United States Patent [19]

Shull

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[54] **LOCK ASSEMBLY WITH RESILIENT LATCH**

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[52] **U.S. Cl.** ..... **70/364 R;** 70/376

[51] **Int. Cl.** **E05b 15/04;** E05b 15/14

[58] **Field of Search** ..... 70/362, 364 R, 364 A, 367, 70/377, 139, 392, 421, DIG. 74, 376

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Primary Examiner—Robert L. Wolfe
Attorney, Agent, or Firm—Gausewitz, Carr & Rothenberg

[57] **ABSTRACT**

A retainer cylinder is rotatably mounted in the bore of a housing cylinder and selectively latched against rotation by means of a resilient latching assembly. The housing cylinder is formed with a longitudinally extending groove and a corresponding recess is formed in the retainer cylinder. In one arrangement, the resilient latching assembly comprises a flat spring captured in the housing cylinder groove and having an intermediate portion resiliently urged into the retainer cylinder recess. A dog slidably mounted in the recess is cammed by a key to force the spring element from the recess and allow rotation of the retainer cylinder. In a second arrangement, the same housing cylinder allows for handle operation of a retainer cylinder wherein the latching assembly comprises a cam pin resiliently mounted in the retainer cylinder recess.

9 Claims, 12 Drawing Figures

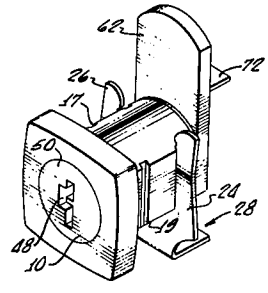


FIG. 1.

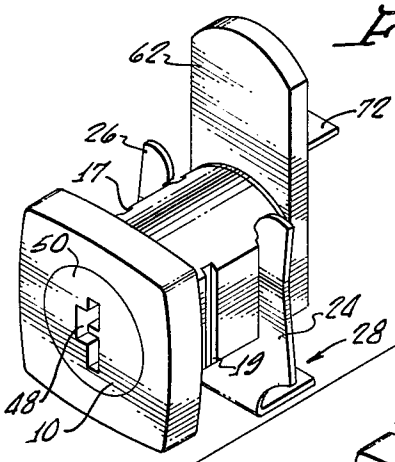
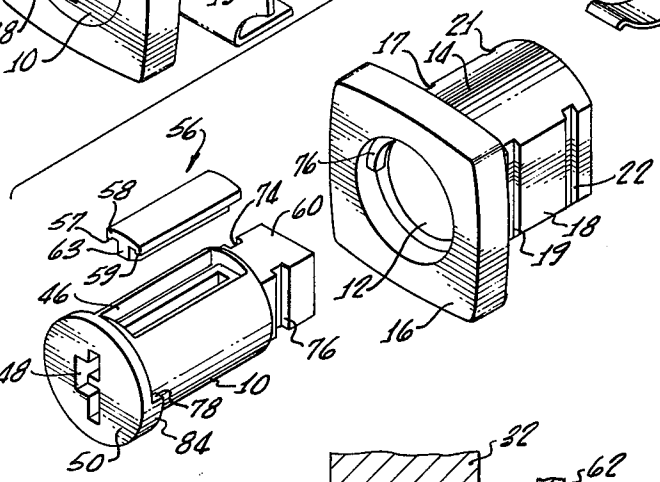


FIG. 2.



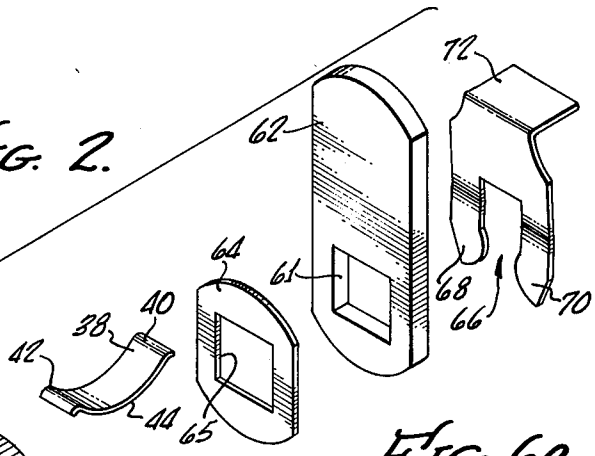
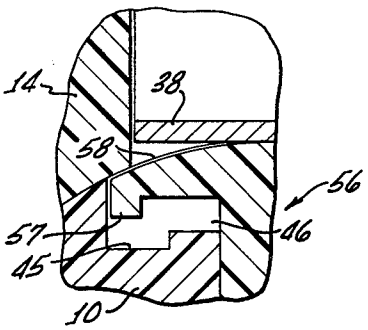


FIG. 6a.



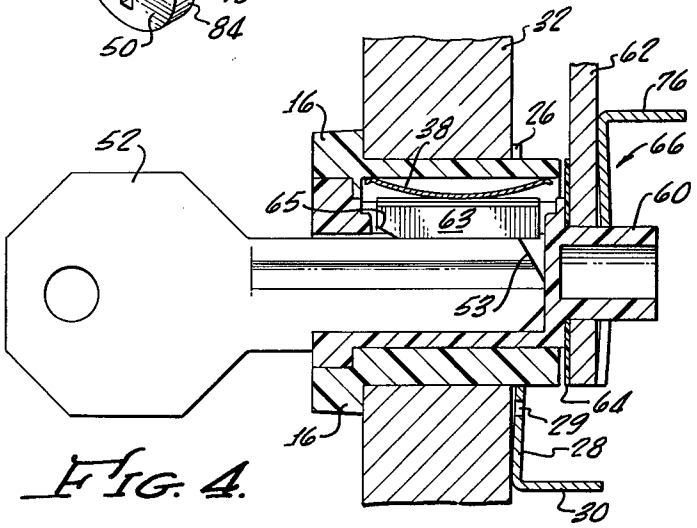


FIG. 4.

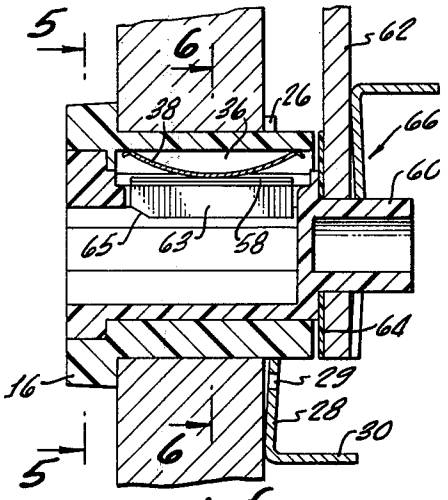


FIG. 3.

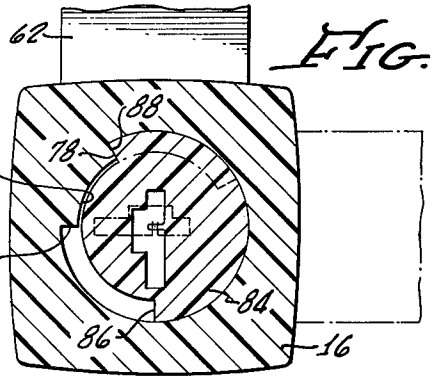


FIG. 5.

FIG. 6.

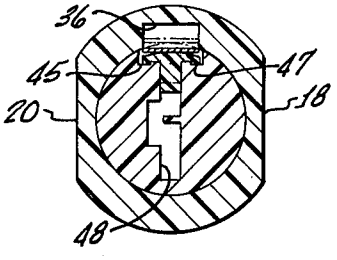
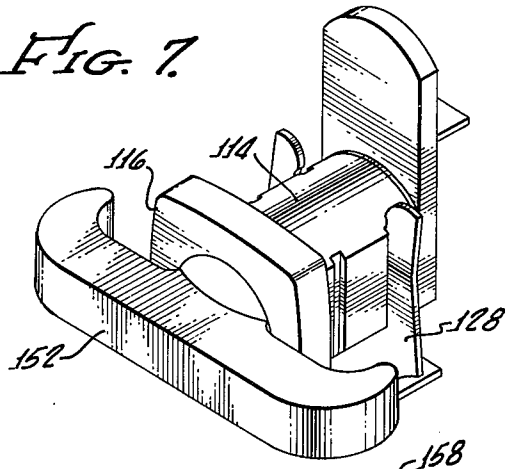


FIG. 7.



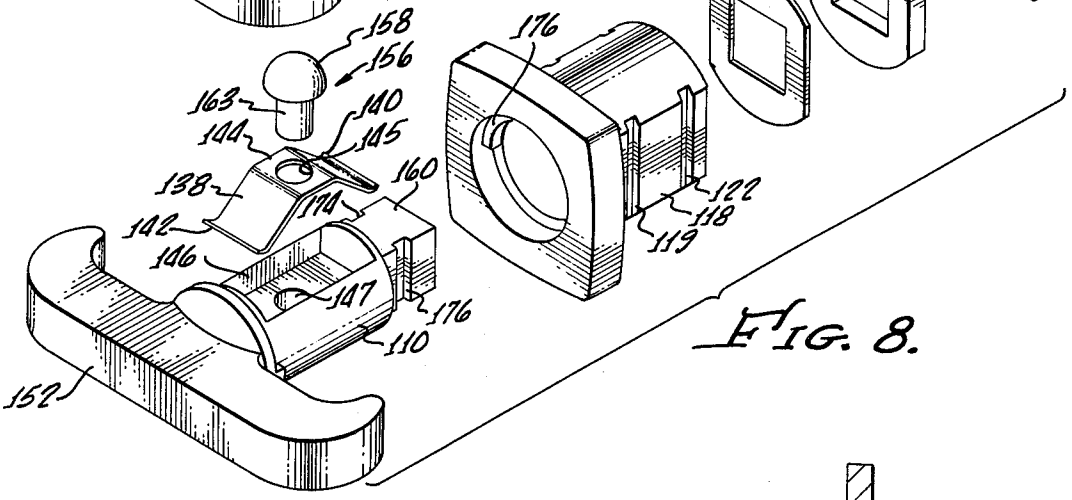


FIG. 8.

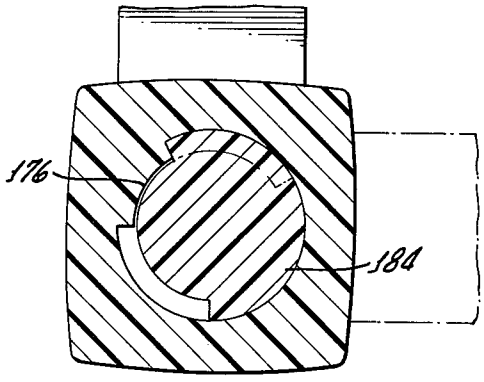


FIG. 10.

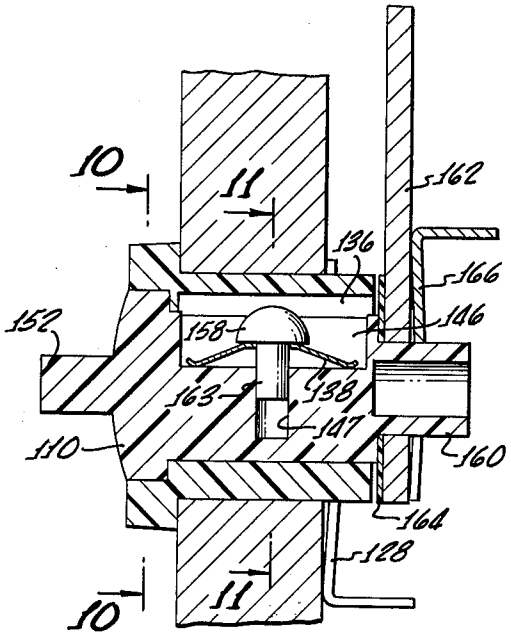


FIG. 9.

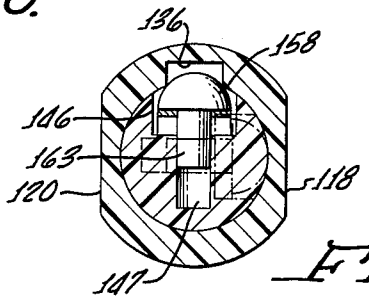


FIG. 11.

LOCK ASSEMBLY WITH RESILIENT LATCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to lock assemblies and more particularly concerns lock assemblies having internally mounted resilient latching means.

2. Description of Prior Art

Locks and latches for doors and other closures, particularly in the field of travel trailers and camping vehicles, are of several types. There is a variety of sturdy, complex and expensive key operated locks, generally employed for the large door of greater structural strength. For smaller doors and in particular for those of little strength, such as doors formed of thin aluminum or other panels, it is common to use spring or magnetic latches having no key operation and no locking cam.

The heavy, complicated and expensive key operated locks are not readily installed in the thin door panels and, moreover, are not warranted for such type of door construction. Nevertheless, it is still desirable that the thin door panel be provided with a positive locking device and preferably one that provides some measure of protection against unauthorized entry where desired. Thus, for doors of travel trailer or camper baggage compartments, there is required and desired a key-operated lock assembly that is compatible with the thin panel construction of the conventional door. Utility compartment doors, on the other hand, must be readily accessible and readily opened for safety purposes. Therefore, it is desired to provide such doors that will be positively latched when closed, but which may be readily unlatched, without a key, by turning a knob provided on the lock itself.

It is an object of the present invention to provide locking assemblies of a simple and inexpensive nature that are readily adapted to provide positive latching and protection against unwanted opening when desired, or merely positive latching, without the use of heavy, complex and expensive locking structure.

SUMMARY OF THE INVENTION

In carrying out principles of the present invention in accordance with a preferred embodiment thereof, a lock assembly is formed of a housing cylinder having a bore and a retainer rotatably mounted in the bore. A resilient latch assembly is carried internally of the lock between the housing and retainer cylinders to selectively prevent relative rotation of the two cylinders. In a first embodiment a spring carried by a groove in the housing has a portion extending into a mating recess in the retainer cylinder but may be cammed to unlocked position by means of a key-operated dog operable in the retainer cylinder.

In a second embodiment, the same internally grooved housing is employed together with a rotatable retainer cylinder carrying a spring pressed cam pin that latches into the housing groove. In this embodiment, a handle or knob of the retainer cylinder is employed for operation of the lock assembly without a separate key.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view of a lock assembly employing principles of a first embodiment of the present invention;

FIG. 2 is an exploded pictorial view of the components of the lock assembly of FIG. 1, omitting one retainer clip;

FIG. 3 is a sectional view of the lock assembly of FIG. 1 showing the parts in unlatched position;

FIG. 4 is a sectional view of the lock assembly of FIG. 1 showing the parts in unlatched position;

FIGS. 5 and 6 are cross-sectional views of the assembly shown in FIG. 3;

FIG. 6*a* is a greatly enlarged fragmentary view of part of the assembly shown in FIG. 6;

FIG. 7 is a pictorial view of a second embodiment of the present invention;

FIG. 8 is an exploded pictoral view of the parts of the lock assembly of FIG. 7 omitting one retainer clip;

FIG. 9 is a sectional view of the lock assembly of FIG. 7; and

FIGS. 10 and 11 are cross-sectional views of the lock assembly of FIG. 9.

DETAILED DESCRIPTION

Referring to FIGS. 1 through 4, a retainer cylinder 10 is rotatably mounted within the bore 12 of a housing cylinder 14. Housing cylinder 14 is formed with an enlarged integral facing flange 16 and has a pair of oppositely disposed flat surfaces 18, 20 (FIG. 6) in which are formed pairs of locking grooves 17, 19 and 21, 22. Grooves 21, 22 respectively receive the oppositely disposed legs 24, 26 of a housing retainer clip 28 (not shown in FIG. 2). Housing retainer clip 28 is formed with an angulated flange 30 (FIGS. 3 and 4) that facilitates insertion of the retainer clip legs in the grooves 21, 22 without the use of tools. The legs of the housing retainer clip 28 are bent to a small degree as shown in FIGS. 1, 3 and 4 so as to resiliently press against a door panel 32 to which the locking assembly is mounted. The locking assembly is secured to the door panel by clamping the latter between the facing flange 16 of the housing cylinder and the housing retainer clip 28. Legs 24, 26 of the retainer clip are forced into the grooves in the housing cylinder flats 18, 20 after the body of the housing cylinder is inserted through an appropriate aperture of the door panel 32.

Housing cylinder 14 is formed with a longitudinally extending groove 36 in which is mounted an elongated spring element 38. Spring 38 has end portions 40, 42 that are captured within and bear upon the bottom (outermost portion) of the groove 36 of housing cylinder 14. An intermediate section 44 of the spring 38, in unstressed position, projects from the groove 36 of the housing cylinder 14 into a recess 46 that extends for a major portion of the length of retainer cylinder 10. Recess 46 has the bottom or radially inner side thereof in communication with a keyway 48 that runs from a front facing surface 50 of the retainer cylinder through a major portion of its body. Keyway 48 is shaped with a suitable irregular cross-section to uniquely receive the body of a key 52 which operates in a fashion to be described more particularly hereinfter.

Slidably mounted for radial motion in the recess 46 of retainer cylinder 10 is a dog 56 formed with a substantially T-shaped cross-section. Dog 56 has an outwardly convex transverse arm 58 and a radially inwardly depending leg 63 that extends into an upper portion of the keyway.

To provide a more compact and dimensionally stable assembly, the opposite longitudinally extending sides of

the bottom portion of recess **46** are formed with longitudinally extending grooves **45, 47** to receive depending flanges **57, 59** of the transverse arm **58** of dog **56.** An enlarged detail of part of this configuration is shown in FIG. **6***a*. With this arrangement, greater rigidity of the dog is provided and the dog is firmly positioned within the recess **46** of the retainer cylinder when the apparatus is in locked position. Further, the uppermost surface of the cross arm **58,** when the key is inserted, extends to the outer cylindrical periphery of the retainer cylinder and thus, beyond the outermost edge of recess **46.** Nevertheless, the depending flanges **57, 59,** in this unlocked position, will still extend into the recess **46** (see FIG. **6**a) so as to prevent any inadvertant circumferentially directed motion of the dog **56** relative to the retainer cylinder **10** as the cylinder is rotated with respect to the housing cylinder. In other words, the flanges **57, 59** keep the dog **56** from being displaced laterally of recess **46** to a position from which it would not be readily returned to the locking position.

Retainer cylinder **10** is formed with a projecting necked-down stub shaft **60,** preferably of non-circular or rectangular cross-section as indicated, for reception of a locking tongue or cam **62** having a rectangular aperture **61** that snugly receives the rectangular cross-section stub shaft **60.** A washer **64** of low-friction material is interposed between cam **62** and the larger diameter body portion of retainer cylinder **10** to provide a smooth sliding surface against the end of the housing cylinder **14.** Washer **64** has a rectangular aperture **65** that mates with the rectangular cross-section of the necked-down stub shaft **60.** Cam **62** is retained upon the stub shaft **60** by means of a second retainer clip **66** having legs **68, 70** and an angulated flange **72.** Retainer clip **66** is substantially identical to retainer clip **28** except that the former is smaller than the latter so that legs **66, 70** will be clamped and locked in oppositely disposed grooves **74, 76** of the necked-down stub shaft **60** of the retainer cylinder **10.**

The door **32** of which a section is shown in FIGS. **3,** 4 and **5** has a relatively great thickness such as may be found in a panel door that is insulated or otherwise built up. For use with a door of such thickness retainer clip **28** is inserted in grooves **21, 22** of flats **20, 18.** For use with a sheet metal panel door, such as a door formed of aluminum or other metallic panel having a thickness of **0.024** inches, for example, the retainer **28** is inserted in the grooves **17, 19** which are positioned closely adjacent facing flange **16** of the housing cylinder **14.** Thus, the locking assembly may be used alternatively with a thick door as shown in FIGS. **3** and **4** or with a thin sheet metal door when the retainer clip **28** is positioned in grooves **17, 19** that are located closer to the facing flange **16.**

Relative rotation of the retainer cylinder within the bore of the housing cylinder is limited by interaction of cooperating abutment means formed on the two relatively rotatable parts. These abutment means comprise a stop **76** having abutment shoulders **78, 80** formed on an inner portion of the housing cylinder **14** within the facing flange **16.** The stop **76** of the housing cylinder cooperates with a mating stop **84** formed on the retainer cylinder and having shoulders **86, 88** (FIG. **5**).

Although the lock assembly shown in FIGS. **1** through **6** obviously may be made in many different sizes, it is readily fabricated in a small size by molding. For example, housing cylinder **14** may have a total length of about 0.9 inches and a maximum transverse dimension of 0.9 inches. The outer diameter of retainer cylinder **10** and the diameter of the bore of the housing cylinder are each 0.5 inches with sufficient tolerance to provide a snug but rotatable fit. The overall length of the locking assembly, except for outwardly projecting flange **72** of the second retainer clip **66,** is approximately 1.1 inches. Preferably all parts are made of a hard molded plastic excepting only the cam **62,** spring **38,** retainer clips **28, 66** and key **52,** which are made of suitable metal.

In mounting of the locking assembly to the door indicated at **32** in FIGS. **3** and **4,** the assembly of the housing cylinder, retainer cylinder, dog and spring is inserted through a suitable aperture in the door and housing retainer clip is then mounted to the mating grooves of the flat sides of the housing cylinder to firmly secure the housing to the door. Suitable retainer clip fasteners, such as nails, screws or rivets (not shown) are inserted through one or more holes **29** in the retainer clip to fix the latter, and thus the entire assembly to the door. Washer **64,** cam **62** and retainer clip **66** are then mounted upon stub shaft **60** and assembly is complete.

In the latched position illustrated in FIG. **3,** the key **52** is withdrawn from the keyway **48** and the transverse arm **58** of the dog **56** is pressed radially inwardly toward the bottom of recess **46** by the intermediate portion **44** of spring **38.** In this position, the intermediate portion **44** of spring **38** enters the recess **46.** The spring has its ends **40, 42** normally captured within the groove **36.** In the latched position illustrated in FIG. **3,** the intermediate section **44** of the spring is also captured within the upper portion of the recess **46** of the retainer cylinder. Accordingly, relative rotation of the retainer cylinder and the housing cylinder is prevented by the spring. Since cam **62** is mounted to the retainer cylinder stub shaft **60** against rotation relative to the shaft **60,** this cam is likewise locked against rotation relative to the housing cylinder **14.**

To unlock the locking assembly, key **52** is inserted in keyway **48** so that a beveled surface **53** at the upper front edge thereof will cooperate with a cam surface **65** formed on the front end of the depending leg of the T-shaped dog **56** to force the dog radially outwardly against the urging of spring **38.** The parts are so dimensioned that when the key is fully inserted as shown in FIG. **4,** the radially outermost surface of the crossarm **58** of dog **56** lies substantially upon or slightly above or without the outer cylindrical surface of the retainer cylinder **10** (see FIG. **6***a*). Thus, the intermediate section **44** of spring **38** is urged radially outwardly so as to completely clear the recess **46** and allow relative rotation of the retainer cylinder within the housing cylinder bore. The retainer recess **46** and the dog cross arm are both wider than the groove **36** of the housing cylinder. This relation performs a two-fold function. It prevents the spring **38** from being erroneously assembled in the recess (since the spring is only as wide as groove **36**). Further, it limits the radially outward displacement of the dog **56** (and prevents the latter from entering groove **36**) by abutment of the outer edges of the dog cross arm with the housing cylinder bore at edges of groove **36.**

Although the parts may be made with a limited degree of motion of 90°, 180° or some other amount, it is preferred to limit the relative rotation to 90° as best shown in FIG. **5.** As illustrated in this Figure, the key-

way **48** is substantially vertical when the parts are in locked position. Further motion of the retainer cylinder in a counter-clockwise direction (as viewed in FIG. **5**) relative to the housing cylinder is limited by engagement of stop shoulders **78, 88.** With the key inserted as shown in FIG. **4,** the retainer cylinder may be rotated clockwise relative to the housing cylinder through 90° to the dotted line position shown in FIG. **5** wherein relative motion is limited by engagement of stop shoulders **80, 86.** In this position, the keyway is substantially horizontal so that a visual indication is available of the locked or unlocked condition of the assembly without the ambiguity that would exist if 180° of motion were possible.

The above-described locking assembly illustrated in FIGS. **1** through **6** is useful in a variety of applications and is particularly adapted for baggage compartments and the like, wherein a measure of security against unauthorized opening is desired. Unlocking of the assembly of FIGS. **1** through **6** requires the insertion of a key that will mate with the cross-sectional configuration of keyway **48** and accordingly, cannot be readily achieved without the key. For some situations such as for storage compartments for utilities, it is often desirable to provide a positive latch for the door that may be readily unlatched and opened without the use of a special key or tool. Such a requirement is of particular use in connection with compartments for storage of volatile materials and fuels. For use in such a situation, the lock assembly of FIGS. **1** through **6** is modified as illustrated in FIGS. **7** through **11.** In the embodiment of FIGS. **7** through **11,** the housing cylinder **114** is identical to the housing cylinder **14** of the embodiment described above and may be used interchangably therewith. Housing **114** includes a facing flange **116** having an abutment **176,** a pair of oppositely disposed flat surfaces **118, 120,** a longitudinally extending groove **136** in its bore and pairs of grooves indicated at **119, 122** in the respective flats **118, 120,** all being identical to the corresponding elements of FIGS. **1** through **6.** Also included for the use of the housing cylinder **114** is a housing retainer clip **128** identical to clip **28** of the first embodiment. This clip is not shown in the exploded view of FIG. **8.**

In the embodiment of FIGS. **7** through **11,** the retainer cylinder **110** is likewise formed with a retainer cylinder recess **146** which in locked position mates with (but is wider than) the longitudinally extending groove **136** of the housing cylinder. Retainer cylinder recess **146** extends for substantially the full length of the main body portion of the retainer cylinder **110.** The latter, like the corresponding cylinder in the prior embodiment is formed with an integral projecting necked-down stub shaft **160** of irregular cross-section such as the rectangular cross section illustrated, having retainer clip receiving grooves **174, 176** receiving the legs of a second retainer clip **166.** Mounted on the projecting stub shaft **160** are a friction minimizing washer **164** and a locking cam **162,** all constructed and arranged just as are the corresponding components of the embodiment of FIGS. **1** through **6.** Although the stub shaft **160** may be made hollow in each of the embodiments, it also may be made solid if deemed necessary or desirable for either or both the described arrangements.

In the arrangement of FIG. **7,** the latching means that is mounted to the retainer cylinder cooperates with the groove **136** in the housing cylinder and is formed of a spring **138** having end portions **140, 142** and an intermediate portion **144.** Intermediate portion **144** is apertured as at **145** to receive the shank **163** of a cam pin **156** having a substantially hemispherical head **158.** Recess **146** is formed with a radially extending bore **147** that slidably receives the depending shank or leg **163** of cam pin **156.**

Integrally formed on one end of the retainer cylinder **110** is a knob or handle **152.**

The embodiment of FIGS. **7** through **11** is mounted to a door in the manner described in connection with the embodiment of FIGS. **1** through **6.** It may be noted at this point that where the locking assembly is to be mounted to a thin panel door such as a door of sheet metal and the like, the entire locking assembly excepting only the housing retainer clip **128** may be fully assembled and the apparatus maneuvered to insert first the free end of the cam and then the corresponding part of the housing through the aperture in the thin door panel, whereupon retainer clip **28** may be affixed to the housing to secure the entire assembly in position.

In the locked position illustrated in FIG. **9** and in full lines in FIG. **11,** the end **158** of the cam pin is urged radially outwardly of recess **146** by the action of the spring **138** to thereby protrude and extend into the groove **136** formed in the housing cylinder **114.** Thus, the cam pin, which is at all times captured within the recess **146** and its depending bore **147,** is also captured (in locked position) in the groove **136** of the housing cylinder. Forcible rotation of the handle **152** in a clockwise direction relative to the housing cylinder (as viewed in FIG. **11**) causes the rounded head **158** of the cam pin to be cammed out of the groove **136** to thereby be moved radially inwardly with its shank **163** sliding inwardly of the bore **147,** whereby the parts may assume the position illustrated in dotted lines in FIG. **11.** In this dotted-line position, the apparatus is unlatched and the longitudinal extent of handle **152** will be in a vertical position (with the orientation shown in the drawings). This once again provides a visual indication of the latched or unlatched condition of the assembly. Just as in the embodiment of FIGS. **1** through **6,** cooperating stop shoulders **176, 184** on the housing cylinder and retainer cylinder respectively, limit the relative rotation of the cylinders through 90° to and between the positions illustrated in FIG. **11.**

To again lock the apparatus of FIGS. **7** through **11,** the handle **152** is rotated in a counter-clockwise direction as viewed from the front of the assembly, through the illustrated 90° angle to a position wherein the urging of spring **138** will once again move the head **158** of the cam pin to project from the recess **146** and to be partly captured within the groove **136** whereby the parts are once again in the latched position.

It will be seen that there have been described simple, reliable, effective and inexpensive arrangements for locking assemblies which can be operated either with or without a key in different embodiments but which nevertheless, can employ the identical housing cylinder in either arrangement.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

What is claims is:

1. A lock assembly comprising a housing cylinder having a bore and a radially inwardly facing longitudinally extending groove formed therein,

a retainer cylinder mounted for rotation in said bore and formed with a radially outwardly facing recess,

a resilient latch assembly having a first portion secured to one of said cylinders and a second portion detachably secured to the other of said cylinders to thereby lock said retainer cylinder against rotation within the bore of said housing cylinder, said resilient latch assembly comprising an elongated flat spring element having first and second end sections captured within said housing cylinder groove and having an intermediate section offset from said end sections and detachably captured within the recess of said retainer cylinder,

means for selectively releasing the engagement of said second portion of said resilient latch assembly from engagement with the other of said cylinders,

said means for releasing the engagement of said second portion of said resilient latch assembly comprising a dog mounted to said retainer cylinder for movement radially thereof and having an outer portion thereof in contact with said intermediate section of said spring element, and

means for shifting said dog radially outwardly of said retainer cylinder to move said intermediate section of said spring element out of said recess and thereby allow relative rotation of said retainer cylinder within the bore of said housing cylinder.

2. The latch assembly of claim 1 wherein said dog has a substantially T-shaped cross-section formed with a radially extending leg and an outwardly convex transverse arm having said outer portion, wherein said recess has a radially extending slot formed in an inner portion thereof, said slot extending longitudinally of said retainer cylinder, said leg of said dog being slidably mounted in said slot and said transverse arm of said dog being in contact with said intermediate section of said spring element, and wherein said means for releasing engagement of the second portion of said latching assembly comprises said dog and an unlocking means detachably inserted into said retainer cylinder slot for camming said dog radially outwardly to thereby move said intermediate section of said spring element out of said recess.

3. The latch assembly of claim 2 wherein said transverse arm has a pair of depending flanges extending into said recess when said outermost portion of said arm is displaced outwardly of the periphery of said retainer cylinder.

4. The latch assembly of claim 2 wherein said recess and said transverse arm are wider than said groove, whereby said dog cannot inadvertently enter said groove.

5. A latch assembly comprising

a housing cylinder having a bore,

an inwardly facing longitudinal groove formed in said bore,

a retainer cylinder rotatably mounted within said bore and having a radially outwardly facing longitudinal recess formed therein,

a longitudinally extending keyway formed in said retainer cylinder communicating with said recess and with one end of said retainer cylinder,

a dog mounted within said recess for radial movement relative to said retainer cylinder, said dog comprising an elongated substantially T-shaped cross-section member having a depending leg slidably received in said retainer cylinder keyway and having an outwardly convex cross-arm extending across said keyway within said retainer cylinder recess,

a longitudinally extending spring resiliently compressed between said dog and said housing cylinder groove and having portions thereof captured within said groove, said spring having a latching portion captured within said recess, and

cam means adapted to be inserted into said retainer cylinder keyway for urging the dog radially outwardly to thereby radially outwardly displace said spring element latching portion from said retainer cylinder recess.

6. A latch assembly comprising

a housing cylinder having a bore,

an inwardly facing longitudinal groove formed in said bore,

a retainer cylinder rotatably mounted within said bore and having a radially outwardly facing recess formed therein,

a longitudinally extending keyway formed in said retainer cylinder communicating with said recess and with one end of said retainer cylinder,

a dog mounted within said recess for radial movement relative to said retainer cylinder, said dog comprising an elongated substantially T-shaped cross-section member having a depending leg slidably received in said retainer cylinder keyway and having an outwardly convex cross-arm extending across said keyway within said retainer cylinder recess,

a spring resiliently compressed between said dog and said housing cylinder groove and having portions thereof captured within said groove, said spring having a latching portion captured within said recess,

cam means adapted to be inserted into said retainer cylinder keyway for urging the dog radially outwardly to thereby radially outwardly displace said spring element latching portion from said retainer cylinder recess,

said cross arm being formed with depending flanges on opposite sides thereof, said flanges extending into the recess of said retainer cylinder to prevent lateral displacement of said dog when the latter is moved radially outwardly to displace said spring element from said recess.

7. The lock assembly of claim 6 wherein said recess is formed with longitudinally extending grooves for receiving said depending flanges when said dog is urged into said recess by the resiliently compressed spring.

8. A latch assembly comprising

a housing cylinder having a bore,

an inwardly facing longitudinal groove formed in said bore,

a retainer cylinder rotatably mounted within said bore and having a radially outwardly facing recess formed therein,

a longitudinally extending keyway formed in said retainer cylinder communicating with said recess and with one end of said retainer cylinder,

a dog mounted within said recess for radial movement relative to said retainer cylinder, said dog comprising an elongated substantially T-shaped

cross-section member having a depending leg slidably received in said retainer cylinder keyway and having an outwardly convex cross-arm extending across said keyway within said retainer cylinder recess,

a spring resiliently compressed between said dog and said housing cylinder groove and having portions thereof captured within said groove, said spring having a latching portion captured within sais recess,

cam means adapted to be inserted into said retainer cylinder keyway for urging the dog radially outwardly to thereby radially outwardly displace said spring element latching portion from said retainer cylinder recess,

said cross member and said recess both being wider than said groove.

9. The lock assembly of claim **5** wherein said spring comprises a substantially flat elongated spring body having first and second end portions displaced from the plane of the main body thereof, said end portions being captured within the groove of said housing cylinder and a portion of said main body being resiliently urged into said recess and toward said dog for engagement with the convex cross arm thereof.

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