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(54) **ADJUSTABLE BLADE ASSEMBLY HAVING MAGNETIC TENSIONING**

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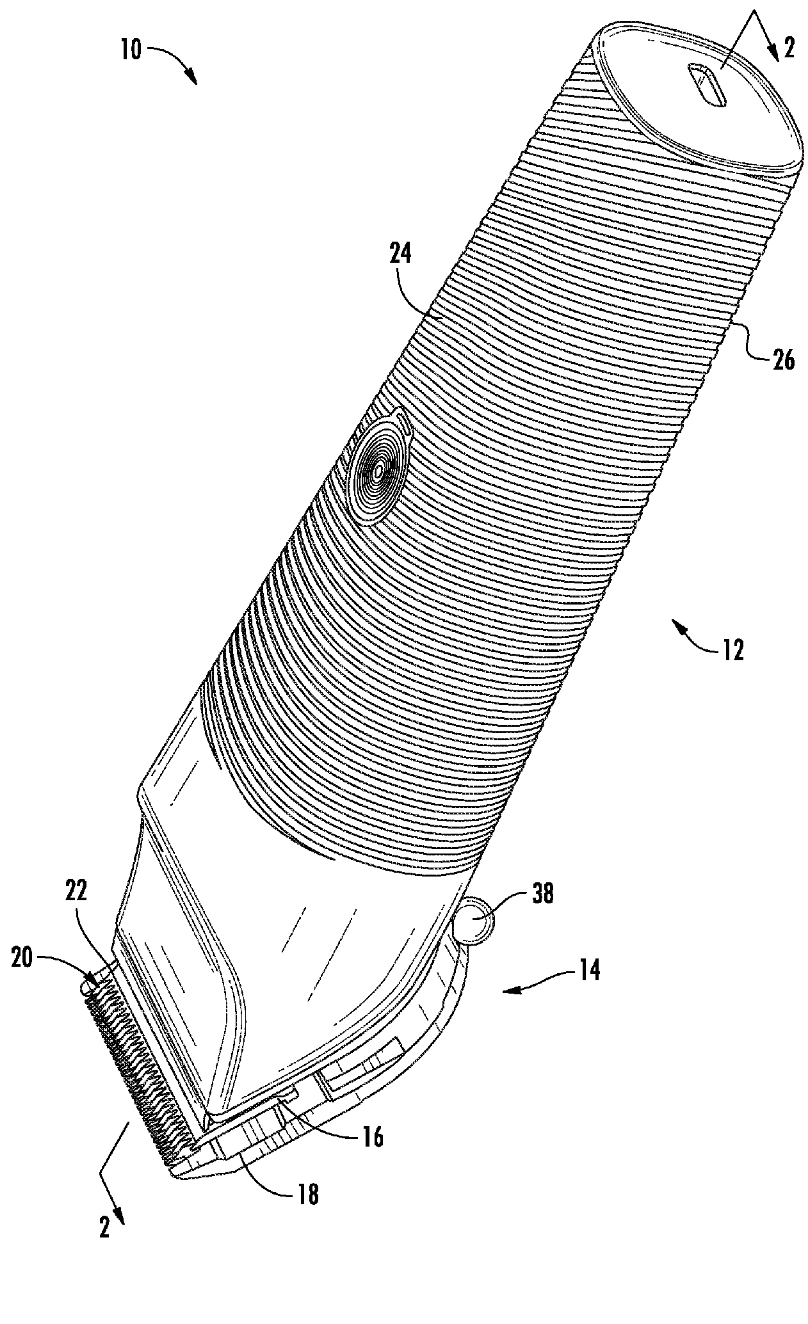
(57) **ABSTRACT**

A hair cutting device or clipper is provided with a magnetic blade assembly. The hair cutting device includes a cutting blade, a stationary blade and a yoke attached to the cutting blade. The yoke and/or cutting blade may be magnetized to create an attractive or repulsive force between the cutting blade and the stationary blade.



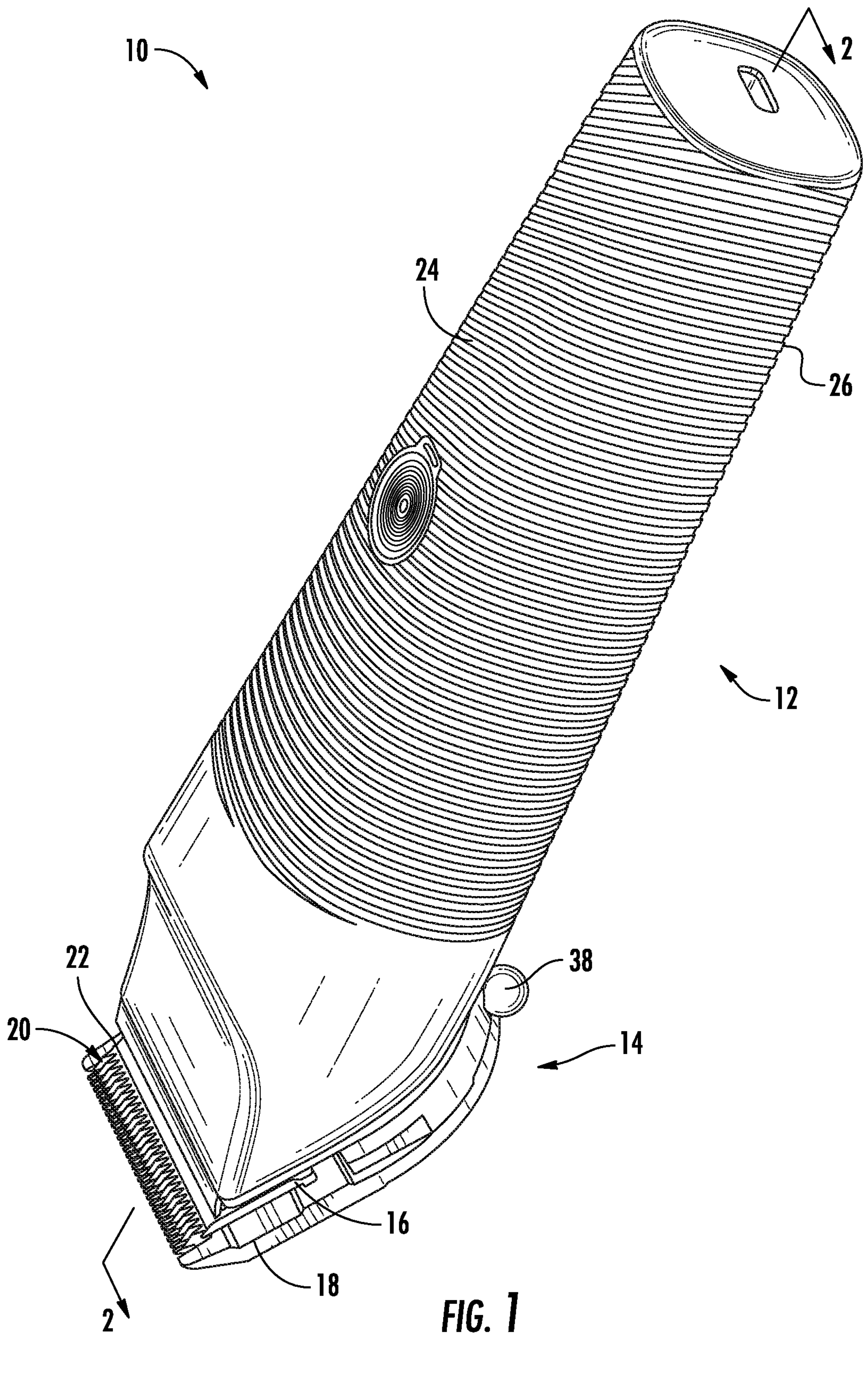


FIG. 1

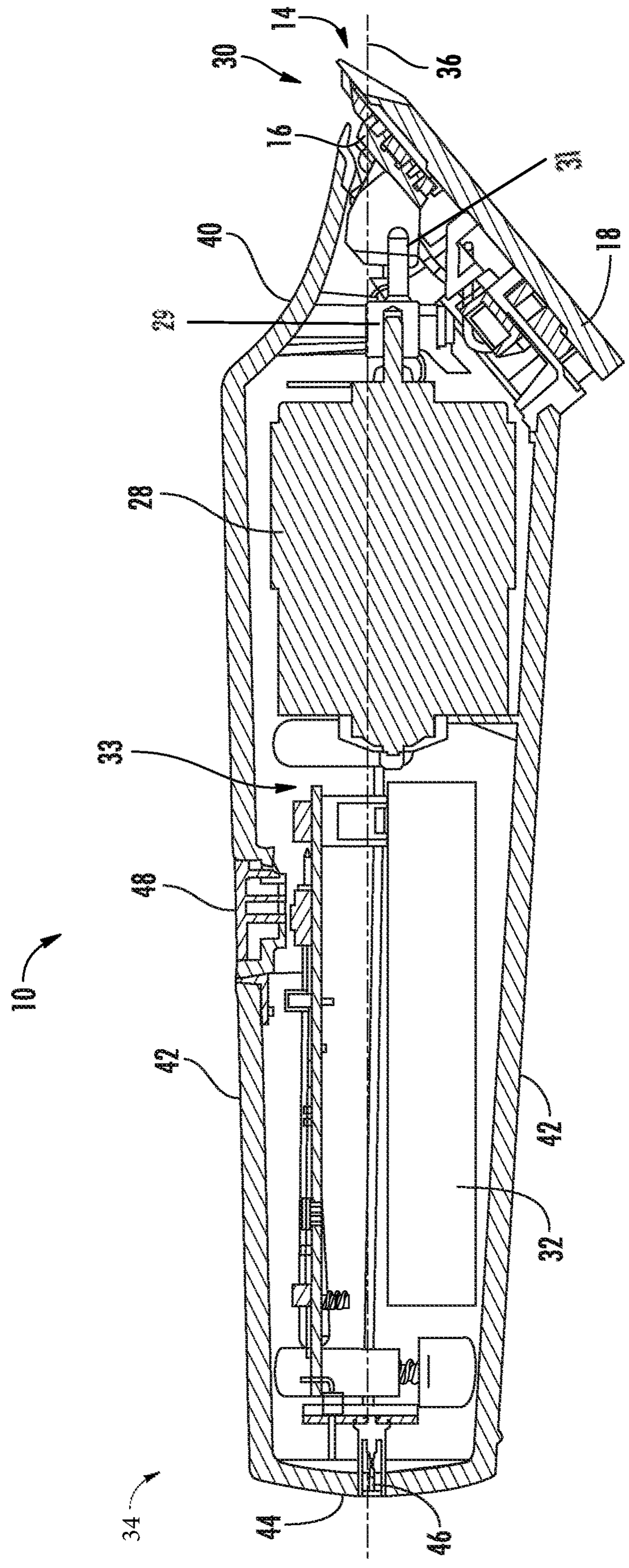


FIG. 2

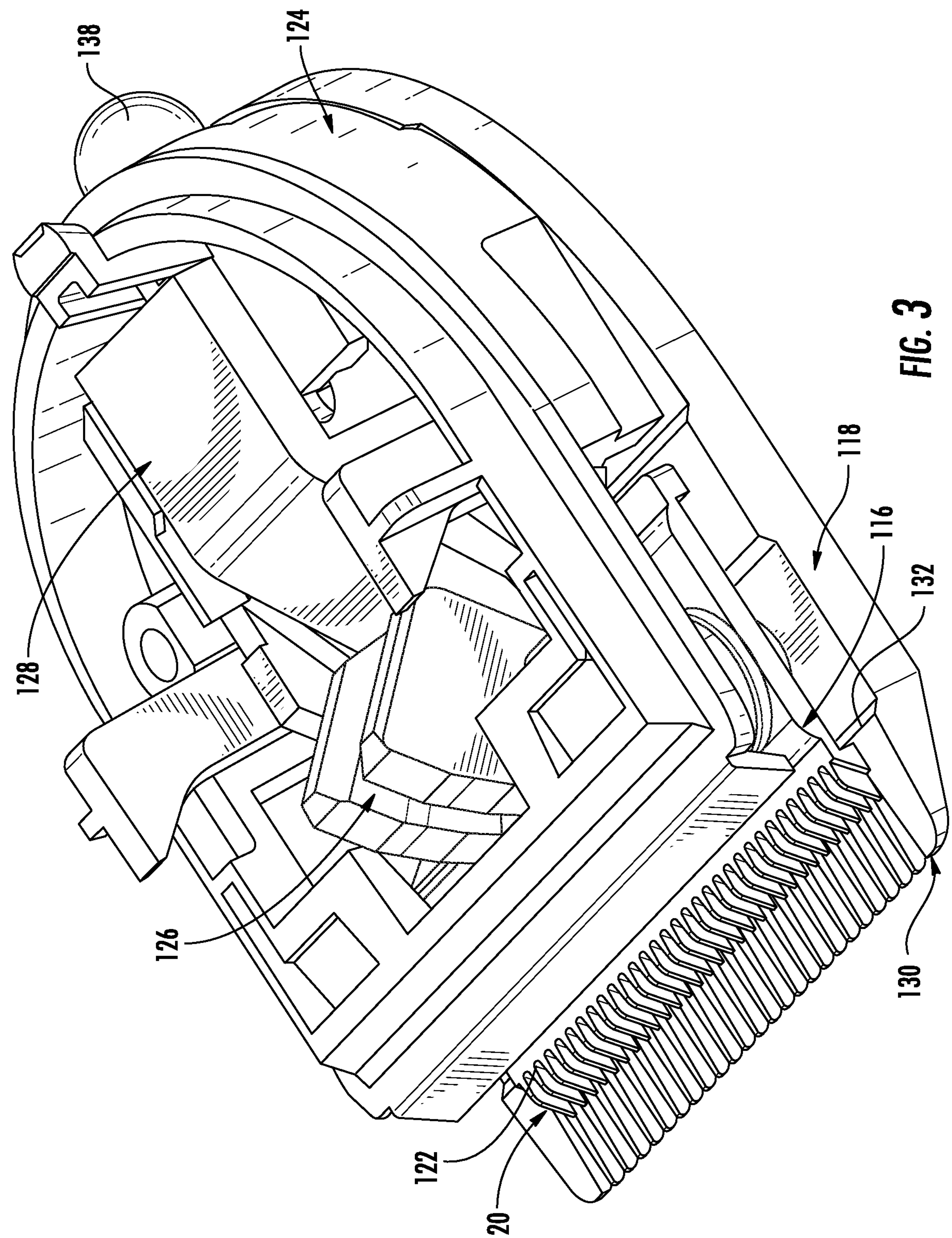


FIG. 3

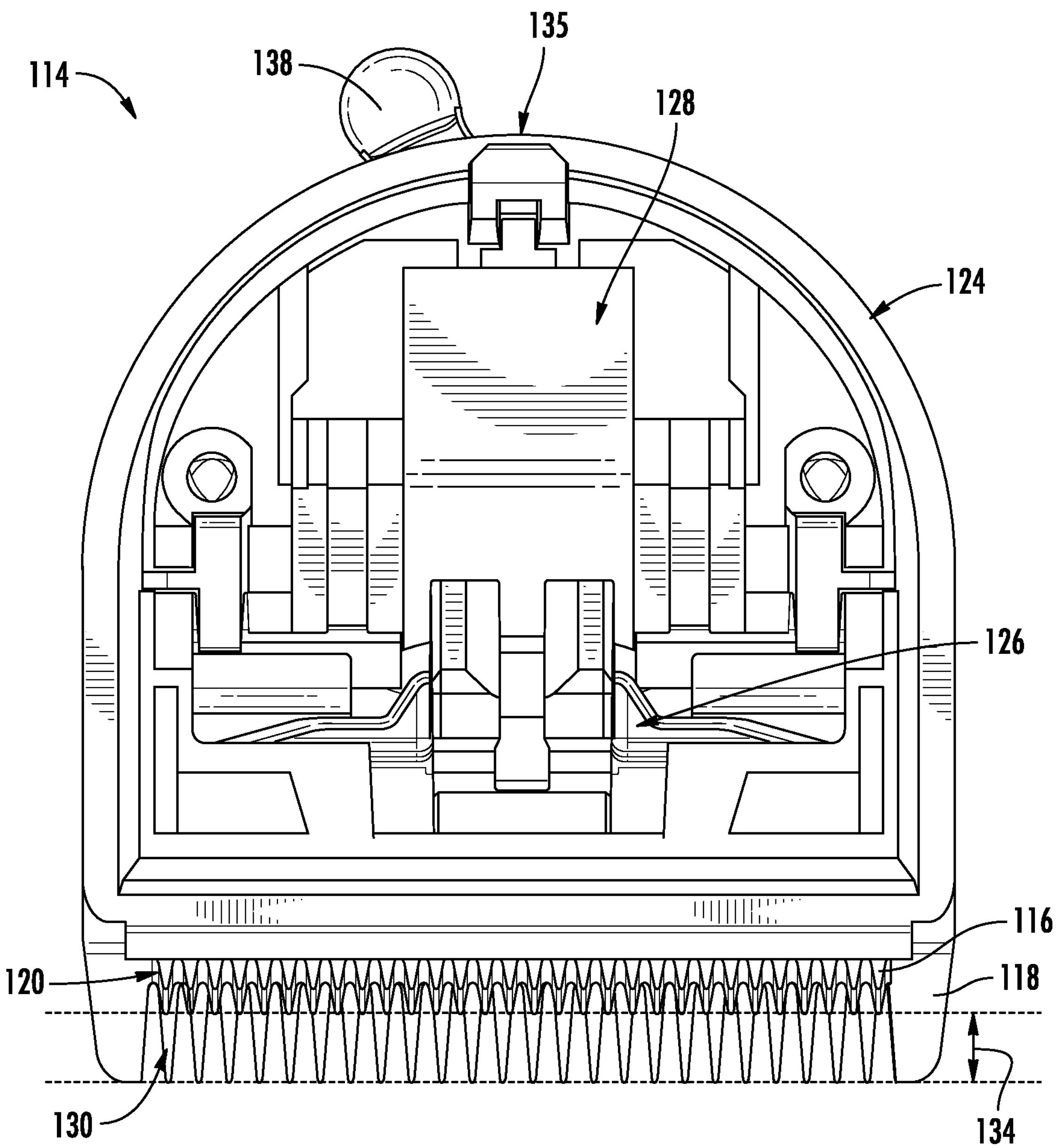


FIG. 4

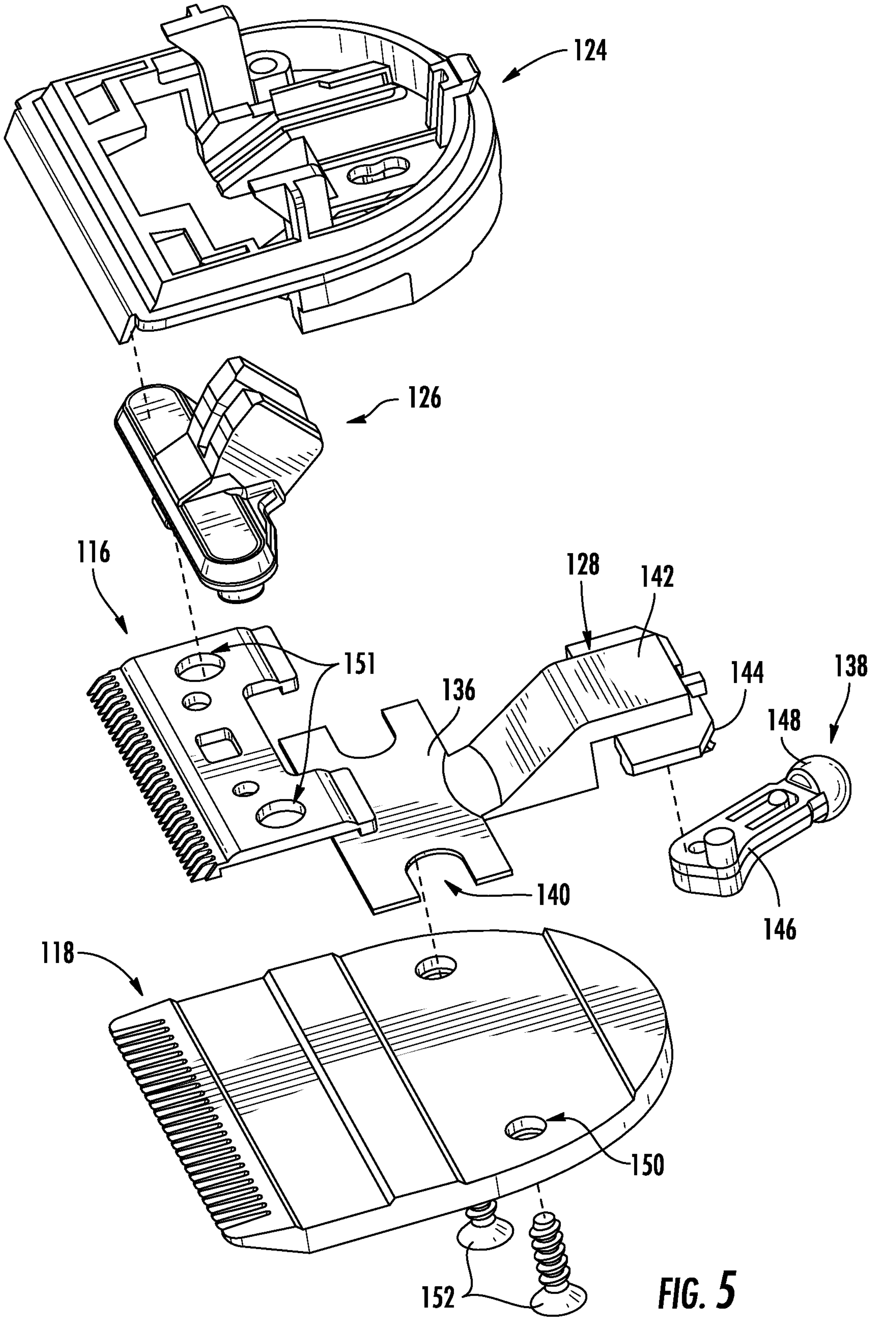


FIG. 5

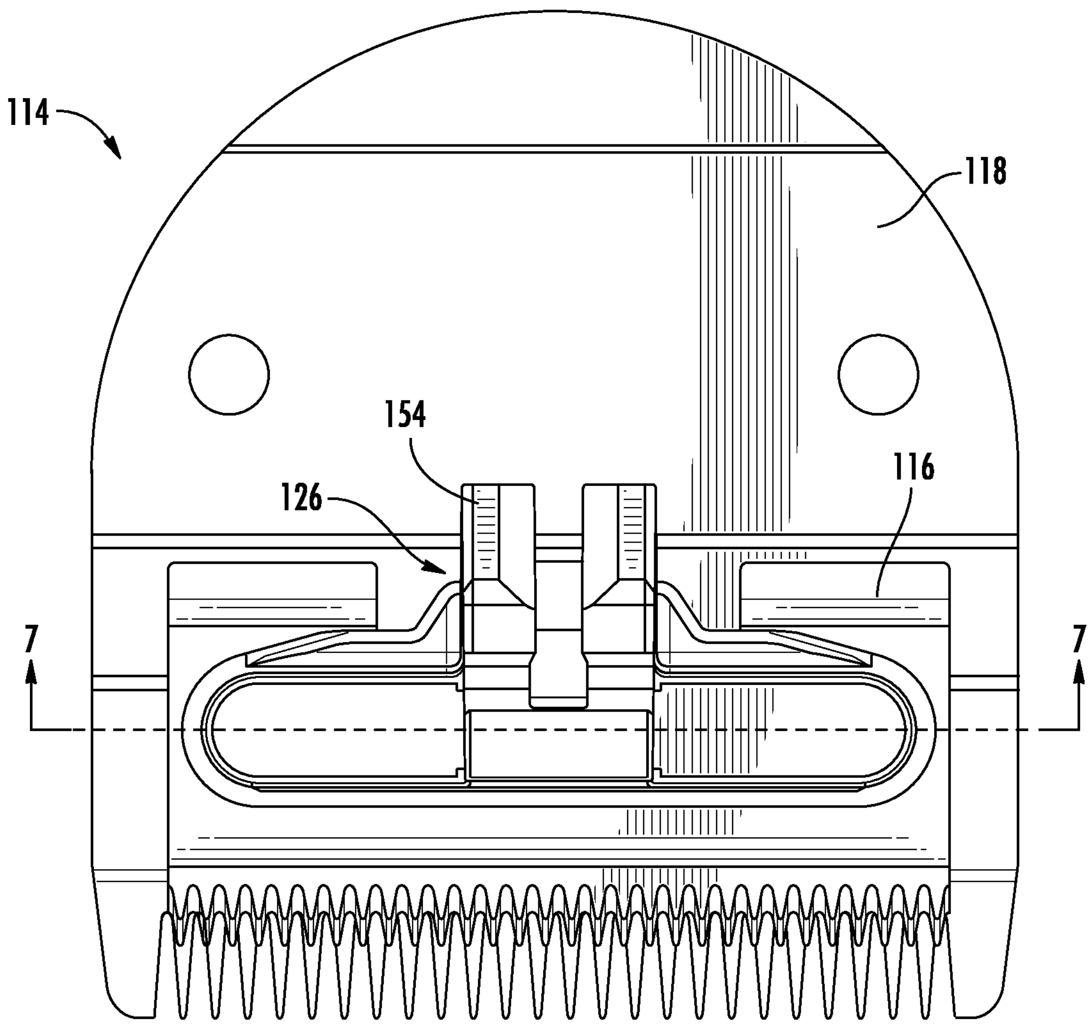


FIG. 6

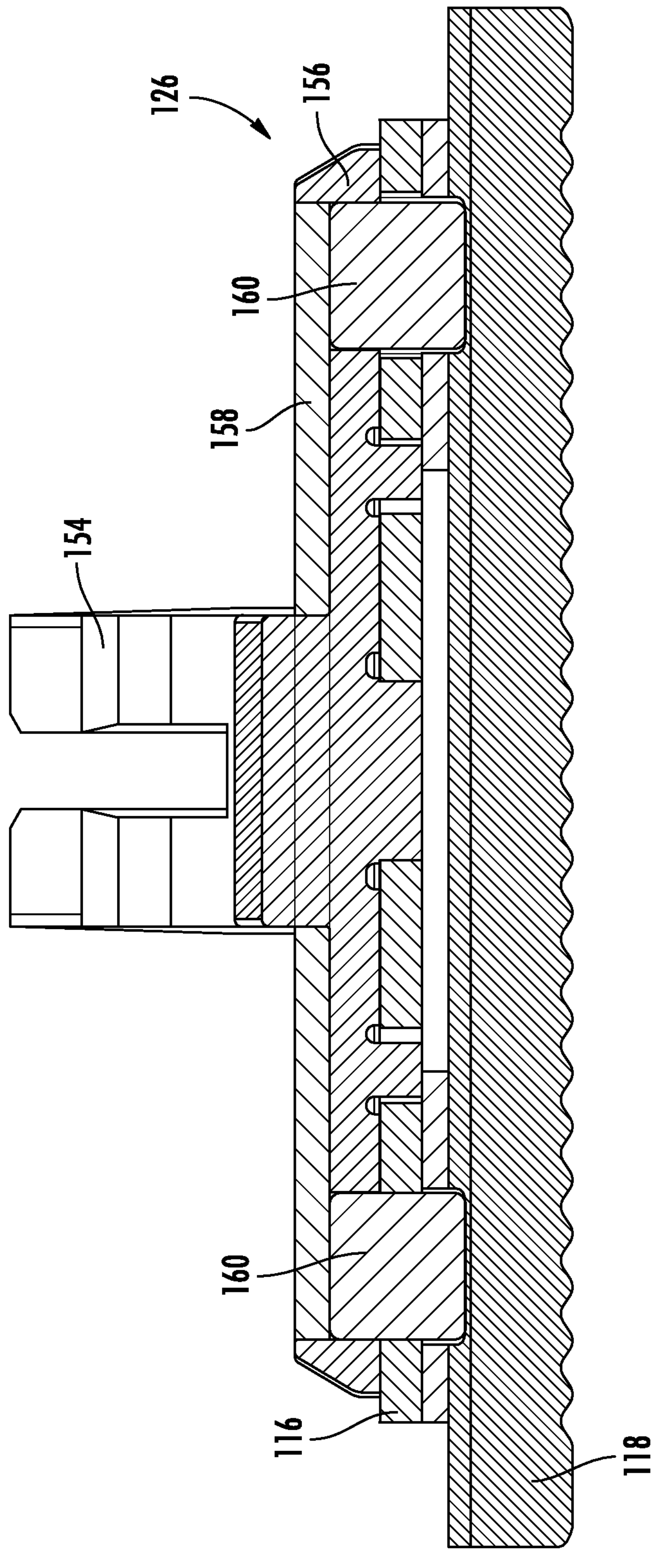
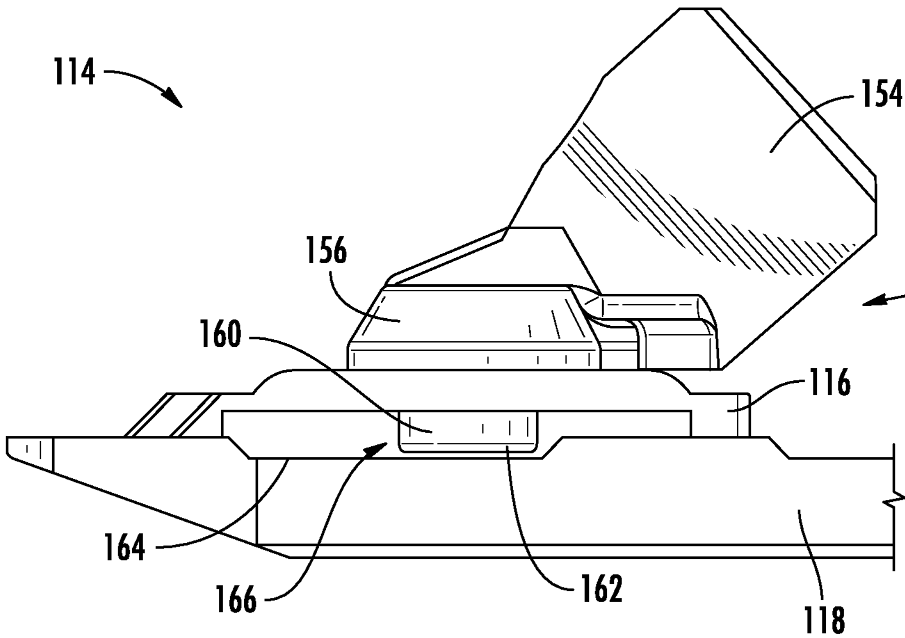


FIG. 7


114
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126
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116
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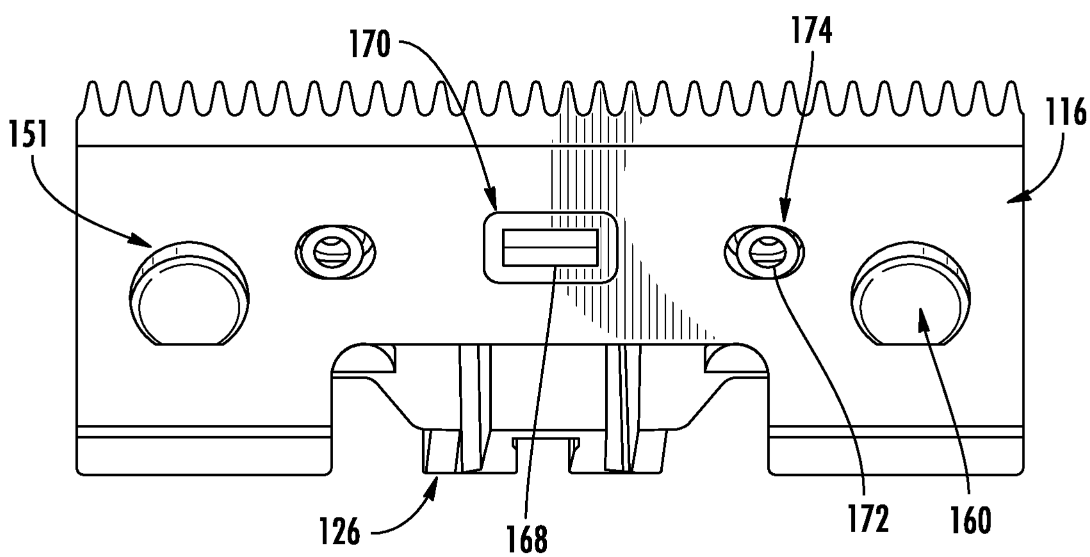
118

FIG. 8


170
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126
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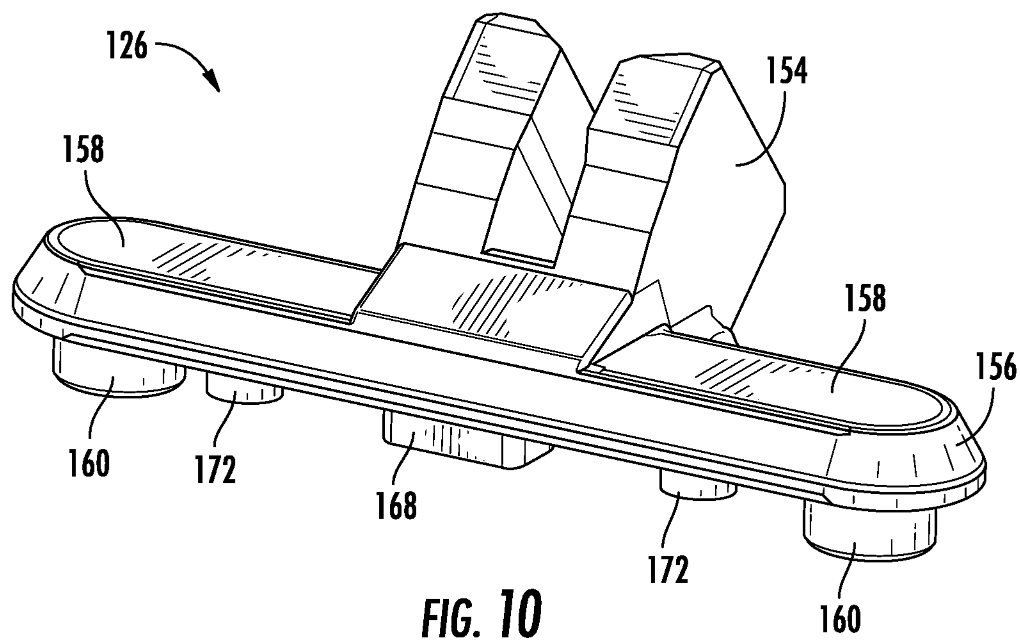
172
160

FIG. 9


126
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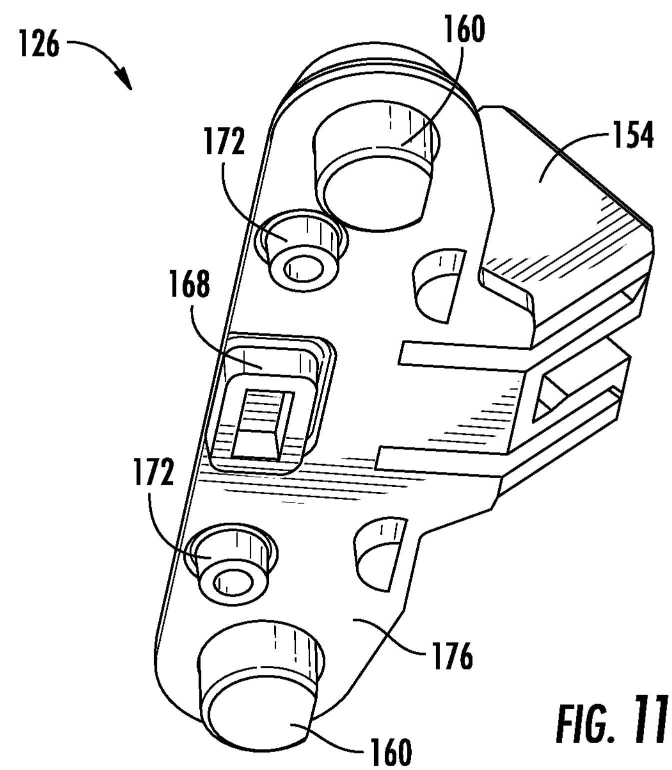
160

FIG. 10


126
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172
154
168
172
176
160

FIG. 11

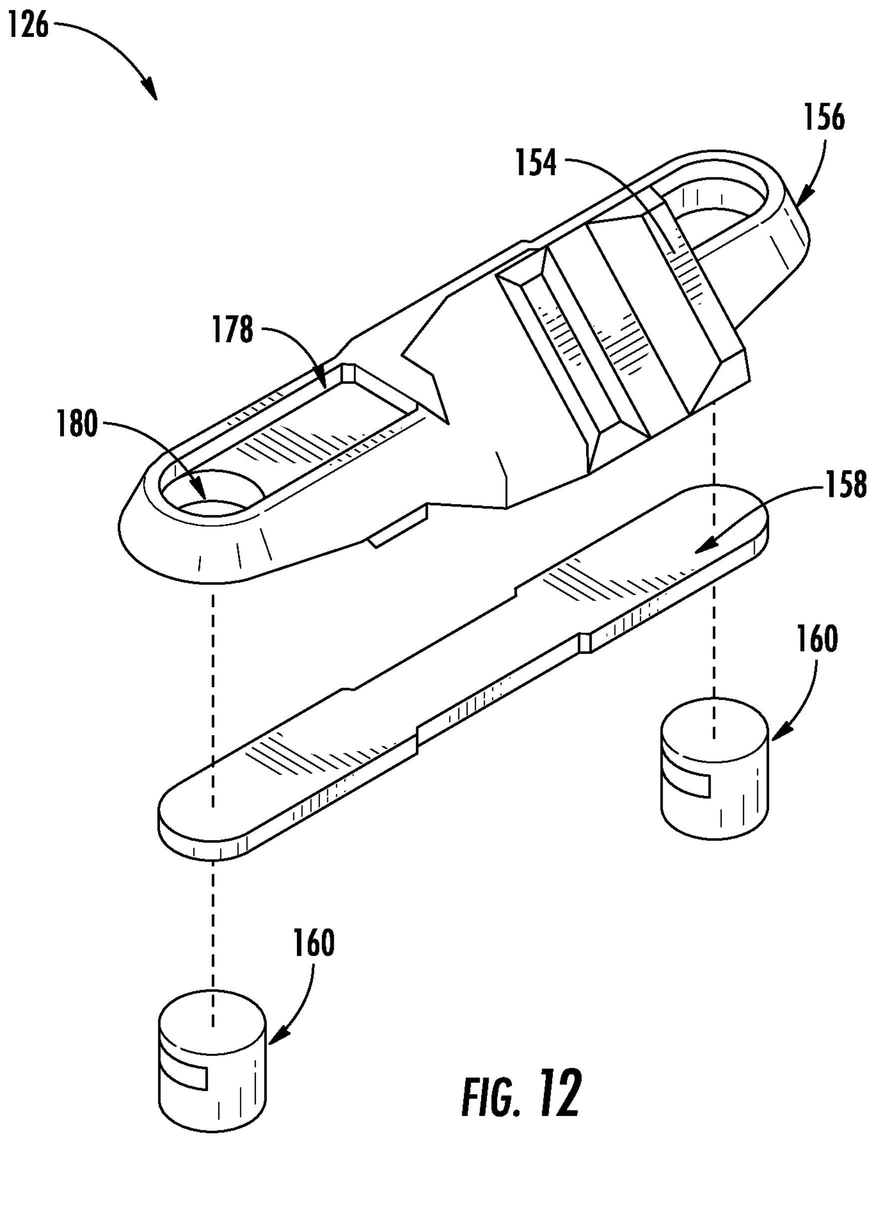


FIG. 12

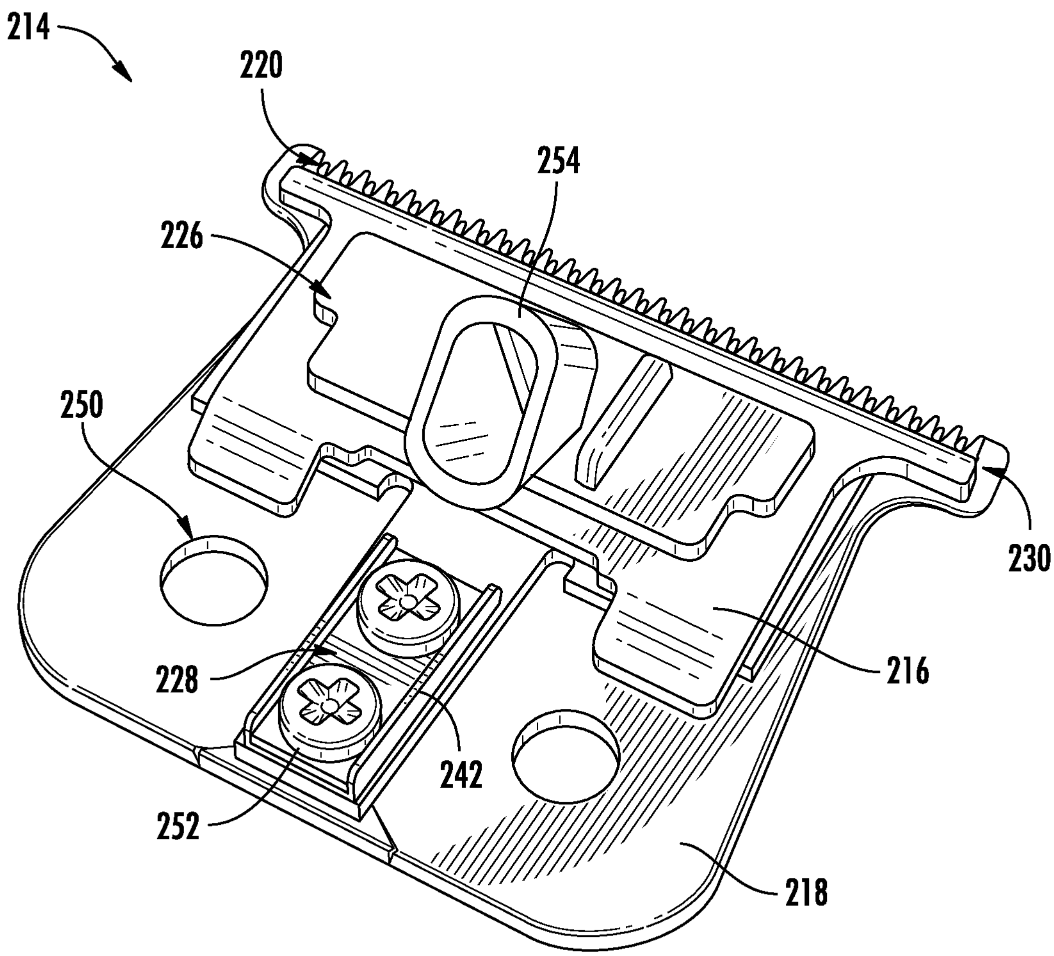


FIG. 13

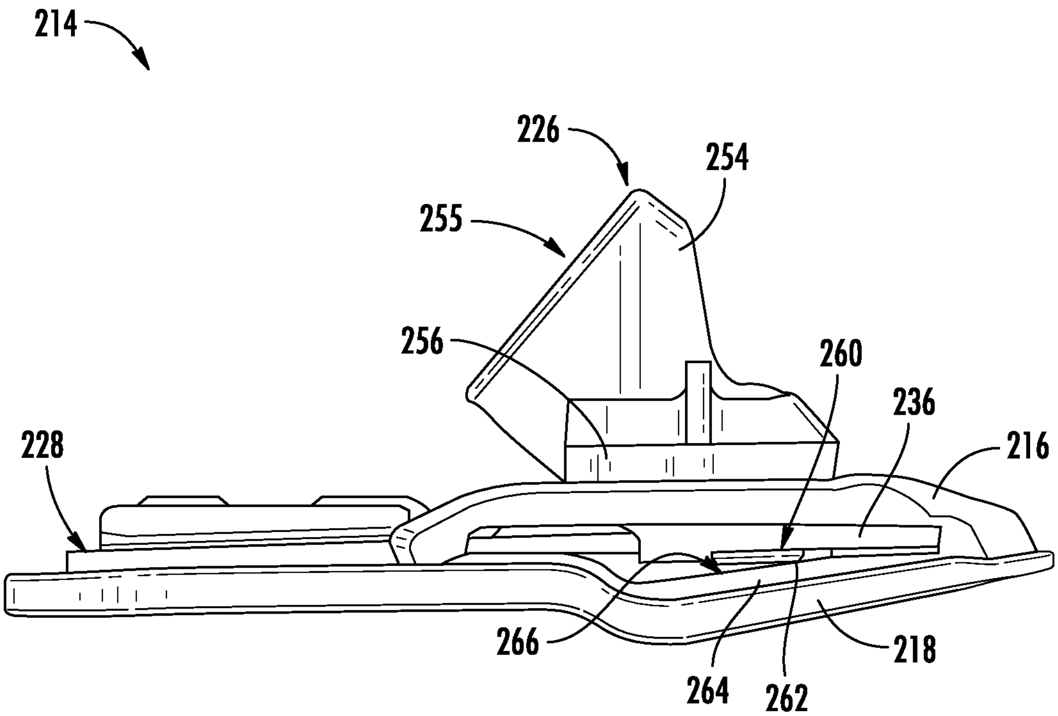


FIG. 14

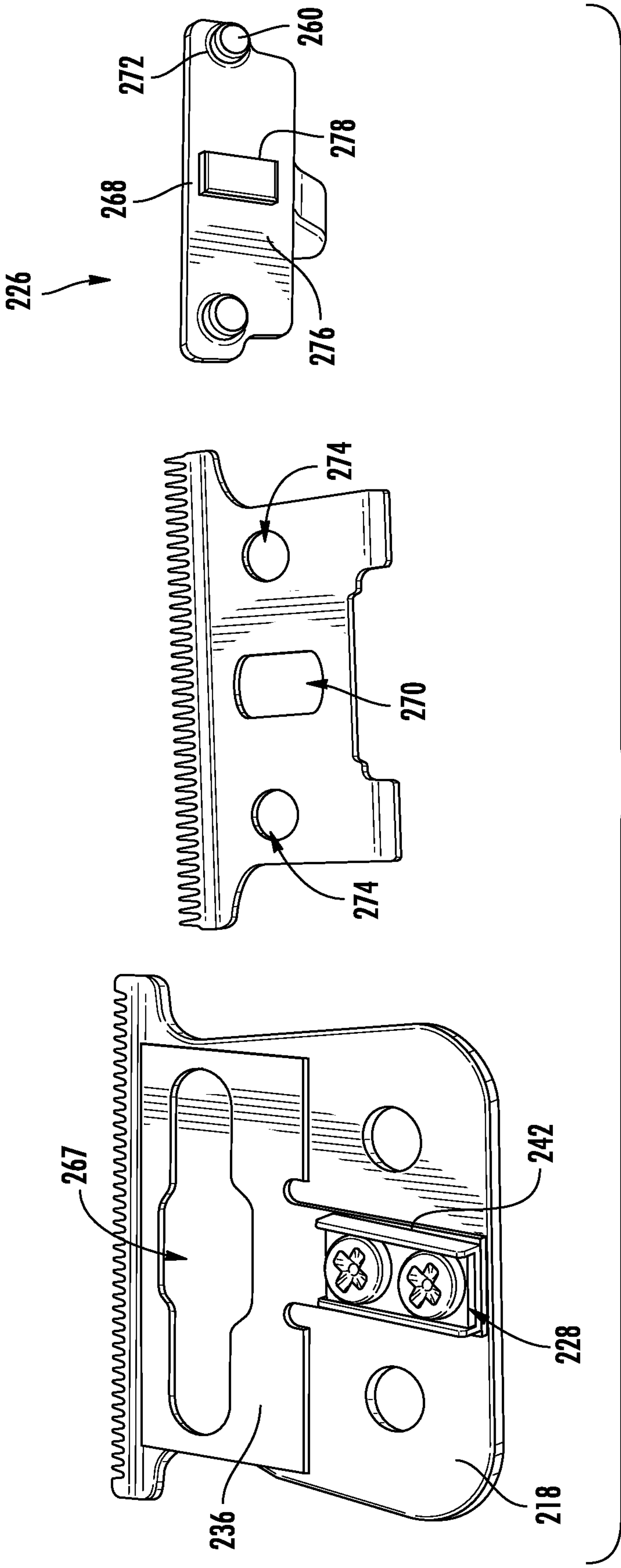


FIG. 15

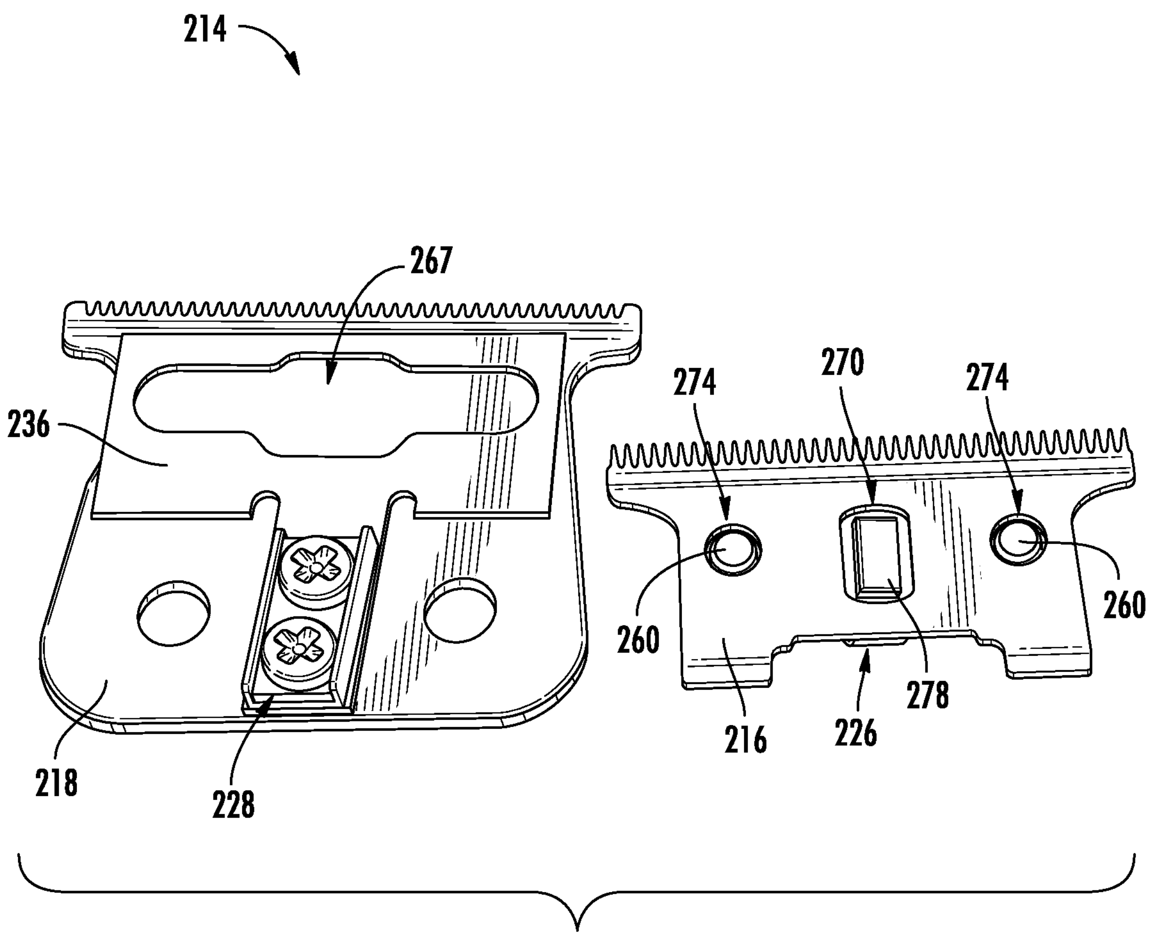
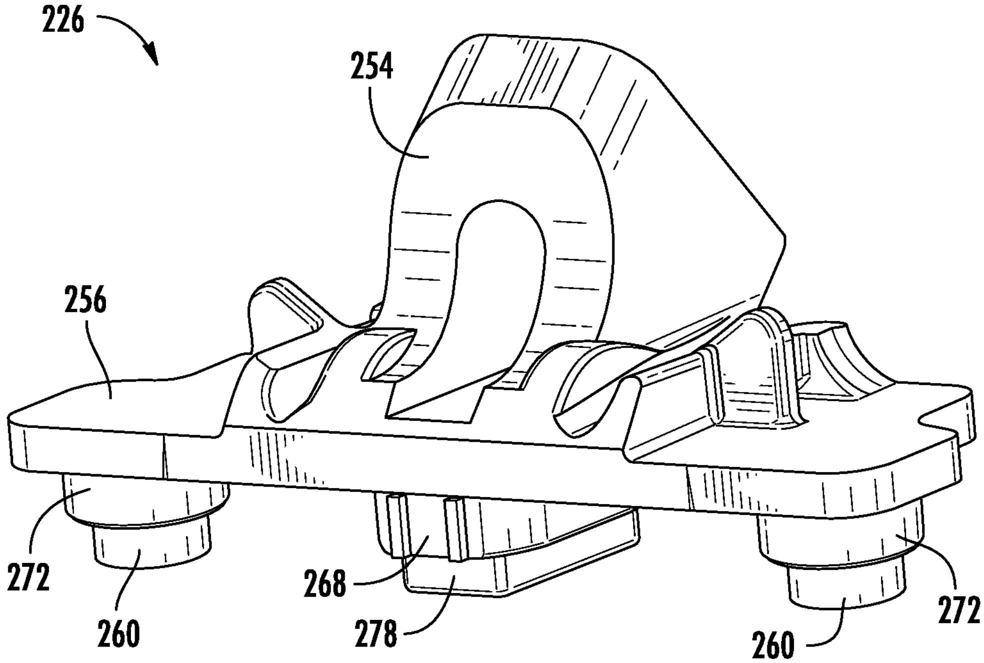


FIG. 16


226
254
256
272
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268
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260

FIG. 17

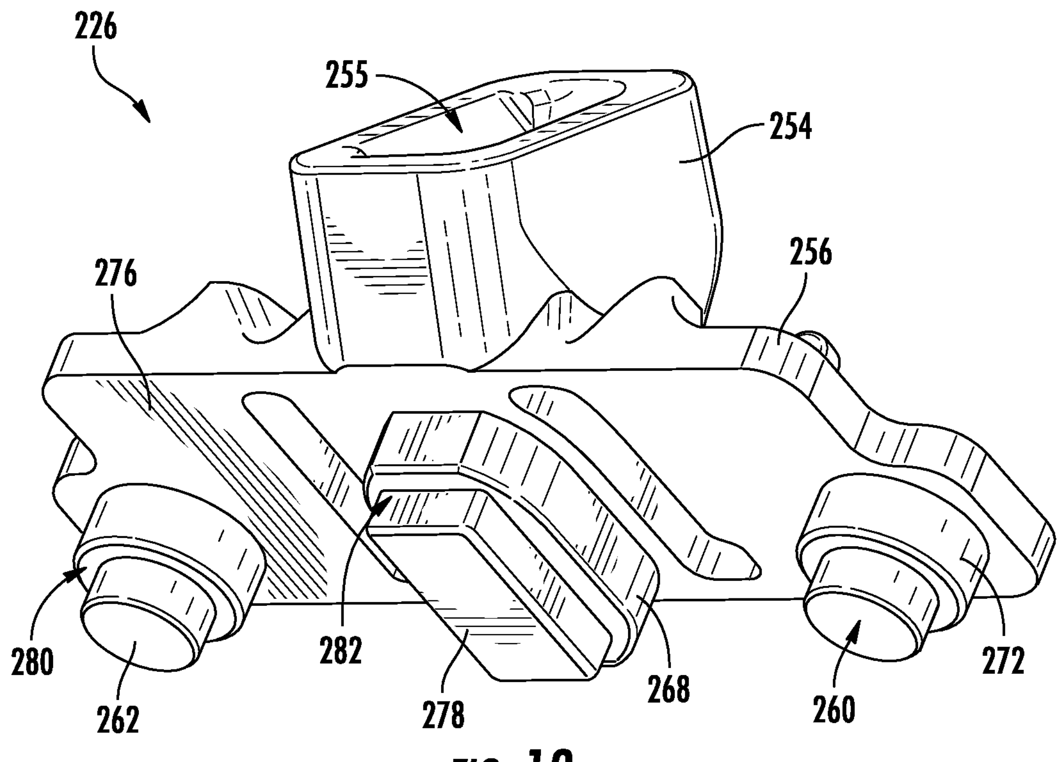
226
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FIG. 18

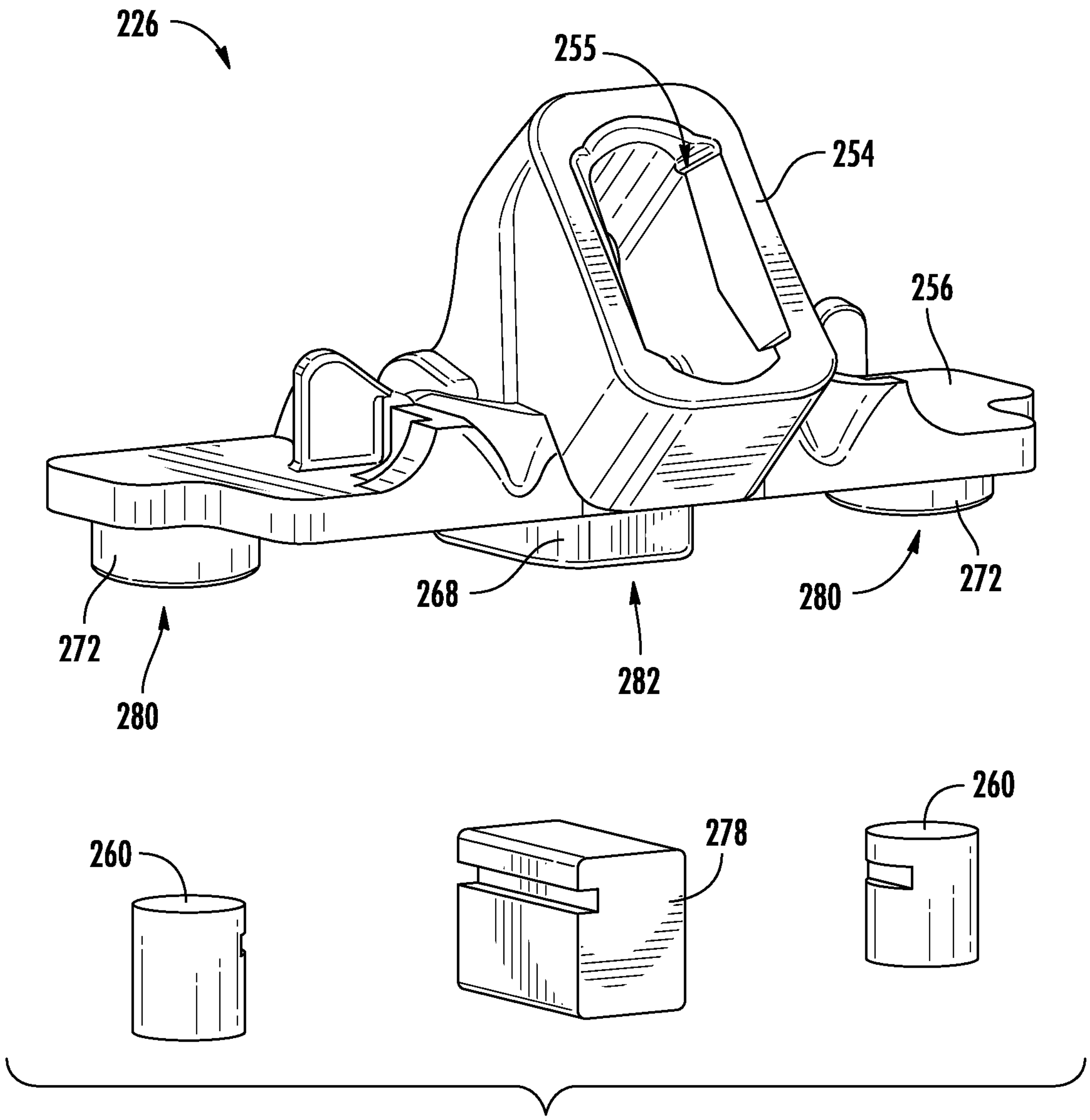

FIG. 19

ADJUSTABLE BLADE ASSEMBLY HAVING MAGNETIC TENSIONING

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to the field of hair cutting devices, such as hair clippers or hair trimmers. The present invention relates specifically to a magnetic tensioning assembly configured to provide tension between a reciprocating blade and a stationary blade of the blade assembly.

SUMMARY OF THE INVENTION

[0002] One embodiment of the invention relates to a magnetic blade assembly. The magnetic blade assembly includes a stationary blade, a cutting blade, a guide member, and a yoke. The stationary blade includes teeth extending along a first blade edge. The cutting blade includes teeth extending along a second blade edge parallel to the first blade edge. The cutting blade is supported relative to the stationary blade such that the cutting teeth are moveable over the stationary blade to cut hair. The guide member includes a base and a cross-portion. The cross-portion is captured between the stationary blade and the cutting blade. The yoke is coupled to the cutting blade and includes a body and a magnet. The body extends in a parallel direction to the second blade edge and the magnet is coupled to the body of the yoke. The magnet generates a tensioning force between the cutting blade and the stationary blade.

[0003] In a specific embodiment, the magnetic blade assembly further includes a metal bar coupled to the yoke. The yoke includes a pair of magnets coupled to the body of the yoke and positioned below the metal bar such that a magnetic circuit is created. One of the pair of magnets includes a first end having a positive pole adjacent to the stationary blade and a second end having a negative pole adjacent to the yoke and the other of the pair of magnets includes a first end having a negative pole adjacent to the stationary blade and a second end having a positive pole adjacent to the yoke.

[0004] Another embodiment of the invention relates to a magnetic blade assembly. The magnetic blade assembly includes a first blade, a second blade, a blade guide assembly, and a yoke. The first blade includes teeth extending along a first blade edge. The second blade includes teeth extending along a second blade edge parallel to the first blade edge and the second blade is support relative to the first blade. The blade guide assembly is captured between the first blade and the second blade. The blade guide assembly maintains the relative position of the first blade edge relative to the second blade edge. The blade guide assembly includes a guide member, the guide member includes a base and a cross-portion. The cross-portion is captured between the first blade and the second blade. The cross-portion has a first side facing the first blade and a second side facing the second blade. The yoke is coupled to the second blade. A magnet is positioned between the yoke and the second blade. The magnet generates a tensioning force between the second blade and the first blade.

[0005] Another embodiment of the invention relates to a magnetic blade assembly. The magnetic blade assembly includes a first blade, a second blade, a guide member, and a yoke. The first blade includes teeth extending along a first blade edge. The second blade includes teeth extending along a second blade edge parallel to the first blade edge and the second blade is support relative to the first blade. The guide member is positioned between the first blade and the second blade. The yoke is coupled to the second blade and includes a body extending in a direction parallel to the second blade edge. A magnet is coupled to the yoke. At least a portion of the magnet extends through a bore defined within the second blade. The magnet generates a tensioning force between the second blade and the first blade.

[0006] Additional features and advantages will be set forth in the detailed description which follows, and, in part, will be readily apparent to those skilled in the art from the description or recognized by practicing the embodiments as described in the written description included, as well as the appended drawings. It is to be understood that both the foregoing general description and the following detailed description are exemplary.

[0007] The accompanying drawings are included to provide further understanding and are incorporated in and constitute a part of this specification. The drawings illustrate one or more embodiments and, together with the description, serve to explain principles and operation of the various embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] This application will become more fully understood from the following detailed description, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements in which:

[0009] FIG. **1** is a perspective view of a hair cutting device according to an exemplary embodiment.

[0010] FIG. **2** is a cross-sectional view of the hair cutting device of FIG. **1**, taken along line **2-2** in FIG. **1**, according to an exemplary embodiment.

[0011] FIG. **3** is a top perspective view of a blade assembly, according to an exemplary embodiment.

[0012] FIG. **4** is a top view of the blade assembly of FIG. **3**, according to an exemplary embodiment.

[0013] FIG. **5** is an exploded view of the blade assembly of FIG. **3**, according to an exemplary embodiment.

[0014] FIG. **6** is a top view of the blade assembly of FIG. **3** with a blade assembly housing and guide member removed, according to an exemplary embodiment.

[0015] FIG. **7** is a cross-sectional view of the blade assembly of FIG. **3**, taken along the line **7-7** in FIG. **6**, according to an exemplary embodiment.

[0016] FIG. **8** is a side view of the blade assembly of FIG. **6**, according to an exemplary embodiment.

[0017] FIG. **9** is a bottom perspective view of a yoke and a cutting blade, according to an exemplary embodiment.

[0018] FIG. **10** is a front perspective view of the yoke, according to an exemplary embodiment.

[0019] FIG. **11** is a bottom perspective view of the yoke of FIG. **10**, according to an exemplary embodiment.

[0020] FIG. **12** is an exploded view of a magnetic tensioning assembly, according to an exemplary embodiment.

[0021] FIG. **13** is a top perspective view of a blade assembly, according to another exemplary embodiment.

[0022] FIG. **14** is a side view of the blade assembly of FIG. **13**, according to an exemplary embodiment.

[0023] FIG. **15** is a partially exploded view of the blade assembly of FIG. **13**, according to an exemplary embodiment.

[0024] FIG. **16** is a partially exploded view of the blade assembly of FIG. **13**, according to an exemplary embodiment.

[0025] FIG. **17** is a front perspective view of a yoke of the blade assembly of FIG. **13**, according to an exemplary embodiment.

[0026] FIG. **18** is a bottom perspective view of the yoke of FIG. **17**, according to an exemplary embodiment.

[0027] FIG. **19** is an exploded view of a magnetic tensioning assembly, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0028] Referring generally to the figures, various embodiments of a hair cutting device are shown. The hair cutting device includes a blade assembly with an upper or cutting blade supported relative to a lower or stationary blade such that the cutting blade is moveable (i.e., oscillates) relative to the stationary blade. Proper tensioning between the cutting blade and the stationary blade reduces friction on the system, and therefore wear and tear on the blades, and enhances the operational life of the motor. The cutting and stationary blades should be tensioned/pulled together so that the oscillation of the cutting blade does not interfere with the other components of the blade assembly and hair cutting device.

[0029] Applicant has found that using a magnetic blade assembly and/or a magnetic force to generate a tensioning force between the cutting and stationary blades allows the tensioning force to be tailored to create the proper tension between the blades to effectively cut hair while also providing a tensioning force which reduces friction between the blades. The reduction of friction between the blades which reduces load on the motor and improves overall efficiency of the system. For example, a yoke positioned above the upper or cutting blade includes magnets or is magnetized creating an attractive force between the blades and reducing the friction of oscillation of the cutting blade. The yoke and/or cutting blade may be magnetized to create a tensioning force (attractive or repulsive) force between the cutting blade and the stationary blade.

[0030] Applicant has found the magnetic tensioning systems discussed herein are more uniform than conventional tensioning structures that use springs. The spring tolerances are difficult to control and therefore provide uneven tension across the blade. Similarly, Applicant believes the magnetic tension system provides more consistent tension across the entire length of blade teeth. As previously noted, the magnetic tensioning system or blade assembly reduces friction specifically by reducing fiction by eliminating the spring leg interaction with the yoke body. Applicant has found this reduction in friction can be seen be improved run-time in hair cutters with battery-operated units. Additionally, Applicant believes the magnetic tensioning system provides consistent cut quality throughout the lifetime of the hair cutter blade, unlike spring tensioning systems which are set to a predetermined position, and therefore, provide less tension over time as the blades wear. Finally, the lack of a large spring component that is required for conventional spring tensioning systems frees or opens space around the blade assembly, allowing for a narrower hair cutting device design. This narrower design allows for an improved line of sight for barber's using the hair cutting device.

[0031] Applicant believes the magnetic tensioning assemblies described herein provide improved tensioning performance compared to magnetic tensioning assemblies where the magnets or magnetized components are only positioned between the cutting blade and stationary blade. Specifically, when the magnet is only positioned between the blades, Applicant has found the magnets selects or chooses one of the cutting blade and stationary blade over the other blade meaning a constant tensioning force is not applied through the blade assembly. For example, if the magnet were positioned on the guide between the blade, the magnets unevenly bias the guide toward either the cutting or stationary blade and therefore the magnetic tensioning system would not apply a constant tension force through the blade assembly.

[0032] Further, Applicant believes the magnetic tensioning assembly discussed herein creates a magnetic system with an improved tensioning performance (i.e., increased magnetic force) compared to magnetic tensioning assemblies that only use magnets and/or a magnetic component. As will be discussed in greater detail below, in a specific embodiment, a pair of magnets positioned with opposing polarities (i.e., one has positive side or pole downward facing towards stationary blade and one has a positive side or pole upward facing toward the yoke) and a metal bar complete a magnetic circuit. Applicant has found the force or tension of the magnetic circuit described herein is greater than a force or tension created by magnets alone.

[0033] For ease of discussion and understanding, the following detailed description will refer to and illustrate the blade assembly that incorporates magnetic tensioning with a hair cutting device or hair clipper. It should be appreciated that a hair clipper is provided for purposes of illustration, and the blade assembly disclosed herein can be used in association with any hair cutting, hair trimming, or hair grooming device. Accordingly, the term hair clipper is inclusive, and refers to any hair grooming device including, but not limited to, a hair trimmer, a hair clipper, or any other hair cutting or hair grooming device. The hair clipping device can be suitable for a human, animal, or any other living or inanimate object having hair.

[0034] Referring to FIG. **1**, a perspective view of a hair cutting device, shown as a hair clipper **10**, is shown according to an exemplary embodiment. Hair clipper **10** includes a body or handle **12** and a blade assembly **14**. Blade assembly **14** includes a lower or stationary blade **18** and an upper or cutting blade **16** that moves or oscillates to cut hair as cutting teeth **20** of cutting blade **16** move or oscillate over stationary blade **18**. Cutting blade **16** has teeth **20** extending from a cutter blade edge **22**. In other words, as cutting blade **16** oscillates over stationary blade **18** in the first direction, the teeth **20** on cutting blade **16** and stationary blade **18** capture hair follicles and cooperate to cut hair.

[0035] Handle **12** includes an upper housing **24** and a lower housing **26**. In various embodiments, handle **12** is a single, continuous, and/or integral part, such that upper housing **24** and lower housing **26** are permanently joined and/or fabricated as an integral continuous component or unitary part. In other embodiments, upper housing **24** is fabricated separately from lower housing **26** and joined or coupled to form handle **12**, e.g., using fasteners.

[0036] Referring to FIG. **2**, handle **12** extends along a longitudinal axis **36** and includes a cutting end **30** and a gripping end **34**. Blade assembly **14** is positioned at cutting end **30** of hair clipper **10**. Gripping end **34** is located longitudinally opposite of cutting end **30**. A motor **28** is positioned near the cutting end **30** and is offset by a counterweight provided by an internally housed battery **32** at a gripping end **34** of handle **12**. Motor **28** and battery **32** are housed within an internal cavity **33** of handle **12**.

[0037] In a specific embodiment, motor **28** is a rotary DC electric motor **28**. In other embodiments, motor **28** is a pivot motor or a magnetic motor that generates oscillating or reciprocating movement for blade assembly **14**. In other embodiments, motor **28** is an AC electric motor or any other suitable motor for generating oscillating or reciprocating movement for a blade assembly **14**. As illustrated, motor **28** is configured to operate on battery power (e.g., cordless), but may be configured to operate with electricity from any suitable electric source, e.g., a hair clipper plugged into an outlet.

[0038] A drive assembly **29** is positioned within cavity **33** and couples blade assembly **14** to motor **28**. A drive shaft **31** is coupled to motor **28** and specifically an output shaft. In a specific embodiment, drive shaft **31** is an eccentric drive shaft **31** that is offset from a motor output shaft. In other words, drive shaft **31** is offset from the axis of rotation of motor **28** such that the drive shaft **31** rotates non-concentrically around the axis of rotation to create an oscillatory rotational motion. Drive shaft **31** is configured to engage a yoke (see e.g., **126** in FIG. **3**) of blade assembly **14** and translate or oscillate cutting blade **16** linearly.

[0039] A hair shield **40** is formed on an exterior surface **42** of upper housing **24**. Hair shield **40** defines a concave depression on a surface of upper housing **24** that prevents cut hair or other debris from entering internal cavity **33** and interfering with motor **28**. In other words, hair shield **40** forms a concave hair shield surface that captures and/or deflects hair and other debris away from internal cavity **33** of handle **12**. At the gripping end **34** of handle **12**, a base **44** of handle **12** has an electric charging port **46**. Charging port **46** extends through handle **12** and is electronically coupled to a battery **32** located within internal cavity **33**. A power button, shown as circular power button **48** within upper housing **24** electronically couples battery **32** to a control board and selectively controls motor **28**, e.g., controls speed and/or powers motor **28** on/off.

[0040] Blade assembly **14** includes an adjustment gap assembly, mechanism, or lever **38** (see FIG. **1**) that translates cutting blade **16** over the stationary blade **18** in a direction that is transverse to the oscillatory motion of cutting blade **16**. Translation of cutting blade **16** in this transverse direction changes the cut-length during operation of hair clipper **10**.

[0041] FIGS. **3-12** illustrate another embodiment of a blade assembly **114** that can be utilized with a hair cutting device such as hair clipper **10**. Blade assembly **114** includes an upper or cutting blade **116** and a lower or stationary blade **116**. Blade assembly **114** is substantially the same or similar to the embodiment of blade assembly **14** shown in FIGS. **1-2**, except for the differences described herein.

[0042] FIG. **3** shows a top perspective view of blade assembly **114** is shown, according to an exemplary embodiment. Cutting blade **116** has teeth **120** extending from a cutting blade edge **122** and defining a first direction parallel to a width of the handle (see e.g., **12** in FIG. **1**). In other words, as cutting blade **116** oscillates over stationary blade **118** in a first direction, the teeth **120** on cutting blade **116** and blade **118** capture hair follicles and cooperate to cut hair. Stationary blade **118** has stationary teeth **130** extending from a second or stationary blade edge **132**.

[0043] Referring to FIG. **4**, a top view of blade assembly **114** is shown, according to an exemplary embodiment. The distance between the imaginary line formed along an outer edge of cutting teeth **120** and the imaginary line formed along the outer edge of stationary teeth **130** is defined as a blade gap **134**. An adjustment assembly **135** allows for adjustment of blade gap **134**. Adjustment assembly **135** includes lever **138**. Movement of lever **138** translates cutting blade **116** relative to stationary blade **118**. This translation changes the placement of drive shaft **31** within yoke **126**. Yoke **126** is configured to receive drive shaft **31** to oscillate cutting blade **116** at any blade gap **134**. In a specific embodiment, three positions or configurations of cutting blade **116** relative to stationary blade **118** can be chosen including "fine," "medium," and "deep" configurations. In various other embodiments, a different number of configurations of the cutting blade **116** relative to stationary blade **118** can be chosen (i.e., **4**, **5**, **6**, etc.).

[0044] A blade assembly housing **124** is positioned above (in the orientation shown in FIGS. **3-4**) cutting blade **116** and stationary blade **118** and above at least a portion of yoke **126**. Adjustment assembly **135** further includes a guide member **128**. Guide member **128** couples or connects cutting blade **116** to lever **138**. Guide member **128** maintains a position of cutting blade **116** relative to stationary blade **118**. In other words, guide member **128** is coupled to and extends between cutting blade **116** and lever **138**. Guide member **128** converts movement of lever **138** into translation of cutting blade **116** in a direction that is transverse to the oscillatory motion of cutting blade **116**. The motion of lever **138** causes guide member **128** to push or pull cutting blade **116** along a top surface of stationary blade **118**. In this way, guide member **128** extends or retracts cutting blade **116** relative to stationary blade **118**.

[0045] FIG. **5** is an exploded view of the blade assembly **114** of FIG. **3**, according to an exemplary embodiment. Guide member **128** is positioned between cutting blade **116** and stationary blade **118** when blade assembly **114** is assembled. In a specific embodiment, guide member generally has a T-shape (i.e., cross-portion **136** is generally perpendicular to arm **142**). Guide member **128** includes a base, extension body, or arm **142** that connects the sliding translation of a cross-portion or guide rail **136** to a ridge under cutting blade **116**. Cross-portion **136** of guide member **128** has a top side adjacent to cutting blade **116** and a bottom side adjacent to stationary blade **118**. Arm **142** extends in a generally perpendicular (i.e., 180 degrees plus or minus 10 degrees) direction from the cross-portion **136** and/or the

[0046] Arm **142** interconnects the cross-portion **136** (captured between upper and lower blades **116** and **118**) of guide member **128** to lever **138**. Arm **142** includes an angled portion that extends upward (i.e., toward blade assembly housing **124** and away from stationary blade **118**). A generally horizontal portion (i.e., approximately planar) of arm **142** of guide member **128** is coupled to a lever connector **144**. When assembled, the generally horizontal portion of arm **142** is positioned above at least a portion of blade assembly housing **124**. Lever connector **144** is positioned below arm **142** and between guide member **128** and stationary blade **118**. Lever **138** includes an extended or elongated body **146** and an actuator **148**. A portion of the elongated body **146** of lever **138** engages with the lever connector **144** such that when a user moves the actuator **148** of lever **138** guide member **128** moves. In a specific embodiment, a projection on elongated body **146** extends upward (i.e., towards lever connector **144**) and is received within a recess of lever connector **144**.

[0047] A pair of fastener holes **150** permit fasteners **152** to pass through stationary blade and fixedly couple stationary blade **118** to blade assembly housing **124**. Cutting blade **116** includes bores **151** configured to receive a portion of a magnetic tensioning assembly. In a specific embodiment, bores **151** are configured to receive magnets. Similarly, cross-portion **136** of guide assembly **128** includes recesses **140** or cut outs on opposing sides of the cross-portion **136** that extend in a direction perpendicular to cutting blade edge **122**. In a specific embodiment, the recesses **140** have a U-shape. When the guide assembly **114** is assembled a portion of a magnetic tensioning assembly such as magnets are positioned within the recesses **140**.

[0048] Referring to FIG. **6**, a top view of the blade assembly **114** of FIG. **3** with blade assembly housing **124** and guide member removed, according to an exemplary embodiment. Yoke **126** includes an upper portion **154**. Upper portion **154** of yoke **126** is configured to receive a portion of a drive shaft (see e.g., **31** in FIG. **2**). Yoke **126** is fixedly coupled to cutting blade **116** and receives motor **28** output through the drive shaft. The movement of the drive shaft causes cutting blade **116** to oscillate over stationary blade **118**.

[0049] FIG. **7** is a cross-sectional view of the blade assembly **114** of FIG. **3**, taken along the line **7-7** in FIG. **6** is shown according to an exemplary embodiment. Yoke **126** includes a body or cross-portion **156** extending in a generally parallel orientation to cutting blade edge **122**. Yoke **126** further includes a bar, shown as metal bar **158** extending along cross-portion **156**. In a specific embodiment, metal bar **158** is formed from a ferromagnetic material such as an iron based metal. In another specific embodiment, metal bar **158** is formed from steel. In another specific embodiment, stationary blade **118** is formed from steel.

[0050] Blade assembly **114** includes a magnetized ferromagnetic material and/or at least one magnet **160** positioned between yoke **126** and stationary blade **118**. For example, yoke **126** is a non-conductive magnet carrier (e.g., a plastic yoke **126** carrying a magnet **160**) or conductive magnetic material. In a specific embodiment, at least one magnet **160** is positioned within and/or coupled to yoke **126** and below metal bar **158**. Each magnet **160** includes a first end that is a positive pole and a second end that opposes the first end, the second end is a negative pole. In a specific embodiment a pair of magnets **160** are positioned below metal bar **158**. Magnets **160** extend through the cutting blade **116** and specifically bores **151** toward stationary blade **118**. In a specific embodiment, magnets **160** are rare earth magnets. In a specific embodiment, the magnets are formed from Neodymium. In such an embodiment, the Neodymium has a grade of N52. In a specific embodiment, magnets **160** have a disc shape. In other embodiments, magnets **160** have a different shape (e.g., polygonal, rectangular, etc.).

[0051] As previously discussed, this arrangement creates a magnetic system or circuit with an improved tensioning performance (i.e., increased magnetic force) compared to magnetic tensioning assemblies that only use magnets and/or a magnetic component. When the polarity of magnets **160** are flipped or opposing (i.e., one has positive side downward facing towards stationary blade **118** and one has a positive side upward facing toward the yoke **126**) along with metal bar **158** a magnetic circuit is created. In such an arrangement, the positive pole of one magnet **160** is facing and/or adjacent to the stationary blade **118** and the negative pole of the same magnet **160** is facing and/or adjacent to the yoke **126**. For the remaining magnet **160**, the positive pole of one magnet **160** is facing and/or adjacent to the yoke **126** and the negative pole of the same magnet **160** is facing and/or adjacent to the stationary blade **118**.

[0052] As will be generally understood, a magnetic circuit is path that contains a magnetic flux generated by a magnet, electromagnet, etc. The magnetic circuit described, creates an attractive or tension force between cutting blade **116** and stationary blade **118**. The attractive tensile force maintains the position of cutting blade (up and down) relative to stationary blade **118** during oscillatory reciprocation (e.g., cutting hair).

[0053] Referring to FIG. **8**, a side view of the blade assembly **114** of FIG. **6** is shown, according to an exemplary embodiment. Magnet **160** includes a lower surface **162** that faces an upper surface **164** of stationary blade **118**. A gap **166** is defined between lower surface **162** of magnet **160** and upper surface **164** of stationary blade **118**. Applicant believes the tensioning force produced reduces friction and/or wear when gap **166** has a dimension or length D. In a specific embodiment, dimension D is between 0.005 and 0.02 inches and more specifically between 0.01 and 0.015 inches.

[0054] Referring to FIG. **9**, a bottom perspective view of a yoke **126** coupled to cutting blade **116** is shown according to an exemplary embodiment. Yoke **126** includes a middle projection **168** extending downward (i.e., toward stationary blade **118**). Middle projection **168** extends through and/or is received within a middle opening **170** of cutting blade **116**. Yoke **126** further includes opposing side projections **172** extending downward (i.e., toward stationary blade **118**). Opposing side projections **172** extend through and/ore are received within side openings or bore **174** in cutting blade **116**. Side openings **174** are positioned on opposing sides of middle opening **170** and specifically between middle opening **170** and bores **151** that receive magnets **160**.

[0055] Referring to FIGS. **10-11**, perspective views of yoke **126** are shown, according to an exemplary embodiment. Yoke **126** further includes a lower or downward facing surface **176** (i.e., toward stationary blade **118**). Middle projection **168** and opposing side projections **172** extend from lower surface **176**. In a specific embodiment, middle projection **168** has a generally rectangular shape. In other embodiments, middle projection **168** has a different shape (e.g., polygonal, circular, etc.). In another specific embodiment, opposing side projections **172** have a generally circular shape. In other embodiments, opposing side projections **172** have a different shape (e.g., polygonal, oval, rectangular etc.).

[0056] Referring to FIG. **12**, an exploded view of yoke **126** and the magnetic tensioning assembly is shown according to an exemplary embodiment. Cross-portion **156** of yoke **126** includes recessed portions **178**. Recessed portions **178** of the yoke **126** are configured to receive metal bar **158**. Within recessed portions **178** is at least one through bore **180** to receive a portion of magnet **160**. In a specific embodiment a pair of through bores **180** receive a portion of magnets **160** that are positioned below metal bar **158** when yoke **126** and the magnetic tensioning system is assembled.

[0057] FIGS. **13-19** illustrate another embodiment of a blade assembly **214** that can be utilized with a hair cutting device such as hair clipper **10**. Blade assembly **214** includes an upper or cutting blade **216** and a lower or stationary blade **216**. Blade assembly **214** is substantially the same or similar to the embodiment of blade assembly **14** shown in FIGS. **1-2** and/or blade assembly **114** shown in FIGS. **3-12**, except for the differences described herein.

[0058] Referring to FIG. **13**, a top perspective view of blade assembly **214** is shown according to another exemplary embodiment. Cutting blade **216** has teeth **220** extending from a cutter blade edge and defining a first direction parallel to a width of the handle (see e.g., **12** in FIG. **1**). As cutting blade **216** oscillates over stationary blade **218** in a first direction, the teeth **220** on cutting blade **216** and stationary blade **218** capture hair follicles and cooperate to cut hair. Stationary blade **218** has stationary teeth **230** extending from a second or stationary blade edge.

[0059] Yoke **226** includes an upper portion **254**. Upper portion **254** of yoke **226** is configured to receive a portion of a drive shaft (see e.g., **31** in FIG. **2**). Specifically, a recess **255** (see e.g., FIG. **14**) is configured to engage with the drive shaft. Yoke **226** is fixedly coupled to cutting blade **216** and receives motor **28** output through the drive shaft. The movement of the drive shaft causes cutting blade **216** to oscillate over stationary blade **218**.

[0060] The guide member **228** is mounted to the stationary blade **218** and includes a guide base or arm **242** and a cross-portion **236**. In a specific embodiment, the blade assembly **214** further includes a washer including a pair of slots or openings extending parallel to the major axis of the guide arm **242** and perpendicular to the major axis of the cross-portion **236** that can be coupled to the guide member **228** using fasteners **252** (e.g., screws). Arm **242** is planar (i.e., flat) and does not include angled portion like arm **142**.

[0061] The cross-portion **236** includes a guide edge parallel to the cutting blade **216** edge and/or the stationary blade **218** edge when the guide member **228** is installed on the stationary blade **218**. The guide member **228** guides the reciprocating movement of the cutting blade **216** with the guide edge. In various embodiments where the blade assembly **214** includes a spring to apply a downward biasing force on the yoke **226**, guide member **228** retains the spring against the stationary blade **218**. In a specific embodiment, guide member **228** is T-Shaped. A pair of fastener holes **250** permit fasteners (e.g., screws) to pass through stationary blade **218** and fixedly couple stationary blade **218** to a blade assembly housing or handle **12** of a hair cutting device **10**.

[0062] Referring to FIG. **14**, a side view of the blade assembly **214** of FIG. **13** is shown, according to an exemplary embodiment. Yoke **226** includes a body or cross-portion **256** extending in a generally parallel orientation to the cutter blade edge. Blade assembly **214** includes a magnetized ferromagnetic material and/or at least one magnet **260** positioned between yoke **226** and stationary blade **218**. For example, yoke **226** is a non-conductive magnet carrier (e.g., a plastic yoke **226** carrying a magnet **260**) or conductive magnetic material. In a specific embodiment, at least one magnet **160** is positioned within and/or coupled to yoke **226**. In a specific embodiment a pair of magnets **260** are coupled to yoke **226**. Magnets **260** extend through the cutting blade **216** and specifically bores **274** (see e.g., FIG. **15**) toward stationary blade **218**. In a specific embodiment, magnets **260** are rare earth magnets. In a specific embodiment, the magnets are formed from Neodymium. In such an embodiment, the Neodymium has a grade of N52.

[0063] Magnet **260** includes a lower surface **262** that faces an upper surface **264** of stationary blade **218**. In a specific embodiment, a gap or space **266** is defined between lower surface **262** of magnet **260** and upper surface **264** of stationary blade **218**. Applicant believes the tensioning force produced reduces friction and/or wear when gap **266** has a dimension or length D2. In a specific embodiment, D2 is between 0.005 and 0.02 inches and more specifically between 0.01 and 0.015 inches. Referring to FIGS. **15-16**, partially exploded views of the blade assembly **214** of FIG. **13** are shown, according to an exemplary embodiment. The cross-portion **236** of guide member **228** includes an opening **267** extending through guide member **228**. When the guide assembly **214** is assembled a portion of a magnetic tensioning assembly such as magnets **260** are positioned within and/or extend through the opening **267**.

[0064] Yoke **226** includes a middle projection **268** extending downward (i.e., toward stationary blade **218**). Middle projection **268** extends through and/or is received within a middle opening **270** of cutting blade **216**. Yoke **226** further includes opposing side projections **272** extending downward (i.e., toward stationary blade **218**). Opposing side projections **272** extend through and/or are received within side openings or bore **274** in cutting blade **216**. Side openings **274** are positioned on opposing sides of middle opening **270** and receive magnets **260** when blade assembly **214** is assembled.

[0065] Yoke **226** further includes a lower or downward facing surface **276** (i.e., toward stationary blade **218**). Middle projection **268** and opposing side projections **272** extend from lower surface **276**. In a specific embodiment, middle projection **268** has a generally rectangular shape. In other embodiments, middle projection **268** has a different shape (e.g., polygonal, circular, etc.). In another specific embodiment, opposing side projections **272** have a generally circular shape. In other embodiments, opposing side projections **272** have a different shape (e.g., polygonal, oval, rectangular etc.).

[0066] Referring to FIGS. **17-18**, perspective view of yoke **226** including the magnetic tensioning assembly are shown, according to exemplary embodiments. Yoke **226** is coupled to a middle magnet **278**. Middle magnet **278** is substantially the same as magnets **260** except for the differences discussed herein. In a specific embodiment, middle magnet **278** has a generally rectangular shape. In other embodiments, middle magnet **278** has a different shape (e.g., polygonal, circular, etc.). In a specific embodiment, middle magnet **278** has a greater size than a size of the magnet **260**. Middle magnet **278** is received within and/or coupled to a recess **282** in middle projection **268**. Magnets **260** are received and/or coupled to recesses **280** defined in side projections **272**.

[0067] Referring to FIG. **19**, an exploded view of yoke **226** is shown according to an exemplary embodiment. Magnets **260** and middle magnet **278** are sized such that a portion of magnets **260** and middle magnet **278** are at least partially received within yoke **226**. At least a portion of magnets **260** and middle magnet **278** extend beyond a bottom or lowermost portion of opposing side projections **272** and middle projection **268**, respectively.

[0068] It should be understood that the figures illustrate the exemplary embodiments in detail, and it should be understood that the present application is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology is for the purpose of description only and should not be regarded as limiting.

[0069] Further modifications and alternative embodiments of various aspects of the invention will be apparent to those skilled in the art in view of this description. Accordingly, this description is to be construed as illustrative only. The construction and arrangements, shown in the various exemplary embodiments, are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter described herein. Some elements shown as integrally formed may be constructed of multiple parts or elements, the position of elements may be reversed or otherwise varied, and the nature or number of discrete elements or positions may be altered or varied. The order or sequence of any process, logical algorithm, or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes and omissions may also be made in the design, operating conditions and arrangement of the various exemplary embodiments without departing from the scope of the present invention.

[0070] For purposes of this disclosure, the term "coupled" means the joining of two components directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two members and any additional intermediate members being integrally formed as a single unitary body with one another or with the two members or the two members and any additional member being attached to one another. Such joining may be permanent in nature or alternatively may be removable or releasable in nature.

[0071] While the current application recites particular combinations of features in the claims appended hereto, various embodiments of the invention relate to any combination of any of the features described herein whether or not such combination is currently claimed, and any such combination of features may be claimed in this or future applications. Any of the features, elements, or components of any of the exemplary embodiments discussed above may be used alone or in combination with any of the features, elements, or components of any of the other embodiments discussed above.

What is claimed is:

1. A magnetic blade assembly, comprising:

a stationary blade having teeth extending along a first blade edge;

a cutting blade having cutting teeth extending along a second blade edge parallel to the first blade edge, and supported relative to the stationary blade such that the cutting teeth are moveable over the stationary blade to cut hair;

a guide member including a base and a cross-portion, the cross-portion being captured between the stationary blade and the cutting blade; and

a yoke coupled to the cutting blade, the yoke comprising:

a body extending in a parallel direction to the second blade edge; and

a magnet coupled to the body of the yoke;

wherein the magnet generates a tensioning force between the cutting blade and the stationary blade.

2. The magnetic blade assembly of claim **1**, further comprising a metal bar coupled to the yoke.

3. The magnetic blade assembly of claim **2**, wherein the yoke includes a pair of magnets coupled to the body of the yoke and positioned below the metal bar such that a magnetic circuit is created.

4. The magnetic blade assembly of claim **3**, wherein one of the pair of magnets includes a first end having a positive pole adjacent to the stationary blade and a second end having a negative pole adjacent to the yoke and wherein the second of the pair of magnets includes a first end having a negative pole adjacent to the stationary blade and a second end having a positive pole adjacent to the yoke.

5. The magnetic blade assembly of claim **2**, wherein the metal bar is formed from steel.

6. The magnetic blade assembly of claim **1**, wherein the magnet is rare earth magnet.

7. The magnetic blade assembly of claim **1**, wherein the base of the guide member is generally perpendicular to second blade edge and wherein a portion of the base extends at an angle relative to the stationary blade.

8. The magnetic blade assembly of claim **1**, wherein a distance between the first blade edge and the second blade edge defines a blade gap, and wherein, when an inner section of the cross-portion of the guide member engages the cutting blade to translate the cutting blade over the stationary blade, the translation of the cutting blade controls the blade gap.

9. A magnetic blade assembly, comprising:

a first blade having teeth extending along a first blade edge;

a second blade having teeth extending along a second blade edge parallel to the first blade edge and supported relative to the first blade;

a blade guide assembly captured between the first blade and the second blade, the blade guide assembly maintaining a relative position of the first blade edge relative to the second blade edge, the blade guide assembly comprising:

a guide member including a base and a cross-portion, the cross-portion being captured between the first blade and the second blade, the cross-portion having a first side facing the first blade and a second side facing the second blade;

a yoke coupled to the second blade, the yoke comprising a body extending in a parallel direction to the second blade edge; and

a magnet positioned between the yoke and the second blade;

wherein the magnet generates a tensioning force between the second blade and the first blade.

10. The magnetic blade assembly of claim **9**, wherein the yoke includes a pair of magnets coupled to the body of the yoke and extending toward the first blade.

11. The magnetic blade assembly of claim **10**, further comprising a metal bar coupled to the yoke, the metal bar positioned above the pair of magnets such that a magnetic circuit is created.

12. The magnetic blade assembly of claim **11**, wherein one of the pair of magnets includes a first end having a positive pole adjacent to the first blade and a second end having a negative pole adjacent to the yoke and wherein the other of the pair of magnets includes a first end having a negative pole adjacent to the first blade and a second end having a positive pole adjacent to the yoke.

13. The magnetic blade assembly of claim **9**, wherein a distance between the first blade edge and the second blade edge defines a blade gap.

14. The magnetic blade assembly of claim **13**, wherein an inner section of the cross-portion of the guide member engages the second blade to translate the second blade over the first blade and wherein translation of the second blade controls the blade gap.

15. A magnetic blade assembly, comprising:

a first blade having teeth extending along a first blade edge;

a second blade having teeth extending along a second blade edge parallel to the first blade edge and supported relative to the first blade;

a guide member positioned between the first blade and the second blade;

a yoke coupled to the second blade, the yoke comprising a body extending in a parallel direction to the second blade edge; and

a magnet coupled to the yoke;

wherein at least a portion of the magnet extends through a bore defined within the second blade and wherein the magnet generates a tensioning force between the second blade and the first blade.

16. The magnetic blade assembly of claim **15**, further comprising two magnets and a metal bar coupled to the yoke, the two magnets are positioned between the metal bar and the second blade.

17. The magnetic blade assembly of claim **16**, wherein the metal bar extends along the body of the yoke in a direction parallel to the second blade edge.

18. The magnetic blade assembly of claim **16**, wherein a positive pole of one of the two magnets is positioned adjacent to the metal bar and wherein a negative pole of the remaining magnet is posited adjacent to the metal bar.

19. The magnetic blade assembly of claim **16**, wherein each of the two magnets includes a lower surface that faces an upper surface of the first blade and wherein a gap is defined between the lower surface of each magnet and the upper surface of the first blade.

20. The magnetic blade assembly of claim **19**, wherein a length of the gap is between 0.005 and 0.02 inches.

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