Jan. 23, 1962 F. PLETERSKI 3,017,761

CODE LOCK

Filed April 30, 1957 4 Sheets-Sheet 1

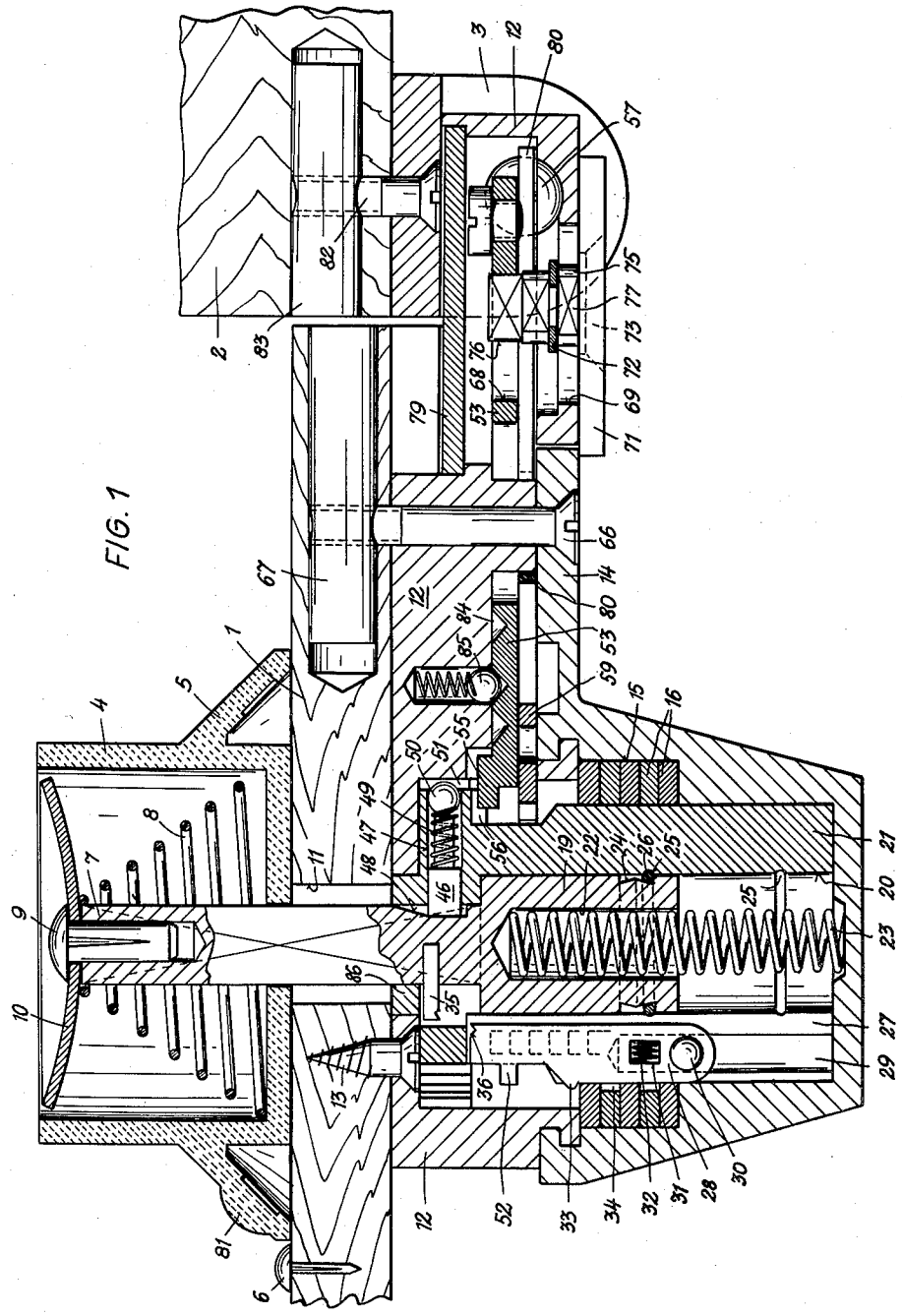


FIG. 1

Jan. 23, 1962 F. PLETERSKI 3,017,761

CODE LOCK

Filed April 30, 1957 4 Sheets-Sheet 2

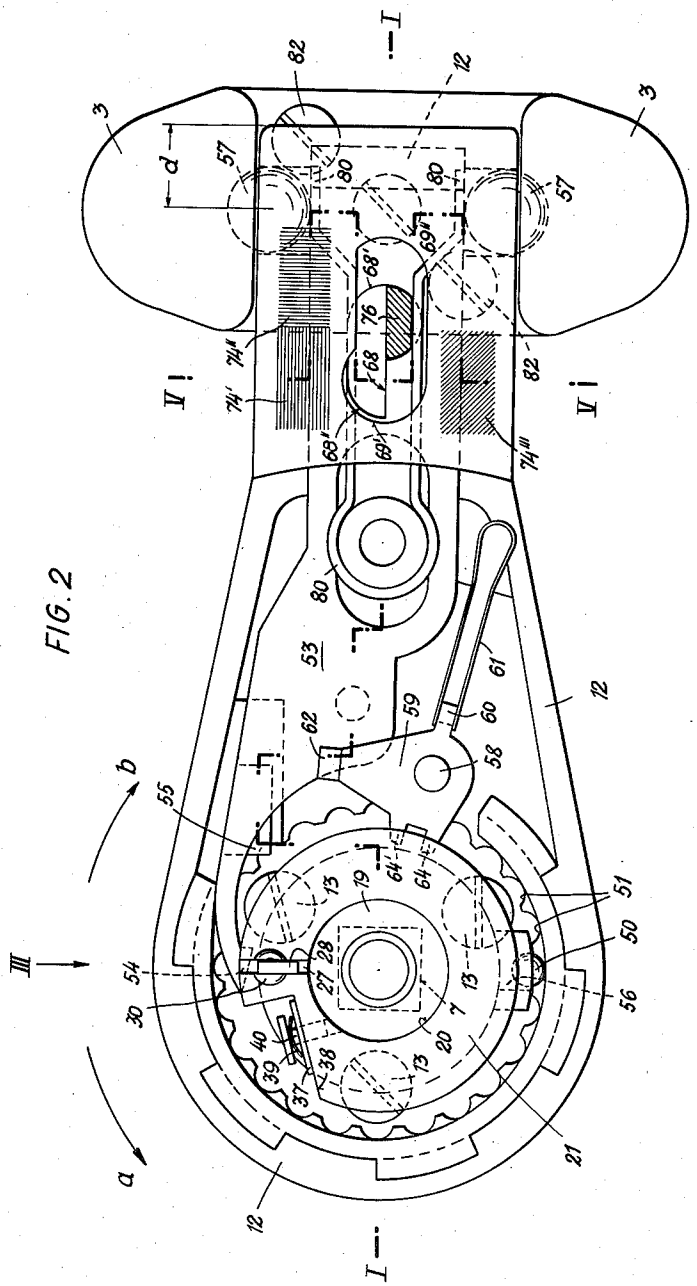


FIG. 2

Jan. 23, 1962 F. PLETERSKI 3,017,761

CODE LOCK

Filed April 30, 1957 4 Sheets-Sheet 3

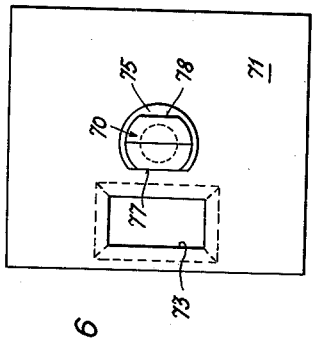


FIG. 6

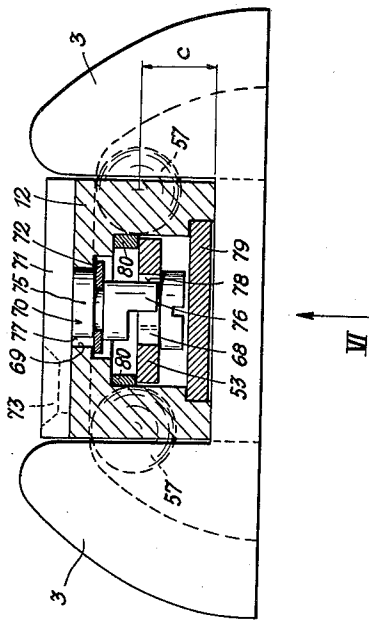


FIG. 5

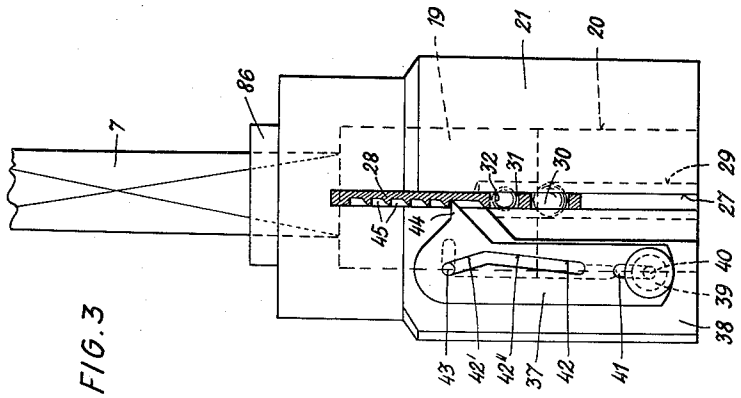


FIG. 3

Jan. 23, 1962 F. PLETERSKI 3,017,761

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Filed April 30, 1957 4 Sheets-Sheet 4

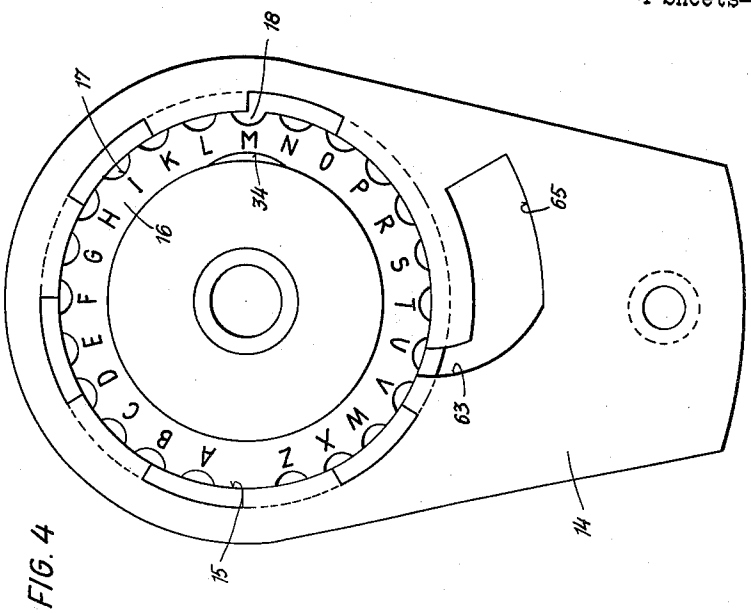


FIG. 4

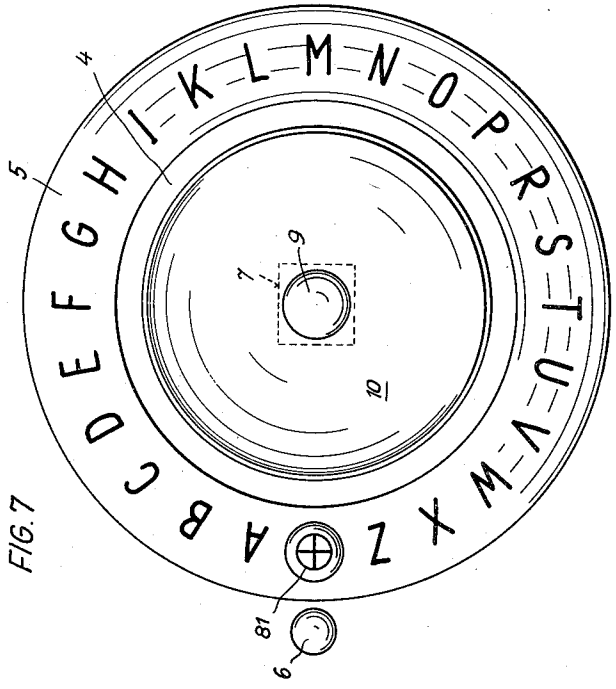


FIG. 7

United States Patent Office 3,017,761 Patented Jan. 23, 1962

3,017,761

CODE LOCK

Friedrich Pleterski, Muhlgasse 9/12, Vienna IV, Austria

Filed Apr. 30, 1957, Ser. No. 656,052
Claims priority, application Austria May 15, 1956
17 Claims. (Cl. 70—133)

This invention relates to a code lock, which comprises a selector member, several adjustably arranged code discs forming a rigid scanning surface, and at least one shiftable member, which can be advanced in steps in positions relative to the scanning surface which are determined by the selected code word. The invention is essentially characterized in that the selector member moves the shiftable member into a predetermined position relative to the scanning surface, which consists substantially of the peripheral surface of a solid of revolution, and by an actuating member which effects the stepwise advance and the return movement of the shifting member. The actuating member is movable in all directions of movement of the selector member and in addition thereto in a direction which is different from all directions of movement of the selector member. Because the selector member moves the shiftable member to the position relative to the code discs which is determined by the code word whereas the advance of the shiftable member is then effected by another actuation as soon as the relative position has been selected, the operation of the code lock is facilitated and the correct setting of the selector member is neither tangible nor audible.

The previously known constructions of code locks have the disadvantage that some part performs a clicking movement in the correct position of the selector member. This is an important aid to an unauthorized opening of the code lock. For instance, code locks comprising code discs and a shiftable member coacting therewith are known, in which the member for setting the code discs effects also the shifting movement of the shiftable member. In such a case the selector member must be turned to the predetermined position and must then be reversely turned to actuate the shiftable member. The actuation of these known devices is difficult because the selector member can be turned only in one direction to the position which corresponds to the respective letter or digit of the code word or code number and an excessive turning of the selector member can no longer be corrected by a reverse turning because a reverse turning of the selector member will immediately cause an actuation of the shiftable member. This enables also the detection of the clicking of the selector member in the correct position, possibly with the aid of sensitive instruments.

As contrasted therewith the construction according to the present invention has the advantage that the selector member can be freely turned in either direction to select the position of the shiftable member relative to the code discs and that no part clicks in the correctly selected position to facilitate the detection of that correct position. After the correct letter or correct number of the respective code word or code number has been freely preselected, the shiftable member may be shifted by the actuation of a separate actuating member. The selector member is suitably operable with the aid of a rotary knob and the actuating member is movable in the direction of the axis of the rotary movement of the rotary knob. The shifting operation will be performed only when the selector member is in its correct position. When the selector member is in a wrong position the axial movement remains ineffective or the previously achieved correct setting is entirely erased.

In a preferred embodiment of the invention the code discs which form the scanning surface consist of axially aligned setting rings, which are formed on one of their

peripheral surfaces with recesses which coact with the shiftable member. This affords the advantage that the direction of movement of the shiftable member agrees with the direction of movement of the actuating member, which involves a simpler construction and increases the reliability in operation. The number of code discs and the length of the code word or code number may be selected as desired without complicating the construction. These advantages are not achieved in the known prior art, in which the scanning surface is formed by the end faces of several concentrically arranged rings.

Special advantages will be obtained if the recesses are arranged according to the invention on the inner peripheral surfaces of the setting rings and consist of shallow depressions. Then the entire mechanism for feeding the shiftable member may be arranged within the setting rings, permitting a particularly space-saving construction.

According to the invention the selector member may be combined with the actuating member in a simple manner to form a single control member, which is rotatable and axially slidable like a push knob. This affords the advantage that only a single part needs to be passed through the door to be locked, whereby obstacles to unauthorized opening are increased. In addition, this arrangement simplifies the operation, to turning a push knob and pressing the same.

Because the setting rings forming the code discs are adjustable to stationary positions in the construction whereas the selector member is rotatably and axially slidably arranged, the setting rings may easily be inserted according to the selected code word when the lock casing has been opened and the code word may be altered without difficulty.

An illustrative embodiment of the code lock according to the invention is diagrammatically shown in the accompanying drawings.

FIG. 1 is a sectional view taken on line I—I of FIG. 2, the shiftable member **28** being turned into the plane of section for greater clarity.

FIG. 2 is an elevation showing the lock as viewed from the inside, with the casing cover removed.

FIG. 3 is an elevation in the direction of the arrow III of FIG. 2 with the shiftable member shown in section.

FIG. 4 is an elevation showing the casing cover as viewed from the inside, with inserted setting rings.

FIG. 5 is a sectional view taken on line V—V of FIG. 2.

FIG. 6 is an elevation showing a detail viewed in the direction of the arrow VI of FIG. 5.

FIG. 7 is an elevation showing the selector handle as viewed from the outside.

Like numerals refer to like parts throughout the specification and the several views of the drawings.

The code lock proper is mounted on the door leaf **1** to be locked whereas the locking claws **3** which cooperate with the locking means of the lock are affixed to the door frame member **2** cooperating with the door leaf **1** to be locked. A selector handle **4**, which consists preferably of transparent plastics, is disposed on the outside of the door leaf. The selector handle **4** comprises a flange **5**, which is provided on its underside with letters or numerals in luminous paint. Thereby it is avoided that the letters are worn off or become illegible by the manual actuation as they might be if provided on the upper side. A fixed marker **6** is provided for alignment with the letters during operation.

The selector handle **4** is slidingly fitted a square shaft **7** and is urged by a conical spiral spring **8** against the surface of the door. The conical spiral spring **8** bears on a disc **10**, which is held by means of a headed pin **9** on the square shaft **7**. Pressure is exerted on the disc **10** during the actuation of the lock.

The square shaft 7 extends through a bore 11 of the door leaf 1 to be locked and during assembly is cut to the length which corresponds to the thickness of door leaf 1. The shaft 7 represents the control member, in which the selector member and the actuating member are combined in a simple and suitable manner.

The casing 12 of the code lock is screwed by means of fixing screws 13 to the inside of the door leaf. The casing 12 is closed by a cover 14 mounted with a bayonet joint. The cover 14 is formed on its inside with a cylindrical counterbore 15, in which the setting rings 16 are inserted. The alphabet or any desired number of numerals are impressed upon the end face of each setting ring 16 (FIG. 4). The outer peripheral surface of each setting ring 16 is formed with notches 17, each of which corresponds to one letter of the alphabet. The cover 14 has a web 18, which engages one of the notches 17, depending on the rotational position of the setting ring, and prevents a rotation of the inserted setting ring 16. When it is desired to set any desired word it is sufficient to insert the setting rings in the cover in the reading sequence of the letters of the code word or of the numerals of the code number, the web 18 engaging only the notch 17 which corresponds to the respective letter of the code word (FIG. 4).

The square shaft 7 is formed at its end with an enlarged cylindrical portion 19, which is slidably guided in a bore 20 of a sleeve 21. The sleeve 21 is axially non-displaceably but rotatably carried in the cover 14 and is connected for rotation with the square shaft 7 by a flange 86, within which shaft 7 slides. The enlarged end 19 of the square shaft 7 is formed with a bore 22, which contains a compression spring 23, which bears on the inside of the cover 14. Pressure on the disc 10 will thus cause the enlarged cylindrical portion 19 of the square shaft 7 to be reciprocated in the bore 20 of the sleeve 21. This axial movement is reversible only at its end points. To this end a split locking ring 26 of spring steel wire cooperates with a double cone 24 of the enlarged cylindrical portion 19 of the shaft 7 and with a pair of spaced transverse grooves 25 of the bore 20. The depth of the grooves 25 is such that the double cone 24 can pass on the inside through the locking ring 26 when the latter yields into one of the grooves 25. Because the grooves are arranged near the end positions of the axial movement of the locking ring 26 and the angle of the double cone is less than the angle of friction of steel in contact with steel (preferably 5 degrees each) the axial movement of the shaft 7 can be reversed only in the two end positions because otherwise the locking ring is forced by the cone against the wall of the bore 20 to lock the longitudinal movement. Thus, an incomplete pressing of the actuating member and a resulting functional disturbance of the code lock is safely avoided. To prevent the operator from depressing shafts 7 and 19 until ring 26 would come below the groove 25 remote from knob 4, this groove is spaced from the bottom of the counterbore 15 a distance combining the width of the spring, when under compression and the width between the bottom portion of shaft 19 above and the bottom of cone 24.

The sleeve 21 comprises a longitudinal slot 27 (FIGS. 2 and 3), in which a shiftable member consisting of a shiftable plate 28 is slidingly guided in a close fit. To this end the sleeve 21 is formed with a bore 29, which extends in the axial direction of the sleeve and in which a ball 30 carried in an orifice of the shiftable plate 28 is slidably arranged (FIGS. 1 and 3). A window 31 of the shiftable plate 28 contains a spring 32, which bears at one end on the wall of the window 31 of the shiftable plate 28 and with the other end on the wall of the bore 29 of the sleeve 21. The window 31 is slightly eccentric relative to the axis of the bore 29 (see FIG. 1).

The shiftable plate 28 has a nose or abutment 33, which is urged by the spring 32 into a position in which it extends radically outwardly into engagement with the inside cylindrical surfaces of the setting rings 16. Each

setting ring 16 has in its inner periphery a shallow depression or notch 34 (FIG. 4), in which the nose 33 of the shiftable plate 28 is slidably received when the shiftable plate 28 has been turned to the correct letter. Thus a rigid scanning surface is formed by the several surfaces of the setting rings superimposed as shown in the present illustrative embodiment to form the surfaces of a hollow circular cylinder with depressions spaced therein at predetermined points.

A retracting pin 35 is pressed into shaft 7. As will be described more fully hereinafter, retracting pin engages a tooth 36 of the shiftable plate 28 and retracts the latter to its initial position when the control member is pressed following a selection of a wrong letter.

In order to enable the shiftable plate 28 to be advanced, a pawl 37 (FIG. 3) is provided, which is longitudinally slidably and pivotally carried on a milled-off portion 38 (see FIG. 2) of the sleeve 21. The pawl is mounted with an interposed spring disc 39 on a pin 40, which is pressed into the sleeve 21, which passes through a slot 41 in pawl 37. The pawl is thereby mounted for limited sliding movement in a direction generally parallel with the axis of shaft 7. See FIGURE 3. Also pawl 37 has a cam slot 42, which consists of two portions 42′ and 42″ forming together a wide angle. The slot 42 receives a pin 43 affixed to the shaft 7. The pawl 37 comprises also a tooth 44, which coacts with recesses 45 in the shiftable plate 28. The distance between two recesses 45 is suitably equal to the axial thickness or dimension of each of the setting rings and the number of recesses corresponds to the number of setting rings. As is apparent from FIG. 3 the recesses 45 have a sawtooth-like profile. As will be described more fully hereinafter this construction ensures a stepwise advance of the shiftable plate 28 responsive to each correct selection and pressing of the control member.

In order to prevent a selection of an intermediate position between two code letters, there is provided a detent pin 46, FIGURE 1. This pin is guided in a bore 47 of the sleeve 21 and coacts at one end with a recess 48 of the shaft 7 and at its reduced other end through the intermediary of a spring 49 and ball 50 with notches 51 of the casing 12, see FIGURE 2. These notches 51 correspond to the notches 17 of the setting rings. If a precise setting is made to a letter the ball 50 will slide into the respective notch 51 and under the influence of the inclination of the recess 48 the pin 46 can yield outwardly against the action of the spring 49 during the subsequent axial movement of the shaft 7. In the case of an inaccurate setting the ball 50 will prevent the pin 46 from giving way because in that case the ball 50 does not lie in the notch 51 but on the land between two notches, closer to the shaft 7. This device will also prevent a rotation of the shaft 7 when the axial movement of the shaft 7 has not been completed because in that case the shaft 7 engages the pin to displace the latter more to the right whereby the ball 50 is prevented from yielding out of the respective notch 51.

When the correct selection and the advancing movement of the shiftable plate 28 have been completed a stop 52 provided on the shiftable plate 28 will lie in the plane of the latch or locking bolt 53 as shown upon FIG. 1. The locking bolt 53 has an arm formed with a tooth 54 (FIG. 2) so that a rotation of the selector handle in the sense of arrow *a* of FIG. 2 will cause the stop 52 of the shiftable plate 28 to engage the tooth 54 of the bolt 53 and move it to the left to its non-locking position. The bolt 53 has also a stop 55, which extends slightly out of the plane of the bolt and is suitably welded thereto, and which cooperates with a counterstop 56 provided on the sleeve 21 (FIG. 1) so that a rotation of the selector handle in the sense of arrow *b* of FIG. 2 will enable the bolt 53 to be moved to the right to its locking position, in which its right-hand end is disposed between two locking balls 57, which seat in recesses in

the locking claws 3 (FIG. 2), the right hand end of the locking bolt preventing the locking balls 57 from yielding inwardly.

A plate 59 pivoted on a shaft 58 in the casing 12 comprises a pin 60, which is held by a spring 61 gripped in the casing 12. The plate 59 has a stop 62, which lies normally in a narrow slot 63 (FIG. 4) of the cover 14 to prevent rotation of the cover 14 and an opening of the bayonet joint between the cover 14 and the casing 12. The plate 59 has also two stops 64 and 64', by means of which the plate 59 can be pivotally moved on the shaft 58 to move the stop 62 to a position in which it can slide into a guide 65 (FIG. 4) formed in the cover 14 to enable the removal of the latter. This movement of the plate 59 will be described more fully hereinafter. The cover 14 may be affixed to the casing 12 and the door leaf 1 by a screw 66, which is suitably prevented from being knocked out by a transverse bolt 67 arranged in the door leaf 1.

The bolt 53 has an aperture 68, which comprises a part 68' shaped according to an arc of a circle and continued by an elongated part 68" (FIG. 2). The casing has also an aperture 69, which consists also of a part 69' shaped according to an arc of a circle and continued by an elongated part 69". A pin 70 fixed with a slide 71 arranged on the outside of the casing cooperates with said apertures 68, 69. The slide 71 is prevented from being removed by a clip 72 engaging a reduced portion of the pin 70 (FIG. 5), and has a window 73, in which marks 74', 74", 74"' arranged in fixed position on the casing and having preferably different colors are visible depending on the position of the slide. For instance, the mark 74' may be green, the mark 74" may be red and the mark 74"' may be white.

The pin 70 of the slide 71 consists substantially of two parts 75 and 76. As is apparent from FIG. 6 the pin portion 75 is cylindrical and has only a milled-off portion 77 on its side facing the window 73. On the other hand, as is apparent from FIG. 2, the pin portion 76 is of semi-circular shape and has a milled-off portion 78.

The casing 12 is covered adjacent to the slide by a hardened steel plate 79 (FIG. 1).

The locking balls 57 are urged outwardly by a spring 80 and are suitably arranged so that the distance *c* (FIG. 5) between the ball centers and the base surface of the locking claws 3 corresponds at least substantially to the distance *d* (FIG. 2) between the ball centers and the outside surface of the casing 12.

The flange 5 of the selector handle 4 is provided with a locking mark 81 (FIGS. 1 and 7), the purpose of which will be explained hereinafter. To enable an actuation also by blind persons the locking mark 81 is embossed (FIG. 1). This tangible starting point for each selection enables the selection of each set code word to be made without seeing the letters because the several letters will be exactly indicated by a click (ball 50 and notches 51); the actuating member is pressed after each selection of a letter. The window 73 of the slide 71 enables the operation to be felt by blind persons also on the inside of the door. Even the setting of a new code word may be effected by a blind person because the setting rings have no notch 17 between the letters Z and A, as is apparent from FIG. 4, and the letters are suitably impressed on the end face of the rings so that a blind person can find out and set the desired letter of the code word by touch.

The locking claws 3 are affixed to the door frame 2 by screws 82, which are suitably prevented from being knocked out by at least one transverse pin 83.

The locking bolt 53 may be secured in its various functional positions by a detent ball 85 received in grooves 84.

Hereinafter the various functions of the code lock according to the invention will be described more fully.

Opening the lock from the outside

The selector handle 4 is turned either clockwise or counter-clockwise until the selected letter of the code word is in register with the mark 6. The shiftable plate 28 is in its initial position, in which it is entirely in the cover 14. The rotation of the selector handle 4 causes the sleeve 21 and the shiftable plate 28 carried thereby to rotate until the nose 33 of the shiftable plate 28 enters the depression 34 of the first setting ring. Then the spring 32 swings the shiftable plate 28 radially outwardly about the ball 30. The control member is then depressed, manually, and the shaft 7 and the retracting pin 35 pressed in the same are axially moved, with the retracting pin 35 sliding below the outwardly swung shiftable plate 28, which thereby is not retracted (FIG. 1). During the axial movement of the shaft 7 against spring 23 the pin 43 inserted in the shaft slides in the cam slot 42 of the pawl 37 (FIG. 3). As long as the pin 43 slides in the part 42' of the cam slot the pawl 37 is swung to the left, as seen in FIG. 3, whereby its tooth 44 is disengaged from the recesses 45 in the shiftable plate 28. Then the pin 43 slides in the slot part 42" and the pawl 37 remains unmoved since slot part 42" extends radially of pivot pin 40. When the pin 43 has reached the end of the slot part 42" the pawl 37 will be moved along, the pin 40 sliding in the guide slot 41 of the pawl 37. When the shaft 7 is then returned under the action of the spring 23 the pin 43 will slide first in the slot part 42", the pawl remaining unmoved. When the pin 43 slides then in the slot part 42' the pawl 37 will be swung about the axis of the bolt 40 to cause the tooth 44 to engage the next following recess 45 of the shiftable plate 28. When the pin 43 has reached the end of the slot part 42' the pawl 37 and with it the shiftable plate 28 will be carried along to advance the shiftable plate 28 to the next following setting ring. Then the next following letter of the code word must be selected, whereafter the control member is again depressed, etc. and the operation repeated. After the last letter of the code word has been selected and the control member has then been depressed the shiftable plate reaches the position shown in FIG. 1, in which the stop 52 of the shiftable plate 28 is in the same plane as the locking bolt 53 so that a counter-clockwise rotation of the selector handle in the sense of the arrow *a* (FIG. 2) will cause the stop 52 to engage the tooth 54 of the bolt, whereby the bolt 53 is pulled to the left to its non-locking position. Now the balls 57 can yield inwardly against the action of the spring 80 and the door can be opened.

After a wrong selection the nose 33 of the shiftable plate 28 does not lie in a depression 34 of the setting ring so that the shiftable plate 28 is forced inwardly. The pressing of the control member will then cause the retracting pin 35, which engages the tooth 36 of the shiftable plate 28, to move the latter back to its initial position. The code word must now be selected again, each selection of a letter being followed by a pressing of the control member.

Opening the lock from the inside

The lock may be opened from the inside in a simple manner by pushing the slide 71 to the right until the green mark 74' provided on the casing appears in the window 73. The bolt 53 is carried along to the left by the pin portion 76 disposed in the lower part of the arcuate section 68' of the aperture 68. Then the lock is open.

Closing the lock from the outside

After the door has been closed the selector handle is turned clockwise in the sense of the arrow *b* of FIG. 2. The stop 55 of the locking bolt is thus caused to cooperate with the counterstop 56 of the sleeve 21 and moves the locking bolt to the right to its locking position. Now the correct setting of the shiftable plate must be erased.

To this end the selector handle **4** is first turned in the sense of the arrow *b* of FIG. 2 until the locking mark **81** is in register with the mark **6**. By this operation the shiftable plate **28** is turned so that its stop **52** is disposed below the tooth **54** of the bolt, whereby the shiftable plate **28** is urged inwardly and will be pushed back to its initial position by the retracting pin **35** following the subsequent axial movement of the square shaft **7** under the finger pressure exerted on the disc **10**. To open the lock from the outside it is then necessary to make a correct selection of the code word and to press the control member completely after each letter.

Closing the lock form the inside

After the door has been closed the slide **71** is pushed to the right until one half of each of the green and red marks **74'** and **74''** appear in its window **73**. During that movement of the slide the bolt **53** is carried along by the pin portion **76** of the slide **71** lying in the lower part of the arcuate aperture **68'** of the bolt (FIG. 2) to a position in which its right-hand end is disposed between the locking balls **57** so that the latter cannot yield towards each other and the door cannot be opened. To open the door from the outside it would now be necessary to select the several letters of the code word and press the control member, whereafter the bolt **53** can be pulled to the left to its open position by turning the selector handle **4** counter-clockwise in the sense of the arrow *a* of FIG. 2.

Locking up from the inside

When it is desired to lock up the door from the inside in such a manner that it cannot be opened from the outside even if the code word is properly operated the slide **71** and with it the bolt **53** is pushed to the right until only the red mark **74''** provided on the casing appears in the window **73** of the slide **71**. In that position the bolt **53** locks the balls **57** and is pushed to such an extent to the right that its tooth **54** is outside the path of the stop **52** of the shiftable plate **28** and is no longer engaged by the stop **52** when the selector handle **4** is turned in the sense of the arrow *a* of FIG. 2.

Locking up from the outside

When it is desired to lock up the lock in such a manner that it cannot be opened from the inside, the slide **71** is moved to the left until the green mark **74'** appears in its window **73**. When the door is open and the slide **71** is in that position the slide can be turned through 180° so that the white mark **74'''** appears in the window **73** of the slide **71**. That rotation is possible because in this position of the slide the arcuate pin portion **75** can slide in the arcuate part **69'** of the aperture **69** in the casing **12**. At the same time the pin portion **76** of the slide **71** is turned out of the arcuate part **68'** of the aperture **68** in the bolt **53**. The slide **71** cannot be turned when the door is closed because the locking claws **3** prevent a rotation of the slide when the door is closed.

When the slide is in position "white" and the door is closed, followed by turning the selector handle **4** in the sense of arrow *b* of FIG. 2 to push the bolt **53** to the right to its locking position, the pin portion **76** sliding in the elongated part **68''** of the aperture **68** of the bolt, the lock cannot be opened from the inside because the slide **71** being guided between the locking claws **3** cannot be turned and cannot be displaced either because the pin portion **75** lies in the arcuate part **69'** of the casing aperture **69**.

Because of this operating the lock can be initiated only when the door is open, and a misuse by persons on the outside of the door is precluded.

Change of the code word or code number

For this purpose the screw **66** is loosened first. While the door is opened the first four letters of the code word are then selected in succession and the control member is depressed after each selection. Thereafter the stop **52** of the shiftable plate **28** lies in the same plane as the plate **59** which carries the stop **62** preventing a rotation of the casing cover **14**. Now the selector handle **4** is set to the letter "G" but without subsequent pressing. Depending on the direction in which this rotation of the selector handle has been performed the stop **52** will engage one of the stops **64** and **64'** of the plate **59**, whereby the plate **59** is turned on its shaft **58** against the action of the spring **61**, which holds it in its position of rest. During that rotation the stop **62** is swung either to or from the square shaft **7**; in the latter case the stop **62** is guided into the guide **65** of the casing cover **14** (FIG. 4). Thereupon the casing cover **14** can be turned to open the bayonet joint between the casing cover **14** and the casing **12**. Then the cover **14** can be removed, the setting rings **16** can be taken out of the cover and reinserted into any desired position, in which they are by the web **18** of the cover **14** engaging one of the notches **17**. As the cover **14** is mounted back on, the selector handle is again turned to the letter "G" because the stop **62** which prevents a rotation of the cover **14** is then swung out. Then the screw **66** is screwed in and after the closing mark has been selected the control member is pressed to erase the correct selection of the first four letters of the code word.

The fixing screws **13** of the casing being arranged inside the casing or casing cover they can be loosened only when the cover has been removed. A removal of the cover is possible only when at least part of the code word has been correctly selected, followed by pressing after each selection. Thus, a discovery of the set code word and a removal of the entire lock by unauthorized persons is prevented whether the door is closed or open and the present invention provides a door lock which cannot be removed by unauthorized persons even when the door is open. In order to prevent the screws from being knocked out they may be secured by transverse pins just as the cover fixing screw **66** and the screws **82** for fixing the locking claws.

The use of a square shaft as a part of the control member has the advantage that it enables the lock to be mounted in four positions for right-hand and left-hand doors and on the upper or lower side of drawers. To this end it is sufficient to push the selector handle **4** in the desired position on the square shaft **4** and to drive in the mark **6** in the corresponding position.

I claim:

1. In a combination lock, a casing, a plurality of discrete rings stacked in said casing in end-to-end relation coaxial of a common axis, each said ring having a notch in its inner periphery and being independently adjustable about said axis, means fixing each said ring relatively to said casing, in a selected one of a plurality of positions of rotational adjustment about said axis a plate shiftable axially along and within said rings, said plate having an abutment and a sequence of recesses extending parallel with the axis of said rings, first means carried by said casing and manually operable to rotate said plate to align said abutment with the notch in each said ring in succession, and pawl means manually operable to engage each said recess in sequence, to advance said plate through said rings, step by step, when said abutment is correctly aligned with the notch in each respective ring.

2. In a combination lock, a casing having a cylindrical recess having an axis of symmetry and a web fixed with the surface of said recess parallel with said axis, a plurality of discrete rings fitting said recess in stacked, end-to-end relation coaxial of said axis, there being a plurality of angularly-spaced notches in the outer periphery of each said ring, each notch being adapted to fit over about said web whereby to individually fix each said ring relatively to said casing, in a selected position of rotational adjustment about said axis there being a notch in the inner periphery of each said ring a bolt carried by said casing for move-

ment between locking and unlocking positions, a plate shiftable axially in and along said rings and having an integral abutment, a stop, and a series of recesses spaced along said axis, means mounting said plate within said rings for rotation about and translation along said axis, first means manually operable to rotate said plate to align said abutment with the notch in each said ring in succession, pawl means operable to engage each said recess in sequence, to translate said plate step by step through each ring when said abutment is aligned with the notch thereof, and means for manually operating said pawl means, said last-named means returning said plate to initial position if said plate has not been rotated into alignment, as aforesaid, said stop being engageable with said bolt to move the same to unlocking position, only when said plate has traversed the final one of said plurality of rings.

3. A combination lock, comprising, a casing having a recess symmetrical about an axis, a plurality of rings in said recess, in end-to-end relation coaxial of said axis, each said ring having a notch in its inner periphery, means releasably fixing each said ring in a selected position of rotational adjustment about said axis, a sleeve fitting within said rings for rotation only about said axis, a shaft rotatably mounted in said casing coaxial of said axis and having an axially slidable non-rotatable connection with said sleeve, plate means, means mounting said plate to said sleeve for rotation as a unit therewith and for radial movement in a plane through said axis, an abutment fixed with said plate means and translatable through each said ring only when rotationally aligned with the notch therein, means responsive to axial translation of said shaft to effect corresponding step-by-step translation of said plate means through each ring in succession, when said abutment is aligned as aforesaid, a lock bolt movable in said casing between locking and unlocking positions, and stop means fixed with said plate means and engageable with said bolt to move the same to unlocking position in response to rotation of said shaft, only when said abutment has traversed the final one of said rings.

4. A combination lock as in claim 2, said casing including a body and a cover separable therefrom, a bayonet joint connection between said body and cover and cover and releasable in response to rotation of said cover about said axis, latch means fixing said cover in position against rotation about said axis, said stop means being axially positioned to engage and release said latch means, only when said abutment has traversed the penultimate one of said rings.

5. In an assembly for a combination lock, a sleeve having a first axis of symmetry and an outwardly-opening slot in a plane through said first axis, a plate fitting said slot for movement in said plane and translation along said axis, means pivoting one end of said plate on a second axis offset from said first axis and normal to said plane, a plurality of discrete recesses in said plate and extending in equally-spaced relation parallel with said axis, and ratchet means pivotally mounted to said sleeve and having a nose engageable with said recesses, in sequence.

6. In an assembly for a combination lock, a sleeve having a first axis of symmetry and an outwardly-opening slot in a plane through said first axis, a plurality of rings fitting about said sleeve and slot, in end-to-end relation, each said ring having a notch in its inner periphery, means fixing said rings in predetermined rotational position about said axis, a plate fitting said slot for movement in the plane thereof and for pivotal movement about a second axis normal to said plane, an abutment fixed with said plate and traversable through each said ring, in succession, only when rotationally aligned with the notch therein, spring means urging said plate outwardly about said second axis, said plate having a series of recesses equally spaced in a direction parallel with said first axis and corresponding in number to the number of said rings, a shaft coaxial of said axis and having a splined connection with said sleeve to manually rotate the same, a pawl mounted to said sleeve for sliding pivotal movement relatively thereto, and having a nose adapted to engage in each said recess in succession, and a pin-and-slot connection between said shaft and said pawl and operable in response to axial translation of said shaft, first to retract said pawl to free the same from said plate and then to move said pawl along said axis by a distance equal to the spacing between contiguous ones of said recesses.

7. In a lock, a casing, a shaft journaled in said casing for manual rotation about an axis and for translation along said axis, a sleeve rotatable in said casing on said axis in response to rotation of said shaft, ring means fixed in said casing about said sleeve coaxially of said axis and having a plurality of angularly-related notches in its inner periphery in respective sequentially-disposed planes normal to said axis, plate means rotatable with said sleeve about said axis and including an abutment traversable through said ring means only when sequentially rotationally aligned with each succeeding notch therein, means interacting between said sleeve and shaft requiring a full axial translation of said shaft between first and second limiting positions, means actuated by axial translation of said shaft to second position moving said plate through each notch in succession when its abutment is rotationally aligned therewith, and means actuated by translation of said shaft restoring said plate to first position along said axis unless its abutment is rotationally aligned with the next succeeding notch in said ring means.

8. In a lock, a casing, a shaft journaled in said casing for manual rotation about an axis and for translation along said axis between a first and a second limiting position, a bolt translatable in said casing toward and from said axis and including a hooked end adjacent and offset from said shaft, a sleeve rotatable in said casing on said axis, ring means fixed in said casing about said sleeve coaxially of said axis and having a plurality of angularly related notches in its inner periphery in respective sequentially disposed planes normal to said axis, plate means rotatable with said sleeve about said axis including an abutment traversable through said ring means only when sequentially rotationally aligned with each succeeding notch therein, means interposed between said sleeve and shaft requiring a full axial translation of said shaft between said positions, means actuated by said shaft restoring said plate to first position along said axis unless its abutment is rotationally aligned with the next succeeding notch in said ring means, and means fixed with said plate means and engageable with the hooked end of said bolt to translate said bolt in response to rotation of said shaft, only after traversing the final one of said plurality of notches and movement of said plate to second position along said axis.

9. In a combination lock, a casing, a bolt movable in said casing between first and second positions, a sleeve mounted in said casing for rotation about its longitudinal axis, a shaft mounted in said casing for rotation on said axis and for translation therealong, means connecting said shaft and sleeve for rotation as a unit about said axis, a plurality of discrete setting rings in said casing in stacked relation and individually adjustably fixed coaxial of said axis, each said ring having a depression in its inner periphery, a bolt-operating plate mounted in said sleeve for rotation therewith and for sliding pivotal movement with respect thereto, abutment means fixed with said plate and constructed and arranged to pass a contiguous ring only when rotationally aligned with the depression therein, ratchet means carried by said sleeve and engaging said plate to move the same through each said depression in sequence, an operating connection between said shaft and ratchet means, and means fixed with said plate and movable therewith into position for operating said bolt from first to second position, only when said plate has moved along said axis to pass its abutment means through the final one of said rings.

10. In a combination lock, a casing, a plurality of rings adjustably fixed in said casing in superposed stacked relation about a common axis, each said ring having a notch in its inner periphery, a sleeve fitting within said rings for rotation about said axis, a bolt-operating plate mounted with said sleeve for rotation as a unit therewith and for pivotal sliding movement in a plane through said axis, said plate having an abutment movable through each said ring, in succession, only when rotationally aligned with the notch therein, a shaft having one end journaled within said sleeve for rotation about said axis, a spline connection between said shaft and said sleeve, whereby said shaft is axially slidable in and relatively to said sleeve between first and second limiting positions but constrained to rotate as a unit therewith, interengaging ratchet means between said sleeve and plate, means operated by and in response to axial translation of said shaft between said positions to actuate said ratchet means to move said plate, step-by-step to position advanced through each said ring, in succession, a bolt, and means fixed with said plate engageable with said bolt to retract the same, only when said plate has traversed all said rings.

11. A lock as in claim 10, and means connected with said shaft and engaging said plate to return the same to first position only when the abutment thereof is not rotationally aligned with the next succeeding notch.

12. In a lock, a casing, a plurality of discrete stacked rings rotationally adjustably fixed in said casing about a common axis, each said ring having a notch in its inner periphery, a sleeve fitting within said rings and rotatable about said axis, a bolt-operating member mounted to said sleeve for rotation as a unit therewith and for pivotal sliding movement relatively to said sleeve in a plane through said axis, said member having an integral abutment movable through each said ring, in succession, only when rotationally aligned with the notch therein, whereby said abutment may be advanced in translation along said axis and through said rings, from an initial position on the remote side of an end one of said rings, to a final position on the remote side of the other end ring of said plurality of rings, a shaft rotatably mounted in said casing for manual translation in and along said axis between first and second limiting positions separated by a distance greater than the combined axial dimension of said rings, interengaging means between said sleeve and shaft constraining the latter to a full stroke between said limiting positions, ratchet means carried by said sleeve and engaging said member to hold the same in position advanced through each said ring in succession, a bolt movable in said casing and including means engageable by said member in response to rotation of said shaft and sleeve only when said member has advanced to carry its abutment to final position, and interengaging means between said shaft and member returning said member to initial position in response to a stroke of said shaft, unless said abutment lies within one of said notches.

13. In a combination lock, a casing, a plurality of superposed stacked discrete rings each adjustably fixed in said casing in a predetermined position rotationally about a common axis, each said ring having a notch in its inner periphery, a sleeve fitting said rings for rotation about said axis, there being a slot in said sleeve in a plane through said axis, a bolt-operating plate having a radially outward abutment and mounted in said slot, means mounting one end of said plate for pivotal sliding motion in and along said slot, means urging the other end of said plate radially outwardly about the pivot thereof, said plate being movable along said axis through each said ring, in succession, only when said abutment is rotationally aligned with the notch therein, a shaft slidably fitting said sleeve and connected for rotation as a unit therewith, ratchet and pawl means operated by axial sliding of said shaft to advance said plate step-by-step through said rings to an unlocking position, and means carried by said plate and engageable with said bolt to shift the same to unlocking position only when said plate is in said unlocking position.

14. In an assembly for a combination lock, a plurality of stacked rings fixed coaxially of a common axis, each said ring having a notch in its periphery, a shaft mounted for rotation on said axis and for translation therealong, abutment means, means mounting said abutment means for rotation with said shaft and for independent rotation in a plane through said axis and for translation along said axis, means constraining said shaft to a full stroke in translation between first and second limiting positions, ratchet means operated by translation of said shaft and moving said abutment means step-by-step through each succeeding ring when rotationally aligned with the notch therein, to advance said abutment means from a first to a second limiting position through all said rings in succession, and means fixed with said shaft and engaging said abutment means to return the same to first position when not rotationally aligned with the notch in the next succeeding ring.

15. In an assembly for a combination lock, a sleeve having a first axis of symmetry and an outwardly-opening slot in a plane through said first axis, a plate fitting said slot for movement in said plane and translation along said axis, means pivoting one end of said plate on a second axis offset from said first axis and normal to said plane, a shaft having one end slidably fitting said sleeve and connected for rotation about said first axis as a unit therewith, spring means urging said shaft in one direction into a limiting position of translation along said first axis, ratchet means engageable with said plate to translate the same along said axis, and means operated by translation of said shaft in said one direction to operate said ratchet means.

16. In an assembly for a combination lock, a sleeve having an axis of symmetry and a slot lying in a plane through said axis and opening outwardly along said sleeve, a plate mounted in said slot for sliding relatively to said sleeve along said axis and for pivotal movement about a second axis normal to said plane, there being a series of recesses in said plate equally spaced in a direction extending parallel with said axis, and means yieldingly urging said plate in rotation about said second axis.

17. An assembly as in claim 16, a shaft having one end slidably fitting said sleeve and having a splined connection therewith, a pawl mounted to said sleeve for sliding relatively thereto along said axis and for pivotal movement about an axis generally parallel with said plate, said pawl including a nose adapted to engage the recesses in said plate in succession, there being a cam slot in said pawl, a pin fixed with said shaft and riding in said slot, to first retract said pawl from said plate and then, while holding said pawl retracted, to axially translate said pawl by a distance equal to the spacing between contiguous ones of said recesses, by and in response to translation of said shaft.

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