



US 20100192447A1

(19) **United States**  
(12) **Patent Application Publication**  
**Cabahug et al.**

(10) **Pub. No.: US 2010/0192447 A1**  
(43) **Pub. Date: Aug. 5, 2010**

(54) **RIFLE ACCESSORY RAIL, COMMUNICATION, AND POWER TRANSFER SYSTEM**

(22) Filed: **Jan. 19, 2010**

**Related U.S. Application Data**

(75) Inventors: **Eric Cabahug**, Fairfax, VA (US); **Joseph Frascati**, Arlington, VA (US); **Ben Feldman**, Reston, VA (US); **John Schroeder**, Leesburg, VA (US); **James Dodd**, Linden, VA (US); **Donald McLaughlin**, Frederick, MD (US); **Hector Tapia**, Ashburn, VA (US)

(60) Provisional application No. 61/145,232, filed on Jan. 16, 2009.

**Publication Classification**

(51) **Int. Cl.**  
**F41C 27/00** (2006.01)  
(52) **U.S. Cl.** ..... **42/84; 42/90**

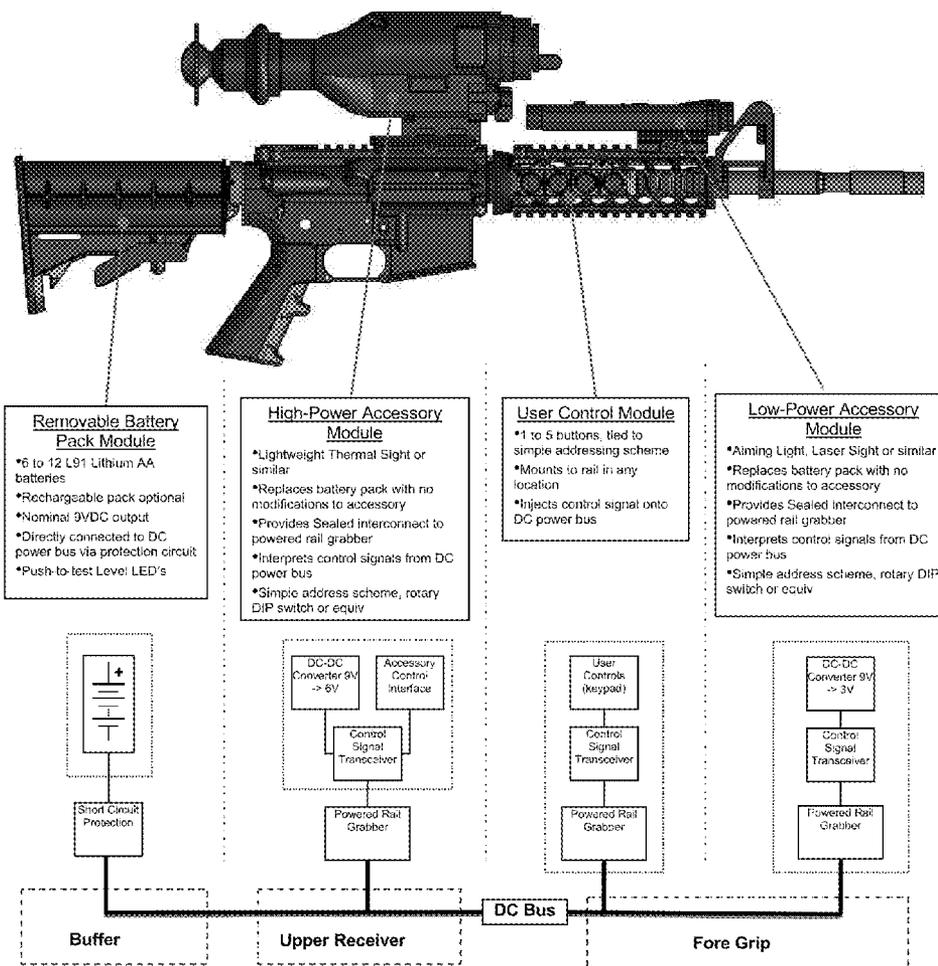
Correspondence Address:  
**SULLIVAN & WORCESTER LLP**  
**1666 K Street NW**  
**Washington, DC 20006 (US)**

(57) **ABSTRACT**

The present invention is related to weapons systems. In particular, the present invention is directed to accessory attachment systems for rifles and small arms weapons that enable attached accessory devices to draw power from a central power source and communicate with the user and/or other devices.

(73) Assignee: **PROTOTYPE PRODUCTIONS, INC.**, Ashburn, VA (US)

(21) Appl. No.: **12/689,430**



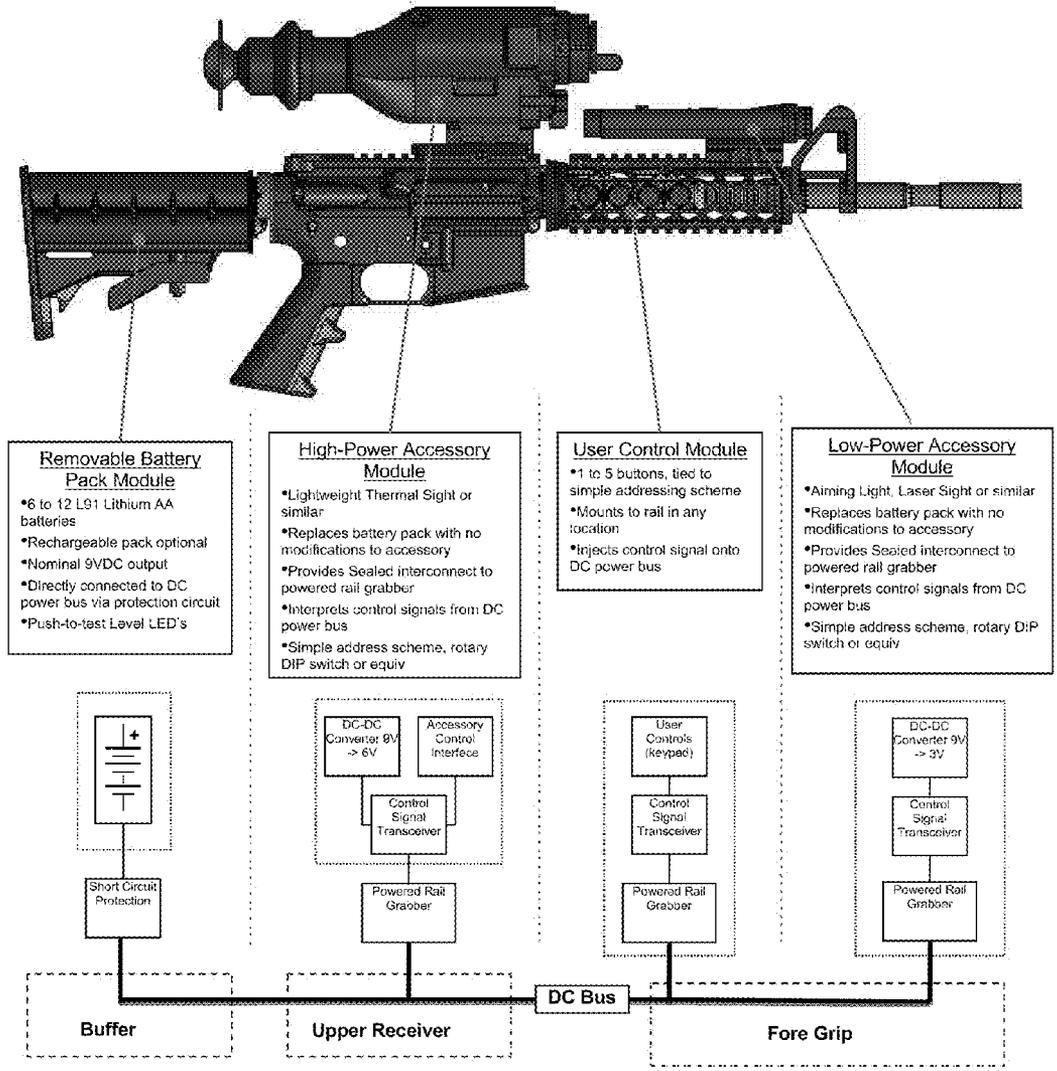


Figure 1

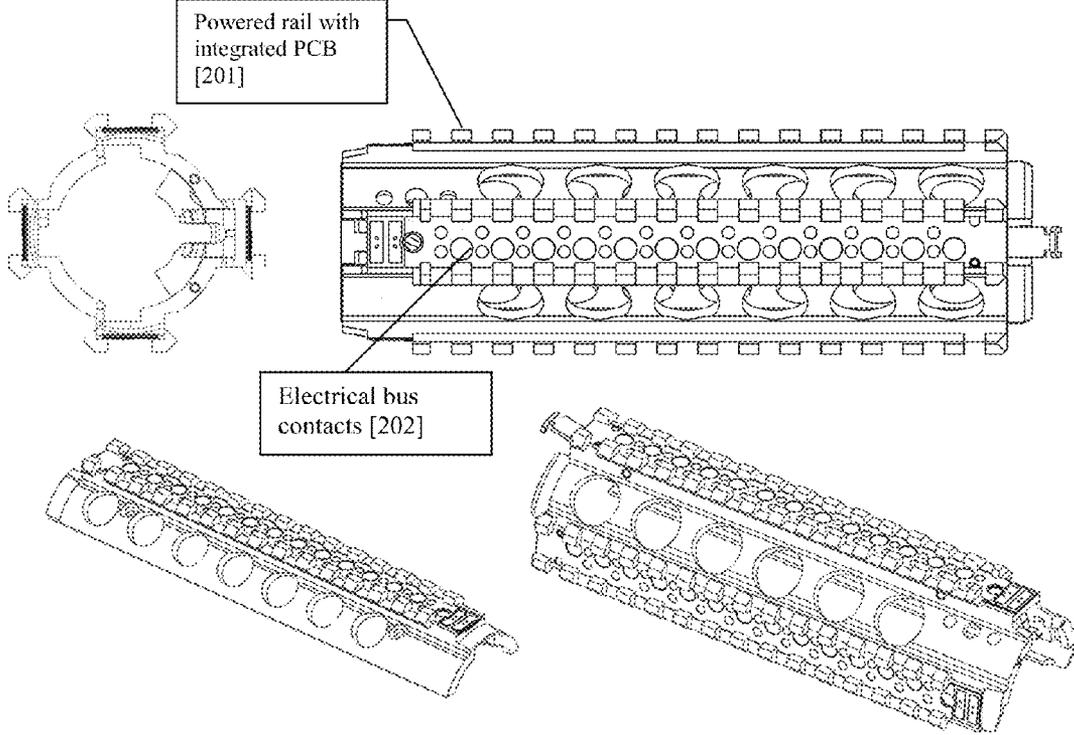


Figure 2

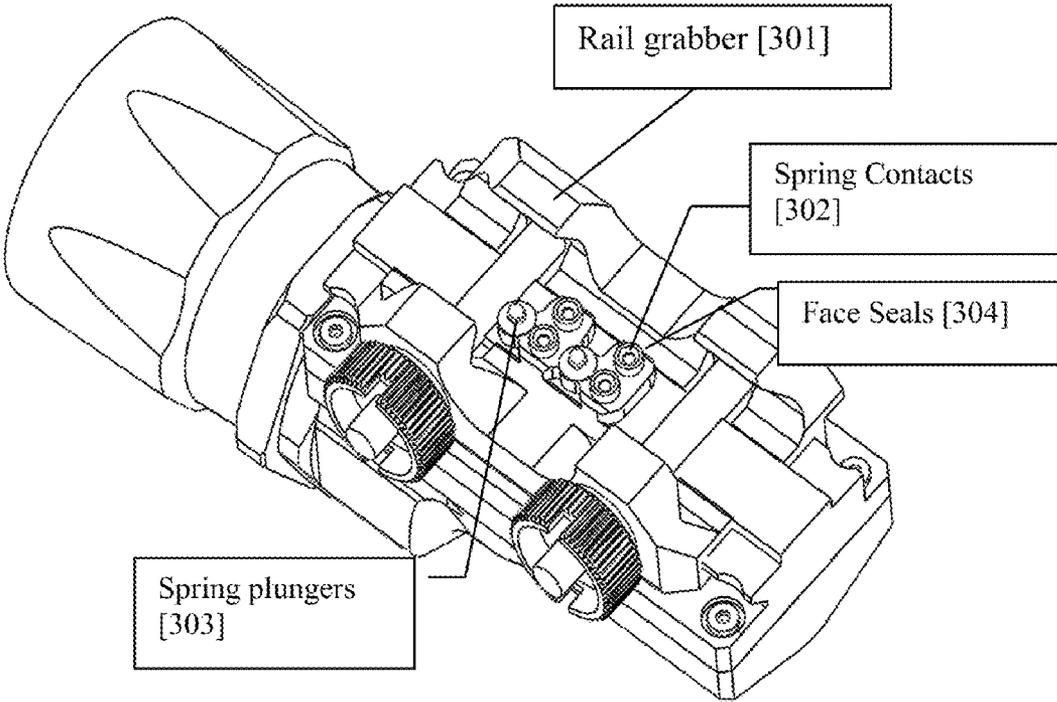


Figure 3

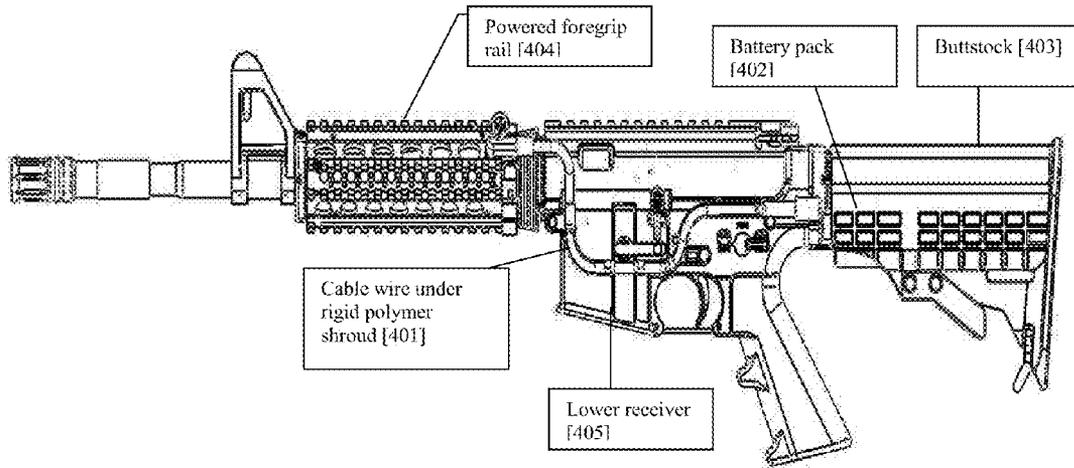


Figure 4

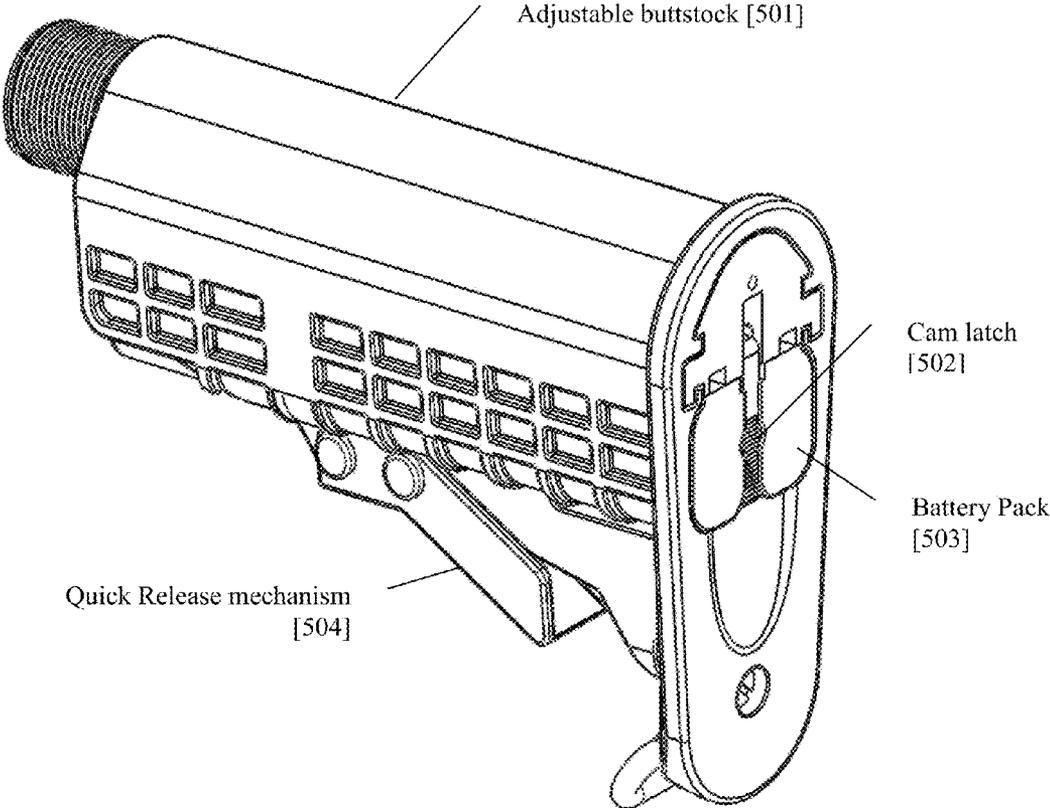


Figure 5

**RIFLE ACCESSORY RAIL,  
COMMUNICATION, AND POWER TRANSFER  
SYSTEM**

**BACKGROUND OF THE INVENTION**

[0001] The present invention is related to weapons systems. In particular, the present invention is directed to accessory attachment systems for rifles and small arms weapons that enable attached accessory devices to draw power from a central power source and communicate with the user and/or other devices.

[0002] The current rifles and small arm weaponry in use by US armed forces can be equipped with numerous combat optics, laser designators/sights, and flashlights; all come with different power requirements and battery supplies. The result is a heavy weapon and a heavier field load of batteries to accommodate the various accessories, which ultimately impacts the soldiers' effectiveness, particularly on longer missions. One of the US Army focus areas is improving the performance of their warfighters' combat equipment while reducing the load that each warfighter has to carry. One of these efforts is concentrated on providing advanced technologies to demonstrate the feasibility of an innovative communications rail and power transfer system. The resulting system will be backwards compatible with current mission support devices and accessories that mount to small arms weapons during operational procedures and it will reduce the overall weight penalties of the current system.

**SUMMARY OF THE INVENTION**

[0003] The present invention is directed to accessory attachment systems for rifles and small arms weapons that enable attached accessory devices to draw power from a central power source and communicate with the user and/or other devices.

[0004] It is an object of the present invention to obviate or mitigate at least one disadvantage of previous firearm accessory rails.

[0005] In a first embodiment of the present invention, there is provided a firearm accessory mounting rail for attachment of a firearm accessory to the barrel of a firearm. The accessory rail may provide a connection for the firearm accessory.

[0006] The present invention embodies firearm systems comprising at least one mounting rail comprising at least one power connection, at least one power source, at least one rail accessory comprising a rail grabber or mount, wherein the at least one rail accessory receives electrical power from the power source.

[0007] Another embodiment of the present invention provides an accessory attachment system for rifles and small arms weapons that enables attached accessory devices to draw power from a central power source and communicate with the user or other devices without exposed wires.

[0008] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

**BRIEF DESCRIPTION OF THE FIGURES**

[0009] FIG. 1 provides a drawing showing system architecture in accordance with one embodiment of the present invention.

[0010] FIG. 2 shows the fully functional powered rail with integrated PCB and electrical bus contacts.

[0011] FIG. 3 shows a powered rail accessory mounting assembly, a typical embodiment of the invention.

[0012] FIG. 4 shows a typical embodiment of the powered rail power distribution system.

[0013] FIG. 5 shows a typical embodiment of the buttstock battery pack.

**DETAILED DESCRIPTION OF THE INVENTION**

[0014] For simplicity and illustrative purposes, the principles of the present invention are described by referring to various exemplary embodiments thereof. Although the preferred embodiments of the invention are particularly disclosed herein, one of ordinary skill in the art will readily recognize that the same principles are equally applicable to, and can be implicated in other compositions and methods, and that any such variation would be within such modifications that do not part from the scope of the present invention. Before explaining the disclosed embodiments of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of any particular embodiment shown, since of course the invention is capable of other embodiments. The terminology used herein is for the purpose of description and not of limitation. Further, although certain methods are described with reference to certain steps that are presented herein in certain order, in many instances, these steps may be performed in any order as may be appreciated by one skilled in the art, and the methods are not limited to the particular arrangement of steps disclosed herein.

[0015] One of the US Army focus areas is improving the performance of their land warrior's combat equipment while reducing the load that each warfighter has to carry. One of these efforts is concentrated on providing advanced technologies to allow power transfer and communication among the accessory devices attached to the weapons used by the land warriors in the adverse environment in which they operate. Currently, the Program Executive Office (PEO) has stated the need for a superior accessory rail communication and power transfer system. A light weight and high-efficiency accessory attachment and power transfer system is necessary to allow the warfighter to operate the multiple accessories using a single power source, while maintaining the modularity of the weapon according to the specific mission. The devices that attach to the weapons use the MIL-Std-1913 rail ("Picatinny rail"). The current attachment rail can hold devices such as spotlights and flashlights, laser designators, reflex optics, night vision systems, and other devices, each with unique power requirements that require soldiers to carry multiple type batteries for each accessory. The innovation of the proposed communication and power transfer system resides in the ability to power multiple devices (with different power requirements) from a single source, while maintaining the standard attachment modularity of existing devices and reducing the soldier's load by eliminating the need for multiple type batteries.

[0016] The development of the communication rail and power transfer system meets the need for the innovative technologies that can mitigate deficiencies of the existing system. Therefore, a business opportunity exists to apply new technologies (mechanical designs and electromechanical concepts) to engineer and develop a new communication and power transfer system that can provide:

- [0017] Higher power densities from a single compact source, eliminating multiple types of batteries
  - [0018] Reduction of battery mass and volume
  - [0019] Significant system-weight reduction
  - [0020] Backwards compatibility with existing systems (MIL-STD-1913 rail and accessories)
  - [0021] Capability for multi-functional operation (multiple power requirements)
  - [0022] Reliability during operation and handling in adverse mission environments (Rain, Mud, Sand)
  - [0023] Compact design for practical transportability
  - [0024] Centralized power supply, concentrating battery mass towards the rear of the weapon, thereby maintaining the center of gravity and improving weapon handling
  - [0025] Structural toughness to withstand rough usage
  - [0026] Flexible manufacturability and affordability
- [0027] The present invention provides a modular accessory rail communication and power transfer system developed from the detailed analysis of proprietary conceptual designs that suggest the use of available lightweight conductive materials, and consider multiple features specifically designed to optimize the system's weight, power efficiency, and soldier's performance. Simultaneously, the design takes into consideration the deficiencies of the existing system, and the requirements and guidelines proposed by the Test Operating Procedure (TOP) 3-2-045, 1-2-502 for durability, and the functionality specifications from MIL-Std-1913.
- [0028] The present invention focuses on the design, development, integration, and interaction of five main components:
- [0029] Picatinny Hand guard rail
  - [0030] Modular weapon system (MWS) Mounting
  - [0031] Rail power distribution
  - [0032] Battery power pack
  - [0033] Rail communications

[0034] PPI's new cost competitive and innovative communications rail and power transfer system would allow the US military not only to ensure the reliability and functionality of all existing small arms weapons; but also would greatly improve the probabilities of implementing this new technology in other higher caliber weapons and/or military vehicles and rotary aircraft. The technology would certainly find attractive applications inside the civilian market and has the potential to revolutionize the powering of electronic applications/devices that require a single source of higher density power delivery with standard attachment options. FIG. 1 shows a diagram of the system architecture, which uses the following: a DC bus with galvanic contact, buttstock battery pack, high power accessory module, low power accessory module, and hand guard user input device.

Picatinny Hand Guard Rail

- [0035] The Picatinny hand guard rail assembly allows for mounting of different devices on the weapons. Most of the sights are the same among the weapons, but mounting of other accessories are unique and may be different depending on mission requirements. For example, the User Input Device, which provides control to Multi-function laser or Daylight Video Sight while holding the weapon. The installation of the M203 grenade launcher which has different mounting configuration from the other accessories used on the rifle.
- [0036] These devices are electrically powered by an integrated electrical bus providing electricity to any point of the

hand guard rails. FIG. 2 shows the fully functional powered rail with integrated PCB [201] and electrical bus contacts [202].

Modular Weapon System Accessory Mounting

[0037] A typical embodiment of the invention includes the use of a powered rail accessory mounting assembly as shown in FIG. 3. The mounting assembly attaches the typical accessory to the powered accessory rail and consists of: the rail grabber [301], the spring contacts [302], the spring plungers [303], and the face seals [304]. The spring plungers [303] depress the snap-dome switches on the powered rail [201], the spring contacts [302] provide electrical contact with the fixed electrical bus contacts [202] on the powered rail PCB assembly, and the face seals [304] provide environmental protection.

Rail Power Distribution

- [0038] The main challenge during development was to demonstrate the feasibility of a power and communication distribution system that would perform to meet the rigors of the battlefield while maintaining the flexibility and modularity of the weapon. This would require a system that is not affected by the environment and does not require tools to use. PPI's design approach was to use an integrated power and communication system using an A/C (for an inductive coupling system) or D/C (for galvanic contact) bus to the Picatinny Rails. The rail design can be modified to keep the same modularity without compromising the structural and functional aspects of the design while providing a conduit and connection point for the power and communications.
- [0039] In FIG. 4, the electrical wire [401] is routed from the battery pack [402] in the buttstock [403] to the powered foregrip rail [404]. The external wiring [401] is housed inside a durable and impact resistant rigid polymer shroud that conforms to the lower receiver. The shroud is securely retained by the takedown pin, as well as the bolt release roll pin or in the trigger/hammer pins. The use of these pins eliminates the need to modify the lower receiver to accommodate the power cable wire [401]. The design also provides an easy access for replacement or repair of the cable assembly and eliminates snag hazards or interferences with the rifle operation and requires no modifications to the rifle lower receiver housing.

Battery Power Pack

- [0040] The purpose of the consolidation of the batteries into one power unit is to reduce system weight, improve weapon balance and handling; the battery system must incorporate batteries with high power density. Key to the development was the design of a central power source that would replace the various size batteries that are currently used in the accessories. PPI researched and determined the necessary size of the central power source, the most suitable location, and developed a preliminary design of the battery compartment. PPI evaluated the accessory power loads, and with input from the Army, determined the highest power draw that the system would be required to handle.
- [0041] A buttstock/recoil tube battery pack assembly includes an adjustable buttstock [501], a cam latch [502], a removable battery pack [503], and a quick release mechanism [504], as shown in FIG. 5. The buttstock [501] adds a compartment to the underside of the buffer tube assembly which allows the battery pack [503] to be installed and withdrawn

for removal through the rear of the rifle. The battery pack [503] mounts on the buffer tube independent of the buttstock [501] which telescopes along the rifle. The buttstock [501] is adjustable and can be extended in various multiple intermediate positions providing an adjustable overall length of the firearm.

[0042] These and other embodiments will be apparent to those of skill in the art, all within the scope of the present invention, which is defined solely by the claims appended hereto.

What is claimed is:

1. A firearm system comprising:
  - at least one mounting rail comprising an electrical contact;
  - at least one power source;
  - at least one rail accessory;
  - and wherein the at least one rail accessory receives electrical power from the power source.
2. The system of claim 1, wherein the power source is a battery pack.
3. The system of claim 2, wherein the battery pack is located in the buttstock.
4. The system of claim 1 further comprising a power switch for controlling the flow of electrical power from the power source to the rail accessory.
5. The system of claim 1 wherein the at least one powered mounting rail is a detachable mounting rail.

6. The system of claim 1 wherein the at least one powered mounting rail a Picatinny rail.

7. The system of claim 1, further comprising a butt stock assembly wherein the buttstock assembly comprises the power source.

8. The system of claim 1, further comprising an external power pack wherein the external power pack comprises the power source.

9. The system of claim 1, further comprising a foregrip assembly wherein the foregrip assembly comprises the power source.

10. The system of claim 8, wherein the external power pack attaches to the mounting rail.

11. The system of claim 1, wherein the power source is located in a pistol grip.

12. The system of claim 1 further comprising: a first rail accessory mechanically connected to the at least one mounting rail and electrically connected to the at least one power connection; a second rail accessory mechanically connected to the at least one mounting rail and electrically connected to the at least one power connection.

13. The system of claim 1, wherein the at least one mounting rail is a detachable mounting rail.

14. The system of claim 1 wherein weight is moved rearward in the weapon, eliminating the need to employ discrete batteries in accessories at the front of the weapon

\* \* \* \* \*