

[54] **BUNDLE TIE DEVICE**
 [72] Inventor: **Henry George Wasserlein, Jr.**, Largo, Fla.
 [73] Assignee: **AMP Incorporated**, Harrisburg, Pa.
 [22] Filed: **Oct. 14, 1970**
 [21] Appl. No.: **80,548**

1,094,610 1967 Great Britain.....24/20 EE

Primary Examiner—Donald A. Griffin
Attorney—William J. Keating, Ronald D. Grefe, Gerald K. Kita, Frederick W. Raring and Jay L. Seitchik

[52] **U.S. Cl.**24/16 PB
 [51] **Int. Cl.**B65d 63/00
 [58] **Field of Search.** 24/16 PB, 73 PB, 206 A, 20 EE, 24/20 TT, 22, 23 EE

[57] **ABSTRACT**

A bundle tie device. The central portion of a strap, preferably a form of plastic, has vanes which are turned at an angle to the strap surfaces. Each vane is defined by two transverse slits each ending in holes, the area between adjacent holes comprising a web. Strap ends are overlapped and the vanes allowed to interleave causing forward hole edges of one vane to engage trailing hole edges of an overlapped vane, the hole edges lock up absorbing the maximum tensile load placed on the strap.

[56] **References Cited**

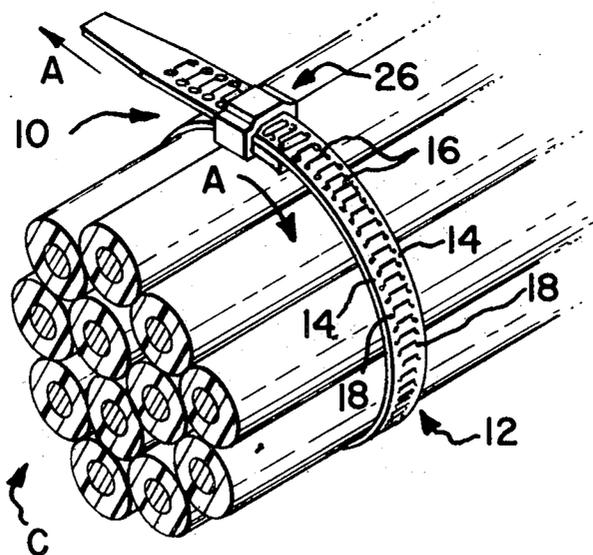
UNITED STATES PATENTS

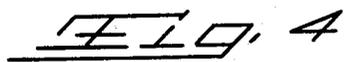
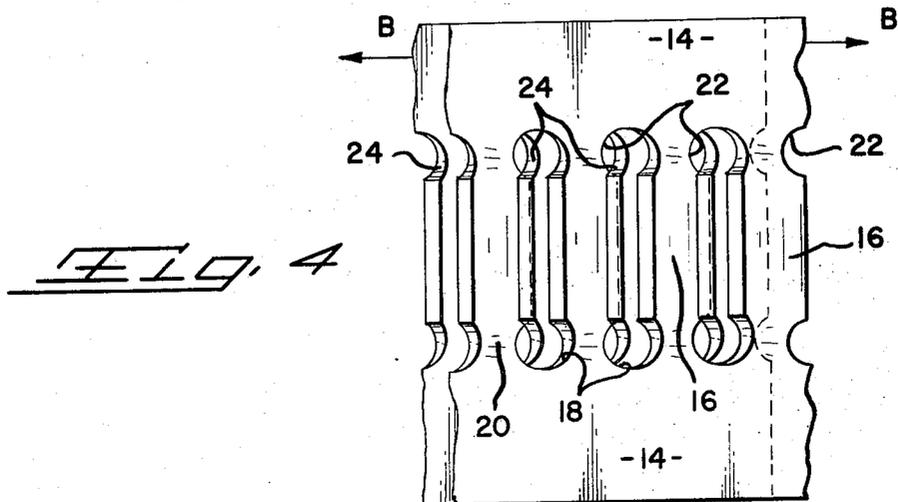
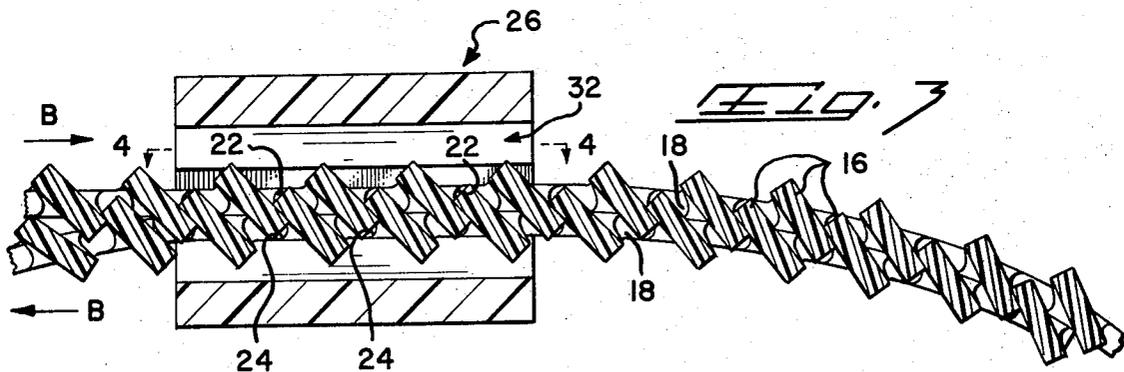
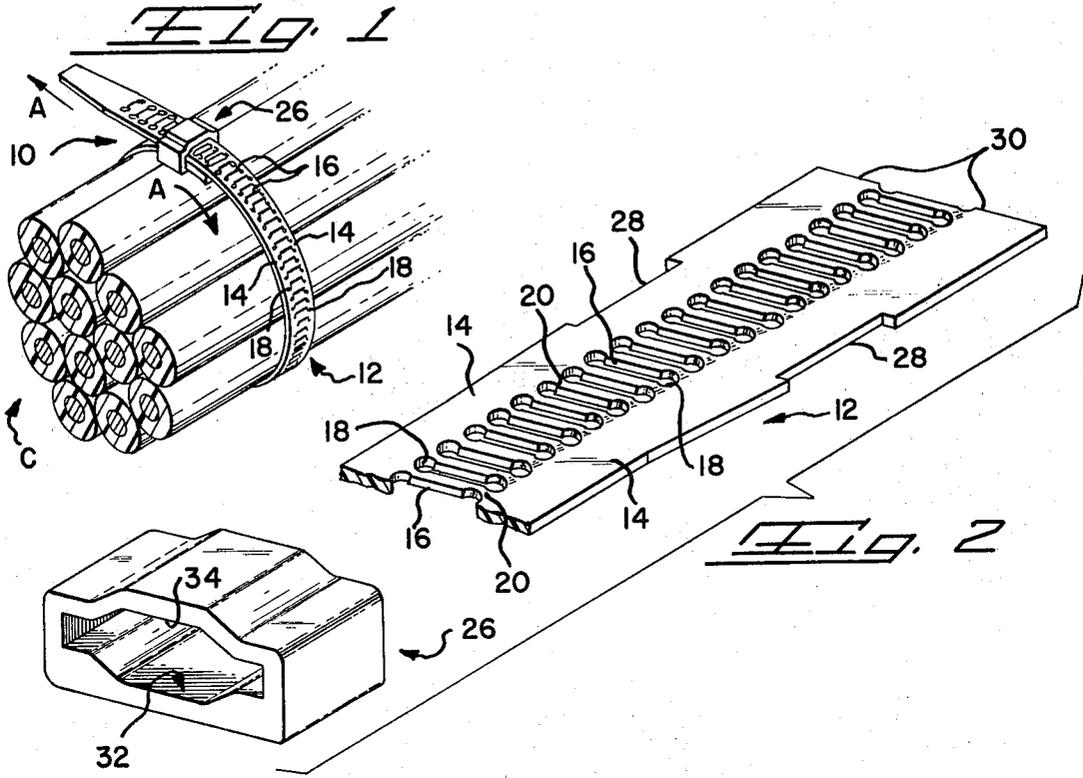
1,414,731 5/1922 Englund.....24/20 TT
 2,935,773 5/1960 Weckesser.....24/20 TT
 3,078,532 2/1963 Bywater.....24/22

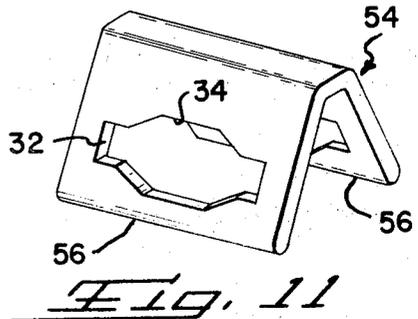
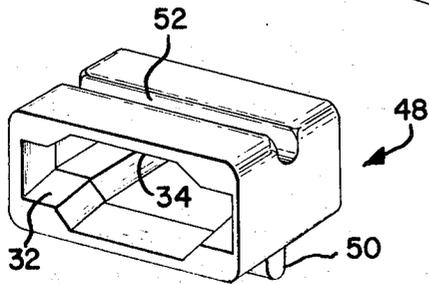
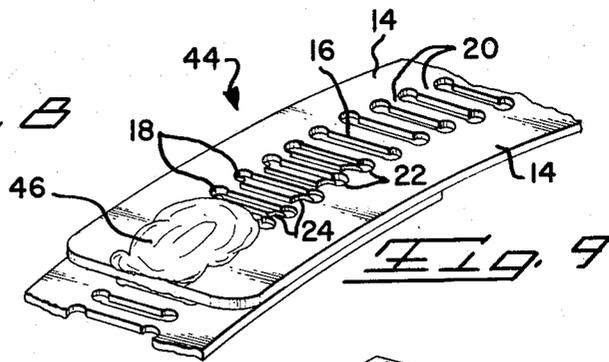
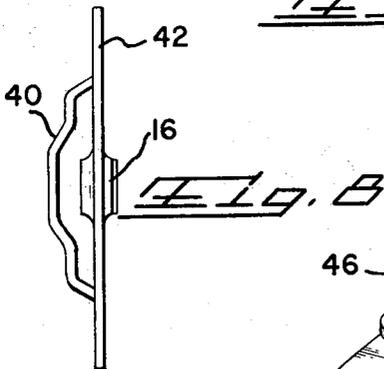
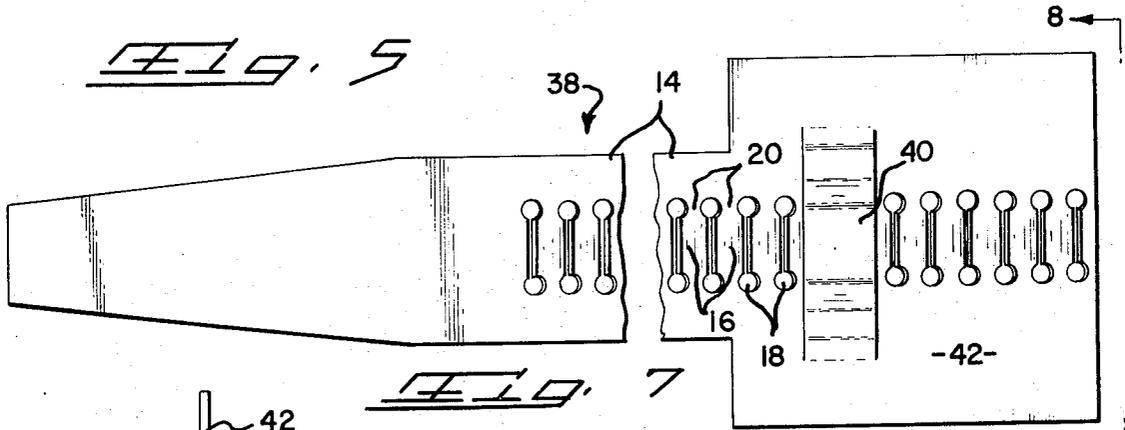
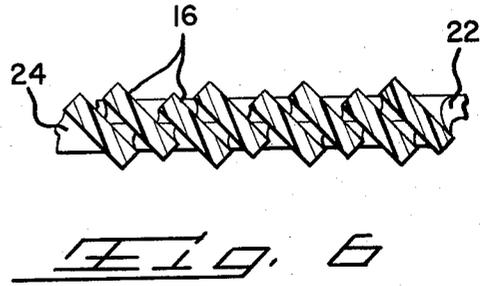
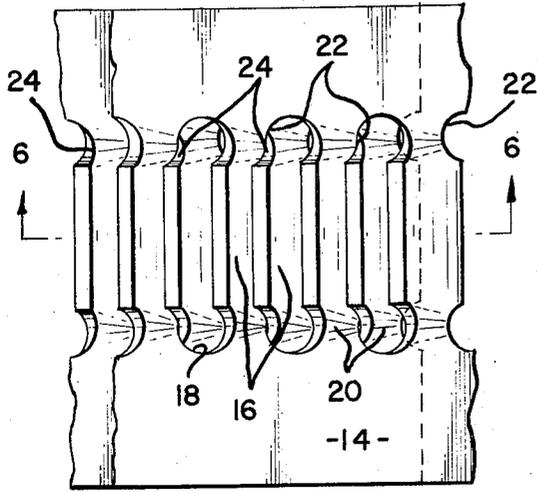
FOREIGN PATENTS OR APPLICATIONS

1,032,303 1966 Great Britain.....24/20 EE

12 Claims, 11 Drawing Figures







BUNDLE TIE DEVICE**BACKGROUND OF THE INVENTION**

The invention is for use in bundling or tying together a multiplicity of electrical wire conductors or the like. The tie device has general utility and is not restricted to the specific environments illustrated and described.

Heretofore, bundle tie devices, for the use described above, have relied on a separate or integral keeper member to secure the overlapped strap portions against relative circumferential movement thereby locking the two ends about a bundle. Such a device is depicted in U.S. Pat. No. 3,078,532. Such prior art devices have drawbacks, primarily, in cost of manufacture and cost in operator assembly.

SUMMARY OF THE INVENTION

The bundle tie comprises a strip of relatively thin material having a series of vanes formed in the central portion thereof and defined by transverse slits each of which ends in an aperture, the material between the apertures and the outer margins of the strip defining legs which absorb the tensile load placed on the strap. The vanes are formed at an angle to the strip surfaces such that upon overlapping of the end of the strip the vanes of the overlapping portion will interleave with the vanes of the overlapped portion, causing the trailing edges of the apertures of the overlapping portion to lock up with or engage the respective leading edges of apertures in the overlapped portion of the strip whereby tensile forces are absorbed by the side margins or legs of the strip. To prevent the free end of the overlapping portion of the strip from being pulled away from the mating portion of the strip by some external or foreign object an apertured keeper member is provided through which both portions of the strip are passed. In lieu of a keeper member the free end of the overlapping portion of the strip may be spot welded to the overlapped portion of the strip such as by thermal or ultrasonic welding methods.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide a bundle tie device for securing together a plurality of electrical conductors or the like.

It is a further object of the invention to provide a bundle tie device that is adaptable to being applied by automatic tools or applied by hand.

It is still another object of the invention to provide a bundle tie device where expansive tensile forces are constrained by the tie strip alone.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration and principles thereof and the manner of applying them in practical use so that they may modify them in various forms, each as may be best suited to the conditions of a particular use.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an embodiment of the invention as used to secure together a bundle of electrical conductors;

FIG. 2 is a perspective view of one end and the keeper member of the device of FIG. 1;

FIG. 3 is a sectional view taken along the longitudinal centerline of the strip and keeper member and showing the interleaving of the cooperating vanes;

FIG. 4 is a plan view showing the relationship of the vanes as in FIG. 3;

FIG. 5 is a plan view similar to FIG. 4 but showing the vanes fully interleaved with leading aperture edges of the bottom or overlapped strip portion engaging trailing aperture edges of the top or overlapping strip portion;

FIG. 6 is a sectional view taken along lines 6-6 in FIG. 5;

FIG. 7 is a plan view of another embodiment of the strip wherein, in lieu of a separate keeper member, a portion of the strip is offset and performs the function of a keeper member;

FIG. 8 is a view of FIG. 7 taken along the lines 8-8;

FIG. 9 is a perspective view showing a further embodiment wherein the free end of the overlapping portion of the strip is spot welded to the overlapped portion of the strip;

FIG. 10 is a perspective view depicting an alternative nut configuration; and

FIG. 11 is a perspective view depicting still another alternative nut configuration.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. 1-6 there is seen a bundle tie device 10 made from a suitable material, preferably a plastic, such as polyvinyl chloride, Nylon, Mylar, etc., but also made from a metal, such as stainless steel, aluminum, etc. The tie device 10, shown securing a bundle of conductors or conduits C, comprises an elongated strip 12 having legs or edge margins 14, a plurality of vanes 16 located between legs 14, and parallel rows of apertures 18 located between the legs 14 and vanes 16. Each aperture defines one end of each slit that separates each vane from its adjacent vane.

The material located between adjacent apertures of the same row comprises a web 20. Each web 20 is integral at one end with a leg 14 and at the other end with a vane 16. Each vane is rotated or formed out of the strip such that the angle α of the parallel surfaces of each vane with the parallel surfaces of the strip is in the range of 25° to 60°. In practice, the best angle α has proven to be between 35° and 45°.

In operation the tie strip 12 is wrapped about a bundle of conductor elements C and the two strip portions overlapped. It should be noted that overlapping must be oriented such that, as the strip is pulled tighter about the bundle the vanes of the overlapping portion of the strip will ratchet relative to the vanes of the overlapped portion of the strip. As seen in FIG. 1 the relative stressing of the two portions of the strip as it is cinched or tightened is shown by the arrows A; viz., the top portion moves to the left and the bottom portion remains stationary with respect to the bundle. The spacing

between the top surface of one vane and the bottom surface of an adjacent vane is such as to be greater than the thickness of the individual vanes. This spacing is variable and depends on the amount of angle α . As previously mentioned, an angle α of 35° to 45° is preferred.

When the strip has been sufficiently tightened tension is relaxed while maintaining the two portions in contact with each other. As the strip begins to loosen slightly the vanes of the overlapping portion interleave with the vanes of the overlapped portion. FIGS. 3 and 4 show the two portions just after tension has been relaxed and relative movement of each is depicted by arrows B. In FIGS. 5 and 6 the vanes are fully interleaved allowing the respective trailing edges 22 of each aperture in the overlapping portion to engage and interfere with the respective leading edges 24 of each aperture in the overlapped portion. In this manner, the tensile load applied to the strip by the expansive force of the tightly contained bundle of conductors C is wholly absorbed by the legs of the strip through the engagement of the respective interfering aperture edges. At this point the vanes 16 are passive with respect to sustaining any tensile forces imposed on the strip 12.

In the embodiment illustrated in FIGS. 1 - 3 an apertured keeper member 26 is used and serves two functions: first, to aid in maintaining the overlapped portions in face-to-face engagement when the applicator releases tension, although such can be done by the applicator without the keeper member; and secondly, to prohibit an external force or object from accidentally or inadvertently pulling the overlapping portion's free end away from the overlapped portion. In this second function, if there is no possibility of this happening then the keeper can be dispensed with. When keeper 26 is to be used it is assembled onto one end of the strip 12 and is held thereon by notches 28 located in a slightly wider portion 30 of the strip.

The passageway 32 of keeper 26 is slightly larger at the central portion 34 to facilitate passage therethrough of the vanes 16. The raised central portion is enlarged to facilitate orientation of keeper 26 during assembly onto the strip, and to facilitate orientation of the tie device relative to the conductor bundle.

FIGS. 7 and 8 show a modified tie strip 38 wherein like numerals have been used to depict like features of the embodiment of FIGS. 1 - 6. The strip 38 differs in having an integral keeper member formed by forming a strip portion 40 out of the enlarged end portion 42 to provide an opening. The function is the same as described in preceding paragraphs relating to keeper 26.

Both of the tie devices described heretofore will generally be used in loose-piece form and applied by hand or by hand with the aid of small inexpensive hand tools for tensioning.

The embodiment of FIG. 9 is envisioned as being adaptable to application by automatic tools. Like numerals have been used to indicate like parts as heretofore described. This strip 44 is of constant width. In lieu of a keeper member to hold the overlapping portion against the overlapped portion after aperture edge lockup, a spot weld 46 by a thermal or ultrasonic tool, may be used. This spot weld 46 serves only to prevent the overlapping portion's free end from being pulled

out away from the overlapped end by some external force or object. The weld 46 in no way resists or absorbs any expansive tension placed on the tie device by the wire bundle.

FIGS. 10 and 11 depict two variations in keeper configuration to be used in the same manner as keeper 26 in FIGS. 1 - 3.

In FIG. 10 keeper member 48 has a transverse rib 50 and a transverse groove 52 which facilitates stacking of keeper 48 in a magazine. Such a keeper could be used in a hand application or an automatic tool application. The rib 50, being parallel to the wires of a bundle, will engage the bundle between two adjacent conductors so that during and after application the keeper will remain stationary relative to the bundle.

In FIG. 11 the keeper member 54 has the shape of an inverted V with the two leg edges 56 serving the same function as rib 50 of keeper 48 by engaging the bundle between adjacent wires and holding the keeper 54 stationary relative to the wire bundle. Keeper 54 may be used in either hand or automatic tool applications.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein are intended as merely illustrative and not as restrictive of the invention.

I claim:

1. A tie member in constrictive surrounding relationship to an object such as a cable, said tie member comprising:

a strap extending around said object, the end portions of said strap overlapping,
said strap having two evenly spaced parallel rows of apertures, one row adjacent each side edge of the strap,

there being opposed apertures in the rows being joined by transverse slits,

the material between adjacent slits forming substantially parallel vanes extending at an angle to the plane of the strap, the vanes on the overlapped portions being interleaved and said strap being under tension so that the edges of the holes in one overlapped portion are against the edges of the holes in the other overlapped portion thereby to transmit the tensile forces from one of the overlapped portions to the other portion, and said interleaved vanes preventing disengagement of said overlapped portions.

2. A tie member as set forth in claim 1 including a keeper member on said overlapped portion, said keeper extending across said tie member and over the outer one of said overlapped portions.

3. A tie member in constrictive surrounding relationship to an object such as a cable, said tie member comprising:

A strap surrounding said object, the end portions of said strap overlapping and constituting overlapped portions,

said strap having two evenly spaced parallel rows of holes in said overlapped portions one of said rows being adjacent each side edge of said strap,

there being a slit extending transversely on said strap between each pair of opposed holes, the material between two adjacent slits constituting a vane,

5

the material between each two adjacent holes in each row being deformed to orient said vanes at an angle to the plane of said strap, the vanes on said overlapped portions being interleaved, and said strap being under tension so that the edge portions or the holes in one overlapped portion are against edge portions of the holes in the other overlapped portion to transmit the tensile forces from the one overlapped portion to the other overlapped portion.

4. A tie member as set forth in claim 3 and including a keeper extending across at least the outer one of said overlapped portions.

5. A tie member as set forth in claim 4 wherein said keeper comprises a member having an opening extending therethrough, both of said overlapped portions extending through said opening.

6. A tie member as set forth in claim 4 wherein said keeper comprises an outwardly formed portion of one of said overlapped portions, the remaining one of said overlapped portions extending through said outwardly formed portion.

7. A tie member as set forth in claim 4, said overlapped portions being bonded to each other in at least a localized area.

8. A tie member as set forth in claim 3 wherein said angle at which said vanes are oriented with respect to the plane of said strap is in the range of about 25° to 60°.

9. A tie member as set forth in claim 3 wherein said holes are circular.

10. A tie member as set forth in claim 3 wherein said strap is of a plastic material.

6

11. A tie member as set forth in claim 3 wherein said strap is of metal.

12. A tie member adapted to be applied to a bundle or the like, said tie member comprising:

a strap of finite length,

said strap having two evenly spaced parallel rows of round holes, said holes being adjacent to each side edge of said strap,

there being a slit extending transversely on said strap between each pair of opposed holes, the material between two adjacent slits constituting a vane,

the material between each two adjacent holes in each row being deformed to orient said vanes at an angle in the range of 25° to 60° to the plane of said strap, all of said vanes being in the same attitude, and

a keeper on said strap which is adapted to receive at least one end portion of said strap

when said strap is applied to a bundle or the like whereby, upon application of said strap to said bundle, the end portions of said strap are overlapped and at least one end is passed through said keeper, and said vanes in the overlapped portions ratchet over each other as said strap is drawn tight on said bundle until said strap is under tension, and under static tension said vanes interleave and edge portions of the holes in one overlapped portion engage edge portions of the holes in the other overlapped portion to transmit the tensile forces in the one overlapped portion to the other overlapped portion, and said keeper functions to prevent peeling of the outer overlapped portion from the inner overlapped portion.

* * * * *

35

40

45

50

55

60

65