Lock and key with double code pattern

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a lock and key combination including a cylinder lock and a key with a flat key blade. ~~The lock has a rotatable key plug having a key slot for receiving a flat key blade, and at least two side locking tumblers in the cylinder lock, said side locking tumblers being guided for elevational and possibly also rotational movement in associated chambers in said key plug and having transverse fingers projecting into the key slot for engagement with the key blade, upon inserting the key into the key slot. The key blade has an associated code pattern in a side recess for engagement with said side locking tumblers and positioning said side locking tumblers into positions that allow the key plug to rotate in the cylinder lock upon inserting a correctly coded key into the key slot.~~

Such locks and keys are previously known, e.g. from the US patents 4,756,177 and 5,715,717 (both in the name of Bo Widén). These known lock and key systems provide a high level of security and offer a large number of code combinations.

Furthermore, the Austrian patent specification AT 392 508 B discloses a similar lock and key combination where the transverse fingers of the side locking tumblers have different lengths, one having a first, short length and another one having a second, long length, wherein the short fingers engage with a primary code surface having a number of first code surface portions at an external portion of said side recess of the key blade, and the long fingers engage with a secondary code surface having a number of second code surface portions at an internal, deeper portion of said side recess of the key blade.

~~OBJECT OF THE INVENTION~~

~~Against this background, the present invention aims at providing~~ It would be desirable therefore to provide an even higher number of code combinations while retaining at least the same or an improved security level.

SUMMARY OF THE INVENTION

The present invention provides a lock and key combination including

- a cylinder lock with a rotatable key plug having a key slot for receiving a flat key blade,
- a key with said flat key blade, and
- at least two side locking tumblers in said cylinder lock, said side locking tumblers being guided for elevational and possibly also rotational movement in associated chambers in said key plug and having transverse fingers projecting into said key slot for engagement with said key blade, upon inserting said key into said key slot, and
- an associated code pattern in a side recess of said key blade for engagement with said transverse fingers and positioning said side locking tumblers into positions that allow said key plug to rotate in said cylinder lock upon inserting a correctly coded key into the key slot,
- said fingers having different lengths, at least one having a first, short length and at least one having a second, long length,
- the short fingers engaging with a primary code surface having a number of first code surface portions at an external portion of said side recess of the key blade, and the long fingers engaging with a secondary code surface having a number of second code surface portions at an

- internal, deeper portion of said side recess of the key blade,

characterized in that

- said transverse fingers are each located at a specific longitudinal position which is centered in relation to or is longitudinally displaced from a transverse plane extending through a central axis of the associated chamber, and
- said first and second code surface portions of said key are specifically distributed longitudinally so as to allow said transverse fingers to be seated on said first and second code surface portions upon inserting the key into the key slot,
- wherein said first and second code surface portions are located at distinct positions which are generally variable or separated in three dimensions in said flat key blade, namely
- in a direction upwards and downwards in a vertical plane defining said flat key blade,
- in a depth direction which is perpendicular to said vertical plane, and
- in a longitudinal direction along said key blade,

such that a compact code pattern with an increased number of code combinations is formed on the key blade.

The present invention also provides a key for operating a cylinder lock having a key plug with a key slot and at least two side locking tumblers, said key comprising: a substantially flat key blade having, in a side recess, a code pattern for engagement with said side locking tumblers and positioning said side locking tumblers into positions that allow said key plug to rotate in said cylinder lock upon insertion of the key blade into the key slot,

characterized in that

said code pattern in the side recess of the key blade comprises at least two separate code surfaces being formed on at least one side of the key blade and extending along at least a part of the length of the key blade, comprising, on the same side of the key blade:

- a primary code surface with first code surface portions specifically distributed longitudinally on at least one side wall in an external portion of said side recess and adjoining said one side surface of the key blade, and at least one secondary code surface with second code surface portions specifically distributed longitudinally in an internal, deeper portion of said side recess,
- said first and second code surface portions being located in well-defined positions which are generally variable or separated in three dimensions in a respective tumbler contacting region of said key blade, namely
- in a direction upwards and downwards in a vertical plane defining said flat key blade,
- in a depth direction which is perpendicular to said vertical plane, and
- in a longitudinal direction along said key blade,

such that a compact code pattern with an increased number of code combinations is formed on the key blade.

The lock has a rotatable key plug having a key slot for receiving a flat key blade, and at least two side locking tumblers in the cylinder lock, said side locking tumblers being guided for elevational and possibly also rotational movement in associated chambers in said key plug and having transverse fingers projecting into the key slot for engagement with the key blade, upon inserting the key into the key slot. The key blade has an associated code pattern in a side recess for engagement with said side locking tumblers and positioning said side locking tumblers into positions that allow the key

plug to rotate in the cylinder lock upon inserting a correctly coded key into the key slot.

- ~~This object is achieved for~~Described herein is a lock and key combination where said transverse fingers are each located at a specific longitudinal position which is centered in relation to or is longitudinally displaced from a transverse plane extending through a central axis of the associated chamber, and
- said first and second code surface portions of said key are specifically distributed longitudinally so as to allow said transverse fingers to be seated on said first and second code surface portions (111, 112; 141, 142; 151, 152) upon inserting the key into the key slot,
- wherein said first and second code surface portions are located at distinct positions which are generally variable or separated in three dimensions in said flat key blade, namely
- in a direction upwards and downwards in a vertical plane defining said flat key blade,
- in a depth direction which is perpendicular to said vertical plane, and
- in a longitudinal direction along said key blade,

such that a compact code pattern with an increased number of code combinations is formed on the key blade.

Thus, the two kinds of side locking tumblers, provided with first and second fingers, respectively, will provide extensive code combinations in conjunction with the various code locations on the two code surfaces. These code surfaces may

CLAIMS

1. A lock and key combination including

- a cylinder lock with a rotatable key plug having a key slot for receiving a flat key blade,
- a key ~~(100)~~ with said flat key blade, and
- at least two side locking tumblers ~~(201a, 201b; 301, 302; 401, 402)~~ in said cylinder lock, said side locking tumblers being guided for elevational and possibly also rotational movement in associated chambers in said key plug and having transverse fingers ~~(211a, 211b; 311, 312; 411, 412a, 412b)~~ projecting into said key slot for engagement with said key blade, upon inserting said key into said key slot, and
- an associated code pattern ~~(110)~~ in a side recess ~~(115, 118)~~ of said key blade for engagement with said transverse fingers and positioning said side locking tumblers into positions that allow said key plug to rotate in said cylinder lock upon inserting a correctly coded key into the key slot,
- said fingers having different lengths, at least one having a first, short length and at least one having a second, long length,
- the short fingers engaging with a primary code surface having a number of first code surface portions at an external portion of said side recess of the key blade, and the long fingers engaging with a secondary code surface having a number of second code surface portions at an internal, deeper portion of said side recess of the key blade,

characterized in that

- said transverse fingers are each located at a specific longitudinal position which is centered in relation to or is longitudinally displaced from a transverse plane

extending through a central axis of the associated chamber, and

- said first and second code surface portions of said key are specifically distributed longitudinally so as to allow said transverse fingers to be seated on said first and second code surface portions ~~(111, 112; 141, 142; 151, 152)~~ upon inserting the key into the key slot,
- wherein said first and second code surface portions are located at distinct positions which are generally variable or separated in three dimensions in said flat key blade, namely
- in a direction upwards and downwards in a vertical plane defining said flat key blade,
- in a depth direction which is perpendicular to said vertical plane, and
- in a longitudinal direction along said key blade,

such that a compact code pattern with an increased number of code combinations is formed on the key blade.

2. A lock and key combination as defined in claim 1, wherein said secondary code surface is formed by an internal groove forming said deeper portion of said side recess.

3. A lock and key combination as defined in claim 2, wherein said primary code surface is formed by an external groove forming said external portion ~~(111; 141', 151)~~ of said side recess, said external groove comprising two opposite side walls adjoining said one side surface of the flat key blade.

4. A lock and key combination as defined in claim 3, wherein said internal groove ~~(112)~~ is narrower than said external portion ~~(111)~~ of said side recess.

5. A lock and key combination as defined in claim 3, wherein said internal groove ~~(152)~~ is undercut and wider than said external portion ~~(151)~~ of said side recess.

6. A lock and key combination as defined in claim 1, wherein at least one of said separate code surfaces ~~(131-135; 141'-145)~~ is wave-like.

7. A lock and key combination as defined in claim 1, wherein at least one of said first and second fingers ~~(211a, 211b)~~ is positively guided between opposite walls in said side recess ~~(112, 111)~~.

8. A lock and key combination as defined in claim 1, wherein one ~~(211b)~~ of said first and second fingers is higher than the other ~~(211a)~~, measured in a vertical dimension being transverse to a longitudinal direction of said key blade.

9. A lock and key combination as defined in claim 1, wherein at least one ~~(401)~~ of said first and second side locking tumblers is spring-biased so as to engage with the associated code surface.

10. A lock and key combination as defined in claim 1, wherein at least one ~~(201a, 201b)~~ of said first and second side locking tumblers is constituted by a half body being supplementary to another half body accommodated in the same chamber, the two half bodies in each pair being movable independently of each other.

11. A lock and key combination as defined in claim 10, wherein there is a longitudinal row of pairs ~~(201a, 201b, 202a, 202b)~~ of side tumblers, each pair comprising two supplementary half bodies.

12. A lock and key combination as defined in claim 1, wherein said first side tumblers ~~(201b)~~ and/or said second side locking tumblers ~~(201a)~~ are non-rotationally guided in said key plug.

13. A lock and key combination as defined in claim 12, wherein said side tumblers ~~(302)~~, which are non-rotationally guided in said key plug, are provided with transverse fingers which are located in a specific position which is centered ~~(312c)~~ in relation to or longitudinally displaced ~~(312ℓ, 312r)~~ from a central plane extending through the respective side tumbler, transversely to the longitudinal direction of said key slot.

14. A lock and key combination as defined in claim 5, wherein at least one of said second side locking tumblers ~~(502)~~ is provided with a finger ~~(512ℓ, 512c, 512r)~~ having a first narrow portion and a second, widened portion being configured to fit into an undercut portion of said internal groove.

15. A lock and key combination as defined in claim 1, wherein at least one ~~(401)~~ of said side tumblers is rotationally guided in said key plug, and wherein the associated finger ~~(411)~~ is pivotable between two end positions, while being engaged by the associated code surface.

16. A lock and key combination as defined in claim 1, forming a part of a lock and key system having at least one master key ~~(A)~~ and at least two specific keys ~~(B, C)~~, all these keys ~~(A, B, C)~~ having a double code with primary and secondary code surfaces, said master key ~~(A)~~ being configured to release all locks in a group of locks having different kinds of locking tumblers ~~(311c or 312c)~~ at various positions, whereas

each of said specific keys ~~(B, C)~~ is configured to release only one lock or a subset of locks within said group of locks.

17. A lock and key combination as defined in any one of the preceding claims, wherein at least one of said side locking tumblers is constituted by a circular-cylindrical body.

18. A key ~~(100)~~ for operating a cylinder lock having a key plug with a key slot and at least two side locking tumblers, said key comprising: a substantially flat key blade ~~(102)~~ having, in a side recess, a code pattern ~~(110)~~ for engagement with said side locking tumblers and positioning said side locking tumblers into positions that allow said key plug to rotate in said cylinder lock upon insertion of the key blade into the key slot,

characterized in that

said code pattern in the side recess of the key blade comprises at least two separate code surfaces being formed on at least one side of the key blade and extending along at least a part of the length of the key blade, comprising, on the same side ~~(101)~~ of the key blade:

- a primary code surface ~~(131-135; 141'; 151)~~ with first code surface portions specifically distributed longitudinally on at least one side wall in an external portion of said side recess and adjoining said one side surface of the key blade, and at least one secondary code surface ~~(141-145; 142'; 152)~~ with second code surface portions specifically distributed longitudinally in an internal, deeper portion of said side recess,
- said first and second code surface portions being located in well-defined positions which are generally variable or separated in three dimensions in a respective tumbler contacting region of said key blade, namely