US007591098B2

(12) **United States Patent**
Matthews et al.

(10) **Patent No.: US 7,591,098 B2**
(45) **Date of Patent: *Sep. 22, 2009**

(54) **ACCESSORY DEVICES FOR FIREARMS**

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(73) Assignee: **Surefire, LLC**, Fountain Valley, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 684 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/302,002**

(22) Filed: **Dec. 12, 2005**

(65) **Prior Publication Data**

US 2006/0196099 A1 Sep. 7, 2006

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/819,535, filed on Apr. 6, 2004, now Pat. No. 7,117,624.

(51) **Int. Cl.**
F41C 23/00 (2006.01)

(52) **U.S. Cl.** **42/85**; 42/90; 42/124; 89/200; 362/110

(58) **Field of Classification Search** 42/85, 42/190, 124, 113, 90; 89/200; 362/110
See application file for complete search history.

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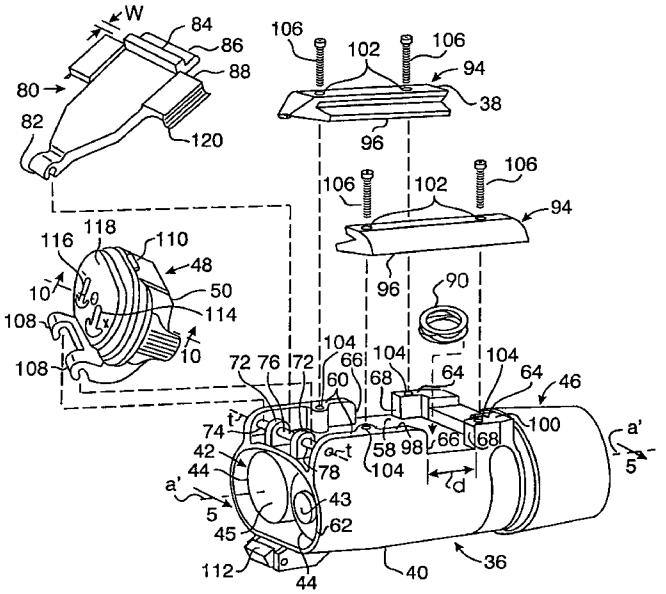
Primary Examiner—J. Woodrow Eldred
(74) *Attorney, Agent, or Firm*—David Weiss

(57) **ABSTRACT**

An accessory device for being mounted to a longitudinal rail carried by a firearm and accommodating longitudinal rails of different configurations. A preferred embodiment comprises a light beam generator including a housing, elongate members removably secured to the housing and complementing the rail for enabling the housing to be retainably slid along the rail, a transverse rail latching device removably secured to the housing, and a replaceable ambidextrous tail cap switch.

34 Claims, 11 Drawing Sheets



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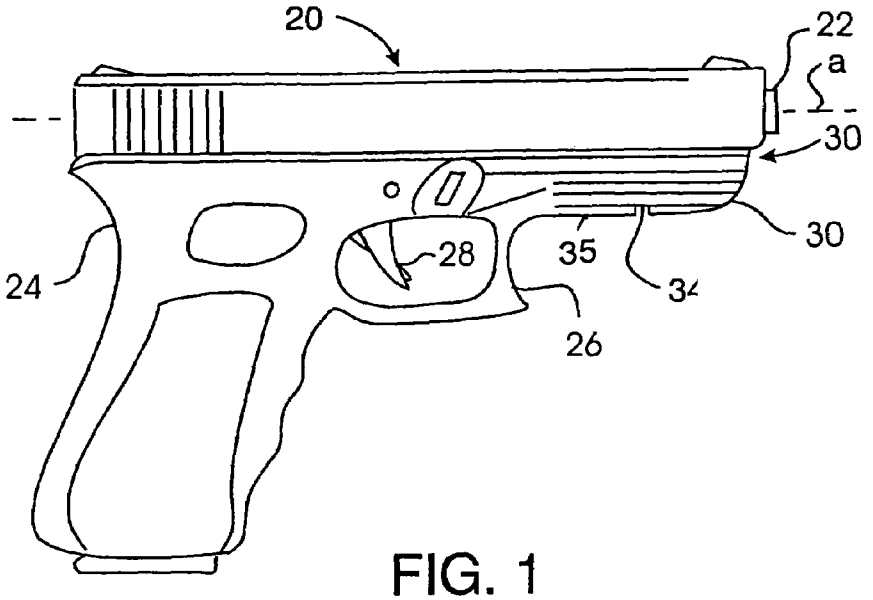


FIG. 1

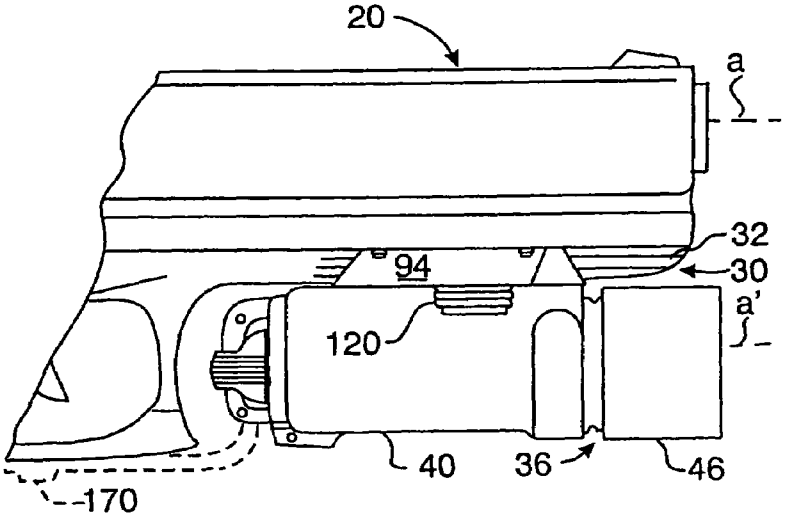
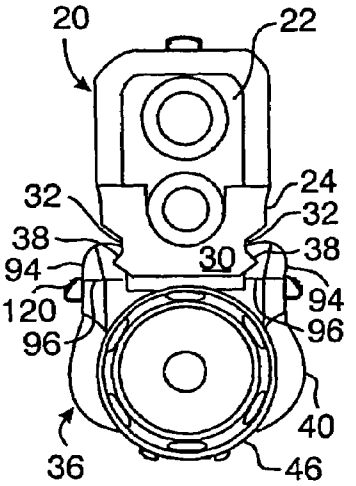


FIG .2



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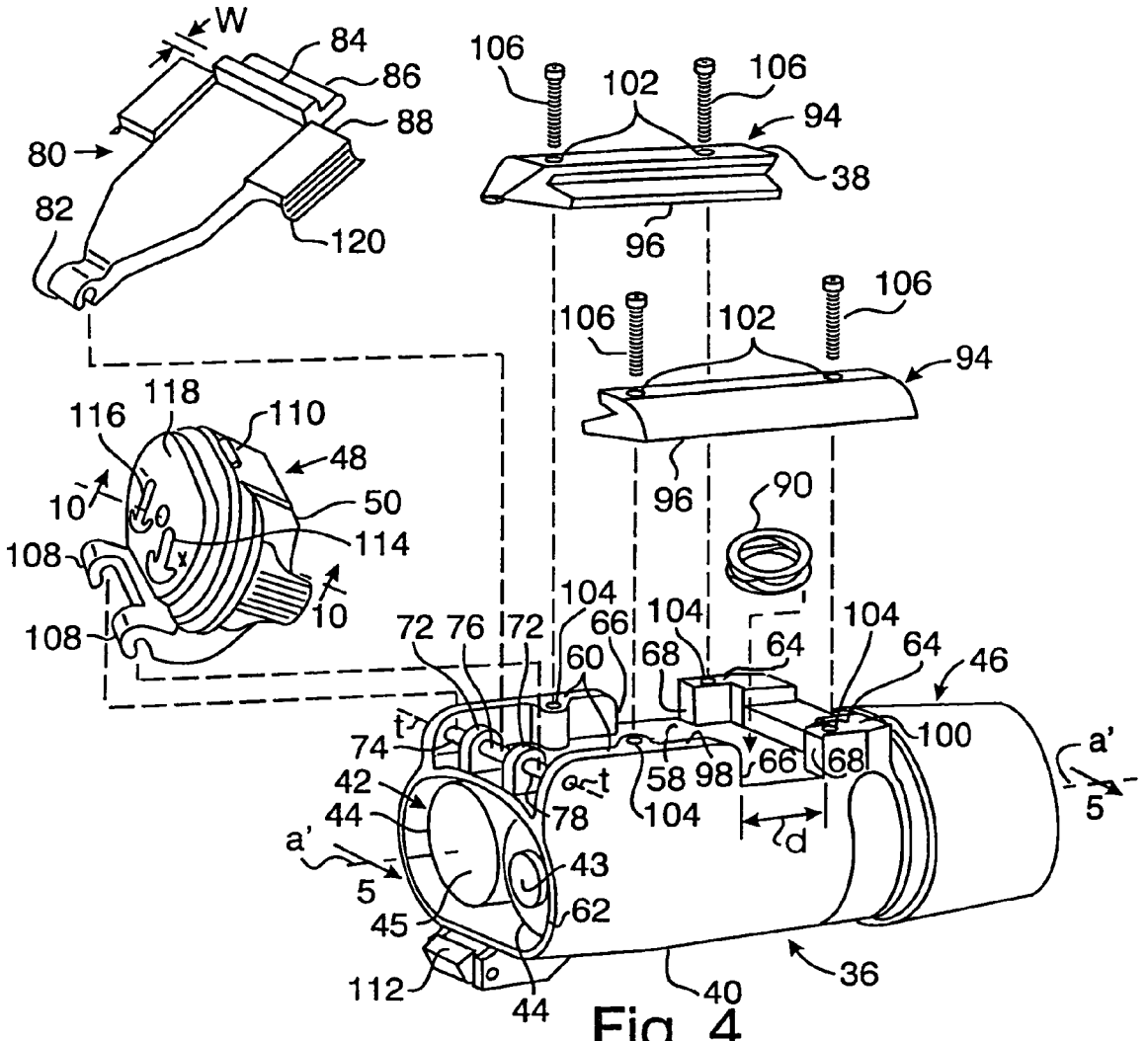
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Fig. 4

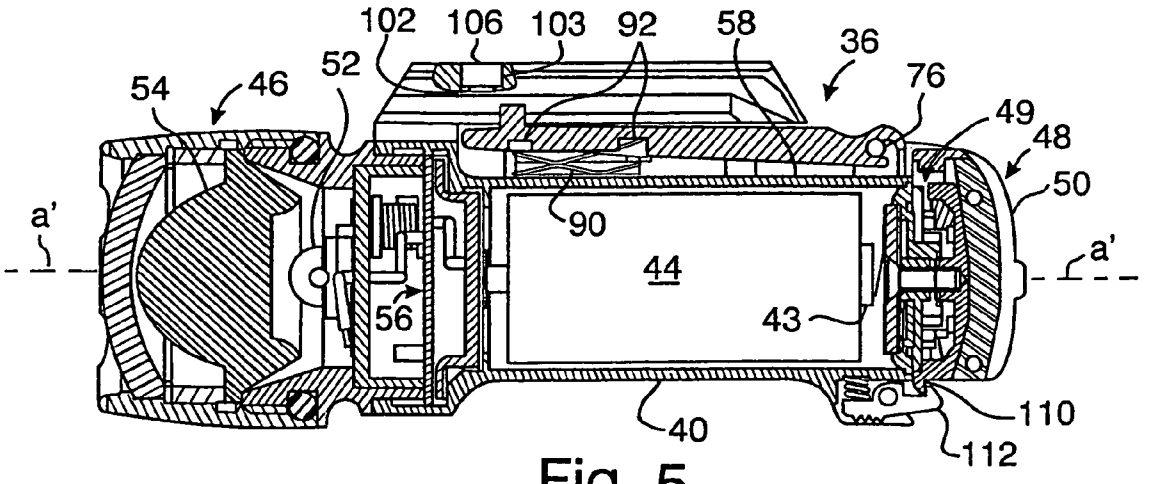
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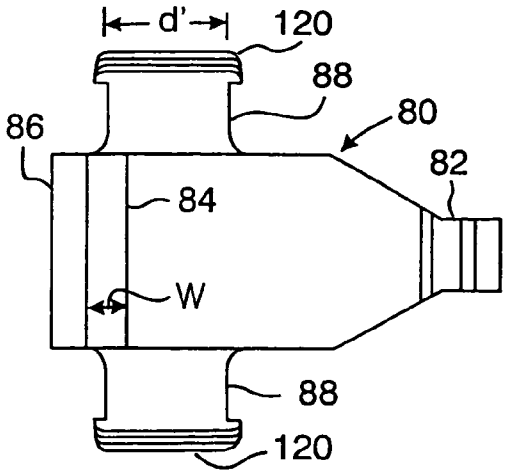
Fig. 5



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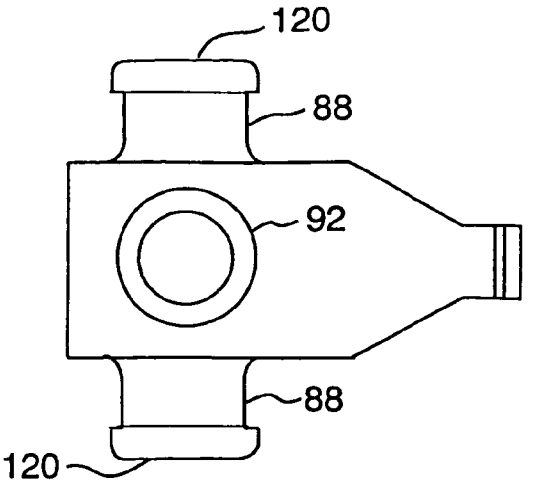

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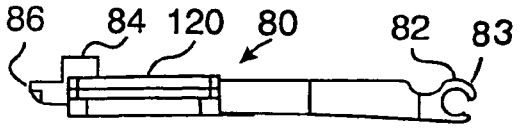

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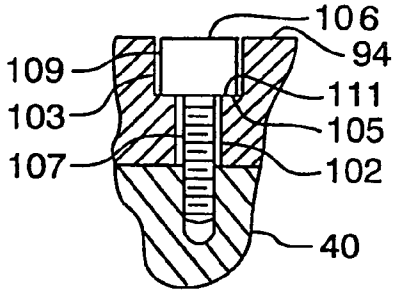


Fig. 9

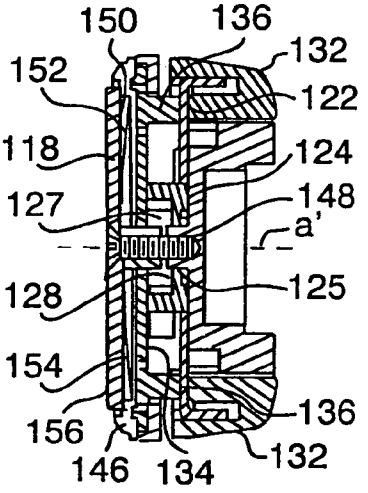


FIG. 10

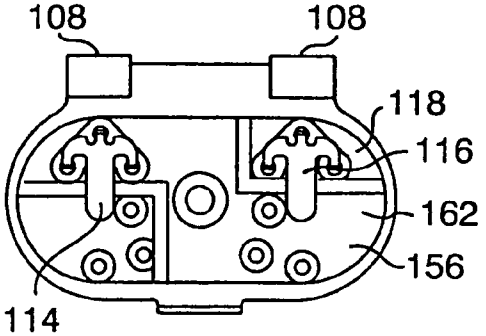


FIG. 11

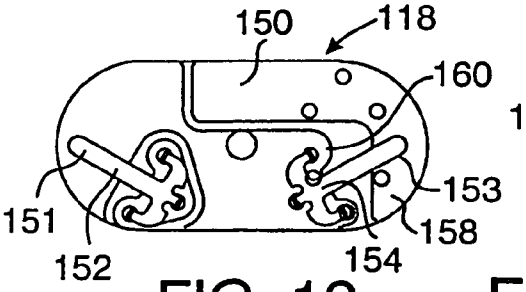
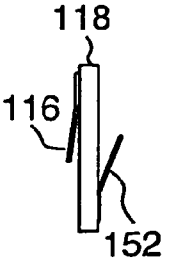


FIG. 12



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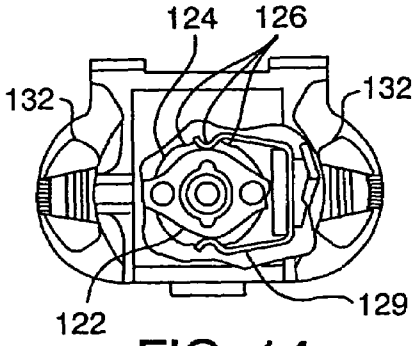


FIG. 14

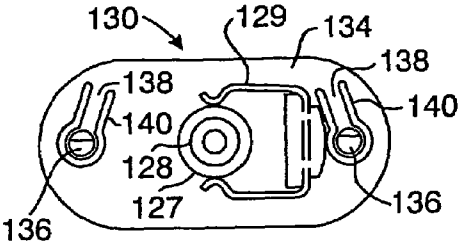


FIG. 15

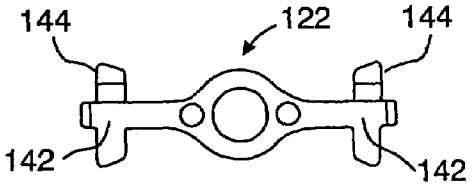


FIG. 16

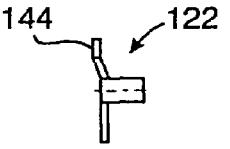
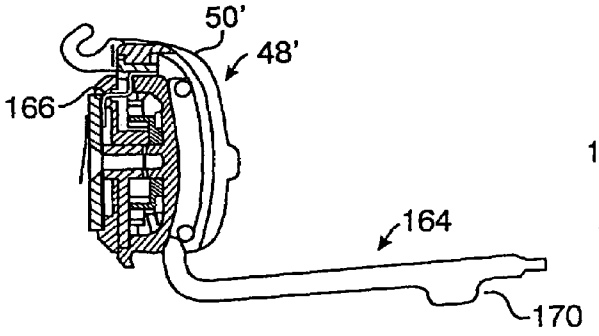


FIG. 17



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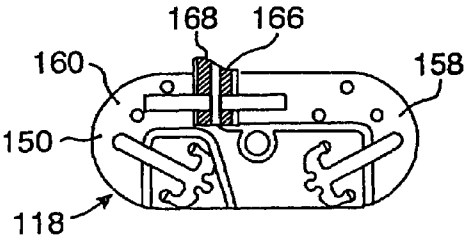


FIG. 19

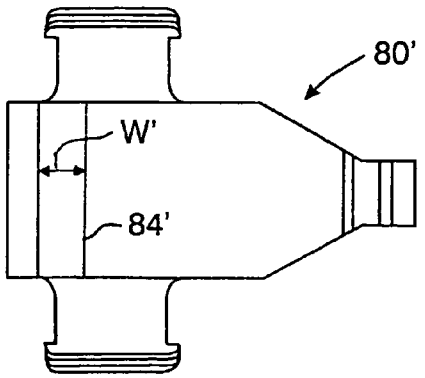
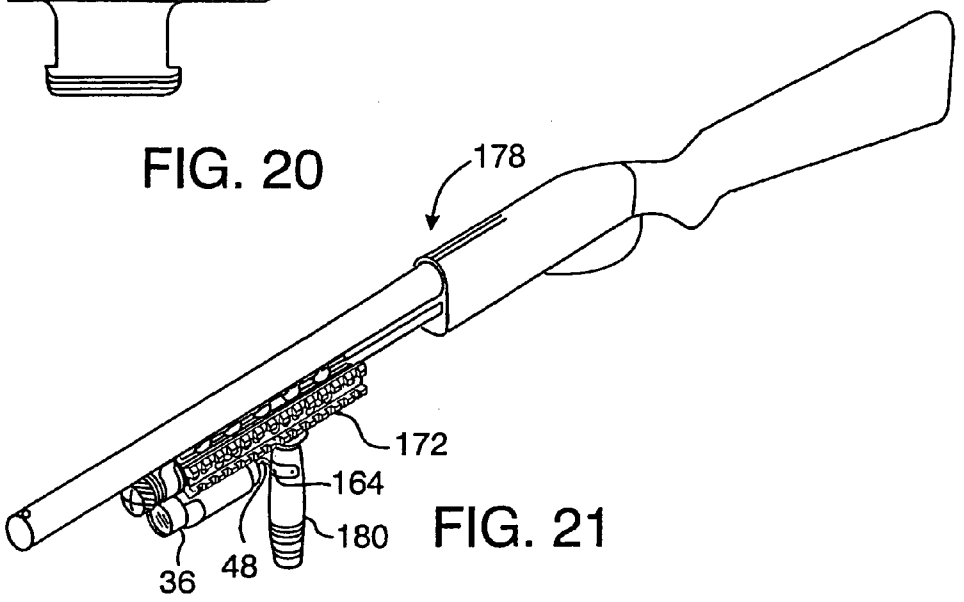


FIG. 20



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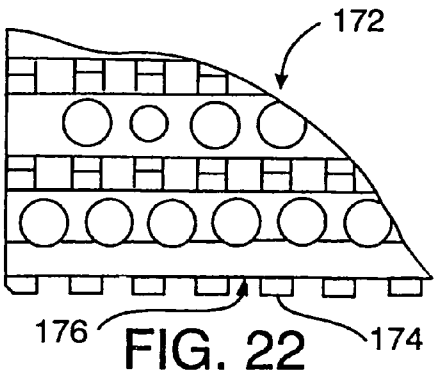

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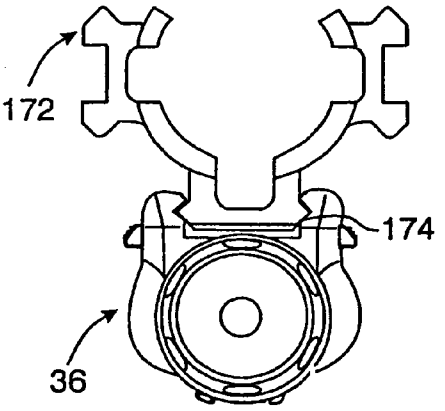
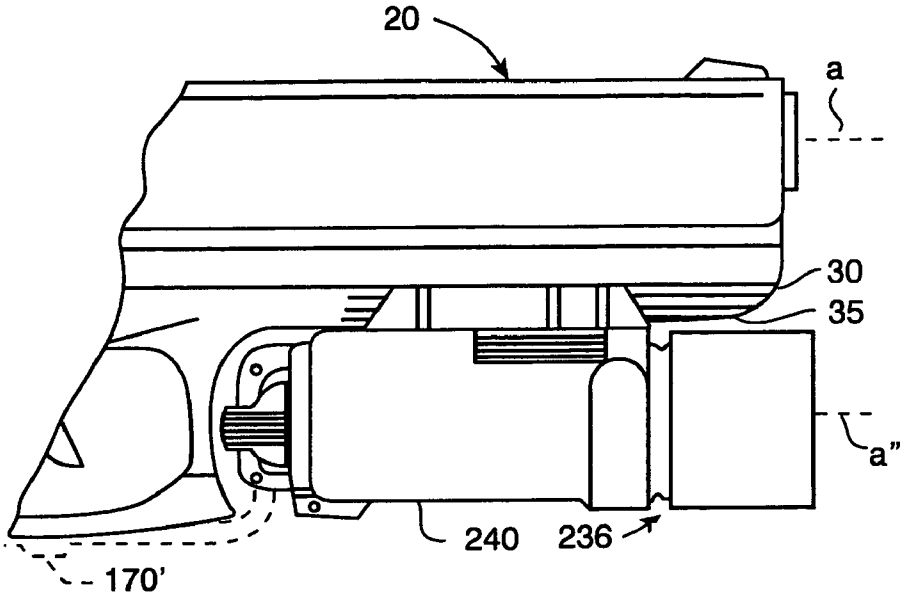


FIG. 23



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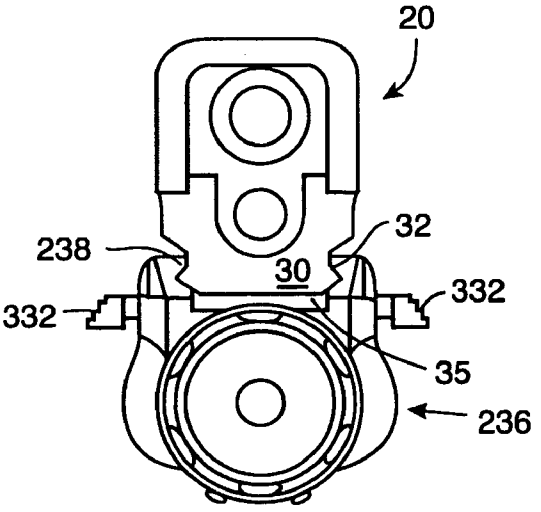

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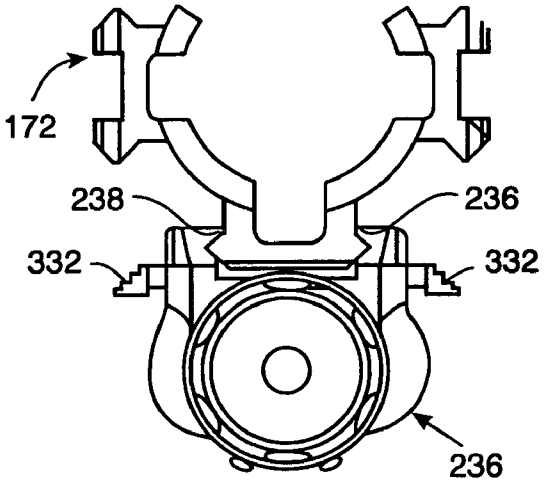

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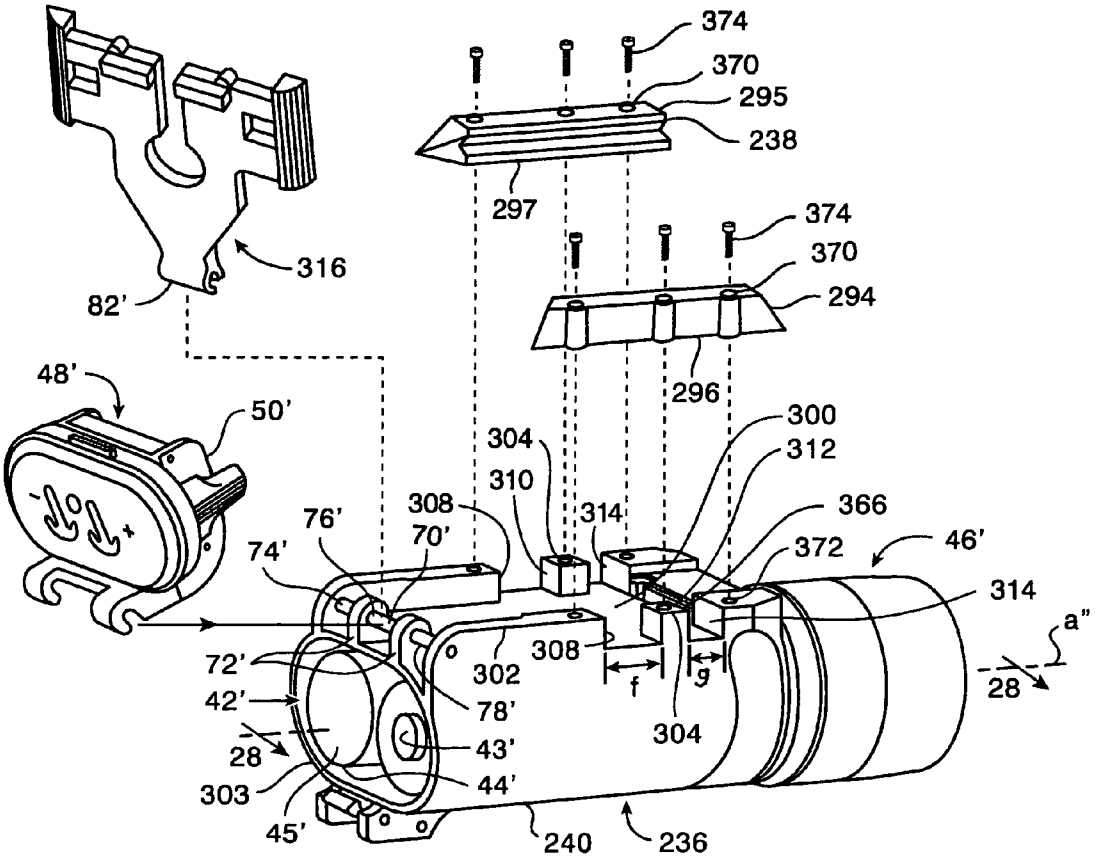
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FIG. 27

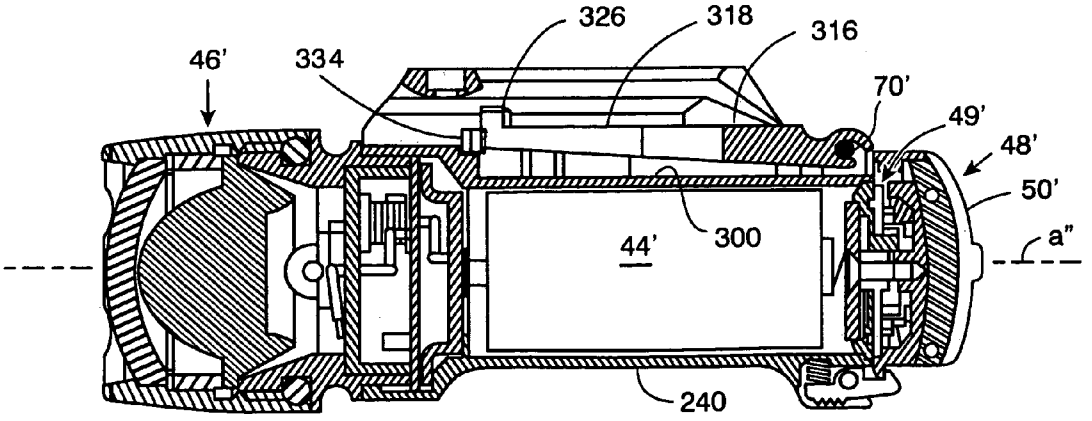
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FIG. 28

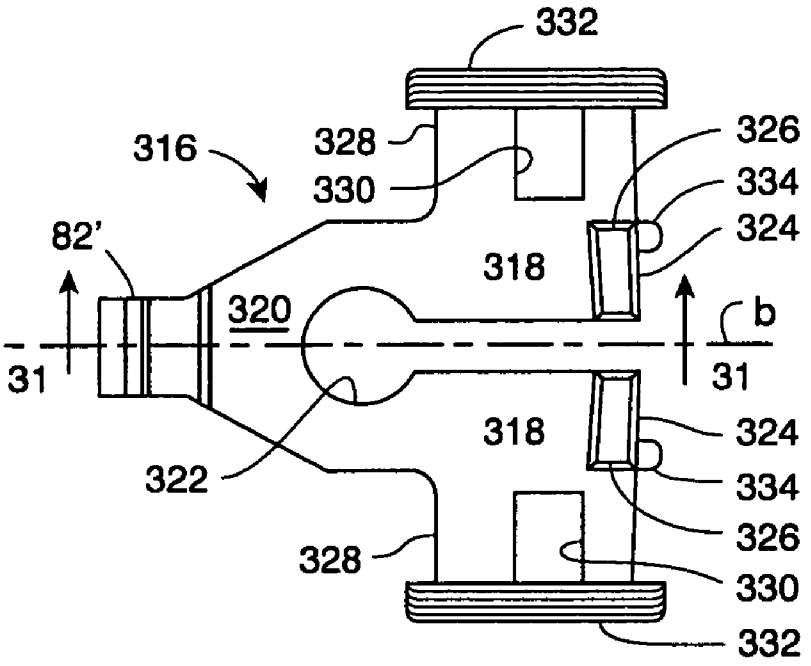
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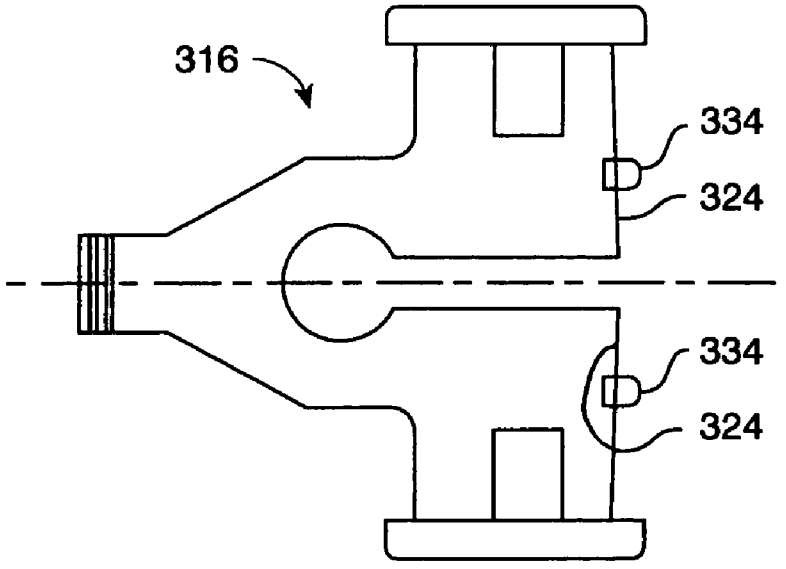
FIG. 29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324

FIG. 30

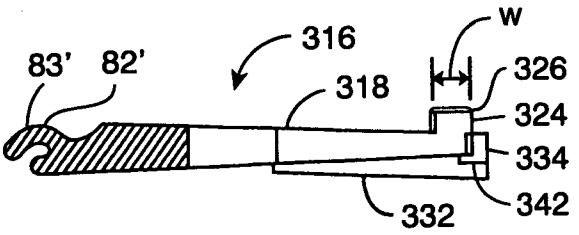

FIG. 31

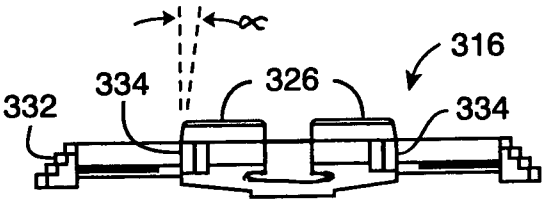

FIG. 32

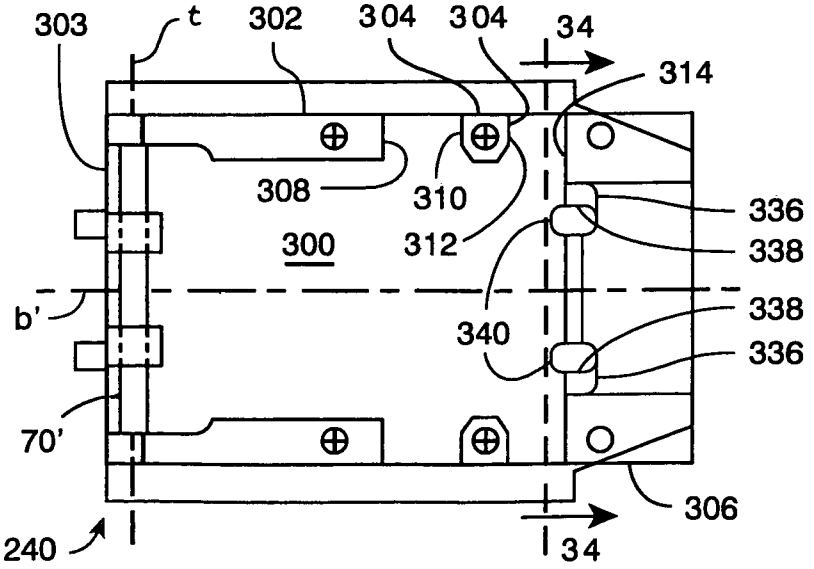

FIG. 33

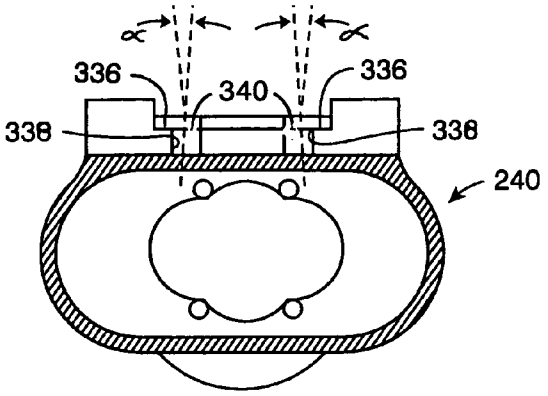

FIG. 34

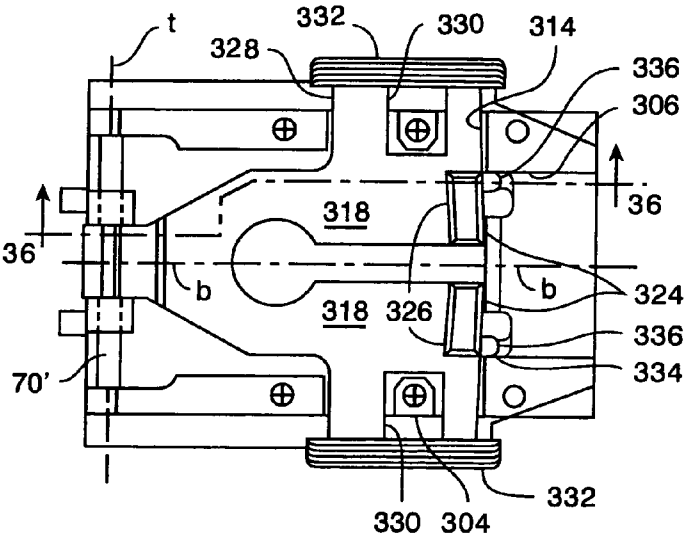

FIG. 35

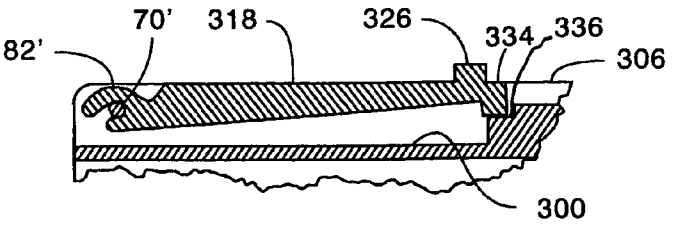

FIG. 36

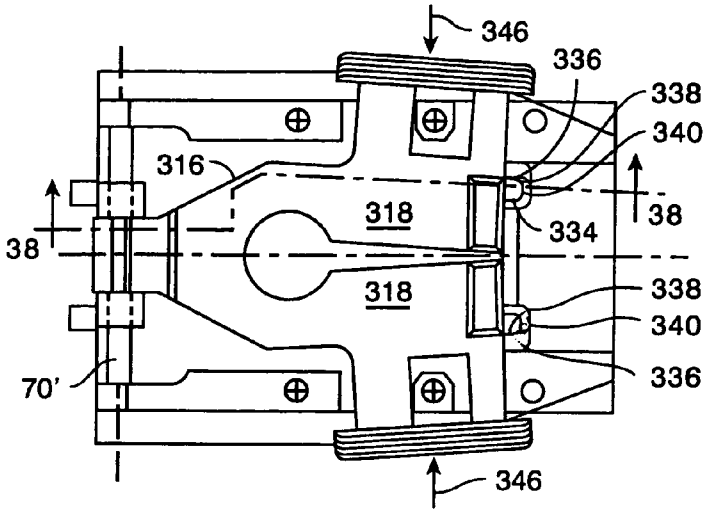

FIG. 37

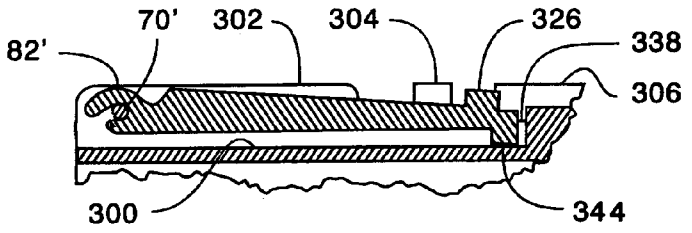

FIG. 38

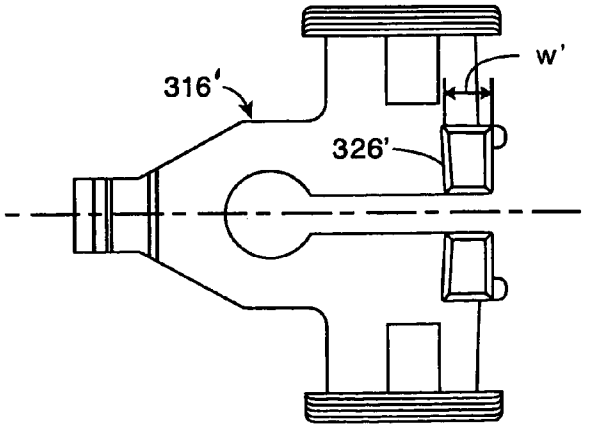

FIG. 39

ACCESSORY DEVICES FOR FIREARMS

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. patent application Ser. No. 10/819,535, filed Apr. 6, 2004 now U.S. Pat. No. 7,117,624, incorporated herein by reference.

BACKGROUND OF THE INVENTION

This invention relates to accessory devices for being mounted to a firearm, and more particularly to a light beam generator for being mounted to a firearm including a handgun.

Accessory devices including light beam generators, such as flashlights and laser aiming devices, have long been adapted for being secured to firearms as target illuminators and laser sights. As particularly relating to handguns, such accessory devices may utilize a longitudinal rail carried by the frame of the handgun and forwardly of the trigger guard, which rail may be integral with the frame as disclosed in U.S. Pat. No. 6,276,088, or such rail may be provided as a separate structure removably attachable to the handgun as disclosed in U.S. Pat. No. 6,378,237, both patents issued to John W. Matthews and Paul Y. Kim and assigned to the assignee of the present invention, which patents are incorporated herein by reference.

Handgun manufacturers have introduced various handgun models having a longitudinal rail along the handgun's frame, below the barrel and forwardly of the trigger guard, such rail being configured with two longitudinal grooves, one along each side of the rail, and further configured with a transverse slot in the bottom surface of the rail. As is well known, such rails are intended for cooperating with accessories such as a light beam generator having a housing configured with a pair of longitudinal tongues complementing the longitudinal grooves for slidably retaining the light beam generator on the rail. A latch on the light beam generator housing co-acts with the transverse slot in the rail for releasably preventing further longitudinal movement of the light beam generator along the rail when the light beam generator is at a predetermined longitudinal position.

The longitudinal rails of handguns of some manufacturers may be of different configuration than the longitudinal rails of handguns of other manufacturers. For example, some handguns include a longitudinal rail commonly known as a Universal rail, while other handguns include a rail commonly known as a Picatinny rail. The slot width of the Universal rail is substantially less than the slot width of the Picatinny rail. Until the present inventions, an accessory device securable to one type of rail was not securable to another type of rail.

SUMMARY OF THE INVENTION

The present invention provides an accessory device that is adapted to accommodate handguns and other firearms carrying longitudinal rails of different configurations. For example, the accessory device of the present invention may be secured to a longitudinal rail carried by a firearm having a slot width different than the slot width of another longitudinal rail carried by a firearm. In a particular example, the accessory device of the present invention accommodates a Universal rail as well as a Picatinny rail.

A preferred embodiment of the accessory device of the present invention comprises a light beam generator, such as a target illuminator or a laser sight, that includes a removably attachable switch device for being replaced by or interchanged with another switch device having a different or modified switch configuration.

The aforementioned parent application Ser. No. 10/819,535 discloses, according to one aspect of that invention, an accessory device for a firearm including a frame, a longitudinal barrel, a longitudinal rail carried by the frame, and a depression in the rail, the accessory device comprising: a housing; elongate members removably secured to the housing, the elongate members complementing the rail for enabling the housing to be retainably slid along the rail; and a plate pivotally secured to the housing about a transverse axis and having a free end biased away from the housing, the plate including a protuberance in the vicinity of the free end, the protuberance receivable by the depression for stopping sliding of the housing along the rail. The plate is captured to the housing by the elongate members secured to the housing, and the plate is removable from its securement about the transverse axis when the elongate members are removed from the housing.

The plate preferably includes transversely extending arms through the housing, which arms are captured to the housing by the elongate members when secured to the housing, and the arms are adapted to be urged by an operator for pivoting the plate about the transverse axis toward the housing.

In a preferred embodiment disclosed in the parent application, as well as in the present application, the accessory device is a light beam generator. The light beam generator of the parent application preferably comprises: a housing; elongate members removably secured to the housing, the elongate members complementing the rail for enabling the housing to be retainably slid along the rail; a plate pivotally secured to the housing about a transverse axis and having a free end biased away from the housing, the plate including a protuberance in the vicinity of the free end, the plate receivable by the depression for stopping sliding of the housing along the rail; a light emitter assembly carried by the housing; a battery carried by the housing in circuit for energizing the light emitter assembly when switch actuated; and a switch device including a switch actuator for the battery. The switch device preferably comprises a tail cap switch pivotally secured to the housing about a pivot axis, the tail cap switch preferably removable from its pivotal securement. The switch actuator is preferably operable by either hand of an operator when the housing is installed on the rail for placing the switch device in a CONSTANT ON or OFF position, and operable by either hand of the operator when the housing is installed on the rail for placing the switch device in a MOMENTARY ON position. A remote switch actuator may be provided for communicating with the switch device for remotely actuating the switch device to a MOMENTARY ON position.

According to a further aspect of the invention disclosed in the parent application, a method is provided of assembling an accessory device for installation on a first rail having a depression and carried by a firearm, comprising: providing the accessory device including a housing; providing elongate members complementing the rail; providing a plate having a protuberance in the vicinity of an end thereof, the protuberance sized for being received by the depression; pivotally securing the plate to the housing with such end biased away from the housing; and removably securing the elongate members to the housing with the elongate members capturing the plate to the housing and enabling the housing to be retainably slid along the rail. The method may further include: removing the elongate members from the housing; removing the plate from the housing; providing a second plate having a protuberance in the vicinity of an end thereof, the protuberance of

the second plate sized for being received by a depression in a second rail carried by a firearm, the protuberance of the second plate being of a different size than the protuberance in the first plate; pivotally securing the second plate to the housing with such second plate end biased away from the housing; and removably securing the elongate members to the housing with the elongate members capturing the second plate to the housing and enabling the housing to be retainably slid along the second rail.

According to yet another aspect of that invention, there is provided a method of adapting an accessory device normally installable on a first rail carried by a firearm and having a depression, for installation on a second rail carried by a firearm and having a depression of a different size than the depression of the first rail, comprising: providing the accessory device including a housing, a first plate having a protuberance in the vicinity of an end thereof, the protuberance of the first plate sized for being received by the depression in the first rail, the plate being removably pivotally secured to the housing along a transverse axis with such end thereof biased away from the housing, and elongate members complementing the first rail and removably secured to the housing and capturing the plate to the housing, the elongate members enabling the housing to be retainably slid along the first or second rails; removing the elongate members from the housing; removing the first plate from the housing; providing a second plate having a protuberance in the vicinity of an end thereof sized for being received by the depression in the second rail; removably pivotally securing the second plate to the housing along a transverse axis with such end of the second plate biased away from the housing; and removably securing elongate members complementing the second rail to the housing and capturing the second plate to the housing and enabling the housing to be retainably slid along the second rail. In the elongate members securing step, the elongate members being secured may be the same elongate members removed in the elongate members removing step.

According to one aspect of the invention of the present application, there is provided an accessory device for a firearm carrying a longitudinal rail including a transverse slot, the accessory device comprising: a housing; elongate members secured to the housing and complementing the rail for enabling the housing to be retainably slid along the rail; a generally U-shaped plate including two resilient legs longitudinally extending from a base pivotally (and preferably removably) secured to the housing about a transverse axis, each of the legs having a free end and an upstanding protuberance in the vicinity of the free end, the legs transversely urgable for resiliently displacing the legs' free ends toward one another; and the housing adapted for releasably retaining the free ends in a first vertical position with the upstanding protuberances non-receivable in the slot when the housing is applied to the rail with the free ends resiliently displaced toward one another and the plate downwardly pivoted, the housing adapted for supporting the free ends in a second vertical position with the upstanding protuberances receivable in the slot. The plate preferably includes two arms transversely extending from the legs respectively, the arms urgable by a user for resiliently displacing the free ends toward each other and for pivoting the plate.

In a preferred embodiment of the generally U-shaped plate, each of the legs includes a forward protuberance at its free end; the housing includes two spaced-apart supports engageable with the forward protuberances for supporting the undisplaced free ends in the second vertical position; and the housing includes two depressions adjacent to the supports for respectively receiving the forward protuberances with the free ends in the first vertical position when the legs are transversely urged and the plate is downwardly pivoted.

The depressions of the preferred housing embodiment are configured for releasably retaining the forward protuberances resiliently biased by the legs. For example, each of the depressions may include a wall for being laterally engaged by the forward protuberances resiliently biased by the legs with the free ends transversely displaced toward one another.

According to another aspect of the present invention, there is provided a method of assembling an accessory device for installation on a longitudinal rail carried by a firearm, the rail including a transverse slot therein, the method comprising: providing the accessory device including a housing; providing elongate members complementing the rail; providing a latch plate including at least one upstanding protuberance sized for being received by the slot in the rail; pivotally securing the plate to the housing with the at least upstanding protuberance in the vicinity of at least one free end of the plate; and removably securing the elongate members to the housing with the elongate members capturing the plate to the housing and enabling the housing to be retainable slid along the rail. In the pivotally securing step, the plate is preferably removably secured to the housing about a transverse axis.

In a preferred manner of practicing the method, the provided plate is generally U-shaped having two resilient legs longitudinally extending from a base, each of the legs having a free end with an upstanding protuberance in the vicinity of the free end; the provided housing is adapted for releasably retaining the free ends of the legs in a first vertical position, and for supporting the free ends of the legs in a second vertical position; and during the pivotally securing step, the base of the plate is removably pivotally secured to the housing about a transverse axis.

According to yet another aspect of the present invention, there is provided a method of installing an accessory device to a longitudinal rail including a transverse slot therein, the method comprising: providing an accessory device slidable along the rail and including a housing, a generally U-shaped plate having two resilient legs longitudinally extending from a base pivotally secured to the housing about a transverse axis, each of the legs having a free end and an upstanding protuberance in the vicinity of the free end, the housing adapted for releasably retaining the free ends in a first vertical position with the upstanding protuberances non-receivable in the slot, the housing adapted for supporting the free ends in a second vertical position with the upstanding protuberances receivable in the slot; transversely urging the legs to displace the free ends toward one another while downwardly pivoting the plate to place the free ends in the first vertical position in the housing; sliding the accessory device along the rail until the upstanding protuberances are positioned beneath the slot; and upwardly pivoting the plate to release the free ends from the first vertical position and to be supported by the housing in the second vertical position with the upstanding protuberances received in the slot. For removing the accessory device from the rail, the method continues by transversely urging the legs to displace the free ends toward one another while downwardly pivoting the plate to place the free ends in the first vertical position with the upstanding protuberances removed from the slot; and sliding the accessory device along the rail until removed therefrom.

The present invention further provides a method of adapting an accessory device normally installable on a first longitudinal rail including a transverse slot, for installation on a second longitudinal rail including a transverse slot of a different size than the slot in the first rail, the method comprising: providing an accessory device including a housing, a

generally U-shaped first plate having two resilient legs longitudinally extending from a base removably pivotally secured to the housing about a transverse axis, each of the legs having a free end and an upstanding protuberance in the vicinity of the free end, the upstanding protuberances of the first plate sized for being received by the slot in the first rail, and elongate members complementing the first rail and removably secured to the housing and capturing the plate to the housing, the elongate members enabling the housing to be retainably slid along the first rail; removing the elongate members from the housing; removing the first plate from the housing; providing a generally U-shaped second plate having two resilient legs longitudinally extending from a base removably pivotally securable to the housing about a transverse axis, each of the legs having a free end and an upstanding protuberance in the vicinity of the free end, the upstanding protuberances of the second plate sized for being received by the slot in the second rail; removably pivotally securing the second plate to the housing; and removably securing elongate members complementing the second rail to the housing and capturing the second plate to the housing and enabling the housing to be retainably slid along the second rail. In the elongate members securing step, the elongate members being secured may be (but need not be) the same elongate members removed in the elongate members removing step.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed to be characteristic of the inventions, together with further advantages thereof, will be better understood from the following description considered in connection with the accompanying drawings in which preferred embodiments of the inventions are illustrated by way of example. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention.

FIG. **1** is a side elevation view of a firearm having a longitudinal rail structure to which may be removably secured an accessory device according to both the present invention and the invention disclosed in the aforementioned parent application Ser. No. 10/819,535;

FIG. **2** is a side elevation view of a preferred embodiment of an accessory device according to the parent application, specifically a preferred embodiment of a light beam generator, removably secured to the rail structure of the firearm of FIG. **1** (in increased scale);

FIG. **3** is a front elevation view of the firearm and secured light beam generator of FIG. **2**;

FIG. **4** is an exploded side/rear perspective view of the light beam generator of FIGS. **2** and **3**, illustrated during assembly of various components thereof;

FIG. **5** is a longitudinal cross-sectional view of the assembled light beam generator of FIG. **4** (in further increased scale), taken along a vertical plane along the light beam generator's longitudinal axis a' (the line **5-5** of FIG. **4**) and viewed in the direction of the appended arrows;

FIG. **6** is a top plan view of a preferred embodiment of a replaceable lever latch plate (in same scale as in FIG. **5**) included in the preferred embodiment of the accessory device or light beam generator of FIGS. **2-5**;

FIG. **7** is a bottom plan view of the lever latch plate of FIG. **6**;

FIG. **8** is a side elevation view of the lever latch plate of FIG. **6**;

FIG. **9** is a fragmentary, part cross-sectional elevation view of an example of a rail interface member secured to the accessory device housing according to the preferred embodiment;

FIG. **10** is a cross-sectional view of the preferred embodiment of a replaceable tail cap switch assembly shown in FIG. **4**, taken along a transverse plane along the longitudinal axis a' (the line **10-10** of FIG. **4**) and viewed in the direction of the appended arrows;

FIG. **11** is a front elevation view of the tail cap switch assembly, which view includes the front surface of the switch circuit board with battery rear terminal contacts;

FIG. **12** is a rear view of the tail cap switch assembly circuit board of FIG. **11**;

FIG. **13** is a side elevation view of the tail cap switch assembly circuit board of FIGS. **11** and **12**;

FIG. **14** is a rear elevation view of the tail cap broken away to show structure of a preferred switch actuator mechanism;

FIG. **15** is a front elevation view of a tail cap insert included in the tail cap switch actuator mechanism;

FIG. **16** is a rear elevation view of an actuator arm included in the tail cap switch actuator mechanism;

FIG. **17** is a left side view of the actuator arm of FIG. **16**;

FIG. **18** is a cross-sectional view of a replaceable tail cap switch assembly similar to the tail cap switch assembly shown in FIG. **5** but further including a pressure tape switch;

FIG. **19** is a rear view of the switch assembly circuit board of FIG. **18**;

FIG. **20** is a top plan view of a second preferred embodiment of a replaceable lever latch plate included in the preferred embodiment of the accessory device or light beam generator of FIGS. **2-5**;

FIG. **21** is a perspective view of a firearm to which is attached a conventional accessory rail mount structure to which is mounted the preferred embodiment of the accessory device or light beam generator of the invention disclosed in the parent application or of the present invention;

FIG. **22** is a side elevation view of a fragment of the front portion of the accessory rail mount exemplified in FIG. **21**;

FIG. **23** is a front elevation view of the accessory rail mount of FIG. **22** to which is mounted a light beam generator according to the invention disclosed in the parent application;

FIG. **24** is side elevation view of a preferred embodiment of an accessory device according to the present invention, specifically a preferred embodiment of a light beam generator, removably secured to the rail structure of the firearm in FIG. **1** (in increased scale);

FIG. **25** is a front elevation view of the firearm and secured light beam generator of FIG. **24**;

FIG. **26** is a front elevation view of the accessory rail mount of FIG. **22** to which is mounted the light beam generator of FIG. **24**;

FIG. **27** is an exploded side/rear perspective view of the light beam generator of FIGS. **24-26**, illustrated during assembly of various components thereof;

FIG. **28** is a longitudinal cross-sectional view of the assembled light beam generator of FIG. **27**, taken along a vertical plane along the light beam generator's longitudinal axis a" (the line **28-28**) of FIG. **27** and viewed in the direction of the appended arrows;

FIG. **29** is a top plan view of a preferred embodiment of a latch plate (in the same scale as FIG. **28**) included in the preferred embodiment of the accessory device or light beam generator of FIGS. **27** and **28**;

FIG. **30** is a bottom plan view of the latch plate of FIG. **29**;

FIG. **31** is a cross-sectional view of the latch plate of FIG. **29**, taken along the line **31-31** and viewed in the direction of the appended arrows;

FIG. **32** is a front elevation view of the latch plate of FIG. **29**;

FIG. **33** is a top plan view of the battery housing of the light beam generator shown in FIGS. **27** and **28**;

FIG. **34** is a cross-sectional view of the housing of FIG. **33** taken along the line **34-34** and viewed in the direction of the appended arrows;

FIG. **35** is a top view of the latch plate of FIGS. **29-32** installed to the battery housing of FIGS. **33** and **34** (shown with the elongate rail interface members removed for clarity of description), with the latch shown in its latching position;

FIG. **36** is a fragmentary cross-sectional view of the latch plate/housing combination of FIG. **35**, taken along the line **36-36** and viewed in the direction of the appended arrows;

FIG. **37** is the same view as in FIG. **35**, with the latch plate shown in its unlatching position;

FIG. **38** is a fragmentary cross-sectional view of the latch plate/housing shown in FIG. **37**, taken along the line **38-38** and viewed in the direction of the appended arrows; and

FIG. **39** is a top plan view of a second preferred embodiment of a latch plate included in the preferred embodiment of the accessory device or light beam generator of FIGS. **27** and **28**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning first to FIG. **1**, there is illustrated an example of a firearm **20**, specifically a handgun including a barrel **22** extending along a longitudinal axis a from the handgun's frame **24**. The handgun **20** includes a trigger guard **26** in front of the handgun's trigger **28**.

As used herein, "longitudinal" describes a direction along or parallel to the longitudinal axis a of the firearm's barrel, or along or parallel to the longitudinal axis a' of the light beam generator **36** (see FIGS. **2**, **4** and **5**), or along or parallel to the longitudinal axis a" of the light beam generator **236** (see FIGS. **24**, **27** and **28**), or along or parallel to the longitudinal axis b of the latch plate **316** (see FIG. **29**), or along or parallel to the longitudinal axis b' of the battery housing **240** (see FIG. **33**), which axes a', a", b and b' are parallel to the axis a when the light beam generator **36** or **236** is installed on the firearm; "transverse" describes a horizontal direction perpendicular to the axis a (or axis a', a", b or b') when the barrel **22** (or light beam generator **36** or **236**) is horizontally positioned; "above" means vertically above and "upward" means vertically upward when the firearm barrel **22** (or light beam generator **36** or **236**) is horizontally positioned; "below" or "beneath" means vertically below and "downward" means vertically downward when the firearm barrel **22** (or light beam generator **36** or **236**) is horizontally positioned; "front" or "forward" describes the longitudinal direction toward the muzzle of the barrel **22** or the light emitter assembly **46** (i.e., to the right as shown in FIGS. **1**, **2**, **4**, **24**, **27**, **29-31**, **33** and **35-39**, and to the left as shown in FIGS. **5** and **28**); and "rear" or "rearward" describes the longitudinal direction opposite the front or forward direction (i.e., to the left as shown in FIGS. **1**, **2**, **4**, **24**, **27**, **29-31**, **33** and **35-39**, and to the right as shown in FIGS. **5** and **28**).

The handgun **20** includes a longitudinal rail **30** along the frame **24**, below the barrel **22** and forwardly of the trigger guard **26**. Such rails are well known in the handgun art, for mounting accessories thereto such as a light beam generator. The rail **30** is configured with two longitudinal grooves **32**, one along each side of the rail **30**, and is further configured with a transverse slot **34** in the bottom surface **35** of the rail **30**. As is well known, such rails are intended for cooperating with accessories such as a light beam generator having a housing configured with a pair of longitudinal tongues (in this respect, see the tongues **38** and **238** of the preferred light beam generators **36** and **236**, respectively, of the present inventions as represented in FIGS. **3** and **25**), with such tongues **38** or **238** complementing the longitudinal grooves **32** for slidably retaining such light beam generator on the rail **30**. A latch on the light beam generator housing co-acts with the transverse slot **34** in the rail **30** for releasably preventing further longitudinal movement of the light beam generator along the rail **30** when the light beam generator **36** or **236** is at a predetermined position along the rail **30**.

Although the rail **30** is represented in FIG. **1** as being integral with the frame **24** of the handgun **20**, the rail **30** may also be provided as a separate structure that may be removably attached to the handgun beneath the barrel and forwardly of the trigger guard. As previously noted, such rails for handguns, both integral to the frame and removably attachable to the handgun, as well as light beam generators adapted for being removably attached to such rails as discussed above, are disclosed in the aforementioned U.S. Pat. Nos. 6,276,088 and 6,378,237 incorporated herein by reference.

Handgun manufacturers have introduced various handgun models with integral rails having longitudinal grooves of the type shown in FIGS. **1-3**. Although such longitudinal grooves among manufacturers have been of substantially similar dimensions, the transverse slots in the rails of handguns of some manufacturers are of different width than the transverse slot in the rails of handguns of other manufacturers. Specifically, the rails of some handguns include a transverse slot of one predetermined width while the rails of other handguns include a transverse slot of another predetermined width. For example, some handguns include a rail commonly known as a Universal rail, while other handguns include a rail commonly known as a Picatinny rail; the slot width of the Universal rail is substantially less than the slot width of the Picatinny rail. The accessory device or light beam generator **36** or **236** of the present invention accommodates both types of rails.

The light beam generator **36** or **236** further includes a removably attachable switch device, for being replaced by or interchanged with another switch device having a different or modified switch configuration.

Turning also to FIGS. **4-8**, the light beam generator **36** includes a housing **40** in which is contained a power source such as a battery **42** of one or more battery cells **44** (for example, two 3-volt lithium battery cells **44**). A light emitter assembly **46** is carried by the housing **40** forwardly of the battery **42** and in circuit with a positive front terminal of one of the battery cells **44** and a negative front terminal of another of the battery cells **44**. A switch device **48** preferably situated at the rear of the housing **40** in and including a tail cap **50**, includes a switch actuator assembly **49** for selectively completing and opening the light emitter energization circuit. In the embodiment shown, this is accomplished by the switch actuator assembly **49** establishing a conductive path between the rear positive terminal **43** of one of the battery cells **44** and the rear negative terminal **45** of the other of the battery cells **44** for placing the switch device **48** in an ON position for causing the battery **42** to energize the light emitter assembly **46**, and by opening such conductive path for placing the switch in an OFF position where the battery **42** does not energize the light emitter assembly **46**.

As shown in FIG. **5**, a preferred light emitter assembly **46** may include a light emitter **52** such as a light emitting diode (LED), preferably a high luminous flux LED such as a 3-watt or 5-watt LED manufactured by Lumileds Lighting, LLC (of San Jose, Calif.) and marketed under the trademark LUXEON including such LEDs marketed under the LUXEON STAR trademark.

With such an LED as the light emitter **52**, the emitted light may be directed by a lens system contained in the light emitter assembly **46** including a totally internal reflective (TIR) lens **54** (as represented in FIG. **5**), or by a parabolic reflector system as disclosed in U.S. patent application Ser. No. 10/346,537 of Paul Y. Kim and William A. Hunt, assigned to the assignee of the present invention, which patent application is incorporated herein by reference. The light emitter assembly **46** may alternatively include an incandescent lamp as the light emitter **52**, such as a high intensity tungsten light bulb, with the emitted light preferably directed by a parabolic reflector.

In either case, the light emitter assembly **46** may further include a controller **56** for regulating the power to the light emitter for providing light output of constant brightness with decreasing battery voltage over time. The use of such controllers is discussed in the aforesaid patent application Ser. No. 10/346,537 incorporated herein by reference.

The preferred embodiment of the housing **40** of the light beam generator **36** includes a substantially flat upwardly facing surface **58** with two upstanding first wall segments **60** longitudinally extending forwardly along opposite sides of the surface **58** from the vicinity of the housing's rear end **62**, and two upstanding second wall segments **64** forwardly of the respective first wall segments **60**. The forward generally vertical ends **66** of the respective first wall segments are transversely aligned, and the rear generally vertical ends **68** of the respective second wall segments **64** are transversely aligned and spaced from the second wall segments' forward ends **68** by a predetermined distance d.

A transversely disposed pin **70** is secured to the housing **40** in the vicinity of its rear end **62** and above the housing's flat surface **58**. As shown in FIG. **4**, the transverse pin **70** is secured to the first wall segments **60** in the vicinity of their rear ends and above the flat surface **58**. The pin **70** additionally extends through apertures in two upstanding protuberances or partitions **72** from the flat surface **58**. The two partitions **72** are laterally spaced so as to divide the transverse pin into three exposed segments **74**, **76**, **78** which may be of substantially equal lengths.

The light beam generator **36** includes a latch lever plate **80** having a generally U-shaped rear end **82** configured for receiving the middle segment **76** of the transverse pin **70**. One leg (preferably the upper leg **83**) of the U may curve over a portion of the generally rearwardly facing opening of the U, and the plate **80** is preferably made of a material such that the legs are somewhat resilient. As illustrated in FIG. **4**, the latch plate **80** is installed to the housing **36** by placing the opening of the latch plate's rear end **82** to the transverse pin segment **76**, and the installer urging the rear end **82** to snap onto the pin segment **76**. The latch plate **80** accordingly is hinged at its rear end **82** about the transverse hinge pin **70**, specifically about the hinge pin segment **76**; i.e., the plate **80** is pivotally secured to the housing **40** about a transverse axis t along the pin **70**.

The top surface of the plate **80** includes an upstanding protuberance, preferably a transversely disposed elongate protuberance **84**, in the vicinity of the plate's front end **86**, the elongate projection **84** having a width w (along the longitudinal direction) slightly less than the slot **34** of the firearm's rail **30** for being received therein. Lateral arms **88** transversely extend outwardly from opposite sides of the plate **80**, the arms **88** situated in the vicinity of the plate's front end **86** and being of a width d' (along the longitudinal direction) slightly less the distance d between the forward ends **66** of the first wall segments **60** and the respective rear ends **68** of the second wall segments **64** (see FIG. **4**) such that the arms **88** are received between such ends **66** and **68**. The vertical height of the end portions **66** and **68** is preferably greater than the sum of the vertical thickness of the plate **80** and the vertical height of the protuberance **84**.

During installation of the plate **80** to the housing **40**, after being hinged to the hinge pin segment **76** the plate **80** is pivoted toward the housing's upwardly facing surface **58** (i.e., in the clockwise direction as viewed in FIG. **4**) with a wave spring **90** held by an annular groove **92** in the underside of the plate **80** (see also FIGS. **5** and **7**) in the longitudinal vicinity of the protuberance **84** and the lateral arms **88**, until the spring **90** contacts the flat upwardly facing surface **58** of the housing **40** while the lateral arms **88** of the plate **80** are caused to enter the space between the wall surfaces **66** and **68**.

The accessory device or light beam generator **36** includes two elongate members **94** removably secured to the housing **40**, for interfacing with the firearm rail **30** to enable the housing **40** to be retainably slid along the rail **30** (see, in particular, FIGS. **1-5**). Each elongate member **94** includes an inwardly directed tongue **38** longitudinally extending along such member **94**; i.e., such elongate rail interface members **94** are installed to the housing **40** with the longitudinal tongue **38** of one of the members **94** facing the longitudinal tongue **38** of the other of the members **94**, the tongues **38** complementing the firearm's longitudinal grooves **32** for slidably cooperating with the firearm's longitudinal grooves **32** while being vertically retained by the rail **30** as shown in FIGS. **2** and **3**.

The elongate rail interface members **94** are installed to the housing **40** after the latch plate **80** has been hinged to the hinge pin segment **76** and pivoted with its lateral arms **88** in the space between the upstanding wall segment ends **66** and **68** as discussed above. Each member **94** includes a flat bottom surface **96** for contacting the top surfaces **98** and **100** of the housing's respective wall segments **60** and **64**. The members **94** include bores **102** therethrough aligned with internally threaded blind vertical bores **104** in the top surfaces **98**, **100** of the housing's wall segments **60**, **64**, preferably forwardly of the wall segment ends **68** and rearwardly of the wall segment ends **66**, the members **94** being removably secured to the wall segments **60**, **64** by headed screws **106** respectively extending into the bores **102** through the member **94** and threaded into the respectively aligned threaded bores **104** in the housing **40**. With the elongate members **94** so installed, their bottom surfaces **96**—which contact and extend along the top surfaces **98**, **100** of the wall segments **60**, **64**—bridge the wall segments **60**, **64** and provide a ceiling to the space between the wall ends **66**, **68**. Such bridge or ceiling upwardly captures the lateral arms **88** within such space, while the wall ends **66**, **68** longitudinally captures the lateral arms **88** within such space, resulting in the hinged latch plate **80** being captured to the housing **40** as well.

The elongate rail interface members **94** may be removed from the housing **40** by unscrewing the screws **106**, and if desired the elongate rail interface members **94** may be replaced by other or different elongate rail interface members which are similarly removably securable to the housing **40**. It may be appreciated that when the rail interface members **94** have been removed from the housing **40**, the lateral arms **88** of the hinged latch plate **80** are no longer upwardly blocked or captured by the members **94**, so that the latch plate **80** may be pivoted about the hinge pin **70** away from the surface **58** of the

housing **40** and pulled away from the hinge pin segment **76**. In such manner, the latch plate **80** may be removed from the housing **40** and another or different latch plate **80**, which is similarly removably securable to the housing **40**, may be hinged to the hinge pin **70** and upwardly captured by reinstalling the rail interface members **94**.

Another feature of the preferred embodiment of the light beam generator **36** of the present invention comprises the tail cap switch device **48** which functions both as a battery cover permitting the battery cells **44** to be installed and retained in the housing **40** and as a switch for actuating the battery **42** to selectively energize the light emitter of the light emitter assembly **46**. The preferred embodiment of the tail cap switch **48** is removably securable to the rear end **62** of the housing **40**.

The switch device **48** includes a tail cap **50** which is hinged to the transverse hinge pin **70** by two transversely spaced-apart forward projections **108** each having a generally U-shaped end portion, one leg of the U preferably curving over a portion of the generally upwardly and rearwardly facing opening of the U. The projections **108** are preferably somewhat resilient and, as illustrated in FIG. **4**, the switch device **48** is installed to the housing **36** by placing the openings of the cap's projections **108** to the transverse pin outer segments **74** and **78**, the installer urging the projections **108** to snap onto the pin segments **74**, **78**. The tail cap **50** accordingly is hinged about the transverse hinge pin **70**, specifically about the hinge pin segments **74**, **78**; i.e., the tail cap switch is pivotally secured to the housing **40** about a pivot axis, preferably the transverse axis t.

The installer thereupon rotates the tail cap **50** toward the housing's open rear end **62** (i.e., counterclockwise as viewed in FIG. **4**) until the rear opening of the housing **40** is closed and the tail cap **50** is locked into place by cooperation of a catch **110** along the lower edge of the tail cap **50** with a spring-biased latch **112** on the housing **40** (FIGS. **4** and **5**). When the tail cap **50** is in its latched position, the forwardly facing battery contacts **114**, **116** on the switch device circuit board **118** are in conductive contact with the respective rear battery terminals **43**, **45**.

The switch device **48** may be removed from the housing **40** by manually unlatching the latch **112**, pivoting the tail cap **50** upwardly about the hinge pin **70** away from the housing's rear opening (for example, to the position generally illustrated in FIG. **4**) and pulling the switch device **48** away from the hinge pin segments **74** and **78**. In such manner, the switch device **48** may be removed from the housing **40** and another or different switch device, which is similarly removably securable to the housing **40**, may be hinged to the hinge pin **70** and locked to the rear end **62** of the housing **40** by operation of the latch **112**.

When the light beam generator **36** is in its assembled condition (i.e., with the tail cap switch **48**, latch plate **80** and rail interface members **94** installed to the housing **40** as described above), the assembled light beam generator **36** may be removably installed to the firearm **20**. The light beam generator **36** is placed to the firearm **20** with the rear ends of the tongues **38** of the rail interface members **94** respectively engaging the forward ends of the grooves **32** of the rail **30** carried by the firearm **20**. The light beam generator **36** is thereupon rearwardly urged, thereby sliding the housing **40** along the rail **30** while the housing **40** is being vertically retained by the rail **30**. When the transverse upstanding protuberance **84** of the latch plate **80** contacts the bottom surface of the rail **30** (which may be facilitated by a swept-back profile of the forward portion of the rail **30** illustrated in FIGS. **1** and **2**, preferably of a height at least as great as the height of the protuberance **84**), the latch plate is thereby urged to pivot about the hinge pin **70** against the bias of the spring **90**, until the transverse protuberance **84** enters the transverse slot **34** as the spring **90** urges the plate **80** to pivot about the hinge pin segment **76**.

As earlier noted, the width w of the protuberance **84** is slightly less than the width of the slot **34** such that the protuberance **84** just fits into the slot **34**. The engagement of the protuberance **84** with the slot **34** stops further longitudinal movement of the housing **40** along the rail **30**, longitudinally latching the housing **40** in this position. The longitudinal positions of the slot **34** and of the protuberance **84** are preferably predetermined such that the rear end of the tail cap **50** is situated just forwardly of the handgun's trigger guard **26** when the protuberance **84** engages the slot **34**.

Because the dimensional tolerances of rails **30** may differ among firearm manufacturers, and even among firearms manufactured by the same manufacturer, the rail interface members **94** may be configured to accommodate such differences. In a preferred embodiment of the rail interface members **94** for accommodating such differences, the bores **102** and the counterbores **103** in the rail interface members **94** may be slightly greater in at least the transverse direction than the respective diameters of the threaded shaft **107** and head **109** of the screws **106**, for providing a loose fit in at least the transverse direction between the screws **106** and the bore **102**/counterbore **103** combinations. For example, the diameters of the screw-head **109** and threaded shaft **107** may be slightly greater than the diameters of the counterbore **103** and bore **102**, respectively.

During installation of the light beam generator **36** to a particular firearm rail **30**, if the engagement of rail interface members **94** to the rail **30** is too loose, the installer may simply loosen the screws **106**, move the rail interface members **94** inwardly (transversely toward each other) and thereupon tighten the screws **106** with the screw-heads **109** urged against the peripheral floor annular ledge **105** of the counterbores **103**. If the engagement between the rail interface members **94** and the rail **30** is too tight, the installer may loosen the screws **106**, move the rail interface members **94** outwardly (transversely away from each other), and tighten the screws **106** with the bottom surface **111** of the screw-heads **109** urged against the peripheral floor or annular ledge **105** of the counterbores **103**.

To remove the accessory device **36** from the firearm **20**, the operator downwardly urges the laterally protruding handles **120** on the ends of the lateral arms **88**, causing the plate **80** to pivot about the hinge pin **70**, against the bias of the spring **90**, until the protuberance **84** is disengaged from the transverse slot **34**. The operator thereupon forwardly urges the accessory device **36** to slide along the rail **30** until the accessory device **36** is removed therefrom.

A preferred embodiment of the tail cap switch device **48** of the present invention permits ambidextrous actuation of the switch device **48** for energizing the light emitter **52** in a CONSTANT ON/OFF mode as well as in a MOMENTARY ON mode. The switch mechanism for implementing such operation is shown in FIGS. **10-17**.

A switch actuator arm **122** (e.g. fabricated of stainless steel) is affixed to an actuator disk **124** (e.g. fabricated of a polymeric material) rotatable about a circular protuberance **125** along the longitudinal axis a'. The actuator disk **124** is also rotatable about an elastomeric washer **127** (e.g. fabricated of rubber) rearwardly projecting from the tail cap insert **130** and having a rearwardly facing annular rim **128** adjacent to the forward surface of the actuator disk **124**.

The actuator disk **124** is rotatable with the actuator arm **122** about the longitudinal axis a'. The disk **124** includes peripheral notches **126** engaged by ends of a latching spring **129** secured to the tail cap insert **130**, for latching the disk **124** and

hence the actuator arm **122** in a first rotational position where the arm **122** is transversely oriented (FIG. **14**), a second rotational position where the arm **122** is rotated clockwise by a predetermined angle (say, approximately 20°), and a third rotational position where the arm **122** is rotated counterclockwise by a predetermined angle (say, approximately 20°). An operator may selectively rotate the arm into these three alternative latched positions by manipulating up or down either one of the handles **132** attached to the ends of the actuator arm **122**.

The tail cap insert **130** includes a plate **134** (preferably of a plastic material such as polypropylene), having two rearwardly projecting nubs **136** at the free ends of flexible fingers **138** formed by cuts **140** through the insert plate **134**. The end portions **142** of the actuator arm **122** are situated just to the rear of the rearwardly projecting nubs **136**. Angularly extending from each of the actuator arm end portions **142** is a forwardly stepped tab **144**. The end portions **142** of the actuator arm **122** are normally situated longitudinally just to the rear of the rearwardly projecting nubs **136** when the actuator arm **122** is in its latched first or transverse position. However, when the actuator arm **122** is in either of its latched second or third rotated positions, one of the forwardly stepped tabs **144** contacts one of the nubs **136** and urges such contacted nub **136** to be forwardly displaced. When the operator rotatably replaces the actuator arm **122** to its latched first or transverse position, the corresponding resilient finger **138** replaces the affected nub **136** to its normal or unactuated position.

When the switch actuator arm **122** is in its latched first rotational or transverse position, the operator may push either of the handles **132** in the forward direction, causing the actuator arm **122** to compress a peripheral portion of the elastomeric rimmed washer **127**, rocking the actuator arm **122** so that its pushed end portion **142** is caused to be forwardly displaced. Such end portion **142** contacts and forwardly urges the correspondingly situated nub **136** for such time that the handle **132** is forwardly urged by the operator. When the operator releases the handle **132**, the resiliency of the washer **127** replaces the actuator arm **122** end portion **142** to its normal undepressed position thereby permitting the resilient finger **138** of the affected nub **136** to replace such nub **136** in its normal unactuated position.

It may be appreciated that the forward displacement of the actuator arm ends, and their resilient replacement, may be implemented by other mechanisms, for example by increasing the longitudinal elasticity of the actuator arm itself.

The forward face of the insert plate **134** is covered with a non-conductive elastomeric sheet, such as a rubber membrane **146** secured to the plate **134**. The tail cap insert **130** is mounted within the tail cap **50** by screw **148**, with the rubber membrane **146** obverse and in proximity to the rear face **150** of the tail cap battery terminal circuit board **118** also secured to the tail cap **50** by the screw **148**. The respective free end portions **151**, **153** of the resilient contacts **152**, **154** secured to the tail cap circuit board's rear face **150** are situated directly forwardly of the nubs **136** with the rubber membrane **146** interposed therebetween. When a nub **136** is forwardly displaced, such nub **136** presses (through the interposed rubber membrane **146**) the corresponding resilient contact's end portion **151** or **153** into contact engagement with the circuit board's rear face **150**.

When the tail cap **50** is installed and latched to the housing **40**, the battery contacts **114**, **116** secured to the circuit board's forward face **156** are in contact engagement with the respective battery cell terminals **43**, **45**; i.e., the battery contact **114** is in contact engagement with the positive terminal **43** of one of the battery cells **44**, and the battery contact **116** is in contact engagement with the negative terminal **45** of the other of the battery cells **44**.

The positive battery contact **114** (FIG. **11**) conductively communicates with a first conductive area **158** (FIG. **12**) on the rear surface **150** of the circuit board **118**, while the negative battery contact **116** conductively communicates with a second conductive area **160** on the rear face **150** of the circuit board **118** to which the resilient contact **154** is conductively secured. When the free end **153** of resilient contact **154** on the circuit board's rear face **150** is urged into contact engagement with the first conductive area **158**, there is established a conductive path between the negative battery terminal contact **116** and the positive battery terminal contact **114** (and hence between the negative and positive battery terminals **45**, **43**), thereby placing the switch device **48** in an ON position completing the electrical circuit between the battery **42** and the light emitter assembly **46**.

The positive battery contact **114** is conductively secured to a third conductive area **162** (FIG. **11**) on the forward face **156** of the circuit board **118**, while the resilient contact **152** on the circuit board's rear face **150** (but which is normally electrically isolated from the conductive areas on the circuit board's rear face **150**) conductively communicates with the conductive area **162** on the circuit board's forward face **156**. When the free end **151** of the resilient contact **152** is urged into contact engagement with the second conductive area **160** on the circuit board's rear face **150**, there is established a conductive path between the positive battery terminal contact **114** and the negative battery terminal contact **116** (and hence between the positive and negative battery terminals **43**, **45**), thereby placing the switch device **48** in an ON position completing the electrical circuit between the battery **42** and the light emitter assembly **46**.

The switch device **48** is in an OFF position when the actuator arm **122** is in its normal position, i.e. in its first latched or transverse position and with neither of its end portions **142** forwardly depressed. It may be appreciated that when an operator manually urges either one of the handles **132** either downwardly or upwardly, the actuator arm **122** is rotated into either one of its latched second or third positions thereby placing the switch **48** in a CONSTANT ON position. The switch **48** remains in such CONSTANT ON position until the operator manually urges either one of the actuator arm handles **132** to effect a reverse rotation of the actuator arm **122** for causing the actuator arm **122** to be replaced in its latched first or transverse position, in which position the switch **48** is placed and maintained in its normal OFF position until further actuation by the operator.

It may be appreciated, as well, that the switch **48** may be actuated from an OFF position to a MOMENTARY ON position. When the actuator arm **122** is in its latched first or transverse position, the operator may manually forwardly urge or depress either one of the actuator arm handles **132**, placing the switch **48** in its ON position for only as long as the operator continues to depress the handle **132**. When the operator releases the handle **132**, the switch **48** resumes its normal OFF position.

An important feature of the preferred embodiment of the switch **48** is its ability to be actuated by either hand of the operator, in placing the switch **48** in its CONSTANT ON position and back to its normal OFF position, as well as for placing the switch **48** in its MOMENTARY ON position.

A second preferred tail cap switch embodiment **48'** is shown in FIGS. **18** and **19**. This second embodiment **48'** is substantially the same as the first switch embodiment **48** except that, in addition to the CONSTANT ON/OFF and

MOMENTARY ON switch operations actuable upon manipulation of either of the handles **132** at the ends of the switch actuator arm **122**, the second switch embodiment **48'** further includes a MOMENTARY ON remote switching capability provided by a type of switch commonly known as a slimline or tape switch **164**. Tape switches are well known in the art, and their construction typically includes spaced electrodes in a flexible enclosure to which pressure may be manually applied by an operator for squeezing the electrodes together thereby bringing them into electrical contact with each other. The electrodes resume their spaced condition when the operator discontinues the application of such pressure. Tape switches used with illumination apparatus removably attachable to handguns are described in U.S. Pat. No. 5,654,594 issued to Bernie E. Bjornsen, III, Peter Hauk and John W. Matthews and assigned to the assignee of the present invention, and in U.S. Pat. No. 6,276,088 issued to John W. Matthews and Paul Y. Kim and assigned to the assignee of the present invention, which patents are incorporated herein by reference.

The tape switch **164** which may be utilized in connection with the second preferred embodiment **48'** of the tail cap switch device includes two electrically conductive leads **166**, **168** insulated from each other and extending from the tail cap **50'** to a pressure sensitive switch actuator **170** remote from the tail cap **50'**. The switch actuator **170** may be positioned under the trigger guard **26** (as shown in phantom in FIG. **2**), or the switch actuator **170** may be of a type which horseshoes about the handgun grip as shown in the aforementioned U.S. Pat. Nos. 5,654,594 and 6,276,088 .

The tail cap-situated ends of the conductive leads **166**, **168** are conductively secured to the tail cap circuit board **118** for conductively communicating with the positive and negative battery cell contacts **114**, **116**. As shown in FIG. **19**, the tape switch lead **166** is conductively secured to the first conductive area **158** of the circuit board's rear face **150**, which conductive area **158** conductively communicates with the positive battery contact **114** on the circuit board's forward face **156** as previously described. The tape switch lead **168** is conductively secured to the conductive area **160** on the circuit board's rear face **150**, which conductive area **160** conductively communicates with the battery cell negative terminal contact **116** on the circuit board's forward face **156** as previously described. Accordingly, when the circuit of the tape switch **164** is closed upon the application of pressure to the tape switch actuator **170**, the battery cell positive terminal **43** is conductively connected to the battery cell negative terminal **45** during such time that actuating pressure is continued to be applied to the tape switch actuator **170**.

It should be noted that, like the two switching modes of the tail cap switch **48** permitted by the switch actuator arm **122**, the remotely situated tape switch actuator **170** (whether situated under the trigger guard or horseshoed about the front of the handgun grip) may be operated with either of the operator's hands and, in addition, the tape switch actuator **170** may be operated by the same hand used for pulling the handgun's trigger.

It has been noted that the latch plate **80**, described in connection with FIG. **6**, includes a transversely disposed elongate protuberance **84** having a width w slightly less than the slot **34** of the firearm's rail **30** for being received therein. Different firearm rails may have different slot widths, and indeed two well-known types of rails (namely, a Universal rail and a Picatinny rail) have slots of respectively different standardized widths. In order to accommodate both types of rails, the preferred embodiment of the accessory device **36** of the present invention may be provided with two types of replaceable latch plates. For example, the accessory device **36** may be provided with a latch plate **80** having a protuberance width w of approximately 0.125 inch for accommodating the transverse slot in a Universal rail, while another latch plate **80'** (shown in FIG. **20**) may be provided having a width w' of its transversely disposed elongate protuberance **84'** of approximately 0.205 inch for accommodating the transverse slot of a Picatinny rail. Except for the differences in the width of the transverse protuberance shown as examples of the latch plate **80** and the latch plate **80'**, the two latch plates **80**, **80'** are substantially identical and one may be substituted for the other in the accessory device **36** according to the invention.

Accessory devices according to the invention, including the preferred embodiment **36** thereof, may be removably secured to firearms other than handguns, as well as to other types of firearms that do not have integral rails but are adapted for having accessory rail mount system devices secured thereto. Such rail mount system devices are well known in the firearms art, and may be of the type **172** (see FIG. **21**) comprising a series of longitudinally spaced-apart ribs **174** separated by transverse slots **176**, such as a Picatinny rail specified in MIL-STD-1913 incorporated herein by reference.

Such rail mount structures **172** may be secured to long arms, for example to a rifle or shotgun **176** illustrated in FIG. **21** and as further disclosed in U.S. Pat. No. 6, 655,069 issued to Paul Y. Kim and incorporated herein by reference. Other examples of rail structures **172**, including Picatinny rails, on other types of firearms are disclosed in U.S. Pat. Nos. 6,508, 027 and 6,622,416, both issued to Paul Y. Kim and incorporated herein by reference; and in U.S. patent application Ser. No. 10/447,874 of Paul Y. Kim and John W. Matthews, assigned to the assignee of the present invention and incorporated herein by reference.

As shown in FIGS. **21** and **23**, the accessory device or light beam generator **36** may be removably secured to such rail structures **172** secured to firearms other than hand weapons. Where such rail structure **172** is of a type having Picatinny rails, the latch plate **80'** shown in FIG. **20** would be installed in the accessory device **36**, with the transverse protrusion **34'** having a width w' for matingly engaging any one of the Picatinny rail slots **176**. The accessory device **36** may be removably secured to the rail structure **172** in substantially the same way as the accessory device **36** may be removably secured to the rail **30** carried by the handgun **20**. The operator may adjust the longitudinal position of the accessory device **36** on the rail by depressing the handles **120** until a selected slot **176** has been encountered by the protuberance **34**.

As shown in FIG. **21**, a handgrip **180** may be secured to the rail structure **172**, rearwardly of the light beam generator **36** but in proximity with the tail cap for permitting the operator to conveniently operate the tail cap switch device. In addition, FIG. **21** shows a tape switch **164** connected to the tail cap and having an actuator horseshoed about the front of the handgrip **180**. In such configuration, and if both the accessory device **36** and the handgrip **180** are secured to the bottom rail **172** (as illustrated in FIG. **23**), the tail cap switch **48** may be actuated in both the CONSTANT ON/OFF and MOMENTARY ON modes with either hand.

The accessory device or light beam generator **36**, and in particular the housing **40**, elongate members **94**, pivot plate **80** and tail cap **50** may be manufactured using fabrication methods well-known in the art, of well known materials typically used in the art of making such components including rigid and durable materials such as polymeric materials as well as light weight aluminum alloys.

Although a target illuminator embodiment of the light beam generator **36** is described above in detail, laser aiming

devices securable to rails carried by firearms are included within the scope of light beam generators according to the invention of the parent application.

The preferred embodiment of the accessory device according to the present invention, specifically the preferred embodiment of the light beam generator **236**, is shown with reference to FIGS. **24-39**. Turning specifically to FIGS. **27-39** (wherein primed reference numerals indicate components similar to components in FIGS. **4-19** shown with corresponding reference numerals), the light beam generator **236** includes a housing **240** in which is contained a power source such as a battery **42'** of one or more battery cells **44'** (for example, two 3-volt lithium battery cells **44'**) similarly to the power source described above with respect to the light beam generator **36**. Also similarly to the light beam generator **36**, a light emitter assembly **46'** is carried by the light beam generator housing **240** forwardly of the battery **42'** and in circuit with a positive front terminal of one of the battery cells **44'** and a negative front terminal of another of the battery cells **44'**. The switch device **48'** (similar to the switch device **48** previously described) is preferably situated at the rear of the housing **240** in and including a tail cap **50'**, the switch device **48'** including a switch actuator assembly **49'** for selectively completing and opening the light emitter energization circuit. In the embodiment shown, this is accomplished by the switch actuator assembly **49'** establishing a conductive path between the rear positive terminal **43'** of one of the battery cells **44'** and the rear negative terminal **45'** of the other of the battery cells **44'** for placing the switch device **48'** in an ON position causing the battery **42'** to energize the light emitter assembly **46'**, and by opening such conductive path for placing the switch in an OFF position where the battery **42'** does not energize the light emitter assembly **46'**.

The preferred light emitter assembly **46'** shown in FIG. **28**, as well as alternative embodiments thereof, are described above in connection with the light emitter assembly **46** shown in FIG. **5**. Similarly, the structure and operation of the switch device **48'** and tail cap **50'** of the enhanced light beam generator **236**, shown in FIGS. **27** and **28**, are described above in connection with the switch device **48** and tail cap **50** shown in FIGS. **4**, **5** and **10-19**.

Considering FIGS. **27** and **33**, the preferred embodiment of the housing **240** of the light beam generator **236** of the present invention includes a substantially flat upwardly facing or top surface **300**. Two upstanding first wall segments **302** longitudinally extend forwardly along opposite sides of the top surface **300** from the vicinity of the housing's rear end **303**, two upstanding second wall segments **304** longitudinally extend forwardly of the respective first wall segments **302**, and two upstanding third wall segments **306** longitudinally extend forwardly of the respective second wall segments **304**. The forward generally vertical ends **308** of the respective first wall segments **302** are transversely aligned, and the rearward generally vertical ends **310** of the respective second wall segments **304** are transversely aligned and longitudinally spaced from the second wall segments' forward ends **308** by a predetermined distance f. The forward generally vertical ends **312** of the respective second wall segments **304** are transversely aligned and longitudinally spaced from the rearwardly facing transversely aligned generally vertical ends **314** of the third upstanding wall segments **306** by a predetermined distance g.

A transversely disposed pin **70'** is secured to the housing **240** in the vicinity of its rear end **303** and above the housing's top surface **300**. The transverse pin **70'** is secured to the first wall segments **302** in the vicinity of their rear ends and above the top surface **300**. The pin **70'** additionally extends through apertures in two upstanding protuberances or partitions **72'** from the top surface **300**. The two partitions **72'** are laterally spaced so as to divide the transverse pin **70'** into three exposed segments **74'**, **76'**, **78'** which may be of substantially equal lengths.

The light beam generator **236** includes a latch plate **316** in cooperative engagement with and preferably removably secured to the housing **240**. Similarly to the latch plate **80** shown in FIGS. **4-8**, the latch plate **316** shown in FIGS. **27-32** includes a generally U-shaped rear end **82'** configured for receiving the middle segment **76'** of the transverse pin **70'**. One leg (preferably the upper leg **83'**) of the U may curve over a portion of the generally rearwardly facing opening of the U, and the plate **316** is preferably made of a material such that the legs are somewhat resilient. As illustrated in FIG. **27**, the latch plate **316** is installed to the housing **240** by placing the opening of the latch plate's rear end **82'** to the transverse pin segment **76'**, and the installer urging the rear end **82'** to snap onto the pin segment **76'**. The latch plate **316** accordingly is hinged at its rear end **82'** about the transverse hinge pin **70'**, specifically about the hinge pin segment **76'**; i.e., the latch plate **316** is pivotally secured to the housing **240** about a transverse axis t along the pin **70'** (see also FIG. **33**).

As shown in FIGS. **29-32**, the preferred embodiment of the latch plate **316** is configured as a generally U-shaped plate including two legs **318** extending along opposite sides of a longitudinal axis b, with the base **320** of the U rearwardly extending to the plate's rear end **82'**. The legs **318** are transversely (preferably equally) spaced from the plate's longitudinal axis b, and extend from an opening **322** through the plate **316** preferably having a transverse dimension greater than the distance separating the two legs **318**. In the illustrated plate embodiment, the opening **322** is generally circular with a diameter greater than the transverse distance separating the two legs **318**, as shown in FIG. **29**. The plate **316** is fabricated of a material (such as nylon) having sufficient resiliency for permitting the free ends **324** of the legs **318** to be transversely displaced toward one another when forces are transversely applied simultaneously to the legs **318** toward the longitudinal axis b, and for resiliently tending to return the free ends **324** of the legs **318** to their normally spaced-apart position (as shown in FIG. **29**) when the applied forces are removed.

Each of the legs **318** includes an upstanding protuberance **326**, preferably a transversely disposed elongate protuberance **326**, in the vicinity of the legs' free ends **324**, the elongate upstanding protuberance **326** having a width w (along the longitudinal direction) slightly less than the width of the slot **34** in the firearm's rail **30** for being received therein. In the illustrated embodiment, lateral arms **328** transversely extend outwardly from the respective legs **318**, the arms **328** extending from the vicinity of the legs' free ends **324** and being of a width (along the longitudinal direction) slightly less than the distance between the rear ends **314** of the third wall segments **306** and the forward ends **308** of the housing's first wall segments **302**, each of the arms **328** having a cutout section **330** for receiving the second wall segments **304** when the latch plate **316** is installed to the housing **240**. The arms **328** terminate with longitudinal handles **332** laterally extending from the housing **240** when the latch plate **312** is installed to the housing (see, for example, FIGS. **25** and **35**).

When the assembled light beam generator **236** is installed to the firearm rail **30** (as shown in FIGS. **24** and **25**), the latch plate **316** co-acts with the housing **240** such that the free ends **324** of the legs **318** may be caused to assume a first vertical position in which the latch plate's upstanding protuberances **326** are lower than and therefore not receivable in the rail slot **34** (FIGS. **37** and **38**), and alternatively the free ends **324** of

the legs **318** may be caused to be supported by the housing **240** in a second vertical position in which the upstanding protuberances **326** are receivable in the rail slot **34** (FIGS. **35** and **36**). In the illustrated embodiment, each of the plate's legs **318** includes a protuberance **334** forwardly extending from the legs' free ends **324** and preferably slightly depending therefrom. The forward protuberances **334** are transversely (preferably equally) spaced from the plate's longitudinal axis b and are configured to be respectively supported by two upwardly facing support surfaces **336** of the battery housing **240**. The support surfaces **336** are situated just inwardly of the third wall segments **306** and forwardly of the third segment's rear ends **314**, the two support surfaces **336** being transversely (preferably equally) spaced from the housing's longitudinal axis b' (which is directly beneath the plate's longitudinal axis b when the plate is installed to the housing). The two support surfaces **336** are at a height above the housing's upwardly facing flat surface **300** such that the free ends **324** of the legs **318** are in the second vertical position with the upstanding protuberances **326** of the installed latch plate **316** at a height for being received by the rail slot **34** when the light beam generator is installed to the rail **30**.

The inner boundary of each raised support **336** defines an outwardly lateral wall **338** of respective depressions **340** for receiving the forward protuberances **334** when a user applies inwardly directed forces to the handles **332** and downwardly pivots the latch plate **316** about the transverse axis t, i.e. about the pivot pin **70'**. As shown in FIGS. **37** and **38**, such application of forces (represented by force arrows **346**) inwardly urge the two resilient legs **318** such that their free ends **324** are displaced toward one another, and along with the downward pivoting of the latch plate **316**, causes the forward protuberances **334** to enter the depressions **340** until the bottom surface **342** of the depressions engage the respective floors **344** of the depressions **340** (which floors **344** may be continuations of the housing's upwardly facing surface **300**, FIG. **38**). When the applied force is removed by the user, the resiliency of the legs **318** causes the forward protuberances **334** to be outwardly biased against the respective depression walls **338**, thereby retaining the forward protuberances **334** in the depressions **340**. The height of the depression floors **340** is such that the free ends **324** of the legs **318** are in the first vertical position with the upstanding protuberances **326** of the installed latch plate **316** at a height below the rail **30** and therefore not receivable in the rail slot **34**.

As shown in FIGS. **34** and **32**, the wall **338** of each of the depressions **340** may be inwardly sloped by an angle α (e.g. 5 degrees from vertical), and the outer sides of the forward protuberances **334** may be complementarily sloped, for assisting the releasable retention of the forward protuberances **334** within the depressions **340**.

The latch plate **316**, described in connection with FIGS. **29-32**, includes upstanding transverse elongate protuberances **326** having a width w slightly less than the slot **34** of the firearm's rail **30** for being received therein. As previously noted, different firearm rails have different slot widths, including two well known types of rails (namely, a Universal rail and a Picatinny rail) having slots of respectively different standardized widths. In order to accommodate both types of rails, the preferred embodiment of the accessory device **236** of the present invention may be provided with two types of replaceable latch plates. For example, the accessory device **236** may be provided with a latch plate **316** having an upstanding protuberance width w of approximately 0.125 inch for accommodating the transverse slot in a Universal rail, while another latch plate **316'** (shown in FIG. **39**) may be provided with its transversely disposed upstanding elongate protuberances **326'** having a width w' of approximately 0.205 inch for accommodating the transverse slot of a Picatinny rail. Except for the differences in the width of the upstanding protuberances shown as examples of the latch plate **316** and the latch plate **316'**, the two latch plates **316**, **316'** are substantially similar and one may be substituted for the other in the accessory device **236**.

Similarly, accessory devices according to the present invention, including the preferred embodiment **236** thereof, may be removably secured to firearms other than handguns, as well as to other types of firearms that do not have integral rails and are adapted for having accessory rail mount system devices secured thereto. Such rail mount system devices are well known in the firearms art, including the Picatinny rail **172** described above in connection with FIGS. **21** and **22**. As shown in FIG. **26**, the accessory device or light beam generator **236** may be removably secured to such rail structures **172**, which rail structures may be secured to firearms other than handguns as previously discussed in connection with FIGS. **21-23**.

The accessory device or light beam generator **236** includes two elongate members **294**, **295** removably secured to the housing **240**, for interfacing with the firearm rail **30** to enable the housing **240** to be retainably slid along the rail **30** or **172** (see, in particular, FIGS. **1** and **24-28**). Each elongate member **294**, **295** includes an inwardly directed tongue **238** longitudinally extending along such member **294**, **295**; i.e., the elongate rail interface members **294**, **295** are installed to the housing **240** with the longitudinal tongue **238** of one of the members **294**, **295** facing the longitudinal tongue **238** of the other of the members **294**, **295**, the tongues **238** complementing the firearm rail's longitudinal grooves **32** for slidably cooperating with the rail's longitudinal grooves **32** while being vertically retained by the rail **30** (or the rail **172**) as shown in FIGS. **25** and **26**.

The elongate rail interface members **294**, **295** are installed to the housing **240** after the latch plate **316** has been placed to the housing **240** as previously described. Each member **294**, **295** includes a flat bottom surface **296**, **297**, respectively, for contacting the top surfaces of the first, second and third wall segments **302**, **304**, **306**. The members **294**, **295** include bores **370** therethrough aligned with internally threaded blind vertical bores **372** in the wall segments **302**, **304**, **306**, the members **294**, **295** being removably secured to the walls by headed screws **374** respectively extending into the bores **370** through the members **294**, **295** and threaded into the respectively aligned threaded bores **372** in the housing **240**.

With the elongate members **294**, **295** so installed, their bottom surfaces **296**, **297**—which contact and extend along the top surface of the wall segments **302**, **304**, **306**—bridge those wall segments and provide a ceiling to the spaces between them. Such bridges or ceilings upwardly capture the lateral arms **328** within such spaces, while the wall ends **308**, **310** and **312**, **314** longitudinally capture the lateral arms **328** within such spaces, resulting in the hinged latch plate **316** being captured to the housing **240** as well.

The elongate rail interface members **294**, **295** may be removed from the housing **240** by unscrewing the screws **374**, and if desired the elongate rail interface members **294**, **295** may be replaced by other or different elongate rail interface members which are similarly removably securable to the housing **240**. It may be appreciated that when the rail interface members **294**, **295** have been removed from the housing **240**, the lateral arms **328** of the hinged latch plate **240** are no longer upwardly blocked or captured by the members **294**, **295**, so that the latch plate **240** may be pivoted about the hinge pin **70'** away from the surface **300** of the housing **240** and

pulled away from the hinge pin **70'**. In such manner, the latch plate **316** may be removed from the housing **240**, and a replacement latch plate **316** or a different latch plate (such as the latch plate **316'**), which is similarly removably securable to the housing **240**, may be hinged to the hinge pin **70'** and captured to the housing **240** by reinstalling the rail interface members **295**, **295**.

When the light beam generator **236** is in its assembled condition (i.e., with the tail cap switch **48'**, light emitter assembly **46'**, latch plate **316** and rail interface members **294**, **295** installed to the housing **240** as described above), the assembled light beam generator **236** may be removably installed to the firearm rail **30** (or **172**). The user typically holds the light beam generator **236** in one hand and transversely urges the handles **332** inwardly (i.e. applies transverse inwardly directed forces to the handles **332**) such as with his/her thumb and index finger, while downwardly urging the handles **332** (such as with the same thumb and index finger). Such maneuver causes the resilient legs **318** to be squeezed toward one another at their free ends **324** while being downwardly pivoted, causing the forward protuberances **334** at the legs' free ends **324** to transversely inwardly slide from their respective support surfaces **336** and into the respective depressions **340**. The user may release the inwardly transverse and downward urging, whereupon the resilient legs **318** bias the forward projections **334** laterally against the generally lateral substantially vertical walls **338** of the depressions **340**. The free ends **324** of the legs **318** are thereby releasably retained in their first vertical position with the upstanding protuberances **326** at a height where they are unable to be received in the slot **34** of the rail **30** when the light beam generator **236** is applied to the rail **30**. The light beam generator **236** is then placed to the rail **30** with the rear ends of the tongues **238** (see FIG. **25**) of the rail interface members respectively engaging the forward ends of the grooves **32** of the rail **30** carried by the firearm **20**. The light beam generator **236** is thereupon rearwardly urged by the user, thereby sliding the housing **240** along the rail **30** while the housing **240** is being vertically retained by the rail **30**.

When the light beam generator **236** has been rearwardly slid along the rail **30** until the latch plate's upstanding protrusions **326** are vertically aligned beneath the rail slot **34**, the user upwardly urges the latch plates' handles **332**, which action causes the latch plate **316** to be upwardly pivoted about the hinge pin **70'**, causing the latch plate's forward protuberances **234** to be upwardly removed from their respective depressions **340**. The resiliency of the latch plate's legs **318** outwardly urges the forward protuberances **334** to engage and be supported by their respective support surfaces **336**. Consequently, the free ends **324** of the latch plate legs **318** are supported in the second vertical position with the upstanding protuberances **326** received in the rail slot **34**.

As earlier noted, the width w of the upstanding protuberances **326** is slightly less than the width of the slot **34** such that the upstanding protuberances **326** just fit into the slot **34**. The engagement of the upstanding protuberances **326** with the slot **34** stops further longitudinal movement of the housing **240** along the rail **30**, longitudinally latching the housing **240** in this position. The longitudinal positions of the slot **34** and of the upstanding protuberances **326** are preferably predetermined such that the rear end of the tail cap **50'** is situated just forwardly of or in contact with the handgun's trigger guard **26** when the upstanding protuberances **326** are received in the slot **34**.

To remove the accessory device or light beam generator **236** from the firearm rail **30**, the user transversely inwardly and downwardly urges the laterally protruding handles **332**, causing the legs **318** of the plate **316** to be squeezed together and the latch plate **316** to be downwardly pivoted about the hinge pin **70'**. As previously described, this action results in the forward protuberances **334** being removed from their respective support surfaces **336** and received by their respective depressions **340**. The user's release of such inward and downward urging results in the forward protuberances **334** being resiliently urged against the depressions' outer walls **336**, thereby releasably retaining the latch plate legs' free ends **324** in their first vertical position with the upstanding protuberances **326** removed from the slot **34**. The user thereupon forwardly urges the light beam generator **236** to slide along the rail **30** until the light beam generator **236** is removed therefrom.

The rail interface members **294**, **295** may be configured to accommodate differences in the dimensional tolerances of firearm rails **30** manufactured by different manufacturers, and even among firearm rails manufactured by the same manufacturer. In a preferred embodiment of the rail interface members **294**, **295** for accommodating such differences, the bores **370** and counterbores in the rail interface members **294**, **295** may be configured similarly as the bores **102** and the counterbores **103** in the rail interface members **94** as previously described (see FIG. **9**). During installation of the light beam generator **236** to a particular firearm rail **30**, if the engagement of the rail interface members **294**, **295** to the rail **30** is too loose, the user may simply loosen the screws **374**, move the rail interface members **294**, **295** inwardly (transversely toward each other) and thereupon tighten the screws **374**. If the engagement between the rail interface members **294**, **295** and the rail **30** is too tight, the user may loosen the screws **374**, move the rail interface members **294**, **295** outwardly (transversely away from each other) and tighten the screws **374**. In either event, the adjustment assists in the prevention of transverse movement of the accessory device **236** with respect to the rail **30** which may be caused, for example, upon discharge of the firearm.

The accessory device or light beam generator **236** may be manufactured using fabrication methods well-known in the art, of well-known materials typically used in the art of making such components including rigid and durable materials such as polymeric materials as well as lightweight aluminum alloys, and resilient materials such as nylon materials. In an example of the preferred embodiment of the light beam generator **236**, the housing **240** may be fabricated of an aluminum alloy; and the latch plate **316** and the elongate members **294**, **295** may be fabricated of a nylon material.

Although a target illuminator embodiment of the light beam generator **236** is described above in detail, laser aiming devices securable to rails carried by firearms are included within the scope of light beam generators according to the present invention.

Thus, there has been described a preferred embodiment of an accessory device which is removably securable to a longitudinal rail carried by a firearm, which accommodates longitudinal rails of different configurations carried by firearms, and which includes a removably securable latching device. The light beam generator of the preferred embodiment includes a removable tail cap switch actuable by either hand of an operator for placing the switch in CONSTANT ON/OFF positions and in a MOMENTARY ON position, as well as for remote actuation by either hand to a MOMENTARY ON position. Other embodiments of the present invention, and variations of the embodiments presented herein, may be developed without departing from the essential characteristics thereof. Accordingly, the invention should be limited only by the scope of the claims listed below.

We claim:

1. An accessory device for a firearm carrying a longitudinal rail including a transverse slot, the accessory device comprising:

a housing;

elongate members secured to said housing, said elongate members complementing the rail for enabling said housing to be retainably slid along the rail;

a generally U-shaped plate including two resilient legs longitudinally extending from a base pivotally secured to said housing about a transverse axis, each of said legs having a free end and an upstanding protuberance in the vicinity of said free end, said legs transversely urgable for resiliently displacing the free ends toward one another; and

said housing adapted for releasably retaining said free ends in a first vertical position with the upstanding protuberances non-receivable in the slot when said housing is applied to said rail with said free ends resiliently displaced toward one another and said plate downwardly pivoted, said housing adapted for supporting said free ends in a second vertical position with said upstanding protuberances receivable in the slot.

2. The accessory device according to claim 1, wherein:

said plate includes two arms transversely extending from said legs respectively, said arms urgable by a user for resiliently displacing said free ends toward each other and for pivoting said plate.

3. The accessory device according to claim 1, wherein:

each of said legs includes a forward protuberance at said free end;

said housing includes two spaced-apart supports engageable with the forward protuberances for supporting said free ends in said second vertical position; and

said housing includes two depressions adjacent to said supports for respectively receiving said forward protuberances with said free ends in said first vertical position when said legs are transversely urged and said plate is downwardly pivoted.

4. The accessory device according to claim 3, wherein:

said depressions are configured for releasably retaining said forward protuberances resiliently biased by said legs.

5. The accessory device according to claim 3, wherein:

each of said depressions includes a wall for being laterally engaged by said forward protuberances resiliently biased by said legs with said free ends displaced toward one another.

6. The accessory device according to claim 1, wherein:

said elongate members are removably secured to said housing.

7. The accessory device according to claim 1, wherein:

said plate is removably secured to said housing.

8. The accessory device according to claim 6, wherein:

said plate is captured to said housing by said elongate members secured to said housing, and said plate is removable from said housing when said elongate members are removed from said housing.

9. The accessory according to claim 8, wherein:

said plate is removable from its securement about said transverse axis when said elongate members are removed from said housing.

10. The accessory device according to claim 1, including:

a light emitter assembly carried by said housing;

a battery carried by said housing in circuit for energizing said light emitter assembly when switch actuated; and

a switch device including a switch actuator for said battery.

11. The accessory device according to claim 10, wherein:

said switch device is removably secured to said housing.

12. The accessory device according to claim 10, wherein:

said switch actuator is rotatably urgable by either hand of an operator when said housing is installed on the rail for placing said switch device in a CONSTANT ON or OFF position, and forwardly urgable by either hand of the operator when said housing is installed on the rail for placing said switch device in a MOMENTARY ON position.

13. The accessory device according to claim 12, including:

a remote switch actuator communicating with said switch device for remotely actuating said switch device to a MOMENTARY ON position.

14. The accessory device according to claim 10, wherein:

said switch device comprises a tail cap switch pivotally secured to said housing about a pivot axis, said tail cap switch pivotable about said pivot axis away from said housing.

15. The accessory device according to claim 14, wherein:

said tail cap switch is adapted for being removed by an operator from its securement about said pivot axis.

16. The accessory device according to claim 14, wherein:

said tail cap switch is adapted for being removed by an operator from its securement about said pivot axis only when said tail cap switch is pivoted away from said housing.

17. The accessory device according to claim 14, wherein:

said tail cap switch includes a switch actuator rotatably urgable by either hand of an operator when said housing is installed on the rail for placing said tail cap switch in a CONSTANT ON or OFF position, and axially urgable by either hand of the operator when said housing is installed on the rail for placing said tail cap switch in a MOMENTARY ON position.

18. The accessory device according to claim 17, including:

a remote switch actuator communicating with said tail cap switch and operable by either hand of the operator for placing said tail cap switch in a MOMENTARY ON position.

19. The accessory device according to claim 10, wherein:

said switch device comprises a tail cap switch and said switch actuator includes an actuator arm rotable at its center about a longitudinal axis of said housing, said actuator arm including longitudinally displaceable ends with handles at said ends, one of said handles accessible to one hand of the operator and the other of said handles accessible to the other hand of the operator when said housing is installed on the rail;

said switch actuator is adapted for placing said tail cap switch in a CONSTANT ON position when either of said handles is upwardly or downwardly urged by the operator from an OFF position of said switch, and for returning said tail cap switch to the OFF position upon reverse urging of either of said handles; and

said switch actuator is adapted for placing said switch in a MOMENTARY ON position when either of said handles is forwardly urged from the OFF position by the operator.

20. The accessory device according to claim 19, wherein:

said switch actuator is latched in the OFF position when said actuator arm is transversely oriented, and said switch actuator is latched in the CONSTANT ON position when said actuator arm is rotationally displaced from its transverse orientation.

21. The accessory device according to claim 19, wherein:
said tail cap switch is pivotally secured to said housing about a pivot axis.

22. The accessory device according to claim 21, wherein:
said tail cap switch is adapted for being removed by an operator from its securement about said pivot axis.

23. The accessory device according to claim 6, wherein:
the securement of said elongate members is transversely adjustable.

24. The accessory device according to claim 6, wherein:
said elongate members are secured to said housing with headed screws retained in bores in said elongate members respectively communicating with threaded bores in said housing, said bores in said elongate members providing a loose fit with said headed screws at least in the transverse direction for adjusting the transverse distance between said members.

25. A method of assembling an accessory device for installation on a longitudinal rail carried by a firearm, the rail including a transverse slot therein, the method comprising:
providing the accessory device including a housing;
providing elongate members complementing the rail;
providing a latch plate including at least one upstanding protuberance sized for being received by the slot in the rail;
pivotally securing said plate to said housing with said at least one upstanding protuberance in the vicinity of at least one free end of said plate; and
removably securing said elongate members to said housing with said elongate members capturing said plate to said housing and enabling said housing to be retainably slid along the rail.

26. The method according to claim 25, wherein:
in the pivotally securing step, said plate is removably secured to said housing about a transverse axis.

27. The method according to claim 26 wherein the rail is a first rail, further including:
removing said elongate members from said housing;
removing said plate from said housing;
providing a second latch plate including at least one upstanding protuberance sized for being received by a transverse slot in a second longitudinal rail carried by a firearm;
pivotally securing said second plate to said housing with said at least one upstanding protuberance in the vicinity of at least one free end thereof; and
removably securing said elongate members to said housing with said elongate members capturing said second plate to said housing and enabling said housing to be retainably slid along the second rail.

28. The method according to claim 27, wherein:
in the second plate providing step, said at least one upstanding protuberance of said second plate is of a different size than said least one upstanding protuberance of said first plate.

29. The method according to claim 25, wherein:
during the plate providing step, said plate is generally U-shaped having two resilient legs longitudinally extending from a base, each of said legs having a free end with one of said at least one upstanding protuberance in the vicinity of said free end;
in the accessory device providing step, said housing is adapted for releasably retaining the free ends of said legs in a first vertical position, said housing adapted for supporting said free ends of said legs in a second vertical position; and
during the pivotally securing step, said base of said plate is removably pivotally secured to said housing about a transverse axis.

30. A method of installing an accessory device to a longitudinal rail including a transverse slot, comprising:
providing an accessory device slidable along the rail and including a housing, a generally U-shaped plate having two resilient legs longitudinally extending from a base pivotally secured to said housing about a transverse axis, each of said legs having a free end and an upstanding protuberance in the vicinity of said free end, said housing adapted for releasably retaining the free ends in a first vertical position with the upstanding protuberances non-receivable in the slot, said housing adapted for supporting said free ends in a second vertical position with said upstanding protuberances receivable in the slot;
transversely urging said legs to resiliently displace said free ends toward one another while downwardly pivoting said plate to place said free ends in said first vertical position in said housing;
sliding said accessory device along the rail until said upstanding protuberances are positioned beneath the slot; and
upwardly pivoting said plate to release said free ends from said first vertical position and to be supported by said housing in said second vertical position with said upstanding protuberances received in the slot.

31. The method according to claim 30, further including:
transversely urging said legs to displace said free ends toward one another while downwardly pivoting said plate to place said free ends in said first vertical position with said upstanding protuberances removed from the slot; and
sliding said accessory device along said rail until said accessory device is removed therefrom.

32. The method according to claim 30, wherein:
during the accessory device providing step, each of said legs includes a forward protuberance at said free end, said housing includes two spaced-apart supports engageable with the forward protuberances, and said housing includes two depressions adjacent to said supports for respectively receiving said forward protuberances;
during the transversely urging step, said forward protuberances are disengaged from said supports and are respectively received by said depressions to place said free ends in said first vertical position; and
during the upwardly pivoting step, said forward protuberances are removed from said depressions and engage said supports to place said free ends in said second vertical position.

33. A method of adapting an accessory device normally installable on a first longitudinal rail including a transverse slot, for installation on a second longitudinal rail including a transverse slot of a different size than the slot in the first rail, the method comprising:
providing an accessory device including a housing, a generally U-shaped first plate having two resilient legs longitudinally extending from a base removably pivotally secured to said housing about a transverse axis, each of said legs having a free end and an upstanding protuberance in the vicinity of said free end, the upstanding protuberances of said first plate sized for being received by the slot in the first rail, and elongate members complementing the first rail and removably secured to said housing and capturing said plate to said housing,

said elongate members enabling said housing to be retainably slid along the first rail;

removing said elongate members from said housing;

removing said first plate from said housing;

providing a generally U-shaped second plate having two resilient legs longitudinally extending from a base removably pivotally securable to said housing about a transverse axis, each of said legs having a free end and an upstanding protuberance in the vicinity of said free end, the upstanding protuberances of said second plate sized for being received by the slot in the second rail;

removably pivotally securing said second plate to said housing; and

removably securing elongate members complementing said second rail to said housing and capturing said second plate to said housing and enabling said housing to be retainably slid along the second rail.

34. The method according to claim **33**, wherein:

in the elongate members securing step, the elongate members being secured are the same elongate members removed in the elongate members removing step.

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