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Yereance

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[54] **LOCK HAVING FLEXIBLE SHACKLE WITH SEVERANCE ALARM**

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[52] **U.S. Cl.** **340/274;** 70/49; 340/63; 340/65; 340/232; 340/280; 340/283

[51] **Int. Cl.** **G08b 13/12**

[58] **Field of Search** ..... 340/274, 296, 280, 224, 340/63; 116/137 R, 138, 143, 153, 164, 166, 116/168, 169, 80, 79, 33; 70/30, 31, 43, 49, 275, 277, 441, 457; 200/61.76, 39, 61.79, 61.8, 61.5 A, 40, 161

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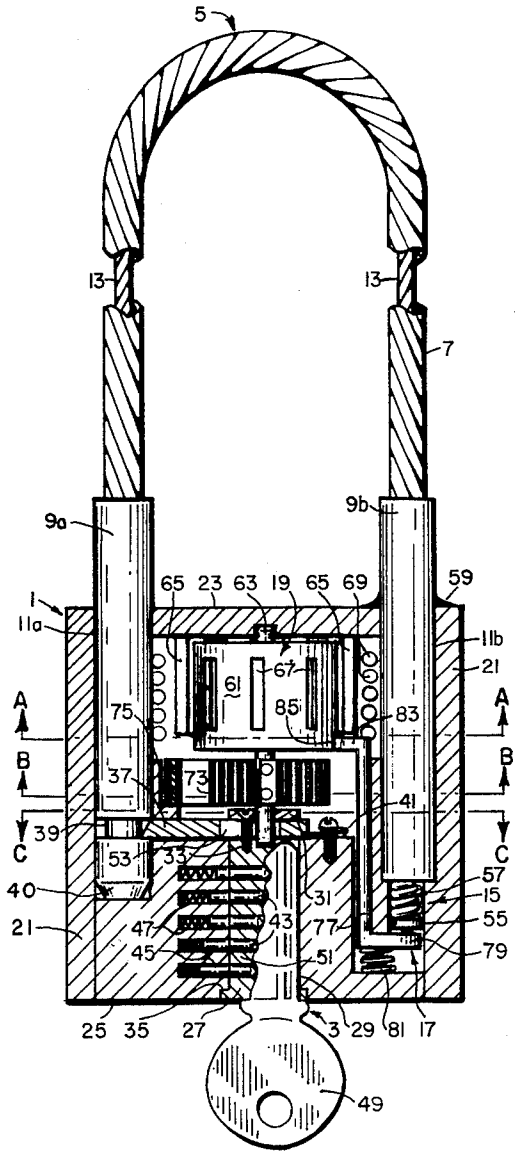
[57] **ABSTRACT**

A lock containing a flexible shackle made of a flexible outer cable and a filament loosely carried in the cable wherein the filament is under tension and including an alarm device that is released or energized in the event the filament is severed.

6 Claims, 7 Drawing Figures



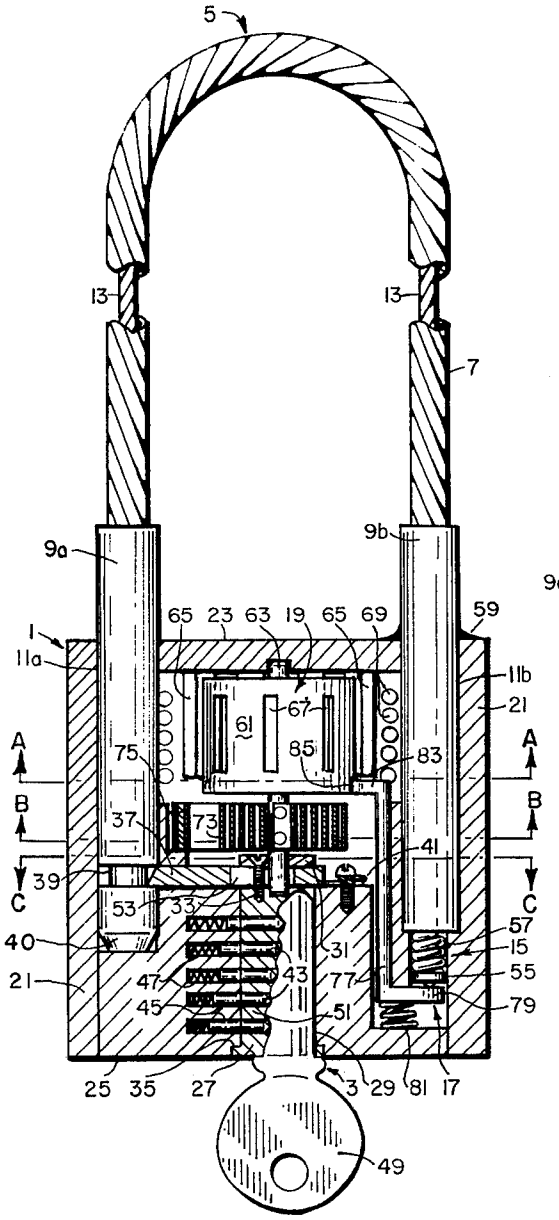


FIG. 1

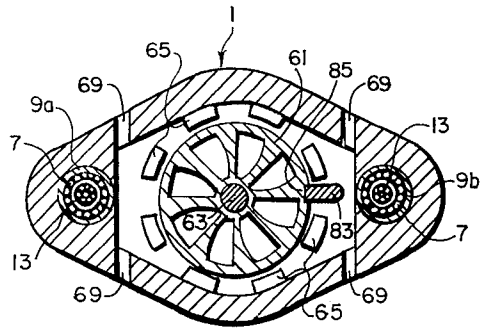


FIG. 2

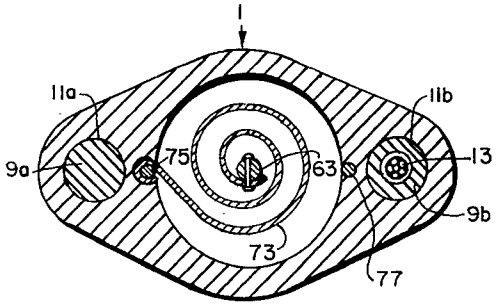


FIG. 3

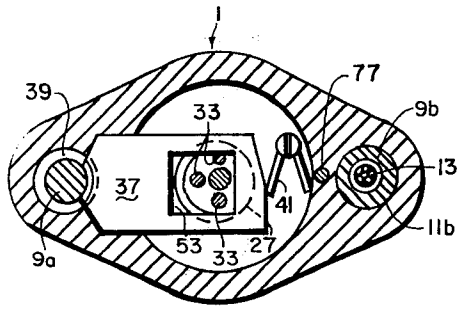


FIG. 4

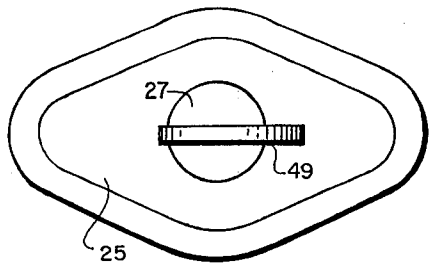
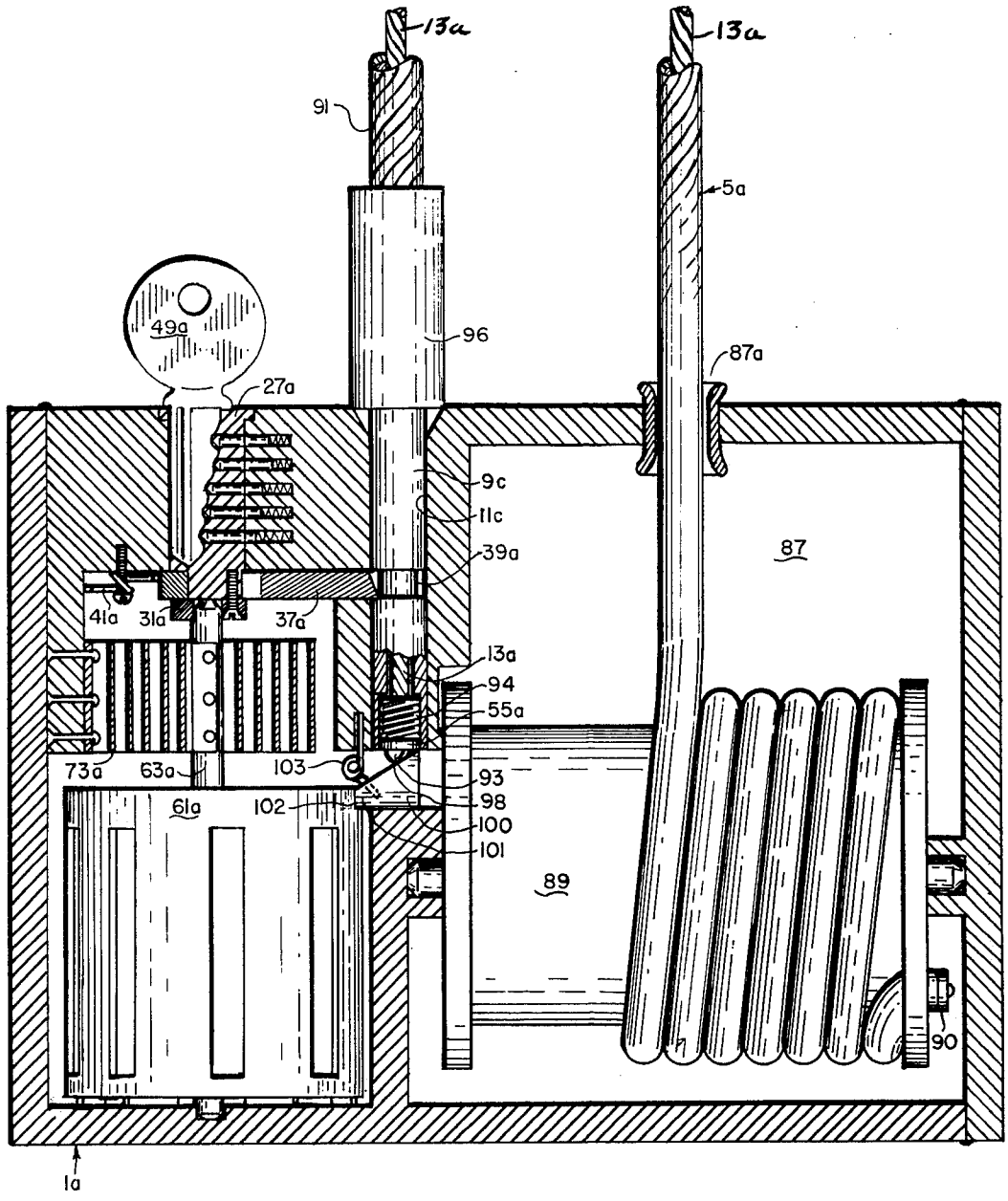


FIG. 5


13a
13a
91
5a
49a
96
87a
27a
9c
11c
39a
87
41a
31a
37a
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73a
63a
103
93
61a
102
98
100
101
89
90
1a

FIG. 6

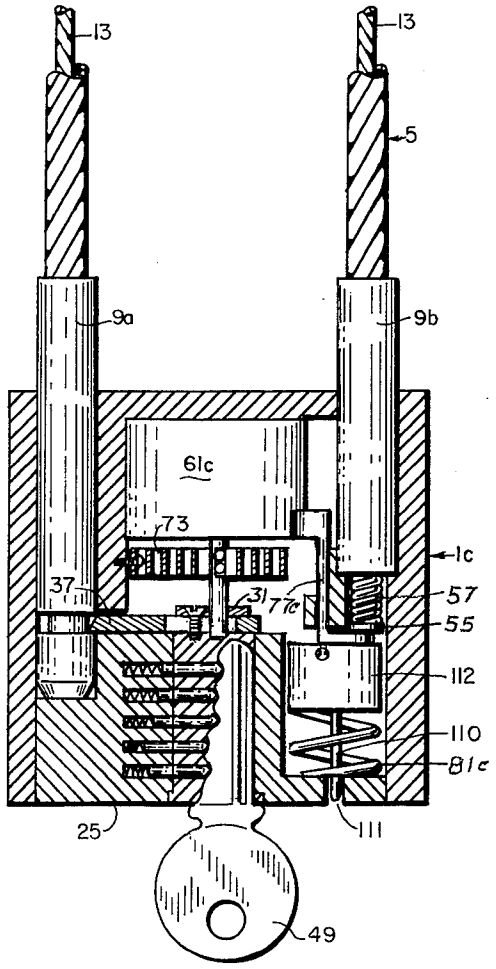

FIG. 7

LOCK HAVING FLEXIBLE SHACKLE WITH SEVERANCE ALARM

BACKGROUND OF THE INVENTION

This invention pertains to the field of security devices such as locks. More particularly, this invention pertains to a shackle-type lock wherein the ends of the shackle may be locked in a common casing, and released by manipulation of a key or numerical combination.

Security locks are one of the oldest forms of mechanical devices. Man seemingly has not been able to instill a sufficient degree of honesty in his fellow man to permit doing away with some form of securing his possessions from the hands of others.

Shackle locks in which this invention pertains are used extensively to secure a loop and hasp such as on a door, or the free ends of a cable that are wrapped about one's possession and a fixed object. Although the lock opening mechanism, i.e., the key lock or the numerical combination lock, has been developed to the point where overcoming the mechanism is rather difficult, the shackle-type lock does indeed suffer from a distinct disadvantage, that being the ease with which one may cut the shackle with a pair of common bolt shears, or hack saw.

In recent years, the increased use of bicycles and motorbikes has pointed up the ease with which shackle-type locks may be broken. A steel cable having looped ends is usually wrapped about the frame of the cycle and shackle-locked about a tree or parking post. Thieves very conveniently cut the shackle or the steel cable and make off with the vehicle. Regardless of the strength of the shackle and/or the strength of the cable used with the shackle lock, a common pair of bolt cutters will easily break these items. Some development of alarm locks has already taken place such as in automobile locks wherein the horn sounds if one attempts to forceably open the door. However, these locks can be effectively circumvented by first severing the wires to the horn and then forcing open the door or lock. There is, therefore, a serious need for a better type of shackle lock.

SUMMARY AND OBJECTS OF THE INVENTION

This invention is a shackle-type lock wherein the shackle is flexible and further where the shackle contains an inner filament that is tensioned at all times. The filament engages a trigger mechanism when locked in the lock casing. Severance at any point along the shackle releases the filament to trigger an alarm, either audible or inaudible, that will warn the owner the lock has been broken. This invention may take many forms or embodiments. The shackle may be of variable length; in one embodiment, it is capable of different lengths. The alarm device may be as simple as a siren or klaxon horn or as sophisticated as a radio-frequency oscillating device. The lock mechanism that locks and unlocks the shackle from the casing may take the form of virtually any conventional lock mechanism such as a keysplit tumbler assembly or a numerical combination lock.

One of the unique aspects of this device is that the alarm, alarm power device and lock are all conveniently arranged in the lock casing thus depriving the would-be wrongdoer from tampering with the components prior to cutting the shackle.

Succinctly stated, this invention comprises a lock casing including means for locking and unlocking a flexible shackle therein, a flexible shackle comprising a hollow cable having the ends thereof anchored in connectors that are adapted to lock in the casing and a filament of approximately equal length slideably carried inside the cable, means for tensioning the filament inside the cable, alarm means for emitting a signal including driving means therefor, and trigger means in the casing for activating the alarm means upon severance of the tensioned filament in the flexible shackle.

Therefore, the main object of this invention is a flexible shackle lock that contains its own lock severance alarm. Another object of this invention is a flexible shackle lock having a severance alarm that remains cocked and ready for use whether the shackle is locked in the lock casing or not. Still another object of this invention is a simple, low-cost security device for motorcycles, bicycles, and other objects that eliminates the need for extra cables. These and other objects will become more apparent to the reader upon reading the following description of the preferred embodiments in conjunction with the drawings appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a medial vertical sectional view of one embodiment of flexible shackle lock showing in detail the arrangement of the elements within the lock casing.

FIG. 2 is a horizontal sectional view taken along the line A—A of FIG. 1.

FIG. 3 is a similar view taken along the line B—B of FIG. 1.

FIG. 4 is another horizontal view taken along the line C—C of FIG. 1.

FIG. 5 is a bottom plan view of the lock shown in FIG. 1.

FIG. 6 is a longitudinal, vertical sectional view of a modified flexible shackle lock having a take-up reel for the flexible shackle.

FIG. 7 is a vertical sectional view taken through still another modified lock according to this invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

With respect to the drawings, FIGS. 1–5 show a preferred embodiment of this invention which comprises a lock casing or vault **1** that contains means **3** for locking and unlocking a flexible shackle **5** therein. Flexible shackle **5** comprises a hollow cable or sheath **7**, whose ends are anchored in connectors or ferrules **9***a* and **9***b* that lock into complemental bores **11***a* and **11***b* in casing **1**, and a filament **13** of approximately equal length that is slideably carried inside cable **7**. Inside casing **1** is means **15** for tensioning filament **13** and connect it through a trigger means **17** to an alarm means **19** that becomes activated when filament **13** is severed.

Lock casing or vault **1** comprises a variable geometry container made of steel or other strong material having sides **21**; top surface **23**, and bottom surface **25**. Means **3** for locking the ends of shackle **5** into casing **1** is shown to comprise a conventional lock cylinder **27** complementally received in a bore **29** formed in one surface, usually bottom surface **25**, of casing **1**. Cylinder **27** is held in casing **1** by a hold-down plate **31**, that is fastened to the innermost end of cylinder **27** by machine screws **33** (see FIG. 4), and is fashioned to ride against boss **35** cut into the bottom surface.

Between hold-down plate **31** and the adjacent end of lock cylinder **27** is positioned a latch **37** that is adapted to move transversely across the end of lock cylinder **27** and into and out of contact with a detent **39** formed in shackle connector **9a** (see FIG. **4**). A spring **41** urges latch **37** into engagement with detent **39.** The lock includes the usual split tumbler pins **43** which are movable in pin bores **45** and are urged toward lock cylinder **27** by springs **47.** Upon insertion of a proper key **49** into a complemental receiving slot formed in cylinder **27,** the split tumbler pins **43** will have their mating ends aligned along the interface **51** of lock cylinder **27** and bore **29,** thus permitting key **49** and lock cylinder **27** to be rotated with respect to casing **1.** During rotation of the cylinder **27,** one of the screws **33** engages the rear edge of a square aperture **53** formed in latch **37** and this slides latch **37** rearwardly out of contact with detent **39,** permitting shackle connector **9*a*** to be withdrawn manually from bore **11a** to thus open the lock.

Flexible shackle **5** may be of virtually any length. A length sufficient to slip through the wheel of a motorcycle and around a tree is contemplated herein and would eliminate the necessity of a secondary cable that is presently used with rigid shackle locks thereby eliminating this extra element from security locking devices. Cable or sheath **7** may be constructed of any strong material such as coiled steel wire not unlike that used in automobile manual choke cables, speedometer cables and the like. Cable **7** is anchored rigidly in members **9*a*** and **9*b*** by conventional techniques such as welding, silver solder, etc.

Connectors **9a** and **9b** are tubular metal elements having inside diameters similar to the outside diameter of cable **7** for ease in fastening them together. Connector **9*a*** differs from **9*b*** in that, as the lockable connector, its free end forms a beveled edge **40** for ease in inserting it into bore **11*a*** and further has a lock detent or restriction **39** formed therearound to receive lock latch **37.** While connector **9b** is shown to be rigidly anchored in casing **1** by a weldment **59,** it is contemplated in this invention that both connectors **9*a*** and **9*b*** may be made releasably lockable into casing **1** similar to connector **9*a*.**

Filament **13** that is slideably carried in cable **7** may similary be made of virtually any strong material that is capable of tensioning short of plastic deformation, such as a steel wire, or a series of tightly spiraled wires, etc. In the embodiment shown in FIG. **1,** cable **7** and filament **13** are rigidly anchored together in connector **9*a*** and the other end of filament **13** passes completely through connector **9b** terminating at means **15** for applying tension to filament **13.** It is contemplated however, that both ends of filament **13** may be tensioned by means **15.**

Means **15** comprises a cross-member or plate **55** rigidly attached to filament **13** and a spring **57** compressed between crossmember **55** and the nearest end of connector **9*b*.** Since connector **9*b*** is rigidly anchored in bore **11b** by a weldment **59,** compressed spring **57** attempts to pull filament **13** through cable **7** and, because filament **13** is anchored with cable **7** in connector **9*a*,** filament **13** is placed under tensile stress or tensioned.

Alarm means **19** in FIG. **1** takes the form of a high pitch whistle or siren and includes a chambered rotor or cylinder **61** mounted on a shaft **63** passing completely therethrough. The shaft **63** is journaled in top surface **23** of casing **1** and lock cylinder **27.** Fixed segmented baffles **65** are arranged in spaced apart relation about the outer wall of cylinder **61,** (see FIG. **2**). Apertures **67** are formed in cylinder **61** both vertically and transversely and react with baffles **65** during rotation of cylinder **61** to produce an audible siren-type signal. A series of holes or apertures **69** may be formed in the side walls **21** of casing **1** to improve emission of the audible signal from casing **1.**

A driving means for turning cylinder **61** is shown in FIG. **3** to comprise a spring motor which includes a coiled clock spring **73** joined at one end **75** to casing **1** and at the other end to shaft **63.**

The rotor or cylinder **61** of the siren alarm is normally held against rotation by trigger means **17** which comprises a Z-shaped locking pin **77** reciprocally mounted in casing **1** and having a rigid bottom arm **79** extending transversely therefrom immediately beneath the cross-member **55.** The pin **77** also includes at its upper end an oppositely extending catch **83** which normally engages within a notch **85** formed in the lower peripheral edge of the rotor **61.** The locking pin **77** is biased toward its rotor-locking position by a spring **81** which engages the lower trigger arm **79** of the pin **77.**

Thus, in normal operation, the free end connector **9a** of the shackle **5** may be released from or locked within the casing **1** of the lock by means of the key-actuated lock tumbler cylinder **27** and the latch plate **37** without activation of the alarm or signal mechanism, since the coaxial filament **13** will remain intact and under tension of spring **57.** However, should the shackle **5** and its filament be severed by cutting or otherwise breaking it, the spring **57** will then expand and push the button **55** and trigger arm **77** downwardly to disengage the catch **83** from the notch or recess **85** of the rotor **61.** This permits or causes the siren rotor **61** to be driven in comparatively high speed rotation by the tensioned clock spring **75** and its drive shaft **63.** High speed rotation of the chambered rotor **61** in relation to the fixed baffle segments **65** causes a high pitched whistle to be emitted from the lock casing by way of the apertures **69.**

FIG. **6** shows a slightly modified form of flexible shackle lock with severance alarm, and in which a substantially longer shackle cable is used. Since several of the parts of the modified lock shown in FIG. **6** are quite similar in structure and function to those employed in the preferred construction of FIGS. **1–5,** similar reference numerals will be used with an additional postscript letter. In this modification, the casing **1a** of the lock is substantially enlarged in its transverse dimensions to include an internal take-up reel chamber **87** which houses a springtensioned take-up reel **89.** The inner or anchored end of the shackle cable **5*a*** is fixed to the reel **89,** as at **90,** and the reel **89** normally contains thereon a number of coils or convolutions of the shackle cable **5*a*.** The cable **5*a*** exits from or enters into the chamber **87** by way of a grommeted opening **87*a*.** The loose or lockable end portion **91** of the flexible shackle cable **5*a*** is welded or otherwise securely connected to a rigid tubular connector sleeve **9*c*,** but the coaxial filament **13a** is slidable within the connector sleeve **9*c*.** The outer end of the filament **13*a*** is welded or otherwise secured to a washer or button **55*a*** having a depending, semi-spherical cam surface **93.** The filament button **55*a*** and a compressed filament-tensioning

spring **94** are normally positioned within a counterbore formed in the lower end of the connector sleeve **9***c*.

As will be noted, the connector sleeve **9***c* is arranged for insertion within the shackle-receiving bore **11***c* of the lock housing, and includes an intermediate, circumferential recess or notch **39***a* for cooperative locking engagement with the slidable, key-actuated latch plate **37***a*. The connector sleeve **9***c* may advantageously include a diametrically enlarged stop collar portion **96** which is arranged to abut the outer surface of the lock casing **1***a* when the connector sleeve **9***c* is fully inserted within the bore **11***c*.

When the connector sleeve 9c is fully inserted within the bore **11**c of the lock casing **1***a*, the cam surface **93** carried at the end of the filament **13***a* is disposed closely adjacent the inclined or beveled surface **98** of a slidable catch block **100.** The catch block **100** is formed with a reduced end portion or detent **101** which is normally held within a notch or recess **102** formed in the upper peripheral edge portion of the siren rotor or cylinder **61***a* by a bow spring **103.**

In the operation of the modified lock shown in FIG. **6**, the free end portion of the shackle cable **5***a*, which includes the connector sleeve **9***c*, may be selectively released from or locked within the lock casing **1***a* by proper activation of the key-activated locking mechanism as previously described in connection with the preferred locking mechanism shown in FIGS. **1–5.** The cable storage or take-up reel **89** is normally spring-biased to draw in and wind the intermediate portion of the flexible shackle cable **5***a* around the reel, but will readily permit a comparatively long length of the cable **5***a* to be withdrawn from the chamber **87** to accomodate a particular locking situation requiring a long shackle. When the rigid connector sleeve **9***c* of the shackle is fully inserted and locked in the bore **11***c* by the slidable latch **37***a*, the lock is then set to sound an audible siren alarm should the coaxial filament **13***a* of the shackle cable **5***a* be severed. If the filament **13***a* should be severed, the spring **94** immediately forces the cam button **93** against the inclined cam surface **98** of the catch block **100** and causes the block to shift rightwardly as viewed in FIG. **6** and to a position where the detent **101** is withdrawn from the notch **102** of the siren rotor **61***a*. The rotor **61**a is then free to rotate under the driving force of the spring motor **73**a and drive shaft **63***a* to emit the desired audible alarm. If desired, the slidable catch block **100** may be arranged so that upon severance of the filament **13***a*, it will not only release the siren rotor, but will also engage the reel **89** in such manner as to prevent rotation thereof.

FIG. **7** illustrates still another modified form of flexible shackle, severance alarm lock in which an audible alarm signal is replaced by an inaudible radio frequency signal. The lock of FIG. **7** is substantially identical in construction and operation to that shown in FIG. **1,** except that the siren rotor **61** is replaced by a rotary electric generator **61***c* which provides power for a radio frequency oscillator **112** which includes an extensible antenna extension **110.** The antenna extension **110** is suitably electrically connected in the oscillator circuit and is arranged to be extended outwardly through an opening **111** in the bottom wall **25** of the lock casing **1***c* upon severence of the filament **13** and release of the trigger pin **77***c*. As in the locks of FIGS. **1** and **6,** the motive power for the signal or alarm-producing means of FIG. **7** is supplied by a spring motor **73.** It should be understood, however, that the spring motor is illustrative of only one prefered type of motive power, and may be replaced by other equivalent means, such as a small, battery-operated, electric motor.

In view of the foregoing, it will be seen that the present invention provides a portable, flexible shackle-type lock having a self-contained, or built-in alarm or signal means adapted to be automatically activated upon breakage, cutting, or other severance of the shackle of the lock.

While preferred embodiments of the invention have been illustrated and described in detail, it will be understood that various modifications in design and details of construction are possible without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a lock, the combination of:

a. a lock casing including a locking mechanism for locking and unlocking a shackle therein;

b. a flexible shackle including an outer tubular cable having opposite ends arranged to be locked to said casing and a continuous filament slidably carried in said cable;

c. means engaged with the filament of said shackle and normally applying a tensile force thereto;

d. signal-producing means in said lock casing; and

e. trigger means in said casing connected between the filament of said shackle and said signal-producing means and arranged normally to engage and hold said signal-producing means against activation, but movable to activate said signal-producing means in response to the severance of the filament of said shackle.

2. A lock according to claim **1,** wherein the means (c) for applying a tensile force to said filament comprises a spring positioned between an end of said tubular cable and an end of said filament and biasing said end of said filament toward movement outwardly from said end of said cable, and wherein said trigger means includes a lever arm positioned adjacent said end of said filament and movable in response to the outward movement of said end of said filament.

3. A lock according to claim **1,** wherein said signal-producing means comprises a spring motor-driven whistle.

4. A lock according to claim **1,** wherein said signal-producing means comprises a radio frequency oscillator.

5. A lock according to claim **4,** wherein said radio frequency oscillator includes an antenna normally concealed in said casing, but arranged to be extended outwardly from said casing by said trigger means upon severance of said filament.

6. A lock according to claim **1,** wherein the tubular cable of said flexible shackle is provided at one end thereof with a rigid connector sleeve which joins the said one end of said cable with an adjacent end of said filament, and which is normally releaseable from said casing by actuation of said locking mechanism.

* * * * *