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(54) Title: FISH HOOK WITH MULTIPLE CONVEX FACETS

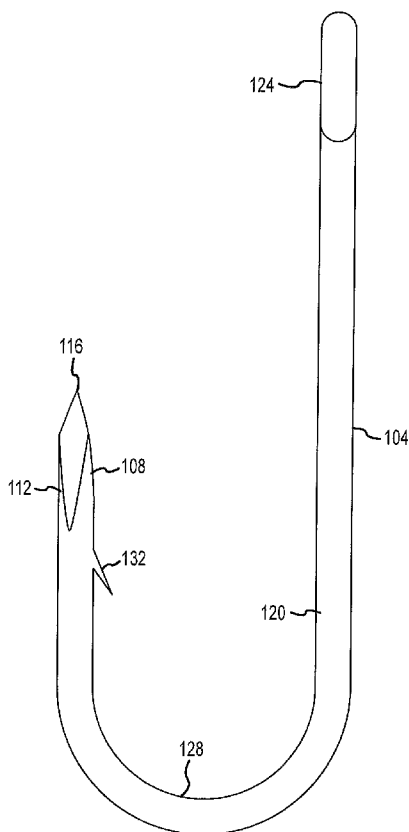


FIG. 1

(57) Abstract: A fish hook with multiple convex facets is provided. Each facet may have a length that is some multiple of the diameter of the hook body. In addition, each convex facet has a radius of curvature that is some multiple of the diameter of the wire. Each facet may alternatively be formed from first and second convex surfaces, having first and second curvatures.



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FISH HOOK WITH MULTIPLE CONVEX FACETS

FIELD

The present invention is directed to a fish hook with multiple convex facets.

BACKGROUND

5 Line and hook fishing is a popular and efficient means of catching fish. Typically, a fish hook is formed from round wire that has been bent into a U or hook shape, with a point at a first end, and an eye at a second end. In a typical fish hook, the point is formed into a conical or “needle point” shape. In order for a conical point to penetrate the fish’s mouth, the membrane comprising the lining of the mouth must be stretched over the point
10 before the membrane is punctured. Moreover, the point has to continue to expand the membrane to penetrate up to and beyond the barb, which can require a significant amount of energy.

In order to reduce the force required to penetrate the fish’s mouth, faceted points have been developed. A faceted point provides cutting edges that allow the point to more
15 efficiently penetrate the fish’s mouth. In particular, the amount of energy required for a faceted point to penetrate a membrane can be much less than is required for a conical point of similar size to penetrate that membrane. However, faceted points typically are weak, and therefore prone to bending or breaking. This is because the faceted surfaces typically acquire a concave shape during the grinding process used to form the facets, leaving little
20 material at or towards the apex of the point. Therefore, the strength and durability of the resulting point may be less than desired.

SUMMARY

The present invention is directed to solving these and other problems and disadvantages of the prior art. In accordance with embodiments of the present invention, a
25 fish hook with multiple convex facets is provided. As a result, at a selected distance from the tip of the point, the cross-section of a point as disclosed herein has more material, and therefore is stronger, than an otherwise similar point with a typical concave facet shape. Accordingly, a strong point that provides multiple cutting edges is provided.

A fish hook as disclosed herein includes a point with two or more convex facets.
30 For example, the point of a fish hook in accordance with embodiments of the present invention can include three convex facets. In accordance with further embodiments, the point can include three or more convex facets. The facets can each have the same or different dimensions. In accordance with further embodiments, the facets can include

double radius facets, where each facet follows a first radius over a first portion or distance, and a second radius over a second portion or distance.

In accordance with embodiments of the present invention, the facets have a length that is from about 2 times to about 6 times the diameter of the wire on which the multiple
5 convex facet point is formed. In accordance with further embodiments, the curve of the convex facets follows a radius that is from about 15 times to about 150 times the diameter of the wire on which the multiple convex facets of the point are formed. In accordance with other embodiments, the ratio of the facet length to the wire diameter is about 4.5 to 1, and the ratio of the radius of curvature of the convex facets to the wire diameter is about
10 30 to 1, 120 to 1, 140 to 1, or 150 to 1.

Additional features and advantages of embodiments of the present invention will become more readily apparent from the following description, particularly when taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

15 **Fig. 1** is a side view of a fish hook with multiple convex facets in accordance with embodiments of the present invention;

Fig. 2 is a top plan view of a point portion of a fish hook having multiple convex facets in accordance with embodiments of the present invention;

20 **Fig. 3** is a view taken along a line corresponding to the intersection between two adjacent facets of a fish hook with multiple convex facets in accordance with embodiments of the present invention;

Fig. 4 is a side view of a point portion of a fish hook having multiple convex facets in accordance with embodiments of the present invention;

25 **Fig. 5** is an end on view of a point portion of a fish hook with multiple convex facets in accordance with embodiments of the present invention;

Fig. 6 is a top plan view of a point portion of a fish hook with multiple convex facets in accordance with other embodiments of the present invention;

Fig. 7 is a side view of a point portion of a fish hook with multiple convex facets in accordance with other embodiments of the present invention;

30 **Fig. 8** is an end on view of a point portion of a fish hook having multiple facets in accordance with other embodiments of the present invention;

Fig. 9 is a top plan view of a point portion of a fish hook having multiple convex facets in accordance with other embodiments of the present invention;

Fig. 10 is a view taken along a line corresponding to the intersection between two adjacent facets of a fish hook with multiple convex facets in accordance with other embodiments of the present invention;

Fig. 11 is a side view of a point portion of a fish hook having multiple convex
5 facets in accordance with other embodiments of the present invention; and

Fig. 12 is an end on view of the point portion of a fish hook with multiple convex facets in accordance with other embodiments of the present invention.

DETAILED DESCRIPTION

Fig. 1 illustrates a fish hook 104 in accordance with embodiments of the present
10 invention. The fish hook 104 includes a point portion 108 formed from multiple facets 112. More particularly, the point portion 108 in accordance with embodiments of the present invention is formed from multiple convex facets 112. The tip 116 of the point portion 108 is located at a first end of a wire blank or body 120 from which the fish hook 104 is formed. In the finished form illustrated in **Fig. 1**, the fish hook 104 typically
15 includes an eye 124 formed at a second end of the wire body 120 with a bend 128 formed between the first and second ends, creating a hook shape. The fish hook 104 can also include a barb 132 adjacent the point portion 108.

Fig. 2 is a top plan view of the point portion 108 and barb 132 of a fish hook 104 in accordance with embodiments of the present invention. In this embodiment, which
20 features three convex facets 112, a first convex facet 112a is shown. In accordance with embodiments of the present invention, the facet 112 has a length L that is from about 2 times to about 6 times the diameter D of the wire body 120. In accordance with still other embodiments, the length L of the facets 112 is about 4.5 times the diameter D of the body 120. As used herein, a dimension or parameter is “about” another dimension or parameter
25 if it is within about 10% of the stated dimension or parameter. In accordance with still other embodiments, the length L of each facet 112 is 4.5 times the diameter D of the wire body 120.

Fig. 3 illustrates a view of the point portion 108 and barb 132 of the fish hook 104 shown in **Figs. 1-2**, with the point portion 108 of the fish hook 104 rotated about 60° about
30 a center axis C of the point portion 108 as compared to the view shown in **Fig. 2**. More particularly, the intersection between two convex facets 112a and 112b is shown. In addition, the point portion 108, including areas at and near the tip 116, can be seen to benefit from reinforcement as a result of the convex facets 112a and 112b provided by the present invention. That is, as compared to a point having facets with a flat or concave

surface, a point portion 108 with convex facets 112 as described herein has a larger cross section for a given wire diameter, facet length, and distance from the tip.

Fig. 4 illustrates the point portion 108 and barb 132 of the fish hook shown in **Figs. 1-3**, in side elevation. Accordingly, the view in **Fig. 4** is with the point portion 108 of fish hook 104 rotated about 90° about the center axis C of the point portion 108 as compared to the view shown in **Fig. 2**, and by about 30° as compared to the view shown in **Fig. 3**. In **Fig. 4**, the convex surface of the first facet 112a is best illustrated. Although depicted with a distinct peak or break for purposes of clarity and to emphasize that the facets 112 are convex (*i.e.*, they bulge outwardly), it should be appreciated that embodiments of the present disclosure can have facets 112 that each have a surface that follows a smooth curve having a relatively large radius (*e.g.*, as shown in **Fig. 1**). In accordance with embodiments of the present invention, the radius of curvature of each of the convex facets 112 is from about 15 times to about 150 times the diameter D of the wire body 120. In accordance with still other embodiments, the radius of curvature of each of the facets 112 is about 140 times the diameter D of the body portion 120. In accordance with still other embodiments, the radius of curvature of each facet 112 is about 120 times the diameter D of the body portion 120. As used herein, "about" means within $\pm 5\%$ of the stated amount.

Fig. 5 is an end on view, taken along the center axis C of the point portion 108 of the fish hook 104, of the point portion 108 and barb 132 of the fish hook illustrated in **Figs. 1-4**. In particular, **Fig. 5** shows each of the three facets 112a, 112b and 112c that comprise the point portion 108 of this three faceted point embodiment.

Fig. 6 is a top plan view of the point portion 108 of a fish hook 104 in accordance with other embodiments of the present invention. More particularly, **Fig. 6** illustrates a point 108 formed from four facets 112. In the view shown in **Fig. 6**, the radius of curvature of the second 112b and fourth 112d facets can be seen. The facet 112 length, wire body 120 diameter ratios, and the facet 112 radius of curvature to wire body 120 diameter ratios can be within the same or similar ranges as other described embodiments.

Fig. 7 is a side view of the point portion 108 of a fish hook 104 of the embodiment illustrated in **Fig. 6**. The view in **Fig. 7** is with the point portion 108 of the fish hook 104 rotated by about 90° about the center axis C of the point portion 108 as compared to the view shown in **Fig. 6**. **Fig. 7** shows the convex curvature of the first 112a and third 112c facets of the point portion 108 of the fish hook 104. The radius of curvature of the first 112a and third 112c facets can be described by a radius of curvature that is within the same or similar ratio ranges to the wire diameter as other described embodiments.

Fig. 8 is an end on view, taken along the center axis C of the point portion 108 of the fish hook 104, of the point portion 108 and barb 132 of the fish hook 104 illustrated in **Figs. 6** and **7**. In **Fig. 8**, each of the facets 112a-112d can be seen.

Fig. 9 is a top plan view of the point portion 108 and barb 132 of a fish hook 104 in accordance with still other embodiments of the present invention. In this embodiment, the facets 112 comprise dual radius facets. In particular, a first or tip portion 904 of each facet 112 follows a first radius of curvature, while a second portion 908 of each facet 112 follows a second radius of curvature. **Fig. 10** illustrates the point portion 108 and barb 132 of the fish hook 104 of **Fig. 9**, with the point portion 108 of the fish hook 104 rotated about 60° about a center axis of the point portion 108 as compared to the view shown in **Fig. 9**. **Fig. 11** illustrates the point portion 108 and barb 132 of the fish hook shown in **Figs. 9** and **10**, with the point portion 108 of the fish hook 104 rotated by about 90° about a center axis of the point portion 108 as compared to the view shown in **Fig. 9**, and by about 30° as compared to the view shown in **Fig. 10**. **Fig. 12** is an end on view, taken along the center axis C of the point portion 108 of the fish hook 104, of the point portion 108 and barb 132 of the fish hook illustrated in **Figs. 9-11**. In particular, **Fig. 12** shows each of the three facets 112a, 112b, and 112c that comprise the point portion 108 of this three faceted point embodiment. Moreover, **Fig. 12** shows the first 904 and second 908 portions of each of the facets 112. In accordance with embodiments featuring dual radius facets, the first portion 904 of each facet 112 can feature or follow a radius of curvature that is different than the radius of curvature of the second portion 908. As an example, the first portion 904 of each facet 112 can feature a radius of curvature that is about 30 times the diameter D of the wire body 120, while the radius of curvature of the second portion 908 can be from about 20 times to about 150 times the diameter D of the wire body 120. As yet another example, one portion 904 or 908 can have a radius of curvature that is infinite (*i.e.*, one portion 904 or 908 can be flat).

Although a barb 132 has been illustrated as part of a fish hook 104, it should be appreciated that a barb 132 is not required. Accordingly, a point with multiple convex facets 112 in accordance with embodiments of the present invention can be provided as part of a barbless fish hook 104. Alternatively, a point with multiple convex facets 112 in accordance with embodiments of the present invention can be provided with multiple barbs 132.

In various embodiments illustrated and described herein, the facets 112 are shown having equal sizes, radiuses of curvature and spacings. However, other embodiments can

be provided with facets 112 of different sizes, radiuses of curvature and spacings. In accordance with embodiments of the present invention, a fish hook 104 with multiple facets is formed by grinding an end of a wire. Moreover, the wire may be of any diameter deemed suitable for a particular application of the hook 104 formed therefrom. In addition, although the body 120 has been described as comprising wire, other materials and/or forms of material can be provided with a multiple faceted point as part of a fish hook 104 in accordance with embodiments of the present invention. For example, a fish hook 104 with multiple convex facets 112 can be formed by molding a plastic or other material.

10 A fish hook 104 with multiple convex facets 112 in accordance with embodiments of the present invention can be defined using three parameters: wire diameter, point length L to wire diameter D ratio, and the ratio of the grind radius of the facets 112 to the wire diameter D , referred to herein as the radius of curvature of the facets 112. A fish hook 104 having multiple convex facets 112 as described herein can be formed using computer
15 numeric control machining techniques. More particularly, by providing three axes of wire blank motion, facets 112 having a convex shape can be formed. In addition, although various radiuses of curvature have been provided as examples, embodiments of the present invention are not limited thereto. In particular, a fish hook 104 having a point portion 108 formed from multiple facets 112, where each facet is convex and therefore curves
20 outwardly from a line drawn between the tip of the point and the starting point of the facet can be provided. Moreover, in addition to following a first radius of curvature, or following first and second radiuses of curvature, facets 112 can have three or more radiuses of curvature. In addition, the tip portion 904 can have a radius of curvature that is larger than the radius of curvature of the second portion 908 of a multiple radius faceted
25 112 fish hook 104.

In an exemplary configuration, a fish hook 104 featuring three convex facets 112 having a length that is 4.5 times the diameter of the body 120 and a radius of curvature that is 150 times the diameter of the body 120 is provided. For such an exemplary embodiment, at a distance of about 15 thousandths of an inch from the apex of the point,
30 the amount of material in a cross-section at that location is about 2 times the amount of material provided in a conventional concave three facet point and as a result the strength of this exemplary embodiment is about twice that of the conventional faceted point. Other exemplary facet 112 length L to wire diameter D ratios include three to one and six to one.

Other exemplary convex facet 112 curvatures include radius of curvature to wire diameter D ratios of 20 to 1, 25 to 1, 120 to 1, 140 to 1, and 160 to 1.

5 The foregoing discussion of the invention has been presented for purposes of illustration and description. Further, the description is not intended to limit the invention to the form disclosed herein. Consequently, variations and modifications commensurate with the above teachings, within the skill or knowledge of the relevant art, are within the scope of the present invention. The embodiments described hereinabove are further intended to explain the best mode presently known of practicing the invention and to enable others skilled in the art to utilize the invention in such or in other embodiments and
10 with various modifications required by the particular application or use of the invention. It is intended that the appended claims be construed to include alternative embodiments to the extent permitted by the prior art.

What is claimed is:

1. A fish hook, comprising:
a body;
a point having a plurality of facets formed at a first end of the body, wherein each
5 of the facets includes a convex surface.
2. The fish hook of Claim 1, wherein the body has a diameter, and wherein
the convex surface of each facet has a radius of curvature of from about 15 times to about
150 times the diameter.
3. The fish hook of Claim 2, wherein a length of each convex facet is from
10 about 2 times to about 6 times the wire diameter.
4. The fish hook of Claim 3, wherein the point includes at least three facets.
5. The fish hook of Claim 3, wherein the point includes three facets.
6. The fish hook of Claim 2, wherein the point includes at least three facets.
7. The fish hook of Claim 2, wherein the point includes three facets.
- 15 8. The fish hook of Claim 1, wherein the body is bent to form a bend portion
between the point at the first end and a second end of the body.
9. The fish hook of Claim 8, wherein a shank portion, the bend, and the point
are all formed from a single piece of wire.
10. The fish hook of Claim 9, wherein the wire has a diameter, wherein the
20 length of each convex surface is about 4.5 times the diameter of the wire, and wherein the
convex surface of each facet has a radius of about 30 times the diameter of the wire.
11. The fish hook of Claim 1, further comprising a barb.
12. The fish hook of Claim 1, wherein each facet includes first and second
convex surfaces.
- 25 13. The fish hook of Claim 12, wherein the first convex surface has a first
radius, and wherein the second convex surface has a second radius.
14. A method for producing a fish hook comprising:
grinding multiple convex facets at an end of a wire.
15. The method of Claim 14, wherein grinding multiple convex facets includes
30 grinding the multiple convex facets to a radius that is from about 15 times to about 50
times a diameter of the wire.
16. The method of Claim 15, wherein grinding multiple convex facets includes
grinding the multiple convex facets to a length that is from about 2 times to about 6 times
the diameter of the wire.

17. The method of Claim 16, wherein grinding multiple convex facets includes grinding at least three convex facets.

18. The method of Claim 17, further comprising:
forming a barb.

5 19. The method of Claim 18, wherein grinding multiple convex facets includes grinding a first convex surface having a first radius and a grinding a second convex surface for each of the facets.

20. A fish hook, comprising:

a wire body, wherein the wire has a diameter;

10 a three faceted point at a first end of the wire, wherein each facet of the point is convex and has a radius of 4.5 times the diameter of wire, and wherein each facet has a length that is from 100 to 150 times the diameter of the wire;

an eye at a second end of the wire;

a bend between the eye and the point;

15 a barb between the bend and the point.

1/4

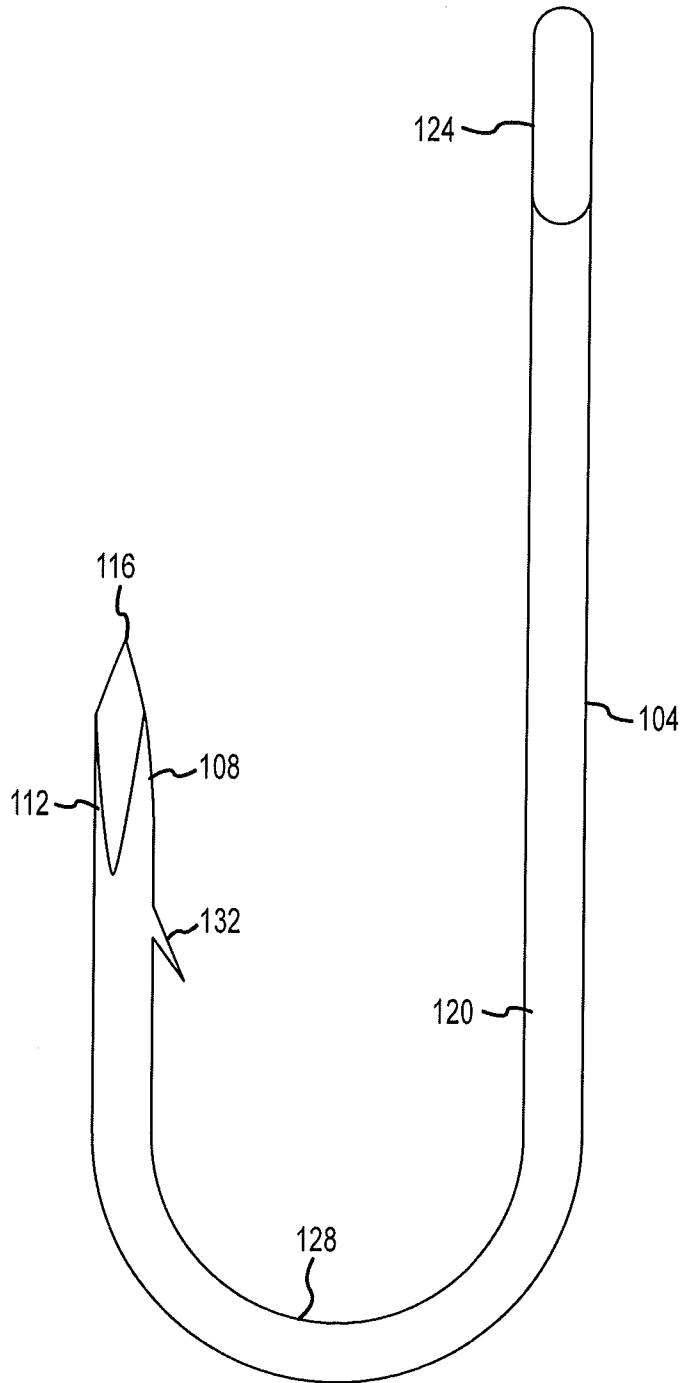


FIG.1

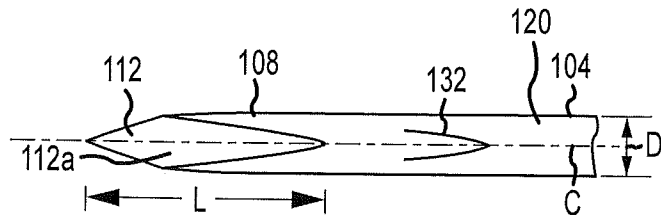


FIG. 2

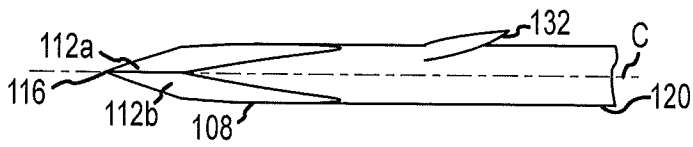


FIG. 3

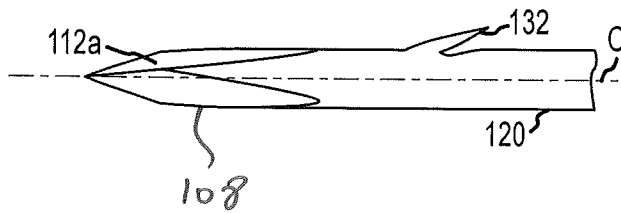


FIG. 4

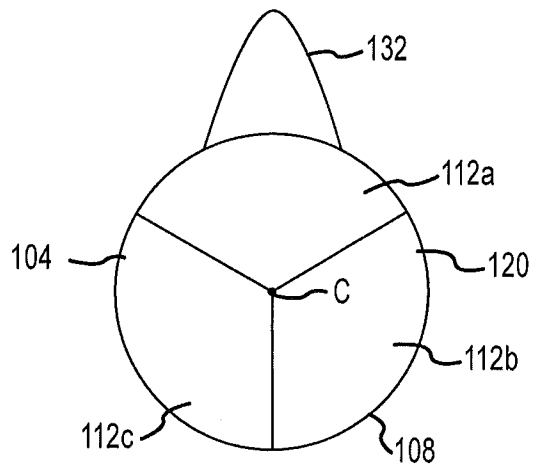


FIG. 5

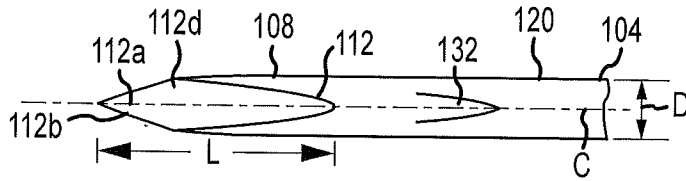


FIG. 6

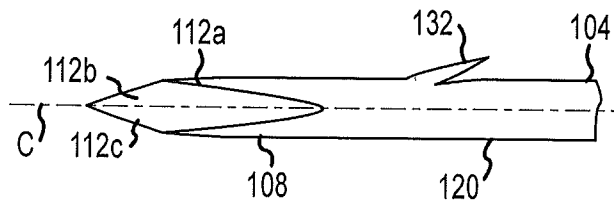


FIG. 7

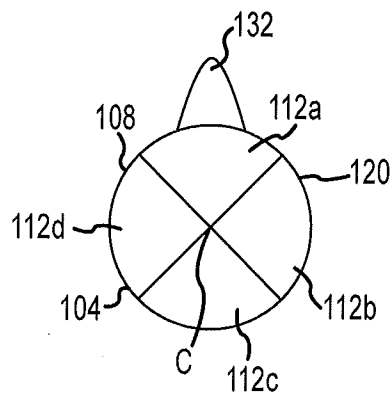


FIG. 8

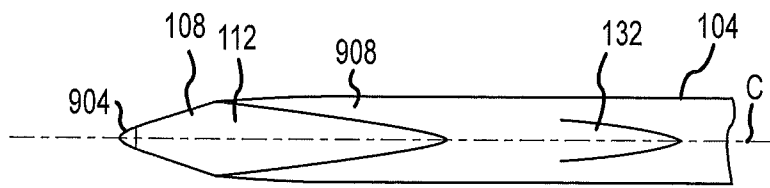


FIG. 9

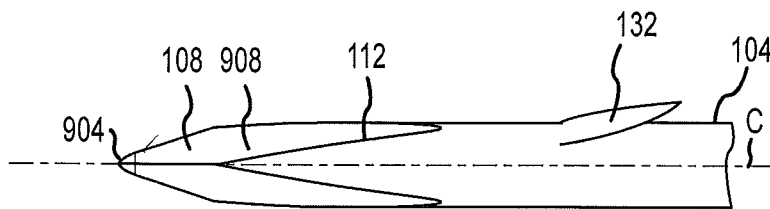


FIG. 10

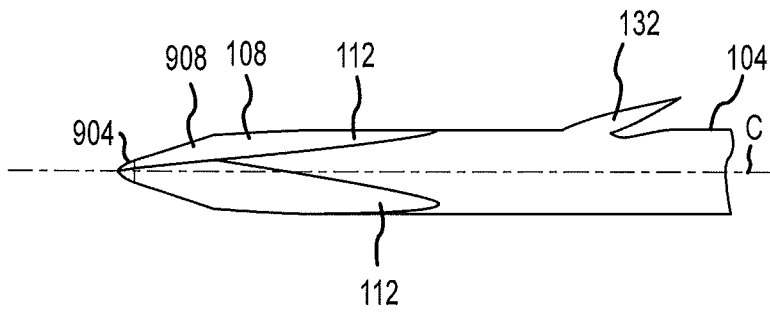


FIG. 11

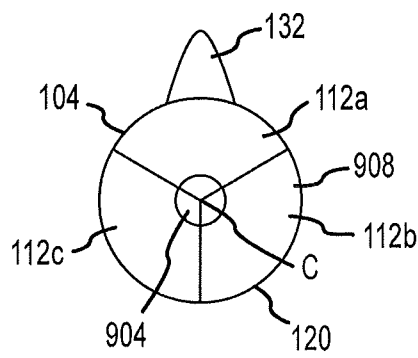


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/37018

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - A01K 83/00 (2012.01)
 USPC - 43/43.16
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC: A01K 83/00 (2012.01)
 USPC: 43/43.16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 IPC: A01K 83/00 (2012.01)
 USPC: 43/4, 34, 43.1, 44.82

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 DialogWeb (European Patents Fulltext; WIPO/PCTPatents Fulltext; U.S. Patents Fulltext), Google (Patents Scholar, Web)
 Search Terms: fish, angle, bait, troll, hook, catch, grapple, multiple, numerous, multitude, many, diverse, multifaceted, facet, face, plane, feature, convex, bent, arch, concave, dent, scoop, round indent, sunk, bend, barb, prong.

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 2,164,807 A (Evans) 04 July 1939 (04.07.1939) page 1, col 2, ln 49 to page 2, col 1, ln 1; Fig. 1, 2, 4	1-8, 11-13 ----- 9, 10, 14-20
Y	US 2005/0241214 A1 (Ferguson) 03 November 2005 (03.11.2005) Fig 1; para [0016], [0017]	9, 10, 14-20
A	US D594,528 S (Ferguson et al.) 16 June 2009 (16.06.2009) Entire document	1-20
A	US D594,527 S (Ferguson et al.) 16 June 2009 (16.06.2009) Entire document	1-20

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
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"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 03 July 2012 (03.07.2012)	Date of mailing of the international search report 16 JUL 2012
Name and mailing address of the ISA/US 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