United States Patent [19]

Dobrjanskyj et al.

[11] **3,824,816**

[45] **July 23, 1974**

[54] **COMBINATION PADLOCK**

[75] Inventors: **Lew Dobrjanskyj,** Flushing; **Ruediger Einhorn,** Katonah, both of N.Y.

[73] Assignee: **Coats & Clark, Inc.,** New York, N.Y.

[22] Filed: **May 25, 1972**

[21] Appl. No.: **256,648**

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

[51] **Int. Cl.** **E05b 37/14**

[58] **Field of Search** ..... 70/24, 25, 26, 28, 38 A, 70/38 R, 38 B, 38 C, 53, 332, 20, 21, 70/316–318

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Primary Examiner—Robert L. Wolfe

[57] **ABSTRACT**

Combination padlock having a slidable internal bolt mounted between mating shells forming the body of the padlock. Combination number wheels are provided with internal slots that are engagable by projections formed on the bolt when slid to the unlocked position allowing the hasp to be released. Another embodiment utilizes combination cylinders having slots that receive corresponding projections on the bolt for the unlocked position. When the combination wheels or cylinders are rotated so that the projections cannot slide into the slots, the padlock remains in locked position.

14 Claims, 38 Drawing Figures

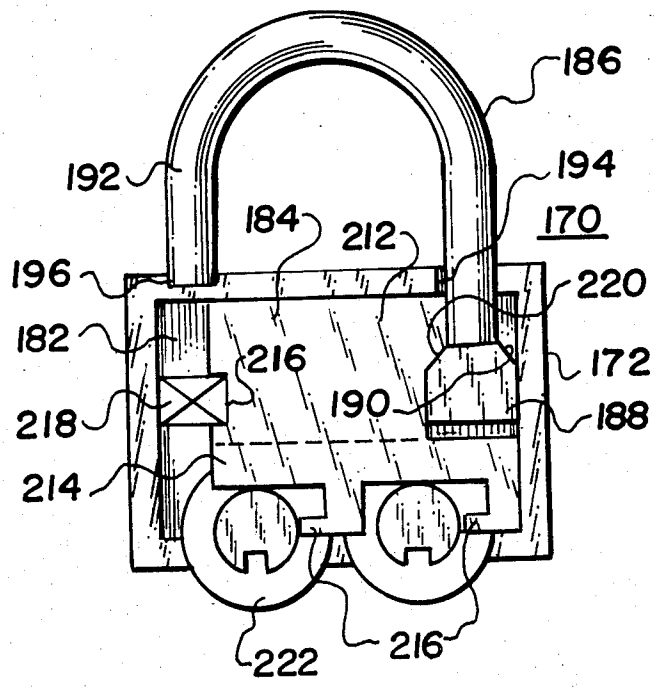


FIG.1

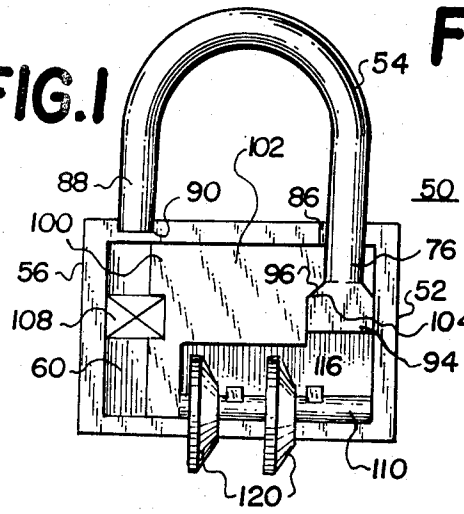


FIG.2

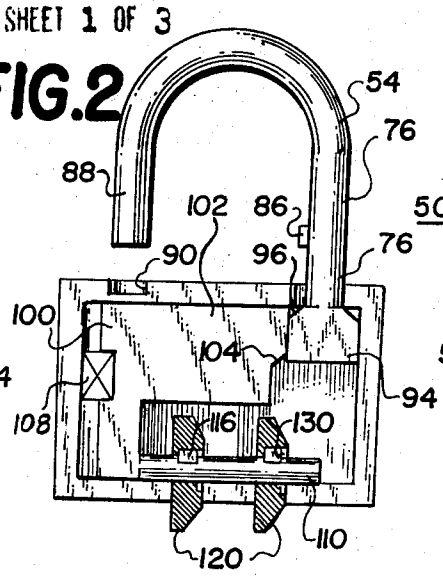


FIG.3

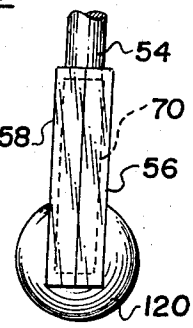


FIG.4

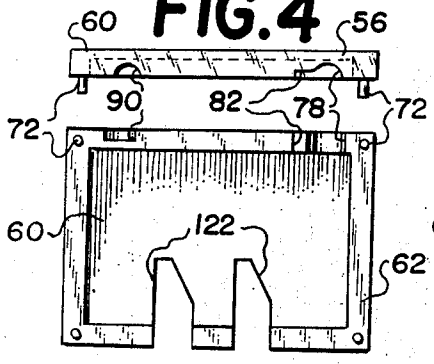


FIG.5

FIG.6

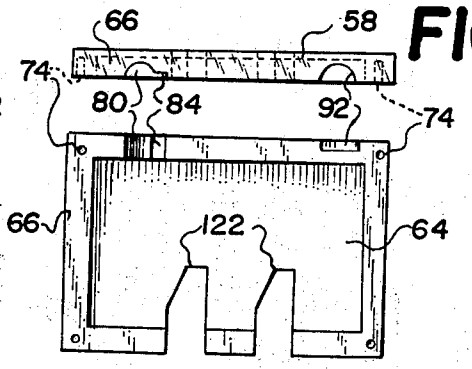
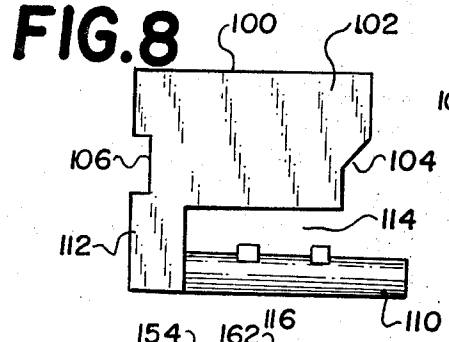


FIG.7

FIG.8



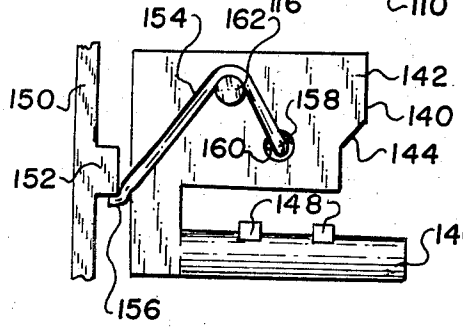
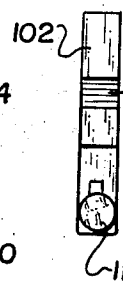
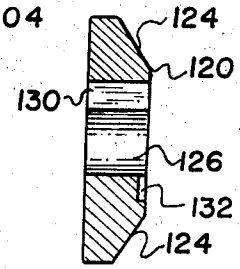


FIG.12

FIG.9





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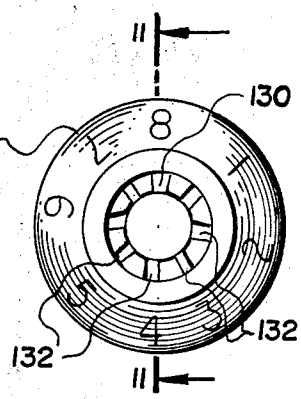

FIG.10

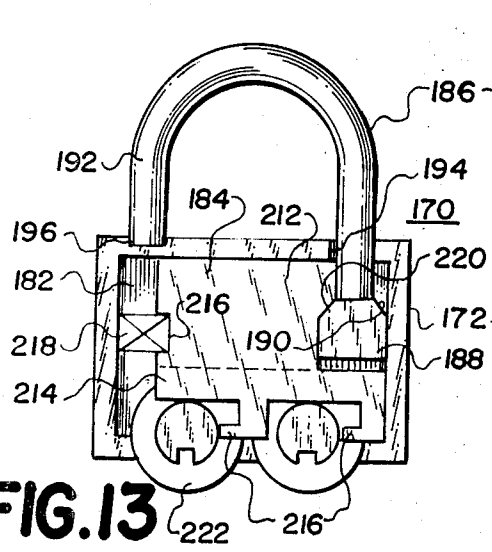

FIG. 13

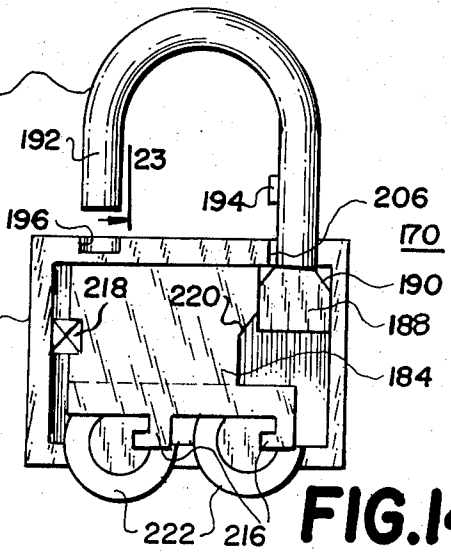

FIG. 14

FIG. 15

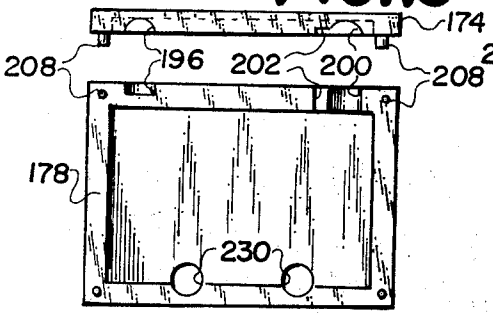

FIG. 16

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FIG. 17

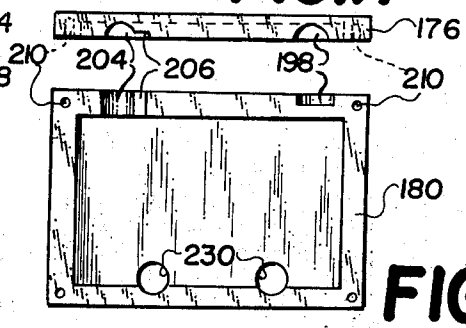


FIG. 18

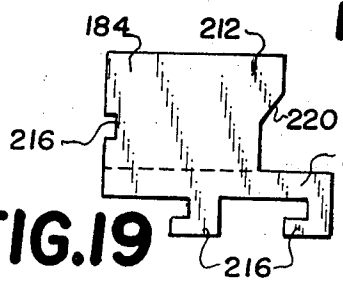
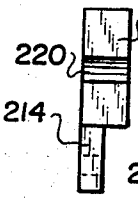


FIG. 19

FIG. 20



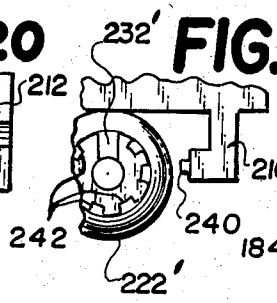


FIG. 24

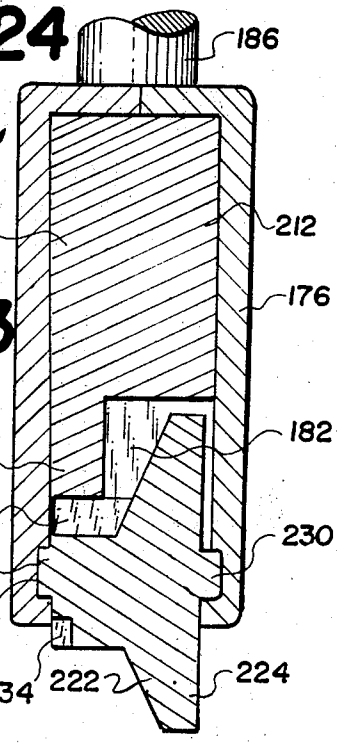


FIG. 23

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FIG. 21

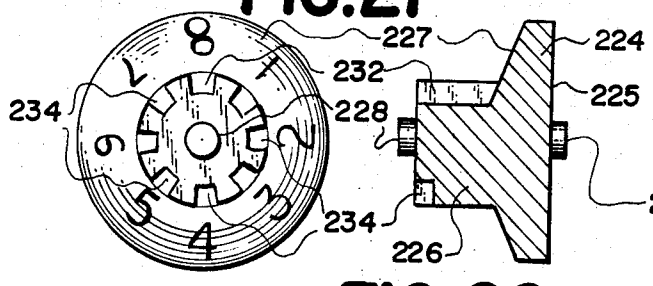

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FIG. 22

FIG.25

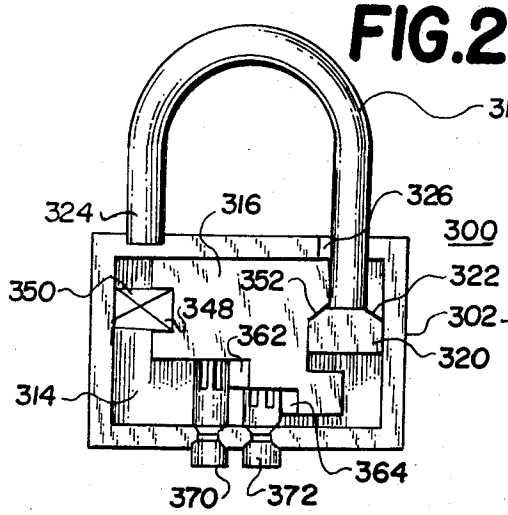

FIG.26

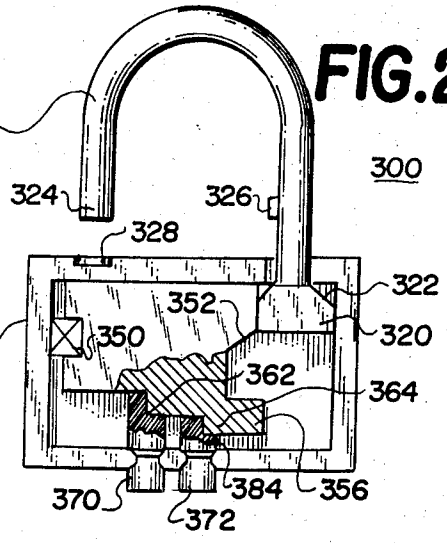

FIG.27

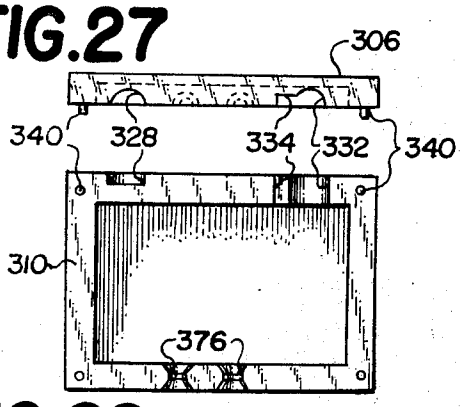

FIG.29

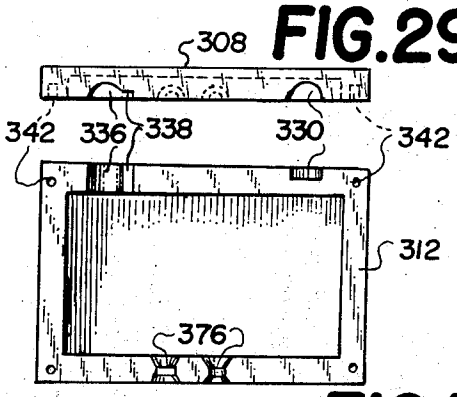

FIG.28

FIG.30

FIG.31

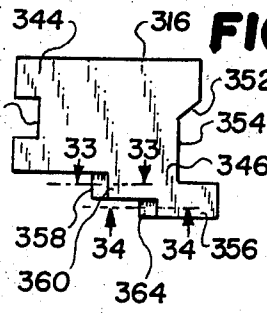

FIG.32

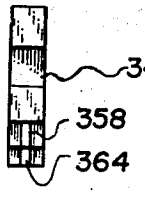

FIG.33

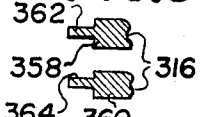

FIG.34

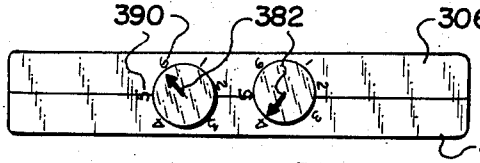

FIG.38

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FIG.36

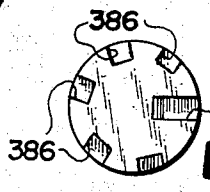

FIG.35

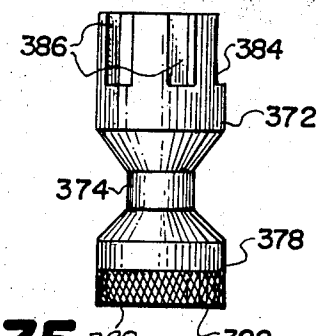

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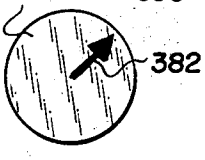
FIG.37



COMBINATION PADLOCK

BROAD STATEMENT OF INVENTION

The present invention relates to combination padlocks and is particularly concerned with the provision of an internally slidable bolt that allows the padlock to be moved between locked and unlocked condition depending upon the positioning of combination wheels or cylinders.

DESCRIPTION OF THE PRIOR ART

It is well known in the prior art to provide padlocks having combination indicia wheels which can be rotated to a particular combination of numbers so that a hasp of the padlock can be moved to unlocked position. An example of such a combination padlock is U.S. Pat. No. 3,386,271 issued on June 4, 1968 to Louis H. Morin. This patent shows a plurality of combination wheels mounted on the side of the padlock through which an end of the hasp is inserted, and the hasp is slid out to the unlocked position when the wheels are set in the proper combination. However, the mounting of the combination wheels along the side of the padlock in direct contact with the hasp member may not be desired in all uses of the padlock. It may be desired to have the combination wheels mounted differently with respect to the padlock body so that the dimensions of the padlock may be changed and the sides remain flat and smooth for other uses. Moreover, if the combination wheels could be mounted in another position, such as the lower part of the padlock, then it is possible to have a different type of hasp and arrangement for locking and unlocking the padlock.

DESCRIPTION OF THE INVENTION

The present invention provides an improved combination padlock with respect to the location of the combination indicia or number wheels and the locking and unlocking of the hasp.

In the present invention the rotatable number units are provided on the bottom of the padlock and includes slots cooperable with an internally slidable bolt that allows the hasp to be locked or unlocked.

Another provision of the present invention is a bolt mounted within a padlock and having projections allowing the bolt to slide when the projections enter into slots on correctly positioned number wheels so that the hasp can move to unlocked positions.

A further provision of the present invention is a padlock having mating shells within which a bolt having projections is slidable within correctly positioned number wheels for the unlocked position.

There is further provided in the present invention a combination padlock having number wheels with a plurality of internal slots therein corresponding in number to the indicia on the wheels, and one of said slots adapted to receive a projection of an internally sliding bolt for unlocking the padlock.

A still further provision of the present invention is a padlock having a plurality of number wheels mounted with their axes in the same line adjacent the bottom of the padlock and including alignable slots therein to receive projections on an internally sliding bolt movable into the unlocked position.

Another provision of the present invention is a padlock having number wheels mounted with their axes parallel and adjacent the bottom of enclosed mating

shells with such wheels including slots engagable by projections on an internally sliding bolt for movement into the unlocked position.

A further provision of the present invention is a padlock having an internally sliding bolt with projecting hooks that are engagable by correctly positioned slots in corresponding number wheels for movement into the unlocked position.

A still further provision of the present invention is a padlock having number wheels of which part thereof include inclined surfaces for the indicia and the other part includes a plurality of slots of which one slot is sufficiently enlarged to receive a hook member carried by a sliding bolt within the padlock **50** that it will move into unlocked position.

Yet another provision of the present invention is a padlock having an internally sliding bolt of stepped configuration with a plurality of cylinder units extending inwardly from the bottom of the padlock and cooperable with the stepped configuration to move the padlock into unlocked position.

A further provision of the present invention is a padlock having an internally sliding bolt with stepped portions each of which is engagable with a correctly positioned slot in a corresponding cylindrical unit mounted to extend inwardly from the bottom of the lock with the cylindrical units rotatable into correct position for cooperation with the stepped portion to provide unlocking of the padlock.

In a first embodiment of the present invention the padlock is formed of mating shells with a hollow space formed therein to receive an internal bolt that is slidable against a biasing element. A hasp member is partly received within the shells and includes one end that is permanently in contact with one end of the bolt. The biasing of the bolt is provided in one direction by spring means, and includes an inclined surface that can form a locking engagement with a corresponding inclined surface on the one end of the hasp so that the padlock remains locked. The bolt includes a lower projecting part on which a plurality of number wheels are mounted for rotation about a common axis. The number wheels include the usual indicia or numbers arranged around the outer periphery which may be an inclined surface and which extend partway out of the shells. The wheels also include at least one internal slot selected to correspond with one of the numbers. The bolt includes a projecting part with spaced lugs mounted thereon corresponding in number to the wheels, and each lug is alignable with a respective internal slot in the wheel when the wheel is rotated into the correct combination. In this condition movement of the hasp towards its unlocked position allows the bolt to slide against the spring as the lugs move within the slots. If an internal slot of a wheel is not in its correct position in the combination, the lug will abut an external surface of the wheel and the bolt cannot slide so that the locking position of the hasp is maintained. A plurality of additional slots may be formed around the circular interior of the wheel corresponding to its indicia to allow partial entry of a respective lug to provide an indication of such number position but preventing complete entry of the lug to unlock the hasp.

A second embodiment of the present invention has the primary distinction in the positioning of the number wheels. The mating shells are the same as in the first embodiment except at the location where the number

wheels are mounted to extend partway therefrom. The number wheels in this embodiment have their axes parallelly spaced as the wheels are mounted along the bottom of the mating shells which include a hollow space for the reception of an internal bolt that is slidable against a spring bias. The hasp is formed in the same manner as in the first embodiment including an inclined surface to form a locking relationship with the bolt. Hook-like members are formed on the bottom of the bolt with each individual hook alignable to be received in an individual slot of the respective wheel when it is positioned in the correct position of the combination. With such correct positioning, movement to unlock the hasp will allow the bolt to be slid against the spring as the hooks are received in the slot so that the hasp can move to the unlocked position. The individual number wheels are mounted with stub shafts to rotate within the shells and include a first part that can be inclined for the indicia to appear thereon and a second part which includes an individual slot sufficiently deep to receive its respective hook. A plurality of additional slots of less depth can be formed around the inner periphery corresponding to the indicia to provide an indication of the position of the wheel without unlocking the hasp. At the end of each hook can be formed a small protuberance that will fit into the additional slots as the wheel is rotated. In this second embodiment the bolt has its main portion substantially filling the space between the mating shells at the upper part thereof, and the lower portion is offset to include the hook-like members with the open space provided by the offset for receiving the number wheels. Since the second embodiment of the invention includes the number wheels with their axes spaced in parallel, it is seen that a thinner lock is provided as compared with the first embodiment.

In a third embodiment of the present invention a slidable bolt is again mounted between mating shells and has the same locking arrangement with a hasp. However, the lower portion of this sliding bolt has stepped portions, and cylindrical units are mounted along the bottom of the padlock with each cylindrical unit being of a different elongation to be in contact with a respective stepped portion. The sliding bolt is biased as in the earlier described embodiments to normally maintain the hasp in locked position. Each cylindrical unit has one end extending outwardly of the shells and includes a marker alignable with indicia on the shell surfaces. A slot is formed at the internal end of the cylindrical unit corresponding to the marker, and the slot is configured so that it can completely receive its respective stepped portion when it is in the correct combination position. This allows the bolt to be slid against the bias of the spring as the hasp is moved to the unlocked position. The cylindrical units can have a plurality of slots formed around the internal end, but such slots have insufficient depth to fully receive a stepped portion so that they merely indicate the position of the marker with respect to the various indicia. Each cylindrical unit includes a narrow portion extending through the abutting edges of the shells for holding such units in place and allowing rotation therein.

The nature of the present invention will become more clearly apparent and better understood from the following description and accompanying drawings in which:

FIG. **1** is a diagrammatic view with one body shell removed showing one embodiment of the combination padlock of the present invention in locked condition;

FIG. **2** is a view similar to FIG. **1** with the number wheels in section to show the operating parts of the padlock in unlocked condition;

FIG. **3** is an end view of the combination padlock;

FIG. **4** is a top view of one body shell;

FIG. **5** is an inside elevational view of the body shell of FIG. **4**;

FIG. **6** is a top view of the opposite body shell;

FIG. **7** is an inside elevational view of the body shell of FIG. **6**;

FIG. **8** is an elevational view of the internal bolt of the combination padlock;

FIG. **9** is an end view of the bolt shown in FIG. **8**;

FIG. **10** is a front view of a number wheel of the present invention shown in FIG. **1**;

FIG. **11** is a sectional view taken along line **11—11** of FIG. **10**;

FIG. **12** is an elevational view of the internal bolt showing a modification of the biasing means;

FIG. **13** is a second embodiment of the present invention in a diagrammatic view similar to FIG. **1** showing the combination padlock in locked condition;

FIG. **14** is a view similar to FIG. **13** showing the combination padlock in unlocked condition;

FIG. **15** is a top view of one body shell of the padlock shown in FIG. **13**;

FIG. **16** is an inside elevational view of the body shell shown in FIG. **15**;

FIG. **17** is a top view of the opposite body shell of the padlock shown in FIG. **13**;

FIG. **18** is an inside elevational view of the body shell of FIG. **17**;

FIG. **19** is an elevational view of the internal bolt of the padlock shown in FIG. **13**;

FIG. **20** is an end view of the bolt shown in FIG. **19**;

FIG. **21** is a front view of a number wheel of the padlock shown in FIG. **13**;

FIG. **22** is a sectional view taken along lines **22—22** of FIG. **21**;

FIG. **23** is a sectional view taken along lines **23—23** of FIG. **14**;

FIG. **24** is an elevational view of a number wheel and the internal bolt with part thereof broken away showing a modification thereof;

FIG. **25** is a further embodiment of the present invention in a diagrammatic view similar to FIG. **1** showing the combination padlock in locked condition;

FIG. **26** is a view similar to FIG. **25** showing the combination padlock in unlocked condition;

FIG. **27** is a top view of one body shell of the padlock shown in FIG. **25**;

FIG. **28** is an inside elevational view of the body shell shown in FIG. **27**;

FIG. **29** is a top view of the opposite body shell of the padlock shown in FIG. **25**;

FIG. **30** is an inside elevational view of the body shell shown in FIG. **29**;

FIG. **31** is an elevational view of the internal bolt of the padlock shown in FIG. **25**;

FIG. **32** is an end view of the bolt shown in FIG. **31**;

FIG. 33 is a sectional view taken along lines 33—33 of FIG. 31;

FIG. 34 is a sectional view taken along lines 34—34 of FIG. 31;

FIG. 35 is an elevational view of one of the cylindrical units shown in FIG. 25;

FIG. 36 is a top view of the cylindrical unit shown in FIG. 35;

FIG. 37 is a bottom view of the cylindrical unit shown in FIG. 35; and

FIG. 38 is a bottom view of the padlock shown in FIG. 25.

It will be understood that the accompanying drawings are merely diagrammatic, and reference should be made to the following description for a more detailed explanation of the various modifications of the present invention. In FIGS. 1 and 2 a first embodiment of a combination padlock 50 of the present invention is shown in locked and unlocked condition, respectively. Padlock 50 comprises a body portion 52 and a yoke or hasp 54 that is slidable between the locked position of FIG. 1 and the unlocked position of FIG. 2. Body portion 52 comprises a pair of mating shells 56 and 58, and in FIGS. 1 and 2 shell 58 has been removed so that the interior elements can be clearly seen. Shells 56 and 58 are the same except for the fastening means to be described hereinafter. The body shells have a generally rectangular shape as shown in the drawings, but this is not a critical feature of the invention, and other configurations can be utilized as long as they include inner flat surfaces for the sliding elements to be explained hereinafter.

Each body shell includes a main portion around the periphery of which is an internally extending border portion. In shell 56 the main portion 60 is surrounded by the border portion 62, and in shell 58 the main portion 64 is surrounded by the border portion 66. When shells 56 and 58 are mated as shown in FIG. 3, border portions 62 and 66 abut and form a hollow space 70 therebetween. The fastening means for the mating shells comprise a plurality of projections or rivets 72 formed or mounted in the corners of shell 56 and a plurality of corresponding openings 74 formed in the corners of shell 58. The shells are mated together and the rivets 72 staked in the holes 74 for the fastening.

The top portion of each of mated shells 56 and 58 include an opening on one side for one end 76 of hasp 54 to pass therethrough. This opening is formed with part in each body shell so that it is seen that half of a circular opening 78 is formed in shell 56 with a corresponding matching circular opening 80 formed in shell 58. Each opening 78 and 80 includes part of a slot extending toward the center of the padlock along the center line thereof, with slot part 82 extending from opening 78 and slot part 84 extending from opening 80.

Hasp 54 has a circular cross-section and is bent in the form of a U with the one end 76 being longer and permanently mounted in a sliding manner within space 70. End 76 passes through the opening 78,80, and as seen in FIGS. 1 and 2, end 76 includes a projection 86 located to correspond with and slide through slot 82,84. As seen in FIG. 1, when padlock 50 is in the locked position, projection 86 is located within slot 82,84. However, when hasp 54 is moved to the unlocked position shown in FIG. 2, projection 86 extends above shells 56 and 58, and if hasp 54 is rotated to a different angular position about end 76, hasp 54 cannot be moved downward into the locked position since projection 86 would then be stopped by the top border 62 or 66.

Hasp 54 includes another end 88 which is received in a depression formed in the other side of the top of borders 62 and 66. Part of the depression is formed in each body shell, and as seen in FIGS. 4 and 6 a semi-circular depression 90 is formed in shell 56 while a matching and corresponding semi-circular depression 92 is formed in shell 58. When the body shells are mated, a circular depression is thereby formed by depression parts 90 and 92 to receive end 88 in the locked position as shown in FIG. 1.

End 76 of hasp 54 includes a termination part 94 that is enlarged with respect to the cross-sectional diameter of the upper part of the hasp and includes surface 96 that is inclined downwardly when considered with respect to projection 86.

Within hollow space 70 is mounted a bolt 100 of a size extending between the top and bottom surfaces of borders 62 and 66 and adapted for longitudinal sliding movement between the side surfaces of the borders. Bolt 100 includes an upper section 102 having one end in contact with the one end of hasp 54 and having a cutback section including a surface 104 that has an inclination corresponding with inclined surface 96. Surfaces 96 and 104 are seen to be in abutting relationship in the locked position of FIG. 1.

At the other end of section 102 a cut-out portion 106 is formed, and a coil spring 108 is seated therein to extend and abut against the side of body shells 56 and 58 so as to create a bias forcing bolt 100 toward end 76.

Bolt 100 includes a lower section formed as a projecting part 110 that is attached to section 102 through connecting part 112 as shown in FIG. 8 so that a space 114 is formed between sections 102 and 110. As seen in FIG. 9, section 102 is formed as a generally flat section with parallel sides to slide between shells 56 and 58 while section 110 has a circular configuration in order to receive number wheels to be rotatably positioned thereon as explained hereinafter. A plurality of projections 116 are formed on the part of the section 110 nearest section 102. The projections 116 are equally spaced from the lower surface borders 62 and 66 and in alignment with each other along a plane that passes through the intersection of the mating shells. In the embodiment disclosed, two projecting lugs 116 have been shown to correspond with the number wheels, but it is to be understood that the invention is not to be restricted to two projections 116 or two number wheels as more than two number wheels and projections 116 can be utilized in the present invention.

Number wheels 120 are mounted to freely rotate on circular section 110. Wheels 120 would have a close fit on section 110 so that a predetermined force would be necessary to effect the rotation as is conventional in a combination padlock, and the wheels would remain in the position desired due to the close fit.

Cut-out sections 122 are formed in the lower part of body shells 56 and 58 for receiving the major part of wheels 120 and restrain them from any longitudinal movement at the time that the bolt 100 and section 110 is moved. Accordingly, it is seen that part of wheels 120 extend beyond the padlock for visibility.

FIGS. 10 and 11 show a desired configuration for number wheels 120, and an outer periphery on one side designated the face has an inclined surface 124 on

which indicia, such as numbers 1–8, are spaced as is conventionally known. Each number wheel **120** includes a bore **126** corresponding in size to the diameter of section **110.** Spaced around central bore **126** and extending radially outwardly therefrom are a plurality of slots corresponding in number to the indicia. One slot **130** extends completely through number wheel **120,** and the remaining slots **132** extend partway from the face of the wheel.

It is to be noted that the projections **116** are of a size such that they can fit completely within slot **130** as shown in FIG. **2,** thereby allowing bolt **100** to move to the extreme left as shown in FIG. **2** and allow the hasp **54** to move to the unlocked position. This is provided by rotating each wheel **120** so that its slot **130** is positioned to be in alignment with the respective projection **116.** It is understood that each wheel would have its through slot **130** positioned opposite a different indicia number to provide a varying combination, and when this combination of numbers is correctly set as shown in FIG. **2,** each of the projections **116** can then slide within its respective slot **130.**

In operation, the padlock generally is in the locked position as shown in FIG. **1,** and the wheel numbers are set on different indicia whereby through slots **130** are not in alignment with projections **116.** If an attempt is made to open the padlock by pulling up on hasp **54,** inclined surface **96** transmits a force toward inclined surface **104** tending to force bolt **100** to the left as shown in FIG. **1.** However, in the locked position the projections **116** abut against wheels **120** and are individually received within one of shallow slots **132.** Accordingly, it is not possible for bolt **100** to slide any further to the left, and the inclined surface **104** prevents the upward movement of hasp **54** so that padlock **50** remains in the locked position. In this position the wheels **120** can be rotated allowing projections **116** to click into each slot **132,** and this will prevent tampering or the possibility of easily determining the combination. However, when the correct combination is set so that each through slot **130** is aligned with its corresponding projection **116,** an upward pull on hasp **54** allows surface **96** to slide with respect to surface **104** since bolt **100** can now move to the unlocked position shown in FIG. **2** as the projections **116** slide completely within slots **130.** In this unlocked position with enlarged end **94** moved upwardly as shown in FIG. **2,** the side surface of enlarged end **94,** which is parallel to the border **62,** now abuts the upper end of bolt **100** presenting a similar parallel surface so that bolt **100** remains in the unlocked position since inclined surfaces **96** and **104** no longer are engaged. In this unlocked position wheels **120** cannot be rotated because of the presence of projections **116** within slots **130,** and the combination padlock can be mounted for display and sold in this position since the proper combination is then available for observation. As mentioned hereinabove, if hasp **54** is rotated in the unlocked position, it cannot then be moved downwardly to allow locking since projection **86** can only move downwardly through slots **82,84** when end **88** is positioned to drop into opening **90,92.**

If the combination padlock is formed with three number wheels, it is understood that there would then be three corresponding projections **116** formed on section **110,** but otherwise the construction of the padlock would be the same as shown in FIGS. **1–11.** The use of three number wheels instead of two number wheels is for the purpose of making a more complex combination.

FIG. **12** illustrates a modification of the biasing means for the bolt. In FIG. **12** a bolt **140** would be mounted in the padlock in the same position as the bolt shown in FIG. **1,** and would include a first section **142** having an inclined surface **144** that would be in contact with a corresponding inclined surface on the hasp in locked position. Bolt **140** includes a lower section **146** on which projections **148** are mounted in the same manner as the projections shown in FIG. **8.** The body shells would be formed substantially similar to the embodiment shown in FIGS. **4–7.** However, along the side of the body shell indicated by numeral **150** a projecting part **152** is formed to provide an anchor for a spring **154.** The spring **154** has one end **156** held under anchor **152** to be fixed thereon. The other end **158** of spring **154** is anchored in an opening **160** formed in bolt **140,** and the center part of the spring is bent around a projection **162** mounted on bolt **140** to provide a constant bias tending to force bolt **140** to the right as shown in FIG. **12.**

The operation of bolt **140** is the same as the operation of bolt **100** described previously. Spring **154** causes the bolt to tend to be forced to the right maintaining a pressure on the hasp through inclined surface **144.** If the number wheels are positioned so that projections **140** are aligned with through slots in the number wheels, then pulling on the hasp will force the projections **148** into the trough slots in the number wheels, and the bolt **140** will move to the left against the bias of spring **154** so that the hasp can be pulled out to the unlocked position.

FIGS. **13–23** represent a second embodiment of the present invention wherein the number wheels have their axes in spaced parallel arrangement transverse to the body of the padlock, and the slidable bolt includes hook-like members engagable with corresponding slots in the number wheels to effect the unlocked position. As seen in FIGS. **13** and **14,** padlock **170** includes a body portion **172** which is formed from a pair of mating shells **174** and **176** as clearly shown in FIGS. **15–18.** The shells **174** and **176** have generally the same shape, except as explained hereinafter, as the shells in the first embodiment, although it is to be understood that this rectangular shape as shown is not critical to the present invention, and other shapes can be used for the mating shells as long as internal flat surfaces are provided for sliding of a bolt as will be described. An internally projecting border **178** is formed around the inside periphery of shell **174,** and an internally projecting border **180** is formed around the inside periphery of shell **176** so that when the shells are fastened together, a hollow space **182** (see FIG. **23**) is formed therebetween within which a sliding bolt **184** and one end of a hasp **186** are mounted. Hasp **186** is formed in the same shape as hasp **54** shown in the first embodiment and is positioned in body portion **172** so as to slide in a similar manner between locked and unlocked position. Accordingly, it is seen in FIGS. **13** and **14** that hasp **186** includes an enlarged end **188** that remains permanently within the padlock and has an inclined surface **190** on its upper portion as shown in FIGS. **13** and **14.** Hasp **186** includes its other end **192** that is removable from body portion **172** in the unlocked position. Hasp **186** further includes a projecting lug **194** that is located in the same

position and performs the same function as projecting lug **86** in the first embodiment.

Shells **174** and **176** each include a semi-circular depression in the upper borders as in the first embodiment that forms a receiving depression for end **192** in the locked position. Semi-circular depression **196** is formed on one side of shell **174,** and semi-circular depression **198** is formed on a corresponding part of shell **176.** At the other end of this same side of the mating shells as in the first embodiment are formed corresponding circular openings including slot portions to receive the other part of the hasp that includes projecting lug **194.** In shell **174** opening **200** includes slot portion **202,** and in shell **176** opening **204** includes slot portion **206.** The fastening means for the mating shells are the same as in the first embodiment and include projecting rivets **208** in shell **174** and corresponding receiving openings **210** in shell **176.**

The configuration of bolt **184** is seen in FIGS. **19** and **20** and in cross-section in FIG. **23** and includes an upper portion **212** that substantially fills the cross-sectional dimension of hollow space **182** and further includes a depending off-set portion **214** to which are appended hook-like elements **216.** Although two hook elements are shown, there may be three or more hook elements provided in this embodiment of the present invention as long as the number of hook elements correspond to the number of number wheels provided for the combination. Top portion **212** of bolt **184** has a similar configuration to the top portion of bolt **100** shown in the first embodiment in that it includes a cut-out portion **216** on one side to receive a coil spring **218** that abuts the borders of the mating shells to exert a bias tending to force bolt **184** toward the end of the hasp having enlarged end **188.** At the other end of bolt **184** opposite to cut-out portion **216** a cut-back section is formed with an inclined surface **220** that corresponds in inclination with surface **190** and is in abutment therewith when the padlock is in the locked condition as shown in FIG. **13.** FIGS. **19** and **20** clearly show these portions of bolt **184,** and it is to be appreciated that the surface shown as the top thereof is flat as in the first embodiment so as to slide in abutting relationship with the corresponding adjacent borders of the mating shells while the outermost surfaces of hooks **216** are flat to slide along the opposing borders of the mating shells.

A plurality of number wheels **222** are provided, and in the illustrated embodiment of FIGS. **13–23** two wheels are shown although the invention is not to be considered so limited since three or more number wheels can be utilized to provide a more complex combination. Wheels **222** are constructed differently from wheels **120** shown in the first embodiment, particularly as to the slot that receives the hook element **216.** As most clearly shown in FIGS. **21–23** each wheel **222** includes a large diameter portion **224** having a flat outer surface **225** and an inner surface extending radially outwardly from its outer periphery down to a smaller diameter portion **226** to form an inclined face **227** on which the indicia numbers are provided. A pair of depressions **230** are located within the mating shells adjacent the lower borders, respectively, to mount each number wheel. As shown in FIGS. **16, 18** and **23,** depressions **230** are circularly shaped and sized to accommodate in rotative engagement a pair of stub shafts **228** formed on the extended axis of each number wheel. When the wheels **222** are mounted therein, a portion of the wheels will extend outside of body **172** for viewing of the combination numbers as they are rotated. It is understood that the mounting is of a tight fit so that the wheels rotate only when a turning pressure is applied, and they remain in the position set.

A plurality of radially located slots are formed around the periphery of wheel portion **226** extending axially inwardly from the end surface thereof and corresponding respectively to individual indicia formed on surface **227.** The radial slots comprise one slot **232** that extends completely along the periphery of wheel portion **226** up to the inclined surface **227** so as to have a length sufficient to completely receive therein a respective hook element **216** when correctly positioned. The remaining radially located slots are shown as slots **234** and extend partially into portion **226** so that they will receive only part of a respective hook element **216** when aligned therewith. It is understood that rotation of wheel **222** will continually allow one of the radial slots to be positioned opposite a hook element **216,** and when opening pressure is put on hasp **186** so that inclined surface **190** is forced against inclined surface **220,** the hook **216** will sequentially enter each radial slot but will only be able to pass completely within slot **232.** The partial positioning within one of slots **234** will maintain bolt **184** in the locked position so that hasp **186** cannot be removed from body portion **172.** It will also be appreciated that a click will take place every time hook element **216** slides into one of slots **234** or into slot **232.** Accordingly, rotating number wheel **222** will give no indication as to which of the slots is the correct position for opening the padlock unless the proper combination is known.

The operation of the embodiment shown in FIGS. **13–23** is the same as the operation of the first embodiment. In the locked position when hook elements **216** are not in alignment with the corresponding slots **232,** the bolt is forced to the right by spring **218** as shown in FIG. **13,** and an opening force applied on hasp **186** will not allow end **188** to move upwardly since bolt **184** cannot move towards spring **218.** However, when the wheels **222** are set so that slots **232** are aligned with the respective hook elements **216,** then bolt **184** is movable to the position shown in FIG. **14** as hasp **186** can then be pulled upwardly with respect to body portion **172.** When bolt **184** moves to the left as shown in FIG. **14,** inclined surface **190** can slide past surface **220** so that hasp end **192** moves out of depression **196** and the padlock is open. Projecting lug **194** has thereby moved out of slot **202,206,** and it is to be noted that if the hasp **186** is now rotated about end **188,** then it cannot be moved back into the locked position since lug **194** will be out of alignment with slot **202,206.** This is to prevent the hasp being moved into the locked position when end **192** is out of alignment with depression **196.** It is to be understood that in the unlocked position wheels **222** will remain in the setting of the correct combination since hook elements **216** are located within slots **232.** In this position the padlock can be maintained and sold, such as on a blister display sheet so that the correct combination is therefore available to the purchaser.

Both of the embodiments shown in FIGS. **1–12** and FIGS. **13–23** are intended for combination padlocks of a small size, such as would be utilized for locking jewelry boxes, purses, drawer cabinets, small lockers or the like. With the embodiments described the padlocks

could be made quite small and of a size such that the padlock body itself could be on the order of about one inch in the longest dimension. The advantage of having the number wheels on the side of the body opposite to the hasp provides continuous flat sides on the padlock on which decorative designs or panels can be placed. For example, if the padlock of the present invention is used in conjunction with an object having decorative elements, such as hinges, then the same decorative design could also appear on the padlock to give a matching set of related elements. Such design could extend to a door in which the same design appears on the hinges, the knob element and the padlock associated therewith.

A further embodiment of the hook element is shown in FIG. **24.** In this embodiment a hook element **216'** has a protuberance **240** located on the tip thereof projecting toward a number wheel **222'**. Wheel **222'** has a single extended slot **232'** for completely receiving the hook element **216'** when the wheel is placed in the correct position. The difference in the FIG. **24** embodiment is that the radially located remaining slots are of a smaller size, sufficient only to receive the proturberance **240.** Such smaller slots are shown as radially spaced slots **242** located opposite a respective indicia to perform the same function as previously described. As wheel **222'** is rotated and each slot **222** comes into alignment with the end of hook element **216'**, protuberance **240** will click into a respective slot. However, only slot **232'** will completely receive the hook element **216'** to allow the bolt to move to the unlocked position. The advantage of the FIG. **24** embodiment is that smaller slots can be formed in the number wheel as compared with the previously described embodiments.

A third embodiment of the invention is illustrated in FIGS. **25–38** wherein cylindrical units are utilized in the padlock instead of the number wheels illustrated in the earlier described embodiment. In FIGS. **25** and **26** a padlock **300** is seen to comprise a body portion **302** which is formed from mating shells **306** and **308** as most clearly shown in FIGS. **27–30.** The shells **306** and **308** have generally the same shape, except as explained hereinafter, as the shells in the earlier described embodiments. An internally projecting border **310** is formed around the inside periphery of shell **306,** and an internally projecting border **312** is formed around the inside periphery of shell **308** so that when the shells are fastened together, a hollow space **314** is formed therebetween within which a sliding bolt **316** and one end of a hasp **318** are located. Hasp **318** is formed in the same shape as the hasp in the earlier embodiments and is positioned in body **302** so as to slide in a similar manner between locked and unlocked position. Hasp **318** includes an enlarged end **320** that remains permanently within padlock **300** and has an inclined surface **322** on its upper portion as shown in FIGS. **25** and **26.** Hasp **318** includes its other end **324** which is removable from body portion **302** in the unlocked position. A projecting lug **326** is located on hasp **318** adjacent enlarged end **320** to perform the same function as described in the earlier embodiment.

Shells **306** and **308** each include a semi-circular depression in the upper parts of borders **310** and **312,** respectively, as described in the earlier embodiments so as to form a receiving depression for end **324** in the locked position. Semi-circular depression **328** is formed in shell **306,** and semi-circular depression **330** is formed in shell **312.** The receiving depression **328, 330** is formed at one end of the upper part of borders **310,312** as shown in FIGS. **27–30,** and at the other end of the upper borders are formed corresponding circular openings including slot portions to receive the part of the hasp that includes projecting lug **326.** In shell **306** the circular opening **332** is provided and includes slot portion **334,** and in shell **308** the circular opening **336** is provided and includes slot portion **338.** The fastening means for the mating shells are the same as in the earlier embodiments and includes projecting rivets **340** formed in shell **306** and corresponding receiving openings **342** formed in shell **308.**

The configuration of sliding bolt **316** is seen most clearly in FIGS. **31–34** and includes an upper section **344** that substantially fills the narrow transverse dimension of hollow space **314** and further includes a lower section **346** having a novel configuration to be described hereinafter. Upper portion **344** has a similar configuration to the upper portion of the sliding bolts of the earlier described embodiments in that it includes a cut-out portion **348** for receiving a coil spring **350** which abuts the side surfaces of borders **310** and **312** as shown in FIGS. **1** and **2** so as to exert a bias tending to force bolt **316** toward the end of the hasp having enlarged end **320.** At the other end of bolt **316** opposite to cut-out portion **348** is formed a cut-back section with an inclined surface **352** that corresponds in inclination with surface **322** and is in abutment therewith when padlock **300** is in the locked condition as shown in FIG. **25.** As shown in the drawings and particularly in FIGS. **25, 26** and **31** from inclined surface **352** a side **354** extends vertically for a distance and then projects outwardly so that lower portion **346** has a lower projection **356.** Portion **356** is then connected with the other end of bolt **316** by a plurality of stepped portions **358** and **360.** The number of steps determine how many numbers will be in the combination, and although only two steps are shown in the embodiment of FIGS. **25–38,** it is to be understood that more than two steps can be utilized for a more complex combination by merely increasing the number of steps and the corresponding cylindrical units, which will be described hereinafter.

Each step **358** and **360** includes a respective step projection of smaller transverse dimension that is located so as to extend in a plane passing through the center of space **314,** and FIGS. **33** and **34** particularly show the relative dimensions and location of the step projections. Step **358** includes a step projection **362,** and step **360** includes a step projection **364.**

A plurality of cylindrical units are provided corresponding in number to the steps of the sliding bolt. Each cylindrical unit is elongated in shape with the main part of the unit located in space **314** adjacent to and cooperating with one of the steps of the bolt, and part of each cylindrical unit extends outwardly from the mating shells for a determination of the combination number as will be described. Due to the stepped configuration of bolt **316,** step **358** is spaced farther than step **360** from the lower surfaces of borders **310,312,** as shown in FIGS. **25** and **26.** Accordingly, each cylindrical unit has a different elongation so that it can cooperate with its respective step and yet extend outside of the padlock for the same distance. A first cylindrical unit **370** is located to be cooperative with step

358, and a second cylindrical unit 372 is located to cooperate with step 360. Although the cylindrical units differ in elongation, they are alike in the part that extends outside of padlock body 302 and the portion that is located to be rotatable within borders 310,312. This particular configuration of the lower part of each cylindrical unit is most clearly shown in FIGS. 35–37 which is an enlargement of cylindrical unit 372. The cylindrical unit is seen to include a narrowed or necked-down portion 374 which is mounted to rotate in a correspondingly shaped opening 376 in the lower part of borders 310,312. The narrowed or pinched section 374 maintains each cylindrical unit in palce within body 302 while the rotation takes place. It is desirable that a close fit be formed between portion 374 and opening 376 so that a predetermined amount of force is needed to rotate each cylindrical unit from its set position. Portion 378 of the cylindrical unit is the part that extends outwardly of body 302 and terminates in a flat surface 380 of circular configuration. On surface 380 is located a marker 382 which may be in the form of an arrow as shown in FIG. 37, but may be any other type of indicia marking such as a line or dot for indicating a number in the combination.

The upper part of each cylindrical unit includes a plurality of slots equally spaced around the periphery. As shown in FIG. 36, one slot 384 has a depth and a longitudinal dimension sufficient to accommodate in its entirety a corresponding step projection. The remaining slots 386 have the same longitudinal dimension for receiving a step projection, but they have less depth so that a step projection can only extend partway therein. Accordingly, it is to be appreciated that as cylindrical unit 370 or 372 is rotated, the different slots move into position to receive step projections 362 and 364, respectively. If the deep slot 384 is positioned adjacent step projection 364 and the corresponding deep slot of cylindrical unit 370 is positioned adjacent step projection 362, the step projections are completely received in the deep slots as shown in FIG. 26, and hasp 318 can be pulled into the unlocked position as bolt 316 moves to the left. If one or both of the steps 362 or 364 is aligned with a shallow slot 386, then bolt 316 can move only partway to the left as shown in the drawings, and the enlarged portion 320 cannot clear the bolt in order to move to the unlocked position. As an aid for rotating each cylindrical unit, end 378 may have a knurled portion 388.

FIG. 38 shows the relationship of the indicia numbers with markers 382 on the cylindrical units. Indicia numbers 390 are formed on the bottom of shells 306 and 308 to be equally spaced adjacent the periphery of cylindrical units 370 and 372. As shown in FIGS. 38, indicia numbers 390 may comprise the numerals 1 through 6, but this is to be considered merely illustrative since other indicators can be used such as additional or less numerals or other symbols as long as a plurality are provided so that a combination can be arranged. The markers 382 are seen to be rotatable to be positioned opposite the various indicia, and each marker 382 is located on surface 380 such that when it is positioned opposite the correct predetermined number, deep slot 384 will then be in alignment with its corresponding step projection.

The operation of the embodiment shown in FIGS. 25–38 will now be described. In the locked position shown in FIG. 25, all of deep slots 384 are not in alignment with step projections 362 there by spring 350 with the abutment of surfaces 322 and 352. In the locked position an upward opening force applied to hasp 318 will not allow enlarged end 320 to move upwardly, since bolt 316 cannot move sufficiently to the left to eliminate the abutment of surfaces 322 and 352, and accordingly padlock 300 remains in the locked position.

Each cylindrical unit can be rotated by means of projecting ends 378, and as each slot 384 or 386 comes into alignment with a step projection, there will be a click as the projection moves into the slot. The provision of slots 386 provides a security feature in that the click will be the same for any slot so that it cannot be appreciated when the right slot is in alignment unless the indicia combination is known. When the markers 382 are positioned opposite the correct indicia numbers so that each deep slot 384 is positioned in alignment with its respective step projection, an upward force applied to hasp 318 will thereby force bolt 316 completely to the left as shown in FIG. 26 so that the enlarged end 316 can move upwardly to the unlocked position. Lug 326 is now in its exposed position, and if hasp 318 is rotated so that lug 326 is no longer in alignment with slot 334,338, then hasp 318 cannot be moved back into the locked position, and this will prevent the hasp being locked when end 324 is out of alignment with depression 328,330.

It is to be understood that in the unlocked position shown in FIG. 26, step projections 362 and 364 remain within slots 384 due to the abutment of bolt 316 against enlarged end 320. In this position the padlock can be maintained and sold, so that the purchaser has the correct combination indicated to him.

The rotation of cylindrical units 370 and 372 can be performed otherwise than as described hereinabove. For example, the ends of the cylindrical units remote from the slots can be formed to be flush with the outside surfaces of the mating shells. Rotation could then be achieved by forming a slot in the end surfaces, and such rotation could be effected by a fingernail or a special tool supplied to the purchaser.

It will be understood that other changes and modifications may be made by those skilled in the art in the particular features of the various embodiments which have been described above for illustrative purposes without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. A combination padlock comprising a pair of mating body shells whose sides form the body of the padlock and provide a hollow space therein;

a movable bolt having sides located in said hollow space, said bolt being biased in one direction;

a hasp member having one end permanently located in said hollow space in contact with said bolt, a central U-shaped portion, and further having the other end positionable within said shells in a locked position and being removable from said shells to an unlocked position;

said bolt including a projecting part spaced from said ends of said hasp;

means located on said projecting part;

a plurality of spaced number wheels mounted to rotate within said hollow space and extend partway out of said shells;

said wheels including means cooperable with said projecting part means to allow said bolt to move in a direction opposing its bias to allow said hasp to move from locked to unlocked position;

each said shell having a generally rectangular shape with an internally extending border of predetermined width formed along its four sides, one side of each said mating shells including an end part having an opening for said one end of said hasp to pass therethrough and further including an opposite end part having a depression to receive the other end of said hasp in locked position, the opposing side of each said shell including a plurality of cut-out portions corresponding in number to said number wheels to receive said wheels in operative position, and further comprising a projecting lug on said hasp between said central portion and said one end, and a corresponding slot in said one side of each said mating shell in communication with said opening therein allowing said lug to slide therethrough when said other end of said hasp is aligned with said depression.

2. A combination padlock comprising

a pair of mating body shells whose sides form the body of the padlock and provide a hollow space therein;

a movable bolt having sides located in said hollow space, said bolt being biased in one direction;

a hasp member having one end permanently located in said hollow space in contact with said bolt, a central U-shaped portion, and further having the other end positionable within said shells in a locked position and being removable from said shells to an unlocked position;

said bolt including a projecting part spaced from said ends of said hasp;

means located on said projecting part;

a plurality of spaced number wheels mounted to rotate within said hollow space and extend partway out of said shells;

said wheels including means cooperable with said projecting part means to allow said bolt to move in a direction opposing its bias to allow said hasp to move from locked to unlocked position,

each shell having a generally rectangular shape with an internally extending border of predetermined width formed along its four sides, one side of each of said mating shells including an end part having an opening for said one end of said hasp to pass therethrough and further including an opposite end part having a depression to receive the other side of said hasp in locked position, the opposing side of each said shell including corresponding pairs of depressions that correspond to said wheels,

each said wheel having a pair of stub shafts projecting respectively along its axis from each side thereof for mounting in said pairs of depressions respectively, whereby the axes of adjacent wheels lie in parallel spaced planes.

3. A combination padlock comprising

a pair of mating body shells whose sides form the body of the padlock and provide a hollow space therein;

a movable bolt having sides located in said hollow space, said bolt being biased in one direction;

a hasp member having one end permanently located in said hollow space in contact with said bolt, a central U-shaped portion, and further having the other end positionable within said shells in a locked position and being removable from said shells to an unlocked position;

said bolt including a projecting part spaced from said ends of said hasp;

means located on said projecting part;

a plurality of spaced number wheels mounted to rotate within said hollow space and extend partway out of said shells;

said wheels including means cooperable with said projecting part means to allow said bolt to move in a direction opposing its bias to allow said hasp to move from locked to unlocked position,

each shell having a generally rectangular shape with an internally extending border of predetermined width formed along its four sides one side of each of said mating shells including an end part having an opening for said one end of said hasp to pass therethrough and further including an opposite end part having a depression to receive the other side of said hasp in locked position, the opposing side of each said shell incuding corresponding pairs of depressions that correspond to said wheels,

said bolt projecting part means comprising a plurality of hook-like elements depending therefrom and corresponding in number with said number wheels, said elements positioned out of contact with said wheels when said bolt is in its locked position, and said elements adapted to slide within respective wheels to provide the unlocked position.

4. A padlock according to claim **3** in which each number wheel includes a plurality of indicia equally spaced around its periphery, said number wheel cooperating means comprises a plurality of slots formed in the surface of an inner part of each wheel, said slots corresponding in number to said indicia with each slot respectively located adjacent one of said indicia, one of said slots projecting deeper into its said respective wheel than any of said other slots of said wheel, and said one slot adapted to receive a respective hook-like member therein in its entirety to allow the hasp to move to unlocked position.

5. A padlock according to claim **4** in which each said number wheel includes a portion inclined to its rotating axis, and said indicia comprise numbers formed on said inclined portion.

6. A padlock according to claim **4** in which each of said hook-like elements comprises an extending part of predetermined size so as to be completely received within said one slot in a close fit, said extending part having a protuberance on the end thereof, and said other slots being smaller in width than said one slot so as to selectively receive only said protuberance therein.

7. A combination lock, comprising

a body member defining a hollow space having first and second parallel opposed sides,

a first aperture in said one side,

a U-shaped hasp having one end extending through said first aperture, said one end being enlarged and having an inclined surface;

a bolt in said space and having a first edge slidably engaging said first side of said space,

means resiliently urging said bolt to slide in a first direction along said first side of said space toward said one end of said hasp,

said bolt having an inclined surface engaging the inclined surface of said hasp,

said second side of said space being apertured,

a plurality of number wheels rotatably mounted in said space and having indicia carrying portions extending through said second side in spaced-apart relation to permit manual rotation thereof, each of said wheels having a notch that is angularly displaceable upon rotation of the respective wheel,

and projection means on said bolt positioned to engage said notches at predetermined angular displacements thereof,

whereby when said notches are positioned at said predetermined angular displacements, outward directed force upon said hasp affects the displacement of said projection means into said notches due to the engagement between the inclined surfaces of said bolt and hasp to permit outward displacement of said hasp, and at other angular displacements of said notches displacement of said bolt is inhibited to prevent outward displacement of said bolt.

8. The combination padlock of claim **7** wherein said number wheels are rotatably mounted on separate axes which extend in a plane parallel to the plane of said second side of said space and extending normal to said first direction, said projection means comprising hook shaped projections on the edge of said bolt opposite said first edge.

9. The combination padlock of claim **8** wherein said hook shaped projections are positioned to slidably engage said second side of said space.

10. The combination lock of claim **7** wherein said number wheels are rotatably mounted on separate parallel axes which extend in a plane parallel to said second side and normal to said direction of movement of said bolt, said number wheels having first end portions carrying indicia and second end portions of a diameter smaller than said first end portions, said notches being radially extending notches positioned in said second end portions of said number wheels, said first end portions extending through the apertures in said second side of said body member.

11. The combination lock of claim **8** in which said body member has parallel first and back sides extending between said first and second sides, said bolt being positioned in said hollow space to slidably engage said front and back sides, said projection means being positioned to slidably engage said second side of said space adjacent said second end portions of said number wheels.

12. The combination lock of claim **11** wherein said projection means are positioned to slidably engage one of said front and back sides and are spaced from the other of said front and back sides, said first end portions of said number wheels extending between said projection means and said other of said front and back sides.

13. The combination lock of claim **7** wherein said inclined surface of said hasp inclines inwardly from said one end of said hasp.

14. The combination lock of claim **13** wherein said bolt has a recess on the end thereof toward said first direction, said inclined surface of said bolt defining in part said recess of said bolt.

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