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### DIRECT FIRE WEAPON SYSTEM TRAINING AND FIRING AID

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#### Abstract

A weapon system training and firing aid comprising a shoulder bar attachment for elevating and/or traversing a weapon system is disclosed. It may have an elongate arm for attachment to the weapon system and extending in a generally rearward direction from the weapon system. Once coupled to a weapon system, it gives a user a stable method of supporting and moving the weapon system, allowing the user to quickly elevate and traverse the weapon system by giving the user an additional point of contact, for example at the shoulder or under the arm, to support and stabilize the weapon system.

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## **Background/Summary**

CROSS REFERENCE TO RELATED APPLICATION [0001] This application is a continuation of U.S. patent application Ser. No. 18/050,594, filed Oct. 28, 2022, which is a continuation-in-part of U.S. patent application Ser. No. 17/153,598, filed Jan. 20, 2021, now U.S. Pat. No. 11,486,678, issued on Nov. 1, 2022, which is a continuation-in-part of U.S. patent application Ser. No. 17/060,033, filed Sep. 30, 2020, now U.S. Pat. No. 11,486,673, issued on Nov. 1, 2022, which claims priority to U.S. Provisional Patent Application Ser. No. 62/916,043, filed Oct. 16, 2019, the disclosures of which are hereby incorporated entirely herein by reference. U.S. patent application Ser. No. 17/153,598 also claims priority to U.S. Provisional Patent Application Ser. No. 62/963,864, filed Jan. 21, 2020, the disclosures of which are hereby incorporated entirely herein by reference.

### **BACKGROUND OF THE INVENTION**

#### **Technical Field**

[0002] This invention relates generally to armaments, and particularly to a weapon training and firing aid comprising a shoulder bar attachment for elevating and/or traversing a weapon system.

#### **State of the Art**

[0003] Conventional direct fire, externally-powered weapon systems, such as the M134 family of weapon systems, for example, and other U.S. and International weapon systems, rely on powered or mechanical devices to traverse and elevate the weapon. Such devices are generally integral to the weapon mount to which the weapon is mounted. When faced with multiple targets in various directions and/or at different ranges, the mechanical movement is typically very slow. If a user chooses to bypass these mechanical traversing and elevation devices, the systems, then described as “free”, become heavy, unstable, and/or inaccurate. Other conventional weapon systems are internally powered that are also generally coupled to a mount in a preferred configuration for operation. These systems suffer from similar issues as to externally powered weapon systems. Accordingly, there is a need for a means of stabilizing and improving the accuracy of a weapon, mounted to a weapon mount, while free of a mechanical traversing and/or elevating device.

### **SUMMARY OF THE INVENTION**

[0004] The present invention relates to armaments, and particularly to a weapon system training and firing aid comprising a shoulder bar attachment for elevating and/or traversing a weapon system.

[0005] An embodiment may include a direct fire weapon system training and firing aid, comprising: an elongate arm, wherein the arm comprises a first end configured to be coupled to a direct fire weapon system for accommodating coupling thereto, and an opposed distal end configured to extend in a rearward direction from the weapon system; a receiver extending perpendicularly from the first end, the receiver comprising: an upper surface configured to engage a lower surface of a cross member of a spade grips device of the weapon system, the lower surface having at least two apertures extending therethrough; and at least two mounting apertures extending through the receiver and corresponding to at least two apertures in the cross member; and threaded couplers inserted through the at least two mounting apertures in the receiver, the at least two apertures in the cross member and threaded into corresponding threaded recesses in a grip

of the spade grips device.

[0006] Another embodiment includes a direct fire weapon system training and firing aid, comprising: an elongate arm, wherein the arm comprises a first end configured to be coupled to a direct fire weapon system without modification of the weapon system for accommodating coupling thereto, and an opposed distal end configured to extend in a rearward direction from the weapon system; a receiver extending perpendicularly from the first end, the receiver comprising: an upper surface configured to engage a lower surface of a cross member of a spade grips device of the weapon system; a threaded aperture on the upper surface of the receiver, wherein a bolt extending through and holding a grip of the spade grips in place engages the threaded aperture to couple the receiver to the cross member of the spade grips, and at least one threaded recess on each of two opposed sides thereof; and a C-shaped clamp, comprising: a channel therethrough for receiving the cross member and the receiver therethrough to keep the receiver from rotating when coupled to the spade grips; and at least one mounting bolt aperture through each of a pair of opposed parallel legs thereof corresponding to the at least one threaded recess for receiving a mounting bolt therethrough, wherein the receiver is configured to be further coupled to the cross member by at least one mounting bolt inserted through each of the at least one mounting bolt aperture and threaded into the corresponding at least one threaded recess.

[0007] Another embodiment may include a direct fire weapon system training and firing aid, comprising: a replacement grip for a spade grips device of a direct fire weapon system; and an elongate arm, wherein the arm comprises a first end rotatably coupled to the replacement grip; wherein the replacement grip is coupled between an upper cross member and a lower cross member of the spade grips device in a location to replace an original grip of the spade grips device, wherein an opposed distal end of the elongate arm extends in a rearward direction from the weapon system when the replacement is coupled to the spade grips device.

[0008] The foregoing and other features and advantages of the present invention will be apparent from the following more detailed description of the particular embodiments of the invention, as illustrated in the accompanying drawings.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in conjunction with the Figures, wherein like reference numbers refer to similar items throughout the Figures, and:

[0010] FIG. 1 is a perspective view of an embodiment of a weapon system training and firing aid coupled to a conventional M134D weapon system;

[0011] FIG. 2 is a partially-exploded perspective view of a weapon system training and firing aid with a conventional M134D weapon system, according to an embodiment;

[0012] FIG. 3 is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0013] FIG. 4 is a perspective view of a weapon system training and firing aid coupled to the spade grips of a conventional direct fire weapon system, according to an embodiment;

[0014] FIG. 5 is a partially-exploded perspective view of a weapon system training and firing aid, according to an embodiment;

[0015] FIG. 6 is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0016] FIG. 7A is a perspective view of a weapon system training and firing aid coupled to the spade grips of a conventional direct fire weapon system, according to an embodiment;

[0017] FIG. 7B is a partially-exploded perspective view of a weapon system training and firing aid,

according to an embodiment;

[0018] FIG. **8** is a perspective view of an embodiment of a weapon system training and firing aid coupled to a weapon system;

[0019] FIG. **9** is a side view of a weapon system training and firing aid, according to an embodiment;

[0020] FIG. **10** is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0021] FIG. **11** is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0022] FIG. **12** is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0023] FIG. **13** is a perspective view of a weapon system training and firing aid, according to an embodiment;

[0024] FIG. **14A** is an exploded perspective view of a portion of a weapon system training and firing aid, according to an embodiment;

[0025] FIG. **14B** is a perspective view of a portion of a weapon system training and firing aid, according to an embodiment;

[0026] FIG. **15A** is an exploded perspective view of a portion of a weapon system training and firing aid, according to an embodiment; and

[0027] FIG. **15B** is a perspective view of a portion of a weapon system training and firing aid, according to an embodiment.

#### DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0028] As discussed above, embodiments of the present invention relate to armaments, and particularly to a weapon system training (aiming) and firing aid comprising a shoulder bar attachment, giving leverage to a user for manual and rapid training of a weapon system mounted to a weapon mount, by quickly and accurately elevating and/or traversing the weapon system.

[0029] Referring to the drawings, FIGS. **1-3** illustrate a weapon system training and firing aid **10**, according to an embodiment. A weapon system training and firing aid **10** (hereinafter “Aid”) may comprise an elongate arm **12** configured to be coupled to a weapon system **14**, such as an M134D direct fire weapon system, for example, without modification of the weapon system **14**, wherein a first end **16** of the Aid **10** is coupled to the weapon system **14** and the arm **12** extends in a generally rearward direction from the weapon system **14**, as shown in FIG. **1**.

[0030] An Aid **10**, of the present invention may comprise a receiver **18**, extending perpendicularly from the first end **16**, for coupling the arm **12** to a weapon system **14**. For example, the M134D direct fire weapon system **14**, shown in FIG. **2**, comprises spade grip device **42**, having a lower cross member **44** coupled between two grips **50**. Receiver **18** may be configured to be coupled to spade grip device **42**, wherein an upper surface **20** of receiver **18** engages a lower surface **46** of cross member **44** and is secured thereto by C-shaped clamp **28**, and wherein the lower cross member **44** and receiver **18** extend through a channel **36** of C-shaped clamp **28**, and opposed legs **32** of C-shaped clamp **28** are secured to receiver **18** by mounting bolts or screws **24**. Channel **36** may be sized appropriately to accommodate lower cross member **44** and receiver **18** with minimal clearance in order to minimize relative motion between lower cross member **44** and receiver **18** when coupled together. As shown in FIG. **2**, mounting bolts **24** may extend through mounting bolt apertures **30** in legs **32** of C-shaped clamp **28** and into threaded recesses **26** of receiver **18**.

[0031] In some embodiments, as shown in FIGS. **7A** and **7B**, the receiver **18** may further include an aperture **21** through the upper surface **20** of the receiver **18**. The aperture **21** may be a threaded aperture **21**. The aperture **21** operates to receive a bolt **51** that coupled the grip **50** to the spade grip device **42**, wherein the bolt **51** extend through the grip **50** and couples to the aperture **21** of the receiver **18**. In this embodiment, C-shaped clamp **28** operates to further couple the receiver **18** to the spade grip, but further, the C-shaped clamp **28** operates to prevent the receiver **18** from rotating.

In another embodiment, aperture **21** is a nonthreaded hole. In this embodiment, the bolt **51** may include a nut, such as a nylock nut on the opposite side of surface **20** that bolt **51** engages to retain receiver **18**.

[0032] In some embodiments, as shown in FIGS. **4** and **5**, receiver **18** may be L-shaped, having first leg **54** and second leg **56** extending perpendicularly therefrom, wherein FIG. **4** shows a conventional spade grips device **42** in dashed lines and an Aid **10**, of the present invention, in solid lines. In such embodiments, second leg **56** may be configured to engage a lower surface **58** of cross member brace **48** of a spade grip device **42**. A second C-shaped clamp **52** may be configured to secure the second leg **56** to cross member brace **48** in a similar manner as how the first leg **54** of receiver **18** is secured to cross lower cross member **44**, as described above. Securing a second leg **56** to cross member brace **48**, in this manner, provides additional stability and restriction of motion between spade grip device **42** and receiver **18**. In some embodiments, as shown in FIG. **5**, receiver **18** may comprise a recess **22** in the upper surface **20** for accommodating grip-mounting hardware (not shown) or other profile features of the lower surface **46** of cross member **44**.

[0033] Referring to FIG. **3**, some embodiments of Aid **10** may comprise a quick-release mechanism **34** coupled between arm **12** and receiver **18**. The quick-release mechanism **34** provides a means of adjusting the angle of arm **12** with respect to the direction of fire of weapon system **14**, when coupled thereto. In operation of the embodiment shown in FIG. **3**, the angle of arm **12** with respect to the direction of fire of weapon system **14** may be adjusted by first releasing quick-release mechanism **34**, adjusting the angle of arm **12**, and the securing quick-release mechanism **34** again. For example, in some cases, a user may wish to extend distal end **38** of arm **12** over the user's shoulder, in which case arm **12** may be adjusted to extend upward over the user's shoulder. In other cases, a user may wish to extend distal end **38** of arm **12** under the user's arm and to the user's side, in which case arm **12** may be adjusted to extend in a lower direction under the user's arm and to the user's side. The direction of rotation of arm **12**, about the quick-release mechanism **34**, is indicated in FIG. **3** by the arrows, and alternative exemplary non-limiting relative positions of arm **12** are shown in dashed lines. Such angle adjustments may accommodate users of different sizes and heights, and having different angle preferences, for example. In some embodiments, quick-release mechanism **34** may be configured to secure and release a splined coupler **60**, wherein a first portion **62** of splined coupler **60** is coupled to first end **16** of arm **12** and a second portion **64** of splined coupler **60** is coupled to receiver **18**. When quick-release mechanism **34** is secured, splines of the first portion **62** engage corresponding splines of the second portion **64** to prevent rotation of the first portion **62** with respect to the second portion **64**. When quick-release mechanism **34** is disengaged, first portion **62** is free to rotate with respect to second portion **64**. In some embodiments, the quick-release mechanism **34** may be spring-loaded or the splined coupler **60** may be spring loaded, such as a spring between the first portion **62** and the second portion **64** to bias them apart, wherein the quick release mechanism operates to move the first portion **62** and the second portion **64** between an engaged position and a disengaged position by applying force or releasing force. Quick-release mechanism **34** may be large enough to be quickly and easily manipulated by a user wearing gloves.

[0034] Although Aid **10**, as shown in the drawings, and described above, is configured to be coupled to a conventional M134D direct fire weapon system in the manner shown in the drawings and described above, this is not intended to be limiting. For example, Aid **10** may be configured to be coupled to either the right or left side of a direct fire weapon system **14**. In addition, Aid **10** may be configured to be coupled directly to the receiver or other suitable location on a direct fire weapon system **14**, without modification of the direct fire weapon system **14**. Furthermore, Aid **10** may be configured to be coupled to any of a variety of other direct fire weapon systems known now or in the future, and by any of a variety of coupling means, known now or in the future. Such a weapon system **14** may be externally-powered, whether the external power is provided manually, mechanically, electrically, pneumatically, hydraulically, or any combination thereof. For example,

embodiments of an Aid **10** may be coupled to a direct fire weapon system **14** by one or more screws, clips, pins, quick-release pins, clamping devices, and the like, with or without a C-shaped clamp **28**, wherein the Aid **10** is configured to be coupled to the weapon system **14** without modification of the weapon system **14**. As an illustrative example, FIG. **6** illustrates an alternative embodiment of Aid **10**, coupled to a conventional spade grip device **42** (shown in dashed lines), wherein the receiver **18** comprises a pair of mounting apertures **72** therethrough corresponding to through holes in the lower cross member **44** through which mounting threaded couplers **70** inserted and threaded into corresponding threaded recesses (not shown) in grip **50**. It is understood that receiver **18** may similarly be coupled to either the top end or bottom end on either the right or left side of spade grip device **42**, by mounting screws **70** threaded into the corresponding threaded recesses at either the top or bottom on the right or left side grip **50**.

[0035] In some embodiments, the arm **12** of a weapon training and firing aid **10** may be articulatable. For example, in some embodiments, an arm **12** may comprise at least one joint therein, wherein the at least one joint allows segments of the arm **12** to rotate relative to each other in order to conform the arm **12** to a desirable configuration. However, this is not intended to be limiting. The at least one joint may be any of a variety of hinged joints, whether ball-and-detent or not, splined or not, having stops or not, spring-loaded or not, and the like, or any combination thereof, known now or in the future, and securable by any of a variety of securing means, known now or in the future, whereby at least one segment of the arm **12** may be rotatable about the at least one joint while a securing means of the at least one joint is in a disengaged position and not rotatable about the at least one joint while the securing means of the at least one joint is in a disengaged position.

[0036] In some embodiments, the arm **12** may comprise a single component of unitary construction. In other embodiments, the arm **12** may comprise a plurality of segments removably coupled together. For example, as shown in FIG. **3**, the distal segment **66** of the arm **12** may be removable from that segment **68** of the arm **12** proximate the first end **16**. In some embodiments, various segments of the arm **12** may be telescoping, or otherwise extendable and retractable, such as by a securable slide mechanism, for example.

[0037] In operation, an Aid **10** may be coupled to a direct fire weapon system **14**, as described, wherein a distal end **38** of the arm **12** of the Aid **10** may be disposed over a user's shoulder or under the user's arm, as may be desired, for example, wherein the user may be a gunner positioned behind the weapon system **14**, relative to the direction of fire, leaving the user's hands free to engage and manipulate any of a light, laser, sighting system, and the like, coupled to the weapon system **14**, or to direct any light, laser, illumination device, aiming device, fire control device, coaxial-mounted weapon, and the like, or any combination thereof, coupled to the weapon system **14**. The user may utilize his or her body to stabilize and control direction and aiming of the weapon by engaging the distal end **38** of the arm **12**, for example, with the user's shoulder and neck or the user's side and underarm, accordingly, or by any other suitable body part. The length of the arm **12**, extending from the weapon system **14**, provides additional leverage, control, and a sense of direction to the user, while elevating and/or traversing the weapon, not otherwise available to the user without the Aid **10**. The additional leverage provided by the arm **12** further allows a user to more quickly traverse and/or elevate any other system coupled to the weapon system **14** than without the Aid **10**. Aid **10** may be used by a user in any of a variety of firing positions, such as while standing, kneeling, or sitting, for example, and while the weapon system **14** is coupled to a weapon mount, for example, the weapon mount being attached to any of a variety of base platforms, such as to a vehicular gun ring, swing arm mounting, pedestal, tripod, and the like.

[0038] Some embodiments may comprise a pad **40** coupled to the distal end **38** of the arm **12**, for providing comfort to a user in contact with the arm **12**. For example, as shown in FIGS. **1-3**, a tubular pad **40** may be removably coupled around the distal end **38**. The pad **40** may be coupled to and removed from the arm **12** by simply sliding the pad **40** on or off of the arm **12**, respectively. In

addition, any of a variety of other optional components (not shown) may be coupled to or integrated with an Aid **10**, of the present invention, including, without limitation, any of a variety of handgrips, electronic controls, firing aids, sighting aids, and the like, and/or any combination thereof.

[0039] Another embodiment of a firing aid **10**, is depicted in FIGS. **8-15B**. The Aid **10** may comprise an elongate arm **12** configured to be coupled to a weapon system **14**, wherein a first end **16** of the Aid **10** is coupled to the weapon system **14** and the arm **12** extends in a generally rearward direction from the weapon system **14**, as shown in FIG. **8**.

[0040] Referring to FIGS. **8-13**, an Aid **10**, of the present invention may comprise a replacement grip **80**, coupled to the first end **16**, for coupling the arm **12** to a weapon system **14**. For example, the weapon system **14**, shown in FIG. **8**, comprises spade grip device having an upper cross member **41**, having a lower cross member **44** with one grip **50** coupled on a right side of the spade grip device between the upper cross member **41** and the lower cross member **44** and the replacement grip **80** coupled on a left side of the spade grip device between the upper cross member **41** and the lower cross member **44**. The first end **16** of the Aid **10** may be coupled to the replacement grip with a quick-release mechanism **34** may be configured to secure and release a splined coupler **60** that is coupled to the replacement grip **80**. The spline coupler **60** may include a first portion **62** and a second portion **64**, wherein the first portion **62** of splined coupler **60** is coupled to first end **16** of arm **12** and the second portion **64** of splined coupler **60** is coupled to replacement grip **80**. When quick-release mechanism **34** is secured, splines of the first portion **62** engage corresponding splines of the second portion **64** to prevent rotation of the first portion **62** with respect to the second portion **64**. When quick-release mechanism **34** is disengaged, first portion **62** is free to rotate with respect to second portion **64**. In some embodiments, the quick-release mechanism **34** may be spring-loaded or the splined coupler **60** may be spring loaded, such as a spring between the first portion **62** and the second portion **64** to bias them apart, wherein the quick release mechanism operates to move the first portion **62** and the second portion **64** between an engaged position and a disengaged position by applying force or releasing force. Quick-release mechanism **34** may be large enough to be quickly and easily manipulated by a user wearing gloves.

[0041] Referring further to FIGS, **14A** and **14B**, replacement grip **80** may be configured to be coupled to spade grip device between the upper cross member **41** and lower cross member **44** utilizing couplers **82** and **84**. Couplers **82** and **84** may engage a tube **90** extending through the replacement grip **80** to couple the replacement grip **80** between the upper cross member **41** and the lower cross member **44**. In these embodiments, the couplers **82** and **84** may be bolts that engage threads in the tube **90** that extends though the replacement grip **80**. In some embodiments, the replacement grip **80** is compressed between the upper cross member **41** and the lower cross member **44**.

[0042] As the couplers **82** and **84** are tightened, the replacement grip **80** has a tendency to rotate. In order to prevent rotation and ensure the proper orientation of the Aid **10** with respect to the weapon system **14**, the handle includes a protrusion **81** at a bottom end of the replacement grip **80**. A C-shaped clamp **86** may be coupled around a portion of the lower cross member **44** and engage the protrusion **81** with a pin **88**. The clamp **86** coupled to the protrusion **81** operates to maintain the proper orientation of the replacement grip **80** and the Aid **10** when tightening the couplers **82** and **84** (see FIGS. **14A** and **14B**). Additionally, in order to resist the loosening of the couplers **82** and **84**, embodiment may include a small recess **43** (see FIGS. **12**, **14A** and **14B**), wherein an abrupt force (such as a stake with a hammer) may be applied to the couplers **82** and **84** to engage the couplers **82** and **84** with small recesses **43** to modify the couplers **82** and **84** with a notch that is in contact with and engages the small recesses **43**. This operates to resist rotation of the couplers **82** and **84**. This is important because operation of the weapon system **14** provides significant vibrations that can cause bolts to rotate and this engagement resists such rotation during firing of the weapon system **14**.

[0043] The replacement grip **80**, as shown in FIGS. **14A-15B**, may include a flat recessed surface **89** formed in a side of the replacement grip **80** and located near a bottom end of the grip **80**, such that when coupled to the spade grip device, the flat recessed surface **89** is adjacent the lower cross member **44**. The flat recessed surface **89** may include quick release aperture **83**, upper mounting aperture **85** and lower mounting aperture **87**. The upper mounting aperture **85** and the lower mounting aperture **87** may be threaded. These apertures **83**, **85**, **87** operate to couple the quick-release mechanism **34** to the grip **80** and to secure the splined coupler **60** to the replacement grip **80**. Second portion **64** of the splined coupler **60** may include a quick release aperture **63**, an upper mounting aperture **65** and a lower mounting aperture **67**. The second portion **64** of the splined coupler **60** may then be placed in contact with and engage the flat recessed surface **89** of the replacement grip **80**. Mounting bolts **89** may be coupled through the upper mounting aperture **65** and the lower mounting aperture **67** of the second portion **64** of the splined coupler **60**, and threaded into the upper mounting aperture **85** and the lower mounting aperture **87** of the replacement grip **80**. This operates to couple the second portion **64** of the splined coupler **60** to the replacement grip **80**. The coupling also aligns the quick release aperture **83** of the grip **80** with the quick release aperture **63** of the second portion **64** of the splined coupler **60**. This allows the quick release mechanism **34** to couple the first portion **62** of the splined coupler **60** to the second portion **64** of the splined coupler **60**. This also operates to couple the elongate arm **12** to the first portion **62** of the splined coupler **60** with the quick release mechanism **34**.

[0044] Some embodiments of Aid **10** may comprise a quick-release mechanism **34** coupled between arm **12** and replacement grip **80**. The quick-release mechanism **34** provides a means of adjusting the angle of arm **12** with respect to the direction of fire of weapon system **14**, when coupled thereto. In operation of the embodiment shown in FIGS. **7-12**, the angle of arm **12** with respect to the direction of fire of weapon system **14** may be adjusted by first releasing quick-release mechanism **34**, adjusting the angle of arm **12**, and the securing quick-release mechanism **34** again. For example, in some cases, a user may wish to extend distal end **38** of arm **12** over the user's shoulder, in which case arm **12** may be adjusted to extend upward over the user's shoulder. In other cases, a user may wish to extend distal end **38** of arm **12** under the user's arm and to the user's side, in which case arm **12** may be adjusted to extend in a lower direction under the user's arm and to the user's side. The direction of rotation of arm **12**, about the quick-release mechanism **34**, is similar as the positions indicated in FIG. **3** by the arrows, and alternative exemplary non-limiting relative positions of arm **12** are shown in dashed lines. Such angle adjustments may accommodate users of different sizes and heights, and having different angle preferences, for example. This quick-release mechanism **34** may operate in conjunction with the spline coupler **60** as discussed above.

[0045] Although Aid **10**, as shown in the drawings, and described above, is configured to be coupled to a weapon system in the manner shown in the drawings and described above, this is not intended to be limiting. For example, Aid **10** may be configured to be coupled to either the right or left side of a weapon system **14**. Furthermore, Aid **10** may be configured to be coupled to any of a variety of other weapon systems known now or in the future, and by any of a variety of coupling means, known now or in the future. Such a weapon system **14** may be internally powered or may be externally-powered, whether the external power is provided manually, mechanically, electrically, pneumatically, hydraulically, or any combination thereof. For example, embodiments of an Aid **10** may be coupled to a weapon system **14** by one or more screws, clips, pins, quick-release pins, clamping devices, and the like, wherein the Aid **10** is configured to be coupled to the weapon system **14** without modification of the weapon system **14** except for replacing a grip **50** with the replacement grip **80** of the Aid **10**.

[0046] The drawing figures depict embodiments of the present invention being utilized with certain weapons and weapon systems. It will be understood that the invention includes but is not limited to the depicted weapon systems. The weapon system training and firing aid **10** may be utilized with minigun variants, such as the 134D, GAU-17, M134, and Mk 44. The weapon system training and



firing aid may also be used with M2 Browning heavy machine gun variants, such as the M2A1, M2 HB, M2 HQCB HMGs. The weapon system training and firing aid may also be used with automatic grenade launchers, such as the Mk19 AGL, and spade grip equipped general purpose machine guns like the M240D GPMG, M240H GPMGs, and other weapon systems that employ a spade grip.

[0047] The components defining any weapon system training and firing aid **10**, of the present invention, may be formed of any of many different types of materials or combinations thereof that can readily be formed into shaped objects provided that the components selected are consistent with the intended operation of a weapon system training and firing aid **10**. For example, the components may be formed of: rubbers (synthetic and/or natural) and/or other like materials; glasses (such as fiberglass) carbon-fiber, aramid-fiber, any combination thereof, and/or other like materials; polymers such as thermoplastics (such as ABS, Fluoropolymers, Polyacetal, Polyamide; Polycarbonate, Polyethylene, Polysulfone, and/or the like), thermosets (such as Epoxy, Phenolic Resin, Polyimide, Polyurethane, Silicone, and/or the like), any combination thereof, and/or other like materials; composites and/or other like materials; metals, such as copper, zinc, magnesium, titanium, copper, iron, steel, carbon steel, alloy steel, tool steel, stainless steel, aluminum, any combination thereof, and/or other like materials; alloys, such as aluminum alloy, titanium alloy, magnesium alloy, copper alloy, any combination thereof, and/or other like materials; any other suitable material; and/or any combination thereof.

[0048] Furthermore, the components defining any weapon system training and firing aid **10** may be purchased pre-manufactured or manufactured separately and then assembled together. However, any or all of the components may be manufactured simultaneously and integrally joined with one another. Manufacture of these components separately or simultaneously may involve extrusion, pultrusion, vacuum forming, injection molding, blow molding, resin transfer molding, casting, forging, cold rolling, milling, drilling, reaming, turning, grinding, stamping, cutting, bending, welding, soldering, hardening, riveting, punching, plating, and/or the like. If any of the components are manufactured separately, they may then be coupled with one another in any manner, such as with adhesive, a weld, a fastener (e.g. a bolt, a nut, a screw, a nail, a rivet, a pin, and/or the like), wiring, sewing, any combination thereof, and/or the like for example, depending on, among other considerations, the particular material forming the components. Other forms of manufacture might include additive manufacturing, such as, but not limited to, selective laser sintering. Other possible steps might include sand blasting, polishing, powder coating, zinc plating, anodizing, hard anodizing, and/or painting the components for example.

[0049] The embodiments and examples set forth herein were presented in order to best explain the present invention and its practical application and to thereby enable those of ordinary skill in the art to make and use the invention. However, those of ordinary skill in the art will recognize that the foregoing description and examples have been presented for the purposes of illustration and example only. The description as set forth is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of the teachings above without departing from the spirit and scope of the forthcoming claims.

## Claims

1. A direct fire weapon system training and firing aid, comprising: an elongate arm, wherein the arm comprises a first end configured to be coupled to a direct fire weapon system, and an opposed distal end configured to extend in a rearward direction from the weapon system; a receiver extending at an angle from the first end, the receiver configured to couple to a spade grip of the weapon system; and a joint coupled between the arm and the receiver, wherein the arm is rotatable about the joint with respect to the receiver.

2. The direct fire weapon system training and firing aid of claim 1, wherein the weapon system is

an externally-powered direct fire weapon system or an internally powered direct fire weapon system.

3. The direct fire weapon system training and firing aid of claim 1, wherein the weapon system is coupled to a weapon mount.
  4. The direct fire weapon system training and firing aid of claim 1, wherein the joint is a splined joint releasably securable by a quick-release mechanism coupled thereto, wherein the quick-release mechanism is changeable between an engaged position and a disengaged position.
  5. The direct fire weapon system training and firing aid of claim 1, further comprising a pad coupled to the distal end of the arm.
  6. The direct fire weapon system training and firing aid of claim 1, wherein the arm is telescopic.
  7. A method of using a direct fire weapon system training and firing aid, the method comprising: providing a firing aid, the firing aid comprising an elongate arm having a first end and a second end, a receiver extending at an angle from the first end, and a joint coupled between the elongate arm and the receiver, wherein the arm is rotatable about the joint with respect to the receiver; coupling the receiver to a spade grip of a weapon system; and rotating the elongate arm about the joint to extend the elongate arm in a rearward direction from the weapon system.
  8. The method of claim 7, wherein the weapon system is an externally-powered direct fire weapon system or an internally powered direct fire weapon system.
  9. The method of claim 7, further comprising coupling the weapon system to a weapon mount.
  10. The method of claim 7, wherein the joint is a splined joint releasably securable by a quick-release mechanism coupled thereto, wherein the quick-release mechanism is changeable between an engaged position and a disengaged position.
  11. The method of claim 7, wherein the elongate arm is telescopic.
  12. The method of claim 7, further comprising placing the second end of the elongate arm, the second end of the elongate arm comprising a pad coupled thereto, over a shoulder or under an arm of a user firing the weapon system.
  13. A direct fire weapon system training and firing aid, comprising: an elongate arm, wherein the arm comprises a first end configured to be coupled to a direct fire weapon system, and an opposed distal end configured to extend in a rearward direction from the weapon system; a receiver extending at an angle from the first end, the receiver configured to couple to a housing of the weapon system; and a joint coupled between the arm and the receiver, wherein the arm is rotatable about the joint with respect to the receiver.
  14. The direct fire weapon system training and firing aid of claim 1, wherein the weapon system is an externally-powered direct fire weapon system or an internally powered direct fire weapon system.
  15. The direct fire weapon system training and firing aid of claim 1, wherein the weapon system is coupled to a weapon mount.
  16. The direct fire weapon system training and firing aid of claim 1, wherein the joint is a splined joint releasably securable by a quick-release mechanism coupled thereto, wherein the quick-release mechanism is changeable between an engaged position and a disengaged position.
  17. The direct fire weapon system training and firing aid of claim 1, further comprising a pad coupled to the distal end of the arm.
  18. The direct fire weapon system training and firing aid of claim 1, wherein the arm is telescopic.
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