United States Patent [19]

Falk

[11] **3,855,824**

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[54] **KEY RETAINING LOCK**

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[73] Assignee: **Fort Lock Corporation,** River Grove, Ill.

[22] Filed: **Dec. 10, 1973**

[21] Appl. No.: **423,167**

[52] **U.S. Cl.** ..... **70/38 A,** 70/49, 70/389

[51] **Int. Cl.**.. **E05b 11/00,** E05b 67/06, E05b 67/22

[58] **Field of Search** ..... 70/30, 49, 38 R, 38 A, 70/38 B, 25, 389

[56] **References Cited**

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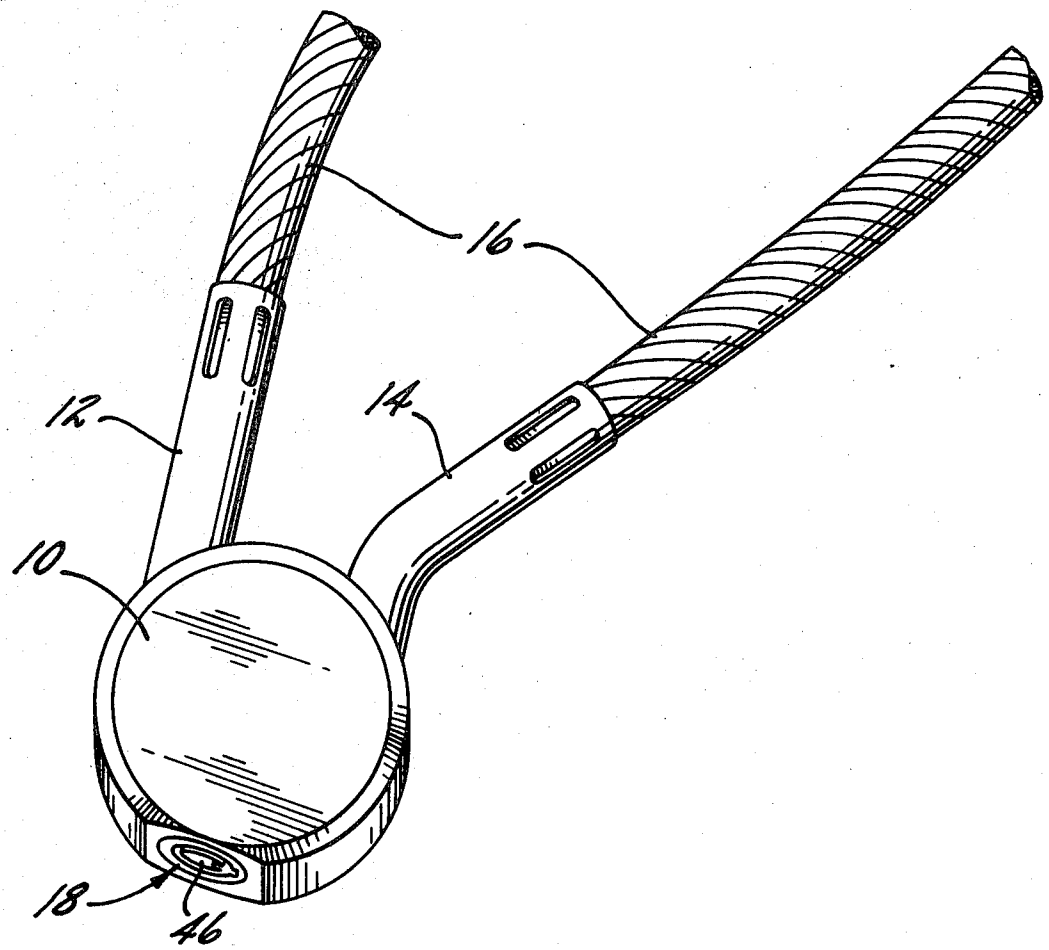
Primary Examiner—Robert L. Wolfe

Attorney, Agent, or Firm—Wolfe, Hubbard, Leydig, Voit & Osann, Ltd.

[57] **ABSTRACT**

A locking device of the type having a padlock body and a split shackle for receiving a flexible cable or the like attached to the shackle parts, wherein one of the shackle parts remains fixed to the lock body while the other is detached by the key actuated lock and provision is made for preventing the removal of the key when the lock is opened and the removable shackle part is separated from the lock body. Return of the lock to the key removal position is permitted only when the removable shackle is properly in place so that it is positively assured that locking has been completed when the key is removed.

6 Claims, 8 Drawing Figures



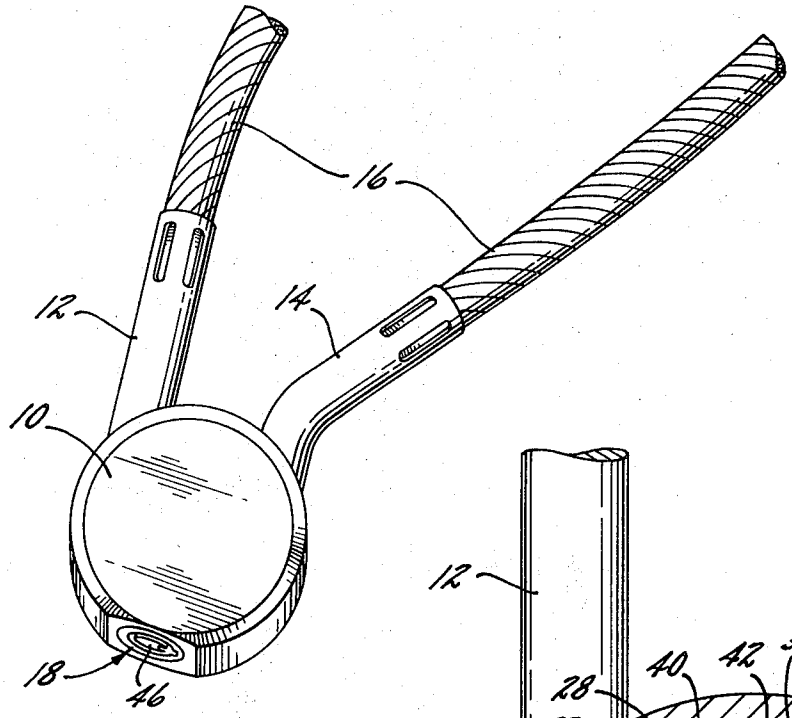


Fig. 1.

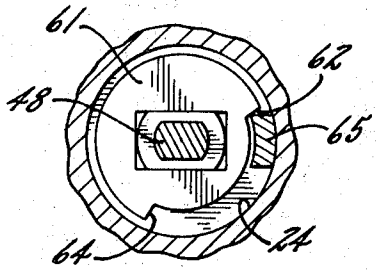


Fig. 3.

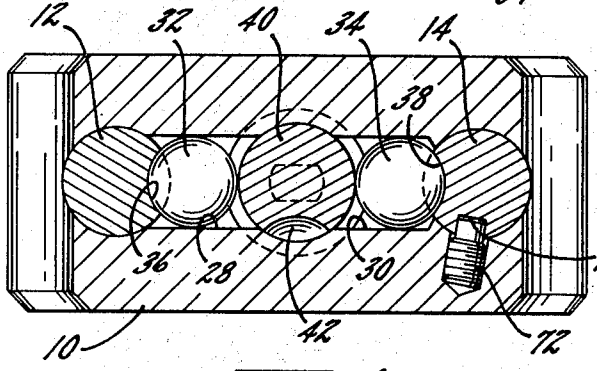


Fig. 4.

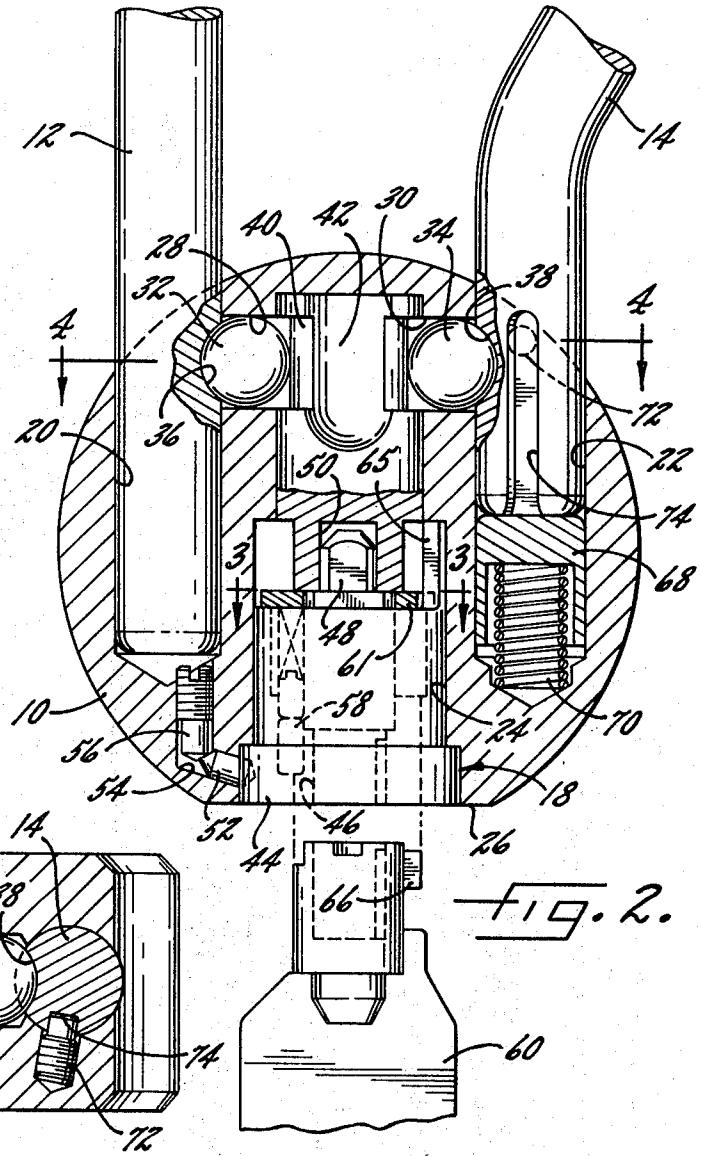


Fig. 2.

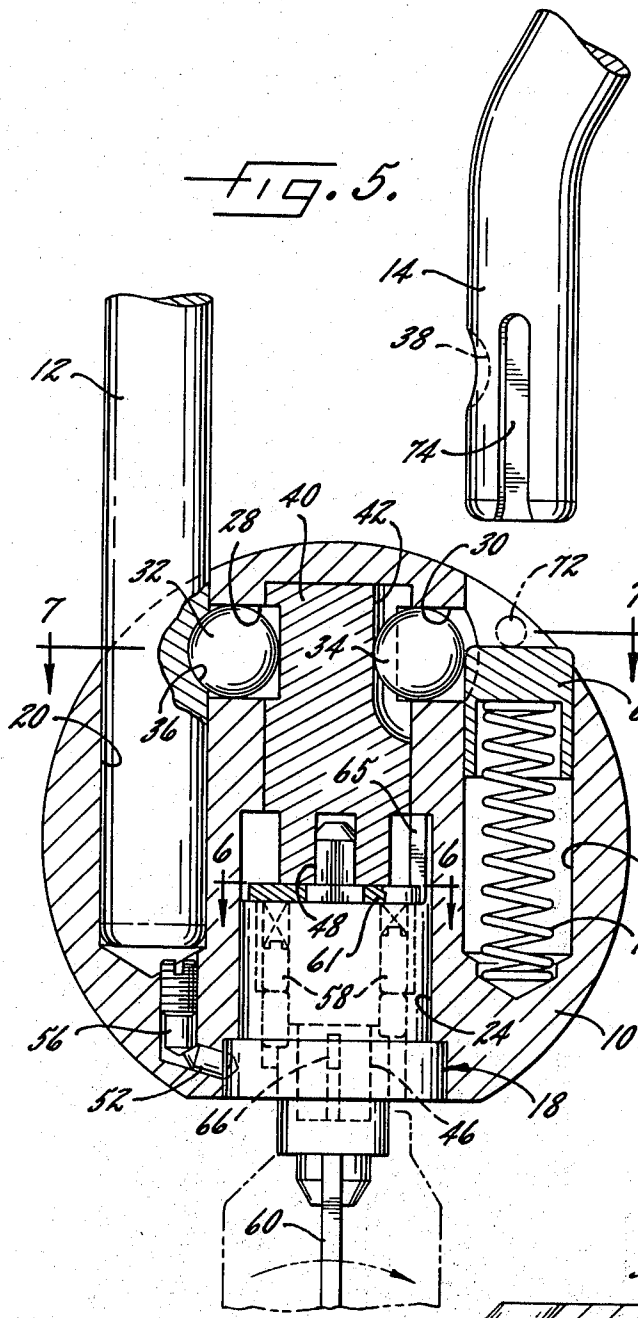


Fig. 5.

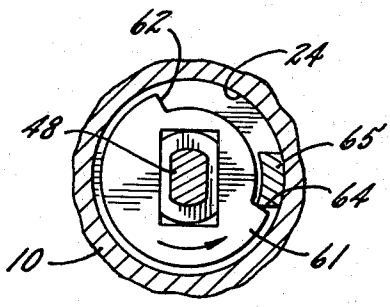


Fig. 6.

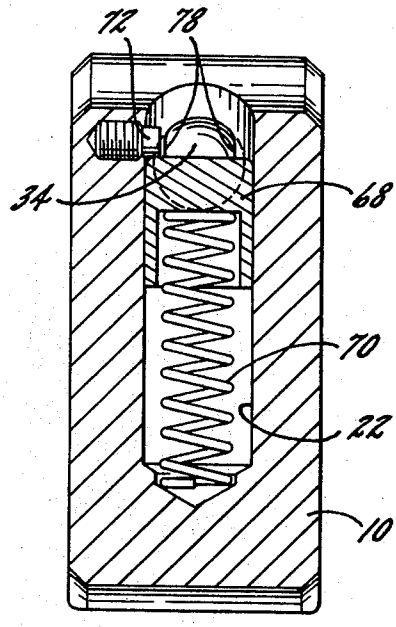


Fig. 8.

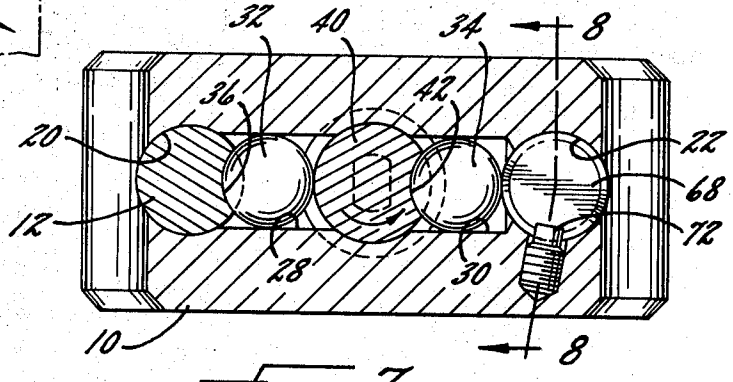


Fig. 7.

KEY RETAINING LOCK

DESCRIPTION OF THE INVENTION

This invention relates generally to split shackle padlocks and more particularly concerns a split shackle lock with a key retaining means for preventing removal of the key when the lock is open and insuring that the shackle is properly replaced and locking occurs when the key is removed.

With the increasing use of bicycles, for example, there is a greater need for locking devices that may be used to secure them against thefts. One type of lock which has found increasing favor for such use is the split shackle padlock where the shackle components are interconnected with a length of flexible cable or the like. In the split shackle lock, one of the shackle ends remains fixed to the padlock body while key operation of the lock releases the other shackle component from the lock body so that the cable may be threaded around and through the bicycle wheels and frame as well as being secured to a fixed object.

One problem that has arisen in connection with such split shackle locks is that the user while opening the lock with a key, then removes the key and may try to insert the free shackle end into the lock body to resecure the lock. Situations may be incurred where users do not fully insert the free shackle in place to fulfill the locking action and after leaving, a theft could occur because the lock was found to come open by a curious handling of the lock.

In conventional single piece shackle locks, inclusion of the feature of retaining the key in the lock until the shackle is snapped shut to locking position, is controlled at the end of the shackle which does not come free of the lock. It is heretofore been considered a problem to achieve this key retaining function with a split shackle lock and no satisfactory arrangement has heretofore been made for controlling such function at the removable shackle side of the lock.

It is therefore the principal object of the invention to provide a padlock which is of the split shackle type that permits removal of the key only when the free or removable shackle side is fully inserted in the lock and in locking position.

It is a related object to provide a lock of the foregoing type wherein such key removal prevention means is associated with the removable shackle side of the lock.

It is another object to provide a split shackle lock of the foregoing type wherein positive locking to hold the free or removable shackle in place is accomplished by returning the key to the locking position.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. **1** is a view in perspective generally showing a lock embodying the present invention with only a fragmentary portion of the flexible cable being shown;

FIG. **2** is an enlarged partial sectional view of the lock portion of the device shown in FIG. **1**, showing the interior parts and illustrating a key to be inserted into the lock;

FIG. **3** is a sectional view taken substantially in the plane of line **3—3** in FIG. **2** and showing the cam which limits the rotation of the key between the lock and unlocked positions;

FIG. **4** is a sectional view taken substantially in the plane of line **4—4** in FIG. **2** showing a position of the lock parts in a locked state;

FIG. **5** is a sectional view similar to that of FIG. **2** here showing the key inserted and the lock in the open position with the removable shackle portion released from the lock body;

FIG. **6** is a sectional view taken substantially in the plane of line **6—6** in FIG. **5** here illustrating the cam in the open position;

FIG. **7** is a sectional view taken substantially in the plane of line **7—7** in FIG. **5** showing the position of the lock parts in the open state; and

FIG. **8** is a sectional view taken substantially in the plane of line **8—8** in FIG. **7**.

While the invention will be described in connection with a preferred embodiment, it will be understood that it is not intended to limit the invention to that embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention.

Turning to the figures, there is shown, in FIG. **1**, a typical locking device incorporating the present invention, the lock here being a padlock **10** having a confined shackle **12** and a removable shackle **14**, the latter being removable upon the opening of the lock. A flexible cable **16**, shown only in part, interconnects the shackles **12, 14.**

Where the flexible cable **16** is selected from sturdier materials with larger diameters to be more resistant against cutting, flexibility is diminished and it has been found to be desirable to angle or bend the shackle **14** to make it easier for insertion in the lock body **10.**

In the present instance, the locking device generally indicated at **18** is of the axial pin tumbler type since it provides a rugged lock of high security, and the axial orientation of the pins, the annular keyway and other factors make the lock hard to pick or otherwise open by unauthorized means. Locks of this general type are illustrated in U.S. Pat. Nos. 3,041,086 and 3,509,748. It will be understood, however, as the discussion proceeds that the present invention is not limited to use with axial pin tumbler type locking devices but other types of key retaining locks may be used if desired.

Referring to FIG. **2**, the lock body **10** is provided with a pair of spaced apart bores **20, 22** extending from the top of the lock body and adapted to receive respective shackle portions **12, 14.** A stepped bore **24** extending in from the opposite end of the lock body **10,** which may be flattened as indicated at **26,** is arranged with the bore **24** being disposed between the shackle receiving bores **20, 22.** A pair of transverse passages **28, 30** interconnect the stepped bore **24** with respective bores **20, 22** adjacent the top of the lock body **10.**

In order to secure the shackles **12, 14** in their respective bores **20, 22,** there is provided a pair of hardened metal balls **32, 34** disposed in respective passages **28, 30** with the outer surfaces of the balls bearing against respective indentations **36, 38** in shackles **12, 14.** The inner surfaces of the balls **32, 34** bear against the peripheral surface of a retaining member **40** disposed within the upper end of the bore **24.** The arrangement is such, as best shown in FIG. **4,** that the balls **32, 34** are held captive against the retaining member **40** and the indentations **36, 38** of shackle members **12, 14** which offer no clearance for the shackles to be removed from the lock body **10.**

In order to permit removal of the shackle **14,** an indentation **42** is provided on the retaining member **40** so that when the retaining member is rotated to a position where the indentation **42** is aligned with the ball **34,** (FIGS. **5** and **7**) ball **34** may move inwardly sufficient to clear the indentation **38** on shackle **14,** thus allowing shackle **14** to be removed from the lock body.

In the illustrated device, as shown for example in FIG. **2,** the lock mechanism **18** includes a casing **44** and a spindle **46** mounted for rotation within the casing. The inner end of the spindle **46** carries a protruding flat sided pin **48** which is received in a corresponding opening **50** in the retaining member **40.** Accordingly, when the spindle **46** is rotated within the lock casing **44** the retaining member **40** is also rotated to bring the indentation **42** in alignment with ball **34** for releasing the shackle **14.** In order to secure the lock casing **44** to the lock body **10,** a pin **52** received in a dog leg passage **54** is held against the lock casing **44** by a set screw **56.**

The lock mechanism **18** is secured against unauthorized operation by a number of tumbler pins **58** arranged circumferentially around the axis of the lock mechanism which prevent rotation of the spindle **46** until a proper key **60** is inserted and aligns the tumbler pins with a radially oriented interface between the casing and the spindle. For details of the axial pin tumbler lock mechanism of the type useful in the present lock, reference is made to the aforementioned U.S. Pat. Nos. 3,415,086 and 3,509,748.

In order to limit the degree of rotation of the lock spindle **46** and the retainer **40** so that the indentation **42** may not be moved in alignment with ball **32** to release the fixed shackle **12,** a cam plate **61** (FIGS. **2** and **3**) is carried by the pin **48** and has abutment shoulders **62, 64** which act against a fixed stop **65** that limits the rotation of the spindle to 90° (FIG. **6**).

In accordance with the present invention, provision is made for preventing rotation of the retaining member **40** when the shackle **14** has been removed and the key **60** within the lock is turned to the lock open position from which it cannot be removed until the shackle **14** is replaced and the key returned to the lock position. It will be appreciated that the key **60** includes a lug **66** (FIG. **2**) which allows the key to be inserted in the keyway when the locking mechanism is locked, but when the key is turned 90° to the open position lug **66** prevents its removal from the keyway.

In accordance with the present invention, as best shown by reference to FIGS. **5** and **8,** a plunger member **68** disposed in shackle bore **22** is normally urged upwardly by spring **70** so that the plunger moves upwardly when shackle **14** is removed and engages the outer surface of ball **34.** This action urges the ball **34** against the indentation **42** of retaining member **40** preventing the rotation of the latter by the key and consequently the key is held captive in the unlock position and cannot be removed from the keyway. The upper limit of travel of the plunger member **68** is limited by a pin **72** shown here as threadably received in the lock body **10.** It will be appreciated, however, that the pin may be force fit or otherwise secured to the lock body to prevent its removal.

In accordance with another aspect of the present invention, the pin **72** in conjunction with a polarizing slot **74** on shackle **14** insures proper guiding and orientation of the shackle **14** for insertion in the bore **22** to align the indentation **38** with the ball **34** as required for locking. The spring pressure of spring **70** is properly selected so that the plunger member **68** is not too difficult to overcome when the shackle **14** is inserted to compress the plunger as shown in FIG. **2.**

In addition, the passageway **30** which holds the ball **34** is staked with flattened sides **78** (FIG. **8**) so that the ball **34** may not fall out if the plunger **68** is depressed by some means other than the shackle **14.**

I claim as my invention:

1. A locking device having a padlock body and first and second shackle parts interconnected by flexible cable or the like and having a key receiving locking mechanism which when rotated by a proper key inserted in the lock and rotated from a "lock" position to a lock "open" position, means associated with the key and locking mechanism prevents removal of the key, the combination comprising, rotatable retaining means connected to said lock mechanism disposed in said padlock body, said first and second shackle parts being received in bore means on opposite sides of said retaining means in the body, fixing means disposed between the retaining means and each of the shackle parts bearing against the retaining member and the shackle parts when the lock mechanism is in the "lock" position for holding said first and second shackle parts fixed to the padlock body, and said retaining means having indentation means thereon so that rotation with the lock mechanism to the "open" position aligns said indentation means with one of said shackle fixing means providing clearance therefor and the first shackle part associated therewith may be removed from the body bore means, plunger means contained within said removable shackle bore means being normally biased outwardly for movement against said shackle fixing means when the removable shackle is removed thereby holding said shackle fixing means in engagement with said retaining member indentation means and preventing rotation of said retaining member, locking mechanism and key to the "lock" position where said key may be removed from the lock.

2. A locking device as claimed in claim **1** wherein said shackle fixing means comprises a pair of hardened metal balls.

3. A locking device as claimed in claim **1** wherein said locking mechanism includes cam and stop means for limiting the rotation of said retaining member between said one shackle fixing means alignment position and an intermediate position while preventing alignment of said indentation with the other shackle fixing means.

4. A locking device as claimed in claim **1** wherein said removable shackle is bent so as to include a portion angularly oriented with respect to the portion of said shackle received in the body bore means.

5. A locking device as claimed in claim **1** wherein said removable shackle and the body bore means receiving the same includes cooperating polarizing means for orienting and guiding the shackle part into the bore.

6. A locking device as claimed in claim **5** wherein said polarizing means comprises a longitudinally extending slot in said shackle and a pin in said body projecting into said bore, said pin restraining the outward movement of said plunger means.

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