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(54) **Improvements in a method of and apparatus for applying elastic material to garments.**

(57) Apparatus for applying elastic material to a portion of garment material comprises a sewing station 51, and a metering device 62 for feeding a strip of elastic material 32 to lie on or under the garment material 20 to enable the elastic material to be progressively secured by the sewing station 51 in face to face contact to a marginal portion of the garment material until a required length of elastic material is secured to the garment material. A cutting device 70 cuts the elastic material from its supply to form a finite length. A tension holder 80 holds the unsecured portion of the cut finite length under tension whilst the securing operation is being completed.

A method of applying elastic material and garments having elasticated portions are also disclosed.

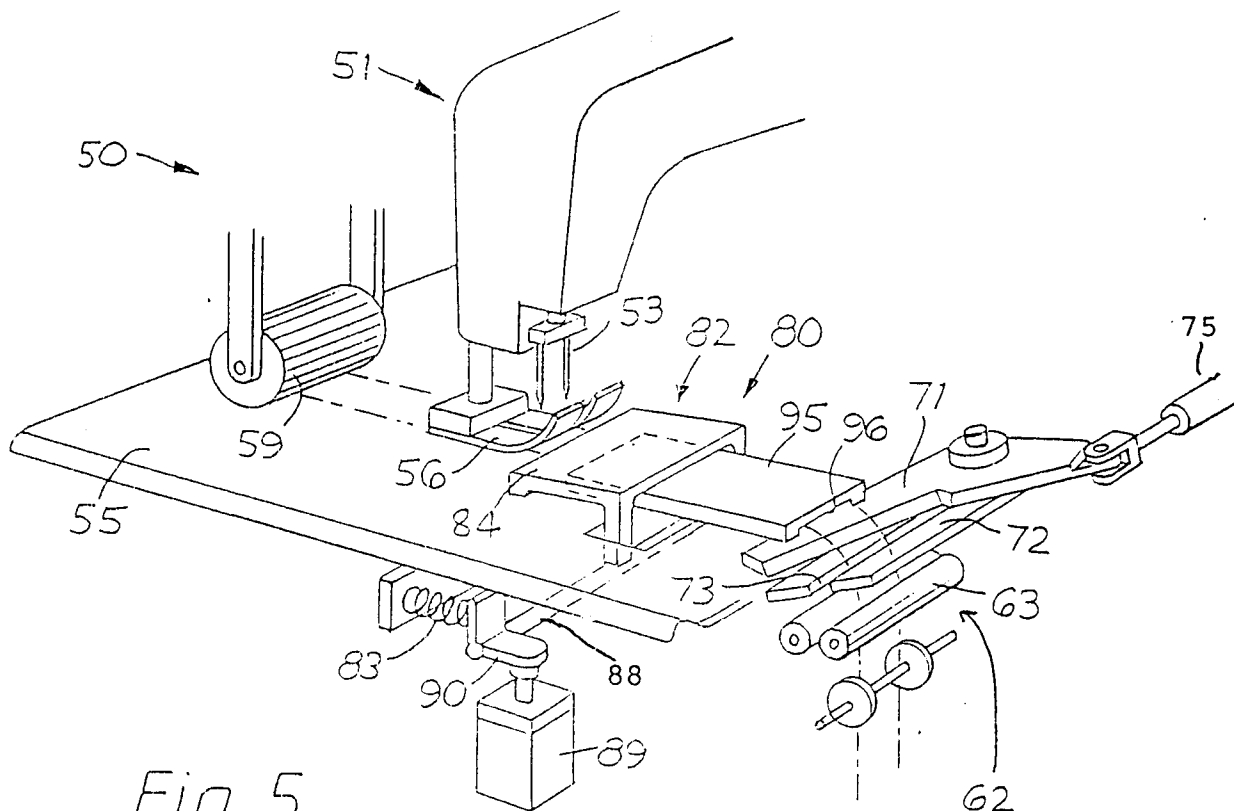


Fig. 5

The present invention relates to a method of and apparatus for applying elastic material to garments.

In the manufacture of garments, such as for example boxer shorts, one known method of applying elastic is that an elasticated band is initially applied to a garment blank in a flat or open condition. The band is applied under tension so that on relaxation the fabric to which it is attached is ruched and thereby enables the band to expand when the garment is being worn. The garment blank is then completed into tubular form by seaming opposed side edges with an overlapped stitched seam. A problem with this type of manufacture is that the seamed edges which join the elasticated band extend transversely across the band and so protrude. This can be unsightly and uncomfortable for the wearer.

Another well known method of applying elastic is first forming a continuous loop of the material, applying a loop of elastic material at the upper edge of the loop to form the waistband and then finishing the garment. The elastic is applied by cutting a length of elastic material, stitching the ends of the length together to form a loop and then stitching the loop of elastic material to the loop of garment material. The disadvantage associated with this prior art method is that there are three operations involved, i.e. cutting the elastic, forming the elastic into a loop and applying the elastic loop to the garment, all of which make the garment more expensive to produce.

According to the present invention, there is provided a method of forming an elasticated portion in a garment, the method comprising securing one end of a length of elastic material in face to face contact to a marginal portion of the garment material, progressively securing the length whilst under tension along the portion of the garment material, severing the length of elastic material from its supply so that a finite length of elastic is applied to the garment material and holding under tension the unsecured portion of the finite length whilst it is being secured to the garment material.

Preferably, the method includes feeding the length of elastic material to lie on or under the garment material and holding the cut end of the supply of elastic material for use with a subsequent piece of garment material.

Advantageously, the method also includes metering the length of elastic material from beneath the securing area.

Preferably, the method further includes forming an opening in a substantially completed garment, securing one end of the length of elastic material in face to face contact to a marginal portion of the garment surrounding the opening, severing the length of elastic material to form a finite length and securing the finite length under tension to the garment until a portion of the finite length of elastic material, including the other end, overlaps said one end to provide an elas-

ticated portion in the form of an elasticated band.

The present invention also provides apparatus for applying elastic material to a portion of garment material comprising securing means, means for feeding a strip of elastic material to lie on or under the garment material to enable the elastic material to be progressively secured by the securing means in face to face contact to a marginal portion of the garment material until a required length of elastic material is secured to the garment material, a cutting device for cutting the elastic material from its supply to form a finite length, and a tension holder for holding the unsecured portion of the cut finite length under tension whilst the securing operation is being completed.

Advantageously, the apparatus includes programmable electronic metering means for metering the elastic material from beneath the securing means and for holding the cut end of the supply of elastic material for use with the subsequent piece of garment material.

Preferably, the apparatus also includes feed means for simultaneously feeding the length of elastic material and garment marginal portion passed the securing means, the feed means being arranged to pull the elastic material past the tension holder located immediately upstream of the securing means, the tension holder being engageable with the length of elastic material to resist its longitudinal movement and thereby generate tension in the length of elastic material between the feed means and the tension holder so that the length of elastic material is secured to the marginal portion under tension.

Preferably, the length of elastic material is supplied to the securing means from a continuous length stored for example on a reel, the metering means being provided upstream of the tension holder and arranged positively to feed the continuous length of elastic material toward the securing means at a slower rate than said feed means to thereby tension the length of elastic material located between the metering means and the feed means, the tension holder being selectively actuatable to grip or release the length of elastic material to isolate respectively the metering means from the feed means or enable the metering means to apply tension to the length of elastic material.

Advantageously, the tension holder comprises a movable clamp head and a platform, the clamp head being movable towards and away from the platform respectively, between an elastic gripping position and an elastic release position.

Preferably, the clamp head is in the form of a recessed plate which defines a grip edge at one end for engaging the elastic material, the plate being fixedly mounted on a pivotable shaft having biasing means for moving the plate to the release position and piston means operable against a lever coupled to the shaft for moving the plate to the gripping position.

Conveniently, a static guide plate having a chan-

nel is provided for guiding the edges of the length of elastic material towards the grip edge, the guide plate extending within the recess of the clamp plate up to close proximity with the grip edge.

The invention further provides a garment having an elasticated opening defined by a band of elastic material secured by one or more longitudinally extending lines of stitching in face to face contact with a marginal portion of the garment surrounding the opening, the band having a join region defined by a first end secured in face to face contact to the marginal portion and a second end which overlaps and is secured in face to face contact to the band adjacent the first end and additionally to the garment, whereby the join region has at least two overlapping lines of stitching secured to the garment material.

Advantageously, the garment is folded about the lower edge of the elasticated band and the elasticated band is secured in face to face contact to a further marginal portion of the garment material to form a tunnelled waistband.

Preferably, the garment has a lining secured thereto with the band of elastic material.

The invention also provides a garment having an elasticated portion defined by a finite length of elastic material secured by one or more longitudinally extending lines of stitching in face to face contact to a marginal portion of the garment material, the finite length of elastic material being secured to the garment material under tension between its first end and its remote second end.

The invention will hereinafter be more particularly described with reference to the accompanying drawings, which show, by way of example only, one embodiment of an elasticated garment according to the invention and one embodiment of apparatus according to the invention. In the drawings:

Figure 1 is a schematic representation of a flat garment blank for forming a garment having a waist opening;

Figure 2 is a schematic view of the blank of Figure 1 folded to form a garment;

Figure 3 is a schematic view similar to Figure 2 showing an elasticated band attached to the waist opening;

Figure 4 is a part schematic view of the garment of Figure 3 showing the join of the waist band;

Figure 5 is a perspective view of an apparatus according to the present invention;

Figure 6 is a diagrammatic representation of the apparatus shown in Figure 5.

Referring to Figures 1 to 4, there is shown a garment blank 20 for forming a pair of shorts such as boxer shorts. The blank 20 is cut from a desirable material, preferably a woven fabric and has leg forming portions 21 and a waist opening forming edge portion 22.

To form the garment, the blank 20 is folded to

bring opposed end edges 26 into contact and the edges 26 are joined together by sewing, usually by an overlock machine, to produce a seam 30.

The garment now has a waist opening 31 and in accordance with the present invention, an elasticated band 32 is secured in face to face contact to a marginal portion 33 of the garment surrounding the waist opening 31. The band 32 is secured to the garment whilst in a tensioned condition (i.e. stretched condition) so that on relaxation, the fabric of the marginal portion 33 is ruched thereby enabling the band to stretch when the garment is being worn.

As shown more clearly in Figure 4, the band 32 is secured to the garment blank such that one end portion 35 overlies and is in face to face contact with the other end portion 36. Preferably, as shown in Figure 4, the band 32 is secured to the fabric by a pair of lines of stitching 37, 38 which extend longitudinally of the band and which also secure the end portions 35, 36 to one another. Accordingly, no seams are provided extending transversely through the end portions 35, 36 and as a consequence the join 40 at the opposed ends of the band is relatively flat. It will be appreciated that any desired number of longitudinally extending lines of stitching may be provided for securing the band to the garment.

The end portion 35 is preferably applied and secured whilst in a tensioned condition such that the elasticated band 32 provides elastication around the entire periphery of the waist opening 31.

Apparatus for applying the elasticated band 32 to the marginal portion 33 surrounding the opening 31 is illustrated in Figures 5 and 6.

The apparatus 50 includes a sewing station 51 at which the band 32 is secured to the marginal portion 33. In the illustrated embodiment the sewing station 51 is defined by a sewing machine including twin needles 53, a platform 55 and a presser foot 56. Feed dogs (not shown) are located beneath the presser foot 56 for feeding the marginal portion and band past the needles 53.

Downstream of the sewing station 51 is a tension roller 59 which is driven by the sewing machine in synchronism with the feed dogs. The purpose of the roller 59 is to maintain the band located between itself and the sewing needles 56 in a stretched condition so as to enable satisfactory stitching to be achieved. The rate of feed of the roller 59 and the feed dogs is therefore preferably the same. The roller 59 is located above the platform 55 so as to define a nip region 60 therebetween for engaging the marginal portion and band. The roller 59 preferably has a periphery adapted to frictionally engage the fabric passing through the nip region. Thus, the periphery may be provided with ribs and/or be formed from a material having a high co-efficient of friction.

On the upstream side of the sewing machine, the band 32 is positively fed from a continuous length-

supply by metering device 62 having a pair of nip rollers 63.

The nip rollers 63 are preferably driven by an electric stepper motor (not shown) which is controllable to provide the desired tension. The motor is arranged to drive the rollers in a clockwise or anti-clockwise direction to increase or decrease tension in the band being applied to the sewing machine. During sewing, the motor is controlled to rotate the rollers in synchronism with the feed of the sewing machine in order to maintain the desired tension.

In order to form the join 40 it is necessary to sever the band 32 from its supply whilst maintaining tension within the band as it passes through the sewing station 51.

This is achieved by the provision of a severing means 70 located between the sewing station 51 and metering device 61 and a tension holder 80 located between the cutting means 70 and the sewing station 51.

The tension holder 80 is preferably in the form of a movable clamp head 82 located above the platform 55. The clamp head 82 is movable between a band engaged position whereat the clamp head 82 in co-operation with the platform 55 grips the band 32 and a band disengaged position whereat the clamp head 82 is spaced from the platform so as not to grip the band. Preferably, the clamp head 82 is in the form of a recessed plate 84 which defines a grip edge 85 at one end for engaging the band 32. Accordingly, it is possible for the grip edge 85 to be located in close proximity to the presser foot 56 at the sewing station 51.

The plate 84 is fixedly mounted on a pivoting shaft 88 which is biased by for example a spring 83 in one direction for moving the plate to the disengaged position and which is moved in the opposite direction by a pneumatic piston 89 operating on a lever 90 fixed to shaft 88. By suitable adjustment of the fluid pressure applied to piston 89 it is possible to vary the pressure applied on the band by the grip edge 85 and thereby control the tension applied to the band. This tension is chosen to be the same as that applied by the metering device 62.

The severing means 70 is preferably in the form of a movable blade 71 which is pivotally mounted at one end and which co-operates with a static blade 72 for severing the band 32. The static blade 72 includes a slit 73 through which the band is guided and the blade 71 is preferably moved across the static blade 72 in scissor-like fashion by a pneumatic piston 75 to co-operate with an opposed edge of the slit to sever the band.

In order to obtain a clean cut through the band 32 so as to produce a neat square end edge it is necessary to cut the band 32 whilst it is in a relaxed condition.

Accordingly, when it is desired to sever the band

32, feeding of the band 32 and marginal portion 33 is stopped by simultaneously stopping the sewing machine. The band 33 is now static but still held under tension between the sewing station and the metering device 62.

Clamp 82 is now operated to move to its band engaged position and the metering device 62 is operated to feed band 32. The band 32 between the clamp 82 and the metering device 62 is now fully relaxed and the band 32 between the clamp 82 and feed roller 59 is still held under tension. The severing means 70 is now operated to sever the band 32. After severance, the sewing machine is operated causing the band 32 to be pulled through the clamp 82, the drag imposed on the band 32 by the clamp 82 serving to maintain the desired tension in the band.

Eventually, the end of the band 32 emerges from the clamp 82 and as a consequence the length of the band in between the presser foot 56 and the clamp contracts before being sewn. The point at which this happens is chosen such that the join 40 has already been made so that elasticsation around the waist opening is not affected. The length of band released from the clamp 82 is relatively short since the grip edge 85 is located in close proximity to the presser foot and so does not present a problem for correct guiding to the sewing machine.

In order to provide positive guiding of the band upstream of the grip edge 85 after severance, a static guide plate 95 is provided. The guide plate 95 extends within the recess 84a of clamp plate 84 up to close proximity with the grip edge 85. The guide plate 95 includes a channel 96 which is preferably of the same width as the band when relaxed. In this way the band is positively guided along both edges. It is envisaged that different guide plates 95 would be provided having differing widths of channel in order to accommodate different widths of band.

The clamp plate 84 and guide plate 95 also serve as a support surface for the marginal portion for shielding the marginal portion from the band until reaching the sewing station.

The sequence of operation is as follows:

The cycle is started by an operative back-treadling the sewing machine causing the presser foot 56 and the roller 59 to be raised.

The operative inserts the garment over the band, drops the presser foot 56, sews a pre-set number of stitches, typically two or three, after which the roller 59 drops automatically, and the metering device 62 automatically reverses to apply the pre-programmed tension to the band so that the ruched effect can be achieved. If desired, a non-ruched or flat area can be incorporated into the band. This is achieved by the metering device 62 over-feeding the elastic material. To return to the ruched effect, the metering device 62 then reverses again until the pre-programmed tension is applied.

The operative then sews to the cutting position and stops, at which point the clamp 82 automatically drops onto the band and then the operator operates a control to cause the metering device 62 to release the tension, and simultaneously causes both the clamp 82 to be retained in the engaged position and the cutter to operate. The sequence is then completed by the operative sewing to the cut end of the band and back-treadling to remove the garment and thereby re-start the sequence, by automatically feeding in the band (elastic) to the presser foot.

Sequencing control of the clamp 82, metering device 62 and cutter 70 is achieved via a programmable electronic control means (not shown) which senses the motor position of the sensing machine via an encoder.

Using the above invention as a basis, further refinements can be applied to produce other garments for use in leisure wear and normal dress.

A garment with an elasticated band attached may be folded about the lower edge of the elasticated band and the elasticated band secured, most conveniently by a seam covering machine, in face to face contact to a further marginal portion of the garment to form a tunnelled waistband. Seam covering is a type of stitching used in the garment industry in which two parallel rows of stitching are continuously looped by a third covering thread so that a multiplicity of short lengths of thread extend between the two parallel rows of stitching. The rows of stitching applied during the elastication process prevent the elastic material from twisting within the tunnel.

An inner lining material may be attached during the elastication process. The lining can be attached with one or more rows of stitching, then pushed down into the garment and seam covered, if required.

Also, using the apparatus of the invention, discrete lengths of elastic material may be attached to any portion of a garment rather than using an entire loop or length of elastic material. The discrete length can be controlled under tension by the tension holder 80. In this way, elastication can be applied to only the portion or portions of the garment where it is required, thus resulting in a saving of elastic material.

It will of course be understood that the invention is not limited to the specific details described herein, which are given by way of example only, and that various modifications and alterations are possible within the scope of the invention as defined in the appended claims.

Claims

1. A method of forming an elasticated portion in a garment, the method comprising securing one end of a length of elastic material in face to face contact to a marginal portion of the garment ma-

terial, progressively securing the length whilst under tension along the portion of the garment material, severing the length of elastic material from its supply so that a finite length of elastic is applied to the garment material, and holding under tension the unsecured portion of the finite length whilst it is being secured to the garment material.

2. A method as claimed in Claim 1, including feeding the length of elastic material to lie on or under the garment material and holding the cut end of the supply of elastic material for use with a subsequent piece of garment material.

3. A method as claimed Claim 1 or Claim 2, including metering the length of elastic material from beneath the securing area.

4. A method as claimed in any one of Claims 1 to 3, including forming an opening in a substantially completed garment, securing one end of the length of elastic material in face to face contact to a marginal portion of the garment surrounding the opening, severing the length of elastic material to form a finite length and securing the finite length under tension to the garment until a portion of the finite length of elastic material, including the other end, overlaps said one end to provide an elasticated portion in the form of an elasticated band.

5. Apparatus for applying elastic material to a portion of garment material comprising securing means, means for feeding a strip of elastic material to lie on or under the garment material to enable the elastic material to be progressively secured by the securing means in face to face contact to a marginal portion of the garment material until a required length of elastic material is secured to the garment material, a cutting device for cutting the elastic material from its supply to form a finite length, and a tension holder for holding the unsecured portion of the cut finite length under tension whilst the securing operation is being completed.

6. Apparatus as claimed in Claim 5, including programmable electronic metering means for metering the elastic material from beneath the securing means and for holding the cut end of the supply of elastic material for use with the subsequent piece of garment material.

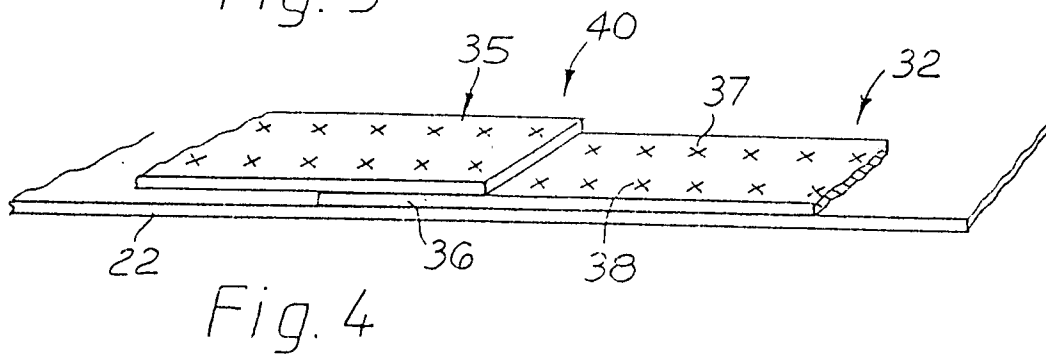
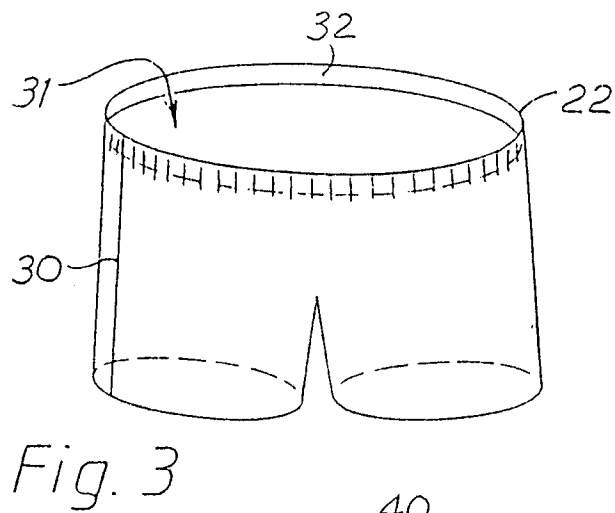
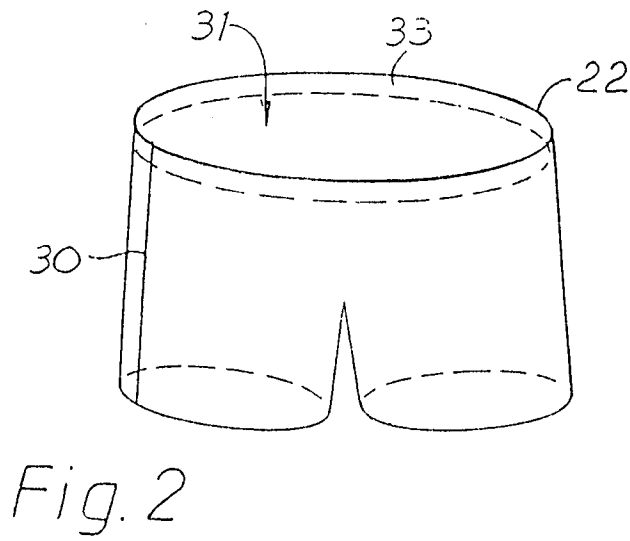
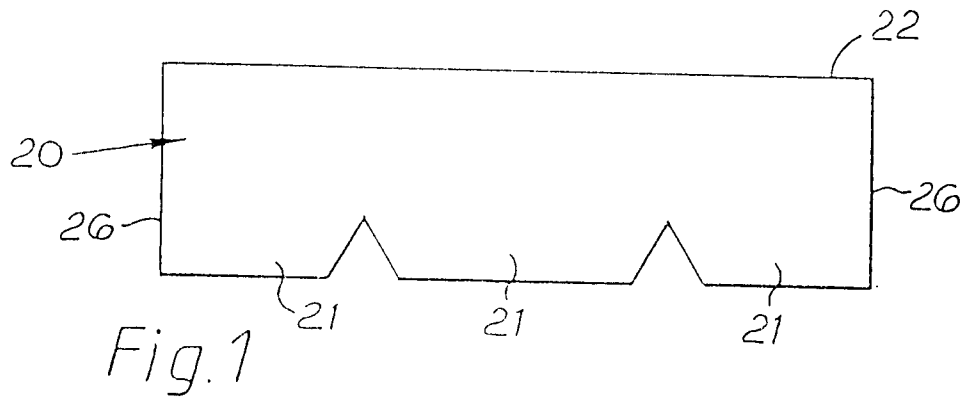
7. Apparatus as claimed in Claims 5 or 6, which includes feed means for simultaneously feeding the length of elastic material and garment marginal portion passed the securing means, the feed means being arranged to pull the elastic material

past the tension holder located immediately upstream of the securing means, the tension holder being engageable with the length of elastic material to resist its longitudinal movement and thereby generate tension in the length of elastic material between the feed means and the tension holder so that the length of elastic material is secured to the marginal portion under tension.

8. Apparatus as claimed in any one of Claims 5 to 7, in which the length of elastic material is supplied to the securing means from a continuous length stored for example on a reel, the metering means being provided upstream of the tension holder and arranged positively to feed the continuous length of elastic material toward the securing means at a slower rate than said feed means to thereby tension the length of elastic material located between the metering means and the feed means, the tension holder being selectively actuatable to grip or release the length of elastic material to isolate respectively the metering means from the feed means or enable the metering means to apply tension to the length of elastic material.
9. Apparatus as claimed in Claim 8, in which the tension holder comprises a movable clamp head and a platform, the clamp head being movable towards and away from the platform respectively, between an elastic gripping position and an elastic release position.
10. Apparatus as claimed in Claim 9, in which the clamp head is in the form of a recessed plate which defines a grip edge at one end for engaging the elastic material, the plate being fixedly mounted on a pivotable shaft having biasing means for moving the plate to the release position and piston means operable against a lever coupled to the shaft for moving the plate to the gripping position.
11. Apparatus as claimed in Claim 10, in which a static guide plate having a channel is provided for guiding the edges of the length of elastic material toward the grip edge, the guide plate extending within the recess of the clamp plate up to close proximity with the grip edge.
12. A garment having an elasticated opening defined by a band of elastic material secured by one or more longitudinally extending lines of stitching in face to face contact with a marginal portion of the garment surrounding the opening, the band having a join region defined by a first end secured in face to face contact to the marginal portion and a second end which overlaps and is secured in face

to face contact to the band adjacent the first end and additionally to the garment, whereby the join region has at least two overlapping lines of stitching secured to the garment material.

13. A garment as claimed in Claim 12, in which the garment is folded about the lower edge of the elasticated band and the elasticated band is secured in face to face contact to a further marginal portion of the garment material to form a tunnelled waistband.
14. A garment as claimed in either Claim 12 or 13, having a lining secured thereto with the band of elastic material.
15. A garment having an elasticated portion defined by a finite length of elastic material secured by one or more longitudinally extending lines of stitching in face to face contact to a marginal portion of the garment material, the finite length of elastic material being secured to the garment material under tension between its first end and its remote second end.



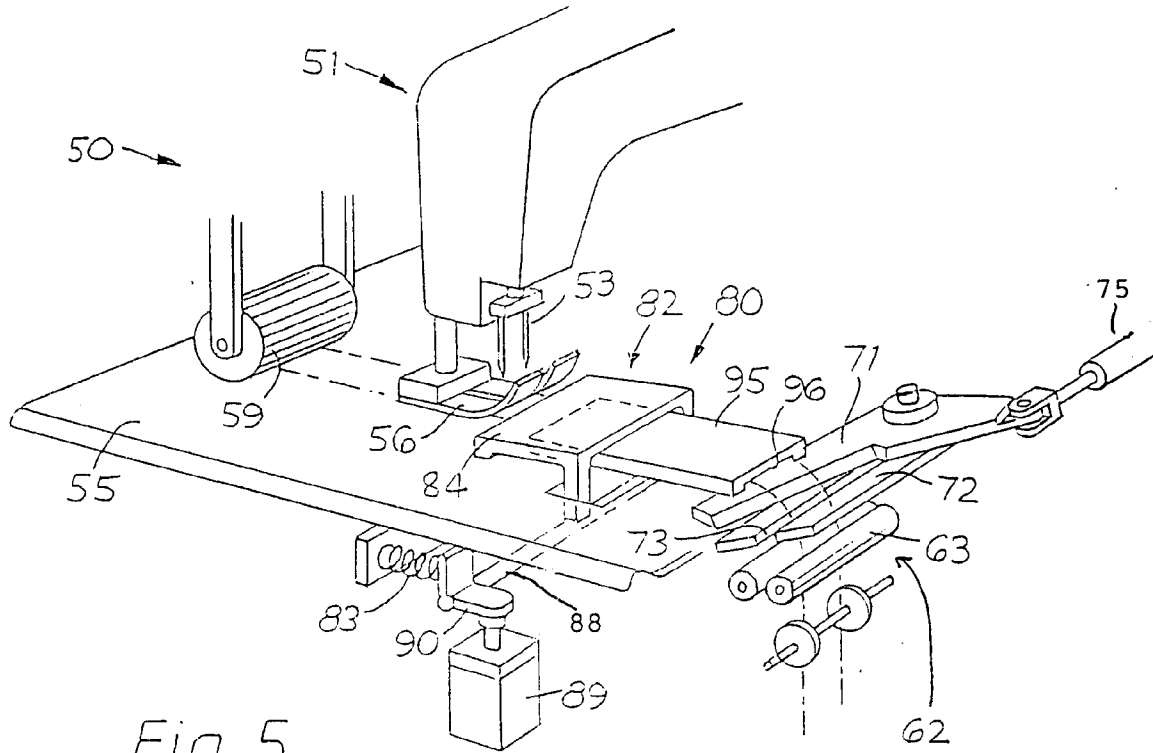


Fig. 5

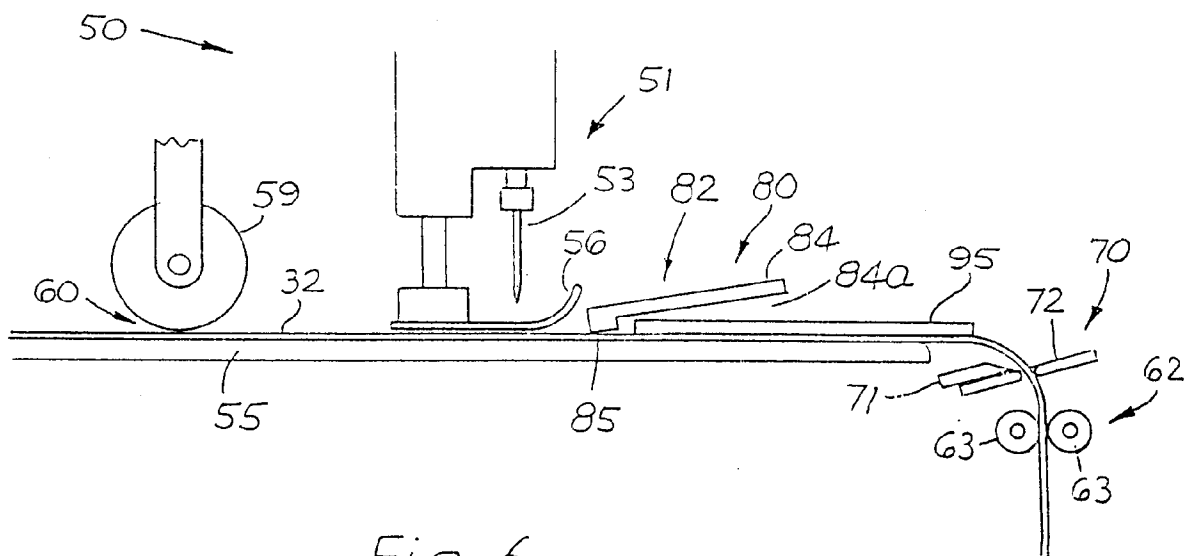


Fig. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 7137

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 279 749 (D. PLANTE) * the whole document * ---	1, 2, 4, 5, 7-12, 15	D05B35/06 A41F9/02
X	EP-A-0 165 380 (H. SCHIPS) * page 7 - page 8 * ---	1, 2, 4, 5, 8-12, 15 3, 6	
A	US-A-3 964 410 (R.J. BOSER; G. GLUCKIN) * column 1, line 62 - column 2, line 5 * * column 4, line 3 - column 6, line 32 * * column 7, line 50 - column 8, line 10 * ---	1-7, 12, 13, 15	
X	GB-A-1 406 822 (AUTOMATIC BRAIDING CO. LIMITED) * page 1, line 10 - line 20 * * page 3, line 29 - line 85 * ---	1, 3, 4, 12-15	
A	DE-C-3 638 989 (TEXPA ARBTER MASCHINENBAU GMBH) ---		TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	GB-A-1 041 071 (R. & W. H. SYMINGTON AND COMPANY LIMITED) ---		D05B
A	GB-A-1 445 391 (AUTOMATIC BRAIDING CO. LIMITED) -----		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 NOVEMBER 1991	Examiner D HULSTER E.W.F.
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