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(54) **Manually operated locking mechanism**

(57) A manually operated locking mechanism (10) for a closure member, such as an openable door or window, said mechanism being adapted to be mounted in a closing face of the closure member and comprising: a housing (11); a deadbolt (12) mounted in the housing (11) for movement between a withdrawn position within the housing and a projecting locking position; a manually operable actuator element mounted on the housing (11) for movement from a datum position in a locking direction or an opposite unlocking direction in order respectively to lock and unlock the mechanism (10); an actuating mechanism (20) in the housing (11) which is engageable with the deadbolt (12) in order to displace the deadbolt to the locking position when the actuator element is moved in the locking direction; a tumbler (13) mounted in the mechanism (10) and adjustable between a first mode of operation in which it allows the deadbolt (12) to move to, and be maintained in the locking position when the actuator element is moved in the locking direction from the datum position, and a second mode of operation in which it allows the deadbolt to be returned to the withdrawn position when the actuator element is moved in the opposite direction from the datum position; and, a disabling arrangement (16) operative to initiate unlocking of the mechanism (10) by effecting adjustment of the tumbler (13) to the second mode of operation, said arrangement including a biasing arrangement (16) which is operative to hold the tumbler (13) in its second mode so that movement of the actuator element in the unlocking direction can effect withdrawal of the deadbolt (12), and also disengagement of the biasing arrangement (16) from the tumbler (13).

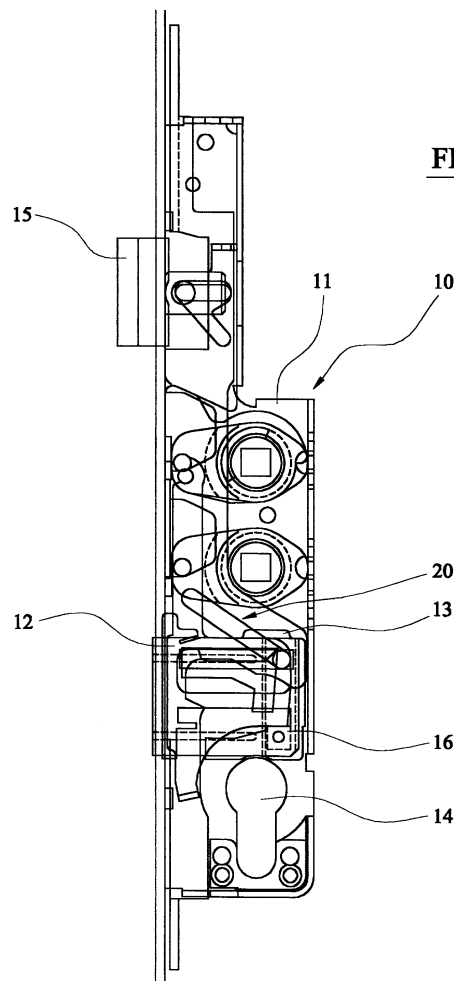


FIG. 1

Description

[0001] This invention relates to a manually operated locking mechanism for an openable door or window.

[0002] Handle operated locking mechanisms are provided in particular for high security doors e.g. front and rear entry doors to homes, and usually have a number of separate locking elements, so as to provide a multi-point locking arrangement. In a typical arrangement, there may be a central deadbolt, pivotable hooks, cams and shootbolts, all mounted on a closing face of a door and which, upon actuation of the locking mechanism, move into locking engagement with respective keepers mounted on a fixed frame in which the door is mounted.

[0003] The locking mechanism usually includes a spring loaded latch with an inclined cam face which gives a self-latching facility when the door is pushed to a closed position, and downward turning movement of the handle effects withdrawal of the latch from a keeper in the fixed frame to allow opening of the door. The same handle is also used to activate the various locking elements, and this is achieved by two separate actions in existing designs.

[0004] First of all, the handle is turned upwardly from a horizontal datum or rest position, and this is converted into linear displacement of actuators running lengthwise of the closing face of the door. The activators then displace cams and shootbolts (if provided) to locking engagement with respective keepers on the fixed frame, and also pivot any pivoting locking hooks if provided. However, the operation of the handle does not apply any locking movement to the central deadbolt, but merely activates the deadbolt in the sense of making it ready to be moved or "thrown" to a projecting locked position by subsequent operation of a key.

[0005] There is therefore a locking cylinder which is rotatable through 360° by a key (inserted from externally or internally of the door as required), and this is done after actuation of the locking mechanism by upward turning movement of the handle, and subsequent release of the handle to the horizontal rest position. Following rotation of the locking cylinder to lock the central deadbolt, the mechanism also maintains the other locking elements in their locked positions, despite the fact that the handle has by now returned to its rest position.

[0006] To unlock the mechanism, the key is inserted and rotates the cylinder in an opposite direction through 360°, and which causes withdrawal of the central deadbolt, and de-activates the mechanism in the sense that subsequent downward turning of the handle causes all of the other locking elements to be withdrawn from engagement with the respective keepers, and at the same time withdraws the latch so that the door can be opened.

[0007] These known handle operated locking mechanisms work satisfactorily and are widely used. However, necessarily the locking operation requires two separate actions, namely first upward turning movement of the handle in a locking direction, and secondly subse-

quent key operated rotation of the locking cylinder through 360°.

[0008] The invention seeks to simplify the locking operation while at the same time maintaining the integrity of a handle operated locking mechanism.

[0009] According to the invention there is provided a manually operated locking mechanism for a closure member, such as an openable door or window, said mechanism being adapted to be mounted in a closing face of the closure member and comprising:

a housing;

a deadbolt mounted in the housing for movement between a withdrawn position within the housing and a projecting locking position;

a manually operable actuator element mounted on the housing for movement from a datum position in a locking direction or an opposite unlocking direction in order respectively to lock and unlock the mechanism;

an actuating mechanism in the housing which is engagable with the deadbolt in order to displace the deadbolt to the locking position when the actuator element is moved in the locking direction;

a tumbler mounted in the mechanism and adjustable between a first mode of operation in which it allows the deadbolt to move to, and be maintained in the locking position when the actuator element is moved in the locking direction from the datum position, and a second mode of operation in which it allows the deadbolt to be returned to the withdrawn position when the actuator element is moved in the unlocking direction from the datum position; and, a disabling arrangement operative to initiate unlocking of the mechanism by effecting adjustment of the tumbler to the second mode of operation, said arrangement including a biasing arrangement which is operative to hold the tumbler in its second mode so that movement of the actuator element in the unlocking direction can effect withdrawal of the deadbolt, and also disengagement of the biasing arrangement from the tumbler.

[0010] A locking mechanism according to the invention therefore permits locking of the mechanism simply by movement of the actuator element, which will usually and preferably be upward turning movement of a handle from a horizontal rest or datum position. This enables simple locking of the mechanism (from the inside or the outside) as required. However, to unlock the mechanism, the disabling arrangement is operated which initiates temporary holding of the tumbler in its second mode of operation ready for subsequent operation of the actuator element (handle) to effect withdrawal of the deadbolt when the handle is turned in an opposite direction from its rest position.

[0011] The manually operated actuator element preferably comprises a rotatable handle, but may comprise,

as an alternative, a knob set.

[0012] The provision of a deadbolt is a minimum requirement in a locking mechanism according to the invention, and which will preferably be a central deadbolt, operating in conjunction with a latch which is also operable to a released position by movement of the handle in the unlocking direction.

[0013] The disabling arrangement preferably comprises a key-operated cylinder lock. However, at least for disabling the locking mechanism from internally of the closure member (door) the disabling arrangement may comprise a so-called "thumb turn".

[0014] Preferably, the locking mechanism of the invention is incorporated in a multi-point locking arrangement, which may include one or more additional locking elements such as: locking cams; pivotable hooks or deadbolts and shootbolts. The additional locking element(s) is connected to the locking mechanism by a respective actuator e.g. a linearly displaceable rod which is operative to move the element to the locking position when the actuating mechanism is operated to move the central deadbolt to the projected locking position.

[0015] The rotation of the key (to initiate the unlocking sequence) preferably applies displacement movement to the tumbler in a direction transverse to the direction of reciprocation of the deadbolt, and the biasing arrangement holds the tumbler in this displaced position so that operation of the handle in the unlocking direction can then effect withdrawal of the deadbolt.

[0016] Preferably, the biasing arrangement comprises a spring loaded element which is carried by the deadbolt, i.e. moves with it, but which holds the tumbler in the displaced position for the second mode of operation. However, the spring arrangement allows the tumbler to return automatically to its original position (ready to initiate the further locking action) when the unlocking action of the handle has been completed.

[0017] A preferred embodiment of manually operated locking mechanism according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a handle operated locking mechanism for an openable door, and mounted in a closing face thereof, showing a tumbler of the mechanism in a lower position preventing any wander of any of the locking elements; Figure 2 is a view, similar to Figure 1, showing the position taken by the tumbler in a locked position of the mechanism, and preventing the locking elements from being pushed back from their locking positions, and this position being automatically obtained by actuation of an operating handle; Figure 3 is a view, similar to Figures 1 and 2, but showing the tumbler raised by operation of a key operated unlocking mechanism, but held in an adjusted second mode of operation by a spring biased arrangement prior to a handle operated unlocking

action; and,

Figures 4a, b and c are, respectively, details of; the position of the tumbler in the unlocked position corresponding to Figure 1; the position of the tumbler in the locked position of Figure 2; and the position of the tumbler shown in Figure 3 when the key has been inserted and rotated to initiate unlocking of the mechanism.

[0018] Referring now to the drawings, a preferred embodiment of handle operated locking mechanism will now be described in detail, by way of example only, in connection with a locking mechanism for a multi-point locking mechanism of a high security door.

[0019] The mechanism is designated generally by reference 10 and is adapted to be mounted in a closing face of the door and which comprises a housing 11, a central deadbolt 12 mounted in the housing 11 for movement between a withdrawn position within the housing 11, shown in Figure 1, and a projecting locking position shown in Figures 2 and 3.

[0020] A handle-operated actuating mechanism (designated generally by reference 20) is provided in the housing 11, and which is engageable with the deadbolt 12 in order to displace the deadbolt to the locking position when the handle (not shown) operating the mechanism is turned in a locking direction. In a preferred arrangement, the handle will have a horizontal rest or datum position, and the turning movement in the locking direction will be upward turning movement. As an alternative to operations of the mechanism 10 by a handle, a knob set (not shown) may be utilised.

[0021] A tumbler 13 is mounted in the mechanism and is adjustable to a first mode of operation in which it allows the deadbolt 12 to move, and to be maintained in the locking position when the handle is turned in the locking position from the datum position, as shown in Figures 1 and 2. The tumbler can also be adjusted to a second mode of operation (see Figure 3) in which it allows the deadbolt 12 to be returned to the withdrawn position when the handle is turned in an opposite direction from the datum position.

[0022] A key-operable disabling arrangement is provided, operative to initiate unlocking of the mechanism 10 by effecting adjustment of the tumbler 13 to the second mode of operation, this arrangement including a biasing arrangement which is operative to hold the tumbler 13 in its second mode of adjustment so that turning movement of the handle in the unlocking direction can effect withdrawal of the deadbolt, and disengagement of the biasing arrangement from the tumbler. However, other disabling arrangements may be provided e.g. a thumb turn.

[0023] The locking mechanism 10 therefore permits locking of the mechanism simply by locking movement of the handle, which will usually and preferably be upward turning movement from a horizontal rest or datum position. This enables simple locking of the mechanism

(from the inside or the outside) as required. However, to unlock the mechanism, a key is required, entered through key aperture 14, which initiates temporary holding of the tumbler 13 in its second mode of adjustment, ready for subsequent handle operated withdrawal of the deadbolt when the handle is turned in an opposite direction from its rest position.

[0024] The provision of deadbolt 12 is a minimum requirement in a locking mechanism according to the invention, and which will preferably be a central deadbolt, operating in conjunction with a latch 15 which is also operable to a release position by downward movement of the handle. The latch 15 has an inclined cam face, which allows automatic latching when the door is moved to a closed position.

[0025] In a preferred arrangement, the mechanism 10 is incorporated in a multi-point locking arrangement, which includes one or more additional locking elements, such as locking cams, pivotable hooks, shootbolts, and additional deadbolts if required. These additional locking elements are connected to the locking mechanism within housing 11 by respective actuators which are operative to move the locking elements to the locking position when the actuating mechanism is operated to move the deadbolt 12 to the projecting locking position shown in Figures 2 and 3.

[0026] The rotation of the key (to initiate the unlocking sequence) applies displacement to the tumbler 13 in a direction transverse to the direction of reciprocation of the deadbolt 12, and in order to take-up the displaced position shown in Figure 3.

[0027] The key-operated arrangement includes, as mentioned above, a biasing arrangement which is operative to hold the tumbler 13 in its second mode of adjustment, so that turning movement of the handle in the locking direction can effect withdrawal of the deadbolt 12, and also disengagement of the biasing arrangement from the tumbler.

[0028] In the preferred arrangement, shown in the drawings, the biasing arrangement comprises a spring loaded element 16 which is carried by the deadbolt 12 so as to be movable therewith (see Figures 2 and 3, and 4b and 4c), and this element 16 holds the tumbler 13 in the displaced position for the second mode of adjustment of the tumbler 13, after key-operated unlocking of the mechanism.

[0029] However, the spring loaded arrangement 16 holds the tumbler 13 in the position shown in Figure 3, after operation of the key operated unlocking mechanism, so that subsequent downward turning and unlocking movement of the handle then effects withdrawal of the deadbolt 12 from the projected locking position to the withdrawn unlocking position. Downward movement of the handle also disengages any other locking elements (not shown) e.g. cams, hooks, shootbolts, and deadbolts.

[0030] After completion of the unlocking action caused by downward unlocking turning movement of

the handle, the spring loaded element 16 is disengaged from the tumbler 13, which returns automatically to its original position, ready to initiate a further locking action when required.

[0031] Therefore, by contrast with the known designs of handle operated multi-point lock mechanism, the embodiment of the invention disclosed herein has the following sequence of operations:

1. The handle is lifted, which automatically throws the hook / deadbolts and cams if fitted. In addition, the handle simultaneously "throws" the centre deadbolt and locks all of the locking elements in position. Therefore, to withdraw these locking elements from engagement with the respective keepers, a key must be used.
2. To unlock the mechanism, a key is inserted into a locking cylinder, and is turned through 360°, and then the handle is depressed i.e. is turned in a downward and unlocking direction from the horizontal datum or rest position.

[0032] A conventional locking system normally has two indents in the tumbler, to provide locking and prevent movement of the mechanism whilst in the unlocked position.

[0033] In the embodiment of the invention, the locking indent in the tumbler is automatically obtained by using the handle without a key. Since the handle is required solely to operate the lock mechanism (and not the key as in the conventional arrangement), the only function of the key operated mechanism in the embodiment is to raise the tumbler from its indent position, to allow the central deadbolt, and the other locking elements (hooks, cams etc) to be withdrawn.

[0034] As indicated above, the biasing arrangement which holds the tumbler 13 in its second mode of adjustment preferably takes the form of a spring loaded element, although it should be understood that it is within the scope of the invention to provide other biasing arrangements to perform the required function. What is important is that the mechanism provides rapid release from the key operation of the unlocking mode, so as to avoid any risk of failure in the event of the handle being re-operated in a locking mode before a full cycle has been completed.

[0035] As mentioned above, Figure 1 shows the position of the tumbler in the unlocked position, and Figure 2 shows the position of the tumbler in the locked position. Figures 4a and 4b are details, showing the positions of the tumbler and the deadbolt in the positions of Figures 1 and 2 respectively, whereas Figure 4c corresponds with Figure 3, and shows the raised position of the tumbler 13, following operation of the key, and in which position it is held by the spring loaded element 16 attached to deadbolt 12. In the position shown in Figure 4c, the tumbler 13 has been raised, engaging the spring mechanism which holds the tumbler 13 in the raised po-

sition. When the handle is depressed from the horizontal rest or datum position, in an unlocking direction, all locking elements connected via actuators to the locking mechanism are withdrawn, and the spring loaded element 16 automatically reverts to its original position, without use of the key.

[0036] Therefore, in general terms, the invention is concerned with a biasing arrangement, preferably a spring loaded mechanism, which holds the tumbler in the raised position while all locking elements are withdrawn, during an unlocking operation of the mechanism.

Claims

1. A manually operated locking mechanism (10) for a closure member, such as an openable door or window, said mechanism being adapted to be mounted in a closing face of the closure member and comprising:

a housing (11);

a deadbolt (12) mounted in the housing (11) for movement between a withdrawn position within the housing and a projecting locking position; a manually operable actuator element mounted on the housing (11) for movement from a datum position in a locking direction or an opposite unlocking direction in order respectively to lock and unlock the mechanism (10);

an actuating mechanism (20) in the housing (11) which is engageable with the deadbolt (12) in order to displace the deadbolt to the locking position when the actuator element is moved in the locking direction;

a tumbler (13) mounted in the mechanism (10) and adjustable between a first mode of operation in which it allows the deadbolt (12) to move to, and be maintained in the locking position when the actuator element is moved in the locking direction from the datum position, and a second mode of operation in which it allows the deadbolt to be returned to the withdrawn position when the actuator element is moved in the opposite direction from the datum position; and,

a disabling arrangement (16) operative to initiate unlocking of the mechanism (10) by effecting adjustment of the tumbler (13) to the second mode of operation, said arrangement including a biasing arrangement (16) which is operative to hold the tumbler (13) in its second mode so that movement of the actuator element in the unlocking direction can effect withdrawal of the deadbolt (12), and also disengagement of the biasing arrangement (16) from the tumbler (13).

2. A locking mechanism according to claim 1, in which the deadbolt (12) is a central deadbolt, operating in

conjunction with a latch (15) which is also operable to a release position by movement of the actuator element in the unlocking direction.

3. A locking mechanism according to claim 1 or 2, and incorporated in a multi-point locking arrangement which includes one or more additional locking elements.

4. A locking mechanism according to claim 3, in which the additional locking elements include locking cams, pivotable hooks, shootbolts, and additional deadbolts.

5. A locking mechanism according to claim 4, including respective actuators connected to the locking mechanism and operative to move the respective locking element to a locking position when the actuating mechanism (20) is operated to move the central deadbolt (12) to the projected locking position.

6. A locking mechanism according to any one of claims 1 to 5, in which the tumbler (13) is movable in a direction transverse to the direction of reciprocation of the deadbolt (12), when adjusted to its second mode of operation, and the biasing arrangement (16) is arranged to hold the tumbler (13) in this displaced position so that operation of the actuator element in the unlocking direction can then effect withdrawal of the deadbolt (12).

7. A locking mechanism according to any one of the preceding claims, in which the biasing arrangement comprises a spring loaded element (16) which is carried by the deadbolt (12) and is movable therewith, but which holds the tumbler (13) in the displaced position for the second mode of operation.

8. A locking mechanism according to claim 7, in which the spring arrangement (16) is operative to allow the tumbler (13) to return automatically to its original position when the unlocking action of the handle has been completed.

9. A locking mechanism according to any one of the preceding claims, in which the manually operable actuator element comprises a rotatable handle.

10. A locking mechanism according to any one of the preceding claims, in which the disabling arrangement comprises a key-operable cylinder.

FIG. 1

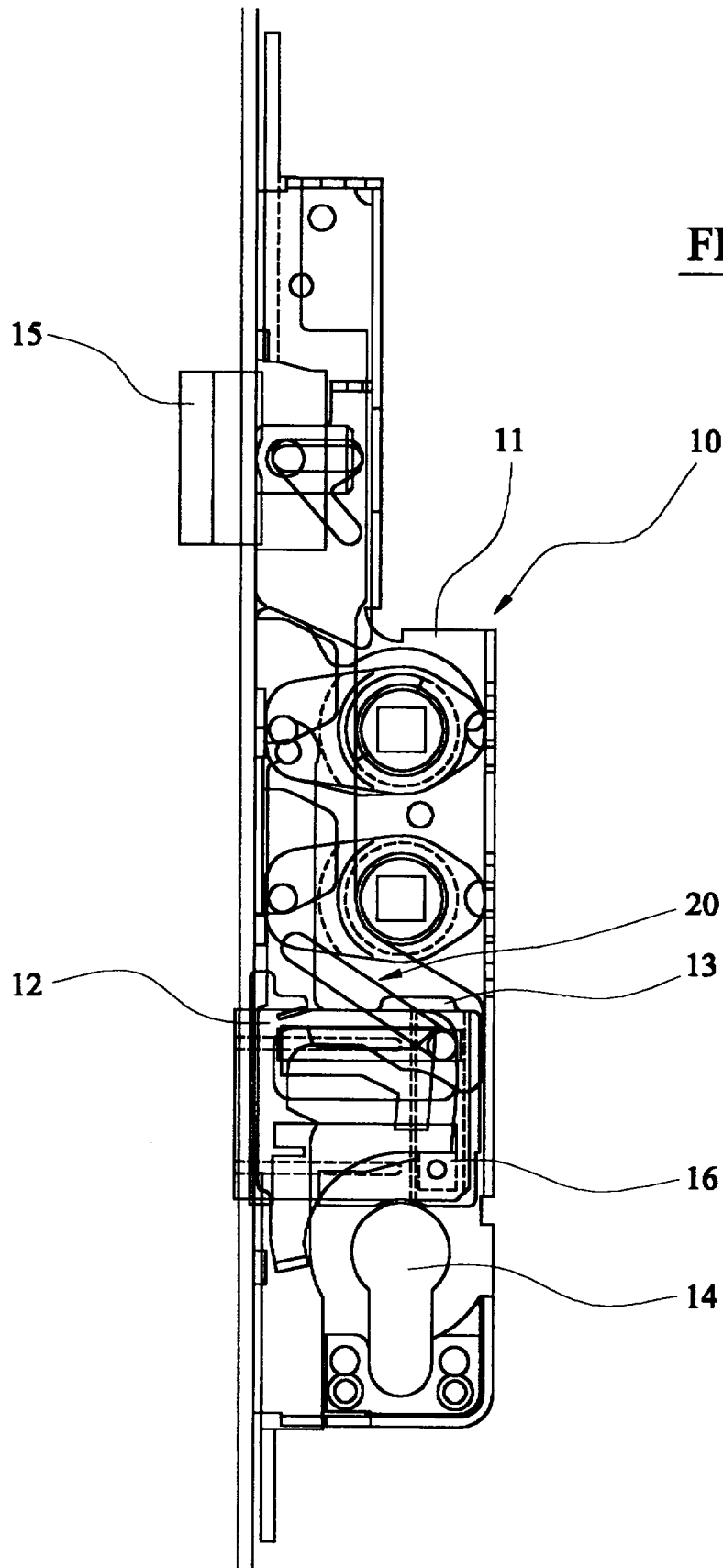


FIG. 2

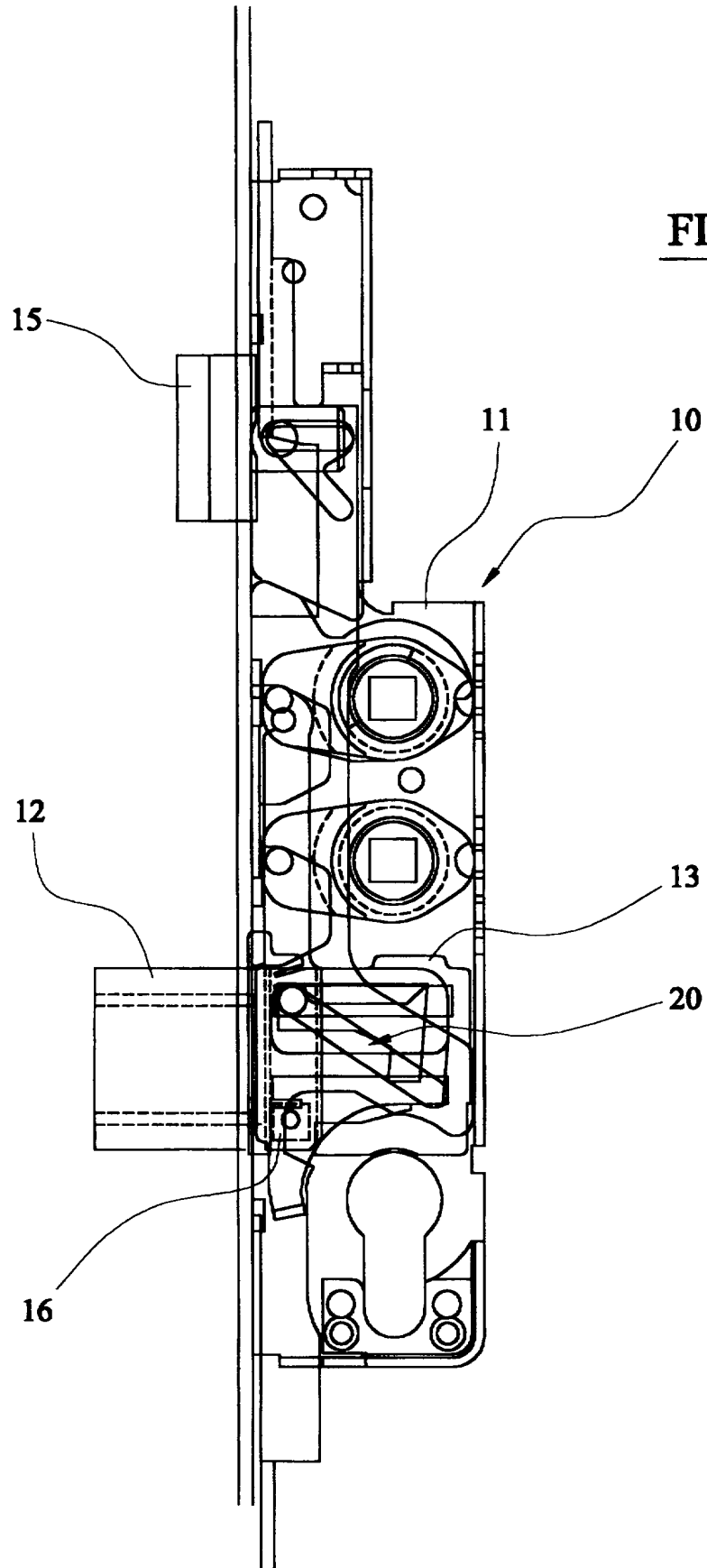
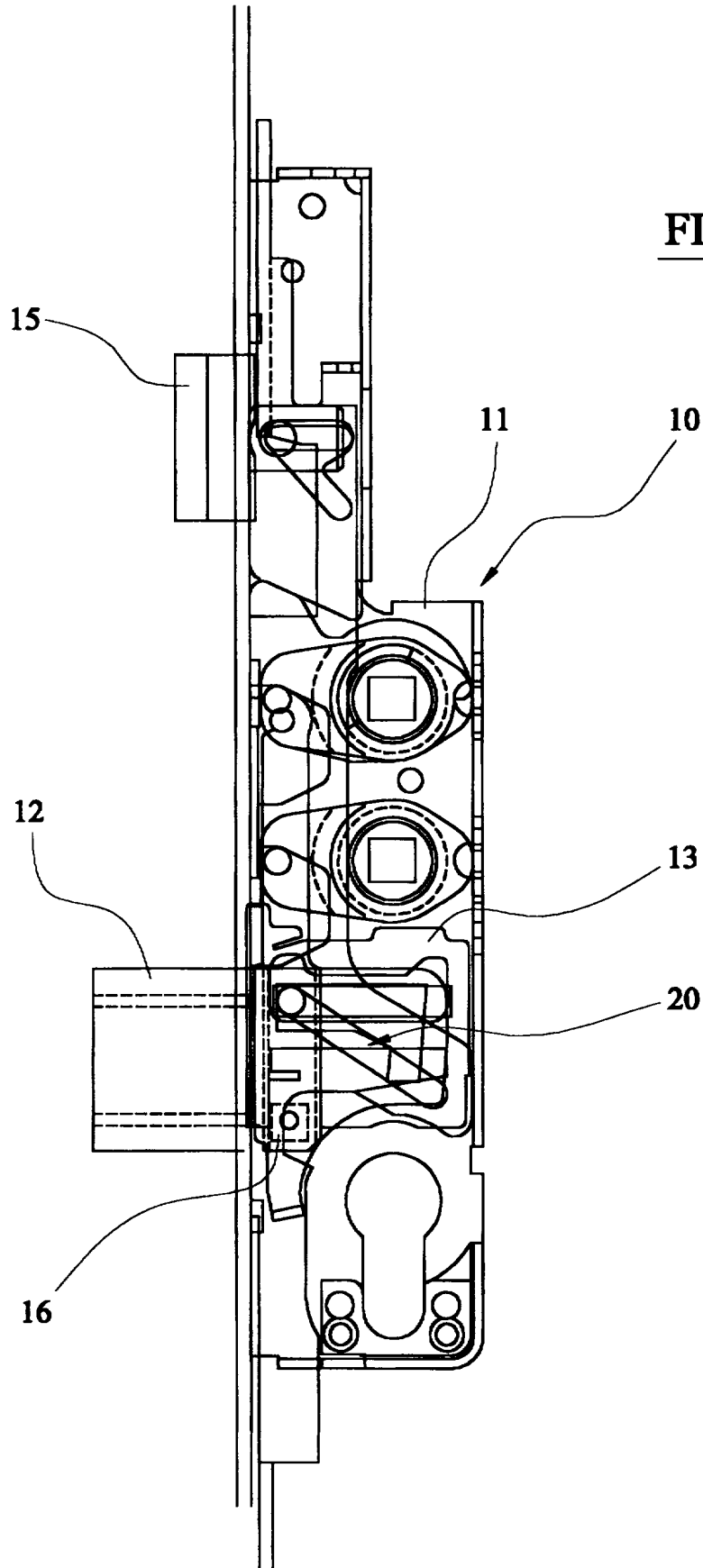


FIG. 3



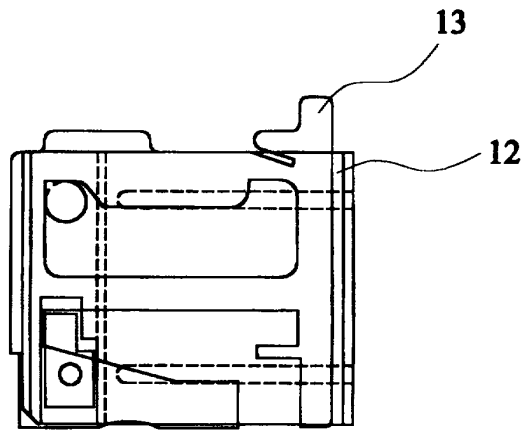


FIG. 4(a)

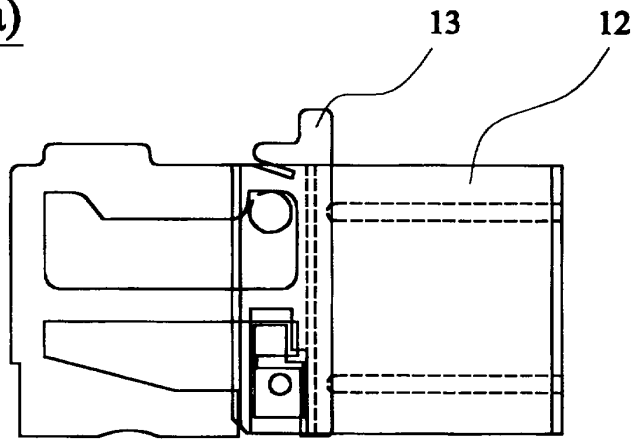


FIG. 4(b)

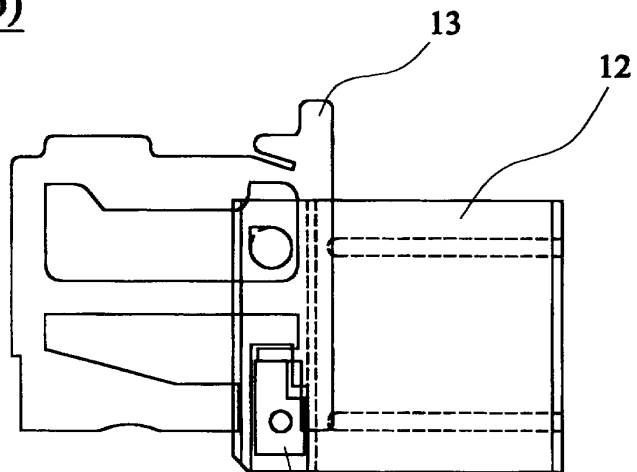


FIG. 4(c)