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(54) **Automatic lock**

(57) An automatic lock for locking a movable member (200) relative to a fixed member (400) comprises a mechanism box (30) arranged in said movable member (400), a pusher member (1) fitted on the box (30), driving means (20, 21, 12) of the pusher member (1) and a locking lever (6) for being displaceably driven by the pusher member (1) in said box (30) outwards therefrom, to a mutual locking position of the closure members (200, 400), or to the interior thereof, to a mutual unlocking position of the clo-

sure members (200, 400). Locking means (50) are provided to lock the locking lever (6) comprising a locking arm (2) rotatably mounted around a shaft (7) formed integrally with the locking lever (6), the locking arm (2) being drivable by the pusher member (1) so that in the locking position, the arm (2) is disposed in an angular position such that the locking lever (6) is prevented from being moved.

EP 2 148 029 A1

Description

Field of the Invention

[0001] The invention relates to an automatic lock for locking a movable closure member to a fixed closure member, specifically in applications for remotely unlocking both members, although the invention also finds application in manual direct opening systems.

[0002] The automatic lock of the invention includes a mechanism box arranged in the movable member, such as a door or the like, a pusher member acting on a locking lever and means for driving the pusher member. The lever can be displaceably driven by the pusher member outwards therefrom, in a mutual locking position of the closure members, or inwardly therein, in a mutual unlocking position of the closure members.

[0003] The invention also refers to an automatic lock assembly which comprises a lock as described, that is fitted in the movable member, as well as a strike block, mounted on the fixed member, designed for receiving the locking lever.

Background of invention

[0004] Automatic locks are known including a locking lever fitted within a mechanism box such that it can be displaced therein. For mutually locking the closure members, the locking lever is moved outwards the box, protruding from the movable member (usually the door) for being received into the fixed member (usually the door frame), inside an opening (typically into the strike block).

[0005] The displacement of the locking lever out of the door is carried out through driving means. Said driving means are operated such that, when the door is closed and placed into the frame, the locking lever is actuated so that it is moved outwards for being inserted into frame and thereby automatically locking the door with no further user intervention.

[0006] Door unlocking occurs when activating means cause reverse actuation of the mechanism resulting in the displacement of the locking lever into the interior of the box and, consequently, unlocking of the door relative to the frame.

[0007] One example of this type of lock is disclosed in the utility model ES1036179. The lock described in this document provides the advantage that no electrical pre-installation on the door is required, with the activating means assembled in the frame for remotely opening of the door. However, the proposed lock does not provide for a complete security in the mutual locking position of the closure members.

[0008] The utility model ES2284369, owned by the same assignee as the present invention, relates to an automatic lock as the one described, which has the advantage over the lock described in the utility model ES1036179 that it provides for an additional security in the mutual locking position of the closure members by

including locking means preventing the lever from being moved once it is in said locking position. However, this lock has the disadvantage that the activation means for moving the lever, for remotely opening of the door, are mounted on the door itself, so that there is a need for an electrical pre-installation thereon for fitting the automatic lock.

Summary of the invention

[0009] The present invention consists of an automatic lock of the above described type, that is, in which locking of the movable member (the door) to the fixed member (frame) is carried out automatically when the door is closed in the frame, with no further user intervention.

[0010] The lock of the invention has the feature that it includes locking means to lock the locking lever, which comprise a locking arm rotatably mounted around a shaft formed integrally with the locking lever. In the locking position, the arm is arranged in an angular position such that the locking lever is prevented from being moved.

[0011] As noted above, in this type of lock, the step from the unlocking position to the locking position of the door is carried out automatically when closing the door to the frame. The reverse step (unlocking of the door) is carried out by activating the pusher member (for example, in such a way that it is rotated around a shaft formed integrally with the box), which may be carried out by different means, as detailed below.

[0012] The automatic lock of the invention is provided with driving means for driving the pusher member, which may be of the manual type (handle shaft receiving opening, lock cylinder) or of the electrical type, for remote operation. In the latter case (remote operation), a reciprocating device that is displaceably received in the box, in the movable member, and activating means, which are fitted in the fixed member, for acting on the pusher member through the aforementioned reciprocating device, are provided.

[0013] With the above described features an automatic lock is obtained having a very simple construction, taking up least space and with which prior art disadvantages are overcome. On the one hand, it allows remotely unlocking of the closure members without the need for providing the door with electrical means (forming the so called activating means), since they are assembled in the frame, thus avoiding the necessity for an electrical pre-installation in the movable member and, on the other hand, it provides for a greater security in the mutual locking of the members by the provision of locking means as described.

[0014] A further advantage of the automatic lock of the invention is that it has a simplified machining. This allows to be received inside a small mechanism box, adaptable to all types of doors. In addition, as no electrical pre-installation is required in the door, the lock of the invention is suitable for a wide range of doors, further providing a high degree of security due to its reinforced lever locking

system.

[0015] Preferably, the first end of the locking arm is adapted to be pushed through a lateral portion of the pusher member and therefore causing the movement of the locking arm and the displacement of the locking lever to an unlocking position of the lock.

[0016] In some embodiments of the automatic lock of the invention, said locking arm may be provided with a shoulder that can be extended upwards for causing its rotation around the shaft thereof, to the unlocking position, when driven by the pusher member.

[0017] The pusher member may be also provided with biasing portions serving the purpose of causing a further rotation of the locking arm around the shaft thereof and a displacement of the locking lever. Displacement of the locking lever is carried out with the pusher member acting, through its biasing portion, on the locking arm shaft integral with the locking lever to the unlocking position.

[0018] Specifically, the pusher member includes three biasing portions: a first biasing portion for causing rotation of the locking arm around the shaft thereof, a second biasing portion for causing the locking lever to be biased through the surface to the locking position of the closure members, and a third biasing portion for causing the locking lever to be pulled through the shaft integral thereto, to the mutual unlocking position of the closure members.

[0019] Also in some embodiments it is preferred that the movement of the pusher member, due to the action of the above mentioned reciprocating device, is in rotation around a shaft formed integrally with the mechanism box.

[0020] Return means of the locking arm may be also provided for causing it to be rotated to the locking position.

[0021] The invention further relates to a lock assembly comprising the above described automatic lock, fitted on the movable member, and a strike block mounted on the fixed member. This lock assembly according to the invention further includes activating means fitted on the fixed member serving the purpose of driving the pusher member for bringing the locking lever to the unlocking position.

[0022] Other objects, advantages and features of the lock assembly and the automatic lock of the present invention will be more clear from the description of a preferred embodiment of the invention. This description is given by way of a non-limiting example and it is shown in the appended drawings herein.

Brief description of the drawings

[0023] In these drawings,

Fig. 1 is an elevational view in which one embodiment a lock assembly is shown in detail including an automatic lock shown in a mutual locking position of the closure members, i.e. with the door closed and the lever locked;

Fig. 2 is an elevational view in which the embodiment of the lock assembly in Fig. 1 is shown in detail with the automatic lock in a first movement to the mutual unlocking position of the closure members;

Figure 3 is an elevational view in which the embodiment of the lock assembly in Fig. 1 is shown in detail with the automatic lock in the mutual unlocking position of the closure members, i. e. with the door unlocked (whether it is inside the frame ready to be opened or when the door is already out therefrom);

Figure 4 is a perspective view of the pusher member;

Figure 5 is a perspective view of the locking lever;

Figure 6 is a perspective view of the locking arm; and

Figure 7 is a perspective view of the stop block in the locking arm.

Detailed description of particular embodiments

[0024] An automatic lock assembly is shown in the figures which has been indicated as a whole by reference numeral 110. The automatic lock assembly 110 comprises, on the one hand, an automatic lock 100, that is fitted on a movable member 200 (shown on the right side in Figs. 1-3) and, on the other hand, a strike block 300, which is fitted in the fixed member 400 (shown on the left side in Figs. 1-3), which is intended for receiving the locking lever 6 of the lock 100.

[0025] The lock 100 is capable of automatically, and particularly safely, locking the movable member 200 to the fixed member 400 and comfortably and effectively unlocking each other through different alternative driving means 20, 21, 12, as it will be detailed.

[0026] The movable member 200 will be referred to as "door" hereinafter, and the fixed member 400 as "frame", so that in the locking position, the door 200 is locked to the frame 400 (Fig. 1).

[0027] The automatic lock 100 of the lock assembly 110, which is shown by way of an example in the figures, includes a mechanism box 30 fitted within the door 200. Driving means 20, 21, 12 are received within the mechanism box 30 for causing the door to be unlocked, which are capable of acting on a pusher 1, as it will be described hereinafter.

[0028] One of said driving means is, for example, a reciprocating device 20 which, in addition to drive the pusher member 1 for unlocking the door 200, it further performs the function of automatic locking when closing the door 200. More specifically, the reciprocating device 20 can be moved inside the box 30 relative to it in two directions. In a first direction, the reciprocating device 20 is moved into the interior of the mechanism box 30 (to the right in the figures) when the door 200 abuts the frame 400 and, through a biasing means 60, the system is ar-

ranged such that locking of the lever 6 occurs once it has entered an opening 40 in the frame 400, so that locking takes place, as it will be explained thereafter. In the reverse direction, the reciprocating device is moved outwards the mechanism box 30 (to the left in the figures), through activating means 500 which are fitted on the frame 400 of the door and which allows the pusher member 1 to be pulled by the reciprocating device thus releasing the system.

[0029] The pusher member of the automatic lock 100 shown in the drawings consists of a pusher plate 1 that can be rotatably driven around a shaft 22 of the box 30 (received in a hole 23 of said plate 1) through the above mentioned driving means 20, 21, 12.

[0030] Specifically, said driving means can be of the manual type (by means of a handle shaft receiving opening 21, or a lock cylinder 12) or of the electrical type for remote driving (via the above mentioned reciprocating device 20, displaceably received into the box 30).

[0031] The lock 100 is completed with the locking lever 6, displaceably received into the mechanism box 30.

[0032] In order to arrange the locking lever 6 in the locking position shown in Fig. 1 of the drawings, it is displaceably driven outwards the mechanism box 30 (to the left in the figures) protruding from the door 200 for being placed inside an opening 40 in the frame 400, thereby preventing the door 200 from being opened relative to it.

[0033] In order to arrange the locking lever 6 in the unlocking position (Fig. 3), the lever 6 is displaceably driven (to the right in the figures) to the interior of the mechanism box 30 to allow the door 200 to be opened, as it will be described in greater detail hereinafter. As noted above, displacement of the lever 6 can be performed out remotely through activating means 500, located in the fixed member 400, which acts on the reciprocating device 20 which, in turn, causes the pusher plate 1 to be moved resulting in the displacement of the lever 6 such that the door 200 is released.

[0034] For ensuring closure or locking of the door 200 to the frame 400, locking means 50 are provided in the lock 100 for locking the lever 6 in the locking position (Fig. 1). Specifically, said locking means 50 comprise a locking arm 2 which will be described hereinafter in greater detail.

[0035] The locking arm 2 is rotatably mounted around a shaft 7 that is formed integral with the locking lever 6 and that is received into a hole 19 of said locking lever 6, as shown in Fig. 5. According to Figs. 1-3, the locking arm 2 has a first end 2A extending to one side thereof and it has a surface 16 intended to be pushed by a first biasing portion 15A of the pusher member 1, in the locking position (Fig. 1), and a second end 2B intended for abutting, in said locking position, on one end 11 of a stop block 3 formed integral with the mechanism box 30, as shown in Fig. 1. In the embodiment shown, the locking arm 2 is arranged between the pusher member 1 and the stop block 3, and exhibits a construction such that the ends 2A, 2B thereof are misaligned to each other.

[0036] The first end 2A of the locking arm 2 is adapted for being pushed by a first biasing portion 15A of the pusher plate 1 and thereby causing the locking arm 2 to be rotated and then the locking lever 6 to be displaced to an unlocking position of the lock 100 (to the right in the figure) when the pusher member 1 is driven on the shaft 7. This is because the shaft 7 is formed integrally with the locking lever 6 as noted above, and hence, it is moved with it and with the locking lever 2.

[0037] As can be seen more clearly from Fig. 6 of the appended drawings, the locking arm 2 includes an upwardly extending shoulder 16, which is intended to be pushed by the first biasing portion 15A of the pusher member 1, causing it to be rotated around its shaft 7, to the unlocking position. This may occur, as noted above, when the pusher plate 1 is driven through any of the driving means 20, 21, 12.

[0038] The pusher plate 1 further includes a third laterally-extending biasing portion 17 serving the purpose of pushing the locking lever 6 in a direction so as to move it outwards the mechanism box 30 pushing against a biasing face 13 arranged in the locking lever 6 itself, and in another direction for moving it into the interior of the mechanism box pushing against the upper extension of the shaft 7 integral with the mechanism box 30 itself and the locking arm 2. Again, this may occur when the pusher plate 1 is driven by any of the driving means 20, 21, 12. The unlocking position is reached when the lever 6 is substantially adjacent to the stop block 3.

[0039] As shown in Figs. 1-3 of the appended drawings, biasing means 60, 70, 80, 90 are provided which are directly or indirectly linked to the reciprocating device 20 (biasing means 60), to the pusher member 1 (biasing means 70 and 80), and to the locking arm (biasing means 90), for their return movement. Other alternative return means may be also provided. In the particular case of the locking lever 2, said alternative return means may consist, as shown in Fig. 6, in providing a second end 2B of the locking arm 2 that is larger in size or weight than the first end 2A, causing the locking arm 2 to tend to automatically rotate clockwise around its shaft 7 until said second stop 2B abuts on the stop end 11 of the stop block 3, reaching the locking position shown in Fig. 1.

[0040] The operation of the automatic lock of the present invention is described below.

[0041] Starting from the locking position shown in Fig. 1, i.e. with the door closed 200 to the frame 400 by having its locking lever 6 out of the mechanism box 30, inserted within the opening 40 of the frame 400, the process followed by the lock 100 to the unlocking position (Fig. 3) for releasing the door 200 is as follows.

[0042] In the locking position, shown in Fig. 1 of the drawings, the pusher plate 1 is arranged with a second biasing portion 15B thereof (shown in detail in the perspective view in Fig. 4) pushing against one biasing face 13 of the locking lever 6 (shown in detail in the perspective view in Fig. 5), keeping said lever 6 out of the mechanism box 30 (to the left in Fig. 1) for having the lock 100 in the

locking position (door 200 closed, Fig. 1).

[0043] While the lock 100 is in the locking position (Fig. 1), said position is secured by the locking arm 2, avoiding any attempt for an unintentional or spiteful retraction of the locking lever 6 that causes it to be moved back to the right in the figure, outside the opening 40 of the frame 400. From Fig. 1 it can be seen how, in this locking position, the second end 2B of the locking arm 2 is in a substantially horizontal position (Fig. 1), with the locking arm 2 remaining locked in the end 11 of the stop block 3.

[0044] Unlocking of the door 200, from the locking position described with reference to Fig. 1 of the drawings, is carried out by moving the pusher plate 1. This can be carried out through different driving means, as indicated above, which may be of the electric type for remote operation (acting on the reciprocating device 20 that can be displaceably moved through driving means 500 fitted in the frame 400 of the door) or of the manual type (handle shaft receiving opening 21 of the lock or lock cylinder 12, by means of a key).

[0045] Driving of the pusher plate 1 through any of the above mentioned driving means 20, 21, 12 for unlocking the lever 6 causes the locking arm 2 to be pivoted counter-clockwise around its shaft 7 (formed integrally with the locking lever 6) whereby the first end 2A of the locking arm 2 travels the first biasing portion 15A of the pusher plate 1, as shown in Fig. 2 which depicts how the pusher plate 1 has been also rotated counter-clockwise around the shaft 22 of the box 30 relative to the locking position shown in Fig. 1.

[0046] The movement of the pusher plate 1 causes the shoulder 16 of the locking arm 2 to be pushed forcing it to be rotated counter-clockwise, as indicated, around the shaft 7, thereby unlocking the lever 6. The pusher plate 1 continues moving until the third biasing portion 17 (Fig. 4) abuts the shaft 7 formed integrally with the locking lever 6. Since the shaft 7 around which the locking arm is rotated, is integral with the locking lever 6, as noted above, the movement of the pusher plate 1 simultaneously causes the displacement of the locking lever 6 into the interior of the box 30.

[0047] At this point, the pusher plate 1 stops moving the locking arm 2, which will continue rotating counter-clockwise around the shaft 7 since, as the locking lever 6 is pulled, it slides on the surface 18 of the stop block 3 shown in Fig. 7. The locking lever 6 continues being pushed, through the third biasing portion 17 of the pusher plate 1 and through the shaft 7, until it is fully retracted. At the same time, the locking arm 2 has continued rotating counter-clockwise around the shaft 7, with the second end 2B of the locking arm 2 being disposed finally in a substantially vertical position, as shown in Fig. 3, reaching the unlocking position, in which the door 200 can be opened out of the frame 400.

[0048] Fig. 3 shows the lock assembly 110 with the lock 100 already in the unlocking position, i.e. with the lever 6 retracted inside the box 30, out of the opening 40 of the frame 400, and ready for the pusher plate 1, through

its second biasing portion 15B (shown in Fig. 4), to push the lever 6 again through its biasing face 13 (shown in Fig. 5), to the locking position in Fig. 1 (to the left). At this point, since the locking arm 2 is released, it is automatically returned to its original locking position, that is, it is rotated clockwise around the shaft 7 for being disposed with its second end 2B again in the horizontal position shown in Fig. 1 and abutting the end 11 of the stop block 3, thus locking the lever 6 in place again and ensuring the locking position of the door 200.

[0049] The lock 100 includes a manual unlocking assembly comprising a lock cylinder 12. The lock cylinder 12 can act on a first end 5A of a driving cam 5 rotatably mounted in the box 30, so that it can be rotated around a shaft 10. The cam 5 is linked, by a second end 5B thereof, to the pusher plate 1 through a shaft 9 formed integrally with the second end 5B of the cam 5 and through a slotted hole 4 in the pusher plate 1. Thus, for manually releasing the door 200 the lock cylinder 12 is rotatably driven such that it acts on the cam 5 causing it to be rotated around the shaft 10. This results in pulling of the pusher plate 1, due to displacement of the shaft 9 through the slotted bore 4, around the shaft 22, bringing the lever 6 to the unlocking position in Fig. 3 for allowing the door 200 to be opened.

[0050] While the present invention has been described in the specification and has been shown in the accompanying drawings with reference to a preferred embodiment thereof, the automatic lock of the invention is susceptible to various changes without departing from the scope of protection defined by the following claims.

Claims

1. Automatic lock (100) for locking a movable member (200) relative to a fixed member (400) which comprises:

- a mechanism box (30) arranged in said movable member (400);
- a pusher member (1) fitted on the box (30);
- driving means (20, 21, 12) of the pusher member (1);

and

- a locking lever (6) for being displaceably driven by the pusher member (1) in said box (30) outwards therefrom, to a mutual locking position of the closure members (200, 400), or to the interior thereof, to a mutual unlocking position of the closure members (200, 400),

the lock (100) being **characterized in that** it includes locking means (50) to lock the locking lever (6) which comprise a locking arm (2) rotatably mounted around a shaft (7) formed integrally with the locking lever (6), the locking arm (2) being drivable by the pusher member (1) so that in the locking position, the arm (2) is disposed

in an angular position such that the locking lever (6) is prevented from being moved.

2. Automatic lock (100) as claimed in claim 1, wherein the locking arm (2) has a first end (2A) adapted for being pushed by the pusher member (1) and causing the rotation of said locking arm (2) unlocking the locking lever (6) for being subsequently pulled into a mutual unlocking position of the closure members (200, 400). 5
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3. Automatic lock (100) as claimed in claim 1 or 2, wherein it includes return means of the locking arm (2) for causing it to be rotated to the locking position. 15
4. Automatic lock (100) as claimed in claim 1 or 2, wherein the locking arm (2) includes a shoulder (16) for causing it to be rotated around its shaft (7) to the locking position when the pusher member (1) is driven. 20
5. Automatic lock (100) as claimed in claim 1, wherein the pusher member (1) includes a first biasing portion (15A) for causing the locking arm (2) to be rotated around its shaft (7), a second biasing portion (15B) for pushing the locking lever (6) through the surface (13) to the locking position of the closure members (200, 400), and a third biasing portion (17) for causing the locking lever (6) to be pulled through the shaft (7) integral therewith to the mutual unlocking position of the closure members (200, 400). 25
30
6. Automatic lock (100) as claimed in any of the preceding claims, wherein said driving means of the pusher member (1) comprise a reciprocating device (20) displaceably received in the box (30). 35
7. Automatic lock (100) as claimed in any of the preceding claims, wherein said pusher member (1) is capable of being rotatably driven around a shaft (22). 40
8. Automatic lock assembly (110), which includes a lock (100) as claimed in any of the preceding claims, fitted in the movable member (200), **characterized in that** it further includes activation means (500) fitted in the fixed member (400) for driving the pusher member (1). 45

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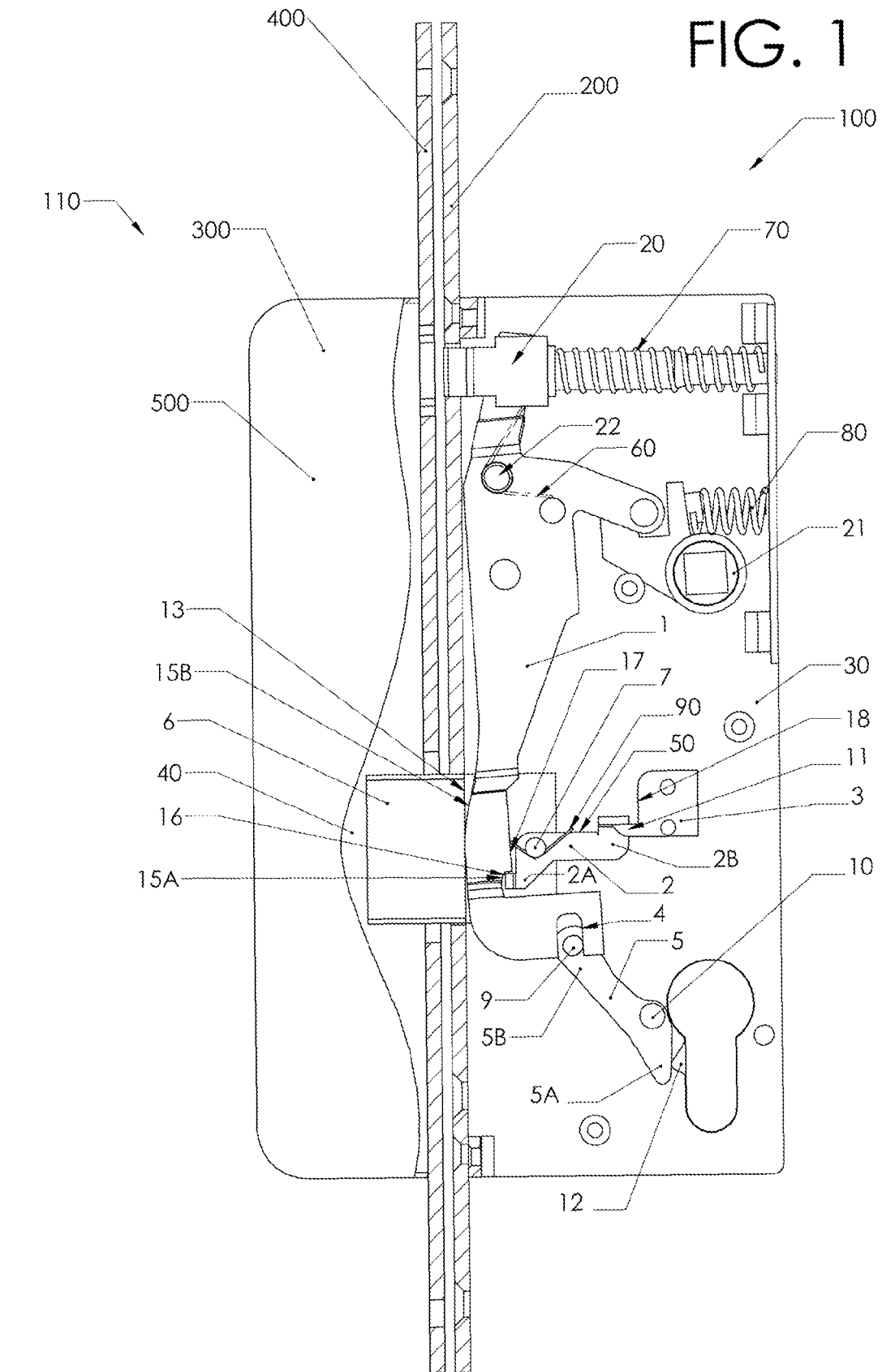


FIG. 2

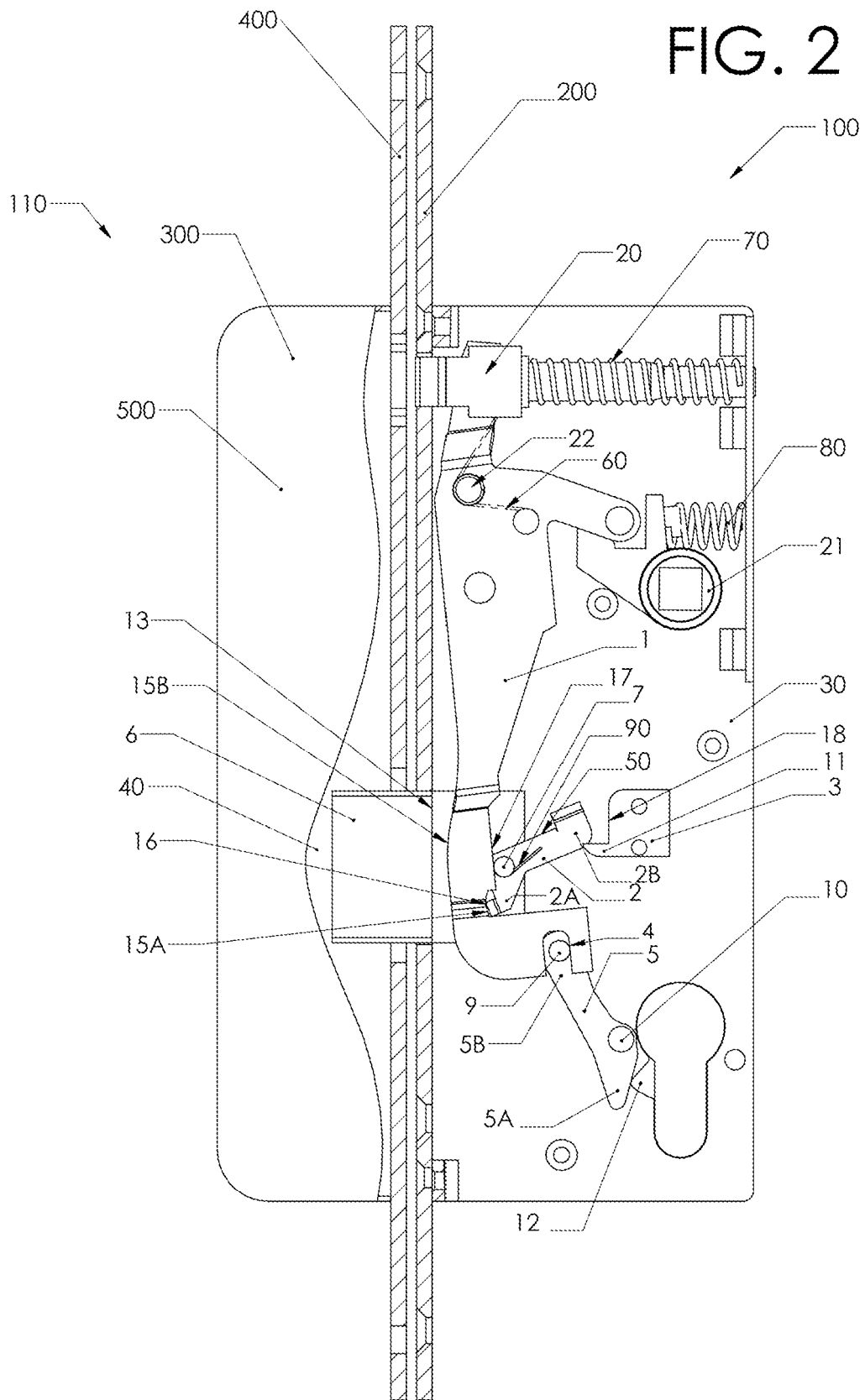


FIG. 3

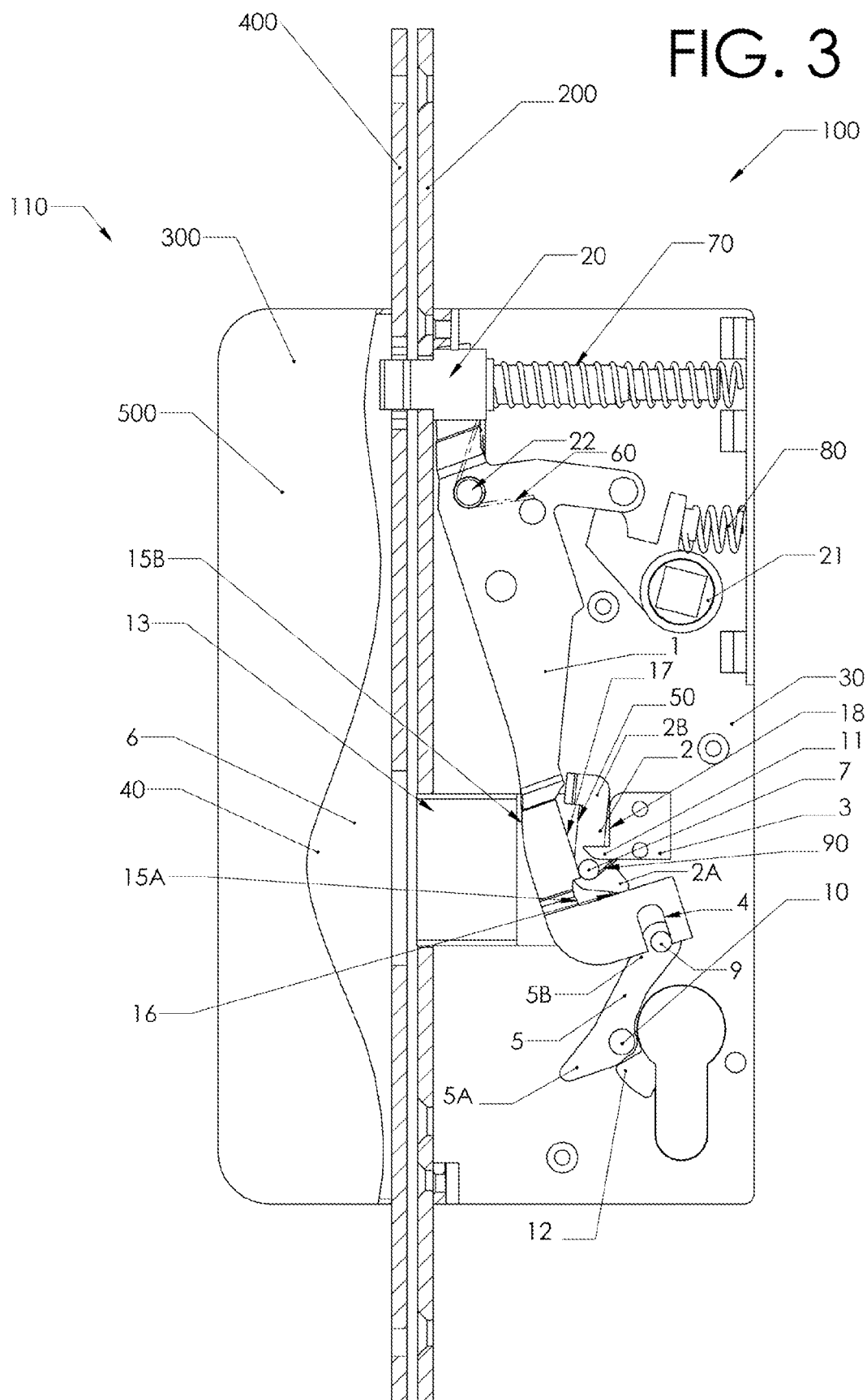


FIG. 4

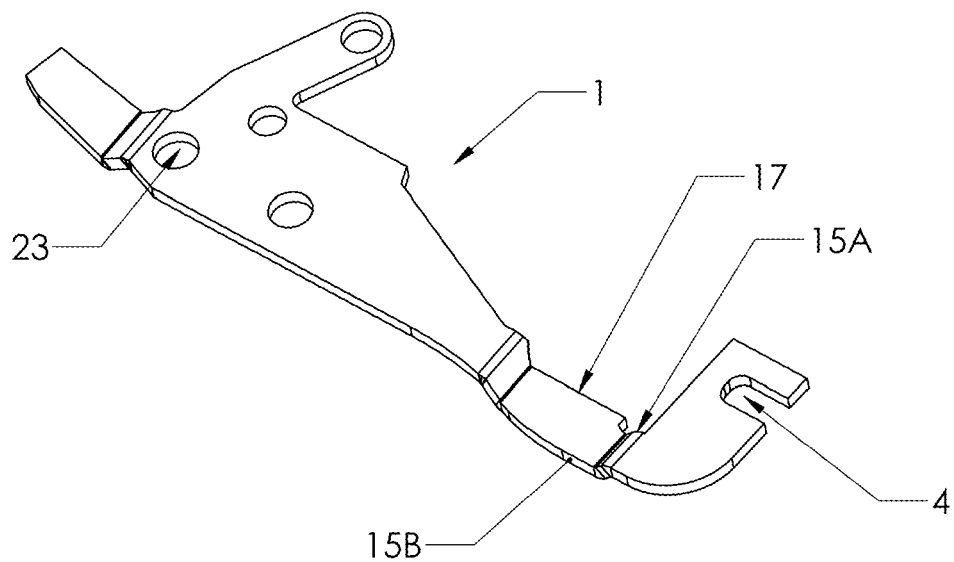


FIG. 5

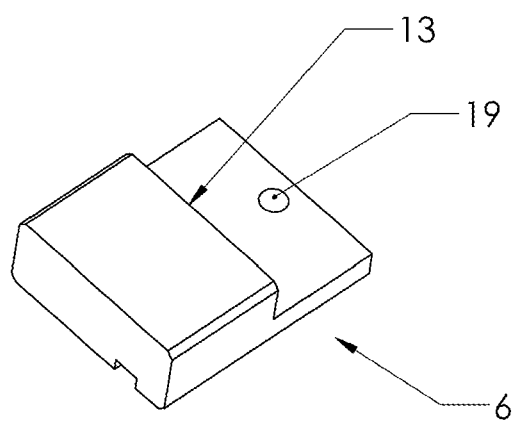


FIG. 6

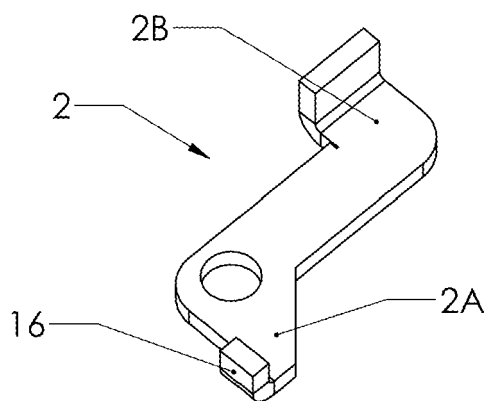
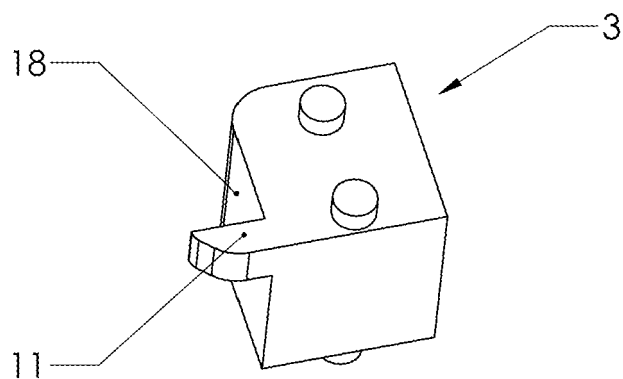


FIG. 7





EUROPEAN SEARCH REPORT

Application Number
EP 09 16 5943

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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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Place of search The Hague		Date of completion of the search 6 November 2009	Examiner Perez Mendez, J
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 16 5943

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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