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(71) Applicant: **ASICS Corporation**
Kobe-shi, Hyogo 650-8555 (JP)

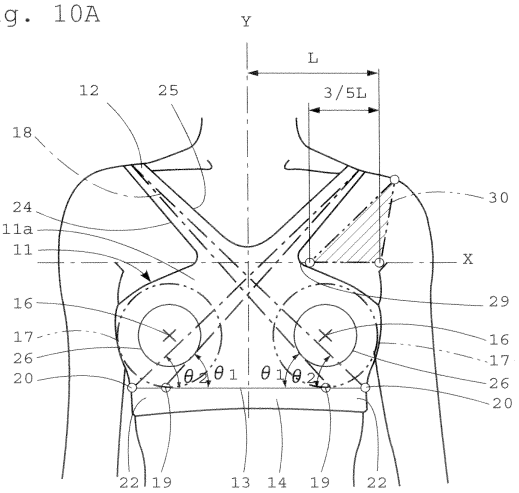
(72) Inventors:
- **TAKAMOTO Yoshikuni**
  Kobe-shi
  Hyogo 650-8555 (JP)
- **OCHIAI Riko**
  Kobe-shi
  Hyogo 650-8555 (JP)
- **OMURO Mamoru**
  Kobe-shi
  Hyogo 650-8555 (JP)
- **TSUJI Yoshie**
  Kobe-shi
  Hyogo 650-8555 (JP)
- **KATSU Makoto**
  Kobe-shi
  Hyogo 650-8555 (JP)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser
Leopoldstrasse 4
80802 München (DE)

(54) BRAZIER

(57) In order to produce an effect of suppressing movement of breasts while limiting a range in which the breasts are compressed, to thereby reduce compression on various parts of internal organs such as a heart and lungs, the breasts, and the like and, at the same time, prevent chafing of a skin, provided is a brassiere including: a brassiere main body I made of a front body for covering a chest and a back body for covering a back; right and left shoulder straps 12 provided between upper end edges of the front body and the back body; an under belt 14 that is provided at a lower end edge of the brassiere main body 11 with an intermediation of an under-bust line 13; and a pair of right and left cup parts 17 provided in the front body. An attachment angle θ of the shoulder straps 12 to the brassiere main body 11 is defined by such an angle that an intermediate line 18 of each shoulder strap 12 extends to pass through a central portion of the cup part 17 at a diagonal position of the shoulder strap 12 and reach a range including an inferior point 19 of a bust point and inferior point 20 of an anterior axilla point on the under-bust line 13.

Fig. 10A



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Description

Technical Field

[0001] The present invention relates to a brassiere, and, more particularly, to a brassiere that suppresses movement of breasts during exercise and prevents chafing of a skin of a human body. The present invention is suitably applied to a sports brassiere and the like.

Background Art

[0002] Suppression of movement of breasts during exercise is required as an important function of sports brassieres, and various sports brassieres each having a movement suppressing function have been known conventionally (Patent Literatures I to 4).

[0003] Such conventional sports brassieres are common in increasing the compressions (compression pressures applied by the brassiere in wear) of cup parts and an under belt and tightening breasts, to thereby suppress movement of the breasts. Such conventional sports brassieres are also common in that shoulder straps are attached to a brassiere main body at a substantially right angle to an under-bust line.

[0004] Fig. 11 illustrates an example of a conventionally known sports brassiere. This brassiere includes: a brassiere main body 11 made of a front body for covering a chest and a back body for covering a back; and right and left shoulder straps 12 provided between the upper end edges of the front body and the back body. An under belt 14 is provided at the lower end edge of the brassiere main body 11 with the intermediation of an under-bust line 13.

[0005] Bust points 16 are respectively positioned in the right and left of the front body of the brassiere main body 11, and a given range that covers a breast about each of the bust points 16 is referred to as a cup part 17. Pads are fitted as appropriate to the rear surface of the brassiere main body 11 with reference to the positions of the bust points 16. An attachment angle θ of the shoulder straps 12 to the brassiere main body 11 is approximately 90°.

[0006] According to the conventional sports brassiere configured as described above, the entirety thereof is brought into close contact with a wearer body, the compression of the cup parts 17 and portions therearound is increased by flexibility of the material thereof, and the breasts are compressed to be thereby suppressed from moving.

[0007] Meanwhile, Patent Literature 4 discloses a front-open type brassiere, in which parts of shoulder straps are in contact with the insides of cup parts, and the lower ends of the shoulder straps reach side parts of the under belt, respectively.

[0008] Note that, for ease of the following description, names of other parts of the brassiere than those described above are defined in the following manner.

[0009] Inferior point 19 of bust point: a point on the under-bust line 13, of a vertical line drawn from the bust point 16

[0010] Inferior point 20 of anterior axilla point: a point on the under-bust line 13, of an anterior axillary line 21

[0011] Side part 22 of under belt: a portion of the under belt 14 between the inferior point 19 of the bust point and the inferior point 20 of the anterior axilla point

[0012] Front part 23 of under belt: a front central portion of the under belt 14 between the right and left inferior points 19 of the bust points

Citation List

Patent Literature

[0013]

Patent Literature 1: Japanese Patent Application Laid-Open No. 2003-221705

Patent Literature 2: Japanese Patent Application Laid-Open No. 2006-104613

Patent Literature 3: Japanese Patent Application Laid-Open No. 2009-133027

Patent Literature 4: US 5378192 A (the 6th line to the 8th line in the first column, the 18th line in the third column to the 38th line in the fourth column, and Figs. 3 and 6)

Summary of Invention

Technical Problem

[0014] Movement of breasts during exercise provokes extension and damage of Cooper's ligaments inside of the breasts, and causes sagging of the breasts. If the compression of the cup parts or the portions therearound is increased to suppress the movement of the breasts as in the conventional sports brassieres, a heart, lungs, and internal organs are compressed, which is not desirable. Further, if the compression of the cup parts or the under belt is excessive, the positions and forms of various parts of the internal organs may be unfavorably changed.

[0015] Moreover, in the conventional structure, a wide region ranging over the cup parts 17 and the portions therearound is tightened, and the attachment angle θ of the shoulder straps 12 to the brassiere main body 11 is substantially 90°. Hence, a large portion of the brassiere in the conventional structure overlaps with a large skin strain area 30 during exercise. For this reason, chafing of a skin is likely to occur, and the brassiere main body 11 is likely to be slid upward in the course of the exercise.

[0016] Similarly in the brassiere described in Patent Literature 4, the shoulder straps only pass through extremely small portions inside of the cup parts. Hence, an effect of obliquely holding breasts is small, and almost no effect of suppressing movement of the breasts is produced.

[0017] Note that the large skin strain area 30 refers to a triangular range surrounded by points X1, X2, and X3 in the drawings. X1 denotes an acromion, X2 denotes an anterior axilla point, and X3 denotes a point at 3/5 of a distance L from the anterior axilla point X2, the distance L being a distance between: the anterior axilla point X2; and an intersection point X4 between a horizontal line X from the anterior axilla point and a midline Y.

[0018] In view of the above, the present invention has an object to produce an effect of suppressing movement of breasts while limiting a range in which the breasts are compressed, to thereby reduce compression on various parts of internal organs such as a heart and lungs, the breasts, and the like and, at the same time, eliminate an overlap range with a large skin strain area during exercise, thus preventing chafing of a skin.

Solution to Problem

[0019] In order to solve the above-mentioned problems, the present invention provides a brassiere including: a brassiere main body made of a front body for covering a chest and a back body for covering a back; right and left shoulder straps provided between upper end edges of the front body and the back body; an under belt that is provided at a lower end edge of the brassiere main body with an intermediation of an under-bust line; and a pair of right and left cup parts provided in the front body. An attachment angle of the shoulder straps to the brassiere main body is defined by such an angle that an intermediate line of each shoulder strap extends to pass through a central portion of the cup part at a diagonal position of the shoulder strap and reach a range including an inferior point of a bust point and an inferior point of an anterior axilla point on the under-bust line.

[0020] In the present invention, an outer circumferential circle of the cup part is defined by a circle having a radius that is a distance between the bust point in a center of the cup part and the inferior point of the bust point on the under-bust line, and a range of the central portion of the cup part is defined by a concentric reference circle having a radius that is 0.6 times the radius of the cup part.

[0021] Specifically, an inclination angle of the intermediate line to the under-bust line falls within a range between a largest inclination angle $\theta 1$ defined below in (1) and a smallest inclination angle $\theta 2$ defined below in (2):

(1) the largest inclination angle $\theta 1$ is defined by such an angle that the intermediate line that passes on an inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through an inside of the reference circle and reach the range including the inferior point of the bust point and the inferior point of the anterior axilla point on the under-bust line; and
(2) the smallest inclination angle $\theta 2$ is defined by such an angle that the intermediate line that passes on an outer side of the bust point of the cup part at the diagonal position or passes through the bust point extends to come into contact with the reference circle or pass through the inside of the reference circle and reach the range including the inferior point of the bust point and the inferior point of the anterior axilla point on the under-bust line.

[0022] Alternatively, an inclination angle of the intermediate line to the under-bust line may fall within a range between a largest inclination angle $\theta 1$ defined below in (1) and a smallest inclination angle $\theta 2$ defined below in (2):

(1) the largest inclination angle $\theta 1$ is defined by such an angle that the intermediate line that passes on an inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through an inside of the reference circle and reach the inferior point of the bust point on the under-bust line; and
(2) the smallest inclination angle $\theta 2$ is defined by such an angle that the intermediate line that passes on the inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through the inside of the reference circle and reach the inferior point of the anterior axilla point on the under-bust line.

[0023] Further, a medial reference line that passes through a medial point of a smallest-width portion of the shoulder strap and is parallel to the intermediate line that defines the largest inclination angle $\theta 1$ passes through the inside of the reference circle along this intermediate line, and a lateral reference line that passes through a lateral point of the smallest-width portion of the shoulder strap and is parallel to the intermediate line that defines the smallest inclination angle $\theta 2$ passes through the inside of the reference circle along this intermediate line.

[0024] Further, an armhole is formed between a lateral edge of each shoulder strap and the upper end edge of the front body, and a maximum curvature point of the armhole is set on an inner side of a point at 3/5 of a distance from the anterior axilla point to a midline, on a horizontal line from the anterior axilla point.

[0025] The attachment angle of the shoulder straps to the brassiere main body is defined as described above, whereby an obliquely acting tension is partially applied to each side part of the under belt across the cup part located at the diagonal position of each shoulder strap (the cup part at the diagonal position with respect to each shoulder strap), with the result that movement of breasts is suppressed.

[0026] The attachment angle of the shoulder straps is more greatly inclined in a direction in which the lower end thereof approaches the midline of a wearer body, compared with conventional cases. Accordingly, an armhole can be formed so as to be greatly curved along each shoulder strap thus configured, and an overlap with a

large skin strain area can be avoided.

Advantageous Effects of Invention

[0027] As described above, the brassiere of the present invention can locally increase the compression of the side parts of the under belt at the respective diagonal positions by means of the tensions of the shoulder straps, to thereby suppress movement of breasts. Although the compression of the side parts of the under belt is increased, the compression of the under-chest part does not need to be increased, and the compression applied to the breasts is partial. Hence, compression on a heart, lungs, and various parts of internal organs is reduced.

[0028] Further, the armholes can be formed at positions that do not overlap with the large skin strain area. Hence, chafing of a skin is prevented, the degree of freedom in motion such as an arm swing is increased, and the brassiere main body is prevented from sliding up due to a motion.

[0029] Accordingly, the brassiere of the present invention is suitably applied to sports.

Brief Description of Drawings

[0030]

Fig. 1A is a front view illustrating a wear state of a sample a in Experiment 1.
Fig. 1B is a front view illustrating a wear state of a sample b in Experiment 1.
Fig. 1C is a front view illustrating a wear state of a sample c in Experiment 1.
Fig. 2A shows a movement track of a right breast.
Fig. 2B shows a movement track of a left breast.
Fig. 3A is a graph showing a relation between an under-armpit part compression and an up-down movement.
Fig. 3B is a graph showing a relation between the under-armpit part compression and a right-left movement.
Fig. 4A is a graph showing a relation between an under-chest part compression and the up-down movement.
Fig. 4B is a graph showing a relation between the under-chest part compression and the right-left movement.
Fig. 5A is a front view illustrating a wear state of a sample A in Experiment 2.
Fig. 5B is a front view illustrating a wear state of a sample B in Experiment 2.
Fig. 5C is a front view illustrating a wear state of a sample C in Experiment 2.
Fig. 5D is a front view illustrating a wear state of a sample D in Experiment 2.
Fig. 5E is a front view illustrating a wear state of a sample E in Experiment 2.
Fig. 6 is a graph showing measurement results of the under-armpit part compression.
Fig. 7A is a graph showing measurement results of the up-down movement.
Fig. 7B is a graph showing measurement results of the right-left movement.
Fig. 8 is a graph showing measurement results of the under-chest part compression.
Fig. 9 is a front view illustrating a brassiere in Embodiment 1.
Fig. 10A is a front view illustrating a wear state of the brassiere in Embodiment 1.
Fig. 10B is a rear view of Fig. 10A.
Fig. 11 is a front view illustrating a wear state in a conventional example.

Description of Embodiments

[0031] Experiments from conceiving of the present invention to completion thereof are first described as [Experiment 1] and [Experiment 2], and a specific embodiment of the present invention is then described as [Embodiment 1].

[Experiment 1]

1. Purpose of Experiment

[0032] The experiment is intended to know a relation between: movement of breasts; and an under-armpit part compression and an under-chest part compression.

2. Samples

[0033] Three types of sports brassieres of samples a to c illustrated in Fig. 1A to Fig. 1C are used as the samples. Among these samples, the position of an under belt 21 is lowest for the sample a, at a middle height for the sample b, and highest for the sample c, in a conventional sports brassiere (see Fig. 1). An attachment angle θ of shoulder straps 12 is approximately 90° for all the samples. A neck line 25 is circular for the samples a and b, and angular for the sample c.

3. Contents of Experiment

[0034] The same woman who wore the samples a to c one after another ran at 9 km/h on a treadmill in the state where markers were respectively added to bust points 16, and how the markers moved at that time was measured using a three-dimensional motion analysis system (VICON), on the basis of a fossa jugularis (an intersection point between: a straight line connecting upper sternal ends of right and left collarbones; and a midline) as a reference point.

4. Experiment Results

(1) Movement Track

[0035] The movement track for the sample a is shown in Fig. 2A (right breast) and Fig. 2B (left breast). Although the amplitude was different in the other samples b and c, the movement tracks for the samples b and c also showed such tracks (substantially two-leaf forms) as those in Figs. 2A and 2B as a whole form. In this track, a node J of the movement exists in its central portion, and amplitude parts W1 and W2 extend obliquely upward in a two-leaf pattern on both the right and left sides of the node J.

(2) Relation between Under-armpit Part Compression and Movement

[0036] Fig. 3A shows a relation between the under-armpit part compression and an up-down movement for the samples a to c, and Fig. 3B shows a relation between the under-armpit part compression and a right-left movement for the samples a to c.

(3) Relation between Under-chest Part Compression and Movement

[0037] Fig. 4A shows a relation between the under-chest part compression and the up-down movement for the samples a to c, and Fig. 4B shows a relation between the under-chest part compression and the right-left movement for the samples a to c.

5. Considerations

[0038] (1) The experiment results showed that, for the sample a, both the under-armpit part compression and the under-chest part compression were largest, and the amplitude was smallest (in other words, a movement suppressing effect was highest).

[0039] Considering the positions at which the breasts are compressed, it is apparent that the under-chest part compression is more likely to cause compression on a heart, lungs, and various parts of internal organs, compared with the under-armpit part compression.

[0040] In contrast, the under-armpit part compression is less likely to cause compression on the internal organs. If the attachment angle of the shoulder straps 12 is inclined, the tensions of the shoulder straps 12 can be applied to under-armpit parts, and the under-armpit part compression can be locally increased.

[0041] The following idea is obtained on the basis of the above considerations. That is, the attachment angle θ of the shoulder straps 12 is appropriately set, whereby the tensions of the shoulder straps 12 are respectively applied so as to obliquely pass through cup parts 17 at the diagonal positions of the shoulder straps 12 to reach the under-armpit parts. As a result, the under-armpit part compression can be increased, and the movement of the breasts can be effectively suppressed, while compression on the heart, lungs, and the like is avoided.

[0042] Note that the following measures can be conceived as a comparison with the above-mentioned idea. That is, the attachment angle θ of the shoulder straps 12 is appropriately set, whereby the tensions of the shoulder straps 12 are concentrated on an under-chest part, and the under-chest part compression is locally increased. However, the attachment angle θ in this case is relatively large, and hence the tensions of the shoulder straps 12 cannot be effectively applied so as to respectively increase the compressions of the side parts of the under belt at the diagonal positions.

[0043] (2) Because the attachment angle of the shoulder straps 12 is substantially 90° for all the samples a to c, armhole lines 24 cannot be set to be large. Hence, an overlap range with a large skin strain area 30 (see Fig. 11) during exercise is large, and chafing of a skin may occur in the large range. Further, a brassiere main body 11 tends to slide up together with skin expansion/contraction.

[Experiment 2]

1. Purpose of Experiment

[0044] Experiment 2 is intended to examine a relation among the attachment angle θ of the shoulder straps 12, the magnitude of the under-armpit part compression, and movement suppression, in order to embody the idea obtained by Experiment 1 and check technical effects thereof.

2. Samples

[0045] Fig. 5A to Fig. 5E illustrate samples A to E, respectively. The basic configuration of each sample is similar to that in a conventional example (see Fig. 11), but is different in the attachment angle θ of the shoulder straps 12 in the following manner. The angle θ is described using modes of intermediate lines 18 of the shoulder straps 12.

[0046] Sample A: The intermediate lines 18 obliquely extend across central portions of the cup parts 17 at the diagonal positions to reach inferior points 20 of anterior axilla points, respectively.

[0047] Sample B: The intermediate lines 18 extend to reach the center of the under-chest part on an under-bust line 13.

[0048] Sample C: The intermediate lines 18 extend to reach central portions of anterior axillary lines 21, respectively.

[0049] Sample D: Similarly to the brassiere disclosed in Patent Literature 4, parts of the shoulder straps are in contact with the insides of the cup parts, and the lower ends of the shoulder straps reach the side parts of the under belt, respectively. The intermediate lines 18 extend

to reach portions of the under-chest part near inferior points 19 of the bust points at the diagonal positions, respectively.

[0050] Sample E: The intermediate lines 18 extend to reach portions of the under-armpit parts immediately therebelow, respectively.

3. Contents of Experiment

[0051] The under-armpit part compression was measured by putting the samples A to E one after another on the same mannequin that allows compression measurement. Further, the same woman wore the samples A and E, and it was measured how the markers moved during running on the treadmill under the same conditions as those in Experiment 1, whereby the up-down amplitudes and the right-left amplitudes were obtained.

4. Experiment Results

[0052] The under-armpit part compressions for the samples A to E are shown in Fig. 6. The up-down amplitudes and the right-left amplitudes therefor are shown in Fig. 7A and Fig. 7B, respectively. The under-chest part compressions therefor are shown in Fig. 8.

5. Considerations

[0053] With regard to a relation between the modes of the intermediate lines 18, that is, the attachment angle θ of the shoulder straps 12 and the under-armpit part compression, if the angle θ is relatively large (the samples B, D, and E) and if the angle θ is relatively small (the sample C), the under-armpit part compression is relatively low (see Fig. 6), and the sample A has a superior suppressing effect in the comparison of the samples A and E. For the samples B to E, the intermediate lines 18 of the shoulder straps 12 respectively extend to reach positions away from the side parts 22 of the under belt, and do not reach the side parts 22. This can be considered as a reason why the under-armpit part compression is relatively low.

[0054] In contrast, the sample A is remarkably different from the samples B, C, and D in that the intermediate lines 18 obliquely extend across the centers of the cup parts 17 at the diagonal positions to reach the side parts 22 of the under belt, respectively.

[0055] In the case of the sample A, even if the under-armpit part compression is increased to some degree, positionally, an influence on the heart, lungs, and the like is small. Further, the range in which the breasts are compressed is limited to a local range along the intermediate lines 18, and the entire breasts are not compressed. Further, the armhole lines 24 can be greatly curved inward along the inclinations of the shoulder straps 12, and hence an overlap with the large skin strain area 30 can be easily avoided.

[0056] For more information, measurement results of the under-chest compressions for the samples A and E are shown in Fig. 8. The samples A and E exhibited similar low values.

[0057] Note that Experiment 2 is described in the state where on-shoulder portions of the shoulder straps 12 are fixed to given positions, but the positions are each set as appropriate within a shoulder width range.

[Embodiment 1]

[0058] It is examined as to which range is preferable for the attachment angle θ of the shoulder straps 12 in the case where a sports brassiere having a preferable structure is manufactured on the basis of Experiment 1 and Experiment 2 described above.

[0059] In Experiment 1 and Experiment 2, the tension of each shoulder strap 12 is represented by one intermediate line 18, but the shoulder strap 12 actually has a given width, a belt of spreading tension corresponding to the given width is applied and locally increases the compression of the side part 22 of the under belt through the cup part 17.

[0060] Accordingly, as illustrated in Fig. 9, the intermediate line 18 is defined by a line obtained by connecting an intermediate point c1 of a smallest-width portion (in the drawings, the uppermost end) of the shoulder strap 12 to an intermediate point c2 of a width at a position that is away from the smallest-width portion by a given distance in the length direction. The tension that is distributed along the intermediate line 18 in a belt-like pattern having the width of the smallest-width portion is considered to locally increase the compression of the side part 22 of the under belt.

[0061] Considering the results of Experiment 2, if the intermediate line 18 is excessively away from the central portion of the cup part 17, that is, the bust point 16, a movement suppressing effect is impaired. Accordingly, in order to exclude, from the targets, the intermediate lines 18 that pass through portions away from the central portion by a given distance or more, a concentric circle having a radius that is 0.6 times a radius a of the cup part 17 is set as a reference circle 26. The value of 0.6 times is empirically determined considering that the tensions of the shoulder straps 12 can reach the movement track ranges in Fig. 2A and Fig. 2B.

[0062] On the basis of the above considerations, a largest attachment angle $\theta 1$ and a smallest attachment angle $\theta 2$ of the shoulder straps 12 can be set in the following manner. Note that, for ease of description, the following terms are defined.

- · Medial reference line 27: a line that passes through a medial point d1 of the smallest-width portion of the shoulder strap 12 and is parallel to the intermediate line 18
- · Lateral reference line 28: a line that passes through a lateral point e1 of the smallest-width portion of the shoulder strap 12 and is parallel to the intermediate line 18

[0063] Note that, in the drawings, X denotes a horizontal line from an anterior axilla point, and Y denotes a midline.

(1) Largest Attachment Angle θ1 of Shoulder Straps 12

[0064] The largest attachment angle θ1 is defined by an angle of the intermediate line 18 when the medial reference line 27 is in contact with the reference circle 26 in the cup part 17 at the diagonal position of each shoulder strap 12 and when an intersection point d2 between the medial reference line 27 and the under-bust line 13 falls within a range of the side part 22 of the under belt at the diagonal position, the range including the inferior point 19 of the bust point and the inferior point 20 of the anterior axilla point on the under-bust line 13.

(2) Smallest Attachment Angle θ2 of Shoulder Straps 12

[0065] The smallest attachment angle θ2 is defined by an angle of the intermediate line 18 when the lateral reference line 28 passes through the inside of the reference circle 26 and when an intersection point e2 between the lateral reference line 28 and the under-bust line 13 coincides with the inferior point 20 of the anterior axilla point.

[0066] If the attachment angle of the shoulder straps 12 falls outside of the range between the angles θ1 and θ2, the tensions of the shoulder straps 12 respectively come out of the reference circles 26 or the side parts 22 of the under belt, so that an effect of suppressing movement of the breasts is decreased. Further, the armhole lines 24 and the neck line 25 cannot be set to be large.

(3) Position of Maximum Curvature Point 29 of Armhole Line 24

[0067] It is desirable that the position of the maximum curvature point 29 of each armhole line 24 be located on the inner side of a point X3 in the large skin strain area 30, on the horizontal line X from the anterior axilla point.

[0068] A specific sports brassiere that is manufactured on the basis of a basic configuration described with reference to Fig. 9 is illustrated in Fig. 10A and Fig. 10B. This brassiere includes: the brassiere main body 11 made of a front body 11a for covering a chest and a back body 11b for covering a back; and the right and left shoulder straps 12 provided between the upper end edges of the front body 11a and the back body 11b. The under belt 14 is provided at the lower end edge of the brassiere main body 11 with the intermediation of the under-bust line 13. The brassiere material may be in any form of woven fabric, knitted fabric, non-woven fabric, and the like. Further, the used fibers may be in any form of filament fibers, spun fibers, and the like, and it is possible to use, as appropriate: natural fibers such as cotton, linen, and wool; synthetic fibers such as polyamide fibers, acrylic fibers, and polyolefin fibers; and spandex fibers and the like that are blended and spun, combined into filaments, mixed and woven, or mixed and knitted.

[0069] A pair of the right and left bust points 16 is defined in the front body 11a, and pads are fitted to the rear surface of the brassiere main body 11 with reference to the positions of the bust points 16. Note that, for some brassieres, such pads are not fitted, and hence the pads may be used as needed.

[0070] The attachment angle θ of the shoulder straps 12 to the brassiere main body 11n this case is determined by an inclination angle of the intermediate lines 18 of the shoulder straps 12. The intermediate lines 18 in the drawings have such an inclination angle that each intermediate line 18 extends to reach the inferior point 20 of the anterior axilla point on the under-bust line 13.

[0071] The maximum curvature point 29 of each armhole line 24 is set outside of the large skin strain area 30, and both the shoulder straps 12 and the brassiere main body 11 are outside of the large skin strain area 30.

Reference Signs List

[0072]

d1	medial point
d2	intersection point
e1	lateral point
e2	intersection point
θ	attachment angle
X	horizontal line from anterior axilla point
Y	midline
11	brassiere main body
11a	front body
11b	back body
12	shoulder strap
13	under-bust line
14	under belt
16	bust point
17	cup part
18	intermediate line
19	inferior point of bust point
20	inferior point of anterior axilla point
21	anterior axillary line
22	side part of under belt
23	front part of under belt
24	armhole line
25	neck line
26	reference circle
27	medial reference line
28	lateral reference line
29	maximum curvature point
30	large skin strain area

Claims

1. A brassiere comprising:

a brassiere main body made of a front body for

covering a chest and a back body for covering a back;
right and left shoulder straps provided between upper end edges of the front body and the back body;
an under belt that is provided at a lower end edge of the brassiere main body with an intermediation of an under-bust line; and
a pair of right and left cup parts provided in the front body, wherein
an attachment angle of the shoulder straps to the brassiere main body is defined by such an angle that an intermediate line of each shoulder strap extends to pass through a central portion of the cup part at a diagonal position of the shoulder strap and reach a range including an inferior point of a bust point and an inferior point of an anterior axilla point on the under-bust line.

2. The brassiere according to claim 1, being used for sports.

3. The brassiere according to claim 1 or 2, wherein
an outer circumferential circle of the cup part is defined by a circle having a radius that is a distance between the bust point in a center of the cup part and the inferior point of the bust point on the under-bust line, and
a range of the central portion of the cup part is defined by a concentric reference circle having a radius that is 0.6 times the radius of the cup part.

4. The brassiere according to any of claims 1 to 3, wherein
an inclination angle of the intermediate line to the under-bust line falls within a range between a largest inclination angle $\theta 1$ defined below in (1) and a smallest inclination angle $\theta 2$ defined below in (2):

(1) the largest inclination angle $\theta 1$ is defined by such an angle that the intermediate line that passes on an inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through an inside of the reference circle and reach the range including the inferior point of the bust point and the inferior point of the anterior axilla point on the under-bust line; and
(2) the smallest inclination angle $\theta 2$ is defined by such an angle that the intermediate line that passes on an outer side of the bust point of the cup part at the diagonal position or passes through the bust point extends to come into contact with the reference circle or pass through the inside of the reference circle and reach the range including the inferior point of the bust point and the inferior point of the anterior axilla point on the under-bust line.

5. The brassiere according to any of claims 1 to 3, wherein
an inclination angle of the intermediate line to the under-bust line falls within a range between a largest inclination angle $\theta 1$ defined below in (1) and a smallest inclination angle $\theta 2$ defined below in (2):

(1) the largest inclination angle $\theta 1$ is defined by such an angle that the intermediate line that passes on an inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through an inside of the reference circle and reach the inferior point of the bust point on the under-bust line; and
(2) the smallest inclination angle $\theta 2$ is defined by such an angle that the intermediate line that passes on the inner side of the bust point of the cup part at the diagonal position extends to come into contact with the reference circle or pass through the inside of the reference circle and reach the inferior point of the anterior axilla point on the under-bust line.

6. The brassiere according to claim 4 or 5, wherein
a medial reference line that passes through a medial point of a smallest-width portion of the shoulder strap and is parallel to the intermediate line that defines the largest inclination angle $\theta 1$ passes through the inside of the reference circle along this intermediate line, and
a lateral reference line that passes through a lateral point of the smallest-width portion of the shoulder strap and is parallel to the intermediate line that defines the smallest inclination angle $\theta 2$ passes through the inside of the reference circle along this intermediate line.

7. The brassiere according to any of claims 1 to 6, wherein
an armhole is formed between a lateral edge of each shoulder strap and the upper end edge of the front body, and
a maximum curvature point of the armhole is set on an inner side of a point at 3/5 of a distance from the anterior axilla point to a midline, on a horizontal line from the anterior axilla point.

Fig. 1A

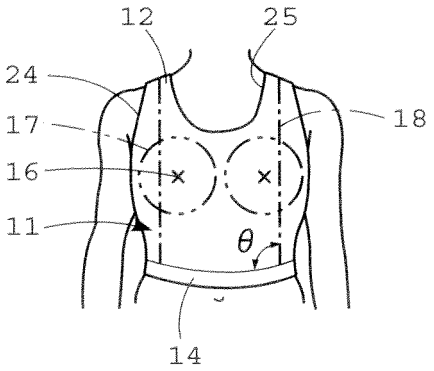


Fig. 1B

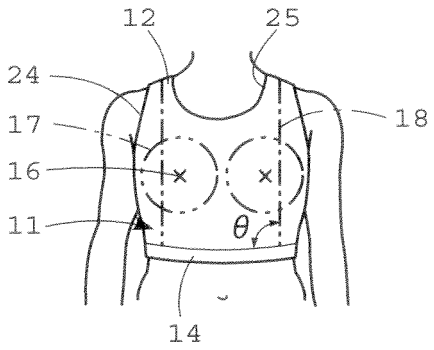


Fig. 1C

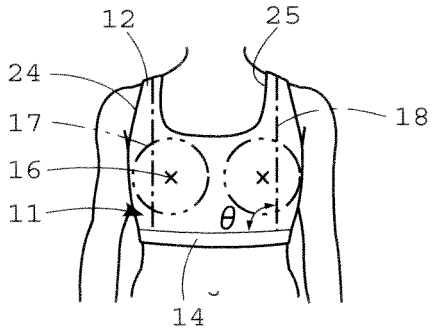


Fig. 2A

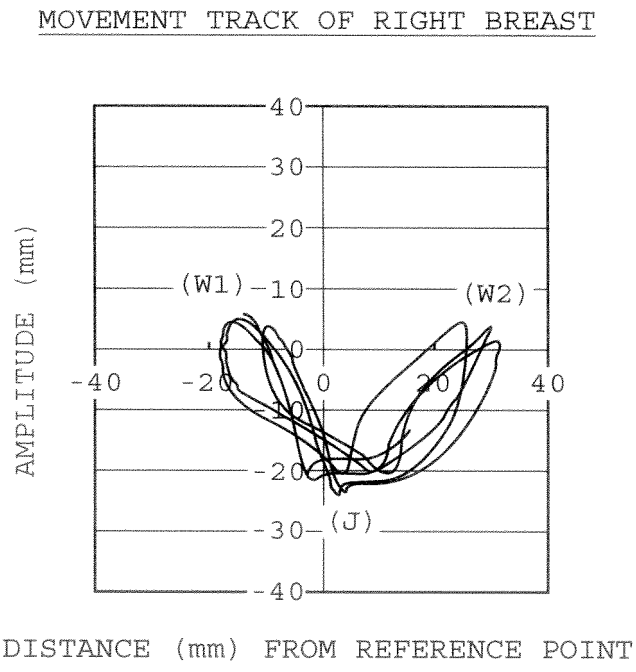

MOVEMENT TRACK OF RIGHT BREAST
AMPLITUDE (mm)
40
30
20
(W1)
10
(W2)
0
-40
-20
0
20
40
-10
-20
(J)
-30
-40
DISTANCE (mm) FROM REFERENCE POINT

Fig. 2B

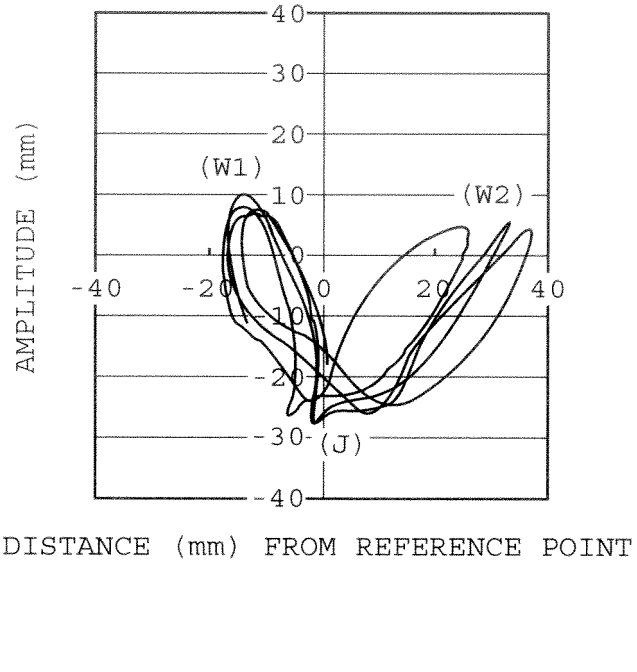

MOVEMENT TRACK OF LEFT BREAST
AMPLITUDE (mm)
40
30
20
(W1)
10
(W2)
0
-40
-20
0
20
40
-10
-20
-30
(J)
-40
DISTANCE (mm) FROM REFERENCE POINT

Fig. 3A

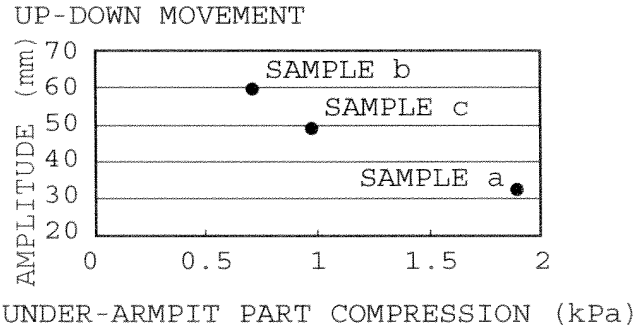


Fig. 3B

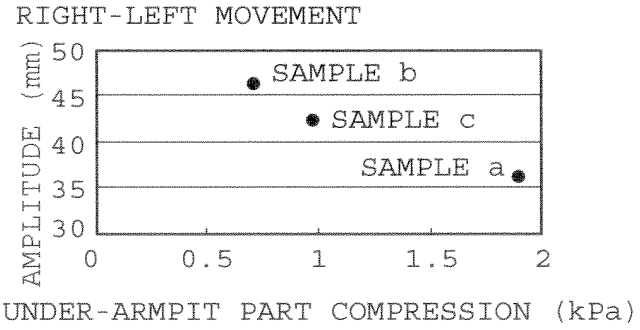


Fig. 4A

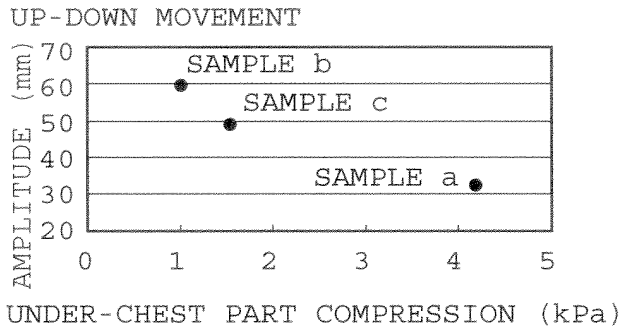


Fig. 4B

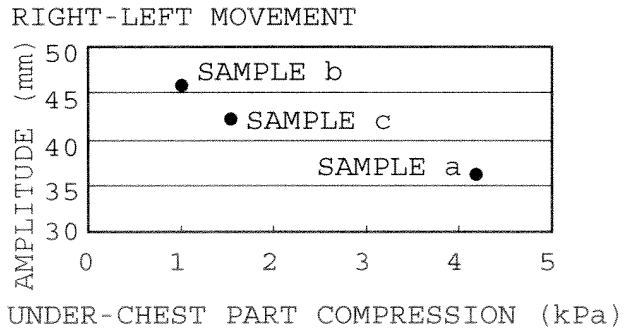


Fig. 5A

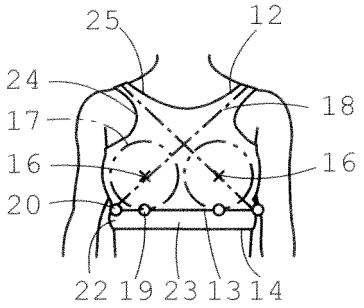


Fig. 5B

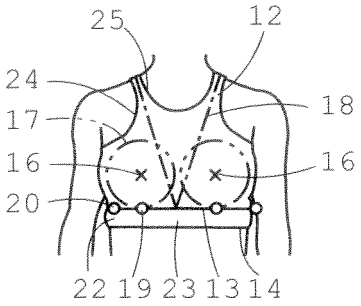


Fig. 5C

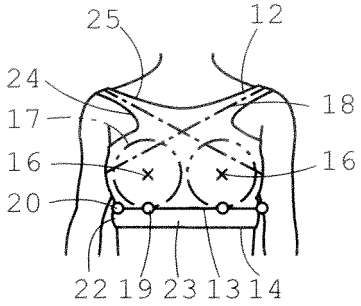


Fig. 5D

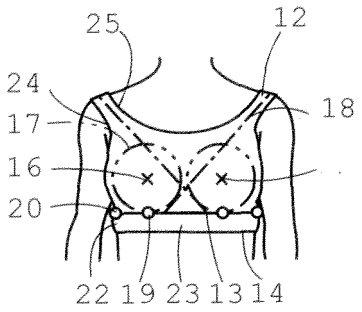

25
12
24
17
18
16
20
22 19 23 13 14

Fig. 5E

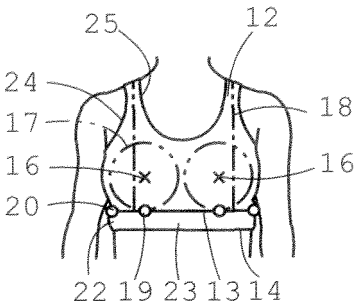

25
12
24
17
18
16
16
20
22 19 23 13 14

Fig. 6

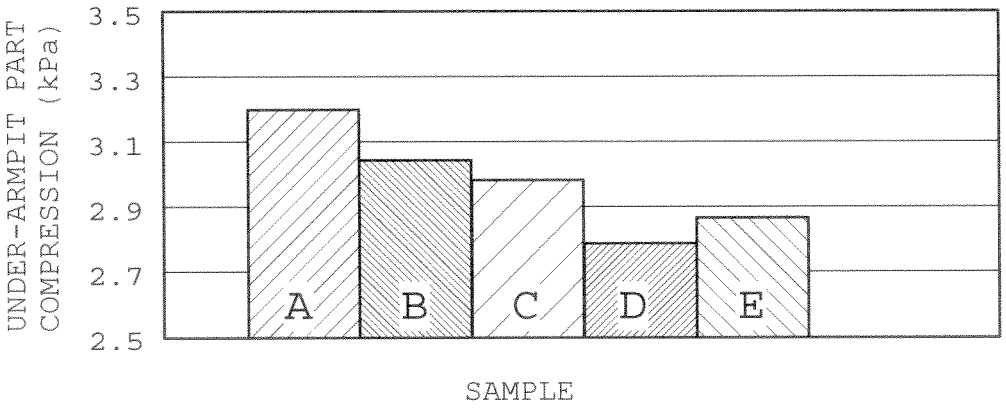

UNDER-ARMPIT PART COMPRESSION (kPa)
3.5
3.3
3.1
2.9
2.7
2.5
A
B
C
D
E
SAMPLE

Fig. 7A

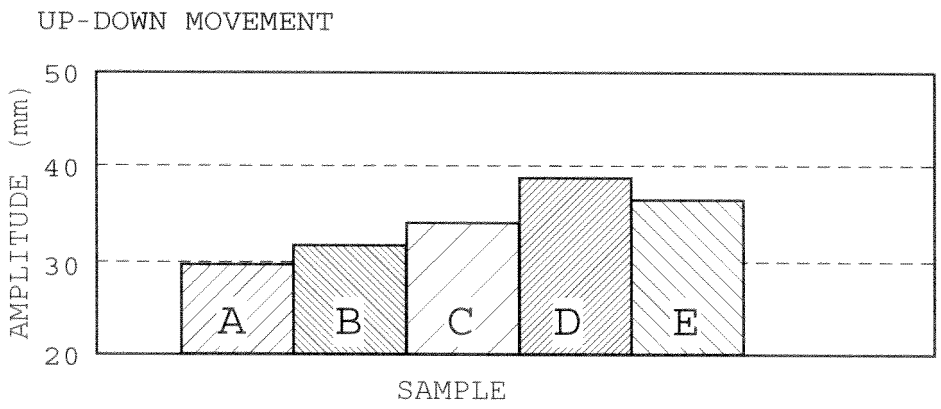


Fig. 7B

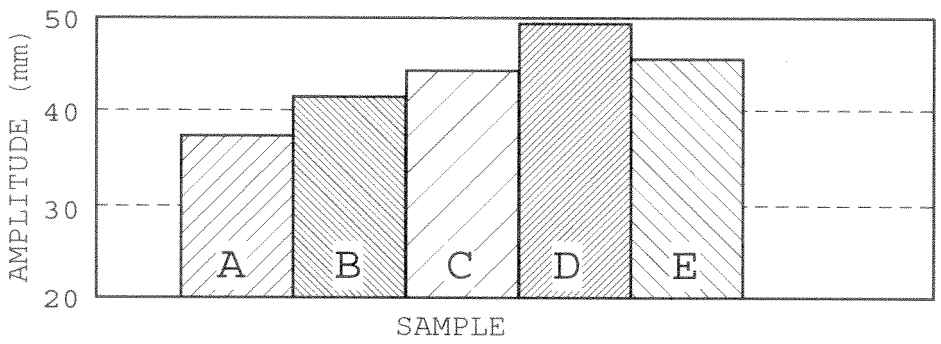


Fig. 8

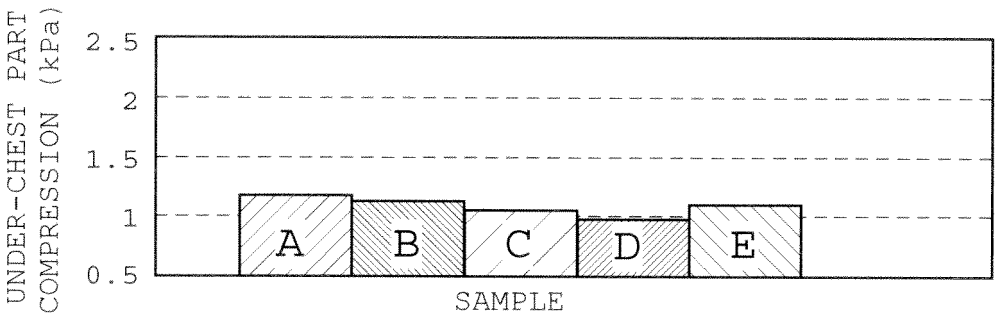


Fig. 9

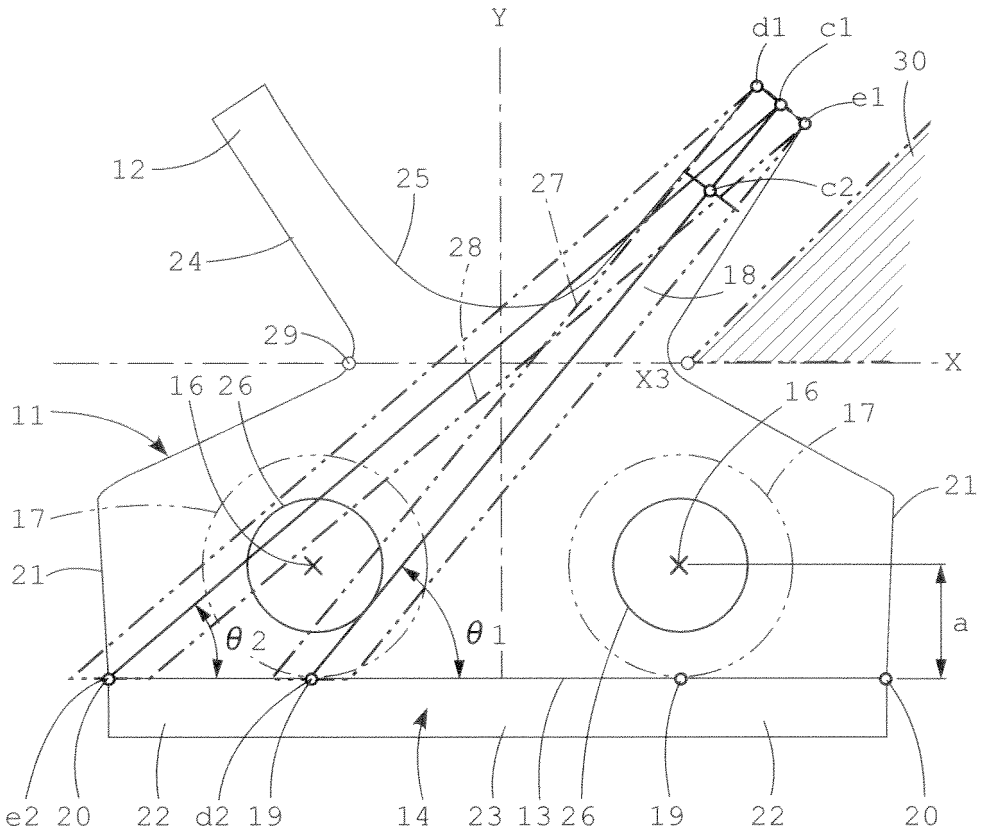

Y
d1
c1
30
e1
12
25
27
c2
24
28
18
29
X
X3
16 26
16
17
11
21
17
21
θ 2
θ 1
a
e2 20
22
d2 19
14
23 13 26
19
22
20

Fig. 10A

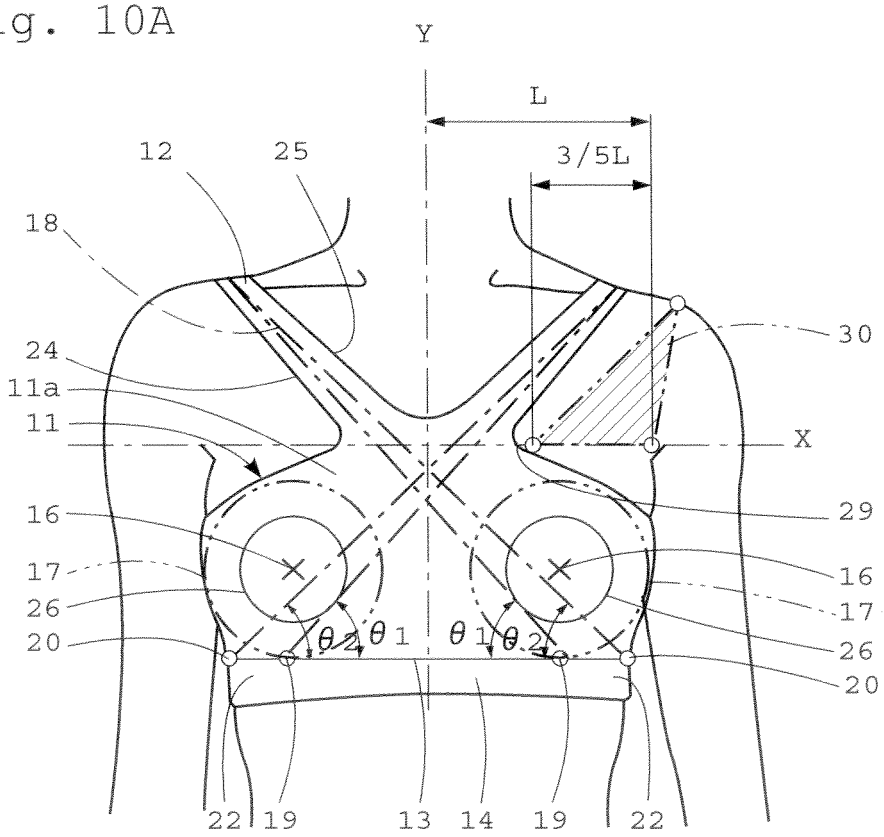


Fig. 10B

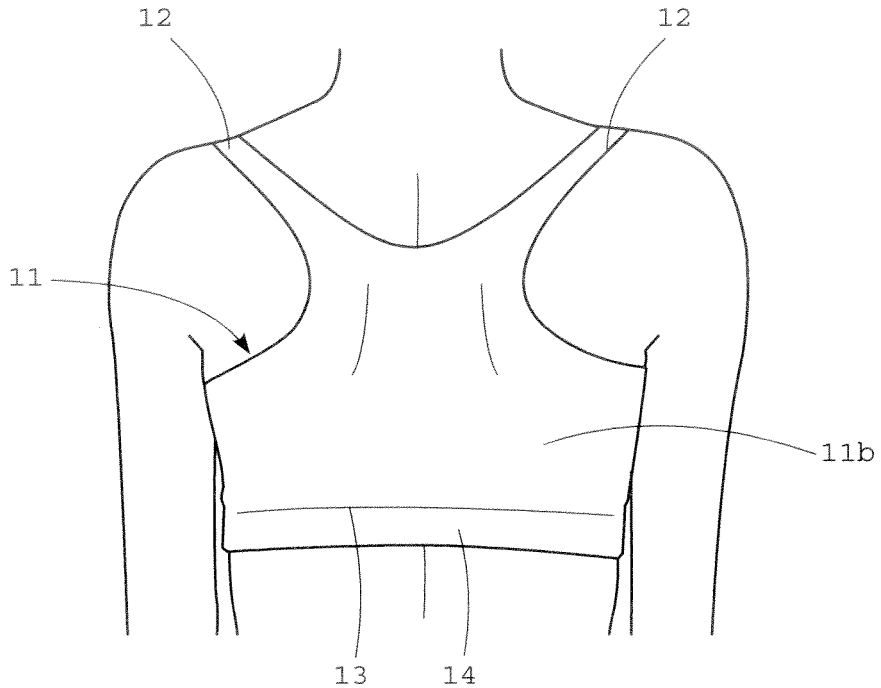
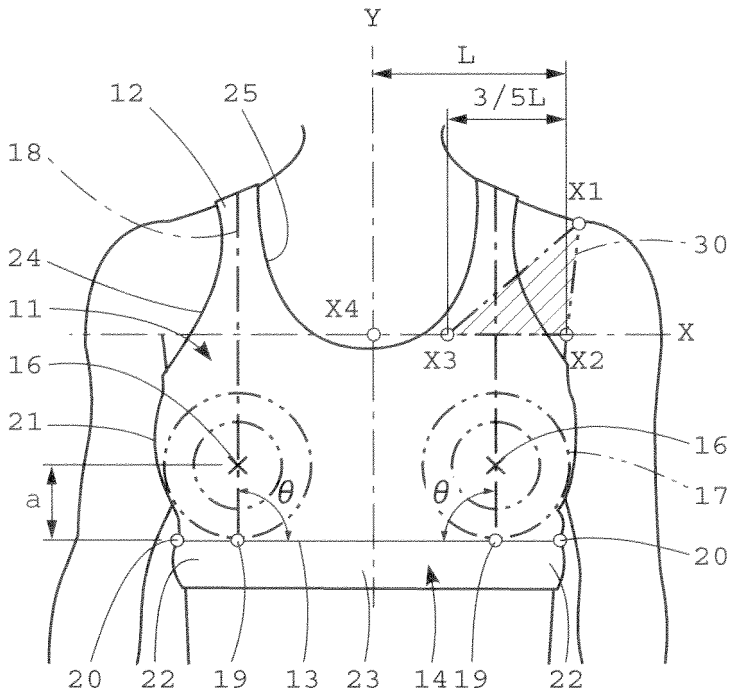


Fig. 11


Y
L
3/5L
12
25
18
X1
30
24
11
X4
X
X3
X2
16
21
16
17
a
θ
θ
20
20
22
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14
19
22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/057916

A. CLASSIFICATION OF SUBJECT MATTER
A41C3/12(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A41C3/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 7-207503 A (Sanae KAMO), 08 August 1995 (08.08.1995), paragraphs [0007] to [0009]; fig. 1 to 2 (Family: none)	1-6 7
Y	US 5378192 A (Dale T. DARMANTE), 03 January 1995 (03.01.1995), column 1, lines 6 to 8; column 3, line 18 to column 4, line 38; fig. 3, 6 (Family: none)	7
A	US 5897422 A (Marguerite K. McGee), 27 April 1999 (27.04.1999), fig. 1 to 6 (Family: none)	1-7

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 May, 2012 (30.05.12)	12 June, 2012 (12.06.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/057916

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-220005 A (MIZUNO INC.), 08 August 2000 (08.08.2000), paragraph [0001]; fig. 1 (Family: none)	1-7
A	US 4909771 A (DANSPORT INTERNATIONAL LTD.), 20 March 1990 (20.03.1990), column 1, lines 4 to 7; fig. 1 & GB 2183144 A	1-7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003221705 A **[0013]**
- JP 2006104613 A **[0013]**
- JP 2009133027 A **[0013]**
- US 5378192 A **[0013]**