June 7, 1966 L. L. KRIEGER 3,254,653

SECURITY BRASSIERE

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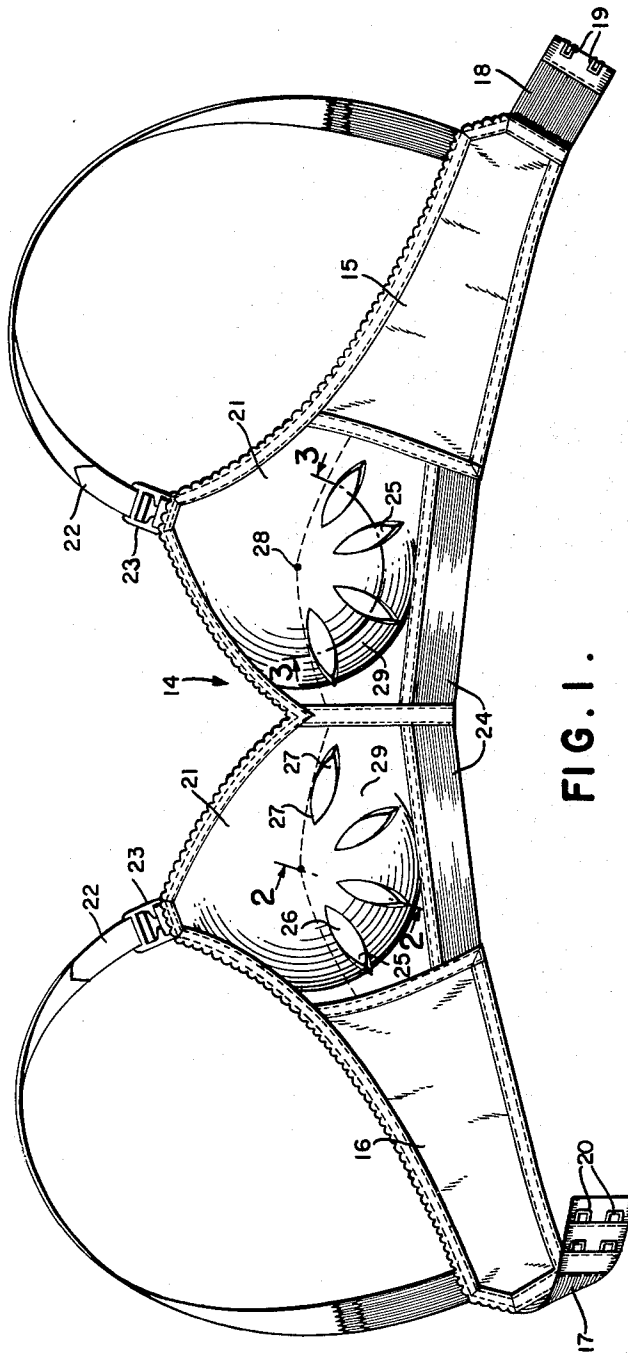


FIG. 1.

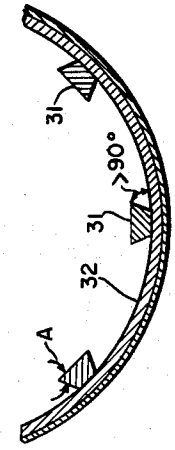


FIG. 4.

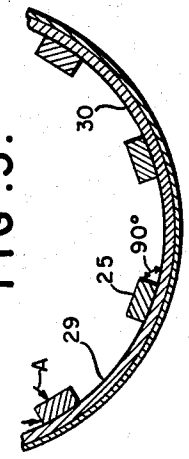


FIG. 3.

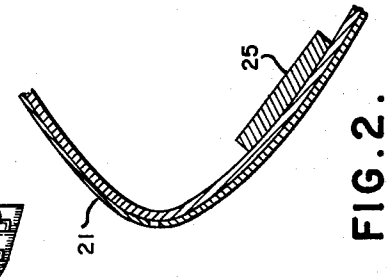


FIG. 2.

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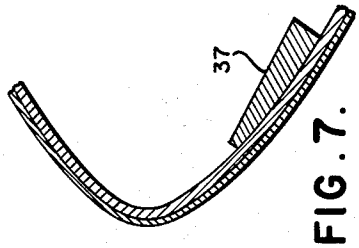


FIG. 7.

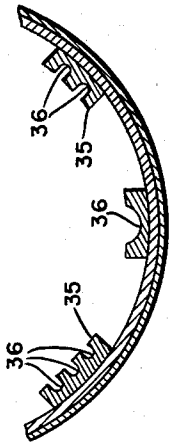


FIG. 6.

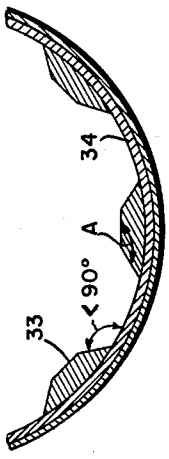


FIG. 5.

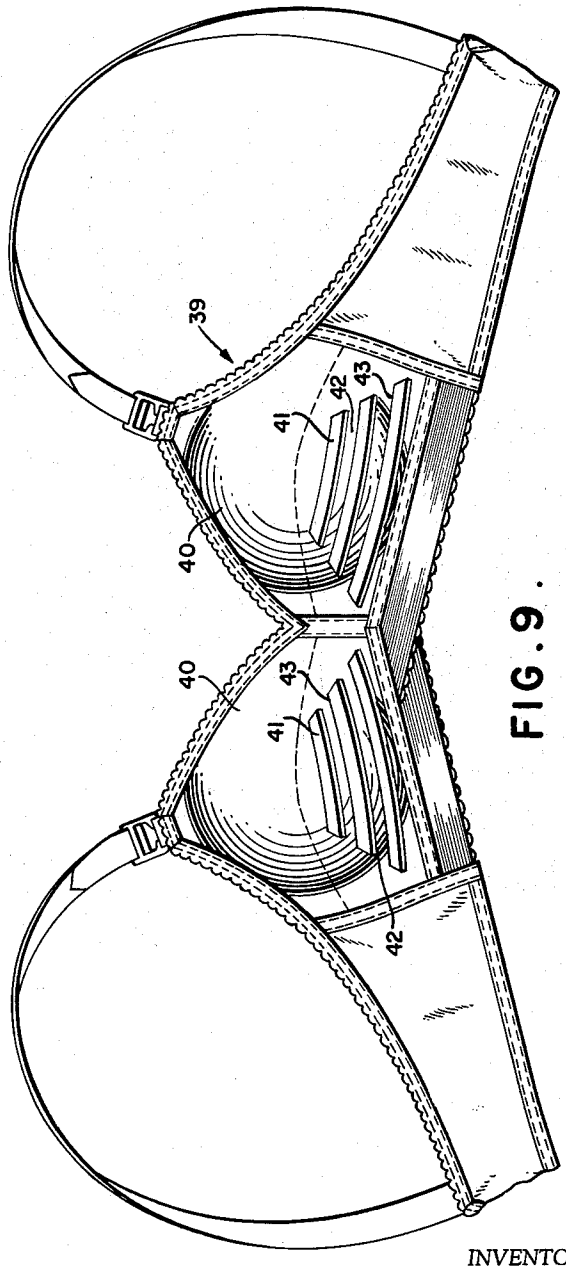


FIG. 9.

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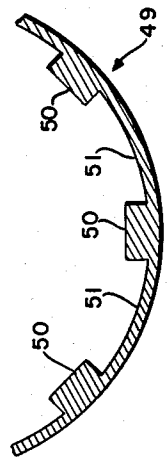


FIG. 11.

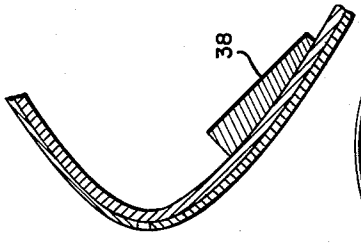


FIG. 8.

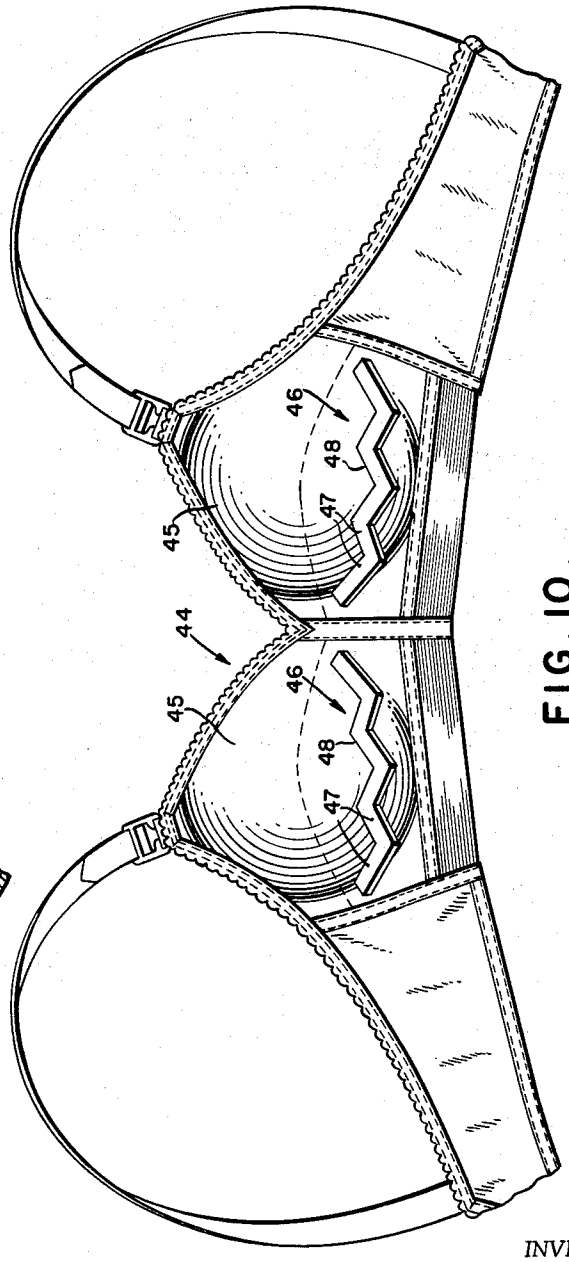


FIG. 10.

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SECURITY BRASSIERE

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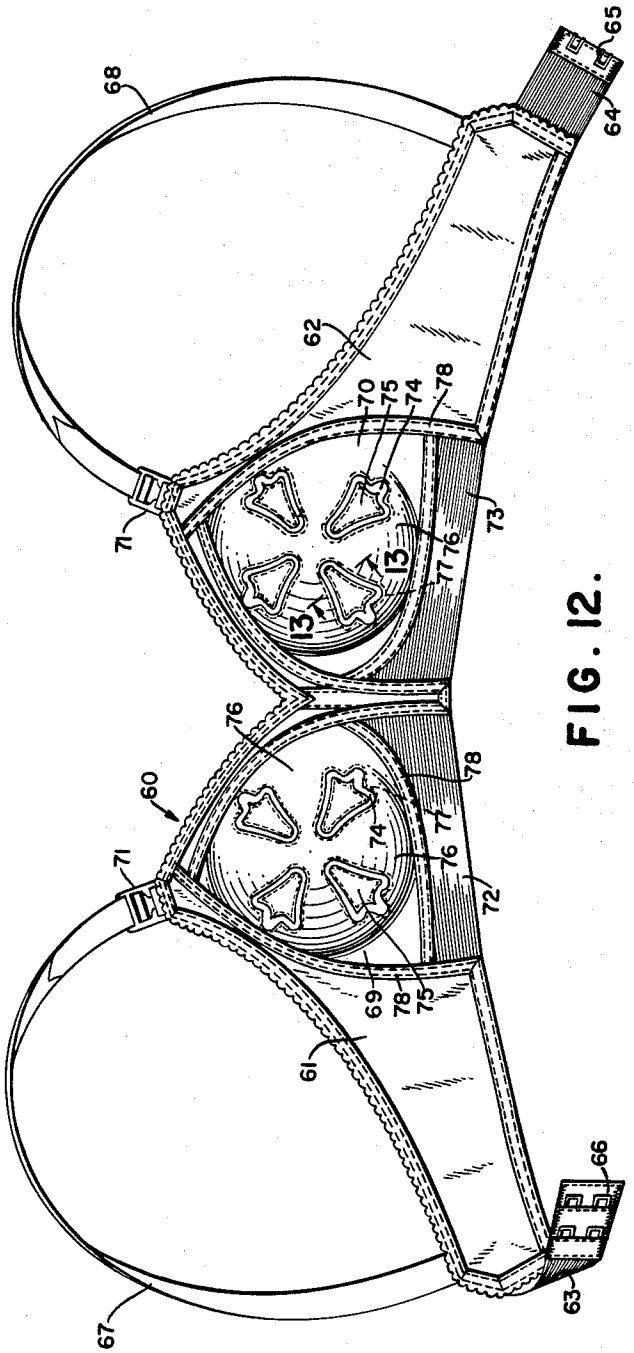


FIG. 12.

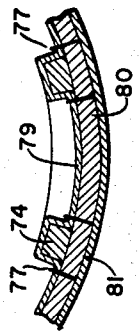


FIG. 13.

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SECURITY BRASSIERE

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Filed Feb. 12, 1962, Ser. No. 172,496
7 Claims. (Cl. 128—463)

This invention is a brassiere which gives greater security and assurance to the wearer and which moreover is adaptable to a wide variety of body sizes and shapes.

I have come to realize that conventional brassieres allow excessive movement of the breast itself within the breast cup. Both breast and cup are generally hemispherical, and a "ball-and-socket" kind of relative movement is possible, especially some downward rotation of the front surface of the breast. When the breast cups are formed not of sewn cloth but of a more self-sustaining reinforced material in the nature of molded plastic shells, even more do these tend to allow the breasts to slide and sag within the cups. In sports and some forms of dancing where exertive movement occurs, the breast will often shift its position and sag within the cup. This shifting mars the well-groomed look of the wearer and gives her a feeling of insecurity, and can moreover cause irritation of the skin of the breast, including the tender nipple area.

Another problem besetting the brassiere industry, apparently unrelated but which the present invention will also deal with, is the difficulty in making a brassiere that will properly fit a large number of body sizes.

Brassiere cup sizes are, of economic necessity, standardized in a few step gradations of size; and the actual distribution of sizes of women's breasts is only approximated by those step gradations. That is to say: most women's breasts are a little larger or a little smaller than the nearest size manufactured. Also, many women have breasts of which one or the other is larger, and the economic mass-produced brassiere with identical right and left breast cups cannot perfectly fit both. Moreover, the size and shape of the breasts vary cyclically over periods of time, making it more thoroughly difficult for one predetermined size of cup to be a perfect fit.

This invention is to substantially eliminate undesirable movement of the breast within the breast cup, give a feeling of security to the wearer even after exertive movement, and give a proper fit regardless of variations or changes in the breasts.

These and other objects are accomplished by the brassieres of the present invention which provide in the inner surface of the lower half of each breast cup at least one elevated, skin-engaging jut of flexible resilient material which is partially compressible by the weight of the breasts and acts as an anti-slip member to hold the flesh of the breast against slipping within the cup. The jut comprises a raised surface which presses into the flesh of the breast and holds it against slipping and sagging within the cup. Two or more of these security juts or gripping members may be provided in each cup, each having substantial height and width and with spacing between them to form depressions or valleys in which some of the flesh of the breasts becomes positioned and held against excessive movement. The raised jut surfaces advantageously may comprise no more than about 25% of the surface area of the lower half of the cup. Advantageously also the valleys have dimensions such that the greatest distance between the juts is greater than the width of the juts' raised surfaces and greater than the height of the juts. It has been found particularly advantageous for each jut to have four inches or more of circumferential length for each square inch of raised surface area. The juts may be made in a variety of shapes

and sizes having different ratios of length to width and to height and include solid figures as well as the raised outlines of figures. One advantageous form is a biconvex shape which is preferably positioned in the cup with one end spaced from but pointing to the apex or nipple area of the cup. Other shapes include bars, squares, rectangles, stars, flowers, bells and the like.

The highly flexible, resiliently compressible security juts engage the flesh of the breast, and where more than one is used in spaced relationship they engage the flesh of the breasts with a spring-like clamping and gripping action somewhat in the manner of supporting fingers. The flesh of the smaller breast will become positioned in and partially fill the valleys between the juts and will slightly compress the juts. The larger breast will more completely fill the valleys and will compress the juts to a greater extent, but in both cases the skin-engaging action will hold the breasts from excessive movement within the cups. The juts are made of flexible, resilient material so that practically no sensation of pressure is experienced and a snug fit is obtained regardless of differences in size of the breasts.

As was mentioned earlier, the breast and the brassiere cup, both being substantially hemispherical in shape, act somewhat in the nature of a ball and socket joint, affording undesirable likelihood to the breast of slipping and moving within the cup, and the present invention restrains the breast from excessive movement by providing at least one anti-slip jut in the lower half of the cup to present surfaces which oppose the motion of the breast. The greatest movement of the breast occurs as a rotational motion about the transverse horizontal axis of the breast, or displacement along the vertical axis of the breast. In preferred embodiment the juts in the breast cups have substantial transverse horizontal vector components. Other embodiments, where the juts are not arranged primarily in a horizontal position, will still have vector effects that can give effective resistance to movement. The present invention thus provides important restraint against undesired slippage, avoids irritating rubbing of the skin, and gives the wearer a feeling of security and assurance.

The drawings which accompany and form part of this specification illustrate the invention which is however not to be taken as limited to just the embodiments shown.

In the drawings the smaller views show some sections and details. Specifically:

FIG. 1 is an elevational view of the inside of one brassiere made in accordance with the invention;

FIG. 2 is a sectional view along line 2—2 of FIG. 1;

FIG. 3 is a transverse sectional view along line 3—3 of FIG. 1;

FIG. 4 is a transverse sectional view showing undercut juts;

FIG. 5 is a transverse sectional view showing the juts having a base that is broader than the top;

FIG. 6 is a transverse sectional view showing the juts with indented top surfaces;

FIG. 7 is a sectional view where the juts are tapered;

FIG. 8 is a sectional view where the juts have a reverse taper from that shown in FIG. 7;

FIG. 9 is an inside view in elevation, of a portion of a brassiere showing an embodiment of the invention having bar-shape juts;

FIG. 10 is an inside view in elevation, of a portion of a brassiere showing an embodiment of the invention having zig-zag juts;

FIG. 11 is a transverse sectional view of a brassiere cup having integrally formed juts;

FIG. 12 is an elevational view of the inside of a brassiere having a different embodiment of the invention in

that each jut comprises a strip of material in the raised outline of a generally bell-shaped figure;

FIG. 13 is a sectional view along line 13—13 of FIG. 12.

FIG. 1 illustrates one embodiment in which a brassiere **14** has body-encircling bands comprising dorsal sections **15** and **16**, and elastic sections **17** and **18** which carry complementary fastening means such as hooks **19** and eyes **20**. The brassiere has breast cups **21** which have shoulder straps **22** connected to the tops of the cups by means of slidable buckles **23**. Below the breast cups are front panels **24** which may be of elastic material. On the inner surface or floor of each cup **21** in accordance with this embodiment of the invention are radially arranged spaced, discrete, skin-engaging juts **25** which rise above the inner surface of the cup. The juts are biconvex in shape and each has a relatively wide central area **26** which presses into and depresses the flesh of the breast over a substantial area without undue pressure. Their end areas **27** have a narrower contour and present sharper lines to give more bite for traction to prevent slippage. The juts in this embodiment, for an average 34B-size brassiere, rise about ¼ inch above the inner surface of the cup, are spaced about ¾ inch from each other and are about 1½ inches long and about ½-inch wide at their widest point. The juts have an average perimeter of about 3.8 inches and an average raised surface of about 0.66 sq. inch so that there are approximately 5.7 inches of circumferential length for each square inch of raised surface area. The juts are spaced from the apex area **28** of the cups so as not to press upon the tender area of the nipples and also to avoid interference with the contour of the breast in this area. They form a series of depressions or valleys **29** that extend across the nipple area and communicate directly, between the juts, with the periphery of the cup, and these valleys provide space in which some of the flesh of the breasts may become positioned. The juts may be secured to the inner face of the breast cups by sewing, glueing or other method.

Foam material and nonwoven fabrics such as Nysulloft and Pellon are included in the materials of which the juts may be made. They may be left uncovered, covered with a fabric such as cotton broadcloth, Helanca, or the like, or flocked with short textile fibers. It is presently preferred when the juts are made of foam rubber that they be covered.

It will be noted that for the most part the cup has the same shape that the breast will assume when secured in it and the juts of FIG. 1 for example constitute a relatively minor portion, e.g., approximately 24% of the inner surface of the lower half of the cup. A substantial area of the breast will be in contact with the area of the cup which is free of the juts and the breast will fit snugly and smoothly in the generally hemispherical surface of the cup proper. A natural feel and appearance is thus maintained with the juts serving to hold the breast against slippage without undue alteration of the breast contours. In this connection it should be noted also that the instant invention is primarily for anti-slip purposes and is distinguished from prior art brassieres which use massive padding in the cup to pad out or push up under-developed breasts.

FIG. 2 shows a section through one of the juts **25** along the line 2—2 of FIG. 1. It shows that the top surfaces of the juts may be flat and their walls vertical.

FIG. 3 illustrates the relative positions of the juts along line 3—3 of FIG. 1. The walls of the juts make a 90° angle with the inner surface or floor **30** of the cup. The valleys **29** are advantageously substantially twice as long as the juts **25** are high and allow room into which some of the flesh of the breast will become positioned. The upper corners of the juts describe angles A which are approximately 90° and make abrupt upper edges which effectively engage the flesh of the breast.

In FIG. 4 the walls of the juts **31** make an angle with the inner surface or floor **32** of the cup which is less than 90°. The angles A in this illustration are also smaller than 90° and make even more abrupt edges than those of FIG. 3. All other factors being the same, such as the material of which the juts are made and their size and arrangement, the holding and gripping power of the arrangement in FIG. 4 is theoretically greater than the arrangement shown in FIG. 3.

In FIG. 5 the walls of the juts **33** make an angle which is more than 90° with inner surface of the cup **34** and the angles A are also greater than 90°. While this arrangement will effectively engage the flesh of the breast and prevent slippage within the cup, it is more gentle and less restraining than those of FIG. 3 or 4.

In FIG. 6 an added feature of the invention is shown. The juts **35** illustrated there do not have smooth top surfaces, but are provided with one or a plurality of grooves **36** in the surface of each jut. Thus the surfaces of the juts **35** are serrated or ridged and their lands and grooves provide configurations of smaller dimensions than those of the jut itself, imposed upon its surface, to give at once a large-scale and a small-scale gripping pattern. Thus flesh of different characteristics is still well served in anti-slip action either by the large-scale variations or the small-scale variations, or both in combination.

FIGS. 7 and 8 depict additional features of the invention. The jut **37** of FIG. 7 is larger in the rear and tapers to the front where it is smaller. This tapered construction allows the larger rear end to project more deeply into the flesh and thus give more gripping action than the front. This is of advantage where the rear areas of the breast are lacking in fullness. Conversely, jut **38** in FIG. 8 has a reverse taper to that shown in FIG. 7 and is of advantage where the front of the breast is not as full as the rear and requires a higher jut to give effective holding and gripping against slippage.

In FIG. 9 the numeral **39** designates a brassiere to which the invention is applied where the cups **40** have bar-shaped juts **41**. Between each jut **41** there is a valley **42** which provides space within which the breast may become positioned. The juts are disposed in a generally horizontal arrangement and have edges **43** which directly oppose any downward movement of the breasts. In this embodiment, for a 34B-size brassiere, the juts are approximately ⅜" wide and range in length from about 3" for the shortest jut to about 5" in length for the longest jut. The valleys **42** are about ⅝" wide between juts. The juts in this figure extend horizontally for practically the full extent of the breast cup; they may however be shorter in length.

FIG. 10 shows a brassiere **44** wherein the practice of this invention is illustrated with only one jut in each breast cup. As shown, breast cups **45** have a single elevated jut **46** which has a zigzag shape. Here the jut **46** is arranged also in a generally horizontal direction but has angular portions **47** with edges **48**. The angular portions **47**, pointing in a somewhat upward direction will oppose sidewise movements in addition to downward movements, due to vector effects of the juts.

FIG. 11 is a transverse sectional view of a brassiere cup **49** and projecting juts **50** all made of one piece of material and having valleys **51**. The fabrication of a unitary, one piece article having projecting parts from nonwoven fabrics or sponge or foam rubber are well known procedures which do not form part of this invention. Nonwoven fabrics for example may be molded to form the raised jut by embossing, stamping, etc. Cellular rubber products may be produced by placing suitable rubber compounds in molds having the desired shape and then causing cellular structure to occur by chemical or other means after which curing of the cellular rubber article is carried out. These and other processes are all well known in the molding art and many excellent reference works are available for the purpose. This method of

practicing the present invention by producing a unitary brassiere cup with projecting juts offers additional advantages in low cost and ease of manufacture and such cup with integral juts may be incorporated into a brassiere by methods well known in the brassiere art such as sewing, etc.

FIG. 12 illustrates a still further embodiment of the invention where the juts define the raised outline of a generally bell-shaped figure. It comprises a brassiere **60** having a pair of side sections **61** and **62** which are adapted to extend around the sides to the back of the wearer. End sections **63** and **64** are of elastic material and carry complementary fastening means such as hooks **65** and eyes **66** enabling the brassiere to be fastened in place on the body of the wearer. Shoulder straps **67** and **68** are attached to the tops of the breast cups **70** by means of slidable buckles **71**, and attached as by sewing to fixed spaced positions on the back of the side sections.

Attached to the bottom edges of the breast cups are front panels **72** and **73** which may be elastic leno cloth stretchable primarily in a horizontal direction and substantially inelastic in a vertical direction. The tops of the panels **72** and **73** are concavely shaped to conform to the bottom edges of the breast cups while the vertical edges of the panels constitute continuations of the side edges of the breast cups. The panels **72** and **73** thus cooperate with the breast cups and form a firm support for the breasts and prevent the escape of the flesh of the lower portion of the breast.

In accordance with the present invention the brassiere has juts **74** disposed on the inside of the breast cups. The juts in this illustration generally resemble the outline of a bell and rise above the inner surface of the breast cup much in the same way that an atoll rises above the surface of the ocean. The valleys **75** of the inner surface of the breast cup which are encompassed within the inner periphery of each jut, and the valleys **76** which adjoin each jut, provide room in which some of the flesh of the breast becomes positioned. For a 34B-bra, each valley **75** is about 1½ inches long, about ⅛-inch wide at its narrowest point and about ¾-inch wide at its widest point.

The juts themselves are about $\frac{9}{32}$ inch in width and rise about ⅛ inch above the inner surface of the cup. Each valley **76** is about 1¼ inches wide at the greatest distance between juts and about ¾ inch wide at the shortest distance between juts. The juts have an average circumference of about 5½" and an average raised surface of about 1.2 sq. inches so that there are approximately 4½ inches of circumferential length for each square inch of raised surface area. It is to be understood that these dimensions may be varied according to the different sizes of brassieres and of course according to the material of which the juts are made. Each breast cup is made of a base fabric **80** to which the juts are secured in any suitable manner as by glueing or sewing. A second layer of fabric **79** (FIG. 13) for example Helanca is placed upon the inner surface of the cup to cover the juts and sewed with stitching **77** along the inner and outer peripheries of each jut. The stitching **77** serves also to define the outline of the juts. The Helanca fabric covers the entire inner surface of the cup and is sewn to the outer edges of the breast cup along its entire periphery by stitching **78**. A front-facing fabric **81** is also provided and may be secured in any conventional manner. In use, the breasts of the wearer are held against moving in the cup by the juts **74** which press into the breast and act as anti-slip tread members. By the juts having an outer surface which lies wholly within the boundaries of the cup and which is closed upon itself as shown in FIG. 12, maximum bridging effect is obtained and thus maximum accommodation to different sizes of breasts. Wherever the flesh of the breast extends from the inner surface of the cup to the raised edge of a jut, it carries out a bridging effect. The smaller breast will bridge in a straighter line whereas the larger breast will, in bridging, be positioned farther down into the angle portion between the inner surface of the cup and the raised jut. The degree of accommodation through differences in bridging action is a function of the linear extent of the jut lying wholly within the boundaries of the cup. The specified relation maximizes the accommodating effect while maximizing also the security gripping action. The fact that the juts have surfaces which extend in all directions of orientation within a given sector of the cup means that security gripping against relative motion in any direction is provided within a limited locality. In the form illustrated the several juts give anti-slippage security throughout and also hold all portions of the breast firmly in place, not allowing parts of the breast to pile up and pinch other parts.

The juts are flexible and resiliently compressible by the weight and pressure of the breasts. They may be made from a wide variety of materials including nonwoven fabrics and cellular materials. A nonwoven fabric may be defined as a web or continuous sheet of staple length fibers, laid down mechanically or deposited by air, where the fibers are arranged in an oriented or random manner and bonded together with an adhesive. A fuller discussion of these materials may be found in Nonwoven Fabris published by Nonwovens Associates in 1959. Cellular materials which are useable comprise easily compressible foams such as foam rubber, foam latex, foam vinyl polymers, foam polyurethane polymers, and the like, which may be of either the open cell or closed cell variety. The material of which the juts are made must not be so stiff and rigid that they cannot be partially compressed by the breasts yet should be firm enough to offer some resistance to the movement of the breasts. The more easily compressible is the material, the taller may be the juts. Conversely the less easily compressible is the material, the shorter may be the juts.

The advantages of the present invention are obtained when the juts rise from about $\frac{3}{32}$ inch to about ⅜ inch above the inner face of the cups. It has been found for example that a material which is compressed 25% of its original thickness by a force of 9 to 13 lb. per square inch may advantageously be used in heights ranging from $\frac{3}{32}$ inch to about $\frac{9}{32}$ inch. Materials which are compressed 25% of their original dimension by a force of 2 to 5 lb. per square inch may advantageously be used in heights of about $\frac{4}{32}$ inch to about $\frac{8}{32}$ inch and materials which are compressed 25% of their original height by a force of 0.45 to 0.75 lb. per square inch may advantageously be used in heights of about $\frac{9}{32}$ inch to about $\frac{12}{32}$ inch.

The juts of this invention should be made of materials which have a relatively low compression set, that is a high tendency to return to their original height when the weight of the breasts is removed.

Many variations from the illustrative forms shown may be made and still be within the teaching, spirit and scope of the invention.

I claim:

1. A brassiere having a body-encircling member and breast cups, each cup having an inner surface which for the most part is generally hemispherical and forms a smooth continuous contour, said cups having in the lower half thereof at least one skin-engaging raised jut, said juts projecting above the surface of the inner face of each cup and being of a readily compressible, resilient material and having surfaces with substantially transverse horizontal vector components for pressing into the flesh of the breast in a plurality of spots, each jut having a surface configuration such that a portion of the jut faces in the direction of the center of the cup, whereby said juts hold the breast against slippage and sagging while producing a lifting support of the under portion of the bust in the direction of the center of the cup, allowing

the rest of the bust to fit smoothly and uniformly against the generally hemispherical, smooth continuous contour.

2. The brassiere of claim 1 in which the juts project at least three-thirty-seconds of an inch above the surface of the inner face of the cup.

3. The brassiere of claim 1 in which the juts are formed from an anti-slip foam.

4. The brassiere of claim 1 in which the juts are formed from nonwoven fabric.

5. The brassiere of claim 1 in which spacing between juts is greater than twice their height.

6. The brassiere of claim 1 in which the body-contacting surface of each jut has a depressed contour to provide additional gripping of the bust.

7. The brassiere of claim 1 in which the shape of each jut is contoured to provide additional gripping of the bust.

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