June 15, 1937. W. B. GRUBB, SR 2,083,782

COMBINATION LOCK

Filed Aug. 29, 1936

Fig. 1

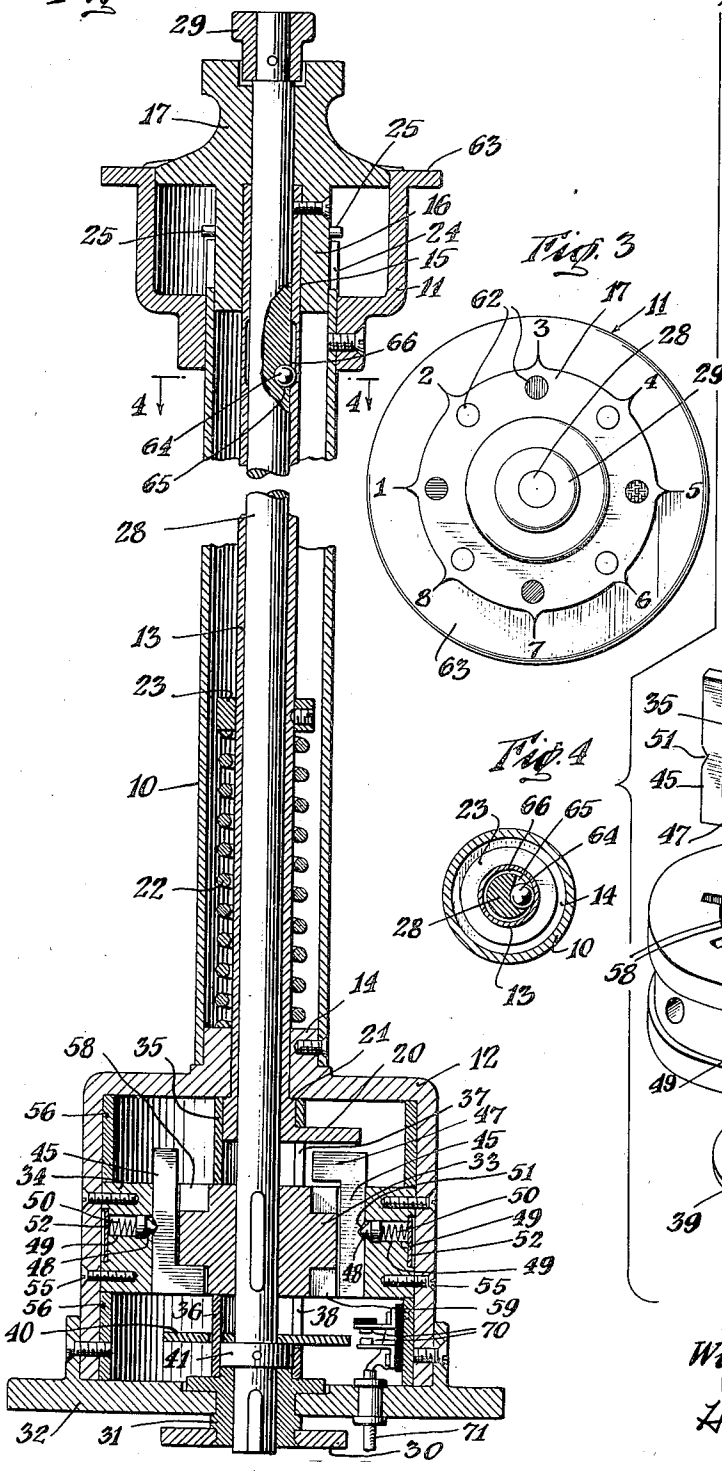
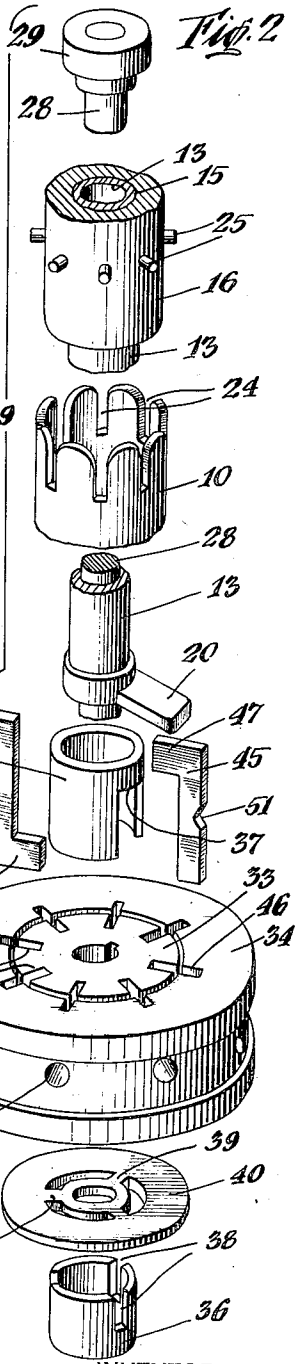


Fig. 3

Fig. 4

Fig. 2



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Patented June 15, 1937 2,083,782

UNITED STATES PATENT OFFICE

2,083,782

COMBINATION LOCK

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Application August 29, 1936, Serial No. 98,500

15 Claims. (Cl. 70—299)

This invention relates to a combination lock of the type having a plurality of slide members which are adapted to be selectively set into locking or releasing position.

A feature of the invention consists in a rotating element adapted to selectively engage the slide members for positioning the same in releasing position. Provision is made whereby actuation of any member which has been set to releasing position will serve to shift the same into locking position, thereby preventing the lock from actuating unless the selected and only the selected members are actuated.

An object of this invention is to provide a combination lock of simple construction in which the combination cannot be detected by either feel or sound.

Another object is to provide an improved, dependable and efficient lock of the above character.

The invention also consists in various details of construction and combinations of parts hereinafter more fully set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages and the manner of its operation, will be better understood by referring to the following description taken in connection with the accompanying drawing in which a preferred embodiment of the invention has been set forth for purposes of illustration.

In the drawing:

Fig. 1 is a longitudinal section through a lock embodying the present invention;

Fig. 2 is an exploded detail view showing the relative positions of the various elements;

Fig. 3 is a top plan view of the lock; and

Fig. 4 is a section taken along the line 4—4 of Fig. 1.

In the following description and in the claims certain specific terms are used for convenience in referring to various details of the invention. It is to be understood, however, that these terms are to be given as broad an interpretation as the state of the art will permit.

Referring to the drawing more in detail, the lock is shown as comprising a tubular housing 10 supporting an upper housing 11 and a lower housing 12 in which are mounted the various elements to be described. A sleeve 13 is loosely mounted within the housing 10 by means of a lower bearing 14 in the lower housing 12, and an upper bearing 15 formed by an extension 16 of a dial member 17 which is journalled in the housing 10. The sleeve 13 carries a finger 20 at its lower end within the lower housing 12, said finger being adapted to selectively engage and actuate the various slide members to be described. The sleeve 13 is limited in its upward movement by a shoulder 21 formed thereon and engaging the under surface of the lower housing 12. A spring 22, seated between the lower housing 12 and a collar 23 secured to the sleeve 13, normally holds the sleeve in its upper position. The arrangement is such, however, that the sleeve may be depressed in response to a longitudinal movement of the dial member 17.

In order to properly position the sleeve when the same is depressed, the housing 10 is provided at its upper end with a plurality of slots 24 into which a set of pins 25 carried by the extension 16 of the dial member 17 are adapted to slide. The slots 24 are inclined at their upper ends so as to facilitate the entrance of the pins 25 into the slots and to assist in properly positioning the dial member 17 during the working of the combination.

A shaft 28 is journalled within the sleeve 13 and extends through said sleeve carrying at its upper end a knob 29 and at its lower end being keyed to a rotating cam member 30 which is held in suitable bearings 31 in a base plate 32 which is secured to the lower housing 12 and forms a closure for the lock mechanism.

The shaft 28 is also keyed to a drum 33 which is mounted within the lower housing 12 and registers with a stationary collar 34 carried in said housing. The drum 33 is held in proper position by spacing sleeves 35 and 36 which are located above and below said drum, respectively.

The spacing sleeve 35 is provided with a slot 37 through which the finger 20 extends and turns with the shaft 28. The spacing sleeve 36 is provided with a plurality of slots 38 which receive spokes 39 carrying a reset disk 40 which is journalled about the lower end of the shaft 28. The reset disk is adapted to slide axially with respect to the spacing sleeve 36 and is actuated by a collar 41 carried by the shaft 28.

A plurality of slide members 45 are mounted in slots 46 formed in the collar 34. These members are provided with locking flanges 47 and are releasably held in a set position by detents 48 seated in recesses 49 in the collar 34 and held by springs 50 in engagement with recesses 51 formed in said members 45. A strap 52 may be disposed about the collar 34 to hold the various springs 50 in place and to thereby prevent the detents 48 and springs 50 from flying out of the recesses 49 when the collar 34 is removed from the housing 12. The collar 34 may be secured in the housing 12 by suitable means, such as screws 55 and spacing and supporting rings 56 may be disposed above and below said collar to securely hold the same in position.

The drum 33 is provided with a plurality of recesses 58 in its upper surface registering with the respective recesses 46 in the collar 34 and is

also provided with a plurality of lower recesses 59 likewise registering with the recesses 46 of the collar 34. The recesses 58 and 59 are adapted to receive the locking flanges 47 of the members 45 when the members are in locking position.

In assembling the lock it will be noted that certain of the slide members are positioned in the recesses 46 with their locking flanges 47 at the top and other slide members are positioned in recesses 46 with their locking flanges 47 at the bottom. Consequently, when all of the members are in elevated position as indicated in Fig. 1, the members having their locking flanges 47 at the bottom engage the recesses 59 in the drum 33 thereby locking said drum securely to the collar 34. The members having their locking flanges 47 at the top are then in releasing position.

In order to release the drum 33, it is necessary to depress the first mentioned members, thereby removing the lower locking flanges 47 from the recesses 59 whereupon the drum is free to rotate with the shaft 28 within the collar 34. If, however, one of the last mentioned members is accidentally depressed, the upper locking flange 47 will be brought into engagement with a recess 58 in the drum 33 thereby locking the drum securely to the collar 34. Consequently, in order to release the drum, it is necessary to depress only the members having their locking flanges at the bottom. Depression of any of the other members immediately relocks the drum.

The dial member 17 may be provided with a plurality of designations 62, such for example as colored dots variously disposed about the periphery thereof. A suitable index chart having numbers spaced to correspond to the different positions of the slide members may be placed upon a flange 63 which is formed as a part of the upper housing 11. The designations 62 are arranged to correspond with the index numbers on the flange 63.

In order to permit the shaft 28 to be operated by the dial member 17 when the lock is released, a one way clutch is provided as shown in Fig. 4 which comprises a ball 64 held in a recess 65 in the shaft 28 and engaging a cooperating recess 66 in the sleeve 13. The shape of the recess 65 is such that the ball releases the sleeve when the sleeve is rotated in one direction, but binds to establish a driving connection between the sleeve and shaft when the sleeve is rotated in the opposite direction.

In the operation of this lock certain designated slide members are positioned with their locking flanges 47 at the bottom and in engagement with the recesses 59 of the drum 33. For example, the members corresponding in position to the index numbers 1, 3, 5, and 7 of the chart carried by the flange 63. The finger 20 carried by the sleeve 13 is adapted to register with the various members when the dial member 17 is correctly positioned with the pins 25 engaging the slots 24. A designation 62 of a certain color known only to the operator of the lock corresponds to this position of the finger 20 and constitutes a guide by which the lock is operated. A plurality of such colored designations are provided in order to minimize the possibility of a person unfamiliar with the lock operating the same. It is obvious, however, that only one designation 62 need be employed if this additional safety factor is not required.

In order to release the lock the dial member 17 is progressively rotated in one direction, as for example a clockwise direction, to successively bring the proper designation 62 in register with the selected numbers, for example 1, 3, 5, and 7 on the flange 63 and the dial member is depressed when the designation 62 is in each of the above mentioned positions. This depression of the dial member causes longitudinal movement of the sleeve 13 and thereby causes the finger 20 to successively depress the various slide members in the 1, 3, 5, and 7 positions so as to shift the same from locking to releasing positions.

After all of the above mentioned members have been depressed all of the locking flanges 47 are released and the drum 33 is free to rotate. The dial member 17 is then rotated in the reverse direction thereby, through the one-way clutch above described, picking up the shaft 28 and causing rotation thereof. This shaft carries the cam member 30, which is adapted to actuate the locking bolts or other locking mechanism not shown. It is to be noted that, if any of the slide members other than those above mentioned are accidentally depressed by the finger 20, they will enter the recesses 58 and lock the drum 33 against rotation and it will be necessary to reset all of the slide members before the lock can again be released.

For resetting the slide members, it is only necessary to pull the shaft 28 upwardly by means of the knob 29. This raises the reset disk 40 and causes the same disk to engage all of the members 45 and move the same into their upper positions.

In order to provide an additional safety factor, an alarm mechanism may be arranged to be operated in case any of the wrong slide members are accidentally depressed. This mechanism may comprise a set of contacts 70 carried by the spacing ring 56 and arranged in alignment with selected members 45 whereby the contacts are closed when said members are depressed. The contacts are connected by suitable leads 71 to a visual or audible alarm. Preferably the contacts are arranged in alignment with only the members which have their locking flanges in the upper position, so that the alarm will be operated when a person depresses the wrong members, but will not be operated if the lock is being manipulated by the authorized person to release only the members which are in locking position.

In the above described lock the combination may be readily changed by removing the collar 34 and reversing the position of certain of the members 45. For this purpose the base 32 and the spacing ring 56 may be removed after which the collar 34 may be released and slidably removed from the lower housing 12. The straps 52 prevent the springs 50 from being released when the collar 34 is removed from the housing. The recesses 49 are made of such shape as to provide a stop for the detents 48 and to prevent the same from being forced entirely out of said recesses by the spring 50. It is obvious that the above described lock may be mounted with the dial member 17 exposed and with the remainder of the mechanism in a concealed position. For example, when the lock is used on a vault, the housing 10 may extend through the vault wall or through the door of the vault as may be required. The mechanism of the lock itself is accordingly inaccessible except when the vault or other member is open. Consequently, the lock cannot be reset or tampered with by unauthorized persons.

Obviously, the one way clutch mechanism may be omitted in which case the shaft 28 may be

turned by the knob 29 when the lock is released. In many cases, however, it is preferable to provide the one way clutch because the dial member 17 permits a greater force to be transmitted to the shaft than could be transmitted from the small knob 29.

This lock can also be used for other purposes, such as for an automobile lock, door lock, or the like, by a small change in dimensions.

Although a preferred embodiment of the invention has been shown for purposes of illustration, it is obvious that various changes and substitutions may be made therein as will be apparent to a person skilled in the art; hence the invention is to be limited only in accordance with the following claims when interpreted in view of the prior art.

I claim:

1. A combination lock comprising a shaft adapted to actuate locking mechanism, a drum carried by said shaft, a stationary collar registering with said drum and having a plurality of recesses, members slidably mounted in said recesses, each member having a locking flange, recesses formed in said drum adapted to receive the respective locking flanges when the members are in locking position whereby the drum and collar are securely locked together, certain of said members being set with said locking flanges in locking position and certain others of said members being set with their flanges in releasing position, rotating means adapted to selectively engage said members for shifting the same into their opposite positions, and control means for actuating said rotating means having designations to enable an authorized operator to actuate only the first mentioned members.

2. A combination lock comprising a shaft adapted to actuate locking mechanism, a drum carried by said shaft, a stationary collar registering with said drum and having a plurality of axial recesses, members slidably mounted in said recesses, recesses formed in both faces of said drum and registering with said first recesses, each member having a locking flange adapted to enter said last recesses to lock the drum and collar together, certain of said members being arranged with their locking flanges registering with the recesses in one face of the drum and certain others of said members being arranged with their locking flanges registering with the recesses in the other face of the drum, means shifting all of said members in the same axial direction for setting the lock with the first mentioned members in locking position and the last mentioned members in releasing position, rotating means adapted to engage said first members for shifting the same into releasing position and to engage said last members for shifting the same into locking position and control means for actuating said rotating means having designations to enable an authorized operator to actuate only the first mentioned members.

3. A combination lock comprising a shaft adapted to actuate locking mechanism, a drum carried by said shaft, a stationary collar registering with said drum and having a plurality of axial recesses, members slidably mounted in said recesses, recesses formed in both faces of said drum and registering with said first recesses, each member having a locking flange adapted to enter said last recesses to lock the drum and collar together, certain of said members being arranged with their locking flanges registering with the recesses in one face of the drum and certain others of said members being arranged with their locking flanges registering with the recesses in the other face of the drum, means shifting all of said members in the same axial direction for setting the lock with the first mentioned members in locking position and the last mentioned members in releasing position, a finger, means rotating said finger to cause the same to register with the various members, and means to depress said finger in selected positions to shift the selected members into opposite positions.

4. A combination lock comprising a shaft adapted to actuate locking mechanism, a drum carried by said shaft, a stationary collar registering with said drum and having a plurality of axial recesses, members slidably mounted in said recesses, recesses formed in both faces of said drum and registering with said first recesses, each member having a locking flange adapted to enter said last recesses to lock the drum and collar together, certain of said members being arranged with their locking flanges registering with the recesses in one face of the drum and certain others of said members being arranged with their locking flanges registering with the recesses in the other face of the drum, means shifting all of said members in the same axial direction for setting the lock with the first mentioned members in locking position and the last mentioned members in releasing position, a sleeve journalled around said shaft, said sleeve carrying a finger to selectively engage and shift said members, and means to position the sleeve to actuate selected members.

5. A combination lock comprising a shaft adapted to actuate locking mechanism, a drum carried by said shaft, a stationary collar registering with said drum and having a plurality of axial recesses, members slidably mounted in said recesses, recesses formed in both faces of said drum and registering with said first recesses, each member having a locking flange adapted to enter said last recesses to lock the drum and collar together, certain of said members being arranged with their locking flanges registering with the recesses in one face of the drum and certain others of said members being arranged with their locking flanges registering with the recesses in the other face of the drum, means shifting all of said members in the same axial direction for setting the lock with the first mentioned members in locking position and the last mentioned members in releasing position, a sleeve journalled around said shaft, said sleeve carrying a finger to selectively engage and shift said members, means to position the sleeve to actuate selected members and means preventing axial movement of the sleeve except in tumbler actuating positions.

6. A combination lock comprising a stationary housing, a sleeve journalled in said housing and carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position and means for actuating the release finger to engage and shift selected members into reverse positions.

7. A combination lock comprising a stationary housing, a sleeve journalled in said housing and

carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position and means for actuating the release finger to engage and shift selected members into reverse positions and a reset disc carried by said shaft to shift all of said members to set position.

8. A combination lock comprising a stationary housing, a sleeve journalled in said housing and carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position, said sleeve being axially movable to cause the release finger to shift selected members into reverse positions, and means responsive to axial movement of said shaft to set all of said members.

9. A combination lock comprising a stationary housing, a sleeve journalled in said housing and carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position and means for actuating the release finger to engage and shift selected members into reverse positions and means selectively connecting the sleeve to said shaft for actuating the same in unison with said sleeve when the members are all in release position.

10. A combination lock comprising a stationary housing, a sleeve journalled in said housing and carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position and means for actuating the release finger to engage and shift selected members into reverse positions and a one way clutch connecting the sleeve to said shaft whereby the shaft may be actuated, when released, by rotation of the sleeve in one direction.

11. In a combination lock, a housing, a shaft journalled therein, a drum carried by said shaft, a collar carried by said housing, members slidably held in said collar, each member having means to engage and lock said drum in one axial position of said member and to release said drum in another axial position thereof, certain of said members being set in locking position and others of said members being set in releasing position, and means whereby reversal of selected members changes the set position thereof for altering the combination of the lock.

12. In a combination lock, a housing, a shaft journalled therein, a drum carried by said shaft, a collar carried by said housing, members slidably held in said collar, means to axially shift said members between two predetermined positions, means whereby in one position a certain group of members lock said drum to said collar and another group of members is released, means whereby in the other position the first group releases the drum and the second group locks the drum, and means whereby reversal of any member changes the same from the first group to the second group.

13. A combination lock comprising a stationary housing, a shaft journalled in said sleeve, said shaft carrying a locking drum having recesses in the two faces thereof, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having radially projecting locking flanges at one end adapted to individually engage the recesses in said drum, certain of said members being normally set in locking position and others of said members being set in releasing position, a release finger adapted to selectively shift the first members into releasing position, and spring pressed detents in said collar normally holding the members in set position.

14. A combination lock comprising a stationary housing, a shaft journalled in said sleeve, said shaft carrying a locking drum having recesses in the two faces thereof, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having radially projecting locking flanges at one end adapted to individually engage the recesses in said drum, certain of said members being normally set in locking position and others of said members being set in releasing position, a release finger adapted to selectively shift the first members into releasing position, and spring pressed detents in said collar normally holding the members in set position and means carried by said collar to hold said detents in place when the collar is removed from said housing.

15. A combination lock comprising a stationary housing, a sleeve journalled in said housing and carrying a dial member and a release finger, a shaft journalled in said sleeve, said shaft carrying a locking drum, a collar mounted in said housing and registering with said drum, a plurality of slide members carried in said collar, said slide members having locking flanges adapted to individually engage and lock said drum, certain of said members being normally set in locking position and others of said members being set in releasing position and means for actuating the release finger to engage and shift selected members into reverse positions, and an alarm circuit adapted to be actuated by shifting of the other members.

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