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(54) Strike plate of a lock

(57) Strike plate with a housing (10a) provided with a keep (11) in the form of an opening for receiving a bolt (4) of a lock (1), characterised in that the strike plate (3) is provided with two locking pins (12) that are axially movable in the housing (10a) between a locked position, whereby the locking pins (12) at least partly extend into the keep (11) in order to be held in cutaways (5) of the bolt (4) provided to this end in order to block the bolt (4) in the strike plate (3), and an unlocked position whereby these locking pins (12) are at least partly retracted from the keep (11), from the aforementioned locked position, in order to release the locking pins (12) from the cutaways (5) of the bolt (4) in order to be able to withdraw the bolt (4) from the keep (11).

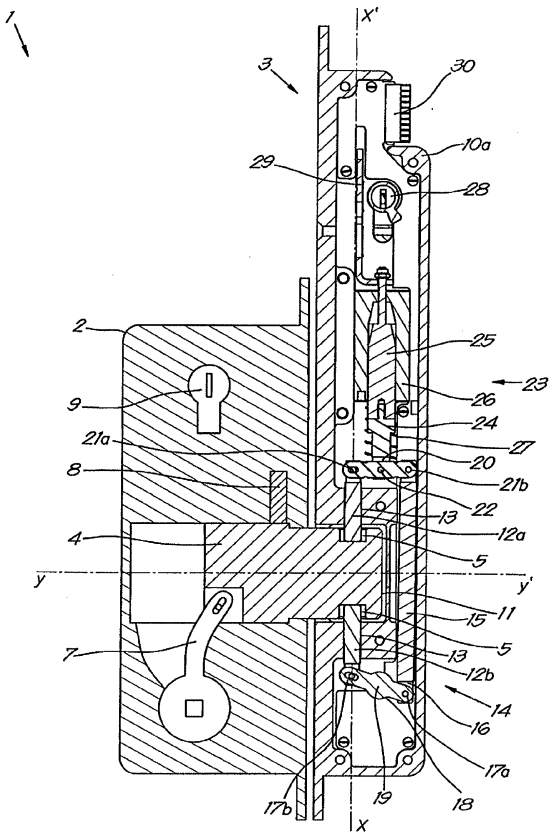

Fig.2

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Description

[0001] The present intention relates to a strike plate of a lock.

[0002] More specifically the invention relates to a strike plate of a lock with a keep (11) for a bolt (4) of a lock (1) whereby the bolt (4) can be moved between a retracted position in an open lock, and a limited extended position whereby the bolt is held by at least a certain length in the keep of the strike plate in a closed lock.

[0003] Bolt here not only means a sliding bolt or turning bolt as is traditionally used in a lock, but also a rod or beam that is movably provided on the leaf of a door, window or similar.

[0004] Door or window here also means a sliding door, fence, gate, sliding gate, roller shutter and similar.

[0005] Traditionally, with such a lock the bolt is blocked in the extended position in a lock case, in which the bolt is provided, in order to lock the bolt. Conventionally, the lock case is then built into the leaf of a window or door and the strike plate in the frame of the window or door.

[0006] This has the disadvantage that the jamb and leaf can be pushed apart, such that the lock is relatively easily sabotaged and the door or window can be opened.

[0007] Moreover, when it is desired to automate the locking of such known locks electrically, it means that an electric cable link is required between the door jamb and the electric lock in the leaf.

[0008] This cable link between the door jamb and leaf has the disadvantage that it is sensitive to wear and sabotage.

[0009] An alternative consists of building the lock case into the door jamb instead of in the leaf, whereby the locking and/or unlocking of the bolt can be realised electrically in the jamb.

[0010] A problem that arises here is that the built-in depth in the jamb is limited, and it is thus necessarily limited to a lock with a bolt whose length is limited, such that the break-in resistance of the door set is degraded.

[0011] Moreover, in this embodiment an opening can be forced between the leaf and the jamb such that people with malicious intent can sabotage the lock.

[0012] A disadvantage of locks whereby the bolt is blocked in the keep is that, when after the passage of time the leaf sags from the hinges due to wear and tear, the operation of the lock is hampered because the bolt is no longer aligned with respect to the lock.

[0013] The purpose of the present invention is to provide a solution to at least one of the aforementioned and other disadvantages.

[0014] The subject of the present invention is a strike plate provided with a keep in the form of an opening for receiving a bolt of a lock, whereby the strike plate is provided with two locking pins that are axially movable in the housing between a locked position, whereby the locking pins at least partly extend into the keep in order to be held in cutaways of the bolt provided to this end in order to block the bolt in the strike plate, and an unlocked position whereby these locking pins are at least partly retracted from the keep, from the aforementioned locked position, in order to release the locking pins from these aforementioned cutaways of the bolt in order to be able to withdraw the bolt from the keep.

[0015] An advantage is that when a lock with such a strike plate and a lock case in which the bolt is provided is built into a door, whereby the strike plate is fitted in the leaf and the lock case in the frame, the leaf and the frame cannot be pushed apart because the bolt is locked in the strike plate by means of two locking pins, whereby sabotage of the lock is as good as impossible because the locked bolt prevents the leaf and the frame from being pulled away from one another in order to force an opening between the two.

[0016] As a result a strike plate according to the invention is suitable for use as a strike plate of a security lock against break-in or breakout, for example for use in prisons.

[0017] According to a preferred embodiment the locking pins are movable in a direction perpendicular to the direction of movement of the bolt when it is moved in and out of the keep.

[0018] And advantage is that, due to the perpendicular movement of the locking pins, the security is maximised as in the event of an attempt to break it open, the forces occur in the direction of movement of the bolt and the locking pins provide maximum resistance to the aforementioned forces.

[0019] According to a preferred characteristic of the invention, the locking pins are in line with one another on either side of the bolt, whereby the locking pins are preferably mechanically connected together by means of a reversal mechanism in such a way that when one of the two locking pins is moved in an axial direction by the operating mechanism, the other locking pin is also moved in an axial direction but in the opposite sense.

[0020] This has the advantage that the locking pins can be operated at the same time.

[0021] In the most preferred embodiment, the strike plate is provided with a an additional equalising bar that can mate with the reversal mechanism so that the locking pins together are movable in the same direction in their axial direction X-X'.

[0022] This equalising bar has the advantage that when the leaf of the door sags after the passage of time, for example due to the wear of the door hinges, the resulting height difference between the bolt and the strike plate can be accommodated without the security or break-in prevention being degraded.

[0023] The invention also concerns a lock formed by a strike plate according to the invention and a bolt that mates with it and at least a part of which can be received in the keep of the strike plate, and which is provided with cutaways for locking the bolt in the strike plate by means of the locking pins when they are in their locked position and are hereby held in the aforementioned cutaways.

[0024] With the intention of better showing the charac-

teristics of the invention, a few preferred embodiments of a strike plate and a lock according to the invention are described hereinafter by way of an example, without any limiting nature, with reference to the accompanying drawings, wherein:

Figure 1 schematically shows an exploded view in perspective of a strike plate according to the invention with an accompanying lock case;
figure 2 schematically shows a cross-section of a strike plate according to the invention in a closed and locked position, with an accompanying lock case with extended bolt;
figure 3 schematically shows a cross-section of the strike plate in an unlocked position with the lock case with retracted bolt;
figure 4 schematically shows the lock of figure 2, whereby the bolt and strike plate can be moved vertically with respect one another.

[0025] The lock 1 shown in figures 1, 2 and 3 essentially consists of a lock case 2 that is intended to be built into the leaf of a door or window and a strike plate 3 that is intended to be built into the frame of the door or window, more specifically in an upright jamb.

[0026] However it is also possible for the lock case 2 to be built into the frame of the door or window and the strike plate 3 in the leaf of the door or window. Moreover, the building into the frame can also be done in a horizontal beam instead of in an upright jamb. This is useful for example when the lock 1 is used in a sliding door or similar.

[0027] The lock case 2 is provided with a sliding bolt 4 that is movable in the sliding direction Y-Y' between a retracted position, whereby the bolt 4 is retracted into the lock case, as shown in figure 3, corresponding to a situation in which the lock is open, and an extended position whereby the bolt 4 extends out of the lock case, at least by a certain length L, corresponding to a closed lock whereby the bolt 4 extends into the keep 11, as shown in figure 2. The sliding bolt 4 fits into the keep 11 with a certain lateral clearance 11.

[0028] Two cutaways 5 are provided in the sliding bolt 4 on two opposite sides, in particular on the top and bottom of the bolt 4 when the lock 1 is mounted vertically.

[0029] Furthermore, the lock case 2 can also be provided with a handle 6 for operating the sliding bolt 4 via a transmission 7 in the lock case 2.

[0030] In the lock case 2 there is also a locking pin 8 whereby this can be affixed in the cutaway 5 of the sliding bolt 4 to lock the sliding bolt 4 in the retracted position as shown in figure 3.

[0031] The locking pin 8 can be operated mechanically, in this case using a key and cylinder lock 9.

[0032] However, it is not excluded that the locking pin 8 in the lock case 2 can be operated electrically.

[0033] The strike plate 3 is provided with a housing 10a with two side plates 10b. An opening is provided in the housing, i.e. a keep 11 in which the sliding bolt 4 fits.

[0034] Furthermore, two movable locking pins 12 are also provided, i.e. a first locking pin 12a and a second locking pin 12b, which are in line with one another on either side of the keep 11, and which are held movably in the holes 13 of the housing 10a along a direction X-X' perpendicular to the sliding direction Y-Y'.

[0035] The locking pins 12a, 12b can be moved between a position in which they are retracted into the housing 10a, as shown in figure 3, and an extended position in which they are held in the cutaways 5 when the sliding bolt 4 is in the locked position in the keep 11.

[0036] The locking pins 12a, 12b fit in the cutaways 5 of the sliding bolt 4 with a certain clearance in the sliding direction Y-Y' of the sliding bolt 4, for example by the cutaways 5 being oval shaped.

[0037] The locking pins 12a, 12b are mechanically connected together by means of a reversal mechanism 14 that is formed by a connecting rod 15 that follows the movements of the first locking pin 12a, and which is connected by one end 16 to an end 17a of a rocker arm 18 that can be pivoted around a fixed pivot point 19 of the strike plate 3, and which is connected in a hinged way by the other end 17b to the second locking pin 12.

[0038] The connecting rod 15 is connected to the first locking pin 12a by means of an equalising bar 20 that is connected by one end 21a to the first locking pin 12a, and the other end 21b is connected to the connecting rod 15, and which is hinged around a central hinge point 22 that is connected to an operating rod 23 to simultaneously push in and retract the locking pins 12a, 12b.

[0039] The operating rod 23 consists of a fork 24 that is connected to the central hinge point 22 and the plunger 25 of an electromagnet 26, whereby the fork 24 is connected to the plunger 25 and the plunger 25 is held movably in the electromagnet 26. The operating rod 23 can be moved in a direction parallel to the axial direction X-X' of the locking pins 12a, 12b.

[0040] Furthermore, a spring 27 is also provided in the strike plate 3 that is stretched around the operating rod 23 between the equalising bar 20 and the housing, in this case the housing of the electromagnet 26.

[0041] Furthermore, in this case the strike plate 3 is, but not necessarily, also provided with a cylinder 28 that can be operated with a key and which can operate a sliding piece 29.

[0042] The sliding piece 29 is movable in a direction parallel to the aforementioned axial direction X-X' and is connected to the operating rod 23, more specifically to the plunger 25.

[0043] Finally, an electronic connector 30 is provided in the strike plate 3.

[0044] The operation of the lock 1 as shown in figures 1 to 3 is very simple and as follows.

[0045] Figure 2 shows the lock in the closed situation whereby the sliding bolt 4 is inserted in the keep 11 of the strike plate 3 and this sliding bolt 4 is locked against retraction in the strike plate 3 by means of the two locking

pins 12a, 12b that are held in the cutaways 5 under the influence of the force of the spring 27 that pushes the equalising bar 20 away from the electromagnet 26, and as a result pushes the locking pin 12a and the connecting rod 15 downwards together, such that the rocker arm 18 pivots around the fixed pivot point 19 and hereby pushes the second locking pin 12 upwards.

[0046] The advantage of the spring 27 is that the locking of the lock 1, in other words the locking of the bolt 4 in the strike plate 3, is done mechanically such that no electric power is needed to lock the lock 1.

[0047] This has the advantage that in the event of a power failure, the strike plate 3 will always remain locked under the influence of the elasticity of the spring 27, which of course is desired in applications in prison doors for example.

[0048] Thanks to the clearance in the cutaways 5, inaccuracies of the installation in a door or window can be easily accommodated.

[0049] Going from this closed situation, the lock can be opened, by means of an operating mechanism that operates the first locking pin 12a. In this case by pulling the operating rod 23 upwards against the force of the spring 27, and this either due to the operation of the cylinder 28 and the sliding piece 29, or by the electrical operation of the electromagnet 26 in this case.

[0050] When the lock is unlocked by means of the electromagnet 26, the electronic connector 30 provides the necessary power to energise the electromagnet 26.

[0051] However, it is also possible for the power to be supplied directly to the electromagnet from the outside.

[0052] By pulling the operating rod 23 upwards, the equalising bar 20 is taken with it and as a result also pulls the locking pin 12a and the connecting rod 15 upwards, whereby this connecting rod 15 in turn makes the rocker arm 18 pivot and pulls the locking pin 12b in the reverse direction downwards.

[0053] The travel distance of the operating rod 23 is such that during this movement, both locking pins 12a, 12b are retracted from their cutaways 5.

[0054] The lock can now be opened by the operation of the handle 6 and the transmission 7 in this case, in order to withdraw the sliding bolt 4 from the keep.

[0055] Thanks to the aforementioned height clearance between the bolt 4 and the keep 11, the bolt 4 will not knock when the leaf sags due to the wear of the hinges that can occur after the passage of time. This situation is shown in figure 4.

[0056] The construction with the reversal mechanism 14 also allows the locking pins 12a, 12b to have a certain freedom of movement that enables these locking pins 12a, 12b to accommodate this relative movement due to wear, and in other words the locking pins 12a, 12b in the locked situation will always be in contact with the base 31 of the cutaways 5 and thus grip in the cutaways to a maximum.

[0057] The mechanism behind it is shown by a comparison of the situation of figure 2 and the situation of figure 4 for a door that presents a certain height difference between the strike plate 3 and the lock case 2, which ensures that the sliding bolt 4 is shifted upwards in the keep 11, and as a result the locking pin 12a, which is in contact with the base 31 of the top cutaway 5, is pushed upwards.

[0058] As a result the equalising bar 20 pivots around the central hinge point 22, which in view of the pressure exerted by the spring 27, is a fixed point.

[0059] Due to this pivoting, the connecting rod 15 is pushed downwards and the locking pin 12b is pushed upwards by the movement of the rocker arm 18 to against the base 31 of the bottom cutaway 5.

[0060] Thus both locking pins 12a, 12b grip to a maximum in both cutaways 5, such that the security against sabotage is maximised.

[0061] It is clear that the strike plate 3 consequently automatically adjusts to any play in the hinges of the door or other phenomena that mean that a height difference between the lock case and 2 the strike plate 3 prevails.

[0062] When the bolt 4 is located at the bottom of the keep 11 to a maximum, an analogous principle will ensure that both locking pins 12a, 12b are pushed to the base 31 of the respective cutaways 5 in the sliding bolt 4.

[0063] In this case the second locking pin 12b cannot be extended as far as in the situation in which the bolt 4 is central in the keep 11, such that the connecting rod 15 will not move as far downwards under the influence of the rocker arm 18.

[0064] As a result the end 21b of the equalising bar 20 will be higher.

[0065] However, under the influence of the elasticity the central hinge point 22 of the equalising bar 20 will always be pushed downwards, such that the equalising bar 20 will pivot and the end 21a will be pushed further downwards.

[0066] In this way, the first locking pin 12a will be pushed further downwards 31 until it touches the base 31 of the cutaway 5 of the sliding bolt 4.

[0067] It is clear that the locking pins 12a, 12b in the strike plate 3 can also be operated just with the use of the cylinder 28 in the strike plate 3 in order to obtain a fully mechanical lock.

[0068] It is clear that the bolt 4 for this mechanism can be a sliding bolt or a swivel bolt.

[0069] It is also possible for the electronic connector 30 to be provided with detectors that register the state of the door, the state of the bolt 4 and the state of the locking pins 12a, 12b such that this information can be entirely or partially passed on to the outside world in the form of electrical signals by means of a connection provided on the connector.

[0070] Furthermore, it is also possible to provide the electronic connector 30 with a microprocessor loaded with a program specially developed for this purpose, so that the strike plate 3, on the basis of the information from the aforementioned detectors in combination with an external operating signal, can decide when the extended

sliding bolt 4 must be locked or unlocked by both locking pins 12a, 12b.

[0071] It is clear that the reversal mechanism 14 can be realised in different ways, for example by each locking pin 12a, 12b being provided with its own electromagnet 26 that operates in the reverse direction upon activation.

[0072] Depending on the intended purpose of the strike plate 3, it could be that the locking of the locking pins 12a, 12b is activated by energising the electromagnet 26 and that the locking pins 12a, 12b are retracted under the influence of a tension spring, or by a dual-action electromagnet 26, by a bistable electromagnet, an electric motor, a linear conductor, a voice coil, compressed air or hydraulic cylinder or any other drive.

[0073] The present invention is by no means limited to the embodiments described as an example and shown in the drawings, but a strike plate according to the invention and a lock according to the invention can be realised in all kinds of forms and dimensions, without departing from the scope of the invention.

Claims

1. Strike plate with a housing (10a) provided with a keep (11) in the form of an opening for receiving a bolt (4) of a lock (1), **characterised in that** the strike plate (3) is provided with two locking pins (12) that are axially movable in the housing (10a) between a locked position, whereby the locking pins (12) at least partly extend into the keep (11) in order to be held in cutaways (5) of the bolt (4) provided to this end in order to block the bolt (4) in the strike plate (3), and an unlocked position whereby these locking pins (12) are at least partly retracted from the keep (11), from the aforementioned locked position, in order to release the locking pins (12) from the cutaways (5) of the bolt (4) in order to be able to withdraw the bolt (4) from the keep (11).

2. Strike plate according to claim 1, **characterised in that** the two locking pins (12) are movable in a direction perpendicular to a direction of movement of the bolt (4) when it is moved in and out of the keep (11).

3. Strike plate according to claim 1 or 2, **characterised in that** the strike plate (3) is provided with an operating mechanism for operating the locking pins (12).

4. Strike plate according to claim 3, **characterised in that** the operating mechanism is spring loaded by means of a spring (27) that pushes the locking pins (12) in the direction of the keep (11) in the aforementioned locked position.

5. Strike plate according to claim 3 or 4 **characterised in that** to retract the locking pins (12) into the aforementioned unlocked position, the operating mechanism is provided with an electrical drive.

6. Strike plate according to claim 5, **characterised in that** the drive is formed by an electromagnet (26) that is provided with an operating rod (23) that is movable in a direction parallel to the axial direction X-X' of one of the locking pins (12).

7. Strike plate according to any one of the previous claims, **characterised in that** the locking pins (12) are in line with one another on either side of the keep (11).

8. Strike plate according to claim 3 and 7, **characterised in that** the locking pins (12) are mechanically connected together by means of a reversal mechanism (14) in such a way that, when one of the two locking pins (12a) is moved by the operating mechanism in an axial direction, the other locking pin (12b) is also moved in an axial direction, but in the opposite direction.

9. Strike plate according to claim 8, **characterised in that** the reversal mechanism (14) is formed by a connecting rod (15) that follows the movements of one locking pin (12a), and which is connected by one end (16) to an end (17a) of a rocker arm (18) that can pivot around a fixed pivot point (19) of the strike plate (3), and which is connected in a hinged way by the other end (17b) to the other locking pin (12b).

10. Strike plate according to claim 9, **characterised in that** it is provided with an additional equalising bar (20) that can mate with the reversal mechanism (14) so that the locking pins (12) can move together in the same direction in their axial direction X-X'.

11. Strike plate according to claim 10, **characterised in that** the equalising bar (20) is connected in a hinged way by one end (21a) to one of the two locking pins (12a), and is connected in a hinged way by the other end (21b) to the connecting rod (15,) which itself is connected to the other locking pin (12b), whereby the equalising bar (20) is hinged around a central hinge point (22) that is connected to the aforementioned operating rod (23) in order to simultaneously insert and retract the locking pins (12).

12. Strike plate according to any one of the previous claims, **characterised in that** an electronic connector (30) is built **in that** provides the electromagnet (26) with power.

13. Strike plate according to claim 12, **characterised in that** the electronic connector (30) is provided with detectors to register the state of the bolt (4) and/or the state of the locking pins (12a, 12b), and to pass

on this information or a part of it to the outside world by means of a connection.

14. Strike plate according to claim 13, **characterised in that** the electronic connector (30) is provided with a microprocessor loaded with a program specially developed for this purpose so that the strike plate (3), based on the information from the aforementioned detectors in combination with an external operating signal, can decide when a bolt (4) in the keep (11) must be locked or unlocked by the locking pins (12a, 12b).

15. Lock formed by a strike plate (3) according to any one of the previous claims and a bolt (4) that mates with it and at least a part of which can be received in the keep (11) of the strike plate (3), and which is provided with cutaways (5) for locking the bolt (4) in the strike plate (3) by means of the locking pins (12) when they are in their locked position and are hereby held in the aforementioned cutaways (5).

16. Lock according to claim 15, **characterised in that** the locking pins (12) are held in their locked position in the cutaways (5) with a certain clearance in the direction of movement of the bolt (4).

17. Lock according to claim 14 or 15, **characterised in that** the keep (11) is dimensioned such that there is a clearance in the axial direction of the locking pins between the bolt (4) and the keep (11).

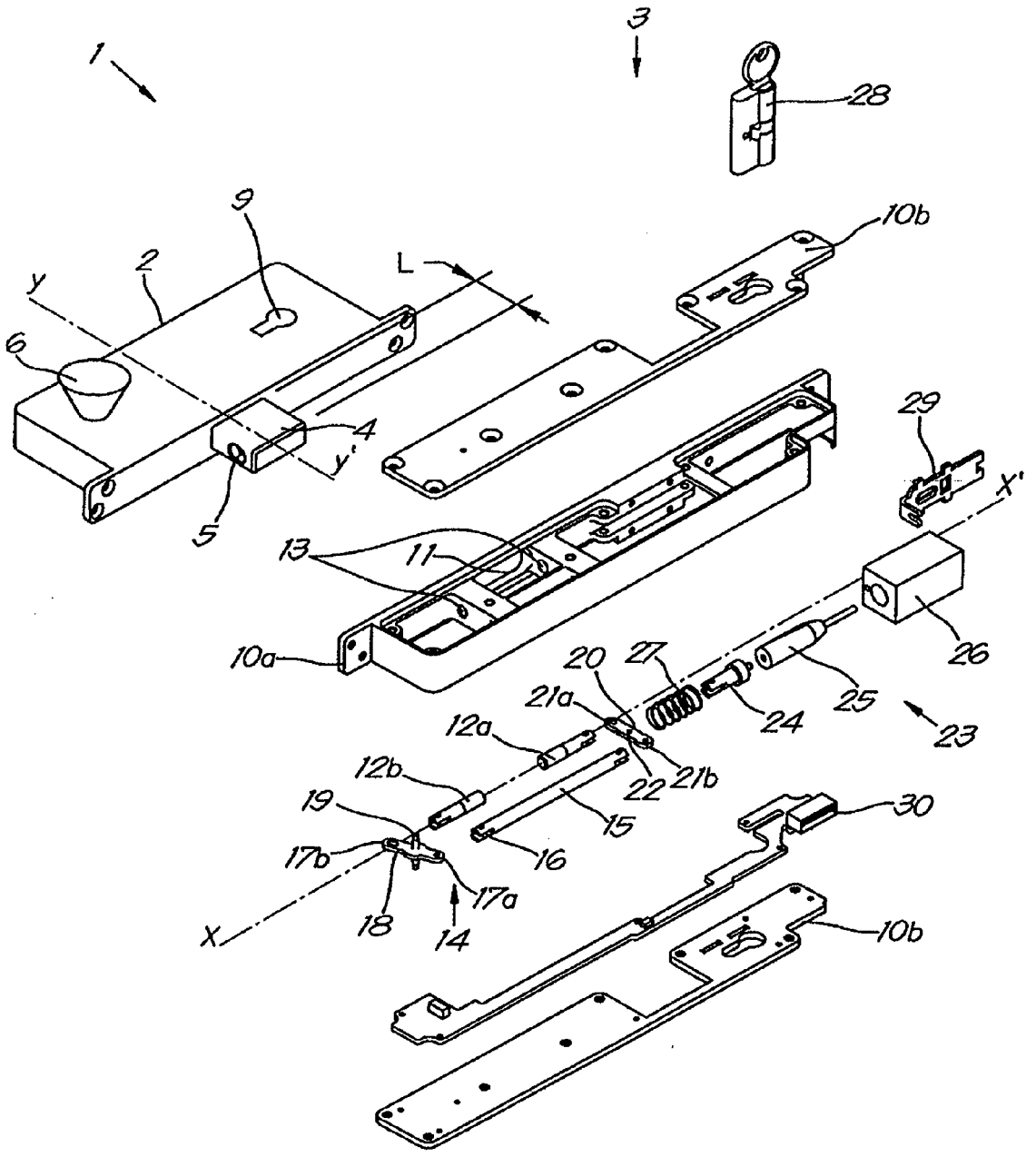
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Fig. 1

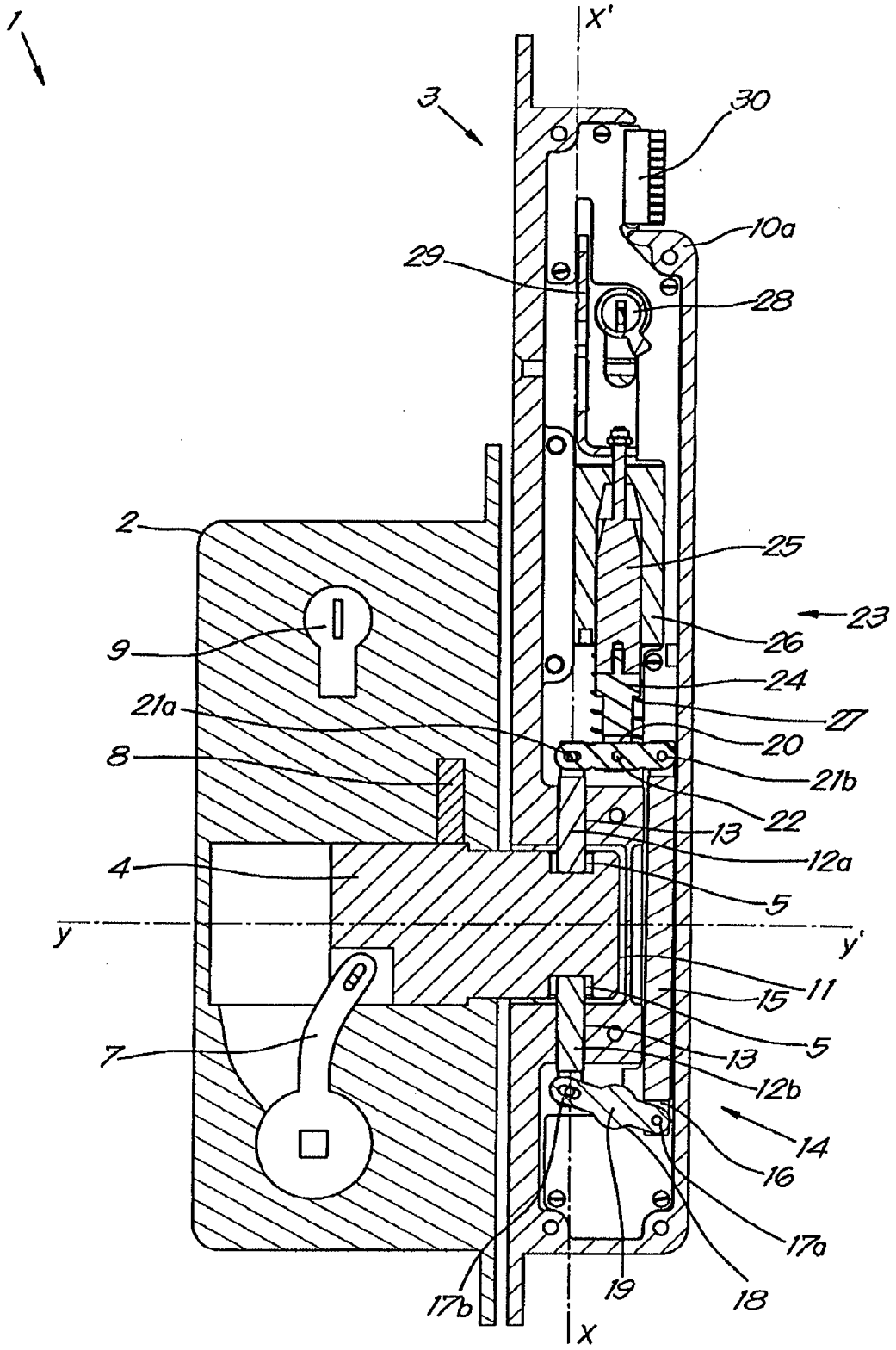
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Fig.2

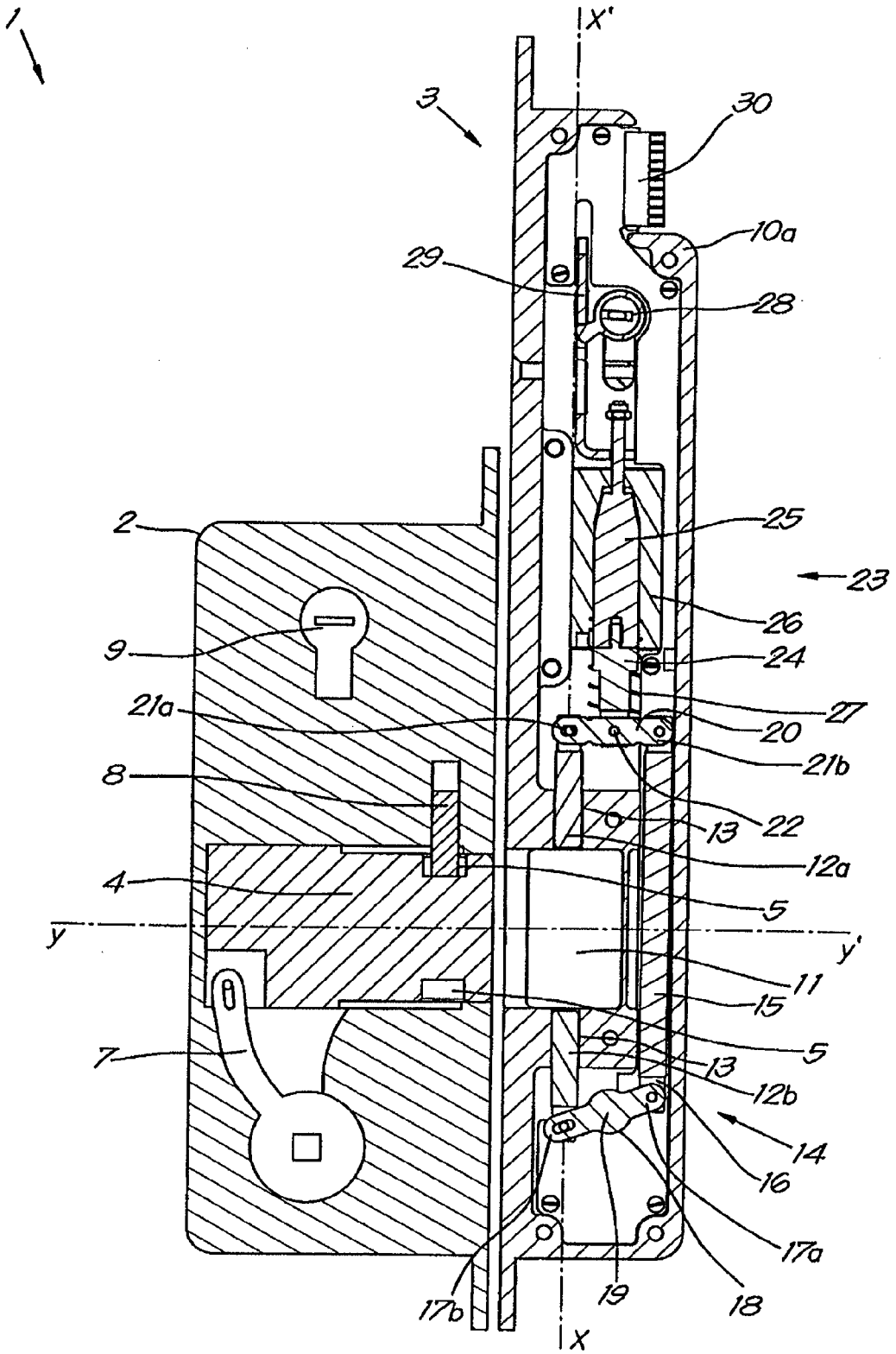
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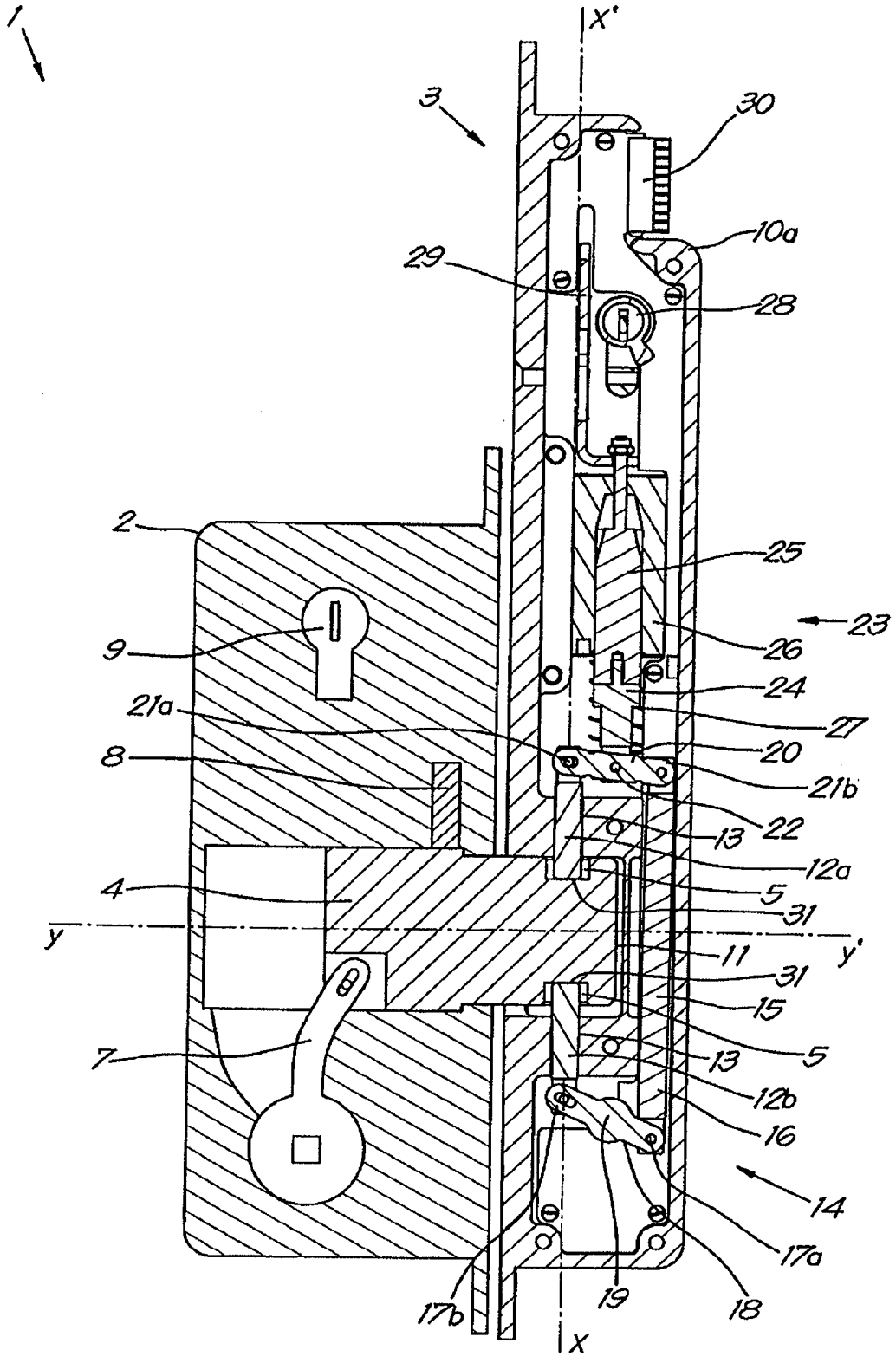
Fig.3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17a
17b
19
18
X

Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 00 0917

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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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			TECHNICAL FIELDS SEARCHED (IPC) E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 April 2014	Geerts, Arnold

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 00 0917

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