United States Patent [19]

Heine et al.

[11] **3,766,758**

[45] **Oct. 23, 1973**

[54] **COMBINATION PADLOCK**

[75] Inventors: **Henry Heine**, Vernon; **Rudolf Wingert**, High Crest Lake, both of N.J.

[73] Assignee: **Presto Lock Company, Division of Walter Kidde & Company, Inc.**, Garfield, N.Y.

[22] Filed: **Aug. 24, 1972**

[21] Appl. No.: **283,303**

[52] **U.S. Cl.** **70/25**, 70/318

[51] **Int. Cl.** **E05b 37/02**

[58] **Field of Search** ..... 70/25, 24, 26, 52, 70/316, 317, 318, 312, 315, DIG. 44

[56] **References Cited**

UNITED STATES PATENTS

2,163,852	6/1939	Pond	70/25 X
3,439,515	4/1969	Gehrie	70/317 X
2,114,073	4/1938	Denerich	70/25
940,763	11/1909	Wahalen	70/318 X

FOREIGN PATENTS OR APPLICATIONS

571,747	3/1959	Canada	70/25

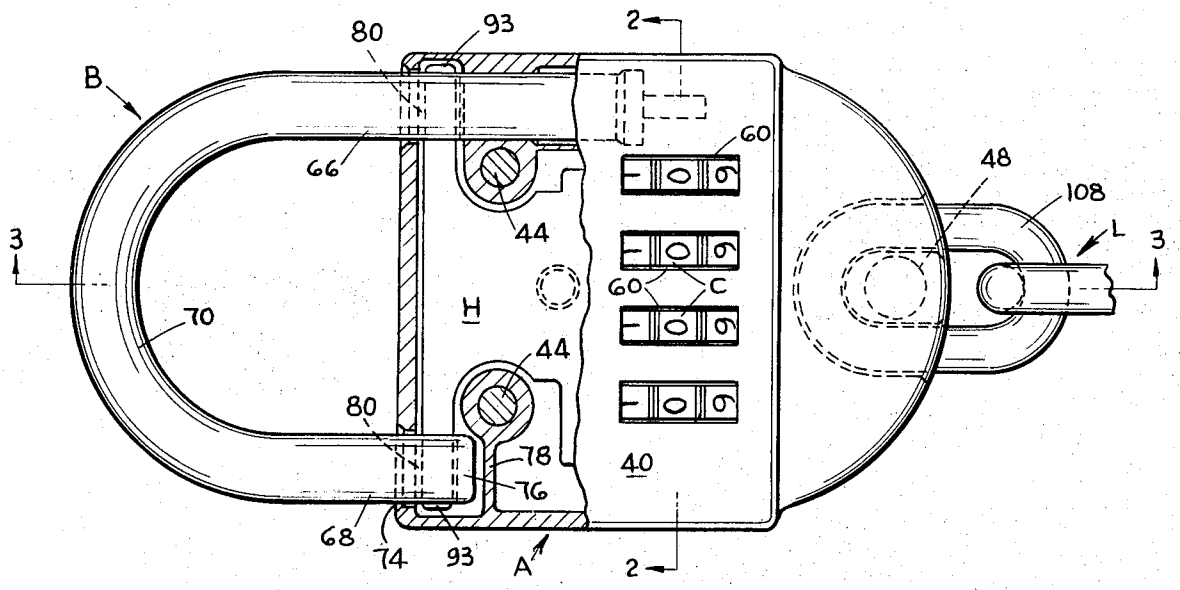
Primary Examiner—Robert L. Wolfe

Attorney—Harry G. Shapiro et al.

[57] **ABSTRACT**

A combination padlock of the multiple dial type is provided with a cam at the end of the long portion of the essential shackle for cooperation with the sleeves for the dials to enable setting or changing the combination. Also, the elements of the padlock are so related to one another that the device is suitable for heavy duty usage including the permanent connection thereto of a chain without increasing the size of the device to any appreciable degree.

12 Claims, 10 Drawing Figures



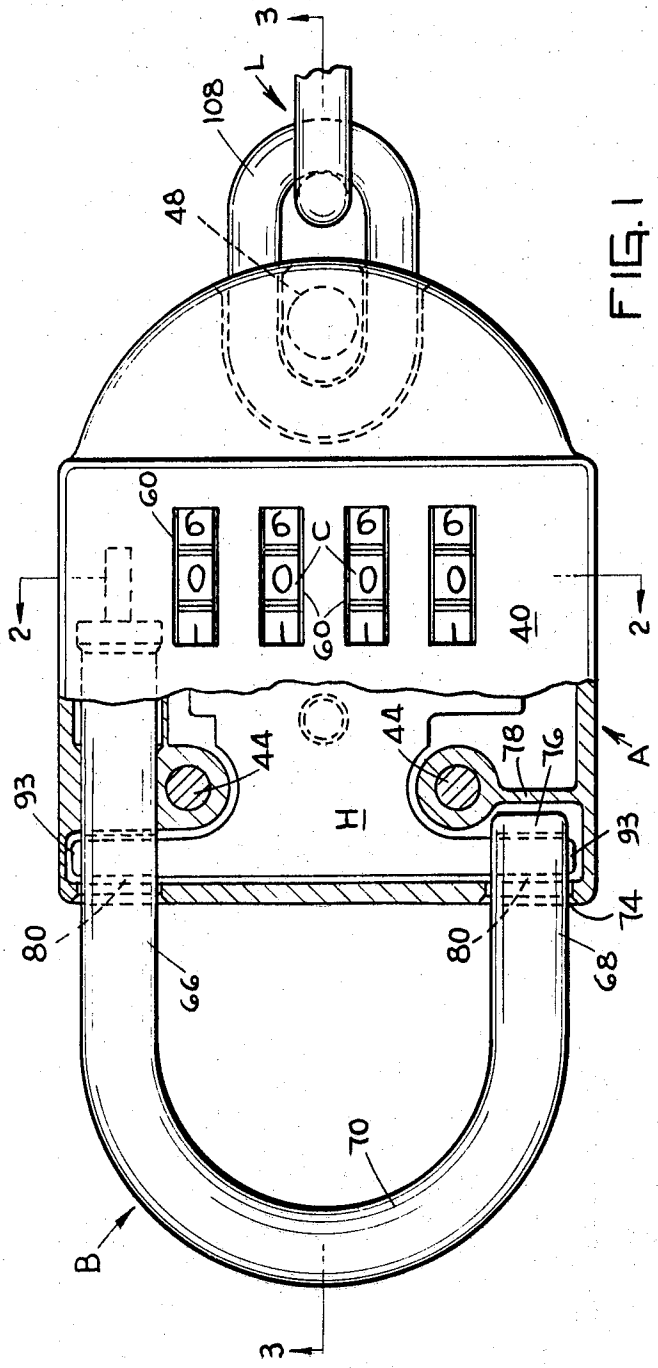

3
L
108
48
60
C
60
2
2
40
44
44
78
76
A
93
H
93
80
74
80
66
68
70
B
3

FIG. 1

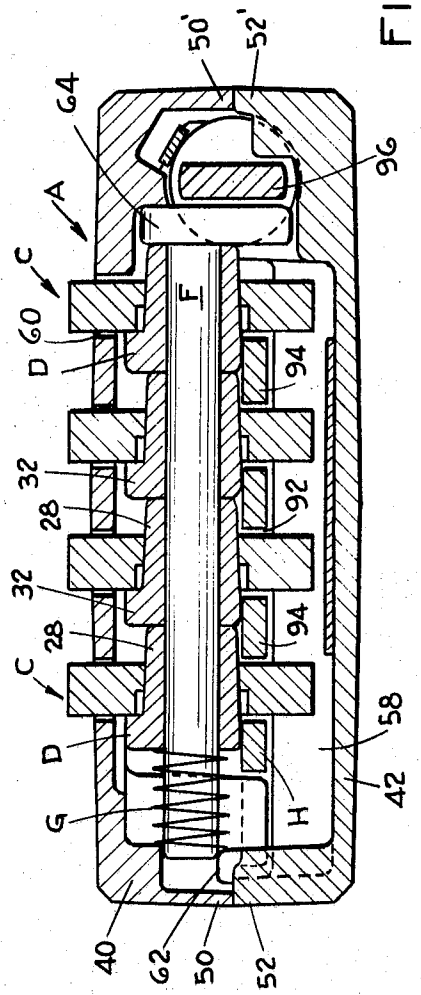

50'
52'
64
96
A
C
D
60
F
94
32
28
92
32
28
94
C
D
G
H
58
42
40
62
50
52

FIG. 2

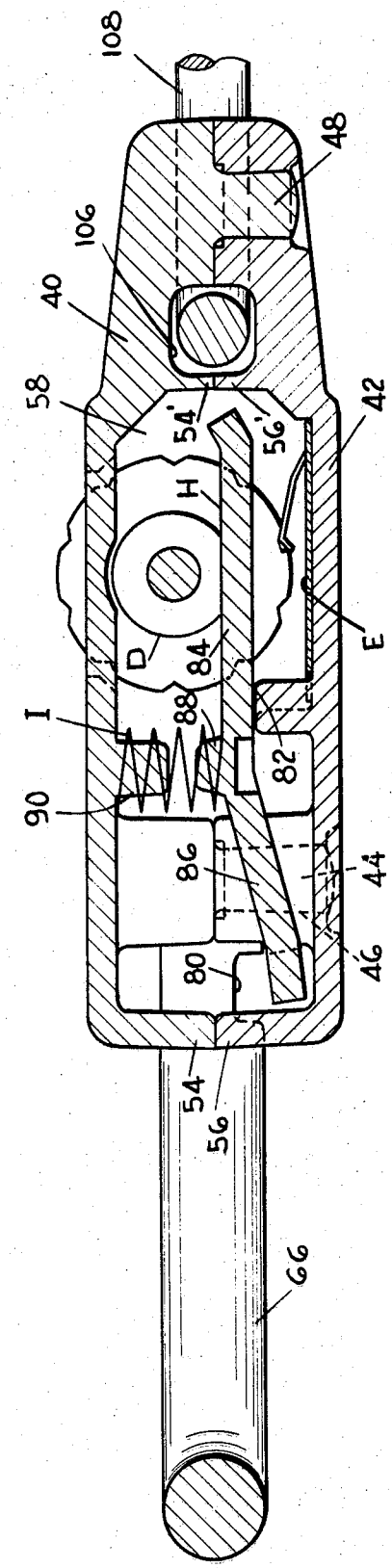

108
48
106
40
58
54'
56'
42
H
D
84
E
I
88
82
90
86
44
46
80
54
56
66

FIG. 3

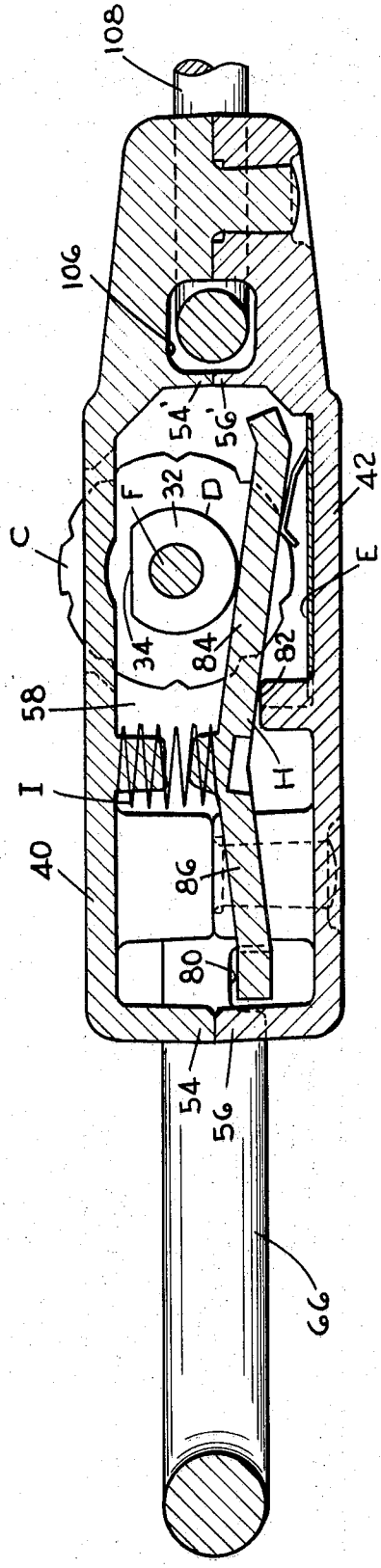

108
106
54'
56'
F
32
D
42
C
E
34
84
82
58
H
I
40
86
80
54
56
66

FIG. 4

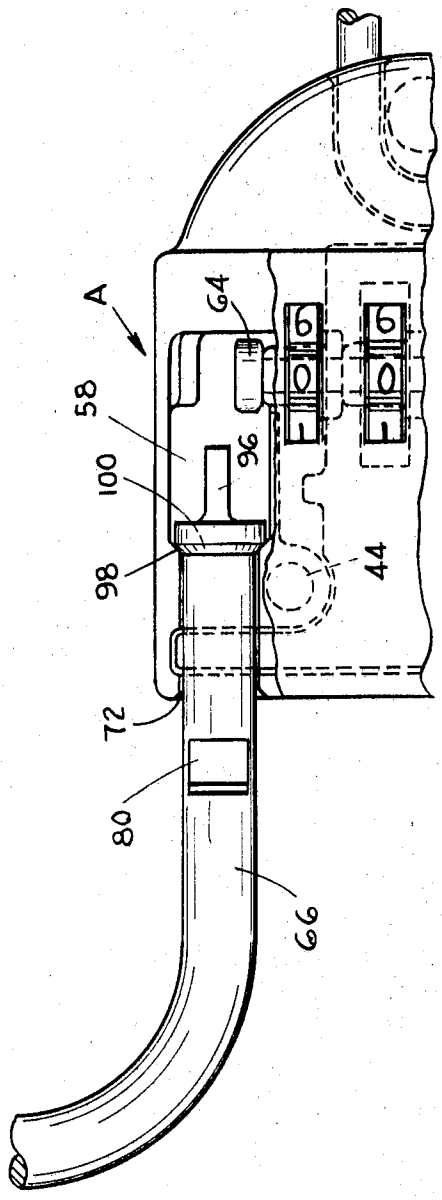


FIG. 5

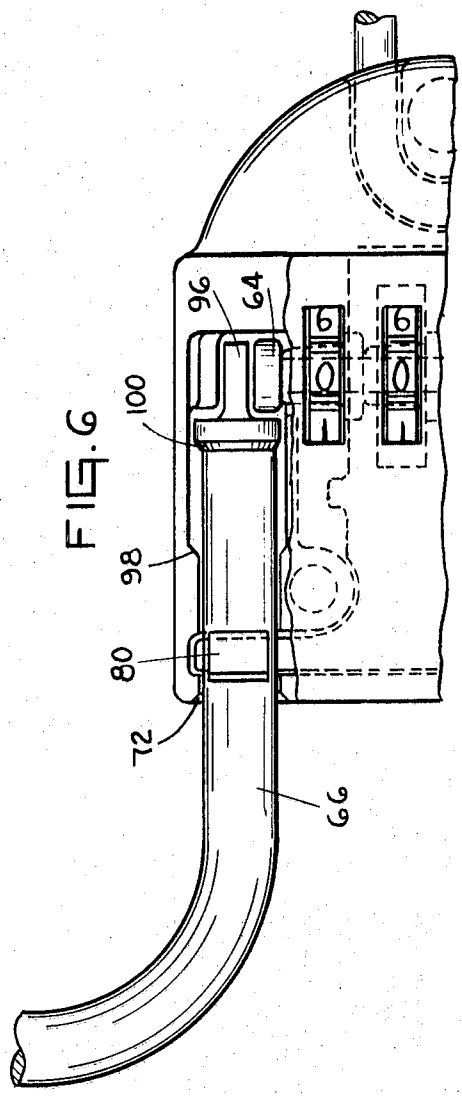


FIG. 6

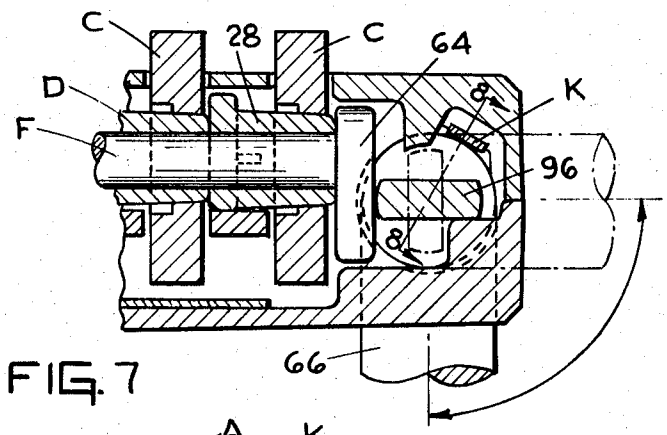


FIG. 7

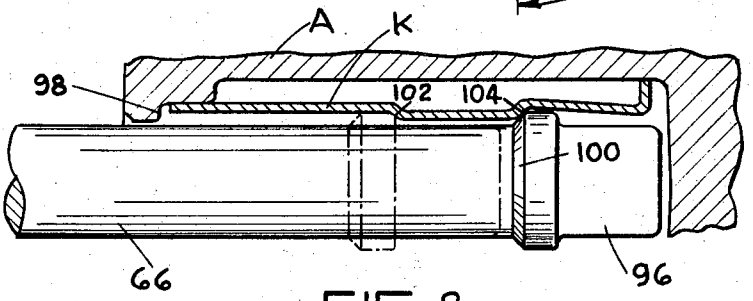


FIG. 8

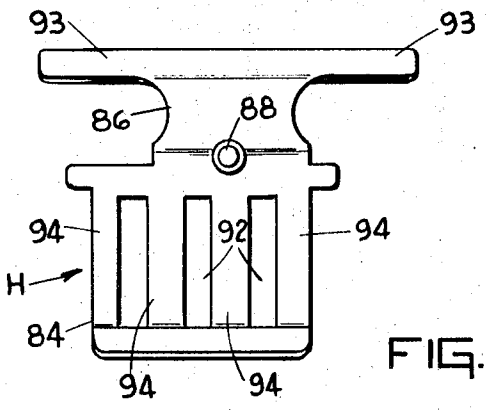
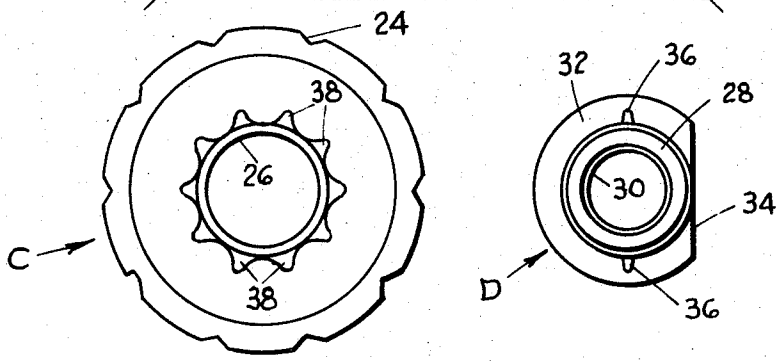


FIG. 9

FIG. 10



COMBINATION PADLOCK

The invention relates to combination padlocks, and is more particularly directed to improvements in combination padlocks of a type including means for setting or changing the combination to a combination of one's own personal choice.

BACKGROUND OF THE INVENTION

U.S. Denerich Pat. 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 patent 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 arrangement 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.

SUMMARY OF THE INVENTION

A combination lock made in accordance with the invention comprises a body having an internal cavity and a plurality of spaced slots in communication with the cavity. A dial provided with indicia or numbers is positioned in each slot. A shaft is mounted within the cavity, the shaft being mounted for displacement in the direction of its axis. A sleeve for each dial is mounted on the shaft with the sleeves in abutting, end-to-end relationship. Each sleeve has a flange and a flat portion. Cooperable means is provided by each dial and its respective sleeve for separably keying them together, and spring means is provided to normally urge the sleeves into keyed relationship with their respective dials. A bolt is positioned within the cavity of the body, and means is provided for normally resiliently maintaining the bolt against the sleeves. A shackle having a long portion and a short portion is mounted on the body so that the long portion extends into the internal cavity. As usual, the shackle is moveable to a first open position and a second closed position. One end of the body is provided with means to receive the end of the shackle's short portion in the closed position of the shackle. The long portion of the shackle and the shaft for the sleeves and dials lie substantially in the same plane with the longitudinal axis of the shackle's long portion extending perpendicular to the longitudinal axis of the shaft. Cooperable means are provided by the shackle and the bolt whereby the shackle is prevented from longitudinal movement when the shackle is in closed position and the bolt is displaced by a flange on a sleeve.

To enable changing or setting of the combination to a combination of one's own personal and secret choice, the free end of the long portion of the shackle is provided with cam means, such cam means being cooperable with the end of the shaft to displace the shaft and disengage the sleeves from their respective dials.

An object of the invention is to provide a combination padlock which eliminates obtrusive or visible means for changing the combination.

Another object of the invention is to provide a combination padlock having a minimal number of rugged parts to thereby furnish a combination padlock suitable for heavy duty.

A further object of the invention is 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.

Still another object of the invention is 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 objects and advantages of the invention will be apparent from the following detailed description, taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

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

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

FIG. **3** is a longitudinal, vertical cross-sectional view taken approximately in the plane of line **3—3** of FIG. **2**, 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;

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

FIGS. **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 shaft in various stages of the manipulation of the shackle to change or set the combination;

FIG. **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 FIG. **7**;

FIG. **9** is a top plan view of the bolt member; and

FIG. **10** shows a dial with an associated flanged sleeve.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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 member or resilient dial cooperable means E is related to the dials to furnish controlled rotation of the dials. The sleeves D are mounted on a shaft F with the sleeves in abutting, end-to-end relationship.

In the embodiment of the invention illustrated the combination locking means includes 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 desired number of dials may be used to furnish the desired 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 U.S. Gehrie Pat. No. 3,416,338 granted Dec. 17, 1968. The dials C are each provided with indicia or numbers in equidistantly spaced relation on the outer circumference. Between adjacent numbers there are grooves **24** adapted to receive means provided by the dial cooperable means or spring member E (FIGS. **3** and **4**) so that the dials when related to their respective sleeves D and mounted on the shaft F may be resiliently maintained in selected circumferential position.

As shown in FIG. **10**, each dial C has a central opening **26** through which the shank **28** of a sleeve D may be extended with a slight amount of clearance (FIGS. **2** and **7**). The sleeve has a central bore **30** of a diameter slightly greater than the diameter of the shaft 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 flanged end of the sleeve is provided with a flat portion **34.** At the juncture of the flange and the sleeve's shank, a detent or detents **36** are 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 may be keyed or meshed to one another. As shown in FIG. **2** spring means G surrounding the shaft F acts to normally urge the sleeves into keyed relationship with their respective dials.

As shown in FIGS. **1–4**, the body A comprises a pair of body or casing members **40** and **42** suitably 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** (FIGS. **3** and **4**) through which the connecting studs are extended. 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, 50'** and **52, 52'** (FIG. **2**) and of the inturned ends **54, 54'** and **56, 56'** (FIGS. **3** and **4**) of the body members **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 a body member, the member **40** as shown. The slots each have a dial C positioned therein. As shown in FIG. **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 shaft F. The opposite end of the shaft is provided with an enlarged headed portion **64** and the body members are cast to receive, when assembled, the enlarged head portion of the shaft with a slight amount of clearance to permit the shaft to be reciprocated or displaced in the direction of its longitudinal axis. The purpose of the displaceable shaft and its headed end will be subsequently described.

The shackle B has the usual J-shape and comprises a long portion or leg **66** and a short portion or leg **68** parallel thereto. The legs are connected by a curved or bent portion **70.** The long portion extends through an opening **72** in the body (FIGS. **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 **76** of the short portion **68** when the shackle is in the closed position shown in FIG. **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 notch **80** for cooperation with a bolt H. Preferably, the shackle is provided with a pair of notches, one in each leg of the shackle and in alignment with one another.

The bolt H is related to the sleeves D and cooperable with the notches **80** provided by the shackle B to lock and unlock the device. As shown in FIGS. **3** and **4**, the bolt is mounted for pivotal movement about a fulcrum **82** provided by the body or, more specifically, 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 related to the shackle. Means is provided for normally resiliently maintaining the bolt against the sleeves, and for this purpose a coiled compression spring I is positioned with one end thereof bearing against a locating projection **88** on the arm side **86** of the bolt. The opposite end of the spring surrounds an aligned locating projection **90** formed on the underside body member **40.**

As shown in FIG. **9**, the bolt H is provided with slots **92** to allow the dials to extend therethrough. Where four dials are used the bolt need have but three slots, the fourth dial being positioned adjacent one end of the bolt as shown in FIG. **2.** The arm side **86** of the 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 FIG. **2** the flange portions **32** of the sleeves D are related to the web portions **94** of the bolt so that when a dial is rotated, the concomitantly its keyed sleeve is rotated, a flange **32** may apply force against a portion **94** of the bolt to displace the bolt against the action of the spring I from the position shown in FIG. **3** to the position shown in FIG. **4.**

When the sleeves D are all oriented so that the flat portions **34** are in alignment with the bolt H as shown in FIG. **3**, the padlock is "on combination". In such relationship of the parts the shackle B may be moved from the closed position of FIG. **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 FIG. **3** to allow movement of the shackle. To lock the device or place the padlock "off combination", the shackle is

moved to the closed position shown in FIG. 1, and a dial or dials are rotated to cause a flange or flanges 32 on a sleeve or sleeves to rock the bolt about the fulcrum 82, whereupon the bar portions 93 of the bolt enter the notches 80 as shown in FIG. 4 to prevent the shackle from being pulled out of the body A.

To effect a change in the combination of to set the device upon a new combination, the free end of the long portion of the shackle is provided with cam means for cooperation with the end of the shaft F to disengage the sleeves D from their respective dials C and allow resetting the sleeves with respect to the dials.

As best shown in FIGS. 1 and 5–8, the shackle's long portion 66 is provided with a flat portion or section 96 at the free end of the otherwise substantially round cross section of the shackle. Referring to FIGS. 1 and 7 it will be observed that the shaft 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 shaft. As previously described the long portion of the shackle is moveable in a direction parallel to 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 leg 66 as shown in FIGS. 5 and 6. The cam means or flat section is cooperable with the end of the shaft, or the shaft's headed portion 64 in a selected rotated position of the shackle.

The manipulative steps to change or set the device to a combination of one's own selection is accomplished as follows. With the device "on combination" and the shackle pulled out to the open position or to the point 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 FIG. 5. Secondly, the shackle is pushed inwardly to the position shown in FIG. 6. In this position the flat cam 96 is oriented so that a face thereof is positioned opposite the end of the shaft or the enlarged head portion 64 which on its opposite side abuts an adjoining sleeve D of the plurality of the end-to-end arranged sleeves on the shaft F. Thirdly, the shackle is rotated back 90° from the position shown in dot-dash line to the solid line position shown in FIG. 7 to furnish the camming action and thereby cause the shaft F to be displaced and the sleeves D to be unkeyed from the dials C. Now, the dials may be rotated to the desired combination following which the described manipulative procedure is reversed to furnish 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 cooperation with the flange 100 on the shackle. As best shown in FIG. 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 head portion 64 of the shaft 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 FIG. 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 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 bolt B. A bar portion 93 of the bolt bears against the periphery of the long portion 66 of the shackle at an area adjoining the notch 80 or on the periphery of the shackle where it has its greatest diameter so that the bolt is maintained in the position shown in FIG. 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. In the preferred form of the invention, and as shown in FIGS. 1, 3 and 4, 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 assembling or 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 FIGS. 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.

It is believed that the advantages and improved results of the invention will be apparent from the foregoing detailed description of a preferred embodiment of the invention. Various changes may be made without departing from the spirit and scope of the invention as sought to be defined in the following claims.

We claim:

1. A combination padlock comprising a body having an internal cavity and a plurality of spaced slots in communication with the cavity, a shaft mounted for reciprocation within the cavity, a dial positioned in each slot, a sleeve for each dial mounted on the shaft with the sleeves in abutting, end-to-end relationship, each sleeve having a flange and a flat portion, cooperable means provided by each dial and its respective sleeve for keying them together, spring means normally urging the sleeves into keyed relationship with their respective dials, a bolt, means for normally resiliently maintaining the bolt against the sleeves, a shackle having a long portion and a short portion, the long portion extending into said internal cavity, the shaft 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 shaft, cooperable means provided by the shackle and the bolt whereby the shackle is prevented from longitudinal movement when the bolt is displaced by a flange on a sleeve in the closed position of the shackle, and cam

means at the free end of the long portion of the shackle for cooperation with the end of the shaft 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 a direction parallel to the longitudinal axis thereof and the shackle is rotatable about the longitudinal axis of its long portion, the cam means being cooperable with the end of the shaft in a selected rotated position of said long portion.

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

4. A combination padlock according to claim 3, including spring means and cooperable means 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, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and 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 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 means 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 a connecting stud integral with one casing member, the free end of the connecting stud extending through an opening in the other body member; and wherein the end link of the chain has the connecting stud extended therethrough.

7. A combination padlock according to claim 2, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and 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 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

8. A combination padlock according to claim 3, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and 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 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

9. A combination padlock according to claim 4, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and 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 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

10. A combination padlock according to claim 2, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and means connecting the body members including a connecting stud integral with one body member, the free end of the stud extending through an opening in the other body member, said plurality of spaced slots being provided in one of said face portions, one end of the body having an opening adjacent to said connecting stud, a chain having its end link positioned within the opening and the connecting stud extended through the link, 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

11. A combination padlock according to claim 3, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and means connecting the body members including a connecting stud integral with one body member, the free end of the stud extending through an opening in the other body member, said plurality of spaced slots being provided in one of said face portions, one end of the body having an opening adjacent to said connecting stud, a chain having its end link positioned within the opening and the connecting stud extended through the link, 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

12. A combination padlock according to claim 4, wherein the body comprises a pair of body members each having a face portion, opposite side portions and opposite end portions, and means connecting the body members including a connecting stud integral with one body member, the free end of the stud extending through an opening in the other body member, said plurality of spaced slots being provided in one of said face portions, one end of the body having an opening adjacent to said connecting stud, a chain having its end link positioned within the opening and the connecting stud extended through the link, 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 means to receive the end of the short portion of the shackle in the closed position of the shackle.

* * * * *