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(54) **Lock for the secondary leaf of fire doors**

Schloss für den Standflügel von Brandschutztüren

Serrure pour le battant secondaire d'une porte coupe-feu

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## Description

**[0001]** The present invention concerns a lock for the secondary leaf of fire doors.

**[0002]** So-called fire doors of the two-leaf type are currently known, which are used for reasons of safety in public premises and the like. The secondary leaf of these fire doors is generally provided with a locking device which normally attaches it to the frame. In particular, this locking device usually consists of a lock which is provided with a pair of rods which slide vertically, in opposite directions, in the leaf, such that they can engage in ferrules in corresponding seats provided respectively in the door frame and in the floor. In use, when they are in a position retracted inside the leaf, the said rods enable the door to be opened fully, whereas in the extended position they lock the secondary leaf.

**[0003]** The rods in question are generally slid into the extended leaf-locking position by means of a mechanism which is actuated manually by a lever or handle. The said mechanism is fitted in a seat provided in the profile of the secondary leaf. In the event of activation by means of a lever, the latter is accessible after the main leaf has been opened; in this case the activating lever is disposed in a housing which is delimited by the mechanism casing.

**[0004]** With particular reference to locks which are activated by means of a lever, and which specifically are used in fire doors, the said activating lever usually has a pair of transverse pins by means of which it engages the locking rods, such as to enable them to be moved into the said extended locking position and the retracted release position. Essentially, the leaf is both released and locked manually, by rotating the activating lever angularly, for example by an angle of 180°.

**[0005]** Locks of this type nevertheless have some disadvantages of both a structural and functional nature, which restrict optimum use thereof. In fact these locks generally have relatively high production costs, as well as dimensions which are often large. In addition, manual closing of the leaf constitutes an obvious limitation in the use of fire doors.

**[0006]** In addition, complaints have been made that the leaves of fire doors are not sufficiently secure as far as potential attempted break-ins are concerned.

**[0007]** German Utility Model No G 87 01 630.3 in the name of BKS GmbH describes and claims a lock for a secondary leaf of fire doors which comprises a pair of rods which slide vertically, in opposite directions, between an extended locking position and a retracted release position, and which at their ends engage corresponding seats provided respectively in a door frame and in a floor, a first upper and a second lower slide which can be connected to the rods and guided in a sliding manner vertically in a casing of the lock against respective return spring means between a position of reciprocal withdrawal and a position of approach, corresponding respectively to the locking and the release positions of the rods, a rocker return device pivoted centrally on a

first pivot in the casing and having at opposite ends pin coupling grooves into which project pins from the slides, for transmission of movement from the first slide to the second slide, a second pivot on the casing on which an activating lever pivots to act on the first slide against second return spring means, such as to give rise to movement of the slides into the position of reciprocal approach.

**[0008]** The lock according to the BKS Utility model has the disadvantage that it is large in size, and does not protect adequately against attempted break-ins.

**[0009]** Another example of this type of lock is known from the German Patent DE C 3 417 054, in the name of BKS GmbH too, which discloses and claims a connecting rod closure for the fixed leaf of double-leaf automatically closing fire doors, comprising a swivel actuating lever arranged inside the connecting rod lock, its outer actuating end being able to swing through an aperture in the face plate of the connecting rod lock, its inner end indirectly or directly clasping the inner end of the lower connecting rod, under the action of a return spring means which holds it in its retracted position inside the connecting rod lock even when the connecting rods are retracted.

**[0010]** Connecting rod locks made according to the latter German Patent however are rather complex, have large size and do not solve the problems related to the security of fire doors against possible break-ins.

**[0011]** The object of the present invention is to solve the aforementioned problem, by devising a small lock for the secondary leaf of fire doors, which enables the door to be closed automatically, and which also provides adequate protection against any attempted break-ins.

**[0012]** Within the context of this task, a further object of the present invention is to provide a lock for the secondary leaf of fire doors which has a simple design, functions securely and reliably, is versatile, and costs relatively little.

**[0013]** According to the present invention a lock for mounting within a recess in the narrow closing face of a secondary leaf of fire doors, which lock defines an aperture in that face capable of receiving and permitting access to an activating lever and serving as a strike and comprises a pair of rods which slide vertically, in opposite directions, between an extended locking position and a retracted release position, and which at their ends engage corresponding seats provided respectively in a door frame and in a floor, a first upper and a second lower slide connected to the rods and guided in a sliding manner vertically in a casing of the lock against respective return spring means between a position of reciprocal withdrawal and a position of approach, corresponding respectively to the locking and the release positions of the rods, a rocker return device pivoted centrally on a first pivot in the casing and having at opposite ends pin coupling grooves into which project pins from the slides, for transmission of movement from the first slide to the second slide, a second pivot on the casing on which the activating lever pivots to act on the first slide against second return spring means, such as to give rise to move-

ment of the slides into the position of reciprocal approach, characterised in that the first slide is provided with an opening through which a projection on the casing extends.

**[0014]** The details of the invention will become more apparent from the following detailed description of a preferred embodiment of the lock for the secondary leaf of fire doors, which is illustrated by way of example only in the attached drawings, in which:

Figure 1 is a vertical cross-section of the lock in question, in the closing position;

Figure 2 is a corresponding front view thereof; and  
Figures 3 and 4 are views in vertical cross-section of the lock, in successive opening stages.

**[0015]** With particular reference to these Figures, reference numeral 1 indicates the casing of the lock in question, which is destined to be fitted in a seat provided in the secondary leaf of a fire door. The casing 1 has a front 2 of a shape which is extended vertically, in which there is provided an aperture 3 for extraction of a lever 4 for activation of the lock.

**[0016]** The activating lever 4 is hinged at the top of the casing 1 on a transverse fulcrum 5, and has a lower folded portion 6 which enables it to be gripped. The lever 4 is stressed by a flexure spring 7, which is disposed at the fulcrum 5, and which acts against rotation of the lever in the opening position.

**[0017]** Inside the casing 1 there are guided vertically, first and second, respectively upper and lower slides 8, 9, which are connected to the casing by means of respective springs 10 which fulfil a return function along the axis of sliding of the slides; for the sake of greater clarity, in the drawing only the spring 10 relative to the upper slide 8 is shown.

**[0018]** The spring 10 relative to the slide 8 is located between a projection 20 extending perpendicularly from the slide 8 itself and an abutment surface 21.

**[0019]** The slides 8, 9 are advantageously made of flattened metal elements which are disposed such as to be coplanar on the vertical sliding plane. On the side facing longitudinally outwards, the slides 8, 9 have a slot 11 which is destined to be coupled with a coupling device of the respective leaf closing rods, not shown in the drawing.

**[0020]** The slides 8, 9 slide longitudinally in opposite directions between a reciprocal withdrawal position and an approach position, which correspond respectively to the extended locking position and the retracted release position of the rods. On the top of the upper locking rod there is preferably associated a locking mechanism which can maintain the rod in the retracted position when the leaf is open, and which is preferably of the type illustrated in European Patent No 0, 547,746.

**[0021]** The slides 8, 9 are articulated to one another on the side facing the inside of the casing 1, by means of a rocker return device 12, which is hinged to a fulcrum

13 transverse to the casing. On opposite longitudinal ends the rocker 12 has grooves 14 destined for sliding coupling with respective pins 15 which project transversely from the slides 8, 9. The pins 15 are guided along respective slots 16 which are provided vertically in the casing 1.

**[0022]** It should be noted that in the position of the coupling groove 14 on the lower slide 9, the rocker 12 has a flattened portion 17. This flattened portion 17 enables the lower slide 9 to slide upwards independently of the upper slide 8.

**[0023]** On its top, the activating lever 4 has a tooth 18 with a suitably rounded profile, which during the opening stage can abut a roller pin 19 which projects transversely from the upper slide 8.

**[0024]** The slide 8 is provided with an extended opening or slot 23 through which a locating pin 22 extending between the sides of the casing passes. This has the advantage that the pin provides both a further point of connection between the sides of the casing and serves as a guide for the slide at an intermediate point along the length of the slide.

**[0025]** Additionally, the pin may serve to locate the abutment surface, as in the disclosed embodiment.

**[0026]** The functioning of the lock is easily understood from the above description.

**[0027]** In the locking position of the leaf, the slides 8, 9 are disposed in a position of maximum reciprocal withdrawal, corresponding to the extended position of the locking rods of the leaf (Figure 1); the slides 8, 9 are stressed by the respective springs 10 which act longitudinally in opposite directions, and such as to draw the slides outwards.

**[0028]** In order to open the secondary leaf, the activating lever 4 is rotated angularly, such that by means of the tooth 18 it acts on the roller pin 19 of the upper slide 8. It should be noted that the lever 4 travels a limited unloaded path before engaging the pin 19 (Figure 3). This enables the lever 4 to be extracted partially from its seat without force, by means of the gripper portion 6, and thus allows the opening mechanism to be activated more easily.

**[0029]** Further rotation of the activating lever 4 gives rise to downward movement of the upper slide 8; the lower slide 9 in turn is moved symmetrically upwards by means of the rocker return 12 which acts as a movement transmission device (Figure 4). The slides 8, 9 therefore move into a position of mutual approach, corresponding to the retracted position of the closing rods which enables the leaf to be opened.

**[0030]** The locking mechanism which is associated with the upper locking rod maintains the rods in the retracted, release position, until the leaf is reclosed. Vice versa when it is released, the activating lever 4 is returned elastically inside its seat, by the spring 7.

**[0031]** When the leaf is closed, the above-described locking device automatically releases the upper locking rod, enabling the slides 8, 9 to return to the withdrawn

position of extraction of the locking rods, by means of the thrust exerted by the springs 10. In other words, the leaf is opened manually by means of the activating lever 4, whereas closing takes place automatically, with an obvious functional advantage.

**[0032]** The locking mechanism described has very small dimensions, in particular on the transverse plane, such that the possibility of fitting it in the door leaf is optimised. This is obtained in particular by production of the slides 8, 9 using flattened coplanar elements. The activating lever 4 and the rocker 12 in turn contribute to this reduction of size, since they are also made of flattened elements which are disposed on a vertical plane abutting that of the slides 8, 9.

**[0033]** The aforementioned embodiment of the slides 8, 9 as well as that of the lever 4 and rocker 12, also permits very low production costs to be obtained, since in practice the elements are obtained by means of simple cutting work or the like.

**[0034]** In particular it should be noted that the lock provides improved protection against any attempted break-ins, since the lower slide 9 can slide upwards independently of the upper slide 8. In fact if an attempt is made to release the closing mechanism from the bottom by means of the lower closing rod, only the slide 9 slides, which, owing to the flattened portion 17, does not make the rocker 12 pivot. Thus the upper slide 8 is not moved, and the corresponding closing rod ensures that the leaf remains locked.

**[0035]** The above-described possibility of independent sliding of the lower slide 9 is also advantageous in normal use of the door, in order to compensate for partial obstruction of the engagement seat of the lower closing rod ferrule, caused for example by the presence of dirt or the like. In fact in this case, the upper slide 8 can complete the full raising course of the corresponding closing rod, for engagement of the ferrule of this rod in the seat provided on the door jamb, whereas the lower slide 9 can remain partially raised, without causing stress on the lock mechanism.

**[0036]** In practical implementation of the invention, any materials, forms and dimensions can be used, according to requirements.

## Claims

1. A lock for mounting within a recess in the narrow closing face of a secondary leaf of fire doors, which lock defines an aperture in that face capable of receiving and permitting access to an activating lever (4) and serving as a strike and comprises a pair of rods which slide vertically, in opposite directions, between an extended locking position and a retracted release position, and which at their ends engage corresponding seats provided respectively in a door frame and in a floor, a first upper and a second lower slide (8, 9) connected to the rods and guided in a

sliding manner vertically in a casing (1) of the lock against respective return spring means (10) between a position of reciprocal withdrawal and a position of approach, corresponding respectively to the locking and the release positions of the rods, a rocker return device (12) pivoted centrally on a first pivot (13) in the casing and having at opposite ends pin coupling grooves (14) into which project pins (15) from the slides, for transmission of movement from the first slide (8) to the second slide (9), a second pivot (5) on the casing on which the activating lever (4) pivots to act on the first slide (8) against second return spring means (7), such as to give rise to movement of the slides into the position of reciprocal approach, **characterised in that** the first slide (8) is provided with an opening (23) through which a projection (22) on the casing extends; and wherein the activating lever (4) has a first major shank and a minor shank to form a substantially L-shape, and wherein a gripper portion (6) is formed on an end of the minor shank remote from the major shank, and wherein the major shank, the minor shank and the gripper portion (6) together form a concave region of the activating lever (4), which concave region serves as an extraction means for enabling the activating lever (4) to be extracted from its seat within the aperture (3).

2. A lock according to claim 1, **characterised in that** on its top the activating lever (4) has a tooth (18) with a suitably rounded profile, which during the opening stage can abut a roller pin (19) which projects transversely from the first slide (8).
3. A lock according to claim 1, **characterised in that** in the position of the coupling groove (14) on the second lower side the rocker return device (12) has a flattened portion which enables the second lower slide (9) to slide upwards independently of the first upper slide (8).
4. A lock according to claim 1, **characterised in that** the slides (8, 9) are advantageously made of flattened metal elements which are disposed such as to be coplanar on the vertical sliding plane.
5. A lock according to claim 1, **characterised in that** the transmission pins (15) of the rocker return device (12) move along slots (16) provided vertically in the casing (1).

## Patentansprüche

1. Schloß zum Montieren in einer Ausnehmung in der engen schließenden Stirnseite eines zweiten Türblattes von Brandschutztüren, wobei das Schloß eine Öffnung in derjenigen Fläche definiert, die imstande ist, einen Betätigungshebel aufzunehmen

und Zugang zu diesem zu ermöglichen, und das als Türbeschlag dient und aufweist: ein Paar von Stäben, die in einander entgegengesetzten Richtungen vertikal zwischen einer ausgefahrenen Verriegelungsposition und einer eingezogenen Freigabeposition gleiten, und die an ihren Enden in entsprechende Sitze eingreifen, welche jeweils in einem Türrahmen und in einem Boden angebracht sind; ein erstes oberes und ein zweites unteres Gleitstück (8, 9), die mit den Stäben verbunden und vertikal gleitend in einem Gehäuse (1) des Schlosses gegen jeweilige Rückholfedermittel (10) zwischen einer Position reziproker Zurückziehung und einer Annäherungsposition geführt werden, jeweils entsprechend den Verriegelungs- und den Freigabepositionen der Stäbe; eine Kipphebel-Rückstellvorrichtung (12), die zentral auf einem ersten Drehzapfen (13) in dem Gehäuse gelenkig gelagert ist und an entgegengesetzten Enden Stiftenlenkhehlen (14) aufweist, in die von dem jeweils entsprechend ersten und zweiten Gleitstück Stifte (15) zur Übertragung der Bewegung vom ersten Gleitstück (8) zum zweiten Gleitstück (9) vorspringen; ein zweiter Drehzapfen (5) im Gehäuse, auf dem der aktivierende Hebel (4) schwenkbar gelagert ist, um auf das erste Gleitstück (8) gegen das zweite Rückholfedermittel (7) einzuwirken, derart, daß eine Bewegung der Gleitstücke in die Position reziproker Annäherung veranlaßt wird, **dadurch gekennzeichnet, daß** das erste Gleitstück (8) mit einer Öffnung (23) versehen ist, durch die sich ein Vorsprung auf dem Gehäuse erstreckt, und wobei der Betätigungshebel (4) einen ersten größeren Schaft und einen kleineren Schaft aufweist, um im wesentlichen eine L-Form zu bilden, und wobei ein Griffteil (6) an einem Ende des kleineren Schaft abgelegen vom größeren Schaft ausgebildet ist, und wobei der größere Schaft, der kleinere Schaft und der Griffteil (6) ein konkaves Gebiet des Betätigungshebels (4) bilden, welches konkave Gebiet als herausziehendes Mittel dient, das Herausziehen des Betätigungshebels (4) von seinem Sitz innerhalb der Öffnung (3) zu ermöglichen.

2. Schloß nach anspruch 1, **dadurch gekennzeichnet, daß** der Betätigungshebel (4) an seinem oberen Ende einen Zahn (18) mit einem passend gerundeten Profil aufweist, der während der Öffnungsphase gegen einen Rollenstift (19) anschlagen kann, der quer zum ersten Gleitstück (8) vorspringt.
3. Schloß nach anspruch 1, **dadurch gekennzeichnet, daß** die Kipphebel-Rückstellvorrichtung (12) in der Position der Stiftenlenkhehle (14) am zweiten unteren Gleitstück einen abgeflachten Teil aufweist, derart, daß er dem zweiten unteren Gleitstück (9) ermöglicht, unabhängig vom ersten oberen Gleitstück (8) aufwärts zu gleiten.

4. Schloß nach anspruch 1, **dadurch gekennzeichnet, daß** die Gleitstücke (8, 9) vorteilhaft aus abgeflachten Metallelementen hergestellt sind, die so angeordnet sind, daß sie an der vertikalen Gleitebene koplanar verlaufen.

5. Schloß nach Anspruch 1, **dadurch gekennzeichnet, daß** sich die Übertragungsstifte (15) von der Kipphebel-Rückstellvorrichtung (12) entlang von Schlitzen (16) bewegen, die vertikal im Gehäuse (1) angebracht sind.

## Revendications

1. Serrure destinée à être montée dans un évidement de la face de la fermeture étroite d'un battant secondaire de portes coupe-feu, laquelle serrure définit dans cette face une ouverture capable de recevoir un levier d'actionnement (4) et de permettre d'accéder à ce levier d'actionnement et servant de gâche, et comprenant une paire de tiges qui coulissent verticalement l'une en sens inverse de l'autre, entre une position d'extension, de verrouillage, et une position rétractée, de déverrouillage, et qui, à leurs extrémités, s'engagent dans des logements correspondants prévus respectivement dans un châssis de porte et dans un sol, un premier coulisseau supérieur et un deuxième coulisseau inférieur (8, 9) solidaires des tiges et guidés de façon à coulisser verticalement dans un boîtier (1) de la serrure à l'encontre de moyens de rappel à ressort respectifs (10) entre une position d'éloignement réciproque et une position de rapprochement, qui correspondent respectivement aux positions de verrouillage et de déverrouillage des tiges, un dispositif de rappel à culbuteur (12) monté pivotant en son centre sur un premier pivot (13) dans le boîtier et ayant à la première et à la deuxième extrémité une première et une deuxième rainure (14) d'accouplement de doigts dans lesquelles sont engagés des doigts (15) qui font saillie sur les coulisseaux, pour la transmission du mouvement du premier coulisseau (8) au deuxième coulisseau (9), un deuxième pivot (5) prévu sur le boîtier, sur lequel le levier d'actionnement (4) pivote pour agir sur le premier coulisseau (8) à l'encontre de deuxièmes moyens de rappel à ressort (7), de manière à provoquer le mouvement des coulisseaux qui les place dans la position de rapprochement réciproque, **caractérisée en ce que** le premier coulisseau (8) est muni d'une ouverture (23) à travers laquelle s'étend une saillie (22) portée par le boîtier; et où le levier d'actionnement (4) a une première branche majeure et une branche plus petite de façon à former substantiellement un L, et où une portion de prise (6) est formée à une extrémité de la branche plus petite en retrait par rapport à la branche majeure, et où la branche majeure, la branche plus petite et la

portion de prise (6) forment ensemble une région concave du levier d'actionnement (4), laquelle région concave sert de moyen d'extraction, pour permettre l'extraction du levier d'actionnement (4) de son siège à l'intérieur de l'ouverture (3).

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2. Serrure selon la revendication 1, **caractérisée en ce que**, sur sa partie haute, le levier d'adionnement (4) possède une dent (18) munie d'un profil convenablement arrondi qui, pendent la phase d'ouverture, peut buter contre un doigt à galet (19) qui fait saillie transversalement sur le premier coulisseau (8).
 

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3. Serrure selon la revendication 1, **caractérisée en ce que**, dans la position de la rainure d'accouplement (14) du deuxième coulisseau inférieur le dispositif de rappel a culbuteur (12) présente une portion aplatie qui permet au deuxième coulisseau inférieur (9) de coulisser vers le haut indépendamment du premier coulisseau supérieur (8).
 

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4. Serrure selon la revendication 1, **caractérisée en ce que**, les coulisseaux (8, 9) sont avantageusement faits d'éléments métalliques de forme aplatie qui sont disposés de manière à être coplanaires dans le plan de coulissement vertical.
 

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5. Serrure selon la revendication 1, **caractérisée en ce que** les doigts de transmission (15) du dispositif de rappel a culbuteur (12) se déplacent le long de fentes (16) pratiquées verticalement dans le boîtier (1).
 

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