Oct. 3, 1933. W. F. DOENGES 1,928,853

TUMBLER FOR COMBINATION LOCKS

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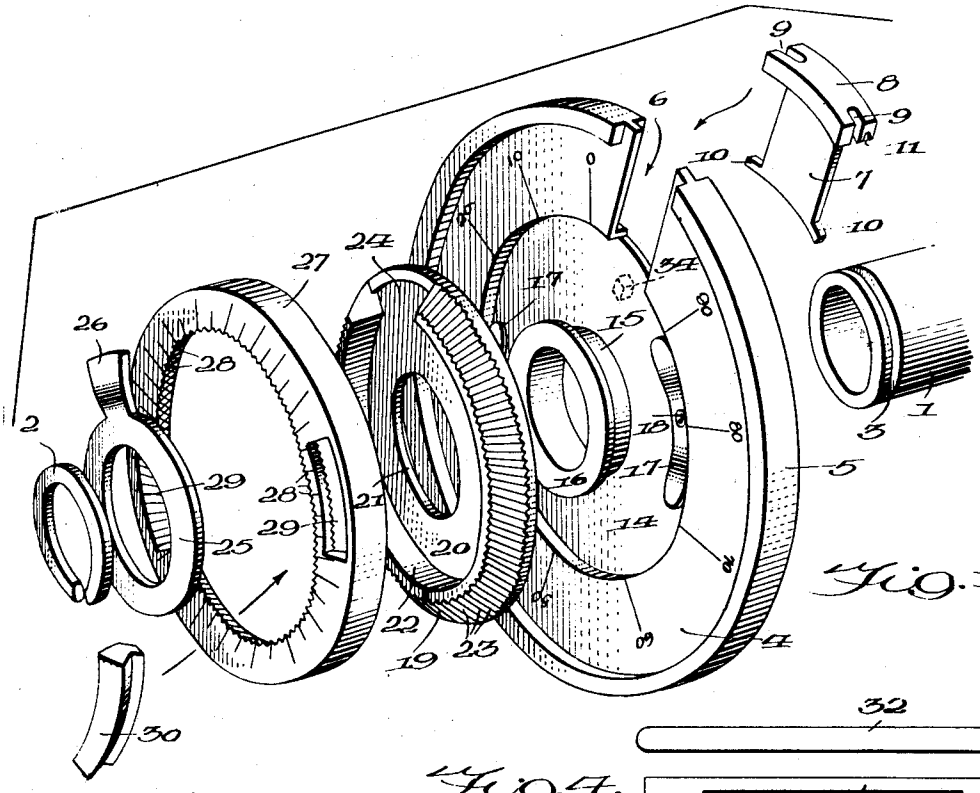


Fig. 1.

Fig. 4.

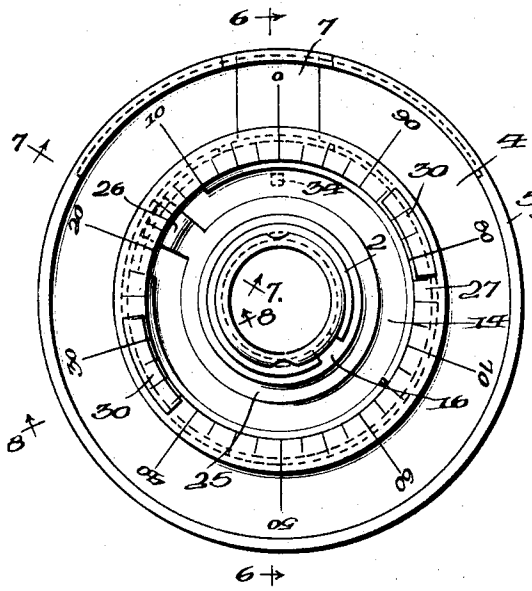


Fig. 2.

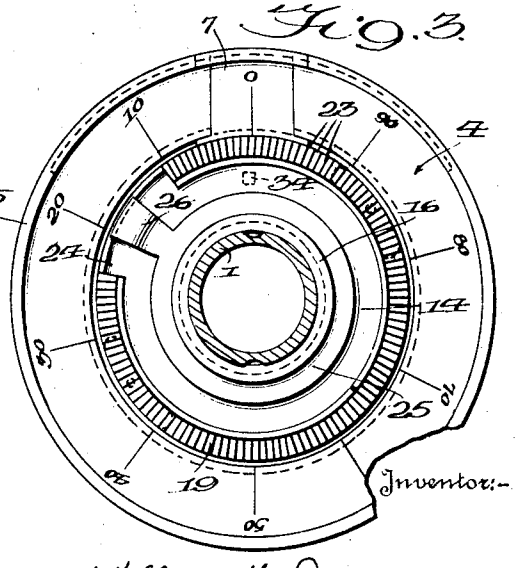


Fig. 3.

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Fig. 5.

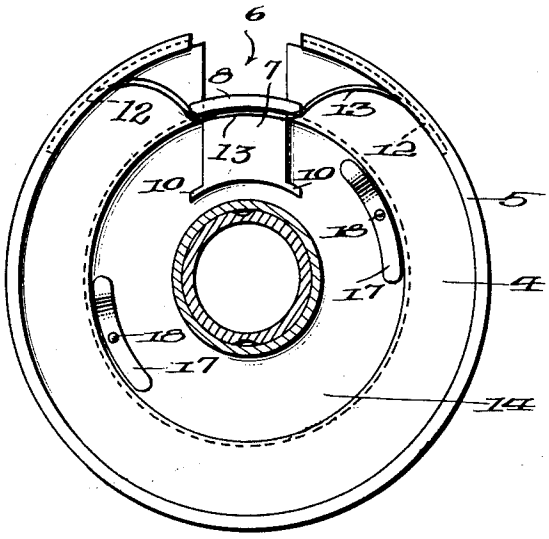


Fig. 6.

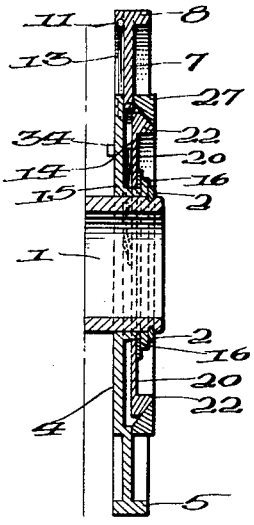


Fig. 7.

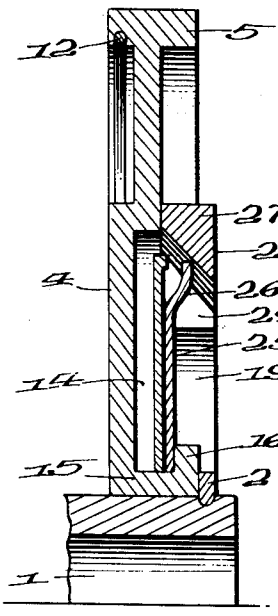


Fig. 8.

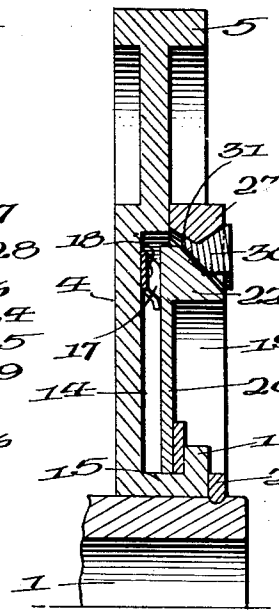
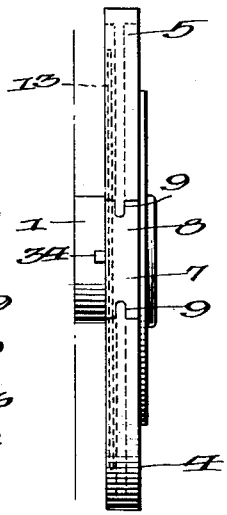


Fig. 9.



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UNITED STATES PATENT OFFICE

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TUMBLER FOR COMBINATION LOCKS

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Application March 4, 1932. Serial No. 596,869

10 Claims. (Cl. 70—53)

My invention relates to a tumbler for use in combination or permutation locks, and has particular reference to a tumbler having a normally-closed tumbler opening. While primarily intended for use in connection with new lock constructions, my improved tumbler may be made of such a shape and size that it can be used to replace the conventional tumblers now generally used in combination and permutation lock installations, in which installations the tumblers have a normally open tumbler opening which may be rendered visible from the exterior of the lock casing by the use of certain forms of electric rays.

In the usual construction of combination or permutation locks of the rotating tumbler type, such, for example, as the well known and widely used combination lock made by The Yale & Towne Manufacturing Company, each tumbler is provided with an opening or recess which, when properly alined with the like openings of its adjacent, associated tumblers, permits the cooperating lock bolt to enter the series of alined recesses to effect the release of the locking member, whereby the door or other closure with which the lock is associated, may be released and moved to open position. In such constructions, the proper alinement of the openings of the respective tumblers requires a prior knowledge of a predetermined combination or tumbler setting. Recent developments and improvements in the art relating to X-rays and the gamma rays of radium have led to the production of relatively simple, portable apparatus for the generation of rays which will penetrate an ordinary lock casing and its associated parts to render the tumbler openings or recesses readily visible from the exterior of the casing, and hence, it is a comparatively easy matter for a burglar or other person not knowing the lock combination or tumbler setting, to resort to the use of such apparatus to determine the relative position of the tumbler openings and to aline the openings of the associated tumblers so as to effect the release of the lock mechanism and the door or other closure with which the lock mechanism is associated.

It is an object of my invention to provide a tumbler for use in combination or permutation locks, in which the tumbler opening is normally closed so that it cannot be rendered visible from the exterior of the casing by the use of certain forms of electric rays.

It is an object of my invention to provide a tumbler for use in combination or permutation locks in which the tumbler opening is normally closed, and, hence, not visible from the exterior of the lock casing when subjected to penetration by certain forms of electric rays, the construction being such that the normal closure means for the tumbler opening may be moved to expose the opening only when the tumbler openings of all the cooperating tumblers are properly alined and the tumbler-engaging portion of the associated lock mechanism is moved into said alined openings.

It is an object of my invention to provide a tumbler for use in combination or permutation locks of the rotary tumbler type, in which the tumbler opening is normally closed by a sliding plate which occupies said opening, the construction being such that this plate can be moved inwardly by the tumbler engaging portion of the lock mechanism, when the tumbler openings of the cooperating tumblers are properly alined to thus permit the said tumbler engaging portion of the lock mechanism to enter the tumbler openings to permit the release of the door or closure with which the lock is associated.

It is a further object of my invention to provide a tumbler of the type above described and including means for changing or varying the combination or setting of the tumblers to control the point in the cycle of rotation of the respective tumblers whereby their rotation is transmitted to the adjacent tumbler to effect the alining of the several tumbler openings.

It is a further object of my invention to provide a tumbler for use in combination or permutation locks that may be used in the construction of new lock mechanisms or for the replacement or substitution of conventional rotary tumblers now ordinarily employed in such lock mechanisms, my improved tumbler being simple in construction, cheap and easy to manufacture, strong and durable, readily adjustable to vary the combination or setting, and highly efficient in the purposes for which designed.

In the accompanying drawings forming a part of this specification and wherein, for the purpose of illustration, I have shown a preferred embodiment of my invention,

Figure 1 is an exploded view showing in perspective the several component parts employed in the manufacture of my improved tumbler, and also showing a portion of the post and the snap ring usually employed with lock mechanisms of this general type for supporting and retaining the tumblers,

Figure 2 is a plan view of a completely assembled tumbler embodying my invention,

Figure 3 is a plan view of a partial or incomplete assembly of the tumbler,

Figure 4 includes plan and side views of one form of tool or instrument which may be employed to assist in resetting the combination of the tumblers,

Figure 5 is a plan view of a partial or incomplete assembly of the tumbler showing the sliding plate or closure in its inner or non-closing position,

Figure 6 is a vertical sectional view on the lines 6—6 of Figure 2,

Figure 7 is an enlarged sectional view on the line 7—7 of Figure 2,

Figure 8 is an enlarged sectional view on the line 8—8 of Figure 2, and

Figure 9 is a side elevation of my improved tumbler construction.

Referring to the drawings, wherein like reference numerals are employed to designate like parts throughout the several views, the numeral 1 designates the post of a combination or permutation lock mechanism adapted to receive thereon a plurality of rotary tumblers which are retained on the post by means of a snap ring 2, adapted to enter within the groove 3 near the outer end of the post 1. Ordinarily, the respective tumblers are maintained in spaced relation on the post 1 by means of washers, (not shown) nonrotatably mounted on the post 1, these washers serving to prevent the transmission of the rotation of one tumbler to the adjacent tumbler except through the "pin and fly" connection, as will be readily understood by those skilled in the art. In the accompanying drawings, I have illustrated only one tumbler embodying the features of my invention, it being understood that a plurality, say four or five, of these tumblers are to be mounted in parallel, spaced relation on the post 1.

Referring now to the construction of the tumbler which forms the subject-matter of the present application, it will be seen that the same comprises a disk-like body portion 4, having a peripheral flange 5 and provided with a tumbler opening 6 which extends radially of the outer portion of the body member 4 and through the peripheral flange 5. The ends of the peripheral flange 5 adjacent the opening 6 are cut back a short distance beyond the walls defining the opening 6, and a closure plate 7 is slidably mounted in the said opening, said plate having a top flange 8 corresponding in width and thickness to the peripheral flange 5. The ends of the top flange 8 are notched or grooved as at 9, said grooves engaging the walls which define the opening 6 and guiding the plate 7 in its movement into and out of the tumbler opening.

In order to prevent the closure plate 7 from moving outwardly when it is assembled within the opening 6, the lower corners 10 of said plate are extended to engage beneath a fixed part of the body member 4, thus permitting the said plate 7 to move inwardly but preventing said plate from moving outwardly beyond the peripheral flange 5. In order to retain the closure plate 7 in its outermost position whereby to normally close the tumbler opening 6, I groove the under side of the top flange 8 and the under side of a portion of the flange 5 adjacent each side of the opening 6, as clearly shown by the reference characters 11 and 12 respectively, and provide a bow spring 13 of a length corresponding to the length of the groove 12, the tendency of this spring being to normally force the plate 7 to its outermost position with the top flange 8 flush with the peripheral flange 5. The ends of the spring 13 engage against the ends of the groove 12 and when sufficient pressure is applied against the closure plate 7, i. e., when the tumbler-engaging portion of the lock mechanism is forced against said closure plate, said spring will flex as clearly shown in Fig. 5 of the accompanying drawings and will permit the closure plate to slide toward the center of the body member 4. As soon as the pressure of the tumbler-engaging portion of the lock is removed, the spring 13 will assume its normal bowed position within the grooves 11 and 12 and the closure plate 7 will be thus moved outwardly to completely close the tumbler opening.

The central portion of the body member 4 is offset or depressed with respect to the outer portion thereof and has its outer wall extending in a plane with the outer edge of the peripheral flange 5, this offset portion forming an annular chamber 14 adapted to house some of the working parts of the tumbler, as hereinafter explained. The inner end of the offset portion terminates in an axially-extending sleeve or hub portion 15 which extends from the back of the body member 4 toward the front thereof, and terminates in an upstanding annular flange 16, the hub portion 15 of said body member having an internal diameter slightly greater than the diameter of the post 1, whereby the tumbler can be rotatably mounted on said post. Within the annular chamber 14, I mount a pair of relatively flat springs 17, each secured at diametrically opposite sides of the chamber 14 by means of rivets or other fastening means 18, the central portion of each of these spring members lying flat against the wall of the chamber and the opposite ends of said springs flexing away from said wall.

A member 19 having a disk-like body portion 20 provided with a central opening 21 of slightly greater diameter than the hub 15, is mounted on the said hub 15 before the flange 16 is turned up or formed. This member 19 is slightly less in diameter than the annular chamber 14, and is provided with a peripheral flange 22 which extends to one side only of said member, the outer face of this flange being inclined and provided with a plurality of teeth 23, it being understood that this member 19 is freely rotatable on the hub 15 and within the annular chamber 14, and that the springs 17 engage the back of this member and tend to force the same away from the back wall of the annular chamber 14. The peripheral flange 22 is cut away as indicated at 24. A fly ring 25 having a fly member 26 is mounted on the hub 15 prior to the turning-up or forming of the flange 16, with the fly 26 extending into the cutout portion 24 of the flange 22. The annular flange 16 is then turned up or otherwise formed to retain the members on the hub 15, it being understood that both members 19 and 25 are freely rotatable with respect to the hub 15, and that the engagement of the fly 26 with the ends of the cut out portion 24, permits limited rotation between the fly ring 25 and the member 19.

An annular member 27 is next provided, said member having its inner surface inclined to correspond with the inclination of the inclined surface on the flange 22 and being provided with a plurality of teeth 28 adapted to register or mesh with the teeth 23 on the member 19. The annular member has its inner side face welded, brazed or otherwise secured to the face of the body

member 4 and is provided with diametrically opposite, arcuate openings 29 which extend completely through the said annular member 27, each of these openings having arcuate plug members 30 inserted therein.

The outer walls of the openings 29 are V-shaped in cross section as shown at 31 in Fig. 8, and the outer walls of the plug members 30 are correspondingly shaped, the relative shape and size of these plug members with respect to the openings 29 permitting said plugs to be moved inwardly a short distance but preventing said plugs from falling out of the said openings 29 when assembled therein, it being noted that said plugs 30 normally project a short distance beyond the outer side wall of the annular member 27 as best shown in Fig. 8. The inner side and bottom edges of each of the plug members 30 are cut away or inclined to correspond to the inclination of the teeth 23 on the flange 22 of the member 19, these inclined surfaces preferably being smooth or flat, i. e., devoid of teeth. In Fig. 4 of the accompanying drawings, I have shown a form of tool 32 having depending portions 33 at each end thereof, the distance between the centers of these depending portions 33 being approximately the same as the distance between the diametrically-opposite plug members 30 of the tumbler construction above described.

In order to transmit rotation of one tumbler to the adjacent tumblers by means of the usual "pin and fly" connection, I provide on the back of each tumbler a projection 34 which, when the tumblers are properly assembled on the tumbler post 1, will extend into the face of the adjacent tumbler to engage the fly 26 to transmit the rotation of one tumbler to its adjacent cooperating tumbler. In the accompanying drawings I have shown the pin or projection 34 arranged on the back of the body portion 4 in a line with the tumbler opening 6, but in manufacturing my improved tumblers I prefer to arrange these plugs at different positions with respect to said tumbler opening, i. e., the position of said pin or projection 34 will vary in each one-hundred tumblers manufactured.

When a plurality of these tumblers made in accordance with my present invention are assembled on the post 1, the first of said tumblers is rotated on said post through the instrumentality of an operating knob, operating shaft and primary drive wheel, all of which are old and well known mechanisms, the construction and operation of which is obvious to those skilled in the art. Due to the "pin and fly" connection existing between adjacent tumblers, the rotation of the first of the tumblers is transmitted to the second tumbler and so on through the four or five tumblers arranged on the post 1. A proper manipulation of the operating knob, which manipulation requires a prior knowledge of the combination or "setting" of the tumblers, brings all of the tumbler openings 6 in alinement, whereupon the inner or "fence" end of the lock bolt can move into the normally closed tumbler openings 6 to permit the releasing of the lock mechanism, the inward movement of said inner or "fence" end of the lock bolt forcing the plate 7 of each tumbler inwardly against the spring 13 to a position corresponding to that shown in Fig. 5 of the accompanying drawings. As soon as the lock mechanism is closed, i. e., the inner or "fence" end of the lock bolt is removed from the tumbler openings, the spring 13 moves to its normal position and forces the plate 7 outwardly to again close the tumbler opening. During the inward and outward movements of the plate 7, said plate is guided by the engagement between the grooves or notches 9 and the adjacent walls of the body member which define the opening 6, it being noted that when the plate 7 is in its inner position, it occupies a position within the annular chamber 14 between the inner wall of said chamber and the rear wall 20 of the annular member 19. It will thus be seen that I have provided a construction in which the tumbler opening is normally closed so that it cannot be rendered visible from the exterior of the casing by the use of certain forms of electric rays, and in which the normal closure means for the tumbler opening may be moved to expose the said opening only when the tumbler openings of all the cooperating tumblers are properly alined and the tumbler-engaging portion of the associated lock mechanism is moved into said alined openings to permit the release of the door or closure with which the lock is associated.

In order to permit the changing of the lock combination or setting, whereby to control the point in the cycle of rotation of the tumblers where the rotation of one tumbler is transmitted to the adjacent tumblers to effect the alining of the several tumbler openings, I have provided novel means for selectively varying the position of the "fly" member of each tumbler. To this end, I provide the faces of the members 4 and 27 with a series of graduations numbered in a counter-clockwise series of consecutive numerals, say from 1 to 100 inclusive, and corresponding with the unit marks or graduations on the dial associated with the operating knob of the lock mechanism. The front edge of the member 19 is provided with a suitable mark adapted, when the member 19 is rotated, to be brought into registry with any one of the graduations on the members 27 and 4, it being noted that in Fig. 2 of the accompanying drawings, the said mark is in registry with the graduation "65", i. e., the combination or "setting" for this particular tumbler is "65". To effect the rotation of the member 19 to bring the mark thereon into registry with any of the numerals to vary the position of the fly member 26 with respect to the tumbler opening 6, it is necessary to engage the faces of the plug members 30 with a suitable instrument, for example, the tool shown in Fig. 4 of the accompanying drawings, and to push the said plug members 30 inwardly. This moves the member 19 into the chamber 14 against the springs 17 therein and disengages the teeth 23 from the teeth 28, whereupon the member 19 can be rotated about the hub portion 15 to bring the mark on said member into registration with the desired graduation on the member 27. As soon as the proper registration is obtained, the tool or instrument is removed from contact with the plug members 30 and the springs 17 move the member 19 out of the chamber 14 and force the teeth 23 into engagement with the teeth 28 to thereby hold the member 19 against further rotation on the hub 15.

To form a new combination or setting with the combination-changing mechanism above described, it is necessary to remove the tumblers, say four in number, and their associated spacing washers, from the post 1, this removal being permitted by disengaging the snap ring 2 from the post groove 3. Assuming that the combination desired is "10—20—30—40", it is only necessary to depress the plug members 30 of the first tum-

bler to disengage the teeth 23 from the teeth 28 and to rotate the member 20 on the hub 15 until the mark on the edge of the flange 22 comes opposite the numeral "10" on the face of the member 27. This adjusted tumbler is then replaced on the post 1 and a washer (not shown) placed next to it. Operate the same way for the second tumbler, rotating the member 20 until the mark on the edge of the flange 22 is opposite the numeral "20". This second tumbler is then replaced on the post 1 and a washer (not shown) placed next to it, the pin or projection 34 of the first tumbler projecting into the annular space between the flange 22 and the member 25 to engage the fly member 26 to transmit the rotation of the first tumbler to the second tumbler. The other two tumblers are similarly operated to set them at "30" and "40" respectively, and after being placed in position on the post 1, the snap ring 2 is replaced in the groove 3 to hold the tumblers on said post, it being understood that the "fly and pin" connection between the primary drive wheel and the adjacent tumbler and between the consecutively adjacent tumblers, transmits the rotation of the shaft to the tumblers and that by a proper manipulation of the knob and dial for a "10—20—30—40" combination setting, the tumbler openings 6 are moved into axial alinement, this alinement permitting the inner or "fence" end of the lock bolt to engage the closure plates 7 and to move them inwardly to release the lock mechanism.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same and that various changes may be made in the shape, size and construction of parts without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A tumbler for combination locks comprising a body member having a peripheral flange and a tumbler opening extending through said flange, a sliding plate fitting within said opening and having a top flange thereon corresponding in width and thickness to the said peripheral flange, and a spring engaging beneath the top flange of the sliding plate to retain the plate in a position to normally close the tumbler opening.

2. A tumbler for combination locks comprising a disk-like body member having a peripheral flange and having a tumbler opening extending through said flange, a sliding plate fitting within said tumbler opening and having a top flange thereon, and a spring engaging beneath the flanges to retain the plate in a position to normally close the tumbler opening.

3. A tumbler for combination locks comprising a disk-like body member having a peripheral flange and having a tumbler opening extending through said flange, said flange having a groove on its underside extending on opposite sides of the tumbler opening, a sliding plate fitting within said tumbler opening and having a top flange thereon, said top flange having a groove on its underside, and a spring positioned within the grooves to retain the plate in a position to normally close the tumbler opening.

4. A tumbler for combination locks comprising a body member having a tumbler opening, a sliding plate fitting within the tumbler opening and having a flange extending beyond the sides of said plate, said flange being grooved at its ends to engage the walls defining the tumbler opening, and a spring engaging the plate to retain the same in a position to normally close the tumbler opening.

5. A tumbler for combination locks comprising a disk-like body member having a peripheral flange and having a tumbler opening extending through said flange, the ends of the peripheral flange terminating short of the walls defining the tumbler opening, a sliding plate fitting within said opening and having a top flange thereon, the ends of said flange extending beyond the walls defining the tumbler opening and being grooved to engage said walls, and a spring engaging beneath said top flange to retain the plate in a position to normally close the tumbler opening.

6. A tumbler for combination locks comprising a disk-like body having an offset central portion forming an annular chamber, the peripheral portion of said body having a tumbler opening therein, a fly member positioned within said chamber and movable to a selected position to determine the setting of the tumbler, a locking ring secured to the tumbler adjacent the annular chamber, and means for moving said annular fly member into engagement with the locking ring to retain the fly member in selected position.

7. A tumbler for combination locks comprising a disk-like body having an offset central portion forming an annular chamber, the peripheral portion of said body having a tumbler opening therein, an annular fly member positioned within said chamber and movable to a selected position to determine the setting of the tumbler, a locking ring secured to the tumbler adjacent the annular chamber, resilient means for normally retaining said fly member in engagement with the locking ring, and means to move said fly member out of engagement with the locking ring to permit the tumbler setting to be changed.

8. A tumbler for combination locks comprising a disk-like body having an offset central portion forming an annular chamber, the peripheral portion of said body having a tumbler opening therein, an annular member positioned within said chamber and movable to a selected position to determine the setting of the tumbler, said annular member having a toothed surface, a fly member carried by and movable with said annular member, a locking ring secured to the tumbler adjacent the annular chamber and having a toothed surface, means for normally retaining the teeth of the annular member in engagement with the teeth of the locking ring to prevent rotation of said annular member and associated fly member independently of the body of the tumbler, and means for moving the annular member to disengage the teeth to permit the tumbler setting to be changed.

9. A tumbler for combination locks, comprising a disk-like body having an offset central portion forming an annular chamber, the peripheral portion of said body having a tumbler opening therein, an annular member positioned within said chamber and movable to a selected position to determine the setting of the tumbler, said annular member having a toothed surface, a fly member carried by and movable with said annular member, a locking ring secured to the tumbler adjacent the annular chamber and having a toothed surface, a spring engaging the annular member to normally retain the teeth of said member and the teeth of the locking ring in engagement to prevent rotation of said annular member and associated fly member independently of the body of the tumbler, and means for

moving the annular member to disengage the teeth to permit the tumbler setting to be changed.

10. A tumbler for combination locks, comprising a disk-like body having an offset central portion forming an annular chamber, the peripheral portion of said body having a tumbler opening therein, an annular member positioned within said chamber and movable to a selected position to determine the setting of the tumbler, said annular member having a flange provided with teeth on its outer surface, a fly member carried by and movable with said annular member, a locking ring secured to the tumbler adjacent the annular chamber and having a toothed inner surface, springs mounted within the annular chamber and engaging the back of the annular member to normally retain the teeth on the flange in engagement with the teeth on the locking ring to prevent rotation of said annular member and associated fly member independently of the body of the tumbler, and a plug member carried by the locking ring adapted to move the annular member to disengage the teeth to permit the tumbler setting to be changed.

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