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(54) **HOOK DEVICE WITH OPPOSING JAWS**

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Publication Classification

(51) **Int. Cl.**

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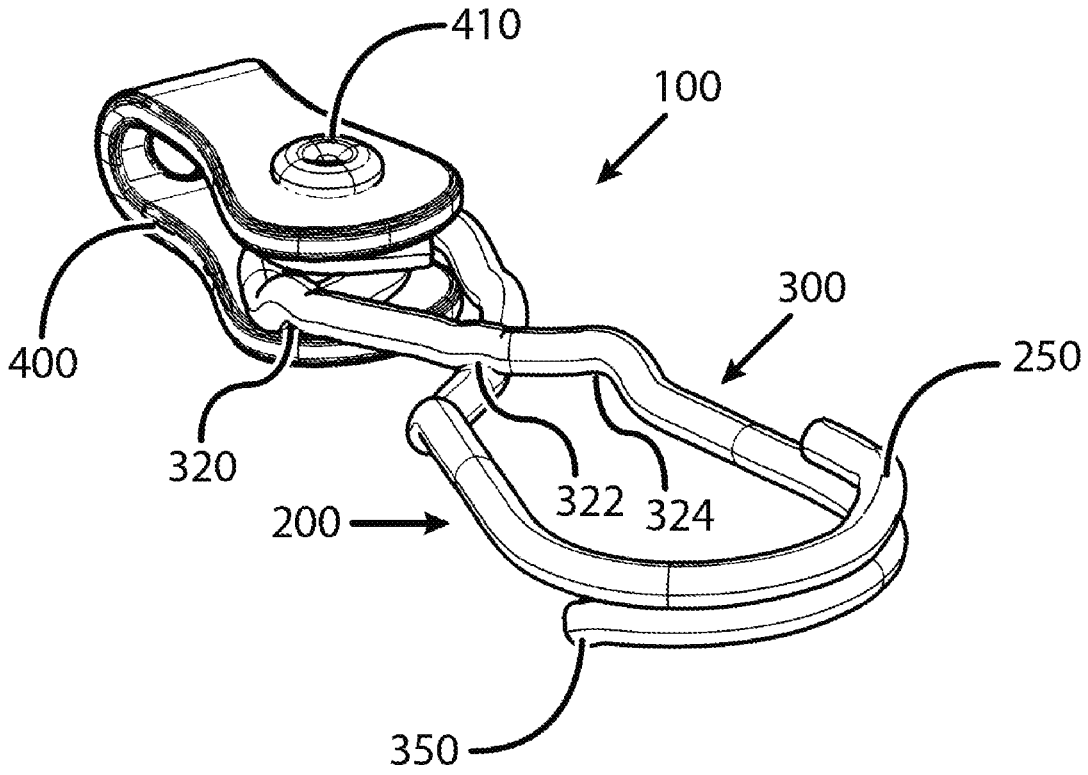
B60P 7/08	(2006.01)
F16B 2/10	(2006.01)

(52) **U.S. Cl.**

CPC ***F16B 45/00*** (2013.01); ***F16B 2/10*** (2013.01); ***B60P 7/0823*** (2013.01)

(57) **ABSTRACT**

A hook device for bungee cords comprising a pair of opposing hooks whose bends substantially overlap when the device is in a closed configuration. The hooks may rotate away from each other into an opened configuration to enclose an object, and the hooks may rotate towards each other into a crossed configuration to provide a pull tab. The hooks are resistively held in each configuration by retaining elements. One hook may have a shallow throat to enable insertion into narrow openings.



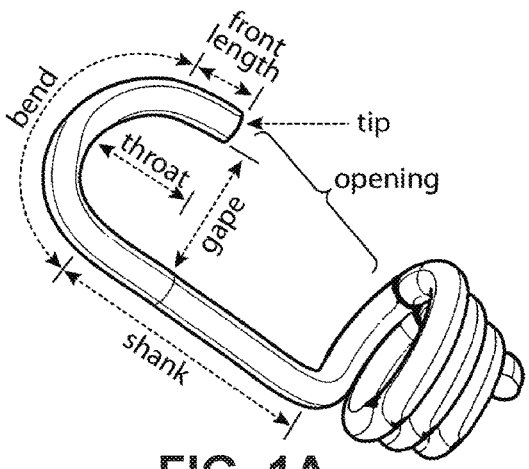


FIG. 1A

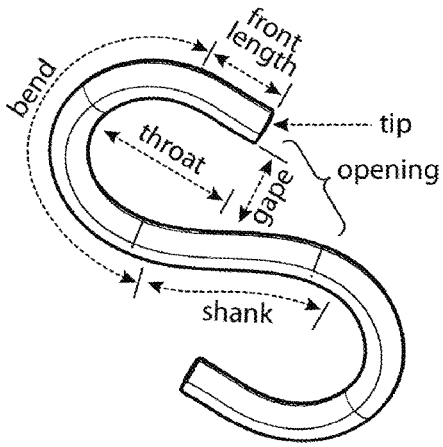


FIG. 1B

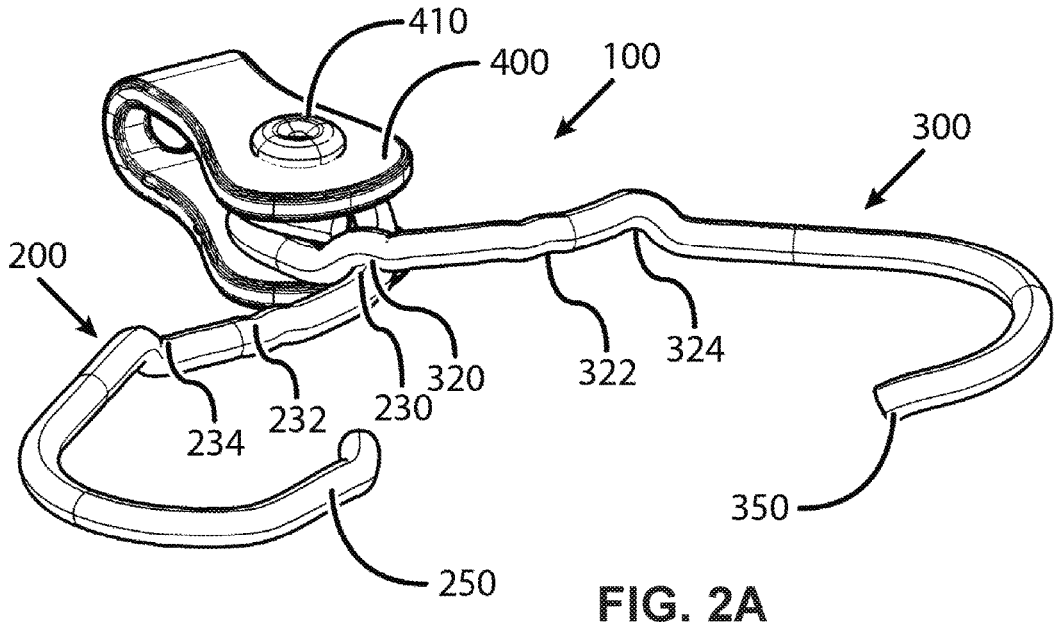
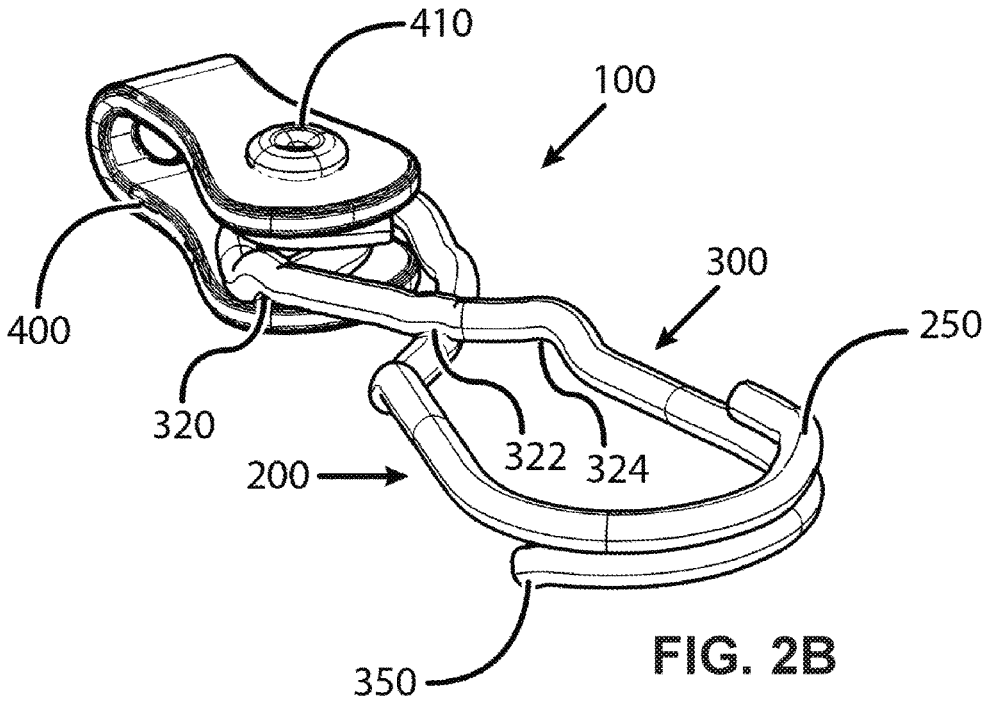


FIG. 2A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300
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350

FIG. 2B

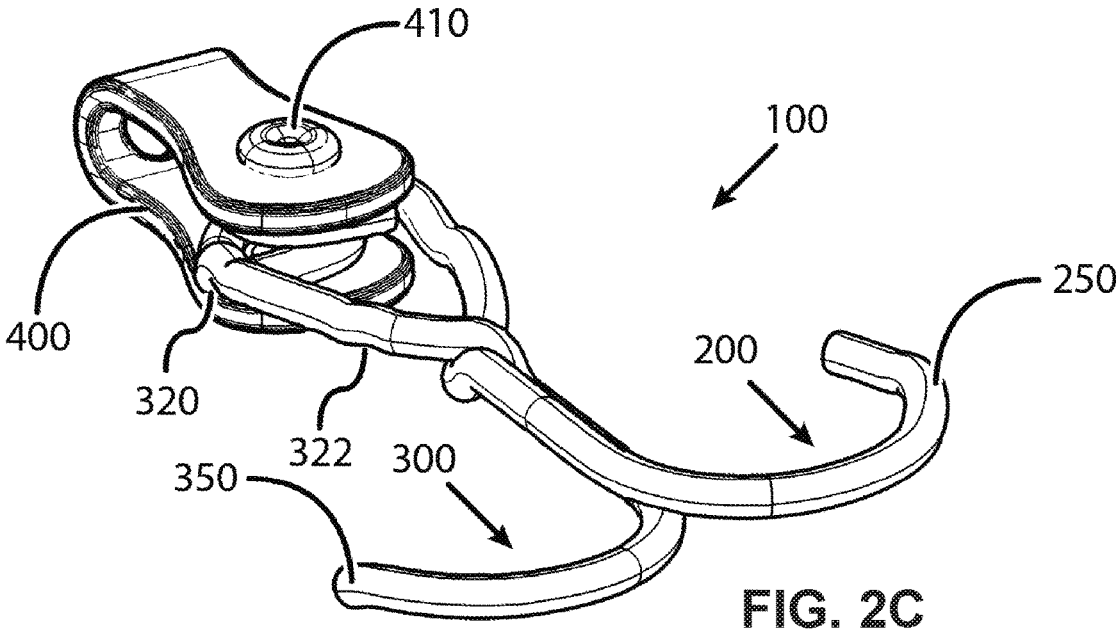
410
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FIG. 2C

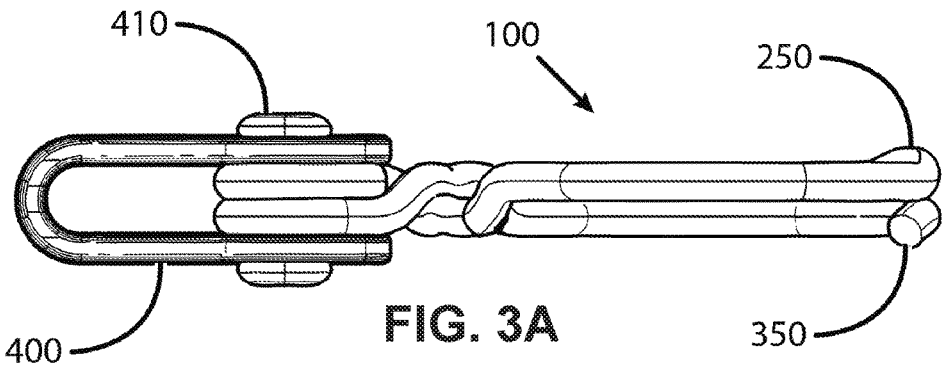

FIG. 3A

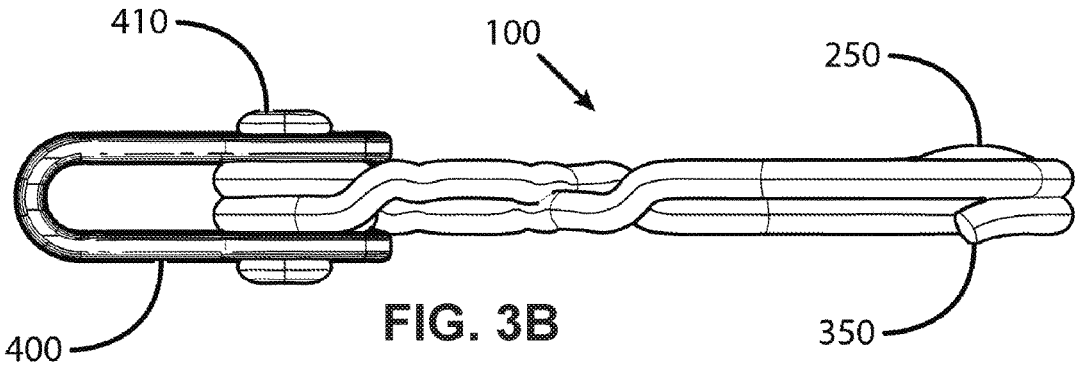

FIG. 3B

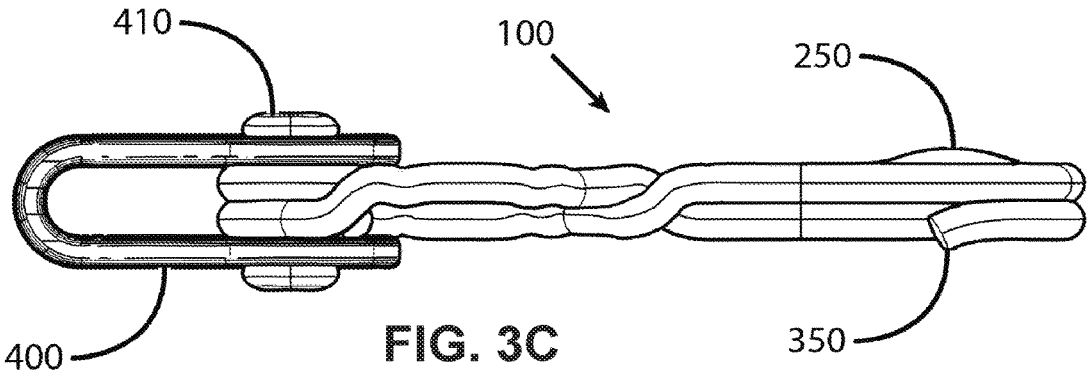

FIG. 3C

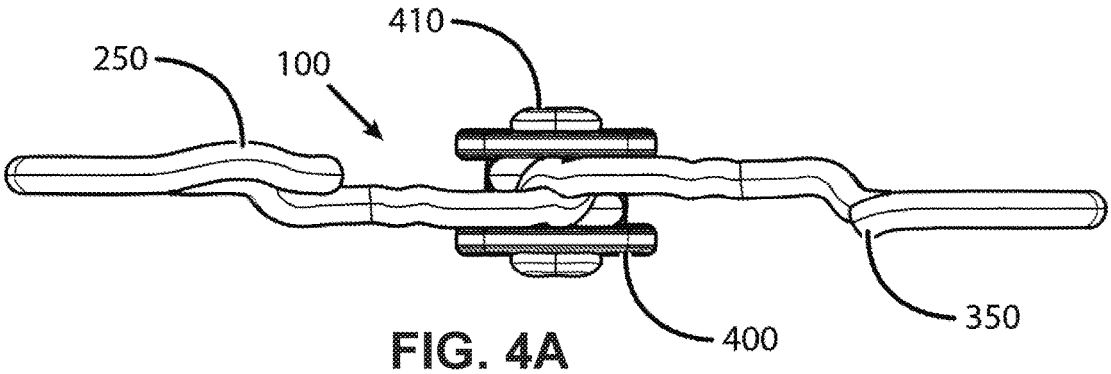

FIG. 4A

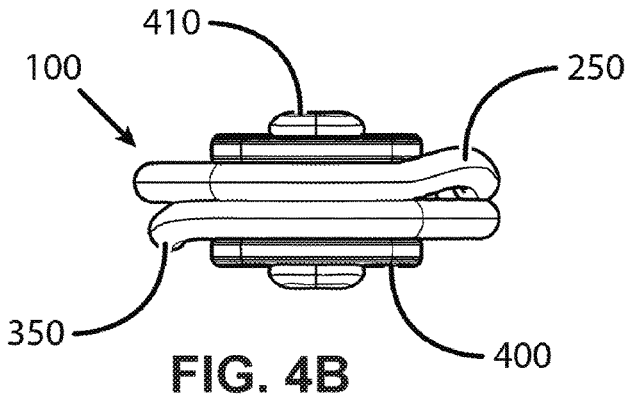

FIG. 4B

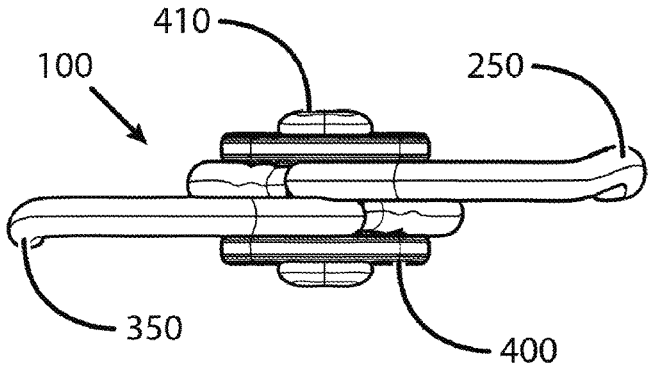

FIG. 4C

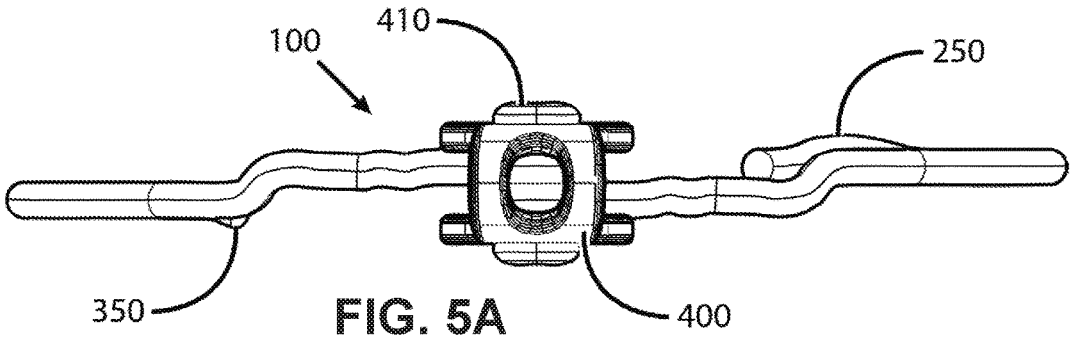

FIG. 5A

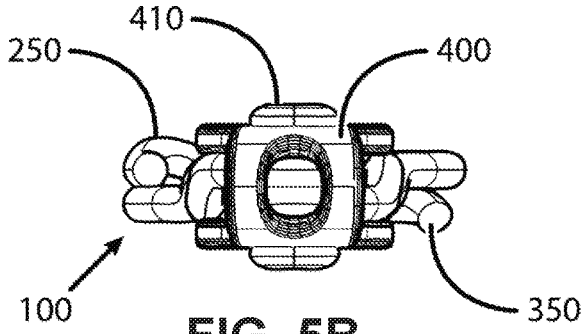

FIG. 5B

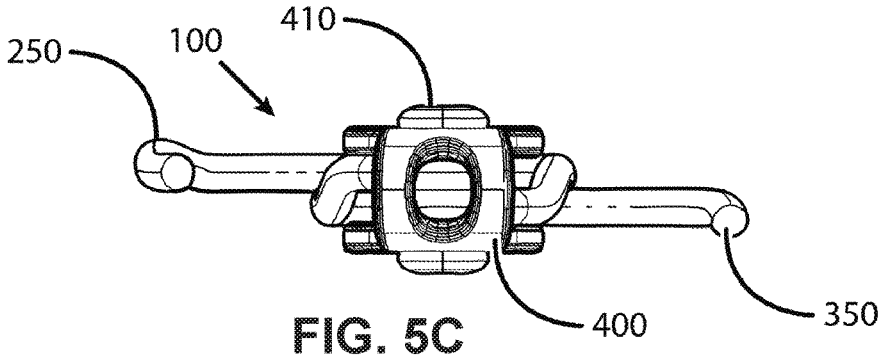

FIG. 5C

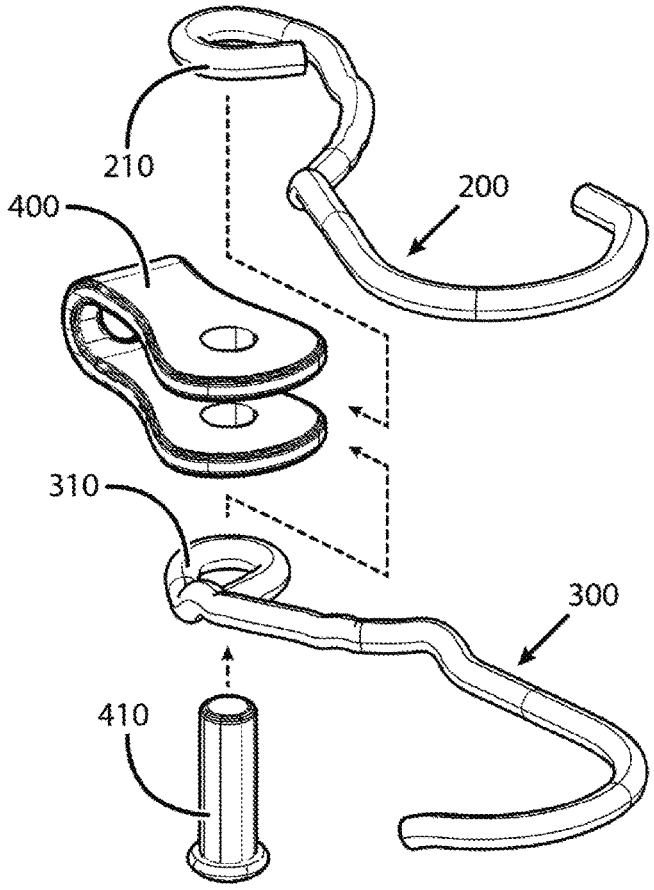

FIG. 6

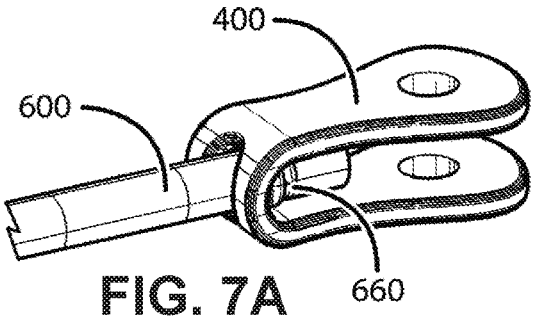

FIG. 7A

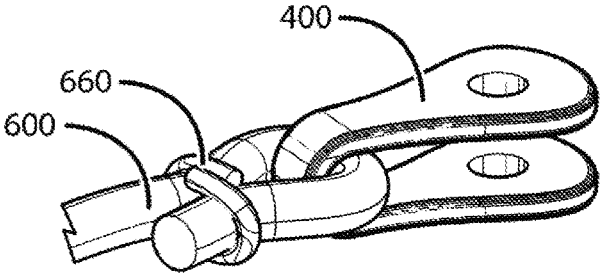

FIG. 7B

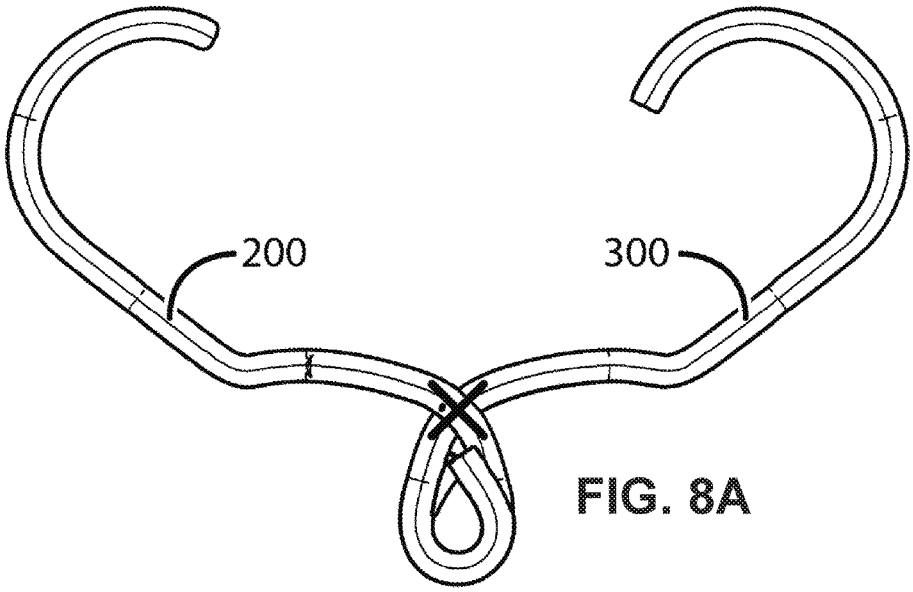

FIG. 8A

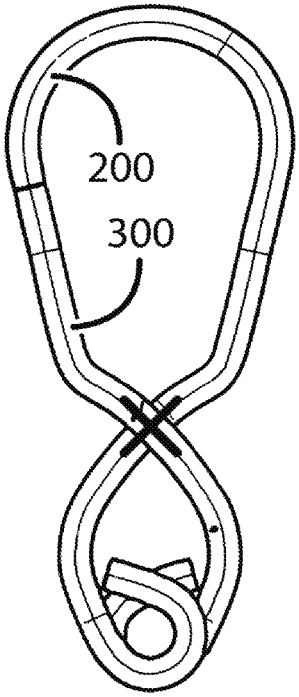

FIG. 8B

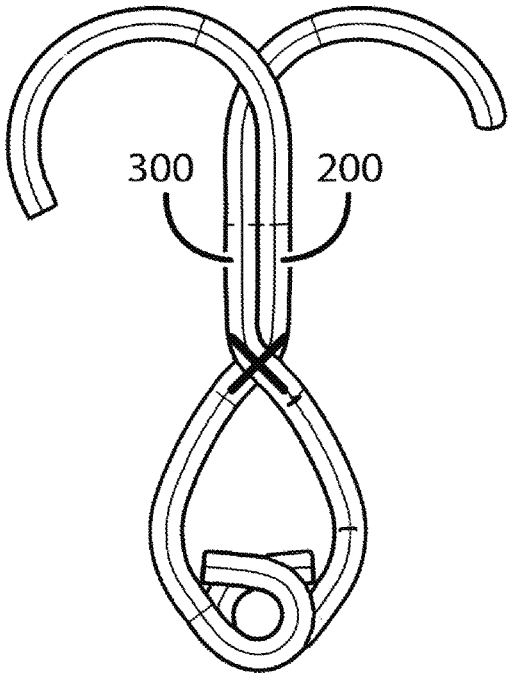

FIG. 8C

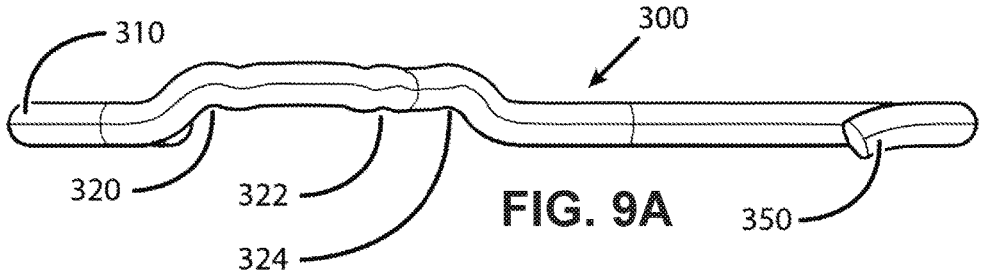

FIG. 9A

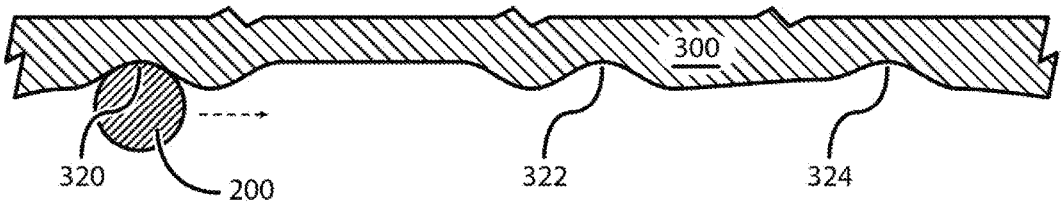

FIG. 9B

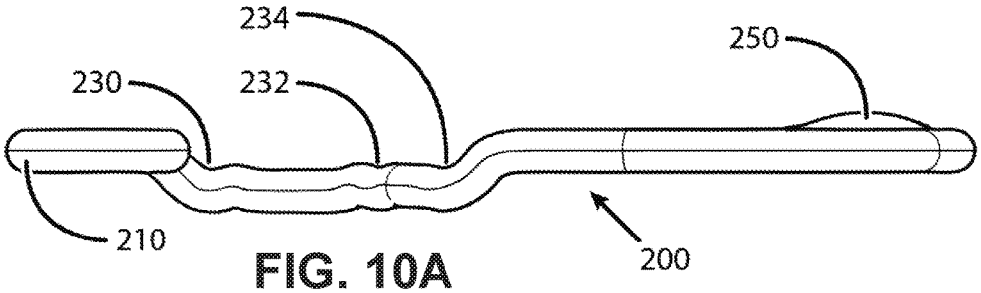

FIG. 10A

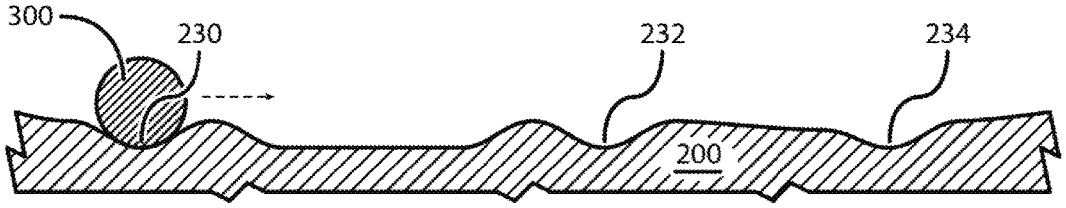

FIG. 10B

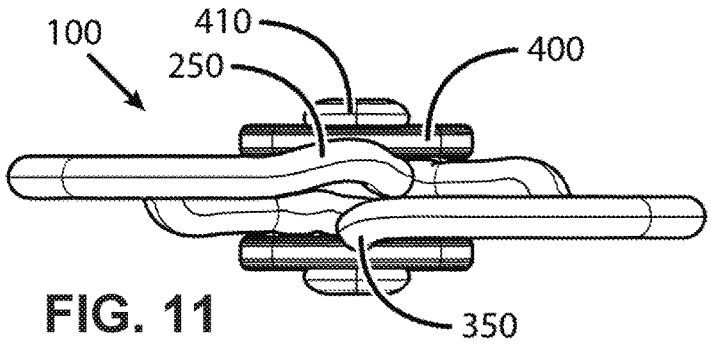

FIG. 11

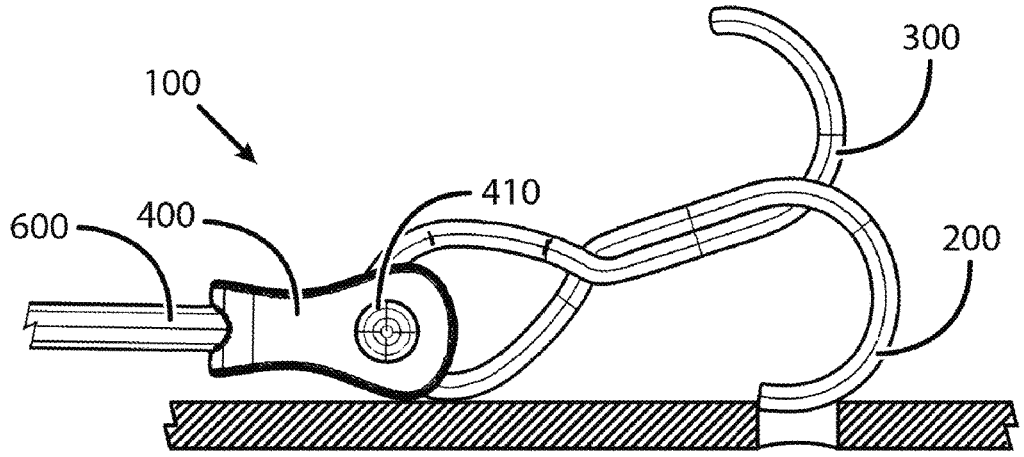

FIG. 12A

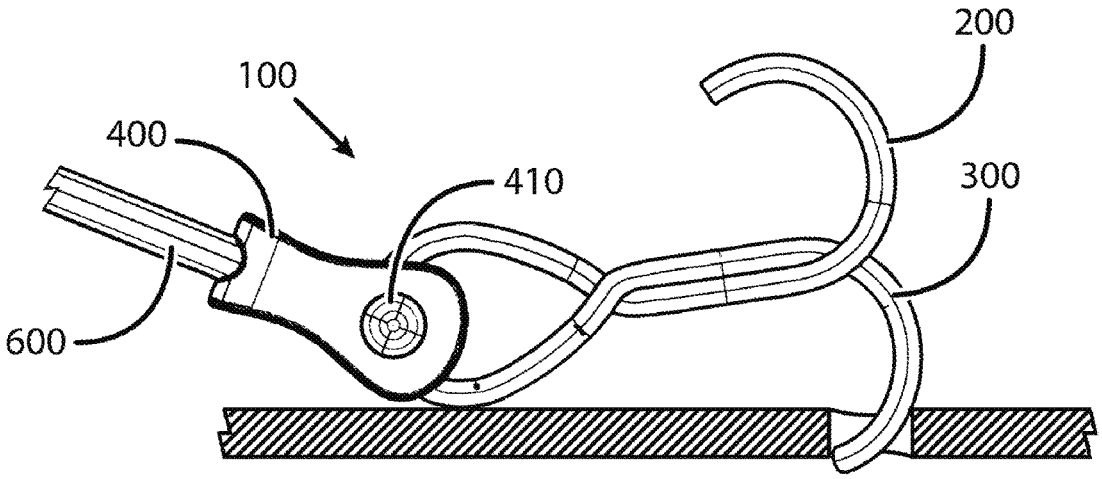

FIG. 12B

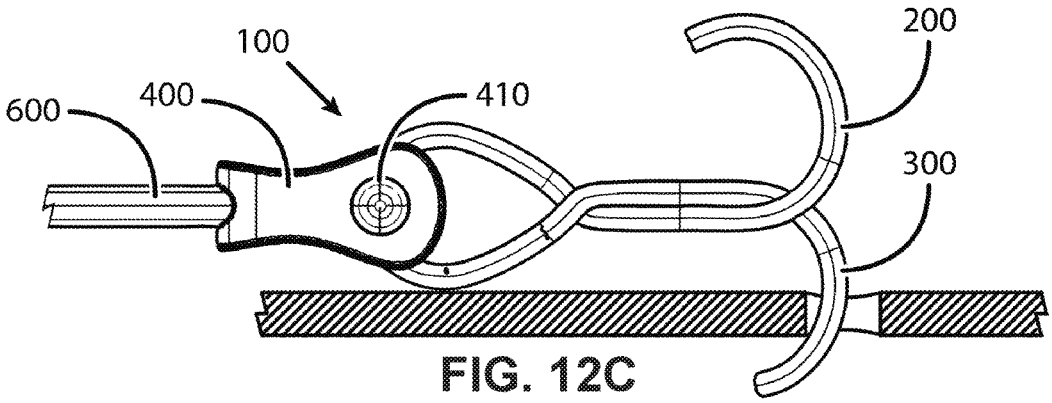

FIG. 12C

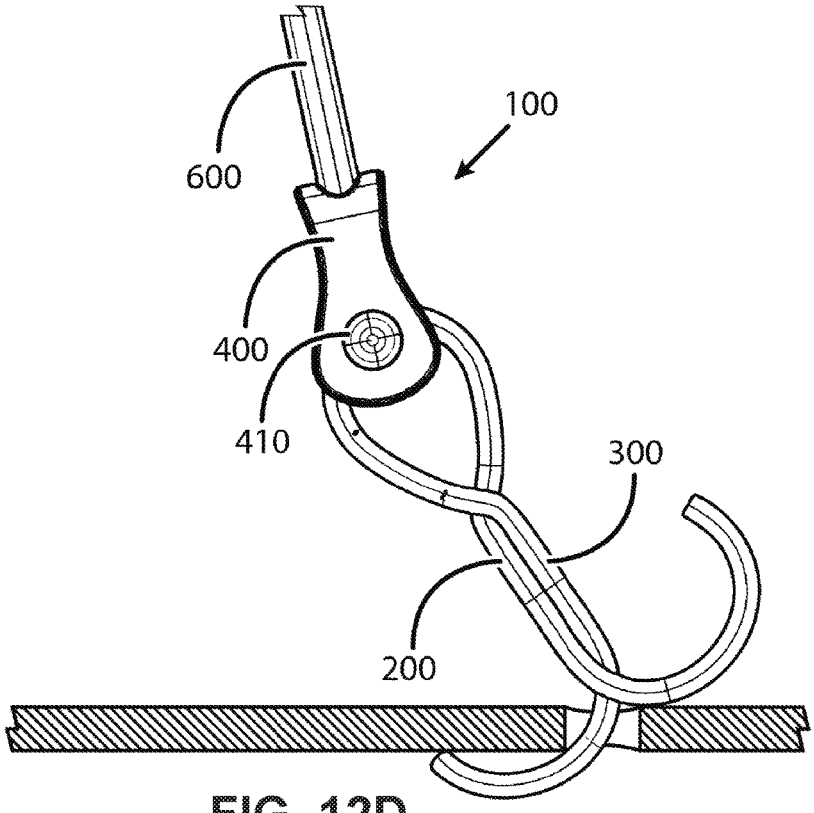

FIG. 12D

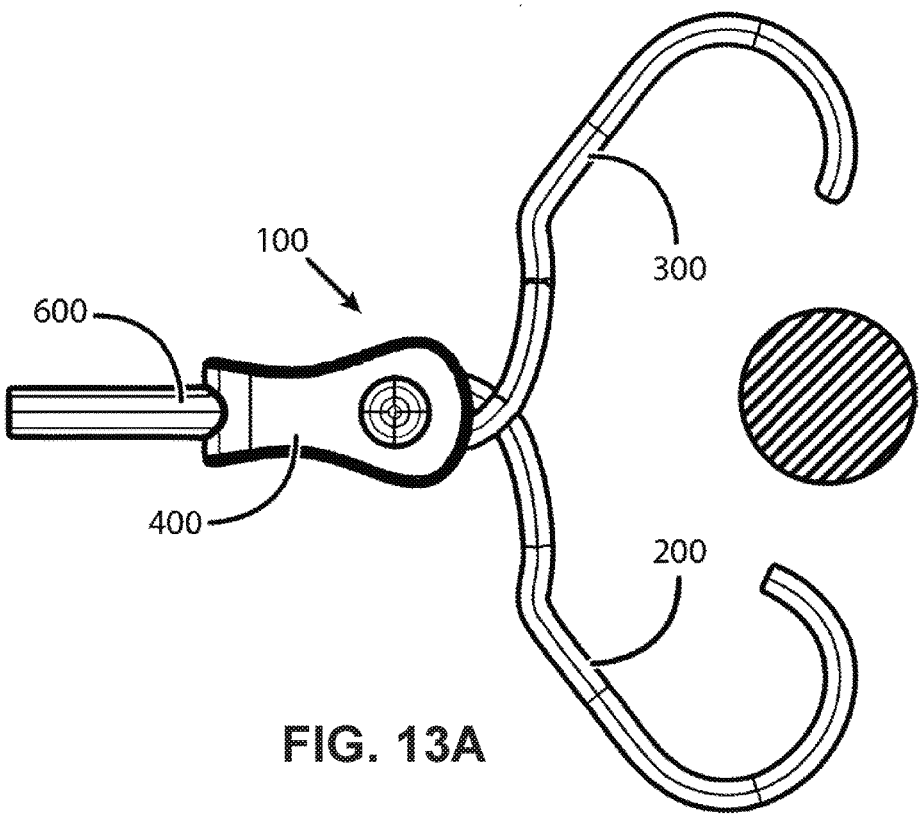

FIG. 13A

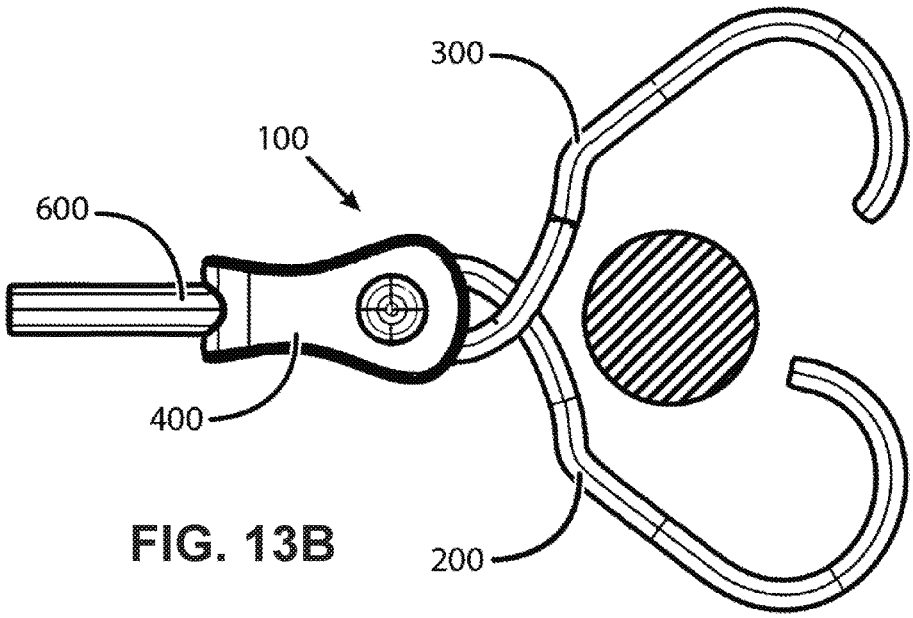

FIG. 13B

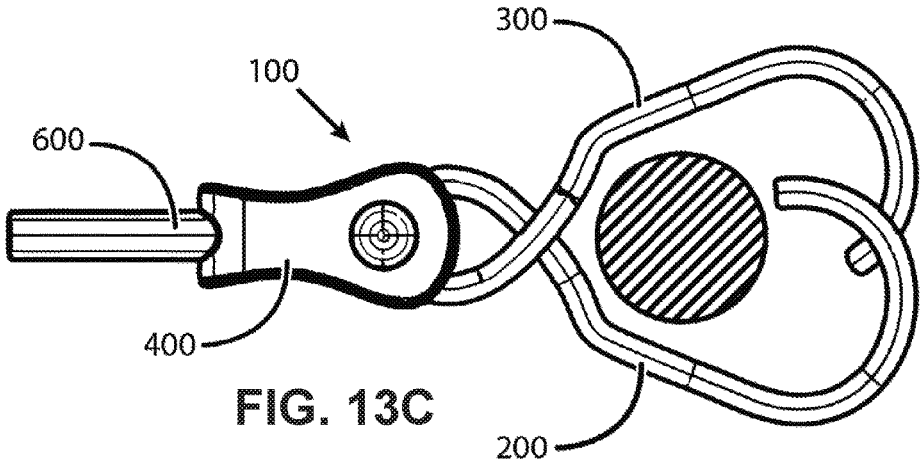

FIG. 13C

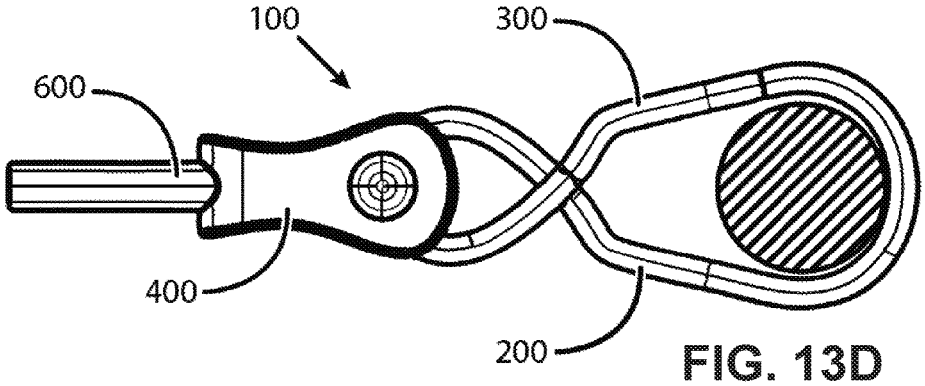

FIG. 13D

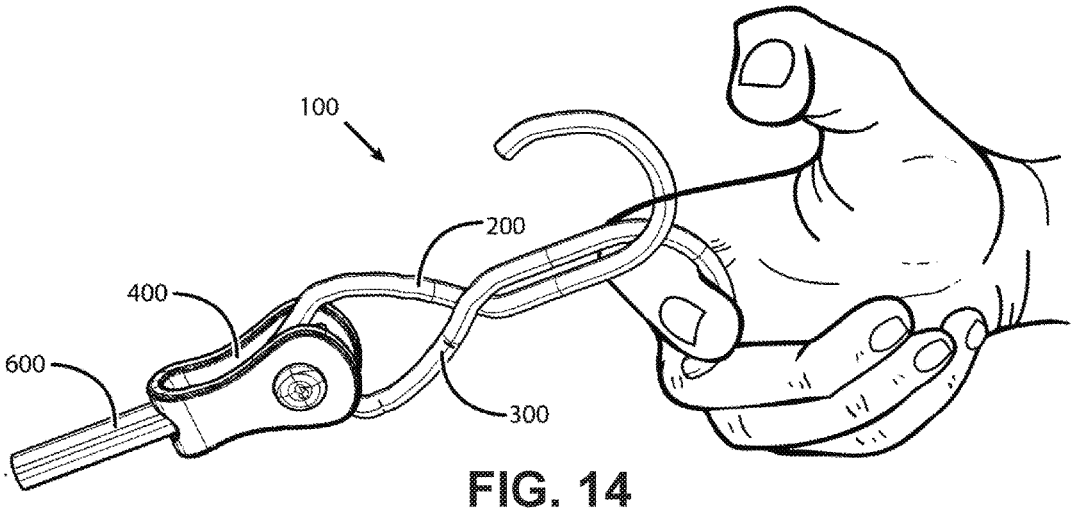

FIG. 14

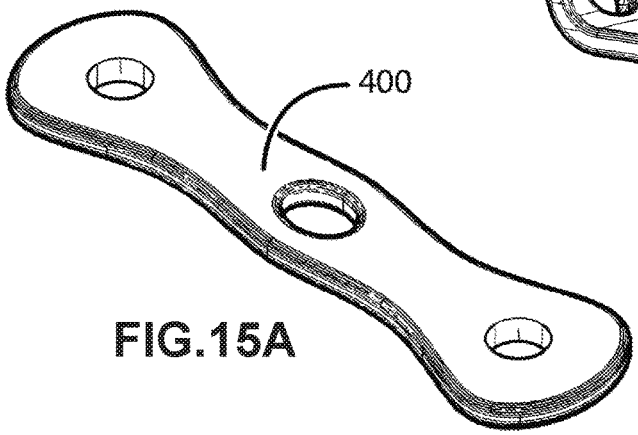

FIG.15A

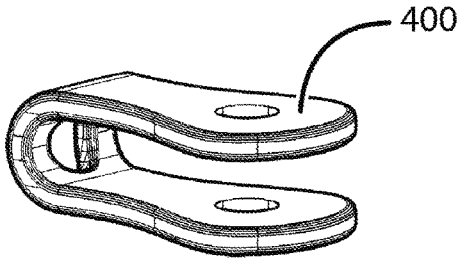

FIG. 15B

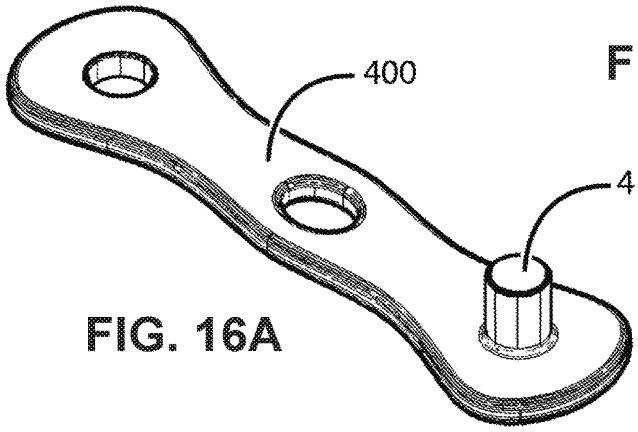

FIG. 16A

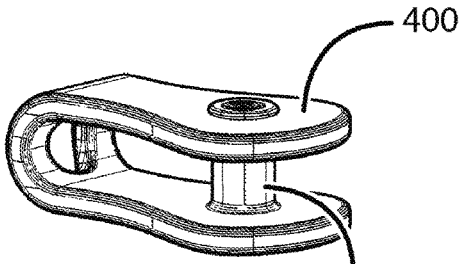

FIG. 16B

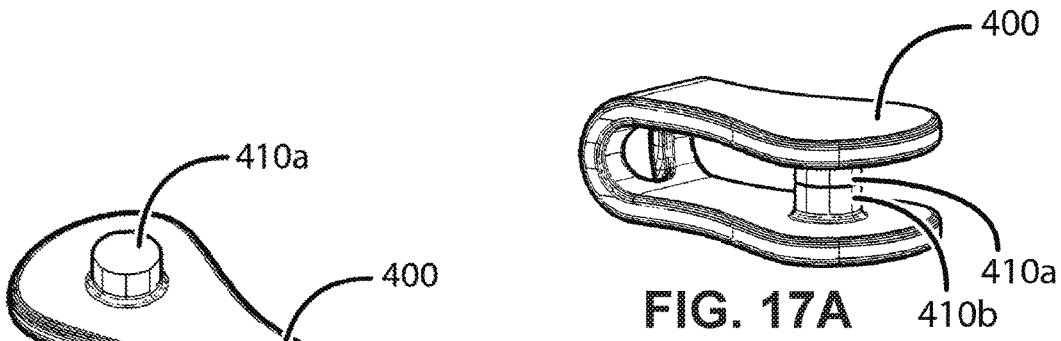

FIG. 17A

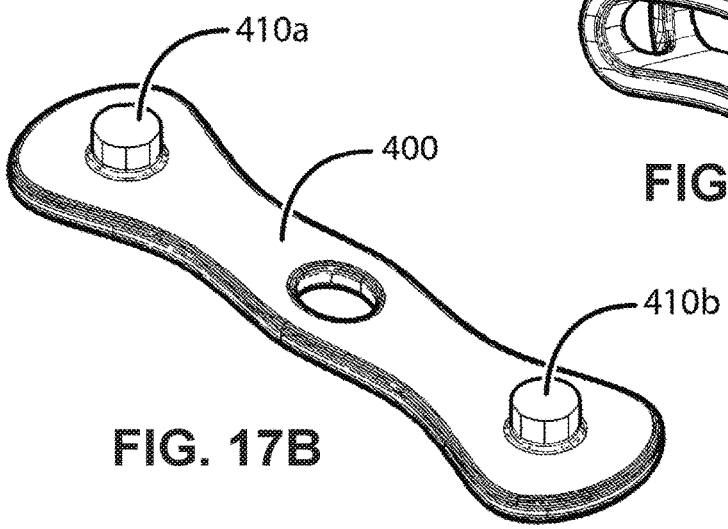

FIG. 17B

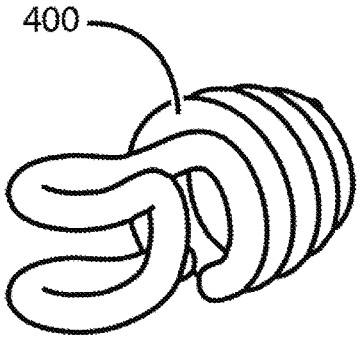

FIG. 18A

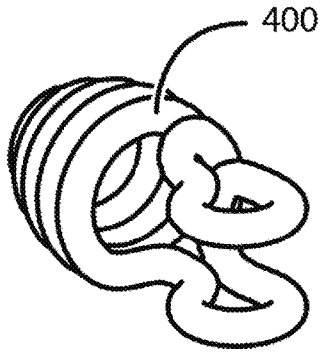

FIG. 18B

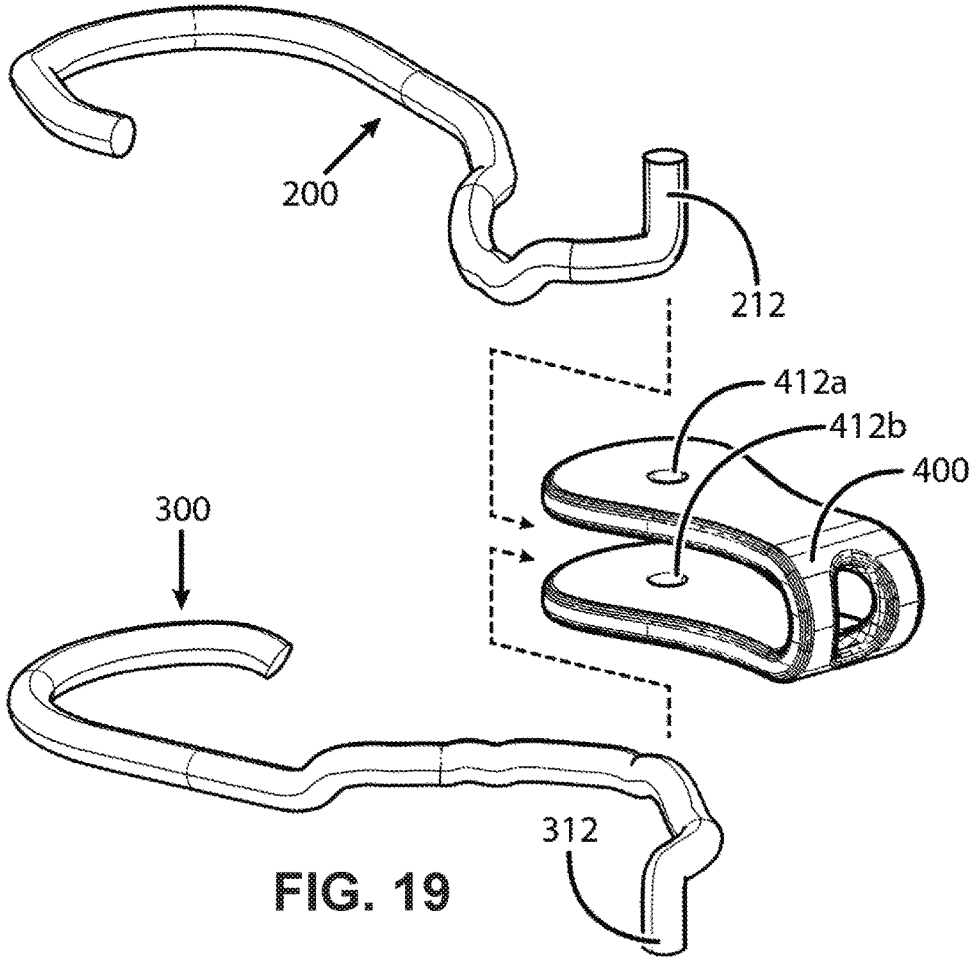

FIG. 19

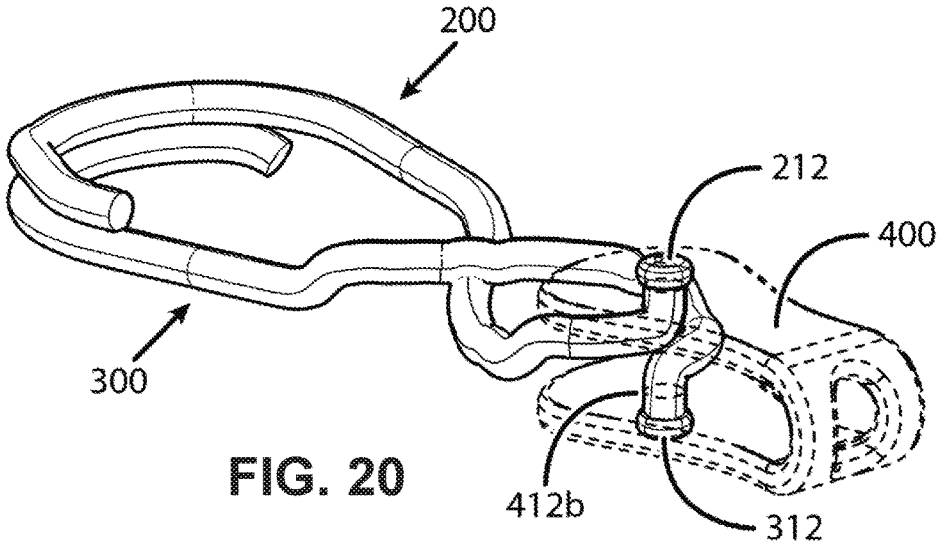

FIG. 20

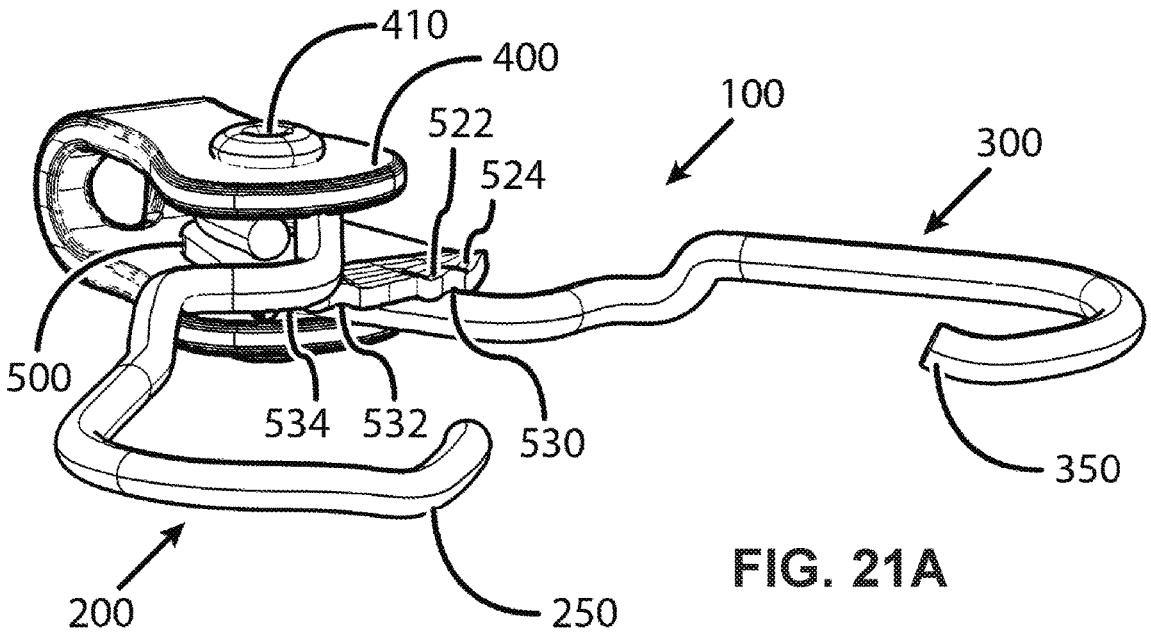

FIG. 21A

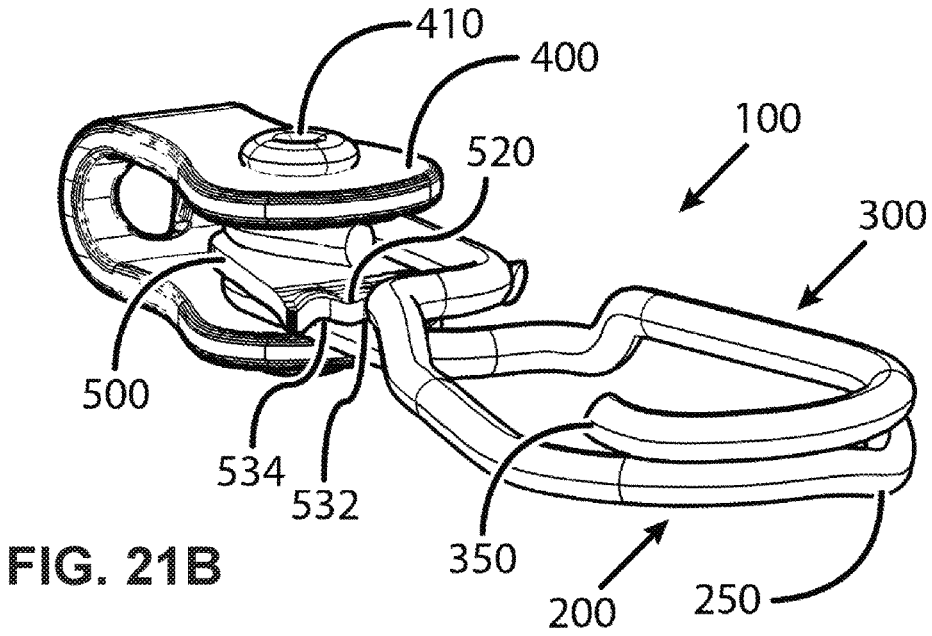

FIG. 21B

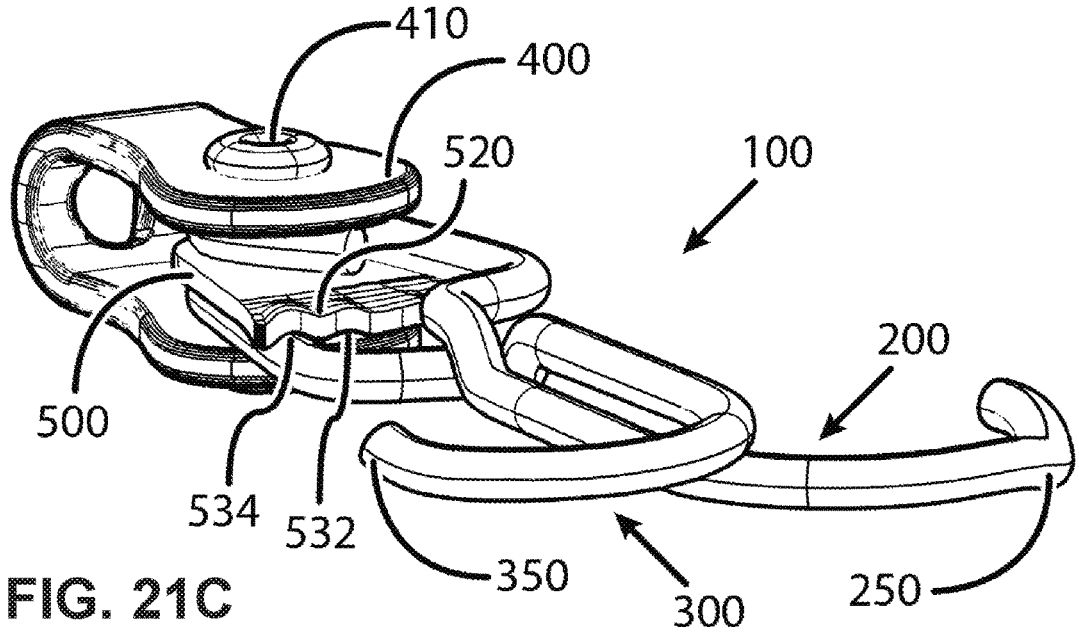

FIG. 21C

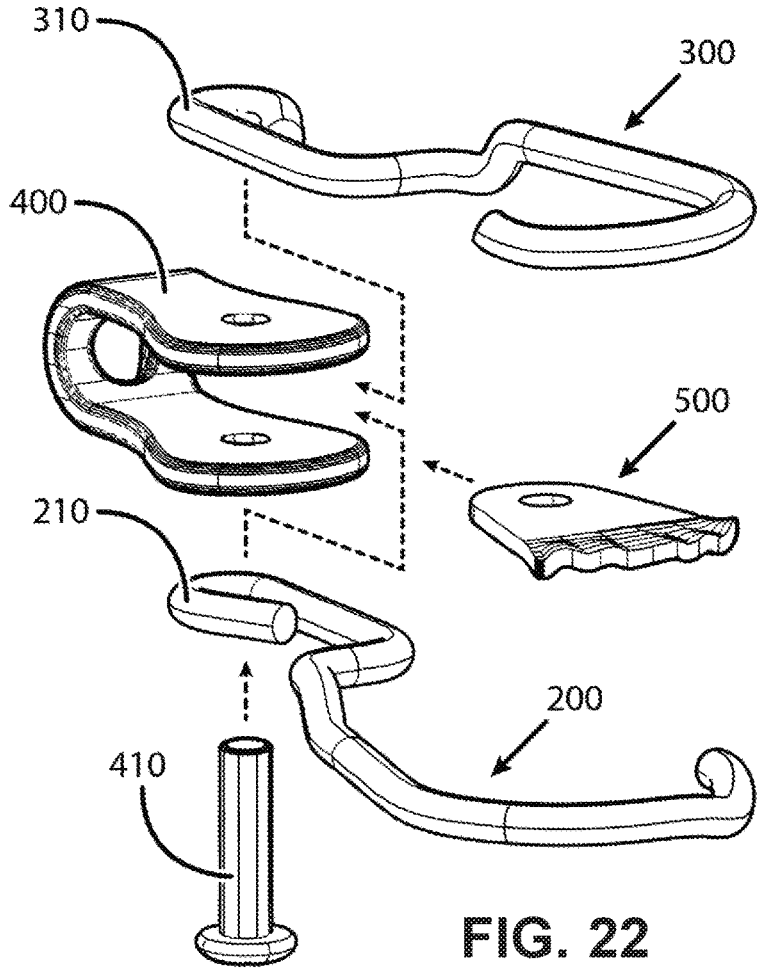

FIG. 22

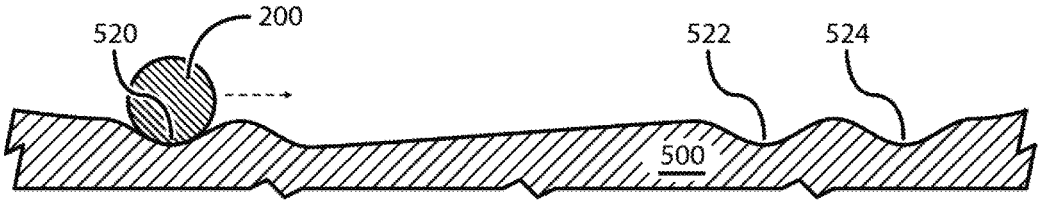

FIG. 23B

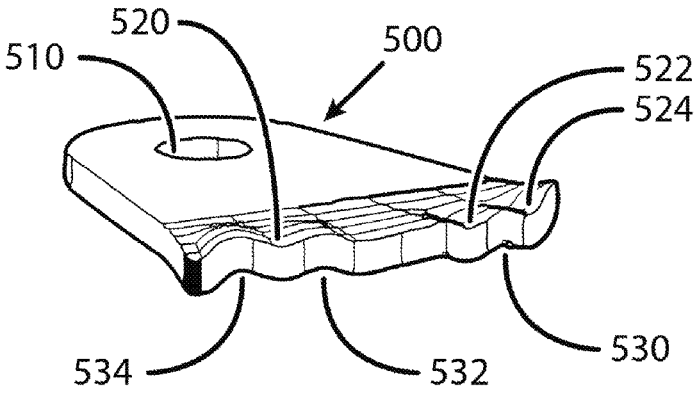

FIG. 23A

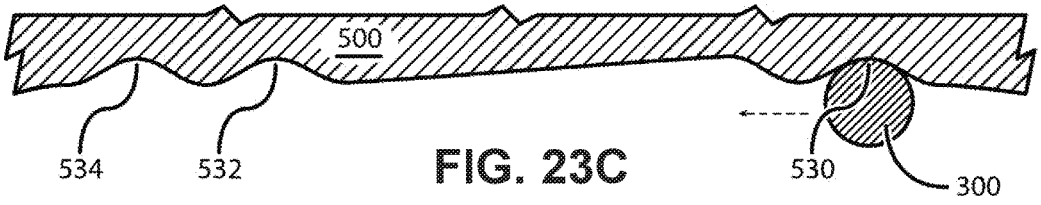

FIG. 23C

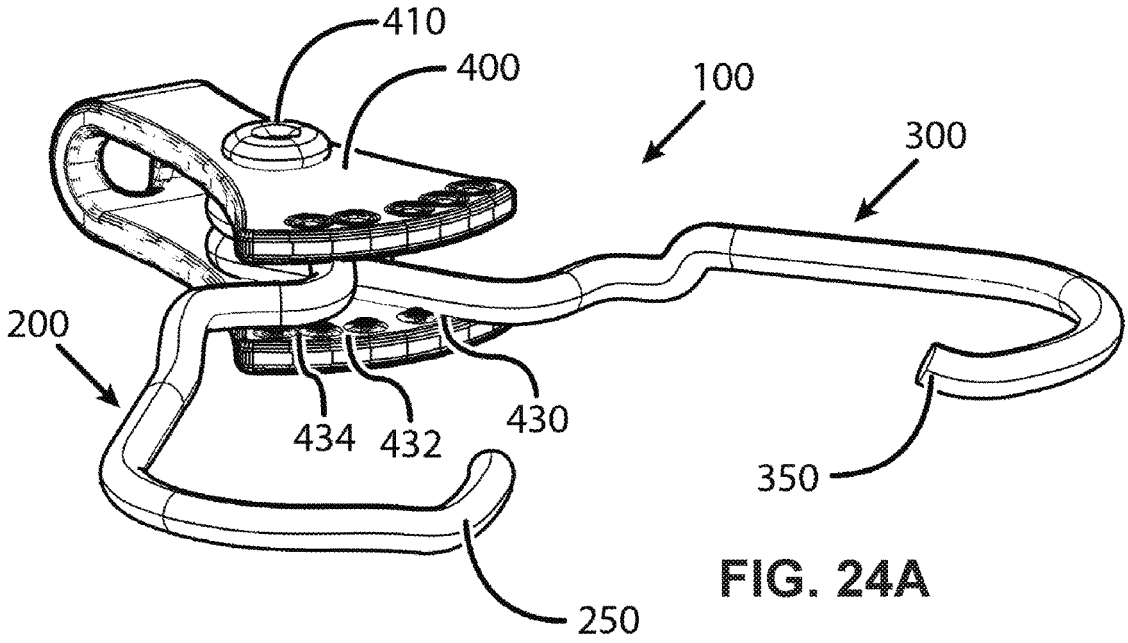

FIG. 24A

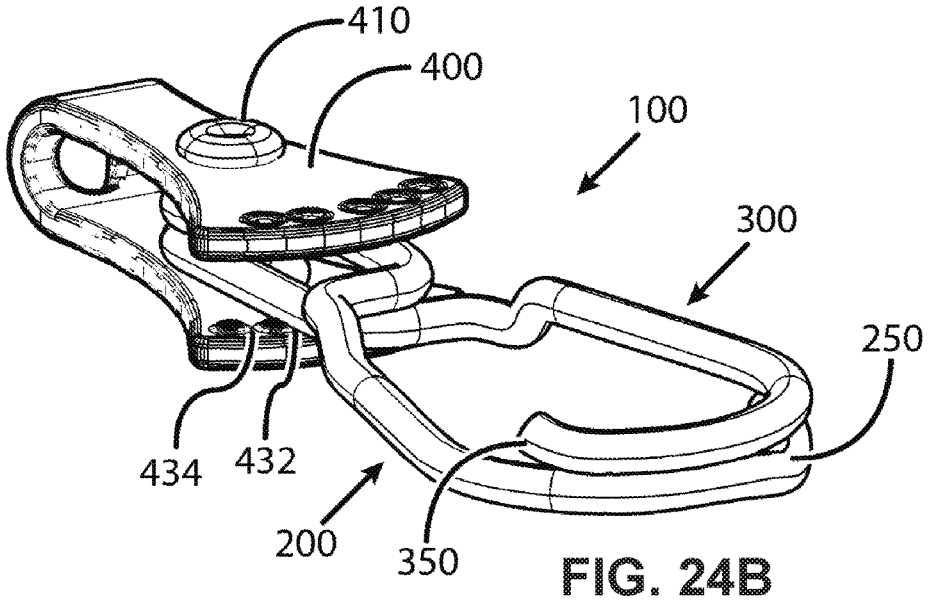

FIG. 24B

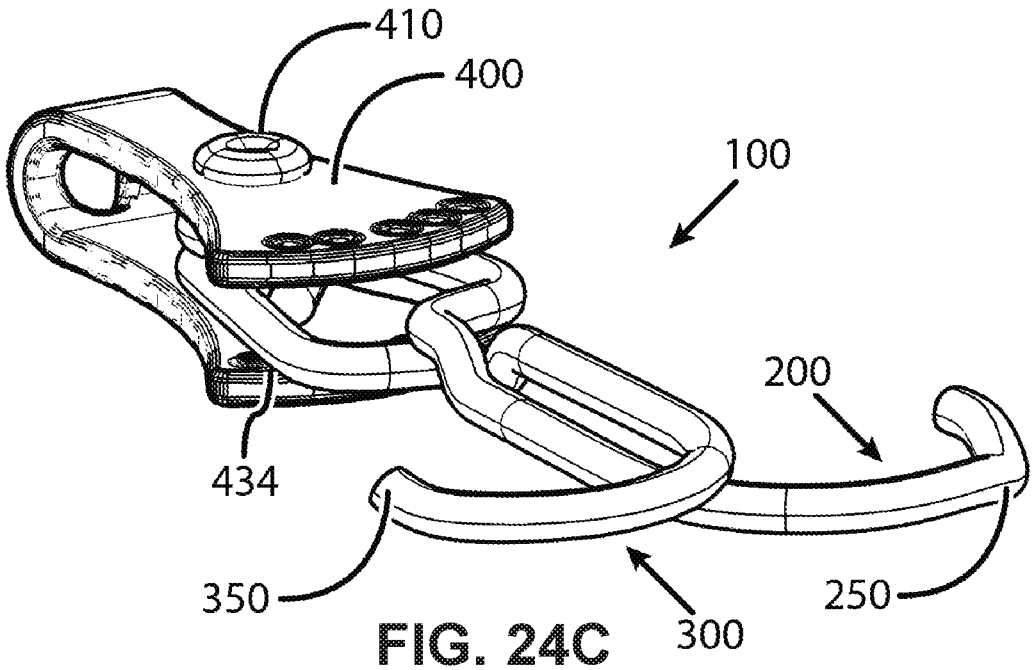

FIG. 24C

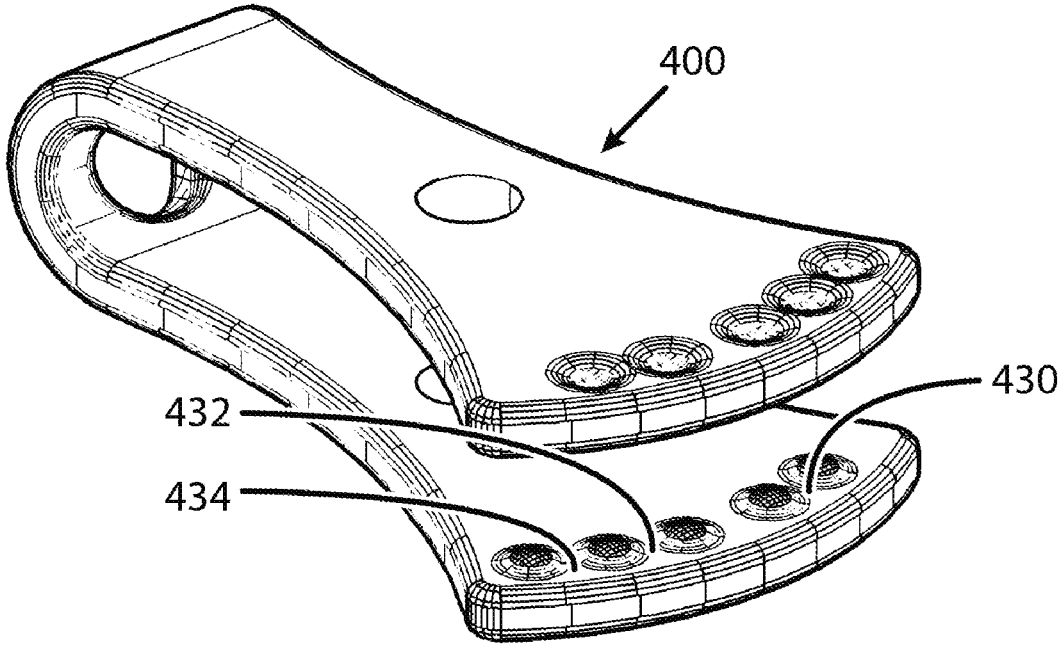

FIG. 25

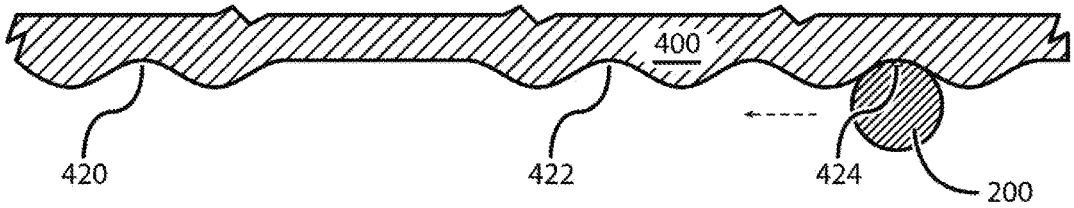

FIG. 26B

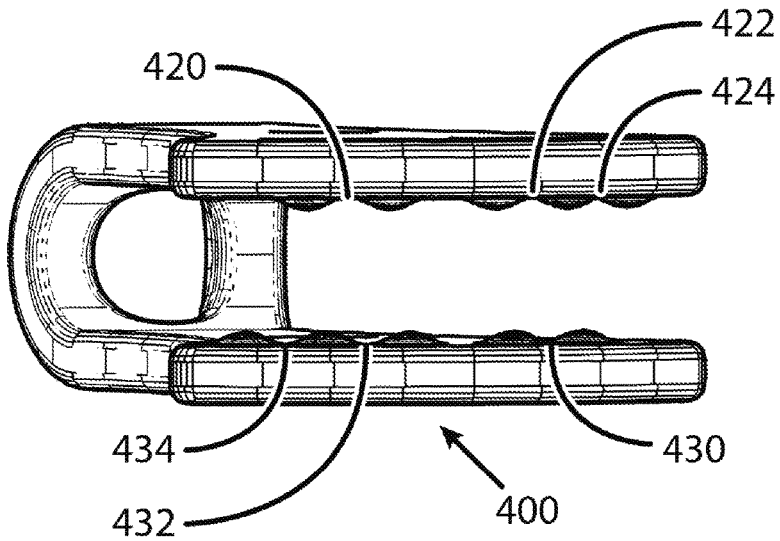

FIG. 26A

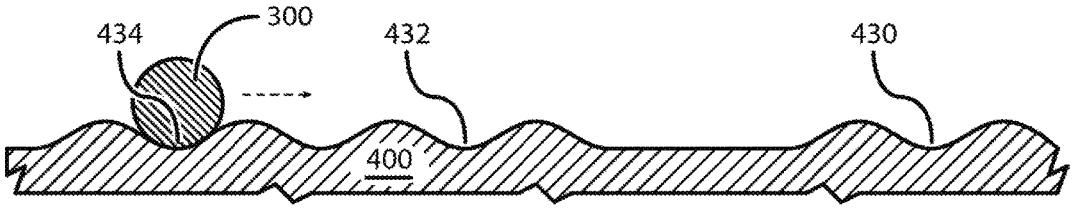

FIG. 26C

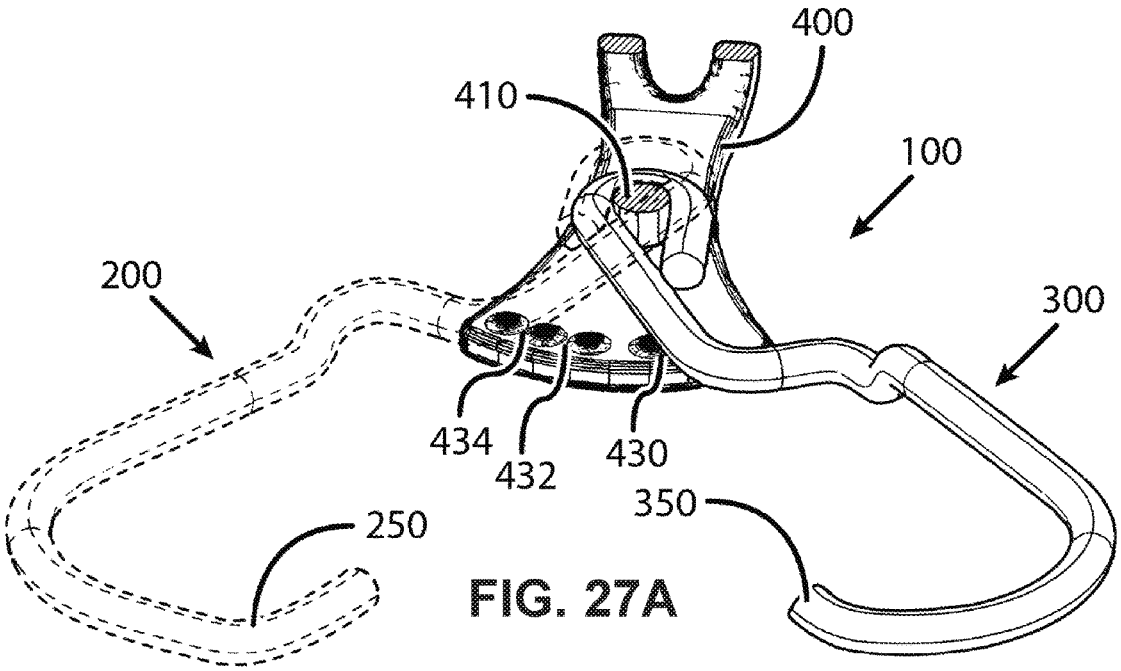

FIG. 27A

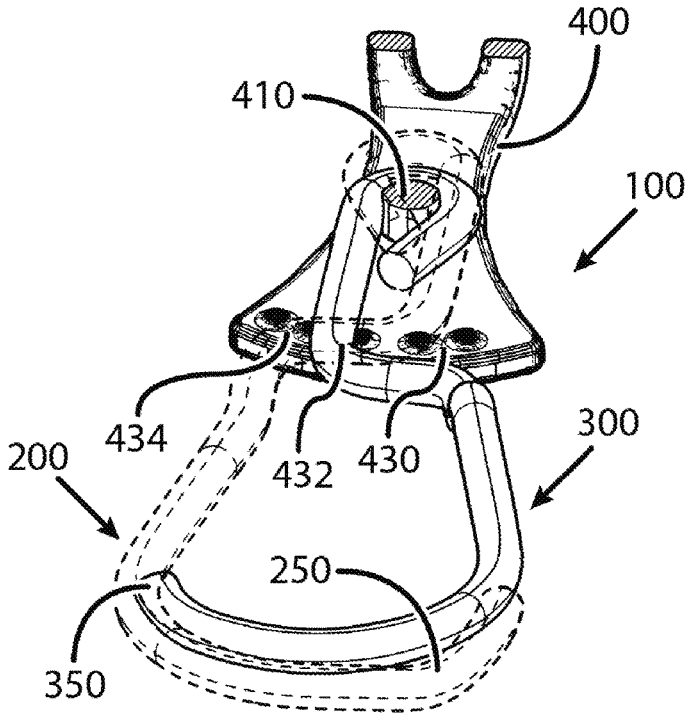

FIG. 27B

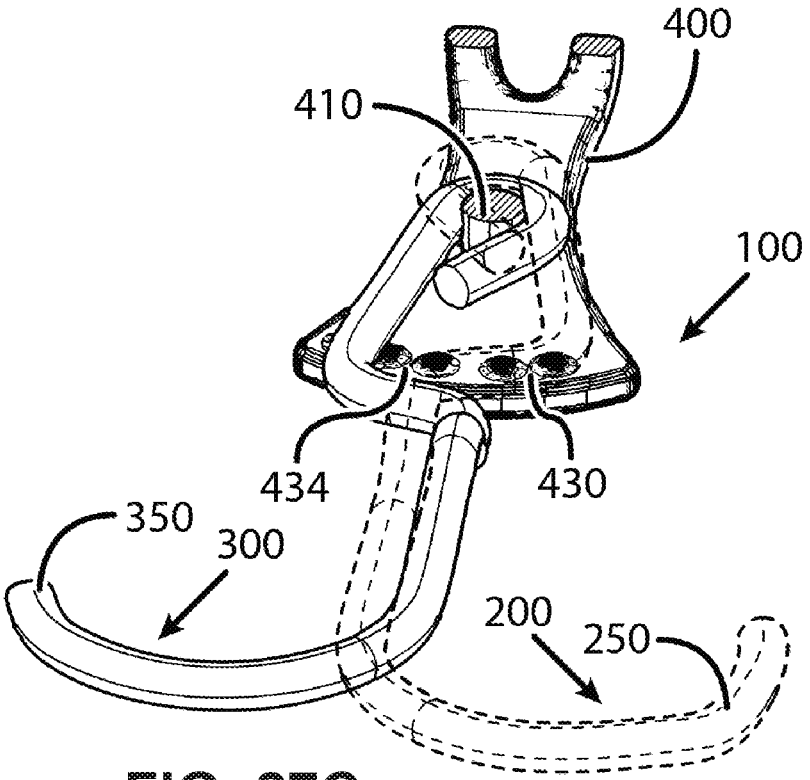

FIG. 27C

HOOK DEVICE WITH OPPOSING JAWS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is claims the benefit of provisional U.S. Pat. App. 62/441,409, filed Jan. 1, 2017. The disclosure of the prior application is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to straps and cords for tying, bundling, or securing objects. Examples include bungee cords, tie-downs, tarp straps, cargo cords, and stretch cords (hereafter simply referred to as bungee cords, collectively). A bungee cord is generally a segment of elastic cord with a rigid hook on one or both ends. The elastic cord may be shock cord, elastic webbing, natural or synthetic rubber such as EPDM, or any suitable elastomeric material. The hook may be metal and/or plastic, and may have practically any shape, size, and strength.

[0003] The shank, gape, and throat of a hook determine the size and type of objects that can be hooked. For example, a hook having a shallow throat (short bend) may not attach securely around an object but it may be inserted into a small-diameter hole. On the other hand, a hook having a deep throat may attach securely around an object but it may not be inserted into a small-diameter hole. Most standard "S" and "C" hooks have deep throats, and are therefore not suited for all applications. Consequently, manufacturers produce bungee cords with hooks specially shaped for certain applications. For example, U.S. Pat. No. 4,995,329 discloses a hook with a restricted opening that permits a cord of a certain diameter to pass in and out of the hook when stretched but not when contracted. However, a user may want to limit the number of special-purpose bungee cords he buys or carries. U.S. Pat. No. 8,069,539 partially addresses this issue by disclosing a universal fitting that allows a user to attach differently sized and shaped hooks to the cord segment. Although this system may reduce the number of cords, it still requires the user to manage a collection of hooks.

[0004] Bungee cords having "S" or "C" hooks may frustrate a user when he attempts to remove a single bungee cord from a bin of bungee cords. Such hooks may tangle with cords and other hooks. To provide more user-friendly storage, U.S. Pat. No. 9,249,825 discloses a bungee cord with interlocking hooks to prevent tangling. Additionally, tangle-free racks and carriers for storing bungee cords have been disclosed, e.g., U.S. Pat. Nos. 5,845,787, 6,099,060, and 9,345,346.

[0005] Many "S" and "C" hooks, as well as carabiners, do not provide an adequate grip to hold on to when stretching a bungee cord. If a bungee cord recoils when a user loses his grip, it may cause injury or property damage. Additionally, if a user curls a finger around the bend of the hook, his finger may get pinched. To address these issues, U.S. Pat. Nos. 4,380,101 and 5,317,788 and US Pat. App. 2013/0232733 disclose various embodiments of disposing a pull tab on the shank of a hook for gripping with a finger.

[0006] Finally, a notable limitation of standard "S" and "C" hooks is that they may detach from an object due to slack in the cord, shifting of an object, or vibrations. Hooks such as carabiners and snap hooks address this limitation by providing a pivoting or sliding gate that creates an enclosed loop. The gate of a carabiner hook usually pivots inward, and may be biased by a spring, e.g., U.S. Pat. No. 6,606,769; a magnet, e.g., U.S. Pat. No. 8,448,307; or a flexible member, e.g., U.S. Pat. Nos. 805,646, 3,748,703, and 4,380,101. The gate may be shaped as a hook as disclosed in U.S. Pat. No. 1,686,424. That device comprises a stationary C-shaped jaw and an opposing coplanar rotatable C-shaped jaw acting as a gate. Instead of a bias means to hold the gate in the closed position, that device has a notch on the bend of the stationary jaw and a complementary rib on the bend of the rotatable jaw. However, a small amount of play in the pivot joint may cause a large planar separation between the adjacent surfaces of the bends and therefore cause the retainer to fail. That device it does not provide a means to retain the rotatable jaw in an opened position, nor does it provide a means to rotate or retain the rotatable jaw past the stationary jaw to implement a pull tab.

[0007] Four issues of hook devices have been described above: (1) a hook having either too deep too shallow of a throat; (2) a hook tangling with cords and other hooks; (3) a hook lacking an adequate grip; and (4) a hook detaching from an object. The prior art has addressed several of these issues, but with tradeoffs in functionality, cost, and/or easy or use. This disclosure teaches a hook assembly that addresses all four issues simultaneously without significant tradeoffs.

BRIEF SUMMARY OF THE INVENTION

[0008] This disclosure teaches a hook assembly that may improve the functionality of many cargo management devices, for example a bungee cord. The assembly comprises two opposing hooks (i.e., the opening of each hook faces the opening of the other hook). Each hook rotates about a pivot joint at a base so that the angle between the shanks of the hooks may vary.

[0009] The hook assembly includes a plurality of retainers adjacent to the rotational path of each shank. Each retainer retains a shank at some predetermined angle relative to the other shank or to the base. The retainers may be defined on the opposite shank, on the base, on another member, or a combination thereof. A retainer may be any element that impedes the rotation of a hook at some predetermined angle relative to the other hook, to the base, or to another member. Examples of a retainer include a depression or dimple on a surface, a trough of a corrugation, a kink or bend or deformity of a member, or any combination thereof in which a shank may rest. Alternatively, a retainer may be an elevation or bump on a surface, a peak of a corrugation, a kink or bend or deformity of a member, or any combination thereof that may engage with a depression on a shank.

[0010] A retainer may be biased by a spring or any force perpendicular to the plane of rotation. Retainers may have different retention forces. A user may overcome a retention force by applying some predetermined amount of force to a relevant hook along its path of rotation.

[0011] The distance between adjacent retainers that retain a given shank determines the discrete configurations of the hook assembly. A "closed" configuration is where the bends of the hooks superimpose each other to form a substantially closed loop. This may look like a teardrop when viewed from above or below the plane of rotation. The hook assembly may be in the closed configuration when attached to an object or when stored.

[0012] An "opened" configuration is where the angle between the shanks is increased from that of the closed configuration to create a gap between the bends. This may look like a broken heart when viewed from above or below the plane of rotation. The hook assembly may be in the opened configuration just prior to enclosing around an object. In one embodiment, the hooks may not rotate beyond the opened configuration, for example in the first embodiment described below. In another embodiment, the hooks may rotate beyond the opened configuration, for example in the third embodiment below.

[0013] A "crossed" configuration is where the angle between the shanks is decreased from that of the closed configuration to be adjacent and generally parallel to each other. This may look like a grappling hook when viewed from above or below the plane of rotation. The hook assembly may be in the crossed configuration when a user wants to have a pull tab or, if one of the hooks has a shallow throat, when the hook assembly must be secured to a small hole. In one embodiment, the hooks may not rotate beyond the closed configuration, for example in the embodiments described below. In another embodiment, the hooks may rotate beyond the closed configuration, for example where the shanks do not braid around each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1**A shows a standard "C" hook and FIG. **1**B shows a standard "S" hook.

[0015] FIGS. **2**A-**2**C show perspective views of a first embodiment in opened, closed, and crossed configurations, respectively.

[0016] FIGS. **3**A-**3**C show side views of the first embodiment in the opened, closed, and crossed configurations, respectively.

[0017] FIGS. **4**A-**4**C show front views of the first embodiment in the opened, closed, and crossed configurations, respectively.

[0018] FIGS. **5**A-**5**C show back views of the first embodiment in the opened, closed, and crossed configurations, respectively.

[0019] FIG. **6** shows an exploded view of the first embodiment.

[0020] FIGS. **7**A-**7**B show exemplary means to attach a cord to the base of the first embodiment.

[0021] FIG. **8**A-**8**C show a top view of the hooks crossing each other in the opened, closed, and crossed configurations, respectively.

[0022] FIG. **9**A shows a side view of the retainers defined on a first hook and FIG. **9**B shows a cartoon representation of these retainers.

[0023] FIG. **10**A shows a side view of the retainers defined on a second hook and FIG. **10**B shows a cartoon representation of these retainers.

[0024] FIG. **11** shows a front view of the hook assembly transitioning from the opened to closed configuration wherein the distal protrusions on each hook are adjacent to each other.

[0025] FIG. **12**A shows a first hook having a deep throat unable to insert into a small hole. FIGS. **12**B-**12**D show a second hook having a shallow throat that is able to be inserted into the small hole.

[0026] FIGS. **13**A-**13**D show the first embodiment closing around an object.

[0027] FIG. **14** shows a finger pulling on a first hook of the first embodiment in the crossed configuration.

[0028] FIGS. **15**A-**17**B show exemplary bases and an exemplary means to manufacture such bases by bending flat metal stock.

[0029] FIGS. **18**A-**18**B show an exemplary base made from bent metal wire.

[0030] FIG. **19** shows an exploded view of an alternate method to form a pivot joint wherein the axle comprises integral portions of the hooks, and FIG. **20** shows this alternate method as an assembled hook assembly

[0031] FIGS. **21**A-**21**C show perspective views of a second embodiment in opened, closed, and crossed configurations, respectively.

[0032] FIG. **22** shows an exploded view of the second embodiment.

[0033] FIG. **23**A shows a perspective view of the retainers defined on a panel and FIGS. **23**B-**23**C show cartoon representations of these retainers.

[0034] FIGS. **24**A-**24**C show perspective views of a third embodiment in opened, closed, and crossed configurations, respectively.

[0035] FIG. **25** shows an exemplary base of the third embodiment.

[0036] FIG. **26**A shows a perspective view of the retainers defined on the base and FIGS. **26**B-**26**C show cartoon representations of these retainers.

[0037] FIGS. **27**A-**27**C show perspective cutaway views of the third embodiment in the opened, closed, and crossed configurations, respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0038] The following numerals are used to identify the corresponding elements in the figures for the several embodiments. 200-level numbers refer to elements on or associated with the deep hook; 300-level numbers refer to elements on or associated with the shallow hook; 400-level numbers refer to elements on or associated with the base; 500-level numbers refer to elements on or associated with the panel; 600-level numbers refer to elements on or associated with the cord.

[0039] **100** hook assembly
[0040] **200** deep hook
[0041] **210** sleeve
[0042] **212** pin
[0043] **230** retainer for opened position (of shallow hook)
[0044] **232** retainer for closed position (of shallow hook)
[0045] **234** retainer for crossed position (of shallow hook)
[0046] **250** protrusion
[0047] **300** shallow hook
[0048] **310** sleeve
[0049] **312** pin
[0050] **320** retainer for opened position (of deep hook)
[0051] **322** retainer for closed position (of deep hook)
[0052] **324** retainer for crossed position (of deep hook)
[0053] **350** protrusion
[0054] **400** base
[0055] **410** pin
[0056] **412** sleeve
[0057] **420** retainer for opened position (of deep hook)

[0058] **422** retainer for closed position (of deep hook)

[0059] **424** retainer for crossed position (of deep hook)

[0060] **430** retainer for opened position (of shallow hook)

[0061] **432** retainer for closed position (of shallow hook)

[0062] **434** retainer for crossed position (of shallow hook)

[0063] **500** panel

[0064] **510** sleeve

[0065] **520** retainer for opened position (of deep hook)

[0066] **522** retainer for closed position (of deep hook)

[0067] **524** retainer for crossed position (of deep hook)

[0068] **530** retainer for opened position (of shallow hook)

[0069] **532** retainer for closed position (of shallow hook)

[0070] **534** retainer for crossed position (of shallow hook)

[0071] **600** cord

[0072] **660** clasp

[0073] FIG. **1**A shows a standard "C" hook and FIG. **1**B shows a standard "S" hook. The shank is the relatively straight segment of a hook proximal to a point of attachment to a cord (although a shank may be curved). The bend is the relatively curved segment between the shank and the tip (the proximal end of the bend is adjacent to the shank and the distal end is adjacent to the tip or to a front length). A hook may have a relatively straight front length segment between the bend and the tip. The gape is the distance between the proximal end of the bend and the tip. The throat is the distance between a medial point of the bend and a medial point of a line projected from the tip to the proximal end of the bend. A deep throat corresponds to a large distance and a shallow throat corresponds to a small distance. The opening is the empty space opposite the shank and is an approximate function of the gape, throat, and shank. Hereafter the terms "hook," "jaw," and "arm" are used interchangeably to describe an elongated member having a shank, a bend, a throat, and a gape.

[0074] FIGS. **2**A, **3**A, and **4**A show a first embodiment of the hook assembly **100** in an opened configuration; FIGS. **2**B, **3**B, and **4**B show the first embodiment in a closed configuration; and FIGS. **2**C, **3**C, and **4**C show the first embodiment in a crossed configuration. The hook assembly **100** comprises a pair of opposing hooks, referred to as deep hook **200** and shallow hook **300**, each secured to a base **400** via a pivot joint. These hooks may have throats of equal or unequal depths; they may have gapes of equal or unequal sizes; and they may have shanks of equal or unequal lengths. The base **400** may be secured to a distal end or medial portion of a cord **600** in any suitable manner, for example via hole in the base **400** and a clasp **660** as shown in FIG. **7**A or via a loop around the base **400** and a clasp **660** as shown in FIG. **7**B. Additionally, a cord **600** may be molded within a plastic base **400** (not illustrated), or a base **400** may be permanently crimped or temporarily clamped or wedged onto a cord **600** (not illustrated). The base may be any member and any material suitable for securing a cord thereto and for contributing to a pivot joint, for example molded plastic, machined plastic, cast metal, fabricated metal (for example FIGS. **15**A-**17**B), and bent wire (for example FIGS. **18**A-**18**B).

[0075] As shown in FIG. **6**, the pivot joint of the deep hook **200** comprises a sleeve **210** that loops around a pin **410**, and the pivot joint of the shallow hook **300** comprises a sleeve **310** that also loops around the pin **410**. These pivot joints are uniaxial and coaxial, which restricts rotation of deep hook **200** and the shallow hook **300** to parallel planes (hereafter simply referred to as the plane of rotation, collectively). The axle of each pivot joint need not comprise a pin **410** held by the base **400** as shown in FIGS. **2**A-**5**C and FIG. **6**. For example, the axle may be integrally formed onto the base **400** as shown in FIGS. **15**A-**16**B. Such an integrated axle may comprise a single integrated pin **410***c* as shown in FIGS. **16**A-**16**B or it may comprise a pair of integrated partial pins pin **410***a* and pin **410***b* as shown in FIGS. **17**A-**17**B. Further, the relative locations of the components that contribute to each pivot joint may be swapped. For example, as shown in FIGS. **19**-**20**, the pivot joint of the deep hook **200** may comprise a pin **212** defined on the deep hook **200** that inserts into a sleeve **412***a* defined on the base **400**, and the pivot joint of the shallow hook **300** may comprise a pin **312** defined on the shallow hook **300** that inserts into a sleeve **412***b* defined on the base **400**.

[0076] In this first embodiment there is a plurality of retainers located on the shank of the deep hook **200** and there is a plurality of retainers located on the shank of the shallow hook **300**. The retainers located on the deep hook **200** retain the shank of the shallow hook **300**, and the retainers located on the shallow hook **300** retain the shank of the deep hook **200**. Each retainer is defined on the surface of a given hook adjacent to the path of rotation of the shank of the other hook, and the retainer impedes rotation of that other hook relative to the given hook. Consequently, a retainer pauses a rotating hook at a predetermined angle relative to the other hook, thereby creating a particular discrete configuration of the hook assembly **100**. In particular, there may be three retainers defined on the deep hook **200**: the retainer **230** retains the shallow hook **300** in its opened position; the retainer **232** retains the shallow hook **300** in its closed position; and the retainer **234** retains the shallow hook **300** in its crossed position. Similarly, there may be three retainers defined on the shallow hook **300**: the retainer **320** retains the deep hook **200** in its opened position; the retainer **322** retains the deep hook **200** in its closed position; and the retainer **324** retains the deep hook **200** in its crossed position. There may be greater or fewer than three retainers per hook.

[0077] FIGS. **8**A-**8**C illustrate the crossing of the shank of the deep hook **200** with the shank of the shallow hook **300**. The segment of each shank comprising the retainers may be appropriately curved so that in any of the predetermined configurations of the hook assembly **100** the shanks cross at approximately 90 degrees to each other, indicated by an "X" in FIGS. **8**A-**8**C.

[0078] FIG. **9**B shows a cartoon profile of the retainers of the deep hook **200** shown in FIG. **9**A, and FIG. **10**B shows a cartoon profile of the retainers of the shallow hook **300** shown in FIG. **10**A. These cartoon profiles are exemplary and are not drawn to scale. The retainer profile on the deep hook **200** may or may not be a mirror image of the retainer profile on the shallow hook **300**. Further, for a given retainer profile, the distance between retainers, the depth of each retainer, and whether the space between retainers is filled with or void of material may vary to produce a hook assembly **100** having a desired function and feel when transitioning between the different configurations.

[0079] In general, a retainer that is deep or has steep walls impedes the movement of the shank of a hook with greater resistance than does a retainer that is shallow or has gradual walls. For example, when the hook assembly **100** transitions from the opened to closed configuration, the shank of the deep hook **200** must overcome the wall of the retainer for opened position **320** in the direction of the dotted arrow shown in FIG. **9**B. Overcoming this wall requires the shank of the deep hook **200** to deflect from the plane of rotation in conflict with the axis of the pivot joint. A greater axial conflict results in a greater resistive force.

[0080] In the exemplary profile of FIG. **9**B there is a large separation between the retainer for opened position **320** and the retainer for closed position **322**. A larger distance corresponds to a wider opening when the hook assembly **100** is in the opened configuration (large gap between the bends of the hooks), which helps the hook assembly **100** to enclose around large objects. Between the retainer for opened position **320** and the retainer for closed position **322** there is a "dead zone" in which the shank of the deep hook **200** may rotate without deflection from the plane of rotation. This optional dead zone helps to prevent a distal end of the deep hook **200** from deflecting out of the plane of rotation and crisscrossing a distal end of the shallow hook **300** when the bends of the hooks begin to overlap during the transition of the hook assembly **100** from the opened to closed configuration.

[0081] There need not be a dead zone between adjacent retainers of a surface; instead there may be an elevated region as shown between the retainer for closed position **322** and the retainer for crossed position **324** in FIG. **9**B. Because the bends of the hooks overlap in the closed configuration, there is no risk that distal ends of the hooks crisscross when transitioning away from this configuration. This elevated region deflects the shank of the deep hook **200** out of the plane of rotation and therefore creates a perpendicular force (and friction) against the deep hook **200** during the transition between the closed and crossed configurations. This elevated region may be sloped towards the retainer for crossed position **324** to bias the shank of the deep hook **200** towards the retainer for crossed position **324** once that shank overcomes the wall of the retainer for closed position **322** in the direction of the dotted arrow.

[0082] FIG. **11** shows the hook assembly **100** during the transition from the opened to closed configuration. To help prevent the bends from crisscrossing during this transition, a portion of the distal end of the deep hook **200** may define a protrusion **250** that protrudes out of the plane of rotation away from the shallow hook **300**. Similarly, a portion of the distal end of the shallow hook **300** may define a protrusion **350** that protrude out of the plane of rotation away from the deep hook **200**.

[0083] FIGS. **12**A-**12**D illustrate a benefit of the optional feature of defining a shallower throat on the shallow hook **300** relative to the throat of the deep hook **200**. A deep throat may prevent the bend of a hook from being inserted into a narrow opening as shown in FIG. **12**A. In contrast, a shallow throat may be easily inserted into the same narrow hole as shown in FIGS. **12**B-**12**D. Practically all bungee cord hooks have deep throats because it is more common to attach a hook around an object than inserting a hook into a hole. However, because the hook assembly **100** comprises a pair of hooks, it may provide both deep- and shallow-throat hooks without any loss of functionality. In fact, providing both throat depths makes the hook assembly **100** more versatile.

[0084] FIGS. **13**A-**13**D show the hook assembly **100** enclosing around an object. The hook assembly **100** starts in the opened configuration shown in FIG. **13**A and ends up in the closed configuration shown in FIG. **13**D. In this first embodiment the intermediate positions of the hooks in FIGS. **13**B-**13**C do not correspond to configurations determined by any retainers.

[0085] FIG. **13** illustrates a benefit of the crossed configuration. In this example a user may curl a finger around the shallow hook **300**, pull the hook assembly **100** to the desired location, and attach the hook assembly **100** to an object using the deep hook **200**. Either hook may serve as a pull tab.

[0086] Locating retainers on the shank of the deep hook **200** and the shank of the shallow hook **300** may contribute to several benefits, for example minimal part count or ease of manufacturing. Further, the hook assembly **100** may be easy to use because each predetermined configuration is defined only by the rotational angle between the hooks rather than defined by both the rotational angle between the hooks and the rotational angle between each hook and some other member. However, the retainers may be located on any other member, for example on the base or on an additional member. FIGS. **21**A-**23**C illustrate a second embodiment of the hook assembly **100** wherein the retainers are located on a panel **500** that is sandwiched between the deep hook **200** and the shallow hook **300**, and FIGS. **24**A-**27**C illustrate a third embodiment wherein the retainers are located on the base **400**. Further embodiments exist that are not illustrated, such as distributing the retainers among several members. For example, given three retainers that retain a deep hook **200**, a first retainer may be disposed on a shallow hook **300**, a second retainer may be disposed on a panel **500**, and a third retainer may be disposed on a base **400**.

[0087] FIGS. **21**A-**21**C show the retainers located on a panel **500** sandwiched between the deep hook **200** and the shallow hook **300**. The retainer for opened position **520** retains the deep hook **200** in the opened configuration; the retainer for closed position **522** retains the deep hook **200** in the closed configuration; and the retainer for crossed position **524** retains the deep hook **200** in the crossed configuration. Similarly, the retainer for opened position **530** retains the shallow hook **300** in the opened configuration; the retainer for closed position **532** retains the shallow hook **300** in the closed configuration; and the retainer for crossed position **534** retains the shallow hook **300** in the crossed configuration.

[0088] The panel **500** may be secured to the base **400** via a pivot joint comprising the sleeve **510** and the pin **410**. Rotation of the panel **500**, while not necessary, does enable the hooks to maintain a given configuration while rotating relative to the base, for example maintaining the crossed configuration as shown in FIG. **12**A. The hook assembly **100** may include multiple panels, for example a panel **500** sandwiched between the deep hook **200** and the base **400** and a panel **500** sandwiched between the shallow hook **300** and the base **400** (not illustrated).

[0089] FIG. **23**A shows a close-up of the retainers of the panel **500**. FIG. **23**B shows a cartoon profile of the retainers that retain the deep hook **200** and FIG. **23**C shows a cartoon profile of the retainers that retain the shallow hook **300**. These cartoon profiles are exemplary and are not drawn to

scale. The function of these retainers is similar to those of the first embodiment described above.

[0090] FIGS. **24**A-**24**C show the hook assembly **100** having the retainers located on the base **400** and FIGS. **27**A-**27**C show cutaway views thereof. The retainer for opened position **420** retains the deep hook **200** in the opened configuration; the retainer for closed position **422** retains the deep hook **200** in the closed configuration; and the retainer for crossed position **424** retains the deep hook **200** in the crossed configuration. Similarly, the retainer for opened position **430** retains the shallow hook **300** in the opened configuration; the retainer for closed position **432** retains the shallow hook **300** in the closed configuration; and the retainer for crossed position **434** retains the shallow hook **300** in the crossed configuration.

[0091] FIG. **26**A shows a close-up of the retainers of the base **400**. FIG. **26**B shows a cartoon profile of the retainers that retain the deep hook **200** and FIG. **26**C shows a cartoon profile of the retainers that retain the shallow hook **300**. These cartoon profiles are exemplary and are not drawn to scale. The function of these retainers is similar to those of the first embodiment described above.

[0092] The retainers of the hook assembly **100** for each embodiment have been illustrated as depressions along a surface in which the shank of a hook may rest. However, a retainer may be any element that impedes the rotation of a hook at some predetermined angle relative to the other hook, to the base, or to another member. For example, a retainer may comprise a depression on a surface that engages with an elevation on the shank of a hook, or conversely a retainer may comprise an elevation on a surface that may engage with a depression on the shank of a hook. This latter case may be practical for a large-diameter or a shank having a flat surface.

[0093] The foregoing embodiments are exemplary and should not be interpreted as limiting the scope of the present invention. Various implementations and combinations of these embodiments have been recognized and anticipated. It is therefore intended that the appended claims cover all such embodiments that do not depart from the spirit and scope of the present invention.

What is claimed is:

1. A hook device comprising:

(a) a first pivot joint comprising a base and a first hook, the first hook comprising a proximal first shank and a distal first bend both substantially parallel to a first plane of rotation;

(b) a second pivot joint coaxial with the first pivot joint comprising the base and a second hook, the second hook comprising a proximal second shank and a distal second bend both substantially parallel to a second plane of rotation, the second hook adjacent to and opposing the first hook;

(c) a plurality of first retainers adjacent to the first shank, each first retainer impeding movement of the first shank therefrom; and

(d) a plurality of second retainers adjacent to the second shank, each second retainer impeding movement of the second shank therefrom.

2. The hook device of CLAIM **1** wherein:

(a) the plurality of first retainers is defined on the second shank adjacent to the first shank; and

(b) the plurality of second retainers is defined on the first shank adjacent to the second shank.

3. The hook device of CLAIM **2** wherein:

(a) the plurality of first retainers comprises retainers **1**A, **1**B, and **1**C; and

(b) the plurality of second retainers comprises retainers **2**A, **2**B, and **2**C;

(c) wherein:

(1) the first bend and the second bend are separated by an angular gap when the first shank is retained by **1**A and the second shank is retained by **2**A;

(2) the first bend and the second bend are substantially superimposed when the first shank is retained by **1**B and the second shank is retained by **2**B; and

(3) a proximal portion of the first bend and a proximal portion of the second bend are adjacent to each other when the first shank is retained by **1**C and the second shank is retained by **2**C.

4. The hook device of CLAIM **3** wherein the bend of the second hook is shorter than the bend of the first hook.

5. The hook device of CLAIM **4** wherein:

(a) a distal portion of the first bend protrudes away from the first and second planes of rotation; and

(b) a distal portion of the second bend protrudes away from the first and second planes of rotation.

6. The hook device of CLAIM **1** wherein:

(a) the plurality of first retainers is defined on a first surface of the base adjacent to the first shank; and

(b) the plurality of second retainers is defined on a second surface of the base adjacent to the second shank.

7. The hook device of CLAIM **6** wherein:

(a) the plurality of first retainers comprises retainers **1**A, **1**B, and **1**C; and

(b) the plurality of second retainers comprises retainers **2**A, **2**B, and **2**C;

(c) wherein:

(1) the first bend and the second bend are separated by an angular gap when the first shank is retained by **1**A and the second shank is retained by **2**A;

(2) the first bend and the second bend are substantially superimposed when the first shank is retained by **1**B and the second shank is retained by **2**B; and

(3) a proximal portion of the first bend and a proximal portion of the second bend are adjacent to each other when the first shank is retained by **1**C and the second shank is retained by **2**C.

8. The hook device of CLAIM **7** wherein the bend of the second hook is shorter than the bend of the first hook.

9. The hook device of CLAIM **8** wherein:

(a) a distal portion of the first bend protrudes away from the first and second planes of rotation; and

(b) a distal portion of the second bend protrudes away from the first and second planes of rotation.

10. The hook device of CLAIM **1** further comprising:

(a) a panel disposed between the first pivot joint and the second pivot joint;

(b) wherein:

(1) the plurality of first retainers is defined on a first surface of the panel adjacent to the first shank; and

(2) the plurality of second retainers is defined on a second surface of the panel adjacent to the second shank.

11. The hook device of CLAIM **10** wherein:

(a) the plurality of first retainers comprises retainers **1**A, **1**B, and **1**C; and

(b) the plurality of second retainers comprises retainers **2**A, **2**B, and **2**C;

(c) wherein:

(1) the first bend and the second bend are separated by an angular gap when the first shank is retained by **1**A and the second shank is retained by **2**A;

(2) the first bend and the second bend are substantially superimposed when the first shank is retained by **1**B and the second shank is retained by **2**B; and

(3) a proximal portion of the first bend and a proximal portion of the second bend are adjacent to each other when the first shank is retained by **1**C and the second shank is retained by **2**C.

12. The hook device of CLAIM **11** wherein the bend of the second hook is shorter than the bend of the first hook.

13. The hook device of CLAIM **12** wherein:

(a) a distal portion of the first bend protrudes away from the first and second planes of rotation; and

(b) a distal portion of the second bend protrudes away from the first and second planes of rotation.

14. The hook device of CLAIM **1** wherein:

(a) the plurality of first retainers comprises retainers **1**A, **1**B, and **1**C; and

(b) the plurality of second retainers comprises retainers **2**A, **2**B, and **2**C;

(c) wherein:

(1) the first bend and the second bend are separated by an angular gap when the first shank is retained by **1**A and the second shank is retained by **2**A;

(2) the first bend and the second bend are substantially superimposed when the first shank is retained by **1**B and the second shank is retained by **2**B; and

(3) a proximal portion of the first bend and a proximal portion of the second bend are adjacent to each other when the first shank is retained by **1**C and the second shank is retained by **2**C.

15. The hook device of CLAIM **14** wherein the bend of the second hook is shorter than the bend of the first hook.

16. The hook device of CLAIM **15** wherein:

(a) a distal portion of the first bend protrudes away from the first and second planes of rotation; and

(b) a distal portion of the second bend protrudes away from the first and second planes of rotation.

17. The hook device of CLAIM **1** wherein the bend of the second hook is shorter than the bend of the first hook.

18. The hook device of CLAIM **17** wherein:

(a) a distal portion of the first bend protrudes away from the first and second planes of rotation; and

(b) a distal portion of the second bend protrudes away from the first and second planes of rotation.

19. A method of using a hook device comprising:

(a) rotating a first hook relative to an adjacent opposing parallel second hook about a common pivot joint;

(b) wherein:

(1) the first hook and the second hook are each initially resistively retained in a first configuration wherein the bend of the first hook and the bend of the second hook are substantially superimposed; and

(2) the first hook and the second hook are each finally resistively retained in a second configuration wherein the bend of the first hook and the bend of the second hook are separated by an angular gap.

20. A method of using a hook device comprising:

(a) rotating a first hook relative to an adjacent opposing parallel second hook about a common pivot joint;

(b) wherein:

(1) the first hook and the second hook are each initially resistively retained in a first configuration wherein the bend of the first hook and the bend of the second hook are substantially superimposed; and

(2) the first hook and the second hook are each finally resistively retained in a second configuration wherein a proximal portion of the bend of the first hook and a proximal portion of the bend of the second hook are adjacent to each other.

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