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(54) A flat key with an additional security element

(57) A key (1) for a lock cylinder (2) with standard dimensions having longitudinal grooves (13) in a blade (10) on at least one wide blade surface (12), transversal notches (15) different in height and shape on a narrow blade surface (14), and at least one through hole (16) in which a rotating element (18) is inserted, the through hole (16) with a preferably constant cross-section having its openings in a plane of wide surfaces (12) of the blade (10) of the key (1) and the rotating element (18) is inserted into the through hole (16) by means of a key pin (19) to freely rotate in the hole (16), while its movement in direction of the key pin (19) is rendered impossible.

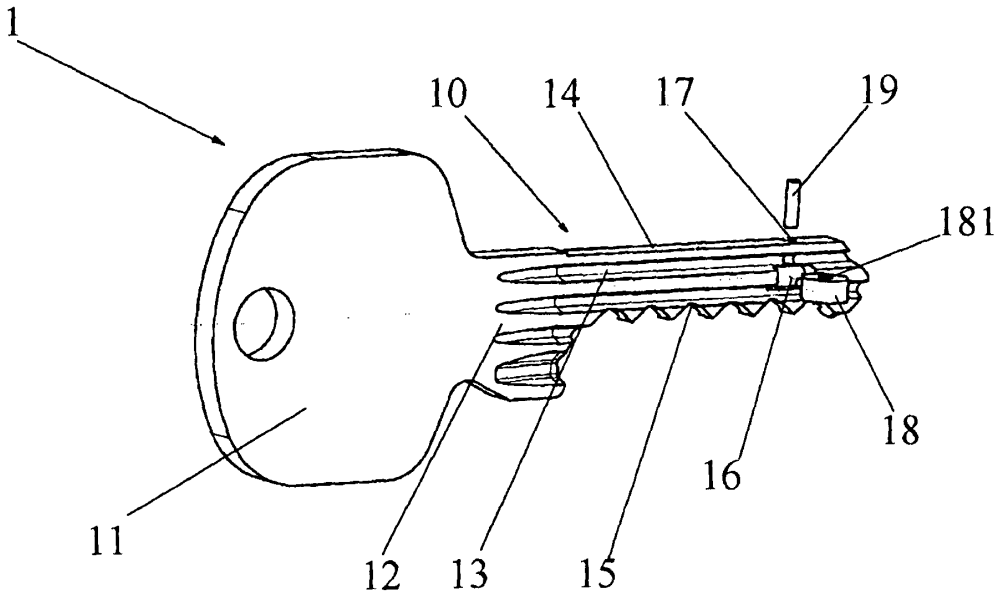

Fig. 1

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Description

Subject of Invention

[0001] The subject of the present invention is a flat key for a standard-size lock cylinder, the blade of which insertedinto a groove of a cylinder core of the belonging lock cylinder, is formed by two wide surfaces having longitudinal grooves, and two narrow surfaces having profiled notches transversely to a longitudinal blade axis, whereby said blade has at least one rotating bearing element.

Technical problem

[0002] The technical problem is to design such flat key having longitudinal grooves on at least one wide blade surface, and transverse notches on a narrow blade surface usually used for a standard-size lock cylinder with a determined number of vertical pins in a cylinder housing which should comprise security elements in the key blade not produced by removing the material but by inserting additional elements into the blade, whereby such key can be produced by conventional processing machines without using demanding computer controlled machines, like CNC machines, with as few operations as possible and with simple assembly, which will not substantially increase production costs, however, such key will prevent an unauthorized person from producing an additional key by means of simple machinery.

Prior Art

[0003] A lock cylinder can be easily unlocked by a key manufactured without the owner's knowledge at one of street key makers. Manufacturing or forgery of an additional key is easily solved by removing the material by the principle of copying. Such processes and machines are well-known and enable quick manufacturing of additional keys for lock cylinders.

[0004] Different combinations and shapes of removed material on the key blade can hinder manufacturing of a key, yet do not prevent production thereof. One of such embodiments is described in the patent SI 9400135 of the same applicant, in which a lock cylinder contains additional side blocking pins. In case of proper key dimensions and shapes of key cavities side blocking pins are pushed aside and aligned with longitudinal grooves in cylinder casing. The lock cylinder is unlocked. Keys equipped by elements produced by way of removing the material do therefore not allow any supervision over the production of additional keys, which should be done only by the producer of the original key or authorized dealers. Supervision over production and thus prevention of forgery of a key is possible with such keys that have an element in a key blade representing an additional level for a corresponding pin in a lock cylinder.

[0005] EP 0983411 (Dermanin) describes a key having a through borehole in the part of a blade positioned away from the grip part, said borehole extending transversely to a longitudinal blade axis and parallel to a middle blade plane. The borehole has additionally formed openings opened toward each wide blade surface. This borehole acts as a bearing to the element having a limited movement area in its longitudinal axis direction. It has several surfaces with different inclinations on its circumference. The surfaces of the moving key element arranged in the lock cylinder determine the position of two additional side blocking pins extending through side openings of the borehole. The moving key element inserted into the key has a very complicated shape.

[0006] DE 10058590C1 (Braun) describes a rotating key having a notch inclined for 45° at one end of a blade in which a ring is clamped by a pin. The pin diameter is smaller than that of a borehole of the inserted ring, which allows its limited movement in the inclined notch. This ring in the key determines a deviation of an extra blocking pin in the lock cylinder to the zero position, thereby allowing the cylinder plug to turn. A disadvantage of the aforementioned solution is the large number of elements having demanding shapes, said elements possessing numerous surfaces inserted in the key, and special openings on the key. The manufacturing of such elements and/or openings needs special tools, and specially adapted machines like computer controlled three-dimensional CNC machines. All these contributes to the increase of manufacturing costs and is therefore adequate for keys and lock cylinders of the highest price class.

[0007] EP 0029498B1 (Wolter) describes a standard key with longitudinal profile grooves on a wide blade surface, and transversal notches on a narrow blade surface having specially designed bearings with two inserted balls in one of profile grooves. To prevent the balls to fall out of the bearings, the legs of the groove are slightly pressed after the insertion of the balls. The balls cannot fall out from the groove but they can freely rotate. Force of pressing should be exactly determined to allow the balls to rotate and to be of the same shape as the inclination of sides of the longitudinal groove in thelock cylinder in order to prevent the key from stopping when inserted in the lock cylinder. Production of such key calls for very precise machines rendering it possible to exactly adjust the forces and shifts.

[0008] The scope of present invention is to design such key for a lock cylinder with an optional number of longitudinal grooves on wide blade surfaces and transverse notches on a narrow blade surface that will be provided with such additional element on at least one optional place of the key blade that will not allow manufacturing of an extra key to unauthorised persons with simple machinery like street key manufacturers and individuals and it would be possible to manufacture it only at the producer's of the key or authorised dealers; such key would allow supervision over the production of keys and contribute to better security. At the same time the additional element will not render the production and assembly of

key elements into the key complicated and will not call for extra machines with expensive computer technology. Manufacture will be economically justified even for keys of lower price classes.

Solution to the Technical Problem

[0009] The described technical problem is solved by a key having longitudinal grooves on wide blade surfaces and transversal notches of different heights on a narrow blade surface which key having in a blade on an optional place, preferably at the top of the blade, a through hole in which an element is inserted, which can freely rotate around its axis. The rotating element is a ring with a base surface being preferably annular. The rotating element is secured against falling out by a pin tightly fitting with the key blade and loosely fitting with the rotating element. The diameter of the rotating element is bigger than the thickness of the key blade, the lock cylinder should therefore have an additional groove in the longitudinal key channel of the lock cylinder, into which the key can be inserted, said additional groove corresponding to the element both in shape and dimensions. Besides plug pins in the cylinder casing the lock cylinder should have a pair of side blocking pins on an adequate place as described in the patent SI 9400135. The additional groove in the cylinder plug of the lock cylinder serves as a track when inserting the key blade into the lock cylinder. The rotating element and the pin which both are located on the key are not complicated in shape and can be produced by standard machines usually used in the manufacturing of lock cylinders and keys without a need for expensive three dimensional CNC machines. Inserting of the ring and the pin into the key blade can be solved by a minor mounting devices allowing exact positioning, which is needed upon insertion of the key into the lock cylinder for the ring not to cause additional friction in the lock cylinder and not to cause stopping of side blocking pins in the circumference of the lock cylinder.

[0010] The present invention will now be described in more detail on the basis of an embodiment and the accompanying drawings in which:

Fig. 1 shows an explosion figure of the key of the invention

Fig. 2 shows a cross-section of the key of the invention inserted into the lock cylinder

[0011] A key 1 for a lock cylinder 2 with standard dimensions having in a blade 10 longitudinal grooves 13 on at least one wide blade surface 12, transversal notches 15 of different heights and shape on a narrow blade surface 14, and at least one through hole 16 in which a rotating element 18 is inserted, the through hole 16 with preferably constant cross-section having its openings in a plane of wide surfaces 12 of the blade 10 of the key 1 and the rotating element 18 is inserted into the through hole 16 by means of a key pin 19 to freely rotate in the hole 16 while its moving in direction of the key pin 19 is impossible.

[0012] The through hole 16 is located on the blade 10 of the key 1 preferably in the part more distant from a grip portion 18 of the key 1. The shape and the diameter of the hole 16 depend on the inserted element 18 but should be such to meet all strength requirements needed in repeated unlocking of the lock cylinder. The shape of the cross-section of the through hole 16 depends on the shape of the rotating element 18 and is preferably rectangular, whereby the longer side of the opening of the hole 16 is parallel to the longitudinal axis of the blade 10 of the key 1. The position of the through hole 16 according to the height of the wide surface 12 of the blade 10 depends on positioning of side blocking pins 21 in the lock cylinder 2.

[0013] The rotating element 18 inserted in the blade 10 of the key 1 is an optional body preferably a cylinder with a central borehole or a ring body. The diameter of the rotating element 18 is smaller than the longer side of the opening of the hole 16 in the blade 10 of the key 1 to enable its free rotation in the hole 16 without friction and bigger than the thickness of the blade 10 of the key 1. The height of the rotating element 18 is smaller than its diameter. Its shape and thereby the shape of its cross-section is optional, but the edges between the basic surfaces and the casing should preferably not cause stopping or additional friction between the rotating element 18 and the longitudinal groove 22 of the cylinder plug 23 of the lock cylinder 2 when the key 1 is inserted into the lock cylinder 2.

[0014] The key pin 19 is shaped as a narrow long cylinder and is simultaneously loosely fit with the centric borehole 181 of the rotating element 18 and tightly fit with the borehole 17 lying in a plane of the blade 10 of the key 1, and having an opening on the narrow surface 14 of the blade 10 of the key 1.

[0015] The through hole 16 in the blade 10 of the key 1 is produced by cutting preferably by stamping and simultaneous forming of the basic shape of the key out of a blank, or subsequently, if this is more convenient for the producer. Both built-in parts, the rotating element 18 preferably in the shape of a cylinder, and the pin 19, are of simple shapes. Their production does not require special demanding machines. The cylindrical element 18 with the diameter bigger than its height and bigger than the thickness of the blade of the key simultaneously fulfils a need for additional parts or elements which are more difficult to be added in the key as to be taken away from the key blade to imitate the proper thickness and shape of the key. An advantage of a cylindrical element over other shapes of elements, e.g. a ball is also making the borehole for the pin and later on assembly. The positioning and the clamping of the cylindrical rotating element into a clamping device is much easier. When manufacturing the rotating element and the pin, it is important that both are produced within dimensions and tolerance demanded for lock cylinders. The production of the borehole

for the pin in the blade and the mounting of both elements into the key blade is solved by a minor mounting device which is not the subject of the present invention and which ascertains the needed precision in the manufacturing of such key despite its simplicity.

[0016] For the lock cylinder to accept a key with an additional built-in rotating element it must have, apart from its usual blocking pins, also an adequate number of side pins equalling the number of rotating elements which act together with the aforementioned rotating elements.

Claims

1. A key 1 for a lock cylinder 2 with standard dimensions having longitudinal grooves 13 in a blade 10 on at least one wide blade surface 12, transversal notches 15 different in height and shape on a narrow blade surface 14, and at least one through hole 16, in which a rotating element 18 is inserted, **characterized in that** the through hole 16 with a preferably constant cross-section has its openings in a plane of wide surfaces 12 of the blade 10 of the key 1 and the rotating element 18 is inserted into the through hole 16 by means of a key pin 19 to freely rotate in the hole 16, while its movement in direction of the key pin 19 is rendered impossible..

2. The key according to claim 1, **characterized in that** the through hole 16 is located on the blade 10 of the key 1 preferably in the part more distant from the grip portion 18 of the key 1.

3. The key according to claim 1, **characterized in that** the rotating element (18) is a cylinder body with a central borehole (181) preferably a ring body, the diameter of which is smaller than the longer side of the opening of the hole (16) in the blade (10) of the key (1).

4. The key according to claim 1, **characterized in that** the diameter of the rotating element (18) is bigger than the thickness of the blade 10 of the key 1.

5. The key according to claim 1, **characterized in that** the key pin (19) is simultaneously in tight fit with the blade (10) of the key (1) and in loose fit with the rotating element (18).

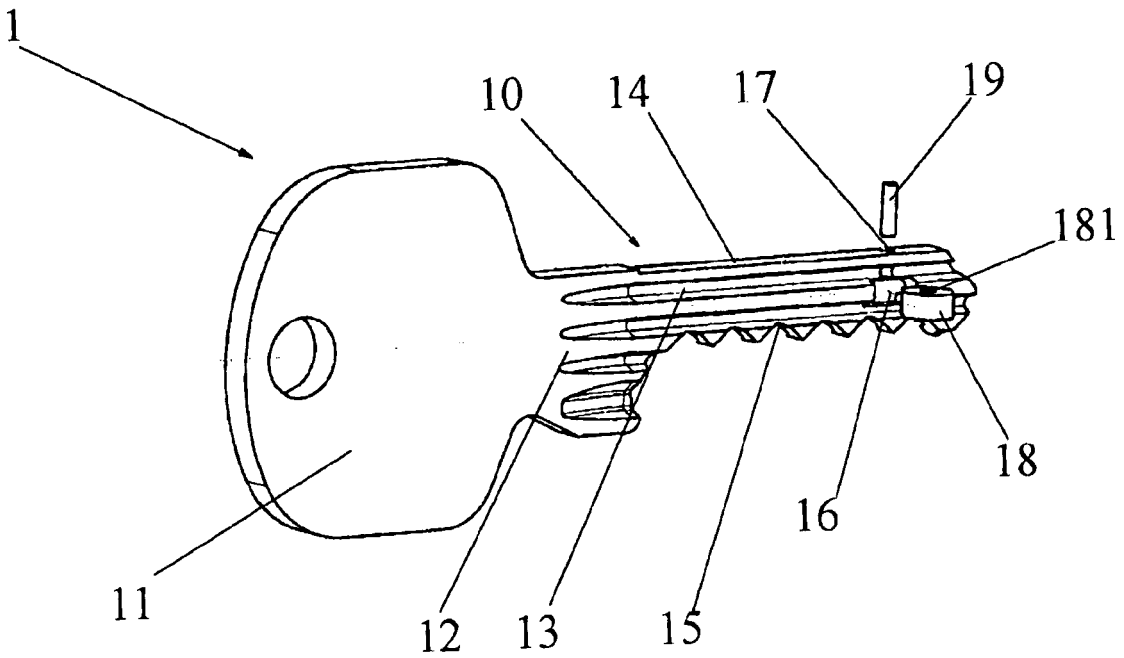

Fig. 1

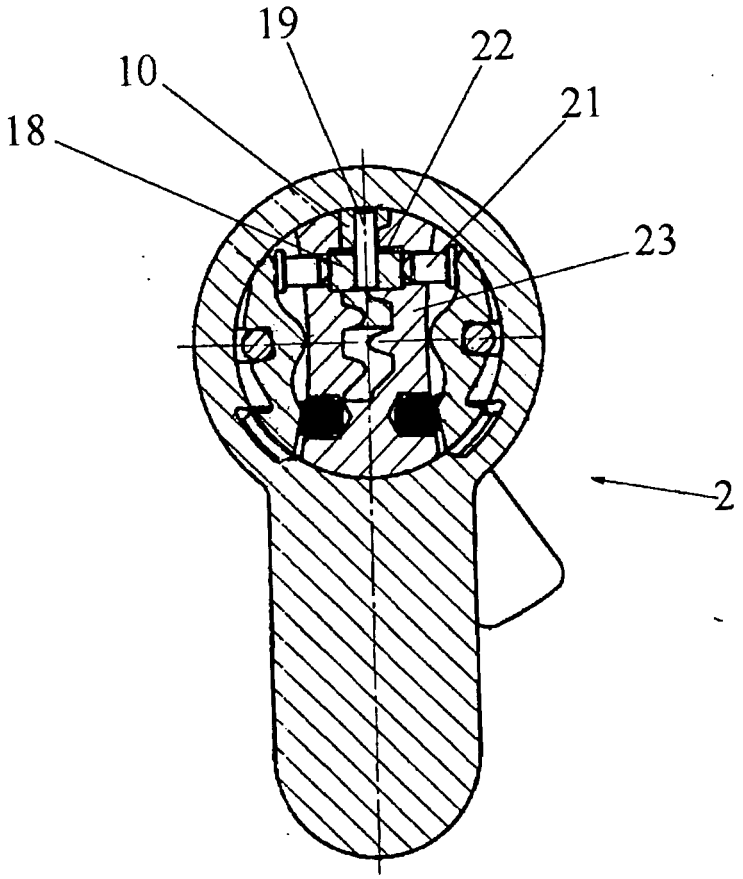

Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 46 8022

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)
X	WO 03/064795 A (DOM SICHERHEITSTECHNIK GMBH & CO. KG; BRAUN, PETER) 7 August 2003 (2003-08-07) * page 8, last paragraph - page 9, paragraph 1 *	1-5	E05B19/06
D,X	DE 100 58 590 C1 (DOM SICHERHEITSTECHNIK GMBH & CO KG) 25 July 2002 (2002-07-25) * the whole document *	1-5	
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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	Date of completion of the search	Examiner
The Hague	21 April 2005	Westin, K

CATEGORY OF CITED DOCUMENTS

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