United States Patent

[11] **3,612,110**

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[54] **WOVEN TAPES**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **139/383,** 139/408
[51] **Int. Cl.** **D03d 25/00,** D03d 23/00
[50] **Field of Search** ..... 139/384, 383, 407–415, 397, 398; 28/72 CS

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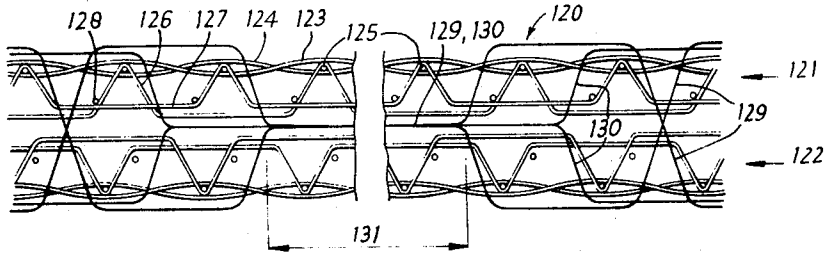
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ABSTRACT: The specification describes a method of making a woven tape of the kind comprising two separate webs which are constituted by warp yarns and weft yarns and which are held together in face-to-face relation by binding warp yarns woven into both webs, the said two webs being capable of being parted by breaking the binding yarns, which method comprises securing the two webs together face to face by means of the binding yarns in one portion of the length of the tape and leaving the webs unsecured together in another portion of the length of the tape. The binding yarns conveniently extend continuously through said other portion of the tape and can be disposed between the two webs or woven into one of the webs in said other portion.



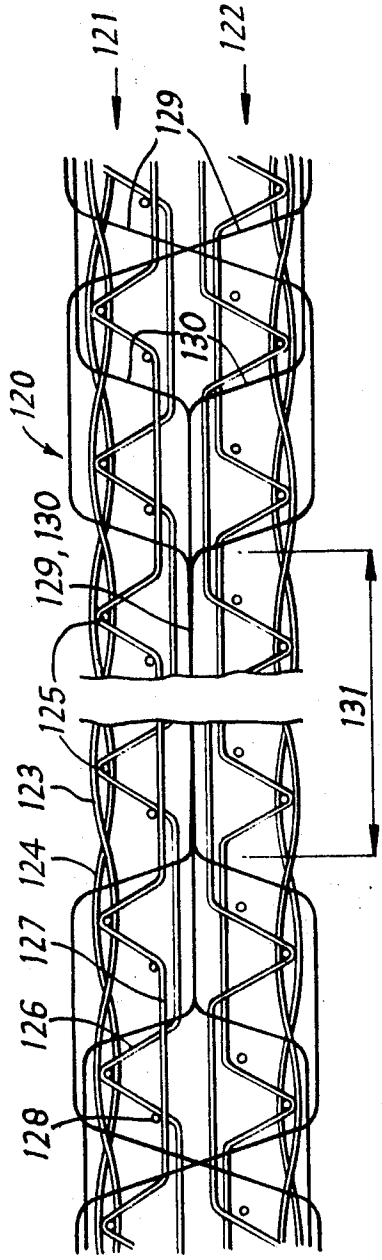


Fig. 1.

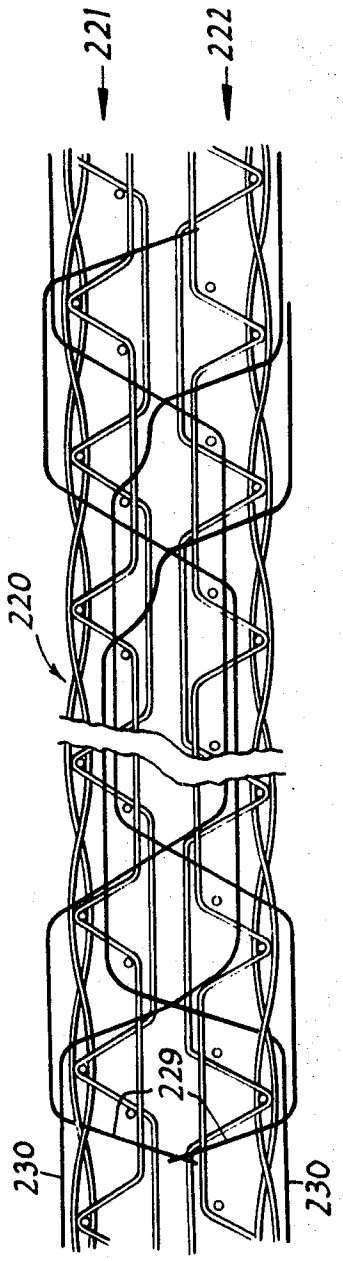


Fig. 2.

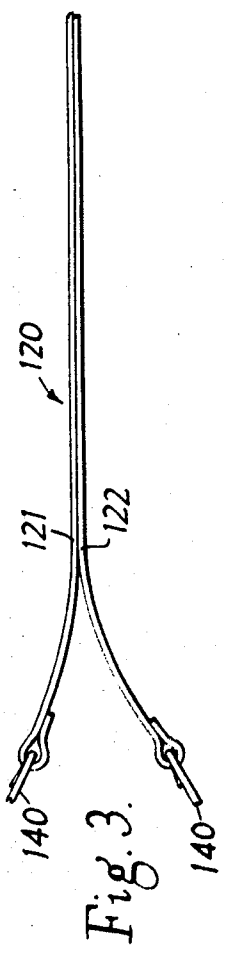


Fig. 3.

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WOVEN TAPES

This invention relates to the manufacture of woven tapes more particularly but not exclusively for energy absorption purposes, and of the kind comprising two separate webs which are constituted by warp yarns and weft yarns and which are held together in face-to-face relation by binding warp yarns woven into both webs, the said two webs being capable of being parted by breaking the binding yarns. Woven tapes of this kind are described in our U.S. Pat. application Ser. No. 656,583, now Pat. No. 3,463,202.

According to the present invention there is provided a method of making a woven tape of the kind described above comprising securing the two webs together face to face by means of the binding yarns in one or more portions of the length of the tape and leaving the webs unsecured together in the other portion, or the intervening portions as the case may be, of the length of the tape.

Preferably the binding yarns extend through said other portion or said intervening portions of the length of the tape. The binding yarns may be laid, preferably in an unwoven state, between the two webs in said other portion or said intervening portions of the length of the tape, or alternatively, they may be disposed among the weft yarns of one or both of the webs in said other portion or said intervening portions of the length of the tape, preferably in the same manner as "stuffers."

It will be seen that at these lengths where the binder tapes are not woven into either of the webs, the two webs can be easily parted so as to be secured to separate members. In this way, the necessity of carrying out the rather time consuming and difficult operation of cutting the binder tapes as required in the arrangements described in our U.S. Pat. application Ser. No. 656,583 is obviated.

Two embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIGS. 1 and 2 are longitudinal sectional views of two woven tapes according to the invention respectively; and

FIG. 3 shows a length of the tape having buckles secured thereto.

Referring now to FIG. 1, the woven tape **120** comprises two separate webs **121** and **122** which have respective warp and weft yarns that do not cross over from one web to the other. The webs **121** and **122** are identical mirror images of each other and are each woven as offset tubular webs with the warp yarns arranged in four groups. In web **121**, the warp yarns **123** and **124** cross alternately to bind each alternate pick **125** to form the upper or outer face of each web. The other warp yarns **126** and **127** alternately pass over the said alternate picks **125**. The other picks **128** lie between the warp yarns **123** and **124** above and the warp yarns **126** and **127** below. The two webs **121** and **122** are bound close together by two sets of binder warp yarns **129** and **130**. The sets of binder warp yarns **129** cross over from one web to the other at every fourth pick of each web (i.e. every eighth pick of the tape). Similarly, the other binder warp yarns **130** cross over from one web to the other at similar spacings, the crossover points being offset by two picks of each web (i.e. by four picks of the tape) from those of the binder warp yarns **129**.

Spaced at intervals along the tape there are portions **131** of the length at which the binder tape warp yarns **129** and **130** are not woven into the webs **121** and **122** but lie in an unwoven state between the two webs **121** and **122**. When the tape is being cut into units of the appropriate dimensions for use, it is arranged that one of the portions **131** or a part of one of these portions **131** is located at the end of each unit. It will be seen that the webs **121** and **122** are readily separable at the portions **131** because these parts of the webs are not bound together but merely lie with their faces on either side of the unwoven binder yarns **129** and **130**. These parts of the webs **121** and **122** may have buckles **140** or loops or other attachment means secured to them as shown in FIG. 3 so that the two webs may be attached respectively to two members which are to be moved apart under considerable force. When these two members are separated, they exert a tearing force tending to tear the two webs apart. This tearing force is met by the resistance of the binder yarns so that the tape serves as a shock or energy absorber.

The tape has a number of applications as a shock absorber, especially in safety equipment and in the aircraft industry. Among other applications, the tape can be used in parachute harnesses to limit the initial stress on the parachutist when the parachute opens.

It will also be noted that it is not necessary to cut the binder yarns **129** and **130** to part the two webs by cutting the binder yarns over a part of the length as was necessary in the embodiments disclosed in the aforesaid complete specification.

Referring now to FIG. 2, there is shown a tape **220** which is substantially identical to that of FIG. 1. However, in this tape **220**, over the said lengths of the tape where the two webs are not bound together the binder yarns **229** and **230** lie among the weft yarns of the two webs **221** and **222** in the same manner as would "stuffers" in bulked tapes.

The particular number and type of yarns and binder yarns used and the other pattern of weaving may be as disclosed in the aforesaid complete specification and may be varied as required.

It will be understood that where a length of tape is being woven for division into a number of units the tape may conveniently be woven so that the spacing of the portions **131** of the lengths of the tape is such that portions **131** are provided at one end or possibly at both ends of the unit. The portions **131** of tape may be made of any required length.

We claim:

1. A method of making a woven energy-absorbing tape comprising two separate continuous webs each of which is constituted by warp yarns and weft yarns woven together continuously along the length of the web and which are held together in face-to-face relation by binding warp yarns, the said two webs being capable of being at least partially parted by the application of forces to adjacent ends of the two webs so as to break the binding yarns without destroying the integrity of the webs while absorbing energy from said forces, which method comprises, over at least one portion of the length of tape, weaving the binding warp yarns into both of the webs by crossing and recrossing repeatedly from one web to the other to secure the webs together and, over at least one other portion of the length of the tape, extending the binding warp yarns along the tape while weaving said two separate webs having said weft yarns and said warp yarns but leaving the webs unsecured.

2. A method as claimed in claim 1, further comprising weaving a plurality of said portions wherein said webs are secured together and an intervening plurality of said portions wherein said webs are unsecured.

3. A method as claimed in claim 2, wherein the binding yarns extend through said at least one other portion of the length of the tape.

4. A method as claimed in claim 3, wherein the binding yarns are laid between the two webs in said at least one other portion of the length of the tape.

5. A method as claimed in claim 4, wherein the binding yarns in said at least one other portion are unwoven.

6. A method as claimed in claim 3, wherein the binding yarns are disposed among the weft yarns of one of the webs in said at least one other portion of the length of the tape.

7. A woven energy-absorbing tape comprising two separate webs which extend continuously along the length of the tape and each of which is made up from the warp yarns and weft yarns woven together continuously along the length of the web, and a plurality of binding warp yarns which over a first part of the length of the tape are woven into the two webs and cross and recross repeatedly from one web to the other for holding the two webs together in face-to-face relationship, and which over another part of the length of the tape lie in an unwoven state along the longitudinal direction of the tape, the two webs being capable of being at least partially parted by the

application of forces to adjacent ends of the two webs so as to break the binding yarns without destroying the integrity of the webs while absorbing energy from said forces.

8. A woven energy-absorbing tape as claimed in claim 7, wherein over said another part of the length of said tape said binding warp yarns lie between said two webs.

9. A woven energy-absorbing tape as claimed in claim 7, wherein over said another part of the length of said tape said binding warp yarns lie among said weft yarns of said two webs.

10. An energy-absorbing tape as claimed in claim 7 wherein each of the two webs is a tubular web.