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COMBINATION RESETTING GUARD FOR EXPOSED SHACKLE PADLOCK

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Fig. 1.

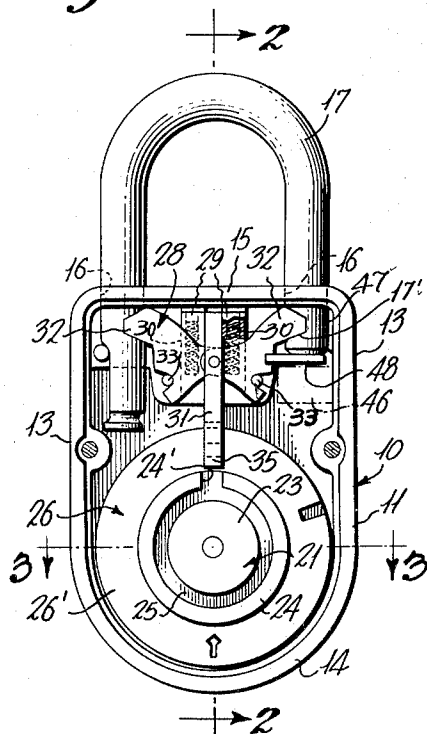


Fig. 2.

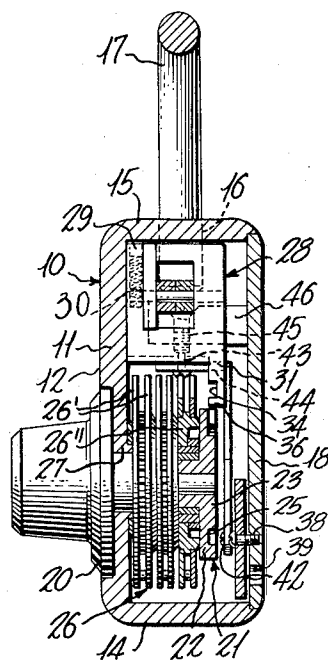


Fig. 3.

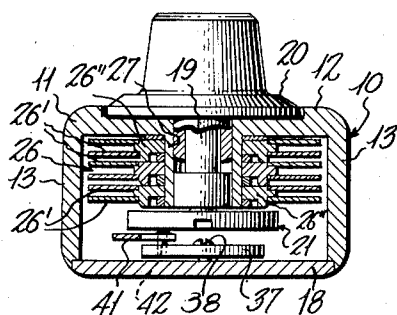
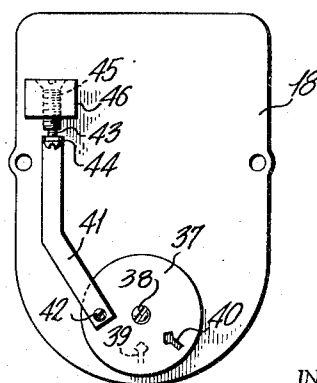


Fig. 4.



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COMBINATION RESETTING GUARD FOR EXPOSED SHACKLE PADLOCK

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5 Claims. (Cl. 70—25)

The present invention relates in general to combination resetting means for combination locks, and more particularly to a combination lock of the exposed shackle padlock type having a facility for preventing access to the tumblers for resetting the combination or observance of the movement of the tumblers to achieve unauthorized unlocking of the lock at all times except when the lock has been unlocked and especially adjusted by persons having knowledge of the combination.

In combination locks of the general type herein involved having a plurality of rotary tumblers driven from an exposed dial, the combination can be reset at any time by inserting a combination changing key from externally of the lock housing through an opening usually provided in the rear cover plate of the housing and into openings in the tumblers which are aligned with the key opening in the rear cover plate when the tumblers are in a predetermined position. The insertion of the combination changing key into the openings provided therefor in the tumblers effects a release of the outer annular disk portion of the tumblers of conventional construction from their inner hub portion by which the tumblers are driven, so that the position of the inner hub portions of the tumblers relative to their outer annular disk portions may be reset to any desired combination by turning the dial and driving cam. Since padlocks of the type having exposed shackles are designed to be usually coupled through a hasp staple, the lock housing is exposed and freely available to inspection by persons seeking unauthorized admission to the enclosure protected by the padlock. In view of this condition, movement of the tumblers, or at least the rearmost tumbler in these conventional combination locks, may be observed through the combination changing key opening in the rear cover plate of the lock housing and persons having knowledge of the general structural features of this type of lock can fairly readily detect the combination of the lock by insertion of small pieces of material such as shim stock through the exposed combination changing key opening and thereby gain unauthorized admission to the locked enclosure.

An object of the present invention is the provision of novel guard means for the resetting key opening of combination padlocks, wherein the location of the resetting key opening in the padlock cover plate is concealed by the guard means to resist unauthorized access to the interior of the padlock housing.

Another object of the present invention is the provision of novel guard means for closing the rear cover plate resetting key opening of a combination lock housing to prevent manipulation of the guard means at all times, except when the lock has been unlocked.

Another object of the present invention is the provision of a novel combination changing mechanism for combination padlocks which is manipulatable to expose the mechanism for actuation only when the padlock is in unlocked condition.

Other objects, advantages and capabilities of the present invention will become apparent from the following

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detailed description, taken in conjunction with the accompanying drawing showing only a preferred embodiment of the invention.

In the drawing:

5 Figure 1 is a rear elevation of an exposed shackle combination padlock embodying the present invention, with the cover plate removed.

Figure 2 is a vertical longitudinal section view of the combination padlock, taken along the line 2—2 of Figure 1;

Figure 3 is a horizontal transverse section view of the padlock taken along the line 3—3 of Figure 1; and

Figure 4 is an elevation of the interior surface of the rear cover plate and the components supported thereon, with the cover plate removed from the lock housing.

Referring to the drawing wherein like reference characters designate corresponding parts throughout the several views, the structure embodying the preferred embodiment of the present invention comprises a combination padlock generally indicated at 10 having a lock housing 11 including a front wall 12, side walls 13, curved bottom wall 14 and top wall 15, all integrally formed with the front wall 12 to produce a rearwardly opening body. The top wall 15 is formed with a pair of laterally spaced circular openings 16 located adjacent the side walls 13 for receiving the legs of the usual U-shaped shackle 17 when the padlock is in locked condition. In accordance with conventional practice, one of the legs of the shackle 17 is slidably connected with the housing 11 so as to permit reciprocal movement of the shackle while that leg remains continuously within the housing 11. The end of the opposite leg of the shackle 17 when the shackle is shifted to its outermost position relative to the housing 11 clears the outer surface of the top wall 15 permitting the shackle to be rotated about the axis of the leg which is retained within the housing 11.

The padlock housing 11 is also provided with a removable rear cover plate 18 which is attached to the side, bottom and top walls of the lock housing in any suitable manner.

Journalled in the front wall 12 of the padlock housing is an arbor 19 which has fixed on the front end thereof the usual dial 20 which is disposed in accordance with conventional practice in overlying relation to the front wall 12 of the padlock housing, the dial 20 being rotatable to turn the arbor 19 and thereby control movement of the usual tumblers. The arbor 19 supports a unique driving cam 21 in fixed relation to the arbor at a point near the inner end of the arbor. The driving cam 21 is of unique form in that it is formed of a disk portion 22 keyed to the arbor 19 having an integral rearwardly projecting hub portion 23 centrally disposed thereon and an annular peripheral flange 24 projecting rearwardly from the margin of the disk portion and spaced from the hub portion 23 to define an annular groove 25 therebetween. A slot 24' is formed through the flange 24 at one circumferential point along the periphery of the driving cam 21 to form a guideway accommodating a fence, to be later described, for reciprocative movement radially of the cam 21.

The reference character 26 designates several tumblers which are constructed in the usual manner with outer annular disks 26' and inner annular hubs 26'' rotatably supported on a tubular boss 27 integral with and projecting rearwardly from the front wall 12 of the padlock housing. The tubular boss 27 also serves as the bearing in which the arbor 19 rotates. The outer annular disk portions 26' of the tumblers 26 are provided with the usual peripheral recesses for receiving the fence 28 for operation in the usual fashion of tumbler combination locks in which the dial is turned in opposite directions

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alternately for predetermined numbers of turns until the peripheral recesses of all the tumblers are in alignment to receive the fence and permit movement thereof to unlock the shackle. The tumblers 26 are therefore provided with the usual lost motion connection and the driving cam 21 has a conventional inwardly extending driving pin which engages a stop member on the rearmost tumbler 26 to drive the rearmost tumbler on rotation of the dial 20 and through the lost motion interconnections between the rearmost tumbler and the rest of the tumblers achieve rotation of all of the tumblers.

The tumblers 26 are mounted between the driving cam 21 and the front wall 12 of the padlock housing with their circular edges adjacent to the curved bottom wall 14 of the housing so that the parts can be arranged compactly and occupy a minimum of space. The tumblers cooperate with the fence member 28 which is mounted above the tumblers and is reciprocally slidable in suitable guideways 29 in the direction of the longitudinal medial axis of the housing to bring the lower leg of the fence member which extends laterally over the width of all of the tumblers 26 into contact with the tumblers. A plurality of coil springs 30 are disposed in the guideways 29 and bear upon projecting shoulders of the fence member 28 to urge the fence toward the top wall 15 out of contact with the tumblers 26. The fence member 28 is likewise provided with a downwardly projecting leg 31 operatively associated with the driving cam 21 and carries a pivotally supported pair of locking arms 32 having outwardly directed locking portions positioned by the fixed pins 33 on the front housing wall 12 received in suitable notches in the locking arms to seat in the notches 17' of the shackle 17 and lock the shackle.

The forwardly facing edge of the downwardly projecting leg 31 of the fence member 28 is provided with a recess 34 complementary to the cross section of the annular flange 24 on the driving cam 21 to slidably receive the flange 24 therein. This recess 34, spaced above the lower end of the fence leg 31, produces a hook formation 35 at this lower end having a nose 36 adapted to project into the annular groove 25 in the driving cam 21 and ride therein underlying the flange 24 when the slot 24' is out of alignment with the fence 28.

When the dial 20 has been rotated in accordance with a preselected combination to align the peripheral recesses of the tumblers 26 with the fence member 28, and the slot 24' in the driving cam peripheral flange 24 has been aligned with the downwardly projecting leg 31 on the fence 28, outward manual pressure on the shackle 17 will pivot the locking portions of the locking arms 32 inwardly toward each other about the fixed pins 33. If the tumbler recesses and driving cam slot 24' are aligned with the fence 28, such movement of the shackle 17 and locking arms 32 will project the fence 28 downwardly against the bias of the springs 30 to seat in the aligned recesses and slot and release the shackle 17 for sliding movement outwardly of the lock housing. If the tumbler recesses are not aligned with the fence member 28, the periphery of the non-aligned tumbler or tumblers will intercept downward movement of the fence 28 and prevent sufficient movement of the fence to permit the locking arms 32 to pivot free of the shackle notches 17'.

The construction of the tumblers 26 and the manner in which the outer annular disks 26' of each tumbler are disconnected from the hub portion 26'' to permit resetting of the combination forms no part of this invention, it being understood that the outer annular disks 26' are disconnected from the hubs 26'' for resetting the combination by inserting a key through an opening in the rear cover plate 21 and through corresponding openings in the outer annular disks 26' of the tumblers which are aligned with the key opening in the cover plate when the tumblers are all moved to a predetermined combina-

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tion resetting position. This application has to do specifically with mechanism which prevents observance of the movement of the tumbler mechanism or gaining access to the tumbler chamber for resetting the tumbler combination except when the lock has been unlocked so that the combination cannot be reset by unauthorized persons or by someone who does not know the existing combination. This is achieved by providing a rotatable guard disk 37 supported on the inner surface of the rear cover plate 18 of the lock housing by means of a screw 38 or other journalling facility, the guard disk 37 being located in covering relation to a conventional combination changing key opening 39 in the cover plate 18. Located on one radius of the disk 37 near the periphery thereof is a key hole 40 for the combination changing key. One end of a connecting link 41 is pivotally connected as at 42 to the disk 37 at an eccentric point on the disk, and at its other end is connected by means of a screw 43 extending through an opening in a flange 44 on the link 41 to a set screw 45 into which the adjusting screw 43 is threaded. The opening in the flange 44 is of greater diameter than the shank of the adjusting screw 43 to permit rocking of the connecting link 41 out of alignment with the axis of the screw 43 but is smaller than the head of the screw 43 so that the head of the screw 43 will draw the link 41 upwardly upon upward movement of the set screw 45. The set screw 45 is threaded into a supporting block 46 fixed on the cover plate 18 and is located so that the slotted head of the set screw 45 lies at the bottom of the socket 47 disposed immediately below the opening 15 designed to receive the short leg of the shackle 17. The slotted head of the set screw 45 is therefore exposed at the bottom of the socket 47 to be manipulated by a screw driver inserted into the socket 47 when the lock is unlocked, the shackle 17 retracted to withdraw the short leg from the socket 47, and the shackle rotated about its long leg to clear the entrance of the socket 47.

The adjusting screw 43 may be set when the cover plate 18 is removed from the lock housing to give a proper throw to the connecting link 41 so that the guard disk 37 will be rotated the proper amount to dispose the opening 40 in precise registry with opening 39 when the set screw 45 is backed off a preselected number of turns.

The locking arm 32, adapted to engage the shorter leg of the shackle 17, is in the preferred embodiment provided with an integral outwardly projecting plate 48 below the locking nose thereon to be engaged by the bottom of the short shackle leg when the shackle is pushed inwardly of the lock casing from unlocked position to assist in shifting the fence 28 away from the tumblers.

The operation of the combination padlock embodying the present invention is as follows:

Assuming the components to be in the relative positions illustrated in Figures 1 and 4 with the padlock in locked condition, the padlock is manipulated to release the shackle 17 for withdrawal from locked condition in the padlock casing by manipulating the knob of the dial 20 to rotate the driving cam 21 in clockwise and counterclockwise directions alternately for preselected numbers of revolutions, in accordance with conventional practice in this art. The tumblers 26 are driven by the driving cam 21 to position the peripheral recesses of the tumblers in alignment with the axis of movement of the fence member 28 to receive the fence member when it is rectilinearly shifted toward the axis of the tumblers. The particular combination which must be manipulated by the operator is determined, of course, by the relative positions of the peripheral and hub portions 26' and 26'' of the tumblers, as established by the previous adjustment of the combination. When the tumbler recesses have been thus aligned in registry with the fence member 28, the driving cam is then shifted by rotation

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of the dial knob 20 to position the slot 24' in the peripheral flange 24 of the driving cam 21 to receive the depending leg 31 of the fence member 28. If the operator then manually grasps the shackle 17 and applies a force thereto in a direction tending to withdraw the shackle from the padlock casing 13, the locking arms 32 will be rotated about their fixed pivot pins 33 by the camming force on the noses of the locking arms 32 produced by the inclined edges of the notches 17' of the shackle 17. This movement of the locking arms 32 shifts the fence member 28 to which the locking arms are pivoted toward the tumblers and driving cam and against the resilient upward force exerted on the fence member 28 by the springs 30. It will be understood that the fence member 28 will not be permitted to slide toward the tumbler axis a sufficient distance to enable the noses of the locking arms 32 to be withdrawn clear of the shackle notches 17' if any of the tumbler recesses or driving cam slots 24' are out of registry with the fence member.

Upon rotation of the shackle 17 about the long leg thereof to position the shorter leg out of axial alignment with the socket 47, the slotted head of the set screw 45 will be exposed to permit manipulation thereof by a screw driver blade inserted into the socket 47. To change the combination, the operator manipulates the screw driver to back off the set screw 45 a preselected number of turns, displacing the set screw 45 upwardly and carrying the adjusting screw 43 with it. The head of the screw 43 bears against the flange 44 of the connecting link 41 to draw the link 41 upwardly to rotate the guard disk 37 about its pivot 38 an appropriate distance to shift the combination changing key hole 40 in the guard disk 37 into alignment with the hole 39 in the rear cover plate 18. The combination change key may then be inserted through the aligned openings 39 and 40 and into the conventional opening provided therefor in the outer annular disks 26' of the tumblers 26 to rotate the conventional cam or other facility in the tumblers for disconnecting the annular disks 26' from the hub portions 26''. By the construction herein described, the dial 20 may thereupon be adjusted to set up the desired combination without returning the fence member 28 to shackle-locking position, thereby eliminating this procedural step from conventional combination lock-changing procedure. Because of the particular construction of the driving cam 21 and fence member 28, the driving cam is free to rotate when the depending leg 31 of the fence member 28 is fully projected toward the axis of the driving cam by virtue of the alignment of the transverse recess 34 in the hook portion 35 of the fence member leg 31 with the peripheral flange 24 on the rear face of the driving cam and the accommodation of the nose 36 of the hook portion 35 in the driving cam annular recess 25. The driving cam 21 may thereupon be rotated by manipulation of the dial 20 to shift the hub portions 26'' of the tumblers 26 relative to their annular disks 26' in accordance with conventional combination-changing procedure to set up the desired relative positioning between the annular disks 26' and the hub portions 26'' and establish a new combination for the padlock.

The combination-changing key is then withdrawn from the aligned holes 39 and 40, the screw driver reinserted into the socket 47 to rotate the set screw 45 in a direction to displace the set screw downwardly. The lower end of the set screw 45 bears upon the flange 44 of the connecting link 41 to force the link downwardly and return the guard disk 37 to the position illustrated in Figure 4, wherein the holes 39 and 40 are out of alignment. The padlock may then be returned to locked condition by forcing the shackle 17 toward the padlock casing, whereupon the noses of the locking arms 32 are projected into locking engagement with the shackle sockets 17' under the influence of the springs 30 when the same come into registry.

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While only one preferred embodiment of the invention has been particularly shown and described, it is apparent that other modifications may be made in the invention without departing from the spirit and scope thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are set forth in the appended claims.

I claim:

1. In a combination lock, the combination with a lock housing having a socket therein and including a wall having a combination resetting key opening, rotatable tumblers, a driving cam therefor, a fence operatively associated with said tumblers and driving cam, and means normally occupying said socket barring access thereto when said lock is in locked condition and removable from said socket to expose the same when said lock is unlocked, of a guard mechanism comprising a guard member rotatably supported on said wall with a portion thereof normally covering said wall key opening and having a resetting key opening disposed out of registry with said wall key opening, a guard member adjusting screw disposed at the base of said socket for axial adjustment upon rotation of the same by an instrument inserted into said socket when the socket is exposed, and linkage means interconnecting said screw with said guard member for translating axial movement of said adjusting screw into rotary movement of said guard member to shift said guard member key opening into and out of registry with said wall key opening upon preselected axial movement of said adjusting screw.

2. In an exposed shackle combination padlock, the combination with a padlock housing having a socket therein and including a wall having a combination resetting key opening, a reciprocative shackle shiftable relative to said housing to permit complete withdrawal of one leg thereof from and out of alignment with said socket, rotatable tumblers, a driving cam therefor, and tumbler resetting mechanism, a guard mechanism for the tumbler resetting mechanism comprising a guard plate movably supported on the wall of said housing in intercepting position between said wall key opening and said resetting mechanism and having a resetting key opening disposed out of registry with said wall key opening, an adjusting screw disposed at the base of said socket for axial movement upon rotation thereof by an instrument inserted into said socket, said one shackle leg barring access to said adjusting screw when said leg occupies said socket, and linkage means interconnecting said screw with said guard plate for coordinating movement of said screw and said guard plate to shift said guard plate key opening between positions of nonregistry and registry with said wall key opening upon manipulation of said adjusting screw.

3. In an exposed shackle combination padlock, the combination with a padlock housing having a socket therein and including a wall having a combination resetting key opening, a reciprocative shackle shiftable relative to said housing to permit complete withdrawal of one leg thereof from and out of alignment with said socket, rotatable tumblers, a driving cam therefor, and tumbler resetting mechanism, of a guard mechanism for the tumbler resetting mechanism comprising a guard disc rotatably supported on the wall of said housing in intercepting position between said wall key opening and said resetting mechanism and having a resetting key opening disposed out of registry with said wall key opening, an adjusting screw disposed at the base of said socket for axial movement upon rotation thereof by an instrument inserted into said socket, said one shackle leg barring access to said adjusting screw when said leg occupies said socket, and linkage means interconnecting said screw with said guard plate for translating axial movement of said screw into rotation of said guard disc to shift said guard disc key opening between positions

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of nonregistry and registry with said wall key opening upon manipulation of said adjusting screw.

4. In an exposed shackle combination padlock, the combination with a padlock having an end wall provided with a socket therein and a cover plate provided with a combination resetting key opening, a reciprocative U-shaped shackle having one leg thereof removably seated in said socket, means interlocking with said leg when said leg is seated in said socket to retain said leg locked therein, means supporting the other leg of said shackle in said housing for axial and rotary movement to permit complete withdrawal of said one leg from and out of alignment with said socket, rotatable tumblers, a driving cam for adjusting said tumblers, a fence operatively associated with said tumblers and driving cam for controlling said interlocking means, and tumbler resetting mechanism incorporated in each of said tumblers, of a guard mechanism for the tumbler resetting mechanisms comprising a guard disc rotatably supported on said cover plate and interposed between the resetting key opening therein and said tumbler resetting mechanisms, said guard disc having a portion normally covering said wall key opening to prevent insertion of a resetting key therethrough into said resetting mechanisms and a resetting key opening positioned out of registry therewith, a guard disc adjusting screw disposed at the base of said socket for axial adjustment upon rotation of the screw by an instrument inserted into said socket when said one shackle leg is withdrawn therefrom, and linkage means interconnecting said screw with said guard disc for rotating said guard disc in response to axial movement of said adjusting screw to rotate said guard disc key opening into and out of registry with said wall key opening upon rotation of said adjusting screw when said shackle leg is withdrawn from said socket.

5. In an exposed shackle combination padlock, the combination with a padlock having an end wall provided with a socket therein and a cover plate provided with a

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combination resetting key opening, a reciprocative U-shaped shackle having one leg thereof removably seated in said socket, means interlocking with said leg when said leg is seated in said socket to retain said leg locked therein, means supporting the other leg of said shackle in said housing for axial and rotary movement to permit complete withdrawal of said one leg from and out of alignment with said socket, rotatable tumblers, a driving cam for adjusting said tumblers, a fence operatively associated with said tumblers and driving cam for controlling said interlocking means, and tumbler resetting mechanism incorporated in each of said tumblers, of a guard mechanism for the tumbler resetting mechanisms comprising a guard disc rotatably supported on said cover plate and interposed between the resetting key opening therein and said tumbler resetting mechanisms, said guard disc having a portion normally covering said wall key opening to prevent insertion of a resetting key therethrough into said resetting mechanisms and a resetting key opening positioned out of registry therewith, a guard disc adjusting screw disposed at the base of said socket, a supporting block on said cover plate supporting said screw for axial adjustment upon rotation of the screw by an instrument inserted into said socket when said one shackle leg is withdrawn therefrom, and linkage means interconnecting said screw with an eccentric point on said guard disc for rotating said guard disc in response to axial movement of said adjusting screw to rotate said guard disc key opening into and out of registry with said wall key opening upon rotation of said adjusting screw when said shackle leg is withdrawn from said socket.

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