W. E. BLAIS.

COMBINATION LOCK.

APPLICATION FILED AUG. 20, 1913.

1,222,920.

Patented Apr. 17, 1917.

Fig. 3.

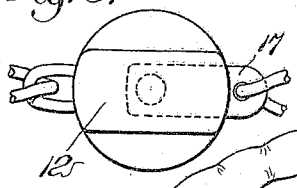


Fig. 1.

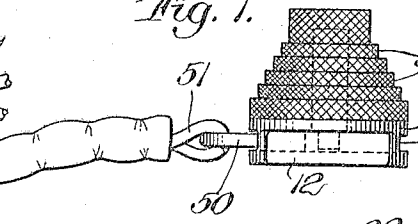


Fig. 8.

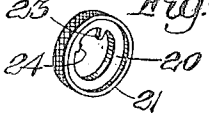


Fig. 10.

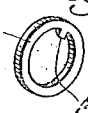


Fig. 9.

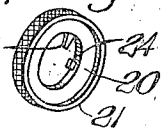


Fig. 2.

Fig. 5.

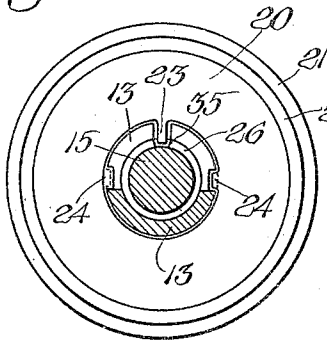


Fig. 4.

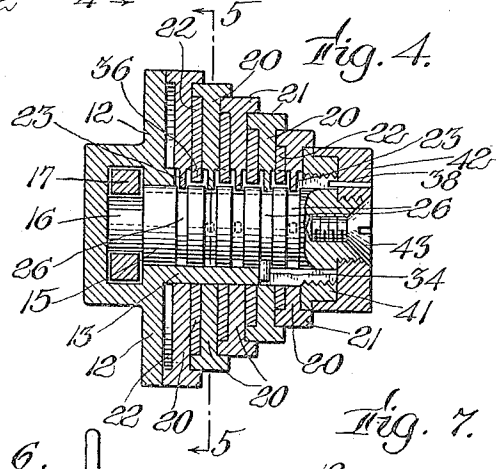


Fig. 6.

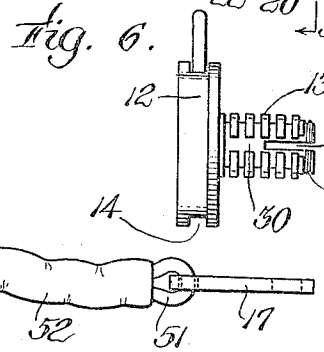
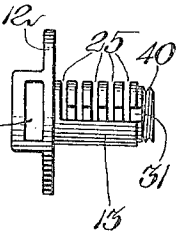


Fig. 7.



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UNITED STATES PATENT OFFICE.

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COMBINATION-LOCK.

1,222,920. Specification of Letters Patent. Patented Apr. 17, 1917.

Application filed August 20, 1913. Serial No. 785,704.

To all whom it may concern:

Be it known that I, WILLIAM E. BLAIS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Combination-Lock, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a combination lock which may be set arbitrarily and can be unlocked only by a person conversant with the code.

The main object of my invention is to provide a lock of simple, cheap and efficient construction which may be applied to various uses and which can be unlocked without a key but only by one in possession of the code.

A further object of the invention is to secure a lock which may be easily operated by the sense of touch and therefore in the dark as well as in daylight.

Other objects of the invention will be specifically pointed out and described hereinafter.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 is a side elevation of a lock constructed and operated in accordance with my invention, the lock being shown as mounted on one end of a chain, the other end being provided with a latch to be locked in said lock; Fig. 2 is a plan view of the lock and latch and end portions of the chain looking downwardly in Fig. 1; Fig. 3 is a plan view looking upwardly in Fig. 1 showing the latch in locked position; Fig. 4 is a central longitudinal sectional view on line 4—4 in Fig. 2 but showing the locking spindle in elevation; Fig. 5 is a transverse sectional view looking from right to left on line 5—5 in Fig. 4; Fig. 6 is a side elevation of the body-portion of the lock; Fig. 7 is also a side elevation of the same turned through an arc of ninety degrees; Figs. 8 and 9 are views in perspective of the rings and Fig. 10 is a view in perspective of a washer.

Briefly, the preferred embodiment of my invention comprises a body-portion of any suitable form having a cylindrical sleeve to hold a longitudinally movable spindle and a recess to receive a bolt or latch member adapted to be held in a locked position by the said spindle. The longitudinal movement of the spindle is controlled by a series of rings rotatably mounted on said sleeve and having projections or pins which pass through slots in the sleeve and engage slots or grooves in the spindle and when the rings are arranged according to a predetermined code the spindle may be moved longitudinally into a locked or unlocked position and may be secured in that position by turning the rings to disturb the arrangement thereof. Until the rings are returned to this particular predetermined arrangement the spindle cannot be moved longitudinally.

In the accompanying drawings my invention is shown as embodied in a chain lock which may be used for various purposes as for instance for fastening automobile tires to prevent theft. This, however, is merely one form of the invention which is capable of wide application and may be, by slight changes, made suitable for all kinds of locks.

Referring to the drawings, 12 designates a body-portion having a sleeve 13 preferably cylindrical and a recess 14. Within the sleeve is mounted a spindle 15 which is longitudinally movable so that one end 16 may be projected into the recess for the purpose of engaging a latch 17 or member to be locked therein. Preferably the end 16 of the spindle is diminished in diameter in order to engage a hole 18 in the latch and thereby lock it within the recess. The forms of the latch and spindle in this respect may be varied to suit different uses. This is also true of the body-portion 12.

For the purpose of locking the spindle against longitudinal movement I provide a series of rotatable members or rings 20 mounted upon the sleeve 13 and provided with means projecting through said sleeve to engage the spindle to control its longitudinal movement. These rings may be graduated in diameter, as shown in Fig. 4, to facilitate their manipulation when the lock is being operated and in such case I prefer to form a flat flange or rim 21 on the perimeter of each ring which may be knurled to afford a grip for the fingers. When assembled the rim of each ring fits on one side inside the rim of the adjacent larger ring and on the other side incloses the rim of the adjacent smaller ring which arrangement conceals the interior parts and prevents the rings being pried apart to inspect the location of the pins. Flat washers 22 may be placed between the rings to prevent friction between adjacent rings. (See Fig. 4.)

Each ring 20 is provided on its inner edge

with an inwardly projecting pin 23 and a stop 24, the distance between the two being about ninety degrees in the lock shown in the drawings. The location of the stop with relation to the pin is an arbitrary one and may be varied more or less, as this distance is always equal to the amount of rotary movement of the ring upon the sleeve. (See Fig. 5.) The sleeve is pierced by a series of semi-annular slots 25 and the spindle 15 has a corresponding series of annular grooves 26. When the parts are in position, the pins 23 project through the slots 25 into the grooves 26 in the spindle. The stops do not project through the slots in the sleeve and therefore have no effect upon the movement of the spindle. The pins, slots and grooves are so related in arrangement that when the spindle is in operative position, that is, when the latch 17 is locked as shown in Fig. 4, all these parts register.

To permit the parts to be assembled and to allow longitudinal movement of the spindle certain longitudinal slots are necessary. In the first place the sleeve has a longitudinal slot 30 which crosses the semi-annular slots 25 in the centers and extend from one end of the sleeve to the other. This slot receives the pins 23 when the rings 20 are being arranged in place on the sleeve. A longitudinal groove 31 on each side of the sleeve accommodates the stops 24. On the opposite side from the slot 30 is arranged a shorter slot 32 which receives a pin 34 set in the spindle and prevents any rotation of the latter in the sleeve without interfering with its longitudinal movement. The spindle has in its upper side a longitudinal groove 35 so that when the rings 20 are so disposed that the pins 23 all lie in this groove 35, the spindle may be moved longitudinally. Each washer 22 has an inwardly projecting pin 36 which, when the lock is assembled, lies in the longitudinal slot 30 in the sleeve and between two transverse slots 25 so that rotary movement of the washer on the sleeve is impossible.

In order to hold the rings in place upon the sleeve, the end thereof is screw-threaded at 40 to receive a collar 41 and the end of the spindle is also threaded to receive a cap 42 which is also held by a screw 43 threaded into the end of the spindle. The cap serves as a finger piece for moving the spindle longitudinally from left to right in Fig. 4 to release the latch 17.

The operations of assembling and taking apart the lock are extremely simple and may be performed by the user without requiring technical knowledge. This makes it possible for the user to change the combination at any time without assistance. In assembling the lock, the spindle is inserted in the sleeve with the pin 34 in the slot 32 which prevents the spindle turning. The longitudinal groove 35 in the top of the spindle as shown in Fig. 4 extends the entire length of the spindle and registers at all times with the longitudinal slot 30 in the top of the sleeve. The rings may then be adjusted in position. First the largest ring 20 is slipped onto the sleeve, the pin 23 traveling in the slot 30 and groove 35 which together constitute a runway and permits the rings to be moved freely on the sleeve in a longitudinal direction. The longitudinal grooves 31 in the sides of the sleeve receive the stops 24 on the rings. The first ring is pressed into engagement with the body-portion 12 and then a washer 22 is mounted on the spindle the pin 36 on the washer traveling in the sleeve slot 30. The next largest ring is then arranged in the same manner as the first and this process is continued until all the rings and washers have been arranged in place as shown in Fig. 4. The collar 41 is then screwed onto the end of the sleeve and the cap 42 secured to the spindle by the screw 43. This completes the assembling and the lock is ready for use. To take the lock apart the foregoing operations are merely reversed. In the illustrated embodiment of the invention five locking rings are shown but a greater or a smaller number may be used, the number of different combinations possible depending of course upon the number of rings.

Passing now to the operation of the device. In the drawings I have shown my lock as fastened by a link 50 to a chain 51 which may be covered with suitable material 52 to prevent chafing. Upon the other end of the chain is mounted the latch 17 which coöperates with the lock and is adapted to be secured therein. By passing the chain around a tire and around a fixed part of an automobile the tire is secured against removal when the latch is inserted and locked in the slot 14. This is merely illustrative of the manner of using the chain and the adaptation of my lock to a chain is but one use to which it may be applied and to illustrate the principle of operation of my invention.

In Fig. 4 the spindle is shown in a locked position, that is, with its end 16 holding the latch locked against withdrawal. The pins 23 of all the rings are alined in the longitudinal slot 30 and groove 35. The spindle may therefore be moved freely from left to right, that is, from a locked position to an unlocked position, by pulling the cap 42 to the right and when in an unlocked position the latch may be withdrawn.

In the position of the parts shown in Fig. 4 the spindle is in its locking position but is not locked against longitudinal movement. To accomplish this result so that the latch can not be released the various rings are rotated and the combination is what may be termed upset. In consequence some of the

pins 23 are on one side of the groove 35 and some on the other side and so long as one pin remains on one side or the other of that groove the spindle is locked against longitudinal movement and the latch or member which is locked cannot be released.

Referring to Figs. 8 and 9 it is to be observed that each ring has one pin and one stop and is reversible, being the same on both sides. This feature permits each ring to be mounted on the sleeve with the stop either on the right hand side or the left hand side. In Fig. 5 are shown two rings, the larger being behind the smaller, and the latter is mounted on the sleeve with the stop 24 on the right hand side and the former with the stop on the left hand side and shown in dotted lines. Both pins 23 are lying within the slot 30 and groove 35. By rotating the smaller ring from right to left the pin 23 moves into the transverse slot 25 and groove 26 and locks the spindle. The larger ring is rotated in the opposite direction with a like result. Each ring is capable of rotation through an arc of ninety degrees and no more and there is nothing to indicate on the outer surface of any ring whether the ring should be turned to the right or to the left as far as it can go in order to bring the pin in the center, that is, in the slot 30 and groove 35. Consequently, by mounting the rings on the sleeve, some with the stop on the left hand side and some with the stop on the right hand side in a predetermined arrangement, it will require knowledge of this arrangement in order to set the rings so that the spindle may be moved longitudinally to unlock the latch. In each case it is necessary, in order to bring the pin in the center, to turn the ring until the stop engages the end of the transverse slot. In Fig. 4 the second, third and fifth rings counting from the left have stops on the right hand side, looking from right to left in that figure, these stops being shown in dotted outline. The first and fourth rings have their stops on the left hand side and consequently these stops are not shown in that figure. Therefore, to release the spindle in this particular lock and with this arrangement of rings, the first or largest ring is turned from right to left, the second and third from left to right, the fourth from right to left and the fifth from left to right. When the rings have been turned in their respective directions as far as they can go, the pins 23 are all in alinement, in the slot 30 and the groove 35 and the spindle can be moved longitudinally. In case the combination becomes known or the owner wishes to change it he can do so as hereinbefore described by just reversing one or more rings on the sleeve.

It is to be noted that this lock can be operated to release the spindle entirely by sense of touch, provided the operator is in possession of the key, that is, is informed as to which rings turn to the left and which to the right. By increasing the number of rings, the number of possible combinations may be greatly increased, so that it will for all practical purposes be impossible to discover the key.

Because of the simplicity of operation and because it can be operated without a light, my lock is especially adapted for use in connection with automobiles and may be employed in many different environments. By making slight changes in the form of the body portion, which will be apparent to any skilled mechanic, the lock may be adapted for a great variety of uses and, therefore, I do not desire to be limited to the specific construction hereinbefore illustrated and described.

What I claim is:

1. A combination lock comprising a sleeve having a series of transverse slots, a spindle mounted in said sleeve and longitudinally movable therein, said spindle having a longitudinal groove and a series of annular grooves, and a plurality of rotatable members mounted on said sleeve, each of said members being provided with means projecting through one of said slots in said sleeve into one of said annular grooves on said spindle and being provided with a stop projecting into the slot in said sleeve to limit the movement of said rotatable member on said sleeve, said stop being so arranged that when it is in engagement with the end of the slot in the sleeve the projecting means on said rotatable member projects into the longitudinal groove on said spindle permitting longitudinal movement thereof.

2. A combination lock comprising a sleeve having a plurality of transverse slots, a spindle mounted in said sleeve and longitudinally movable therein, said spindle having a longitudinal groove and a plurality of annular grooves corresponding to the transverse slots in said sleeve, and a series of rotatable members mounted on said sleeve, each of said members being provided with a pin which projects through one of said slots in said sleeve into one of said transverse grooves on said spindle and being provided with a stop engaging one of said slots in said sleeve to limit the movement of said rotatable member, said stop being so arranged that when it engages the end of the slot on said sleeve the said pin lies within said longitudinal groove on said spindle.

3. A combination lock comprising a body-portion provided with a recess to receive a member to be locked therein, a spindle for locking said member within said recess and a plurality of rings mounted on said body-portion, each of said rings being capable of a limited rotary movement, said rings serv-

ing to retain said spindle in the position of locking the said member within said recess except when all of said rings are rotated to the extreme ends of their movements in one direction or the reverse according to a prearranged code.

4. A combination lock comprising a body-portion provided with a recess to receive a member to be locked therein, a longitudinally movable spindle for locking said member within said recess and a plurality of rings mounted on said body-portion, each of said rings being capable of a limited rotary movement, said rings serving to retain said spindle in the position of locking the said member within said recess except when all of said rings are rotated to the extreme ends of their movements in one direction or the reverse according to a prearranged code.

5. A combination lock comprising a body-portion provided with a recess to receive a member to be locked therein, a longitudinally movable spindle for locking said member within said recess and means having a limited rotary movement for locking said spindle against longitudinal movement except when said means are rotated to the extreme ends of their movements in one direction or the reverse according to a prearranged code.

6. A combination lock comprising a body-portion provided with a recess to receive the member to be locked, a longitudinally movable spindle for locking said member within said recess and a plurality of rotatable members mounted on said body and having a limited rotatable movement and serving to retain said spindle in the position of locking the said member within said recess except when all of said rotary members are rotated to the extreme ends of their movements in one direction or the reverse according to a pre-arranged code.

In testimony whereof, I hereunto set my hand, this the 14th day of August, 1913.

WILLIAM E. BLAIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."