

PATENT SPECIFICATION (11)

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 (72) Inventors HENRY HEINE and RUDOLF WINGERT



(54) COMBINATION PADLOCK

(71) We, WALTER KIDDE & COMPANY, INC., a corporation of the State of Delaware, United States of America of 35 Market Street, East Paterson, New Jersey 07407, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to combination padlocks, and in particular to combination padlocks including means for setting or changing the combination to a combination of one's own personal choice.

United States Denerich Patent Specification No. 1,964,936; July 3, 1934 discloses a combination padlock having a finger piece which extends through an opening in the lower end of the body, the finger piece to be manipulated when it is desired to set or change the combination. The visible finger piece of this prior art device invites tampering. Combination locks have a curious way of tempting persons to manipulate them before becoming familiar with the instructions which accompany the product. As a result, the combination may be lost, and the product has to be returned to the manufacturer who expends considerable effort to open the padlock. Frequently, the product is damaged in the effort to salvage it.

The padlock disclosed in the aforementioned Denerich Specification has the dials located at the bottom end of the lock, or the end opposite the end where the shackle is located. The dials are so located in this prior art device because of the necessity to use the remaining volume of the body to house other elements. Such a construction does not permit the connection of a chain to the body of the padlock; the dials are located where the chain would best be connected to the device.

According to the present invention, we provide a combination padlock comprising a body having an internal cavity and a plurality of spaced slots in communication with the cavity, a spindle mounted for reciproca-

tion within the cavity, a dial positioned in each slot, a sleeve for each dial mounted on the spindle with the sleeves in abutting, end-to-end relationship, each sleeve having a flange and at flat portion, keying means provided by each dial and its respective sleeve, a spring normally urging the sleeves into keyed relationship with their respective dials, a bolt (as herein defined), means for normally resiliently maintaining the said bolt against the sleeves, a shackle comprising a long portion and a short portion connected together, the long portion extending into said internal cavity, the spindle and the long portion of the shackle lying substantially in the same plane with the longitudinal axis of the long portion extending perpendicular to the longitudinal axis of the spindle, a notch provided by the shackle, this notch being cooperable with a bar portion on the said bolt whereby the shackle is prevented from longitudinal movement when the said bolt is displaced by at least one flange in the closed position of the shackle, a cam at the free end of the long portion of the shackle for engagement with the end surface of the spindle to disengage the sleeves from their respective dials to enable changing the combination.

The invention is believed to provide a combination padlock which eliminates obtrusive or visible means for changing the combination;

to provide a combination padlock having a minimal number of rugged parts to thereby furnish a combination padlock suitable for heavy duty;

to provide a combination lock including means for changing the combination to a combination of one's own personal choice, the padlock being constructed so that the essential shackle is formed to provide a cam which is used to change or set the combination; and

to provide a combination padlock wherein the combination elements or dials and their associated sleeves are situated within the body and related to the shackle in a manner to permit the body to act as a base

for the connection thereto of a chain without unduly increasing the size of the product.

These and other advantages of the invention will be apparent from the following detailed description, taken in conjunction with the accompanying drawings; in which:—

Figure 1 is a top plan view, partly broken away for clarity in illustration, of a combination padlock made in accordance with the invention;

Figure 2 is a transverse, vertical cross-sectional view taken approximately in the plane of line 2—2 of Figure 1;

Figure 3 is a longitudinal, vertical cross-sectional view taken approximately in the plane of line 3—3 of Figure 1, this view showing the shackle in closed position but with the mechanism "on combination" with the shackle in readiness to be moved to the outward or open position;

Figure 4 is a view similar to Figure 3, except that the mechanism is "off combination" or in locked condition;

Figures 5, 6 and 7 are partial top plan views, partly broken away and in section, showing the relationship of the cam on the shackle to the end of the spindle in various stages of the manipulation of the shackle to change or set the combination;

Figure 8 is a partial side elevational view showing the extreme longitudinal positions of the long portion of the shackle, this view being taken approximately in the plane of line 8—8 of Figure 7;

Figure 9 is a top plan view of a bolt (as herein defined) forming a component of the padlock of Figures 1 to 8; and

Figure 10 shows a dial with an associated flanged sleeve.

Referring to the drawings, a combination padlock made in accordance with the invention comprises a body A, a shackle B, a plurality of dials C, and a plurality of sleeves D, one for each dial. As known in the art, a spring E is engaged with the dials to furnish controlled rotation of the dials. The sleeves D are mounted on a spindle F with the sleeves in abutting, end-to-end relationship.

The combination locking means comprises four dials C. With four dials each having ten indicia or numbers thereon, there are ten thousand different possible combinations available. It will be understood that any predetermined number of dials may be used to furnish the predetermined number of available combinations.

The structure of the dials and of the sleeves and their relationship to one another are essentially the same as disclosed in United States Gehrie Patent Specification No. 3,416,338 granted December 17, 1968. The dials C are each provided with indicia or numbers in equidistantly spaced relation on the outer circumference. Between adja-

cent numbers there are grooves 24 adapted to receive one end of a spring arm provided by the spring E (Figures 3 and 4) so that the dials when related to their respective sleeves D and mounted on the spindle F may be resiliently maintained in selected circumferential position.

As shown in Figure 10, each dial C has a central opening 26 through which the shank 28 of a sleeve D is extended with a slight amount of clearance (Figures 2 and 7). The sleeve has a central bore 30 of a diameter slightly greater than the diameter of the spindle F. At one end thereof each sleeve is provided with a flange 32 having a larger diameter than the central opening 26 of a dial. The flange of the sleeve is provided with a flat portion 34. At the juncture of the flange and the sleeve's shank, two detents 36 are provided (in a modification, only one detent is provided). On one side of each dial C, circumferentially arranged detent receiving recesses 38 are provided adjacent the opening 26, there being one recess in alignment with each number on the dial's outer circumference. The recesses 38 extend only partially into the side wall of the dial and are adapted to receive the detents 36, whereby a dial and a sleeve are keyed to one another. As shown in Figure 2 a helical spring G surrounding spindle F acts between the bottom flange and the body A to normally urge the sleeves into keyed relationship with their respective dials.

As shown in Figures 1—4, the body A comprises a pair of body members 40 and 42 connected to one another. For convenience of manufacture including minimizing the number of parts and the number of assembly operations, it is preferred that the body members be made by die casting. One body member is provided with a pair of transversely spaced connecting studs 44, and the other body member is made with aligned spaced openings 46 (Figures 3 and 4) into which the connecting studs are inserted. The members are connected to one another by a force fit of the studs within the respective openings. If desired, the connecting studs and the aligned openings may be dimensioned so that the connecting studs are extended through the openings following which the ends of the studs are headed over to securely connect the parts to one another. A third connecting stud 48 is provided on the central longitudinal axis and spaced longitudinally from the aforementioned connecting studs 44 for additional connecting strength and for another function to be subsequently described.

With the body members connected to one another as described, the peripheral edges of the inturned sides 50, 50¹ and 52, 52¹ (Figure 2) and of the inturned ends 54, 54¹ and 56, 56¹ (Figures 3 and 4) of the body mem-

bers 40 and 42 are firmly pressed against one another to provide an internal cavity 58. The internal cavity is in communication with a plurality of transversely spaced slots 60 formed in the face of the body member 40 as shown. The slots each have a dial C positioned therein. As shown in Figure 2, the body members are formed or cast so that when connected to one another a sliding bearing 62 is provided for one end of the spindle F. The opposite end of the spindle is provided with an enlarged portion 64 and the body members receive, when assembled, the enlarged portion of the spindle with a slight amount of clearance to permit the spindle to be reciprocated in the direction of its longitudinal axis. The purpose of the displaceable spindle and its enlarged end portion will be subsequently described.

The shackle B has the usual J-shape and comprises a long portion 66 and a short portion 68 parallel thereto. The portions 66 and 68 are connected by a curved or bent portion 70. The long portion 66 extends through an opening 72 in the body (Figures 5 and 6) with a small amount of clearance and into the cavity 58. The body is provided with an opening 74 to receive the end portion 76 of the short portion 68 when the shackle is in the closed position shown in Figure 1. A web 78 of a body member serves as a stop to limit the extent that the shackle may be moved inwardly to the closed position. The shackle is provided with a pair of notches 80 for engagement by a bolt (as herein defined), shown at H. The pair of notches are one in each leg of the shackle and in alignment with one another, or in a modification there is a notch in one shackle portion only.

The said bolt H is engageable with the sleeves D and with the notches 80 provided by the shackle B to fasten the device. As shown in Figures 3 and 4, the said bolt is mounted for pivotal movement about a fulcrum 82 provided by the body member 42. The bolt has an arm portion 84 on one side of the fulcrum for engagement by each of the sleeves and a second arm portion 86 on the other side of the fulcrum engageable with the shackle. For normally resiliently maintaining the said bolt against the sleeves, a coiled compression spring I is positioned with one end thereof bearing against a projection 88 on the arm portion 86 of the said bolt. The other end portion of the spring surrounds an aligned projection 90 formed on the body member 40.

As shown in Figure 9, the said bolt H is provided with slots 92 to allow the dials to extend therethrough. Where four dials are used the said bolt need only have three slots, the fourth dial being positioned adjacent one end of the said bolt as shown in Figure 2.

The arm portion 86 of the said bolt is provided with oppositely extending bar portions 93 which are dimensioned to be received with a slight amount of clearance in the notches 80 in the long and short portions 66 and 68 of the shackle. As will also be apparent from Figure 2 the flanges 32 of the sleeves D are aligned with the web portions 94 of the said bolt so that when a dial is rotated, and concomitantly its keyed sleeve is rotated, a flange 32 applies a force against a portion 94 of the said bolt to displace the said bolt against the action of the spring 1 from the position shown in Figure 3 to the position shown in Figure 4.

When the sleeves D are all oriented so that the flat portions 34 are adjacent the said bolt H as shown in Figure 3, the padlock is "on combination" (i.e. the combination is set). In such relationship of the parts the shackle B may be moved from the closed position of Figure 1 to the open position and vice versa. When the device is "on combination", the oppositely extending bar portions 93 are clear of the notches 80 in the shackle as shown in Figure 3 to allow movement of the shackle. To lock the device or place the padlock "off combination" (i.e. to ensure that the combination is not set), the shackle is moved to the closed position shown in Figure 1, and a dial or dials is or are rotated to cause a flange or flanges 32 on a sleeve or sleeves to rock the said bolt about the fulcrum 82, whereupon the bar portions 93 of the said bolt enter the notches 80 as shown in Figure 4 to prevent the shackle from being pulled out of the body A.

To effect a change in the combination, the free end of the long portion of the shackle is provided with a cam for engagement with the end of the spindle F to disengage the sleeves D from their respective dials C and allow resetting the sleeves to a different angular position with respect to the dials.

As best shown in Figures 1 and 5-8, the shackle's long portion 66 is provided with a flat portion 96 at the free end of the otherwise substantially round cross section of the shackle. Referring to Figures 1 and 7 it will be observed that the spindle F and the long portion of the shackle lie substantially in the same plane with the longitudinal axis of the long portion extending perpendicularly to the longitudinal axis of the spindle. As previously described the long portion of the shackle is moveable in the direction of the longitudinal axis thereof by virtue of the ability of the shackle to move from the closed position to an open position and vice versa. The movement of the shackle to open position is limited by a stop 98 provided by the body which is engaged by a flange 100 provided on the shackle portion 66 as shown in Figures 5 and 6. The flat

section is engageable with the spindle's end portion 64 in a selected rotated position of the shackle.

The manipulative steps to change the combination to any combination of one's own choice are as follows. With the device "on combination" and the shackle pulled out to the open position, where the flange 100 engages the stop 98, the shackle is rotated 180° about the axis provided by the long portion 66 to the position shown in Figure 5. Secondly, the shackle is pushed inwardly to the position shown in Figure 6. In this position the flat cam 96 is oriented so that a face thereof is positioned adjacent one surface of the spindle's enlarged portion 64 the other surface of which abuts an adjoining sleeve D of the plurality of the end-to-end arranged sleeves on the spindle F. Thirdly, the shackle is rotated back 90° from the position shown in dot-dash line to the solid line position shown in Figure 7 to furnish a camming action and thereby cause the spindle F to be displaced and the sleeves D to be unkeyed from the dials C. Now, the dials may be rotated to a predetermined new combination following which the described manipulative procedure is reversed to fix the new selected combination.

To assist in maintaining or indexing the shackle in its pulled out position and in its innermost position where it is respectively rotated 180° and 90°, it is preferred to provide a leaf spring K for engagement with the flange 100 on the shackle. As best shown in Figure 8, the leaf spring is formed with shoulders 102 and 104 for engagement by the flange 100 in the respective positions of the shackle.

The described padlock is practically tamper-proof. To change the combination one must exactly follow the manipulative procedure hereinbefore described, and following such procedure requires reading the instructions accompanying the product. The end portion 64 of the spindle acts as an obstacle to prevent the cam 96 from reaching the position where it may act to cause disengagement of the sleeves unless the precise procedure above described is followed. In fact, the appearance of the padlock does not suggest that it is of the variety which enables an individual to set the combination to a combination of his own secret choice.

When the sleeves are all oriented as shown in Figure 3, the padlock is "on combination". With the padlock in such condition, the dials cannot be rotated when the shackle has been pulled out to open position and rotated to where the end portion 76 of the shackle is out of alignment with the recess 74. The dials cannot be rotated because of the back pressure being placed on the sleeves D by the said bolt H. The bar portion 93 of the

said bolt bears against the periphery of the long portion 66 of the shackle at an area adjoining the notch 80 so that the said bolt is maintained in the position shown in Figure 3. The dials cannot be rotated to cause the loss of the combination by one who would tamper with the device.

As previously indicated the combination padlock of the invention has the elements thereof arranged or related to one another so that a minimal number of rugged parts furnish a product suitable for heavy duty. The body members 40 and 42 are formed or cast so that when they are connected to one another a tunnel-like opening 106 is provided at the end of the body opposite the end where the shackle is located. Before connecting the body members the end link 108 of a chain L is laid in place so that when the assembly is completed the chain is connected to the body at the bottom end of the assembly and below the dials which appear on one face of the assembly. It will be apparent from the viewing of Figures 3 and 4 that a very strong structure is afforded; the link of the chain is connected to the padlock by substantial thickness of metal and by substantial means, though the total volume of the device is comparatively minimal.

The word "bolt" is employed herein in a broad sense, in that it comprehends a member which holds a second member (the shackle, in the present case) in a locking position, thus acting as a locking member.

WHAT WE CLAIM IS:—

1. A combination padlock comprising a body having an internal cavity and a plurality of spaced slots in communication with the cavity, a spindle mounted for reciprocation within the cavity, a dial positioned in each slot, a sleeve for each dial mounted on the spindle with the sleeves in abutting, end-to-end relationship, each sleeve having a flange and at flat portion, keying means provided by each dial and its respective sleeve, a spring normally urging the sleeves into keyed relationship with their respective dials, a bolt (as herein defined), means for normally resiliently maintaining the said bolt against the sleeves, a shackle comprising a long portion and a short portion connected together, the long portion extending into said internal cavity, the spindle and the long portion of the shackle lying substantially in the same plane with the longitudinal axis of the long portion extending perpendicular to the longitudinal axis of the spindle, a notch provided by the shackle, this notch being cooperable with a bar portion on the said bolt whereby the shackle is prevented from longitudinal movement when the said bolt is displaced by at least one flange in the



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section is engageable with the spindle's end portion 64 in a selected rotated position of the shackle.

The manipulative steps to change the combination to any combination of one's own choice are as follows. With the device "on combination" and the shackle pulled out to the open position, where the flange 100 engages the stop 98, the shackle is rotated 180° about the axis provided by the long portion 66 to the position shown in Figure 5. Secondly, the shackle is pushed inwardly to the position shown in Figure 6. In this position the flat cam 96 is oriented so that a face thereof is positioned adjacent one surface of the spindle's enlarged portion 64 the other surface of which abuts an adjoining sleeve D of the plurality of the end-to-end arranged sleeves on the spindle F. Thirdly, the shackle is rotated back 90° from the position shown in dot-dash line to the solid line position shown in Figure 7 to furnish a camming action and thereby cause the spindle F to be displaced and the sleeves D to be unkeyed from the dials C. Now, the dials may be rotated to a predetermined new combination following which the described manipulative procedure is reversed to fix the new selected combination.

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said bolt bears against the periphery of the long portion 66 of the shackle at an area adjoining the notch 80 so that the said bolt is maintained in the position shown in Figure 3. The dials cannot be rotated to cause the loss of the combination by one who would tamper with the device.

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The word "bolt" is employed herein in a broad sense, in that it comprehends a member which holds a second member (the shackle, in the present case) in a locking position, thus acting as a locking member.

WHAT WE CLAIM IS:—

1. A combination padlock comprising a body having an internal cavity and a plurality of spaced slots in communication with the cavity, a spindle mounted for reciprocation within the cavity, a dial positioned in each slot, a sleeve for each dial mounted on the spindle with the sleeves in abutting, end-to-end relationship, each sleeve having a flange and at flat portion, keying means provided by each dial and its respective sleeve, a spring normally urging the sleeves into keyed relationship with their respective dials, a bolt (as herein defined), means for normally resiliently maintaining the said bolt against the sleeves, a shackle comprising a long portion and a short portion connected together, the long portion extending into said internal cavity, the spindle and the long portion of the shackle lying substantially in the same plane with the longitudinal axis of the long portion extending perpendicular to the longitudinal axis of the spindle, a notch provided by the shackle, this notch being cooperable with a bar portion on the said bolt whereby the shackle is prevented from longitudinal movement when the said bolt is displaced by at least one flange in the

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closed position of the shackle, a cam at the free end of the long portion of the shackle for engagement with the end surface of the spindle to disengage the sleeves from their respective dials to enable changing the combination.

2. A combination padlock according to claim 1, wherein the long portion of the shackle is moveable in the direction of the longitudinal axis thereof and the shackle is rotatable about the longitudinal axis of its long portion, the cam being engageable with the end surface of the spindle in a selected rotated position of said long portion.

3. A combination padlock according to claim 2, wherein the cam comprises a flat section at the end of the otherwise substantially round cross section of the shackle's long portion, the end of the spindle providing an obstacle preventing inward movement of the shackle except when the flat section is oriented with a face thereof parallel to the end surface of the spindle.

4. A combination padlock according to claim 3, comprising a spring and a flange provided by the long portion of the shackle to resiliently maintain the shackle in selected position when moved in a direction parallel to the longitudinal axis of the long portion.

5. A combination padlock according to claim 1, 2, 3 or 4, wherein the body comprises a pair of body members each having a

face portion, opposite side portions and opposite end portions, and a plurality of means connecting the body members, said plurality of spaced slots being provided in one of said face portions, one end of the body having an opening, a chain having one end link thereof secured within the body and extending out from said opening, the opposite end of the body being provided with an opening to allow the long portion of the shackle to extend therethrough and into the cavity and having another opening to receive the end of the short portion of the shackle in the closed position of the shackle.

6. A combination padlock according to claim 5, wherein the means connecting the body members comprises connecting studs integral with one body member, the free end of one of the connecting studs extending through an opening in the other body member; and wherein the end link of the chain has the one connecting stud extended there-through.

7. A combination padlock substantially as hereinbefore described with reference to the accompanying drawings.

For the Applicants:
CARPMAELS & RANSFORD,
Chartered Patent Agents,
43 Bloomsbury Square,
London, WC1A 2RA.

