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(71)(72) Applicant and Inventor: DI MOTTA, Benito [IT/IT]; Via Palestro, I-84100 Salerno (IT).

(74) Agents: ROBBA, Eugenio et al.; Studio "Interpatent", Via Caboto, 35, I-10129 Turin (IT).

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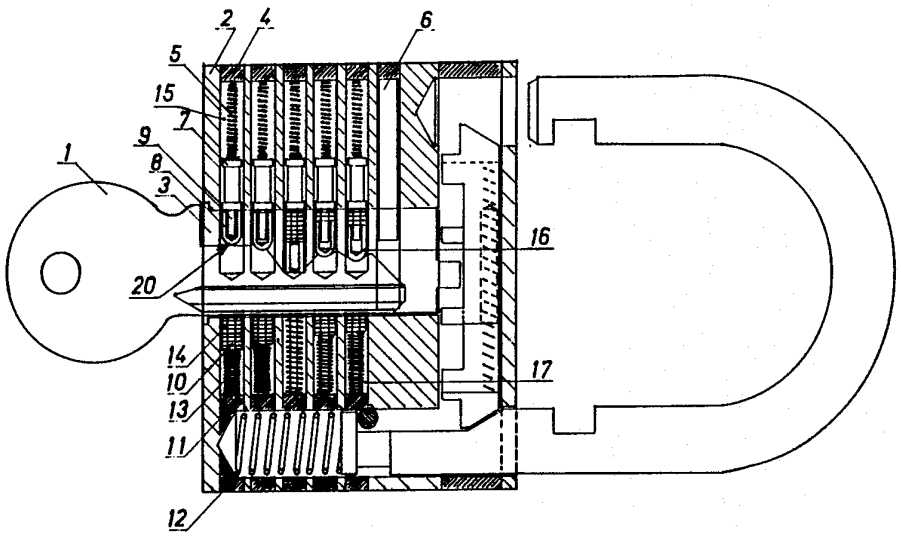
(54) Title: PISTON TUMBLERS FOR A CYLINDERLOCK WITH CHANGEABLE COMBINATION



(57) Abstract

Small pistons having an improved additional structure for a cylinder safety lock comprising an outer block cylinder (2) and an inner cylinder (3) rotatable within the former. Each composite lower pin (20) of a safety lock comprises a hollow piston (8) and a peg (9) slidably received within the piston, and the upper pins (7) of the outer cylinder are of a magnetic material to attract metal holed disks housed in cylindrical seats (17) of the outer cylinder (2) to automatically replace the opening key (1) with another key (1') having a different profile.

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Piston tumblers for a cylinderlock with changeable combination

The present invention concerns small pistons having an improved additional structure for a safety lock of the type known as Yale lock or cylinder lock that can be applied as a locking means both in padlock and the like, and for the closure of doors and similar devices.

The locks of this type comprise an outer cylinder fastened to the fixed portion of the lock, and an inner cylinder that is rotatably housed within the former thanks to a flat key having projections or teeth of different heights.

The lock further comprises a plurality of cylindrical seats radially extending within said outer cylinder, each of them receiving an upper pin and a helical spring, and a corresponding plurality of cylindrical seats in the inner cylinder, radially aligned with the former, each receiving a movable lower pin.

When the key is outside the inner cylinder, the springs push the pairs of pins (upper and lower ones) radially inwards and the upper pins position themselves in both seats, thus preventing the rotation of the inner cylinder and therefore the operation of the latch.

The lenghts of the lower pins are in general different

from one another so that only the introduction of a key having a proper teeth profile is able to cause the lifting of all the lower pins until their extremities are flush with the contact surface between the inner and outer cylinders, thus allowing for their mutual rotation.

A drawback of this type of lock is that the key replacement with another key having a different profile requires the change of the lock inner cylinder and is an operation not too easy to be accomplished.

The object of the present invention is that of providing an improved lower pin structure for a safety lock that allows for the replacement of the key by another having a different profile in a very easy and quick manner, without requiring a locksmith's intervention.

This object is achieved through the invention that consists of small pistons having an improved additional structure for a cylinder safety lock, comprising an outer block cylinder and an inner cylinder rotatable within the former; a first plurality of cylindrical seats radially extending within said inner cylinder, each of them receiving an upper pin and a helical spring; a second plurality of cylindrical seats in said inner cylinder, radially aligned with the seats of the outer cylinder, each receiving a movable lower pin, a third plurality of radial cylindrical seats in

the outer cylinder in a diametrally opposed position in respect of said first plurality, each receiving a helical spring and a plurality of holed disks stacked around a stem, characterized in that each lower pin comprises a hollow piston and a peg slidably received within the piston, and in that the upper pins are of a magnetic material.

The lock employs shim members to change the lenght of the lower pins in accordance with the profile of the key that is to open the lock later on. These shims are made up by holed metal disks housed in suitable magazines diametrally opposed with respect to the cylindrical seats of the upper pins that are attracted by said upper pins built as permanent magnets.

The invention will now be disklosed with reference to a non limiting embodiment shown in the attached drawings in which:

Fig. 1 is a cross section of a padlock incorporating a lock according to the invention; and

Fig. 2 is a transverse cross section of the padlock of Fig. 1.

With reference to the drawings, the cylinder safety lock comprises an outer block cylinder 2 and an inner cylinder 3 rotatable within the outer cylinder 2 by means of a flat key 1 having a predetermined profile. The cylinder 3 is held in seat within the outer cylinder 2 through stop plugs 6.

The outer cylinder 2 comprises five holes or cylindrical radially extending seats 15 having equal diameter, longitudinally positioned side by side, each of which receives an upper pin 7 pushed inwards by a helical spring 5 and is outwards closed by a plug 4. All the pins 7 have the same lenght and according to the invention are made up by a magnetic material so as to form permanent magnets.

In the inner cylinder 3, at axially corresponding positions, there are provided five cylindrical seats 16 with the same diameter of that of the cylindrical seats 15 and radially aligned with them. Each seat 16 receives a lower composite pin globally designated by reference 20, and comprising a hollow piston 8 within which a peg 9 is axially movable, both of them being of a material that can be magnetized, e.g. steel.

All the pins 20 have the same lenght, however their extension can be individually changed by means of holed disks 14 af a material that can be magnetized, the disks being adapted to be fitted around the peg 9 that protrudes under the attractive force of the corresponding permanent magnet 7. In Fig. 1 the third, fourth and fifth cylindrical seats contains a number of disks 14 (in general a different number in each seat) that increase the lenght of the lower composite pins in accordance with the profile of the key 1.

The safety lock further comprises five additional radial cylindrical seats 17 formed in the outer cylinder 3 at a diametrally opposed position in respect of the seats 15 and having an equal diameter.

Each of the seats 17 receives a helical spring 13 and a certain number of metal holed disks 14 stacked around a stem 10. Each seat 17 is outwardly closed by plugs 11 and 12.

The working of the safety lock is the following.

After a prearrangement, the lock is adapted to be operated through a key 1 having a given profile, thanks to the presence of a suitable number of disks attached to each of the composite lower pin, i.e. surrounding the peg 9 and changing the lenght of the associated composite pin 20. When the key is introduced into the lock keyhole, as shown in Fig. 1, the outer ends of the composite lower pins are positioned flush with the outer surface of cylinder 3 that can thus be rotated through 90° to cause the opening of the padlock.

The closure of the lock is achieved by rotating the key backwards into the position of Fig. 1 and withdrawing it, so that (all) the upper pins 7 can enter the seats 16 (although by different lenghts), thus creating a mechanical interference that prevents the rotation of the cylinder 3.

Should it be desired to replace the key 1 with another having a different profile, the key 1 is rotated by 180° and

withdrawn. This way, the cylindrical seats 16 are aligned with the seats 17 and (all) the disks 14 are pushed by the springs 13 to settle within the seats 16.

By introducing into the lock a new key 1' having a different profile of the teeth, the composite pins 20 will be pushed outwards for different lenghts (depending upon the profile of the new key), thus carrying back a corresponding number of disks 14 into each of the seats 17.

Now, through a rotation of 180° backwards in respect of the previous rotation, the inner cylinder 3 will carry with itself the corresponding disks, this way realizing a new pattern of the lower pins, such as to allow the lock to be opened only by the key used to realize such new pattern.

It is evident that the change of the key profile takes place automatically and does not require anything else but the new desired key. Further, a possible undesired rotation through 180° during the usual opening operation will not gring about any adverse consequence, although means to prevent such unintentional rotation will preferably be provided for.

Although the invention has been illustrated with reference to a padlock, it generally applies to all the types of cylinder locks.

C L A I M S

1. A small pistons having an improved additional structure for a cylinder safety lock, comprising an outer block cylinder (2) and an inner cylinder (3) rotatable within the former; a first plurality of cylindrical seats (15) radially extending within said inner cylinder (2), each of them receiving an upper pin (7) and a helical spring (5); a second plurality of cylindrical seats (16) in said inner cylinder (3), radially aligned with the seats of the outer cylinder, each receiving a movable lower pin (14), and a third plurality of radial cylindrical seats (17) in the outer cylinder (2) in a diametrally opposed position in respect of said first plurality, each receiving a helical spring (13) and a plurality of holed disks (14) stacked around a stem (10), characterized in that each lower pin (20) comprises a hollow piston (8) and a peg (9) slidably received within the piston, and in that the upper pins (7) are of a magnetic material.

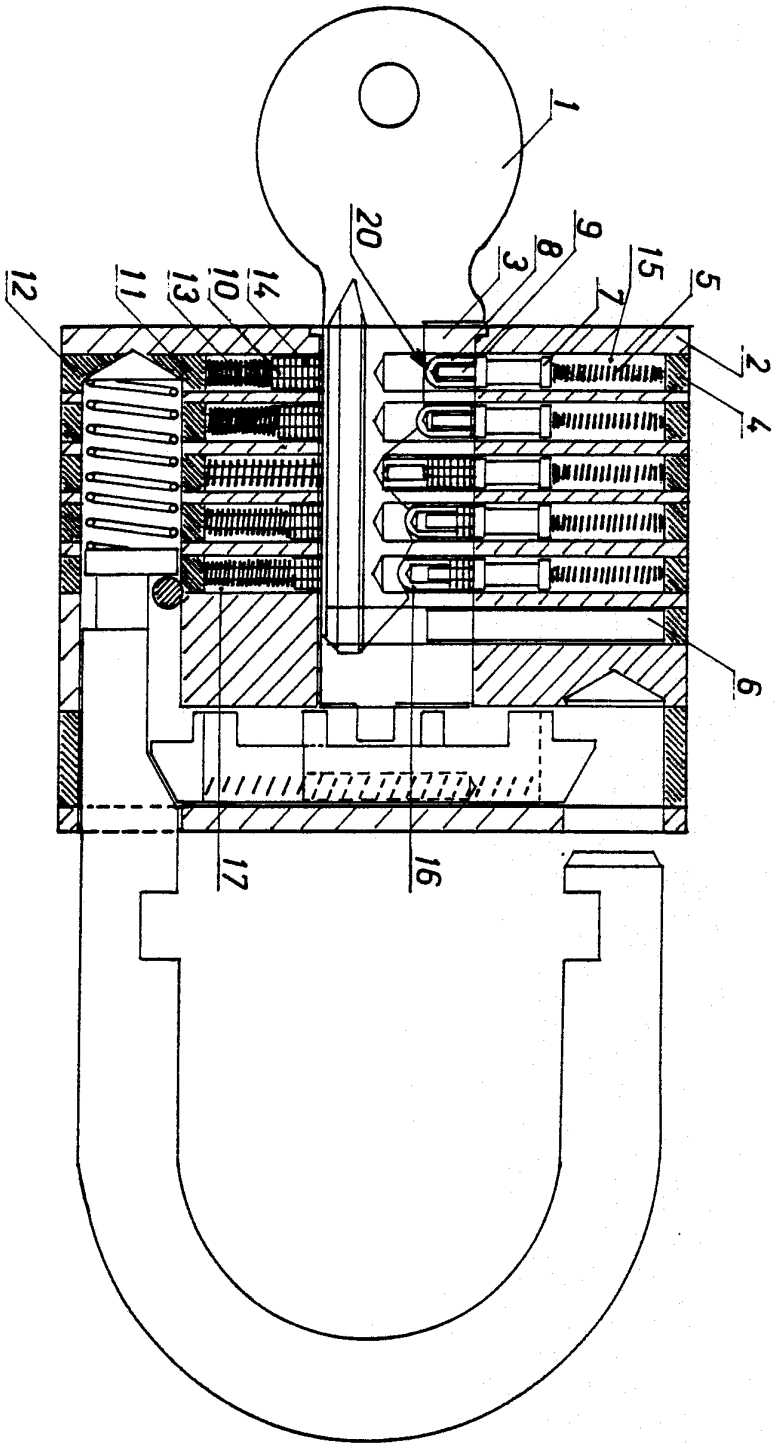

FIG. 1

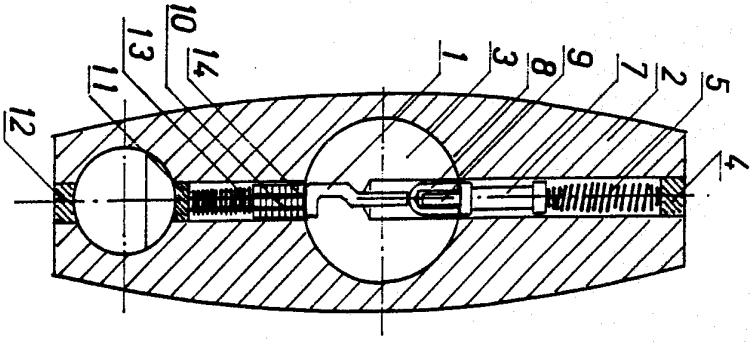

FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 90/01665

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: E 05 B 27/00, E 05 B 35/08

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	E 05 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	GB, A, 2066347 (KABUSHIKI KAISHA GOAL) 8 July 1981 see the whole document	1

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* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
17th December 1990	14 JAN 1991
International Searching Authority	**Signature of Authorized Officer**
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. EP 9001665 SA 40715

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 04/01/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2066347	08-07-81	JP-A,B,C56097075	05-08-81
		CH-A- 642137	30-03-84
		DE-A,C 3048222	24-09-81
		NL-A- 8006983	16-07-81
		US-A- 4403486	13-09-83