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(54) **TWO PIECE RAIL SYSTEM FOR FIREARM**

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Related U.S. Application Data

(60) Provisional application No. 61/143,795, filed on Jan. 11, 2009.

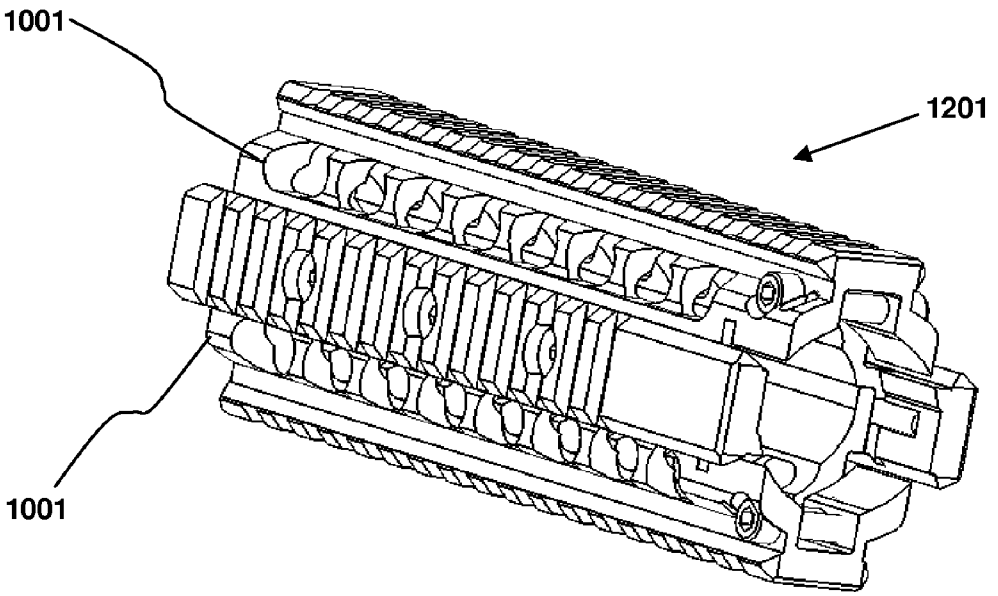
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(52) **U.S. Cl.** **42/71.01**

(57) **ABSTRACT**

A firearm handguard having two identical halves, or half guards, can engage the barrel nut of certain firearms to thereby provide a mounting rail system. The barrel nut attaches the barrel to the receiver. The half guards can be separately positioned in engagement with the barrel nut before fastening them together. The fastening operation can cause the half guards to clamp onto the barrel nut. Alternatively, the front handguard cup of some firearms can prevent the handguard from slipping forward while the rear barrel nut engagement prevents handguard rotation. Free floating variants, however, must clamp onto the barrel nut.



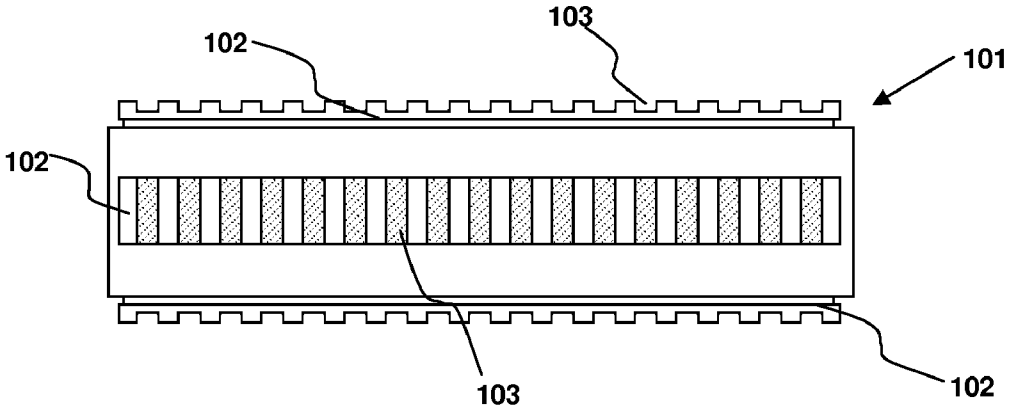


Fig. 1 (Prior Art)

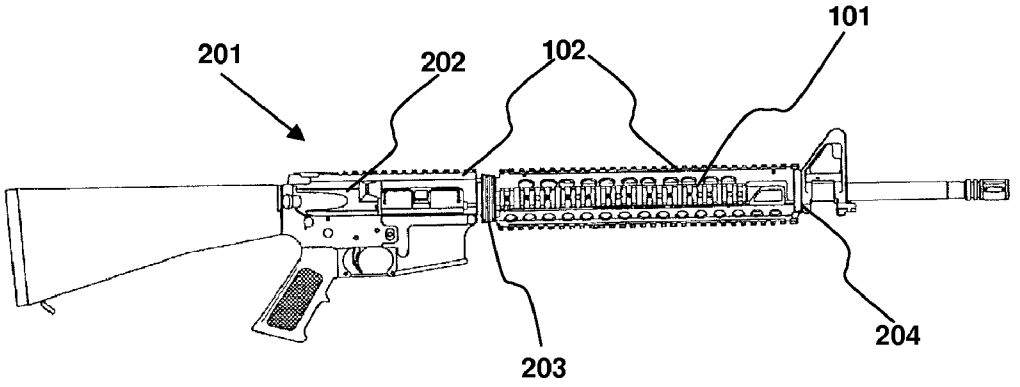


Fig. 2 (Prior Art)

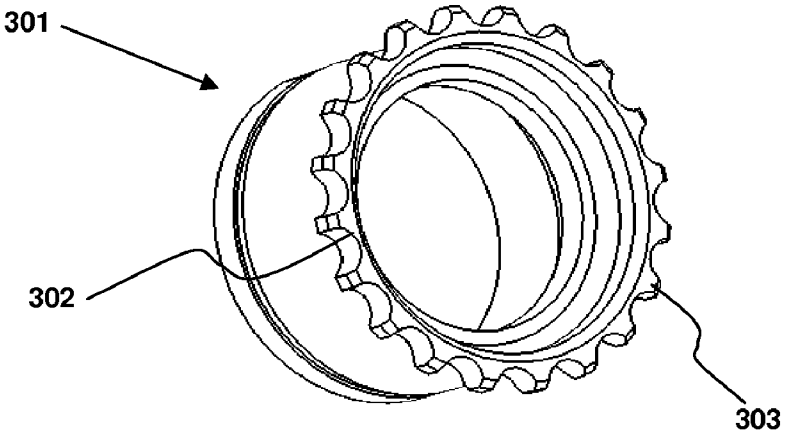


Fig. 3 (Prior Art)

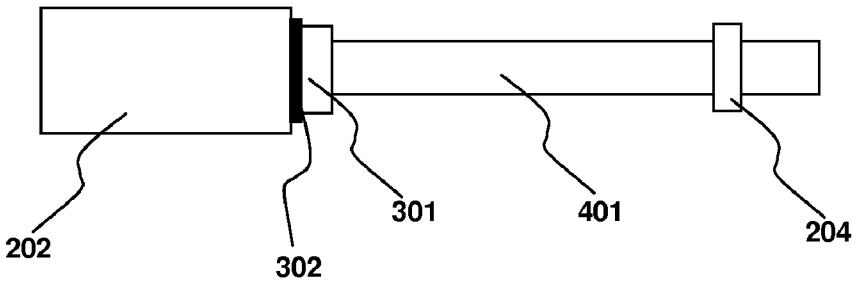


Fig. 4 (Prior Art)

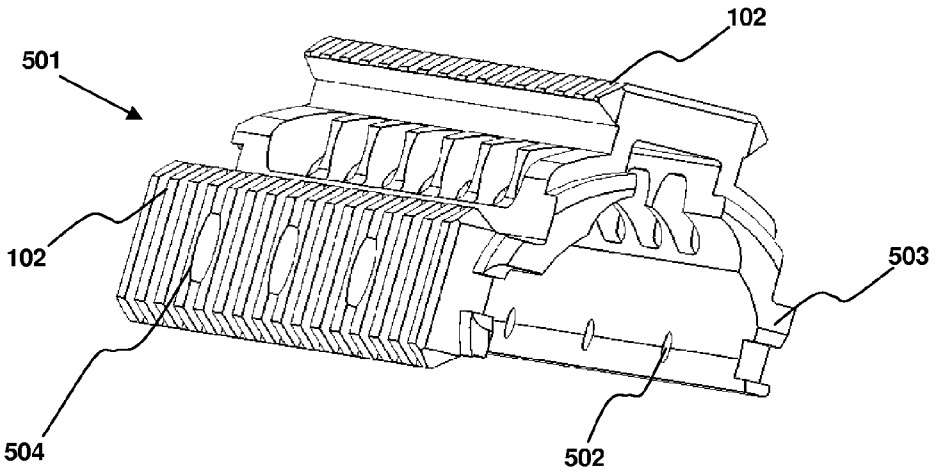


Fig. 5

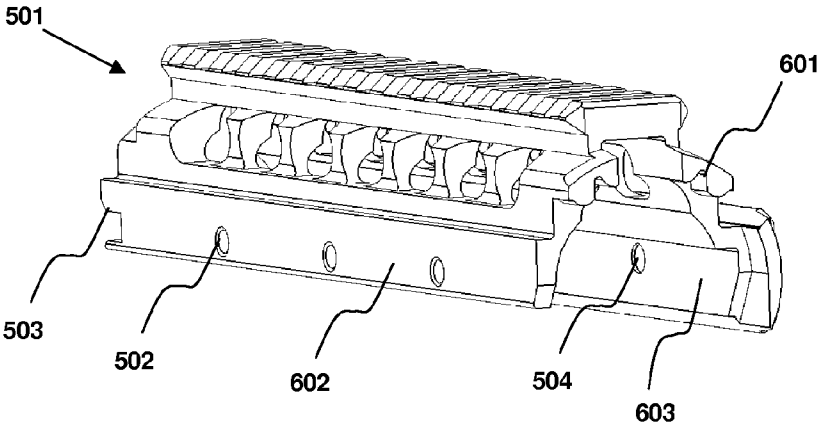


Fig. 6

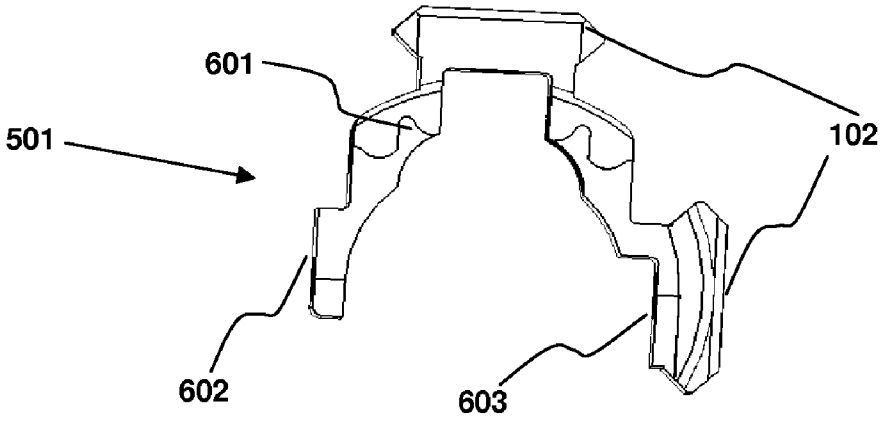


Fig. 7

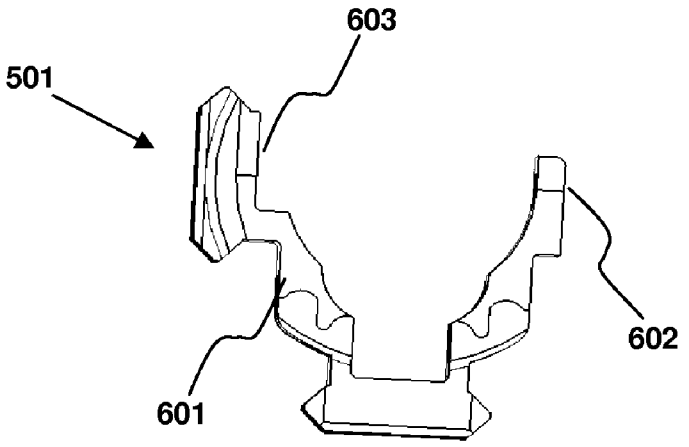


Fig. 8

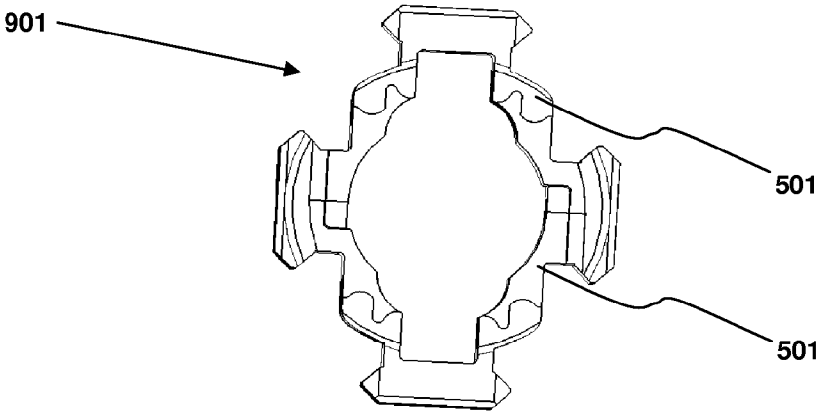

901
501
501

Fig. 9

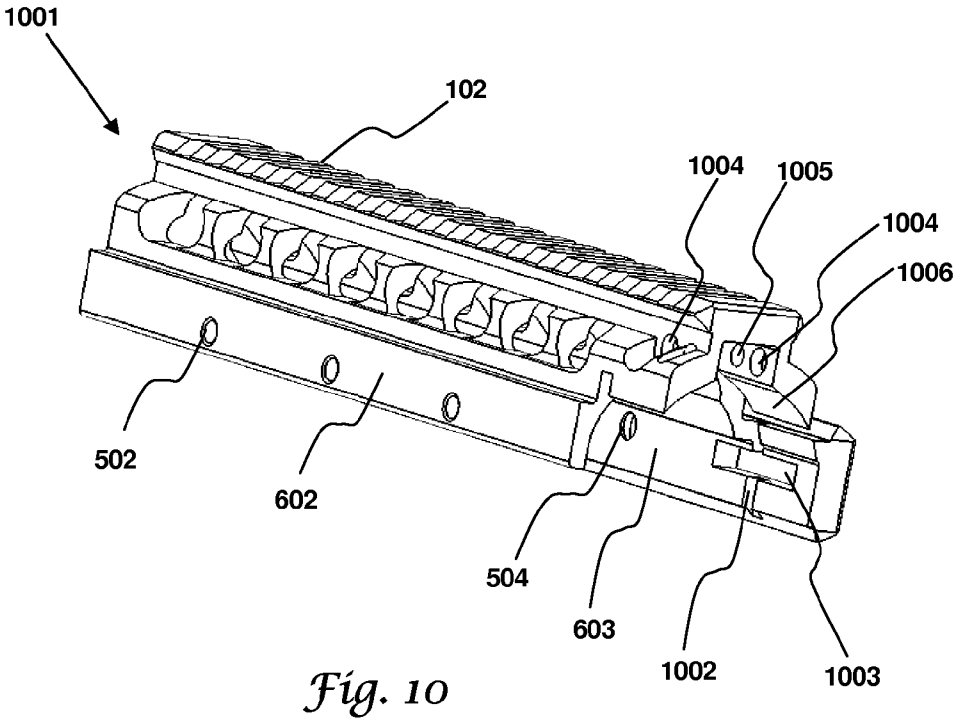

1001
102
1004
1005
1004
1006
502
602
504
603
1002
1003

Fig. 10

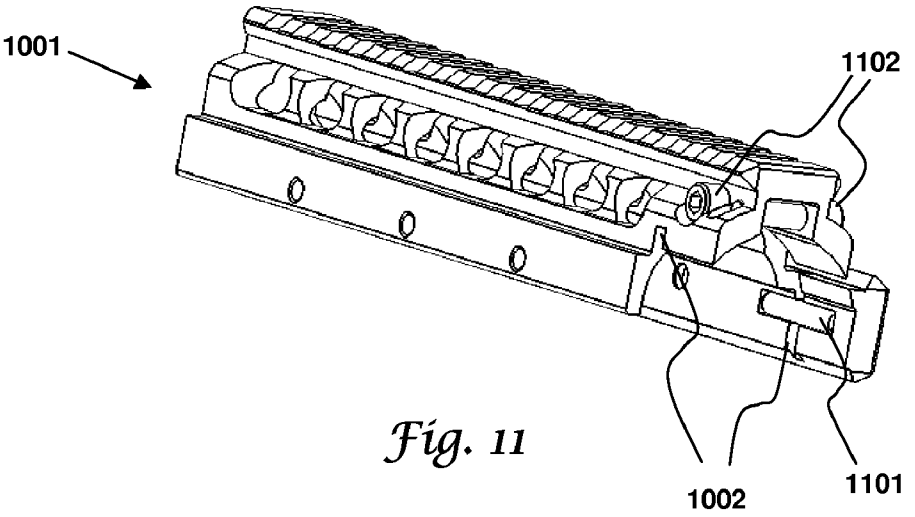


Fig. 11

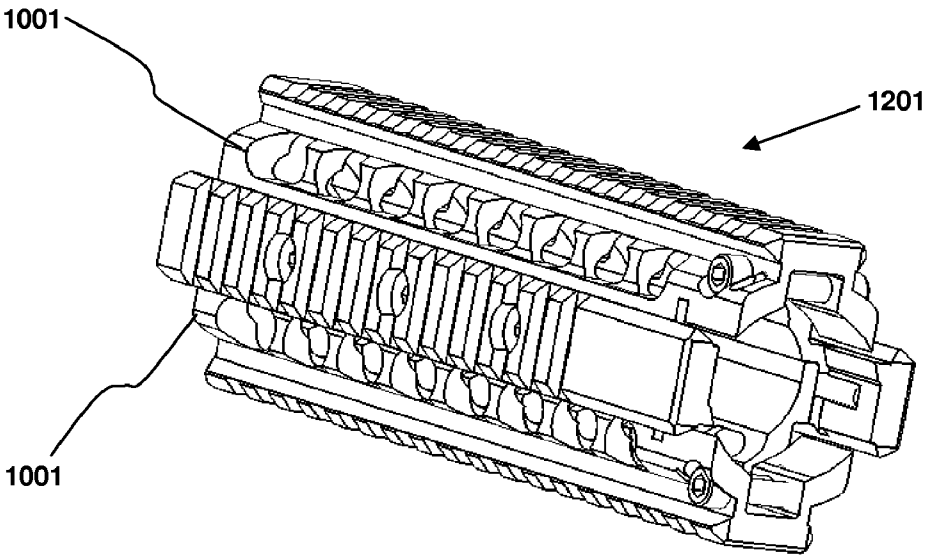


Fig. 12

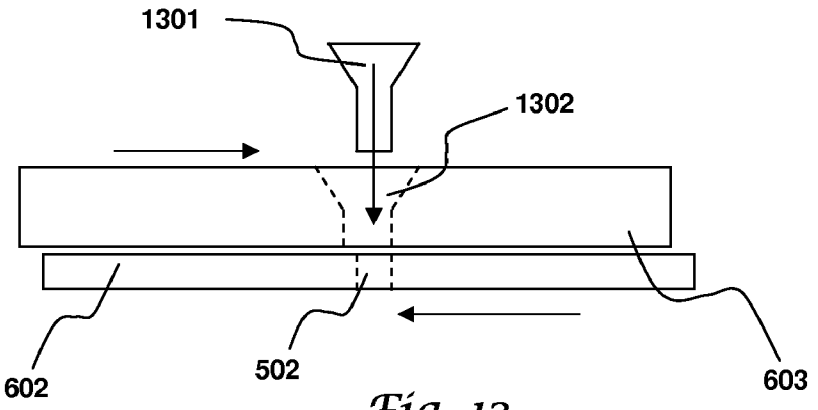


Fig. 13

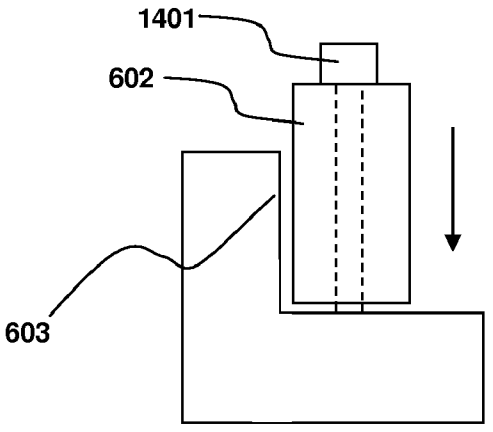


Fig. 14

TWO PIECE RAIL SYSTEM FOR FIREARM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the priority and benefit of U.S. Provisional Patent Application No. 61/143,795 filed on Jan. 11, 2009 entitled "Firearm Vertical Fore Grip and Rail System" and which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments relate to the fields of small arms, rifle handguards, carbine handguards, and mounting rails.

BACKGROUND

[0003] Current small arms use mounting rail systems for attaching accessories to the small arm. For example, M4 and M16 carbines are often fitted with a single piece handguard that incorporates up to four Picatinny rails. Picatinny rails are well known mounting rails that meet the specifications contained in MIL-STD-1913 and MIL-STD-1913 Notice 1. Another mounting rail called the Weaver rail is a notoriously well known variation of the Picatinny rail. Battaglia discloses a mounting rail system in U.S. Pat. No. 6,792,711 while Olson discloses another in U.S. Pat. No. 5,826,363.

[0004] FIG. **1**, labeled as "Prior Art", illustrates a handguard **101** with four mounting rails **102** of which three are visible. A number of accessories have been developed to attach to small arms by way of mounting rails **102**. The mounting rails have recoil grooves **103** that help lock accessories in place and help users attach accessories in repeatable positions.

[0005] FIG. **2**, labeled as "Prior Art", illustrates an M16 type firearm **201** with mounting rails **102**. The specific rifle is a flat top model having a mounting rail **102** on the upper receiver **202** as well as the four on the handguard **101**. The handguard **101** is attached to the firearm by being pushed into a front handguard cup **204** by a delta ring **203**.

[0006] FIG. **3**, labeled as "Prior Art", illustrates a barrel nut **301** having a barrel nut sprocket **302**. The barrel nut sprocket **302** has numerous teeth **303** that can provide a gripping surface for turning the barrel nut **301**.

[0007] FIG. **4**, labeled as "Prior Art", illustrates a barrel nut **301** attaching a barrel **401** to a firearm receiver **202**. The barrel nut **301** is tightened onto the receiver **202** by gripping the barrel nut sprocket **302** and twisting. A special tool is often used to tighten the barrel nut **301** until the barrel nut **301** and the barrel **401** are firmly attached to the receiver **202**.

[0008] Typically, the handguard is a "clamshell" arrangement made of two pieces, an upper piece and a lower piece, that fit between the delta ring **203** and front handguard cup. As such, the handguard is not as rigidly attached as is often desired. Systems and methods for rigidly attaching a handguard with integral mounting rails are needed.

BRIEF SUMMARY

[0009] The following summary is provided to facilitate an understanding of some of the innovative features unique to the embodiments and is not intended to be a full description. A full appreciation of the various aspects of the embodiments can be gained by taking the entire specification, claims, drawings, and abstract as a whole.

[0010] Systems and methods are needed for rigidly attaching a handguard with integral mounting rails to a firearm that uses a barrel nut to attach a barrel to the receiver. The barrel nut has a toothed barrel nut sprocket for gripping and turning the barrel nut.

[0011] The handguard includes two identical half guards fastened together. Each half guard has a mounting rail, an inner engagement, an outer engagement, and a portion that engages the barrel nut, typically at the barrel nut sprocket. The half guards are semi-cylindrical such that an assembled handguard is cylindrical. Fasteners passing through open holes in the outer engagements are threaded into threaded holes in the inner engagements. A complete, rigid, and cylindrical handguard is produced when the fasteners are tightened.

[0012] Tightening the fasteners can cause the handguard to clamp onto the barrel nut or barrel nut sprocket. Optionally, the half guards can include clamping mechanisms such that an assembled handguard can be slipped onto a barrel nut and clamped directly onto it. In some embodiments, the half guards include sprocket slots such that the sprocket slot of each half guard is slipped onto the barrel nut socket before the half guards are fastened together.

[0013] The half guards can incorporate elements to prevent the assembled handguard from rotating around the barrel nut. In some embodiments, the half guards themselves are machined, molded, or cast to include indentations that match the teeth of the barrel nut sprocket. Other embodiments can have slots into which pins fit and engage the teeth to prevent rotation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying figures, in which like reference numerals refer to identical or functionally similar elements throughout the separate views and which are incorporated in and form a part of the specification, further illustrate the present invention and, together with the background of the invention, brief summary of the invention, and detailed description of the invention, serve to explain the principles of the present invention.

[0015] FIG. **1**, labeled as "Prior Art", illustrates a handguard with four mounting rails of which three are visible;

[0016] FIG. **2**, labeled as "Prior Art", illustrates an M16 type firearm with mounting rail;

[0017] FIG. **3**, labeled as "Prior Art", illustrates a barrel nut having a barrel nut sprocket;

[0018] FIG. **4**, labeled as "Prior Art", illustrates a barrel nut attaching a barrel to a firearm receiver;

[0019] FIG. **5** illustrates a quarter front view of a half guard in accordance with aspects of some embodiments;

[0020] FIG. **6** illustrates a quarter back view of a half guard in accordance with aspects of some embodiments;

[0021] FIG. **7** illustrates a rear view of a first half guard in accordance with aspects of some embodiments;

[0022] FIG. **8** illustrates a rear view of a second half guard in accordance with aspects of some embodiments;

[0023] FIG. **9** illustrates a rear view of a first half guard and a second half guard positioned together in a radially opposed arrangement in accordance with aspects of some embodiments;

[0024] FIG. **10** illustrates a quarter back view of a half guard in accordance with aspects of some embodiments;

[0025] FIG. **11** illustrates a quarter back view of a half guard with a clamping fastener and pin in accordance with aspects of some embodiments;

[0026] FIG. **12** illustrates a quarter back view of a free floating type handguard in accordance with aspects of some embodiments;

[0027] FIG. **13** illustrates a tapered head fastener and oversize countersunk open hole for clamping two half guards together in accordance with aspects of some embodiments; and

[0028] FIG. **14** illustrates a fastener clamping two half guards together in accordance with aspects of some embodiments.

DETAILED DESCRIPTION

[0029] The particular values and configurations discussed in these non-limiting examples can be varied and are cited merely to illustrate at least one embodiment and are not intended to limit the scope thereof. In general, the figures are not to scale.

[0030] A firearm handguard having two identical halves, or half guards, can engage the barrel nut of certain firearms to thereby provide a mounting rail system. The barrel nut attaches the barrel to the receiver. The half guards can be separately positioned in engagement with the barrel nut before fastening them together. The fastening operation can cause the half guards to clamp onto the barrel nut. Alternatively, the front handguard cup of some firearms can prevent the handguard from slipping forward while the rear barrel nut engagement prevents handguard rotation. Free floating variants, however, must clamp onto the barrel nut.

[0031] FIG. **5** illustrates a quarter front view of a half guard **501** in accordance with aspects of some embodiments. The front half guard has mounting rails **102**, open holes **504**, threaded holes **502**, and a cup engagement **503**. The open holes **504** can be countersunk so that the heads of fasteners do not stick out. The cup engagement **503** is designed to fit into a firearm's front handguard cup.

[0032] FIG. **6** illustrates a quarter back view of a half guard **501** in accordance with aspects of some embodiments. The back view shows indentations **601** that can engage the teeth **303** of the barrel nut sprocket **302** to keep the half guard **501**, or fully assembled handguard, from rotating around the barrel nut **301**. The inner engagement **602** and outer engagement **603** are more easily visible than in the previous figure.

[0033] FIG. **7** illustrates a rear view of a first half guard in accordance with aspects of some embodiments. The indentations **601** are clearly visible as is the radially opposed arrangement of the inner and outer engagements.

[0034] FIG. **8** illustrates a rear view of a second half guard in accordance with aspects of some embodiments. The second half guard **501** is identical to the first half guard **501** but rotated 180 degrees.

[0035] FIG. **9** illustrates a rear view of a first half guard **501** and a second half guard **501** positioned together in a radially opposed arrangement in accordance with aspects of some embodiments. When fastened together, the two half guards **501** form a handguard **901**. Note that the inner engagements and the outer engagements are aligned so that a fastener passing through an open hole immediately encounters a threaded hole such that the two half guards can be fastened together. The fasteners should not intrude into the handguard interior where they might interfere with the firearm barrel, gas tube, or other element.

[0036] FIG. **10** illustrates a quarter back view of a half guard **1001** in accordance with aspects of some embodiments. This half guard **1001** lacks a cup engagement because it is intended for a free floating handguard. A free floating handguard is a handguard that, ideally, does not touch the barrel at all although some arrangements do contact the barrel where it meets the receiver. The half guard **1001** has a pin slot **1003** and a sprocket slot **1002**. The barrel nut sprocket fits into the sprocket slot **1002** such that the half guard **1001** can not slip forward along the barrel when properly positioned on a firearm.

[0037] The half guard of FIG. **10** also has a clamping mechanism. A clamping fastener can pass through open clamp hole **1004** and be threaded into threaded clamp hole **1005**. When tightened, the clamping fastener can cause clamping surface **1006** to bear down and press against the barrel nut and thereby clamp an assembled handguard to the barrel nut.

[0038] FIG. **11** illustrates a quarter back view of a half guard **1001** with clamping fasteners **1102** and a pin **1101** in accordance with aspects of some embodiments. The pin **1101** is positioned in pin slot **1003** such that it can engage the barrel nut sprocket teeth to prevent the handguard from rotating around the barrel nut. The clamping fasteners **1102** are properly inserted into the half guard. Notice that two clamping fasteners **1102** are illustrated whereas, in practice, one or more can be used.

[0039] FIG. **12** illustrates a quarter back view of a free floating type handguard **1201** in accordance with aspects of some embodiments. Two half guards **1001** are properly positioned in radial opposition to one another. The fasteners for attaching the two halves **1001** together are not shown.

[0040] FIG. **13** illustrates a tapered head fastener **1301** and oversize countersunk open hole **1302** for clamping to two half guards together in accordance with aspects of some embodiments. The oversize countersunk open hole **1302** is in the outer engagement **603** and a threaded hole **502** is in the inner engagement **602**. Tightening the fastener **1301** causes the tapered head to press down into the countersunk hole **1302** and pull two half guards together. The result can be that the half guards, when pulled together, clamp onto the barrel nut, perhaps at the barrel nut sprocket portion of the barrel nut.

[0041] FIG. **14** illustrates a fastener **1401** clamping to two half guards together in accordance with aspects of some embodiments. Tightening the fastener **1401** pulls the two parts together such that a clamping action is achieved.

[0042] It will be appreciated that variations of the above-disclosed and other features and functions, or alternatives thereof, may be desirably combined into many other different systems or applications. Also that various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

What is claimed is:

1. A handguard for a firearm, the firearm comprising a receiver and a barrel nut threaded onto the receiver, wherein the barrel nut comprises a barrel nut sprocket, and wherein the handguard comprises:

a first half guard comprising a mounting rail, inner engagement, outer engagement, and a means for engaging the barrel nut sprocket wherein the first half guard is semi-cylindrical with the inner engagement and the outer engagement radially opposed to one another, wherein the outer engagement comprises at least one open hole, and wherein the inner engagement comprises at least one threaded hole;

a second half guard identical to the first half guard; and

a plurality of threaded fasteners that pass through the open holes and thread into the threaded holes to thereby attach

the first half guard and the second half guard together in a radially opposed arrangement and wherein the threaded fasteners are tightened to thereby clamp the means for engaging the barrel nut sprocket onto the barrel nut sprocket.

2. The handguard of claim **1** wherein the barrel nut sprocket comprises a plurality of teeth, wherein the means for engaging the barrel nut sprocket comprises a plurality of indentations that engage the sprocket teeth and prevent the handguard from rotating around the barrel nut.

3. The handguard of claim **2** wherein the fasteners are loosened but not removed to release the handguard from the barrel nut sprocket and to thereby render the handguard removable from the firearm.

4. The handguard of claim **1** wherein the fasteners are loosened but not removed to release the handguard from the barrel nut sprocket and to thereby render the handguard removable from the firearm.

5. The handguard of claim **1** wherein the barrel nut sprocket comprises a plurality of teeth, wherein the means for engaging the barrel nut sprocket comprises a plurality of indentations that engage the sprocket teeth to prevent the handguard from rotating around the barrel nut.

6. The handguard of claim **1** wherein the firearm further comprises a front handguard cup and wherein the first half guard further comprises a cup engagement that fits into the front handguard cup to thereby retain the first half guard between the receiver and the front handguard cup.

7. A handguard for a firearm, the firearm comprising a receiver and a barrel nut threaded onto the receiver, wherein the barrel nut comprises a barrel nut sprocket, and wherein the handguard comprises:

a first half guard comprising a mounting rail, inner engagement, outer engagement, and a means for engaging the barrel nut sprocket wherein the first half guard is semi-cylindrical with the inner engagement and the outer engagement radially opposed to one another, wherein the outer engagement comprises at least one open hole, and wherein the inner engagement comprises at least one threaded hole;

a second half guard identical to the first half guard;

a plurality of threaded fasteners that pass through the open holes and thread into the threaded holes to thereby attach the first half guard and the second half guard together in a radially opposed arrangement; and

at least one clamping fastener passing through the means for engaging the barrel nut sprocket wherein the means for engaging the barrel nut sprocket clamp onto the barrel nut sprocket when the clamping fastener is tightened and to thereby attach the handguard to the receiver as a free floating handguard.

8. The handguard of claim **7** wherein the means for engaging the barrel nut sprocket comprises a sprocket slot that slips over the sprocket to thereby attach the handguard to the barrel nut.

9. The handguard of claim **8** further comprising a pin, wherein the first half guard further comprises a pin slot, wherein the barrel nut sprocket comprises a plurality of teeth, wherein the pin fits into the pin slot to thereby engage the teeth and prevent the handguard from rotating on the barrel nut.

10. The handguard of claim **7** further comprising a pin, wherein the first half guard further comprises a pin slot, wherein the barrel nut sprocket comprises a plurality of teeth, wherein the pin fits into the pin slot to thereby engage the teeth and prevent the handguard from rotating on the barrel nut.

11. A handguard for a firearm, the firearm comprising a receiver and a barrel nut threaded onto the receiver, wherein the barrel nut comprises a barrel nut sprocket, and wherein the handguard comprises:

a first half guard comprising a mounting rail, inner engagement, outer engagement, and a means for engaging the barrel nut sprocket wherein the first half guard is semi-cylindrical with the inner engagement and the outer engagement radially opposed to one another, wherein the outer engagement comprises at least one open hole, and wherein the inner engagement comprises at least one threaded hole;

a second half guard identical to the first half guard; and

a plurality of threaded fasteners that pass through the open holes and thread into the threaded holes to thereby attach the first half guard and the second half guard together in a radially opposed arrangement.

12. The handguard of claim **11** wherein the barrel nut sprocket comprises a plurality of teeth, wherein the means for engaging the barrel nut sprocket comprises a plurality of indentations that engage the sprocket teeth and prevent the handguard from rotating around the barrel nut.

13. The handguard of claim **12** wherein the fasteners are tapered fasteners and wherein the open holes are oversize and countersunk such that the first half guard and the second half guard pull towards each other as the fasteners are tightened to thereby clamp the handguard onto the barrel nut.

14. The handguard of claim **13** wherein the firearm further comprises a front handguard cup and wherein the first half guard further comprises a cup engagement that fits into the front handguard cup to thereby retain the first half guard between the receiver and the front handguard cup.

15. The handguard of claim **11** further comprising a pin, wherein the first half guard further comprises a pin slot, wherein the barrel nut sprocket comprises a plurality of teeth, wherein the pin fits into the pin slot to thereby engage the teeth and prevent the handguard from rotating on the barrel nut.

16. The handguard of claim **15** wherein the fasteners are tapered fasteners and wherein the open holes are oversize and countersunk such that the first half guard and the second half guard pull towards each other as the fasteners are tightened to thereby clamp the handguard onto the barrel nut.

17. The handguard of claim **16** wherein the means for engaging the barrel nut sprocket comprises a sprocket slot that slips over the sprocket to thereby attach the handguard to the barrel nut.

18. The handguard of claim **11** wherein the firearm further comprises a front handguard cup and wherein the first half guard further comprises a cup engagement that fits into the front handguard cup to thereby retain the first half guard between the receiver and the front handguard cup.

19. The handguard of claim **11** wherein the fasteners are tapered fasteners and wherein the open holes are oversize and countersunk such that the first half guard and the second half guard pull towards each other as the fasteners are tightened to thereby clamp the handguard onto the barrel nut.

20. The handguard of claim **11** wherein the means for engaging the barrel nut sprocket comprises a sprocket slot that slips over the sprocket to thereby attach the handguard to the barrel nut.

* * * * *