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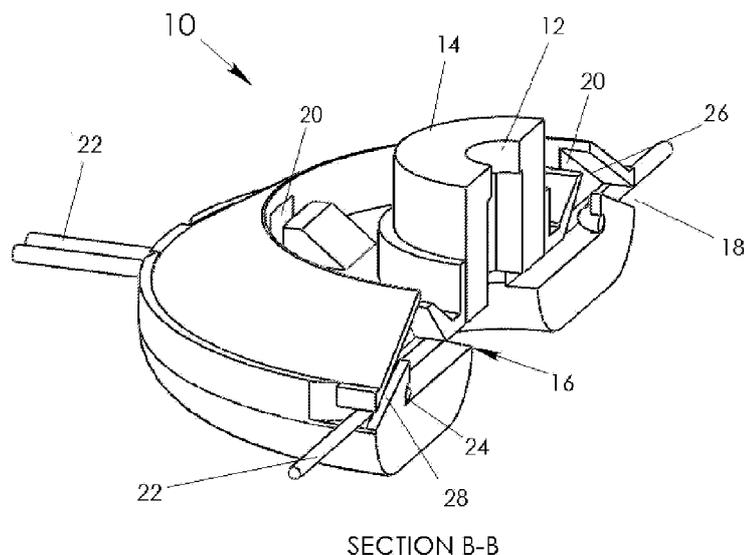
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(54) **Title:** RAMPED CONNECTOR FOR ROTARY HEAD ASSEMBLY



(57) **Abstract:** This invention relates to rotary head assembly apparatuses, and more specifically, to rotary head assembly apparatus configured to easily replace cutting members necessary to cut unwanted plants.

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## RAMPED CONNECTOR FOR ROTARY HEAD ASSEMBLY

### REFERENCE TO RELATED APPLICATIONS

[0001] Claim is hereby made to the benefit of the priority of co-pending U.S. Provisional Patent Appl. No. 61/681,304, filed on August 9, 2012, the disclosure of which is incorporated herein by reference.

### TECHNICAL FIELD

[0002] This invention relates to rotary head assembly apparatuses, and more specifically, to rotary head assembly apparatus configured to easily replace cutting members necessary to cut unwanted plants.

### BACKGROUND

[0003] Presently, there are trimming apparatuses known in the art having a rotatable, attachable head for attachment to a powered device, with the head carrying a series of trimmer lines extending axially out about the periphery of the head. Examples of such weed trimming apparatuses include spool and "bump 'n' feed" weed trimming apparatuses with continuous-feed trimming line, automatic-feed trimmer head, and trimming apparatuses using fixed-length pieces of trimming line or blades. However, such weed trimming apparatuses have certain drawbacks which have gone largely unaddressed in this technical field.

[0004] Both the "bump 'n' feed" and automatic trimmer head relies on an internal spool with trimmer line reserves. Stress on these apparatuses' trimming lines will cause it break from time to time during use. Because of their designs, the trimmer lines often get twisted, tangled or buried within the spool making it difficult to dispense the proper line length for cutting. As a result, the trimmer head must then be disassembled, the trimmer string unwound and again rewound in the proper manner before the trimmer head will again work as designed. This process is difficult, labor intensive and highly time consuming.

[0005] To address the aforementioned problems of the conventional "bump 'n' feed" and automatic trimmer heads, blades or fixed-length trimmer line pieces have been incorporated into the trimmer head. As the blades become dull or the trimmer lines break, often times, it require additional tools and/or a lot of time to replace the worn or

broken pieces. Thus, a need exists for a rotary apparatus that does not tangle, twist, or bind cutting members such as the trimmer lines. Furthermore, a need exists for a rotary apparatus that does not have to be disassembled to have new strings or other types of cutting members added. Lastly, a need exists for a rotary apparatus which requires little time and effort to replace the cutting members such as trimmer lines or cutting blades. These needs are met by the present invention as described and claimed below.

### SUMMARY OF THE INVENTION

[0006] From the foregoing, it is apparent there is still a great and long-felt need for a rotary apparatus, in particular a rotary head assembly, that provides quick and easy insertion of a cutting member in order to resume operation as well as simple and efficient removal of the cutting member when replacing it. The present invention addresses the foregoing need, amongst other needs, in a highly unique and facile way. Thus, in one aspect, the present invention provides a novel rotary apparatus, particularly a rotary head assembly from which a cutting member may extend. Particularly, in at least one of its aspects, this invention provides quick and easy insertion of a cutting member in order to resume operation of the rotary apparatus. In another aspect, the invention also facilitates removal of a cutting member during change out, so that there is no need to disassemble the rotary head assembly of the rotary apparatus, as required in other known trimmer apparatuses. The cutting member of the present invention can be flexible (e.g. wires, strands, etc.), semi-rigid (e.g. plastic blades), or rigid (e.g. metal blades) and may be made of any material and in any shape capable of cutting unwanted plants such as weeds. Non-limiting examples of cutting member materials include plastics (e.g. nylon), metals, metal alloys, and combinations thereof.

[0007] This invention provides a rotary apparatus comprising a rotary head assembly configured for attachment to a rotary power source, wherein the rotary head assembly has at least one cutting member receptacle wherein said cutting member receptacle optionally rotates or is fixed onto the rotary head assembly, defines at least one cutter inlet and at least one cutter outlet, wherein the cutter inlet is positioned opposite the cutter outlet and sized and configured to receive at least one cutting member and comprises a cutting member retainer wherein the cutting member retainer is positioned in between the cutter inlet and the cutter outlet comprising a channel extending from the cutter inlet forming a ramp surface which is optionally declining or inclining relative to

the cutter inlet, so that the cutting member may be inserted into the cutter inlet and engaged with the cutting member retainer and retained by the cutting member receptacle until it is threaded through the cutter outlet.

[0008] These and other features of this invention will be still further apparent from the ensuing description, drawings, and appended claims.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0009] Fig. 1 are perspective views and a cross-sectional view of the rotary head assembly, the cutting member receptacle, and the cutting members consistent with one aspect of the present invention.

[0010] Fig. 2 is a cross-sectional view of the rotary head assembly of Fig. 1.

[0011] Fig. 3 is a cross-sectional view of the rotary head assembly, the cutting member receptacle consistent with one aspect of the present invention.

[0012] Fig. 4 is a cross-sectional view of the cutting member receptacle included within Fig. 3.

[0013] Fig. 5 are perspective views and a cross-sectional view of the cutting member receptacle.

[0014] Fig 5a are exemplary embodiments of the cutting member retainer.

[0015] Fig. 6 is a perspective view of the rotary head assembly, the cutting member receptacle, and the cutting members consistent with one aspect of the present invention.

[0016] Fig. 6a are perspective views and a cross-sectional view of the cutting member receptacle included in Fig. 6.

[0017] Fig. 7 is a perspective view and a cross-sectional view of the cutting member receptacle.

[0018] Fig. 8 is a cross-sectional view of the cutting member receptacle.

[0019] Fig. 9 are perspective views of the cutting member receptacle.

[0020] In each of the above figures, like numerals are used to refer to like or functionally like parts among the several figures.

### **FURTHER DETAILED DESCRIPTION OF THE INVENTION**

[0021] Illustrative implementations of the invention are described below as they might be employed in the construction and use of a rotary apparatus and related method according to at least one implementation of the present invention. It will be of course

appreciated that in the development of such an actual implementation, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure. In the detailed description below, general discussion of alternative steps, configurations, features and/or components may employ reference to numbered components identified in the accompanying figures. However, it should be appreciated that, unless otherwise explicitly noted, such alternative steps, configurations, features and/or components are not necessarily limited to the particular aspect illustrated in the relevant figures, as the use of such number references in this context is merely for the sake of clarity.

[0022] Turning now to the Figures, several illustrative aspects of the apparatus of the present invention are shown. Looking now at Fig. 1, an apparatus comprising a rotary head assembly **10** configured for attachment to a rotary power source (not shown) is shown. The rotary power source may be any source capable to provide sufficient rotation to cut unwanted plants such as weeds. Non-limiting examples of the rotary power source includes any gas-powered, electric-powered, or battery-powered motor found on any standard commercial weed trimming device, such as a "weedeater." The rotary head assembly **10** is sized and configured for attachment to such commercially known weed trimming devices through the use of an attachment member such as a clamp, bolt, or threaded screw (not shown) through the central member aperture **12** defined by the central member **14** of the rotary head assembly.

[0023] In one embodiment, the invention comprises the rotary head assembly **10**, as illustrated in Figs. 1 and 2, wherein the rotary head assembly has at least one cutting member receptacle **16** wherein said cutting member receptacle is fixed onto the rotary head assembly **10**, defines at least one cutter inlet **18** and at least one cutter outlet **20**, wherein the cutter inlet is positioned opposite the cutter outlet and sized and configured to receive at least one cutting member **22** and comprises a cutting member retainer **24** wherein the cutting member retainer is positioned in between the cutter inlet and the cutter outlet comprising a channel **26** extending from the cutter inlet forming a ramp surface **28** which is inclining as shown, but may be optionally configured to be

declining, relative to the cutter inlet, so that the cutting member **22** may be inserted into the cutter inlet **18** and engaged with the cutting member retainer **24** and retained by the cutting member receptacle **16** until it is threaded through the cutter outlet **20**.

**[0024]** As illustrated in Figs. 3 and 4, the invention of another embodiment comprises the rotary head assembly **10**, defines at least one cutting member receptacle **16a** configured to rotate in the same and opposite direction of the rotary head assembly during use, defines at least one cutter inlet **18** and at least one cutter outlet **20**, wherein the cutter inlet is positioned opposite the cutter outlet and sized and configured to receive at least one cutting member **22** and comprises a cutting member retainer **24** wherein the cutting member retainer is positioned in between the cutter inlet and the cutter outlet comprising a channel **26** extending from the cutter inlet forming a ramp surface **28** which is inclining as shown, but may be optionally configured to be declining, relative to the cutter inlet, so that the cutting member **22** may be inserted into the cutter inlet **18** and engaged with the cutting member retainer **24** and retained by the cutting member receptacle **16a** until it is threaded through the cutter outlet **20**.

**[0025]** The cutting member receptacle of the present invention may be spatially arranged in any configuration on, in, or combinations thereof with the rotary head assembly. In another embodiment, the cutting member receptacle may be configured as part of the rotary head assembly or as removable attachments. In yet another embodiment, the rotary head of the present invention may be configured to receive a single cutting member receptacle or a plurality of the cutting member receptacle. In yet a further embodiment, where there are at least two cutting member receptacles, each cutting member receptacle may be spatially arranged in any configuration relative to the other, non-limiting examples include, above, below, opposite, next to, within, or combinations thereof.

**[0026]** As shown in Fig. 5, the cutting member receptacle **16a** portion of the present invention may form various shapes and configurations. In one embodiment, one skilled in the art may shape and configure the cutting member receptacle **16a** to receive different types of cutting member such as a cutting member shaped like a blade **30**, wherein said cutting member of this embodiment has a cutting portion **35** and an attachment portion **40** configured to engage and be retained with the cutting member retainer **24** until the cutter member as exemplified by the blade **30** is threaded through the cutter outlet **20**. The cutting member retainer **24** of the present invention may be

configured in any form or shape to engage and retain the cutting member when in use. Fig. 5a illustrates various examples of the cutting member retainer embodiments **24a**, **24b**, **24c**, and **24d**. In one embodiment, the cutting member retainer **24** may be formed similar to a shape of the a portion of the cutting member's exterior and sized to receive it, non-limiting shapes include circular **24a**, angular **24b** and **24d**, rectangular **24c**, oval, combinations thereof, or any shape capable of retaining the cutting member. In another embodiment, the cutting member retainer **24** comprises a concave space below the cutter outlet **20**.

[0027] In one embodiment as illustrated in Figs. 6 and 6a, a cutting member receptacle **16a** configured to receive cutting members **22** such as those that are commercial available such as flexible monofilament plastic trimmer lines of any suitable type and cross-sectional configuration, e.g., 0.065, 0.080, 0.095, 0.105, 0.12, 0.13 or 0.15 gauge nylon trimmer line or the like. In a further embodiment, the cutting member receptacle **16a** configured to receive a cutting member, such as a trimmer line **22** as exemplified in Fig. 6a. In particular, the cutting member receptacle **16a** defines at least one cutter inlet **18** and at least one cutter outlet **20**, wherein the cutter inlet is positioned opposite the cutter outlet and sized and configured to receive at least one cutting member **22**, and comprises a cutter member retainer **24** wherein the cutter member retainer is positioned in between the cutter inlet and the cutter outlet comprising a channel **26** extending from the cutter inlet forming a ramp surface **28** which is declining or inclining relative to the cutter inlet, so that the cutting member **22** may be inserted into the cutter inlet and engaged with the cutter member retainer and retained by the cutter member retainer until it is threaded through the cutter outlet.

[0028] In another embodiment, as illustrated in Fig. 7, the cutting member receptacle **16b** is configured to be on top of another cutting member receptacle. In yet a further embodiment, the rotary apparatus of the present invention may be configured with a singular cutting member or a plurality of cutting members **22**, as exemplified in Fig. 7, wherein the cutting members may be the same material, same shape, same texture, different material, different shape, different texture, or combinations thereof from each other. As illustrated in Fig. 7, the cutting member receptacle comprises at least one cutting member **22a** which is a flexible trimmer line and at least one cutting member which is a blade-like **22b**.

[0029] In one aspect of the invention as exemplified in Figs. 8 and 9, the cutting

member receptacle **16** comprises a channel **26** comprising of a lower channel opening **45**, an upper channel opening **50**, a lower channel outlet **55** and an upper channel outlet **60**. The distance between the lower channel opening **45** and the upper channel opening **50** is configured to receive the cutting member of choice when inserted through the cutter inlet **18** and the distance between the lower channel outlet **55** and the upper channel outlet **60** is configured to thread the cutting member of choice through the cutter outlet **20**. In another embodiment, the distance between the lower channel opening **45** and the upper channel opening **50** is configured to retain the cutting member when the rotary head is in use. In yet another embodiment, the distance between the lower channel outlet **55** and the upper channel outlet **60** is configured to retain the cutting member when the rotary head is in use. The distance between the lower channel opening **45** and the upper channel opening **50** may be the same or different as the distance between the lower channel outlet **55** and the upper channel outlet **60**. In a preferred embodiment, the distance between the lower channel opening **45** and the upper channel opening **50** is the same as the distance between the lower channel outlet **55** and the upper channel outlet **60**. In another preferred embodiment, the distance between the lower channel opening **45** and the upper channel opening **50** is configured relative to the distance between the lower channel outlet **55** and the upper channel outlet **60** to secure the cutting member when in use and easily removed when threaded through the cutter outlet **20**.

[0030] In yet another aspect of the invention, the lower channel opening **45** and lower channel outlet **55** are configured relative to one another forming a ramp **28** for receiving for a cutting member, wherein the ramp may be optionally inclining or declining relative to the cutter inlet **18**. One skilled in the art may configure the ramp with respect to the embodiments of the present invention at any angle relative to the cutter inlet **18**. In one embodiment on an imaginary axis, when the lower channel opening **45** is positioned lower than the lower channel outlet **55**, a ramp **28** configured to incline relative to the cutter inlet **18** is formed as exemplified in Fig. 8. In another embodiment on an imaginary axis, when the lower channel opening **45** is positioned higher than the lower channel outlet **55**, a ramp configured to decline relative to the cutter inlet **18** is formed. In one embodiment on an imaginary axis, where the ramp is inclining relative to the cutter inlet **18**, the upper channel opening **50** is configured to be level or lower than the lower channel outlet **55**. In another embodiment on an imaginary axis, where the ramp

is declining relative to the cutter inlet **18**, the lower channel opening **45** is configured to be level or higher than the upper channel outlet **60**. In a preferred embodiment on an imaginary axis, the lower channel opening **45** and the lower channel outlet **55** are positioned to secure the cutting member when in use and easily removed when threaded through the cutter outlet **20** when the rotary head is not in use.

**[0031]** In one embodiment (Fig. 9), a cutting member receptacle **16** configured and positioned on top of another cutting member receptacle **16**. In one embodiment, the ramp surface **28** comprises at least two side edges **65**. The side edges **65** are configured and sized to define at least two side channels **70** extending from the cutter inlet to the cutter outlet **20** sufficient to receive a cutting member through the cutter inlet and retain the cutting member within the cutting member retainer **24** when in use and release the cutting member when threaded through the cutter outlet **20**.

**[0032]** Except as may be expressly otherwise indicated, the article "a" or "an" if and as used herein is not intended to limit, and should not be construed as limiting, the description or a claim to a single element to which the article refers. Rather, the article "a" or "an" if and as used herein is intended to cover one or more such elements, unless the text expressly indicates otherwise.

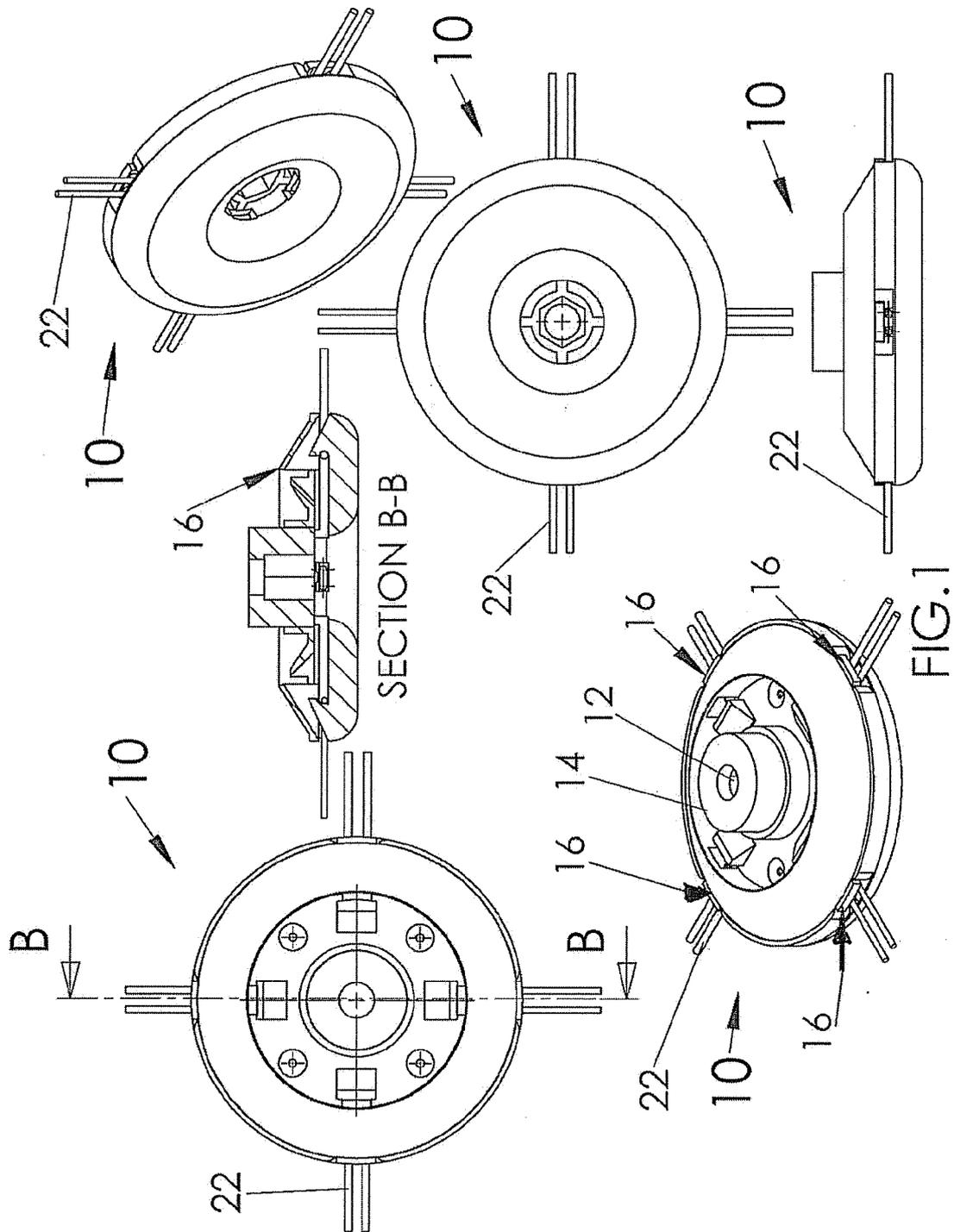
**[0033]** Each and every patent or other publication or published document referred to in any portion of this specification is incorporated *in toto* into this disclosure by reference, as if fully set forth herein.

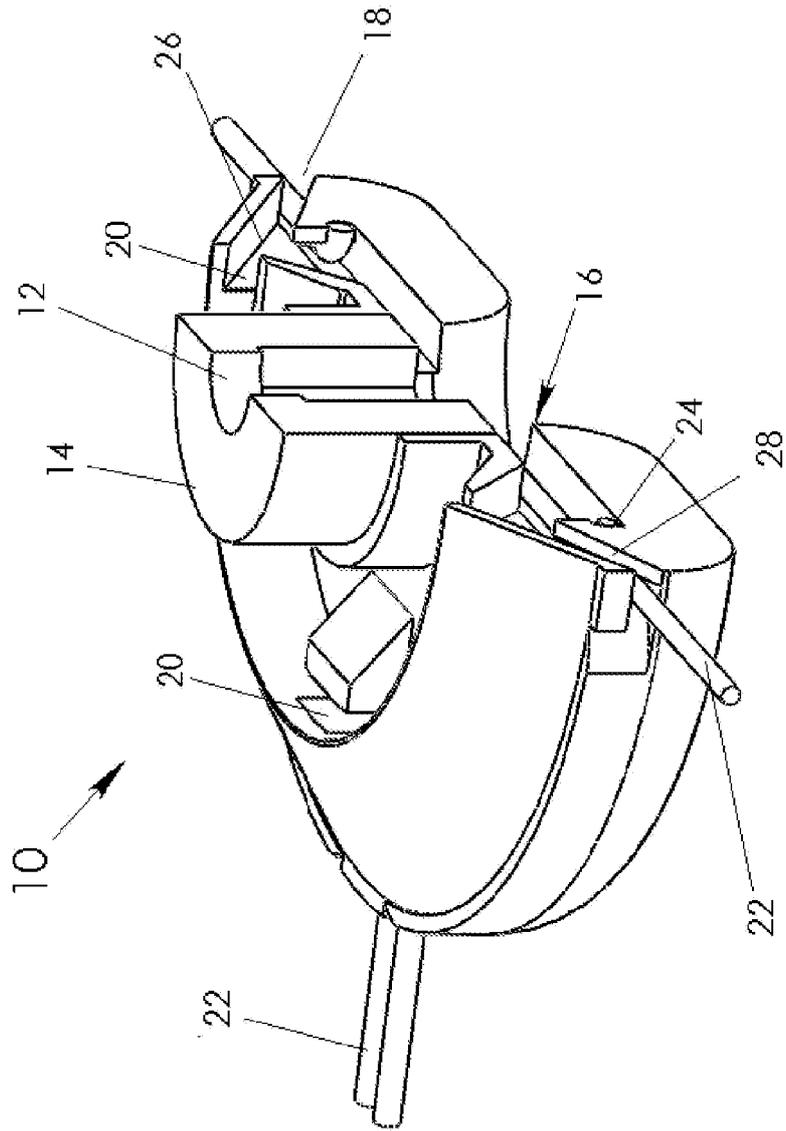
**[0034]** This invention is susceptible to considerable variation within the spirit and scope of the appended claims.

**CLAIMS**

1. An apparatus comprising a rotary head assembly, wherein the rotary head assembly comprises at least one cutting member receptacle wherein said cutting member receptacle:
  - (i) optionally either rotates or is fixed onto the rotary head assembly;
  - (ii) defines at least one cutter inlet and at least one cutter outlet, wherein the cutter inlet is positioned opposite the cutter outlet and sized and configured to receive at least one cutting member; and
  - (iii) comprises a cutting member retainer, wherein the cutting member retainer is positioned in between the cutter inlet and the cutter outlet, defines a channel extending from the cutter inlet to the cutter outlet and comprises a ramp surface which is either inclining or declining, relative to a point of entry into the inlet so that the cutting member may be inserted into the cutter inlet and engaged with the cutting member retainer and retained by the cutting member receptacle until it is threaded through the cutter outlet.
2. The apparatus of Claim 1, wherein at least one cutting member rotates in the same and opposite direction of the rotary head assembly during use.
3. The apparatus of Claim 1, wherein at least one cutting member is fixed to the rotary head assembly.
4. The apparatus of Claim 1, wherein the cutting member is selected from the group consisting of a flexible, semi-rigid, and rigid material.
5. The apparatus of Claim 1, wherein the channel is defined at least in part by a lower channel opening and an upper channel opening, a lower channel outlet, and an upper channel outlet.
6. The apparatus of Claim 5, wherein the distance between the lower channel opening and the upper channel opening configured to receive the cutting member through the cutter inlet.

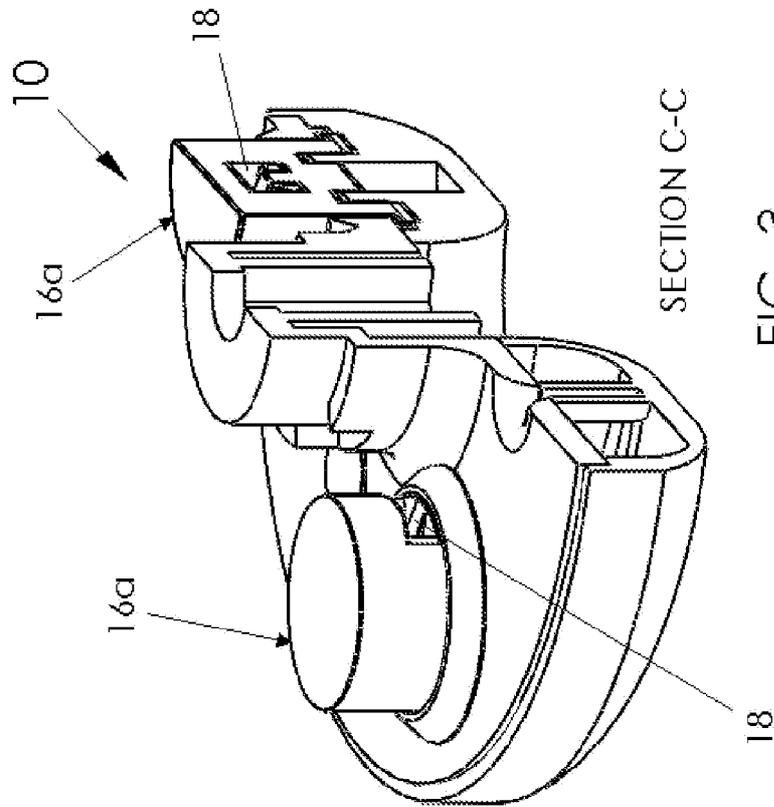
7. The apparatus of Claim 5, wherein the distance between the lower channel outlet and the upper channel outlet configured to thread the cutting member through the cutter outlet.
8. The apparatus of Claim 5, wherein the distance between the lower channel opening and the upper channel opening configured to be optionally the same or different to the distance between the lower channel outlet and the upper channel outlet.
9. The apparatus of Claim 5, wherein the distance between the lower channel opening and the upper channel opening is the same as the distance between the lower channel outlet and the upper channel outlet configured to secure the cutting member when in use and easily removed when threaded through the cutter outlet.
10. The apparatus of Claim 5, wherein the lower channel opening and lower channel outlet configured relative to one another forming a ramp for receiving for a cutting member, wherein the ramp may be optionally inclining or declining relative to the cutter inlet.
11. The apparatus of Claim 10, wherein the ramp is inclining relative to the cutter inlet and the upper channel opening configured to be level or lower than the lower channel outlet.
12. The apparatus of Claim 10, wherein the ramp is declining relative to the cutter inlet and the lower channel opening configured to be level or higher than the upper channel outlet.
13. The apparatus of Claim 1, wherein the ramp surface comprises at least two side edges configured and sized to define at least two side channels extending from the cutter inlet to the cutter outlet sufficient to receive a cutting member through the cutter inlet and retain the cutting member within the cutting member retainer when in use and release the cutting member when threaded through the cutter outlet.

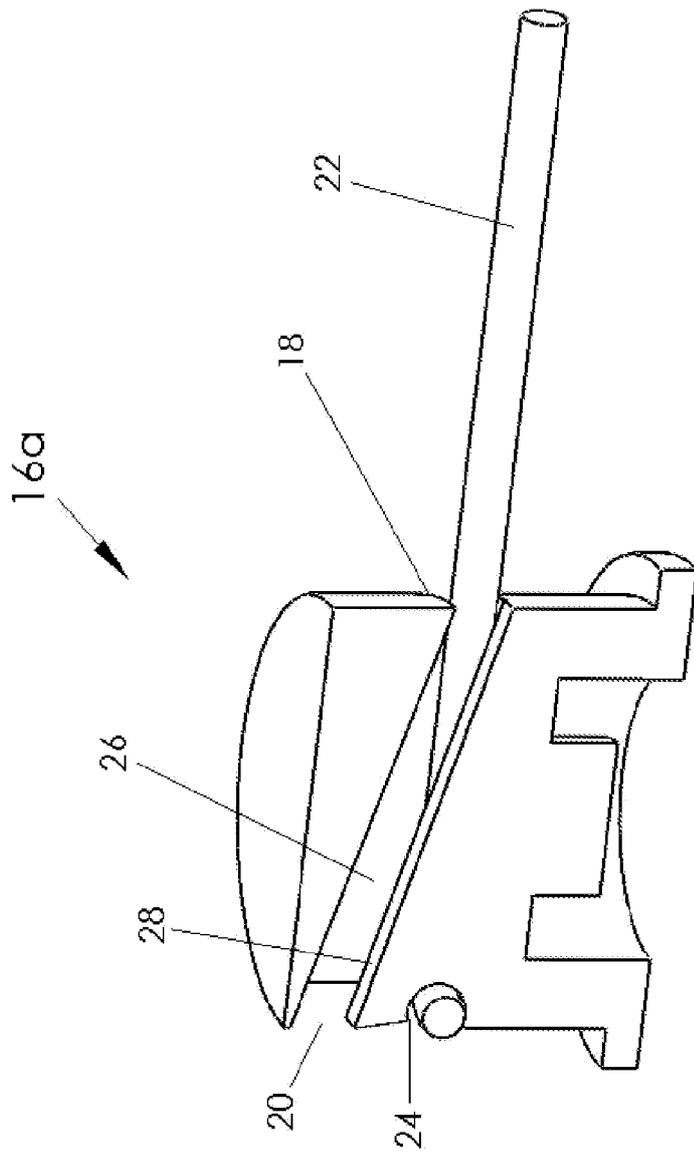




SECTION B-B

fig. 2







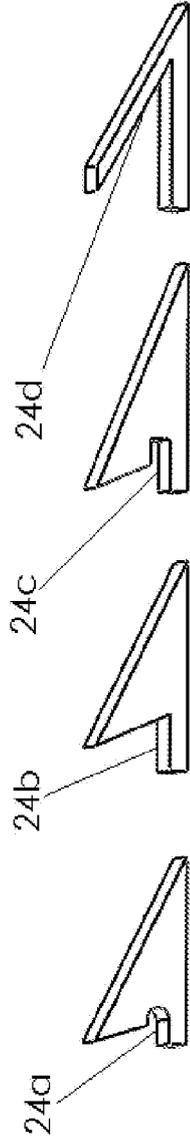


FIG. 5a

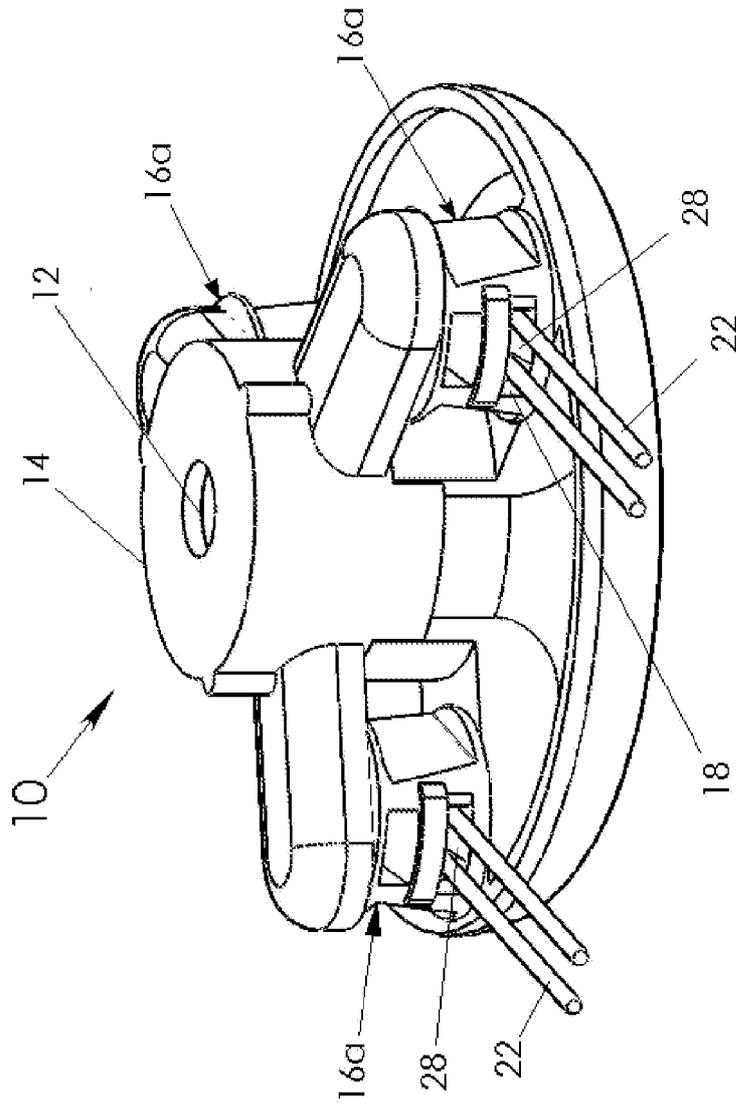


FIG. 6

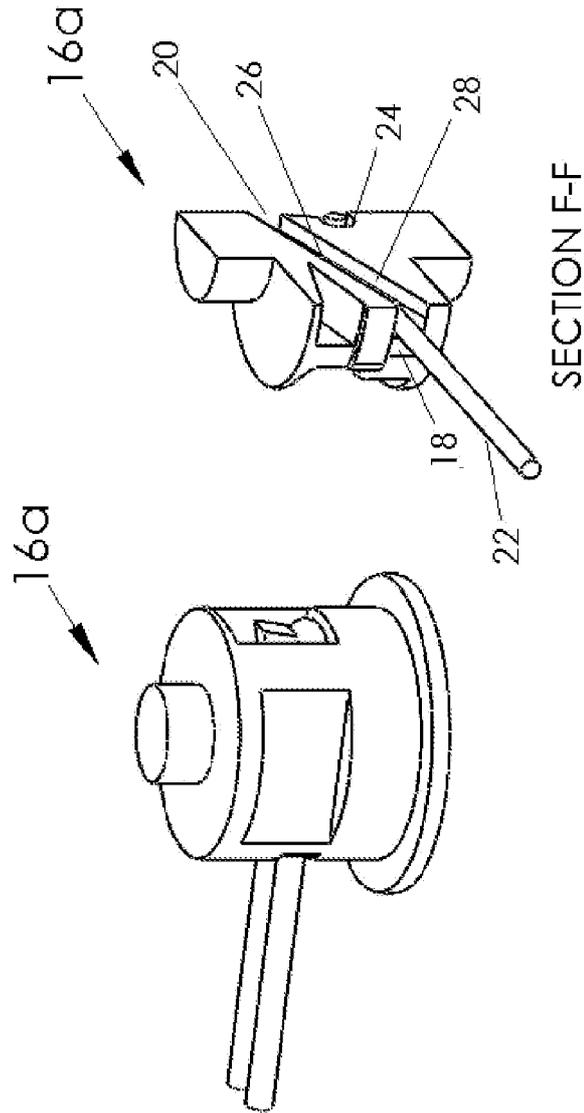


FIG. 6a

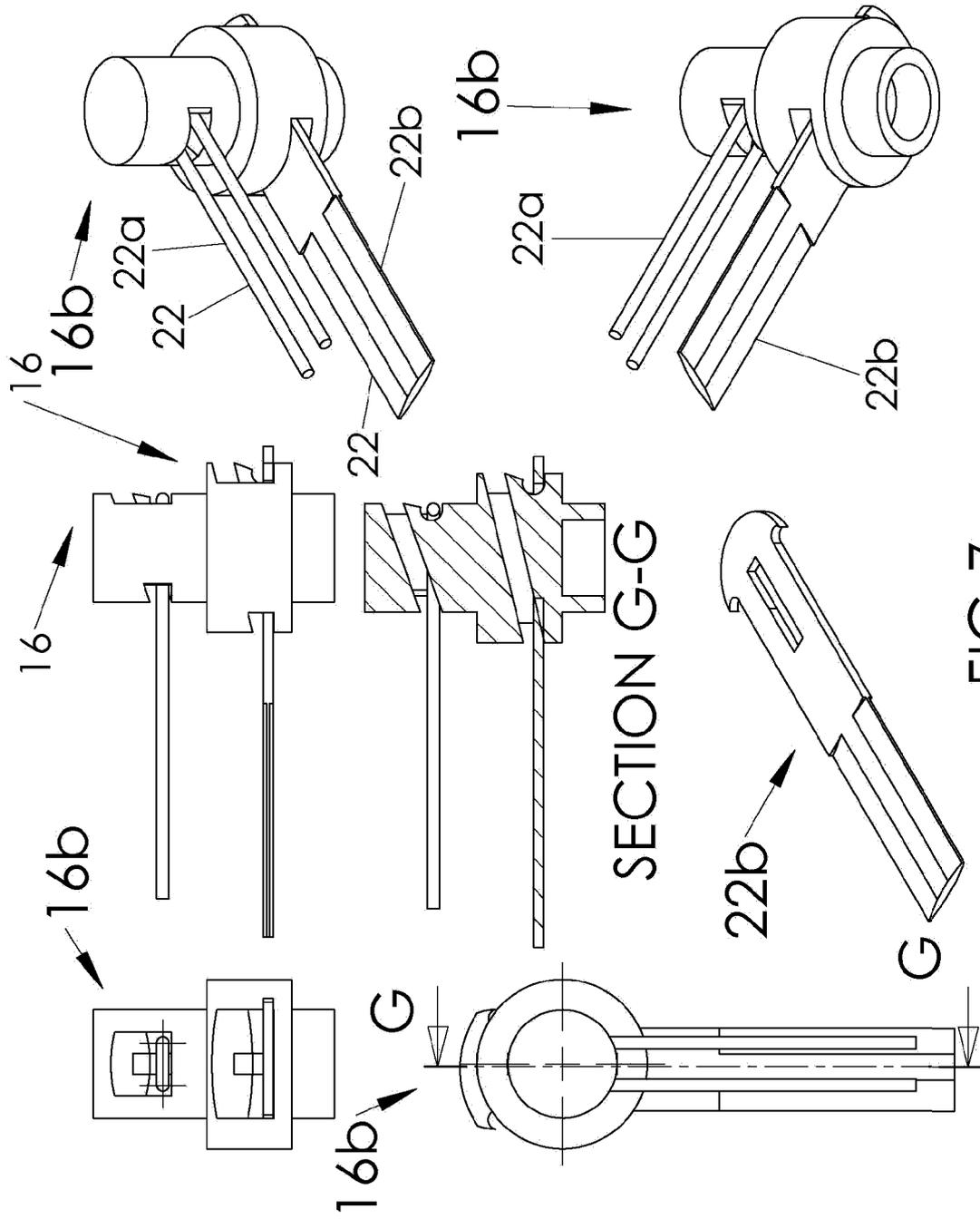
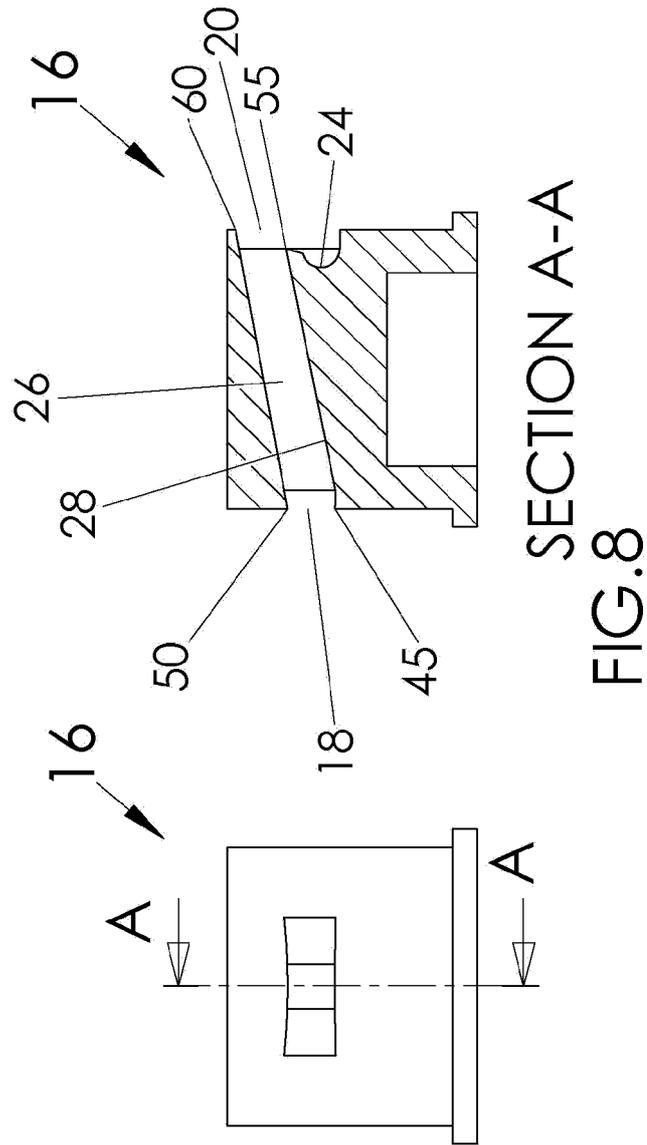


FIG. 7



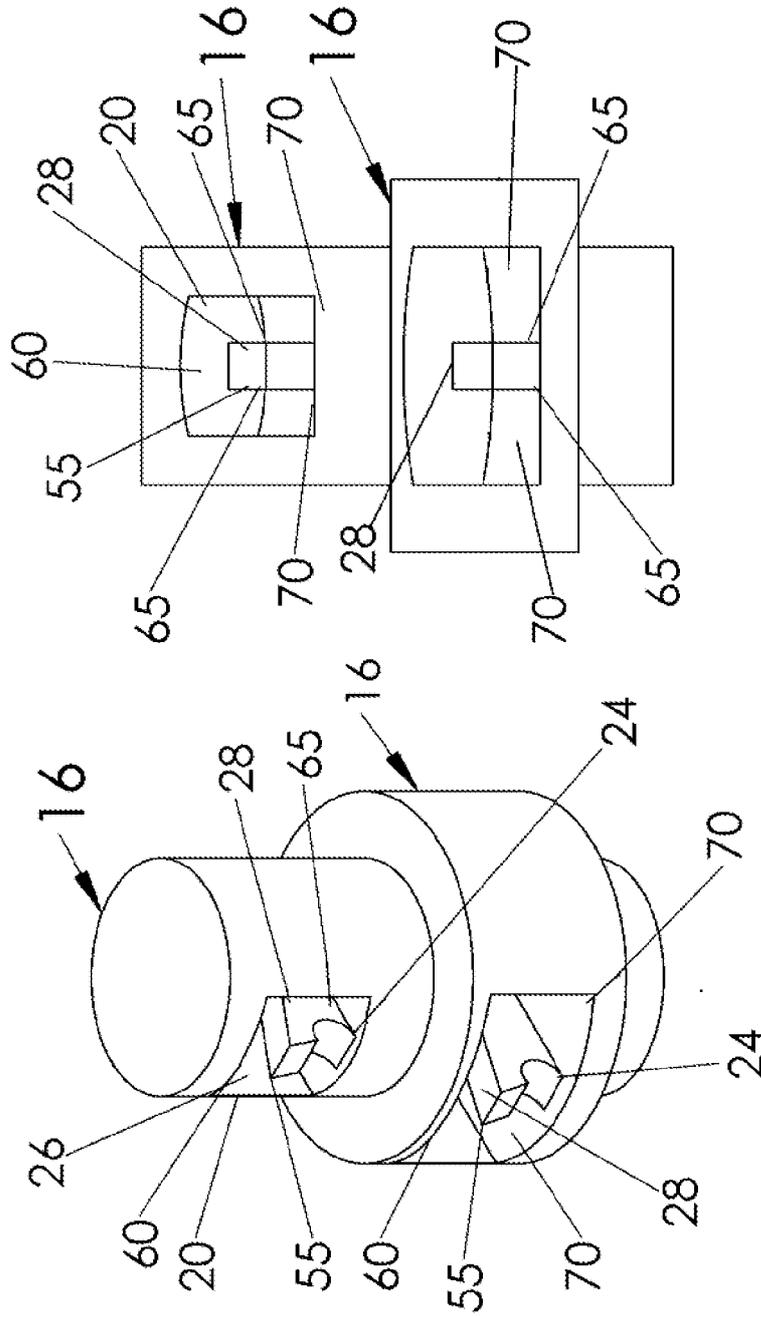


FIG. 9

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 13/53801

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> <b>IPC(8) - A01 D 34/41 6 (2013.01 )</b> <b>USPC - 30/276, 347; 56/12.7</b> According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) USPC 30/276, 347; 56/12.7 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched IPC(8): A01D 34/416 (2013.01) USPC: 30/276, 329, 335, 337, 347, DIG5; 56/12.7 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase, Google (Patents, Scholar, Web):trimmer, edger, whipper snipper, weeder, weedeater, brushcutter, weedwacker, weedwhip, strimmer, trim, cut, shear, edge, grass, lawn, brush, weeds, vegetation, line, string, filament, mono, monofilament, wire, cable, rope, ramp, slope, incline, decline, grade, rise, slant, retain, hold, clamp, secure, grasp,		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,048,278 A (Jones et al) 17 September 1991 (17.09.1991), col 2, ln 61 to col 4, ln 8, Figs. 1-8	1-13
A	US 7,000,324 B2 (Fogle) 21 February 2006 (21.02.2006), col 3, ln 38-47; Fig. 5b	1-13
A	US 5,979,064 A (Kitz et al.) 09 November 1999 (09.11.1999), col. 2, ln. 50 - col. 3, ln. 15, Fig. 5	1-13
A	US 5,433,006A (Taguchi) 18 July 1995 (18.07.1995), col. 4, ln. 38-61, Figs. 2-5	1-13
A	US 6,108,914 A (Sheldon) 29 August 2000 (29.08.2000), col. 2, ln. 37-65, Figs. 2, 4, 6-7	1-13
A	US 5,836,227 A (Dees Jr. et al) 17 November 1998 (17.11.1998), col 1, ln 50 to col 2, ln 17; col 4, ln 6-34, Figs. 4-7	1-13
<input type="checkbox"/> Further documents are listed in the continuation of Box C.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
26 November 2013 (26.11.2013)		02 JAN 2014
Name and mailing address of the ISA / U S Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774