MOLDED BRA CUP AND METHOD OF MANUFACTURING THE SAME

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Appl. No.: 12/591,065

Filed: Nov. 6, 2009

Publication Classification

Int. Cl. A41C 3/00 (2006.01)

ABSTRACT

A bra cup is manufactured by an injection molding process. By injecting a liquid material into a mold and allowing the liquid material to cure into a desired bra cup shape, a wider variety of bra cups shapes may be manufactured. Additionally, the bra cup manufactured according to the injection molding process may not have the tendency to expand nor shrink, because the liquid material is cured directly into a solid state having the desired shape. Such an injection molding process may greatly increase the type of shapes that can be manufactured.
FIG. 3
MOLDED BRA CUP AND METHOD OF MANUFACTURING THE SAME

BACKGROUND

[0001] The manufacturing of bras, and specifically bra cups for bras, incorporates industrial processes in order to achieve a desired final product having the necessary shape, flexibility, and durability. Conventionally, bra cups are manufactured and later incorporated into bras or other articles of clothing. The bra cups themselves are formed using a compression molding process, in which a preformed solid foam form is created into a bra cup. A polyurethane foam is manufactured in the conventional method in a basic shape such as a cuboid or other hexahedron. The polyurethane foam is then placed in a mold and compressed into a desired bra cup shape. This way, the bra cup is formed by pressing the polyurethane foam. Additionally, the conventional processes include placing fabric into the mold with the foam, and simultaneously compressing the foam into the bra cup shape and bonding the foam to the fabric.

[0002] However, bra cups manufactured using the compression molding process suffer from a number of undesirable characteristics, and the types of bra cup shapes that can be manufactured using the compression molding process are limited. Because the bra cup is formed by pressing a foam into a shape that is different from its original state, the foam, now having varying densities according to varying thicknesses created during compression, has a tendency to expand or shrink back toward its original shape once formed into the bra cup shape, thus deforming the bra cup over time. Further, because the foam itself begins as a solid block with uniform thickness and is pressed into a desired shape, the foam must have a thickness greater than or equal to the maximum desired thickness of the thickest portion of the desired bra cup.

[0003] In the conventional compression molding manufacturing method, a foam block is provided to be formed into the bra cup, the foam is placed into the mold having a cross-sectional thickness equal to or greater than the maximum thickness of the bra cup to be manufactured. Thus, the minimum possible thickness of the resulting bra cup is dependent upon the compressibility of the foam and the thickness of the thickest portion of the desired bra cup shape. The possible shapes of a bra cup are further limited by the inability of the polyurethane foam form to be pressed into shapes with a large variation in thickness over a smaller area. The conventional compression molding process of manufacturing bra cups is therefore limited in the possible shapes and types of bra cups which can be manufactured.

SUMMARY

[0004] A method of manufacturing a bra cup using an injection molding process is therefore discussed below. Such an injection molding process may greatly increase the type of shapes that can be manufactured than can be possible using the conventional compression molding process described above. By injecting a liquid material into a mold and allowing the liquid material to cure into a desired bra cup shape, a wider variety of bra cups shapes may be manufactured. Because the bra cup is formed from a liquid material and not a preformed solid foam block, no limitation on the variation in thickness of a bra cup shape exists, and a bra cup with greater variation in the thickest portions and the thinnest portions is possible. Additionally, the bra cup manufactured according to the injection molding process may not have the tendency to expand nor shrink, because the liquid material is cured directly into a solid state having the desired shape.

[0005] This way, a number of bra cup shapes, discussed in exemplary embodiments below, having, for example, thin profile along an edge for greater invisibility against the bust of a wearer while providing push-up or a thicker apex for nipple coverage, may be possible. Such configurations may be considered to have an invisible pad when worn.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIGS. 1A and 1B illustrate a first exemplary embodiment of a bra cup formed by the injection molding process.

[0007] FIGS. 2A and 2B illustrate a second exemplary embodiment of a bra cup formed by the injection molding process.

[0008] FIG. 3 is an exemplary method for manufacturing a bra using the injection molding process.

DETAILED DESCRIPTION

[0009] FIGS. 1A and 1B illustrate a first exemplary embodiment of a bra cup formed by the injection molding process. As shown in FIG. 1A, a bra cup may be formed with a thick portion of at an apex of the bra cup, and thinner portions along the edges of the bra cup. Such a variation in thickness would allow for sufficient coverage of a nipple area while still providing a thin portion which may provide greater invisibility against the bust of a wearer. As shown in FIG. 1B, the bra cup of FIG. 1A may have thicker portions at the Apex B, and thinner portions around the Edges B of the bra cup. In exemplary embodiments, the Apex B may have a thickness of approximately 4 mm, and the Edges B may have a thickness B of 0.3 mm. Each individual edge may not be required to be of the same thickness.

[0010] FIGS. 2A and 2B illustrate a second exemplary embodiment of a bra cup formed by the injection molding process. As shown in FIG. 2A, a bra cup may be formed with a thicker push-up portion disposed at a bottom and an inside of a bra cup. As shown in FIG. 2B, the bra cup of 2A may have a thicker portion in a functional region such as a push-up area D, and become thinner in nonfunctional areas C, to provide greater invisibility against the bust of a wearer, similarly to the first exemplary embodiment. Here, a much greater variation between the thickness of the push-up area and the nonfunctional areas C is possible using the injection molding process described herein. For example, a bra cup having a push-up portion D of a thickness of approximately 21 mm and a nonfunctional areas C of a thickness of approximately 0.3 mm is possible. Though an exemplary bra cup of a push-up type is illustrated in FIGS. 2A and 2B, other bra types with thicker functional areas and thinner nonfunctional areas are possible with the injection molding process described herein. Examples of such additional functional types of bra cups include, but are not limited to, creating balconette-type shapes or providing extra support and shaping along the underarm.

[0011] FIG. 3 illustrates an exemplary method S300 of manufacturing a bra cup using the injection molding process.

[0012] At step S310, the method S300 begins.

[0013] At step S320, a liquid material is injected into a mold having the desired shape of the bra cup. Because the liquid material is injected into the mold in a liquid state, the bra cup resulting from the injection is not under the constraint discussed above with respect to the compression molding of foam blocks in the conventional art. Specifically, the resulting bra cup may not have a tendency to deform, and may have a constant density throughout. Because of this, the mold may be formed with greater variance between the thickest and...
thinnest portions of the desired bra cup shape because the liquid material may directly cure into a solid with the desired shape.

At step S330, curing of the liquid material into a solid having the shape of the bra cup defined by the mold occurs. Because the material used to form the bra cup is cured into a solid from a liquid state, the curing process may occur either in a closed mold or an open mold. Further, the curing process may occur at varying temperatures and durations of time to create a solid bra cup having a desired hardness, flexibility, or other material characteristics drawn to specific application requirements.

At step S350, which may occur optionally at any time before step S320, a reaction of a liquid material occurs. Generally, the reaction at step S350 may include any or all preparation steps of the liquid material necessary to place the material in a suitable state for being formed into the bra cup. The reaction itself may include a number of reactions with various types of gases as may be known in the art to place the liquid into a state in which it can be successfully molded into a desired shape. A polyurethane- or silicone-based material may, for example, react with atmosphere or another gaseous mixture approximating or matching the composition of atmosphere. Similarly, a latex- or rubber-based material may be reacted with nitrogen or a nitrogen-based gas as appropriate. Other combinations of materials and gaseous reactants suitable to use in method S300 specifically, or the method according to this application more generally, may be substituted as is known or may become known.

At step S360, which may occur optionally at any time before step S320, a cloth is applied to a mold. Such cloth may be applied in order to bond the cloth to the molded bra cup during the curing process, occurring at step S330, in which the bra cup is formed. If the cloth is not applied to the mold prior to the curing at step S330, the cloth may be applied, attached, bonded, or otherwise joined at any point after the curing in accordance with the assembly of a garment incorporating the bra cup.

At step S370, which may occur optionally at any time after step S330, post-processing of the solid bra cup occurs. Here, additional processing including, but not limited to, applying a coating to the bra cup to prevent discoloration or other deterioration of the bra cup, removal of flash or other post-manufacturing cleanup, or application of cloth or installation into a garment or product, may be performed.

At step S340, the method S300 ends.

Though certain specific embodiments and examples are given above with respect to both the injection molding process and the bra cup configurations resulting therefrom, the above descriptions are not to be taken to limit this disclosure to those descriptions. The bra cup and method of manufacturing the same may incorporate additional physical components or processes relating to bras, bra cups, or the manufacture of bras or bra cups, that may be known or may become known, without departing from the spirit and scope of the above disclosure.

What is claimed is:

1. A method of manufacturing a bra, the method comprising:
   - providing a material in a liquid state;
   - injecting the material in the liquid state into a mold by an injection molding process to mold the material in the liquid state into a bra cup within the mold; and
   - curing the material in the mold into a solid state to form the bra cup.

2. The method according to claim 1, further comprising reacting the material with a preparing agent prior to the injecting.

3. The method according to claim 2, wherein the material is polyurethane-based or silicone-based, and the preparing agent is atmosphere.

4. The method according to claim 2, wherein the material is latex-based, rubber-based, or silicone-based, and the preparing agent is nitrogen.

5. The method according to claim 1, further comprising applying cloth to the mold, prior to the injecting.

6. The method according to claim 5, wherein the cloth is bonded to the bra cup during the curing.

7. The method according to claim 1, wherein the mold is shaped to form a bra cup with a first region and a second region having a thickness greater than the thickness of the first region.

8. The method according to claim 1, wherein the mold is shaped to form a bra cup with a first region and a second region having a thickness at least fifteen times greater than the thickness of the first region.

9. The method according to claim 1, wherein the molding shapes a bra cup with a first region and a second region having a thickness at least fifty times greater than the thickness of the first region.

10. The method according to claim 7, wherein the first region and the second region are formed in contact with each other.

11. The method according to claim 8, wherein the first region and the second region are formed in contact with each other.

12. The method according to claim 9, wherein the first region and the second region are formed in contact with each other.

13. The method according to claim 1, wherein the curing further forms the bra cup such that the bra cup has a constant density throughout.

14. A bra cup formed by liquid-material injection molding, the bra cup comprising:
   - a first region having a first thickness and a first density; and
   - a second region having a second thickness greater than the first thickness and a second density equal to the first density.

15. A bra cup according to claim 1, wherein the second region is formed at a bust point area of the bra cup.

16. A bra cup according to claim 1, wherein the second region is formed in a push-up area of the bra cup.

17. A bra cup according to claim 1, wherein the bra cup further comprises a single injection-molded piece including first region and the second region.

18. The method according to claim 14, wherein the second region has a thickness at least ten times greater than the thickness of the first region.

19. The method according to claim 14, wherein the second region has a thickness at least fifty times greater than the thickness of the first region.

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