

MG/et

Ernst Keller

This Sheet Has Been Replaced

Key and cylinder for a safety lock

5 The invention relates to a key and cylinder according to the preamble of the independent patent claim 1 and a key for a cylinder with an additional tumbler.

10 Keys of this generic type have the advantage that it is hardly possible for them to be copied without authorization owing to the control element arranged in the shank and thus that the lock systems equipped with such keys have a higher security value. The keys of this generic type which have previously been disclosed, also called "mechanical keys", are, however, still subject to various disadvantages such that, despite the very high security against copying, these keys, in particular as turning keys, have not yet become very widespread.

15 A key of this generic type has been disclosed, for example, by DE-A-35 17 660, which key can be inserted into the keyway of a cylinder and has, in its flat shank, a movable device with which an additional tumbler can be moved into the release state. The movable device of the key comprises a projecting pin which is held displaceably in a blind bore of the key. Arranged additionally in the blind bore is a spring which presses the pin outwards, the pin being prevented from dropping out by steps in the blind bore of the shank and on the pin. Protruding pins are generally disadvantageous in a key since the key easily becomes stuck on the pin.

25 A further key of this generic type has been disclosed by US-A-4,667,495, which key has a pin which is displaceable to a limited extent for positioning the additional tumbler in the shank. When the shank is introduced into the keyway, the pin moves up onto a ramp which is arranged in the rotor and displaces the pin

THIS SHEET HAS BEEN
REPLACED



radially, and the latter thus positions the additional tumbler. In order that the ramp can move towards the pin when the shank is introduced, grooves or other recesses are required on the shaft, which limit the surface available for control bores in the case of a flat key. In practice, the pin therefore has to be arranged as near to the front end of the shank as possible. The loosely displaceable pin usually protrudes with one end on the shank, which means that, here too, the key can become hooked.

A key of this type has likewise been disclosed by EP-A-202 949. In this case, the additional tumbler is likewise positioned by a pin mounted so as to be displaceable to a limited extent in the key shank, which means that the difficulties mentioned above also exist in this case.

The invention is based on the object of providing a key and cylinder of the said generic type, which does not require recesses for a ramp arranged in the cylinder on the outer side of the shank, and which can nevertheless be produced in a simple manner and is extremely secure against copying. The object is achieved by the invention according to Claim 1.

In the key according to the invention, the control element can be precisely flush on the outside with a narrow side of the key, such that such a key can only be differentiated from one without a control element if scrutinized closely. If a corresponding control element is absent in a copied key, the tumbler of the rotor moves radially outwards into the locking position when the key shank is inserted into the keyway. The rotor now cannot be turned and the lock thus cannot be opened. If, instead of the control element, the key has a bore on the corresponding outer side of the key, the tumbler of the rotor blocks the cylinder whenever this tumbler has reached a counter-bolt in the stator after a specific turn of the rotor. This counter-bolt is then not positioned as a result of the absent control element and blocks the cylinder by means of engagement in the recess



of the rotor.

The cylinder can be produced in a comparatively simple and thus cost-effective manner. The additional measures on the stator are comparatively simple, since
5 only a conical depression has to be machined on the inner side of the stator. The tumbler of the rotor can be a quite simple bolt which is guided so as to be radially displaceable without spring loading in a blind bore of the rotor.

10 According to a further development of the invention, the stator has an insert which has the said recess for the tumbler which interacts with the control element. The insert can be produced in a relatively simple manner from hardened steel or from hard metal,
15 thus considerably improving the security against forcible opening of the cylinder. Further advantageous features emerge from the other dependent claims, the following description and the drawing.

An exemplary embodiment of the invention is
20 explained in greater detail below with reference to the drawing, in which:

Figure 1 shows a cross-section through a cylinder according to the invention with an inserted key;

25 Figure 2 shows a cross-section according to Figure 1, but after the rotor has been turned through 90°;

Figure 3 shows a section according to Figure 2, but with a key without a control element;

30 Figures 4a and 4b respectively show a view and a cross-section through an insert;

Figures 5a and 5b respectively show a view and a cross-section through a stator housing;

Figures 6a and 6b show views of a rotor; and

35 Figures 7a and 7b respectively show a partial view and a section through a key according to the invention.

Figure 1 shows a stator 3 with a customary steel casing 4 and a housing 5 in which a rotor 1 is rotatably



mounted. By means of a key 7 introduced in a keyway 2 of the rotor 1, customary pin tumblers (not shown here) are positioned, it being possible for the rotor 1 to be turned to actuate a lock which is not shown in greater detail here. To position these customary tumblers, the key 7 has corresponding blind bores. However, the key 7 can also be a so-called notch key, in which case the cylinder is then obviously adapted accordingly.

As shown in Figures 5a and 5b, the housing 5 of the stator 3 can be produced from lamellae 30 which are soldered together. The lamellae 30 are preferably made of hardened steel. Provided at the rear end of the housing 5 in the upper region is a partially circular recess 29 into which a curved insert 6, preferably made of hardened steel or hard metal, is inserted. The insert 6 has a conical blind bore 6a which interacts with a tumbler 15 of the rotor 1. The housing 5 additionally has longitudinal channels 25 into which slides 19 are inserted, which are known per se and in which housing pins 16 with their springs 20 are guided in bores 31. Such slides 19 are known per se.

The rotor 1 is provided with a radial bore 28 into which a bush 13 with a through bore 14 is inserted. A tumbler 15 in the form of a cylindrical bolt is guided so as to be radially displaceable in the bush 13 which is preferably produced from hardened steel. The radially outer end of the tumbler 15 has a conical surface 15a which is designed to correspond to the bore 6a of the insert 6. A cylindrical part 15b arranged at the other end of the tumbler 15 protrudes through or into the opening 14 in the bush 13. As shown in Figure 1, when a key 7 is introduced in the keyway 2, the tumbler 15 is pressed radially outwards against the insert 6 by a control element 10.

The key 7 preferably has two control elements 9 and 10 which are inserted into a continuous stepped bore 8 at the front end of the key shank, and which are held by a common compression spring 12 in the positions shown in Figure 1. The two control elements 9 and 10 are



cylindrical pins, each having a radially outwardly protruding flange 9a and 10a respectively. The flange 9a rests against a shoulder 8a of the stepped bore 8, thus preventing the control element 9 from being able to move out of the stepped bore 8 at the outer end. The flange 10a of the control element 10 rests correspondingly against a casing 11 which is inserted by press-fitting into the stepped bore 8. As can be seen, the control faces 9b and 10b of the elements 9 and 10 are precisely flush with the narrow sides 7a of the key 7 in the positions shown in Figure 1. The mechanical control device with the elements 9 and 10 and the compression spring 12 can be produced in a comparatively simple manner and is functionally reliable.

The control elements 9 and 10 can be moved inwards into the stepped bore 8 to a limited extent counter to the restoring force of the compression spring 12. The purpose of this mobility emerges from the following functional description.

In order to actuate the cylinder, the shank of the key 7 is inserted, as is customary, into the keyway 2. In this case, the customary tumblers (not shown here) are positioned by the customary bores of the key. In the arrangement shown in Figure 1, the tumbler 15 is additionally raised by the control element 10 so that it engages in the recess 6a of the insert 6. If the key is turned, it would then correspondingly be the control element 9 which would correspondingly raise the tumbler 5. Since the tumbler 15 and the control element can now be moved inwards counter to the restoring force of the compression spring 12, the rotor 1 can be turned with the key, for example anticlockwise in Figure 1, despite the engagement of the tumbler 15 in the recess 6a. This is obviously only possible if the recess 6a and correspondingly the surface 15a are of conical design. When the rotor 1 is turned, the tumbler 15 moves radially inwards until a flat end face 15b has reached the shearing line 27 between the rotor 1 and the stator 3.

If it is now attempted to actuate the cylinder



with a key without a movable control element, the rotor 1 will be blocked by the tumbler 15 even when the customary tumbler is positioned, since the said tumbler 15 rests against the shank of the key and cannot deflect radially inwards. If the insert 6, the tumbler 15 and the bush 13 are made of hard material, for example hardened steel, it is impossible, even using force, to turn the rotor 1. If higher forces are applied, the gripping part of the key is then simply broken off.

10 If, instead of a control element 9 or 10, a key 24 according to Figure 3 has a bore 33 at a corresponding position, the tumbler 15 is not engaged with the insert 6 and, correspondingly, with the customary tumblers being positioned the rotor can provisionally be turned. After
15 the rotor has been turned through 90° clockwise or anticlockwise, however, the counter-bolt 16 in this case drops into the interior of the casing 13 and blocks the cylinder. In this case, the rotor 1 cannot be turned into the position in which the lock is unlocked. If a key 7
20 according to the invention and provided for the cylinder is used, the counter-bolt 16 is positioned by the tumbler 15, and the rotor can thus be turned further than 90° into the position in which the lock is unlocked. In order that the tumbler 15 can position the counter-bolt 16, the
25 compression spring 12 is designed to be stronger than the compression spring 20 which presses the counter-bolt 16 radially inwards. As is customary per se, the counter-bolt 16 has a conical bore 23 which is designed to correspond to the surface 15a of the tumbler 15. The
30 counter-bolt 17 arranged opposite with the bore 22 and the compression spring 21 fulfils precisely the same function. It is illustrated clearly in Figure 2 how the counter-bolt 16 is positioned by the tumbler 15 at a corresponding rotary position of the rotor 1. When the
35 rotor 1 is turned further out of this position, for example anticlockwise, the tumbler 15, in turn, deflects radially inwards, the control element 10 correspondingly also being moved radially inwards counter to the restoring force of the compression spring 12. As can be



- 7 -

seen, the cylinder can be actuated, as is customary, by means of an associated key 7 according to the invention. In the case of a key without a control element, however, actuation is impossible even when high forces are applied.

5

THIS SHEET HAS BEEN
REPLACED



Patent claims

1. Key and cylinder for a safety lock, having at least one control element (9, 10) which is arranged in the shank of the key (7) and interacts with an additional
5. tumbler (15) of the rotor (1), the control element (9, 10) being radially displaceable counter to the restoring force, for example of a compression spring, characterized in that the stator (3) has, on the inner side, a recess (6a) in which the tumbler (15) of the rotor (1) engages
10. due to the action of the control element (9, 10), in that, when the rotor (1) is turned, the tumbler (15) can be moved radially inwards counter to the restoring force, and in that a counter-bolt (16) is arranged with spacing from the recess (6a), which counter-bolt can be
15. positioned by the tumbler (15).

2. Key according to Claim 1, characterized in that an insert (6) is inserted into a recess (29) of the stator (3), which insert has the recess (6a) which interacts with the tumbler (15).

20. 3. Key according to Claim 2, characterized in that the insert (6) consists of hardened steel or hard metal.

4. Key according to Claim 2 or 3, characterized in that the insert is of curved design.

5. Key according to one of Claims 1 to 4,
25. characterized in that the recess (6a) is a conical bore.

6. Key according to one of Claims 1 to 5, characterized in that the tumbler (15) is a bolt which is guided displaceably in a bush (13).

7. Key according to one of Claims 1 to 6,
30. characterized in that the shank of the key (7) has a continuous stepped bore (8) into which a compression spring (12) is inserted, which acts upon two mutually opposite control elements (9, 10).

8. Key according to Claim 7, characterized in that
35. a casing (11) is pressed into the stepped bore (8), in which casing a control element (10) is guided.

9. Key according to Claim 8, characterized in that the control elements (9, 10) each have, at the inner end,

THIS SHEET HAS BEEN
REPLACED



* C L M S *

- 9 -

This Sheet Has Been Replaced



a flange (9a, 10a) which rests against a shoulder (8a) or the casing (11).

10. Key according to one of Claims 7 to 9, characterized in that the control elements (9, 10) have
5 control faces (9b, 10b) which are flush with narrow sides (7a) of the key (7).

THIS SHEET HAS BEEN
REPLACED