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Underwired brassieres

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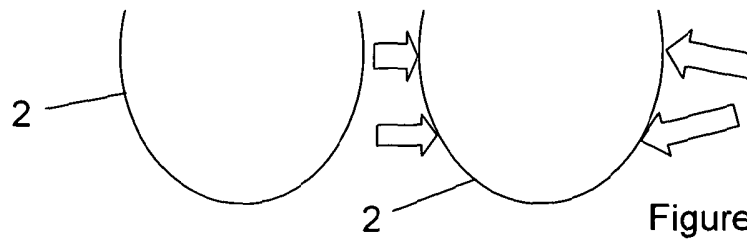


Figure 1

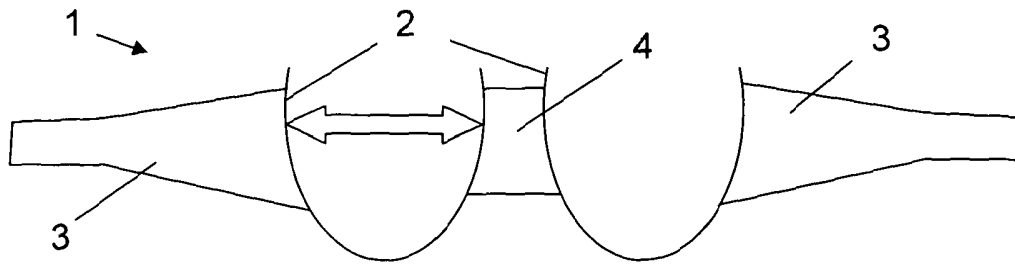


Figure 2

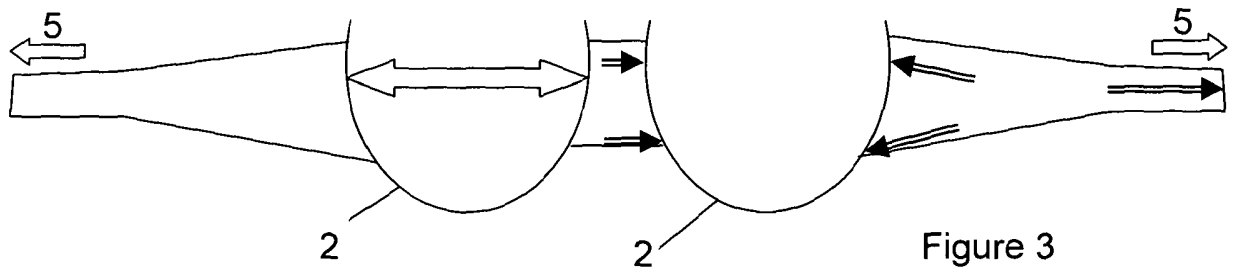


Figure 3

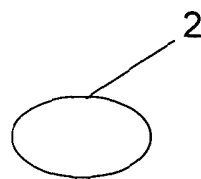


Figure 4

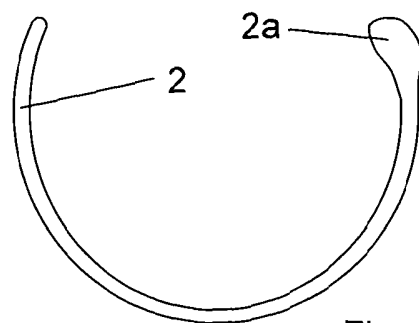


Figure 5

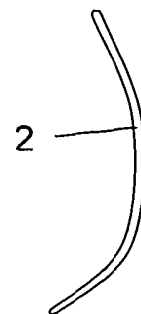


Figure 6

TITLE

Underwired brassieres

DESCRIPTION

5 This invention relates to brassiere design and to structured lingerie design and in particular to a method for designing and producing an underwired brassiere. Aspects of the invention also provide underwired brassieres and structured lingerie designed and produced by such a method.

10 By 'structured lingerie' it is meant any lingerie or corsetry which incorporates an underwired brassiere portion. For brevity, in the remainder of this specification including the claims the term 'underwired brassiere' is used to include any such structured lingerie.

15 BACKGROUND ART

Underwired brassieres are known, and comprise a pair of generally arcuate stiffeners which are sleeved into the fabric of the brassiere cups to lie against the wearer's chest beneath the breasts, following the inframammary root. Metal is generally used as the material of the stiffener, but hard plastics material or a composite structure of both
20 metal and plastics material may alternatively be used. In this specification the term "wire" or "underwire" is used to identify all such stiffener materials, whether metal or not.

Brassieres are made in a wide variety of sizes, with the standard fitting measurements
25 being the under-breast measurement around the body, and the cup size. There are often problems in assuring a proper fit, as the body shapes of wearers vary to a very considerable extent. The problem of obtaining a good fit is exacerbated by the fact that the underwire shape ideally should match the compound curvature of the female body following the precise three-dimensional shape associated with the
30 inframammary root of the wearer. Also, different wearers attach their brassieres differently. Most brassieres come with two or three alternative rows of eyes for the traditional hook and eye fastening. Some wearers fasten their brassieres on the

- tightest fastening, while some use the least tight fastening. Some users even use bra extenders, which are short lengths of elastic with hooks at one end and eyes at the other, to increase the effective length of the under-breast band of the brassiere. Generally those users have purchased brassieres which are too tight around the body
- 5 under the breasts, and the bra extenders are simply a means for modifying the tightness of the brassiere fastening around the body beneath the bust, and are not intended to be used to create an even looser fastening than that of a correctly fitted brassiere.
- 10 Given the range of styles of underwired brassiere and the different shapes available for the elastic gussets which connect the body band to the brassiere cups, it is not surprising that many women choose a brassiere size which is less than perfect for the wearer's body shape. It is an object of the invention to reduce the extent of this problem and to provide a novel and innovative method for designing for an
- 15 underwired brassiere an underwire shape which is capable of accurately following the true compound curvature of a female body as defined by the inframammary root.

THE INVENTION

- The invention provides a method for designing and producing an underwired brassiere
- 20 according to claim 1. The resulting underwired brassiere has an improved underwire shape. The design may be a custom design to create a brassiere underwire which in use has a shape and size which conforms to the measured shape of the inframammary root of an individual for whom the brassiere is being made, or it may be a design for a mass-produced brassiere, based on a notionally average inframammary root shape of a
- 25 notionally average individual or the inframammary root shape of an inanimate mannequin. When a mannequin is used as part of the design process to replicate the upper body shape of a notionally average individual, then it is essential that the mannequin body should replicate the size and shape of that average individual for whom the brassiere is to be designed. In addition however it is highly desirable that
- 30 the mannequin should replicate as closely as possible the flexibility and

compressibility of the human body, so that as the final brassiere is fastened around that mannequin the brassiere stretch and directions of stretch is as close as possible to those which will be experienced when the brassiere is worn by a live person. Throughout this specification and claims the term "mannequin" is used with the above
5 further considerations in mind.

Whether the design is a custom design for an individual or a design for a mass-produced brassiere, the final desired shape for each of the reinforcing underwires can be clearly traced. That shape is a three-dimensional shape which follows as closely as possible the three-dimensional shape of the inframammary root of the individual or
10 notional individual for whom the brassiere is being designed. Also, the intended final length of the brassiere body band is carefully measured to fit the under-bust girth. The brassiere body band is invariably elasticated or includes elasticated panels, and allowance has to be made for the stretch of the material of that body band and any
15 other elasticated elements of the brassiere as it is fastened around the wearer's body. The forces and direction of forces acting on the cup periphery can then be determined. The invention is based on the observation that those forces will tend to straighten out the arcuate shape of the underwire, and deform it to a new three-dimensional shape around the wearer's body. In the design process of the invention, that new three-
20 dimensional shape is initially identified as the desired final shape of the underwires, and working back from that desired final shape an initial shape for the underwires is determined and recorded. In a sample underwire or in a computer simulation, forces equal and opposite to the forces and direction of forces acting on the cup periphery in use are applied to an underwire of the final desired three-dimensional shape, and there
25 is thus created a new shape for each underwire. That new shape is recorded as an identified initial shape for each underwire. That initial shape does not correspond to the normal shape of an inframammary root contour, because it is a result of compressing an underwire created in such a normal shape. However it is to that new initial shape that the underwires are initially formed. It follows however that when
30 the underwired brassiere is worn, the tension in the brassiere body band and elsewhere in the elasticated panels of the brassiere bends the underwires out to the desired final shape which conforms accurately to the body shape of the intended wearer.

The underwires may be made of metal or of plastics material. One or both ends can be flared out into a rounded shape if desired, the better to protect the fabric of the brassiere pocket in which the underwire is to be housed. The underwires may be of circular section or of any other non-circular section which permits the underwire to be formed into the recorded three-dimensional shape. For example, if the underwires are made of metal they may have a generally rectangular section, and if they are made of plastics material they may have a generally elliptical section. Moreover the cross-sectional shape of the underwires may change along the path of the inframammary root in order to provide an optimum support for the breast.

Drawings

The invention is illustrated by the drawings, of which:

Figure 1 is one example of a desired final shape for each of the two underwires of an underwired brassiere.

Figure 2 is a schematic illustration of an underwired brassiere, in a relaxed state, with underwired cups. For simplicity the cup fabric is not shown, and the underwires and brassiere body band are shown as very simple shapes.

Figure 3 is an illustration of the brassiere of Figure 2 when the body band is stretched laterally as it would be when worn around the ribcage of a female wearer.

Figure 4 is a section (highly enlarged) through an underwire of Figures 1 to 3 having an oval cross-section.

Figures 5 and 6 are respectively a front elevation and a side view of an underwire of Figure 1, the two views together illustrating the three-dimensional shape of the underwire.

In the design of a brassiere underwire according to the invention, first the final desired shapes during wear of the underwires are identified. To create a bespoke underwired brassiere for an individual, that identification may be by means of a computer scan of the individual's body, or by shaping a length of malleable metal wire around each inframammary root of the individual, or by shaping any other malleable material to identify the precise three-dimensional shape of that inframammary root which is a track of where the breast tissue leaves the ribcage beneath each breast. To create a

design of an underwire for a mass-produced underwired brassiere, an inanimate mannequin with a suitable body shape and size may be used in place of the individual referred to above, or the notionally average body shape otherwise created in a computer. If a computer is being used in the design process and if the desired
5 inframammary route has been obtained by shaping a malleable wire or other material, then the resulting shape must be scanned or otherwise drawn into the computer so that the desired final shape of each of the brassiere cup underwires is recorded in computer memory. That desired final shape is illustrated in Figure 1, the individual underwires each carrying the reference 2.

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Next, the intended shape, material and decoration of the rest of the brassiere are designed. A typical shape is illustrated very schematically in Figure 2. The entire brassiere is given the reference numeral 1; the underwires are shown as 2; the elastic belt portions of the body band are shown as 3; and the fabric gusset joining together
15 the two cups is shown as 4. The cups themselves are not illustrated. The length of the body band 3 is slightly less than the under-bust measurement of the individual or mannequin for whom the brassiere is being designed, so that when fastened the elasticity of the body band exerts tension around the user's ribcage. Preferably according to the invention only one hook and eye spacing (not shown) between the
20 opposite ends of the body band 3 is provided, so that if the user has correctly measured her under-bust perimeter or girth, the brassiere will always be fastened to the same predetermined degree of tightness. User habits may however demand that a range of fastenings is provided, in which case they are preferably as close together as possible so that the user may appear to have a choice of tensions to which to fasten
25 the brassiere, but in reality that choice is limited to a very narrow range. From the design of brassiere it can be determined what forces are imposed in use on the fabric forming the brassiere cups when the body band is fastened around the user's ribcage beneath the breasts. Those forces are illustrated schematically in Figure 3 as four double-stemmed arrows around the right hand cup as illustrated (similar forces will be
30 imposed around the left-hand cup also) and one double-stemmed arrow extending to the right hand end of the body band 3.

The design process then reverts back to the desired final shape of the underwires as illustrated in Figure 1. Forces equal and opposite to the determined forces illustrated by the double-stemmed arrows of Figure 3 are applied to the underwires, using either a sample underwire or a computer simulation, and the resulting new compressed and distorted shape of each underwire is identified and recorded. It is to that new compressed shape that the underwires of the final underwired brassiere are made, as illustrated in Figure 2. It will be seen in Figure 2 that the width of the underwire cups, as illustrated by a double-headed block arrow, is less than the corresponding width in Figure 3. The entire shape of the underwires is also changed as between Figures 2 and 3. Figure 2 represents the brassiere in its relaxed state, whereas Figure 3 illustrates the final shape when the body band 3 is stretched around the user's ribcage by pulling apart and fastening the ends as depicted by the block arrows 5.

It will be appreciated that the shapes of the underwires in Figure 3 correspond very closely indeed to the desired shapes as illustrated in Figure 1. The relaxed shapes of Figure 2 are, however, much different and do not relate to a shape that would be comfortable for a wearer. In that respect a brassiere underwire designed by the design process of the invention differs from a conventional brassiere underwire shape, in which the initial shape of the underwire in its relaxed state would be based on the shape of the inframammary root.

Figure 4 illustrates a desirable cross-section of the underwires 2, whether that underwire is made of metal or of plastics material. Figures 5 and 6 demonstrate that the shape shown in elevation only in Figure 1 is in fact a three-dimensional shape, so that the equal and opposite forces to be exerted on the underwires 2 of Figure 1 are not planar but are vectors angled to relate to the body shape of the individual or mannequin or a notionally average body shape for which the underwire is being designed. Figure 5 also shows how an end (or possibly both ends) of the underwire can be formed rounded in order to prevent the underwire from damaging the material of the pocket in which it is retained in the brassiere cup and to protect the user from a painful experience if the underwire comes adrift from the pocket in the brassiere cup in use. Such rounded ends are easily achievable if the underwires are made of plastic,

but can also be engineered using metal wires, possibly by moulding resin around the end or ends of the underwires.

CLAIMS.

1. A method for designing and producing an underwired brassiere, comprising
 - 5 identifying a desired final shape which each of the brassiere cup underwires is to conform to in use, being a three-dimensional shape of the inframammary root of an individual or mannequin or a notionally average inframammary root of a notionally average individual to which the underwire is to be designed;
 - 10 determining the force and direction of forces imposed in use on the underwires by the stretched brassiere body when the brassiere is worn by the said individual or mannequin or notionally average individual;
 - 15 identifying an initial shape which would be assumed by each of the brassiere cup underwires by applying to brassiere cup underwires of the desired final shape a force equal and opposite to the determined forces imposed in use to create, on a sample underwire or in a computer simulation, a new shape in which the curve of the underwire is compressed by the applied force, and recording that new shape as the identified initial shape; and
 - 20 forming each of the brassiere underwires to the resulting recorded initial shape.
2. A method according to claim 1, wherein the underwires are made of plastics material.
- 25 3. A method according to claim 2, wherein the underwires are of elliptical cross-section.
- 30 4. A method according to claim 1, wherein the underwires are made of metal.

5. A method according to claim 4, wherein the underwires are of rectangular section.

6. A method according to any preceding claim, in which each of the underwires
5 is made with a cross-section which varies along its length to provide an optimal support to the breast.

7. A method according to any preceding claim, wherein one or both ends of the underwires are flared out into a rounded shape.

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