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A. SOLER MARTI ET AL

2,886,962

SECRET OR COMBINATION LOCK

Filed June 1, 1956

2 Sheets-Sheet 1

Fig. 1

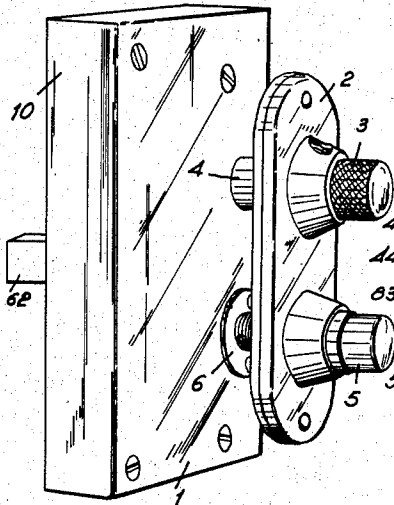


Fig. 2

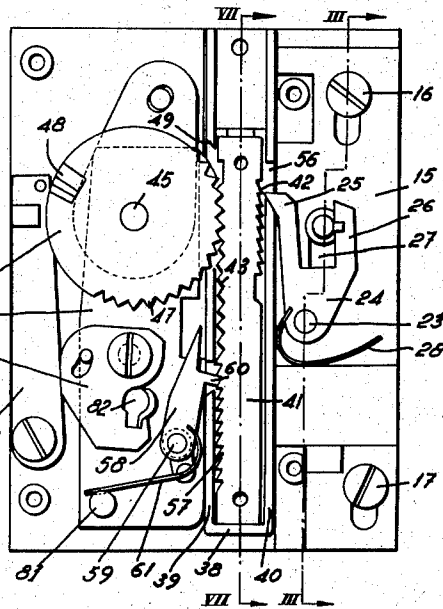


Fig. 3

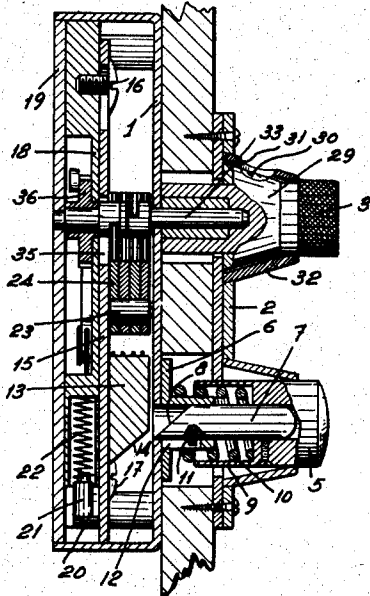
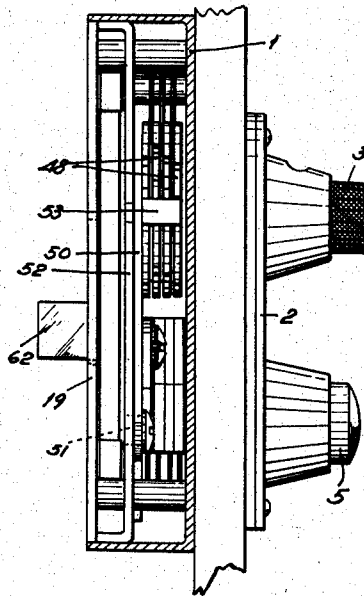


Fig. 4



ANTONIO SOLER MARTI,
JUAN SOLER MARTI,
JOSE SOLER MARTI, AND
MARIO SOLER MARTI,
INVENTORS

BY *Wendroth, Lund & Poreck*
ATTORNEYS

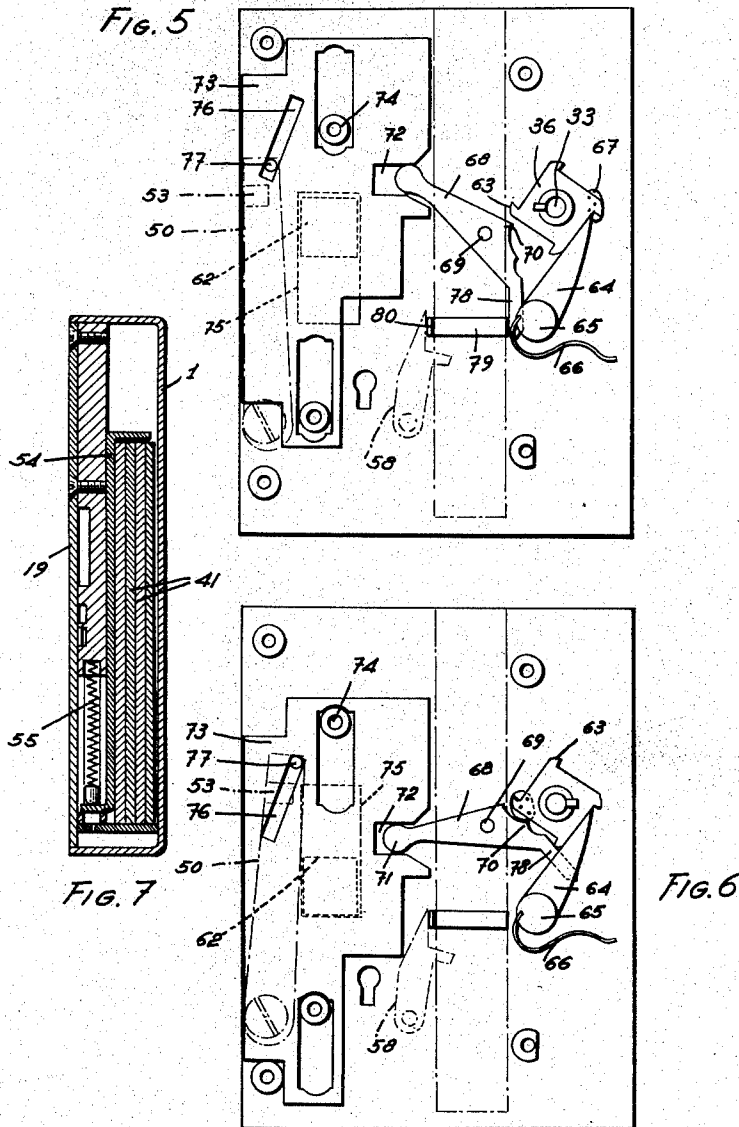
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ANTONIO SOLER MARTI,
JUAN SOLER MARTI,
JOSE SOLER MARTI, AND
MARIO SOLER MARTI, INVENTORS.

BY *Wendroth, Lind & Ponack*

ATTORNEYS

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SECRET OR COMBINATION LOCK

Antonio Soler Marti, Juan Soler Marti, José Soler Marti,
and Mario Soler Marti, all of Barcelona, Spain

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5 Claims. (Cl. 70—306)

The invention relates to automatic secret or combination locks of the type that can be manipulated without a key, and the object of the invention is a new device capable of being used with a large number of secret combinations, and which can, nevertheless, be operated from the outside solely by means of two outer manipulating parts, the lock thus offering complete safety and invulnerability.

The mechanism that is the object of this invention has, in order to operate it, an arrangement consisting of a rotatable selecting axle operated by means of a knob, handle or other device, and a button or feeler that can be displaced in a direction parallel to itself, the rotatable or gyratory axle being able to be revolved at will through fractions of turns and fit into several different angular positions, while the feeler may be actuated a certain number of times, in each of the angular positions of the selecting knob, thereby fixing a partial combination for each position, the whole set of movements making up the total combination of the lock, thereby permitting the releasing and operation of the locking bolt.

Another object of the invention is the arrangement, in combination with a rotatable selecting axle, of a device that, when the above-mentioned knob has attained a predetermined position and after having established the secret combination, acts as locking bolt or a blocking part of said bolt, by the simple working of the selecting axle to the right or to the left, within a given angle. Another object of the invention is the combination with the said selecting axle of a device that allows the removal of the secret combination previously set up, so that all the parts return to their original position or point of departure.

Lastly, the invention also comprises an arrangement for bringing about the change of the secret combination to another secret combination, and means to obtain other complementary purposes which will be seen in the course of the present description.

The lock that is the object of this invention comprises, as stated above, a giratory selecting axle that can be set into several successive angular positions, for which purpose the said axle is provided with a knob or head with several figures and reference signs thereon to show its angular positions in relation to an indicator on the case of the lock or vice versa.

The internal mechanism comprises a series of discs freely rotatably mounted one above the other on a common axle, each of the said discs having on its circumference a slot made at a suitable point and a ratchet on a sector of the said circumference. Each of the said discs is combined with a toothed rack which fits into the ratchet discs, the racks forming a group of several racks one above the other, corresponding to the member of the discs and lodged in a guide-box enabling them to be displaced in a longitudinal direction, preferably upwardly and downwardly. The said toothed racks have on edge opposite the teeth another section with pawl teeth in front of which there are several claws mounted

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on a spindle forming part of a slidable piece, said claws being pushed by respective laminated springs against the pawl teeth, and being provided with a tail or appendix which in turn lies against the lateral face of the gyratory selector axle in such a way to obstruct the approach of the claws to the toothed rack.

Said gyratory axle has a cylindrical central portion adjacent of the claws, said portion being provided with notches or slots displaced a fraction of a turn from each other in such a way that when the axle revolves only one of the claws is able to fit in the respective slot for each angular position of the axle, thus allowing it to catch on a tooth of the corresponding pawl teeth. The sliding plate that carries the axle holding the said claws can move in a direction parallel to the ratchets, the said plate being provided with a bevelled stop peg that stops in front of the inner end of the button or feelers, which is also bevelled, whereby every time the feeler is brought into action the claw bearing plate or slide is displaced upwards and, in its turn, moves the rack that corresponds to the position of the selector axle.

In this way each rack may be worked as many times as may be required, moving at each movement a distance equal to that of one tooth, and drawing with it in its movement the respective ratchet disc for the purpose of causing the notches on every disc to coincide in the same plane, thus allowing a stop peg to move to disengage and engage the lock-bolt.

The said racks are provided with another toothed portion on their edge, the purpose of which is to hold up the racks while they are being moved by the action of the feeler or button.

The attached drawings show as an example, a constructional form of the lock that is the object of the invention.

Figure 1 is an external view of the lock.

Figure 2 shows the internal mechanism, the front wall of the casing having been removed.

Figure 3 is a vertical section along the line III—III of Figure 2, showing the arrangement of the gyratory knob and the button or feeler.

Figure 4 is a view of the mechanism seen from the left.

Figures 5 and 6 show the movement of the lock bolt by means of its own selector axle.

Figure 7 is a section of the racks along the line VII—VII of Figure 2.

The lock according to the invention comprises a case 1 that contains the mechanism of the said lock (Fig. 1). From the front of the said case project the control members supported by the guide shield or plate 2, the said control members consisting of the rotatable knob 3 fixed to an axle supported by the sleeve 4, and the button or feeler 5 that can be axially displaced inside a tubular cap 6 fixed to the said front wall of the case.

The feeler or button 5 serves to work certain parts of the inner mechanism a certain number of times each. To this end, the said feeler or button holds the axle 7 having its inner end 8 bevelled. The head of the button 5 has at its base a cylindrical flange 9 forming a cavity in which is lodged a spiral spring 10 that tends to press the button outwards, the said button or feeler being held by the bolt 11 that moves in a longitudinal slot 12 made in the said cap.

The bevelled end 8 acts on the block 13 having an inclined plane 14, said block forming part of the sliding plate 15 that is capable of an upward and downward movement, suitably guided by the screws 16—17 that are fixed on the intermediate plate 18 that is bridge shaped, thus forming with the rear wall 19 of the framework a case or cavity. The sliding plate 15 is acted on by a spring that pushes it continually towards its

lower end, and, for this purpose, the said plate has, on its rear face, a protuberance or dowel 20 against which there is placed a rod 21 that is acted on by a spring 22 lodged in a suitable cavity in the plate 18.

The sliding plate 15 has the dowel 23 perpendicularly fixed to it above the block 13 and this dowel serves as an axle for the turning of a certain number of claws 24 each provided with a tooth 25 and also with a tail or appendix 26 spaced from tooth 25 to form a recess 27 with said tooth, to allow the axle of the above-mentioned revolving knob to pass through between tooth 25 and tail 26. Each of the claws is acted on by a laminated spring 28 that presses the tail or appendix against the rotatory axle.

The knob 3 carries a body 29 that has on its surface a series of numbers or reference signs 30 which are visible through a window 31 made in the cover 32 that covers the body and is fixed to the front plate 2. The body 29 is coupled to a selector axle 33 by means of a key and said axle is extended towards the inside of the case, being supported by the walls of the case. The said axle 33 goes through the recesses 27 in the claws and has a cylindrical neck 34; it also goes through the slot 35 made in the sliding plate 15, which allows the said sliding plate to move up and down without difficulty, and said axle at its rear end carries an eccentric wheel 36 lodged between the plate 18 and the rear wall 19. The sides tails 26 of the claws 24 bear laterally against the surface of the neck 34 of the axle 33, and this said neck, in the transverse planes corresponding to each of the claws, is provided with notches 37 displaced from each other by a certain angle, whereby, on turning the knob fractions of a turn, one of the claws is brought into the respective notch being impelled by the spring 28, and moving sideways towards the left.

Alongside the sliding plate 15 there is a small rectangular guide-box 38 the two side walls 39 and 40 of which serve as guides for several superimposed toothed racks 41, the number of racks being equal to that of the claws, each of the said toothed racks having a toothed portion 42 opposite the tooth 25 of one of the claws and, on the opposite side, a cogged rack 43. The said toothed racks can move independently of each other along the box, that is to say, upwards or downwards.

On the opposite side of the said box is the plate 44, provided with the dowel 45 that serves as a support for a certain number of superimposed discs 46 that correspond with the toothed racks, the said discs each being provided with a toothed section 47 on their circumference. These discs are so mounted that the toothed portion 47 on each disc meshes with a cogged rack 43 through the aperture 49 of the wall 39 of the box.

In combination with the above mentioned toothed discs there is an oscillating arm 50 rotatably mounted on the axle 51 attached to the plate 52 (Fig. 4), that is fixed to the rear wall 19 of the case and parallel to it. The said arm has, at its upper end, a projecting bar 53 extending transversally to the discs, and bearing against the peripheral edge of the same, the said bar being of a suitable size to go into the slots 48 of the discs when they all coincide on the same plane in front of the said bar 53.

The racks 41, by means of a bent plate 54 are subjected to the action of a spring 55, tend to be displaced downwardly.

The teeth 25 of the claws 24 remain opposite the opening 56 made in the wall 40 of the guide-box 38 for the racks. Said racks also each have a toothed section 57, situated, for example, at its lower end, which is in correspondence with a group of stop pegs 58 mounted on the spindle 59 and each provided with a tooth 60 that catches in the teeth 57 of the rack under the action of the spring 61.

When the knob 3 is rotated a fraction of a turn, one

of the notches 37 in the neck 34, stops in front of the tail 26 of one of the claws 24. In this position, when the feeler 5 is worked by pressing it inwardly, the inclined plane or bevelled part acts on the sliding plate 15 which moves upwardly dragging with it all the claws 24. The claw that is placed in front of the slot in the neck 34, moves to the left and catches on a tooth 42 of the respective rack, while the other claws are restrained by the tails 26 that rub on the surface of the neck 34. Thus, the pressure of the feeler 5 produces the upward displacement of the selected rack 41 to an extent equivalent to the space of one tooth, at the same time causing the respective disc 46 to rotate, the rack and these said members stopping in their new position, and being held by the pawl 58. When the feeler 5 has been actuated the number of times required to cause the notch 48 of the disc that is brought into action to stop in front of the bar 53, the knob 3 is rotated another fraction of a turn, whereby it will change the position of the neck 34 and will stop in position to permit movement of another claw 24, the operation of pressing the feeler being repeated the number of times required to cause the notch of the respective disc to come up into position in front of the bar 53, and so on in succession.

As soon as the notches of all the discs coincide in the same plane, the bar 53 moves into them, and this movement also brings about other movements described below.

The eccentric wheel 36 fixed to the selector axle 33, forms a polygon of as many sides as there are racks in the mechanism and corresponding to the number of slots 37 made in the neck of the selector axle. The said wheel has, on each vertex, a tooth 63 that acts in combination with a retention claw 64 that oscillates on the axle 65 which projects from the rear face of the fixed plate 18, and that is brought into contact with the wheel by the action of the spring 66 thus permitting the selector axle to turn, in one direction only, and preventing it from turning back. The wheel 36 also has an eccentric projection 67 on its rear face, placed near the vertex corresponding to the last rotating position of the wheel, that is to say, this eccentric only comes into action after all the racks have been moved, said eccentric being placed in a position to act on a small lever 68 that extends under the guide-box and turns around the pivot 69.

Lever 68 has two arms: an arm with a shoulder 70 and a second arm with a head 71, the latter being lodged in the notch 72 of the lock-bolt sliding plate 73 that runs on the guide screws 74 fixed to the rear plate 19 of the mechanism. The lock bolt plate has, on its rear face, the stop peg 62 which projects outside through the slot 75 made in the rear wall of the case. The lock-bolt plate also has an inclined aperture 76 through which protrudes a pin 77 on the arm 50. This arm, in the locking or blocked position of the mechanism, is in the position shown in Figure 5, in which the bar 53 rests against the edges of the discs. In this position the lock-bolt plate 73 is held in its upper position by the pin 77 of the arm 50, and the lever 68 as shown in said figure.

After operating the selector axle and the feeler the required number of times, the notches 48 of the discs will be lined up in front of the bar 52 and then the weight of the lock-bolt plate 73 causes the arm 50 to oscillate, introducing the bar 53 in the notches 48 and sliding the lock-bolt plate 73 to the position shown in Figure 6. At the same time the lever 68 oscillates and comes into contact with the eccentric. In this position, a slight movement of the selector knob in either direction causes the lock-bolt plate to rise or to fall, going from the open position to the closed, or vice versa.

A continuation of the turning movement of the selector axle until a complete turn has been made and the original or starting position has been reached, causes

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the eccentric to push the lever 68 a little more, the said lever being provided with a tail 78 which, in its turn, pushes the rod 79 that is provided with a bent end 80 that moves against the edge of all the retention pawls 58, separating them from the teeth of the toothed racks. When these said racks have been freed, they return to their initial lower position, the discs also going back to their starting position moving the arm 50. When the wheel 36 has made a complete turn, the eccentric overtakes the boss 70 on the lever leaving the lock blocked again with the lock-bolt plate in its upward position.

The above-mentioned plate 44 that supports the discs forms part of an arrangement for bringing about a change in the combination. To this end, this plate is mounted to oscillate about its lower end on the dowel 81 fixed to the bridge plate 52 and is, moreover, provided with an opening 82 through which a key that is inserted through the rear wall of the lock may pass. This opening or keyhole is covered by a guard or sliding safety plate 83. In this way, the plate 44 may be given a slight turning movement by means of a key made to fit the above-mentioned opening or key-hole. This turning movement of the plate 44 displaces the discs sideways and separates them from the toothed racks, but this can only be brought about when the notches or grooves 48 of the said discs are all lined up in front of the bar 53, that is to say, when the lock is open or unlocked. In this position the discs are disconnected and the racks are stopped in their displacement by means of the pawls 58. By means of the action of the knob as described above the pawls are separated and the racks return to their zero position and a fresh combination or secret may be marked by operating the knob and the feeler in the ordinary way and then connecting the discs again and withdrawing the key, whereby a different combination will be set up.

This lock may also be arranged having double ended control members for both the axle or revolving knob and the feeler, whereby the lock may be operated from either side and used for dwelling houses and similar purposes.

We claim:

1. A combination lock comprising a plurality of superimposed discs each having a notch and a toothed portion on the circumferential edge thereof, an axle on which said discs are freely rotatably mounted, a plurality of toothed racks, one for each of said discs, and each having a rack portion on one edge thereof engaged with the toothed portion of one of said discs, and a toothed portion on the opposite edge, a plurality of claws, one for each of said racks and each having a tooth thereon engageable between the teeth of said toothed portions of one of said racks, and having a tail spaced from said tooth, a claw carrying plate on which said claws are pivotally mounted in superimposed position, said claw carrying plate having an inclined surface thereon, a bridge to which said plate is slidably secured, a reciprocally mounted feeler button having an inclined plane on one end thereof engageable with the inclined surface on said carrying plate, ratchet means engageable with said racks for holding said racks after movement thereof by said feeler button, said carrying plate and said claws, a selector axle having a knob on one end thereof, indicating means cooperable with said knob on said selector axle for indicating the rotation position of said knob, a central collar on said axle having a plurality of eccentric portions spaced axially and circumferentially from each other, said collar extending through the space between said teeth and said tails on said claws with one eccentric portion corresponding to each tail, spring means bearing against said claws urging said tails into contact with said collar, whereby when a tail engages an eccentric portion, the tooth on the claw is engaged with one of said racks, an oscillating arm having a bar thereon bearing against the peripheries of said discs, a sliding lock plate having an inclined aperture therewith, and a pin on said oscillating arm engaged in the inclined groove in said lock plate,

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whereby in one position of said oscillating arm said pin prevents movement of said sliding lock plate, and movement of said arm permits said sliding lock plate to slide in a straight line.

2. A combination lock as claimed in claim 1 and a wheel on the opposite end of said selector axle from said knob, said wheel having a plurality of radial projections thereon, one for each of said racks, a tooth on each projection, an oscillating claw spring loaded against said wheel for preventing said wheel from turning backwards, a cam on one of said projections, a lever pivoted at its own center, one arm of said lever engaged by said cam, said sliding lock plate having a notch therein in which the other arm of said lever is engaged, whereby turning of said selector axle rotates said wheel which in turn causes said cam to bear against said lever and oscillates said lever and slides said sliding lock plate.

3. A combination lock as claimed in claim 2 and a sliding plate engageable with said means for holding said racks, said sliding plate engageable by said one arm of said lever when said sliding lock plate is in a position with the bar on said oscillating arm out of said notches in said discs, whereby said holding means releases said racks and said racks and said discs are returned to their initial positions.

4. A combination lock as claimed in claim 1 and a pivotally mounted supporting plate on which said discs are mounted, said supporting plate having a keyhole therein, a safety plate pivoted to said supporting plate over said keyhole on the side of said supporting plate toward said knob, and said means for holding said racks mounted on said supporting plate, whereby a key may be inserted into the keyhole and said supporting plate pivoted to disengage said discs and said holding means from said racks for resetting the combination for the lock.

5. A combination lock comprising a plurality of superimposed discs each having a notch and a toothed portion on the circumferential edge thereof, an axle on which said discs are freely rotatably mounted, a plurality of toothed racks, one for each of said discs, and each having a rack portion on one edge thereof engaged with the toothed portion of one of said discs, and a toothed portion on the opposite edge, a plurality of claws, one for each of said racks and each having a tooth thereon engageable between the teeth of said toothed portions of one of said racks, and having a tail spaced from said tooth, a slidable claw carrying plate on which said claws are pivotally mounted in superimposed position, a reciprocally mounted feeler button means engageable with said carrying plate for sliding said carrying plate, ratchet means engageable with said racks for holding said racks after movement thereof by said feeler button means, said carrying plate and one of said claws, a selector axle having a knob on one end thereof and having a plurality of eccentric portions thereon spaced axially and circumferentially from each other, said selector axle extending through the space between said teeth and said tails on said claws with one eccentric portion corresponding to each tail, spring means bearing against said claws urging said tails into contact with said axle, whereby when a tail engages an eccentric portion the tooth on that claw is engaged with one of said racks, an oscillating arm having a bar thereon bearing against the peripheries of said discs, a sliding lock plate means engaged with said oscillating arm for preventing sliding movement of said lock plate means in one position and permitting said sliding lock plate to slide in a straight line when said arm is moved.

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