

[54] MULTI-DIGIT DIAL LOCK

[76] Inventor: Georges Pieddeloup, 18 Avenue
Lefevre, 94 Le Plessis Trevis, France

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70/301, 302, 303, 304, 305, 306, 309, 311

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UNITED STATES PATENTS

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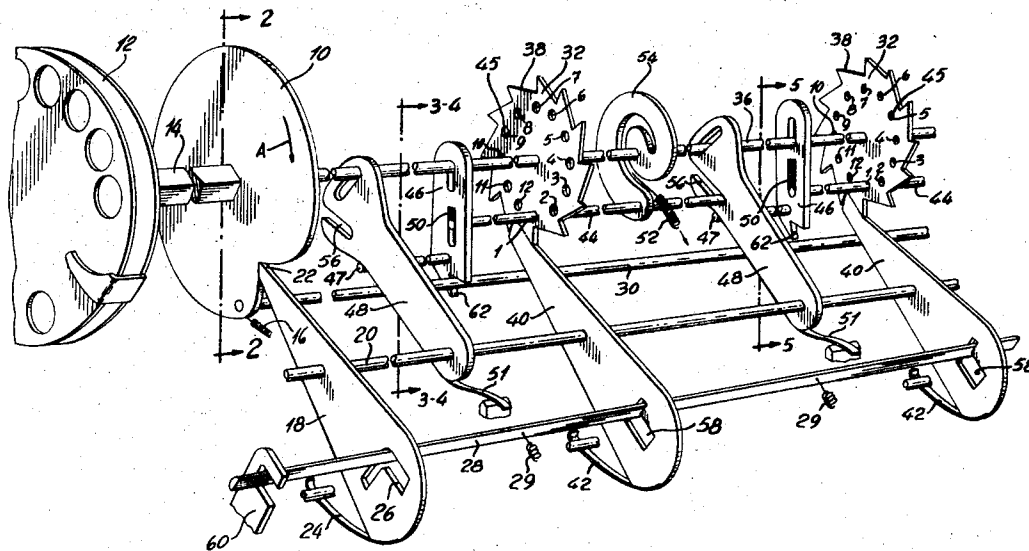
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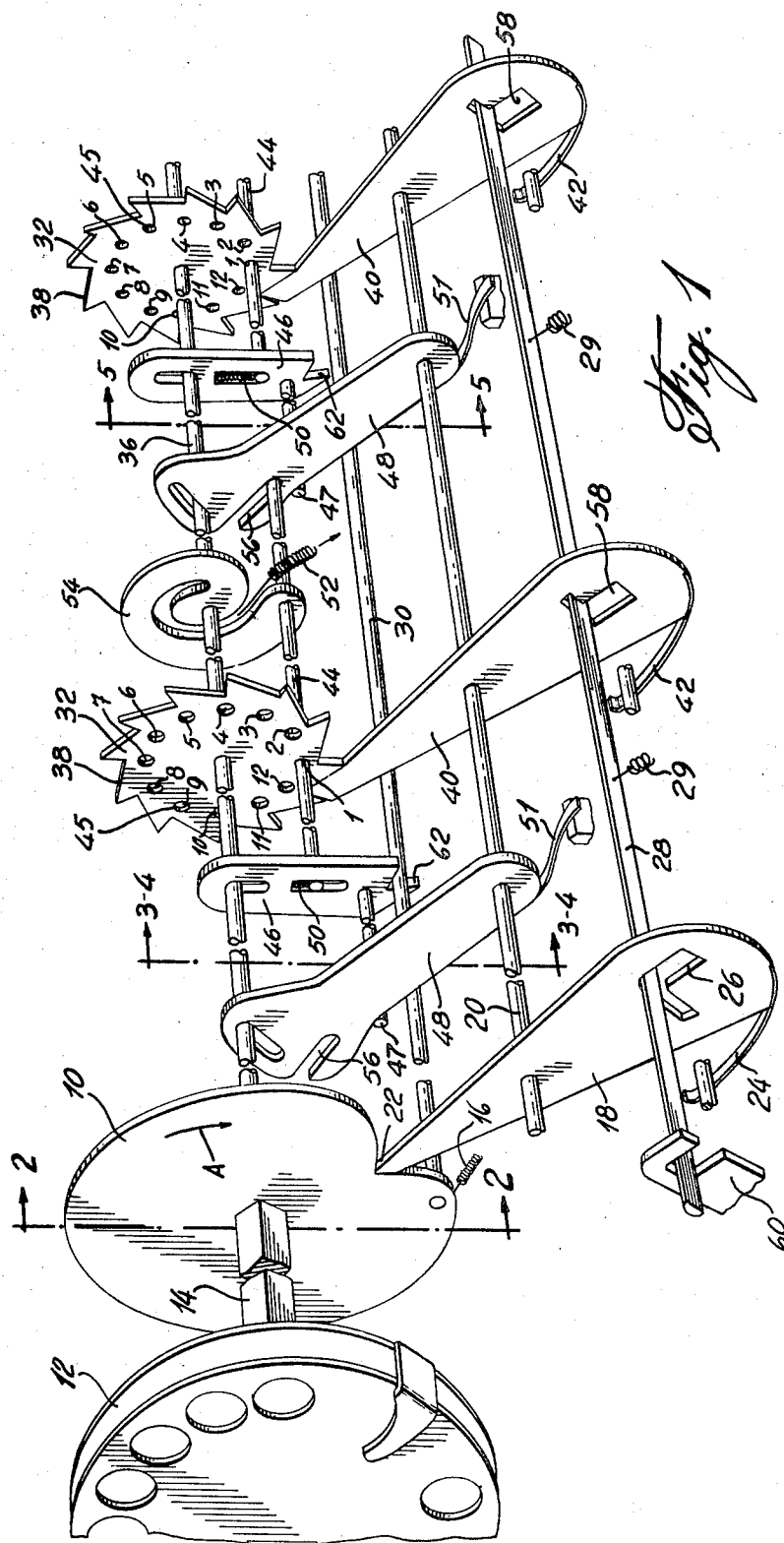
Primary Examiner—Albert G. Craig, Jr.
Attorney—Raymond A. Robic

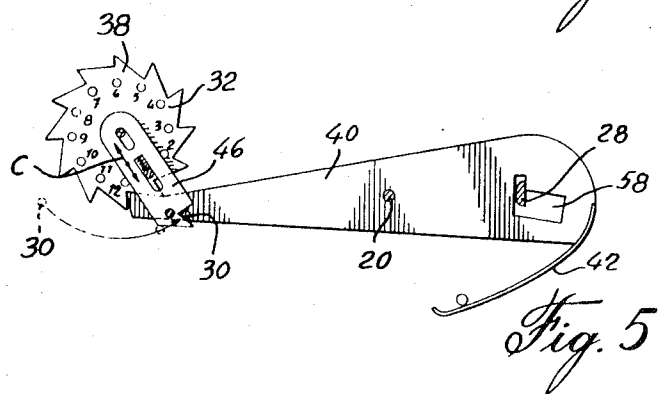
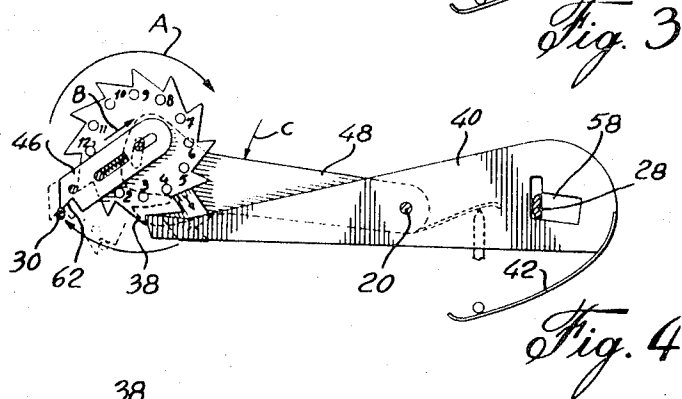
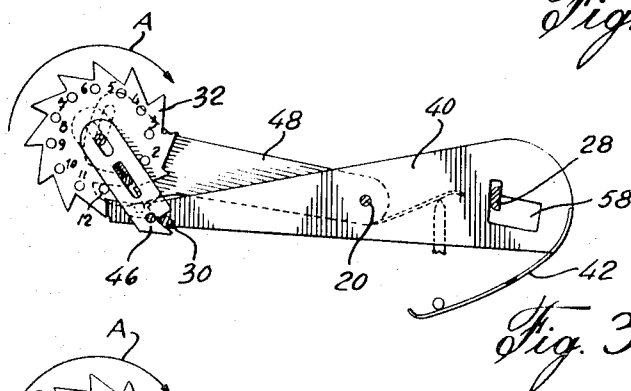
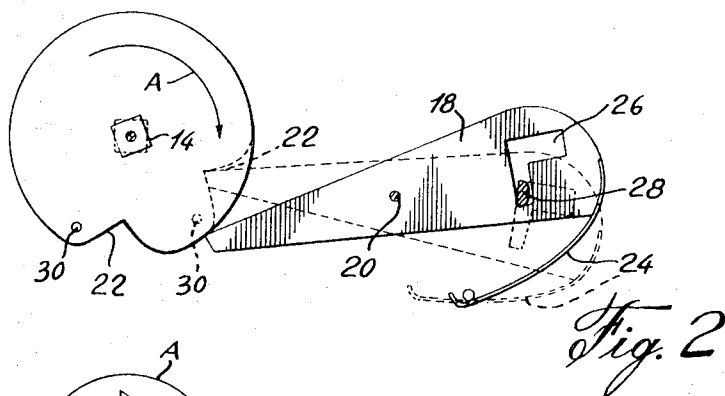
[57] ABSTRACT

A multi-digit dial lock comprising a number of toothed wheels corresponding to the number of digits of a code, and means for successively rotating each toothed wheel to a predetermined angular position. When all the toothed wheels are positioned at such predetermined angular position, the lock opens automatically.

8 Claims, 5 Drawing Figures







MULTI-DIGIT DIAL LOCK

This invention relates to a multi-digit dial lock which may be opened without using any keys simply by dialing a predetermined code composed of plural digits.

In the known devices of this type, additional operations are required either prior, during, or after dialing to open the lock. In addition, the mechanical structure of the known devices limits the number of digits of the code and the complexity of the mechanism for performing the successive dialing of the digits renders such devices very sensitive to shocks.

An attempt has been made to overcome the above drawbacks of the prior art devices in the device disclosed in French Pat. application No. 6,940,330 filed Nov. 24, 1969, now publication No. 2,070,300 published Oct. 15, 1971, by the same applicant as the present application. In such device, the locking and unlocking positions are obtained by means of levers controlled by cams associated with toothed wheels.

The present invention is an improvement over the device of the above patent in that the toothed wheels themselves are used as coded cams and in that positioning levers for such toothed wheels replace the above-mentioned levers thus simplifying the mechanism of the device and lowering the thickness of the mechanism associated with each digit of the code.

The multi-digit dial in accordance with the invention thus comprises a number of toothed wheels corresponding to the number of digits of the code, and means for successively rotating each toothed wheel to a predetermined angular position. When each toothed wheel is positioned at such angular position, the lock opens itself automatically.

The means for successively rotating the toothed wheels may include a dial of the telephone type, a disc secured to the dial and operated in a predetermined direction for successively dialing the digits of the code, a spring biasing the disc to a rest position, and a finger engaging a notch in the disc for stopping the return movement of the disc at the rest position.

A finger is associated with each toothed wheel and has one end thereof adapted to engage the teeth of the toothed wheel to hold the same at the predetermined angular position. The fingers are pivotally mounted on a shaft and the coded digit of each toothed wheel is formed by one tooth which is less deep than the others. The other end of the fingers are provided with L-shaped slots through which may pass a spring biased bar which is used for automatically opening the lock. When the fingers are all positioned in the above-mentioned coded tooth of each toothed wheel, the fingers are all pivoted by the same angle and the bar may slide in the L-shaped slots to open the lock.

The means for successively rotating each toothed wheel further comprises an indexing member which is secured at a predetermined angular position with respect to the above-mentioned coded tooth but is slidable radially, and a rod secured to the disc and movable around the outer periphery of the toothed wheels. A spring normally biases the indexing member out of engagement with the rod but an abutment member is provided for successively operating the following indexing member when dialing each digit so as to cause the indexing member to be engaged by the rod for permitting dialing of the next digit.

The toothed wheels are rotatably mounted on a shaft and spring means are provided for biasing the toothed wheels back to a rest position against a notch in the abutment member.

The angular position of the indexing member on the toothed wheels may be varied with respect to the above-mentioned coded tooth to change the code.

Means are also provided for resetting the lock into its rest position prior to dialing the coded digit or during coding thereof if a mistake has been made.

The invention will now be disclosed with reference to a preferred embodiment thereof and to the accompanying drawings in which:

FIG. 1 illustrates a schematic perspective exploded view of a multi-digit dial lock in accordance with the invention; and

FIGS. 2 to 5 illustrate section views through FIG. 1 of the drawings for the purpose of showing the operation of the multi-digit dial lock.

Referring to FIG. 1, there is shown a lock including a disc 10 secured to a dial 12 by means of a shaft 14. Disc 10 is adapted to be operated in the direction indicated by arrow A by dial 12 and is biased to a rest position by a spring 16. The return movement of disc 10 is stopped by a finger 18 pivotally mounted on a shaft 20 and engaging a notch 22 in the disc. The finger 18 is biased against the outer periphery of the disc 10 by means of a spring 24. The finger 18 is provided with an inverted L-shaped slot 26 through which passes a bar 28 which controls the unlocking of the lock. It will be easily seen, more particularly with reference to FIG. 2, that finger 18 is pivoted counterclockwise during dialing of each digit and thus causes the bar 28 to slide into the vertical portion of the inverted L-shaped slot 26. In such a position, the bar 28 cannot slide to the right under the action of spring 29 to disengage the lock until the disc 10 has returned to its rest position.

The disc 10 is provided with a driving rod 30 which is arranged to rotate around the periphery of a number of toothed wheels 32 which are rotatably mounted on a shaft 36. The number of toothed wheels corresponds to the number of digits of the code and may, in principle, be unlimited.

The numerical value of each digit of the code depends on the number of teeth 38 of the toothed wheels 32. In the example illustrated, there are eleven possible values for each digit of the code, the 12th position being the rest position. The teeth of each toothed wheel are engaged by fingers 40 which rotate around shaft 20 and are biased against the teeth of the toothed wheels by spring 42.

Each toothed wheel is driven by rod 30 through an arrangement including a rod 44 passing through a hole 45 in the toothed wheel and an indexing member 46 when moved into a downward position by an abutment member 48 bearing against a rod 47 secured to the indexing member. The indexing member 46 is moved downwardly against the biasing force of a spring 50 whereas abutment member 48 is biased counterclockwise by means of a spring 51. The toothed wheels 32 are biased into a rest position by means of a spring 52 illustrated schematically and enclosed in a cage 54 secured to shaft 36 and rotatably mounted on rod 44. It will be noted that each abutment member has a notch 56 therein for receiving rod 44 in the rest position and so stop the counterclockwise rotation of the toothed wheels under the action of springs 52. It will also be

noted however that notch 56 of the abutment member 48 adjacent to disc 14 is of no use, the function of such first abutment member being only to maintain its adjacent indexing member 46 in a downward position against rod 30 in the rest position so as to permit rod 30 to drive the first toothed wheel 32.

The tooth corresponding to the opening code of the lock is not as deep as the other teeth as illustrated by tooth No. 2 of the first toothed wheel and tooth No. 6 of the second toothed wheel. In addition, the end of levers 40 which is remote from the toothed wheels 32 is provided with L-shaped slots 58. It will therefore be noted that when the lever 40 rests into a deep tooth 38, as illustrated in FIG. 3, the unlocking bar 28 is in the vertical portion of the L-shaped slot 58 and, consequently, the unlocking bar 28 cannot move to the right to open the lock. On the contrary, when the lever 40 engages a tooth corresponding to the predetermined code, such as illustrated in FIG. 4, the unlocking bar 28 will be permitted to slide into the bottom portion of the L-shaped slot 58 to open the lock.

It will be noted that the toothed wheels are provided with a number of holes 45 therein and that the code may be changed at will by removing rod 44 from a hole 45 and positioning it into another hole.

A lever 60 is coupled with unlocking bar 28 and is provided for rotating levers 40 counterclockwise to free all the toothed wheels. This lever 60 is provided for resetting the lock to a rest position prior to dialing the code or when an error is made in the process of dialing.

Prior to describing the operation of the lock, it will be assumed that the lock has been reset to the position illustrated in FIG. 1 and that the first two digits of the code are 2-6. When the first digit of the code is dialed, disc 12 and rod 30 are rotated in the direction indicated by the arrow A in FIGS. 3 and 4 of the drawings. Because the first abutment member 48 always biases indexing member 46 downwardly in the rest position, notch 62 of indexing member 46 will be engaged by rod 30 and the first toothed wheel 32 will be rotated as illustrated in FIG. 4 until the end of lever 40 engages the coded tooth No. 2. At that time, the rod 30 will return to its rest position and so release the indexing member 46. The indexing member 46 will thus move in the direction of arrow B so as to permit rod 30 to bypass the indexing member 46 if the second digit member of the code is a higher number. The toothed wheel will be maintained at that position by lever 40 while the rod 30 returns to its rest position. When the first digit is dialed, the rod 44 which is resting in slot 56 of the second abutment member 48, as illustrated in FIG. 1, goes out of the slot 56. Such second abutment member 48 will thus be permitted to move downwardly, as indicated by arrow C in FIG. 4, so as to drive indexing member 46 downwardly to cause notch 62 thereof to be engaged by rod 30. When the rod 30 returns to its rest position, as illustrated in FIG. 5, it will hit the inclined back portion of indexing member 46 to raise temporarily the indexing member. However, the indexing member will fall back into a downward position after passage of the rod 30 and dialing of the second digit No. 6 of the code will be done as it was done for the first one. It will be understood that the above operation is repeated for the second digit of the code.

When all the digits of the code have been dialed, the levers 40 are all in the position illustrated in FIG. 4 with the unlocking bar resting in the horizontal portion of

the L-shaped slot 58. This will permit the unlocking bar 28 to move to the right under the action of spring 29 to open the lock. However, if a single digit has not been correctly dialed, the unlocking bar will be in the position illustrated in FIG. 3 for the incorrectly dialed digit and unlocking bar 28 will rest in the vertical portion of slot 58 thereby preventing opening of the lock.

The device in accordance with the invention may be used in every case where a bolt or a key lock is used and more particularly when doors or other devices are reserved to predetermined users. Particular applications may be made for the opening of doors, covers, or for the controlling of electrical devices.

I claim:

1. A multi-digit dial lock comprising: a number of toothed wheels corresponding to the number of digits of a code; means for successively rotating each toothed wheel to a predetermined angular position; means responsive to the positioning of each toothed wheel at said predetermined angular position for unlocking the lock, said means including a dial of the telephone type; a disc secured to said dial and operated in a predetermined direction for successively dialing the digits of a code; a spring biasing said disc back to a rest position, and a finger engaging a notch in said disc for stopping the return movement of said dial at said rest position.

2. A multi-digit dial lock as defined in claim 1, further comprising a finger associated with each toothed wheel and having one end adapted to engage the teeth of the toothed wheel to hold the toothed wheel at said predetermined angular position.

3. A multi-digit dial lock as defined in claim 2, wherein the fingers are pivotally mounted on a shaft and wherein the coded digit of each toothed wheel is formed by one tooth which is less deep than the others.

4. A multi-digit dial lock as defined in claim 3, wherein said means responsive to the positioning of the toothed wheels for unlocking the lock includes a spring biased bar passing through L-shaped slots at the other end of said fingers, and wherein the angular positioning of each finger in said one tooth permits said bar to slide along the bottom position of said L-shaped slots to unlock the lock.

5. A multi-digit dial lock as defined in claim 3, wherein said means for successively rotating each toothed wheel further comprises an indexing member which is secured at a predetermined angular position with respect to said one tooth but is slidable radially, a rod secured to said disc and which is movable around the outer periphery of said toothed wheels, and an abutment member for engaging said indexing member with said rod so as to permit said rod to dial the following digit upon return thereof to its rest position.

6. A multi-digit dial lock as defined in claim 5, wherein said toothed wheels are rotatably mounted on a shaft and further comprising spring means for biasing said toothed wheels back to said rest position against a notch in said abutment member.

7. A multi-digit dial lock as defined in claim 5, wherein the position of said indexing member with respect to said one tooth may be varied to change the code.

8. A multi-digit dial lock as defined in claim 5, further comprising means for returning all the toothed wheels to the rest position prior to dialing the code or if a mistake is made during dialing.

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