Oct. 8, 1935. W. F. DOENGES 2,016,487

TUMBLER FOR COMBINATION LOCKS

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Fig. 1.

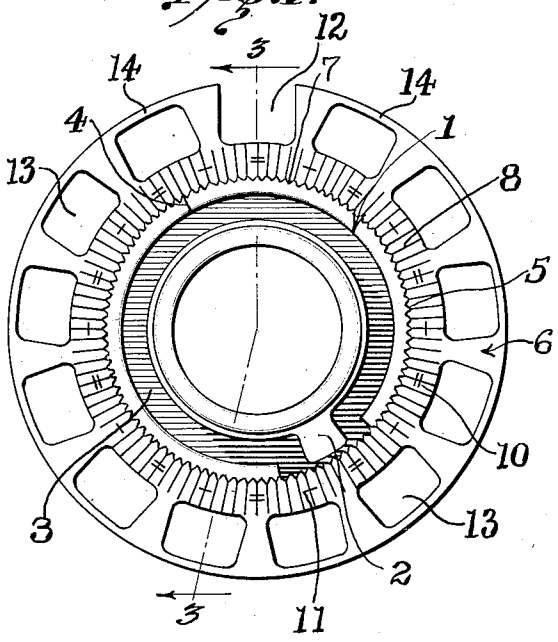


Fig. 2.

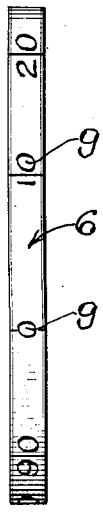


Fig. 3.

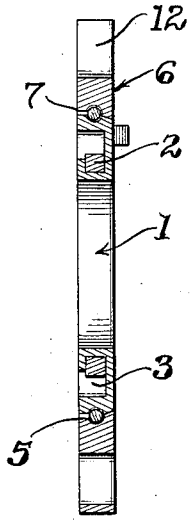
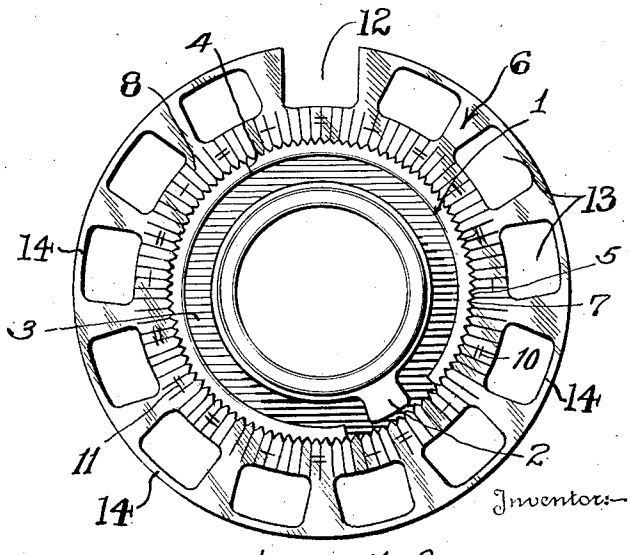


Fig. 4.



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Fig. 5.

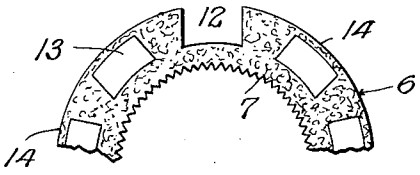


Fig. 6.

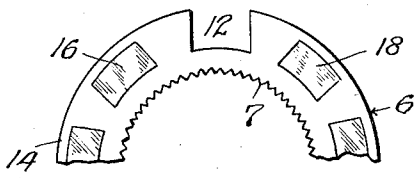


Fig. 7.

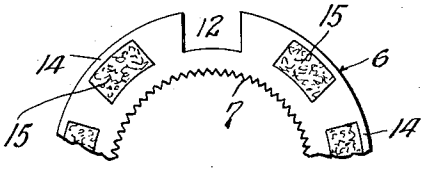


Fig. 8.

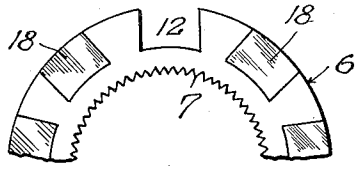


Fig. 9.

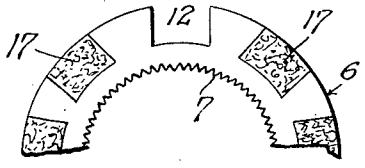


Fig. 10.

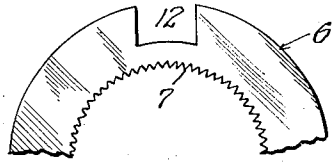


Fig. 11.

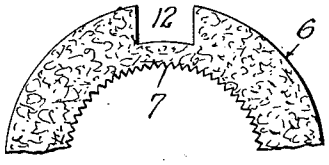


Fig. 12.

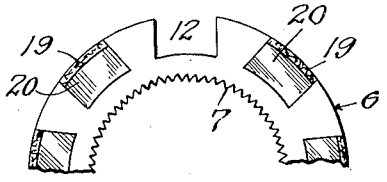
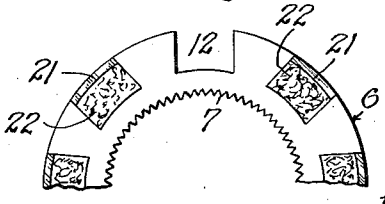


Fig. 13.



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UNITED STATES PATENT OFFICE

2,016,487

TUMBLER FOR COMBINATION LOCKS

William F. Doenges, San Antonio, Tex.

Application March 15, 1934, Serial No. 715,742

11 Claims. (Cl. 70—53)

My invention relates to a tumbler for use in combination or permutation locks of the type in which a plurality of relatively flat disk members, each provided with a peripheral tumbler opening or recess, are rotatably mounted upon a post, and are adapted for rotation on said post in accordance with a predetermined combination or tumbler setting, to bring the openings of the several tumblers into axial alinement to permit the entry of the fence or similar lock mechanism into the alined openings, which permits the retraction or release of the bolt and the subsequent opening of the door or other closure with which the lock is associated. More particularly, my invention relates to an improved tumbler so constructed and arranged that the relative position of the tumbler openings in an assembled lock construction cannot be readily determined from the exterior of the lock casing by the use of certain forms of electric or other penetrating rays.

In the usual construction of combination or permutation locks of the type above referred to, the proper alignment of the openings of the several tumblers usually requires a prior knowledge of a predetermined combination or tumbler setting. Recent developments and improvements in the art relating to X-rays, the gamma rays of radium, light rays and other forms of penetrating rays, and in the art relating to highly-sensitive vacuum tubes, light sensitive cells, galvanometers, micro-ammeters and the like, have led to the production of relatively simple apparatus for the generation, measurement and/or recording of rays which will penetrate an ordinary metallic lock casing and its associated metallic parts to show the location of the tumbler openings or recesses, and, hence, it is a comparatively simple matter for a 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.

It is an object of my invention to provide a tumbler for use in combination or permutation locks, in which the tumbler opening or the relative position of the associated tumbler openings cannot readily be determined from the exterior of the lock casing by the use of certain forms of electric or other penetrating rays.

It is an object of my invention to provide a tumbler having a tumbler opening or recess and in which the entire tumbler or that portion of the tumbler which contains the tumbler opening or recess, is made of a material that is readily penetrated by electric or other penetrating rays. I accomplish this object of my invention by making the tumbler or a portion thereof of a material, the comparative penetrability of which to the selected rays is only slightly less than the penetrability of the space constituting the tumbler opening, and hence, the determination of the position of the tumbler opening or openings by the use of rays is rendered exceedingly difficult.

It is an object of my invention to provide a tumbler for use in combination or permutation locks in which the tumbler is provided with a plurality of openings or recesses, only one of which cooperates with the fence or lock bolt mechanism to permit the opening of the lock when said opening is properly aligned with the openings of like associated tumblers, and in which the remaining openings or recesses may be considered as imitation tumbler openings. By the use of such a tumbler, the selected rays will pass through all of the openings or recesses, the comparative penetrability of which is the same or substantially the same and, hence, the determination of the position of the real or effective tumbler opening or openings by the use of rays is rendered exceedingly difficult.

It is a further object of my invention to provide a tumbler for use in combination or permutation locks, which tumbler has a plurality of spaced peripheral openings, and to further provide means for blocking off certain of the openings to permit the entry of the fence or lock bolt mechanism into only the selected tumbler opening or openings. I accomplish this object of my invention by providing the tumbler with a plurality of spaced openings or recesses of uniform size and shape and by providing certain of the openings with a relatively thin peripheral rim or other form of barrier which will prevent the fence or lock bolt mechanism from entering into certain of the openings. The rim or other form of barrier may be constructed of the same material as that of which the tumbler is made, or may be constructed of material which is more readily penetrated by the selected rays. In such a construction, the provision of the plurality of spaced openings or recesses and the relatively thin peripheral rim or the readily penetrable barriers, renders it exceedingly difficult to determine, by the use of known ray machines, which of the several openings is the real or effective tumbler opening and which are the imitation openings.

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 tumbler to control the point

in the cycle of rotation of the tumbler where the tumbler opening or recess is brought into accurate axial alinement with the other openings or recesses in associated tumblers.

It is a still 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 a plan view of a tumbler made of brass, bronze, steel, or other material and embodying certain features of my invention,

Figure 2 is a side elevation of the same,

Figure 3 is a sectional view on the line 3—3 of Figure 1,

Figure 4 is a plan view of a tumbler comprising an inner disk portion made of brass, bronze, steel or the like and an outer ring portion made entirely of mica, lime glass, or the like,

Fig. 5 is a plan view of a portion of the outer ring of a tumbler, which ring is made entirely of fibre, bakelite or the like,

Fig. 6 is a plan view of a portion of the outer ring of a tumbler, which ring is made of brass, bronze, steel or other material and in which the imitation tumbler openings are filled with mica, lime glass or the like,

Fig. 7 is a view similar to Fig. 6 and showing the imitation tumbler openings filled with fibre, bakelite or the like,

Fig. 8 is a plan view of a portion of the outer ring of a tumbler in which the imitation tumbler openings extend to the periphery of the ring and in which the said imitation tumbler openings are filled with mica, lime glass or the like,

Fig. 9 is a view similar to Fig. 8 and showing the imitation tumbler openings filled with fiber, bakelite or the like,

Fig. 10 is a plan view of a portion of the outer ring of a tumbler constructed entirely of mica, lime glass or the like,

Fig. 11 is a view similar to Fig. 10 and showing the outer ring constructed entirely of fibre, bakelite or the like,

Fig. 12 is a plan view of a portion of the outer ring of a tumbler in which the barrier at the entrance to each imitation tumbler opening is made of fibre, bakelite or the like and the remainder of the opening is filled with mica, lime glass or the like, and

Fig. 13 is a view similar to Fig. 12 and in which the barrier at the entrance of each imitation tumbler opening is made of mica, lime glass or the like and the remainder of the tumbler opening is filled with fibre, bakelite or the like.

Referring to the drawings, wherein like reference numerals are employed to designate like parts throughout the several views, the numeral 1 designates the inner disk portion of my improved tumbler, which portion includes the movable fly member 2, the annular groove 3, the setting mark 4 and the peripheral serrations 5, the structural details of this inner disk portion being old and well known in the art and, of itself, forming no part of my present invention.

The outer ring of the tumbler regardless of the material of which said ring is constructed comprises an annular member 6, the inner edge of which is provided with serrations 7 of the order of the serrations 5 on the periphery of the inner disk 1, it being well understood by those skilled in the art that the inner disk 1 is movable axially into and out of the center opening in the outer ring 6 and that the interengagement between the serrations 5 and 7 effects simultaneous rotation of the inner disk 1 and outer ring 6 when the two parts are assembled as shown in Fig. 1. A series of radially-extending graduations 8 are inscribed on one face of the outer ring 6, these graduations preferably being one hundred in number, as is the usual practice in tumbler constructions of this general character, it being understood that any one of these several graduations may be alined with the setting mark 4 on the inner disk 1 to establish the desired combination or tumbler setting for each particular tumbler. Suitable numerals 0—10—20—30 etc. indicated by the reference numeral 9, are inscribed on the peripheral face of the outer ring member 6 as clearly shown in Fig. 2, the graduations 8 which are in alignment with the numerals 0—10—20—30 etc. being crossed by a pair of transverse lines 10 and each fifth graduation 8 between those designated as 0—10—10—20—30 etc., being crossed by a single transverse line 11, to assist in the setting and/or changing of the tumbler combination.

The outer ring 6 of the tumbler is provided with a tumbler opening 12 which extends completely through the periphery of the tumbler and is adapted to receive therein the fence or other bolt portion (not shown) of the lock mechanism. One or more imitation tumbler openings 13 are cut through the outer ring 6 of the tumbler, these openings corresponding substantially in shape and size to the tumbler opening 12, it being noted, however, that in the forms of my invention shown in Figs. 1, 4, 5, 6 and 7, these imitation tumbler openings do not extend through the periphery of the tumbler but are spaced from said periphery by a relatively thin rim 14 which constitutes a stop or barrier to prevent the entry of the fence or other bolt portion (not shown) into the imitation tumbler openings.

The outer ring 6 of the tumbler is generally made of brass, bronze, steel, or other metal which has sufficient inherent strength to permit the rim section 14 to be relatively thin and yet sufficiently strong to prevent the entry of the fence or other bolt portion into the imitation tumbler opening. If desired, the relatively thin rim sections 14 may be strengthened or reinforced by inserting into each imitation tumbler opening 13 a piece of fibre, bakelite, or the like 15 as shown in Fig. 7, or a piece of mica, lime glass, or the like 16 as shown, for example, in Fig. 6 which materials are readily penetrated by electric or other types of rays, the penetrability of such material being considerably greater than that of the remainder of the outer ring 6 and only slightly less than that of the space constituting the tumbler opening 12. If desired, the imitation tumbler openings 13 may extend completely through the periphery of the outer ring member 6, as is the case with the tumbler opening 12, and a piece of fibre, bakelite, or the like 17 as shown for example in Fig. 9, or a piece of mica, lime glass, or the like 18 as shown for example in Fig. 8 may be inserted within each opening to either bridge or completely fill the opening, to constitute a barrier which will effectively pre-

vent the entry of the fence or other bolt portion into the imitation tumbler openings.

Instead of constructing the outer ring 6 of metal as is the usual practice, I may make this entire outer ring, or both the inner disk and outer ring, of fiber, mica, lime glass, bakelite or other material which is readily penetrated by electric or other types of rays, and may provide a single tumbler opening 12 as shown in Figs. 10 and 11, or I may further provide imitation tumbler openings 13 as shown for example in Figs. 4 and 5. If such imitation tumbler openings are employed in the construction, a peripheral rim section 14 may be retained or provided to prevent the entry of the fence into the imitation tumbler opening, and such rim section may be composed of or reinforced by a material having a greater degree of penetrability to rays than that of which the remainder of the said outer ring 6 is made. In Figs. 6 and 7 the integral rim sections 14 are reinforced respectively by means of mica, lime glass or the like 16 or by fibre, bakelite or the like 15. In Fig. 12 I have shown a construction in which the barrier at the entrance of each imitation tumbler opening is composed of fibre, bakelite or the like 19 which barrier is strengthened by an insert 20 of mica, lime glass, or the like, and in Fig. 13 I have shown a construction in which these materials are reversed, i. e., the barrier 21 is composed of mica, lime glass or the like and the insert of fibre, bakelite or the like 22. It is to be understood that in the several forms of my invention shown in Figs. 4 to 13 inclusive, the outer ring member 6 may be used with an inner disk portion 3 constructed of the same or of a different material from that of which the outer ring member is made.

It will thus be seen that it is well within the scope of my present invention to make the entire tumbler of a material readily penetrated by certain electric or other rays; to make only the outer ring 6 of such material; to make the inner disk 1 and/or the outer ring 6 of such material and to provide the outer ring 6 with a real tumbler opening 12 and one or more imitation tumbler openings 13, each of said openings 13 having a rim or barrier 14 of the same or of a different material more penetrable by rays than that material of which the outer ring is constructed; to make the outer ring 6 of brass, bronze, steel or other metal and to provide the same with a real tumbler opening 12 and with one or more imitation tumbler openings 13, certain of which have a rim or barrier 14 of the same metal of which the outer ring is constructed or a rim or barrier 14 of the same or different material and a strengthening or reinforcing member inserted within each of the imitation tumbler openings; the important object in each instance being to provide a construction in which the penetrability of the body portion of the outer ring or of the imitation tumbler openings is only slightly less than that of the space constituting the real tumbler opening or openings.

With tumblers made in accordance with any of the several forms above described, it is exceedingly difficult, if not impossible, with ray generating, measuring, indicating and/or recording apparatus thus far developed, for an authorized or unauthorized person to open a combination or permutation lock with the aid of a ray machine. For example, if the gamma rays of radium are directed through a lock casing and its associated tumbler mechanism, from the front of a safe door or other closure with which the combination lock is associated, so that a beam of such penetrating rays passes through the marginal or peripheral portions of the successive metallic tumblers of usual or conventional construction each having a peripheral tumbler opening or recess, and such tumblers are slowly rotated on their tumbler post by means of the usual operating dial, it is a comparatively simple matter to locate the exact position and relative positions of the openings or recesses, as the increase in intensity of the rays due to the entry of a tumbler opening or openings into the focal field of the penetrating rays or beam can be readily ascertained by the use of suitable ray-responsive vacuum tubes, galvanometers, micro-ammeters or other ray-sensitive apparatus positioned at the opposite side of the lock casing; such indications or recordations of variations in intensity being due to the great difference in penetrability between the metallic portions of the tumblers and that of the space constituting the tumbler opening. Similar results are readily obtainable by the use of X-rays, light rays and other forms of penetrating rays, variations in the intensity or other properties, due to the penetrability of the rays through the body of the tumbler as compared to the penetrability of the rays through the space constituting the tumbler openings, being readily discernible by the use of ray-sensitive indicating, measuring and/or recording mechanism. Having once determined the relative position of the tumbler openings, it is only necessary to manipulate the operating dial in such a manner as to bring all the tumbler openings in axial alinement and into a position where the fence or similar lock bolt mechanism may enter the said aligned openings, whereupon the bolt may be retracted or released. However, in the tumblers made in accordance with the several forms of my invention as above described, the difference in the degree of penetrability of the body of the tumbler as compared with the penetrability of the space constituting the tumbler opening, is so very slight that apparatus of the type above referred to or any apparatus with which I am familiar, cannot be utilized to effectively detect the very slight differences in penetrability. If the tumbler or the outer ring thereof is constructed of fiber, mica, lime glass, bakelite or other material, then the location of the tumbler openings cannot be determined by the use of ray machines, due to the slight, imperceptible difference between the penetrability of the body portion and the space constituting the tumbler opening. If I provide a metallic tumbler with a plurality of false or imitation tumbler openings bridged by a metallic rim, the presence of the thin metallic rim is not discernible by the ray apparatus and it is impossible to detect or determine which of the several openings in the tumbler is the real tumbler opening, and, hence it is impossible to aline the several effective tumbler openings of the associated tumblers, and this condition exists even though a strengthening or reinforcing member of fiber, mica, lime glass, or other material which is readily penetrated by the rays, is positioned within each of the several imitation tumbler openings. In other words, by constructing the tumbler in such a manner and of such materials as I have above described, the penetrability of the tumbler is substantially the same as that of the tumbler opening and known ray machines are not capable of detecting the position or positions of the tumbler openings.

It is to be understood that the forms of my invention herein shown and described are to be

taken as preferred embodiments of the same, and that various changes in the shape, size, material and construction of parts may be resorted to 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 having a tumbler opening and at least one imitation tumbler opening, said imitation tumbler opening being filled with a material more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

2. A tumbler having a peripheral tumbler opening and at least one imitation tumbler opening, said imitation tumbler opening being filled with a material more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

3. A tumbler having a tumbler opening and at least one imitation tumbler opening, and means for preventing the entry of a bolt mechanism into said imitation tumbler opening, said means being composed of a material which is more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

4. A tumbler having a tumbler opening and at least one imitation tumbler opening, and a member disposed in said imitation tumbler opening to prevent the entry of bolt mechanism into said imitation tumbler opening, said member being composed of a material which is more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

5. A tumbler having a peripheral tumbler opening and at least one imitation tumbler opening, and a relatively thin peripheral rim section bridging the imitation tumbler opening to prevent the entry of bolt mechanism into said imitation tumbler opening.

6. A tumbler having a peripheral tumbler opening and at least one imitation tumbler opening, a relatively thin peripheral rim section bridging the imitation tumbler opening to prevent the entry of bolt mechanism into said imitation tumbler opening, and a reinforcing member disposed within the imitation tumbler opening beneath the peripheral rim section to strengthen said rim section.

7. A tumbled having a tumbler opening and at least one imitation tumbler opening, and a barrier disposed within said imitation tumbler opening to prevent the entry of bolt mechanism into said imiation tumbler opening, said barrier being composed of material which is more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

8. A tumbler having a peripheral tumbler opening and at least one imitation tumbler opening; a peripheral rim section bridging the imitation tumbler opening to prevent entry of bolt mechanism into said imitation tumbler opening, said bridging member being composed of material which is more readily penetrated by penetrating rays than the material of the remainder of the tumbler; and a reinforcing member disposed within the imitation tumbler opening beneath the peripheral rim section to strengthen said rim section, said reinforcing member being composed of material which is more readily penetrated by penetrating rays than the material of the remainder of the tumbler.

9. A tumbler composed of material readily penetrated by penetrating rays and having a tumbler opening, the penetrability of the said material being substantially equal to the penetrability of the space constituting the tumbler opening.

10. A metallic tumbler having a tumbler opening and a plurality of imitation tumbler openings, the metal of said tumbler being highly resistant to penetration by penetrating rays; and means disposed in each imitation tumbler opening to prevent the entry of bolt mechanism into said imitation tumbler openings, said means being composed of a material having a penetrability to such rays greatly in excess of that of the metallic part of the tumbler and substantially equal to the penetrability of the space constituting the tumbler opening.

11. A two part rotary tumbler comprising an outer ring and an inner disk, said ring being made of material readily penetrated by penetrating rays and having a tumbler opening, the penetrability of the said outer ring being greater than the penetrability of the inner disk of the tumbler and substantially equal to the penetrability of the space constituting the tumbler opening.

WILLIAM F. DOENGES.