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(58) Field of Search:
INT CL **A41C, A41D, A41H, B32B**
Other: **EPODOC WPI**

(54) Title of the Invention: **Textile element**
Abstract Title: **Garments comprising structural support components**

(57) A garment comprises a fabric and a structural support component comprising a thermoplastic coating 14 extending along the surface of the fabric. The coating may be located on the exterior of the garment or may be located within the garment, preferably encased between two fabric surfaces of the garment. The coating may be a polyamide or a polyester. The garment may be a brassiere 32, a dress or a bustier. Also disclosed is a method of forming a garment comprising a fabric and a structural support component, the method comprising the step of applying a thermoplastic coating to a surface of the fabric and allowing the coating to cool. Further disclosed is use of a thermoplastic coating to form a structural support component in a garment and a textile element (10, figure 1a) for securing to a garment to form a structural support component, the textile element comprising a fabric strip (12) having a thermoplastic coating (14) extending lengthwise along a surface (16).

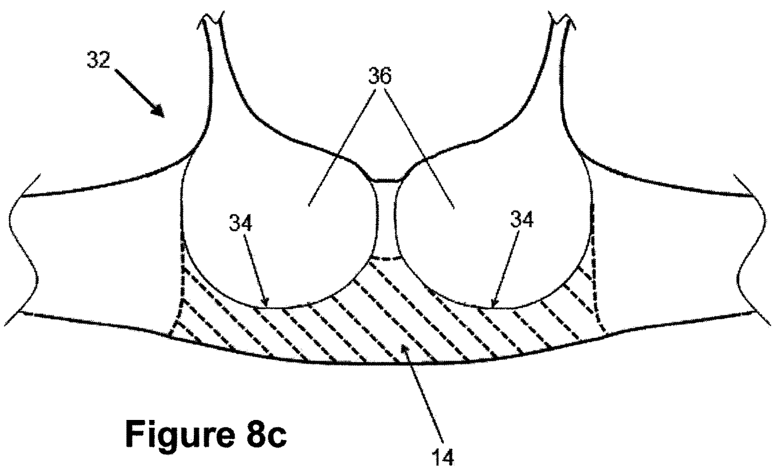

Figure 8c

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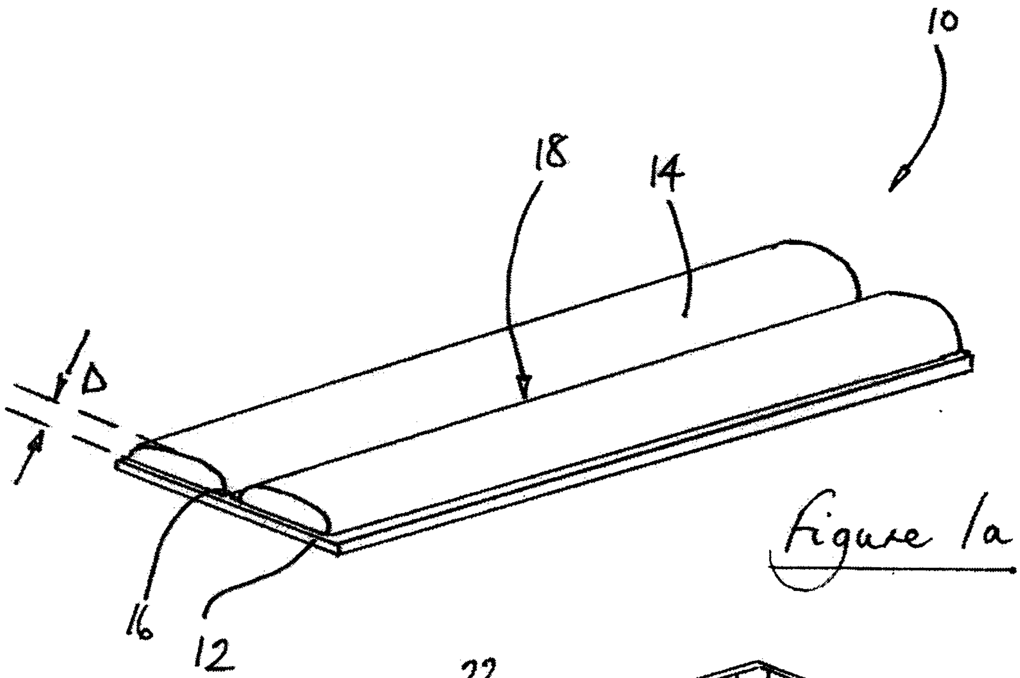

Figure 1a

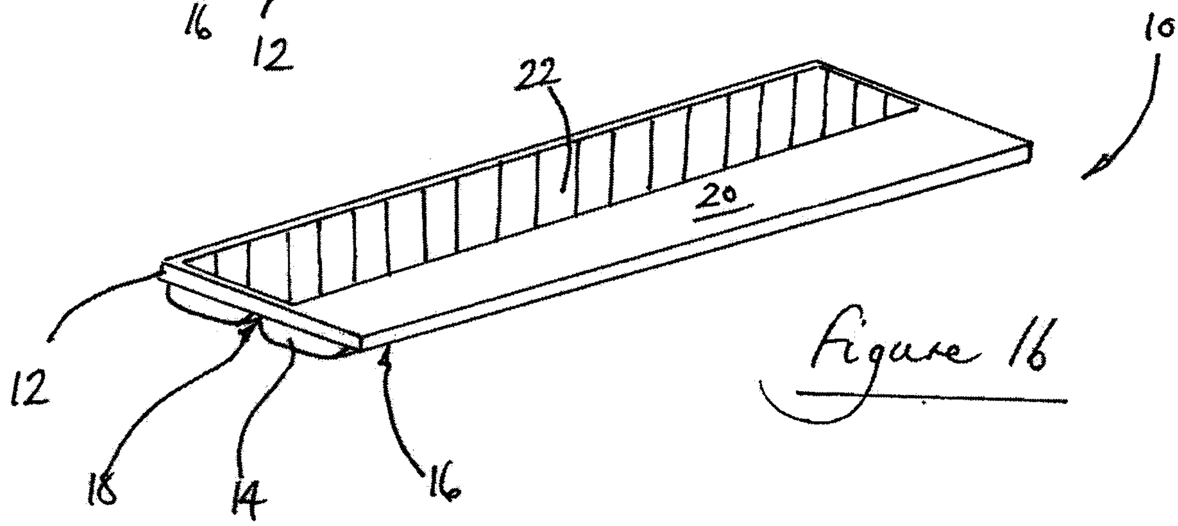

Figure 1b

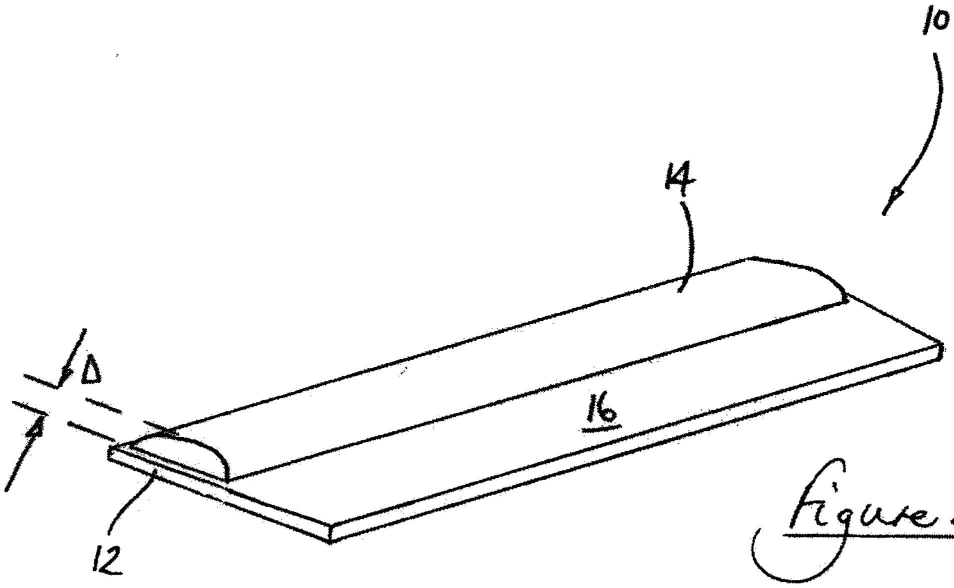

Figure 2a

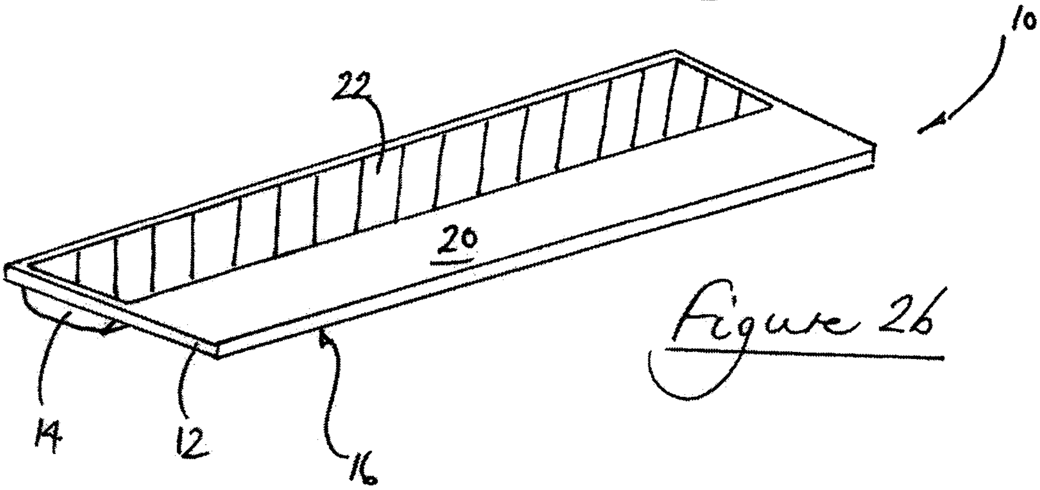

Figure 2b

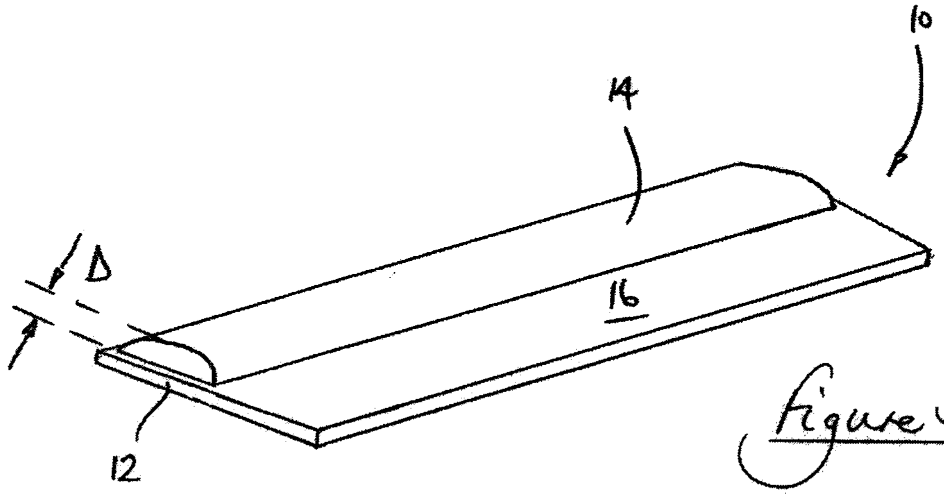

Figure 3a

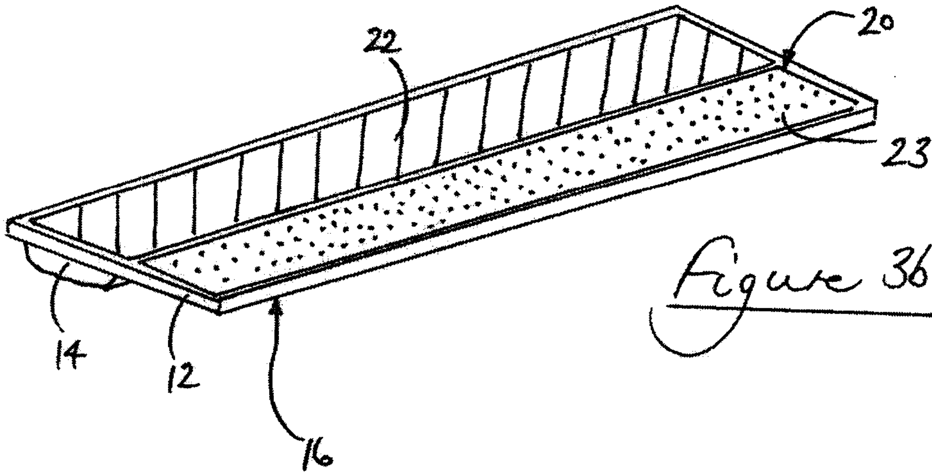

Figure 3b

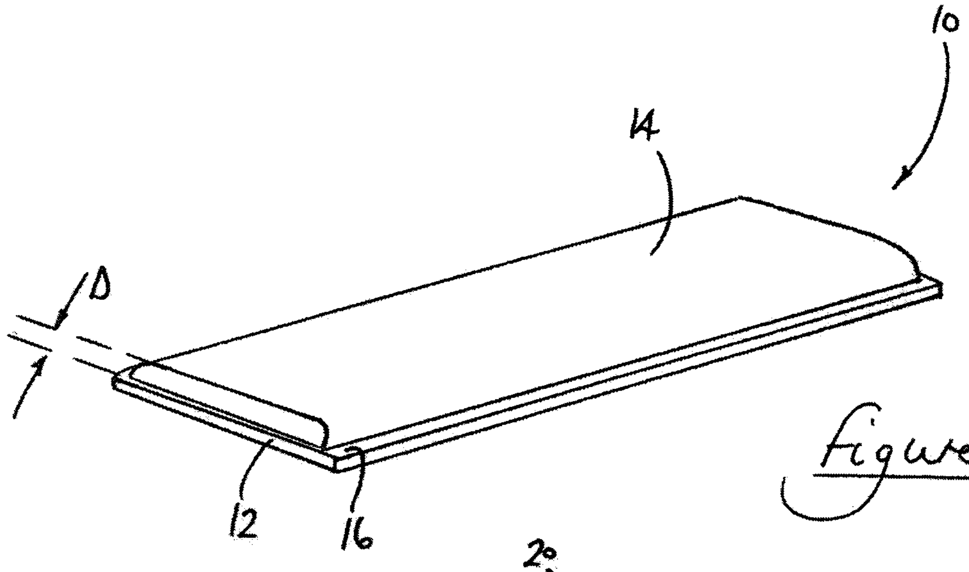

figure 4a

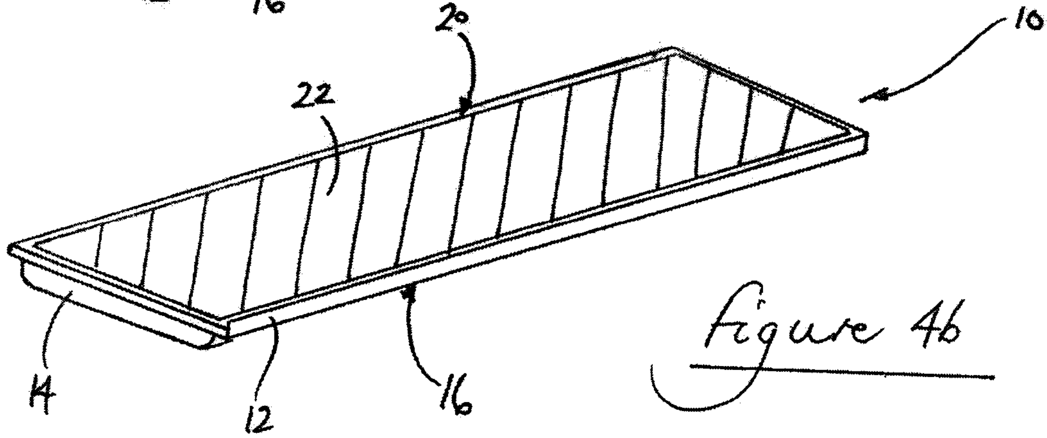

figure 4b

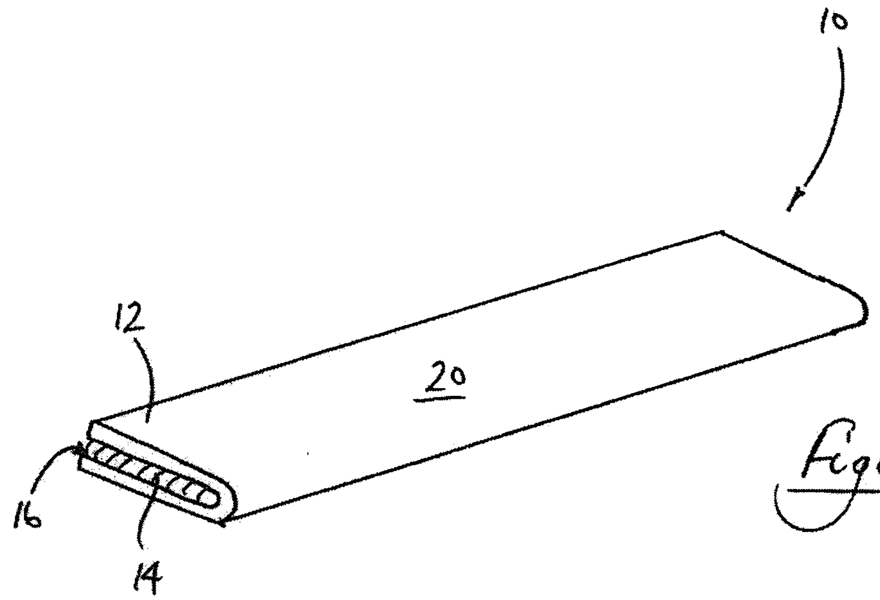

Figure 5

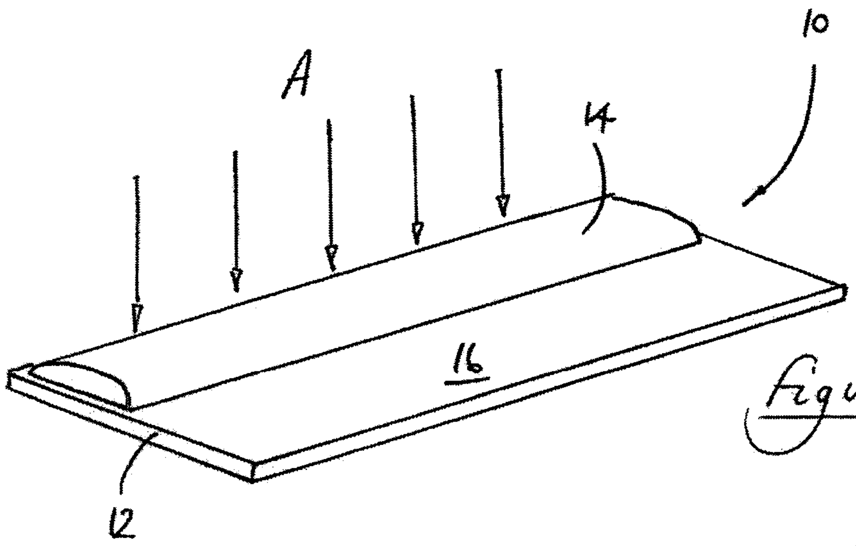

Figure 6a

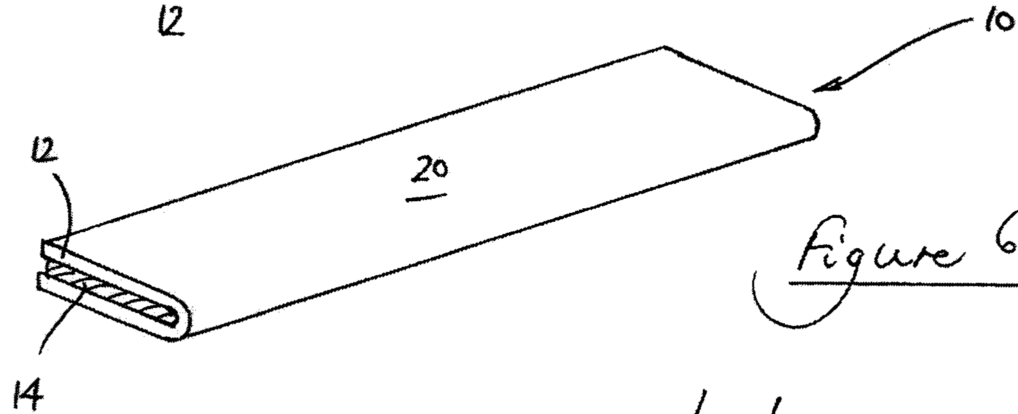

Figure 6b

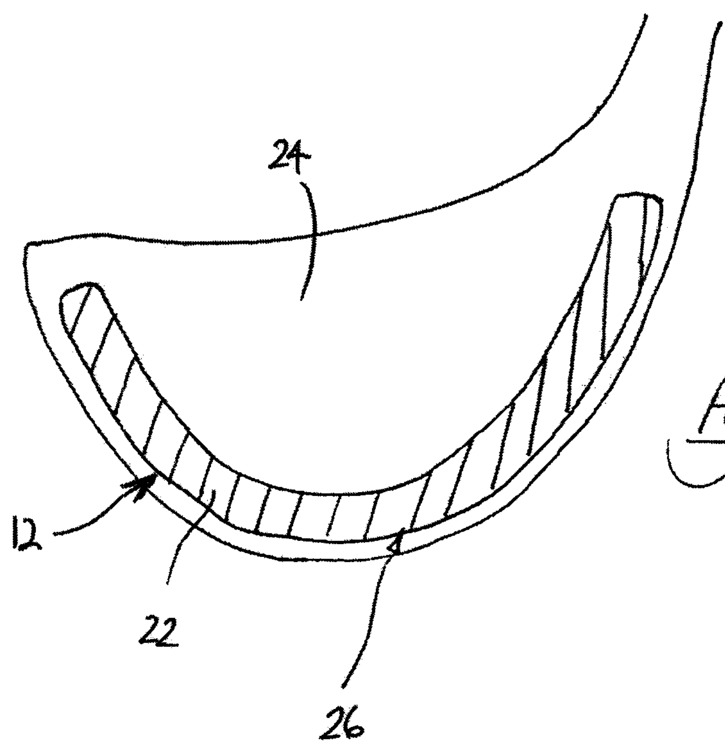

Figure 6c

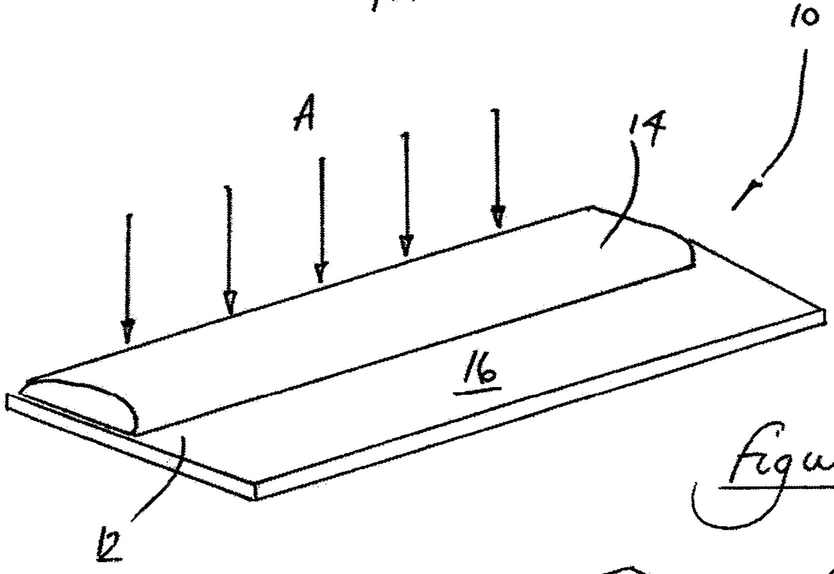

Figure 7a

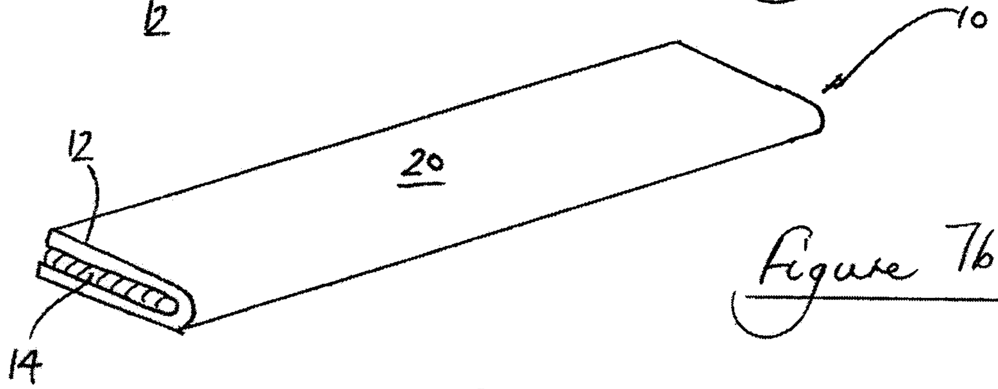

Figure 7b

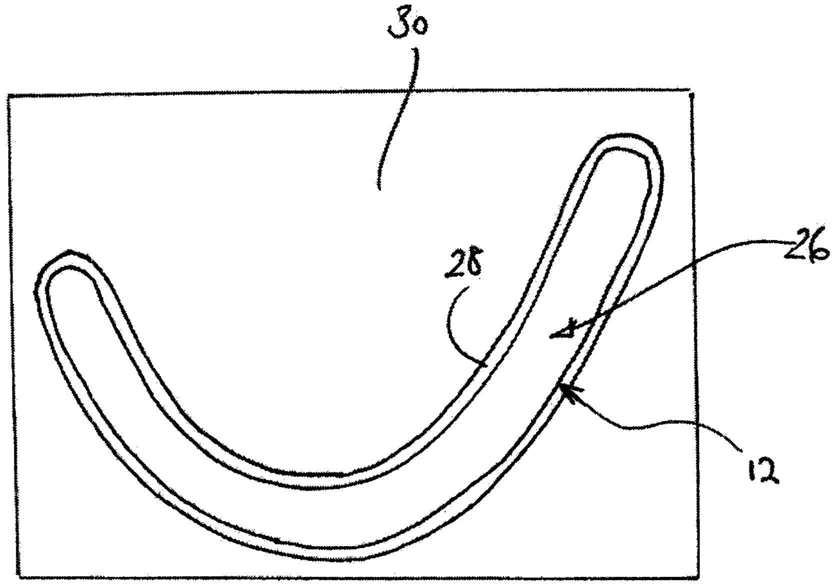

Figure 7c

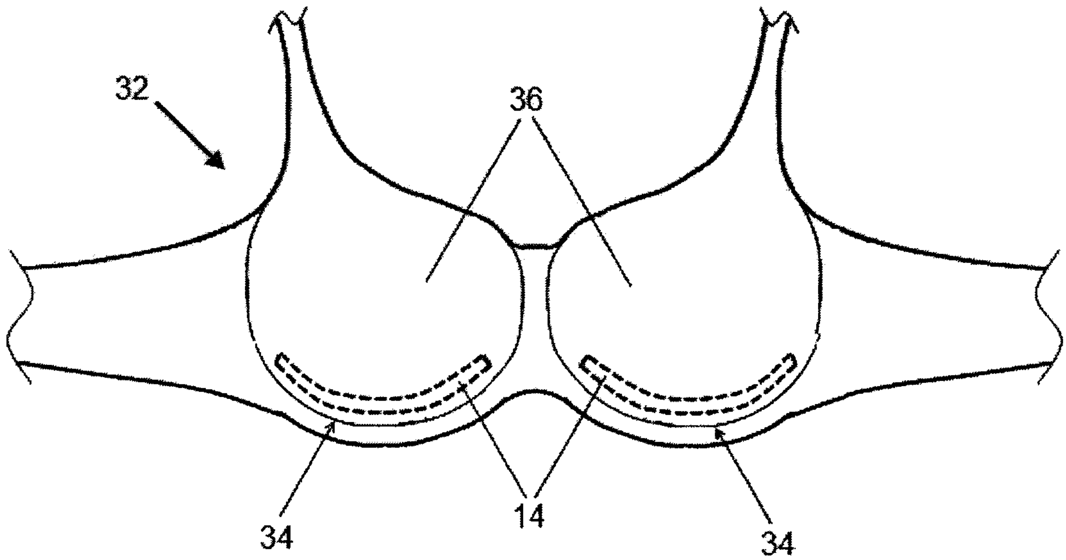

Figure 8a

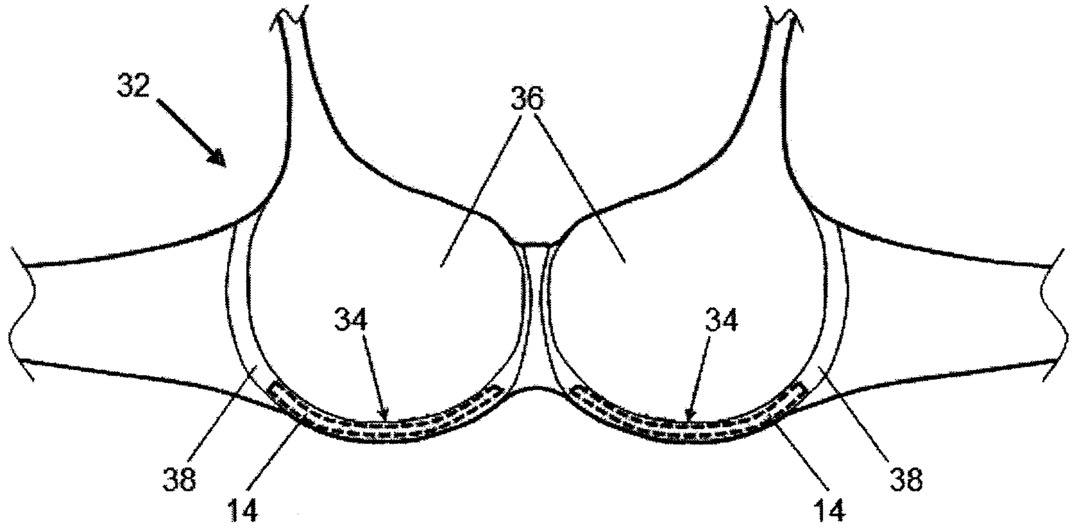

Figure 8b

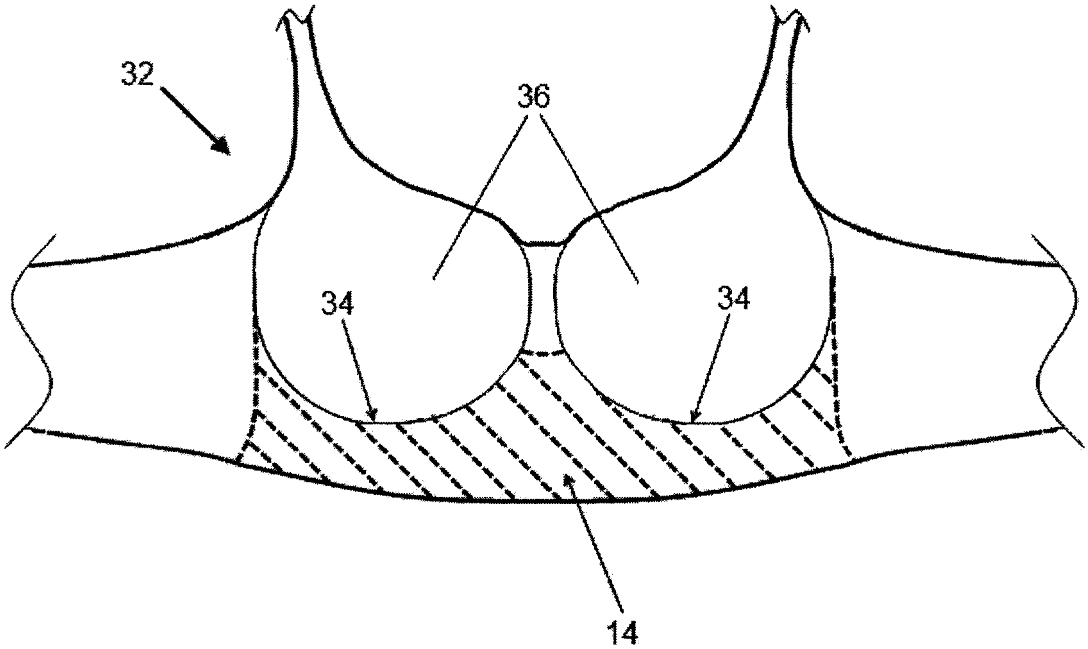

Figure 8c

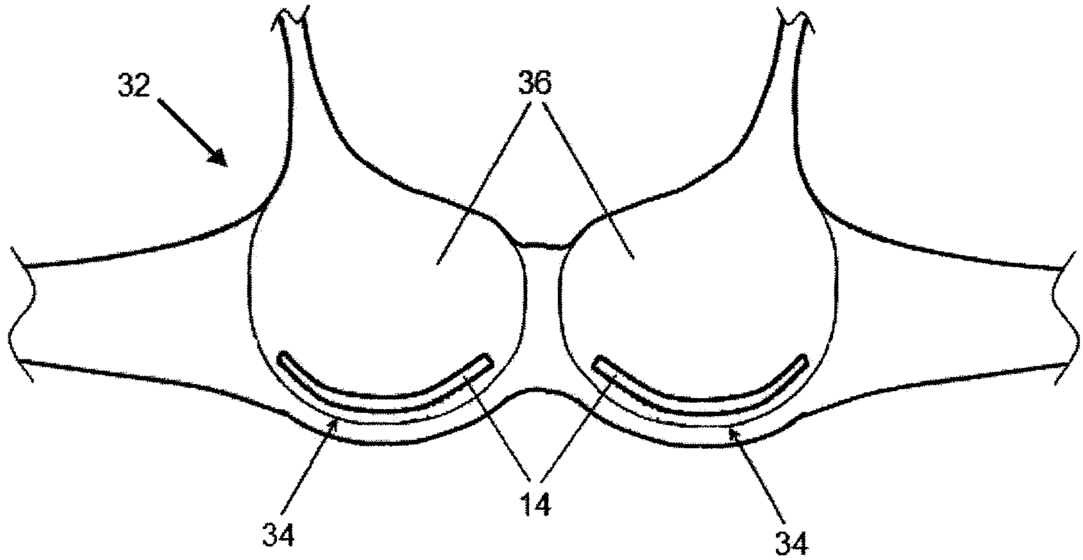

Figure 9a

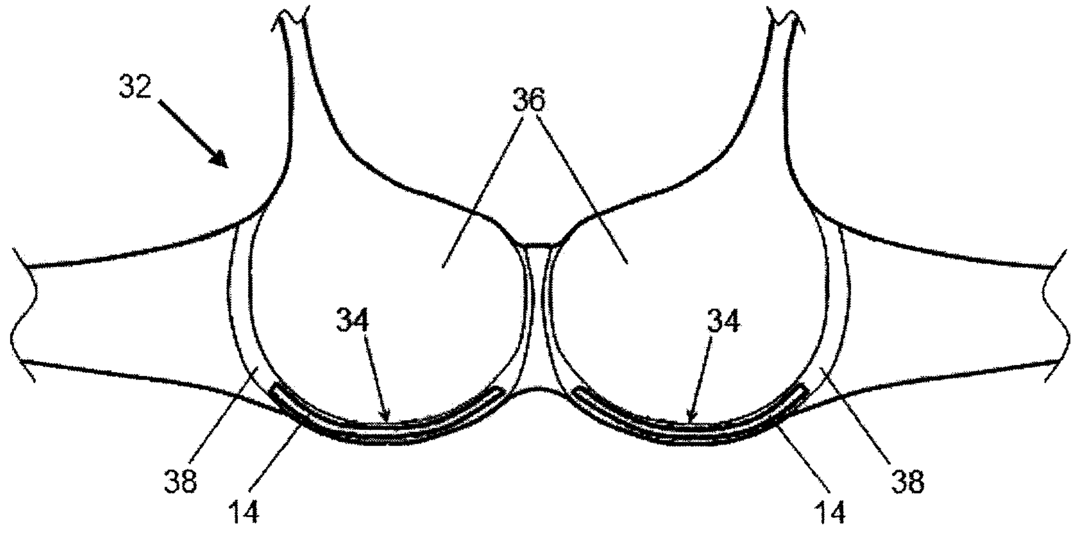

Figure 9b

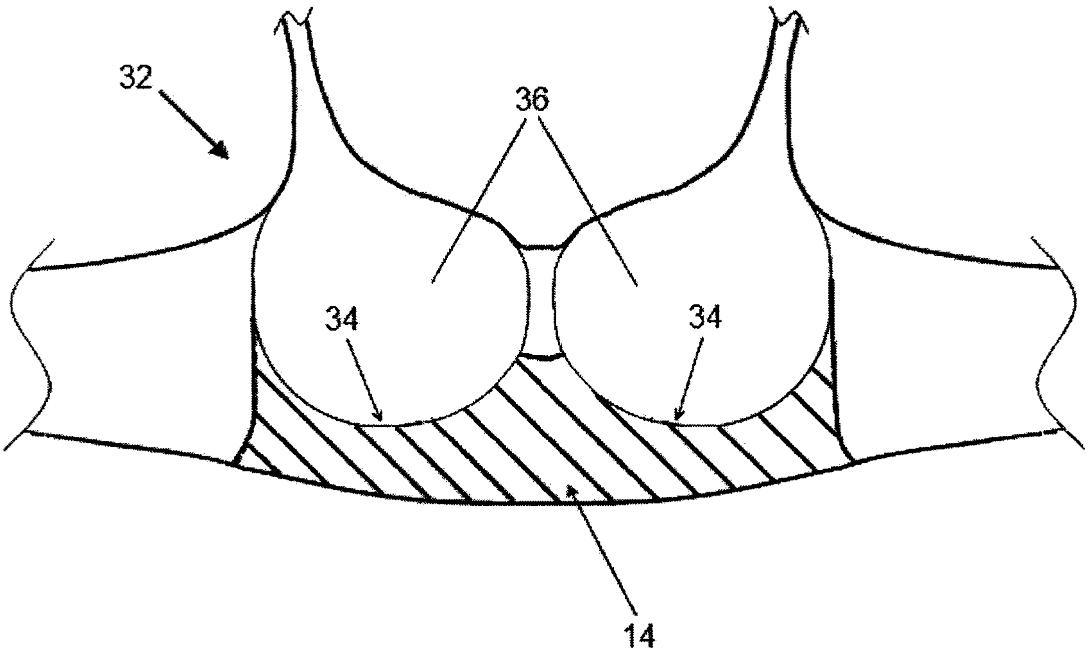

Figure 9c

TEXTILE ELEMENT

The invention relates to a textile element for securing to a garment to form a structural support component. The invention also relates to a method of adding a structural support component to a garment and a method of forming a structural support component. The invention further relates to a garment comprising a structural support component, wherein the garment comprises a fabric, and the structural support component comprises a thermoplastic coating extending along a surface of the fabric of the garment.

According to an aspect of the invention there is provided a textile element for securing to a garment to form a structural support component, the textile element comprising a fabric strip having a thermoplastic coating extending length wise along a surface of the fabric strip.

The provision of a thermoplastic coating allows the fabric strip to be moulded into the shape required to form a structural support component once the fabric strip is heated to melt the thermoplastic coating, the fabric strip retaining the required shape once the thermoplastic is allowed to cool and rigidify. This in turn allows the creation of tailor-made structural support components adopting two- or three-dimensional shapes once moulded.

The textile element is particularly suited for use in the manufacture of brassieres in order to provide the required support for a wearer's breasts and thereby replace the under-wire conventionally used in such garments.

Use of the textile element according to the invention allows the creation of a tailor-made support component for each brassiere. It also allows the resultant structural support component to be secured directly to the fabric and obviates the risk otherwise associated with under-wires that are often made from steel and are prone to protrude from one or both ends of a bra wire pocket and cause wearer discomfort.

The protrusion of a conventional under-wire from one or both ends of a bra wire pocket is exacerbated by movement of the under-wire in the pocket. This movement is required to improve wearer comfort as a result of the generally fixed two-dimensional shape of conventional under-wires. The use of a thermoplastic coating avoids the need for any such movement in garments, such as brassieres, incorporating a structural support component formed using the textile element according to the invention. This is because the thermoplastic coating allows the fabric strip to be moulded into any desired shape and allows the creation of a three-dimensionally shaped support component that may be fixed directly to a garment and does not require the provision of a pocket having closed ends to allow movement of the support component relative to the garment.

The use of a thermoplastic coating also results in the creation of a structural support component that exhibits strength that is comparable to that of a conventional under-wire but which is more flexible and thus provides greater wearer comfort.

It will be appreciated that the amount of support and rigidity provided by a structural support component formed using the textile element according to the invention is dependent on the amount of thermoplastic coating applied to the fabric strip.

In embodiments of the invention the amount of thermoplastic coating applied to the fabric strip may be reduced by providing a thermoplastic coating that extends across half the width of the fabric strip.

In other embodiments the amount of thermoplastic coating applied to the fabric strip may be increased by providing a thermoplastic coating that extends width wise across the fabric strip.

In such embodiments, whether the thermoplastic coating extends across the entire width of the width of the fabric strip or across half the width of the fabric strip, the fabric strip may be folded following heating of the thermoplastic coating and prior to securing to a garment so as to encase the thermoplastic material.

To assist folding of the fabric strip, in embodiments where the thermoplastic coating extends width wise of the fabric strip, the thermoplastic coating may include a centrally located opening extending length wise through the coating. The opening provides an effective fold-line, allowing the creation of a textile only edge along the fold-line following cooling of the thermoplastic coating. Not only does the opening facilitate folding, but the creation of a textile only edge along the fold-line helps to improve wearer comfort.

In other embodiments the folded strip may be folded in half length wise along the fabric strip, about the thermoplastic coating, such that the thermoplastic coating is encased between the folded halves of the fabric strip.

This arrangement reduces the risk of contaminants becoming adhered to the thermoplastic coating when the thermoplastic coating is melted and also reduces the risk of injury to a user that might otherwise occur if the molten thermoplastic coating is brought into direct contact with the user's skin. Such users include a person involved in manufacture of the textile element and/or securing the textile element to a garment.

The comfort of the resultant structural support component may be further improved in embodiments of the invention by flocking the fabric strip on an opposite surface to the thermoplastic coating, the flocking extending length wise of the opposite surface.

In such embodiments the opposite surface may be flocked width wise across the fabric strip. Such an arrangement allows the textile element to be secured to a garment with the thermoplastic coating in face to face contact with the garment fabric and thus presenting the opposite, flocked surface to a wearer's skin when the garment is worn.

In other such embodiments where the fabric strip is intended to be folded before being secured to a garment, such that only half of the opposite surface will be presented to a wearer's skin when the garment is worn, the opposite surface may be flocked across half the width of the fabric strip only.

In order to facilitate attachment of the fabric strip to a garment, the textile element may further include an adhesive coating on an opposite surface of the fabric strip to the thermoplastic coating, the adhesive coating extending length wise of the opposite surface.

In such embodiments, the adhesive coating may extend width wise across the fabric strip.

In other such embodiments where the fabric strip is intended to be folded before being secured to a garment, the adhesive coating may extend across half the width of the fabric strip.

It will be appreciated that both of the adhesive coating and the flocking may extend width wise across the fabric strip in a manner that creates a zero, partial or full overlap between the adhesive coating and the flocking on the opposite surface of the fabric strip to the thermoplastic coating.

The adhesive coating may be any adhesive suitable for adhering two layers of fabric together and may, for example, include a hot-melt polyurethane adhesive or a hot-melt polyamide adhesive or a silicone adhesive. Any such adhesive may be applied in the form of a powder coating or applied by means of extrusion onto the fabric strip.

So as to prevent re-melting of the thermoplastic coating following heating and moulding to create a structural support component, the thermoplastic coating may be formed from a thermoplastic material that melts at temperatures greater than 100°C or approximately 100°C, and preferably at temperatures greater than 150°C or approximately 150°C. In other words, the melting temperature of the thermoplastic coating may be greater than 100°C or approximately 100°C, and preferably greater than 150°C or approximately 150°C.

In embodiments of the invention, the thermoplastic coating on the fabric strip has a thickness in the range of 0.1mm – 3.0mm or approximately 0.1 mm to approximately 3.0 mm, and preferably a thickness in the range of 0.5mm – 3.0mm or approximately 0.5 mm to approximately 3.0 mm, so as to provide the required strength and rigidity following heating and moulding to create a structural support component, and preferably has a thickness of 1.5mm or approximately 1.5 mm. Optionally the thermoplastic coating on the fabric strip may have a thickness in the range of:

0.8 mm to 2.7 mm or approximately 0.8 mm to approximately 2.7 mm;
1.0 mm to 2.5 mm or approximately 1.0 mm to approximately 2.5 mm;
1.0 mm to 2.0 mm or approximately 1.0 mm to approximately 2.0 mm; or
1.25 mm to 1.75 mm or approximately 1.25 mm to approximately 1.75 mm.

It will be appreciated that, on the basis of the description set out above, the thermoplastic coating used in the present invention may include any type of plastic material that can be applied in a melted form as a coating to a surface, and subsequently cooled so that it rigidifies. Thus, thermoplastic coatings suitable for use in the present invention include a coating made from a plastic material which can be remelted after it has rigidified, and a coating made from a plastic material that cannot be remelted after it has rigidified.

In a particularly preferred embodiment, the thermoplastic coating is a polyamide.

In other embodiments the thermoplastic coating may be a polyester.

It is envisaged that the fabric strip may be formed from a knitted or woven fabric.

It is not necessary for the fabric strip to exhibit any stretch. This is because following heating of the thermoplastic coating it is possible to shape the fabric strip without any puckering of the fabric strip.

It is also not necessary, unlike in the applicant's Fortitube® product, to include a fusible yarn, such as Grilon™ K-85, in the fabric strip. This is because there is no requirement in the textile element according to the invention to allow for the creation of a penetration barrier.

It will be appreciated that the textile element according to the invention may be used in any garment requiring a structural support component. Whilst particular reference is made above to the use of the textile element to form a structural support component for use in a brassiere, it is envisaged that it could be used in other undergarments to provide support for a wearer's breasts. It is also envisaged that the textile element could be used in other garments such as, for example, dresses or bustiers that often require the inclusion of stiffening members, commonly referred to as bones, to maintain the shape and structure of the garment.

Whilst it is envisaged that a textile element according to any of the embodiments outlined above may be heated to melt the thermoplastic coating and allow the textile element to be moulded into a required shape, it is also envisaged that a textile element according to any of the embodiments outlined above may be secured directly to a garment without melting the thermoplastic coating to mould the shape of the textile element.

A flat and straight textile element may for example be flexed during securing of the textile element to the garment so as to follow the shape of the garment at the location requiring support. The provision of the thermoplastic coating on the fabric strip of the textile element will provide the required support and the resilient nature of the thermoplastic coating, which will cause the textile element to resume its flat configuration and will thus cause flexing of the textile element. It will be appreciated that the garment to which the textile element is attached will resist this flexing movement and will cause the textile element to assume a three-dimensional shape, which in turn will further enhance comfort wearer if the textile element is attached in a direction so as to ensure that the resultant flexure is directed to follow the curve of a wearer's body.

According to a second aspect of the invention there is provided a method of adding a structural support component to a garment comprising the steps of heating a textile element according to the first aspect of the invention so as to melt the thermoplastic coating, moulding the fabric strip into a required shape, securing the moulded fabric strip in position on the garment and allowing the thermoplastic coating to cool.

It will be appreciated that the step of securing the moulded fabric strip in position on the garment prior to the step of allowing the thermoplastic coating to cool allows flexure of the fabric strip to ensure that it matches the shape required by the garment, thereby leading to the creation of a truly tailor-made support component.

It also acts to hold the fabric strip in position during cooling of the thermoplastic coating and thereby ensures that the fabric strip maintains the required shape.

The resultant shape of the structural support component may be further improved by applying pressure to the textile element whilst allowing the thermoplastic coating to cool. This ensures the formation of a flat surface for contact with a wearer's skin when the garment is worn.

In embodiments of the invention the moulded fabric strip may be secured in position on the garment by means of sewing.

In other embodiments of the invention the moulded fabric strip may be secured in position on the garment by means of an adhesive.

The use of stitches or adhesive to secure the moulded fabric strip to the garment prevents detachment of the moulded fabric strip from the garment during cooling of the thermoplastic coating and ensures that the moulded fabric strip retains the required shape.

In such embodiments, whether the moulded fabric strip is secured to the garment by means of sewing or an adhesive, the method may further include the step of folding the fabric strip in half along its length prior to the step of moulding the fabric strip into the required shape. Folding the fabric strip serves to encase the thermoplastic coating and thereby protect the fabric of the garment when the moulded fabric strip is secured to the garment. The molten thermoplastic coating might otherwise damage the fabric of the garment when the moulded fabric strip is secured to the garment, particularly if the garment is made from a delicate fabric.

In other embodiments, where the fabric of the garment is less delicate or the risk of any potential damage to the fabric of the garment is less important, the step of folding the fabric strip may be omitted and the moulded fabric strip may be secured by laying the molten thermoplastic coating in face to face contact with the fabric of the garment.

In such embodiments, the step of sewing the moulded fabric strip to the garment may be dispensed with, the moulded fabric strip being secured to the garment by means of the molten thermoplastic coating adhering to the fabric of the garment and forming a permanent bond there between as the thermoplastic coating cools and rigidifies.

According to a third aspect of the invention there is provided a method of forming a structural support component for attachment to a garment comprising the steps of heating a textile element according to the first aspect of the invention so as to melt the thermoplastic coating, moulding the fabric strip into a required shape and allowing the thermoplastic coating to cool.

This method allows the creation of structural support components of a predetermined shape that may then be secured to a garment at a later stage as opposed to during formation of the structural support component.

Whilst this method means that it is not possible to tailor each structural support component to the specific garment in which it is to be used, it allows a stock of structural support components to be made in advance for later use during the manufacture of garments. This may be of particular benefit for garments made from delicate fabric that might otherwise become damaged by the heat radiating from the molten thermoplastic coating, even when the molten thermoplastic coating is encased within the fabric strip.

As in the second aspect of the invention outlined above, the resultant shape of the structural support component may be further improved by applying pressure to the textile element whilst allowing the thermoplastic coating to cool. This ensures the formation of a flat surface for contact with a wearer's skin when the garment is worn.

In embodiments of the invention, the method may further include the step of folding the fabric strip in half along its length prior to the step of moulding the fabric strip into the required shape. This improves the aesthetic appearance of the resultant structural support component in that the folding step encases the thermoplastic coating within the fabric strip.

It is also envisaged that in embodiments of the invention the method may further include the step of applying an adhesive coating to an opposite surface of the fabric strip to the thermoplastic coating so that the adhesive coating extends length wise of the opposite surface.

In such embodiments the adhesive coating may be applied to extend width wise across the opposite surface of may be applied to extend across half of the width of the opposite surface. Applying the adhesive coating so as to extend across half of the width of the opposite surface might be particularly advantageous in embodiments wherein the fabric strip is folded in half along its length.

It will be appreciated that the adhesive coating may be applied to the opposite surface at any stage during the method of forming a structural support component. It is however preferable that the adhesive coating is applied after cooling of the thermoplastic coating, particularly if a hot-melt adhesive is used to form the adhesive coating.

It will be appreciated that the concept of the invention is more general than the first, second and third aspects described above. In particular, the invention provides a structural support component formed by applying a thermoplastic coating to a surface of a fabric and allowing the thermoplastic coating to cool and rigidify. The resulting composite material (comprising a cooled thermoplastic coating on the surface of a fabric) provides a structural support component that exhibits strength and flexibility, as discussed above in relation to the first, second and third aspects of the invention.

Accordingly, instead of forming a textile element as described in the first, second and third aspects described above, the thermoplastic coating may be applied directly to the surface of a fabric of a garment, either before, during or after the process of manufacturing the garment. The resulting garment may have the thermoplastic coating on an exterior surface (*i.e.* on an outer surface of the garment), or the thermoplastic coating may be within the garment construction, such that it is on an interior surface (*i.e.* on an inner surface of the garment) and is entirely covered by, or encased between, one or more fabric parts of the garment.

The thermoplastic coating may be directly applied to a surface of a fabric in a desired shape or pattern such that, when it is allowed to cool and rigidify, it forms a structural support component having the desired shape or pattern within the garment. The thermoplastic coating may additionally be moulded into the shape required to form a structural support component by heating the garment (and/or the fabric surface having the thermoplastic coating), the garment (and/or the fabric surface of the garment) retaining the required shape once the thermoplastic coating is allowed to cool and rigidify. These approaches permit the creation of tailor-made structural support components adopting two- or three-dimensional shapes.

The structural support component according to the invention is particularly suited for use in the manufacture of brassieres in order to provide the required support for a wearer's breasts and thereby replace the under-wire conventionally used in such garments. Use of the structural support component according to the invention allows the creation of a tailor-made support component for each brassiere. The resultant structural support component is also secured directly to the fabric of the garment which obviates the risk otherwise associated with under-wires that are often made from steel and are prone to protrude from one or both ends of a bra wire pocket and cause wearer discomfort.

The protrusion of a conventional under-wire from one or both ends of a bra wire pocket is exacerbated by movement of the under-wire in the pocket. This movement is required to improve wearer comfort as a result of the generally fixed two-dimensional shape of conventional under-wires. The use of a thermoplastic coating avoids the need for any such movement in garments, such as brassieres, incorporating a structural support component according to the invention. This is because the thermoplastic coating allows the creation of a structural support component of any desired shape (including three-dimensionally shaped support components) which is fixed directly to a garment and does not require the provision of a pocket having closed ends to allow movement of the support component relative to the garment.

Accordingly, in a fourth aspect, the invention relates to a garment comprising a structural support component, wherein the garment comprises a fabric, and the structural support component comprises a thermoplastic coating extending along a surface of the fabric of the garment.

It will be appreciated the invention also permits the manufacture of a part of a garment comprising a structural support component, or a garment component comprising a structural support component – for example, a cup for a brassiere could be manufactured, the cup comprising a structural support component, which can subsequently be incorporated into a garment. Thus, the fourth aspect of the invention also relates to a part of a garment (such as a cup for a brassiere) comprising a structural support component, wherein the garment part comprises a fabric, and the structural support component comprises a thermoplastic coating extending along a surface of the fabric of the garment part.

In an embodiment of the invention, the thermoplastic coating is located on the exterior of the garment – that is, on an exterior surface (*i.e.* on an outer surface) of the garment. It will be appreciated that locating the thermoplastic coating on the exterior of a garment is convenient because it allows the thermoplastic coating (and hence a structural support component) to be added to an existing garment. Thus, in one embodiment, the garment can be manufactured first and, when complete, a structural support component added to it.

It will be appreciated that it may be desirable for the thermoplastic coating not to be located on the exterior of the garment, where it may be visible to the wearer or come into contact with the wearer's skin and/or other clothing.

An alternative embodiment is therefore preferred, in which the thermoplastic coating is located within the garment – that is, within the garment construction, such that it is on an interior surface (*i.e.* on an inner surface of the garment) and is entirely covered by, or is encased between, one or more fabric parts of the garment. Such an arrangement results in a garment that is more aesthetically-pleasing (because the thermoplastic coating is not visible to the wearer) and/or a garment that is more comfortable (because the thermoplastic coating does not come into contact with the wearer's skin and/or other clothing).

A well known process for forming a garment involves assembling and affixing multiple fabric layers to one another using an adhesive. Typically, individual fabric layers constituting at least a top part and a bottom part of the garment are affixed to one another using an adhesive – in some instances, additional garment components are arranged between the top and bottom fabric layers so that they are incorporated between them, and are thereby affixed within the resulting garment. Such processes are referred to as "lamination" by those in the art, and are frequently used in the manufacture of undergarments, such as brassieres.

Preferably, the garment comprises two or more fabric surfaces and the thermoplastic coating is encased between two fabric surfaces of the garment.

In one arrangement, the garment comprises a laminated construction and the thermoplastic coating is encased between two of the fabric parts of the garment which are laminated together, such that the structural support component is arranged between two of the laminated fabrics of the garment.

In another arrangement, the thermoplastic coating is located on a surface of the fabric of the garment and the fabric is subsequently folded around the thermoplastic coating, such that the fabric encases the thermoplastic coating.

In a further arrangement, the thermoplastic coating is located on a surface of the fabric of the garment and the thermoplastic coating is covered by a fabric to encase it between two fabric surfaces. Preferably, the fabric covering is flocked. As discussed above, flocked surfaces of a garment that are in contact with the wearer's skin may improve comfort.

It is preferred that the thermoplastic coating melts at temperatures greater than 100ºC or approximately 100°C, and preferably at temperatures greater than 150ºC or approximately 150°C, as discussed above in relation to the first, second and third aspects of the invention. In other words, the melting temperature of the thermoplastic coating may be greater than 100°C or approximately 100°C, and preferably greater than 150°C or approximately 150°C.

It is preferred that the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm or approximately 0.1 mm to approximately 3.0 mm, and preferably a thickness in the range of 0.5mm – 3.0mm or approximately 0.5 mm to approximately 3.0 mm, and preferably a thickness of 1.5mm or approximately 1.5 mm, as discussed above in relation to the first, second and third aspects of the invention. Optionally the thermoplastic coating on the fabric strip may have a thickness in the range of:

0.8 mm to 2.7 mm or approximately 0.8 mm to approximately 2.7 mm;
1.0 mm to 2.5 mm or approximately 1.0 mm to approximately 2.5 mm;
1.0 mm to 2.0 mm or approximately 1.0 mm to approximately 2.0 mm; or
1.25 mm to 1.75 mm or approximately 1.25 mm to approximately 1.75 mm.

In an embodiment of the fourth aspect of the invention, the thermoplastic coating has a thickness in the range of 0.1mm to 3.0mm or approximately 0.1 mm to approximately 3.0 mm, and preferably a thickness in the range of 0.5mm – 3.0mm or approximately 0.5 mm to approximately 3.0 mm, and a width in the range of 6mm – 20mm or approximately 6 mm to approximately 20 mm. In that embodiment, the resulting structural support component therefore resembles the dimensions of an under-wire, which as discussed above is conventionally used to provide structural support to a garments.

In another embodiment of the fourth aspect of the invention, the thermoplastic coating has a thickness in the range of 0.1mm – 1.0mm or approximately 0.1 mm to approximately 1.0 mm and a width in the range of 20mm – 50mm or approximately 20 mm to approximately 50 mm.

It will be appreciated that, in this embodiment, the thermoplastic coating does not resemble the dimensions of a conventional under-wire. Instead, the thermoplastic coating is arranged with a thinner dimension than a conventional under-wire and over a larger area (*i.e.* with a larger width and length) than a conventional under-wire, in order to form a broad support region to the garment.

In a preferred embodiment, the broad support region is located adjacent to the part of the garment in which support is required – for example, where the garment is a brassiere, a support region may be located adjacent to each of the cups of the brassiere in order to provide support for the wearer's breasts when the brassiere is worn. Particularly preferred embodiments are described in the accompanying embodiments of the invention and Figures, below.

It will be appreciated that arranging the thermoplastic coating with a thinner dimension and over a larger area than a conventional under-wire may result in improved comfort to the wearer and/or improvements in the aesthetic appearance of the garment. Conventional underwires will often twist and dig into the wearer when the cup supports the weight of the breast, causing discomfort – providing a broader support region allows that weight to be spread across a larger area of the wearer's body, reducing such discomfort. Furthermore, the dimensions of conventional under-wires mean that the location is often apparent in a garment, which many consumers regard as unattractive – providing a thinner structural support component therefore improves the overall appearance of the garment.

Preferably, the thermoplastic coating is a polyamide, and is more preferably a polyester, as discussed above in relation to the first, second and third aspects of the invention.

It will be appreciated that the garment of the fourth aspect of the invention may be any garment requiring a structural support component. Whilst particular reference is made above to the use of the structural support component in a brassiere, it is envisaged that it could be used in other undergarments to provide support for a wearer's breasts. It is also envisaged that the structural support component could be used in other garments such as, for example, dresses or bustiers that often require the inclusion of stiffening members, commonly referred to as bones, to maintain the shape and structure of the garment.

In a fifth aspect, the invention relates to a method of forming a garment as defined in the fourth aspect of the invention. The fifth aspect of the invention therefore relates to a method of forming a garment comprising a structural support component, wherein the garment comprises a fabric, comprising the step of applying a thermoplastic coating to a surface of the fabric, and allowing the thermoplastic coating to cool.

It will be appreciated the invention also permits the manufacture of a part of a garment comprising a structural support component, or a garment component comprising a structural support component – for example, a cup for a brassiere could be manufactured, the cup comprising a structural support component, which can subsequently be incorporated into a garment. Thus, the fifth aspect of the invention also relates to a method of forming a part of a garment comprising a structural support component, wherein the garment part comprises a fabric, comprising the step of applying a thermoplastic coating to a surface of the fabric, and allowing the thermoplastic coating to cool.

Methods suitable for applying a thermoplastic coating to a surface of a fabric of a garment are known in the art. For example, thermoplastic coating may be applied by screen-printing, or laid on to the fabric (for example, by hand or using conventional robotic machinery).

In an embodiment, the step of applying the thermoplastic coating to a surface of the fabric and allowing the thermoplastic coating to cool, is performed during the process of forming the garment. In that embodiment, the thermoplastic coating is applied to a surface of a fabric and allowed to cool, and the resulting fabric then incorporated into a garment, for example, by being affixed to other garment components. That approach therefore allows the structural support component to be formed at any stage during the process of manufacturing a garment.

Preferably, the method further comprises the step of incorporating the fabric having a thermoplastic coating into the garment, for example, by affixing the fabric having the thermoplastic coating to one or more further garment components in order to form the garment.

It is preferred that the method of the fifth aspect of the invention comprises forming a garment using lamination. As discussed above, “lamination” is a conventional approach for forming garments in which multiple fabric layers are assembled and affixed to one another using an adhesive.

Accordingly, the method comprises the step of incorporating the fabric having a thermoplastic coating into the garment by laminating the fabric having the thermoplastic coating to one or more further garment components.

Lamination typically involves powder-coating a surface of one or more of the fabric layers to be affixed to one another with an adhesive. Typically, the adhesive used in lamination approaches has a melting temperature of between 90° to 160°C or between approximately 90°C to approximately 160°C. Lamination is therefore performed by heating the fabric layers to a sufficient temperature to melt the adhesive (for example, at a temperature between 90° to 160°C or between approximately 90°C to approximately 160°C, depending on the melting point of the particular adhesive being used) and then contacting them with one another under pressure and allowing the fabrics and adhesive to cool. As the adhesive cools and sets, the contacted fabric layers adhere to one another. In some instances, additional garment components may be arranged between the fabric layers so that those components are incorporated between them, and are thereby affixed within the garment.

In one embodiment, the method forms a garment having a laminated construction in which the thermoplastic coating is encased between two of the fabric parts of the garment which are laminated together, such that the structural support component is arranged between two of the laminated fabrics of the garment.

In another embodiment, the method comprises the step of locating the thermoplastic coating on a surface of the fabric of the garment and subsequently folding the fabric around the thermoplastic coating, such that the fabric encases the thermoplastic coating. The thermoplastic coating may be cooled before or after the step of folding the fabric around the thermoplastic coating.

Where lamination is used in the method of the fifth aspect of the invention to form the garment, the heating step used to adhere the fabric layers to one another during the lamination process may be performed either: (i) at a temperature sufficient to soften and/or melt the thermoplastic coating; or (ii) at a temperature which is not sufficient to soften and/or melt the thermoplastic coating.

In embodiment (i), where the temperature used during the lamination process is sufficient to soften and/or melt the thermoplastic coating, the garment (and/or the fabric having the thermoplastic coating) may be moulded into a required shape so that, on cooling, the garment (and/or the fabric having the thermoplastic coating) retains that required shape. That embodiment permits the formation of three-dimensional shapes within a garment, in the same way as discussed above in relation to the first, second and third aspects of the invention.

In embodiment (ii), where the temperature used during the lamination process is not sufficient to soften and/or melt the thermoplastic coating, the garment (and/or the fabric having the thermoplastic coating) will retain its shape and will not be moulded during the laminating process. That may be beneficial where the thermoplastic coating is already formed into the required shape, and no further modifications to it need to be made during the lamination process.

A skilled person will be capable of selecting an appropriate thermoplastic coating, laminating adhesives and lamination temperatures to achieve the embodiments discussed in (i) and (ii), above.

Adhesives used in the lamination typically have a melting temperature of between 90° to 160°C or between approximately 90°C to approximately 160°C, and lamination is therefore performed by heating the fabric layers to a sufficient temperature to melt that adhesive (for example, at a temperature between 90° to 160°C or between approximately 90°C to approximately 160°C). As discussed above, it is preferred that the thermoplastic coating melts at a temperatures greater than 100ºC or approximately

100°C and preferably at temperatures greater than 150°C or approximately 150°C. In other words, the melting temperature of the thermoplastic coating may be greater than 100°C or approximately 100°C, and preferably greater than 150°C or approximately 150°C.

Accordingly, embodiment (i) could be achieved, for example, by selecting an adhesive which melts at a temperature of 130°C or approximately 130°C and selecting a thermoplastic coating which melts at a temperature of 150°C or approximately 150°C, and performing the lamination at a temperature between 150°C and 160°C or between approximately 150°C and approximately 160°C. Alternatively, embodiment (i) could be achieved, for example, by selecting an adhesive which melts at a temperature of 120°C or approximately 120°C and selecting a thermoplastic coating which melts at a temperature of 140°C or approximately 140°C, and performing the lamination at a temperature between 140°C and 160°C or between approximately 140°C and approximately 160°C.

Embodiment (ii) could be achieved, for example, by selecting an adhesive which melts at a temperature of 130°C or approximately 130°C and selecting a thermoplastic coating which melts at a temperature of 150°C or approximately 150°C, and performing the lamination at a temperature between 130°C and 140°C or between approximately 130°C and approximately 140°C. Alternatively, embodiment (ii) could be achieved, for example, by selecting an adhesive which melts at a temperature of 90°C or approximately 90°C and selecting a thermoplastic coating which melts at a temperature of 150°C or approximately 150°C, and performing the lamination at a temperature between 90°C and 140°C or between approximately 90°C and approximately 140°C.

Preferably, incorporating the fabric having a thermoplastic coating into the garment comprises the step of affixing one or more fabric onto the fabric having a thermoplastic coating. Such steps result in the formation of a garment in which the thermoplastic coating is covered by a fabric, thereby encasing it between two fabric surfaces, which may improve the aesthetic appearance and/or comfort of the garment. Preferably, the fabric covering is flocked; as discussed above, flocked surfaces of a garment that are in contact with the wearer's skin may improve comfort.

It is preferred that the step of applying the thermoplastic coating to a surface of the fabric and allowing the thermoplastic coating to cool, is performed after the process of forming the garment.

In another embodiment, the thermoplastic coating is applied to a surface of the fabric on the exterior of the garment – that is, on an exterior surface (*i.e.* on an outer surface) of the garment. It will be appreciated that locating the thermoplastic coating on the exterior of a garment is convenient because it allows the thermoplastic coating (and hence a structural support component) to be added to an existing garment. Thus, in one embodiment, the garment can be manufactured first and, when complete, a structural support component added to it.

Preferably, the method of the fifth aspect of the invention further comprises the step of heating the garment so as to melt the thermoplastic coating, moulding the garment into a required shape, and allowing the thermoplastic coating to cool.

As discussed above, the step of heating the garment so as to melt the thermoplastic coating, moulding the garment into a required shape, and allowing the thermoplastic coating to cool, may be performed during the lamination process.

Alternatively, the step of heating the garment so as to melt the thermoplastic coating, moulding the garment into a required shape, and allowing the thermoplastic coating to cool, may be performed after garment has been formed.

Preferably, the method of the fifth aspect of the invention further comprises the step of applying pressure to the garment whilst allowing the thermoplastic coating to cool. As discussed above in relation to the second and third aspects of the invention, the resultant shape of the structural support component may be further improved by applying pressure whilst the thermoplastic coating cools, ensuring the formation of a flat surface for contact with a wearer's skin when the garment is worn.

It is preferred that the thermoplastic coating melts at temperatures greater than 100°C or approximately 100°C, and preferably at temperatures greater than 150°C or approximately 150°C, as discussed above in relation to the first, second, third and fourth aspects of the invention. In other words, the melting temperature of the thermoplastic coating may be greater than 100°C or approximately 100°C, and preferably greater than 150°C or approximately 150°C.

It is preferred that the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm or approximately 0.1 mm to approximately 3.0 mm, and preferably a thickness in the range of 0.5mm – 3.0mm or approximately 0.5 mm to approximately 3.0 mm, and preferably a thickness of 1.5mm or approximately 1.5 mm, as discussed above in relation to the first, second, third and fourth aspects of the invention. Optionally the thermoplastic coating on the fabric strip may have a thickness in the range of:

0.8 mm to 2.7 mm or approximately 0.8 mm to approximately 2.7 mm;
1.0 mm to 2.5 mm or approximately 1.0 mm to approximately 2.5 mm;
1.0 mm to 2.0 mm or approximately 1.0 mm to approximately 2.0 mm; or
1.25 mm to 1.75 mm or approximately 1.25 mm to approximately 1.75 mm.

In one embodiment, the thermoplastic coating has a thickness in the range of 0.1mm to 3.0mm or approximately 0.1 mm to approximately 3.0 mm, and preferably a thickness in the range of 0.5mm – 3.0mm or approximately 0.5 mm to approximately 3.0 mm, and a width in the range of 6mm – 20mm or approximately 6 mm to approximately 20 mm. As discussed above in relation to the fourth aspect of the invention, in that arrangement the resulting structural support component resembles the dimensions of an under-wire, which is conventionally used to provide structural support to a garments.

In another embodiment, the thermoplastic coating has a thickness in the range of 0.1mm – 1.0mm or approximately 0.1 mm to approximately 1.0 mm and a width in the range of 20mm – 50mm or approximately 20 mm to approximately 50 mm. As discussed above in relation to the fourth aspect of the invention, in this embodiment, the thermoplastic coating does not resemble the dimensions of a conventional under-wire, and instead is arranged with a thinner dimension and over a larger area than a conventional under-wire, in order to form a broad support region to the garment. That arrangement results in a garment with improved comfort and/or improved aesthetic appearance, as discussed above.

It is preferred that the broad support region is located adjacent to the part of the garment in which support is required – for example, where the garment is a brassiere, a support region may be located adjacent to each of the cups of the brassiere in order to provide support for the wearer's breasts when the brassiere is worn. Particularly preferred embodiments are described in the accompanying embodiments of the invention and Figures, below.

Preferably, the thermoplastic coating is a polyamide, and is more preferably a polyester, as discussed above in relation to the first, second and third aspects of the invention.

It will be appreciated that method of the fifth aspect of the invention may be used to form any garment requiring a structural support component. Whilst particular reference is made above to the use of the structural support component in a brassiere, it is envisaged that it could be used in other undergarments to provide support for a wearer's breasts. It is also envisaged that the structural support component could be used in other garments such as, for example, dresses or bustiers that often require the inclusion of stiffening members, commonly referred to as bones, to maintain the shape and structure of the garment.

In a sixth aspect, the invention relates to the use of a thermoplastic coating to form a structural support component in a garment, which garment comprises a fabric. Particularly preferred garments, and particularly preferred thermoplastic coating materials and methods of using them to form a structural support component in a garment, are described above in relation to the other aspects of the invention (particularly, in relation to the fourth and fifth aspects of the invention).

Embodiments of the invention will now be described, by way of non-limiting examples, with reference to the accompanying drawings in which:

Figures 1a and 1b show opposites sides of a textile element according to a first embodiment of the invention;

Figures 2a and 2b show opposite sides of a textile element according to a second embodiment of the invention;

Figures 3a and 3b show opposite sides of a textile element according to a third embodiment of the invention;

Figures 4a and 4b show opposite sides of a textile element according to a fourth embodiment of the invention;

Figure 5 shows opposite sides of a textile element according to a fifth embodiment of the invention;

Figures 6a-6c illustrate a method of adding a structural support component to a garment using the textile element shown in Figures 2a and 2b; and

Figures 7a-7c illustrate a method of forming a structural support component using the textile element shown in Figures 2a and 2b.

Figures 8a and 8b respectively show structural support components according to sixth and seventh embodiments of the invention.

Figure 8c shows a structural support component according to an eighth embodiment of the invention.

Figures 9a and 9b respectively show structural support components according to ninth and tenth embodiments of the invention.

Figure 9c shows a structural support component according to an eleventh embodiment of the invention.

A textile element 10 according to a first embodiment of the invention is shown in Figures 1a and 1b, the textile element 10 comprising a fabric strip 12 having a thermoplastic coating 14 extending length wise along a surface 16 of the fabric strip 12 (Figure 1a).

In the embodiment shown in Figures 1a and 1b the thermoplastic coating 14 extends width wise across the surface 16 of the fabric strip 12 and includes a centrally located opening 18 extending length wise through the coating 14.

The textile element 10 is flocked on an opposite surface 20 of the fabric strip 12 to the thermoplastic coating 14, the flocking 22 extending length wise of the opposite surface 20 and extending across half the width of the opposite surface 20 of the fabric strip 12.

The application of the thermoplastic coating 14 on the surface 16 of the fabric strip 12 may vary in other embodiments of the invention.

In a second embodiment of the invention, shown in Figures 2a and 2b, the textile element 10 includes a thermoplastic coating 14 applied so as to extend across half of the width of the surface 16 of the fabric strip 12.

The textile element 10 shown in Figures 2a and 2b includes flocking 22 on the opposite surface 20 of the fabric strip 12, the flocking 22 extending length wise of the opposite surface 20 and extending across half the width of the opposite surface 20 of the fabric strip 12, in a similar manner to the flocking 22 applied to the textile element 10 shown in Figures 1a and 1b.

In other embodiments of the invention, the textile element 10 may further include an adhesive coating on the opposite surface 20 of the fabric strip 12. A textile element 10 according to a third embodiment of the invention, including an adhesive coating on the opposite surface 20 of the fabric strip 12, is shown in Figures 3a and 3b.

The textile element 10 shown in Figures 3a and 3b is similar to the textile element 10 shown in Figures 2a and 2b and so will not be described in detail. The textile element 10 shown in Figures 3a and 3b differs from the textile element 10 shown in Figures 2a and 2b only in that it includes an adhesive coating 23 on the opposite surface 20 of the fabric 12 strip.

The adhesive coating 23 extends length wise of the fabric strip 12 and across the other half of the opposite surface 20 of the fabric strip 12 to the flocking 22.

In other embodiments it is envisaged that the flocking 22 could be omitted and the adhesive coating 23 could extend width wise across the opposite surface 20 of the fabric strip 12. It is also envisaged that in another embodiment the textile element 10 shown in Figures 1a and 1b may be modified to include an adhesive coating 23 extending length wise and half way across the width of the opposite surface 20 of the fabric strip 12, adjacent the flocking 22.

Alternatively the embodiment shown in Figures 1a and 1b could be modified to omit the flocking 22 and include an adhesive coating 23 extending length wise and width wise across the opposite surface 20 of the fabric strip 12.

In other embodiments, the amount of flocking 22 applied to the opposite surface 20 of the fabric strip 12 of the textile element 10 may be varied.

In a fourth embodiment of the invention, shown in Figures 4a and 4b, the textile element 10 includes a thermoplastic coating 14 applied so as to extend across the entire width of the surface 16 of the fabric strip 12.

The textile element 10 shown in Figures 4a and 4b includes flocking 22 on the opposite surface 20 of the fabric strip 12, the flocking 22 extending across the entire width of the opposite surface 20 of the fabric strip 12.

In other embodiments the textile element 10 shown in Figures 4a and 4b to include flocking 22 extending only half way across the opposite surface 20 of the fabric strip 12. It may also be further modified to include flocking 22 extending half way across the opposite of the fabric strip 12 and an adhesive coating 23 extending across the other half of the opposite surface 20 of the fabric strip 12. It may also be modified to exclude flocking 22 and to include an adhesive coating 23 extending half way across the width of the opposite surface 20 of the fabric strip 12 or an adhesive coating 23 extending width wise across the opposite surface 20 of the fabric strip 12.

A textile element 10 according to a fifth embodiment of the invention is shown in Figure 5.

As in each of the first, second, third and fourth embodiments described above, the textile element 10 includes a fabric strip 12 having a thermoplastic coating on a surface 16 thereof. The fabric strip 12 is however folded in half length wise about the thermoplastic coating 14 so that the thermoplastic coating 14 is encased between the folded halves of the fabric strip 12.

In the embodiment shown in Figure 5, the opposite surface 20 omits any flocking 22 or adhesive coating 23. It is envisaged however that in other embodiments, the textile element 10 shown in Figure 5 may be modified to include flocking 22 and/or an adhesive coating 23 on the opposite surface 20 of the fabric strip 12, in a similar manner to that described in connection with the other embodiments described above.

In each of the first, second, third, fourth and fifth embodiments shown in Figures 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b and 5 the thermoplastic coating 14 has a thickness D of 1.5mm. In other embodiments, the thermoplastic coating 14 may have a thickness of approximately 1.5 mm. In still other embodiments, the thickness of the thermoplastic coating 14 may be varied, depending on the strength and rigidity required by the thermoplastic coating 14, within the range of 0.1mm – 1.8mm or approximately 0.1 mm to approximately 1.8 mm, and preferably within the range of 0.5mm – 1.8mm or approximately 0.5 mm to approximately 1.8 mm.

The thermoplastic coating 14 in each of these embodiments is preferably a polyamide coating having a melting temperature in excess of 100ºC or approximately 100°C, and more preferably in excess of 150ºC or approximately 150°C. In other words, the melting temperature of the thermoplastic coating 14 is preferably greater than 100°C or approximately 100°C, and even more preferably greater than 150°C or approximately 150°C. The higher the melting temperature of the thermoplastic coating 14, the less likely the thermoplastic coating 14 is to melt during machine washing of a garment incorporating the textile element 10 as a structural support component.

In other embodiments the thermoplastic coating 14 may be a polyester coating having a similar melting temperature.

The use of the textile element 10 shown in Figures 2a and 2b to add a structural support component to a garment will now be described with reference to Figures 6a to 6c.

As a first step, the fabric strip 12 is heated, as illustrated by arrows A in Figure 6a, to melt the thermoplastic coating 14.

The fabric strip 12 is then folded in half along its length so as to encase the molten thermoplastic coating 14 within the fabric strip 12, as shown in Figure 6b, before moulding the fabric strip 12 into the shape required by the structural support component.

Once moulded into the required shape, the moulded fabric strip 12 is secured in position on a garment 24 by means of sewing before being allowed to cool so as to allow the thermoplastic coating 14 to solidify in the required shape and form the structural support component 26. As shown in Figure 6c, the moulded fabric strip 12 is secured to the garment 24 so that the flocking 22 is exposed. This arrangement ensures that when the garment 24 is worn, the flocking 22 contacts the wearer's skin and improves wearer comfort.

Securing the moulded fabric strip 12 to the garment 24, i.e. securing the textile element 10 to the garment 24, prior to cooling of the thermoplastic coating 14 allows further flexure of the thermoplastic coating 14 to the exact two- or three-dimensional shape required by the garment 24. It thus allows the final shape of the resultant support component to be tailored to match the specific garment in which it is incorporated. The stitches also ensure the moulded fabric strip 12 retains the required shape until solidification of the thermoplastic coating 14 and setting of the required shape is complete.

It is envisaged that in other embodiments the moulded fabric strip 12 may be secured to the garment 24 by means of an adhesive coating 23, such as that included on the opposite surface 20 of the fabric strip 12 of the textile element 10 in Figures 3a and 3b or by means of an adhesive applied directly between the moulded fabric strip 12 and the garment 24.

Preferably, although not illustrated in Figures 6a to 6c, pressure is applied to the moulded fabric strip 12 during cooling of the thermoplastic coating 14. The application of pressure ensures the formation of a flat surface for contact with a wearer's skin when the garment is worn and also further helps to ensure that the moulded fabric strip 12 retains the required shape during cooling of the thermoplastic coating 14.

In Figure 6c, the moulded fabric strip 12 is shown attached to a cup of a brassiere. It is envisaged that the textile element 10 could be used in other garments requiring structural support components 26. The textile element 10 could for example be used to in dresses or bustiers to define a stiffening member required to maintain the shape and structure of the garment.

It will be appreciated that in use of the textile element 10 shown in Figures 1a and 1b the provision of a centrally located opening 18 extending length wise through the thermoplastic coating 14 will assist the folding step illustrated in Figure 6b.

The provision of the centrally located opening 18 in addition allows the creation of opposing edges of the folded fabric strip 12 that do not contain thermoplastic coating 14 and thus present a softer edge than is otherwise created when thermoplastic coating 14 is enveloped by the fabric strip 12 along the fold line. It is envisaged that this will improve wearer comfort and reduce the risk of chaffing as a result of the otherwise relatively hard edge that might be created on folding the fabric strip 12.

In other embodiments the step of folding shown in Figure 6b may be omitted. In use of the textile element 10 shown in Figures 4a and 4b, for example, the fabric strip 12 may be moulded into the required shape and then secured to the garment 24 with the molten thermoplastic coating 14 in face to face contact with the fabric of the garment 24.

In such embodiments the step of sewing the moulded fabric strip 12 to the garment 24 may also be omitted and the bond created between the molten thermoplastic coating 14 and the fabric of the garment 24 may be relied upon to secure the moulded fabric strip 12 to the garment 24.

The provision of flocking 22 across the entire width of the opposite surface 20 of the fabric strip 12, which is inevitably exposed when the molten thermoplastic coating 14 of the moulded fabric strip 12 is secured in face to face contact with the fabric of the garment 24, ensures that wearer comfort is maximised when the garment 24 is worn.

It is envisaged that in other methods, the textile element 10 shown in Figures 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, 5a and 5b may be secured to a garment 24 to form a structural support component without heating the textile element 10 to melt the thermoplastic coating 14. The flat and straight fabric strip 12 may instead be flexed into the required shape whilst it is secured to the garment 24, either by means of sewing or adhesive.

Whilst it will be appreciated that securing the moulded fabric strip 12 to a garment 24 prior to cooling of the molten thermoplastic coating 14 allows the moulded fabric strip 12 to be tailored to match the specific shape of the individual garment 24, the textile element 10 may also be used to form structural support components for incorporation to garments at a later stage.

The formation of a structural support component 26 using the textile element 10 shown in Figures 2a and 2b is shown in Figures 7a to 7c.

As with the process illustrated in Figures 6a to 6c, the fabric strip 12 is heated so as to melt the thermoplastic coating 14 (Figure 7a).

The fabric strip 12 is then folded to encase the molten thermoplastic coating 14 within the fabric strip 12 (Figure 7b), before moulding the fabric strip 12 into the required shape.

The step of moulding the fabric strip 12 into the required shape is achieved in the embodiment illustrated in Figures 7a to 7c by placing the fabric strip 12 into a recess 28 defined in a mould 30 (Figure 7c).

The use of the mould 30 ensures that the moulded fabric strip 12 retains the required shape during cooling of the thermoplastic coating 14.

Preferably, although not shown in Figure 7c, the mould 30 includes a top plate that is applied over the moulded fabric strip 12 during cooling of the thermoplastic coating 14 so as to apply pressure to the moulded fabric strip 12. The application of pressure ensures the formation of a flat surface for contact with a wearer's skin when the resultant support component 26 is incorporated into a garment. It also further helps to ensure that the moulded fabric strip 12 retains the required shape during cooling of the thermoplastic coating 14.

It is envisaged that the elements of the mould 30 may in other embodiments be shaped so as to create a curved cross-sectional shape of the resultant structural support member 26.

It will also be appreciated that the elements of the mould 30 may be shaped to create a structural support member 26 having a three-dimensional shape. The application of pressure during cooling of the thermoplastic coating 14 does not limit the process to the formation of two-dimensionally-shaped structural support components 26.

In Figure 7c, the moulded fabric strip 12 is shown moulded into the shape typically associated with the support components required for use in brassieres. It is envisaged however that the textile element 10 could be used to form structural support components 26 for use in other garments requiring structural support components. The textile element 10 could for example be used to create a structural support component 26 for use in a dress or bustier in the form of a stiffening member to maintain the shape and structure of the garment.

Figure 8a shows a pair of structural support components according to a sixth embodiment of the invention that forms part of a brassiere 32.

In Figure 8a, each structural support component comprises a thermoplastic coating 14, which is moulded into a curved cross-sectional shape, e.g. a curved wire or strip. Each structural support component is encased between laminated fabric layers of the brassiere 32, and extends along a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32, so as to be positioned to support a base of a breast held by that support cup 36.

Figure 8b shows a pair of structural support components according to a seventh embodiment of the invention that forms part of a brassiere 32.

In Figure 8b, each structural support component comprises a thermoplastic coating 14, which is moulded into a curved cross-sectional shape, e.g. a curved wire or strip. Each structural support component is encased between laminated fabric layers of the brassiere 32, and extends along a curved section 38 underneath and adjacent to a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32, so as to be positioned to support a base of a breast held by that support cup 36.

Figure 8c shows a structural support component according to a eighth embodiment of the invention that forms part of a brassiere 32.

In Figure 8c, the structural support component comprises a thermoplastic coating 14, which is moulded into a composite cross-sectional shape that consists of a substantially rectangular shape, from which a pair of substantially semi-circular cut-outs is omitted. The structural support component is encased between laminated fabric layers of the brassiere 32, and extends along a support region underneath support cups 36 of the brassiere 32, so as to be positioned to support a base of each breast held by each support cup 36. The shape of each substantially semi-circular cut-out corresponds to the shape of the bottom edge 34 of the respective support cup 36.

The formation of each structural component shown in Figure 8a will now be described, as follows.

First and second fabric layers are selected such that the two fabric layers are identical in size, and that a part of each fabric layer is formed to have the same shape as a support cup 36.

Powder adhesive is applied to a surface of each fabric layer that defines an inner surface, in order to permit adhesion of the inner surfaces of the first and second fabric layers to each other.

The thermoplastic coating 14 is applied onto a part of the inner surface of the first fabric layer that corresponds to a bottom edge 34 forming part of the support cup 36. The thermoplastic coating 14 is then cooled so as to allow the thermoplastic coating 14 to solidify in the required shape and form the structural support component.

Preferably pressure is applied to the moulded thermoplastic coating 14 during cooling. The application of pressure ensures the formation of a flat surface for contact with a wearer's skin when the garment is worn and also further helps to ensure that the moulded thermoplastic coating 14 retains the required shape during cooling.

The second fabric layer is then placed on top of the first fabric layer such that the inner surfaces of the two fabric layers overlap and that the thermoplastic coating 14 is encased between the inner surfaces of the first and second fabric layers. The two fabric layers are then heated to a lamination temperature that is high enough to melt the powder adhesive, but not high enough to melt the thermoplastic coating 14 so as to allow the thermoplastic coating 14 to retain its moulded shape. Melting the powder adhesive causes adhesion of the inner surfaces of the fabric layers to each other so as to form a pair of laminated fabric layers.

In this manner each structural support component is formed between laminated fabric layers of a brassiere 32, and extends along a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32.

Alternatively the thermoplastic coating 14 may be heated and moulded into its required shape during lamination of the two fabric layers, rather than before the lamination of the two fabric layers. This is achieved by setting the lamination temperature to be high enough to melt the powder adhesive, and also high enough to melt the thermoplastic coating 14 so as to allow the thermoplastic coating 14 to be moulded into its required shape.

The above formation of each structural component shown in Figure 8a applies mutatis mutandis to formation of each structural component shown in Figure 8b, except that the first and second fabric layers are also selected such that another part of each fabric layer is formed to define a curved section 38 underneath and adjacent a bottom edge 34 forming part of a support cup 36 of a brassiere 32, and that the thermoplastic coating 14 is applied onto a part of the inner surface of the first fabric layer that corresponds to the curved section 38.

The above formation of each structural component shown in Figure 8a also applies mutatis mutandis to formation of each structural component shown in Figure 8c, except that the first and second fabric layers are also selected such that another part of each fabric layer is formed to define a support region underneath support cups 36 of a brassiere 32, and that the thermoplastic coating 14 is applied onto a part of the inner surface of the first fabric layer that corresponds to the support region.

Figure 9a shows a pair of structural support components according to a ninth embodiment of the invention that forms part of a brassiere 32. Each structural support component in Figure 9a is identical to each structural support component in Figure 8a, except that each structural support component in Figure 9a is formed on an outer surface of a brassiere along a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32, instead of being encased between laminated fabric layers of the brassiere 32.

Figure 9b shows a pair of structural support components according to a tenth embodiment of the invention that forms part of a brassiere 32. Each structural support component in Figure 9b is identical to each structural support component in Figure 8b, except that each structural support component in Figure 9b is formed on an outer surface of a brassiere along a curved section 38 underneath and adjacent to a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32, instead of being encased between laminated fabric layers of the brassiere 32.

Figure 9c shows a structural support component according to an eleventh embodiment of the invention that forms part of a brassiere 32. The structural support component in Figure 9c is identical to the structural support component in Figure 8c, except that each structural support component in Figure 9b is formed on an outer surface of a brassiere along a support region located underneath support cups 36 of the brassiere 32, instead of being encased between laminated fabric layers of the brassiere 32.

In each of the ninth, tenth and eleventh embodiments respectively shown in Figures 9a, 9b and 9c, the or each structural support component is formed on a front surface of the brassiere 32, i.e. the surface of the brassiere 32 that faces away from a body of a user wearing the brassiere 32. In other embodiments, it is envisaged that each structural support component may be formed on a back surface of the respective support cup 36, i.e. the surface of the brassiere 32 that faces a body of a user wearing the brassiere 32.

The formation of each structural component shown in Figure 9a will now be described as follows.

As with the formation of each structural component shown in Figure 8a, first and second fabric layers are selected such that the two fabric layers are identical in size, and that part of each fabric layer is formed to have the same shape as a support cup 36.

Powder adhesive is applied to a surface of each fabric layer that defines an inner surface, in order to permit adhesion of the inner surfaces of the first and second fabric layers to each other.

The thermoplastic coating 14 is applied onto a part of the outer surface of the first fabric layer that corresponds to a bottom edge 34 forming part of the support cup 36, whereby the outer and inner surfaces are on opposite sides of the first fabric layer. The thermoplastic coating 14 is then cooled so as to allow the thermoplastic coating 14 to solidify in the required shape and form the structural component.

Again, as with the formation of each structural component shown in Figure 8a, pressure is preferably applied to the moulded thermoplastic coating 14 during cooling. The application of pressure ensures the formation of a flat surface for contact with a wearer's skin when the garment is worn and also further helps to ensure that the moulded thermoplastic coating 14 retains the required shape during cooling.

The second fabric layer is then placed on top of the first fabric layer such that the inner surfaces of the two fabric layers overlap. The two fabric layers are then heated to a lamination temperature that is high enough to melt the powder adhesive, but not high enough to melt the thermoplastic coating 14 so as to allow the thermoplastic coating 14 to retain its moulded shape. Melting the powder adhesive causes adhesion of the inner surfaces of the fabric layers to each other so as to form a pair of laminated fabric layers.

In this manner each structural support component is formed on an outer surface of a support cup 36 of the brassiere 32, and extends along a bottom edge 34 forming part of a respective support cup 36 of the brassiere 32.

Alternatively the thermoplastic coating 14 may be heated and moulded into its required shape during lamination of the two fabric layers, rather than before the lamination of the two fabric layers. This is achieved by setting the lamination temperature is high enough to melt the powder adhesive, and also high enough to melt the thermoplastic coating 14 so as to allow the thermoplastic coating 14 to be moulded into its required shape.

The above formation of each structural component shown in Figure 9a applies mutatis mutandis to formation of each structural component shown in Figure 9b, except that the first and second fabric layers are also selected such that another part of each fabric layer is formed to define a curved section 38 underneath and adjacent a bottom edge 34 forming part of a support cup 36 of a brassiere 32, and that the thermoplastic coating 14 is applied onto a part of the outer surface of the first fabric layer that corresponds to the curved section 38.

The above formation of each structural component shown in Figure 9a also applies mutatis mutandis to formation of each structural component shown in Figure 9c, except that the first and second fabric layers are also selected such that another part of each fabric layer is formed to define a support region underneath support cups 36 of a brassiere 32, and that the thermoplastic coating 14 is applied onto a part of the outer surface of the first fabric layer that corresponds to the support region.

In each of the ninth, tenth and eleventh embodiments respectively shown in Figures 9a, 9b and 9c, a surface of the thermoplastic coating 14 may be flocked, and/or each structural support component may further include a covering fabric to cover the thermoplastic coating 14. Such an arrangement allows the thermoplastic coating 14 to be in face to face contact with a wearer's skin when the brassiere 32 is worn.

It is further envisaged that, in other embodiments of the invention, some or all of the structural support components shown in Figures 8a, 8b, 8c, 9a and 9b, 9c may be used in combination in the same brassiere 32.

It will be appreciated that the above method is applicable to other garments that employ the use of a plurality of laminated fabric layers. Furthermore, each structural component may be formed on an outer surface of a single fabric layer, instead of an outer surface of a fabric layer forming part of a plurality of laminated fabric layers.

In Figures 8a, 8b, 8c, 9a, 9b and 9c, the moulded thermoplastic coating 14 is shown moulded into the shape typically associated with the support components required for use in brassieres 32. It is envisaged however that the thermoplastic coating 14 could be used to form a structural support component for use in other garments requiring structural support components. The thermoplastic coating 14 could for example be used to create a structural support component for use in a dress or bustier in the form of a stiffening member to maintain the shape and structure of the garment.

In each of the sixth, seventh, eighth, ninth, tenth and eleventh embodiments shown in Figures 8a, 8b, 8c, 9a, 9b and 9c, the thermoplastic coating 14 has a thickness D of 1.5 mm. In other embodiments, the thermoplastic coating 14 may have a thickness of approximately 1.5 mm. In other embodiments, the thickness of the thermoplastic coating 14 may be varied, depending on the strength and rigidity required by the thermoplastic coating 14, within the range of 0.1mm – 1.8mm or approximately 0.1 mm to approximately 1.8 mm, and preferably in the range of 0.5 mm - 1.8 mm or approximately 0.5 mm to approximately 1.8 mm.

The thermoplastic coating 14 in each of the sixth, seventh, eighth, ninth, tenth and eleventh embodiments is preferably a polyamide coating having a melting temperature in excess of 100ºC or approximately 100°C, and more preferably in excess of 150ºC or approximately 150°C. In other words, the melting temperature of the thermoplastic coating 14 is preferably greater than 100°C or approximately 100°C, and even more preferably greater than 150°C or approximately 150°C. The higher the melting temperature of the thermoplastic coating 14, the less likely the thermoplastic coating 14 is to melt during machine washing of a garment incorporating the thermoplastic coating 14 as a structural support component.

In other embodiments the thermoplastic coating 14 may be a polyester coating having a similar melting temperature.

CLAIMS

1. A garment comprising a structural support component, wherein the garment comprises a fabric, and the structural support component comprises a thermoplastic coating extending along a surface of the fabric of the garment.

2. A garment according to Claim 1 wherein the thermoplastic coating is located on the exterior of the garment.

3. A garment according to Claim 1 wherein the thermoplastic coating is located within the garment.

4. A garment according to Claim 3 wherein the garment comprises two or more fabric surfaces and the thermoplastic coating is encased between two fabric surfaces of the garment.

5. A garment according to any one of the preceding claims wherein the thermoplastic coating melts at temperatures greater than 100°C.

6 A garment according to Claim 5 wherein the thermoplastic coating melts at temperatures greater than 150°C.

7. A garment according to any one of the preceding claims wherein the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm; preferably a thickness in the range of 0.5mm – 3.0mm; more preferably a thickness of 1.5mm.

8. A garment according to any one of the preceding claims wherein the thermoplastic coating has a thickness in the range of 0.1mm to 3.0mm, and preferably a thickness in the range of 0.5mm – 3.0mm, and a width in the range of 6mm – 20mm.

9. A garment according to any one of the preceding claims wherein the thermoplastic coating has a thickness in the range of 0.1mm – 1.0mm and a width in the range of 20mm – 50mm.

10. A garment according to any one of the preceding claims wherein the thermoplastic coating is a polyamide.

11. A garment according to any one of the preceding claims wherein the thermoplastic coating is a polyester.

12. A garment according to any one of the preceding claims wherein the garment is a brassiere, or a dress, or a bustier.

13. A method of forming a garment comprising a structural support component, wherein the garment comprises a fabric, comprising the step of applying a thermoplastic coating to a surface of the fabric, and allowing the thermoplastic coating to cool.

14. A method according to Claim 13, wherein the step of applying the thermoplastic coating to a surface of the fabric and allowing the thermoplastic coating to cool, is performed during the process of forming the garment.

15. A method according to Claim 14, further comprising the step of incorporating the fabric having a thermoplastic coating into the garment.

16. A method according to Claim 15 wherein incorporating the fabric having a thermoplastic coating into the garment comprises the step of affixing one or more fabric onto the fabric having a thermoplastic coating.

17. A method according to Claim 13, wherein the step of applying the thermoplastic coating to a surface of the fabric and allowing the thermoplastic coating to cool, is performed after the process of forming the garment.

18. A method according to Claim 17 wherein the thermoplastic coating is applied to a surface of the fabric on the exterior of the garment.

19. A method according to any one of Claims 13 to 18, further comprising the step of heating the garment so as to melt the thermoplastic coating, moulding the garment into a required shape, and allowing the thermoplastic coating to cool.

20. A method according to any one of Claims 13 to 19 further comprising the step of applying pressure to the garment whilst allowing the thermoplastic coating to cool.

21. A method according to any one of Claims 13 to 20 wherein the thermoplastic coating melts at temperatures greater than 100°C.

22. A method according to Claim 21 wherein the thermoplastic coating melts at temperatures greater than 150°C.

23. A method according to any one of Claims 13 to 22 wherein the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm; preferably a thickness in the range of 0.5mm – 3.0mm; and more preferably a thickness of 1.5mm.

24. A method according to any one of Claims 13 to 23 wherein the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm, or 0.5mm – 3.0mm, and a width in the range of 6mm – 20mm.

25. A method according to any one of Claims 13 to 24 wherein the thermoplastic coating has a thickness in the range of 0.1mm – 1.0mm and a width in the range of 20mm – 50mm.

26. A method according to any one of Claims 13 to 25 wherein the thermoplastic coating is a polyamide.

27. A method according to any one of Claims 13 to 26 wherein the thermoplastic coating is a polyester.

28. A method according to any one of Claims 13 to 27 wherein the garment is a brassiere, or a dress, or a bustier.

29. Use of a thermoplastic coating to form a structural support component in a garment.

30. A garment comprising a structural support component generally as herein described with reference to and/or as illustrated in the accompanying drawings.

31. A method of forming a garment comprising a structural support component generally as herein described with reference to and/or as illustrated in the accompanying drawings.

32. Use of a thermoplastic coating to form a structural support component in a garment generally as herein described with reference to and/or as illustrated in the accompanying drawings.

33. A textile element for securing to a garment to form a structural support component, the textile element comprising a fabric strip having a thermoplastic coating extending length wise along a surface of the fabric strip.

34. A textile element according to Claim 33 wherein the thermoplastic coating extends across half the width of the fabric strip.

35. A textile element according to Claim 33 wherein the thermoplastic coating extends width wise across the fabric strip.

36. A textile element according to Claim 35 wherein the thermoplastic coating includes a centrally located opening extending length wise through the coating.

37. A textile element according to Claim 33 wherein the fabric strip is folded in half length wise along the fabric strip, about the thermoplastic coating, such that the thermoplastic coating is encased between the folded halves of the fabric strip.

38. A textile element according to any one of Claims 33 to 37 preceding claims wherein the fabric strip is flocked on an opposite surface to the thermoplastic coating, the flocking extending length wise of the opposite surface.

39. A textile element according to Claim 38 wherein the opposite surface is flocked width wise across the fabric strip.

40. A textile element according to Claim 38 wherein the opposite surface is flocked across half the width of the fabric strip.

41. A textile element according to any one of Claims 33 to 40 further including an adhesive coating on an opposite surface of the fabric strip to the thermoplastic coating, the adhesive coating extending length wise of the opposite surface.

42. A textile element according to Claim 41 wherein the adhesive coating extends width wise across the fabric strip.

43. A textile element according to Claim 41 wherein the adhesive coating extends across half the width of the fabric strip.

44. A textile element according to any one of Claims 33 to 43 wherein the thermoplastic coating melts at temperatures greater than 100°C.

45 A textile element according to Claim 44 wherein the thermoplastic coating melts at temperatures greater than 150°C.

46. A textile element according to any one of Claims 33 to 45 wherein the thermoplastic coating has a thickness in the range of 0.1mm – 3.0mm; and preferably a thickness in the range of 0.5mm – 3.0mm.

47. A textile element according to Claim 42 wherein the thermoplastic coating has a thickness of 1.5mm.

48. A textile element according to any one of Claims 33 to 47 wherein the fabric strip has a width in the range of 6mm – 20mm.

49. A textile element according to any one of Claims 33 to 47 wherein the thermoplastic coating is a polyamide.

50. A textile element according to any one of Claims 33 to 48 wherein the thermoplastic coating is a polyester.

51. A method of adding a structural support component to a garment comprising the steps of heating a textile element according to any one of Claims 33 to 50 so as to melt the thermoplastic coating, moulding the fabric strip into a required shape, securing the moulded fabric strip in position on the garment and allowing the thermoplastic coating to cool.

52. A method of adding a structural support component to a garment according to Claim 51 further including the step of applying pressure to the textile element whilst allowing the thermoplastic coating to cool.

53. A method of adding a structural support component to a garment according to Claim 51 or Claim 52 wherein the moulded fabric strip is secured in position on the garment by means of sewing.

54. A method of adding a structural support component to a garment according to Claim 51 or Claim 52 wherein the moulded fabric strip is secured in position on the garment by means of an adhesive.

55. A method of adding a structural support component to a garment according to Claim 53 or Claim 54 further including the step of folding the fabric strip in half along its length prior to the step of moulding the fabric strip into the required shape.

56. A method of adding a structural support component to a garment according to Claim 51 or Claim 52 wherein the moulded fabric strip is secured in position on the garment by laying the molten thermoplastic coating in face to face contact with the garment so as to adhere the fabric strip to the garment by means of the thermoplastic coating.

57. A method of forming a structural support component for attachment to a garment comprising the steps of heating a textile element according to any one of Claims 33 to 50 so as to melt the thermoplastic coating, moulding the fabric strip into a required shape and allowing the thermoplastic coating to cool.

58. A method of forming a structural support component for attachment to a garment according to Claim 57 further including the step of applying pressure to the textile element whilst allowing the thermoplastic coating to cool.

59. A method of forming a structural support component for attachment to a garment according to Claim 57 or Claim 58 further including the step of folding the fabric strip in half along its length prior to the step of moulding the fabric strip into the required shape.

60. A method of forming a structural support component for attachment to a garment according to any one of Claims 57 to 59 further including the step of applying an adhesive coating to an opposite surface of the fabric strip to the thermoplastic coating so that the adhesive coating extends length wise of the opposite surface.

61. A textile element generally as herein described with reference to and/or as illustrated in the accompanying drawings.

62. A method of adding a structural support component to a garment generally as herein described with reference to and/or as illustrated in the accompanying drawings.

63. A method of forming a structural support component for attachment to a garment generally as herein described with reference to and/or as illustrated in the accompanying drawings.

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Claims searched:	1 - 12 and 30	**Date of search:**	30 October 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 3 - 12	WO 2007/089848 A2 (HBI BRANDED APPAREL) See pages 4 - 8 and figures 1, 2 & 4.
X	1, 3 - 12	US 5447462 A1 (SMITH et al.) See columns 5, 8 & 9 and figures 2 & 11 - 14.
X	1, 3 - 12	US 4701964 A1 (BELL et al.) See columns 4 - 6, 12 & 13 and figure 7.
X	1, 3 - 12	US 2002/0155786 A1 (QUERQUANT) See pages 2 & 3 and figures 2 - 4.
X	1, 3 - 9, 12	US 2003/0092355 A1 (RABINOWICZ et al.) See pages 2 & 3 and figures 2 - 5.
X	1, 2, 5 - 9, 12	WO 2004/049839 A1 (SARA LEE CORP) See pages 3 & 4 and figures.
X	1, 2, 5 - 9, 12	US 2003/0019373 A1 (JORDAN) See pages 1 & 2 and figures 4 & 12.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A41C; A41D; A41H; B32B

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	**Subgroup**	**Valid From**
A41C	0003/00	01/01/2006
A41C	0005/00	01/01/2006