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(54) **AN ULTRA SLIM FASTENER AND A METHOD OF MANUFACTURING SAME**

(57) This invention relates to an ultra-slim fastener (400) for a bra and a method of manufacturing same. The ultra-slim fastener comprises a male part (200, 300) mounted on a first piece (207) and a female part (100) mounted on a second piece (103, 105). The male part comprises a planar body (201) having a downwardly depending leg (221) terminating in an outwardly projecting foot (205) extending parallel to the body. The female part comprises a substantially planar frame (101) defining a cavity (119) for reception of the foot. The cavity is roofed

in towards the innermost end (125) of the frame only thereby defining an open mouth (107) towards the outermost end (127) of the frame. The frame is mounted directly onto a fabric strip (103). The strip forms a backing for the frame and the bottom of the cavity is closed off. The second piece further comprises an overlay (105) mounted partially above the frame and on the fabric strip, sandwiching the frame between the overlay and the fabric strip. Such a fastener will be very thin yet very strong.

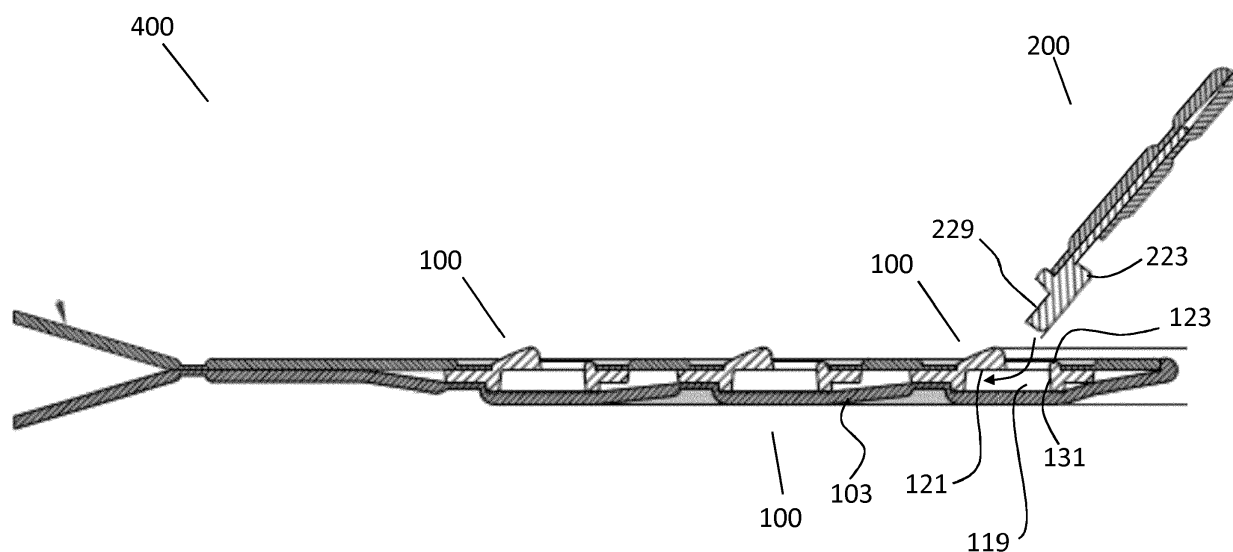


Fig. 10

Description

Introduction

[0001] This invention relates to an ultra-slim fastener and a method of manufacturing same. In particular, the invention relates to an ultra-slim fastener for use in the manufacture of an article of clothing such as a brassiere.

[0002] There are many disparate types of fasteners used in the manufacture of articles of clothing. The type of fastener chosen for a given application will depend in part on the intended application as often different design considerations apply to different applications. For example, fasteners for a brassiere (hereinafter referred to simply as a "bra") will preferably be low profile fasteners, will ideally be relatively simple for the wearer to open and close and yet will be sufficiently secure so that they are not prone to inadvertent opening during normal movement of the wearer. These are all important considerations when designing a fastener for a bra.

[0003] By having a low profile, the fastener will protrude less through the wearer's clothing and will provide a more aesthetically pleasing offering. Furthermore, by having a low profile the fasteners will have less tendency to catch on other items of clothing. It is important that bra fasteners in particular are simple for the wearer to open and close. Often, the closures will be behind the wearer's back and a fastener that is relatively simple to open and close will facilitate dressing and undressing. This is particularly important if the wearer has arthritis or other condition that may affect their manual dexterity.

[0004] It is also important that as well as being relatively simple to open and close deliberately, the fastener must not be prone to inadvertent opening. A fastener that opens inadvertently may cause considerable embarrassment to the wearer as well as inconvenience. For example, if the fastener is part of a bikini or bra, inadvertent opening of the fastener may result in the wearer exposing themselves to others which may be a cause of great distress. Similarly, if the fastener opens unintentionally with regularity, this can be most inconvenient as the wearer will have to resecure the fastener each time it opens. This may require the wearer to leave their current location and go to a place with more privacy such as a bathroom so that they can resecure the fastener.

[0005] However, often, the different design considerations conflict with each other. For example, as a general rule of thumb, the thinner that a fastener becomes, the more prone it will be to opening inadvertently. This is particularly the case for fasteners constructed from plastic material. When the fastener constructed from plastic material is made very thin, it will lose much of its structural rigidity and will have a tendency to bend and therefore open inadvertently under an applied load.

[0006] A number of fasteners are known in the art. European Patent Application No. EP0084747 in the name of Tareau describes a fastener for a garment. United States Patent No. US6536085 in the name of Milano de-

scribes an adjustable fastener for clothing, including brassieres. United States Patent No. US6,309,489 in the name of Fildan et al discloses an adjustable strap fastener for brassieres and a method of making same. French Patent Application No. FR1409820 in the name of Girodet describes a fastener for a brassiere or other article of lingerie. Japanese Patent Application No. JPS547701 U also appears to disclose a fastener.

[0007] It is an object of the present invention to provide a fastener that overcomes at least some of the problems with the known fasteners. It is a further object of the invention to provide a fastener that is ultra-slim, that is relatively simple to open and close but that is not prone to opening inadvertently. Finally, it is a further object of the invention to provide a fastener that offers a useful alternative choice to the consumer.

Statements of Invention

[0008] According to the invention there is provided an ultra-slim fastener for securing two pieces together, the fastener comprising:

a male part mounted on the first piece and a female part mounted on the second piece;

the male part being of the type comprising a substantially planar body having at its outermost end a downwardly depending leg terminating in an outwardly projecting foot extending substantially parallel to the plane of the body;

the female part being of the type comprising a substantially planar frame defining a cavity for reception and retention of the foot, the cavity being partially roofed in towards the innermost end of the frame thereby defining an open mouth towards the outermost end of the frame;

the foot, cavity and the open mouth being dimensioned so that insertion of the foot into the cavity must be realized by inclining the body of the male part relative to the frame of the female part before bringing the male part and the female part together, retention of the foot in the cavity is realized by pivoting the inserted male part from the inclined orientation to a co-planar orientation with respect to the female frame using the roof of the cavity as a fulcrum, and release of the foot from the cavity is realized by pivoting the inserted male part from the co-planar orientation back to the inclined orientation using the roof of the cavity as a fulcrum before moving the male part and the female part apart;

and in which the second piece comprises a fabric strip and the frame of the female part is mounted directly onto the face of the fabric strip so that the fabric strip forms a backing for the frame and the

bottom of the cavity is closed off by the fabric strip;
and

the second piece further comprises an overlay mounted onto the top of the frame and onto the face of the fabric strip, sandwiching the frame between the overlay and the fabric strip, the overlay having an aperture corresponding with the frame's open mouth.

[0009] By having such a fastener, the fastener can be made ultra-slim, less than 4mm in depth from top to bottom, while maintaining greater structural integrity and the ability to resist inadvertent opening under an applied load. Typically, fasteners of this type would be unsuitable for applications with loads over a few kilograms thereby significantly limiting their use. However by mounting the female part's frame directly onto the face of the fabric strip so that the fabric strip forms a backing for the frame and providing an overlay on top of the frame in the manner described, the frame will have significantly greater structural integrity and resistance to bending under tensile strain. This allows for a thinner fastener to be used. The fastener according to the invention will have a tensile strength rating of up to 12kgs which far exceeds the amount for fasteners of this type and will not be inclined to open inadvertently.

[0010] Furthermore, the fabric strip backing will provide greater resistance to the pivoting motion required for release of the male part and have a tendency to keep the male part and the female part in a substantially planar, locked configuration. This will further obviate the possibility of the fastener releasing inadvertently under normal movement by the wearer.

[0011] In one embodiment of the invention there is provided an ultra-slim fastener in which the frame of the female part is bonded to the second piece. Bonding is seen as a particularly useful way of connecting the female part to the second piece as this will facilitate the provision of an ultra-slim fastener.

[0012] In one embodiment of the invention there is provided an ultra-slim fastener in which the frame of the female part is ultrasonic welded to the second piece. Ultrasonic welding is seen as an ideal way to bond the fabric to the plastic that will obviate the need for adhesives and the difficulties inherent with the use of adhesive while allowing a very low profile device to be produced.

[0013] In one embodiment of the invention there is provided an ultra-slim fastener in which the second piece comprises a laminate of tricot fabric and microfiber fabric. The tricot fabric is particularly useful as it will provide a good bond with the plastic material of the female part. Furthermore, both the tricot and the microfiber fabric will be sufficiently resilient that they will allow the male part to be pivoted from a planar configuration to an inclined configuration when desired.

[0014] In one embodiment of the invention there is provided an ultra-slim fastener in which the open mouth com-

prises an upstanding collar surrounding the open mouth. By having an upstanding collar surrounding the mouth, the upstanding collar will protect the fabric overlay from any sharp edges and the likelihood of the overlay being damaged are significantly reduced.

[0015] In one embodiment of the invention there is provided an ultra-slim fastener in which part of the upstanding collar on the side of the open mouth adjacent the innermost end of the frame extends further upwardly from the frame than the remainder of the upstanding collar. This is seen as useful as this part of the upstanding collar will act as a backstop for the toe of the male part's foot and will facilitate the closure of the fastener.

[0016] In one embodiment of the invention there is provided an ultra-slim fastener in which the frame comprises a downwardly depending flange on the side of the cavity adjacent the outermost end of the frame. The downwardly depending flange on the side of the cavity adjacent the outermost end of the frame provides greater rigidity to the frame and will enable the frame to withstand greater forces than would otherwise be the case.

[0017] In one embodiment of the invention there is provided an ultra-slim fastener in which the frame comprises a second downwardly depending flange, the second downwardly depending flange being positioned on the side of the cavity adjacent the innermost end of the frame and being dimensioned to protrude downwardly from the frame by the same distance as the other flange. The second downwardly depending flange is useful in that it will keep the fabric strip backing of the second piece spaced evenly across the rear of the frame and the frame will sit flat across the wearer's back. This in turn will help to ensure that the fastener remains closed and assumes a flatter appearance across the wearer's back.

[0018] In one embodiment of the invention there is provided an ultra-slim fastener in which the side wall of the cavity adjacent the outermost end of the frame slopes towards the outermost end from top to bottom. By having the side wall of the cavity sloping in this fashion, the fastener will be able to withstand greater tensile strain than would otherwise be the case. As the male part and female part are subjected to tensile strain, the heel of the foot portion of the male part will be forced against this side wall of the cavity. By having the side wall sloped in this manner, the heel and by extension the male part will be drawn further inwardly into the cavity under this force, thereby further securing the fastener.

[0019] In one embodiment of the invention there is provided an ultra-slim fastener in which the side wall of the cavity adjacent the innermost end of the frame slopes towards the innermost end from top to bottom.

[0020] In one embodiment of the invention there is provided an ultra-slim fastener in which the first piece comprises a fabric strip.

[0021] In one embodiment of the invention there is provided an ultra-slim fastener in which the fabric strip of the first piece comprises tricot fabric.

[0022] In one embodiment of the invention there is pro-

vided an ultra-slim fastener in which the fabric strip of the first piece comprises microfiber fabric.

[0023] In one embodiment of the invention there is provided an ultra-slim fastener in which the body of the male part is bonded to the first piece.

[0024] In one embodiment of the invention there is provided an ultra-slim fastener in which the body of the male part is ultrasonic welded to the first piece.

[0025] In one embodiment of the invention there is provided an ultra-slim fastener in which the first piece comprises an upper component mounted on the top of the body and a lower component mounted on the bottom of the body, the body being sandwiched between the upper and the lower components. By having both upper and lower components, the male part will have less tendency to twist under load and furthermore a secure connection between the plastic body and the fabric first piece will be provided.

[0026] In one embodiment of the invention there is provided an ultra-slim fastener in which the upper component and the lower component both extend beyond the innermost end of the planar body thereby forming a flap that extends beyond the innermost end of the planar body. This flap will facilitate the connection of the end of the male part of the fastener onto another part of a garment such as the rearward arm of a bikini or a bra.

[0027] In one embodiment of the invention there is provided an ultra-slim fastener in which the upper component and the lower component are connected together beyond the innermost end of the planar body.

[0028] In one embodiment of the invention there is provided an ultra-slim fastener in which the foot has a heel portion that slopes away from the outermost end from top to bottom. As with the sloped wall of the cavity outlined above, by having the heel portion sloping away from the outermost end from top to bottom, the heel will be urged further into the cavity of the female part under load, thereby improving the engagement therebetween.

[0029] In one embodiment of the invention there is provided an ultra-slim fastener in which the foot has a toe portion that slopes away from the outermost end from top to bottom.

[0030] In one embodiment of the invention there is provided an ultra-slim fastener in which the substantially planar body has at its outermost end an upwardly extending flange. As with the collar of the female part's frame, the upwardly extending flange will help to locate the male part in the female part and will also act as an end stop to prevent the male part being forced into the female part too far.

[0031] In one embodiment of the invention there is provided an ultra-slim fastener in which the depth of the male part from the uppermost point on the male part to the sole of the foot is no more than 0.0027m deep. This is seen as preferred to provide an ultra-slim fastener.

[0032] In one embodiment of the invention there is provided an ultra-slim fastener in which the depth of the female part from the uppermost point on the frame to the

lowermost point of the second piece connected to the frame is no more than 0.0034m deep. This is also seen as preferred to provide an ultra-slim fastener.

[0033] In one embodiment of the invention there is provided an ultra-slim fastener in which the depth of the fastener from the uppermost point on the male part to the lowermost point of the second piece connected to the female part's frame when the male and female parts are engaged is no more than 0.0035m deep. By having a fastener of this depth, the fastener will have many beneficial applications from bras, swimwear, sportsbras as well as other items of clothing that would benefit from an ultra-slim fastener of this type.

[0034] In one embodiment of the invention there is provided an ultra-slim fastener in which the cavity and the foot are substantially rectangular shaped.

[0035] In one embodiment of the invention there is provided an ultra-slim fastener in which the female part comprises a plurality of frames arranged in a row, each of the frames defining a cavity for reception and retention of the foot, the cavities being partially roofed in towards the innermost end of the frame thereby each defining an open mouth towards the outermost end of the frame. This is seen as particularly useful as a plurality of frames arranged in a row will provide for easy adjustment of the bra to suit different torso dimensions of the wearer.

[0036] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener of the type according to the preceding claims, the method comprising the steps of:

cutting out an aperture in an overlay sheet;

bonding the overlay sheet to a fabric strip along at least one edge of both the overlay sheet and the fabric strip;

placing the frame of the female part on the overlay sheet with the open mouth of the frame in alignment with the aperture in the overlay sheet;

bonding the frame of the female part to the overlay sheet;

drawing the fabric strip over the other side of the frame of the female part so that the bond line along the bonded edge of both the overlay sheet and the fabric strip is sandwiched between the overlay sheet and the fabric strip; and

bonding the fabric strip to the other side of the frame and bonding the overlay sheet to the fabric strip along any remaining un-bonded edges.

[0037] This is seen as a particularly effective way to manufacture the ultra-slim fastener according to the invention. By having the bond line internally located like this, a fastener with a smooth exterior will be provided

which will not have a tendency to irritate the skin of the wearer. The fastener will therefore be comfortable for the wearer to have in contact with their skin and will also will require less trimming of the fabric.

[0038] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the initial step of bonding the overlay sheet to the fabric strip along at least one edge of both the overlay sheet and the fabric strip comprises bonding the overlay sheet to the fabric strip along three edges of the overlay sheet and the fabric strip thereby forming a pouch, and in which the step of drawing the fabric strip over the other side of the frame of the female part so that the bond line along the bonded edge is sandwiched between the overlay sheet and the fabric strip comprises turning the pouch inside out, thereby drawing the frame inside the pouch. This is seen as a particularly preferred method of manufacturing the fastener that will keep most of the bond lines inside the finished fastener. This will result in a fastener that is both comfortable to wear and efficient to manufacture as less trimming will be required and less waste will have to be disposed of.

[0039] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the overlay sheet is bonded to the fabric strip along one edge but spaced apart from the edge, thereby forming a flap. This will enable the flap to be used in the subsequent attachment of the female part to a garment.

[0040] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the method comprises the subsequent steps of:

allowing the overlay sheet and the fabric strip to cool;
and

trimming the overlay sheet and the fabric strip once they have cooled.

[0041] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the steps of bonding the frame, the overlay strip and the fabric sheet comprise ultrasonic bonding the frame, the overlay strip and the fabric sheet. Ultrasonic welding of the second piece to the frame of the female part is seen as ideal as this will provide a very low profile device while maintaining a strong bond between the two components. This is also seen as cost effective and efficient for the manufacturing process and obviates the needs for adhesives and the inherent difficulties working with adhesives.

[0042] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the method comprises the step of bonding the body of the male part to the first piece.

[0043] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the step of bonding the body of the male part to the first piece comprises ultrasonic bonding the body of

the male part to the first piece.

[0044] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener comprising the steps of: folding the first piece back on itself intermediate its ends; bonding one end of the first piece to one side of the body of the male part; and bonding the other end of the first piece to the other side of the body of the male part.

[0045] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener in which the first piece comprises two separate strips of fabric and the method comprises the steps of: bonding one of the strips of fabric to one side of the body of the male part; and bonding the other of the strips of fabric to the other side of the body of the male part.

[0046] In one embodiment of the invention there is provided a method of manufacturing an ultra-slim fastener comprising the initial step of bonding a layer of tricot fabric to a layer of microfiber fabric.

Detailed Description of the Invention

[0047] The invention will now be more clearly understood from the following description of some embodiments thereof given by way of example only with reference to the accompanying drawings, in which:-

Figure 1 is a front view of a female part of the fastener according to the invention;

Figure 2 is a rear view of the female part of the fastener of Figure 1;

Figure 3 is a front view of a male part of the fastener according to the invention;

Figure 4 is a rear view of the male part of the fastener of Figure 3;

Figure 5 is a front view of an alternative embodiment of a male part of the fastener according to the invention;

Figure 6 is a rear view of the male part of the fastener of Figure 5;

Figure 7 is a side cross-sectional view of the male part shown in Figures 3 and 4;

Figure 8 is a side cross-sectional view of the male part shown in Figures 5 and 6;

Figure 9 is an enlarged side cross-sectional view of the female part of the fastener according to the invention; and

Figure 10 is a side cross-sectional view showing the male part being brought into engagement with the

female part of the fastener according to the invention.

[0048] Referring to Figures 1 and 2, there is shown a female part of the fastener according to the invention, indicated generally by the reference numeral 100, comprising a substantially planar frame 101 mounted directly onto the face of a fabric strip 103. There is further provided an overlay 105 mounted onto the top of the frame and onto the face of the fabric strip 103, sandwiching the frame 101 between the overlay 105 and the fabric strip 103. The frame 101 has a cavity (as will be shown in greater detail with reference to Figure 9 below) partially roofed in thereby defining an open mouth 107. The overlay 105 comprises an aperture 109 corresponding with the frame's open mouth. A plurality of weld lines 111 illustrate the areas where two of the frame, overlay and fabric strip have been joined together. One of the weld lines 111 is spaced apart from the innermost end 113 of the female part thereby forming a flap 115 that may be used to connect the female part to a portion of a garment 117 (shown in dashed outline).

[0049] Referring to Figures 3 and 4, there is shown a first embodiment of a male part of the fastener according to the invention, indicated generally by the reference numeral 200. The male part comprises a substantially planar body 201 having at its outermost end 203 a downwardly depending leg (not shown) terminating in an outwardly projecting foot 205. The outwardly projecting foot extends substantially parallel to the plane of the body 201. The substantially planar body 201 is connected to a first piece 207, in this case a piece of tricot fabric, by weld joints 209. The first piece 207 may then be used to connect the male part to portion of a garment 211 (shown in dashed outline).

[0050] Referring to Figure 7, there is shown an enlarged, side cross-sectional view of the male part 200 of the fastener. It can be seen that an upper component 213 of the tricot fabric first piece 207 is bonded to an upper side 215 of the body 201. The first piece 207 is then turned back on itself, and a lower component 217 of the first piece 207 is then bonded to the lower side 219 of the body 201. Importantly, it can be seen from Figure 7 that the male part comprises a downwardly depending leg 221 at the outermost end 203 of the planar body 201 which terminates in an outwardly projecting foot 205 extending substantially parallel to the plane of the body. The outwardly projecting foot 205 comprises a heel portion 223 and a toe portion 225. The heel portion is inclined rearwardly top to bottom from the outermost end of the male part 200. Finally, there is provided an upwardly extending flange 227 protruding from the upper surface of the substantially planar body coincident with the downwardly depending leg 221.

[0051] Referring now to Figures 5, 6 and 8, there is shown a second embodiment of a male part of the fastener according to the invention, indicated generally by the reference numeral 300, where like parts have been given the same reference numeral as before. The male

part 300 differs from the male part 200 in that the substantially planar body 301 is slightly greater in lateral width than the planar body of the embodiment shown in Figures 3, 4 and 7. Furthermore, instead of having a first piece 207 made from a tricot fabric, the first piece 207 in this instance is constructed from a microfiber fabric. In addition to the foregoing, the upper component 213 of the first piece 207 is separate to the lower component 217 of the first piece 207 and the upper and lower components 213, 217 extend further from the end of the substantially planar body 201 thereby forming a flap 303 that may be used for connection of the male part to a garment 211.

[0052] Referring now to Figure 9, there is shown an enlarged, side cross-sectional view of a female part of the fastener according to the invention, indicated generally by the reference numeral 100. As outlined above in relation to Figures 1 and 2, the female part 100 of the fastener comprises a substantially planar frame 101 mounted directly onto the face of a fabric strip 103 and there is further provided an overlay 105 mounted onto the top of the frame 101 and onto the face of the fabric strip 103, sandwiching the frame 101 between the overlay 105 and the fabric strip 103. In the embodiment shown, there are three frames mounted in a row. This is not intended to be limiting and more or less frames may be provided depending on the degree of adjustability required.

[0053] Each of the frames 101 further comprises a cavity 119 for reception of a foot of a male part. The cavity 119 is partially roofed in by roof 121 and there is defined an open mouth 107 for permitting access to the cavity 119. A circumferential collar 123 is provided which surrounds the open mouth 107 and protrudes upwardly therefrom. This collar protects the fabric overlay placed over the frame and the fabric strip. The circumferential collar 123 protrudes upwardly further towards the inner end 125 of the female part than it does towards the outer end 127 of the female part. This enlarged portion of the collar adjacent the inner end of the female part acts as a backstop 129 for the male part when the male part 200, 300 is being joined together with the female part 100. The cavity wall 131 positioned closer to the outer end 127 of the female part is angled from top to bottom towards the outer end 127. This will facilitate engagement of the male and female parts once the male and female parts come under tension.

[0054] It can be seen that the frame comprises a downwardly depending flange 133 on the side of the cavity adjacent the outermost end of the female part and the frame 101 comprises a second downwardly depending flange 135 positioned on the side of the cavity adjacent the innermost end of the frame 101. The flange 133 provides additional structural rigidity to the frame 101 and the flange 135 is dimensioned to protrude downwardly from the frame by the same distance as the other flange so that the frame 101 may be kept level with respect to the fabric strip 103. It can be seen that the fabric strip

103 provides a backing for the frame 101 and the bottom of the cavity 119 is closed off by the fabric strip.

[0055] Referring to Figure 10, there is shown a fastener, indicated generally by the reference numeral 400. The view is similar to that shown in Figure 9 but with a male member 200 about to be inserted into the frame 101 of the female member 100. It can be seen that the male member is inclined at an angle to the horizontal so that it can be inserted into the cavity 119 through the open mouth 107 of the cavity. The toe portion 225 is inserted first into the open mouth and when the bridge 229 of the foot portion engages with the roof 121 of the cavity, the foot will be pivoted in a clockwise direction using the roof 121 as a fulcrum. The heel 223 will abut against the collar and the collar and/or the heel will be sufficiently resiliently deformable to allow the heel snap in place beyond the collar so that the foot is lying substantially horizontal in the cavity. In other words, the male and female parts will be substantially in line with each other rather than being in the inclined position. Once in position, the fastener will resist inadvertent release as the foot will be engaged in the cavity and the foot (and in particular the heel portion 223 and bridge portion 229) together with the cavity wall 131, the collar 123 and the roof 121 will act to hold the foot in the cavity and the male part 200 and female part 100 together. Furthermore, the fabric strip 103 will also act to prevent inadvertent dislodgement of the male part from the female part as it will act against a pivoting motion of the male part from a parallel configuration to an inclined configuration. It will also act to press the bridge portion 229 of the male part against the roof 121 which helps to maintain the parts together.

[0056] It will be understood that various modifications could be made to the fastener according to the invention without departing from the spirit of the invention. For example, in the examples shown, there are shown three positions (i.e. frames 101) in the female member 100 for reception of the male part of the fastener. More or less frames 101 could be provided to provide a more or less adjustable fastener. It is envisaged however that the fastener as shown provides a degree of adjustability and is considered to be an adjustable fastener. It is further envisaged that the fastener could be used for shoulder straps and is not limited to a back or front fastener for a brassiere, for example. The fastener is preferably made out of plastic material. If desired, an additional layer of padding material could be provided for comfort. Although this will increase the depth of the fastener, for example the padding layer may be of the order of 0.0005m thick or more leading to a fastener that could be of the order of 0.005m thick or more, the padding may provide a more comfortable fastener for the wearer thereby improving the desirability of the fastener. An "ultra-slim" fastener will be understood to be a fastener having a thickness of the order of 0.005m (5mm) or less. In the drawings, some of the dimensions (in millimeters) of the embodiments of fastener are shown however these are not necessarily deemed limiting and other dimensions of fastener could

be provided to good effect.

[0057] In order to manufacture a fastener according to the invention, the method comprises the steps of cutting out an aperture in an overlay sheet before bonding the overlay sheet to a fabric strip along at least one edge of both the overlay sheet and the fabric strip. The frame of the female part is then placed on the overlay sheet with the open mouth of the frame in alignment with the aperture in the overlay sheet. The frame of the female part is bonded to the overlay sheet. Once bonded, the fabric strip is drawn over the other side of the frame of the female part so that the bond line along the bonded edge of both the overlay sheet and the fabric strip is sandwiched between the overlay sheet and the fabric strip. Finally, the fabric strip is bonded to the other side of the frame the overlay sheet is bonded to the fabric strip along any remaining un-bonded edges. It is envisaged that in one implementation, the initial step of bonding the overlay sheet to the fabric strip along at least one edge of both the overlay sheet and the fabric strip will entail bonding the overlay sheet to the fabric strip along three edges of the overlay sheet and the fabric strip thereby forming a pouch. Thereafter, the step of drawing the fabric strip over the other side of the frame of the female part so that the bond line along the bonded edge is sandwiched between the overlay sheet and the fabric strip comprises turning the pouch inside out, thereby drawing the frame inside the pouch. This is seen as a particularly useful method of manufacturing the female part of the fastener. The male part is constructed by bonding the fabric to the substantially planar body. In all cases, ultrasonic welding is seen as a useful choice for bonding the components together.

[0058] In the specification the terms "comprise, comprises, comprised and comprising" and the terms "include, includes, included and including" are all deemed totally interchangeable and should be afforded the widest possible interpretation.

[0059] The invention is in no way limited to the embodiments hereinbefore described but may be varied in both construction and detail within the scope of the claims.

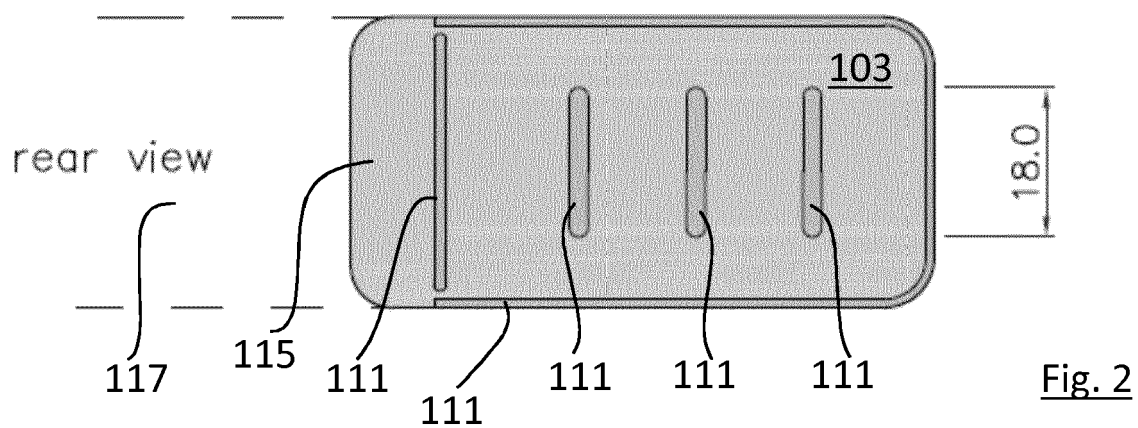
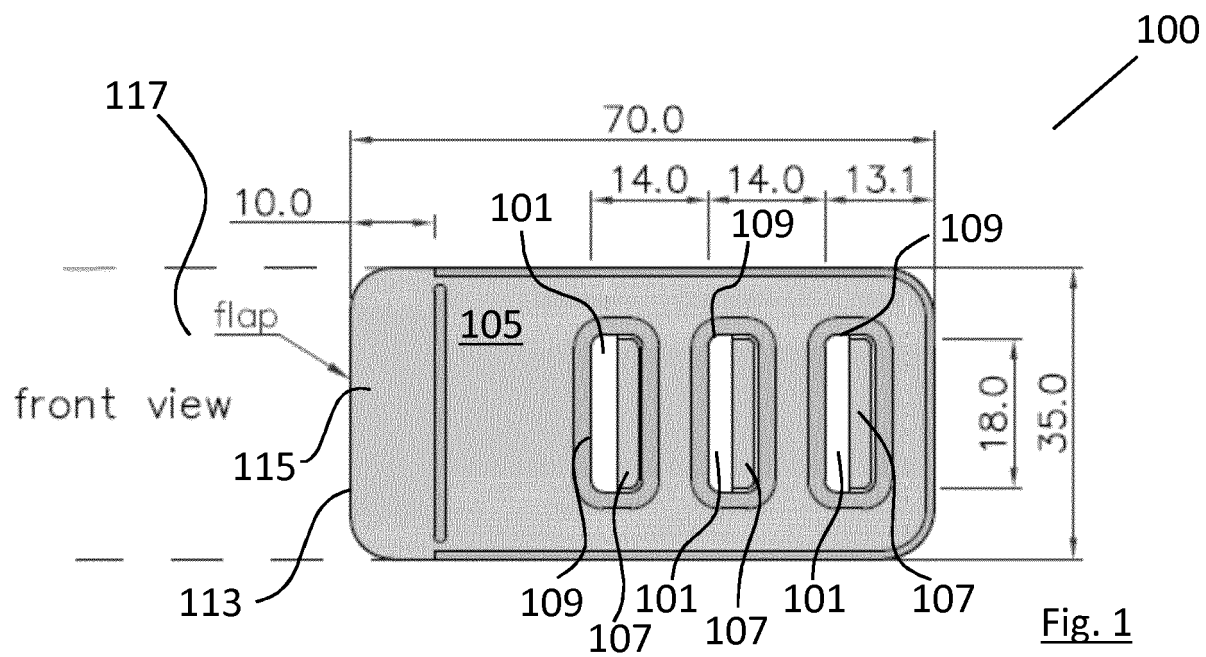
Claims

1. An ultra-slim fastener (400) for securing two pieces together, the fastener comprising a male part (200, 300) mounted on the first piece and a female part (100) mounted on the second piece; **characterised in that:**

the male part (200, 300) is of the type comprising a substantially planar body (201) having at its outermost end (203) a downwardly depending leg (221) terminating in an outwardly projecting foot (205) extending substantially parallel to the plane of the body;
the female part (100) is of the type comprising

- a substantially planar frame (101) defining a cavity (119) for reception and retention of the foot (205), the cavity being partially roofed in towards the innermost end of the frame thereby defining an open mouth (107) towards the outermost end of the frame;
the foot (205), cavity (119) and the open mouth (107) being dimensioned so that insertion of the foot into the cavity must be realized by inclining the body of the male part relative to the frame of the female part before bringing the male part and the female part together, retention of the foot in the cavity is realized by pivoting the inserted male part from the inclined orientation to a co-planar orientation with respect to the female frame using the roof of the cavity as a fulcrum, and release of the foot from the cavity is realized by pivoting the inserted male part from the co-planar orientation back to the inclined orientation using the roof of the cavity as a fulcrum before moving the male part and the female part apart;
and in which the second piece comprises a fabric strip (103) and the frame (101) of the female part is mounted directly onto the face of the fabric strip so that the fabric strip forms a backing for the frame and the bottom of the cavity (119) is closed off by the fabric strip (103); and
the second piece further comprises an overlay (105) mounted onto the top of the frame (101) and onto the face of the fabric strip (103), sandwiching the frame between the overlay and the fabric strip, the overlay (105) having an aperture (109) corresponding with the frame's open mouth.
2. An ultra-slim fastener (400) as claimed in claim 1 in which the frame (101) of the female part (100) is ultrasonic welded to the second piece.
 3. An ultra-slim fastener (400) as claimed in claim 1 or 2 in which the open mouth (107) comprises an upstanding collar (123) surrounding the open mouth.
 4. An ultra-slim fastener (400) as claimed in claim 3 in which part of the upstanding collar (123) on the side of the open mouth (107) adjacent the innermost end (125) of the frame extends further upwardly from the frame than the remainder of the upstanding collar.
 5. An ultra-slim fastener (400) as claimed in any preceding claim in which the frame (101) comprises a first downwardly depending flange (133) on the side of the cavity adjacent the outermost end of the frame and a second downwardly depending flange (135), the second downwardly depending flange being positioned on the side of the cavity adjacent the innermost end of the frame and being dimensioned to protrude downwardly from the frame by the same distance as the first downwardly depending flange.
 6. An ultra-slim fastener (400) as claimed in any preceding claim in which the side wall (131) of the cavity adjacent the outermost end (127) of the frame slopes towards the outermost end from top to bottom.
 7. An ultra-slim fastener (400) as claimed in any preceding claim in which the foot (205) has a heel portion (223) that slopes away from the outermost end from top to bottom.
 8. An ultra-slim fastener (400) as claimed in any preceding claim in which the substantially planar body has adjacent to its outermost end an upwardly extending flange (227).
 9. An ultra-slim fastener (400) as claimed in any preceding claim in which the depth of the male part (200, 300) from the uppermost point on the male part to the sole of the foot is no more than 0.0027m deep; the depth of the female part (100) from the uppermost point on the frame (101) to the lowermost point of the second piece connected to the frame is no more than 0.0034m deep; and the depth of the fastener (400) from the uppermost point on the male part (200, 300) to the lowermost point of the second piece connected to the female part's frame when the male and female parts are engaged is no more than 0.0035m deep.
 10. A method of manufacturing an ultra-slim fastener (400) according to claims 1 to 9, the method comprising the steps of:
 - cutting out an aperture (109) in an overlay sheet (105);
 - bonding the overlay sheet (105) to a fabric strip (103) along at least one edge of both the overlay sheet and the fabric strip;
 - placing a frame (101) of a female part (100) on the overlay sheet (105) with the open mouth (107) of the frame (101) in alignment with the aperture (109) in the overlay sheet;
 - bonding the frame (101) of the female part (100) to the overlay sheet (105);
 - drawing the fabric strip (103) over the other side of the frame (101) of the female part (100) so that the bond line (111) along the bonded edge of both the overlay sheet (105) and the fabric strip (103) is sandwiched between the overlay sheet and the fabric strip; and
 - bonding the fabric strip (103) to the other side of the frame (101) and bonding the overlay sheet (105) to the fabric strip (103) along any remaining un-bonded edges.

11. A method of manufacturing an ultra-slim fastener (400) as claimed in claim 10 in which the initial step of bonding the overlay sheet (105) to the fabric strip (103) along at least one edge of both the overlay sheet and the fabric strip comprises bonding the overlay sheet to the fabric strip along three edges of the overlay sheet and the fabric strip thereby forming a pouch, and in which the step of drawing the fabric strip over the other side of the frame of the female part so that the bond line along the bonded edge is sandwiched between the overlay sheet and the fabric strip comprises turning the pouch inside out, thereby drawing the frame inside the pouch. 5 10
12. A method of manufacturing an ultra-slim fastener (400) as claimed in claims 10 or 11 in which the overlay sheet (105) is bonded to the fabric strip (103) along one edge but spaced apart from the edge, thereby forming a flap (303). 15 20
13. A method of manufacturing an ultra-slim fastener (400) as claimed in claims 10 to 12 in which the method comprises the subsequent steps of:
- allowing the overlay sheet (105) and the fabric strip (103) to cool; and 25
- trimming the overlay sheet and the fabric strip once they have cooled.
14. A method of manufacturing an ultra-slim fastener (400) as claimed in claims 10 to 13 in which the steps of bonding the frame (101), the overlay sheet (105) and the fabric strip (103) comprise ultrasonic bonding the frame, the overlay strip and the fabric sheet. 30 35
15. A method of manufacturing an ultra-slim fastener (400) as claimed in claims 10 to 14 comprising the steps of: folding a first piece (207) back on itself intermediate its ends; bonding one end of the first piece to one side of a body (201) of a male part (200, 300); and bonding the other end of the first piece to the other side of the body (201) of the male part. 40 45 50 55



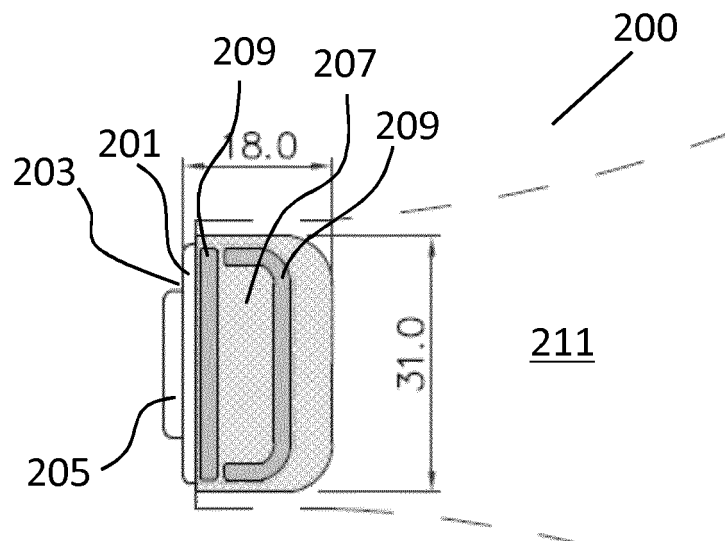


Fig. 3

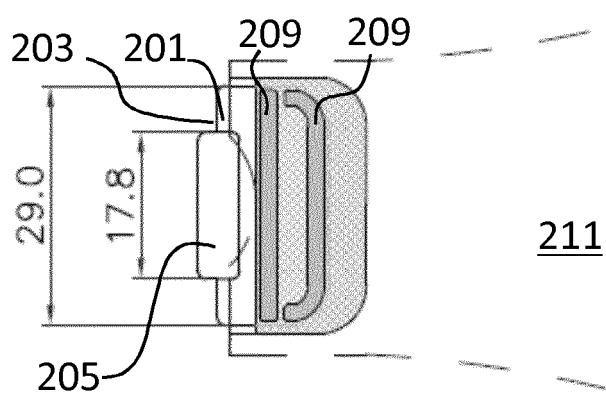


Fig. 4

male tricot version

200

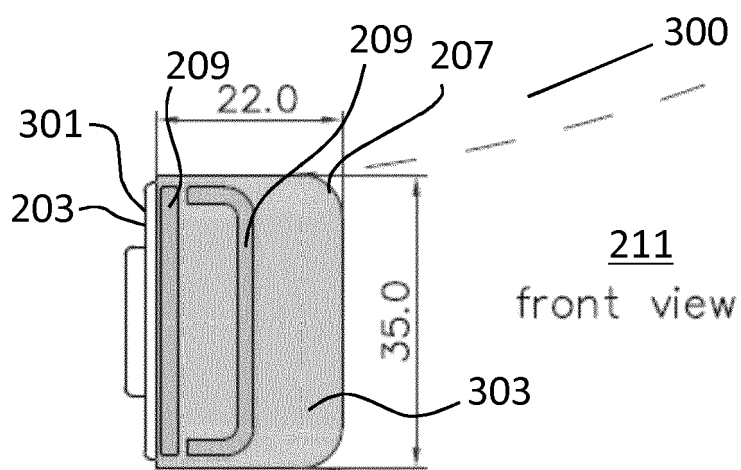


Fig. 5

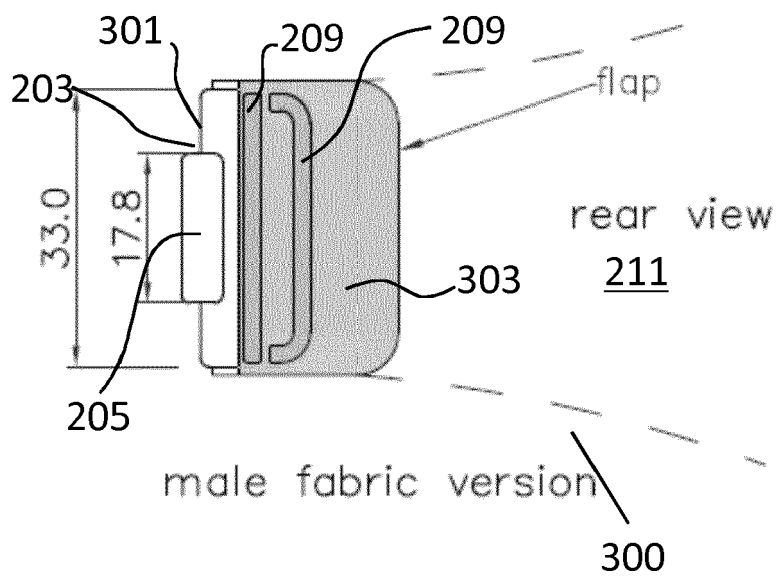
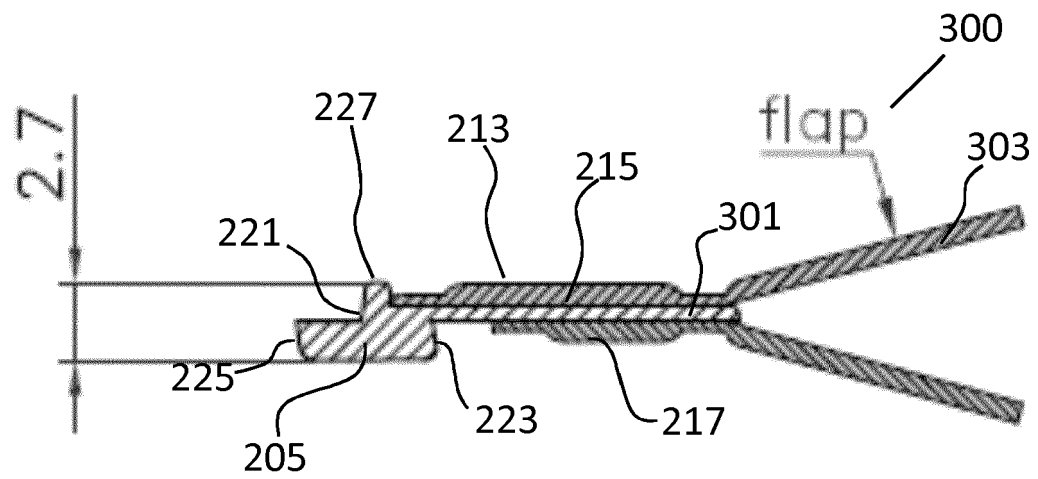
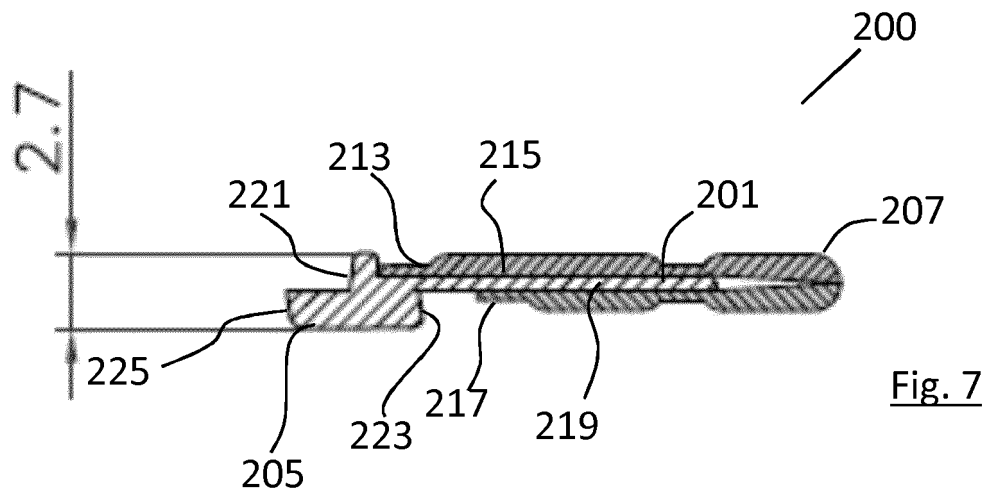
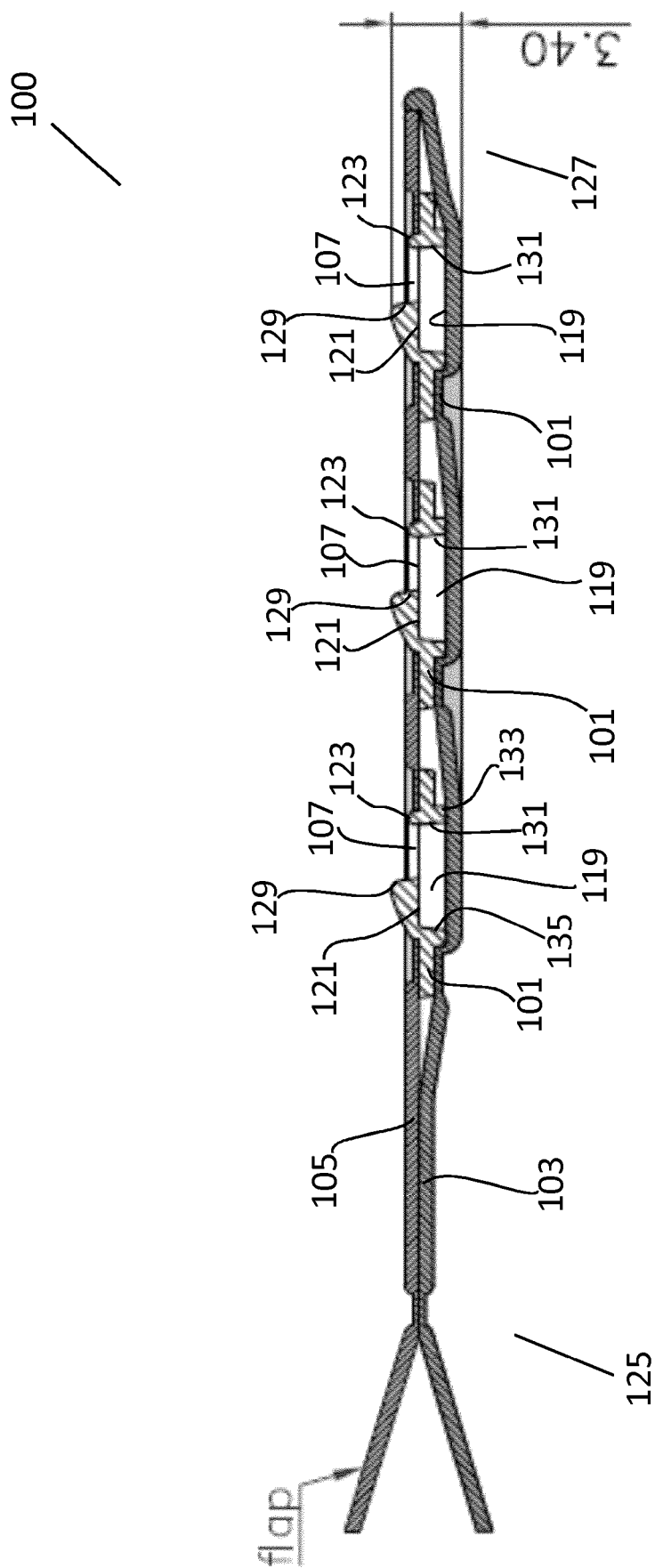


Fig. 6



Fig. 9

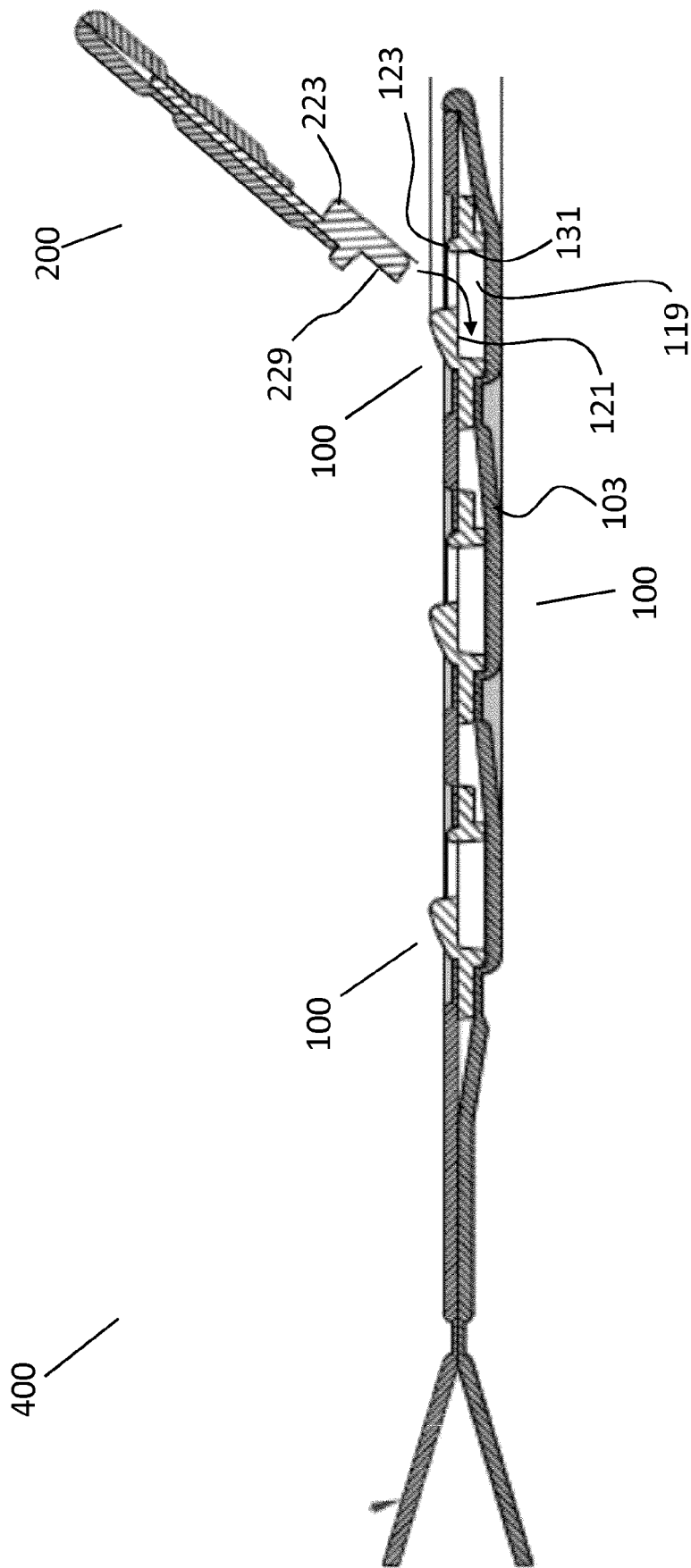


Fig. 10



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