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(54) **Locking arrangement for a door**

(57) A locking arrangement with a locking mechanism (15) for a door (2) comprises a crossbar (24) rotatably mounted in the door (2) and connected in a conventional manner to a lock bolt (7) or cremone bar in the door, and a handle (6) for rotating the crossbar (24), the locking mechanism (15) comprises a first coupling (25, 28) having two coupling parts (25, 28) for bringing the crossbar (24) into and out of engagement with the handle, a second coupling (21, 26) having two coupling parts (21, 26) for bringing the crossbar (24) into and out of engagement with the handle, an electrically operating first actuator (31) for engaging and disengaging the first coupling, and a manually operated second actuator (16) for engaging and disengaging the second coupling. The locking arrangement has a simple structure and can be activated by means of both a fingerprint and a code and manually by a key.

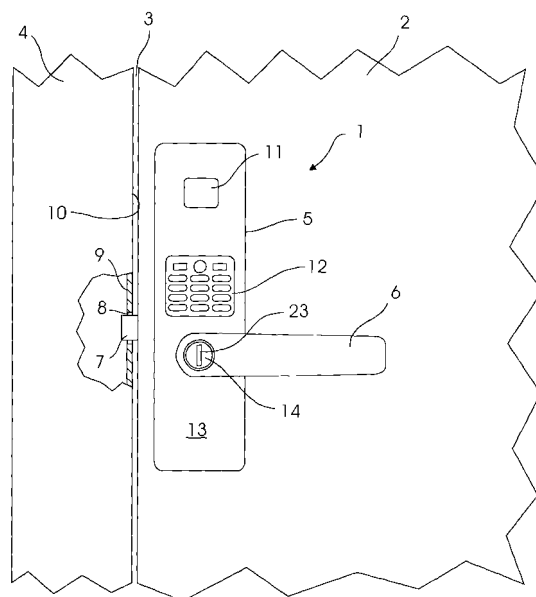


Fig. 1

Description

[0001] The invention relates to a locking arrangement for a locking mechanism for a door and of the kind that comprises a crossbar rotatably mounted in the door and connected in a conventional manner to a lock bolt or cremone bar in the door, and a handle for rotating the crossbar.

[0002] By the concept door is, within the scope of the invention, meant an object for closing an opening in a wall. Examples are a door in a house, a safe, or a car.

[0003] In the following, the invention is described on basis of the example that the object is a hinged door for closing and giving access through a door opening in a house.

[0004] By the concept locking pawl is, in this context, meant a relatively short bar which, upon activation, can be displaced between a retracted position in the door and an extended position in which an end part of the locking pawl is extending out of a lateral edge of the door. When the door is closed, said end part can extend into a corresponding locking opening in the wall or in a frame on the wall and thereby keep the door closed and if so desired, locked.

[0005] By the concept cremone bar is meant a relatively long bar basically functioning in the same way as the above mentioned locking pawl. Usually, there are two such bars working in opposition upon activation and engaging opposite locking openings in the wall or frame on the wall. A three-point locking is thereby formed together with a locking pawl.

[0006] Normally, doors are provided with handles on both sides. The handles are pivotally mounted in the respective door and moment-resistently connected to a usually square crossbar. A locking pawl on the crossbar engages with a lock bolt or cremone bar in such a way that the lock bolt or cremone bar is pushed back and forth or up and down between a closing position and an opening position upon turning of the handle.

[0007] Said arrangement is normally used for merely keeping a door closed. If the door is to be locked as well, a separate lock is generally used, for example a cylinder lock having a cylinder that only can be turned by means of a specific key adapted to the lock. However, it is relatively costly to buy both arrangements and mount them on the same door.

[0008] In recent years, locking arrangements have been developed that can be activated without use of keys. Instead, e.g. biometric fingerprint scanners or code readers are used to ensure that unauthorized persons do not unlock a door.

[0009] This solution is particularly convenient to use and especially in places where a lot of people must have access to the same area, for example a building.

[0010] Authorized persons are spared from having to have often large bunch of keys just as e.g. institutions or companies housed in a building are relieved from the trouble of having to keep track of keys that have been

handed out and keep count of whether or not persons that are no longer authorized have forgotten to turn in the keys.

[0011] Another advantage is that a forgotten or missing key would not prevent a person from entering or exiting a door to e.g. his home or workplace. For example, a fingerprint cannot be forgotten or be lost.

[0012] However, fingerprint scanners and code readers only function as long as they are connected to a power supply. If the power supply is interrupted or circuit of the locking arrangement is broken, the locking arrangement stops functioning. Then, a locked door cannot be opened so that people cannot get in or out of the door opening.

[0013] The above disadvantages of the known locking arrangements are overcome according to the invention by

in a first aspect according to the invention providing a locking arrangement of the kind mentioned in the opening paragraph, that has a simple structure,

in a second aspect according to the invention providing a locking arrangement of the kind mentioned in the opening paragraph, that can be mounted on a door at fewer costs than hitherto known,

in a third aspect according to the invention providing a locking arrangement of the kind mentioned in the opening paragraph, that can be activated both electrically and manually,

in a fourth aspect according to the invention providing a locking arrangement of the kind mentioned in the opening paragraph, that can be activated by a fingerprint and/or a code.

[0014] The novel and unique feature according to the invention, whereby this is achieved, is the fact that the locking mechanism of the locking arrangement comprises a first coupling having two coupling parts for bringing the crossbar into and out of engagement with the handle, a second coupling having two coupling parts for bringing the crossbar into and out of engagement with the handle, an electrically operating first actuator for engaging and disengaging the first coupling, and a manually operated second actuator for engaging and disengaging the second coupling.

[0015] This locking arrangement is inexpensive to produce and easy to mount on the door because there is no need for a separate lock to lock the door but only the handle or handles and the crossbar that are already there.

[0016] The locking arrangement according to the invention comprises electrically operated, biometric fingerprint scanners and/or code readers for activating the electrically operating first actuator for engaging and disengaging the first coupling.

[0017] The presence of the manually operated second actuator for engagement of the second coupling effectively ensures that a locked door can be unlocked if the power to the locking arrangement should fail.

[0018] According to the invention, the crossbar and the handle can form part as essential structural elements of

both couplings whereby the locking arrangement according to the invention is given a simple, inexpensive and very effective structure.

[0019] In an especially advantageous and simple embodiment, one of the coupling parts of the first coupling according to the invention can be shaped as a disc mounted displaceably and moment-resistantly on the crossbar whereas its second coupling part can be made in an end section of the handle. The two coupling parts can e.g. be formed with cooperating claw couplings.

[0020] According to the invention, the electrically operating first actuator for engagement and disengagement of the first coupling can furthermore comprise an engaging fork pivotally mounted on a pivot pin in the locking arrangement and pivotal about this pivot pin by an electric motor. The fork attacks the back (seen in the disengagement direction) of the first coupling disc.

[0021] The two coupling parts of the first coupling are coupled when the current is switched on to the first actuator. The door can now be opened by turning the handle.

[0022] The first actuator is only arranged to engage the disc of the first coupling with its second coupling part.

[0023] According to the invention, the locking arrangement therefore comprises a spring having a spring power applying force to the disc of the first coupling in the disengagement direction whereby the first coupling is automatically disengaged if the power to the motor of the first actuator is disconnected, for example upon power failure.

[0024] According to the invention, one of the coupling parts of the second coupling can furthermore be formed on a pin mounted displaceably and moment-resistantly in a recess in the handle whereas its second coupling part can be formed in an end section of the crossbar.

[0025] As it appears, both the crossbar and the handle are thus used for both the first coupling and the second coupling whereby the number of component parts for producing the two couplings is advantageously reduced.

[0026] In an advantageous embodiment, the manually operated, second actuator can comprise a cylinder lock moment-resistantly mounted in the recess of the handle and a screwed connection between the cylinder of the cylinder lock and the pin of the second coupling.

[0027] If the power to the first actuator fails, the second coupling can be engaged by manually turning a key fitting the cylinder of the cylinder lock so that the pin of the second coupling is screwed into engagement with the second coupling parts of the second coupling on the crossbar by means of the screwed connection.

[0028] Now, the lock can be unlocked and the door be opened.

[0029] According to the invention, the screwed connection can be arranged in such a way that the key has to be turned many times to engage the second coupling. An unauthorized person who is in possession of a correct key would therefore tend to abandon the attempt as the key normally only has to be turned a part of a rotation to be able to unlock a regular lock.

[0030] The invention will be explained in greater details below, describing only exemplary embodiments and advantageous characteristics with reference to the drawing, in which

Fig. 1 is a front fractional view of a door having a control panel and a handle for a locking arrangement according to the invention,

Fig. 2 is a perspective exploded view of a locking mechanism for the locking arrangement,

Fig. 3 is a side elevational view of the locking mechanism in a locking state,

Fig. 4 is a view of the locking mechanism in fig. 3 in an electrically activated unlockable state,

Fig. 5 is a view of the locking mechanism in fig. 3 in a manually activated unlockable state,

Fig. 6 is a diagrammatic side elevational view of an electrically operated actuator for bringing the locking mechanism into the unlockable state in fig. 4, and

Fig. 7 is a front view of the same.

[0031] In the following, an exemplary embodiment according to the invention is described in which the locking arrangement 1 is for a door 2 for closing a door opening 3 encircled by a frame 4.

[0032] Usually, a door can be operated from both sides. In fig. 1 it is shown that a control panel 5 and a handle 6 are mounted on at least one side of the door.

[0033] In the case shown, a lock bolt 7 is pushed into a locking opening 8 formed in a lock washer 9 recessed in the lateral edge 10 of the frame. The door is closed and possibly locked.

[0034] The door can be unlocked electrically by means of a fingerprint on a fingerprint scanner 11 or by entering a specific code on a code reader 12. Both the fingerprint scanner 11 and the code reader 12 are located on a cover 13 on the door 2.

[0035] Alternatively, the door can be unlocked manually by a key fitting a cylinder lock 14 mounted in the handle 6 which is pivotally mounted on the cover 13.

[0036] When the door is to be opened in one of the above-described ways, a locking mechanism 15 in the locking arrangement 1 is activated. This locking mechanism, shown in an exploded view in fig. 2, is partly located in a recess (not shown) in the door.

[0037] The locking mechanism 15 comprises the cylinder lock 14 shown in fig. 1 in the handle 6. In the cylinder lock is a cylinder 16 in which a groove 17 is made in its end face 18. An adapter 19 having a threaded connection 20 fits the groove 17. A pin 21 is screwed onto the threaded connection of the adapter. The cylinder can be turned by a key 22 having a predetermined shape and fitting a

keyhole 23 in the cylinder 16. The keyhole is shown in fig. 1.

[0038] The locking mechanism 15 furthermore comprises a crossbar 24 having in this case a square cross section. The crossbar is rotatably mounted in the door and connected in a conventional manner to the lock bolt 7.

[0039] On rotating the crossbar, the locking pawl 8 is pushed sideways out of the door 2 in a normal manner and into the locking opening 8 in the lock washer 9.

[0040] A disc 25 is displaceably, but moment-resistantly mounted on the crossbar. The disc is formed with claws 27 which can cooperate with corresponding claws 28 on the end part of the handle 6.

[0041] A second disc 26 is fastened on the end of the crossbar. The disc is made with a slot 29 which can cooperate with a corresponding key 30 on the pin 21.

[0042] Figs. 3, 4, and 5 show in detail how the locking mechanism 15 is arranged and functions.

[0043] The displaceable disc 25 with claws 27 form together with the claws 28 on the end part of the handle 6 a first coupling whereas the fixed disc with the slot 29 form a second coupling together with the pin 21 with the key 30.

[0044] In fig. 3, both couplings are disengaged. If the door 2 is closed, it is also locked as there is no connection between the crossbar 24 and the handle 6 which thereby can be turned without bringing the crossbar.

[0045] Figs. 6 and 7 are diagrammatic views of an electrically operated actuator 31 for engaging the first coupling 25, 28. The actuator comprises an engaging fork 32 pivotally mounted on a pivot pin 33 fastened in the door. The engaging fork is provided with two pins 34 catching behind the disc 25. An electric motor 35 has a pinion drive 36 engaging a toothed wheel 37 on the pivot pin 33. On connecting the motor to a power source (not shown), it rotates the engaging fork to the position shown in fig. 6.

[0046] In the situation shown in fig. 4, the claws of the displaceable disc 25 are connected to the claws 28 of the handle, resulting in the crossbar and the handle being connected to each other. This means that the door now can be unlocked merely by turning the handle so that the crossbar is rotated and the lock bolt 7 thereby is pulled out of the locking opening 8 in the frame 4.

[0047] The motor can be connected to a power source (not shown) by providing a fingerprint on the fingerprint scanner 11 of the control panel or alternatively entering a predetermined code on the code reader 12 of the control panel.

[0048] If the power fails, the displaceable disc 25 of the first coupling is pushed back by a pressure spring 38 acting between the displaceable disc 25 and the fixed disc 26 until it comes up against a collar 39 on the crossbar 24.

[0049] The situation is now the same as the one shown in fig. 3. A locked door cannot be unlocked whereby the serious problem that people cannot get either in or out

of the door might occur.

[0050] This problem is solved by means of the second coupling 26, 29 which comprises the fixed disc 26 with the slot 29 and the pin 21 with the key 30.

[0051] As mentioned earlier, the adapter 19 is fitted into a groove 17 in the end face 18 on the cylinder 16 of the cylinder lock 14, and the pin 21 is screwed onto a threaded connection 20 on the adapter.

[0052] Therefore when the cylinder is turned with the key 22, the pin 21 is screwed outwards on the threaded connection 20 of the adapter 19 until its key 30 engages the slot 29 in the fixed disc 26 on the crossbar 24, the adapter being retained against turning by a wedge 40 in a key groove 41 in a recess 42 in the handle.

[0053] In this way, a locked door can be opened manually if the power to the locking arrangement fails.

Claims

1. A locking arrangement with a locking mechanism (15) for a door (2) and of the kind comprising

- a crossbar (24) rotatably mounted in the door (2) and connected in a conventional manner to a lock bolt (7) or cremone bar in the door, and
- a handle (6) for rotating the crossbar (24),

characterized in that the locking mechanism (15) comprises

- a first coupling (25, 28) having two coupling parts (25, 28) for bringing the crossbar (24) into and out of engagement with the handle,
- a second coupling (21, 26) having two coupling parts (21, 26) for bringing the crossbar (24) into and out of engagement with the handle,
- an electrically operating first actuator (31) for engaging and disengaging the first coupling, and
- a manually operated second actuator (16) for engaging and disengaging the second coupling.

2. A locking arrangement according to claim 1, **characterized in that** one of the coupling parts of the first coupling is formed on a disc (25) displaceably and moment-resistantly mounted on the crossbar (24) whereas its second coupling part is formed in an end section (28) of the handle.

3. A locking arrangement according to claim 1 or 2, **characterized in that** the electrically operating first actuator comprises an engaging fork (32) pivotally mounted on a pivot pin (33) in the locking arrangement and an electric motor (35) for pivoting the fork.

4. A locking arrangement according to claim 1, 2, or 3, **characterized in that** the locking mechanism com-

prises a spring (38) having a spring power applying force to the disc (25) of the first coupling in the disengagement direction.

5. A locking arrangement according to any of the claims 1 - 4, **characterized in that** the first coupling (25, 28) is a claw coupling. 5

6. A locking arrangement according to claim 1, **characterized in that** one of the coupling parts of the second coupling is a pin (21) displaceably and moment-resistantly mounted in a recess (42) in the handle (6) whereas its second coupling part is made in an end section (26) of the crossbar (24). 10
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7. A locking arrangement according to claim 6, **characterized in that** the manually operated second actuator comprises a cylinder lock (14) moment-resistantly mounted in a recess (42) in the handle (6), and a screwed connection (20) between the cylinder (16) of the cylinder lock (14) and the pin of the second coupling. 20

8. A locking arrangement according to claim 6 or 7, **characterized in that** the second coupling is a key and slot coupling (30, 29). 25

9. A locking arrangement according to any of the claims 1 - 8, **characterized in that** the locking arrangement comprises at least one signal unit (11, 12) connected to a power source, and a switch for connecting the electrically operating first actuator (31) to the power source upon reception of a signal from the signal unit. 30

10. A locking arrangement according to claim 9, **characterized in that** the signal unit is a biometric fingerprint scanner (11) and/or a code reader (12). 35

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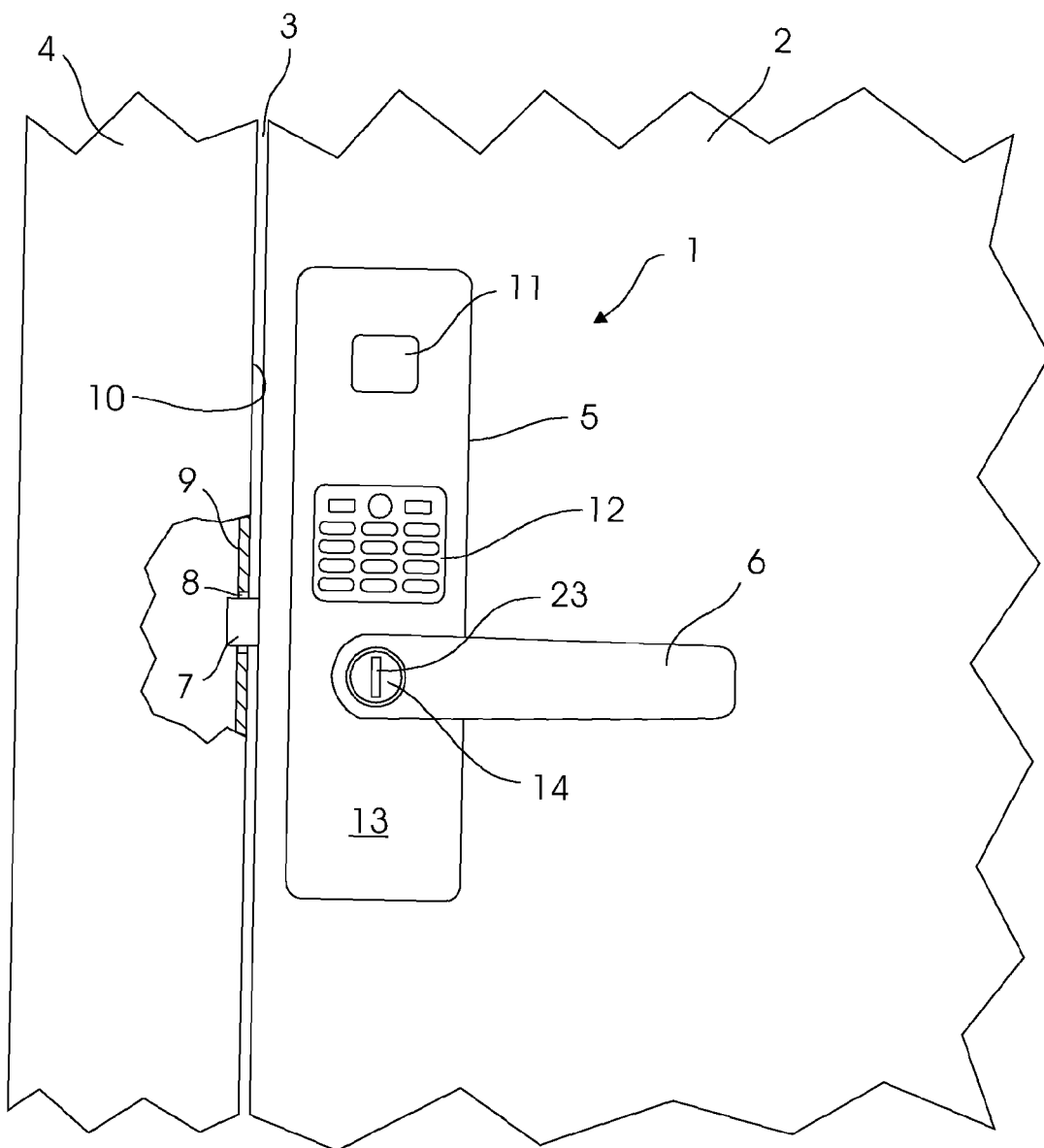


Fig. 1

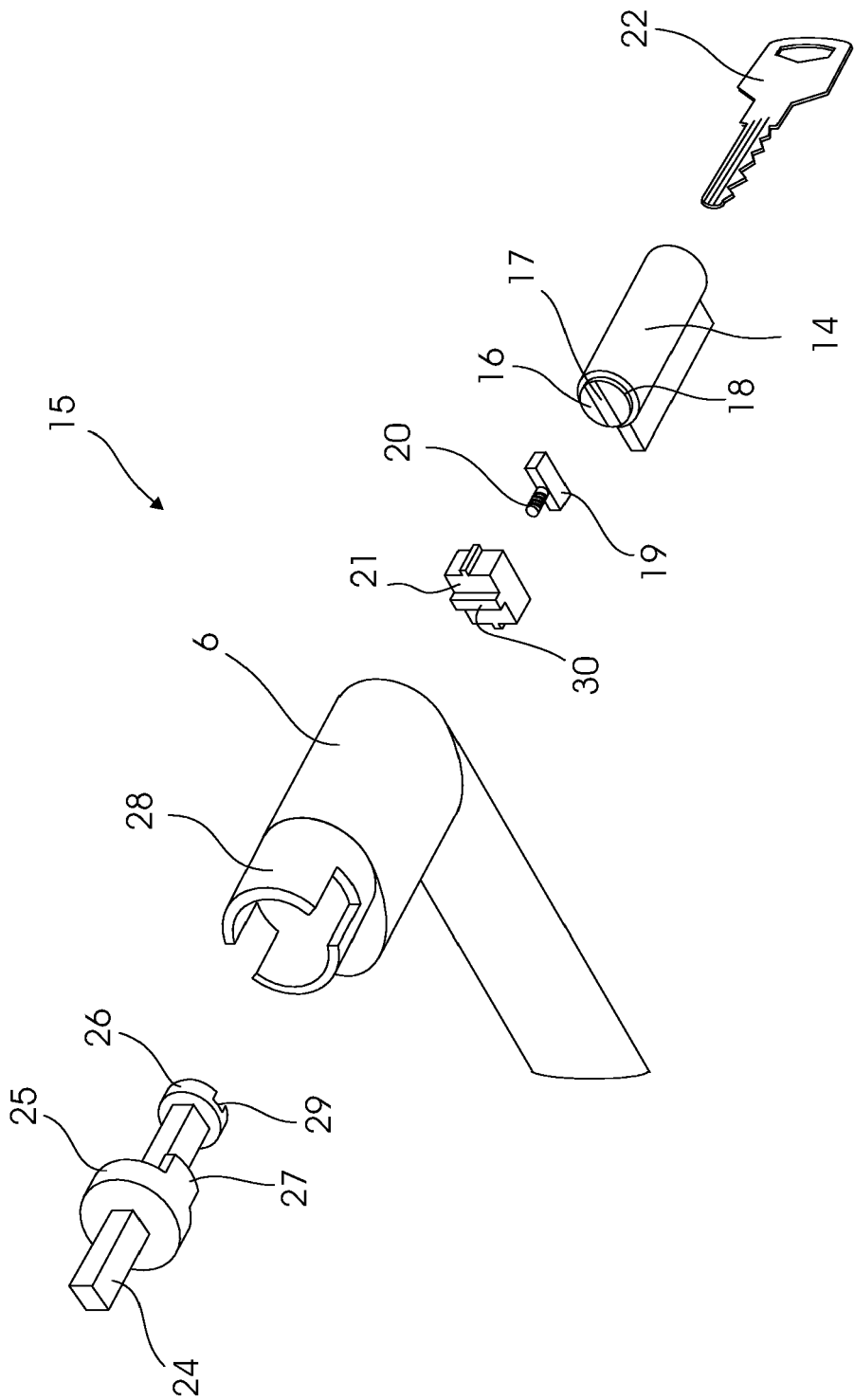


Fig. 2

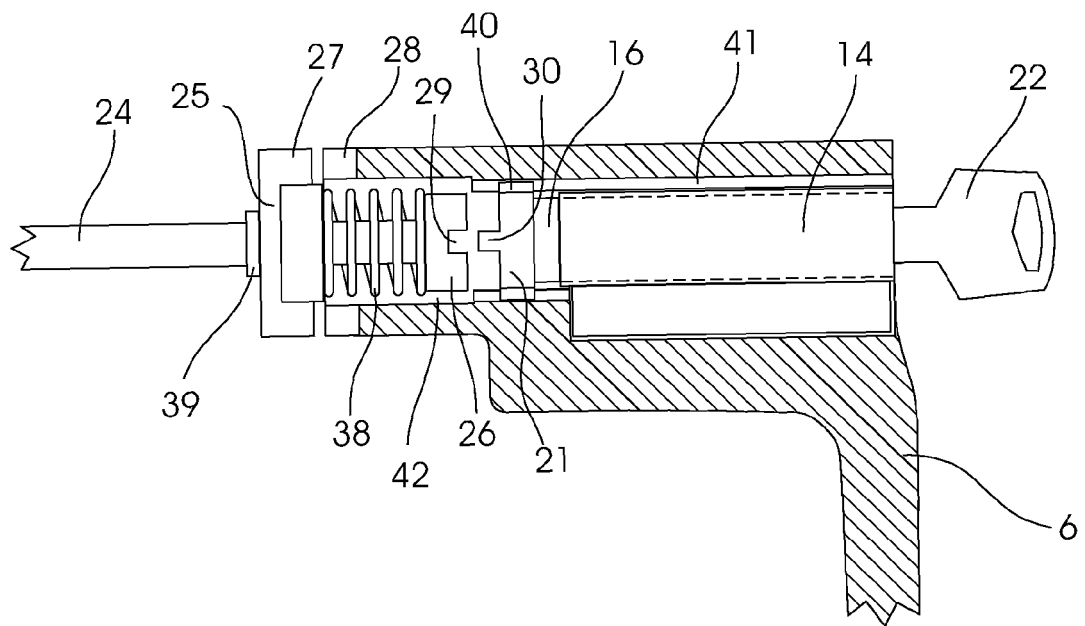


Fig. 3

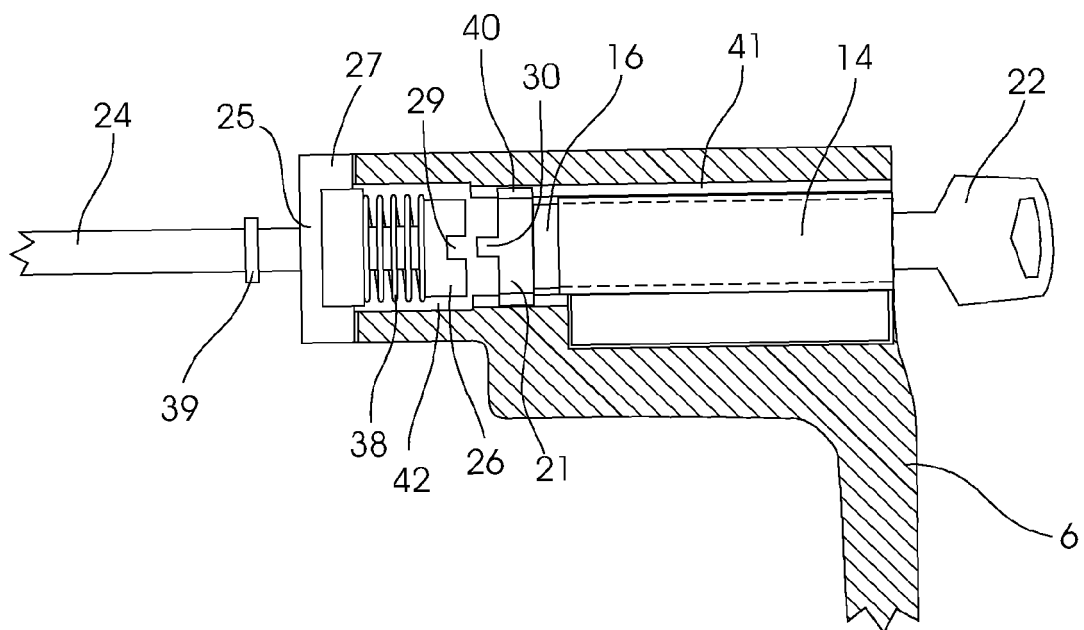


Fig. 4

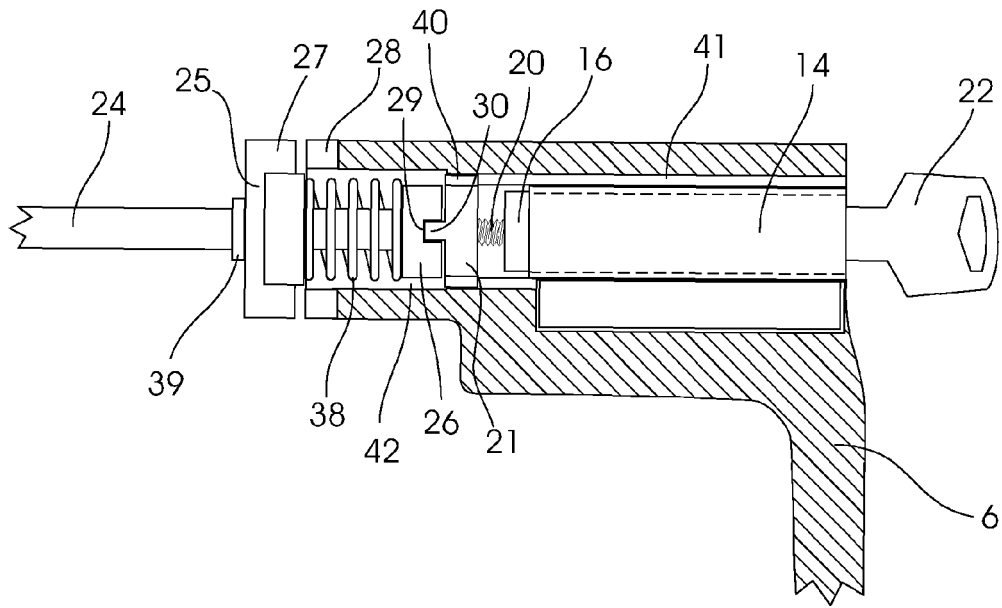


Fig. 5

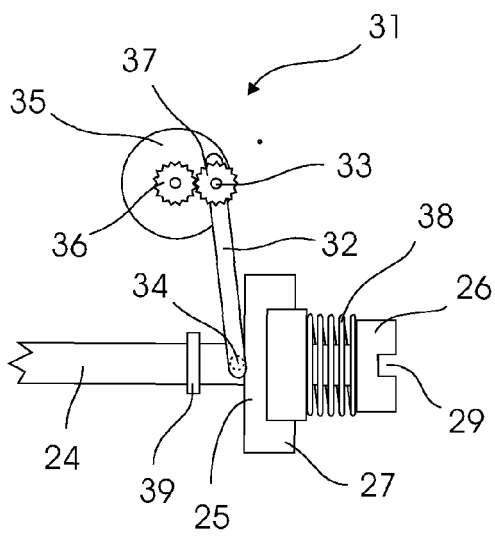


Fig. 6

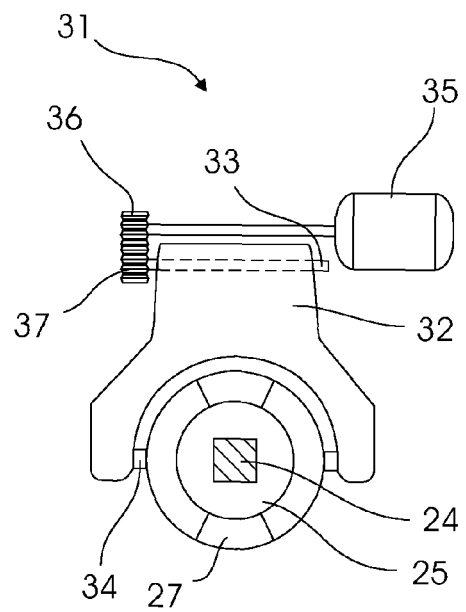


Fig. 7