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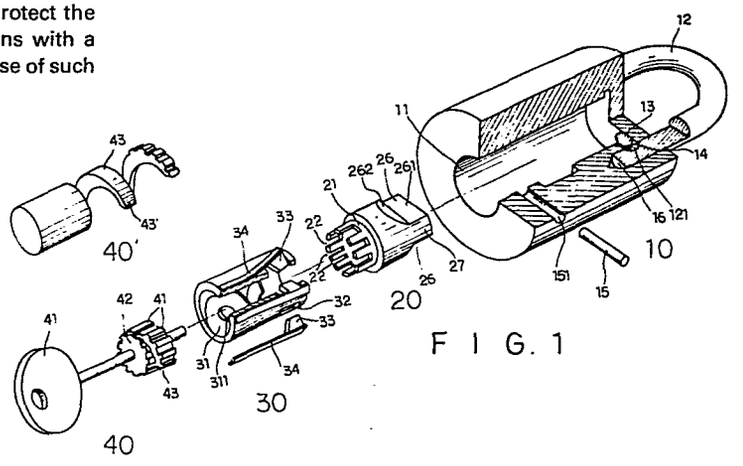
(54) Cylinder lock resistant to picking.

(57) The cylinder lock comprises a body (10), a cylinder (20), a bush (30), and a key (40) to unlock this lock, characterised in that the keyway has a spiral entrance (31) which allows only the entry of a specialised key (40), and in that the ward mechanisms are arranged around the periphery of the cylinder (20), contrasting with those of a conventional cylinder lock which are arranged on a plane, to protect the lock against being picked by unauthorised persons with a wire or skeleton key, and to prolong the life of the use of such lock.



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TITLE MODIFIED
see front page

UNPICKABLE CYLINDER LOCK

The present invention concerns a cylinder lock which an adroit picker finds it difficult to pick with a wire or a skeleton key, and which has resilient means far more durable than conventional cylinder locks.

Basically, conventional cylinder keys comprise substantially a planar key with an indented edge, a cylinder, and a body internally provided with a plurality of pin tumblers resiliently retained in a tunnel orienting to the keyway. When a key with a contoured profile on one edge is inserted into the keyway from the keyhole, the pins will be contacted by these undulation, and once the correct key is inserted thereinto, then the pin tumblers will all be arranged in such a position as to allow the cylinder to be turned. Straight in structure, the keyway of such conventional lock are liable to be picked by probing a wire therein. Moreover, the resilient means, generally springs, which urge the pin tumblers against the notches of a key at a specific level to discriminate if the key is the correct one, are hair-spring thin. After some use accumulation of rust or dirt may lead to failure of such fine parts, thus reducing the life of the lock.

Still further, traditional locks are complicated in their construction which means that these are difficult to assemble and to manufacture and which also means that the cost of production is high.

It is the main object of this invention to provide a cylinder lock which obviates the above defects in that the lock is more secure against unauthorised unlocking without the use of the correct key and also that the use of spring loaded wards is obviated. Thus the life of the lock is increased.

To prevent the lock from being picked by probing a wire or a skeleton thereinto by unauthorised persons, the keyhole of this invention is designed a spiral entrance that allows only the entry of specialised keys, the front end of which is provided with a plurality of projections arranged around the periphery thereof, corresponding to equal number of slots provided at one end of the cylinder, in each of which slots there rests a ward piece resiliently urged thereinto to prevent the rotation of the cylinder, which ward piece is pushed outwardly away from the slot and no longer hinders the rotation of the cylinder when a corresponding projection enters the slot. Only when all the projections of the key exactly coincide with the slots of cylinder can the key be pushed to such an operating position that its projections may urge against the ward pieces. If the projections outnumber the slots, the key is not allowed to reach this position. On the other hand, if the slots outnumber the projections, even if the key is permitted to reach the operating position, there still exists at least one ward piece that hampers the rotation of the cylinder.

Another feature of this invention is that the resilient means can be economically a thick metal reeds instead of the springs fabricated by extremely fine wire, thus

enhancing the durability and reducing the cost of the manufacture thereof.

Other and important objects of this invention will be apparent from the following description, claims and accompanying drawing.

Figure 1 is an exploded perspective view of a cylinder lock constructed in accordance with the invention;

Figure 2 is a longitudinal cross-sectional view of the assembled lock of Figure 1 with the key in position;

Referring now to the drawings, the cylinder lock according to the invention includes a body, a cylinder, a bush and a key, generally designated by reference numerals (10), (20), (30), and (40) respectively.

In the preferred embodiment of Figure 1, the body has a bore (11) which receives cylinder (20) and bush (30), the former being rotatable therein, whereas the latter being immovably secured in place, for example by passing a pin (15) through hole (151).

Hook (12) has a recess (121), the dimension and the position of which allow one part of ball (13) retained within a hole (14) to enter when the hook is in locked position in blind hole (16) so that it cannot be pull up. Like structure may be formed at the other leg of hook (12). (See Figure 2).

At one end of cylinder (20) there are provided with two

opposite recesses (26), each of which is formed by a cutout defined by two intersecting faces(261) (262). When the cylinder is turned to a position such that face (261) directly opposite to ball (13), i.e. normal to the long axis of hole (14), the clearance between the inner wall of body (10) and the upper end of cylinder is broadest and enough to allow the ball to totally leave recess (121) to free hook (12) so that the latter can be unlocked (see Figure 2). Similarly, when cylinder (20) is turned in reverse direction, the non-recessed portion (27) urges ball (13) back into recess (121) to lock hook (12).

To allow only selective entry of specific keys, the outer end of bush (30) is provided with a spiral entrance (31) which is structured so that only an object with spiral structure of which the pitch and lead angle substantially coincides with that of the entrance is allowed to be screwed thereinto. Further, to discriminate whether or not the key thus enters is the correct one, the lower end (21) of cylinder (20), which is nested in the upper end of bush (30), forms a plurality of slots (22) spaced apart from each other around the periphery of end (21) and extending along the length of cylinder (20). Complementary to these slots, the end of key (40), in a preferred embodiment, forms an enlarged end (42) provided with a plurality of projectors (41) arranged around the periphery thereof, the dimension and position of which projections substantially coincide with the slots (22), and at the site at the upper end of bush corresponding to each slot (22) there is a hole (32), through which a ward piece (33) is resiliently urged

inwardly to reach one of said slots (22). The projections are preferably ridges extending along the length of said key. Preferably ward piece (33) is inseparably fixed to one end of a spring reed (34), the other end of the latter being secured to the outer wall of bush (30) by, for example, welding or by a screw (not shown).

To allow key (40) to be screwed into the lock through the spiral entrance (31), there is provided a spiral groove (43) extending across the projections (41), which spiral groove (43) is biten into by the helical edge (311) of spiral entrance (31), thereby allowing the key to be screwed into the bush to reach cylinder. When the whole length of spiral groove passes through the spiral entrance, the key can be directly pushed axially so that the projections fit into their corresponding slots.

With the projections, the enlarged end (42) of the key looks like a gear. However, unlike the gears, the width of each projection and the distance between any two adjacent projections may differ greatly at random, depending on the design of the slots (22). As all of the pitch and the lead angle of the spiral entrance, and the position and number of the slots may vary arbitrarily, the probability that a lock happened to be unlocked by the key of another such lock is extremely low, thus ensuring high security and reliablility of this invention.

An alternative modification of the key (40), designated by (40'), is also feasible. It has a spiral shank (43'), with a length of its front forming a plurality of projections at the outer side. To adapt to such modification, the slots (22) of cylinder (20) and the ward

pieces (33) and holes (32) of bush (30) must be arranged in a spiral trajectory instead of a circumference. This is easy to understand, and therefore not illustrated in the drawing. However, the spiral shank must be structured so that it, before reaching the slots, can be pushed inwardly a short distance in axial direction to fit its projection into mating slots.

CLAIMS :

1. A cylinder lock and a key for unlocking this lock, comprising:
a body (10) with a hook (12), and locking means to prevent said hook from being pull from locked position to unlock position;
a cylinder (20), with its upper end structured so as to effect said locking means to allow said hook to be pull when said cylinder is turned to a certain position;
a bush (30), with one of its end forming a spiral entrance (31) that allows only objects with like pitch and lead angle to be screwed thereinto;
said key (40) being structured so that it can be screwed into said lock through said spiral entrance (31), and then pushed a distance along the axial direction of said lock;
said cylinder (20) being rotatably retained in said body (10), while said bush (30) being immovably secured in said body, and provided with a plurality of ward means to prevent the rotation of said cylinder (20);
the lower end of said cylinder (20) being provided with a plurality of female locking means, arranged at the sites corresponding to the position of each of said ward means of said bush, in a manner such when said lock is in locked condition, each of said ward means effect on their corresponding female locking means to prevent the rotation of said cylinder (20);
a length from the tip end of said key (40) being provided with a plurality of male locking means corres-

ponding to said female locking means in a manner such that when said key is screwed into said lock and pushed axially a distance, each of said female locking means engages with a corresponding male locking means and relievesthe effect of said ward means so that said cylinder can co-rotate with said key in said body.

2. The lock according to Claim 1, wherein said locking means to prevent said hook from being pull are a ball (13) reciprocably retained in a hole (14) of said body (10) communicating with a recess (121) on one leg of said hook, in a manner such that when said lock is in locked condition, part of said ball (13) is urged by the upper and of said cylinder (20) to fit into said recess, and when said lock is in unlocked condition, said ball can completely leave said recess (121).

3. The lock according to Claim 1 or 2, wherein the upper end of said cylinder (20) has at least a recessed portion which allow said ball (13) to enter when said cylinder (20) is turned to unlocked position.

4. The lock according to Claim 1, wherein said ward means are a plurality of ward pieces (33) resiliently urged to engage with said female locking means of said cylinder (20).

5. The lock according to Claim 1, wherein said female locking means are a plurality of slots (22) arranged around the periphery of said cylinder (20), extending

axially, and opening at the lower end of said cylinder.

6. The lock and key according to Claim 1, 4, or 5, wherein said male locking means are a plurality of projections (41) corresponding to said slots (22) and are designed such that when one of such a projection (41) engages with its corresponding slot (22), the corresponding ward is repelled outward and no longer prevent the rotation of said cylinder (20).

7. The lock according to Claim 1, 4, 5, or 6, wherein said bush (30) is provided with a hole at each site of said ward piece (33) to allow the latter to pass through.

8. The lock according to Claim 1 or 4, wherein each of said ward pieces (33) is fixed to a spring reed fixed on the outer wall of said bush and resiliently urging said ward piece toward said slot.

9. The key according to Claim 1 or 6, characterised in that said projections (41) are a plurality of ridges extending along the length of said key (40) and spaced around an enlarged portion near the tip end of said key (40).

10. The key (40) according to Claim 9, wherein said enlarged portion is provided with a spiral groove (43) around said portion and cutting across said ridges; the width, depth, pitch, and lead angle of said groove being such that it enable said key to be screwed

through said spiral entrance (31) into said lock.

11. The key according to Claim 1, characterised in that its anterior portion is a spiral shank with at least a length thereof provided with a plurality of projections corresponding to the slots of said cylinder, the dimension, pitch and lead angle of which shank being such that it can be screwed into said lock through said spiral entrance (31) and then pushed axially a distance so that its projections may fit into corresponding slots (22) of said cylinder (2).

12. The lock and key according to Claim 1, wherein the spirality of said entrance of said key can be either clockwise or counterclockwise viewing from the gripping end of the key.

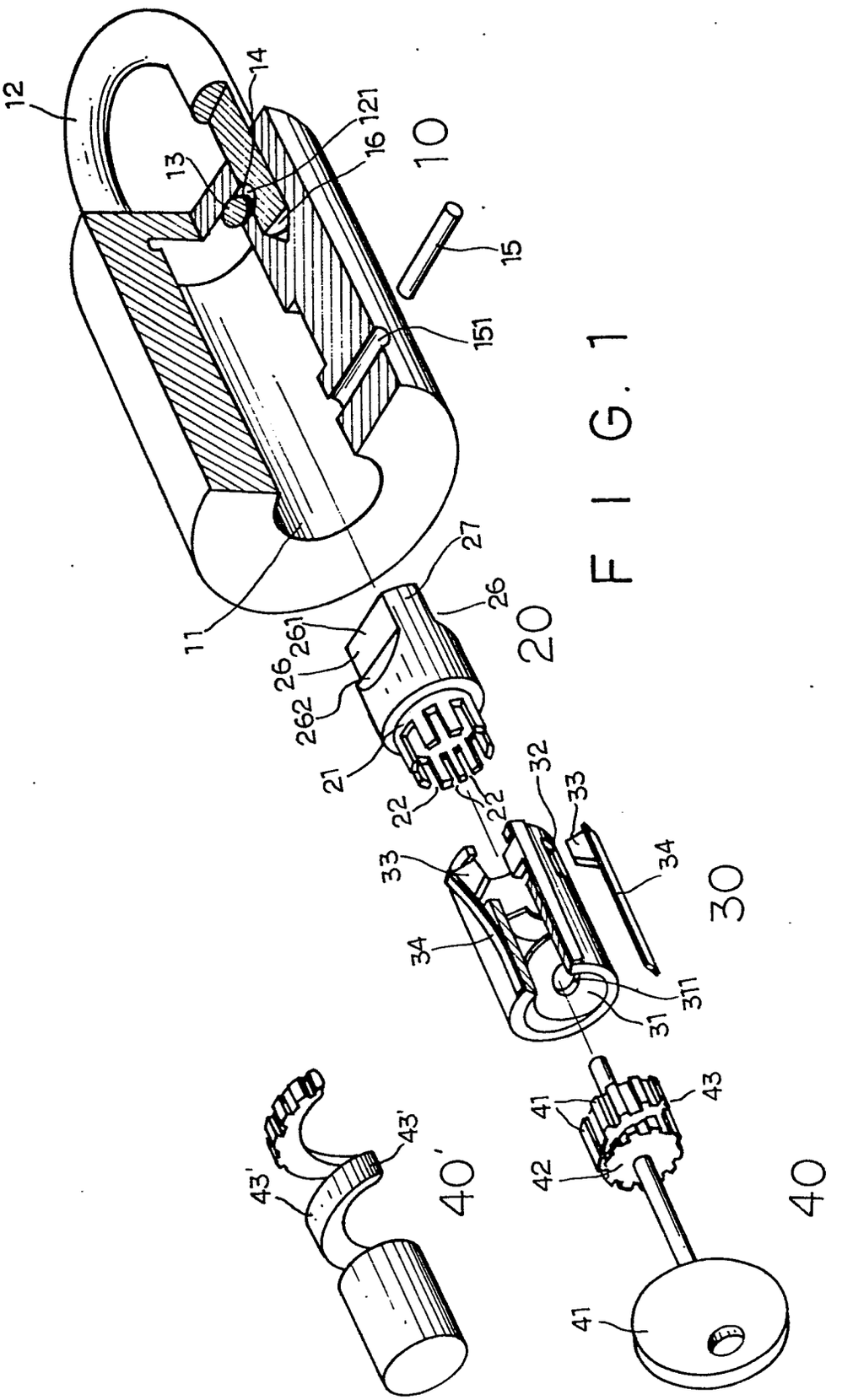
12
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FIG. 1

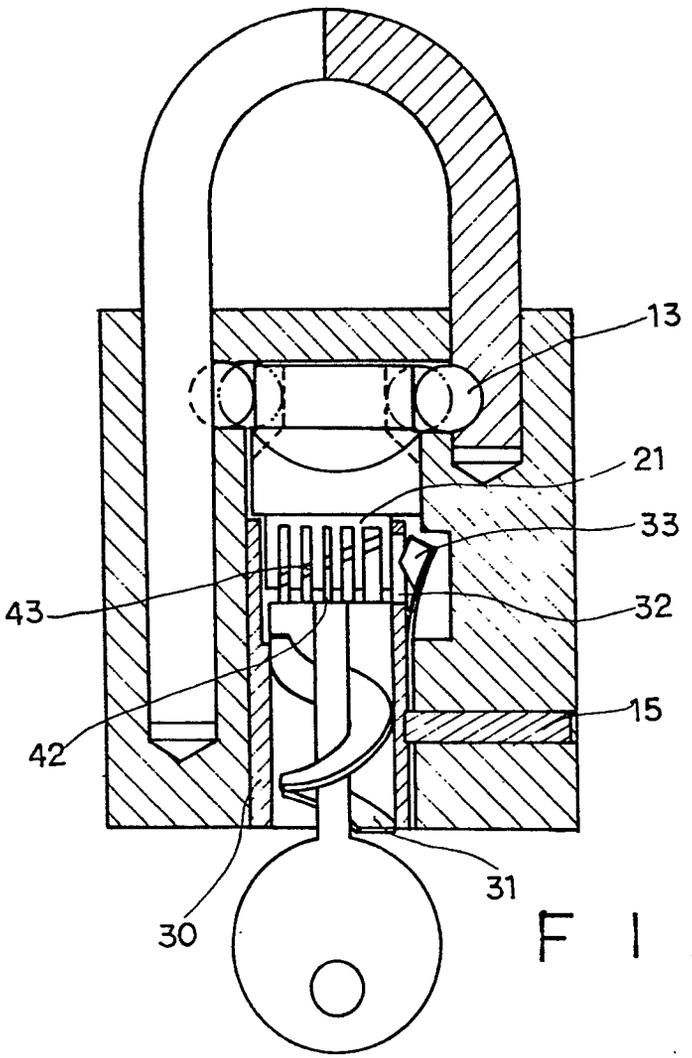

FIG.2

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Application number

EP 81 10 3287.9

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EUROPEAN SEARCH REPORT

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.³)
	US - A - 1 849 070 (C. BUEHNER) * complete document *	1, 10-12	E 05 B 67/26 E 05 B 19/00
A	DE - C - 179 910 (C. JOACHIM) * complete document *	1,6,9	
A	DE - C -593 541 (E. GROSS) * claim; fig. *	1,10	
A	US - A - 1 526 728 (J.S. WAGNER) * complete document *	1,10, 12	TECHNICAL FIELDS SEARCHED (Int. Cl.³)
A	US - A - 2 460 551 (G.E. SWANSON) * complete document *	4, 6-8	E 05 B 19/00 E 05 B 21/00 E 05 B 29/00 E 05 B 67/00
A	US - A - 3 320 783 (W.J. KERR) * column 3, lines 26 to 42; fig. *	1	
A	US - A - 4 138 868 (F.F. RICHARDS) * fig. 1, 2 *	2,3	

CATEGORY OF CITED DOCUMENTS

- X: particularly relevant
- A: technological background
- O: non-written disclosure
- P: intermediate document
- T: theory or principle underlying the invention
- E: conflicting application
- D: document cited in the application
- L: citation for other reasons
- &: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	02-12-1981	WUNDERLICH