

IMPROVEMENTS RELATING TO COMBINATION LOCKS

The use of combination locks, which dispense with the need for a separate key, has in recent years become increasingly popular on articles such as luggage articles, camera, and instrument cases, and the like.

Such locks commonly employ a mechanism whereby the combination of the lock can be changed to one of the user's own choice, by manipulation of a combination-changing device. In the case of locks, for example of the rotary dial and sleeve type, where, for combination changing it is necessary to move the sleeves or other combination elements axially out of coupling engagement with the dials or the like, this is normally effected by a shift member having a manual actuator. Generally, the actuator has only been accessible from the back of the lock, i.e., from the interior of the article to which the lock is applied and, in certain instances, this has proved to be cumbersome in operation. Further, the actuator has generally needed to be moved in the axial direction of the movement of the sleeves relative to the dials in order to uncouple the dials from the

sleeves. (See, for example, U.S. Patent No. 3,800,571 to Heine, issued April 2, 1974 ~~and commonly assigned herewith.~~)

5 It is an object of the present invention to provide a novel form of shift mechanism for a combination lock of the type in which a plurality of combination elements such as sleeves, are moved axially in unison in order to effect a combination change.

10 Another object of the invention is to provide a combination lock of the type having a plurality of combination elements adapted to be moved axially in unison in order to effect a combination change, wherein an actuator for shifting the elements is moved in a direction other than the axial direction of movement
15 of the elements.

A further object of the invention is to provide a combination lock, suitable for use on articles of luggage and the like, wherein a shift mechanism for changing the combination of the lock is readily accessible from the exterior of the article to which the lock
20 is applied.

25 It has previously been proposed in connection with combination padlocks, for example, which employ rotary dials and sleeves, to move the sleeves out of coupling engagement with the dials by utilizing the longer leg of the padlock shackle to provide axial movement of the sleeves, by movement of the shackle in a direction other than the direction of axial movement of

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the sleeves, see, for example, U.S. Patent No. 3,766,578 to Heine et al, issued October 23, 1973, and U.S. Patent No. 4,048,821 to Bako et al, issued September 20, 1977. The present invention, however, is primarily concerned with providing alternative and simplified means for effecting axial movement of the combination elements, for combination changing purposes, by means of an actuator which is operated other than in the direction of movement of the elements.

Summary of the Invention

In accordance with the invention, at least in a preferred embodiment thereof, axial movement of the combination elements of a combination lock, in order to effect a change in combination, is provided by depressing a shift member having a manual actuator portion projecting through an opening in the lock casing. The shift member is mounted on a shaft which carries the combination elements and includes a cam portion effective to move the elements axially when the actuator portion is depressed, by reaction of the shift member with an internal surface of the lock casing.

In a preferred form of lock in accordance with the invention, the shift member cooperates with a locking member, for example, a pivotal bolt, in a manner whereby depression of the shift member to uncouple the combination elements from their cooperating combination components, can only be effected when the locking member

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is in an unlocked condition, i.e., when the lock is on-combination. (16)

The shift member preferably further includes means cooperating with the locking member for holding the locking member in an unlocked condition when the combination elements are moved out of coupling engagement with their cooperating combination components, in order to avoid loss of the combination.

Description of the Drawings

10 Figure 1 is a plan view of a combination lock in accordance with the invention, with parts of the lock being cut away;

Figure 2 is a longitudinal section along line 2-2 of Figure 1;

15 Figure 3 is a cross section along line 3-3 of Figure 2;

Figure 4 is a cross section along line 4-4 of Figure 2;

20 Figure 5 is a view similar to Figure 2 but showing parts of a lock in a combination changing position;

Figure 6 is a view similar to Figure 4 but showing the lock in a combination changing position;

Figure 7 is a perspective view of a shift member used in the lock;

25 Figure 8 is a composite end view of a combination dial and a combination sleeve; and

Figure 9 is a plan view of a pivotal bolt.

Description of Preferred Embodiment

The illustrated combination lock is of the generally known type employing a locking member in the form of a pivotal bolt adapted to engage a hasp, the bolt being movable between locking and unlocked positions under the control of a plurality of combination dials and sleeves. The arrangement is such that when the dials and sleeves are on combination, the bolt automatically assumes its unlocked position, in which the hasp can be inserted into or withdrawn from the lock, and when the dials and sleeves are off combination, the bolt automatically assumes its locking position in which it prevents an inserted hasp from being withdrawn from the lock.

Locks having the above type of locking and unlocking action are known, see, for example, U.S. Patent No. 3,800,571, referred to above. It is to be understood that the present invention is not concerned with the locking and unlocking action per se, and this form of lock is merely used for illustrative purposes as one type of lock to which the present invention may be applied. Thus, the present invention is concerned with a shift mechanism for moving combination elements such as sleeves, axially out of coupling engagement with associated lock components in order to effect a combination change. The invention can be applied to locks having a locking and unlocking action different to the pivotal bolt type locking and unlocking action herein referred to.

Referring now specifically to the drawings, the illustrated lock, generally indicated by reference A, may be attached to a valance B of one section of say a luggage article (see Figure 3) with the other section C of the article carrying a hasp 10 having projecting tongues 14a, 14b (Figure 1) adapted to enter openings in the lock and engage a pivotal bolt 30 to releasably secure the sections of the luggage or like article together.

Lock A has a casing which may, for example, be formed by a channel shaped base member 20, a face plate 22, side wall members 24 and 26, and end brackets 16 and 18. The design and assembly of the casing components is not critical and can follow established practice for locks of this type. As illustrated, base member 20 has openings 25 for attaching the lock as by screws, rivets, or the like, to valance B and side wall member 24 has openings 27 aligned with similar openings 29 in upright wall 31 of the base member, for admission of the hasp tongues 14a and 14b.

Brackets 16 and 18 which define opposite end walls of the casing, respectively, may, for example, be located in recesses 28 in the opposed upright walls of base member 20. The pivotal bolt 30 (Figure 9) is mounted in brackets 16 and 18 by ears 32a, 32b of the bolt which fit in corresponding openings in the brackets, and coil compression springs 34 act between base member 20 and bosses 36 on the undersurface of the bolt to urge the bolt upwardly into the position shown in

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Figures 2 and 6 and shown in solid line in Figures 3 and 4. In this, the unlocked position of the bolt, the hasp tongues 14a and 14b are free to enter and to be removed from the lock through openings 27 and 29. When bolt 30 is lowered, however, to the locking position, against springs 34, by means to be described, and as shown in phantom in Figures 3 and 4, bolt tongues 30a and 30b align vertically with the hasp tongues 14a and 14b to prevent disengagement with the hasp. Downward movement of bolt 30 is limited by a stop 39 on the base member 20.

Brackets 16 and 18 also serve to mount a shaft 40 carrying a series of combination elements in the form of sleeves 42, and encircling combination dials 48. The dials and sleeves are of conventional type insofar as the dials have internal teeth 56 or the like, which mesh with complementary teeth 58 or the like on the sleeves whereby the dials and sleeves are coupled for mutual rotation on the shaft 40. The dials also have a conventional series of circumferential combination indicia on their outer surfaces, with locating detents 60 therebetween and a portion of the periphery of each dial protrudes from casing 10 through respective slots 62 in face plate 22. Similarly, the dials protrude through aligned slots 64 in bolt 30. A conventional dial spring 68 on base member 20 has limbs 70 engaging in the detents 60 of the respective dials.

Shaft 40 further has a fixed or integrally formed collar 72 adjacent the right end sleeve 42, and a coil spring 74 surrounding the shaft and acting between bracket 17 and the left end sleeve. Between collar 72 and bracket 18, the shaft 40 carries a shift member 76, the shift member having an elongated opening 78 through which the shaft extends. Spring 74 urges the assembly of sleeves, shaft and shift member to the right as seen in Figure 2, and holds the sleeves in coupling engagement with the respective dials.

Sleeves 42 have enlarged bosses 44 at the left-hand ends thereof defining circumferential cam surfaces. These cam surfaces have part-circular portions 46 and flattened portions 50, and the cam surfaces act on the upper surface of bolt 30 to control the position of the bolt. Thus, when all the sleeves are aligned by suitable manipulation of the dials, such that the flattened portions of the respective sleeves all engage the bolt (i.e., the on-combination condition), the bolt is free to rise to the unlocked position. If at least one of the sleeves is rotated from this position, the part-circular portion of the sleeve's cam surface cams the bolt down to the locked position. Thus, for the bolt to be unlocked, all the sleeves must have their flat portions in aligned engagement with the bolt and for the bolt to be locked, any one or more of the sleeves must be rotated so that the part-circular cam portion engages the bolt. This form of locking and unlocking action, as

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indicated, is known and will be readily apparent to those skilled in the art.

To enable the combination of the lock to be changed, it is necessary to move the sleeves 42 axially out of coupling engagement with the respective dials, so that at least one of the dials can be rotated independently of the respective sleeve. This is accomplished by shift member 76 when the lock is on combination as will now be described.

Shift member 76, as shown particularly in Figure 7, includes an upwardly projecting manual actuator portion 80, and a depending portion 82 with a projecting tab 84. The shift member is mounted on shaft 40 between collar 72 and bracket 18 and the action of spring 74 holds a rear surface 86 of the shift member in engagement with bracket 18. An inclined front surface 88 of the shift member engages collar 72 and the manual actuator portion 80 projects from the casing through an opening 90 in face plate 22.

The normal rest position of the shift member 76 is shown in Figures 2 and 4. When the lock is off combination, the bolt being in its locked lowered position, shown in phantom in Figure 4, tongue 30b of the bolt is in a blocking position with respect to tab 84 of the shift member and actuator portion 80 of the shift member cannot, therefore, be depressed in opening 90. When the lock is on combination, however, with the bolt in its raised, unlocked position, tongue 30b clears tab 84 and

allows manual actuator portion 80 of the shift member to be depressed in opening 90. Depression of the shift member causes inclined surface 88 to act as a cam surface pressing collar 72 to the left as shown in Figure 2, against the action of spring 74, and thereby axially moving sleeves 42 out of coupling engagement with the respective dials 48. It will be noted, that the shift member is confined to move downwardly at an oblique angle of approximately 20 degrees to the vertical due to the shift member being located in a cut-out portion 92 of bolt 30, the rear surface 94 of which acts as a guide for surface 96 of shift member during downward movement thereof.

Further, during depression of the shift member, the rear surface 86 reacts with the internal surface of bracket 18 to provide the camming action of surface 88 against collar 72.

When the shift member has been depressed, it can be rotated in a counterclockwise direction on shaft 40 as shown in Figure 6, to bring surface 98 of the shift member into engagement under the edge of face plate 22 defining opening 90, and to bring tab 84 into engagement under bolt tongue 30b. In this condition, the shift member can be released and the sleeves will be held out of coupling engagement with respective dials to allow the combination of the lock to be changed. Further, in this position of the shift member, tab 84 prevents the bolt from being lowered into its locked position thereby

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preventing the sleeves 42 from rotating and losing the combination. After the combination of the lock has been changed, the shift member can be rotated in a clockwise direction as seen in Figure 6 and spring 74 returns the sleeves axially into coupling engagement with the respective dials thereby setting the new combination. Simultaneously, collar 72 acting against surface 88 of the shift member returns the shift member to its upper rest position.

It will be seen from the foregoing that the invention provides a convenient form of shift mechanism for use with combination locks, suitable for application to articles of luggage and the like, which shift mechanism can be operated from the top of the lock casing, i.e., from externally of the article to which the lock is applied. Further, the shift mechanism is operated by moving a manual actuator other than in the direction of movement of the combination elements that are moved.

While only a single preferred embodiment of the invention has been described herein in detail, it is to be understood that the invention is not limited thereby, and modifications can be made within the scope of the attached claims.



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Claims

1. A combination lock including a plurality of combination elements disposed coaxially on a shaft in a lock casing for axial movement in unison out of coupling engagement with cooperating combination dials in order to change the combination of the lock, the dials having peripheral portions extending through slots in a face plate of the lock, a shift member mounted in said casing adjacent to a terminal one of said combination elements, said shift member including a manual actuator portion exposed through an opening in said face plate and said shift member being movable substantially transversely to the axis of said shaft and inwardly of the casing by manual depression of said actuator portion in said opening, said shift member further including a cam surface for causing said axial movement of said elements in response to said depression of said actuator portion, means for resiliently biasing said shift member outwardly of said lock casing, means operable upon said depression of said manual actuator portion for holding said shift member inwardly of said casing without continued manual depression of said actuator portion and thereafter operable by manipulation of said manual actuator portion to release said shift member to move outwardly of said casing in response to said biasing means.



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2. A lock as defined in Claim 1, wherein
said means for resiliently biasing said shift member
outwardly of said lock casing comprises spring means
for urging said combination elements in unison into
5 coupling engagement with said cooperating combination
dials, said spring means acting upon said cam surface
through said combination elements.

3. A lock as defined in any preceding claim,
wherein said combination elements comprise sleeves
10 rotationally mounted in axially abutting relation on
said shaft with said dials encircling said sleeves,
respectively.

4. A lock as defined in any preceding claim,
including a collar on said shaft between said terminal
15 one of said combination elements and said shift member,
said cam surface of said shift member engaging said
collar to move said shaft and said sleeves axially in
response to said depression of said actuator portion.

5. A lock as defined in any preceding claim,
20 including a locking member in said casing controlled by
said combination elements for movement between locking
and unlocking positions, said shift member including a
tab adapted to engage said locking member when said



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locking member is in locking position for inhibiting said depression of said actuator portion, said tab clearing said locking member when said locking member is in said unlocking position.

5 6. A lock as defined in Claim 5, wherein said actuator portion has a terminal depressed position for holding said combination elements out of coupling engagement with said cooperating combination
10 dials, said tab engaging said locking member in said terminal position of the actuator portion to retain said locking member in unlocking position.

7. A lock as defined in Claim 5 or 6, wherein said locking member is a pivotal bolt and said combination elements each have a flange with a cam surface adapted
15 to engage said bolt for controlling the movement thereof between locking and unlocking positions dependent upon rotational position of said combination elements.

8. A lock as defined in any preceding claim, wherein said shift member has an elongated opening
20 through which said shaft passes.

9. A lock as defined in any preceding claim, wherein said shift member is supported for movement obliquely relative to said face plate.



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10. A lock as defined in any preceding claim, wherein said shift member is supported for pivotal movement about said axis, and wherein said means for holding and releasing said shift member is responsive 5 to pivotal movement of said shift member in opposite directions, respectively.

11. A lock as defined in Claim 10, wherein said means for holding said shift member comprises a portion of said shift member adapted to engage under 10 an edge portion of said face plate at one end of said opening.

12. A combination lock substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.