April 12, 1938. A. J. DENERICH 2,114,073

LOCK

Filed July 24, 1937

Fig. 1

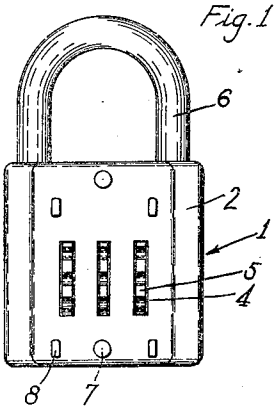


Fig. 2.

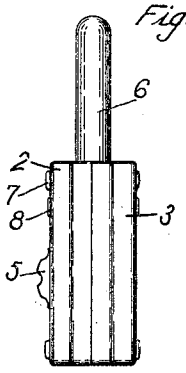


Fig. 9.

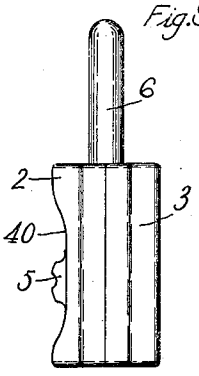


Fig. 3.

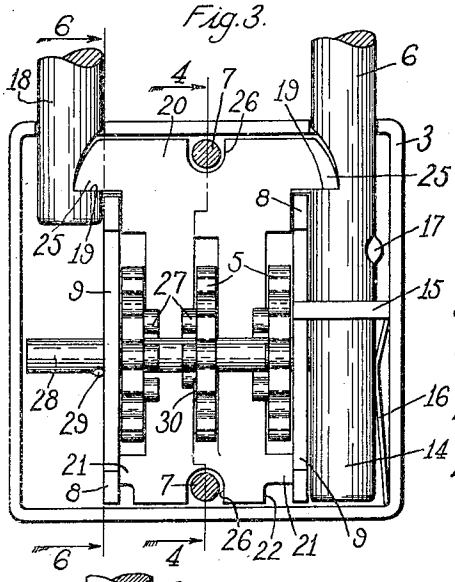


Fig. 4.

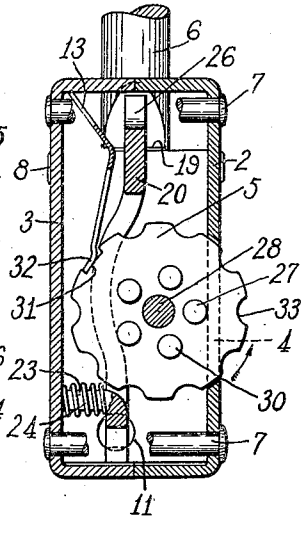


Fig. 5.

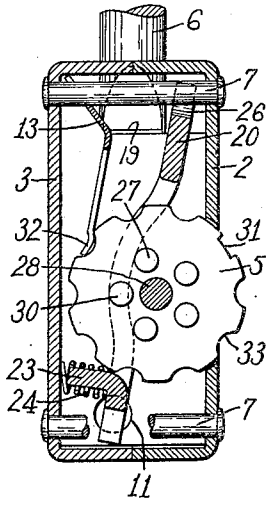


Fig. 6

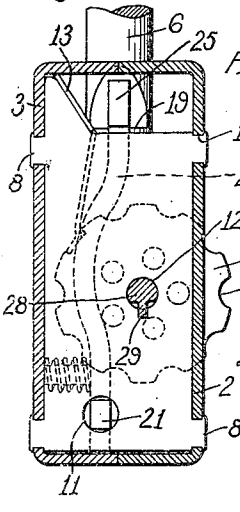


Fig. 8.

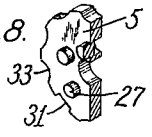
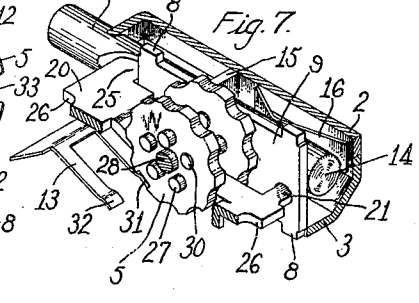


Fig. 7.



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LOCK

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Application July 24, 1937, Serial No. 155,486

22 Claims. (Cl. 70—25)

My invention relates to locks and more particularly to keyless locks operating through the setting of a combination or permutation of lock controlling parts.

It has among its objects to provide an improved lock of the keyless type which has a minimum of simple parts relatively easily manufactured and assembled. Another object of the invention is to provide a rugged, tamper proof keyless lock having novel and improved permutation members. A still further object is to provide a lock controlling member which operates together with the permutation members in an improved and efficient manner. Yet another object of the invention is to provide permutation members having spaced projections engaging and permitting operation of the lock controlling member, while being devised so as not to permit discovery of the combination by any usual tampering methods.

In the accompanying drawing, I have shown for purposes of illustration one embodiment which my invention may assume in practice and certain modifications thereof.

In this drawing,—

Figure 1 is a front view of a lock embodying one form of my invention;

Fig. 2 is a side view of the lock, showing a portion of a permutation member extending beyond the face of the lock;

Fig. 3 is an enlarged view with the front half of the casing removed and with a portion of the hasp cut away to conserve space;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3, showing the parts in locking position;

Fig. 5 is a sectional view also on the line 4—4, showing the parts in unlocking position;

Fig. 6 is a sectional view on the line 6—6 of Fig. 3, showing a partition member and the pivoting of the lock controlling member therein, the assembly rivets being omitted;

Fig. 7 is an isometric view of a partial section of the lock with the casing, lock controlling member and permutation member shaft being broken away to facilitate illustration;

Fig. 8 is an isometric sectional view of a permutation member showing a simple preferred form of construction; and

Fig. 9 is a side view of the lock having a modified form of casing adapted to guard the permutation members.

In this illustrative construction, I have shown my invention applied to a padlock including a casing generally indicated at 1 and having front and rear sectional halves 2 and 3 preferably permitting assembly of the component parts of the lock in the rear half 3 and closure of the parts by the front half 2. As shown, the front half 2 of the casing is provided with a plurality of slots 4 which are adapted to conform closely to the side edges of permutation members or wheels 5 extending through the slots in the casing. The wheels 5 allow manipulation of the combination and locking of a usual padlock hasp 6 by slight movements of the wheel peripheries. It will be noted that the casing halves may be held together by rivets 7 or by extensions 8 on partition members 9, hereinafter described, or may be held together by both the rivets and the extensions on the partition members.

In obtaining control of the hasp 6 by the permutation members 5, I have devised an improved structure whereby it is possible to obtain a rugged keyless lock having comparatively simple parts which may be easily assembled. As shown in Figs. 3 to 7, the operating parts of the lock are preferably arranged together with and may be supported by suitable spaced partition members 9 which have extensions 8 at the extremities thereof adapted to pass through cooperating openings 10 in the casing halves and to be spun against the wall of the casing or otherwise securely fastened thereto. The partition members 9 may be provided with openings 11 adjacent their lower ends and with openings 12 substantially centered relative to the slots 4 in the front casing half, while the upper ends of the partition members are cut away to furnish a working space and to supply supporting surfaces for a detent spring 13.

The hasp or shackle 6 of the lock is curved in a usual manner and is slidable to a locked or to an unlocked position through matched half round openings in the respective casing halves. One side of the hasp has a long leg 14 longitudinally movable in a space formed between one of the partition members 9 and the wall of the casing 3, while being guided and held against lateral movement by a suitable bracket 15 and a bent flat spring 16. To prevent complete removal of the hasp from the casing a raised area 17 is provided on the upper surface of the leg 14 which acts as a stop against excessive longitudinal movement of the hasp. The short leg 18 of the hasp is of a length which allows it to be moved from the casing, whereupon the hasp may be swung freely in a usual manner. The legs of the hasp may be provided with oppositely notched shoulders 19 or with other suitable surfaces which are adapted to be gripped and held, as by a lock controlling member or bolt 20.

In accordance with my invention, I prefer to

employ a lock controlling member 20 which is pivotally mounted at the lower end thereof and disposed between the partition members 9 in order to obtain maximum swinging of the member 20 and clearance from the hasp when the member is in an unlocked position, and to permit a compact arrangement of parts. The lock controlling member or swinging bolt 20 may have suitable extending arms 21 journaled in the openings 11 in the partition members, while the member 20 is cut away adjacent one of the arms, as at 22, in order that the bolt may be readily assembled into position. To allow for cooperation between the permutation wheels 5 and the lock controlling member, the member 20 is slotted and shaped so that it is free to admit the wheels 5 through the apertures thus formed. At the bottom of the central aperture a short offset 23 may be made of the metal cut from the aperture, and on this offset is placed a coil spring 24 adapted to rest against the bottom of the casing 3 when the bolt or member 20 is assembled and to tend to move the bolt about its pivots toward an unlocked position. The upper part of the bolt 20 is preferably provided with outwardly extending flanged shoulders 25 adapted to cooperate with the notched shoulders 19 on the legs of the hasp 6 in holding the hasp in locking position, and the upper part of the bolt is swingable in an arcuate path through the working space furnished by the shaped ends of the partition members 9. When it is planned to employ rivets 7 to hold the casing halves together, the bolt is cut away, as at 26, to permit the passage of the rivets through the casing without interference with the bolt.

In further accord with my invention, I plan to employ a plurality of permutation members 5 preferably in the form of wheels, or discs, and to provide the permutation members with lateral extensions, pins, or lugs 27 arranged on a face of each of the members 5 so as to make contact with the bolt 20 along the edges of the slots therein and to force the bolt into locking position with the hasp except when one combination is set up. As shown in Fig. 8, the lateral extensions or pins 27 on the permutation wheels may be economically formed, as in a die or otherwise, to force the metal upward to constitute the pins. The permutation wheels are suitably mounted to rotate on a shaft or axle 28 which is positioned in the openings 12 in the partition members 9, and which may be of sufficient extra length to extend substantially across the space between the wall of casing 3 and the partition member 9, on the opposite side of the assembly from the long leg 14 of the hasp, so as to prevent the shaft 28 from leaving its position without the need of additional retaining parts. A stop 29 is raised on the shaft 28 to check endwise movement of the same against the leg 14 of the hasp.

The improved permutation members 5 are of sufficient thickness to allow an appreciable small clearance between the sides of the members and the edges of the slotted and shaped apertures formed in the bolt 20. As shown in Fig. 7, one of the pins or lateral projections on each member 5, as indicated at 30, is sheared off or is formed so as to extend only a short distance from the face of the member. The short pins 30 on the wheels are of a height sufficient to permit passage of the same through the slots or apertures in the bolt 20 and yet not make contact with the bolt, as do the other pins 27. By allowing the short pins to extend outwardly from the face of each permutation wheel, it becomes impossible to discover the combination by running a thin piece of metal through any of the slots 4, since the piece of metal makes contact with the short pin in the same manner as with the other pins and discloses nothing regarding the combination. The bolt or lock controlling member 20 is so curved, or otherwise shaped, as to permit swinging movement of the same away from its locking position, as shown in Fig. 4, to its unlocking position, as shown in Fig. 5, without interruption by any of the pins 27, when the shorter pins 30 are aligned adjacent the bolt. It will be appreciated that with the short pins 30 arranged in different locations on each of the permutation wheels 5 and with the wheels arranged in different orders a large number of possible unlocking combinations of the wheels may be obtained.

In order to eliminate the need of numerals or other indicia on the peripheries of the permutation wheels, I prefer to employ a spring or detent member 13 and to provide a cooperating notch 31 in the edge of each of the wheels 5. The detent member 13 may rest without other support, or without requiring additional holding means, against the supporting surfaces of the partition members 9, as already described. The notches 31 preferably have sharp edges which abut against the shaped ends 32 of the detent spring 13 and form a stop for the wheels when they are rotated in a direction opposite to that shown by the arrow in Fig. 4. Other grooves or smooth edged notches 33 are preferably provided in the peripheral edges of the wheels to enable the wheels to be turned readily by a slight movement of the thumb or finger. The grooves 33 when a wheel is moved, pass by and make momentary contact with the detent spring, which gives a step by step motion to the rotation of the wheel. From the stop position of the wheel against the detent, as will be understood, the wheel may be rotated in the direction of the arrow for a predetermined number of steps until the short pin 30 is positioned adjacent the swinging bolt. The combination thus being set individually on each of the permutation wheels, the swinging bolt is free to move under the force of spring 24 and to enable release of the hasp 6.

It will be appreciated that to engage the hasp with the lock controlling member, it is necessary only to introduce the short leg of the hasp into the casing and to force the hasp downward, while at the same time, turning one or more of the permutation members in either direction from the unlocking position to move the lock controlling member into gripping relation with the hasp. Here it will be noted that the combination cannot be disturbed while the hasp is pulled out, it being necessary for the hasp to be reinserted before any permutation wheel can be rotated so as to bring the notched shoulder 19 opposite the shoulder on the member 20 and to allow the member 20 to swing about its pivot without contacting the rounded part of the hasp. Thus, in use, it is unnecessary to turn one of the wheels after unlocking in order to avoid disclosing the combination, as has been necessary in previous locks, the blank or unnumbered wheels and the locking of the same while the hasp is released, disclosing nothing as to the combination when the lock is unlocked. Further, when it is desired to lock again, it is unnecessary, as heretofore, to turn the wheels back to the combination. Instead, the hasp may be

immediately inserted and engaged with the lock controlling member by a slight movement of one or more of the permutation wheels. Moreover, if one of these wheels is not turned, the body of the lock will drop down by gravity away from the hasp in such manner as to indicate that the lock is not locked, and not only remind, but make it necessary for the user to turn one of the wheels in order to effect locking. Here attention is also directed to the fact that the lock herein is a dead lock.

For a three wheel permutation lock, as illustrated, I have simplified the construction so that a minimum of thirteen parts only are needed. Or when rivets or pins are used to hold the casing together, only fifteen parts are required. The parts are devised so that they are easily and economically manufactured and are readily assembled with a minimum of effort and labor. As a result, the finished lock presents no parts which tend to get out of order or which will not stand long wear and abuse. Obviously, by changing the location of the short pin **30**, and, if desired, by reversing the wheels, many combinations are possible, while the springs **32** may be received in the notches **31** in different positions of the wheels.

As shown in Fig. 9, the upper casing half or enclosing portion **2** may be indented, in a modified form of my invention, to obtain a recessed area **40**, within which the permutation wheels **5** are thus protected against bending or other damage by the edges of the casing half **2**.

In the assembly of the casing, the pins **7** alone may be employed to hold the casing together, or as in Fig. 6, the pins may be omitted and the casing halves be securely fastened together by peening over the ends of the extensions **8** on the partitions **9**. Either or both of these methods are satisfactory, but for additional security against tampering, both the pins and extensions are preferably used.

While I have in this specification specifically described one embodiment which my invention may assume in practice and certain modifications thereof, it will be understood that this form of the same, and the modifications, are chosen for purposes of illustration, and that my invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. In a combination lock, a lock controlling member, and a plurality of permutation members each having a plurality of lateral projections on the same predetermining the position of said controlling member.

2. In a combination lock, a lock controlling member, and a plurality of permutation members each having a plurality of lateral projections on the same predetermining the position of said controlling member and engageable therewith to permit the same to move into an unlocking position when said permutation members are set in accordance with a predetermined combination.

3. In a combination lock, a lock controlling member, and a plurality of permutation members each having a plurality of lateral projections on the same predetermining the position of said controlling member and engageable therewith to move the same into a locking position and, when said permutation members are set in a predetermined relation, cooperating with said controlling member to permit the lock controlling member to move into an unlocking position.

4. In a combination lock, a bolt member, and a plurality of permutation members, each having a plurality of lateral projections in spaced relation to one another on the same, said lateral projections coacting with said bolt member to permit the same to move into an unlocking position in accordance with the spaced relation of said lateral projections.

5. In a combination lock, a plurality of permutation members, a bolt member pivoted at one end thereof and having means toward the center of said member tending to move the same to an unlocking position, and operating means including operating members on said permutation members for maintaining said bolt member in a locking position except for a predetermined combination of said permutation members.

6. In a combination lock, a swinging bolt member pivoted adjacent one extremity, spring biasing means acting between said pivot and the other extremity, and combination controlling means acting on said member intermediate said extremities.

7. In a combination lock, a bolt member, spring biasing means tending to move said bolt member, and combination controlling means acting on said member, said bolt member having slots therein and said last mentioned means acting on the edges of said slots.

8. In a combination lock, a swinging bolt member pivoted adjacent one extremity, spring biasing means acting between said pivot and the other extremity, and combination controlling means acting on said member intermediate said extremities, said bolt member having slots therein and said last mentioned means acting on the edges of said slots.

9. In a combination lock, a bolt member, spring biasing means tending to move said bolt member, and combination controlling means acting on said member, said combination controlling means comprising a plurality of discs carrying lateral projections and operative to release said member only when none of the projections on each disc holds said member against the force of said spring biasing means.

10. In a combination lock, a swinging bolt member pivoted adjacent one extremity, spring biasing means acting between said pivot and the other extremity, and combination controlling means acting on said member intermediate said extremities, said combination means comprising a plurality of discs carrying lateral projections and operative to release said member only when none of the projections on each disc holds said member against the force of said spring biasing means.

11. In a combination lock, a swinging bolt member having means including a spring tending to move the same to an unlocking position, and a plurality of permutation members each having a plurality of raised lugs on one face thereof, said bolt also having a shaped area permitting movement of said bolt relative to said lugs to an unlocking position thereof when said permutation members are set for a predetermined combination.

12. In a combination lock, a swinging bolt member having means including a spring tending to move the same to an unlocking position, and a plurality of permutation members each having a plurality of raised lugs on one face thereof, said bolt also having a shaped area permitting move-

ment of said bolt relative to said lugs to an unlocking position thereof when said permutation members are set for a predetermined combination, said shaped area enabling retention of said bolt in a locking position by action of said lugs against said area when the combination is not so set.

13. In a combination lock, a bolt member, a plurality of permutation members comprising means including raised lugs on faces thereof directly effecting movement of said bolt member, and grooved peripheries on said permutation members, one of the grooves having sharply defined edges, and a spring member contacting said grooves and engaging said sharply defined edges on the one groove for stopping each of said permutation members when the same are rotated in one direction while permitting unlimited movement in an opposite direction.

14. A combination lock comprising a casing, partition members longitudinally fixed in said casing, and a swinging bolt comprising pivoted portions at one end thereof journaled in said partition members and having a cut away area adjacent one of said pivot portions to enable insertion of said bolt in the partition members.

15. A combination lock comprising a casing, partition members longitudinally fixed in said casing, a swinging bolt comprising pivoted portions at one end thereof journaled in said partition members and having a cut away area adjacent one of said pivot portions to enable insertion of said bolt in the partition members, and a raised offset extending laterally from said bolt, and means including a spring engaging said offset for moving the bolt to an unlocking position.

16. In a combination lock, a bolt member having a shaped area, a plurality of permutation members each having a plurality of lateral projections in spaced relation to one another on the same, at least one of said lateral projections on each of said permutation members being of shorter length than the others, and means for setting the permutation members and said short projections into adjacency with the shaped area of the bolt member whereby the bolt member is free to move to an unlocking position.

17. In a combination lock, a lock controlling member having apertures therein, a plurality of permutation members each having a plurality of lateral projections on the same, at least one of said lateral projections on each of said permutation members being of shorter length than the others, said permutation members and said short lateral projections being movable through said apertures, and means for setting the permutation members and said short projections for movement of said lock controlling member to an unlocking position.

18. In a combination lock, cooperating separable locking and controlling members, individually operable permutation members cooperating with said controlling member to control said locking member, and means for inhibiting operation of said permutation members while said cooperating members are separated.

19. In a combination lock, cooperating separable locking and controlling members, permutation members cooperating with the latter member to control the former, and means for inhibiting connection of said cooperable members when in adjacency while unlocked until one of said permutation members is operated.

20. In a combination lock, cooperating separable locking and controlling members, permutation members cooperating with the latter member to control the former, means for inhibiting connection of said members when in adjacency while unlocked until one of said permutation members is operated, and means for inhibiting operation of said permutation members while said cooperating members are separated.

21. In a combination lock, a permutation member comprising a disc and a series of lateral projections extending therefrom, at least one of said projections being shorter than the others.

22. In a combination lock, a permutation member comprising a disc and an arrangement of lateral projections extending therefrom, said projections being raised areas of said disc.

ANTHONY J. DENERICH.