



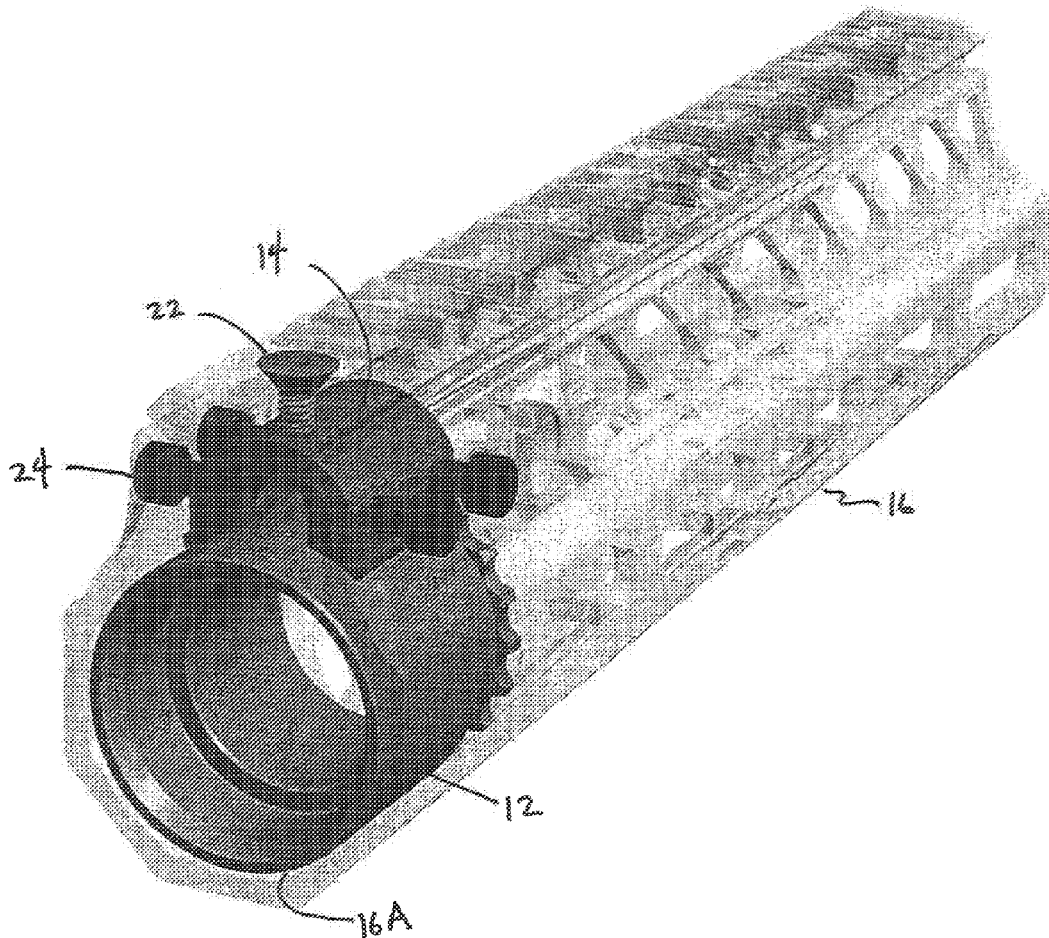
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Samson et al.(10) **Pub. No.: US 2018/0202759 A1**(43) **Pub. Date: Jul. 19, 2018**(54) **FIREARM RAIL/HANDGUARD AND
MOUNTING SYSTEM****Publication Classification**(71) Applicant: **Samson Manufacturing Corp.**, Keene,
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Andrew Dreher, Spofford, NH (US)(51) **Int. Cl.****F41C 23/16** (2006.01)**F41A 3/66** (2006.01)**F41A 21/48** (2006.01)(52) **U.S. Cl.**CPC **F41C 23/16** (2013.01); **F41A 21/48**
(2013.01); **F41A 3/66** (2013.01)(21) Appl. No.: **15/873,434**(22) Filed: **Jan. 17, 2018****Related U.S. Application Data**(60) Provisional application No. 62/525,478, filed on Jun.
27, 2017, provisional application No. 62/447,195,
filed on Jan. 17, 2017.

(57)

ABSTRACT

An assembly for mounting a handguard to a firearm utilizes a clamping element disposed intermediate the barrel nut and the interior end of the handguard. The clamping element has multiple surfaces which mimic different diameter portions of the exterior profile of the barrel nut to prevent any of longitudinal, axial, or radial misalignment of the handguard relative to the axis of the firearm barrel. The clamping element may be secured in place with multiple fasteners having the same or different axes of movement.



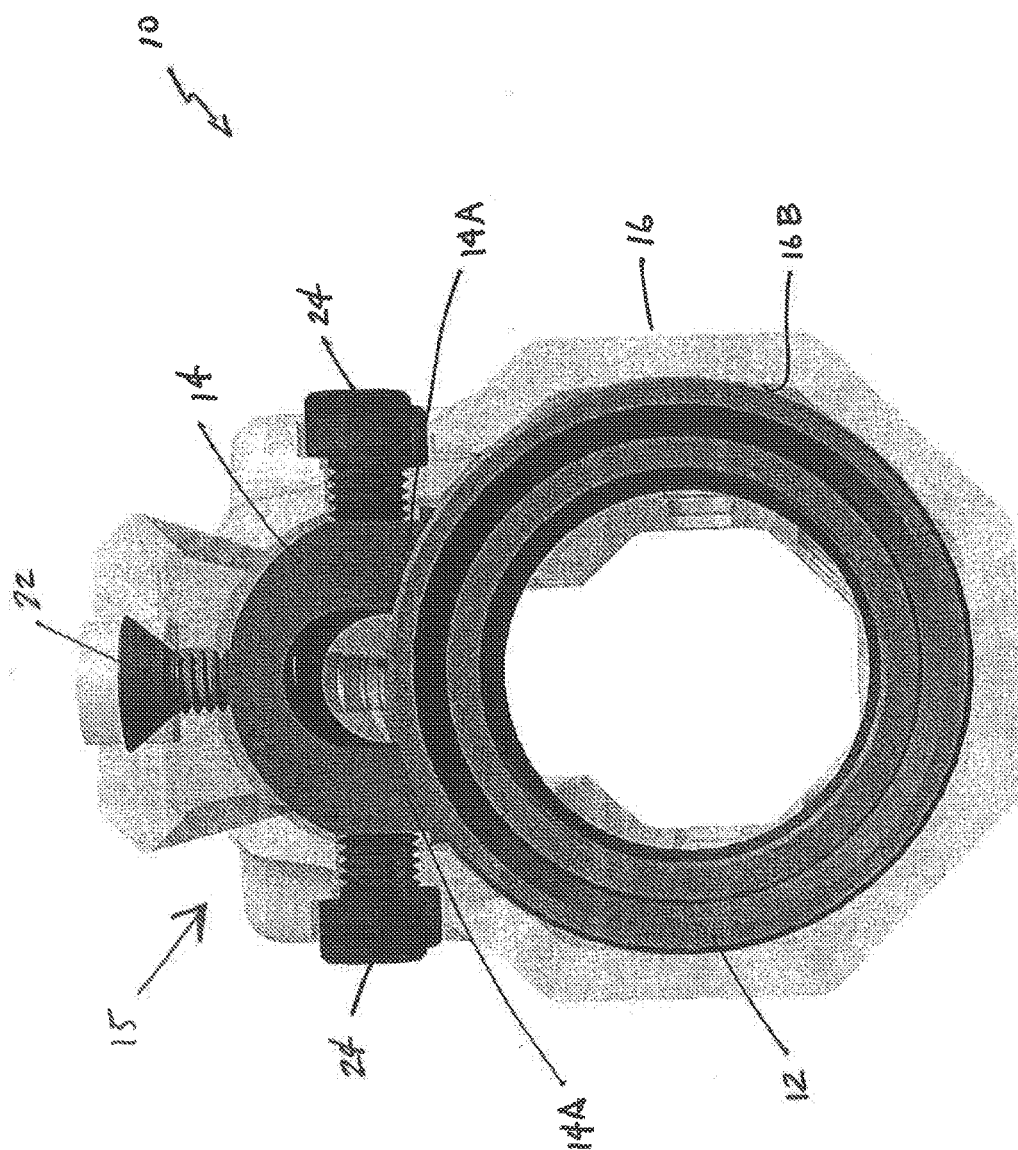


Figure 1

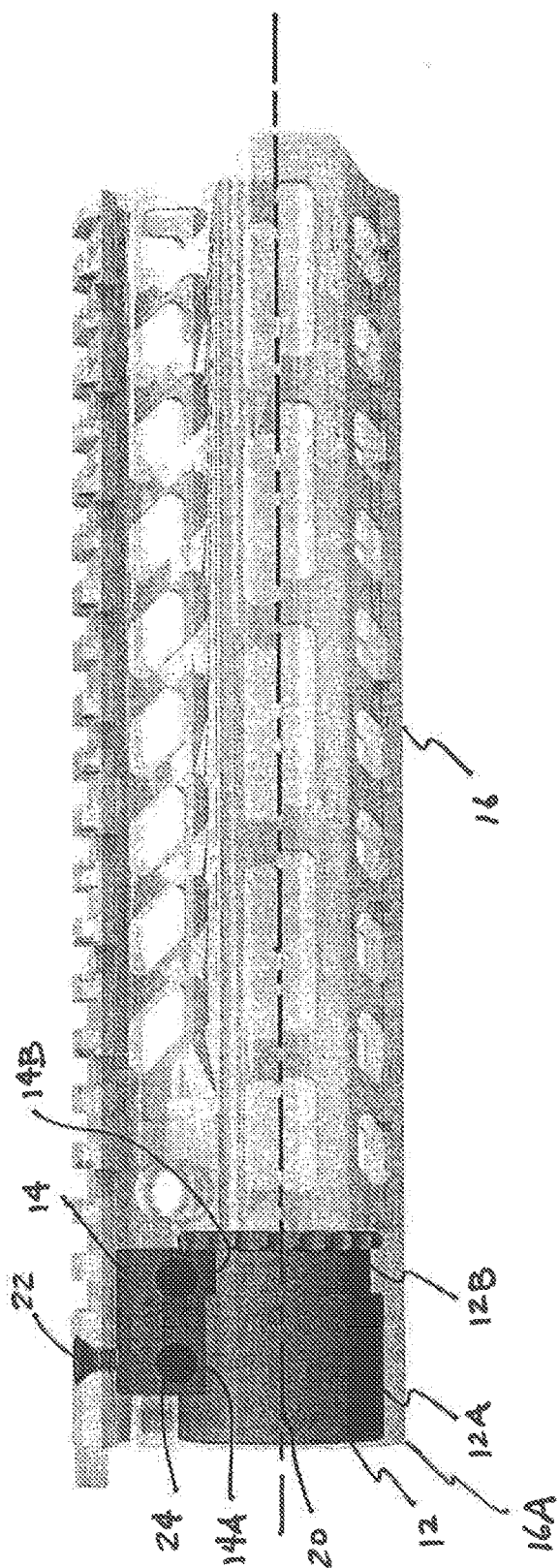


Figure 2

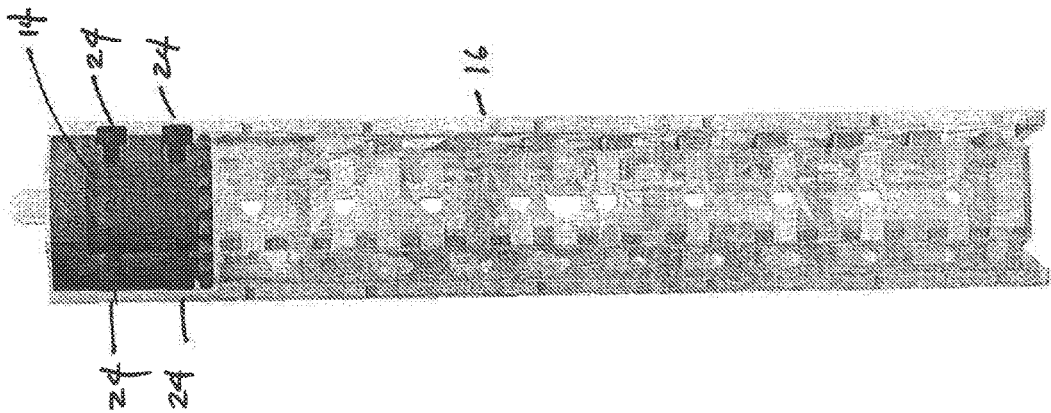


Figure 3

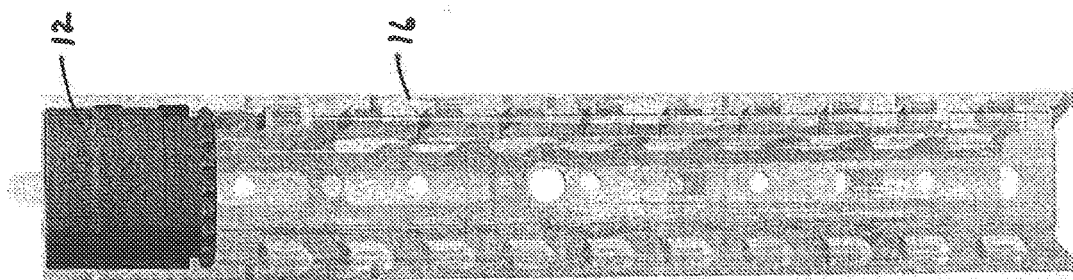
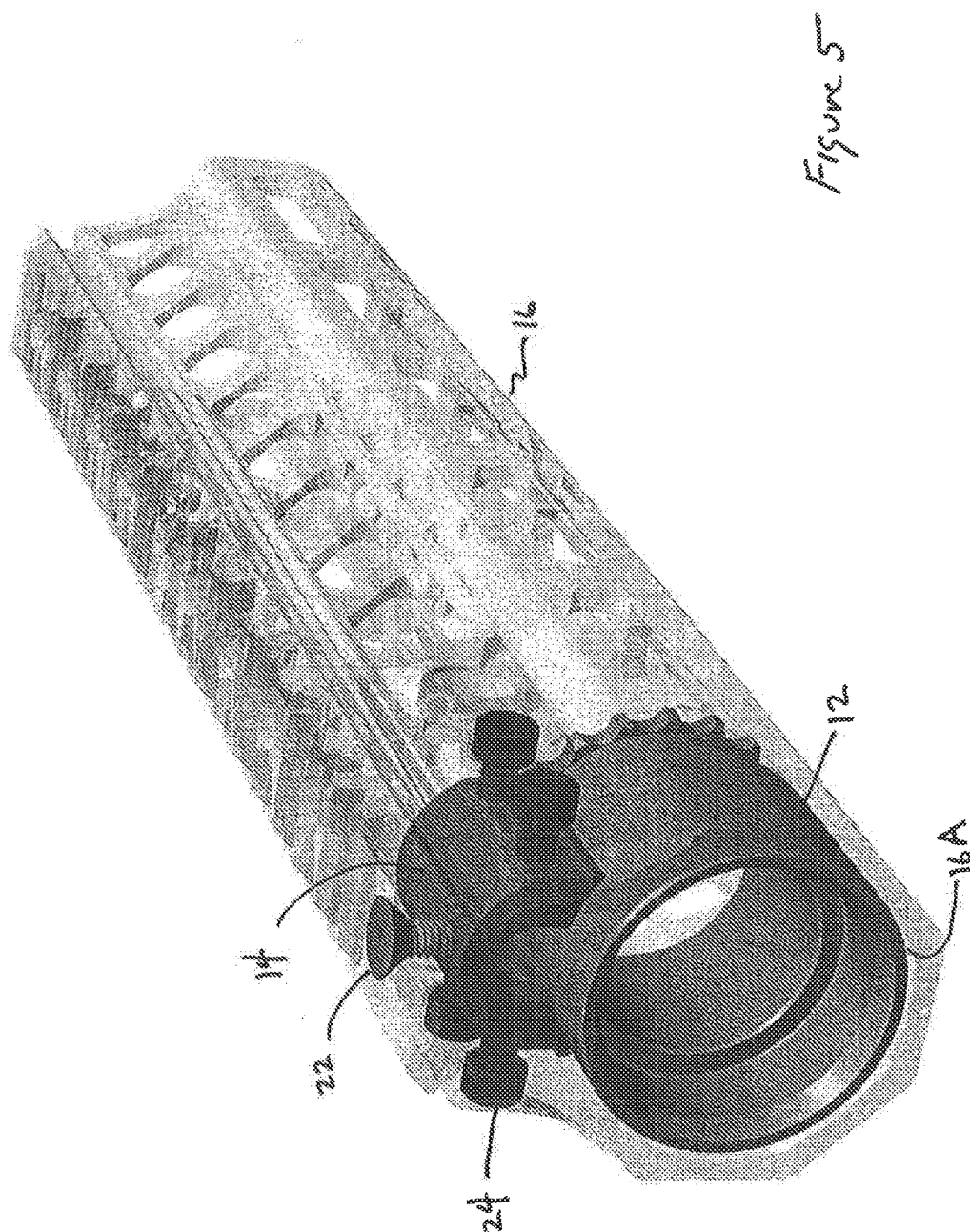


Figure 4



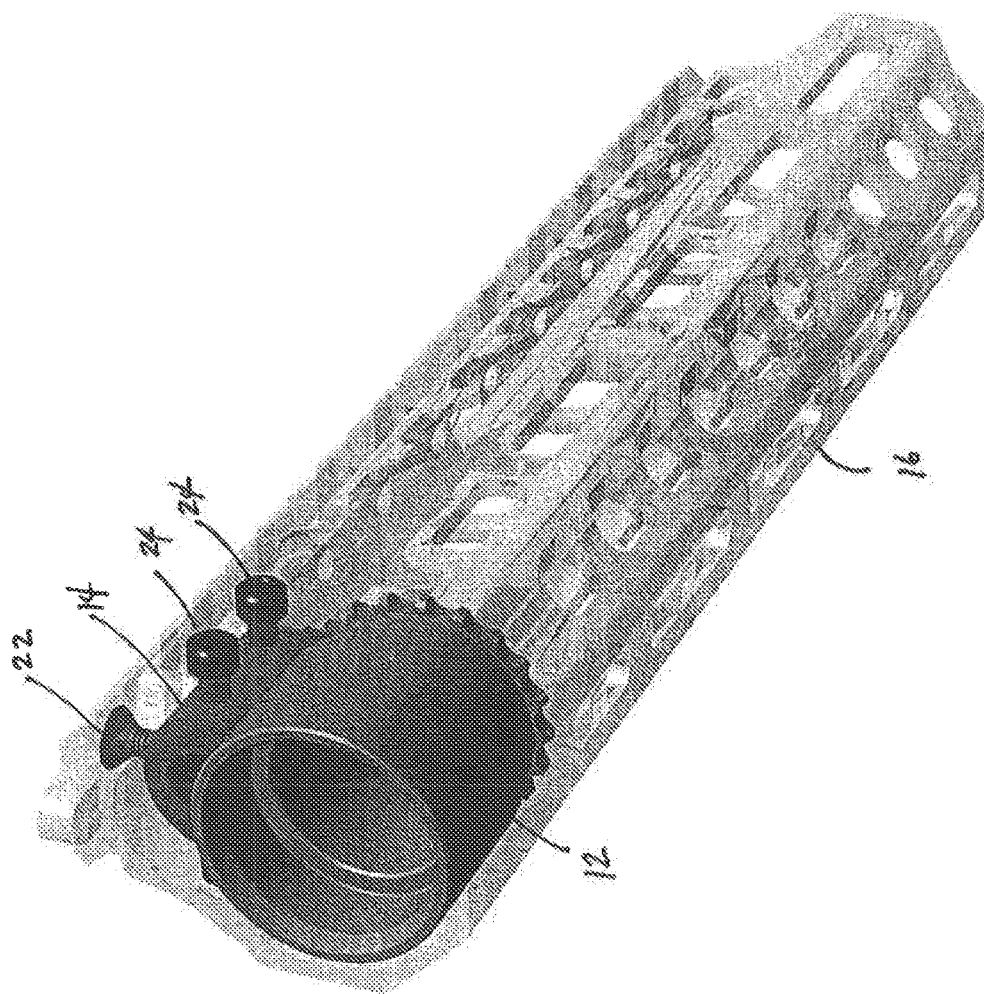


Figure 6

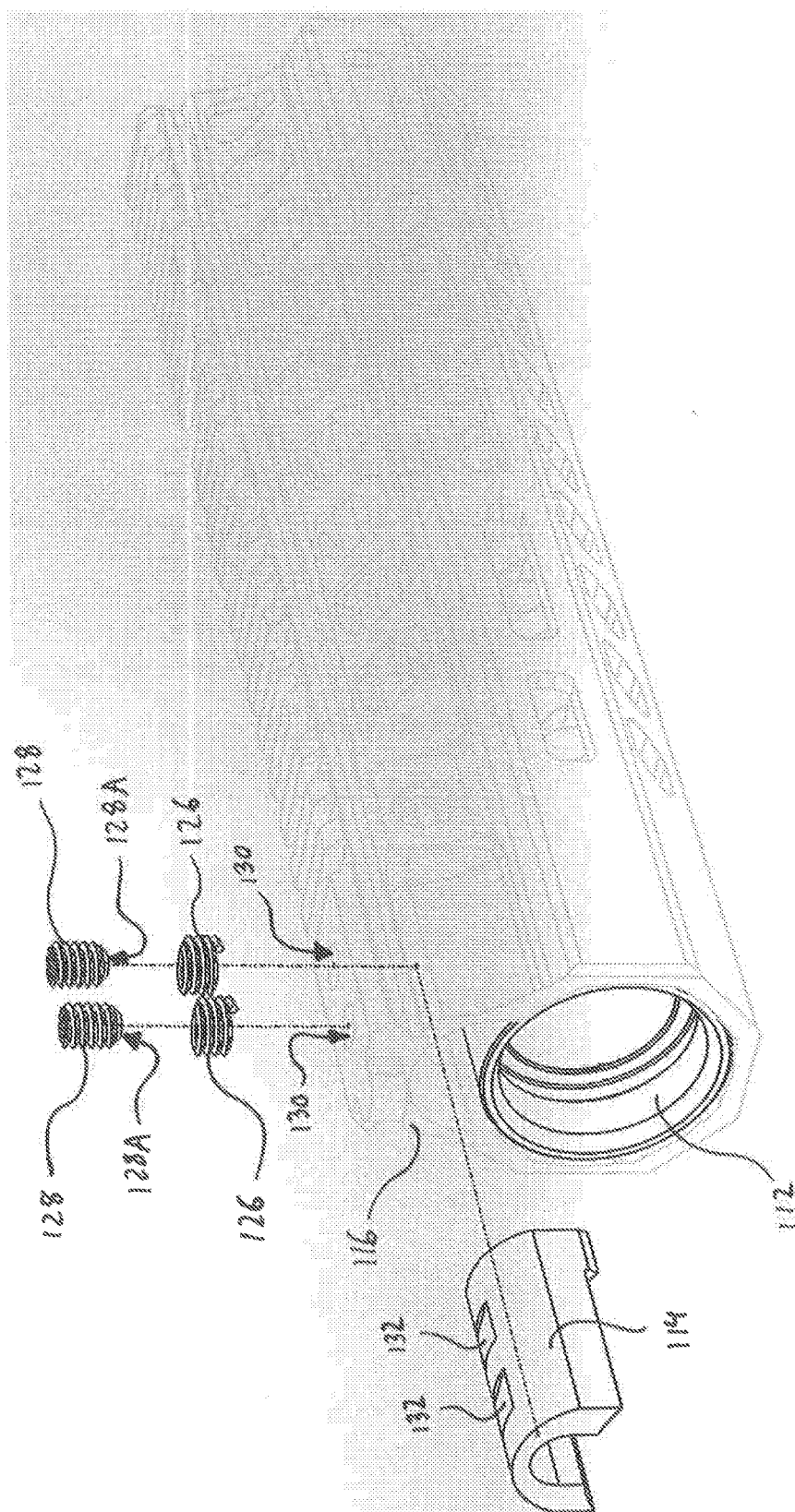


Figure 7

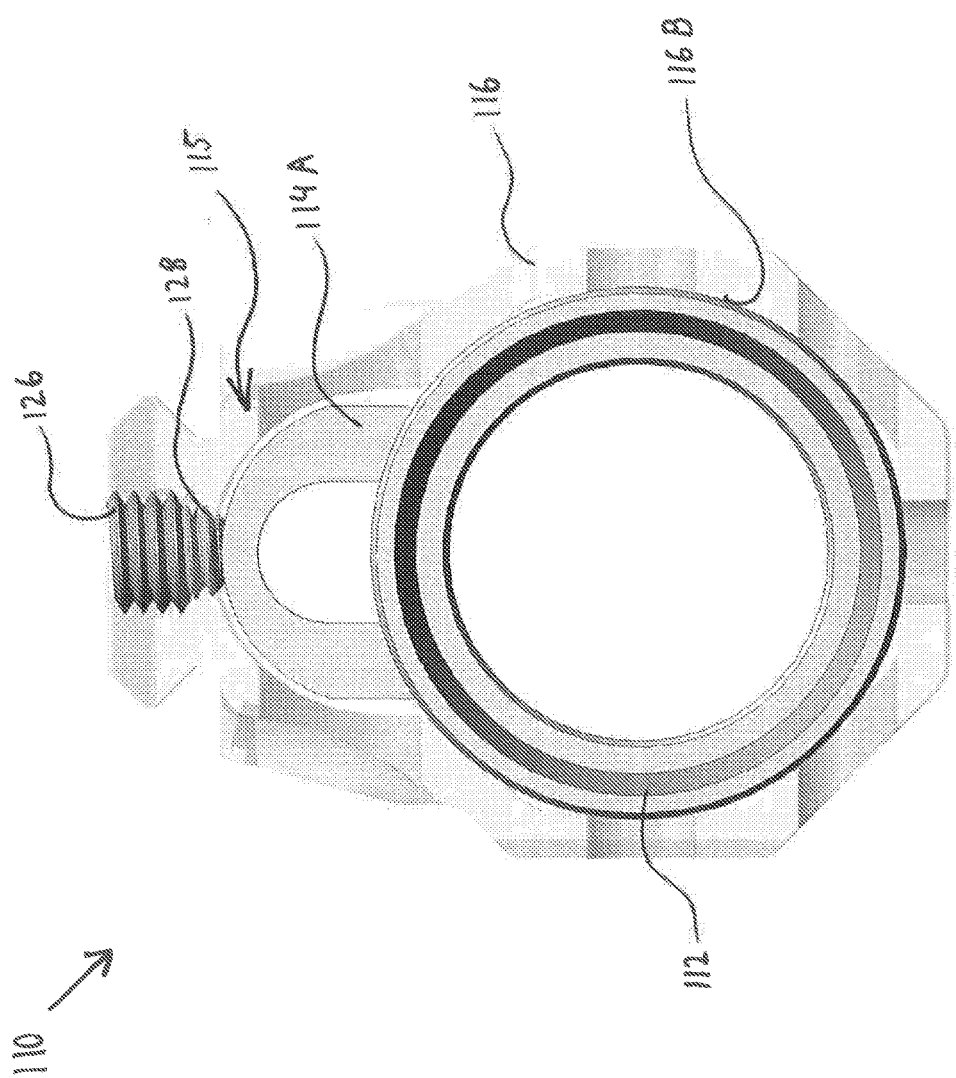


Figure 8

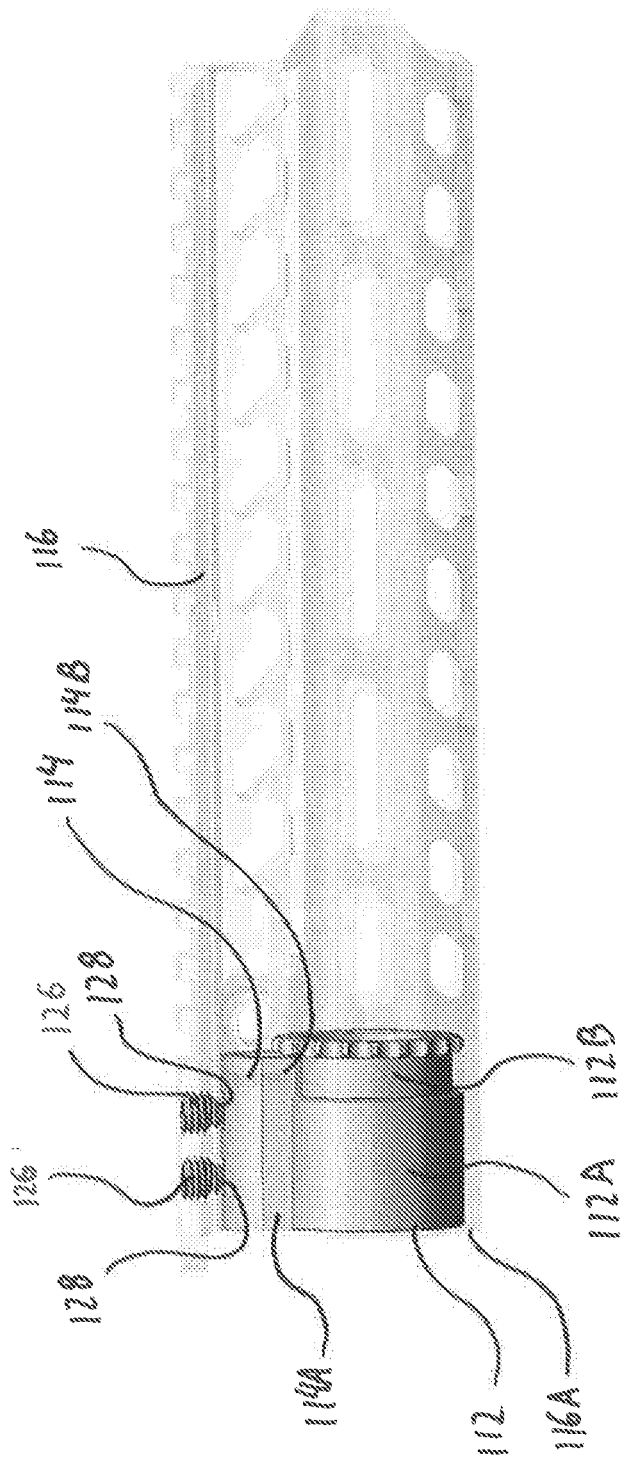


Figure 9

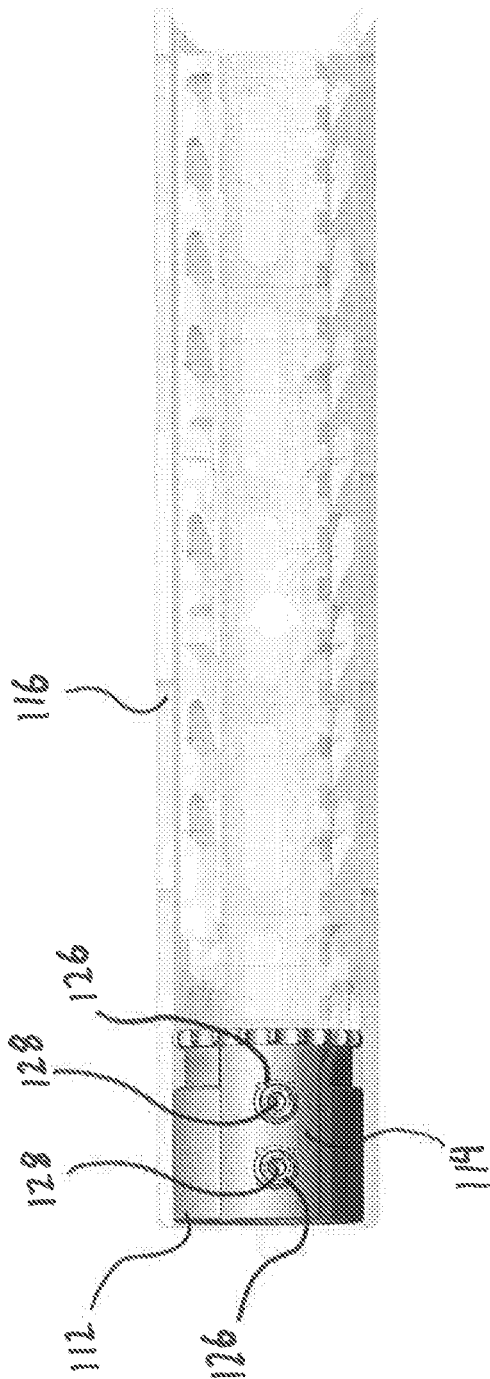


Figure 10

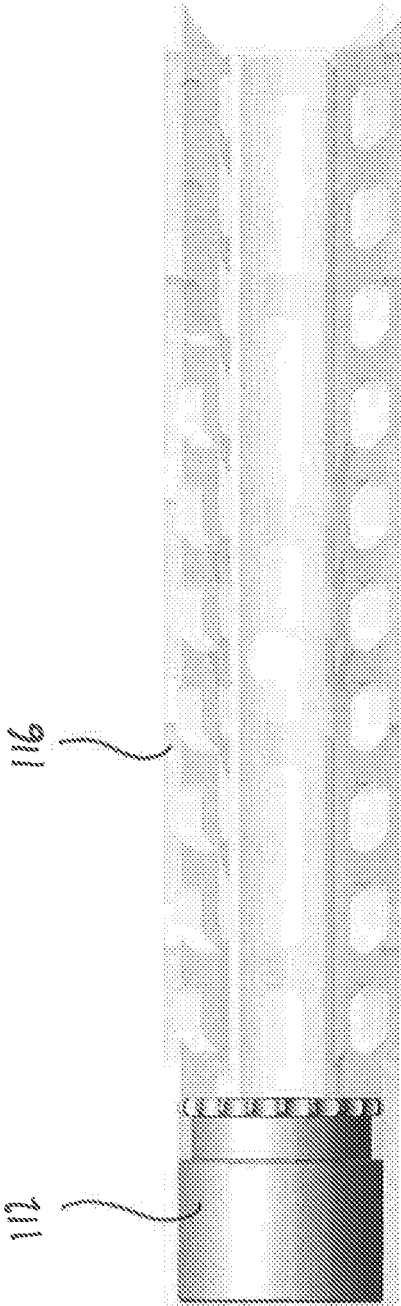


Figure 11

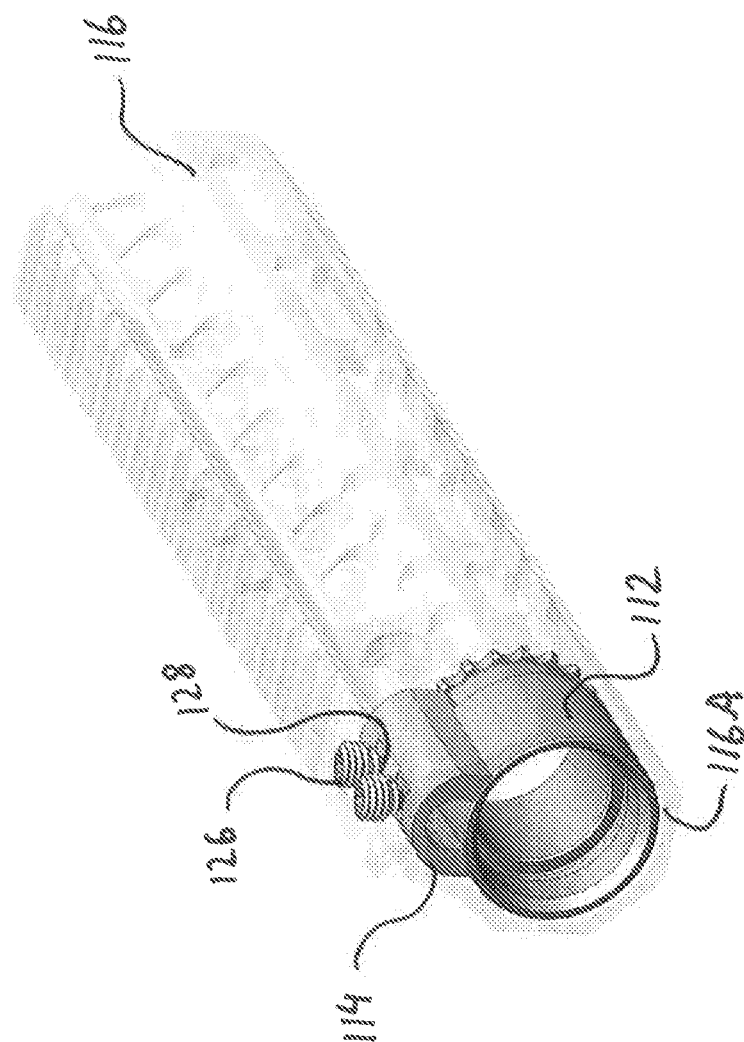


Figure 12

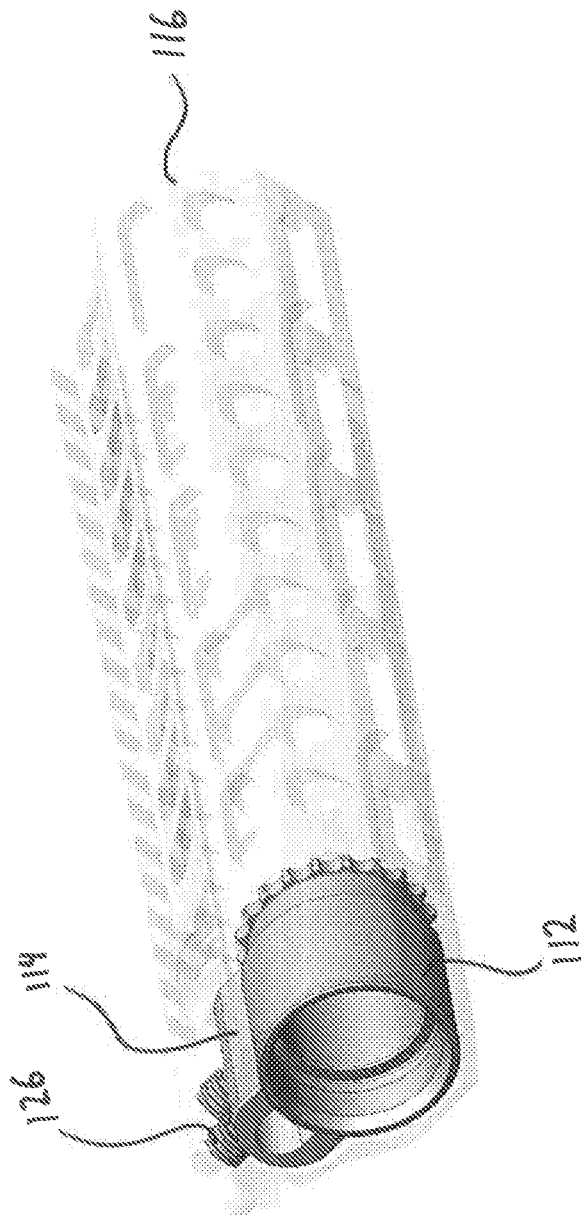


Figure 13

FIREARM RAIL/HANDGUARD AND MOUNTING SYSTEM

FIELD OF THE INVENTION

[0001] The disclosure relates to the field of firearm accessories, and, more specifically, to an assembly for mounting a rail assembly to a firearm which maintains proper alignment of the assembly with the firearm barrel.

BACKGROUND OF THE INVENTION

[0002] In the general field of combat and commercial weaponry, there is a broad range of accessories available for mounting onto standard firearms in order to upgrade the capability of these weapons. Of particular interest in the context of upgrade accessories is the M16/M4 weapon system that is typically utilized in military or combat settings. Most new models of the M16/M4 weapons also include a dovetail rail interface integrally formed along the top of the upper receiver. This interface rail provides a convenient mounting point for many of the available accessories for use with the M16/M4 firearm, such as scopes, sighting devices, lasers and directed fire devices. The barrel is held in assembled relation with the upper receiver by a barrel nut that is threaded onto the outside surface of the barrel-receiving receptacle.

[0003] Some commercially available after market rail/handguard assembly systems require permanent modification of the firearm, such as replacing the original barrel nut with a proprietary barrel nut design, before installation of rail/handguard, while others are compatible with the existing configuration of the barrel nut provided by the manufacturer. Either way, it is critical during the installation and use of the rail/handguard assembly that the alignment of the rail/handguard assembly be longitudinally, axially, and radially, relative to the axis of the barrel bore, free from slippage, canting, or other angular displacements, lest accessories such as scopes securable to the rail/handguard assembly not provide true reference for aiming of the firearm.

[0004] It would therefore be useful to provide a rail/handguard assembly for use with a firearm that prevents any of longitudinal, axial, or radial misalignment of the rail assembly relative to the barrel of the firearm at the time of installation.

[0005] It would be further useful to provide a rail/handguard assembly for use with a firearm which prevents any of longitudinal, axial, or radial misalignment of the rail assembly relative to the barrel axis of the firearm during use.

BRIEF SUMMARY OF THE INVENTION

[0006] Disclosed is an assembly for mounting a handguard to a firearm in a manner which maintains proper alignment of the handguard with the firearm barrel. In particular, the disclosure is directed to an improved mounting configuration for attaching the handguard to the barrel nut of a firearm in a manner that prevents any of longitudinal, axial, or radial misalignment of the handguard relative to the barrel of the firearm. The assembly utilizes a clamping element disposed intermediate the barrel nut and the interior end of the handguard. The clamping element has multiple arcuate surfaces which mimic different diameter portions of the exterior profile of the barrel nut to prevent any of longitudinal, axial, or radial misalignment of the handguard relative to the axis of the firearm barrel. The clamping element may

be secured in place with multiple fasteners having the same or different axes of movement.

[0007] According to one aspect of the disclosure, an assembly for securing a handguard to a firearm barrel nut comprises: a handguard having a first end with an interior diameter shaped to receive at least a portion of an exterior of the barrel nut; a biasing clamp element disposable intermediate the barrel nut and the interior diameter of the handguard, the biasing clamp element having at least one arcuate surface disposed adjacent the exterior perimeter of the barrel nut; and a mechanism for securing the biasing clamp element intermediate the handguard and the barrel nut. In one embodiment, the biasing clamp element prevents movement of the handguard longitudinally along the axis of the barrel. In another embodiment, the biasing clamp element has one or more arcuate surfaces disposed adjacent the exterior perimeter of the barrel nut to prevent radial and/or rotational movement of the barrel nut within the interior of the handguard end. In one embodiment, the mechanism for securing comprises at least one helicoil insert disposed within an aperture within the handguard. In one embodiment, the mechanism for securing the biasing clamp further includes at least one threaded fastener which couples with the helicoil insert and forces the biasing clamp element against the barrel nut. In one embodiment, the mounting assembly system comprises a plurality of helicoil inserts disposed within a plurality of apertures in the handguard. In one embodiment, the mechanism for securing the biasing clamp further includes a plurality of threaded fasteners which couple with the helicoil inserts and force the biasing clamp element against the barrel nut.

[0008] According to another aspect of the disclosure, an assembly kit for use with a firearm having a barrel nut and a handguard comprises: a biasing clamp element disposable intermediate the barrel nut and an interior diameter of the handguard, the biasing clamp element having first and second surfaces disposed adjacent first and second exterior surface portions, respectively, of the barrel nut; and a mechanism for securing the biasing clamp element intermediate the handguard and the barrel nut.

[0009] According to yet another aspect of the disclosure, an assembly apparatus for securing a handguard to a firearm, the firearm having a barrel nut with an exterior perimeter, comprises: a handguard having a first end with an interior diameter shaped to receive at least a portion of the exterior portion of the barrel nut; and a biasing clamp element disposable intermediate the interior diameter of the handguard and a first location on the exterior perimeter of the barrel nut, the biasing clamp element having an arcuate surface with a first radius of diameter and disposable adjacent the first location on the exterior perimeter of the barrel nut, the biasing clamp element having a second arcuate surface having a second radius of diameter and disposable adjacent a second location on the exterior perimeter of the barrel nut; and a first mechanism for securing the first clamping element intermediate the handguard and the barrel nut.

[0010] According to still another aspect of the disclosure, a method for mounting a handguard to a firearm having a cylindrical barrel nut comprises: A) disposing a first end of the handguard about a portion of the barrel nut; B) inserting a biasing clamp element intermediate the first end of the handguard and the barrel nut at a first location about an exterior perimeter of the barrel nut; C) forcing the biasing

clamp element against the barrel nut from a first direction normal to an axis of the barrel nut. In one embodiment, the method further comprises: D) forcing the biasing clamp element against the barrel nut from a second direction normal to an axis of the barrel nut, the second direction different from the first direction.

[0011] For a better understanding of the disclosed system and apparatus, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] In the drawings:

[0013] FIG. 1 is a front, end-on view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0014] FIG. 2 is a side, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0015] FIG. 3 is a top, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0016] FIG. 4 is a bottom, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0017] FIG. 5 is a top, perspective view of the embodiment of FIGS. 1-4 in accordance with the disclosure;

[0018] FIG. 6 is a bottom, perspective view of the embodiment of FIGS. 1-4 in accordance with the disclosure;

[0019] FIG. 7 is an exploded, top, perspective view of an embodiment of a mounting assembly in accordance with the disclosure;

[0020] FIG. 8 is a front, end-on view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0021] FIG. 9 is a side, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0022] FIG. 10 is a top, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0023] FIG. 11 is a bottom, plan view of an embodiment of the mounting assembly system in accordance with the disclosure;

[0024] FIG. 12 is a top, perspective view of the embodiment of FIGS. 8-11 in accordance with the disclosure; and

[0025] FIG. 13 is a bottom, perspective view of the embodiment of FIGS. 8-11 in accordance with the disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0026] FIGS. 1-6 illustrate embodiments of the assembly 10 in accordance with the disclosure. The mounting assembly 10 comprises a handguard 16, optional barrel nut 12 and mounting system 15. Handguard 16 is the structural element that supports the entire rail assembly and serves to transfer the loads or additional weight induced by any attachments into the upper receiver of the firearm. Mounting system 15 comprises a biasing clamp element 14, and its respective

attachment mechanisms, which are mechanically coupled intermediate barrel nut 12 and handguard 16, as described herein in greater detail.

[0027] As illustrated in the Figures, a cylindrical barrel nut 12 extends longitudinally along an axis 20 and has an exterior perimeter defining first and second exterior surface portions 12A and 12B with different exterior diameter values relative to the axis. In the illustrative embodiment, the transition between the diameters of portions 12A and 12B is abrupt, causing a step down in the diameter exterior perimeter. In embodiments, barrel nut 12 may have other exterior perimeter surface features as may be designed by the manufacturer of the firearm. Handguard 16 has a first end 16A with an interior diameter 16B shaped to receive at least a portion of one of the first and second exterior barrel nut portions 12A and 12B thereagainst.

[0028] Biasing clamp element 14 is disposed intermediate the barrel nut 12 and the interior diameter 16B of the handguard 16 and has first and second biasing surfaces 14A and 14B disposed adjacent the first and second exterior surface portions 12A and 12B, respectively, of the barrel nut 12. In embodiments, the surfaces of biasing clamp element 14 disposed adjacent the exterior perimeter of barrel nut 12, including one or both of first and second biasing surfaces 14A and 14B, may be arcuate in shape with substantially the same degree of curvature as the exterior perimeter portion of barrel nut 12 against which biasing surfaces 14A and 14B are disposed. In the illustrative embodiment, biasing clamp element 14 is seated in an indentation in the interior surface of inner diameter 16B. Two pairs of axially aligned apertures extend through handguard 16, and, optionally, partially into biasing clamp element 14, and accept screws 24 or other fastening mechanisms for securing the biasing clamp element 14 intermediate the handguard 16 and the barrel nut 12, as illustrated in the Figures. An additional pair of axially aligned apertures extending through handguard 16, and, optionally, partially into biasing clamp element 14, accepts a screw 22 or other fastening mechanisms for securing the biasing clamp element 14 intermediate the handguard 16 and the barrel nut 12, as illustrated in the Figures.

[0029] In the illustrative embodiment, biasing clamp element 14 may have along a portion of its length a generally U-shaped cross-sectional profile, as seen from a plane normal to axis 20, with first and second clamping surfaces 14A and 14B disposed adjacent the exterior perimeter of barrel nut 12. In the illustrative embodiment, exterior perimeter portion of barrel nut 12 against which clamping surfaces 14A and 14B are disposed may be knurled or contain other surface features to enhance frictional engagement therebetween. In embodiments, clamping surfaces 14A and 14B of biasing clamp element 14 are arcuate with a radius of curvature which substantially mimics the radius of curvature of the exterior surfaces of the perimeter of barrel nut 12. In the illustrative embodiment barrel nut 12 may have multiple different exterior diameters, as illustrated. Accordingly, one or both of the U-shaped legs of each of clamping surfaces 14A and 14B may have arcuate surfaces with respective radii of curvature which substantially mimic the respective radii of curvature of the exterior surfaces of barrel nut 12 with which the clamping surfaces are in contact to prevent any of longitudinal, axial, or radial misalignment of the handguard relative to the axis of the firearm barrel.

[0030] In other embodiments, biasing clamp element 14 may have a generally solid cross-sectional profile, as seen

from a plane normal to axis **20**, with arcuate clamping surfaces **14A** and **14B** substantially as described above. In still other embodiments, biasing clamp element **14** may have a generally U-shaped cross-sectional profile along a portion of its length and a generally solid cross-sectional profile, as seen from a plane normal to axis **20**, e. g., the area above clamping surface **14A** may have a U-shaped cross-sectional profile and the area above clamping surface **14B** may have a solid cross-sectional profile or vice versa.

[0031] Because biasing clamp element **14** mimics the abrupt transition between the diameters of barrel nut **12** between surfaces **12A** and **12B**, the longitudinal cross-sectional profile of biasing clamp element **14** along axis **20** is generally L-shaped and prevents longitudinal misalignment of the handguard assembly relative to axis **20** of barrel nut **12** at the time of installation and during use. Similarly, because clamping surfaces **14A** and **14B** of biasing clamp element **14** have arcuate surfaces that mimic the respective curvatures of surfaces **12A** and **12B** of barrel nut **12**, axial and/or radial misalignment of the handguard relative to barrel nut **12** is prevented at the time of installation and during use.

[0032] A method for mounting the handguard **16** to a firearm having a cylindrical barrel nut **12** comprises disposing a first end of the handguard **16** about a portion of the barrel nut and inserting biasing clamp element **14** intermediate the first end of the handguard **16** and the barrel nut **12** at a first location about an exterior perimeter of the barrel nut. The clamping surfaces **14A** and **14B** are disposed adjacent first and second exterior surface portions, respectively, of the barrel nut **12**. Once biasing element **14** is seated intermediate handguard **16** and barrel nut **12**, screws **24** and fasteners **22** can be used to force biasing clamp element **14** securely against the barrel nut **12**.

[0033] Referring now to FIGS. 7-13, an embodiment of an assembly **110** in accordance with the disclosure is shown. Like reference numerals are used to denote like parts across the various embodiments shown herein.

[0034] The embodiment of FIGS. 7-13 includes a plurality of helicoil inserts **126** and fastening mechanisms **128**. While two helicoil inserts **126** and two fastening mechanisms **128** are shown, various numbers can be used in different embodiments, including only one. The helicoil inserts **126** shown have threaded exteriors for coupling with the threaded interiors of apertures **130** which extend through the handguard **116**. The helicoil inserts **126** also have a threaded interior which can couple with the threaded exterior of the fastening mechanisms **128**. In some cases, the helicoil inserts **126** can be formed from a stronger and more rigid material than the handguard **116** (i.e., steel versus aluminum) to prevent the handguard **116** from warping, crushing, or otherwise deforming due to force through the fastening mechanisms **128**.

[0035] When the biasing clamp element **114** is inserted between the barrel nut **112** and the handguard **116**, surfaces **132** on the biasing clamp element **114** align with the apertures **130** of the handguard **116**. The fastening mechanisms **128** can then be inserted into the apertures **130**, for example, by coupling the threaded outer surfaces of the fastening mechanisms **128** with the threaded inner surfaces of helicoil inserts **126** within the apertures **130**. Lower surfaces **128A** of the fastening mechanisms **128** then contact the exposed surfaces **132** of the biasing clamp element **114**. In some cases, the surfaces **132** of the biasing clamp element

114 and the lower surfaces **128A** of the fastening mechanisms **128** can be substantially flat to maximize contact area. As the fastening mechanisms **128** contact the biasing clamp element **114**, the barrel nut **112** is forced against the interior diameter **116B** of handguard **116**. Further, as discussed in the embodiment of FIGS. 1-6, the first and second biasing surfaces **114A**, **114B** are held adjacent the first and second exterior surface portions **112A**, **112B**, respectively, of the barrel nut **112**, limiting movement of the barrel nut **112** with respect to the biasing clamp element **114** and the handguard **116**.

[0036] The handguard **16**, **116** may be formed generally as a tubular enclosure that is configured to encircle the barrel of the firearm when the assembly **10**, **110** is installed on the firearm in a mounted position. In the illustrative embodiments, the handguard **16**, **116** has a unitary or monolithic construction defined by left and right side walls that extend between ends thereof and generally outwardly and downwardly in an arcuate manner from an integrally formed top dovetail rail to form a substantially cylindrical body. Top dovetail rail extends at least partially longitudinally between the forward end and the rearward end. An optional supplemental dovetail rail interface may be slidably attached to the bottom of the handguard **16**, **116** utilizing an integrally formed projection having a complimentary mating cross-sectional profile.

[0037] In the embodiments, any elements of the assembly **10**, **110** and mounting systems **15**, **115** may be formed of substantially rigid materials including steel, stainless steel, aluminum, ceramics, or other materials capable of withstanding heat generated by the barrel nut **12**, **112** during use of the firearm.

[0038] As illustrated in the Figures, side walls of the handguard **16**, **116** may have a plurality of wall vents extending therethrough to facilitate cooling of the firearm barrel by allowing heated air from the interior of the handguard **16**, **116** to escape through the vents. It will be obvious to those reasonably skilled in the art that any configuration or shape of sidewall vents, including an open lattice structure, may partially define one or both of sidewalls. It will be further obvious to those reasonably skilled in the art that the handguard **16**, **116** may have other cross-sectional profiles, such as a pentagon or octagon or other configuration. In addition, although the handguard **16**, **116** in the illustrative embodiment forms an integral sleeve-like structure, it is contemplated herein that one or more constituent components thereof may be separately assembled into a sleeve-like structure which is insertable over the open end of barrel.

[0039] It can be therefore seen that the disclosure provides a new and improved handguard/rail mounting assembly for a firearm.

[0040] While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims. For example, while embodiments have been described in which helicoil inserts have been utilized, it will be obvious to those reasonably skilled in the arts that other fastening mechanisms may be utilized, such as other threaded inserts with a simple threaded aper-

ture, or even an unthreaded aperture if the handguard is made of a material, such as aluminum, which allows for receiving and co-acting with a threaded or unthreaded fastener.

What is claimed is:

1. An assembly apparatus for securing a handguard to a firearm having a barrel nut, the assembly apparatus comprises:

- a handguard having a first end with an interior diameter shaped to receive at least a portion of an exterior of the barrel nut;
- a biasing clamp element disposable intermediate the barrel nut and the interior diameter of the handguard, the biasing clamp element having at least one arcuate surfaces disposed adjacent the exterior perimeter of the barrel nut; and
- a mechanism for securing the biasing clamp element intermediate the handguard and the barrel nut.

2. The apparatus of claim 1 in combination with a cylindrical barrel nut extending along an axis and having an exterior perimeter defining first and second exterior surface portions with different exterior diameter values relative to the axis.

3. The apparatus of claim 1 wherein the biasing clamp element prevents movement of the handguard longitudinally along the axis of the barrel.

4. The apparatus of claim 1 wherein the biasing clamping element has an arcuate surface disposable adjacent the exterior perimeter of the barrel nut to prevent at least one of radial and rotational movement of the handguard first end relative the barrel nut.

5. The apparatus of claim 1 wherein the mechanism for securing comprises at least one helicoil insert disposed within an aperture in the handguard and a threaded fastener receivable within the helicoil insert for forcing the biasing clamp element against the barrel nut.

6. The apparatus of claim 1 wherein the biasing clamp element further comprises a flat surface on an exterior portion thereof against which the mechanism for securing contacts.

7. The apparatus of claim 1 wherein the mechanism for securing comprises a plurality of helicoil inserts disposed within respective apertures within the handguard and a plurality of threaded fasteners, each receivable within one of the helicoil inserts for forcing the biasing clamp element against the barrel nut.

8. An assembly kit for use with a firearm having a barrel nut and a handguard, the kit comprising:

- a biasing clamp element disposable intermediate the barrel nut and an interior diameter of the handguard, the biasing clamp element having first and second surfaces disposed adjacent first and second exterior surface portions, respectively, of the barrel nut; and
- a mechanism for securing the biasing clamp element intermediate the handguard and the barrel nut.

9. The assembly kit of claim 7 wherein the biasing clamp element has an arcuate surface for positioning adjacent the

exterior perimeter of the barrel nut to prevent at least one of radial and rotational movement of the handguard first end relative the barrel nut.

10. The assembly kit of claim 7 in combination with a cylindrical barrel nut extending along an axis and having an exterior perimeter defining first and second exterior surface portions with different exterior diameter values relative to the axis.

11. The assembly kit of claim 7 in combination with a handguard having a first end with an interior diameter shaped to receive at least a portion of a barrel nut exterior.

12. An assembly apparatus for securing a handguard to a firearm, the firearm having a barrel nut with an exterior perimeter, the assembly apparatus comprises:

- a handguard having a first end with an interior diameter shaped to receive at least a portion of the exterior portion of the barrel nut; and
- a biasing clamp element disposable intermediate the interior diameter of the handguard and a first location on the exterior perimeter of the barrel nut,

the biasing clamp element having an arcuate surface with a first radius of diameter and disposable adjacent the first location on the exterior perimeter of the barrel nut, the biasing clamp element having a second arcuate surface having a second radius of diameter and disposable adjacent a second location on the exterior perimeter of the barrel nut; and

a first mechanism for securing the first clamping element intermediate the handguard and the barrel nut.

13. The assembly apparatus of claim 12 in combination with a cylindrical barrel nut extending along an axis and having an exterior perimeter defining first and second exterior surface portions with different exterior diameter values relative to the axis.

14. The assembly apparatus of claim 16 further comprising:

- a second mechanism for securing the second clamping element intermediate the handguard and the barrel nut.

15. A method for mounting a handguard to a firearm having a cylindrical barrel nut, the method comprising:

- A) disposing a first end of the handguard about a portion of the barrel nut;
- B) inserting a biasing clamp element intermediate the first end of the handguard and the barrel nut at a first location about an exterior perimeter of the barrel nut;
- C) forcing the biasing clamp element against the barrel nut from a first direction normal to an axis of the barrel nut.

16. The method of claim 15 further comprises:

- D) forcing the biasing clamp element against the barrel nut from a second direction normal to an axis of the barrel nut, the second direction different from the first direction.

17. The method of claim 15 further comprising:

- E) exposing the barrel nut of the firearm prior to disposing the first end of the handguard about a portion of the barrel nut.

* * * * *