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(12) **United States Patent**
Power, II et al.

(10) **Patent No.: US 11,964,175 B2**
(45) **Date of Patent: *Apr. 23, 2024**

(54) **BRIDGE ROPE ASSEMBLY**

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(72) Inventors: **Walter Ernest Power, II**, Jordan, MN (US); **Gregory Alan Godfrey**, Richmond Hill, GA (US); **Carl Eugene Kossuth, III**, Rolla, MO (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 87 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/867,553**

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Related U.S. Application Data

(63) Continuation of application No. 17/231,717, filed on Apr. 15, 2021, now Pat. No. 11,504,556, which is a continuation of application No. 16/736,345, filed on Jan. 7, 2020, now abandoned.

(51) **Int. Cl.**
F16M 11/00 (2006.01)
A62B 35/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A62B 35/0075*** (2013.01); ***A62B 35/0037*** (2013.01)

(58) **Field of Classification Search**
CPC A62B 35/0075; A62B 35/0037; A62B 35/0012; A01M 31/02
See application file for complete search history.

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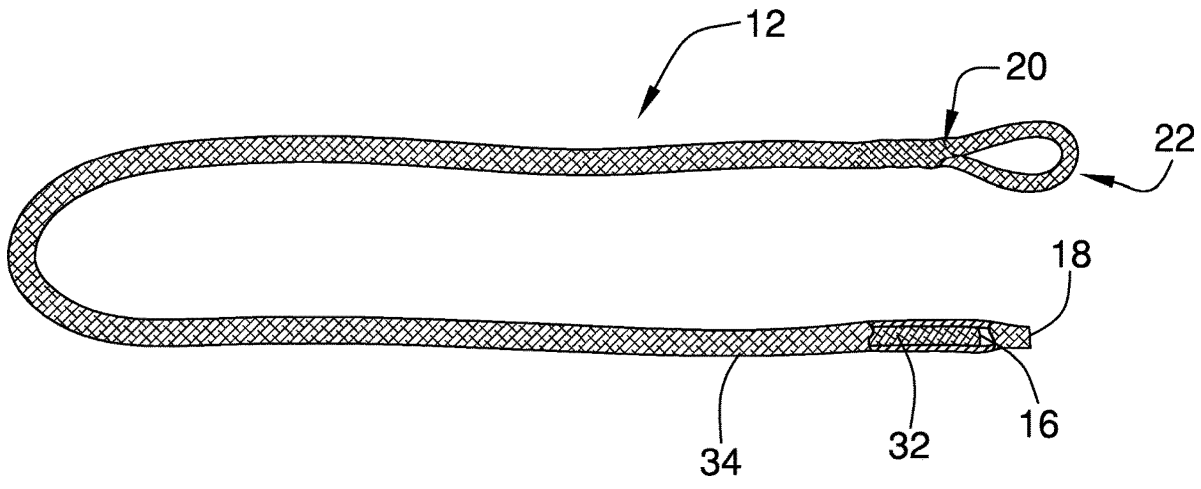
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Primary Examiner — Amy J. Sterling

(57) **ABSTRACT**

A bridge rope assembly includes a main body comprising a rope that has a first end and a second end. The rope has a splice therein to form an eye loop in the main body. The eye loop is configured to engage a first bridge loop of a harness. The main body comprises a first portion including the first end and a second portion including the second end. The first portion extends through the second portion of the main body such that the first end is positioned adjacent to the second end. A distance between the first and second ends is less than 2.0 inches.

14 Claims, 9 Drawing Sheets



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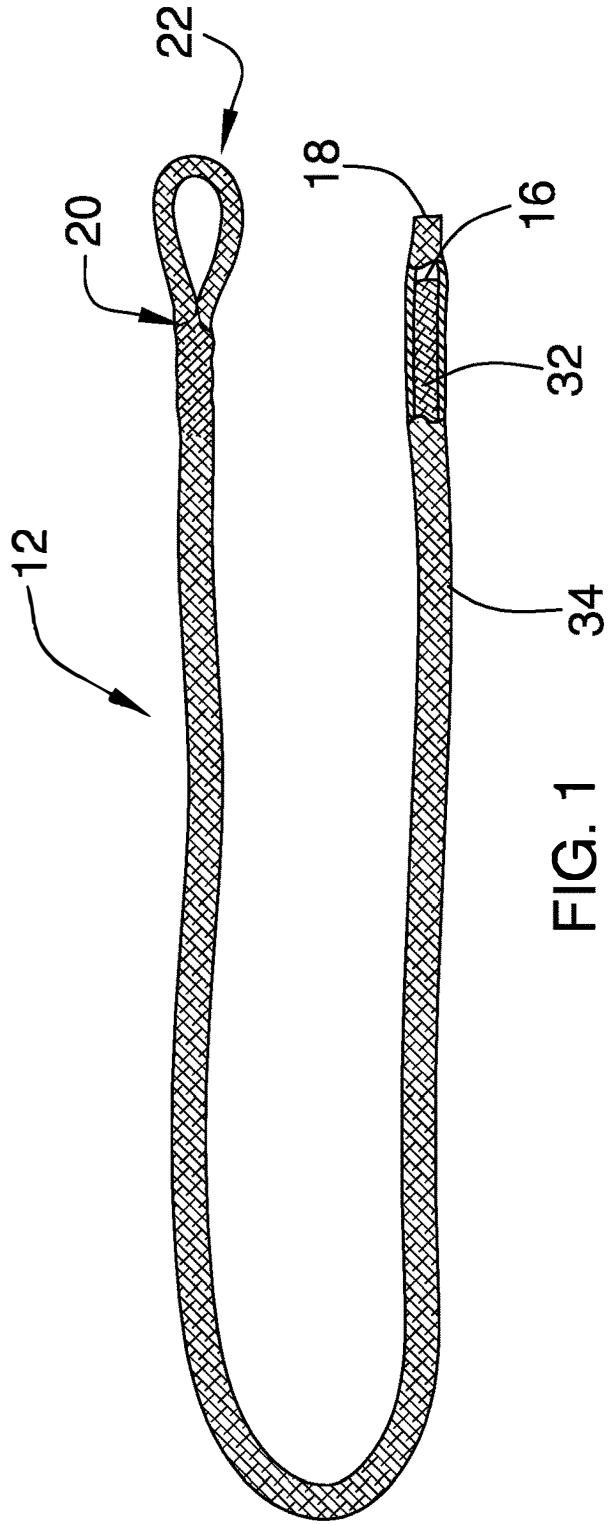


FIG. 1

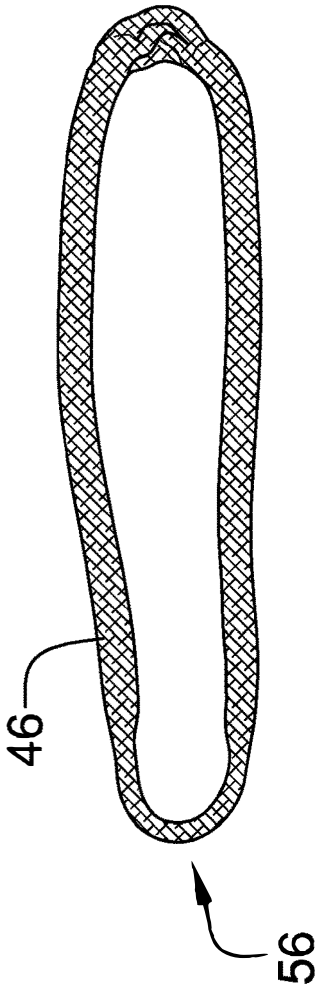


FIG. 2

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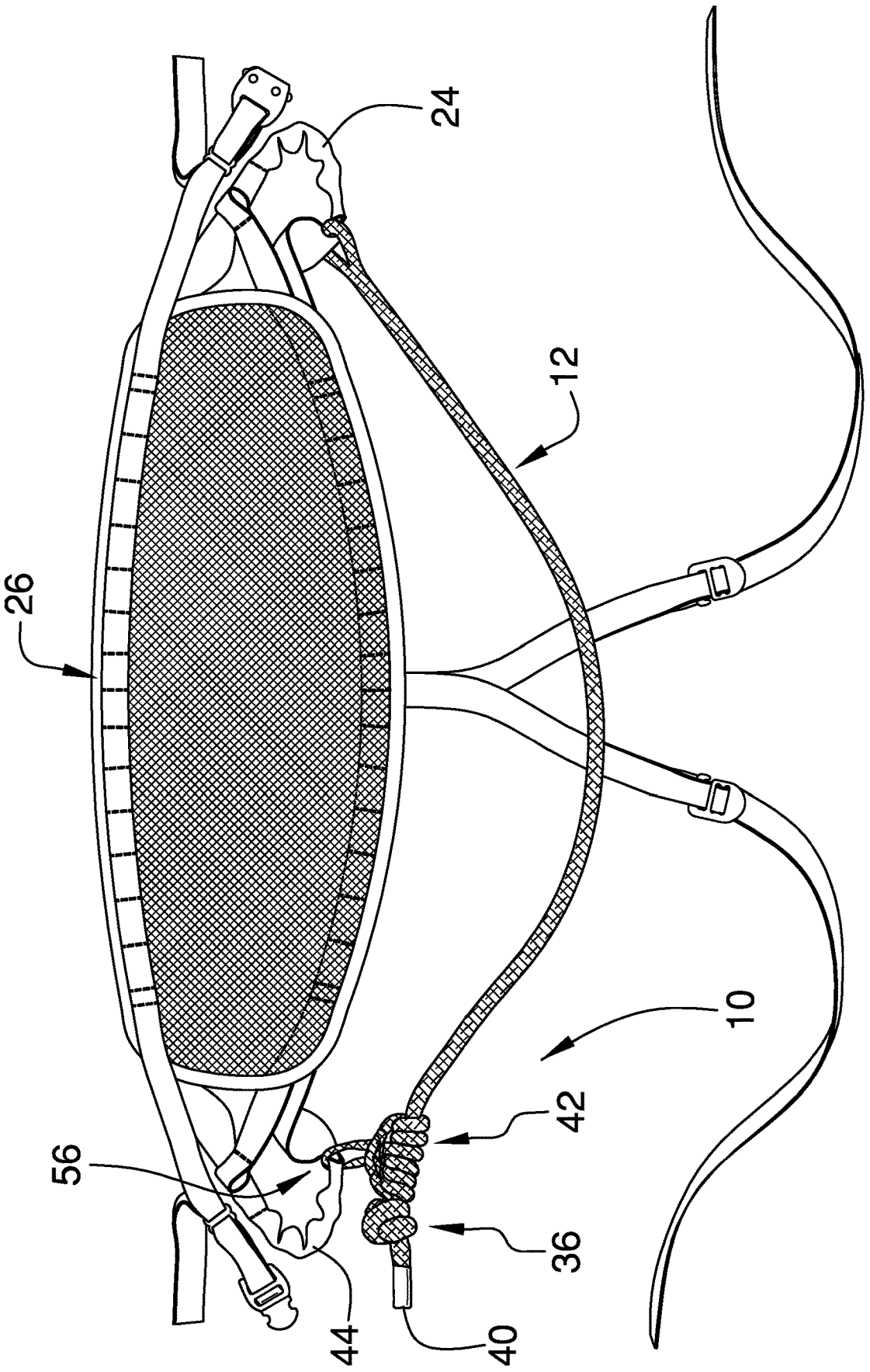


FIG. 3

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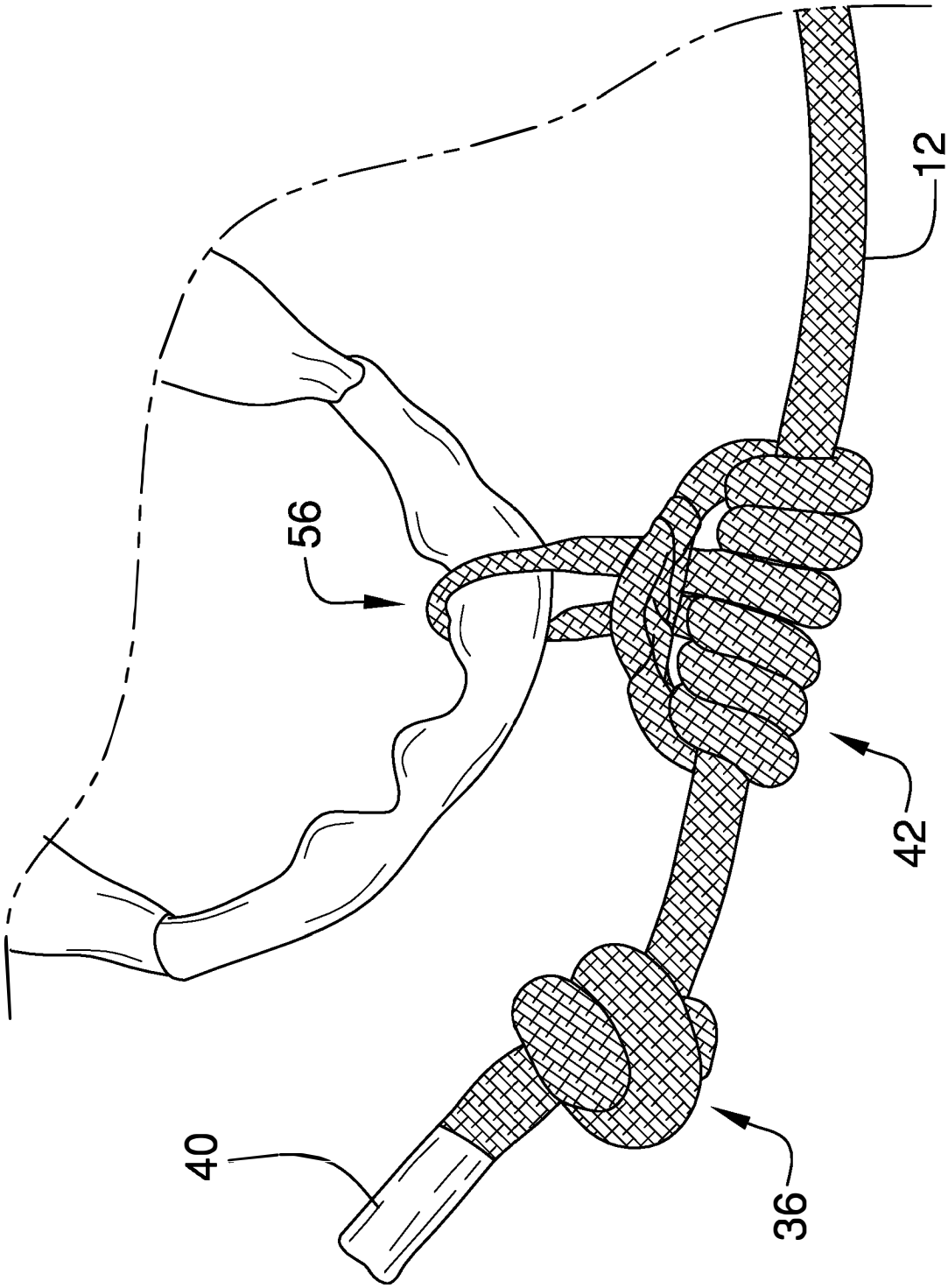


FIG. 4

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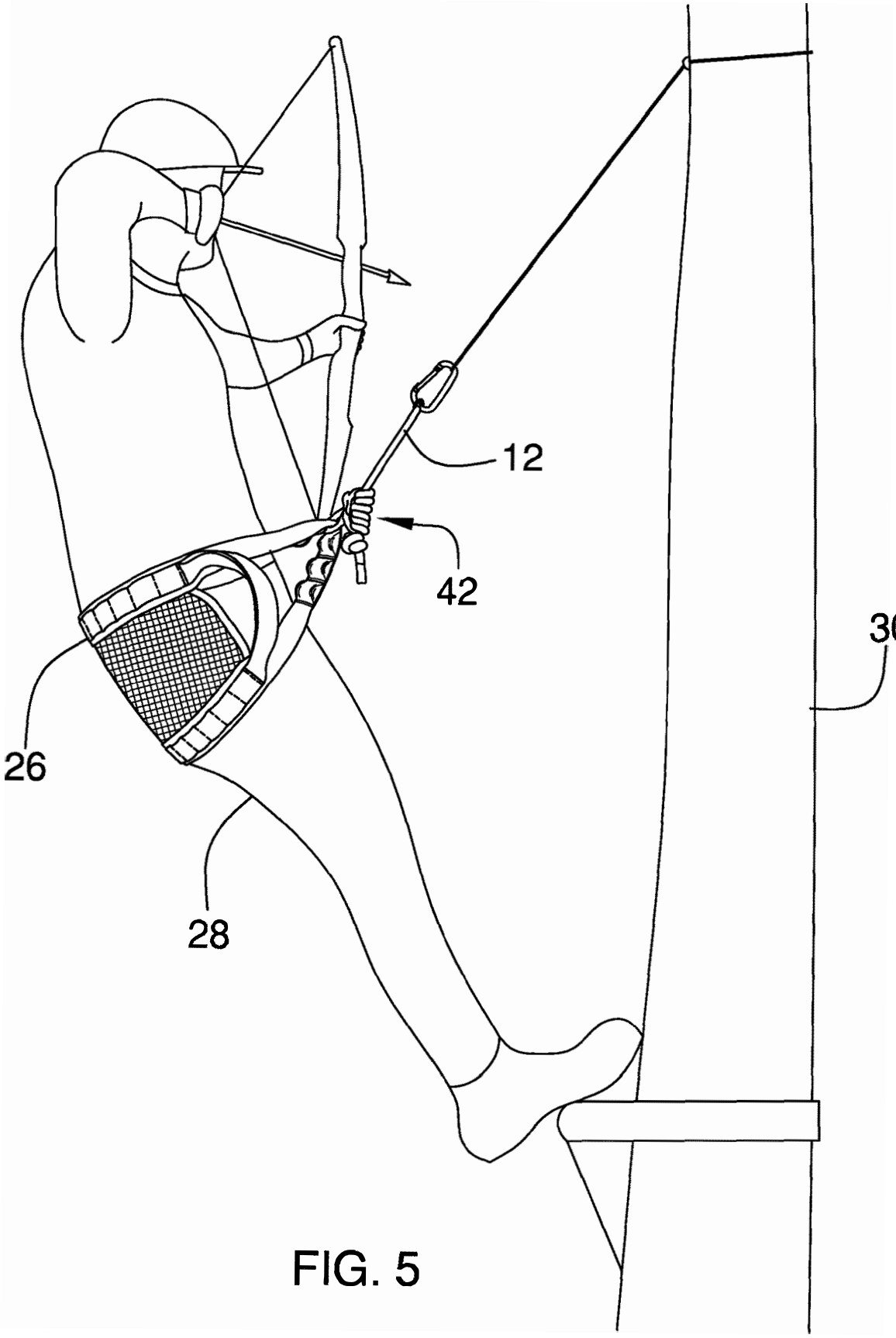


FIG. 5

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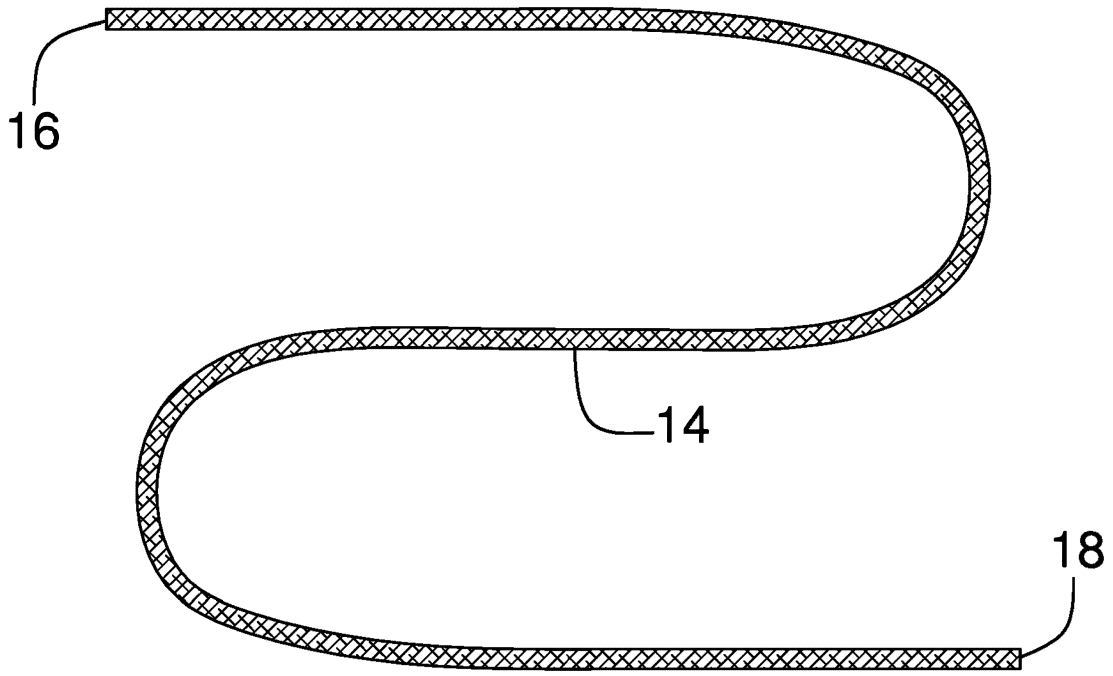


FIG. 6

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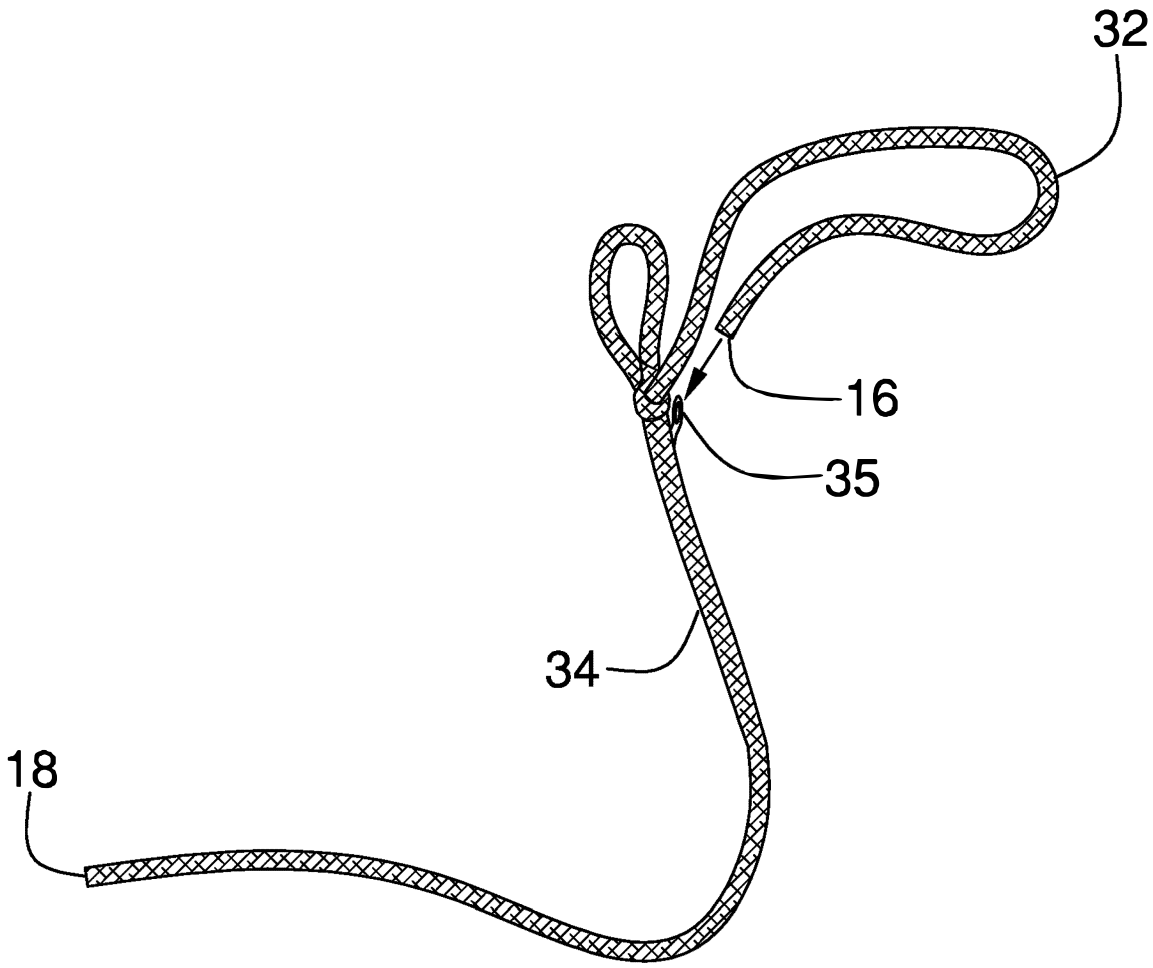


FIG. 7

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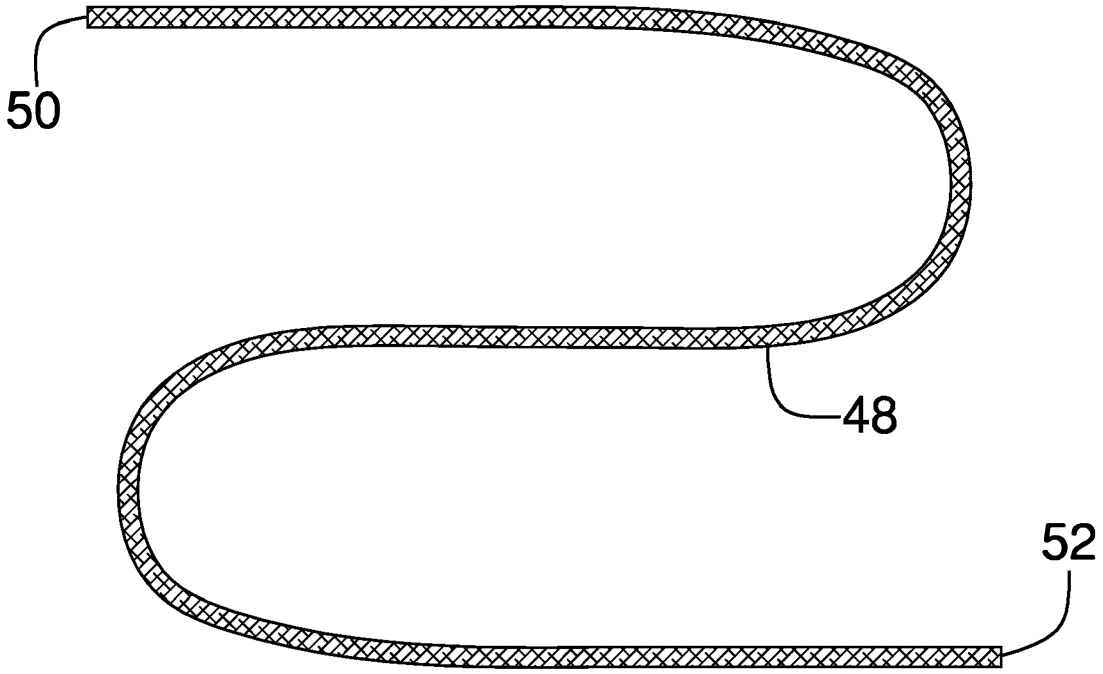


FIG. 8

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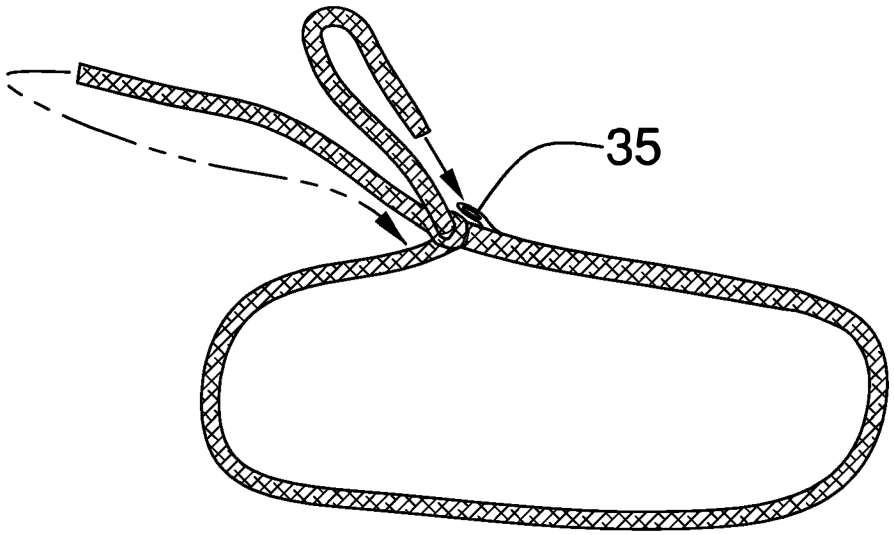


FIG. 9

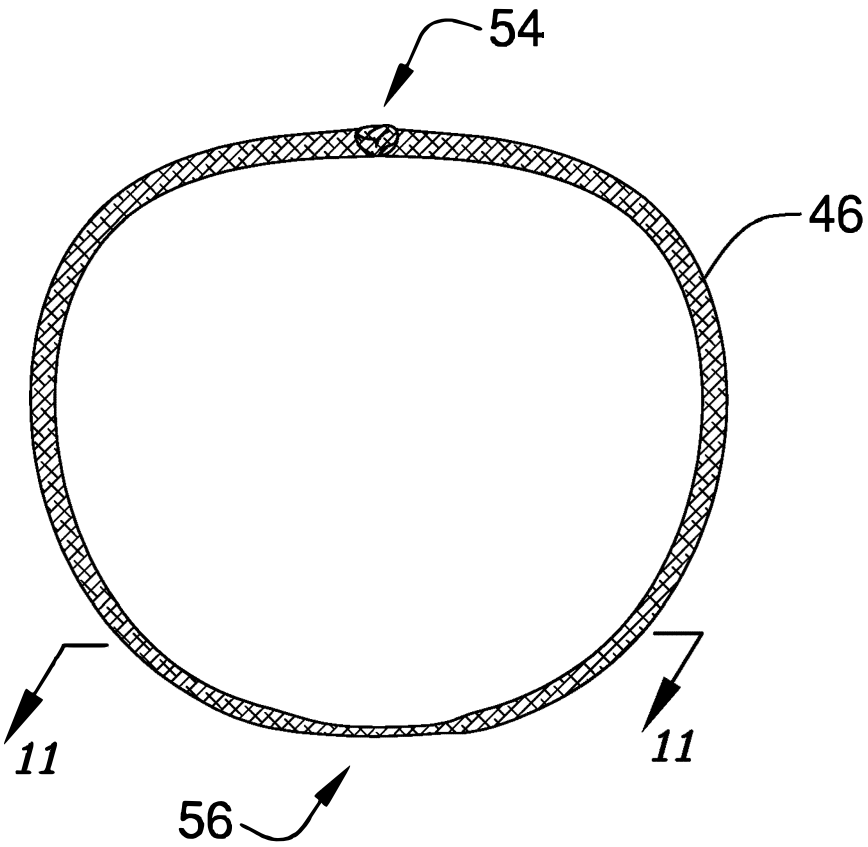


FIG. 10

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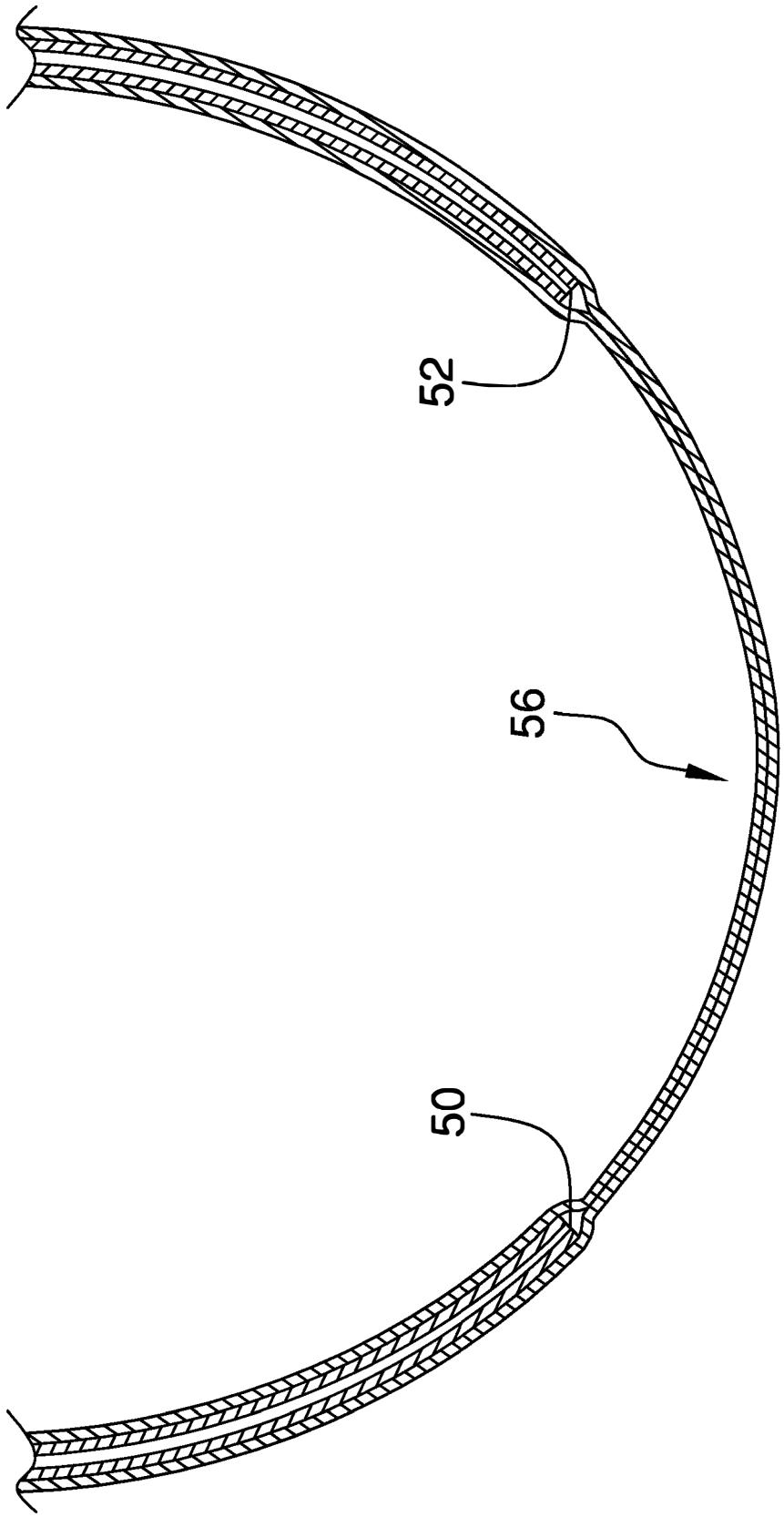


FIG. 11

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BRIDGE ROPE ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation and I claim the benefit of U.S. application Ser. No. 16/736,345, now abandoned, filed on Jan. 7, 2020 and U.S. application Ser. No. 17/231,717 filed on Apr. 15, 2021.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

Not Applicable

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC OR AS A TEXT FILE VIA THE OFFICE ELECTRONIC FILING SYSTEM

Not Applicable

STATEMENT REGARDING PRIOR DISCLOSURES BY THE INVENTOR OR JOINT INVENTOR

Not Applicable

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The disclosure relates to harness rope structures and more particularly pertains to a new harness rope structures for utilizing eye splices having fully buried rope ends which extend completely into their mating counterparts a sufficient distance such that a double layer of rope is created. It has been found that such a construction allows high strength materials that are otherwise susceptible to heat/friction damage, or are of such low friction that they do not typically retain a closed loop formation under stress, to be used safely for harness bridge ropes.

(2) Description of Related Art Including Information Disclosed Under 37 CFR 1.97 and 1.98

The prior art relates to harness ropes which are generally conventional and utilize rope materials that are of inferior strength but which have a higher coefficient of friction and a higher weight to strength ratio.

BRIEF SUMMARY OF THE INVENTION

An embodiment of the disclosure meets the needs presented above by generally comprising a main body including a rope that has a first end and a second end. The rope has a splice therein to form an eye loop in the main body. The eye loop is configured to engage a first bridge loop of a harness. The main body comprises a first portion including the first end and a second portion including the second end. The first portion extends through the second portion of the main body such that the first end is positioned adjacent to the second end. A distance between the first and second ends is less than 2.0 inches.

There has thus been outlined, rather broadly, the more important features of the disclosure in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the disclosure that will be described hereinafter and which will form the subject matter of the claims appended hereto.

The objects of the disclosure, along with the various features of novelty which characterize the disclosure, are pointed out with particularity in the claims annexed to and forming a part of this disclosure.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWING(S)

The disclosure will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. **1** is a front view of a main body of a bridge rope assembly according to an embodiment of the disclosure.

FIG. **2** is a front view of a closed loop of an embodiment of the disclosure.

FIG. **3** is a front in-use view of an embodiment of the disclosure.

FIG. **4** is a front in-use view of an embodiment of the disclosure.

FIG. **5** is a side in-use view of an embodiment of the disclosure.

FIG. **6** is a front view of a rope used in forming a main body of an embodiment of the disclosure.

FIG. **7** is a front view of a step in forming the main body of an embodiment of the disclosure.

FIG. **8** is a front view of a single rope used in forming a friction hitch of an embodiment of the disclosure

FIG. **9** is a front view of a step in forming a continuous loop of an embodiment of the disclosure.

FIG. **10** is a front view of the continuous loop of an embodiment of the disclosure

FIG. **11** is a cross-sectional view taken along line **11-11** of FIG. **10** of an embodiment of the disclosure.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings, and in particular to FIGS. **1** through **11** thereof, a new harness rope structure embodying the principles and concepts of an embodiment of the disclosure and generally designated by the reference numeral **10** will be described.

As best illustrated in FIGS. **1** through **11**, the bridge rope assembly **10** generally includes a main body **12**, as shown in FIGS. **1**, **4**, **6** and **7**, comprising a rope **14** that has a first end **16** and a second end **18**. The main body **12** has a splice **20** therein to form an eye loop **22** in the main body **12**. The splice **20** may be a straight splice or a locked brummel splice. Each is well known in the art of rope manipulation within the harness arts. Generally, a locked brummel splice may be preferred as any buried tags (portions of rope extended within another portion of rope) cannot back themselves out as they are effectively "locked" in place with a knot. A downside of the locked brummel is the knot itself at the splice **20** which creates a bulge in the rope where the

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knot is formed. Buried tags that are the product of a straight splice are not locked in place and therefore can back themselves out when not under tension. However, a straight splice can be secured in place by stitching the resultant tag(s) in place once the tag is in a buried condition if desired. Generally, as it will be understood below, it is the splice **20** which creates one or two tags which is important.

The eye loop **22** is configured to engage a first bridge loop **24** of a harness **26** utilized to support a person **28** secured to a tree **30**. After the formation of the eye loop, the main body **12** comprises a first portion **32** including the first end **16** and a second portion **34** including the second end **18**. The first portion **32** is then extended through the second portion **34** of the main body **12** by threading the first end **16** into the second portion **34** adjacent to the eye loop **22**. The first end **16** of a conventional buried tag, i.e. first portion **32**, is typically retained within the second portion **34** in close proximity to the eye loop **22**. However, in the current disclosure, the eye loop **22** is positioned proximate a central area of the rope **14** such that the first end **16** can be extended adjacently to the second end **18**, wherein the first **32** and second **34** portions each extend away from the eye loop **22**. The first end **16** will typically remain within the second portion **34** and will be located less than 2.0 inches from the second end **18**.

The main body **12** includes a stop knot **36** in the second portion **34** adjacent to the second end **18** and therefore the stop knot **36** further includes the first portion **32** adjacent to the first end **16**. The stop knot **36** may comprise, for example, a double fisherman's knot.

The juncture of the first **16** and second **18** ends may be covered with a securing member or otherwise bonded together with known methods and/or mechanical structures. These may include mechanical stitching, staples, glue, friction/heat bonding and the like. One type of securing member may comprise a heat shrink wrap sleeve having an interior coated with an adhesive to ensure a strong bond between the sleeve and the main body **12**. The sleeve will extend in opposite directions away from a juncture of the first end **16** and the second portion **34** to ensure that that the first end **16** does not move relative to the second portion **34** and protects the juncture from damage, such as for example from fraying. After the shrink wrap is heated and adhered to the second portion **34**, the extra length of section portion **34** extending beyond the first end **16** may be removed such that the first **16** and second **18** ends are flush with each other.

The rope **14** may have a length from the first end **16** to the second end **18** between 72.0 inches and 126.0 inches. The main body **12** may further comprise a 0.25 inch braided rope though other rope diameters are contemplated with the width being typically less than 0.50 inches and generally at least 0.1875 inches. The second end **18** extends away from the eye loop **22** between 0.5 inches and 3.0 inches farther away than the first end **16** extends away from the eye loop **22**, and more preferably less than 2.0 inches farther away. It should be understood that the first end **16** may extend outwardly of the second portion **34** a short distance and either be trimmed back such that it is flush with or within 1.0 inches of the second end **18** and thereafter secured in place. The burying of the first portion **32** within the second portion **34** may be facilitated with conventional threading/splicing tools **35**. Increased friction between the first **32** and second **34** portions due to the increased diameter of the second portion **34** prevents movement of the first **32** and second **34** portions relative to each other to minimize mechanical failure. The increased diameter of the second portion **34** will also result in increased friction between the main body **12** and a friction hitch positioned on the main body **12**. This minimizes mechanical failure of the bridge rope assembly **10** during standardized drop testing.

The main body **12** is comprised of a polyethylene, and in particular ultra high molecular weight polyethylene, typically known as UHMWPE. This material characteristically includes extremely long chains of polyethylene having 100,000 to 250,000 monomer units per molecule. Such material is available from numerous suppliers. One such material is sold under the trademark Amsteel. Amsteel is a trademark of Samson Rope Technologies, Inc. located at 2090 Thorton Street, Ferndale, WA This material may be blended with other materials; however, the rope may consist solely of UHMWPE. UHMWPE, while extremely strong, has a very low coefficient of friction. Therefore the extension of the first portion **32** through the second portion **34** further resists the movement of the first portion **32** outwardly away from the second portion **34** while increasing a thickness of main body **12** such that it may be gripped easier.

In one embodiment, the main body **12** comprises a rope that is 95.0 inches long and is comprised of 0.25 inch diameter Amsteel. A splice **20** is created and a locked brummel used such that a 39.0 inch tag line (first portion **32**) is formed which is buried into what will be an approximately 50.0 inch remainder (second portion **34**) of the rope **14**. The widening of the second portion **34** to accept the first portion **32** causes the second portion **34** to shorten in length which allows the first portion **32** to nearly extend through the second portion **34**. Shrink wrap **40** is then applied over the second **34** portion at a juncture of the first end **16** and second portion **34**. It is heated to form a bond with the second portion **34** and compresses the first **32** and second **34** portions together. After the shrink wrap is heated and adhered to the second portion **34**, the extra length of the second portion **34** extending beyond the first end **16** may be removed such that the first **16** and second **18** ends are flush with each other. The stop knot **36** is formed in the main body **12** adjacent to the shrink wrap **40** by way of a double fisherman's knot. The distance from the stop knot **36** to the eye loop **22** is approximately 31.0 inches.

A friction hitch **42**, as shown particularly in FIGS. **2**, **4**, and **9-11**, is positioned on the main body **12** between the stop knot **36** and the eye loop **22**. The friction hitch **42** is formed in a conventional manner and is configured to engage a second bridge loop **44** of the harness **26**. The friction hitch **42** comprises a closed loop **46**. The closed loop **46** is comprised of a single rope **48** that is formed into a continuous splice using a conventional method except wherein a pair of ends (first end **50** and second end **52**) of the single rope **48** are each buried into the closed loop **46** a distance of at least 40% of a total circumference of the closed loop **46**, more particularly between 40% and at least 50% of the total circumference, though, for reasons stated below, a distance of less than 50% may be preferred.

Using conventional methods, the closed loop **46** is formed at with a splice **54** drawn together by ends **50** and **52** being drawn through the splice **54**. As with the main body **12**, the splice **54** may be a locked brummel splice **54** or a straight splice with the same disadvantages as mentioned above except with two tag lines, as shown in FIG. **9**, instead of one. The first **50** and second **52** ends are then drawn through, or buried, in the continuous loop **46** with the first end **50** being positioned on one side of the locked splices **54** and the second end **52** being positioned on the other side of the locked splices **54**. The first **50** and second **52** ends are thereby extending toward each other within the closed loop **46**. However, they will typically remain spaced apart a

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distance of between 1.0 and 4.0 inches to create a narrow area **56** in the continuous loop **46** having a diameter that is less than a remainder of the continuous loop **46**. Thus, the ends **50**, **52** are each buried typically at least 40% and less than 50% of the total circumference of the continuous loop leaving the narrow area **56** to include less than 100% and greater than 80% of the total circumference.

The single rope **48** of the closed loop **46** has a length between 40.0 inches and 60.0 inches and the closed loop **46** will typically have a total circumference of between 20.0 inches and 30.0 inches. The single rope **48** may further comprise a 3/16 inch braided rope, though other rope diameters are contemplated with the width being typically less than 0.50 inches and generally at least 0.125 inches. As with the main body **12**, the friction hitch **42** is comprised of UHMWPE. By burying the first **50** and second **52** ends of the single rope **48** through a majority of the closed loop **46**, the closed loop **46** will resist damage caused by movement of the first **50** and second **52** ends within closed loop **46** while ensuring that the closed loop **46** remains intact.

In one specific example of the friction hitch **42**, the single rope **48** is 47.0 inches long and is comprised of a 3/16 inch diameter of Amsteel rope, a type of braided rope comprised of UHMWPE. A brummel is formed 13.5" from a center point of the single rope **48** with tag ends of the single rope **48** each being buried to form a resultant closed loop **46** having a circumference from 22" to 24" depending on the stretch of the single rope **46** as it is formed into the closed loop **46**. The narrow area **56** has a length being equal to between 3.0 inches and 4.0 inches. The closed loop **46** is formed into the friction hitch using what is commonly referred to as a Prusik knot.

In use, the eye loop **22** of the main body **12** is engaged on the first bridge loop **24** of the harness **26**. The friction hitch **42** is formed in a conventional manner on the main body **12** and second bridge loop **44**. The friction hitch **42** is positioned between the eye loop **22** and knot **36**. The friction hitch **42** is conventional and can be selectively loosened and moved along the main body **12**. However, the materials and structure of the main body **12** and friction hitch **42** will prevent failure and allow UHMWPE materials to be used in such a manner that they will pass standardized drop tests. The narrow portion **56** of the closed loop **46** will typically be engaged with the second bridge loop **44** and its narrow diameter will assist in locking it in grooves in the second bridge loop **44** should such be provided.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of an embodiment enabled by the disclosure, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by an embodiment of the disclosure.

Therefore, the foregoing is considered as illustrative only of the principles of the disclosure. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the disclosure to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the disclosure. In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be only one of the elements.

We claim:

1. A bridge rope assembly configured to couple together a tree rope to a first bridge loop and a second bridge loop on a harness, the bridge rope assembly including:

a main body comprising a rope having a first end and a second end, the main body having a splice therein to form an eye loop in the main body, the eye loop being configured to engage the first bridge loop, the main body comprising a first portion including the first end and a second portion including the second end, the first portion extending through the second portion of the main body such that the first end is positioned within the second portion adjacent to the second end; and

a friction hitch being positioned on the min body between the second end and the eye loop, the friction hitch being configured to engage the second bridge loop, the friction hitch comprising a closed loop.

2. The bridge rope assembly according to claim **1**, wherein the rope has a length from the first end to the second end between 72.0 inches and 126.0 inches.

3. The bridge rope assembly according to claim **1**, wherein a distance of the eye loop to the second end is between 24.0 inches and 40.0 inches.

4. The bridge rope assembly according to claim **3**, wherein the main body includes a stop knot in the second portion adjacent to the second end.

5. The bridge rope assembly according to claim **4**, further including a securing member being positioned on the main body at a juncture of the first and second ends to retain the first and second ends at a static position relative to each other.

6. The bridge rope assembly according to claim **4**, wherein the closed loop comprises a single rope being formed into the closed loop.

7. The bridge rope assembly according to claim **6**, wherein the single rope of the closed loop has a length between 40.0 inches and 60.0 inches.

8. The bridge rope assembly according to claim **7**, wherein the closed loop has a total circumference of between 20.0 inches and 30.0 inches.

9. The bridge rope assembly according to claim **1**, wherein the closed loop has a total circumference of between 20.0 inches and 30.0 inches.

10. The bridge rope assembly according to claim **9**, wherein the main body and the friction hitch each are comprised of UMWPE.

11. The bridge rope assembly according to claim **1**, wherein the main body is comprised of UHMWPE.

12. The bridge rope assembly according to claim **9**, wherein a distance of the eye loop to the second end is between 24.0 inches and 40.0 inches.

13. The bridge rope assembly according to claim **12**, wherein the closed loop has a total circumference of between 20.0 inches and 30.0 inches.

14. The bridge rope assembly according to claim **12**, wherein a distance between the first and second ends is less than 2.0 inches.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 11,964,175 B2
APPLICATION NO. : 17/867553
DATED : April 23, 2024
INVENTOR(S) : Walter Ernest Power, II, Gregory Alan Godfrey and Carl Eugene Kossuth, III

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 6, Line 20, in Claim 1:
min
Should be changed to:
--main--.

Signed and Sealed this
Twelfth Day of November, 2024

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

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