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(71) Applicant: **RCO Security AB**
176 27 Järfälla (SE)

(72) Inventors:
- **Färnert, Gunnar**
  133 43 SALTSJÖBADEN (SE)
- **Forsgren, Anders**
  186 94 VALLENTUNA (SE)

(74) Representative: **Groth & Co. KB**
P.O. Box 6107
102 32 Stockholm (SE)

(54) **LOCK SYSTEM FOR DOOR KNOB**

(57) The invention relates to a lock system comprising a lock cylinder (4), a rotary knob (5, 5') having a greater diameter than the lock cylinder (4) and a lock cylinder sleeve (2). The lock cylinder (4) comprises a driving blade (42) at a first end (18), the driving blade (42) being configured to be rotated around a rotating axis (A), which is parallel and offset (d) relative to a longitudinal axis (L) of the lock cylinder. The rotary knob (5, 5') is connected to the lock cylinder (4) and configured to be coupled to the driving blade (42) for rotating the driving blade (42) upon a positive identification. The lock cylinder sleeve (2) comprises a circular recess (9) for receiving the lock cylinder (4) and at least a part of the rotary knob (5, 5'), whereby the lock cylinder sleeve (2) is configured to abut a surface of a door (50). The lock cylinder sleeve (2) comprises an at least partially asymmetric inner flange (8) extending perpendicular to the axis (A) into the recess (9) forming an opening (7). The opening (7) is configured to receive the lock cylinder (4), which comprises an at least partially asymmetric flange (24) at a second end (23), so that the asymmetric flange (24) abuts the inner flange (8) of the lock cylinder sleeve (2) so that a rotating axis (A') of the rotary knob (5, 5') is congruent with the rotating axis (A) of the driving blade (42). The rotary knob (5, 5'), the lock cylinder (4) and the lock cylinder sleeve (2) can then be clamped to the door (50) and a door lock (56), respectively, from an inner side of the door (50) via screws that engage the first end (18) of the lock cylinder (4) through the door lock (56).

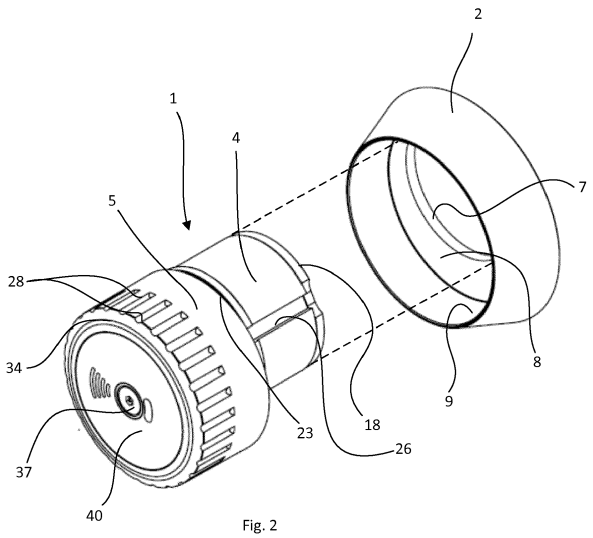

Fig. 2

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Description

Technical Field

[0001] The invention relates to the field of locks in particular door locks where the axis of rotation of a follower in a door lock is offset from the center of the opening in the door. This is typical for many types of locks. This can pose a problem for locks not requiring a key or for locks that are designed in a different manner for instance for locks using a rotary knob.

Background of the Invention

[0002] In existing door solutions the lock cylinder is positioned on a door via a metal frame that comprises at least one circular opening, which circular opening is in line with an opening in the door to access a follower for extending and retreiving a door bolt. Compared to the circular openings the follower is typically arranged offset from the centre of the opening. The offset will also be explained later herein referring to the lock cylinder. The metal frame is not always present so it is possible to install the lock cylinder without the metal frame. The lock cylinder, which typically comprises a driving blade at an inner end, is inserted through the opening in the metal frame and the opening in the door so that the driving blade can engage the follower for locking and unlocking the door. This lock standard is described in European Standard SS-EN15684:2012 or in Swedish Standard SSF 3522. In existing solutions the lock cylinder typically extends out of a plane defined by the surface of the door when it is installed. This extension is around 10mm up to 15mm. In order to make it look nice a ring-shaped sleeve with a conical shape having an increasing diameter towards the door and a decreasing diameter away from it is typically arranged over the extending part of the lock cylinder and fastened to it via a setscrew that is inserted in the ring-shaped sleeve in a direction perpendicular to a longitudinal direction of a lock cylinder. This way the setscrew clamps the sleeve to the lock cylinder.

[0003] One disadvantage with the above is that a robber who wants to disengage or crack the lock can remove the ring-shaped sleeve rather easily by unscrewing the setscrew and removing the ring-shaped element. The access to the lock is therewith not yet given but the first obstacle and protection in the form of the ring-shaped sleeve is removed rather easily. This in particular a problem with electronic lock systems where contactless identification or a number combination is used to grant access to a door in case a positive identification is observed or obtained. Such electronic lock systems typically use a rotary knob to engage the driving blade and therewith the follower and the lock bolt for unlocking a door. Such electronic locks typically comprise an encrypted communication between a receiver in the rotary knob and an electro mechanic engagement system that engages the driving blade upon a positive identification or keeps it disengaged in case of a negative identification. The electro mechanic engagement system is typically protected behind some sort of a sleeve or protection cap made of hardened steel or the like. Still when the ring-shaped sleeve can be easily removed by a robber the access to the rotary knob and the electronics is easier obtained that when the ring-shaped sleeve cannot be removed in a simple manner.

[0004] When referring to electronic locks or locks comprising a rotary knob instead of handle, a further problem can occur, which problem has to do with the offset of the follower or an axis of rotation of the follower compared to the centre of the opening in the door and/or the metal frame. The same offset is present in the lock cylinder where the axis of rotation of the driving blade and the central longitudinal axis of the lock cylinder are not aligned. This is often the case in many standards, due to space that is required for the lock technology in itself within the lock cylinder. The offset, which is typically around 3mm to 10mm leads to a problem with the axis of rotation of the rotary knob. When the rotary knob is positioned on the lock cylinder for engagement of the driving blade the axis of rotation of the rotary knob may be in line with the axis of rotation of the driving blade but this leads to a ring-shaped sleeve which needs to compensate since the rotary knob and the longitudinal axis of the lock cylinder are not aligned. Ring-shaped sleeves that compensate for this are typically asymmetric on an outer side which is not wished for design reasons but more importantly also leads to higher manufacturing costs since special moulds have to be provided to produce such sleeves.

Summary of the Invention

[0005] An object of the present invention is to provide a lock system that is safe, easy to handle and install.

[0006] Another object of the prevent invention is to provide a lock system that is easy to use, practical and robust.

[0007] A further object of the present invention is to provide a lock system that is easy to assemble.

[0008] The inventors of the lock system disclosed herein have realized that it is possible to provide a lock system comprising a rotary knob, a lock cylinder and a ring-shaped lock cylinder sleeve, whereby the ring-shaped lock cylinder sleeve can be connected and fastened to a door and a door lock, respectively, via flanges on the lock cylinder and the ring-shaped lock cylinder sleeve. At the same time the design of the opening in the lock cylinder sleeve and the flanges on the lock cylinder sleeve and the lock cylinder, respectively, allow to compensate for an offset between the axis of rotation of a driving blade and a central longitudinal axis of the lock cylinder.

[0009] Disclosed herein is a lock system comprising a lock cylinder, a rotary knob having a greater diameter than the lock cylinder and a lock cylinder sleeve. The lock cylinder comprises a driving blade at a first end, the driv-

ing blade being configured to be rotated around a rotating axis, which is parallel and offset relative to a central longitudinal axis of the lock cylinder. The rotary knob is connected to the lock cylinder and configured to be coupled to the driving blade for rotating the driving blade upon a positive identification via a given symbol combination, a key and/or any form of contactless identification. The ring-shaped lock cylinder sleeve comprises a circular recess for receiving the lock cylinder and at least a part of the rotary knob, whereby the lock cylinder sleeve is configured to abut a surface of a door. The lock cylinder sleeve comprises an at least partially asymmetric inner flange extending perpendicular to the axis into the recess forming an opening, the opening being configured to receive the lock cylinder. The lock cylinder comprises an at least partially asymmetric flange at a second end so that the asymmetric flange abuts the inner flange of the lock cylinder sleeve so that a rotating axis of the rotary knob is congruent with the rotating axis of the driving blade. Using the described solution, the lock cylinder and the lock cylinder sleeve can be clamped to the door and a door lock, respectively, from an inner side of the door via screws that engage the first end of the lock cylinder through the door lock.

[0010] The above solution allows to clamp the ring-shaped lock cylinder sleeve via the flanges of the lock cylinder sleeve and the asymmetric flange of the lock cylinder from an inside of the lock system and the door, respectively, so that a setscrew can be avoided.

[0011] The asymmetry further leads to a ring-shaped cylinder sleeve that is symmetrical on an outer side. The only feature that is not arranged symmetrical in the lock cylinder sleeve is the opening for receiving the lock cylinder and this is to compensate for the above described offset so that the outer side of the ring-shaped cylindrical sleeve is symmetrical.

[0012] In an embodiment the lock cylinder sleeve partially encompasses the rotary knob and therewith protects the rotary knob.

[0013] The above described feature provides for a better protection of the rotary knob and the lock cylinder.

[0014] The lock cylinder sleeve may be circular and conical with an increasing diameter towards the first end of the lock cylinder.

[0015] This may ensure that there is enough space for the opening and in addition it improves resistance of the lock cylinder sleeve.

[0016] The asymmetric flange and the inner flange may be of crescentic shaped.

[0017] Any shape from half-moon to crescentic may be possible.

[0018] The opening may comprise a protrusion and the lock cylinder may comprise a groove, the protrusion being configured to at least partially engage the groove so that the lock cylinder is correctly inserted and positioned in respect to the lock cylinder sleeve.

[0019] The lock system may further comprise at least one at least partially asymmetric shim element positioned between the inner flange and the asymmetric flange for adjusting the position of the lock cylinder relative to the door lock in a direction along the rotating axis.

[0020] A plurality of shim elements having different thicknesses may be used to adjust the depth and therewith the position of the lock cylinder so that the lock system can be used with various door and door lock combinations.

[0021] The shim element may be of crescentic shape.

[0022] The crescentic shape allows for the shim element to fit into the recess in a snug and smooth manner. At the same time the crescentic shape avoids a wrong-positioning of the shim element in the recess.

[0023] The rotary knob may comprise an electronic receiver and the lock cylinder an electronic engagement mechanism, the electronic receiver may be used for contactless identification and the electronic engagement mechanism may engage the driving blade upon the positive identification so that the driving blade can be rotated via the rotary knob.

[0024] The receiver may work with any type of contactless communication and identification via a tag or an electronic device using short range wireless communication, such as NFC, Wifi protocol, Bluetooth etc. The receiver may comprise an antenna and a circuit board, which circuit board may for instance be configured to communicate in an encrypted manner with a circuit board of the electronic engagement mechanism. The communication between the two circuit boards may be done via a wire or in a contactless manner.

[0025] The lock cylinder may comprise a protection cap or protection sleeve and the electronic engagement mechanism may be arranged within the protection cap or protection sleeve, so that the electronic engagement mechanism cannot be accessed via the rotary knob.

[0026] The rotary knob may comprise different symbols evenly distributed on the rotary knob, each symbol may be able to be activated upon rotation of the rotary knob so that the given symbol combination, which is the positive identification, leads to the electronic engagement mechanism coupling the driving blade to the rotary knob so that a door can be unlocked upon rotation of the rotary knob.

[0027] The driving blade can be chosen to be provided in different lengths in order to match different lock types and followers, respectively.

[0028] This may allow to unlock the door with a combination and sequence of symbols instead of an electronic device such as mobile phone or a tag or the like.

[0029] The symbol combination may be a combination and sequence of different geometrical symbols, letters, digits, animal symbols, etc.

[0030] In an embodiment each of the symbols may be registered when it comes to lie on a z-axis for a certain amount of time upon rotation of the rotary knob.

[0031] In another embodiment the symbol may comprise an LED so that it can be visually indicated that the symbol is registered after it came to lie on the z-axis for

the certain amount of time.

[0032] The above increases the intuitive use of the lock system and can make it easier for kids to open the lock system.

[0033] The certain amount of time may be in a range of some milliseconds up to 1 or 2 seconds, for example 0.5s to 2s.

[0034] In an embodiment the Z-axis can be tilted.

[0035] This may make it easier for shorter persons to use the lock system, since for example the number that is lit up by the LED may be at a lower level.

[0036] The symbols may be arranged in a circular manner on a front side of the rotary knob.

[0037] In another embodiment the symbols may be arranged evenly distributed on a lateral surface close to a front side of the rotary knob.

[0038] Disclosed herein is further a lock system comprising a lock cylinder, a rotary knob having a greater diameter than the lock cylinder and a lock cylinder sleeve. The lock cylinder comprises a driving blade at a first end, the driving blade being configured to be rotated around a rotating axis, which is parallel and offset relative to a longitudinal axis of the lock cylinder. The rotary knob may be connected to the lock cylinder and configured to engage the driving blade so that the driving blade can be rotated via the rotary knob upon a positive identification via a given symbol combination, a key and/or any form of contactless identification. The lock cylinder sleeve may further comprise a circular recess for receiving the lock cylinder and at least a part of the rotary knob, whereby the lock cylinder sleeve may be configured to abut a surface of a door, wherein the lock cylinder comprises an electronic engagement mechanism for engaging the driving blade upon the positive identification so that the driving blade can be rotated via the rotary knob. The rotary knob may comprise different symbols evenly distributed on the rotary knob, each symbol being able to be activated upon rotation of the rotary knob so that a given symbol combination, which is the positive identification, leads to the electronic engagement mechanism coupling the driving blade to the rotary knob so that a door can be unlocked upon rotation of the rotary knob.

[0039] In an embodiment the lock system may comprise an electronic receiver and the electronic receiver may be used for contactless identification and wherein the electronic engagement mechanism is coupling the driving blade to the rotary knob upon the positive identification so that a door can be unlocked via the rotary knob.

[0040] The term at least partially asymmetric herein describes an element or shape that may be symmetrical when mirrored at one or two axis, such as the y- and x-, y- and z- or x- and z-axis. Thus it can be symmetric when mirrored at one or two axis but it is at least asymmetric when mirrored at one or two of the other axis.

[0041] The above described lock cylinder, protection cap or sleeve, ring-shaped lock cylinder sleeve may be made of metal. In particular the lock cylinder and the protection cap or sleeve may be made of hardened steel or the like.

Brief Description of the Drawings

[0042] The present invention will now be described, for exemplary purposes, in more detail by way of an embodiment(s) and with reference to the enclosed drawings, in which:

- Fig. 1 schematically illustrates a perspective view of a lock system according to the invention installed on a door;
- Fig. 2 schematically illustrates a perspective exploded view of a lock system according to the invention;
- Fig. 3 schematically illustrates a side view of a lock cylinder and a rotary knob of a lock system according to the invention;
- Fig. 4 schematically illustrates a back view of the lock cylinder and rotary knob according to figure 3;
- Fig. 5 schematically illustrates a front view of a ring-shaped lock cylinder sleeve of a lock system according to the invention;
- Fig. 6 schematically illustrates a front view of the lock system according to the invention;
- Fig. 7 schematically illustrates a cross-sectional view along plane VI-VI of figure 6 of the lock system according to the invention;
- Fig. 8 schematically illustrates another perspective exploded view of a lock system according to the invention;
- Fig. 9 schematically illustrates a perspective view of a rotary knob of a lock system according to the invention, and
- Fig. 10 schematically illustrates a top down view onto the embodiment of a lock system shown in figure 7.

Detailed Description

[0043] Figure 1 illustrates the lock system 1 according to the invention installed on a door 50. In the door a door lock 56 is installed. The door lock 56 comprises a latching bolt 58 and a locking bolt 54. The latching bolt 58 is extended and retrieved via a handle 52, the locking bolt 54 is extended and retrieved via the lock system 1. The lock system is a contactless identification lock system, which can be used to unlock the door 50 when an electronic device or tag is held in close proximity of a rotary knob 5 of the lock system 1. The electronic device or tag generates a positive identification in the lock system upon with an electronic engagement mechanism couples the rotary knob 5 to a driving blade so that the locking bolt 54 can be retrieved by turning the rotary knob 5. The lock system 1 is herewith explained in greater detail referring to figures 2 to 8.

[0044] Figure 2 illustrates an exploded view of one em-

bodiment of the lock system 1 comprising the rotary knob 5, a lock cylinder 4 and a ring-shaped lock cylinder sleeve 2.

[0045] The rotary knob 5 is connected to the lock cylinder 4 so that it can rotate relative to at least a part of the lock cylinder 4. A screw 37 may be used to at least partially fix the rotary knob 5 to the lock cylinder. The rotary knob 5 is cylindrically shaped and comprises ribs 28 for an easier handling when an operator wants to turn the rotary knob 5. The rotary knob 5 further comprises a LED ring 34. The LED ring 34 may be used to indicate to an operator that the tag or the electronic device has been recognized, once it was held in close proximity of the rotary knob 5. The rotary knob 5 further comprises a front side 40, on which front side 40 the LED ring 34 is positioned.

[0046] The lock cylinder 4 comprises a first end 18 and a second end 23. The first end 18 is positioned away from the rotary knob 5 and the second end 23 is located towards the rotary knob 5. The dashed lines in figure 2 indicate that the lock cylinder 4 together with the rotary knob 5 can be positioned and inserted in the ring-shaped lock cylinder sleeve 2.

[0047] The ring-shaped lock cylinder sleeve 2 comprises a circular recess 9. Within the circular recess 9 there is an inner flange 8 arranged, which inner flange 8 is extending towards an inside of the ring-shaped lock cylinder sleeve 2 forming an opening 7. The opening 7 is configured to smoothly receive the lock cylinder 4 and the recess 9 is configured to smoothly receive at least a part of the rotary knob 5, which part is arranged opposite the front side 40 of the rotary knob 5. The ring-shaped lock cylinder sleeve 4 has a symmetric outer shape and the ring-shaped outer side is conical so that a diameter of the ring-shaped lock cylinder sleeve 2 is extending in a direction away from the rotary knob 5. The ring-shaped lock cylinder sleeve 4 is further also visible in figure 1.

[0048] Turning now to figure 3, which illustrates a side onto the lock cylinder 4 and the rotary knob 5, further details of the lock cylinder 4 are herewith explained. The lock cylinder 4 comprises a rotatable tail piece or driving blade 42, which can be rotated for engaging a follower of a door lock in order to retrieve or extend a locking bolt. The tail piece or driving blade 42 can be engaged via the rotary knob upon a positive identification of an operator or user via an electronic device, a key, a symbol combination or anything similar. In the locked state the rotary knob 5 is disengaged from the driving blade 42. On the first end 18, the lock cylinder 4 comprises a an asymmetric flange 24 extending away from the lock cylinder 4, in the same direction as an overlap 19 of the rotary knob 5 when the rotary knob 5 is connected to the lock cylinder 4. The extension of the asymmetric flange 24 is of crescentic shape (c.f. also figure 4) and extends about 1 mm to 10mm, preferably 2mm to 8mm and more preferably about 3mm to 7mm from a lateral surface of the lock cylinder 4. The asymmetrical flange 24 is preferably made of metal as is the lock cylinder 4 and the driving blade 42. As mentioned previously, the driving blade 42 may be chosen so that it is replaceable with another driving blade having a different length for optimal engagement of a follower of another door lock type, for example.

[0049] Figure 3 further illustrates well how the central longitudinal axis L of the lock cylinder 4 is offset d from the rotational axis A of the driving blade 42 and the rotational axis A' of the rotary knob 5. The rotational axis A' of the rotary knob 5 is also congruent with the rotational axis A of the driving blade 42. The offset d is to compensate for the non-central arrangement of the follower in the door lock versus the lock cylinder 4 and the opening in the door for the door lock as previously explained. Another reason for the lock technology for the offset is that the lock technology in the lock requires space so that a rotational axis A of the driving blade 42 needs to be arranged offset of the central longitudinal axis L of the lock cylinder 4.

[0050] Figure 4 illustrates a view on a back side of the lock cylinder 4 and the rotary knob 5, where the driving blade 42 is well visible. In addition the asymmetric flange 24, in its crescentic or lunate shape is well illustrated. This view makes it clear how the asymmetric flange 24 is engaging the inner flange 8 of the ring-shaped lock cylinder sleeve 2. The lock cylinder 4 further comprises screw receiving holes 27 for receiving screws that clamp the lock cylinder 4 and therewith the rotary knob 5 together with the ring-shaped lock cylinder sleeve 2 to the door and the door lock, respectively, from an inner side of the door. The lock cylinder 4 further comprises a groove 26 (c.f. also figure 2), which groove 26 is used to engage a protrusion 10 of the ring-shaped lock cylinder sleeve 2, which protrusion 10 is well illustrated in figure 5. The geometry of the screw receiving holes 27 can be different from the one illustrated in figure 4 in order to fit other lock types, such as for instance lock types or standards of other countries.

[0051] Figure 5 illustrates a front view of the ring-shaped lock cylinder sleeve 2 illustrating the protrusion 10 that is extending from the inner flange 8 into the opening 7.

Figure 5 illustrates also how the inner flange 8 is of crescentic or lunate shape. The asymmetric and crescentic shape helps to compensate for the previously explained offset d so that the lock system 1 is symmetric on an outer side and so that the ring-shaped lock cylinder sleeve 2 can be clamped to the lock cylinder 4 without the use of a setscrew. The maximal extension of the flange 8 into the inner side of the ring-shaped lock cylinder sleeve 2 is about 2mm to 14mm, preferably about 4mm to 10mm. The circular recess 9 which can receive a part of the rotary knob 5 is also well illustrated in figure 5.

[0052] Figure 7 illustrates a cross sectional view onto a plane of a cut along line VI-VI of figure 6. Figure 6 illustrates the lock system 1 according to the invention where the rotary knob 5 and the ring-shaped cylinder lock sleeve 2 are visible.

Figure 7 further illustrates how the lock cylinder 2, the

rotary knob 5 and ring-shaped cylinder lock sleeve 2 interact via shim elements 3. The asymmetric flange 24 of the lock cylinder 4 engages the shim elements 3 and presses them towards the inner flange 8 of the ring-shaped lock cylinder sleeve 2 when the lock cylinder 4 is fastened to the door lock via screws. Figure 7 illustrates a rather high amount of different shim elements 3 arranged between the asymmetric flange 24 and the inner flange 8 of the ring-shaped cylinder lock sleeve 2. The shim elements have a thickness of 0.5mm, 1 mm, 2mm, 3mm and 4mm. This provides for a high flexibility when the depth of engagement of the lock cylinder 4 into the door has to be adapted, so that the driving blade 42 engages the follower in an optimal manner. With the described shim element-combination of 0.5mm, 1 mm, 2mm, 3mm and 4mm a range of 0mm to 9.5mm can be covered. If the distance needed is more than 10mm a standard lock-extender can be used.

[0053] The rotary knob 5 is connected to the lock cylinder 4 via screws 26, 37, which screws 26 are screwed into screw receiving holes in a protection sleeve 22 or protection cap 22. The protection cap 22 is made of hardened steel and protects an electronic engagement mechanism 20 that is arranged behind the protection 22 towards the second end 23 of the lock cylinder 4. The rotary knob 5 further comprises a receiver 38 having an antenna and a circuit board, which receiver 38 can communicate with the electronic engagement mechanism 20, for example via a wire or in a contactless wireless manner, so that upon the positive identification the electronic engagement mechanism connects the rotary knob 5 via the protection cap 22 to the driving blade 42 for unlocking the door. The communication between the receiver 38 and electronic engagement mechanism 20 is thereby encrypted. The protection cap 22 protects the electronic engagement mechanism 20 in case a perpetrator succeeds in removing the rotary knob 5.

[0054] Figure 8 is a similar exploded view as figure 2 but this time illustrated with shim elements 3. The amount of shim elements 3 illustrated in figure 8 is the same as the ones illustrated in figure 7. Any number higher or lower or any other thickness of shim elements 3 may however be used. The shim elements 3 have a similar shape as the inner flange 8 of the ring-shaped cylinder lock sleeve 2, which is of crescentic or lunate type. The sim elements 3 are symmetric when mirrored on an axis corresponding to the z-direction (vertical direction) but non symmetric when mirrored on the x-direction (horizontal direction). As illustrated in figure 2 the lock system 1 may be used without shim elements 3 as well depending on the design of the door and the door lock and the depth required, respectively.

[0055] Figures 9 and 10 illustrate another embodiment of the lock system 1' according to the invention comprising a rotary knob 5' having symbols 30 a lateral side of the rotary knob 5'. The symbols 30 may be digits as shown, or any other form of symbols such as animals, geometrical symbols etc. The symbols 30 allow for a symbol sequence and combination to generate the positive identification so that the electronic engagement mechanism 20 engages the coupling between the rotary knob 5' and the driving blade 42 for unlocking the door by turning the follower and therewith retrieving the locking bolt. The symbols 30 may be enlightened by LED's 32, whereby an LED 32 is assigned to each symbol 30.

[0056] The symbols 30 allow the rotary knob 5' to be used as a treasure-lock to generate a digit combination by turning the rotary knob 5' so that various digits come to lie on the z-axis Z, whereupon if the digit comes to lie on the z-axis Z for a certain amount of time, the digit is registered as a digit of the digit combination or digit sequence, whereupon the LED 32 of that digit may be used to indicate to the operator that the digit has been registered.

[0057] In order to simplify the use of the lock system 1' for children or a person in a wheelchair, the z-axis Z may be tilted in any direction and at any angle as illustrated in figure 10 with a tilted z-axis Z'. A preferred tilt angle may be 90° so that the digit that is registered comes to lie on the side of the rotary knob 5'.

[0058] The invention has now been described referring to the figures and by illustrating different embodiments. Regarding the embodiment shown in figures 9 and 10, it is clear that this embodiment may be used in normal conventional locks without the flange system described referring to figures 1 to 8. Thus the reassure lock solution may be installed in another lock independently from the actual lock cylinder and the ring-shaped lock cylinder sleeve described above.

Claims

1. A lock system comprising a lock cylinder (4), a rotary knob (5, 5'), having a greater diameter than the lock cylinder (4) and a lock cylinder sleeve (2), the lock cylinder (4) comprising a driving blade (42) at a first end (18), the driving blade (42) being configured to be rotated around a rotating axis (A), which is parallel and offset (d) relative to a longitudinal axis (L) of the lock cylinder, the rotary knob (5, 5') being connected to the lock cylinder (4) and configured to be coupled to the driving blade (42) for rotating the driving blade (42) upon a positive identification, the lock cylinder sleeve (2) comprising a circular recess (9) for receiving the lock cylinder (4) and at least a part of the rotary knob (5, 5'), whereby the lock cylinder sleeve (2) is configured to abut a surface of a door (50), **characterized in that** the lock cylinder sleeve (2) comprises an at least partially asymmetric inner flange (8) extending perpendicular to the axis (A) into the recess (9) forming an opening (7), the opening (7) being configured to receive the lock cylinder (4), which comprises an at least partially asymmetric flange (24) at a second end (23) so that the asymmetric flange (24) abuts the inner flange (8) of the

lock cylinder sleeve (2) so that a rotating axis (A') of the rotary knob (5, 5') is congruent with the rotating axis (A) of the driving blade (42).

2. The lock system according to claim 1, wherein the lock cylinder sleeve (2) partially encompasses the rotary knob (5, 5') and therewith protects the rotary knob (5, 5').

3. The lock system according to claim 1 or 2, wherein the lock cylinder sleeve (2) is circular and conical with an increasing diameter towards the first end (18) of the lock cylinder (4).

4. The lock system according to any of the previous claims, wherein the asymmetric flange (24) and the inner flange (8) are of crescentic shaped.

5. The lock system according to any of the previous claims, wherein the opening (7) comprises a protrusion (10) and wherein the lock cylinder (4) comprises a groove (26), the protrusion (10) being configured to at least partially engage the groove (26) so that the lock cylinder (4) is correctly inserted and positioned in respect to the lock cylinder sleeve (2).

6. The lock system according to any of the previous claims, further comprising at least one at least partially asymmetric shim element (3) positioned between the inner flange (8) and the asymmetric flange (24) for adjusting the position of the lock cylinder (4) relative to the door lock (56) in a direction along the rotating axis (A).

7. The lock system according to claim 6, wherein the shim element (3) is of crescentic shape.

8. The lock system according to any of the previous claims, wherein the rotary knob (5, 5') comprises an electronic receiver (38) and the lock cylinder (4) an electronic engagement mechanism (20), the electronic receiver (38) being used for contactless identification and wherein the electronic engagement mechanism (20) engages the driving blade (42) upon the positive identification so that the driving blade (42) can be rotated via the rotary knob (5, 5').

9. The lock system according to claim 8, wherein the lock cylinder (4) comprises a protection cap (22) and wherein the electronic engagement mechanism (20) is arranged within the protection cap (22) so that the electronic engagement mechanism (20) cannot be accessed via the rotary knob (5, 5').

10. The lock system according to any of the previous claims, wherein the rotary knob (5') comprises different symbols (30) evenly distributed on the rotary knob (5'), each symbol (30) being able to be activated upon rotation of the rotary knob (5') so that the given symbol combination, which is the positive identification, leads to the electronic engagement mechanism (20) coupling the driving blade (42) to the rotary knob (5') so that a door (50) can be unlocked upon rotation of the rotary knob (5').

11. The lock system according to any of the claim 10, wherein each of the symbols (30) is registered when it comes to lie on a Z-axis (Z) for a certain amount of time upon rotation and stop of the rotary knob (5').

12. The lock system according to any of the claim 11, wherein each symbol (30) comprises an LED (32) so that it can be visually indicated that the symbol (30) is registered after it came to lie on the Z-axis for the certain amount of time.

13. The lock system according to any of the claim 11 or 12, wherein the Z-axis (Z') can be tilted.

14. The lock system according to any of claims 11 to 13, wherein the symbols (30) are arranged in a circular manner on a front side (40) of the rotary knob (5').

15. The lock system according to any of claims 11 to 13, wherein the symbols (30) are arranged evenly distributed on a lateral surface close to a front side (40) of the rotary knob (5').

16. The lock system according to any of claims 11 to 15, wherein the symbols are digits chosen from 0 to 9.

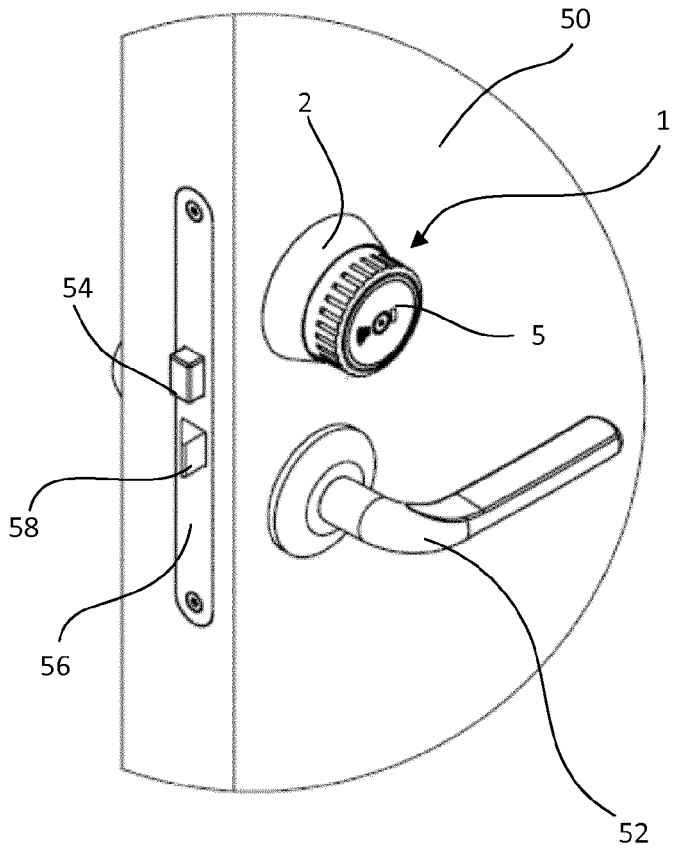

Fig. 1

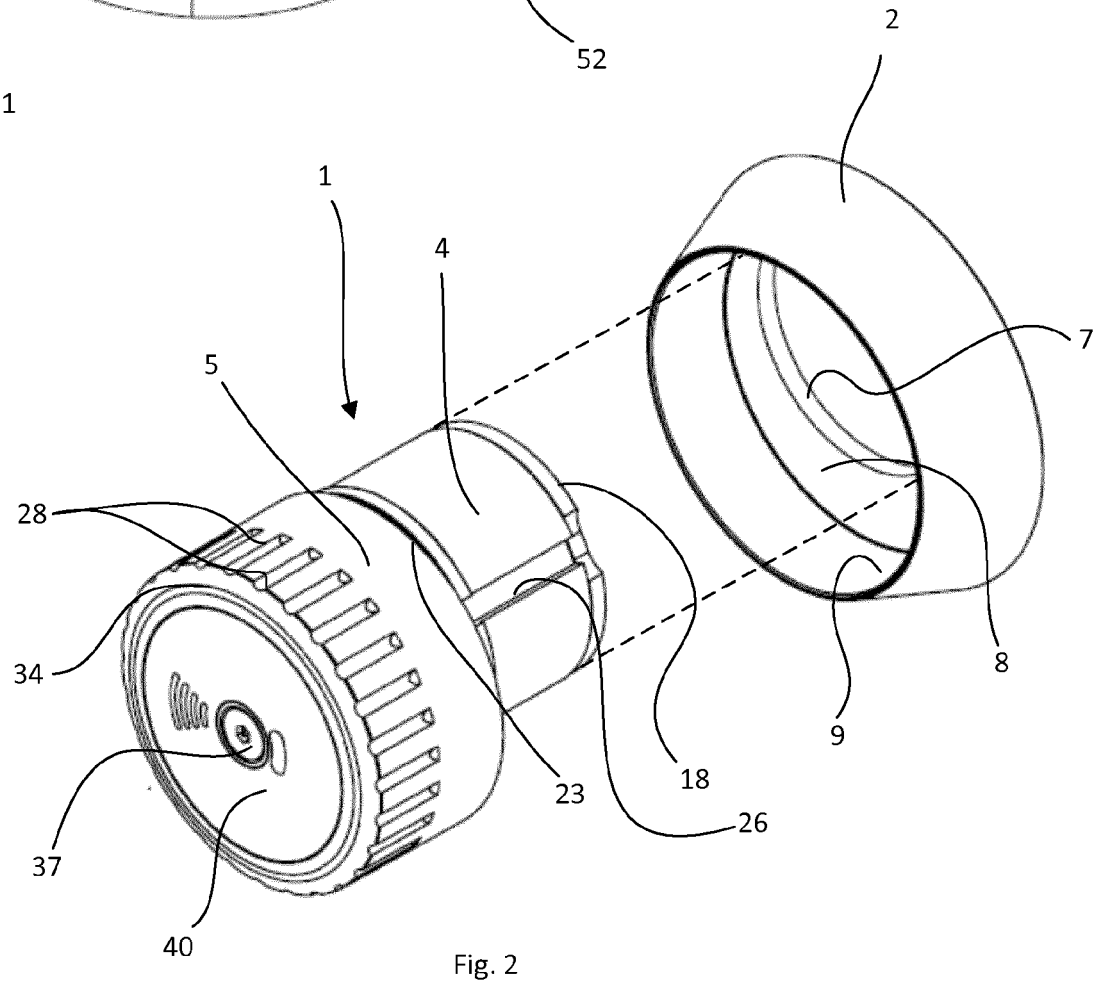

Fig. 2

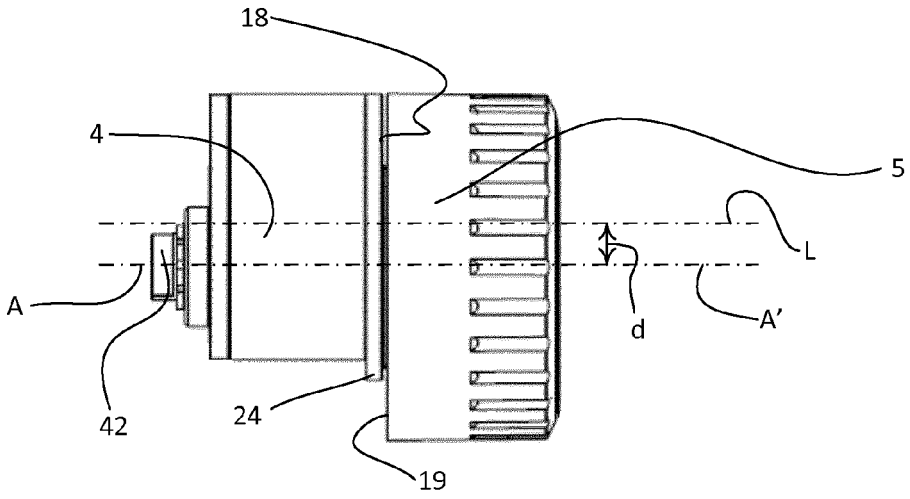

Fig. 3

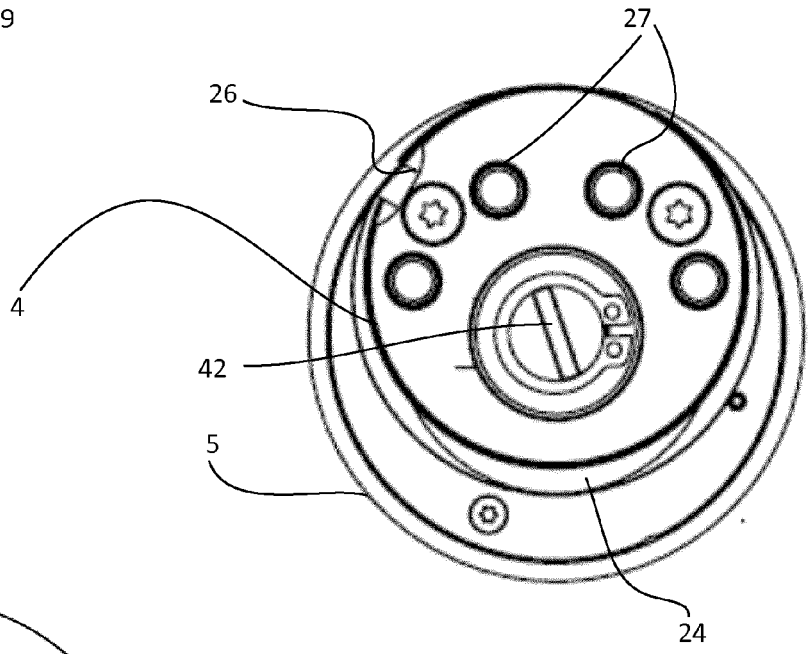

Fig. 4

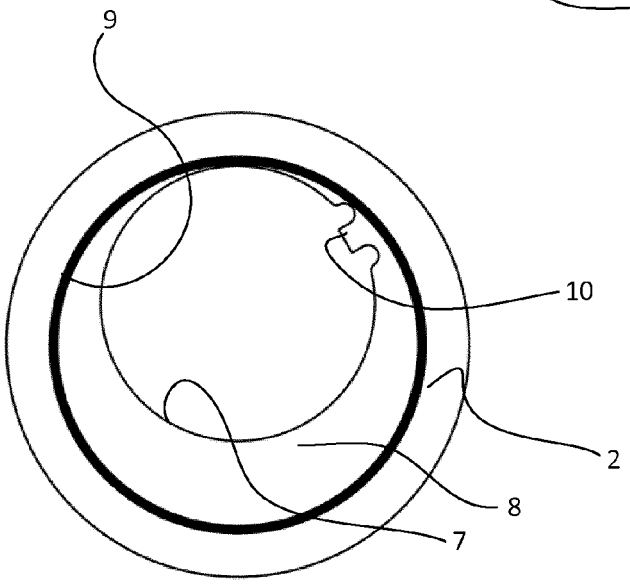

Fig. 5

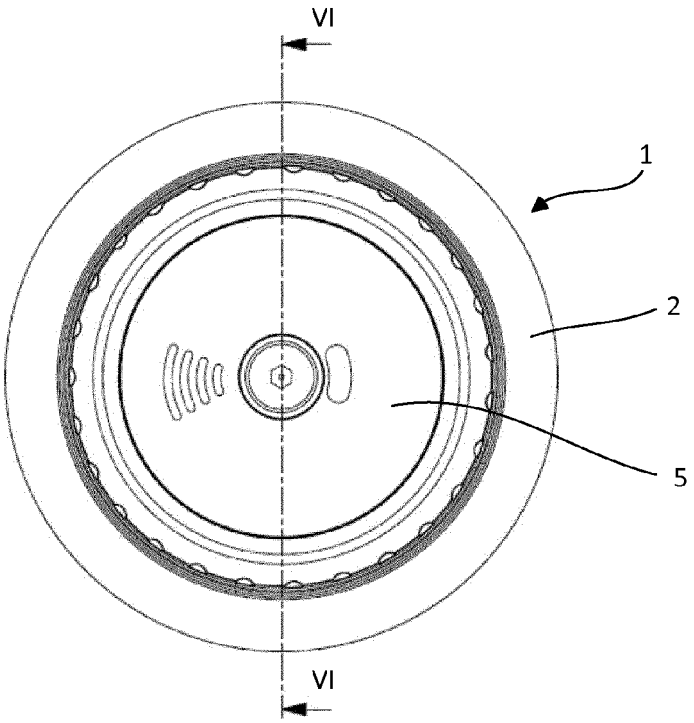

Fig. 6

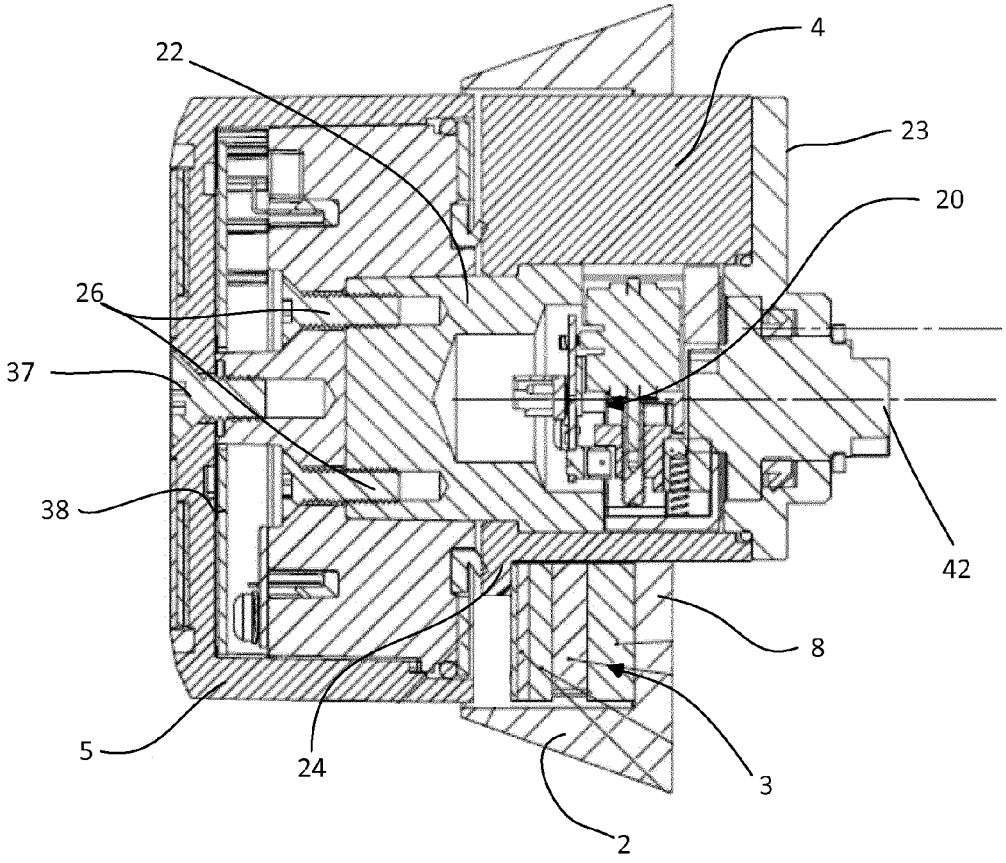

Fig. 7

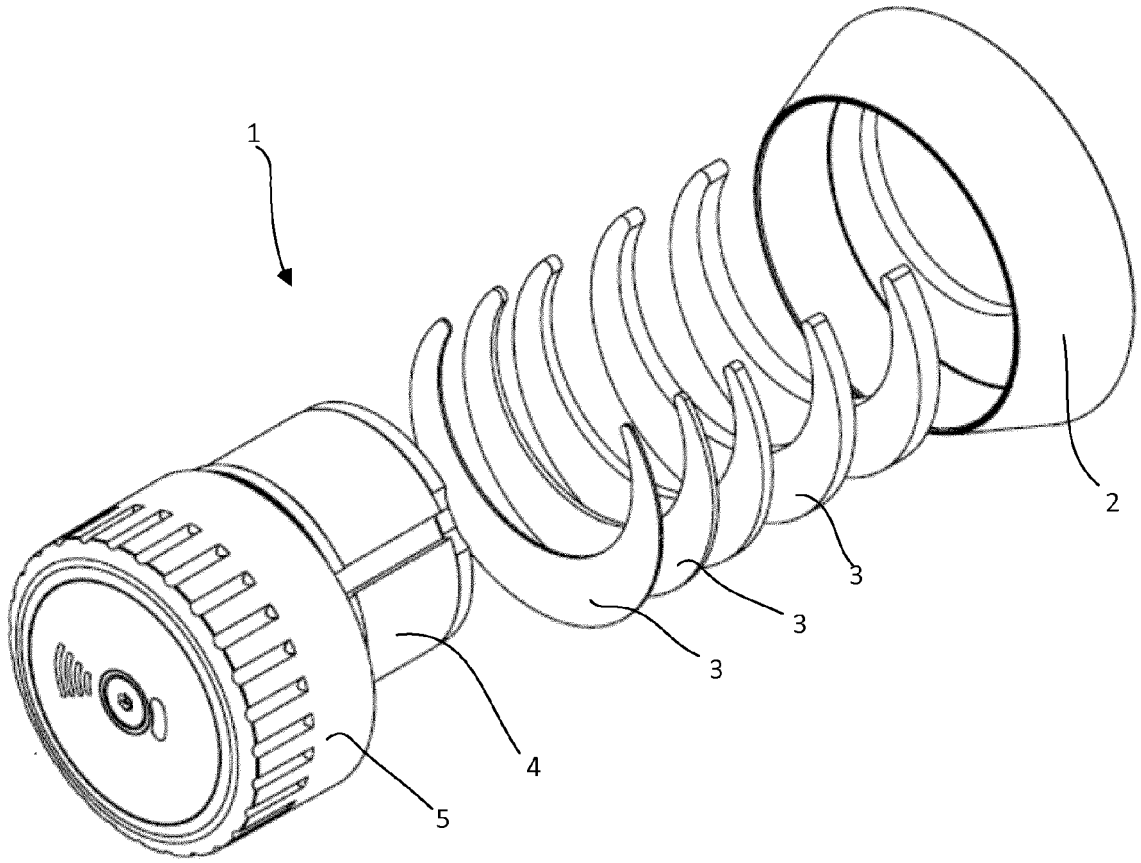

Fig. 8

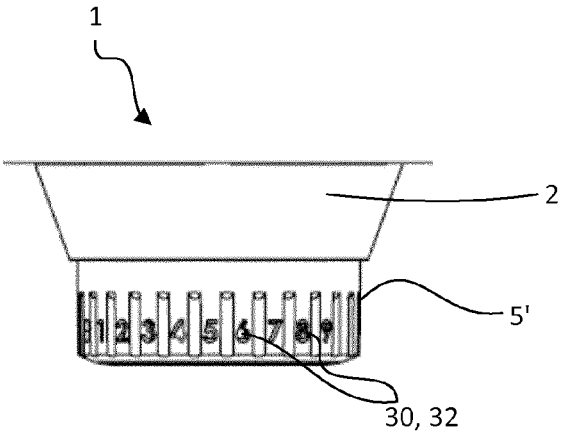

Fig. 9

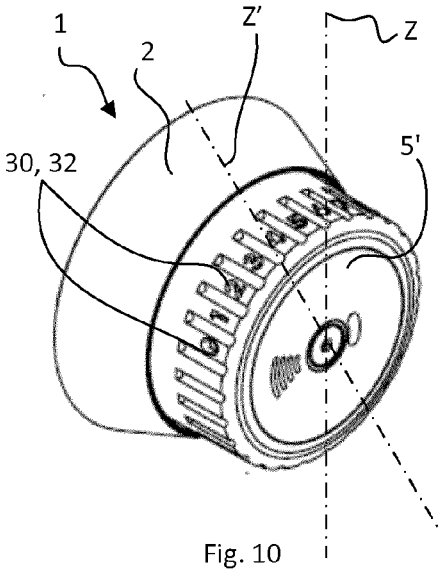

Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 18 19 6832

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 March 2019	Van Beurden, Jason

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