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(54) Improvement in an antipanic lock system for emergency doors.

(57) An impovement in an antipanic lock system for emergency doors, comprising a principal lock bolt (2a) and one or more secondary lock bolts (3a), all of which are activatable simultaneously by means of a bar-type mechanism in which, between a fixed bar (1a) mounted to a door and a mobile semibar (1b) which receives the activating pressure, a converting mechanism is envisaged to transform the movement of two or more angled levers 6 which tilt about their summits which summits are suspendedly situated between both semibars 1a and 1b and which, at the top of their upper arms (6a) are longitudinally slidably mounted to the said mobile semibar 1b while at the bottom of their lower arms (6b) they are jointed with a tiebar (13) which tiebar (13) produces the opening action on the locking mechanism (2).

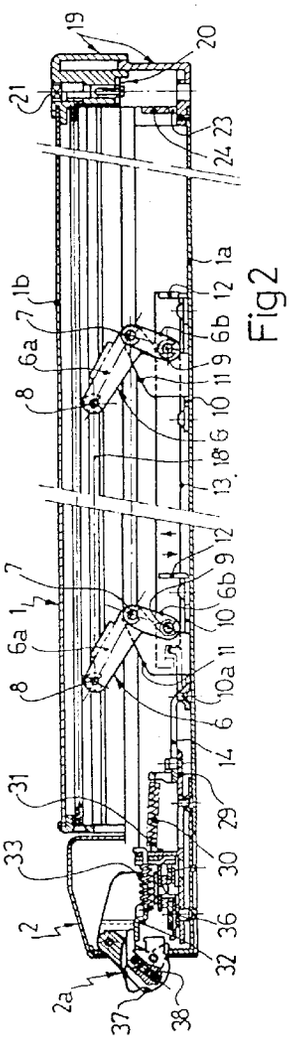

Fig2

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The invention relates to an improvement in an antipanic pushbar system, in particular the type which can be locked on the outside while remaining openable from the inside by simple manual action, without the need for a key. Thus, in an emergency situation, people can exit easily using the door fitted with the antipanic pushbar.

A typical configuration of such systems comprises the installation on one side of the door of a pressure-activated element which, when activated, produces the opening of the bolt of bolts, since frequently more than one of these is used, there often being one principal bolt and a number of secondary bolts. The invention refers to one of these typical configurations.

The prior art embraces systems where the pressure-movable element is a moving barrier, held outwards from the door- front by arms fixed turnably to the door, so that the barrier moves up of down when leaned upon.

In other known systems in the prior art, the pressure-movable element is long, similar to a bar, and comprises a mobile outer semibar installed as a cover exteriorly over the fixed inner semibar and mechanically connected with said fixed semibar in such a way that when pressure is applied perpendicularly to the door, it produces an action on the lock which determines the simultaneaous retraction of the bolts. This concept is aesthetically attractive, modern and less complicated that the previously cited one.

Including the last-cited example, all prior art systems establish the mechanical relationship between the fixed semibars and the mobile semibars by means of an articulated converting device, such as a caliper,which when pressure is applied to the mobile semibar, undergoes deformation and produces the longitudinal displacement of the tie bar which activates the opening of the lock. Such converting devices, or calipers, comprise a first tract which has one end fixed to the mobile semibar and the other mounted articulatedly slidably to the fixed semibar, and a second tract which at one end is articulatedly fixed to the fixed semibar, and at the other end is articulated between the ends of said first tract.

This positioning of the converting device operates in such a way that the displacement of the mobile semibar is not perfectly perpendicular to the door, since it describes a curved trajectory which is due to the horizontal stress generated in longitudinal direction on the bar by the deformation of the caliper of said converting device. It is thus necessity that between the mobile semibar and the box of the lock mechanism there exist a dimensional play which is able to absorb said horizontal stress, since the lock could not otherwise be activated. One of the drawbacks of this dimensional play is that coins and other objects can be inserted into it, thus blocking the functioning of the bar, with possibly tragic consequences in an emergency.

A further drawback of this prior art device is that the existence of horizontal stress can make the pushbar mechanism perform badly when pressure is applied to one end of the bar, instead of in the middle of it; this is not a satisfactory situation.

The present invention relates to a new concept for the converting mechanism for perpendicular pressure and the longitudinal displacement of the tie bar which produces the opening of the lock, wherein the trajectory of the mobile semibar is perfectly perpendicular to the door, avoiding the necessity of longitudinal play which is the cause of the drawbacks inherent in the above-described prior art devices. In particular, the fixed and mobile semibars are mechanically connected by at least one pair of identical tilting mechanisms, each comprising a single lever of rigid angular forme which at its summit is mounted tiltingly about a suspended axis situated between said fixed an mobile semibars and which angled lever is immobilised with respect to the fixed semibar, having a superior arm whose extremity is fixed to the mobile semibar with the possibility only of longitudinal displacement along said mobile semibar and having an inferior arm which is installed rotatably about a pivot which pivot crosses a longitudinal tie bar whose end is tractionably connected to the activating member of the bolt opening mechanism, said tie bar having a longitudinal guide which in the displacement direction of the mobile semibar has a dimensional play greater than the distance in radial direction defined by the curved trajectory discribed by the extremity of said lower arm of the angled lever.

An important advantage of the present invention consists in the fact that the horizontal stress generated by the upper arm during the tilting of the angle lever is absorbed by the displacement ability of the end of the said upper arm of the angled lever with respect to the mobile arm to which it is connected; thus the displacement of said mobile semibar is perfectly straight and can be realised without significant play, avoiding the need to include slots into which coins and other blocking objects could be inserted to disrupt the antipanic emergency function. At the same time, the functional equilibrium of the bar and its activation is correct, even when application of pressure is not central.

Another advantage of the present invention is that it is very simple and economical, both with respect to the number of parts needed to construct it and with respect to its construction.

Other characteristics and advantages of the present invention will better emerge from the detailed description which follows, which, together with the accompanying illustrations, describe a preferred but not exclusive embodiment of the invention.

According to the invention, a mechanism is envisaged which is able to produce the permanent reten-

tion of the open position of the bar (retracted levers), for those cases in which continual traffic of people is envisaged: this mechanism comprises a discoid lever which, travelling with the mobile semibar and being activatable externally using an appropriate tool (namely, a key), is able to turn in a plane which is transversal to the operative movement of the mobile semibar, producing an active position in which with the mobile semibar in the open position, the discoid lever is enserted into a retaining niche cut into a wall envisaged in the fixed semibar, and another position, the non-active position, with the edge of the discoid lever retracted with respect to the said wall, said wall having above said niche another hole, or slot, which interferes with the said discoid lever, bringing it back into the non-active position if it should be accidentally locked into the active position before pressure is applied to the mobile semibar; on such first pressure being applied to the mobile semibar, therefore, the discoid lever is inhibited.

Also, with reference to the mechanism which, starting from the activating member produces the elastic retraction of the principal bolt, according to a preferred embodiment the activating member is connected to a sliding plate guided longitudinally inside and along the fixed semibar; said sliding plate is connected to the fixed structure of the principal lock by means of an extendable spring and has a hooking support for the end of a principal bolt mounted pendulously and activatably against an antagonist spring which is connected to said principal bolt end by means of an rotatable articulation situation below and in front of the tilting axis which the bolt has with respect to the said lock structure; said sliding plate being equipped with tabs which during its longitudinal retraction travel tangentially and push against peripherical protruberances on the rotatable neck envisaged as a means of operative interrelation with other elements of the lock system, such as handles of knobs and transmission bars for the activation of secondary bolts.

According to other characteristics of the invention, the bolt has an open cavity in which a retractable equaliser is mounted and moves against an impulse spring having a hole through which a tilting pivot passes (with play) which pivot is fixed to the said bolt below said end joint and behind the axis of the said impulse spring lodged in it. Said equaliser has a shape which protrudes further that the bolt towards the exterior of the door, and an extra heel which when the equaliser tilts, comes up against an endstop envisaged in the neck, thus preventing the bolt from retracting when an impulse is received from outside the door. This prevents the lock from being violated by the introduction of a plastic card or similar through the splace between the door and the wall, since any impulse from that direction will only cause the blocking of the bolt. This blocking can only be released when pressure is applied to the pushbar inside the door, as the mechanism will then free the equaliser heel from the endstop by turning the neck; obviously the bolt is then also freed.

Further advantages of the invention will better emerge from the detailed description which follows, illustrated in the accompanying diagrams, of a preferred but not exclusive embodiment of the said invention, in which:

- Figure 1 shows a schematic typical configuration of a lock system activated by a pushbar 1 according to the invention; the view is perpendicular to the door on which the system has been installed;
- Figure 2 shows in enlarged scale a longitudinal section of the pushbar 1, including the principal locking mechanism 2, along the plane indicated by 27 of Fig. 1, in which the bar is in a non-activated position;
- Figure 3 is a view corresponding to fig. 2 with the mobile semibar 2b and the cover of the said mechanism of the principal lock not represented;
- Figure 4 is a detail in enlarged scale of a portion of said bar 1 showing the angled pivot 6 very close to the mechanism of the principal locking mechanism 2, when the pushbar 1 is in a non-activated position;
- Figure 5 is similar to figure 4 but refers to an intermediate point in the activation of the pushbar 1, corresponding to the maximum point in longitudinal direction of the curved trajectory described by the upper arm 6a.
- Figure 6 is similar to figs. 4 and 5 but refers to the final activation position of the pushbar 1
- Figure 7 corresponds to fig.4, with the activating element 14 taken away and representing the tie bar 13 in section, for greater clarity;
- Figure 8 shows the retention mechanism in an active position of retention;
- Figure 9 is similar to figure 8 but shows the retention mechanism in a non-retention position;
- Figure 10 is a corresponding view of figure 9;
- Figure 11 is a view according to section plane 28 of figure 10, but referring only to the discoid lever 20 which appears in its non-active position (continuous line) and its active position (broken line), with in a broken-and-dotted line the relative position of the wall 24 having the profile of the lever 25 cut into it.
- Figure 12 is a enlarged-section view of a detail of fig.2, referring to the interior mechanism of the principal locking mechanism 2, according to longitudinal section 27 indicated in fig.1, but not having the end 32 in section, nor the spring 33; in this diagram the bolt 2a is shown in the extended, or locked, position;
- Figure 13 is similar to fig.12, but with the bolt 2a in a retracted, or open, position;
- Figure 14 is a detail which illustrates the block-

ing of the retraction of the bolt 2a by means of a frontal impulse 43 preceded by a tangential impulse 42.

With reference to the illustrations, figure 1 shows a mechanism for activating a locking system comprising in general a principal locking mechanism 2 with a principal bolt 2a, connected to a pushbar 1, with the possibility of other, secondary bolts (3a) which are activated by means of transmission bars 4 and 5 across the secondary locking mechanisms 3 which can comprise inversion devices for the impulse of the transmission bars 4 and 5.

The pushbar 1 comprises (fig.2) the two semibars 1a and 1b. The inner or fixed semibar 1a, of u-shaped metal, is mounted directly on the door and functions as a support for the activating device of the principal locking mechanism 2. The outer of mobile semibar 1b generally has a u-shaped profile and is mounted like a cover on to the inner semibar 1b, overlapping it externally, and has threaded cavities for the fixing of end pieces, such as for example the longitudinal rods 18 which help to absorb the horizontal stress 15 of the operational tilting of the angled levers 6 and which permit the slideable mounting of the mobile semibar 1b with respect to the pivots 8 thus enabling the exterior of the mobile semibar 1b to remain completely smooth, since it is not necessary for it to be a support for screws of other fixing elements for the internal mechanism.

The converting device for changing perpendicular pressure on the pushbar 1 into longitudinal action which produces the opening of the principal locking mechanism comprises angled levers 6, made in single rigid pieces, made of steel pressed into u-shape (figs 3 and 7) and with a variable configuration depending on each single case, in this particular configuration its being considered best that the internal angle should be slightly obtuse and that the operative dimension (distance between axes) of the upper arm 6a and lower arm 6b should be two to one in favour of the former. The pivot 8 constitutes the rotating articulation of the end of the uper arm 6a and has its guided ends in the longitudinal slots 18 of the mobile semibar 1b, so that the sliding of the pivot 8 in the longitudinal slots 18 allows the movement of the mobile semibar 1b to be perfectly perpendicularly straight with respect to the door, there being thus no displacement in longitudinal direction which can be disturbed and blocked by means of coins etc. The pivot 9 constitutes the rotating articulation of the lower arm 6b and crosses the base plate 13 of the tie bar 13 which acts on the activating member 14 of the lock 2.

The tilting of the angled levers 6 is produced around the axis 7 on which it is rotatably mounted; said axis 7 is held in place by a u-shaped column 11 made of double-sheet metal and forming part of the baseplate 10 which is mounted to the bottom of the fixed semibar 1a, supporting the entire configuration.

Figs. 4 to 6 show clearly the functioning of this new concept, according to which, on pressing on the mobile semibar 1b, said semibar 1b gives way because the tilting of the angled lever 6 is produced and, simultaneously a longitudinal displacement of the tiebar 13 which pulls the activating member 14. The said tilting makes the pivot 8 and 9 describe curved trajectories which describe respectively maximum radial amplitudes 15 and 16; radial amplitude 15 is the above-mentioned horizontal stress and it is explained above how this stress is absorbed so as not to affect the straight movement of the mobile semibar 1b; the other radial amplitude 16 is absorbed because the tiebar 13 is guided between the endpieces 12 which are created by bending of the baseplate 10 and that form an open canal that allows the tie bar 13 the necessary compensatory play, which play is also tolerated by the free connection that the said tie bar 13 has with the activating member 14 of the locking mechanism 2. The straightness of the linear movement of the mobile semibar 1b can be seen in figures 4 to 6, where the imaginary straight line travelled by the mark 17 (included solely for this purpose) is indicated.

The retaining mechanism 19 of the pushbar 1 in open position is positioned (figs 8 to 11) between the ends of the non-lock end of the fixed semibar 1a and the mobile semibar 1b. The discoid lever 20 is fixed to the mobile semibar 1b, being mounted on an axis that can be turned by activating the key 22 on the head 21 of the axis, so that in the unturned position (fig. 9) the edge of the lever 20 is displaced against the wall 24 connected to the fixed semibar 1a; on the other hand, if the pushbar 1 is pushed in, and the lever 20 is turned, a part of said lever 20 lodges in a small window 23 in said wall 24, holding the entire mechanism in this way in an open position. If for any reason the lever 20 should be turned to the active position before the puwhbar 1 is pushed, then the first time it is pushed the edge of the lever 20 will be interfered with by the lever-hole 25 cut into the edge of the wall 24, with the result that the lever 20 will pass into the non-active position. The two positions mentioned for the lever 20 are held by means of an anti-spring ball bearing 26 which is positioned above one of other of the orifices 20a in said lever 20.

The internal mechanism of the lock 2, activated by the traction of the activating member 14 to produce the retraction of the principal bolt 2a and, eventually, also the secondary bolt 3a is clearly illustrated in figs.12 and 13, where the activating member 14 is shown pulling the sliding plate 29 against the returning spring 30; while, by means of the support 31, said sliding plate 29 is pulling the end 32 fixed to the bolt 2a by the rotatable joint 34, with the result that said bolt 2a is retracted, tilting with respect to the axis 35 and compressing the antagonist spring 33; at the same time, the sliding plate 29, with its tabs 29a (fig.

3), produces the turning of the neck 36 which establishes the operative activation connection by means of handles installable on the axes 44. Fig. 13 shows the bolt in the state of retration.

Figure 14 shows he anti-retraction security of the bolt 2a when a frontal impulse 43 is placed on it; or possibly not frontal, but a force which is directly placed on it, and which has been preceded by a tangential impulse 42 as would be produced by the insertion at the edge of a plastic card, with the intention of opening the door from the exterior; thus, as the card reaches the edge 40 of the retractable equaliser 37 to which the impulse spring 38 is mounted, the equaliser 37 turns on the pivot 39 and places its heel 41 in the condition of interfering with the neck 36. The emergency action will not be inhibited by this event, since when the the mobile semibar 1b is activated, the tabs 29a will produce the turn ing of the neck 36 and the consequent retraction of the endstop 36a, as has already been explained.

Additions in terms of configurative changes and new materials may be made to the invention without changing its fundamental characteristics.

The applicant, according to the International conventions governing Industrial Property, reserves the right to extend the present application to other countries.

Similarly, the applicant reserves the right to request the relevant Certificate of Addition in the form indicate in a law, whenever additions and improvements should be made.

Claims

1. Improvement in an antipanic lock system for emergency doors, in particular for a system which comprises a principal bolt 2a and one of more secondary bolts 3a, all of which bolts are simultaneous activable by means of a connected antipanic mechanism of the type with a transversal pushbar 1 installed on the side of a door and comprising a fixed or inner semibar 1a mounted on to the said door, and comprising a mobile of outer semibar 1b which receives the external pressure necessary to open the door, wherein said fixed semibar 1a and said mobile semibar 1b are mechanically connected by at least one pair of identical tilting mechanisms, each of which tilting mechanisms comprises a single lever 6 of rigid and angular form which at its summit is mounted tiltingly about a suspended axis 7 situated between said fixed semibar 1a and said mobile semibar 1b and which suspended axis 7 is immobilised with respect to the said fixed semibar 1a; said angled lever 6 having an upper arm 6a which upper arm's 6a end is mounted to said mobile semibar 1b with possibility only of longitudinal displacement along said mobile semibar's 1b length, and said angled lever 6 having a lower arm 6b which is rotatably installed about a pivot 9 which crosses a longitudinal tie bar 13 which tiebar's 13 end is tractionably connected to the activiting member 14 of the opening mechanism 2 of the said bolts 2a, said tie bar 13 having a longitudinal guide which in the displacement direction of the said mobile semibar 1b has a dimensional play of superior magnitude to the amplitude 16 in radial direction described by the curved trajectory of the end of said lower arm 6b.

2. Improvement in an antipanic lock system for emergency doors, as in claim 1, wherein the mounting of the upper arm 6a of the angled lever 6 with respect to the mobile semibar 1b is produced because the end of said upper arm 6a is rotatably mounted on a transversal pivot 8 which pivot's 8 ends are guide in respective longitudinal slots 18 envisaged in the mobile semibar 1b.

3. Improvement in an antipanic lock system for emergency doors, as in claims 1 and 2, wherein said suspended tilting axis 7 of said angled lever 6 is rotatably mounted on a column 11 arranged on a baseplate 10 mounted on the fixed semibar 1a, which baseplate 10 is mounted on the part of the fixed semibar which is mounted on the door.

4. Improvement in an antipanic lock for emergency doors, as in the previous claims, wherein said longitudinal tie bar 13 is a small metal plate of perpendicular plane to the door which is laterally positioned with slidable setting in endslots facing the mobile semibar 1b; which endslots are defined by pairs of endpieces 12 mounted to the fixed semibar 1a.

5. Improvement in an antipanic lock for emergency doors, as in the previous claims, wherein said pairs of endpieces 12 for the guiding of the said longitudinal tie bar 13 are formed out of the said baseplate 10 which also provides the sustaining column 11 of the suspended axis 7.

6. Improvement in an antipanic lock for emergency doors, as in the previous claims, wherein it is preferable that the tilting angled lever 6 is of a functionally assymetric configuration.

7. Improvement in an antipanic lock system for emergency doors, as in claim 6, wherein the assymetry of said angled lever 6 is such that the the distances from the suspended axis 7 to the transversal pivot 8 and from the pivot 9 are about two-to-one.

8. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein it is preferable that the internal angle of the angled lever 6 is slightly obtuse.

9. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein it is envisaged that a mechanism 19 exists which is capable of holding the open position of the bolts 2a, 3a, which mechanism 19 comprises a discoid lever 20 which, travelling with the mobile semibar 1b and being externally activatable by means of an appropriate tool or key 22, is able to turn in a transversal plane on the operative movement of the mobile semibar 1b, producing an active position in which with the mobile semibar 1b activated into the open position, said discoid lever 20 insert into a retaining hole 23 bored into a wall 24 arranged in the fixed semibar 1a, and a non-active position, in which the edge of the discoid lever 20 is displaced against said wall 24; there being in said wall 23, positioned above the said hole 23, a lever-shaped slot 25 which interferes with the upper edge of the lever 25 and removes said lever 25 from the non-active position, if it should accidentally be activated and plact the bolts 2a 2a in a non-active position and prevent the mobile semibar 1b from activating.

10. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein to produce the elastic retraction of the principal bolt 2a, it is envisaged as the preferable means of execution that the activating member 14 is connected to a sliding plate 29 guided longitudinally internally to the fixed semibar 1a, which sliding plate 29 is connected to the fixed structure of the principal locking mechanism 2 by means of an extendable recuperating spring 30 and there being envisaged a connecting support for the end 32 of a principal bolt activatable against an antagonist spring 33 and connected to said end 32 by means of a rotatable joint 34 situated below and in front of the tilting axis 35 which connects said bolt to said lock structure 2.

11. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein the sliding plate 29 is equipped with tabs 29a which during the said sliding plate's 29 longitudinal retraction interfere tangentially and push peripherically against the rotatable neck 36 which neck 36 is envisaged as the means of operative interrelationship between the lock system and other elements, such as a handle or knob and transmission bars 4 and 5 for secondary bolts 3a.

12. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein said bolt 2a has an open cavity in which a retractable equaliser 37 is mounted against an impulsor spring having a slot through which a tilting pivot 39 passes with play, which tilting pivot 39 is fixed to the said bolt 2a below said joint 34 of the end 32 and behind the axis of said impulsor spring 38 lodged internally to it; said equaliser 37 having an outward form 40 which protrudes further than the bolt 2a towards the exterior of the door, and an extra heel 41, which when the equaliser 37 tilts, comes up against an endstop 36a envisaged in the neck 36, thus preventing the bolt from retracting when an impulse is received from outside the door.

13. Improvement in an antipanic lock system for emergency doors, as in the previous claims, wherein on the mobile semibar 1b the sliding retraction of the plate 29 produces with its tabs 29a the turning of the neck 36, thus deviating the end 36a from its position in front of the hell 41 of the equaliser 37, to the retraction direction of the principal bolt 2a.

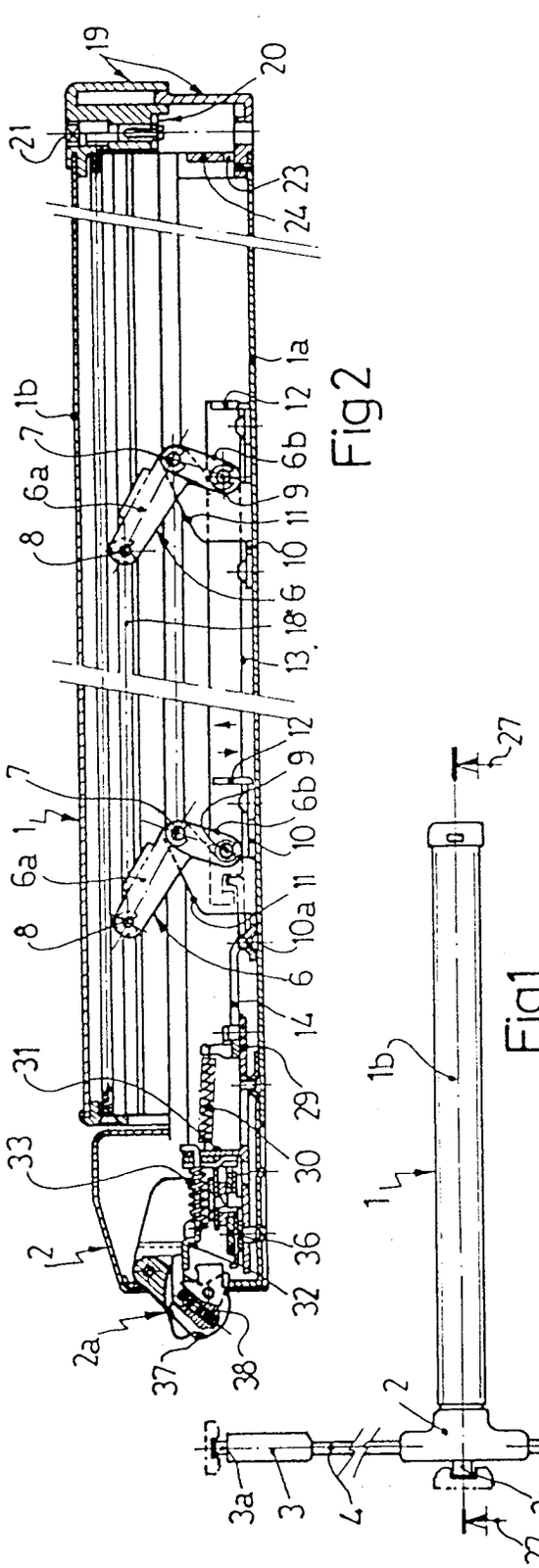

Fig2

Fig1

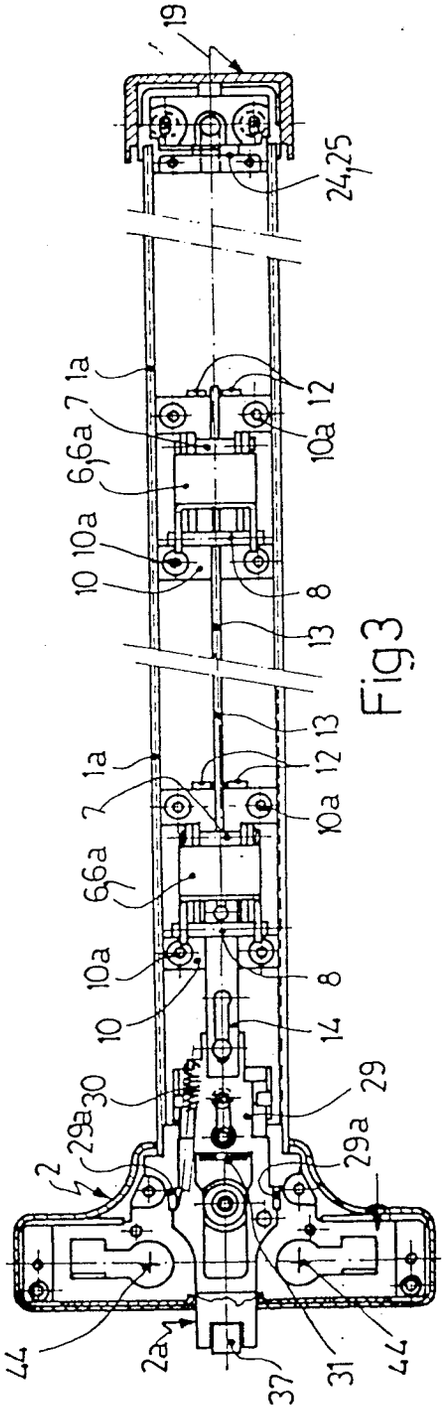

Fig3

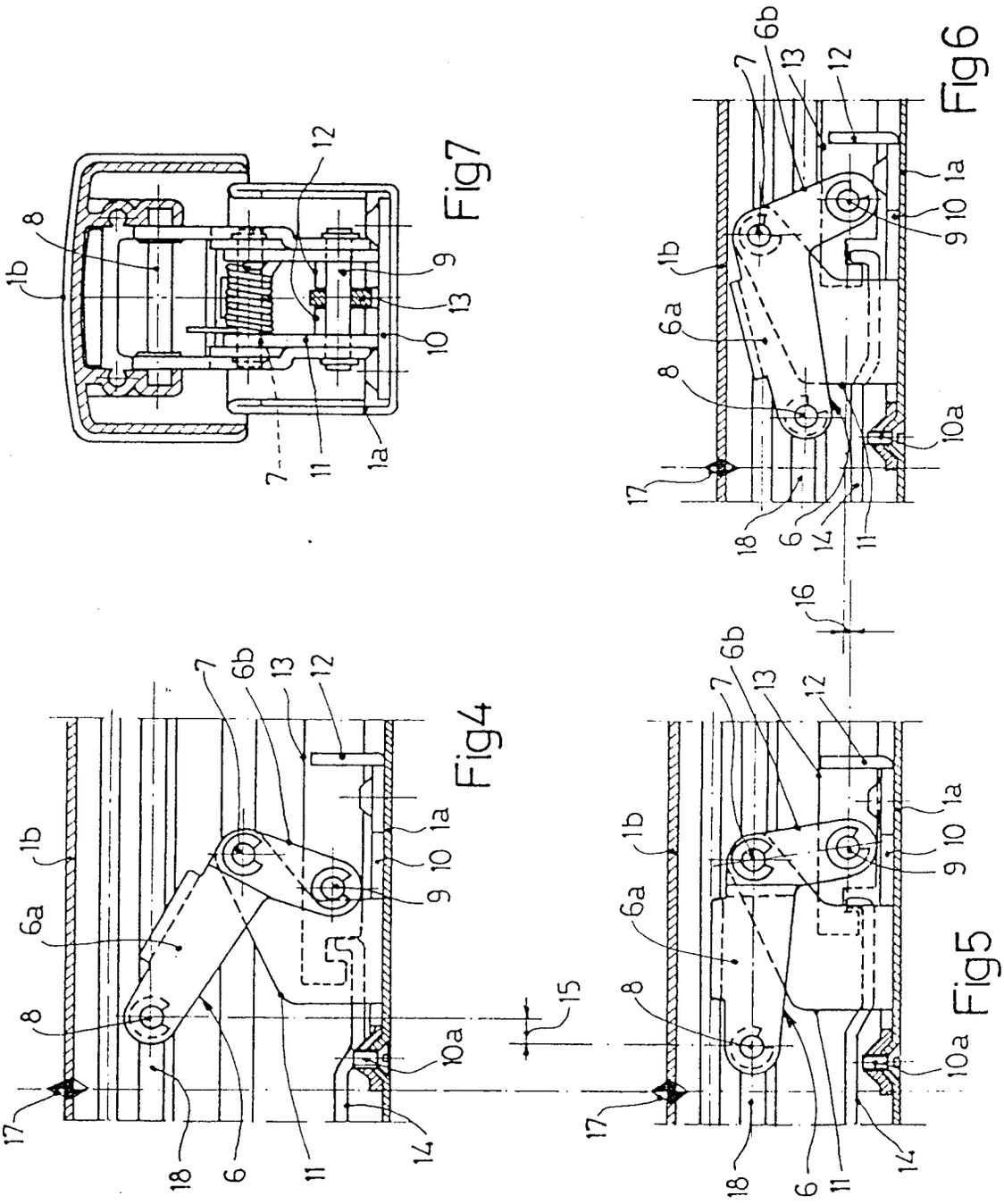
Fig7
Fig6
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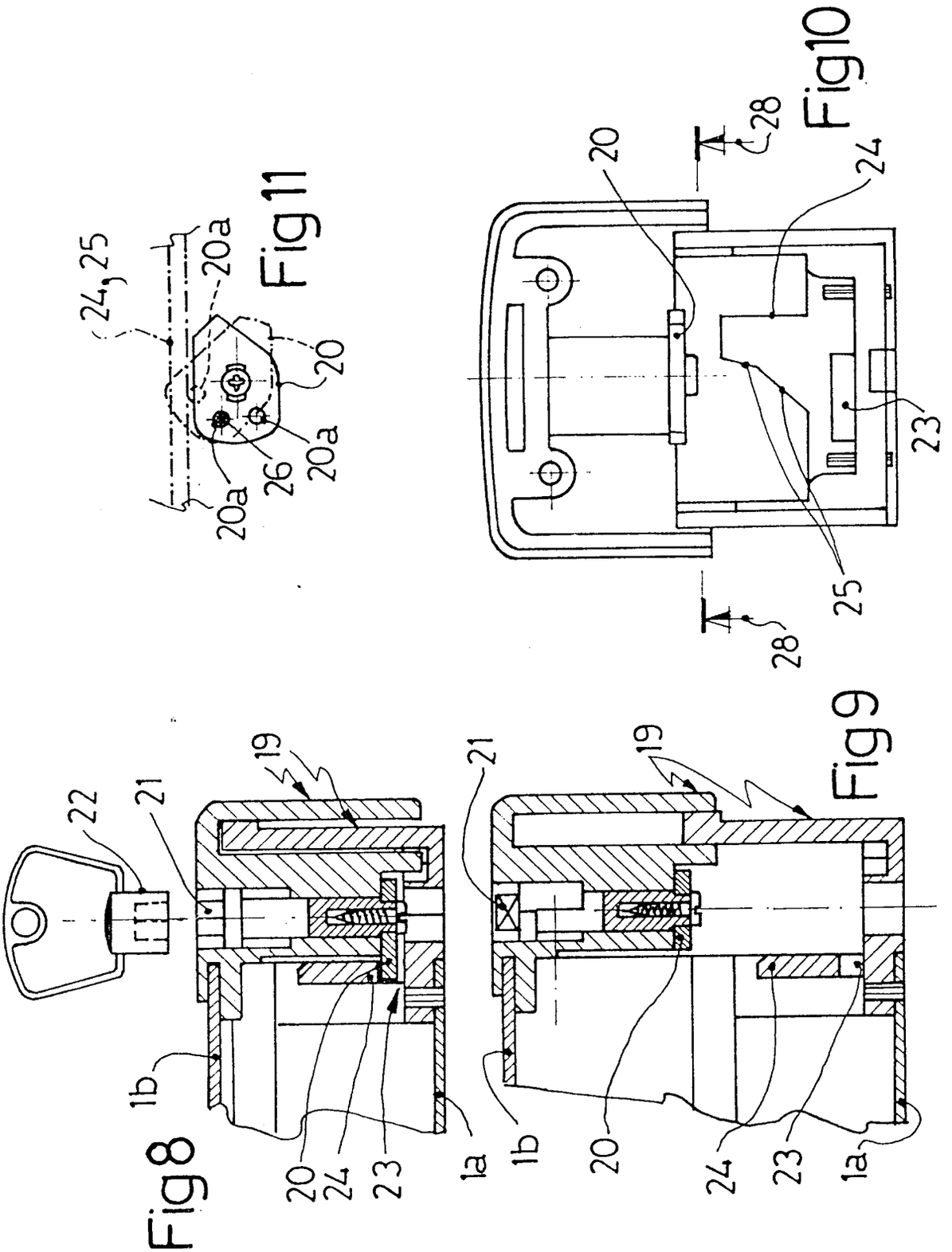
Fig8
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Fig9
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Fig11
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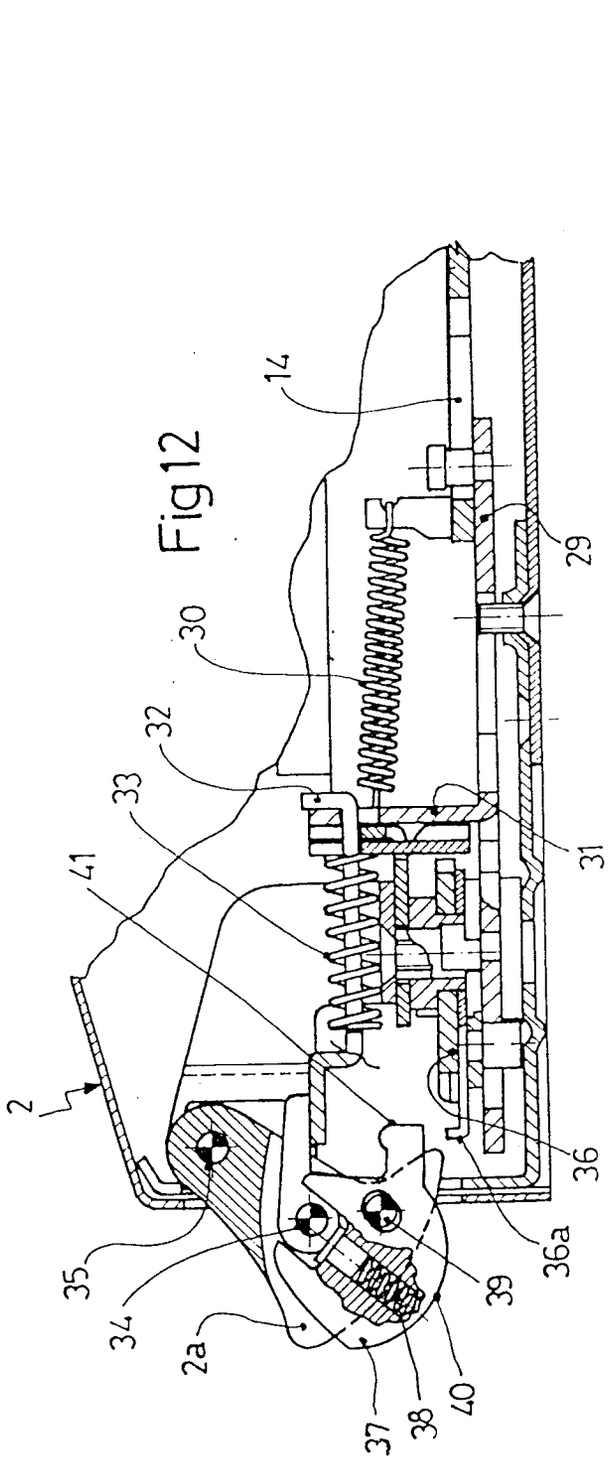
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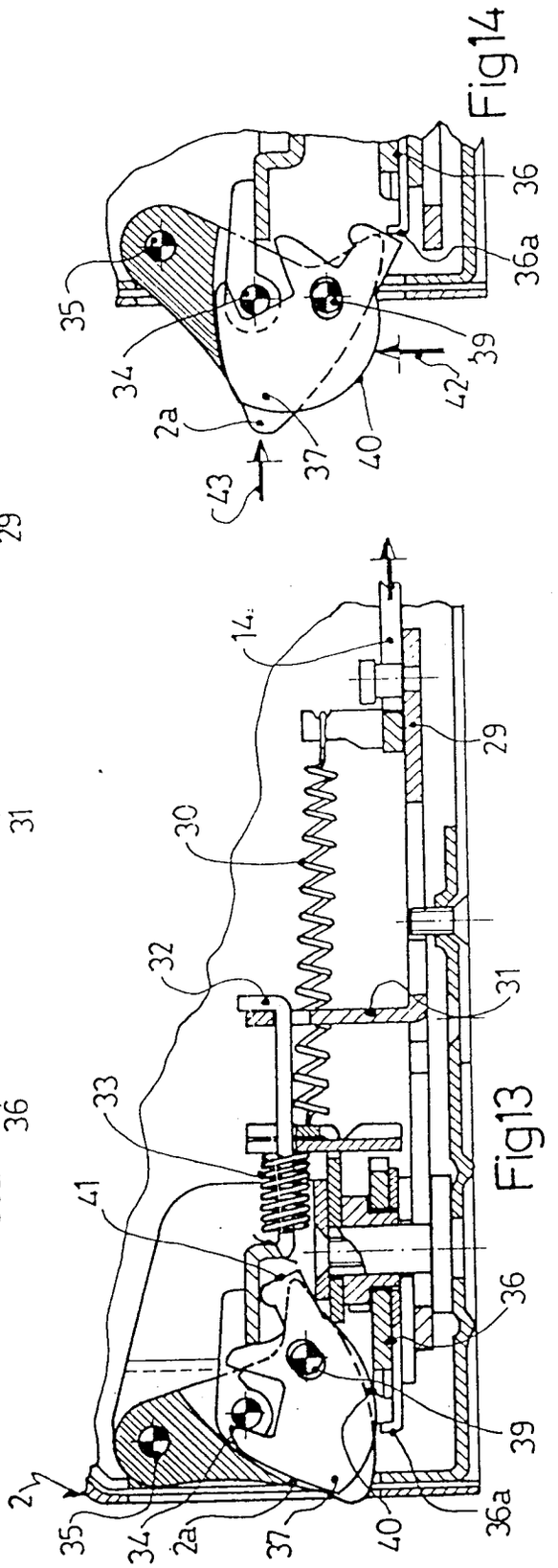
Fig13
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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0429

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.5)
X A	US-A-4 839 988 (BETTS ET AL.) * figure 9 * * column 4, line 46 - line 56 * * column 6, line 43 - line 63 *	1,2 3-5,9,10	E05B65/10
A,P	US-A-5 011 199 (LOWE ET AL.) * figure 1 *	1,2,6-8	
A	EP-A-0 307 088 (YALE SECURITY INC.) * column 4, line 55 - column 5, line 16; figure 8 *	1,11-13	
A	US-A-4 083 590 (FOLGER) * column 3, line 30 - line 42; figures 2,3 *	1	
A	US-A-3 663 047 (ZAWADZKI) * figures 2,3 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 JANUARY 1992	VLECK J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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