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(11) **EP 1 531 218 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.05.2005 Bulletin 2005/20

(51) Int Cl.7: **E05B 65/10, E06B 5/16**

(21) Application number: **04078091.8**

(22) Date of filing: **10.11.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK YU

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(30) Priority: **14.11.2003 NL 1024788**

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(54) **Device for locking a door, and a door and a door assembly**

(57) A device for locking a door, provided with:

- at least one first latch (2) for locking the door during normal use;
- operating means (4) for operating said first latch (2);
- at least one second latch (3) which can be activated under the influence of fire detecting means (5; 105) for locking the door (1);

wherein after activation, said second latch (3) can also be operated by the operating means (4) of said first latch (2) for unlocking the door (1).

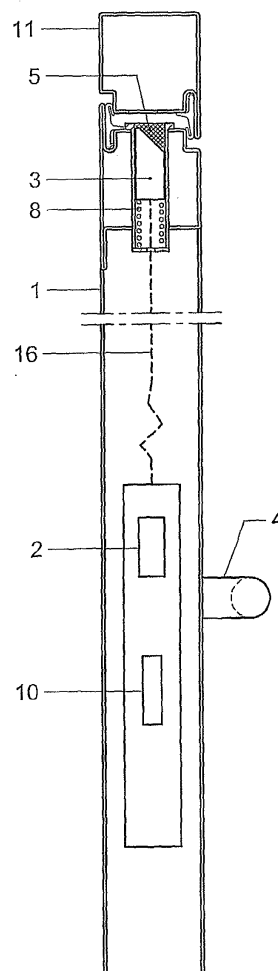


Fig. 2

Description

[0001] The invention relates to a device for locking a door, provided with:

- at least one first latch for locking the door during normal use;
- operating means for operating this first latch.

[0002] Such a device is known from practice and comprises a multipoint door-locking device. Such a locking device is provided with at least two latches for securing the door to surroundings, for instance a post, at least with the door in closed position. During normal use of the door, the latches of the known device are operable by means of the operating means mentioned, in particular for the purpose of locking and unlocking the door.

[0003] An advantage of the known device is that with it, during for instance a fire, the door can be secured to surroundings relatively robustly. Moreover, due to the known locking device, the door can be locked so as to be relatively burglary proof.

[0004] A disadvantage of the known device is that operating the latches is relatively difficult. The latches of the known device have, for instance, a relatively great closing resistance, rendering locking awkward and requiring relatively much force and/or energy. This closing resistance renders the subsequent unlocking of the door relatively awkward too. As both locking and unlocking can be difficult, the device is dangerous when the door is to be operated in an emergency situation, for instance a fire. Further, the known device is relatively susceptible to malfunction, in particular when the device comprises an electric three point lock. Therefore, the known device requires relatively much maintenance to ensure good functioning. Moreover, the operating means need to be of relatively heavy design in order to operate the latches well, rendering the known device relatively expensive.

[0005] The present invention contemplates an improvement of a device for locking a door. In particular, the invention contemplates a device for locking a door in an easy, more in particular safe, manner.

[0006] To this end, the device according to the present invention is characterized by the features of claim 1.

[0007] According to the invention, the device is characterized by:

- at least one second latch which can be activated under the influence of fire detecting means for locking the door;

while, after activation, this second latch can also be operated by the operating means of the first latch for unlocking the door.

[0008] During normal use, the door can be locked in a simple manner by means of the first latch. The first latch can be operated via the operating means, in particular for moving the latch between a door-releasing position and a door-locking position. Here, operating the operating means does not lead to the operation of the at least second latch, which can be activated under the influence of fire detecting means, so that the operating means can be operated with for instance relatively little force and/or energy. In this manner, the operating means can be of relatively simple and/or light design. Preferably, only one first latch is provided, which renders the operating means particularly easy to operate during normal use. By using only one first latch, the door can be opened and closed relatively rapidly during normal use. Moreover, the locking device provided with only one first latch is relatively unsuceptible to malfunction and is maintenance friendly.

[0009] When a fire is detected, at least by the fire detecting means mentioned, the second latch is activated, in order that the door is locked by this second latch. Preferably, the door is then locked both by the first latch and by the second latch mentioned, so that the latches secure the door to surroundings relatively robustly and/or in a form-retaining manner. As a result, undesired bending of the door can be prevented, which renders the door particularly fire resistive.

[0010] After locking, effected through the fire detecting means, the door can moreover be unlocked again by means of the operating means, in particular in that the second latch is then also operable via the operating means. In this manner, the safety of the door is extra well ensured. This allows for instance the door, automatically locked in case of a fire, to be unlocked and opened for liberating victims from a space closed off by the door.

[0011] As the operating means of the first latch can also be used for operating the second latch, at least after the second latch has been activated, the device can be designed with relatively few parts. Moreover, in case of fire, it is directly clear how the automatically locked door is to be unlocked, i.e. by means of the operating means with which the locking of the door is also to be effected during normal use. In this manner, the door, automatically locked in case of fire, can be easily and rapidly opened by anxious bystanders, thus avoiding confusion about unlocking the door.

[0012] The invention further provides a door which is characterized by the features of claim 15, which offers the above-mentioned advantages.

[0013] The invention further provides an assembly, at least provided with:

- at least one door;
- at least one first latch for locking the door during normal use;
- operating means for operating the first latch;
- at least one second latch that can be activated under the influence of fire detecting means for locking the door;

wherein the second latch and the operating means can be coupled to each other for unlocking the door, at least

after the second latch has been activated.

[0014] Such an assembly can be advantageously used for, for instance, closing off a passage, for instance an opening of a post. During normal use, the door can then be locked and unlocked normally by operating the operating means. In case of fire, the door can be secured robustly for closing off the passage in a fire resistant manner. In that case, unlocking the door is still possible, via the same operating means which are used for operating the door during normal use. The assembly can for instance be supplied in separate parts and/or in partly assembled condition.

[0015] Further elaborations of the invention are described in the subclaims. The invention will presently be clarified with reference to an exemplary embodiment and the drawing. In the drawing:

Fig. 1 shows a schematic front view of an exemplary embodiment of the invention;

Fig. 2 shows a cross-sectional view along the line II-II of the exemplary embodiment represented in Fig. 1, while the top latch is in a releasing position; Fig. 3 shows a detail Q of the front view represented in Fig. 1, in a partly cutaway manner, with the top latch in the position as represented in Fig. 2;

Fig. 4 shows a similar view as Fig. 2, while the top latch is moved to a locking position under the influence of fire detecting means;

Fig. 5 shows a similar detail Q as Fig. 3, with the top latch in a position as represented in Fig. 4;

Fig. 6 shows a similar view as Fig. 4, while the top latch has been moved back under the influence of operating means of a first latch, to a releasing position and;

Fig. 7 shows a similar detail Q as Fig. 5, with the top latch in a position as represented in Fig. 6.

[0016] Fig. 1 shows a door 1 arranged in a post opening of a post 11. The door 1 is provided with a locking device for securing the door to the post 11. The present locking device comprises:

- a first latch 2 for securing the door 1 during normal use;
- an operating handle 4 for operating the first latch 2;
- two second latches 3, 3', which can only be activated for locking the door under the influence of fire detecting means 5, 105. After having been activated, the second latches 3, 3' can be operated by the operating handle 4 of the first latch 2 for unlocking the door 1. The first latch 2 can substantially not be activated under the influence of the fire detecting means 5, 105. The term "during normal use" is at least understood to include use when the fire detecting means do not detect a fire.

[0017] As shown in Fig. 1, after assembly, the first latch 2 and the second latches 3, 3' are arranged at a

distance from each other, viewed in vertical direction. In particular, the first latch 2 is located approximately adjacent the middle of the door 1. The operating handle 4 is also located approximately at half the height of the door, at a position that is easy to reach for a user. The second latches comprise a top latch 3, arranged at or adjacent a top side of the door 1, and a bottom latch 3' arranged adjacent a lower side B of the door 1. In the present exemplary embodiment, the latches 2, 3, 3' are each provided in the door 1. Alternatively, one or more latches can for instance be provided in or on the post 11 for securing the door 1.

[0018] Figs. 2 and 3 show the exemplary embodiment in more detail. In Fig. 2, the bottom latch 3' is not visible. The operating handle 4 is coupled to the door 1 so as to be pivotal about a pivot 12. The handle 4 is coupled to the first latch 2 by means of a coupling mechanism (not represented) for operating this latch 2. By pivoting the operating handle 4, the first latch 2 can be brought from a door-locking position shown in Figs. 2 - 5 to a door-releasing position shown in Figs. 6 and 7. Preferably, the door is provided with, for instance, spring means or the like for moving the operating handle 4 and the latch 2 to the initial position shown in Figs. 2 - 5. For the sake of clarity, such spring means have not been represented in the drawing.

[0019] The present exemplary embodiment is further provided with a lock 9 with a dead bolt 10 for locking the door additionally, for instance independently of the operating handle 4. Such a lock is known from practice and can be designed in different manners, for instance as a mechanical lock, a cylinder lock, electric lock and/or the like.

[0020] In Figs. 2 and 3, the top latch 3 is in a door-releasing position. The fire detecting means are provided with a connection 5 disconnectable under the influence of fire, for keeping the top latch 3 in the door-releasing position. In particular, the top latch 3 is coupled to the door 1 by a connection 5 disconnectable under the influence of fire. In the exemplary embodiment, the disconnectable connection comprises a material 5 that at least melts at a particular threshold value of an ambient temperature. Further, the top latch 3 is provided with spring means 8 for bringing the latch 3 automatically to a locking position extending partly outside the door 1, represented in Figs. 4 and 5, at least after melting of the fire detecting means 5. In this locking position, the door 1 is secured to the post 11 by the top latch 3.

[0021] As shown in Figs. 2 - 7, the part of the top latch 3 which, in the locking position, extends outside the door 1 is provided with a bevel, so that the door 1 can be moved with the top latch 3 along the post 11 when the door 1 is brought from an opened position of the door (not represented) to the closed position represented in Fig. 3, in order that the top latch 3 can then secure the door 1 to the post 11.

[0022] Preferably, the bottom latch 3', not visible in Figs. 2 - 7, is designed in substantially the same manner

as the top latch 3. The bottom latch 3' can for instance also be secured in a door-releasing position by means of fusible material 5. In addition, the bottom latch 3' can for instance be coupled to the top latch 3 such that an, automatic movement of the top latch 3 leads to an automatic movement of the bottom latch 3'.

[0023] In the present exemplary embodiment, the fire detecting means are arranged adjacent one or each second latch 3, 3' for the purpose of activating the latch (es) 3, 3'. Alternatively, the fire detecting means can for instance be arranged in the door post 11, adjacent the door 1 and/or the door post 11, or at a distance therefrom. The fire detecting means can for instance comprise a fire detector 105 provided on a ceiling P located nearby, which is represented in Fig. 1. Further, the fire detecting means 105 can for instance form part of a central fire alarm system or the like. The fire detecting means 105 can then for instance be designed for activating one or more second latches 3, 3' via a remote control (not represented). Preferably, the fire detecting means 5, 105 are designed for detecting fire at or adjacent the top side T of the door 1, in order that, in case of a fire, the door can be automatically locked, rapidly and safely.

[0024] The top latch 3 of the present exemplary embodiment is coupled, for instance directly or indirectly, to the operating handle 4 by means of a coupling means 16. The coupling means 16 is designed for giving the operating handle 4 sufficient freedom of movement for operating the first latch 2 when the top latch 3 is still in the releasing position, which is clearly represented in Figs. 2 and 3. The coupling means 16 can for instance comprise a flexible cord, wire, chain or such flexible element, which flexible element 16 has not yet been tensioned when the top latch 3 is in the releasing position represented in Figs. 2 and 3. Naturally, the top latch 3 can also be coupled to the operating handle 4 in different manners.

[0025] When the fusible material 5 has melted, for instance under the influence of fire, the top latch 3 is moved by the spring means 8 to the locking position represented in Figs. 4 and 5. As a result, the coupling means 16 is tensioned such that the top latch 3 can then be operated by means of the operating handle 4. As shown in Figs. 4 and 5, the pivotal movement of the operating handle 4 indicated with arrow X then leads to a movement of the coupling means 16 indicated with arrow Y so that the top latch 3 is pulled to the releasing position represented in Figs. 6 and 7.

[0026] Preferably, the bottom latch 3' is also coupled to the operating handle 4, for instance in accordance with the coupling of the top latch 3 to the operating handle 4, by means of a flexible coupling element (not shown) or the like. As a result, the bottom latch 3' can also be operated by means of the operating handle 4 after the bottom latch 3 has been moved to a door-locking position under the influence of fire detecting means.

[0027] During normal use of the door 1, the second

latches 3, 3' are each in a door-releasing position. The door 1 can then be locked and unlocked in a normal manner by means of the first latch 2 and the operating handle 4, and by means of the lock 9, 10.

[0028] When the fire detecting means 5, 15 detect a fire, the second latches 3, 3' are activated. The second latches 3, 3' then move, for instance simultaneously or successively, to a locking position for locking the door 1. The door 1 is then secured to the post 11 by the first and second latches 2, 3, 3' at three different closing points, at least with the door in closed position. A further closing point can then be provided by the dead bolt 10, depending on the operating condition of the lock 9. In this manner, the door 1 can be secured to surroundings in a relatively robust and/or in a form-retaining manner. Furthermore, the locking of the door can easily be undone by operating the operating handle 4 and the lock 9, which is shown in Figs. 4 - 7. Here, the first latch 2 on the one side, and the top latch 3 and bottom latch 3' on the other side can simply be pulled back simultaneously to a releasing position by the same operating handle 4 for instance via one or more coupling means 16. A possibly locked lock 9 can then, for instance, be brought to a door-releasing position, for instance manually or automatically. Automatic operation of the lock can for instance take place under the influence of the fire detecting means, a central fire alarm system or the like, for instance when the lock 9 comprises an electric lock or the like.

[0029] It is self-evident that the invention is not limited to the exemplary embodiment described. Various modifications are possible within the framework of the invention as set forth in the following claims.

[0030] For instance, the locking device can be designed and/or intended for locking one or more doors.

[0031] Further, each door 1 can be designed in different manners and comprise, for instance, a horizontal sliding door, vertical sliding door, push door, swinging door, swiveling door, pivot door, saloon door, revolving door, overhead door, prison door or the like. The door can be manufactured from various materials and be built up from, for instance, various elements and/or profiles.

[0032] Each latch 2, 3, 3' can be designed in different manners, have various forms and be made of various materials. Each latch 2, 3, 3' can further be provided in, for instance, the door 1 and/or the post 11.

[0033] The coupling between each second latch 3 and the operating means mentioned of the first latch 2 can be designed in various manners. The coupling means 16 can comprise, for instance, mechanical coupling means, electronic and/or electromagnetic coupling means and the like. The coupling means can comprise, for instance, one or more flexible parts, cords, wires, cables, rods, chains, tires, a sprocket transmission, cam transmission or a combination of these and/or other means.

[0034] The fire detecting means can be designed in different manners, and comprise, for instance, fusible

material, material changing length-wise due to heat, bi-metal, a temperature sensitive memory metal, a temperature sensor, an odour sensor, an infrared sensor, a thermocouple, a smoke detector and/or other means. The detecting means can be designed for activating each second latch 3 at or above a particular value of the ambient temperature, for instance in the range of approximately 50 - 70C°, or at a different temperature so that the door 1 is not automatically locked at, for instance, a normal ambient temperature, for instance at room temperature.

[0035] Further, the fire detecting means can be provided in and/or on the door 1 in various manners. The detecting means can be integrated in, for instance, a second latch of the door 1. In addition, the fire detecting means can for instance be arranged at a distance from each door latch. In that case, the fire detecting means can be coupled to the at least one second latch 3, 3' in various manners, for instance mechanically, electrically, electronically, wirelessly, via communication means and/or the like. These communication means can comprise, for instance, optical, radiographic, electric, digital and/or analogous communication means or the like. The door and/or the post can for instance be provided with one or more top latches 3 arranged at a distance from fire detecting means provided on the door and/or the post.

[0036] In addition, the fire detecting means can for instance be provided in different manners on/or adjacent the door top, for instance on and/or in the door, on and/or in the post 11 or the like. The fire detecting means can for instance be present on or adjacent an outer surface of the door 1, on or adjacent an outer surface of the post 11 or the like so that fire can be detected rapidly.

[0037] The fire detecting means can further be designed for, for instance, detecting a fire continuously, periodically and/or otherwise. Furthermore, the fire detecting means can for instance be designed to form part of a central fire alarm system or the like.

[0038] The movement of each first and/or second latch can further be effected in various manners, for instance under the influence of electric means, an electromagnet, an actuator, an electromotor, spring means, gravity, memory metal, and a combination of these possibilities and/or other options.

[0039] For the purpose of moving each first and/or second latch and/or for the purpose of use of electric means, for instance an electromagnet, an actuator, sensor or the like, the door can furthermore be provided with a voltage source, for instance with one or more batteries and/or accumulators.

[0040] Further, the spring means for bringing a latch 2, 3, 3' to a locking position can be designed in various manners.

[0041] The at least first latch 2 can be designed in different manners and comprise for instance a door lock, a door closer, an electric opener, electric door lock, emergency lock, key card lock and the like. Further, for

instance one or more locks can be provided which can be operated independently of the operating means 4 of the first latch 2 for locking the door 1.

[0042] The operating means 4 of the first latch 2 can also be designed in different manners and comprise, for instance, mechanical operating means, electronic and/or electromagnetic operating means or the like. The operating means can comprise, for instance, one or more door handles, door pushers, operating handles, keys, key cards and/or a combination of these and other operating means. The operating means can be arranged so as to be movable in various manners, in various orientations for instance hingedly, pivotally, translatably and the like. Further, the at least one first latch 2 can for instance be integrally provided with such operating means, for instance as an unlocking bolt fixedly connected to the first latch, or the like.

[0043] The at least first latch 2 and/or the operating means 4 can be arranged at various positions, for instance on or adjacent a user's height, the middle of the door 1 and/or on one or more other positions.

Claims

1. A device for locking a door, provided with:

- at least one first latch (2) for locking the door during normal use;
- operating means (4) for operating said first latch (2);
- at least one second latch (3) which can be activated under the influence of fire detecting means (5; 105) for locking the door (1);

wherein after activation, said second latch (3) can also be operated by the operating means (4) of said first latch (2) for unlocking the door (1).

2. A device according to claim 1, provided with coupling means (16) for coupling the operating means (4) of said first latch (2) to said second latch (3).

3. A device according to claim 2, wherein the coupling means (16) comprise mechanical coupling means.

4. A device according to claim 2 or 3, wherein the coupling means comprise electronic and/or electromagnetic coupling means.

5. A device according to any one of the preceding claims, wherein the operating means (4) comprise mechanical operating means.

6. A device according to any one of the preceding claims, wherein the operating means (4) comprise electronic and/or electromagnetic operating means.

7. A device according to any one of the preceding claims, wherein said fire detecting means (5; 105) are designed for detecting fire at or adjacent a top side (T) of the door (1).
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8. A device according to any one of the preceding claims, wherein the fire detecting means (5) comprise material fusible under the influence of fire.
9. A device according to any one of the preceding claims, wherein the at least first latch (2) and the at least second latch (3) are arranged at a distance from each other, viewed in vertical direction.
10
10. A device according to any one of the preceding claims, wherein - after assembly - the at least first latch is located approximately adjacent the middle of the door (1).
15
11. A device according to any one of the preceding claims, provided with at least two latches (3, 3') arranged at a distance from each other.
20
12. A device according to any one of the preceding claims, wherein said fire detecting means (105) form part of a central fire alarm system.
25
13. A device according to any one of the preceding claims, wherein the operating means are designed for moving said first latch (2) between a door locking position and a door-releasing position.
30
14. A device according to any one of the preceding claims, provided with at least one first latch (2).
35
15. A door, provided with a device according to any one of the preceding claims.
16. An assembly, at least provided with:
40
 - at least one door (1);
 - at least one first latch (2) for locking the door during normal use;
 - operating means (4) for operating said first latch (2);
45
 - at least one second latch (3) which can be activated under the influence of fire detecting means (5; 105) for locking the door;

wherein said second latch (3) and the operating means (4) are coupled to each other for unlocking the door (1), at least after activation of said second latch.
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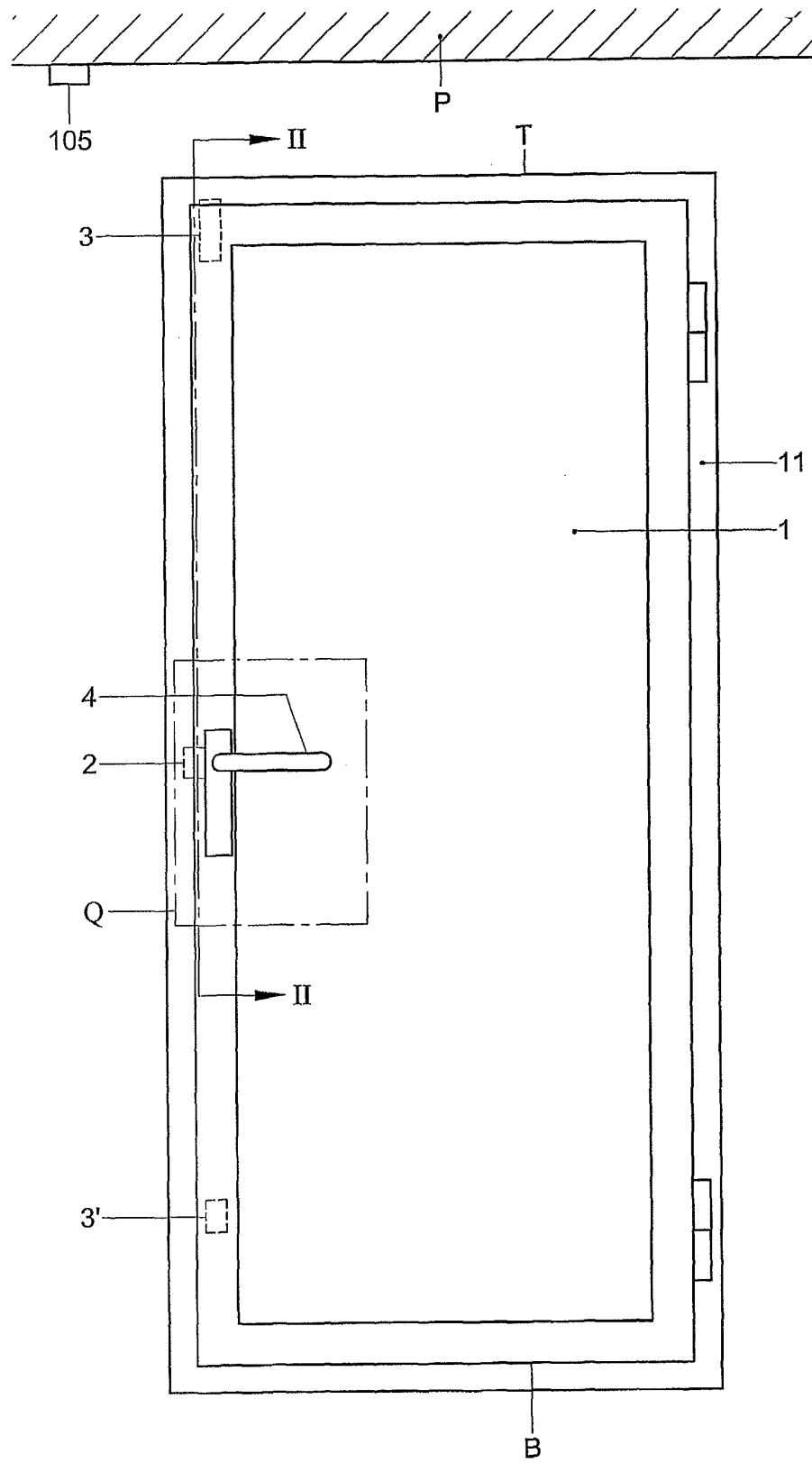


Fig. 1

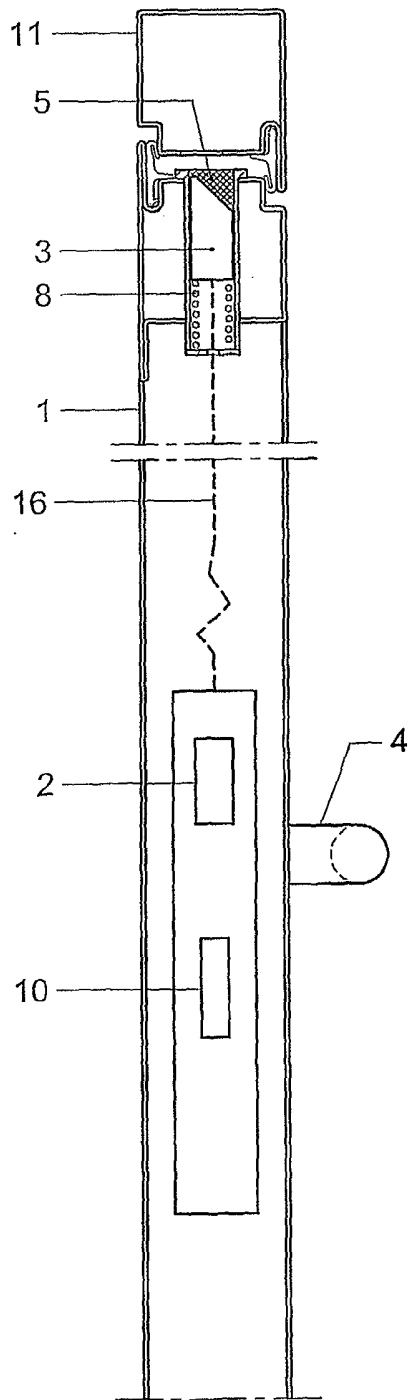


Fig. 2

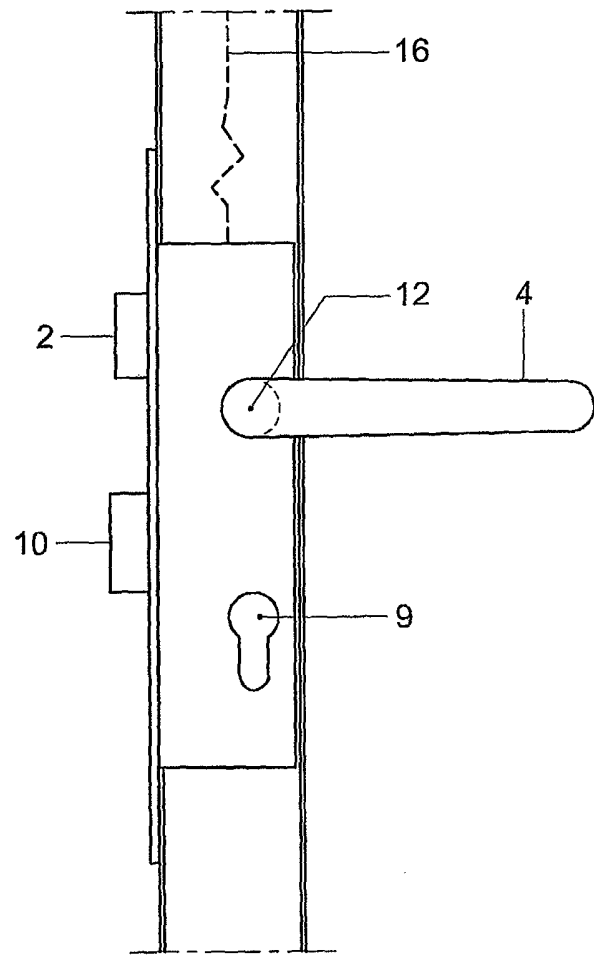


Fig. 3

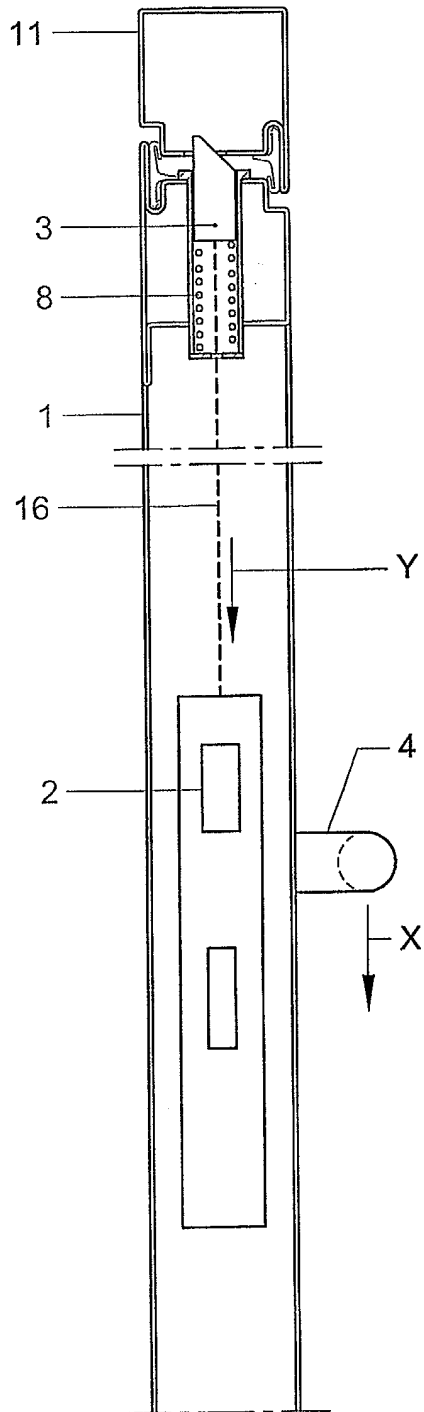


Fig. 4

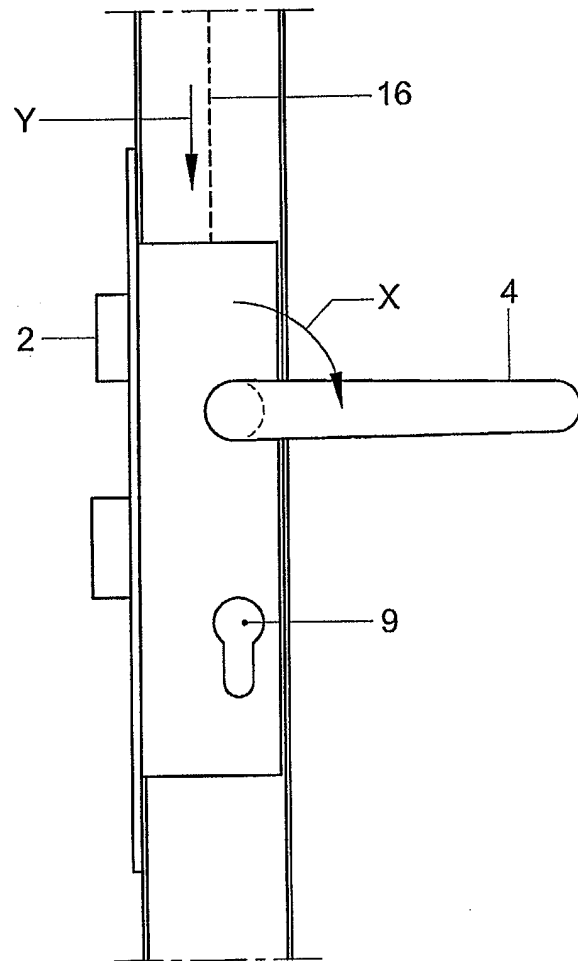


Fig. 5

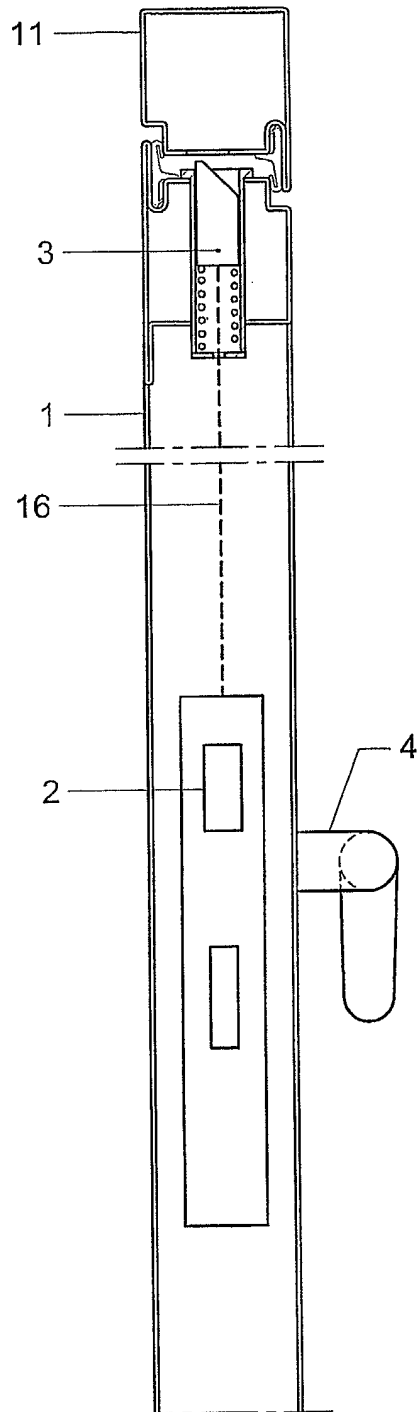


Fig. 6

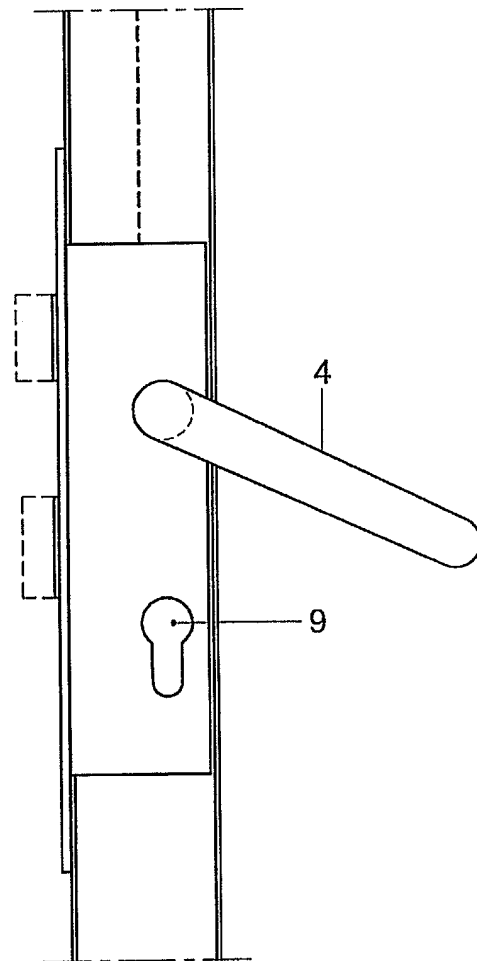


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 8091

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	NL 1 018 457 C (DICTATOR PRODUCTIE B.V.) 8 January 2003 (2003-01-08) * the whole document * -----	1-3,5, 7-11, 13-16	E05B65/10 E06B5/16
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 February 2005	Examiner Westin, K
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 07 8091

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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07-02-2005

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