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J. A. EDEN ET AL

2,183,792

PERMUTATION LOCK

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Fig. 1

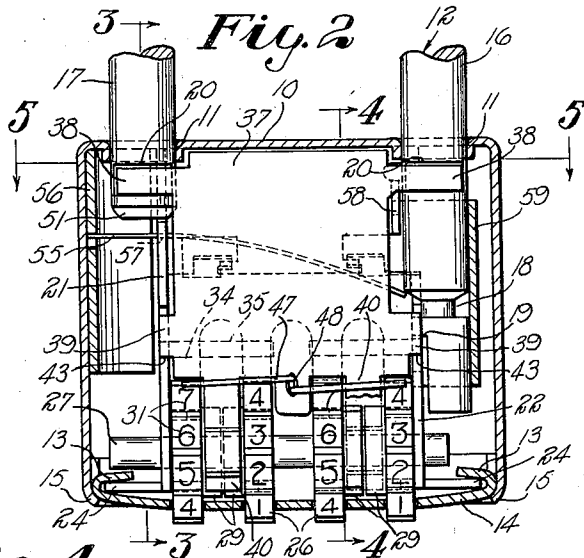
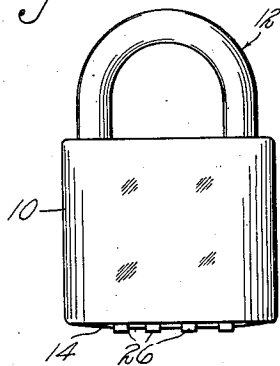


Fig. 3

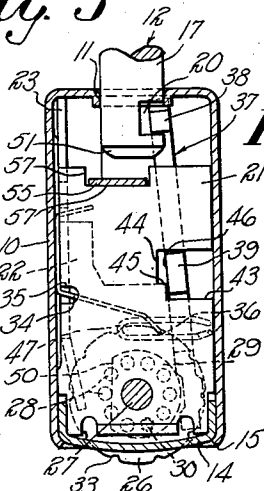


Fig. 4

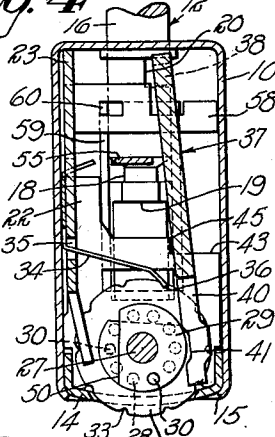


Fig. 5

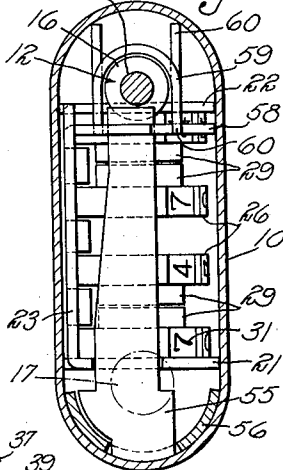


Fig. 6

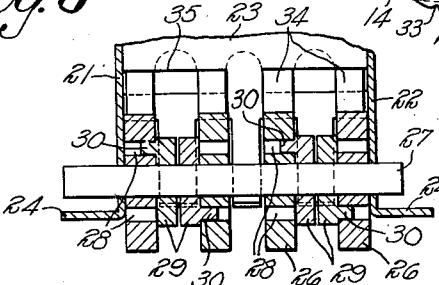


Fig. 8

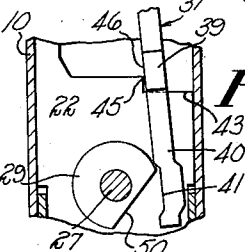
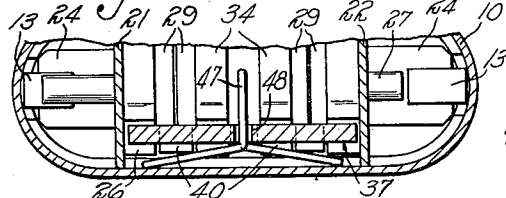


Fig. 7



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PERMUTATION LOCK

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6 Claims. (Cl. 70—25)

This invention relates generally to keyless locks, and has particular reference to permutation locks of the type provided with a plurality of settable wheels or tumblers bearing suitable indicia and with which are associated lock controlling elements. As an instance of a use to which the improvements of the present invention may be applied, reference may be had to padlocks, as our improvements are peculiarly applicable thereto, but it is to be understood that the disclosure of this application of our improvements is by way of illustration only, certain of the improvements being of general application to locks of the type mentioned irrespective of their intended use.

An object of the present invention is to provide an improved lock of this sort in which the operating mechanism may be completely assembled and tested and then inserted as a unitary structure inside the lock whereby once the members are set to a prevailing combination they cannot be changed without destroying the lock.

A further object of this invention is to provide an improved arrangement whereby when force is exerted on the shackle in an effort to force the bolt the strain thereon will be absorbed by the casing of the lock and, therefore, no injury will result to the working mechanism.

A further object of the invention is to provide an improved shackle retaining means which may be assembled with the other operating mechanism of the lock and the shackle subsequently inserted into the casing.

Another aim of the invention is to provide an improved permutation lock of the character described which is characterized by its simplicity in construction, by its economy in manufacture, by its strength and ruggedness, by the security with which the securing element is held in locked position, and by the ease and facility with which it may be manipulated.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawing, wherein is shown, for illustrative purposes, one of the many embodiments which the present invention may take:

Figure 1 is a view of the lock completely assembled;

Fig. 2 is a view with the casing in section

showing the operating parts in their assembled positions;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view on the line 5—5 of Fig. 2;

Fig. 6 is a sectional detail view of the permutation members;

Fig. 7 is a detail view showing the bolt biasing assembly; and

Fig. 8 is a fragmentary detail view of the bolt and cam assembly.

Referring to the drawing in detail, the lock comprises, in general, a casing which is preferably an open-ended drawn steel shell 10, which is without any interior lugs or finish. The closed or top end of the shell is provided with a pair of aligned eyes or openings 11 to accommodate the securing element or shackle 12. There is provided a base plate or closure 14 for the open end, which base plate supports the entire operative mechanism of the lock and is secured in place by bevelling the periphery of the casing 10 over the periphery of the closure to form an inturned flange 15.

The securing element or shackle 12 is shown as having a long leg 16 and a short leg 17; the long leg having a grooved portion 18 below which a segmental section is cut away to form a collar or stop 19. Both legs are provided with parallel slots 20 adapted to receive a locking bolt, as hereinafter described.

The operating parts are carried on a frame or chassis which comprises, generally, a pair of side members or plates 21 and 22 and a connecting cross wall member 23; the cross wall member being of such length that the upper edge thereof is adapted to abut the inner side of the closed end of the casing to position the chassis in position. Each side member is provided with outwardly extending portions 24 over which the tongues 13 of the base plate 14 may be secured to hold the chassis in place.

The permutation members or wheels 26 are rotatably mounted upon a shaft 27 which in turn is supported by the side members of the frame or chassis. Each permutation wheel is provided with a plurality of holes or openings 28 in the side walls thereof, the axes of said openings being parallel to the axis of the shaft 27. Associated in cooperating relationship with each wheel is a bolt operating element or cam 29 which is also rotatably mounted on the shaft 27; each

cam element 29 being provided with a lug 30 extending outwardly from the side wall thereof and parallel to the axis of the shaft 27, said lug being adapted to be selectively engaged with any one of the openings 28 in the cooperating permutation wheel. As the permutation wheels and cam elements are not secured to the shaft in any way, it is possible to cut the shaft from any suitable stock. It is also apparent that the number of prevailing combinations may be multiplied, depending upon the number of openings in each wheel and the manner in which the wheels and cams are arranged in cooperating relationship. The peripheries of the permutation wheels are provided with suitable indicia 31; on the wheels shown this indicia being in the form of equally spaced markings running from "0" to "9", there being an opening 28 in the side of the wheel for each number designated on the periphery thereof. Thus, with ten openings in each permutation wheel, it is possible to vary the combinations in the embodiment disclosed up to ten thousand. For the purpose of retaining the permutation wheels in the various positions in which they may be set, the wheels are provided on their peripheries with spaced notches 33 which cooperate with the end of spring fingers 34. These spring fingers may be supported in any suitable way; in the present instance passing through openings 35 provided therein in the cross member 23 of the chassis and clamped between the chassis and the casing. The notch at the "0" indicia is provided with a straight face 36 to stop the turning of the wheels, whereupon it is possible to set the combination without reading the indicia by merely setting all the wheels to "0" and then counting the clicks therefrom. To reset the combination, it is necessary to shift the wheels 26 transversely sufficiently to release the lugs 30 from the associated opening in the permutation wheels and, after the cam lug 30 has been re-aligned with the proper opening, to close them again. It is apparent that once the prevailing combination is set and the operating parts inserted within the chassis, it is impossible to reset the combination. The shackle securing element or locking bolt 37 comprises a generally flat plate having a body portion of less width than the spacing between the opposite sides of the chassis and is provided at its upper end with a pair of outwardly extending lugs which constitute dogs 38 adapted to enter the recesses 20 in the shackle 12 when the bolt is in locking position. Positioned intermediate of the top and bottom edges of the body plate of bolt 37 are a pair of outwardly extending trunnions 39 of generally rectangular shape, and depending from the lower edge of the body portion of the plate are a plurality of fingers or tangs 40. In the present embodiment, only two tangs are required as each tang cooperates with two of the cams 29. The rear faces of the tangs are further provided near their lower end with a recess 41 which cooperates with the locking elements or cams 29 for purposes hereinafter set forth.

Referring to the manner in which the locking plate or bolt is carried, it will be seen that each of the side members of the chassis is provided at its forward edge with an upwardly facing shoulder 43 above which there is a notch or cut away portion 44; the step intermediate of the notch and the upwardly facing shoulder forming a fulcrum 45 for the rear faces 46 of the trunnions of the locking bolt or plate. The relation of these parts is such that when the bolt is loosely

placed on the chassis the base of the trunnions 39 are disposed above the upwardly facing shoulders 43, and when the rear face of the trunnion pivots on the steps 45 the upper edges of the trunnions will be free to enter into the notches or cut away portions 44. For the purpose of pivoting the locking plate 37 about the fulcrum or step 45, there is provided, intermediate of the trunnions 39 and the permutation cams 29, a suitable spring 47; the spring being so arranged that it will bias the bolt 37 to ineffective position. In the embodiment shown, spring 47 comprises a central U-shaped portion and a pair of legs which extend outwardly from one another in opposite directions. The bolt 37 is provided with a narrow opening 48 therethrough. The spring 47 is positioned by inserting the central U-shaped portion through said opening with the extending legs of the spring bearing against the front wall of the casing. As the opening 48 is substantially narrow, the spring 47 is positioned against turning, and, because of the tension placed thereon by the legs being compressed against the side wall of the casing, the spring cannot be jarred from position.

Thus mounted, the spring 47 normally tends to bias the locking bolt 37 to ineffective position wherein the rear face of the trunnions 39 will lie parallel with the front face of the step or fulcrum 45. When the prevailing combination has been set on the permutation wheels, the flat faces 50 of the cams 29 will align with the rear faces of the tangs 40, and the bolt will assume the above position with the locking dogs 38 out of alignment with the receiving grooves 20 of the shackle 12. However, if the prevailing combination is changed, the cams 29 will pivot the bolt about the fulcrum 45 to compress the spring 47, causing the locking dogs 38 to move to the securing position. If the shackle 12 should be open after the prevailing combination is disturbed, a downward force thereon will cause the bevelled lower end 51 of the shackle to cam dogs 38 forwardly to further compress the spring 47, whereupon the dogs will ride over the end of the shackle and then snap into locking position. If when the lock has been closed and the prevailing combination has only been slightly changed, the recess 41 in the fingers of the locking bolt is so located that the tang will rest on the concentric part of the cam and not on the point of intersection between the flat and curved surface, thus securely holding the dog in locking position and preventing its being jarred or tapped back into the position of the prevailing combination. Due to the free mounting of the bolt if the shackle is pulled outwardly when in effective position, the dogs 38 and upper edge of the bolt 37 will come into direct contact with the casing and the strain taken up thereby.

There is further provided means for holding the shackle in position within the casing. In the embodiment shown, this comprises a substantially flat spring 55 which is arranged with one end positioned in a slot in spacer 56 and positioned transversely in a groove 57 in the top of the chassis side wall 21 and passing beneath an arm 58 which projects inwardly from the chassis cross member 23. As the bottom of groove 57 and the bottom of arm 58 are parallel, spring 55 will always be under slight tension to position the spacer 56. With the spring so mounted, the free end may be biased downwardly with the chassis walls 21 as a fulcrum, but is prevented from upward bias by arm 58.

Because of the free downward bias, the long leg of the shackle may be inserted in the opening therefor in the top of the casing, and as the shackle is forced into place the end of spring 55, which lies in the shackle path, will be biased downwardly and ride over the collar 19 of the shackle stop and in the groove 18; the stop 19 limiting the downward movement of the shackle by abutting against the upper face of the side wall 22 of the chassis. To prevent wobbling of the shackle, there is provided a retainer 59 having oppositely turned fingers 60 which fit into openings therefor in the chassis and abut the wall of the casing. With the spring in the position shown in Fig. 2, when shackle 12 is released spring 55 will immediately force the long leg of the shackle upwardly to move same out of the casing. However, should an attempt be made to remove the shackle, the spring will be lifted against the under surface of the arm 58, whereupon it will lie in the path of the top face of the collar 19 and prevent the removal of the shackle.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

We claim as our invention:

1. In a lock, a casing having a closed end and an open end, the closed end having a pair of aligned openings therein, a shackle receivable in said opening and having an effective and an ineffective position, a chassis within said casing, said chassis having side walls and a cross wall, said cross wall being adapted to abut the front end of the casing to position the chassis therein, an outwardly projecting lug formed integral with each of the side walls at the base thereof, means carried by the chassis for controlling the position of said shackle, a closure member for the open end of the casing, said closure member having outwardly extending tongues adapted to be bevelled over and secured to said outwardly extending lugs for securing the chassis to the closure member, and an intumed flange on the lower end of the casing for securing said closure member and chassis inside the casing.

2. In a lock, a shackle having a long leg and a short leg, said long leg being provided with a groove near its lower end, a casing adapted to receive said shackle, a retaining member for said shackle within said casing, said member comprising a spring disposed generally at right angles to the leg of the shackle and having a fixed end and a free end, and a fulcrum positioned intermediate of the ends of the spring, the free end of the spring lying in the path of the end of the

shackle and being free to bias downwardly, whereby when said shackle is inserted the free end of the spring will ride over the end of the shackle and into said groove, and a stop for preventing upward bias of said spring whereby the shackle may not be removed from the casing after the spring is set into the groove.

3. In a lock, a chassis, a shaft supported on said chassis, a plurality of permutation wheels carried on said shaft, a cam associated with each of said wheels, said wheels having horizontally arranged openings in the side walls thereof, an outwardly projecting lug integral with said cam and adapted to enter one of said openings whereby said wheels and cams may be arranged in a plurality of selective combinations when said wheels and cams are separated transversely, the walls of said chassis being so spaced that when the proper number of cams and wheels are mounted therebetween such transverse opening is prevented.

4. In a lock, a shackle having an effective position and an ineffective position, a locking bolt having depending tangs, a plurality of permutation wheels adapted to be set to a prevailing combination, a cam associated with each of said wheels, said cams having a flat surface and a curved surface, spring means for biasing said tangs into position against the flat surface of the cams when the prevailing combination is set, said tangs having a recess adjacent said cams and so located relative to the point of intersection of the cams' flat and curved surfaces that when the permutation wheels are moved slightly from the prevailing combination said tangs will rest on the curved section of the cams, whereby said permutation wheels may be maintained in position.

5. In a permutation lock, a casing having an end wall provided with openings for accommodating a shackle and having a side wall, a shackle having an effective and an ineffective position, a locking element for said shackle and located in said casing and extending generally in the direction of said side wall, and means for biasing said element into ineffective position and comprising a spring having a central U-shaped portion extending through an opening in said locking element and having legs extending in opposite directions and bearing against said side wall of said casing.

6. In a permutation lock, a casing having an end wall provided with openings for accommodating a shackle and having a side wall, a shackle having an effective and an ineffective position, a locking element for said shackle located in said casing and extending generally in the direction of said side wall, said locking element having a narrow opening therethrough, and means for biasing said element into ineffective position comprising a spring having a central U-shaped portion and having legs extending in opposite directions, said U-shaped portion being receivable in the narrow opening in said bolt to position same against turning, and said legs bearing against the side wall of the casing.

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