Jan. 19, 1954 E. UHER 2,666,322

ROTARY CYLINDER LOCK PROVIDED WITH FLAT TUMBLER ELEMENTS

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Fig. 1

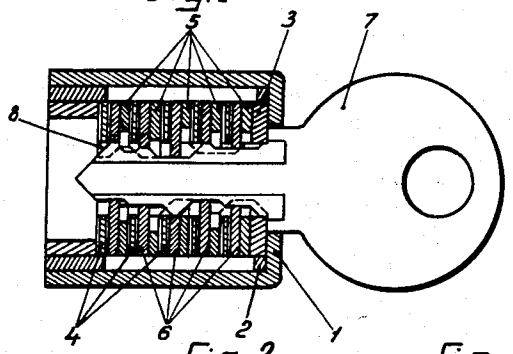


Fig. 2

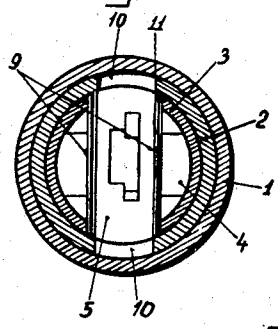


Fig. 3

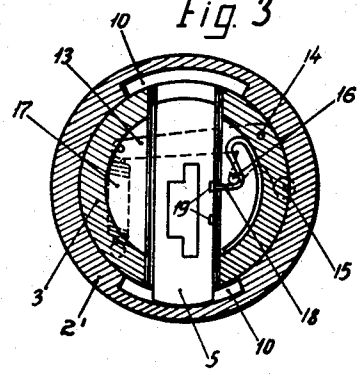


Fig. 4

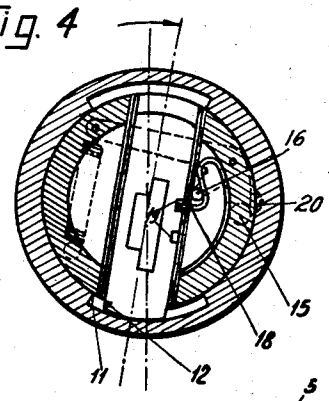


Fig. 6a

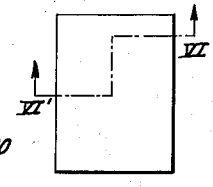


Fig. 5

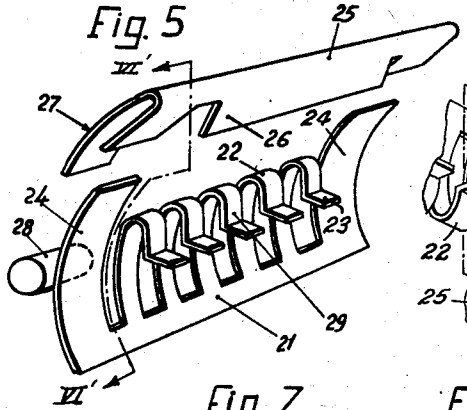
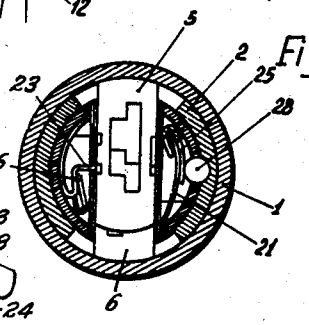


Fig. 6



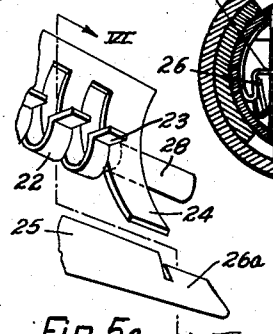
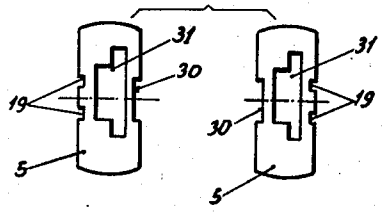


Fig. 5a

Fig. 7



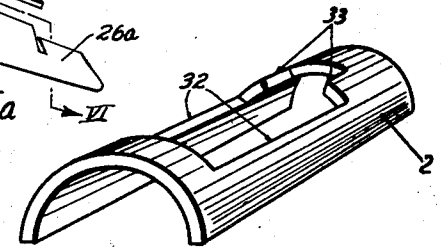


Fig. 8

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ROTARY CYLINDER LOCK PROVIDED WITH FLAT TUMBLER ELEMENTS

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4 Claims. (Cl. 70—419)

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This invention relates to a rotary cylinder lock provided with flat tumbler elements.

It is known that rotary cylinder locks of various types can be picked by a skilled burglar, the picking being effected by first slightly rotating the inner cylinder until this rotation is stopped by the lateral edge of at least one tumbler element bearing against the side of the groove of the outer cylinder in which said tumbler elements are engaged in the locking position, by moving a first tumbler element towards its retracted position in order to detect by a corner of said tumbler element the line of separation between said inner cylinder and said outer cylinder, which indicates that said tumbler element has been brought into its retracted position, by slightly further rotating the inner cylinder in order to maintain said first tumbler element in its retracted position while bringing the next tumbler element in close contact with the side of the groove and so on, the picking being effected step by step until all tumbler elements are brought into the retracted position.

The object of the invention is to provide a rotary cylinder lock in which this possibility of unwanted opening of the lock is definitely prevented.

According to the invention, the grooves of the outer cylinder are made, at least along a part of their length, broader than the slots in the inner cylinder, so that the detecting of the separation line between the inner and outer cylinders by the corners of tumbler elements requires a certain angular relative displacement of the two cylinders while means are provided to positively lock the tumbler elements in their closing position as soon as the inner cylinder is rotated, even by a very small angle, without using for this purpose the particular key of the lock.

According to one feature of the invention, the locking means comprise a series of independent elastic tongues each of which is located adjacent a longitudinal edge of a tumbler element, said edges being each provided with at least one notch, means to urge radially each of said tongues towards the notch of the tumbler element adjacent to which it is located, means to bring all of said tongues into a position removed from said notches, the operation of said means being controlled by the rotation of the barrel, so that in every position of the same, in which the key can be inserted into or withdrawn from said barrel, and in such a position only, said tumbler elements are released and become free to move in a radial direction.

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The invention will be more easily understood with reference to the accompanying drawings, in which are shown, as illustrations, some embodiments thereof.

In these drawings:

Fig. 1 is a longitudinal sectional view of a conventional rotary cylinder lock provided with flat tumbler elements, each guiding compartment containing two free tumbler elements which may be actuated positively towards their withdrawn position by means of a double key, without being urged in either direction by any spring.

Fig. 2 is a cross-section of the rotary cylinder lock shown in Fig. 1.

Fig. 3 is a diagrammatic cross-sectional view showing a rotary cylinder lock according to the invention.

Fig. 4 shows the same rotary cylinder lock as Fig. 3, the inner cylinder having been rotated by a small angle.

Fig. 5 is a perspective view of a practical embodiment of the locking mechanism according to the invention, being the mechanism appearing in the right half of Fig. 6.

Fig. 5*a* represents a perspective view, parts being broken away, of the locking mechanism appearing in the left half of Fig. 6.

Fig. 6 is a cross-section of a rotary cylinder lock into which said mechanism has been incorporated, the left half of the figure being, in part, a section taken on the line VI—VI of Fig. 5*a* and the right half of the figure being, in part, a section taken on the line VI'—VI' of Fig. 5, looking in the direction of the arrows in both instances.

Fig. 6*a* represents a top plan view of the cylinder shown in Fig. 6, bearing the section lines VI—VI'.

Fig. 7 is a top view of two tumbler elements the longer sides of which are provided with notches; and

Fig. 8 is a perspective view of one half of an outer cylinder the longitudinal groove of which comprises a narrowed portion having the same width as the corresponding inner cylinder slot.

Referring first to Fig. 1, there is shown at 1 the lock casing in which the outer cylinder 2 is secured. The outer cylinder is provided with two longitudinal slots 10, as shown in Fig. 2, the width of which, in conventional rotary cylinder locks, corresponds substantially to that of the tumbler elements 5 and 6. The guiding plates 4 are secured in the inner cylinder 3 and constitute, together with the lateral plates 9 securing said guiding plates, a rigid cage; the intermediate

spaces between guiding plates 4, which are all of the same size, are used for guiding axially the tumbler elements 5 and 6 which, in the example shown, are arranged pairwise in said intermediate spaces and can move freely in a radial direction. Each tumbler element is provided with a slot 31 (Fig. 7) through which the shank of the key 7 passes when inserted into the lock and the edges of which are acted upon by the active outlines 8 of said key, which provides a positive control of the corresponding tumbler element. In the example shown in Fig. 1, the inner cylinder is in the unlocked position. When key 7 is withdrawn from the inner cylinder, the tumbler elements are displaced radially under the control of the key outline and engage with the longitudinal slots 10 of the outer cylinder 2, thus preventing the inner cylinder from rotating, said inner cylinder being thus locked.

When trying to open the lock, without the use of a proper key, the burglar has to move all tumbler elements out of engagement with the longitudinal slots 10, and into register with the inner cylinder, so as to unlock said cylinder. Since the internal mechanism is not visible from outside, the burgler can only rely on his touch; he has thus to rotate the inner cylinder by an angle determined by the lateral clearance between the tumbler elements and the sides of the slot, until he has "detected," by means of the outer corners of the tumbler elements, the separation line between the outer and inner cylinders, which permits that tumbler, upon which the burgler is acting at the moment, to remain in the desired mid-position. If this operation is successfully realized with all tumbler elements, the inner cylinder may be unlocked and then freely rotated, so that the lock can be opened.

This invention makes said operation impossible due to the tumbler locking device shown in Fig. 3. This device comprises a roller 15, secured on a three-armed lever 13, rotatively mounted about a pivoting point 14, said roller being adapted to penetrate, under the action of a tension spring 17, into a corresponding recess 20 in the wall of the outer cylinder.

In the inner hollow space of the inner cylinder 3 are disposed leaf springs the tongue shaped portion 18 of which extends into the cage compartments through a slot provided for this purpose in one of the lateral plates 9 (Fig. 4).

Said tumbler elements are provided on one of their longer sides with one or more notches 19, which are so arranged that, when one tumbler element is in one of its end positions, the corresponding notch is located at the level of the corresponding tongue 18. A finger 16, carried by the three-armed lever 13, projects into the hollow space of the inner cylinder, said finger being adapted to retract the tongues 18 from the notches 19 (when roller 15 is pawled into recess 20 of the outer cylinder), so that, in this position of the inner cylinder, each tumbler element may be freely displaced (e. g. by means of the proper key). However, as soon as the cylinder is rotated, even by a small angle (e. g. in the direction of the arrow as shown in Fig. 4) roller 15 is urged out of recess 20, which causes a tilting of lever 13, so that the spring tongue 18 is thus released by finger 16 and penetrates into the corresponding cage compartment. When the tumbler element is in one of its end positions, the tongue 18 engages with the corresponding notch 19 of the tumbler element, to positively lock the same. When the tumbler element is not in one of its end positions, but is in an intermediate position, the tongue rests resiliently against a longitudinal edge of said tumbler element. As soon as the latter is displaced, under any exterior action, the resilient tongue is pawled into one of the notches, after which said tumbler element is locked as previously, so that any subsequent picking operation becomes impossible. However, as soon as the inner cylinder is brought back to that angular position, in which it is resiliently held by roller 15, the resilient tongue is retracted by finger 16, so that, in this particular position of the inner cylinder, the key can be inserted into, or withdrawn from, the lock without any difficulty since the tumbler elements can now be freely moved.

The efficiency of this device is further increased in that the two longitudinal grooves 10 of the outer cylinder 2' are wider than the tumbler elements, so that upon rotation of the inner cylinder the tumbler elements will be locked before, for instance, the portion 12 of the tumbler elements, projecting out of the inner cylinder, has reached edge 11 of one of the longitudinal grooves 10, whereby any detection by touching of the separation line between the two cylinders with the positively locked tumbler elements is prevented.

Another embodiment of the tumbler locking device according to the invention is shown in Figs. 5 and 6. The locking springs are formed as the teeth of a comb 21, the number of teeth corresponding to that of the tumbler elements, or pairs of tumbler elements, provided in the inner cylinder. The outer ends 23 of the comb teeth are bent inwardly to engage with the notches of the tumbler elements. Two lateral teeth 24 of comb 21 are designed to exert a pressure upon a roller 28 positioned in a longitudinal slot of the inner cylinder, this pressure tending to push roller 28 into a longitudinal groove provided in the inner surface of the outer cylinder so as to resiliently lock the inner cylinder when the same is in its normal locking position. The ends 23 of the comb teeth are retracted from the tumbler notches by means of a lever-like member 25 having two lateral arms 27 disposed between roller 28 and teeth 24, and a central arm 26 resting upon the downwardly bent portions 29 of teeth 22. It will now be apparent that initial rotation of the inner cylinder away from its normal locking position will force roller 28 out of the longitudinal groove against the action of teeth 24 whereby this roller will actuate lever 25 in a manner to release the comb teeth 22 so that the same may engage the corresponding notches of the tumbler elements in order to hold the latter against movement.

If two tumbler elements are provided in each guiding compartment, there is provided in the hollow inner space of the inner cylinder two comb-like springs or similar locking devices one on either side of the tumbler elements, and the same (Fig. 7) are then provided, on one of their longer sides, with the blocking notches 19 and, on their opposite longer sides with, a single long notch 30 as deep as notches 19, but the height of which corresponds to the vertical spacing of the end edges of notches 19 considered together. The pairs of tumbler elements are so arranged in their compartments that the different outlines of their longitudinal edges are always in opposition, i. e. on one side of each pair of tumbler elements, one of the tumbler elements of said pair offers notches, such as 19, while the other tumbler element of each pair offers a notch, such

as 30, so that the corresponding resilient tongue exerts a locking action only upon that tumbler element of each pair which is provided on said side with the locking notches 19.

The locking notches 19 are located on either side of the transversal axis (Fig. 7) of the tumbler element symmetrically with respect to said axis; the transversal axis of each notch is spaced from the transversal axis of the tumbler element by a distance corresponding to the maximum radial displacement of said tumbler element in one direction.

The longitudinal long notch 30, provided on the other longitudinal edge of the tumbler element, is also symmetrical with respect to the transversal axis of said tumbler element and has a length greater than the maximum radial displacement of the tumbler element within the inner and outer cylinders.

In order to permit this particular arrangement of the outlines of the lateral edges of the tumbler elements, even with like tumbler elements provided with the same central slot 31, each type of tumbler element is manufactured with the two different longitudinal outlines.

In order to avoid any rotation of the inner cylinder without using the proper key, said rotation being possible since the longitudinal grooves of the outer cylinder are wider than the tumbler elements, the width 32 of one or both diametrically opposed longitudinal grooves of the other cylinder is partially reduced as shown at 33 (Fig. 8), the axial length of said narrowed portion corresponding to the overall thickness of a suitably selected number of tumbler elements from that end of the cylinder at which the key is to be inserted, so that the inner cylinder may be rotated only after having completely inserted the key into the lock.

According to another feature of the invention, the first tumbler elements, adapted to be engaged in said part of the grooves having a reduced width, are not necessarily provided with notches and no tongue is provided opposite to the edges of said tumbler elements. Thus, the burglar is allowed to act upon these first tumbler elements which he may succeed to bring into their retracted position, but, as soon as he reaches the first tumbler element pertaining to the wider portion of the groove, the locking mechanism according to the invention begins to act and any further picking operation is made strictly impossible.

I claim:

1. A rotary cylinder lock comprising a casing provided with an inner cylindrical wall having diametrically opposed longitudinal grooves, a hollow cylindrical barrel rotatively mounted in said casing and provided with two diametrically opposed longitudinal slots, said grooves being wider than the width of said slots, a plurality of compartments in said barrel, a plurality of flat tumbler elements of generally rectangular shape slidably mounted in said barrel, two in each compartment, guided along a diameter thereof crossing the longitudinal axis of said slots and adapted to engage through one of said slots one of said grooves, each of said tumbler elements being provided on one of its longitudinal edges with at least one notch, and on their other longitudinal edge with a cut-off portion symmetric with respect to the transversal axis of said tumbler element and having a length at least equal to twice the maximum radial displacement in one direction of the tumbler element, one half of said tumbler elements being mounted with said notches on one side of the longitudinal axis and the other half with said notches on the other side, two sets of resilient tongues located within said barrel on either side of said tumbler elements, each of said tongues being adapted to engage with a corresponding notch of the tumbler elements when said barrel is rotated away from its normal locking position while the tumbler elements are in their operative position, and means to retract said tongues from said notches upon rotation of the barrel to said normal locking position.

2. A rotary cylinder lock comprising a casing provided with an inner cylindrical wall, having two diametrically opposed longitudinal grooves, a hollow cylindrical barrel rotatively mounted in said casing and provided with two diametrically opposed longitudinal slots, said grooves being wider than the width of said slots along a portion of the length of the latter and a width equal to that of said slots along the remaining portion of said length, the length of said remaining portion being equal to the total thickness of a given number of tumbler elements adjacent that end of the barrel at which the key is inserted, a plurality of flat tumbler elements of generally rectangular shape slidably mounted in said barrel, guided along a diameter thereof crossing the longitudinal axis of said slots and adapted to engage through one of said slots one of said grooves, said tumbler elements being provided on one of their longitudinal edges with at least one notch, a plurality of resilient tongues located within said barrel, each of said tongues being adapted to engage with a corresponding notch of certain tumbler elements when said barrel is rotated away from its normal locking position while the tumbler elements are in their operative position, and means to retract said tongues from said notches upon rotation of the barrel to said normal locking position.

3. A rotary cylinder lock comprising a casing provided with an inner cylindrical wall, having two diametrically opposed longitudinal grooves, a hollow cylindrical barrel rotatively mounted in said casing and provided with two diametrically opposed longitudinal slots, said grooves being wider than the width of said slots, a plurality of flat tumbler elements of generally rectangular shape slidably mounted in said barrel, guided along a diameter thereof crossing the longitudinal axis of said slots and adapted to engage through one of said slots one of said grooves, said tumbler elements being provided on one of their longitudinal edges with at least one notch, a comb constituting a plurality of resilient tongues loctaed within said barrel, each of said tongues being adapted to engage with a corresponding notch of the tumbler elements when said barrel is rotated away from its normal locking position while the tumbler elements are in their operative position, and means to retract said tongues from said notches upon rotation of the barrel to said normal locking position.

4. A rotary cylinder lock comprising a casing provided with an inner cylindrical wall, having two diametrically opposed longitudinal grooves, a hollow cylindrical barrel rotatively mounted in said casing provided with two diametrically opposed longitudinal slots, said grooves being wider than the width of said slots, a plurality of compartments in said barrel, a plurality of flat tumbler elements of generally rectangular shape slidably mounted in said barrel, two in each com-

partment, guided along a diameter thereof crossing the longitudinal axis of said slots and adapted to engage through one of said slots one of said grooves and being provided on one of its longitudinal edges with at least one notch, and on its other longitudinal edge with a cut-off portion symmetric with respect to the transversal axis of said tumbler element and having a length at least equal twice to the maximum radial displacement in one direction of the tumbler element, one half of said tumbler elements being mounted with said notches on one side of the longitudinal axis of the barrel and the other half with said notches on the other side, two combs constituting two sets of resilient tongues located within said barrel, on either side of said tumbler elements, each of said tongues being adapted to engage with a corresponding notch of the tumbler elements when said barrel is rotated away from its normal locking position while the tumbler elements are in their operative position, and means to retract said tongues from said notches upon rotation of the barrel to said normal locking position.

UHER, EDMOND.

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