

- [54] **COMPOSITE ELASTIC BAND FOR USE WITH A GARMENT**
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- [73] Assignee: **Automatic Braiding Co. (Nottingham) Ltd.**, Mowbray, England
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 Apr. 10, 1973 United Kingdom..... 17115/73
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- [51] Int. Cl. .... **B32b 3/04; B32b 3/24; A41f 9/00**
- [58] Field of Search..... 161/89, 100, 101; 2/236-237

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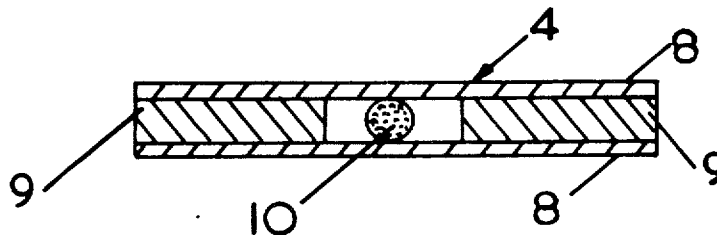
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*Attorney, Agent, or Firm*—Ernest F. Marmorek

[57] **ABSTRACT**  
 A composite elastic band capable of being stretched elastically from a relaxed condition, comprises a core consisting of two elastic ribbons enclosed in a textile cover, preferably a non-woven fabric, with a tie cord extending freely lengthwise of the band between the

two ribbons. Such a band is secured in a hem in a wearer encircling portion of a fabric garment by folding a marginal part of the fabric completely around the band, and stitching the band into the hem. A loop of the tie cord is subsequently extracted through a hole in the fabric by piercing the cover, then cutting the loop to leave two loose ends; one loose end may be extracted through another hole in the fabric by piercing the cover. The loose ends are intended to be tied together by the wearer to tighten the wearer encircling portion around the trunk or a limb of the wearer. The wearer encircling portion may be a waist band, cuff band, or ankle band.

The band is enclosed in a hem tunnel formed in a length of garment fabric by apparatus comprising a pair of metering rollers, at least one of which is driven, for forwarding the band at a predetermined linear speed to region at which a first face of the band is brought into contact with a first face of the fabric along a zone of the latter spaced inwards from an edge of the fabric so that a marginal strip of the fabric protrudes beyond an edge of the band, a pair of rollers, at least one of which is driven, for forwarding the band and fabric in face contact to a fabric-folding region through which they are traversed, a fabric-folding device at said folding region for forming the fabric into a hem tunnel by folding said marginal strip around said edge of the band to overlay the second face of the band and folding the fabric about the other edge of the band to present said second face of the band, and the marginal strip, to the first face of the fabric along a zone of the fabric spaced inwards of the first said zone, and a sewing mechanism for withdrawing the band and fabric from said folding device and for securing the band in the hem tunnel by stitching penetrating through the band and the fabric of the tunnel, including the marginal strip, with said zones.

**5 Claims, 23 Drawing Figures**



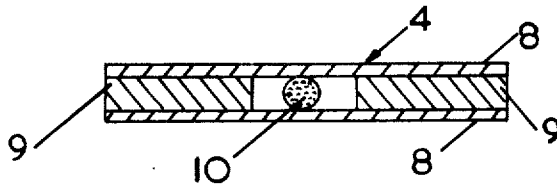


FIG. 1.

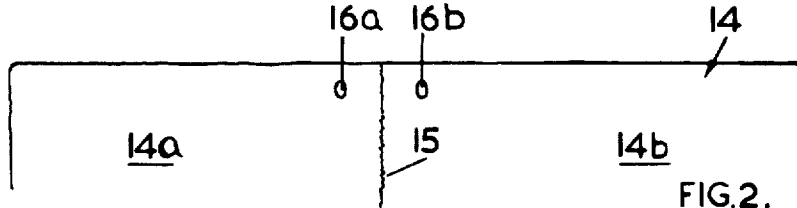


FIG. 2.

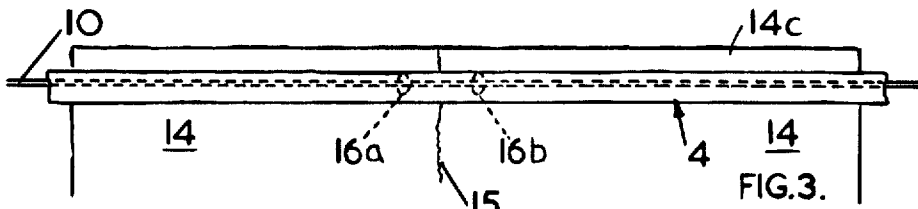


FIG. 3.

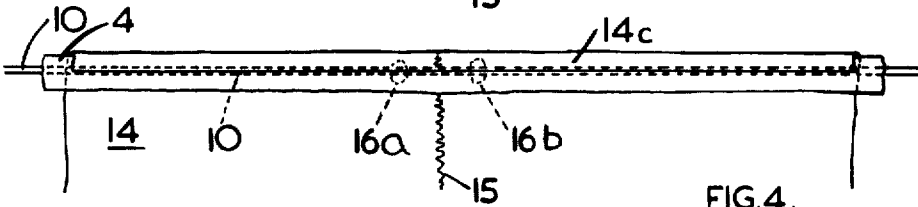


FIG. 4.

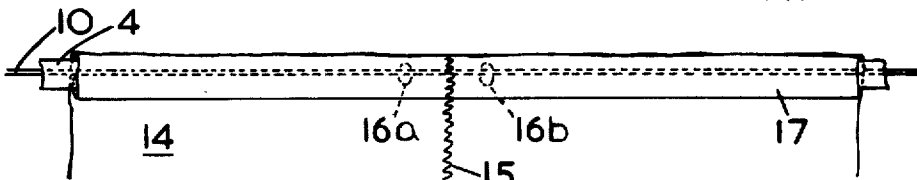


FIG. 5.

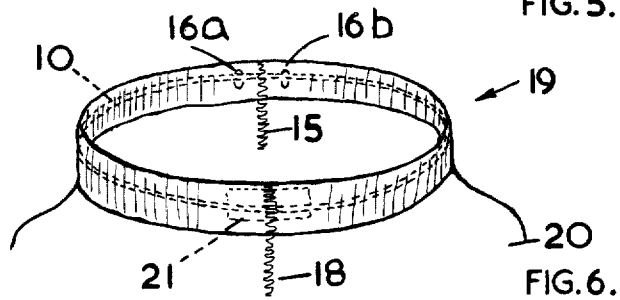


FIG. 6.

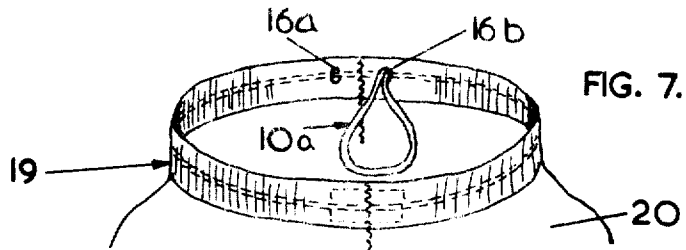


FIG. 7.

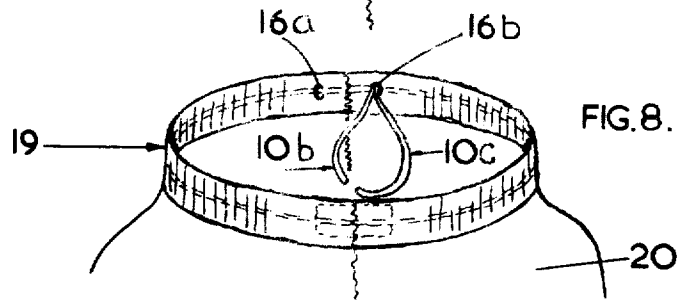


FIG. 8.

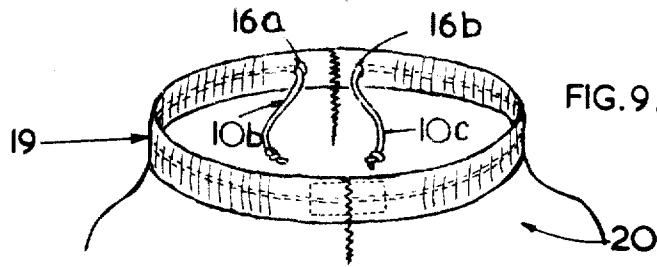


FIG. 9.

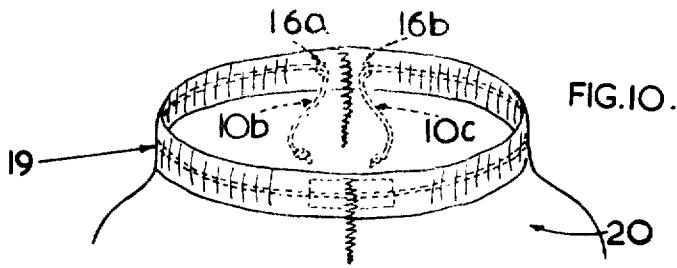


FIG. 10.

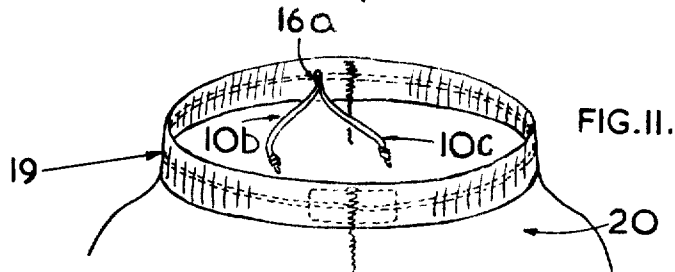


FIG. 11.

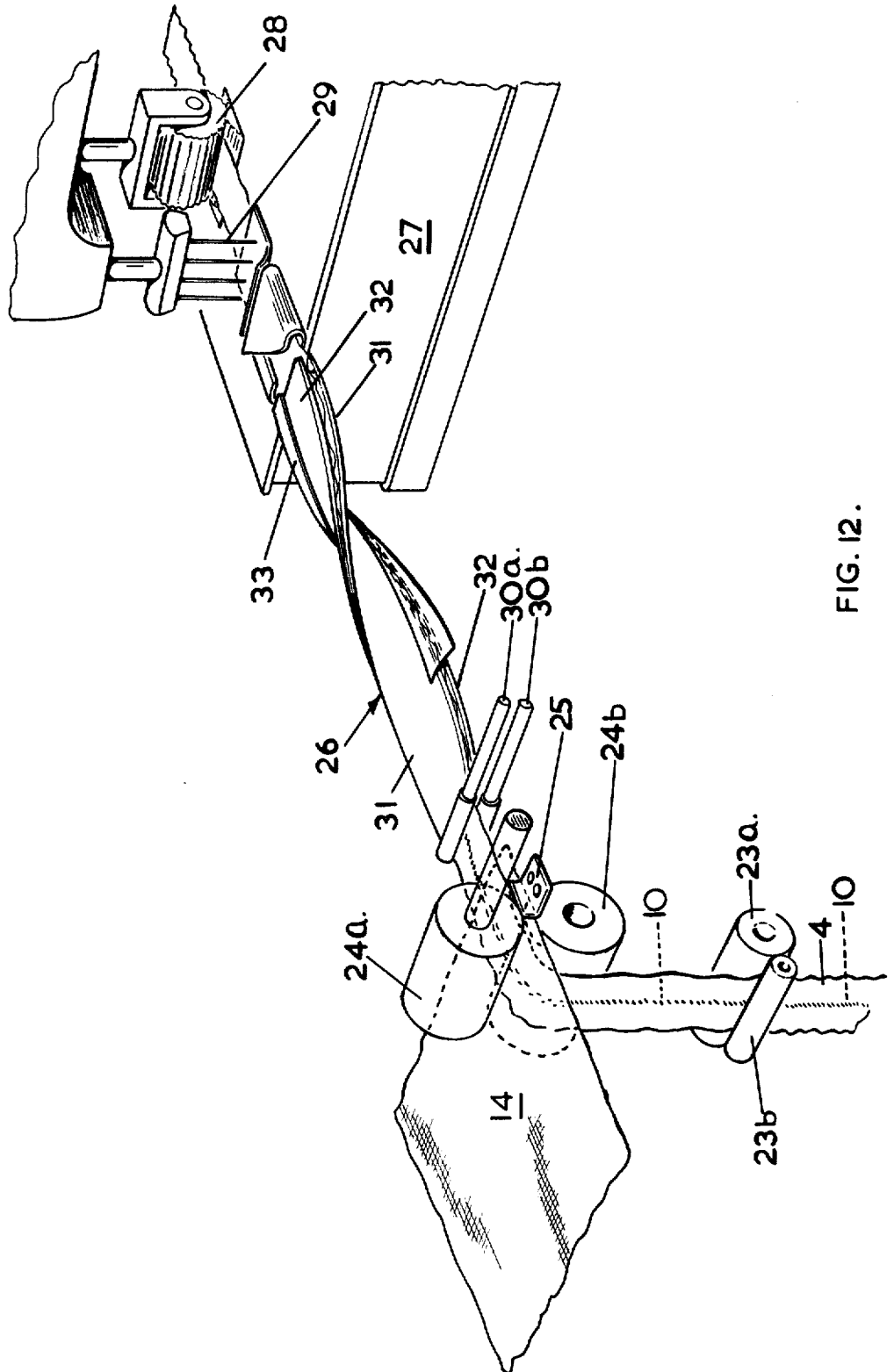


FIG. 12.

FIG. 13.

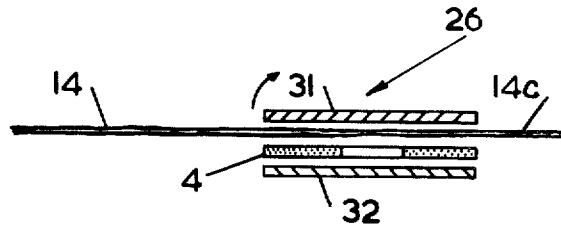


FIG. 14.

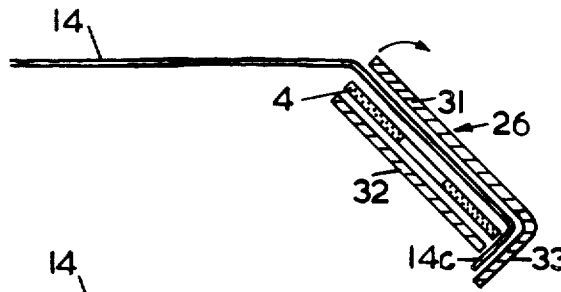


FIG. 15.

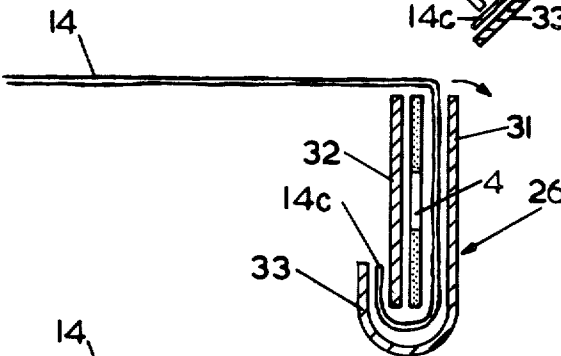


FIG. 16.

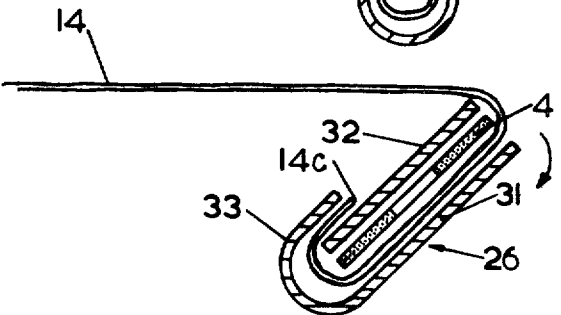
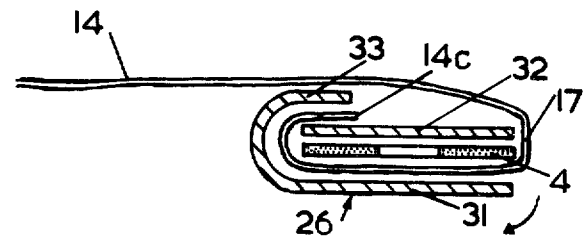


FIG. 17.



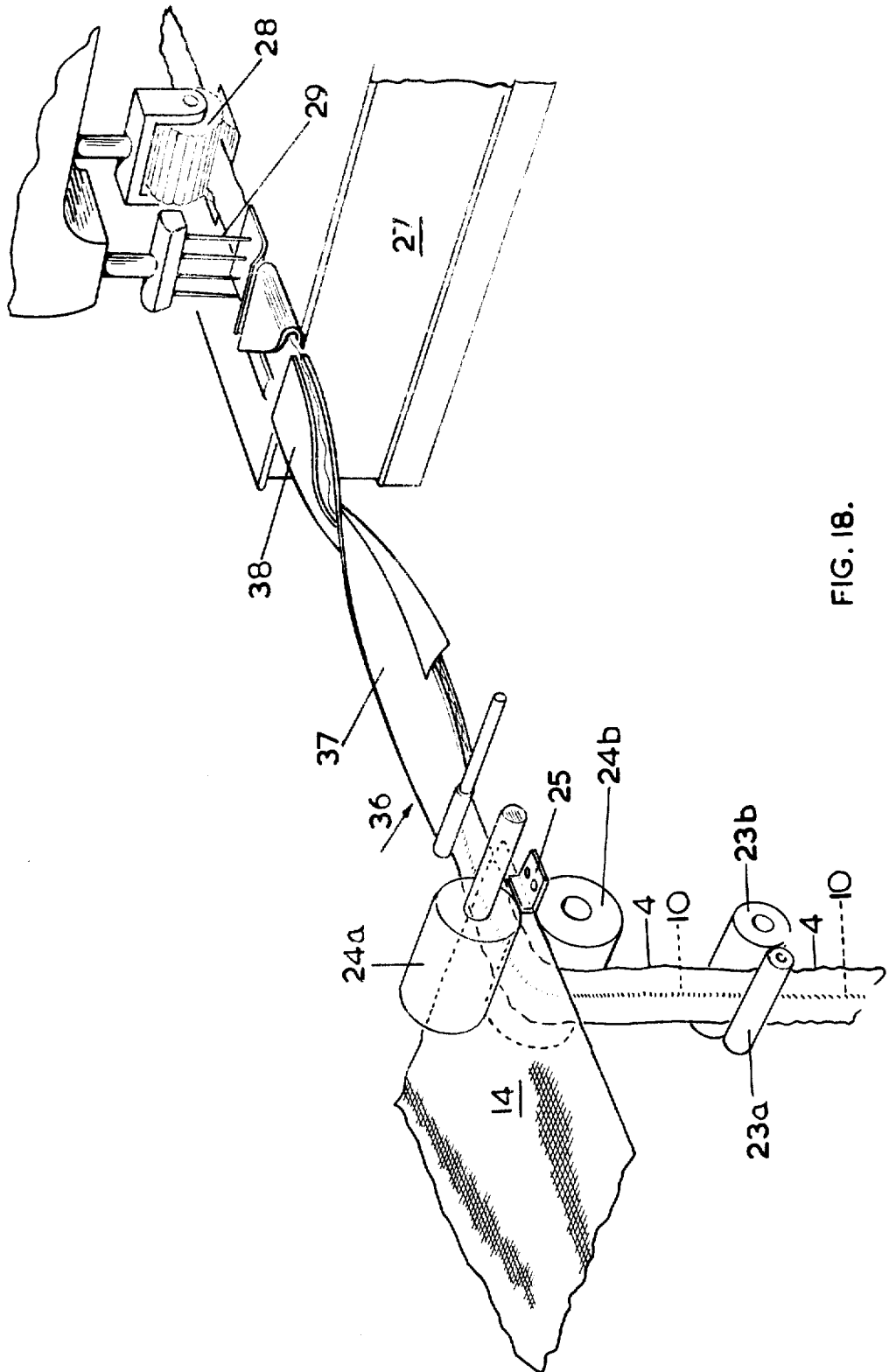


FIG. 1B.

FIG. 19.

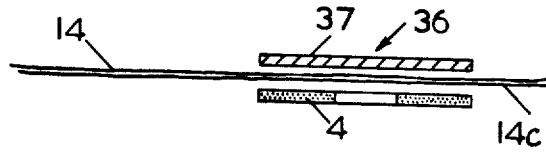


FIG. 20.

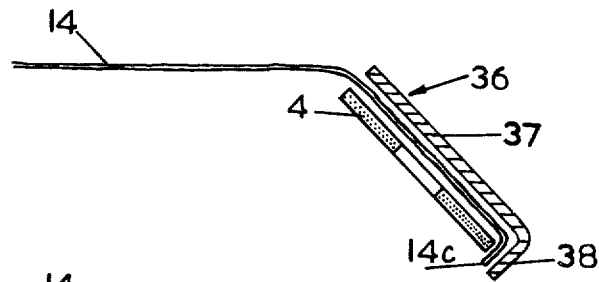


FIG. 21.

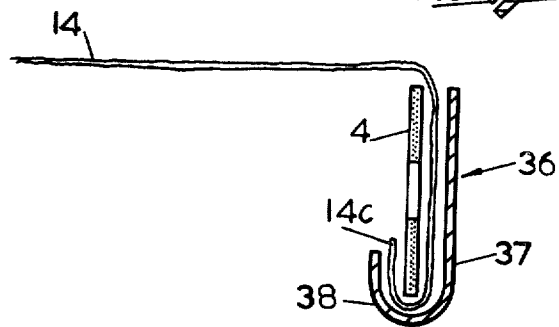


FIG. 22.

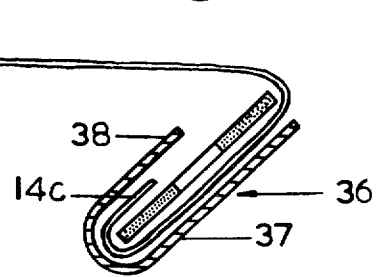
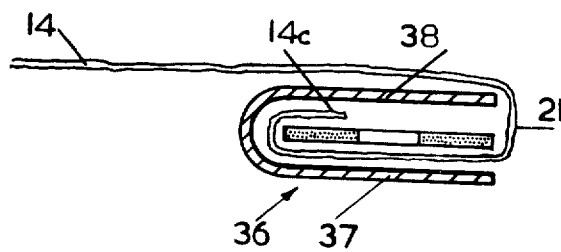


FIG. 23.



## COMPOSITE ELASTIC BAND FOR USE WITH A GARMENT

Reference is had to co-pending application Ser. No. 321,834 filed Jan. 8, 1973.

This invention relates to composite elastic bands, primarily of pre-fabricated form for subsequent attachment to a garment or to a length of fabric for forming at least a part of such a garment.

The invention provides a composite elastic band capable of being stretched elastically from a relaxed condition, and primarily a band in or for a garment, comprising a core of elastic ribbon material and a cover of flexible material covering at least one face of the core and secured to the latter and a tie-cord or draw-cord (hereinafter referred to as a tie-cord) extending lengthwise within the band. It will be appreciated that such a tie-cord should not be so attached to the band as appreciably to restrict the extension of the latter within the limits required in use on the garment.

Preferably the core comprises two spaced ribbons with the tie-cord extending lengthwise of the band between them. The core is preferably made of rubber (natural or synthetic). It is preferably secured to the cover by adhesive. It may be so secured by adhesive extending over substantially the whole of at least one face of the core, or it may have stripes or strips of adhesive closely spaced along the length of the band, or longitudinal stripes or strips of adhesive closely spaced widthwise of the band, or by spaced areas of adhesive (for example as dots of adhesive).

Preferably the cover extends at least partly over the other face of the core. It may consist of two strips of flexible material applied one to each face of the core. Alternatively, it may comprise a single strip of flexible material which covers one face of the core and is folded around at least one edge of the latter to overlap and cover, wholly or in part, the other face of the core.

The cover may be formed of knitted fabric such for an example as interlock fabric, with the wales extending widthwise of lengthwise of the band.

The cover is preferably a non-woven fabric. The term "non-woven fabric" means a web or mat of fibres held together by bonding such as may be effected by an adhesive or other bonding agent, by the application of chemical action or heat, or by a mechanical action which interlocks the fibres together. Specifically the band may be according to British Pat. No. 1279743 but with the aforesaid tie-cord.

The cover is secured to the band while the core is in an extended condition. If the cover is of inextensible material, such as woven or non-woven fabric, this results in the cover being puckered or crinkled when the band is permitted to relax, due to the lengthwise contraction of the core. If the cover is made of extensible material, such as knitted fabric (e.g., interlock fabric) the degree of puckering depends on the extent (if any) to which the covering is stretched while it is being attached to the stretched core.

The invention also provides in the manufacture of a garment having a wearer-encircling portion incorporating the elastic band, the steps of securing a length of the elastic band to fabric of the garment, securing the ends of the elastic band together, and extracting end portions of the tie-cord for subsequent use in constricting said wearer-encircling portion. The wearer-encircling

portion may be a waist band, a cuff band, or an ankle band.

Garments to which the present invention is applicable include pants or similar underwear, sports shorts, swimming or other trunks, pyjamas, trousers, slacks, pullovers, jumpers, and the like.

The bandlength may be first be secured to the length of garment fabric and the ends of the fabric length fastened together and the ends of the band length fastened together.

The ends of the length of garment fabric may be fastened together before the length of band is secured to the garment fabric. Alternatively the ends of the length of garment fabric may be fastened together, and the ends of the band length fastened together to form an endless band, and the latter subsequently attached to the garment.

Preferably however the method comprises the sequential steps of securing the bandlength to the length of the garment fabric, and securing the ends of the fabric length together and the ends of the band length together.

The ends of the tie-cord when extracted can be releasably tied together to constrict the wearer-encircling portion of the garment. An advantage of employing a non-woven fabric for the cover is that this readily permits the cover to be pierced so as to draw out portions of the tie-cord which can then be cut to provide free ends which can subsequently be tied together.

The band may be wholly or partially enclosed in a knitted fabric outer cover.

The band may be enclosed within the hem by a method which comprises the sequential steps of:

a. bringing one face of the band into contact with one face of the fabric along a zone of the latter spaced inwards from an edge of the fabric, with an extreme margin of the fabric protruding beyond an edge of the band,

b. folding the fabric around the band to form the hem by passing the band and fabric, with said faces in contact, through a fabricfolding region at which said margin is folded over said edge to overlay the other face of the band and the fabric is further folded to present said other face of the band, and the overlay, to said face of the fabric at a second zone inwards of the first said zone, and

c. thereafter advancing the band and fabric from said region, with the band in the hem, and securing the band in the hem by stitching penetrating through the band and hem within said zones and within the overlay.

This invention also includes a garment having a wearer-encircling portion incorporating the aforesaid elastic band.

The invention also includes apparatus for securing and enclosing an extensible elastic band within a hem tunnel formed in a length of garment fabric, comprising a pair of metering rollers, at least one of which is driven for forwarding the band at a predetermined linear speed to a region at which a first face of the band is brought into contact with a first face of the fabric along a zone of the latter spaced inwards from an edge of the fabric so that a marginal strip of the fabric protrudes beyond an edge of the band, a pair of rollers, at least one of which is driven, for forwarding the band and fabric in face contact to a fabric-folding region through which they are traversed, a fabric-folding device at said folding region for forming the fabric into a hem tunnel



by folding said marginal strip around said edge of the band to overlay the second face of the band and folding the fabric about the other edge of the band to present said second face of the band, and the marginal strip, to the first face of the fabric along a zone of the fabric spaced inwards of the first said zone, and a sewing mechanism for withdrawing the band and fabric from said folding device and for securing the band in the hem tunnel by stitching penetrating through the band and the fabric of the tunnel, including the marginal strip, with said zones.

The folding device may comprise apparatus for securing and enclosing an extensible elastic band within a hem tunnel formed in a length of garment fabric, comprising a pair of metering rollers, at least one of which is driven, for forwarding the band at a predetermined linear speed to a region at which a first face of the band is brought into contact with a first face of the fabric along a zone of the latter spaced inwards from an edge of the fabric so that a marginal strip of the fabric protrudes beyond an edge of the band, a pair of rollers, at least one of which is driven, for forwarding the band and fabric in face contact to a fabric-folding region through which they are traversed, a fabric-folding device at said folding region for forming the fabric into a hem tunnel by folding said marginal strip around said edge of the band to overlay the second face of the band and folding the fabric about the other edge of the band to present said second face of the band, and the marginal strip, to the first face of the fabric along a zone of the fabric spaced inwards of the first said zone, and a sewing mechanism for withdrawing the band and fabric from said folding device and for securing the band in the hem tunnel by stitching penetrating through the band and the fabric of the tunnel, including the marginal strip, with said zones. The folding device may comprise two parallel members affording between them a gap along which the band and fabric travel in face contact, which members twist their length through 180° and one of which has a turned-over marginal portion for folding the marginal strip of the fabric around the edge of the band.

Alternatively, the folding device may comprise a single member affording a surface along which the fabric travels, which member twists in its length through 180° and has a turned-over marginal portion for folding the marginal strip of the fabric around the edge of the band.

In order that the invention may be better understood reference will now be made to the accompanying drawings which are largely diagrammatic. In these drawings:

FIG. 1 is a sectional view through one form of composite band according to this invention.

FIG. 2 illustrates a length of garment fabric to which a band according to this invention is to be applied.

FIGS. 3 to 5 illustrate successive stages in the enclosure of this band within a hem tunnel formed in the garment fabric at a wearer-encircling portion thereof.

FIGS. 6 to 9 illustrate successive stages in the manufacture of the garment while

FIGS. 10 and 11 illustrate modified constructions of the garment.

FIG. 12 is a prespective view of the apparatus which may be employed to attach the band;

FIGS. 13 to 17 illustrate successive stages in the enclosure of the band in a hem tunnel.

FIG. 18 is a perspective view of another form of the apparatus while

FIGS. 19 to 23 illustrate successive stages in the functioning of the fabric-folding device shown in FIG. 18, during traverse of the garment fabric and band along the device.

Referring firstly to FIG. 1, this illustrates a composite elastic band 4 according to this invention comprising two co-planar strips 9 of elastic ribbon material forming a core sandwiched between and adhered to the inner-faces of two cover strips 8 of non-woven material. Within the gap between the inner margins of the two rubber ribbons 9 there is located a round or flat tie-cord 10 which either freely lengthwise within the band or is not attached thereto in such a manner that it limits the lengthwise extensibility of the band.

The elastic ribbons 9 are stuck to the inner face of the covering strips 8 while in the longitudinally stretched condition and the tie-cord 10 is simultaneously or previously laid in between the ribbons. As a result when the band is permitted to relax the strips 8 and 9 become puckered or crinkled and so does the tie-cord 10.

The puckering of the tie-cord 10 in the relaxed band is illustrated in the lower part of FIG. 12. Since the tie-cord has this disposition in the relaxed band, it does not inhibit the band from being stretched and provides a surplus length of cord permitting free ends of the latter to be drawn out a hereinafter described with reference to FIGS. 7-11.

Other suitable sectional configurations for the band, permitting of the insertion of a tie cord, are shown in FIGS. 2, 3, 7, 8, 9 and 11 of British Pat. No. 1279743.

Instead of the cover being stuck to the ribbons forming the core it may be sewn to them by extensible or non-extensible stitching depending on the extensibility or otherwise of the covering material stitching.

It is intended that the band 4 shall be enclosed within and secured to a hem tunnel formed by folding the fabric of a garment. FIG. 2 shows a length of garment fabric 14, constituted by a plurality of fabric panels sewn together, and in this example by two panels 14a, 14b having edges sewn together at 15. Each panel is provided with a hole 16a, or 16b near one edge thereof for the purpose hereinafter described. The edges of the holes are suitably finished off and the holes may be spaced equally to either side of the seam 15.

The band 4 in an extended condition is brought into face contact with fabric 14 along a zone spaced inwards from a longitudinal edge of the latter so that an extreme margin 14c of the fabric protrudes beyond an edge of the band (see FIG. 3). Thereafter as shown in FIG. 4, this protruding margin is folded over said edge of the band and the fabric is further folded, as shown in FIG. 5, over the other edge of the band so that the band is wholly enclosed in a hem tunnel 17.

While in the hem tunnel the band is secured in position by lines of stitching disposed at opposite sides of the tie cord 10. The stitching penetrates both the ribbons 9 and completely through the covering and hem tunnel. Some of the stitches penetrate the folded-over margin 14c. It may here be mentioned that matters are so arranged that the tie-cord 10 extends in register with the holes 16a, 16b, in the fabric.

After the band 4 has been secured in the hem tunnel its ends are trimmed off substantially level with the ends of the tunnel. The relaxed girth of the body encir-

cling portion 19 (hereinafter referred to) is determined by the degree of extension applied to the band at the time of stitching.

The ends of the length of garment fabric 14, are brought together and secured by a seam 18 so as to form an annular waist band 19 or other body-encircling portion of the garment 20. The ends of the length of the band and of the tie-cord 10 are stitched together and locked inside the hem tunnel in same operation. If desired a piece of fabric 21, such for example as a brand label, may be sewn across the joint to strengthen the waist and to further secure the ends of the tie-cord.

The next stage is to extract a loop 10a of the tie-cord 10 through one of the holes 16a, 16b, by bursting through the covering material 8 of the band 4, (see FIG. 7). The next step, FIG. 8, is to cut this loop 10a, off centre so as to leave two protruding loose ends 10b, 10c of the tie-cord.

Loose end 10b, is then extracted through the other hole 16a. Due to the fact that the loop 10a is cut off-centre the protruding ends 10b, 10c of the tie-cord shown in FIG. 9 are substantially of equal length. The extremities may be finished off by tagging or knotting.

Whether the ends 10b, 10c are presented at the inside or the outside of the wearer-encircling portion 19, depends on two factors viz. whether the hem tunnel is presented inside or outside portion 19 and/or the distance of the holes from the edge. They may be presented at the opposite face of the hem tunnel to that shown in FIG. 5, so that as shown in FIG. 10 the ends 10b, 10c are presented at the outside of portion 19.

A single hole such as 16a FIG. 11 may be provided instead of the two holes 16a, 16b and the loop 10a of tie-cord extracted through this hole so the two ends 10b, 10c protrude through the latter, either at the inside of the garment as shown or at the outside.

FIGS. 6-11 show the wearer-encircling portion in a relaxed and puckered condition. The extent of the puckering, if any, depends on the extent to which the fabric of the hem tunnel 17 is stretched, lengthwise of the band, while the band is stitched within it. Thus, if the fabric 14 is knitted fabric, the hem tunnel may be held in a stretched or partly stretched condition while the band is sewn to it: thus eliminating or partly eliminating puckering of portion 19 when the latter is permitted to relax but not preventing elastic extension of said portion.

Referring now to FIG. 12, the composite elastic band 4 is drawn in relaxed condition from a supply thereof and forwarded positively by metering feed rolls 23a, 23b at a predetermined linear speed.

From the metering rolls, at least one of which is positively driven, the band 4 is forwarded under some degree of extension and tension to nip rollers 24a, 24b, one or both of which may be driven. It is fed over the upper periphery of roller 24b and is thereby forwarded to the fabric-folding device indicated generally at 26. As it passes between rollers 24a, 24b, the upper or first face of the band 4 is brought into contact with the underface (or first face) of a length of garment materials 14 along a zone spaced inwards from a side edge of the garment fabric so that the extreme margin 14c of the latter protrudes beyond an edge of the band, the edge of the fabric being guided by an edge 25. The garment fabric and band, in face to face contact, pass through a folding device 26 and thence to a sewing machine indicated at 27 being pulled away from the device by the

feed means 28 of the machine. The sewing machine is a known type incorporating a plurality of needles 29, by which the band is sewn within a hem of the garment fabric. The parts marked 30a, 30b form the supports for the entry of the device 26.

The band 4 is forwarded by the metering rollers 23a, 23b at a linear speed less than that at which the band 4 and fabric 14 are forwarded by the rollers 24a, 24b and the latter rollers forward the band and fabric at the same or substantially the same linear speed as that at which they are drawn from the device 26 by the sewing machine 27. For this purpose, the driven one of rollers 23a, 23b, the driven one of rollers 24a, 24b, and the feed means 28 of the sewing machine are connected together by any suitable mechanism (not shown) to rotate at the appropriate peripheral speeds: for example being driven from a common power source such as the power source or driving motor of the sewing machine.

Turning now to FIGS. 13 to 17, FIG. 13 is a sectional view showing that the device 26 consists of two plate members 31, 32 which at the entry end lie in parallel horizontal planes. They commence to twist while still occupying parallel planes as shown in FIG. 14 so that the fabric 14 is bent. FIG. 15 shows that at a later stage they twist still further and that the plate 31 then has a turnover portion 33 which commences to fold the extreme margin 14c of the fabric around one edge of band 4. The device 26 twists still further as shown in FIG. 16, so that the part 33 causes the fabric margin 14c to be folded over said one edge of the band 4 to overlie a second or opposite face of the latter and the outer face of the member 32. Finally as shown in FIG. 17, the device 26 completes its twist through 180°.

On being pulled out of the device 26 subsequent to the stage illustrated in FIG. 17, the band 4 lies within the hem tunnel 17 with one face in contact with the fabric at the zone hereinbefore referred to and with the marginal part 14c folded round an edge of the band to overlie the other or second face of the band and with the latter and said overlay portion presented against the first face of the fabric 14 at a second zone spaced inwards of the first zone. This is illustrated in FIG. 5. It is in this condition and with the band at least partially extended (and with the band fabric under tension) that the band, in the tunnel, is pulled past the needles 29 of the sewing machine 27 which operates to fasten the band within the hem tunnel by stitches which penetrate completely through the hem tunnel and through the band, some of said stitching desirably penetrating the overlay 14c. An appropriate length of the band is cut off and the two ends of the garment fabric and the two ends of the band are then stitched to one another, the band being enclosed in the tunnel 17. The fabric tunnel will be puckered allowing the waist band or other region at which the tunnel is provided to be circumferentially expanded to accommodate a part of the body of the garment wearer.

The degree of puckering of the tunnel will depend at least in part on the nature of fabric 14. If that fabric is substantially inextensible there will be considerable degree of puckering. If the fabric has some capacity for extension, the degree of puckering will depend on the extension imparted to the fabric on leaving the device 26 and while passing the needles 29. For example, were the fabric and band to be extended to the same degree, the tunnel would not be puckered but would still be capable of being expanded circumferentially.

It will be appreciated that if the elastic band 4 is stretched during manufacture to an extent greater than that to which it is stretched during incorporation into the garment there will be a surplus length of the tie cord forming loose or free ends, in the resultant garment, which will not pull back into the band even when the wearer-encircling portion of the garment has been stretched circumferentially to its limit. In the relaxed condition of the band, the draw-cord or the cord 10 lies in puckered or crimped form within it (as illustrated in the lower part of FIGS. 12 and 18) as not to inhibit the band from being stretched and to provide a surplus for the free ends of the cord. For this purpose, the cord is interposed between the two ribbons 9 while the latter are stretched, the covering layers 8 being then stuck to the stretched ribbons.

Referring now to FIGS. 18 to 23, the folding device 36 shown therein comprises a single plate member 37 along a surface of which the fabric 14 (with the band 4) travels from the rollers 24a, 24b to the sewing machine 27. This member 37 twists, in its length through 180° and has a turned-over marginal portion 38. The extent to which this portion 38 is turned over develops, as depicted at successive stages in FIGS. 20 to 23. It will be seen that the device 36 operates in a manner similar to the device 26 of FIGS. 12 to 17 from its entry end shown in FIG. 19 to its exit end shown in FIG. 23, the eventual result being that the fabric is folded round

the band 4 to enclose the latter a hem tunnel 17.

I claim:

1. A prefabricated composite elastic band for use in connection with a garment and capable of being stretched elastically from a relaxed condition and of recovery to said condition, comprising a core having two faces including two substantially co-planar elastic ribbons spaced apart from each other with a gap between adjacent edges, a cover composed of a flexible material connected to the core and extending over and covering both faces of the core and covering the gap, and a tie-cord extending freely, within the gap, lengthwise of the band, said tie-cord being puckered when said band is in said relaxed condition.

2. The band as claimed in claim 1, wherein the cover is a single strip of flexible material folded around said core

3. A band according to claim 1, further comprising adhesive means operable to connect said core to said cover.

4. A band according to claim 1, wherein the cover consists of two strips of flexible material, one of said strips being disposed on one face of the core and the other of said strips being disposed on the other face of the core.

5. A band according to claim 1, wherein the cover is a non-woven fabric.

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