present invention in the through-hole in the lock case, attaching the external door fitting,

now carrying the module, to the door, connecting the wire(s) to the internal door fitting, e.g. to a controller and/or electromagnetic actuator contained in the internal door fitting, and attaching the internal door fitting to the door and coupling the actuator to the cylinder assembly.

[0028] The invention is not restricted to the embodiments described above and can be varied in numerous ways within the scope of the claims.

Claims

1. Electronically operated door lock (2) comprising
a lock case (3) comprising a through-hole (10) for a cylinder assembly (11),
a cylinder assembly (11) comprising a housing (15), a cylinder (16) rotatably mounted in the housing (15) and provided with a cam (19) to drive a bolt (8; 9) in the lock case (3),
an electromechanical actuator on one side of the lock case (3) to rotate the cylinder (16) and cam (19) to drive the bolt (8; 9),
an electronic module (33) on the other side of the lock case (3) for controlling the electromechanical actuator, and
door fittings (6, 7), wherein at least the door fitting (6) on the side of the module comprises an opening (32),
characterized in that
the side (15A) of the housing (15) of the cylinder assembly (11) facing towards the module (33) is blind **and by** a mounting element (34) for mounting the module (33) in and/or over the opening (32) in the door fitting (6).

2. Door lock (2) according to claim 1, wherein the side (15A) of the housing (15) of the cylinder assembly (11) facing towards the module (34) covers the corresponding end of the cylinder (16).

3. Door lock (2) according to claim 2, wherein at least one of the cylinder (16) and the part (15A) of the housing (15) that covers the end of the cylinder (16) is made of hardened metal or is provided with at least one hardened element (27).

4. Door lock (2) according to claim 3, wherein the hardened element is a pin (27) or plate.

5. Door lock (2) according to claim 4, wherein the imaginary rotational axis (A) of the cylinder (16) extends through the hardened element (15A; 27).

6. Door lock (2) according to any one of the preceding claims, wherein the cylinder assembly (11) comprises a half cylinder.

7. Door lock (2) according to any one of the preceding claims, wherein mounting element (34) fits at least partially in the opening (32) in the door fitting (6).

8. Door lock (2) according to claim 7, wherein the mounting element comprises a front end (35) that fits at least partially in the opening (32) in the external door fitting (6) and at least one section (36) that, when the mounting element (34) is fitted in the opening (32), abuts the wall of the door fitting (6).

9. Door lock (2) according to claim 7 or 8, wherein the mounting element (34) is attached to the module (33) from within.

10. Door lock (2) according to claim 9, wherein the external door fitting (6) is attached to the door (1) from within.

11. Door lock (2) according to any one of the preceding claims, wherein mounting element (34) fits at least partially in the through-hole (10) in the lock case (3).

12. Door lock (2) according to any one of the preceding claims, wherein at least one of the shape of the through-hole (10) in the lock case (3), the shape of the opening (32) in the door fitting (6), and the cylinder assembly (11) is in accordance with the Euro Profile lock standard, the Oval lock standard, such as a UK Oval lock standard, Scandinavian Oval lock standard or Australian Oval lock standard, or the Swiss profile, Knobset, Rim or Screw-in standard.

13. Door lock (2) according to any one of the preceding claims, wherein at least one of the housing (15) and the through-hole (10) provides a channel (28) through the lock case (3) for accommodating at least one electric wire to the other side of the lock case (3).

14. Door lock (2) according to claim 13, wherein the housing (15) comprises a recess (28) running along the length of the housing (15).

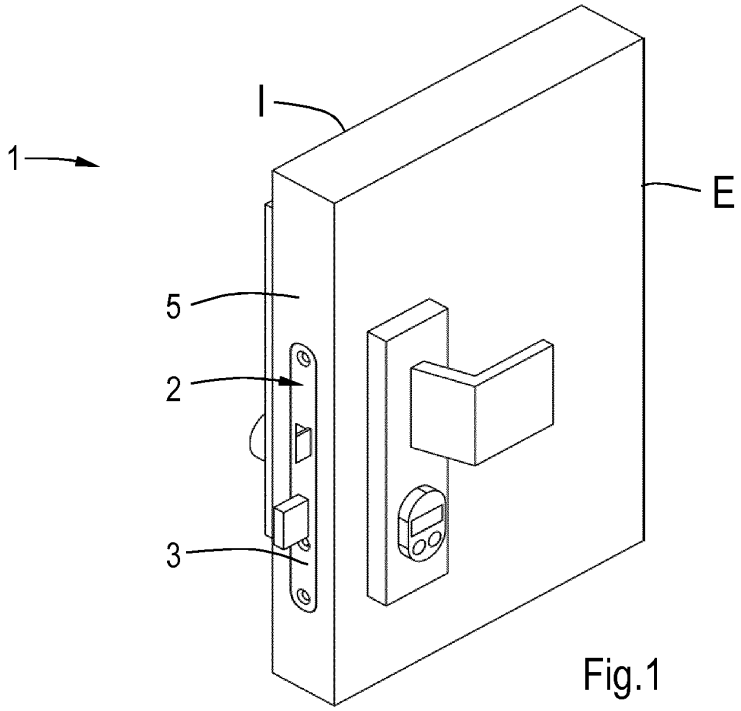

Fig.1

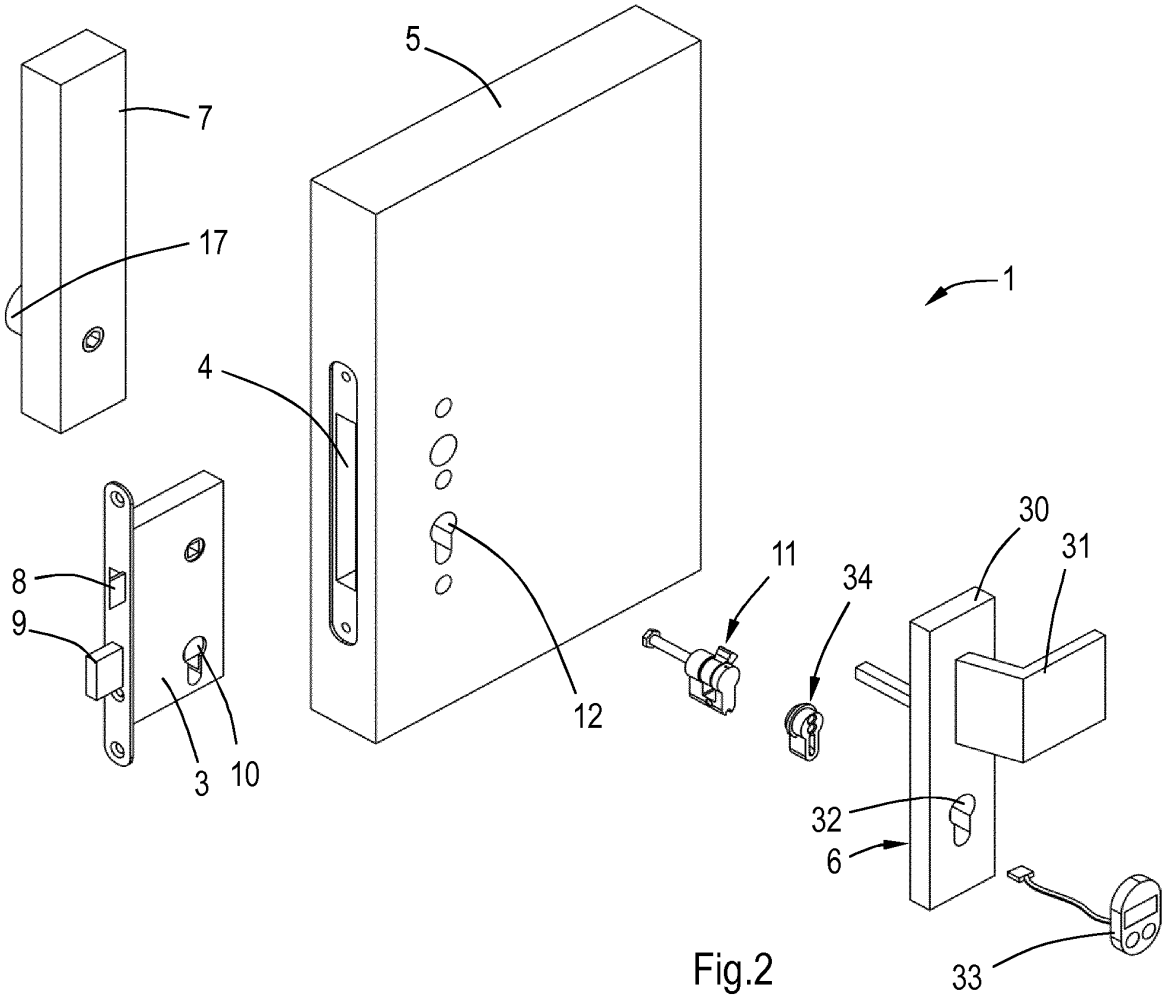

Fig.2

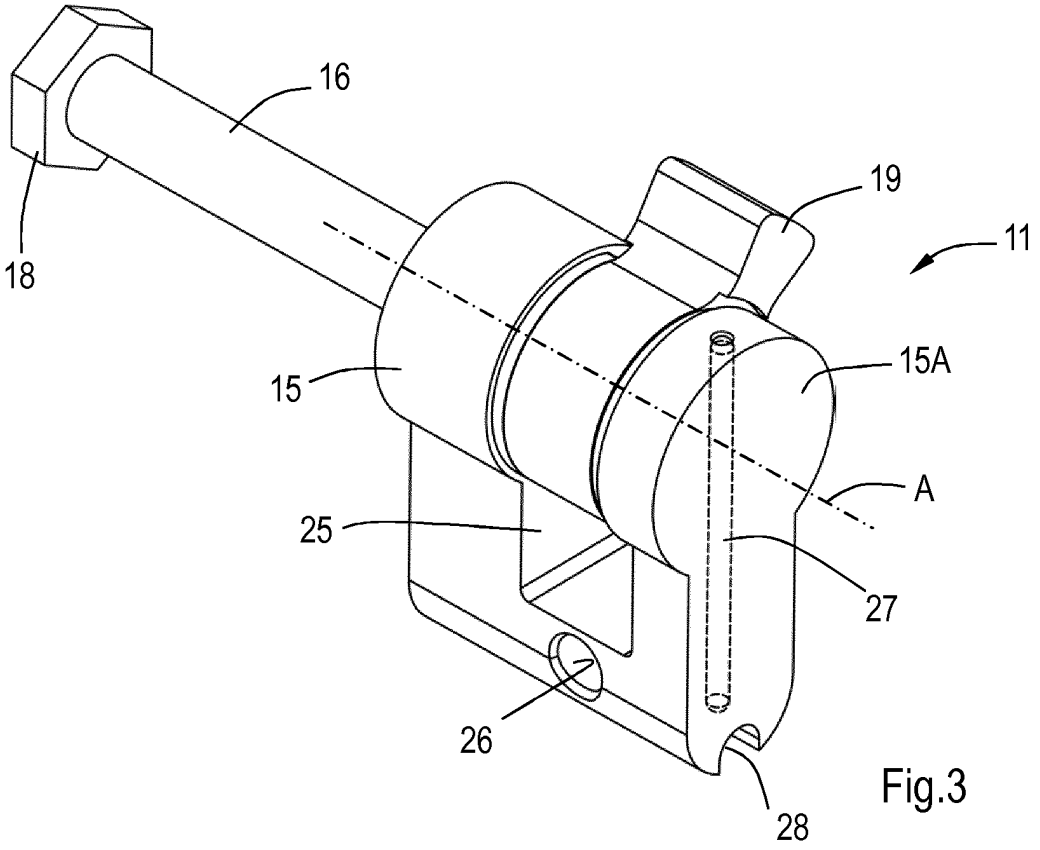

Fig.3

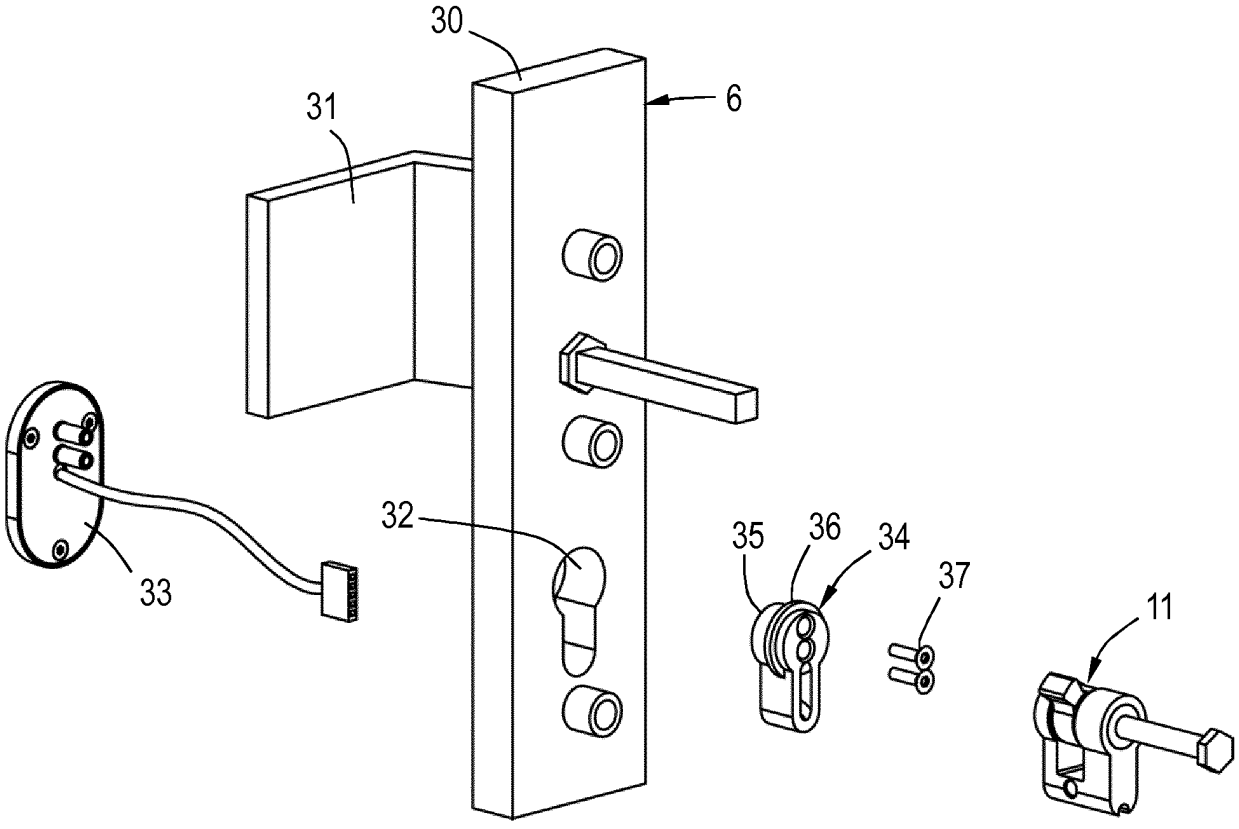

Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 4064

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Place of search	Date of completion of the search	Examiner
The Hague	23 January 2019	Koster, Michael

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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