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(54) **ACCORDION STRAP WITH FORMED WAVES**

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to bundling and attachment devices and more specifically to tie straps for securing about an article or articles to be secured. In even greater particularity, the present invention relates to what is referred to in the art as a "ball-lock" tie strap, which has a ball within a locking head of the tie strap for lockingly engaging the tie strap around the article or articles to be secured. Still, in even further specificity, the present invention relates to a ball-lock tie strap which includes a plurality of formed waves extending from a major plane of the strap body, serving to secure the locking head around the article or articles, as it is e.g. known from EP 0 952 091 A1.

BACKGROUND OF THE INVENTION

[0002] Plastic tie straps have become increasingly popular for a variety of bundling and attachment applications because of their relatively low initial cost and ease of their installation. In many applications, however, it is desirable to use a metallic tie strap. For instance, metal ties are often used in underground, corrosive, nuclear, and heavy vibration environments and in other situations where they are exposed to harsh conditions.

[0003] Metal tie straps may rely on a locking head which allows insertion of an elongate strap in a first direction but, after a slight movement in a second direction, the locking head locks the elongate strap in a "lock position" to keep the strap from further movement in the second direction and does not allow removal of the strap. If too much play exists in the tie strap, however, and depending upon the design of the tie strap and locking head (as well as the type of article or articles secured) the elongate strap may work its way out through various movements in different directions, allowing the article or articles secured by the tie strap to become loose.

[0004] European Publication No. EP 0952091 A1 discloses a ball/roller-lock cable tie for holding an article or group of articles together in a bundle, which includes an elongate strap body, a locking head, a ball, and a strap body.

[0005] In view of the foregoing, a need exists for a tie strap which has a means for preventing retrograde movement of the strap from its locked position and for taking up slack and maintaining tension on the strap, ensuring that the tie strap remains locked under all circumstances.

SUMMARY

[0006] The present invention addresses the above needs by providing a tie strap according to claim 1.

[0007] The ball lock tie strap according to the invention is for holding an article or group of articles together in a bundle. The tie strap includes an elongate strap having

a locking head at one end and a tail at the other end, the elongate strap body there-between. The tail is insertable into the locking head for locking the strap around the article or articles. The tie strap itself is deformable to encompass the article or group of articles. The locking head contains a ball positioned within for lockingly engaging the tail upon insertion of the tail in a first direction, and for locking engagement upon movement of the tail in a second direction opposite the first direction, thereby retaining the tail in the locking head. The strap body is defined by a major plane and a diametrically opposite minor plane, with a plurality of formed waves, wherein each formed wave adjoins in a longitudinal direction of the strap body with at least one other formed wave, and forms an angle with said at least one other formed wave, said plurality of formed waves extending from the major plane opposite the minor plane. The plurality of waves provide a spring-like effect for providing resilient retention of the strap body about the article or articles upon locking engagement of the tail with the head. The plurality of waves allow for the elongate strap itself to have a degree of elasticity, compensating for a lack of elasticity if the article or articles encompassed are non-deformable and confirming the tail of the elongate strap does not move in the second direction which might dislodge the locking head, and loosen the article or articles.

[0008] In various embodiments of the invention, the tie strap is formed of stainless steel (such as 304 stainless steel or 316 stainless steel), aluminum, brass, plastic, or any other material, and may be between 26 and 27 inches (between 660 mm and 686 mm) in length, or, alternately, between 200 mm and 680 mm. The width of the tie strap may be between 4.6mm and 7.9mm.

[0009] In an embodiment of the invention, the formed waves do not extend from the minor plane.

[0010] In various embodiments of the invention, the number of formed waves number between four and seven.

[0011] Each formed wave may form with other waves a sixty degree angle, an angle between fifty-five degrees and sixty-five degrees, a ninety degree angle, or any other angle.

[0012] In an embodiment of the invention the formed waves are located adjacent the head, but the formed waves are located in other embodiments in any portion of the strap body, including adjacent to the tail, or in the middle of the strap body.

[0013] In still another embodiment of the invention, all formed waves may have a combined length of less than one inch (25.4 mm).

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] These and other features, aspects, and advantages of the present invention will become better understood with regard to the following detailed description and accompanying drawings where:

FIG. 1 is a perspective view of a representative tie strap embodying characteristics of the present invention.

FIG. 2 is a perspective view of a portion of the tie strap illustrated in FIG. 1 embodying characteristics of the present invention.

FIG. 3 is a side elevational view of a representative tie strap embodying characteristics of the present invention.

FIG. 4 is a side elevational view of a portion of the tie strap illustrated in FIG. 1 embodying characteristics of the present invention.

FIG. 5 is a side elevational view of a portion of a tie strap showing an alternative embodiment of a plurality of formed waves formed in a strap body embodying characteristics of the present invention.

FIG. 6 is a side elevational view, partially in section, of a tie strap showing another alternative embodiment of a plurality of formed waves formed in a strap body embodying characteristics of the present invention.

FIG. 7 is a bottom view of the tie strap illustrated in FIG. 1 embodying characteristics of the present invention.

FIG. 8 is a side elevational view, partially in section, of the tie strap illustrated in FIG. 1 embodying characteristics of the present invention.

FIG. 9 is a side elevational view, partially in section, of the tie strap illustrated in FIG. 8 embodying characteristics of the present invention.

FIG. 10 is a side elevational view of an alternative embodiment of a tie strap embodying characteristics of the present invention.

DETAILED DESCRIPTION

[0015] Referring now to the drawings for a better understanding of the present invention, a representative tie strap for encircling and securing an article or article generally indicated in FIGS. 1 *et seq.* by reference numeral 10. As displayed in FIG. 1 *et seq.*, tie strap 10 is an elongate member including a locking head 16 at one end and a tail 46 at the other end. An elongate strap body 18 extends between the locking head 16 and the tail 46. The tail 46 is insertable into the locking head 16 for locking the strap around the article or articles to be secured. The locking head 16 contains a ball 22 for retaining the elongate strap 18 and tail 46. The tail 46 may be inserted into the locking head 16 in a first direction and retained via engagement of the locking head 16 and ball 22 upon movement in a second direction opposite the first direction, thereby retaining the tail 46 in the locking head 16. The general structure and function of the tie strap discussed herein is more fully described in commonly assigned Patent 6,076,235 issued June 20, 2000, entitled "Cable Tie." This patent application is incorporated by reference in its entirety here.

[0016] When clenched around an article or article such

as the bundle of steel rods 14 or pipe 12, in order to prevent the ball 22 from moving in the locking head 16, thereby also preventing retrograde movement of the tail in the second direction and avoid the locking head 16 from loosening, a plurality of formed waves formed into the strap body 18 (as displayed variously in FIGS. 1 *et seq.* at reference numerals 26a, 26b, or 26c) are utilized for enhancing the clenching of strap body 18 around article or articles 12, 14. In various embodiments of the invention, the formed waves may number exactly four, five (as displayed at reference number 26a), six (displayed as reference number 26b), or seven (displayed 26c). More or less formed waves are contemplated as well as being within the scope of the invention. The formed waves 26a, 26b, or 26c may be formed near the tail 46, the locking head 16, or at any other location in the elongate strap 18. The tie strap 10 presents the advantages of high tensile strength, is lightweight, has a long service life, and is simple and economical to manufacture.

[0017] In a preferred embodiment, the locking head 16, strap body 18, ball 22, and all other elements of the presently disclosed invention are formed of stainless steel to allow the tie strap to be used over a wide variety of temperature ranges and give the tie strap high tensile strength and excellent resistance to corrosion in harsh elements. Steel such as 304 stainless (known alternately as A2 stainless steel or 18/8 stainless steel), or 316 stainless may be utilized. It should be understood, however, that the tie strap 10 may be constructed out of other materials such as other types of metals including aluminum, brass, copper, iron, or even plastic. Other configurations may be utilized, and all are contemplated as within the scope of the invention. In an embodiment, for example, the sphere 22 may be replaced with a generally cylindrical locking pin, which allows a similar locking engagement.

[0018] Tie strap 10 of the present invention is preferably formed by first obtaining a suitable length of elongate strap 18 depending on application of tie strap 10, from a spool of such (not shown). In an embodiment of the invention, the elongate strap 18 has a length of between 26 and 27 inches (between 660 mm and 680 mm) for general purpose usability in many applications. Alternately, the elongate strap 18 may have a length of 200 millimeters ("mm"), 260 mm, 360 mm, 520 mm, or 680 mm. As still another alternate, the elongate strap 18 may have a length between 190 mm and 200 mm, between 250 and 270 mm, between 350 and 370 mm, between 500 and 540 mm, or between 650 and 700 mm. In various embodiments, the width of the elongate strap 18 may be 4.6 mm, 7.9 mm, or any other (or, alternately, between 4 mm and 5 mm or between 7 and 8 mm). The next step in manufacturing the tie strap 10 is forming the formed waves 26a, 26b, or 26c in the elongate strap 18. In an embodiment, a stamp of a die in a machine press is utilized to form the waves 26a, 26b, 26c in the elongate strap 18. It is most efficient, for manufacturing purposes, for each formed wave to form a sixty degree angle with

other formed waves (as displayed in Fig. 4, reference numeral 85), or any angle between fifty-five degrees and sixty-five degrees, since such angles may be formed with one stamp of the die. An angle of ninety degrees (as displayed in Fig. 5, reference numeral 85'), or any angle between eighty-five degrees and ninety-five degrees may be utilized as well, for the sake of utilization of the presently disclosed invention, but forming such waves may require more than one stamp of the elongate strap 18 by the die. The elongate strap 18 is defined by a major plane 4a and a diametrically opposed minor axis 4b plane, as pictured in FIG. 6.

[0019] Locking head 16 is preferably next formed from a generally flat planar metal blank (not shown) which is substantially rectangular in shape. A roof 32, as shown in FIG. 6, preferably in the form of a totally enclosed dome, is first formed in a central portion of the metal blank. In a preferred embodiment, as best shown in FIG. 7, opposing rectangular notches 34a and 34b are then formed through the metal blank on opposite edges 36a and 36b so that when opposite portions 38a and 38b of the blank, including notches 34a and 34b, are folded together away or beneath roof 32 such that notches 34a and 34b and edges 36a and 36b are in direct opposing relation, they define a bottom 40 of locking head 16 which underlies roof 32. As such, notches 34a and 34b cooperate to define a generally square hole 42 through bottom 40. The respective areas of bend of the metal blank define sidewalls 44a and 44b of locking head 16 while the portion of the metal blank surrounding roof 32 and overlying bottom 40 defines ceiling 43. Thus, it can be seen that sidewalls 44a and 44b interconnect ceiling 43 and bottom 40.

[0020] Next, the roller means of tie strap 10, preferably in the form of sphere 22, is inserted into the locking head 16 through hole 42 in bottom 40. With the locking head 16 oriented so that sphere 22 remains suitably positioned inside of head 16, head 16 is slidably mounted onto strap body 18 over the tail 46 such that bottom 40 is adjacent second surface 20b. In this position, roof 32 and ceiling 43 overlie first surface 20a of strap 18, noting that sphere 22 is captively held within head 16 by roof 32 and strap 18. First end 30 of strap 18 is folded over at perforation 66 and projection 28 is inserted and latched into hole 42, thereby securing the locking head 16 to the strap 18.

[0021] As best shown in FIGS. 6 and 7, locking head 16 includes a strap ingress end 50, a strap egress end 52, and a strap-receiving passageway 54 extending therebetween through locking head 16 which is partially defined by ceiling 43, sidewalls 44a and 44b, and bottom 40. Ceiling 43 may overlie bottom 40 in substantial parallel relation thereto. Roof 32 preferably includes first and second generally straight diverging portions 56 and 58 and a converging generally arcuate portion 60. First and second diverging portions 56 and 58 and bottom 40 diverge from one another in the direction of egress end 52. In a preferred embodiment, second diverging portion 58 has a lesser divergence angle than first diverging portion

56. Conversely, arcuate portion 60 and bottom 40 converge toward one another in the direction of egress end 52. Egress end 52 of head 16 may also serve as a reaction surface for the nose of a conventional strap tightening tool (not shown).

[0022] As shown in FIGS. 1-6 and 8-10, waves 26a, 26b, 26c comprise a plurality of formed waves numbering four formed waves, five waves 26a, six 26b, seven 26c, eight, or more. Each formed wave (26a, 26b, 26c) adjoins in a longitudinal direction of the strap body (18) with at least one other formed wave (26a, 26b, 26c), and forms an angle with said at least one other formed wave (26a, 26b, 26c). In a preferred embodiment, the plurality of formed waves 26a, 26b, 26c may only extend from the major plane 4a opposite the minor plane 4b. In an alternate embodiment, the formed waves extend from both the major plane 4a and the minor plane 4b of the elongate strap 18. As shown in FIG. 4, in an embodiment of the invention, said angle is between fifty-five degrees and sixty-five degrees, or exactly sixty degrees (as displayed 85). In a separate embodiment as shown in FIG. 5, said angle is between eighty-five degrees and ninety-five degrees, or exactly ninety degrees (as displayed 85'). Note that in FIG. 4, element 85 showing the sixty degree angle is shown with regard to five formed waves 26a and that in FIG. 5, element 85' showing the ninety degree angle is also shown with regard to five formed waves 26a', but note that the discussed angles may be used in connection with any number of formed waves formed in the elongate strap 18. The waves may be formed adjacent the head or elsewhere. All formed waves may have a length of less than one inch (25.4 mm), in an embodiment of the invention.

[0023] Referring to FIGS. 8-9, roller means such as ball 22 is movable within locking head 12 from a threading position, shown in FIG. 8, wherein ball 22 may be disposed against arcuate position 60 of roof 32 adjacent strap egress end 52, toward a locking or locked position, shown in FIG. 9 wherein ball 22 is wedged between diverging portion 58 of roof 32 and strap 18 closer to strap ingress end 50 which, in turn, wedges the strap 18 against bottom 40, thereby generally preventing retrograde movement of the strap 18 from its locked position in the locking head 16. As used herein, the terms "wedged" or "wedging" are to be accorded their broad meaning to simply indicate that in the locked position, the ball 22 and strap 18 are squeezed or compressed.

[0024] Operation of tie 10 is as follows: After strap 18 is deformed to encompass an article 12 or group of articles 14, tail 46 of strap body 18 is inserted in a first direction, as shown by the direction of arrow A into locking head 16 through strap ingress end 50. As threading continues in the direction of arrow A through passageway 54, strap 18 engages ball 22 lifting and moving it toward its threading position shown in FIG. 8. It will be appreciated that threading of the strap requires very low force as ball 22 can roll on the strap 18 during threading. This is to be contrasted with prior art ties requiring much higher

threading force wherein a locking tongue, biased to its locking position, has to be forcefully deflected to its threading position. Continued threading in the first direction shown by arrow A through passageway 54 causes strap 18 to exit from the locking head 16 through strap egress end 52. Strap 18 is pulled through locking head 16 until it tightly encircles the article 12 or bundle of articles 14 to a predetermined level as shown in FIG. 8.

[0025] The tightened position as shown in FIG. 9 results from insertion of the tail 46 in the head 16 and tightening of the strap 18. As can be seen in FIGS. 3 and 8-9, tightening of the strap 18 may serve to extend the formed waves 26a, 26b, or 26c in a spring-like fashion. The reactive force exerted by the formed waves 26a, 26b, 26c upon being stretched is utilized to exert a substantial force in a second direction, as shown by arrow B, maintaining the locking engagement of the tie strap around the article or articles to be secured.

[0026] Referring to Fig. 9, after strap 18 is tightened to a predetermined level, release of the strap 18 in conjunction with the force from formed waves 26a, 26b, or 26c causes the elongate strap 18 and the ball 22 to move or recoil in the second direction as displayed by arrow B toward the strap ingress end 50 until the ball 22 simultaneously engages roof 32 and strap 18. As shown in FIGS. 8 and 9, the travel of ball 22 between its threading position and locking position is very short. When the ball 22 is in its locking position, the frictional engagement between the ball 22 and the roof 32 and between the ball 22 and strap 18 is generally sufficient to prevent rolling of the ball 22, thus causing the strap to be tightly wedged against bottom 40. In addition, the force associated with stretched formed waves 26a, 26b, 26c as described above in the second direction shown by arrow B further enhances the prevention of ball 22 from rolling, thus enhancing the locking of the strap 18 within head 16 by contributing to the wedging of strap 18 against bottom 40. The continuous force exerted by the formed waves 26a, 26b, or 26c in the direction of arrow B also maintains the clenching of strap 18 around articles 12 or 14. The ball 22, upon incipient locking, also effects permanent deformation of the strap 18 by indentation causing strap material previously underneath the ball 22 to cold flow in effect forming a rim about the indentation.

[0027] FIG. 10 shows an alternative embodiment of the present invention is designated generally as numeral 10'. Tie 10' is substantially the same as tie 10 with the exception that formed wave 26a, 26b, or 26c indicated as 26a', 26b', or 26c' is positioned at another location on strap 18, such as adjacent the head 16. In still a further embodiment, the formed waves may be located in the center, or approximately the center, of the strap 18.

[0028] In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained. As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description shall be in-

terpreted as illustrative and not in a limiting sense.

Claims

1. Tie strap (10, 10') for securing about an article (12) or articles (14), comprising:

an elongate strap (18) having a locking head (16) at one end and a tail (46) at the other end, the elongate strap body (18) therebetween and the tail (46) being insertable into the locking head (16) for locking the strap (10, 10') around the article (12) or articles (14); and

the locking head (16) containing a ball (22) positioned within said locking head (16) for lockingly engaging said tail (46) by inserting the tail (46) in the head (16) along a first direction and tightening the strap (18), and subsequently moving the tail (46) in a second direction opposite said first direction, thereby retaining said tail (46) associated with said locking head (16);

wherein the strap body (18) further defines a major plane (4a) and a diametrically opposite minor plane (4b), a plurality of formed waves (26a, 26b, 26c), extending from the major plane (4a) opposite the minor plane (4b) of the strap body (18) for providing resilient retention of the strap body (18) about said article (12) or articles (14) upon said locking engagement of said tail (46) with said head (16),

characterized in that, the locking head (16) is secured to the elongate strap body (18) by folding a first end (30) of the elongate strap body (18) over at a perforation (66) such that a projection (28) at the first end of the elongate strap body is inserted and latched into a hole (42) defined on a bottom (40) of the locking head (16).

2. Tie strap of claim 1, wherein the formed waves number four.
3. Tie strap of claim 1, wherein the formed waves (26a) number five.
4. Tie strap of any of the preceding claims, wherein each formed wave forms an angle with other formed waves, said angle being between a fifty five degree angle and a sixty five degree angle.
5. Tie strap of any of the preceding claims, wherein each formed wave forms a sixty degree angle with other formed waves.
6. Tie strap of any of the preceding claims, wherein the tie strap (10, 10') is formed of stainless steel.
7. The tie strap of claim 6, wherein the stainless steel

is 304 stainless steel or 316 stainless steel.

8. Tie strap of any of the preceding claims, wherein the formed waves (26a, 26b, 26c) do not extend from the minor plane (4b). 5
9. Tie strap of claim 8, wherein the formed waves (26a, 26b, 26c) are located adjacent the head (16).
10. Tie strap of any of the preceding claims, wherein all formed waves have a combined length of less than 25,4 mm (1 inch). 10
11. Tie strap of claim 8, wherein the formed waves (26a, 26b, 26c) are located adjacent the tail (46). 15
12. Tie strap of any of the claims 1-11, wherein the elongate strap (18) has a length between 660 mm and 686 mm (26 inches and 27 inches). 20
13. Tie strap of any of the claims 1-11, wherein the elongate strap (18) has a length of between 200 mm and 680 mm.
14. Tie strap of any of the claims 1-11, wherein the elongate strap (18) has a length of selectively one of the following: 200 mm, 260 mm, 360 mm, 520 mm, and 680 mm. 25
15. The tie strap of any of the preceding claims, wherein the elongate strap (18) has a width of 4.6 mm or 7.9 mm. 30

Patentansprüche 35

1. Zugband (10, 10') zur Befestigung um einen Gegenstand (12) oder mehrere Gegenstände (14), umfassend

ein längliches Band (18), das an einem Ende einen Verriegelungskopf (16) und am anderen Ende ein Endstück (46) aufweist, wobei der dazwischen befindliche Körper des länglichen Bandes (18) und das Endstück (46) in den Verriegelungskopf (16) einführbar sind, um das Zugband (10, 10') um den Gegenstand (12) oder die Gegenstände (14) zu verriegeln; und wobei der Verriegelungskopf (16) eine Kugel (22) hat, die in dem Verriegelungskopf (16) zum verriegelnden Eingriff mit dem Endstück (46) durch Einführen des Endstückes (46) in den Kopf (16) entlang einer ersten Richtung und Festziehen des Bandes (18) und anschließendes Bewegen des Endstückes (46) in eine der ersten Richtung entgegengesetzte zweite Richtung angeordnet ist, wodurch das dem Verriegelungskopf (16) zugeordnete Endstück (46)

zurückgehalten wird;

wobei das Band (18) ferner eine Hauptebene (4a) und eine diametral gegenüberliegende Nebenebene (4b) definiert, mehrere Formwellen (26a, 26b, 26c), die sich von der Hauptebene (4a) gegenüberliegend der Nebenebene (4b) des Bandes (18) erstrecken, sind zur Bereitstellung eines elastischen Haltens des Körpers des Bandes (18) um den Gegenstand (12) oder die Gegenstände (14) aufgrund dieses Verriegelungseingriffs des Endstückes (46) mit dem Kopf (16) vorgesehen,

dadurch gekennzeichnet, dass der Verriegelungskopf (16) an dem länglichen Band (18) durch Falten eines ersten Endes (30) des länglichen Bandes (18) an einer Perforation (66) gesichert ist, so dass ein Vorsprung (28) am ersten Ende des länglichen Bandes in ein Loch (42) eingefügt und in dieses eingeklinkt ist, das an einem Boden (40) des Verriegelungskopfes (16) definiert ist.

2. Zugband nach Anspruch 1, wobei die gebildeten Wellen in ihrer Anzahl vier sind.
3. Zugband nach Anspruch 1, wobei die gebildeten Wellen (26a) in ihrer Anzahl fünf sind.
4. Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei jede geformte Welle mit anderen geformten Wellen einen Winkel bildet, wobei der genannte Winkel zwischen einem Winkel von fünfundfünfzig Grad und einem Winkel von fünfundsechzig Grad liegt.
5. Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei jede geformte Welle einen Winkel von sechzig Grad mit anderen geformten Wellen bildet.
6. Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei das Zugband (10, 10') aus Edelstahl gebildet ist.
7. Zugband nach Anspruch 6, wobei der Edelstahl ein 304 rostfreier Stahl oder ein 316 rostfreier Stahl ist.
8. Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei sich die gebildeten Wellen (26a, 26b, 26c) nicht von der Nebenebene (4b) erstrecken.
9. Zugband nach Anspruch 8, wobei die gebildeten Wellen (26a, 26b, 26c) in der Nachbarschaft des Kopfes (16) angeordnet sind.
10. Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei alle gebildeten Wellen eine

kombinierte Länge von weniger als 25,4 mm (1 Zoll) aufweisen.

11. Zugband nach Anspruch 8, wobei die gebildeten Wellen (26a, 26b, 26c) in der Nachbarschaft des Endstücks (46) angeordnet sind.
12. Zugband nach einem beliebigen der Ansprüche 1 - 11, wobei das längliche Band (18) eine Länge zwischen 660 mm und 686 mm (26 Zoll und 27 Zoll) aufweist.
13. Zugband nach einem beliebigen der Ansprüche 1 - 11, wobei das längliche Band (18) eine Länge zwischen 200 mm und 680 mm aufweist.
14. Zugband nach einem beliebigen der Ansprüche 1 - 11, wobei das längliche Band (18) eine Länge von wahlweise einem der folgenden Werte aufweist: 200 mm, 260 mm, 360 mm, 520 mm und 680 mm.
15. Das Zugband nach einem beliebigen der vorhergehenden Ansprüche, wobei das längliche Band (18) eine Breite von 4,6 mm oder 7,9 mm aufweist.

Revendications

1. Sangle d'attache (10, 10') destinée à être fixé autour d'un article (12) ou d'articles (14), comprenant:

une sangle (18) allongée ayant une tête de verrouillage (16) à une extrémité et une queue (46) à l'autre extrémité, le corps de sangle (18) allongée entre ceux-ci et la queue (46) pouvant être insérés dans la tête de verrouillage (16) pour verrouiller la sangle (10, 10') autour de l'article (12) ou des articles (14); et la tête (16) de verrouillage contenant une bille (22) positionnée à l'intérieur de ladite tête de verrouillage (16) pour engager de manière verrouillée ladite queue (46) en insérant la queue (46) dans la tête (16) dans une première direction et en serrant la sangle (18), et, par la suite, en déplaçant la queue (46) dans une seconde direction opposée à ladite première direction, retenant ainsi ladite queue (46) associée à ladite tête de verrouillage (16);

dans lequel le corps de sangle (18) définit en outre un plan principal (4a) et un plan mineur (4b) diamétralement opposé, une pluralité d'ondulations formées (26a, 26b, 26c) s'étendant depuis le plan majeur (4a) opposé au plan mineur (4b) du corps de sangle (18) pour assurer une retenue élastique du corps de sangle (18) autour dudit article (12) ou desdits articles (14) lors dudit engagement de verrouillage de ladite queue (46) avec ladite tête (16),

caractérisée en ce que la tête (16) de verrouillage est attachée au corps de sangle (18) allongée en repliant une première extrémité (30) du corps de sangle (18) allongée au niveau d'une perforation (66) de sorte qu'une saillie (28) située à la première extrémité du corps de sangle allongée est insérée et bloquée dans une ouverture (42) formée dans un fond (40) de la tête de verrouillage (16).

2. Sangle d'attache selon la revendication 1, dans laquelle les ondulations formées sont au nombre de quatre.
3. Sangle d'attache selon la revendication 1, dans laquelle les ondulations (26a) formées sont au nombre de cinq.
4. Sangle d'attache selon l'une quelconque des revendications précédentes, dans laquelle chaque ondulation formée forme un angle avec d'autres ondulations formées, ledit angle étant compris entre un angle de cinquante cinq degrés et un angle de soixante cinq degrés.
5. Sangle d'attache selon l'une quelconque des revendications précédentes, dans laquelle chaque ondulation formée forme un angle de soixante degrés avec d'autres ondulations formées.
6. Sangle d'attache selon l'une quelconque des revendications précédentes, dans laquelle la sangle d'attache (10, 10') est formée d'acier inoxydable.
7. La sangle d'attache selon la revendication 6, dans laquelle l'acier inoxydable est de l'acier inoxydable 304 ou de l'acier inoxydable 316.
8. Sangle d'attache selon l'une quelconque des revendications précédentes, dans laquelle les ondulations formées (26a, 26b, 26c) ne s'étendent pas à partir du plan mineur (4b).
9. Sangle d'attache selon la revendication 8, dans laquelle les ondes formées (26a, 26b, 26c) sont situées à proximité de la tête (16).
10. Sangle d'attache selon l'une quelconque des revendications précédentes, dans laquelle toutes les ondulations formées ont une longueur combinée inférieure à 25,4 mm (1 pouce).
11. Sangle d'attache selon la revendication 8, dans laquelle les ondulations formées (26a, 26b, 26c) sont situées à proximité de la queue (46).
12. Sangle d'attache selon l'une quelconque des revendications 1 à 11, dans laquelle la sangle (18) allongée a une longueur comprise entre 660 et 686 mm

(entre 26 et 27 pouces) .

13. Sangle d'attache selon l'une quelconque des revendications 1 à 11, dans laquelle la sangle (18) allongée a une longueur comprise entre 200 mm et 680 mm. 5
14. Sangle d'attache selon l'une quelconque des revendications 1 à 11, dans laquelle la sangle (18) allongée a une longueur choisie parmi l'une des suivantes: 200 mm, 260 mm, 360 mm, 520 mm et 680 mm. 10
15. La sangle selon l'une quelconque des revendications précédentes, dans laquelle la sangle (18) allongée a une largeur de 4,6 mm ou de 7,9 mm. 15

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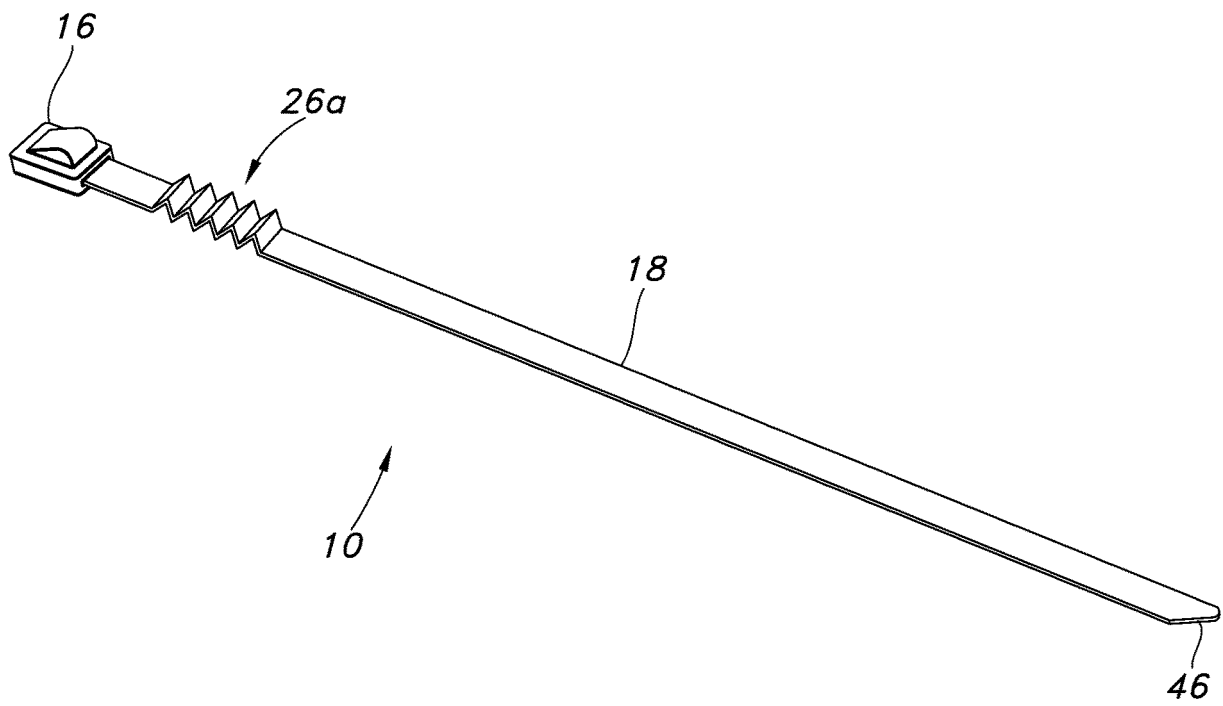


FIG. 1

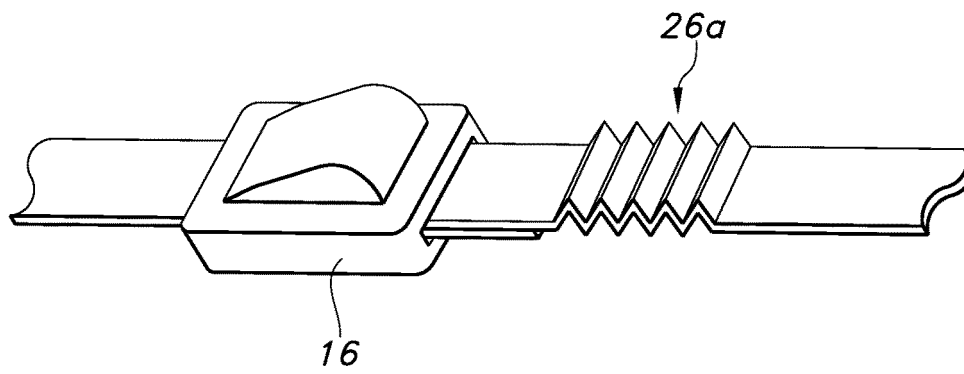


FIG. 2

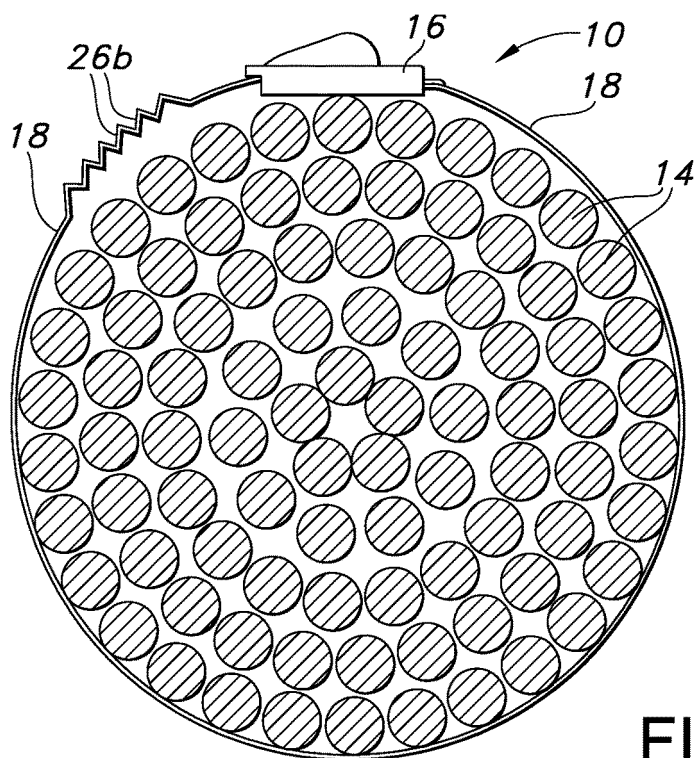


FIG. 3

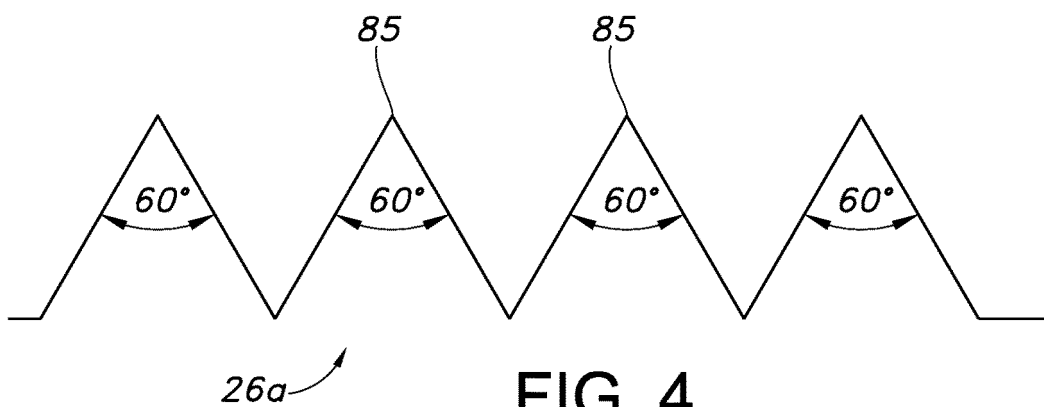


FIG. 4

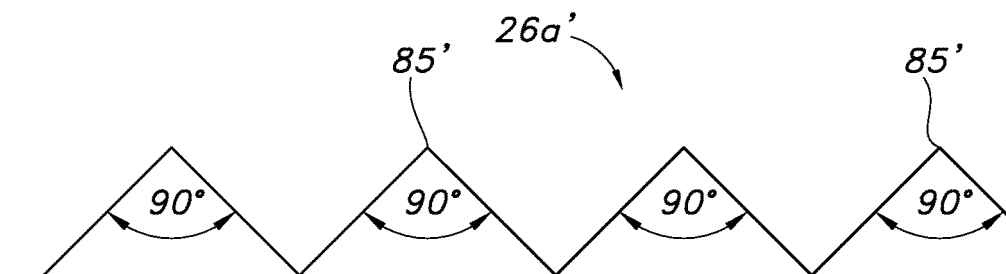


FIG. 5

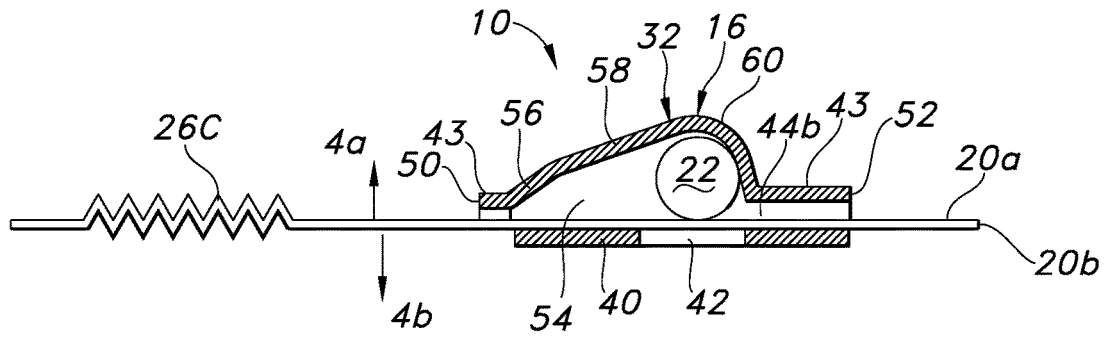


FIG. 6

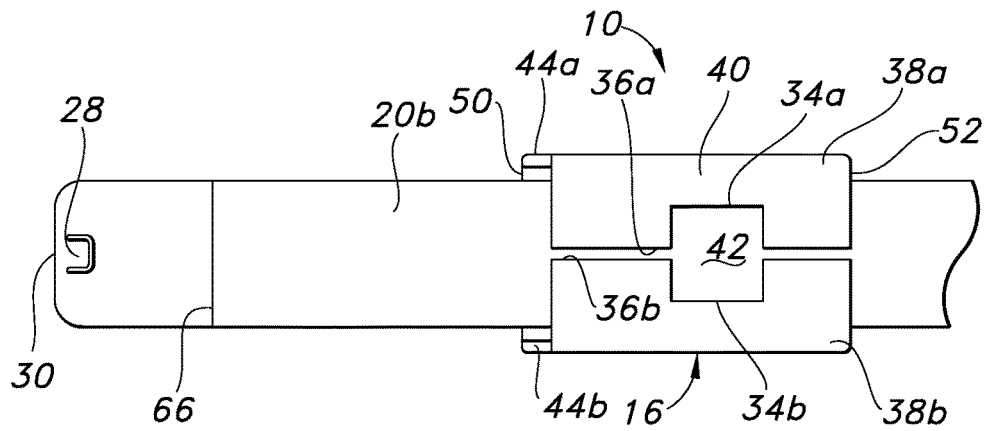
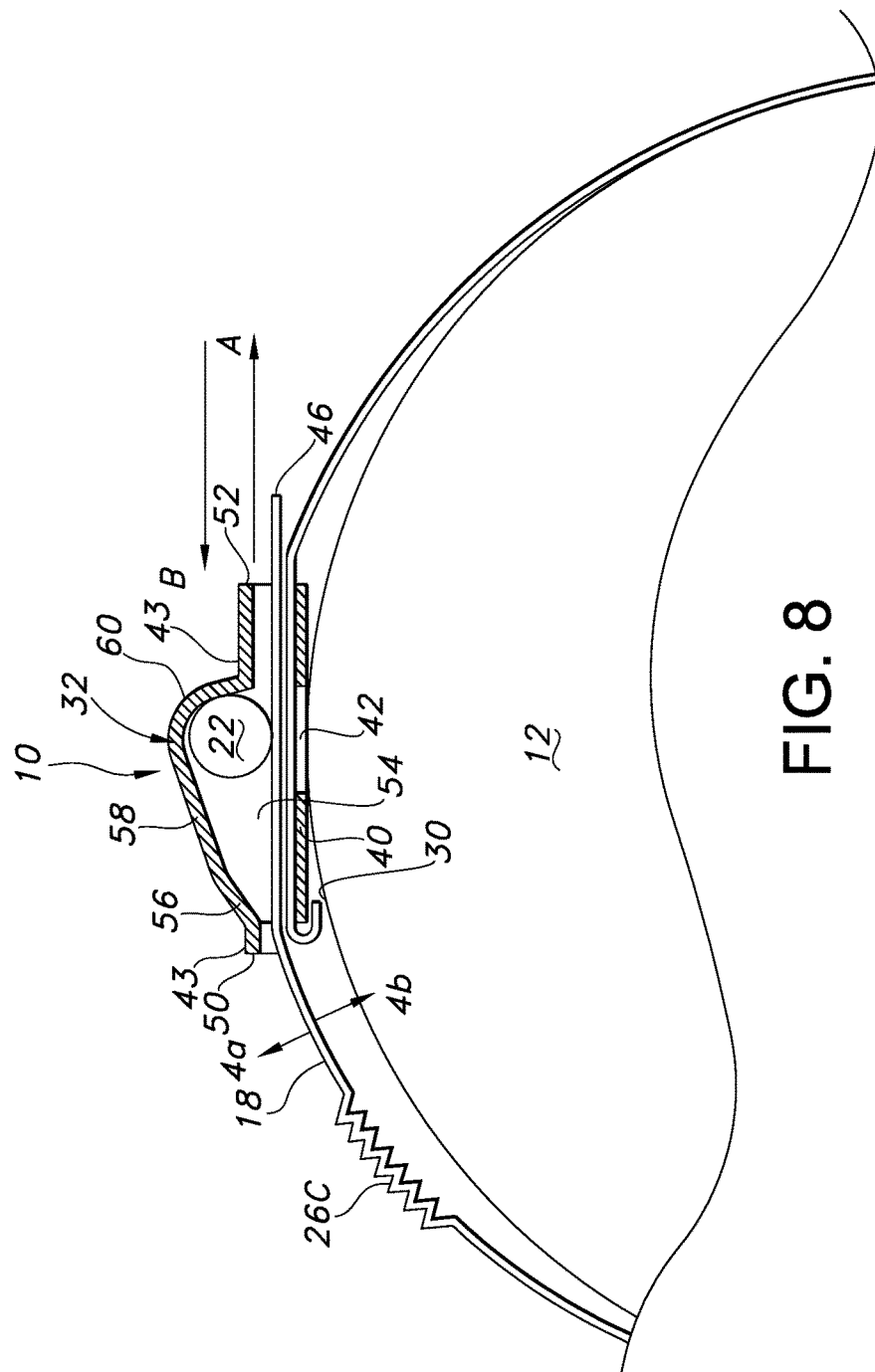


FIG. 7



8
G.
F/G

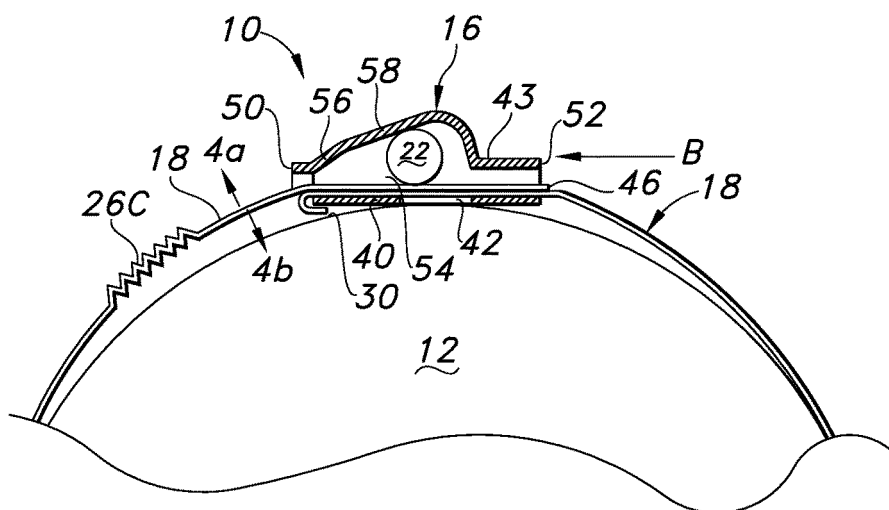


FIG. 9

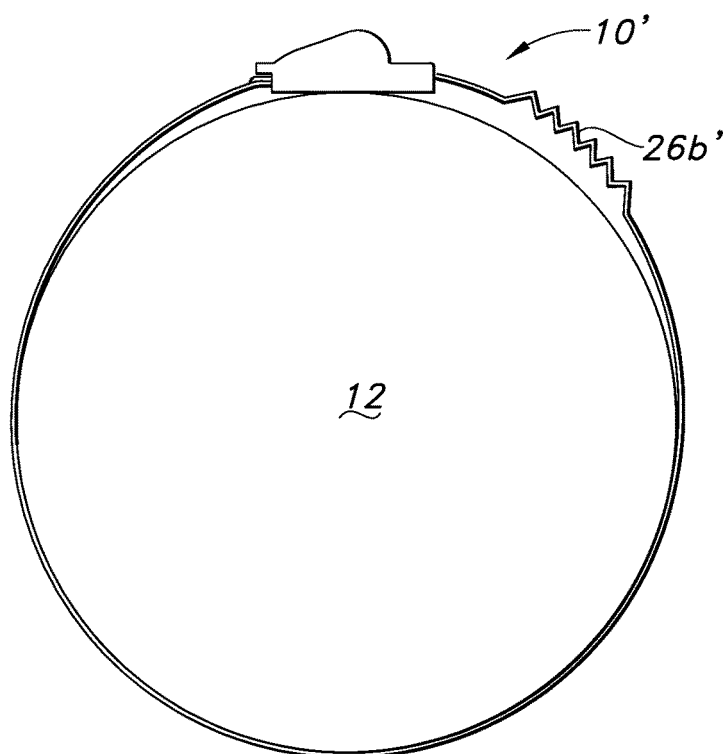


FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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