

Feb. 6, 1951

S. S. NIERATKA

2,540,172

COMBINATION LOCK

Filed March 13, 1946

2 Sheets-Sheet 1

FIG. 1

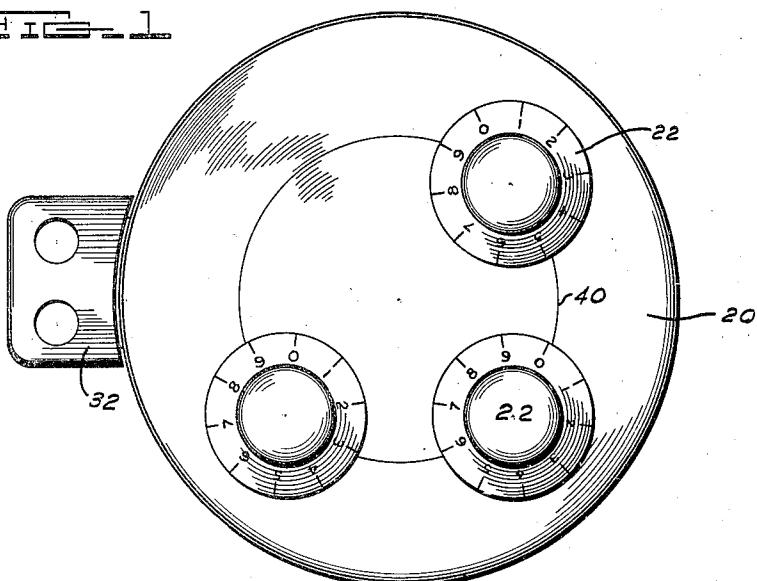
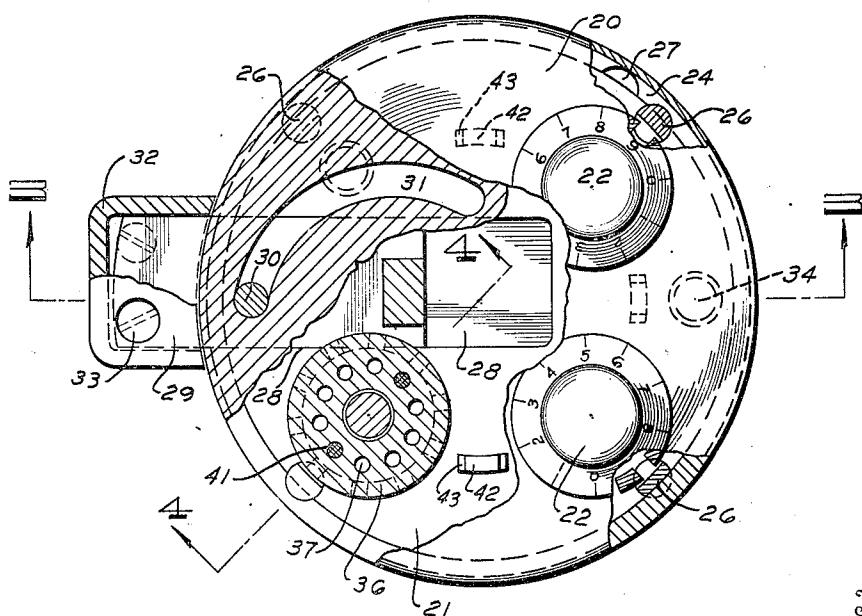


FIG. 2



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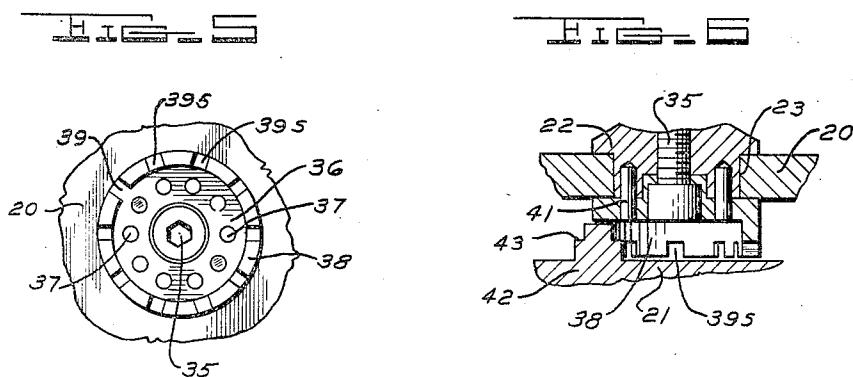
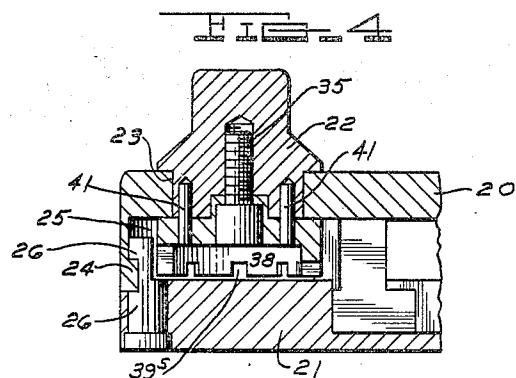
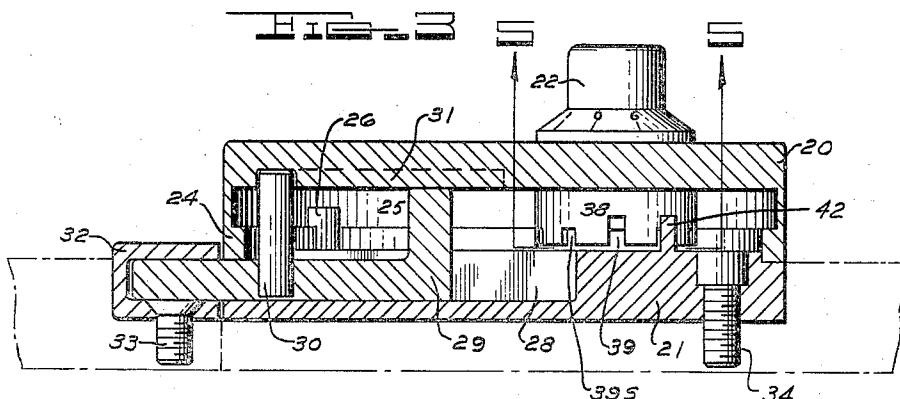
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2 Sheets-Sheet 2



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COMBINATION LOCK

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9 Claims. (Cl. 70—304)

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The present invention relates to improvements in a combination lock especially adaptable for use with either a padlock or bolt lock and has for its objects to provide a simple and efficient combination lock of low manufacturing cost, and which is stronger and less easily picked than conventional pin tumbler locks, yet which is easily operated by anyone knowing the proper combination.

Other objects are to provide an improved combination lock of the character described which can be disassembled or removed from its supporting structure only by a person knowing the correct combination; and further to provide a combination lock which may be operated by use of a single combination from either inside or outside the door for which it is provided.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a top view of a lock embodying the present invention.

Fig. 2 is similar to the view of Fig. 1 but with sections of the cover removed to show details of construction.

Fig. 3 is a sectional view essentially along the line 3—3 of Fig. 2 and in the direction of the arrows.

Fig. 4 is a sectional view essentially along the line 4—4 of Fig. 2 and in the direction of the arrows.

Fig. 5 is a sectional view essentially along the line 5—5 of Fig. 3 and in the direction of the arrows.

Fig. 6 is a sectional view similar to Fig. 4 and showing one of the locking devices embodied by the present invention in relation to its adjacent stile-like locking stud.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now to the drawings and especially to Figs. 1 through 5, an embodiment of the present invention is shown which comprises a cover member 20 detachably mounted for rotation on

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a base member 21 and carrying the three rotatable dial members 22, Figs. 1 and 2, each journaled in the journal openings 23 of said cover member 20, Fig. 4.

5 The cover member 20 can be suitably mounted on the base member 21 by means of a simple interlocking flange or tongue and groove engagement, each member having an essentially annular flange provided with a plurality of discontinuities such that the two members may be separated from each other by aligning each flange element of one member with the discontinuities in the flange of the other member. By 10 rotating the cover 20 on the base 21, the interlocking flanges will engage each other and prevent separation of the cover 20 and base 21 until continued rotation again aligns the flange element of one member with the discontinuities in the flange of the other member.

15 20 In the embodiment shown, Figs. 3 and 4, the cover member 20 has the annular downward extending rim 24 which carries the annular groove 25 within its inside surface. A plurality of tongue members 26 securely attached to and extending upward from the base 21 are adapted to ride in the groove 25 and permit the cover 20 to rotate with respect to the base 21.

25 30 Extending directly downward in the inside wall of the rim 24 and completely through the lower side wall of the groove 25 are the plurality of openings 27, Fig. 2, each opening being adapted to provide a passage for the tongue of one of each of the tongue members 26 and to allow the cover 20 to be attached or detached from the base piece 21 only when the tongue members 26 are aligned with their respective openings 27. Other variations of an interlocking flange engagement will suggest themselves to accomplish the desired purpose of detachably engaging the cover 20 and base 21 so that they may be attached or separated by rotating one member with respect to the other to a particular position of alignment. For example a screw threaded engagement may be employed, or in the embodiment shown the tongue and groove engagement need not necessarily be located at the periphery of the lock.

35 40 45 50

40 45 50 In the preferred embodiment shown in Figs. 1 through 5 it has been found satisfactory to use four tongue members 26 spaced equidistant apart around the periphery of the base 21 and adapted to pass through four corresponding openings 27 into the groove 25. The tongues 26 and openings 27 are aligned at essentially the extreme counterclockwise limit of rotation of the cover 20, Fig. 2, and at every quarter rotation thereafter, but

will not be aligned at any intermediate position.

Within the base 21 is the grooved bolt guide 28 for the sliding bolt 29 which is actuated to its locking or unlocking position by means of the pin 30 secured at one end in the bolt 29 and extending its free end to ride in the arcuate track or groove 31 on the inside of the cover member 20. The arcuate track 31 is adapted to allow not quite a full quarter turn of the cover 20 on the base 21. Thus the present embodiment only permits separation or attachment of the cover 20 and base 21 at one position of alignment, namely, at essentially the extreme limit of the counterclockwise rotation of said cover 20.

External to the lock is the latch holding member 32 secured to its supporting means, a door or wall for example, by the plurality of screws 33 extending through and countersunk in its bottom surface. When the sliding bolt 29 is in the locked position Fig. 3, the screws 33 are covered and consequently cannot be disturbed. Similarly the base piece 21 is secured to its supporting means by the plurality of screws 34 extending through and countersunk in its bottom surface. When the cover 20 is in place, the screws 34 are inaccessible.

On the inside of the cover 20 and attached by way of example by a socket head screw 35 to one of each of the dial members 22 to rotate therewith is a recessed locking member 36 containing a plurality of peg holes 37 and an annular rim 38 castellated by a plurality of slot openings having the same width, all but one opening being of uniform small depth and numbered 39S, the one opening being somewhat deeper and numbered 39, Figs. 3 and 5.

Each peg hole 37 is associated with one of each of the rim openings 39 or 39S which in turn is associated with one of each of the numbered settings of the corresponding dial 22. In the embodiment shown each dial 22 has ten settings numbered from 0 to 9. The number of dials that may be used or the number of settings permissible for each dial will be determined by the size of the lock and degree of complexity desired in the setting of its combination. Where the number of settings permissible is S_1 (varying from 1 to n), the total number of combinations possible with a lock having n dials is well known to be the produce $S_1 S_2 S_3 \dots S_n$. Thus the dials 22 of the lock shown in Figs. 1 and 2 may be set on the circular reference line 40 in a thousand different combinations.

Each recessed member 36 is held in positive but adjustable alignment with its respective dial 22 by a plurality of pegs 41 imbedded in the underside of the dial 22 and extending their free ends through the journal openings 23 to peg into their corresponding peg holes 37. In the preferred embodiment a pair of diametrically opposed pegs 41 have been found sufficient for each dial 22. By loosening the socket head screw 35, the recessed member 36 may be reset upon a different pair of peg holes 37, thus changing the alignment of the large opening or deep slot 39 with respect to the settings on the corresponding dial 22.

Secured to and projecting from the base 21 are a plurality of stationary stile-shaped locking studs 42, each being adjacent to one of each of the recessed members 36 when the bolt 29 is in the locked position, Fig. 2, and each being adapted to pass through the large opening 39 but not the small openings 39S of the recessed members 36.

In Fig. 3 the bolt 29 is in the locked position and the cover 20 is at the limit of its possible clock-

wise rotation as determined by the slot 31. Counterclockwise rotation of the cover 20 is also prevented at this position by contact between the rims 38 and the locking studs 42 projecting from the base 21 and situated so that a stud 42 is adjacent to the forward edge of each rim 38.

When the dials 22 are set on their unlocking combination, the large opening 39 of each recessed member 36 will be aligned to pass its adjacent locking stud 42, thus permitting counterclockwise rotation of the cover 20 until the locking studs 42 contact the opposite side of the rim 38 from the inside of the circular recess formed by said rim 38. At this position the pin 30 will have moved in the arcuate groove 31 to slide the bolt 29 to its unlocked position free from the latch holding member 32. It is also to be noted that in this position the locking studs are completely within the recess enclosed by the rim 38 and that nothing prevents rotation of the dials 22. Thus once the lock is unlocked its dials may be given a spin to prevent disclosure of the unlocking combination if it is desired to leave the lock unguarded and unlocked.

When it is desired to detach the cover 20 from the base 21, a continued counterclockwise rotation of the cover 20 is accomplished by anyone knowing the proper combination by resetting the dials 22 to align each large opening 39 essentially on the other side of the corresponding rim 38. Each recessed member 36 may then pass completely over its stud 42. The additional rotation permitted will bring the cover 20 essentially to the limit of its counterclockwise rotation and will align the tongue members 26 with their respective openings 27 in the underside of the annular groove 25 to allow detachment of the cover 20 from the base piece 21.

It will be noticed in Fig. 6 that the opposed lower steps 43 of the stile-shaped locking studs 42 are adapted to enter any of the small openings 39S aligned with it, but that the body of the stile-shaped studs 42 cannot pass through any of the openings 39S. Consequently it is not possible to pick the lock embodying the present invention by merely "feeling" for the opening 39. Each of the small openings 39S provide the same "feel" as the large opening 39 unless all three openings 39 are aligned to pass over their respective locking studs 42.

I claim:

1. In a lock, the combination of a case comprising a base piece and a cover member rotatably mounted thereon, a locking member supported by said case, mechanical means to actuate said locking member by rotation of said cover member, a plurality of rotatable devices journaled through said cover member and movable therewith and each comprising a dial member operated from the outside of said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and preventing rotatable movement of said cover member by contact with said recessed members, and an opening in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto and to pass a locking stud aligned therewith into the recess of said recessed member.

2. In a lock, the combination of a base piece, a sliding bolt, a bolt guide provided by said base piece to guide said sliding bolt, a cover member rotatably mounted on said base piece, an arcuate track provided by said cover member, a stud

projecting from said sliding bolt and engaged at its free end for movement along said arcuate track to actuate said sliding bolt upon rotation of said cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, a large opening and a plurality of small openings in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto, said small openings being adapted to partially receive a locking stud aligned therewith, said large openings being adapted to pass a locking stud aligned therewith into the recess of said recessed member.

3. In a lock, the combination of a base piece, a cover member rotatably mounted on said base piece, a bolt means supported by said base piece, mechanical means to actuate said bolt means by rotation of said cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, a large opening and a plurality of small openings in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto, said small openings being adapted to partially receive a locking stud aligned therewith, said large openings being adapted to pass a locking stud aligned therewith into the recess of said recessed member.

4. In a lock, the combination of a base piece, means to secure said base piece to the supporting means of said lock from the inside of said base piece, a bolt means supported by said base piece, mechanical means to actuate said bolt means by rotation of said cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, a large opening and a plurality of small openings in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto, said small openings being adapted to partially receive a locking stud aligned therewith, said large openings being adapted to pass a locking stud aligned therewith into the recess of said recessed member.

5. In a lock, the combination of a base piece, a bolt means supported by said base piece, a cover member detachably mounted for rotation on said base piece by a discontinuous interlocking flange engagement therewith, mechanical means to actuate said bolt means by rotation of said

cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, and an opening in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto and to pass a locking stud aligned therewith into the recess of said recessed member and adapted by continued rotation of said recessed member to be aligned on the other side of a locking stud within the recess of said recessed member.

6. In a lock, the combination of a base piece, a bolt means supported by said base piece, a cover member detachably mounted for rotation on said base piece by a discontinuous interlocking flange engagement therewith, mechanical means to actuate said bolt means by rotation of said cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, a large opening and a plurality of small openings in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto, said small openings being adapted to partially receive a locking stud aligned therewith, said large openings being adapted to pass a locking stud aligned therewith into the recess of said recessed member.

7. In a lock, the combination of a base piece, a sliding bolt, a bolt guide provided by said base piece to guide said sliding bolt, a cover member detachably mounted for rotation on said base piece by a discontinuous interlocking flange engagement therewith, an arcuate track provided by said cover member, a stud projecting from said sliding bolt and engaged at its free end for movement along said arcuate track to actuate said sliding bolt upon rotation of said cover member, a plurality of rotatable locking devices journaled through said cover member and movable therewith and each comprising a dial member operated from outside said cover member and a recessed member on the inside thereof adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and locking said cover member against rotatable movement by contact with said recessed members, a large opening and a plurality of small openings in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto, said small openings being adapted to partially receive a locking stud aligned therewith, said large openings being adapted to pass a locking stud aligned therewith into the recess of said recessed member.

8. In a lock, the combination of a case comprising a base piece and a cover movably mounted thereon, a locking member supported by said case, mechanical means to actuate said locking mem-

ber by the relative movement of said cover member, a plurality of rotatable devices journaled through said cover member and movable therewith and each comprising a dial member operated from the outside of said cover member and a recessed member on the inside thereof connected through said cover member to said dial member for rotation therewith, said recessed member having an annular rim forming a circular recess therein, a plurality of locking studs projecting from said base piece and preventing movement of said cover member by contact with said recessed members, and an opening in the rim of each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto and to pass a locking stud aligned therewith into the recess of said recessed member.

9. In a lock, the combination of a case comprising a base piece and a cover member movably mounted thereon, a locking member supported by said case, mechanical means to actuate said locking member by the relative movement of said cover member, a plurality of rotatable devices journaled through said cover member and movable therewith and each comprising a dial member operated from the outside of said cover member and a recessed member on the inside thereof

adjustably connected through said cover member to said dial member for rotation therewith, a plurality of stationary locking studs projecting from said base piece and preventing movement of said cover member by contact with said recessed members, and an opening in each recessed member adapted by rotation thereof to be aligned with the locking studs adjacent thereto and to pass a locking stud aligned therewith into the recess of said recessed member.

10 STEAVE S. NIERATKA.

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