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(54) **Arc-shaped underwire for bra**

(57) The invention relates to the field of women's underwear. The technical problem solved by the invention is to provide a comfortable arc-shaped underwire (11, 12, 14) with simple structure. An arc-shaped underwire, is embedded in the lower edge of a bra cup (2) for supporting the breasts; the underwire is arc-shaped as a

whole and is provided with an inner (11) and outer end (12) that respectively faces and deviates from the middle part (4) of the bra; at least one end of the outer and inner ends deflects in a direction deviating from the body. The end of the underwire maintains a certain gap with the body to ensure that it would not press the user. The structure is comfortable to use.

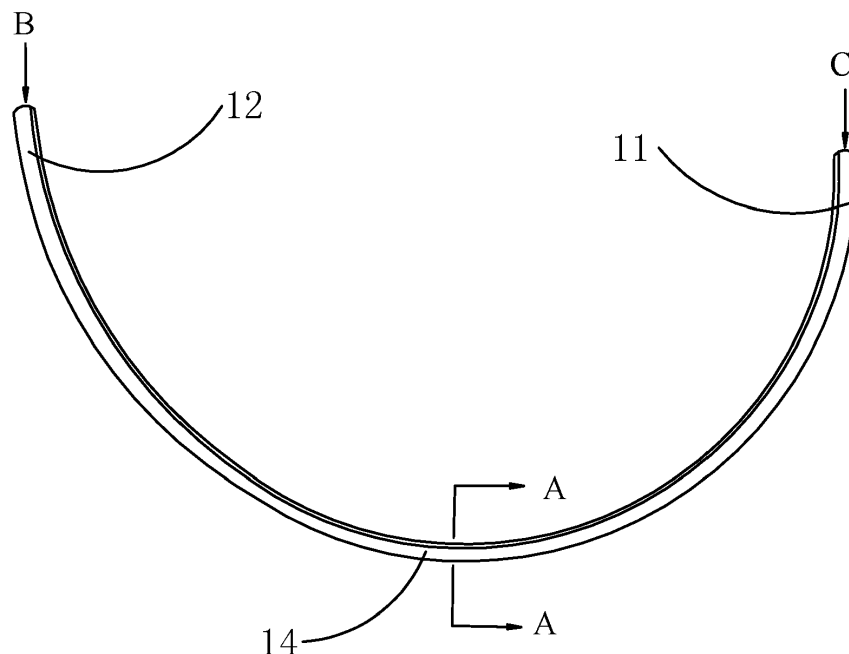


Figure 2

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Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The invention relates to the field of women's underwear, in particular to a comfortable arc-shaped underwire.

2. Description of Related Art

[0002] In order to get better body shape, the lower edge of the cup of existing bras, shape wears and other women's underwears is lined with semi-circular underwires. Most of the current underwires are made by bending a banded metal strip into a semi-circular shape. However, planar underwires cannot be matched with hemispherical cups, so the exertion of the functions of the underwire is influenced, which means that the underwire has bad supporting effects. What's more, traces of the underwire tend to be left on the body of the users who wear the bra, influencing the comfort when wearing. In addition, both ends of the current arc-shaped underwires extend upwards, so that they tend to twist under pressure during use and make the users have the feelings of being oppressed and sick.

[0003] In order to be worn comfortably, the current underwires are made close to the body curve of the chest, which could get more contact area between the corsage supported by underwire and the breast. However, each woman having a different curve of chest, the current underwires are made of elastic material. After a period of wearing, the underwire can match the curve of the breast through the body activity. This technology has been used for long time, as described in US patent No3884244, and in Chinese patents of the present inventor, namely CN200620058554.8, CN200710029877.3, CN200720-055986.8, CN200720055985.3, CN200910040015.X. The period extending from the moment when the user starts to wear this kind of underwire to the moment when the matching of the curve of the chest is obtained is long, the user could feel uncomfortable even when the user is wearing it for long time.

[0004] There are many underwires made by inelastic material and made into the shape matched with the curve of the chest, as in US patent 6346028B1 and US-7425170B1. However, this kind of underwire made by inelastic material cannot meet the users' variety requirements. The consumer will feel uncomfortable when taking activities when wearing the corsage.

BRIEF SUMMARY OF THE INVENTION

[0005] The technical problem solved by the invention is to overcome the shortcomings of the prior art and to provide a comfortable arc-shaped underwire with simple structure.

[0006] In order to solve the aforementioned technical problem, the technical characteristics adopted by the invention are as follows:

[0007] A comfortable arc-shaped underwire is embedded in the lower edge of a bra cup for supporting the breasts. The underwire is arc-shaped as a whole and is provided with an inner and outer end placed respectively towards and away from the middle part of the bra; at least one end of the outer and inner ends deflects in a direction deviating from the body. This structure is different from the traditional one with no deflection, meaning that the end of the underwire fits the *curves* of a *women's chest better* to ensure that the ends of the underwire would not press the bearer, so that the structure is comfortable to use. In Regard of the actual contact between the cup and the body, the structure in which the outer end deflects in a direction deviating from the body is preferred. The scheme of the present invention is based on the underwire made of existing elastic material, the underwire is provided with pre-deformation when making, as the outer or inner end which matches the curve of chest deflects in a direction deviating from the body. The advantage to the users is that the underwire based on a pre-deformation can deform and match the body curve rapidly, and there is a larger contact area between the corsage supported by the underwire and breast in a short time, so that the uncomfortable wearing period can be shortened.

[0008] In order to ensure a maximum comfort during use, the deflection is as follows: the underwire starts to deflect gradually towards the outer or inner end from the side of the cup to form an inclined section that has a smooth transition with other parts of the underwire. The smooth transition is to ensure that there is no bending or bumps on the underwire, that is, there is no obvious over-rotation angle and the underwire sheath of the cup won't be worn when used and washed, further facilitating the improvement of the comfort upon wearing. Preferably, the inclined section is an arc-shaped section that gradually deflects in a direction deviating from the body. The arc-shaped structure is adapted to avoid the contact of the end of the underwire with the body when using. What's more, during movement, the arc-shaped section is the main section to contact the body so that the contact area is larger, thereby reducing the pressure on the body and enhancing the comfort.

[0009] In order to ease the squeeze of both ends of the arc-shaped underwire on the chest, the inner or outer end of the arc-shaped underwire extends towards both sides of the cup to form an arc-shaped section that bends outward. This structure fits the aforementioned deflected structure and also has the effect of increasing the contact area, greatly improving the wearing comfort and reducing the pressure on the chest and other body parts.

[0010] The inner and outer ends of the arc-shaped underwire can be designed as an asymmetric structure and the outer end of the arc-shaped underwire extends continuously tangent to the direction of the arc-shaped part, forming an exceeding section the length of which is com-

prised between 0.5 and 5 cm, measured from this inner end. The length of the exceeding section that is slightly curved is preferably from 1 to 2.5 cm. According to the characteristics of the female body, the outer contour line of the breast extends to the armpit, while the inner contour line extends only to the chest, so that the outer edge of the cup has a longer extension compared with the inner edge thereof in order to make bras or underwear that fits body conformation better. The object of the present invention is to make the arc-shaped underwire with exceeding section according to the structural characteristics of the body so that the arc-shaped underwire fits the women's breast shape better and is more comfortable when wearing.

[0011] The steel wire constituting the arc-shaped underwire is preferably a flat structure with a width. The flat structure makes the underwire have the rigidity according to the arc method, which means, on one hand, that the underwire is not easily deformed; on the other hand, the contact area between the underwire and the body curve is increased. What's more, the underwire's sheath can also be realized in the shape of a sheath with flat structure so as to render the underwire "invisible". The structure improves the supporting effects of the underwire so that it is more comfortable to wear and more pleasing in appearance. In order to comply to different breast shapes or using effects, the flat steel wire can be made according to the following three structures:

[0012] According to a first structure, the flat steel wire of at least one side of the cup has a slope, while the flat steel wire at the bottom of the cup is vertical without slope, the connection between the flat steel wire with slope and the flat steel wire without slope being gradual. The inclination or slope is defined as the angle included between a horizontal plane and the vertical plane of the flat steel wire when used.

[0013] According to a second structure, the flat steel wire of at least one side of the cup is vertical without slope, while the flat steel wire at the bottom of the cup has a slope, the connection between the flat steel wire with slope and the flat steel wire without slope being gradual.

[0014] According to a third structure, the steel wire constituting the arc-shaped underwire is a flat structure with a width and the flat steel wire has a slope.

[0015] The third structure is the most preferred in that it optimizes the matching with the body curve and improves the supporting effects of the underwire.

[0016] The inclination can be 15 to 85 degrees, but generally the inclination of the inclined section ranges preferably from 20 to 75 degrees according to the requirements of different users. If the user has a small breast, the smaller inclination is more appropriate, that is, 30 to 40 degrees; if the user has a big breast, a larger inclination is more appropriate, that is, 60 to 75 degrees. For the size of most users, the inclination of the inclined section is preferably 38 ± 4 or 26 ± 6 degrees.

[0017] In order to ensure that both ends of the under-

wire will not prick the bra supporter at the lower edge of the cup so as to prolong the service life of the underwear and to increase wearing comfort, the end of the underwire is coated with a paint protection layer, epoxy resin layer or polyurethane layer, or covered by nylon layer or thermoplastic elastomer.

[0018] In order to further enhance the structural safety of the underwire and increase comfort of use, the end of the underwire can further be covered by at least one layer of thermoplastic sleeve made of polyethylene.

[0019] The wire constituting the underwire of the bra can be stainless steel, high carbon steel, titanium metal wire, resin plastics or polyester plastics. The advantage of using such elastic materials is that the underwire has a possibility of deformation which can transfer and match the curve of the chest. Additionally, the elastic material has the function of resetting to some extent, that is, the elastic material can restore to its original shape which is suitable to use when taking activity and cannot bring an uncomfortable squeeze feeling.

[0020] Compared with the prior art, the beneficial effects of the technical properties of the invention are as follows: at least one end of the outer and inner end of the underwire of the invention deflects in a direction deviating from the body to form an arc-shaped section that gradually deflects in a direction deviating from the body for avoiding the pressure of the end of the underwire on the body so as to feel comfortable when wearing; Meanwhile, the inner or outer end of the underwire extends towards both sides of the cup to form an arc-shaped section that bends outward to avoid squeezing on the chest, improving wearing comfort; In addition, the underwire is designed to have a certain inclination or slope, which is more adapted to the body curves, improving wearing comfort and having better supporting effects.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a diagram of application of the invention;
FIG. 2 is the structure diagram of embodiment 1;
FIG. 3 is a left view of FIG. 2;
FIG. 4 is a sectional schematic cut view taken along the plan A-A of FIG. 1;
FIG. 5 is an end schematic view taken along plane B of FIG. 1;
FIG. 6 is an end schematic view taken along plane C of FIG. 1;
FIG. 7 is a structure diagram of embodiment 2;
FIG. 8 is a structure diagram of embodiment 3.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Technical characteristics of the invention will be described below reference being made to the attached drawings.

Embodiment 1

[0023] As shown in Figure 1 that is a sketch of the invention, an underwire is embedded in the bra supporter 24 of the lower edge of a bra cup 2 for supporting the breast. A cup 2 comprises an inner side 21 that is close to the middle part of the bra 4, an outer side 22 placed away from the middle part of the bra 4 and a bottom part 23. Figure 2 represents the underwire in a left cup of the bra of Figure 1. The end of the underwire close to the middle part 4 of the bra is the inner end 11, while the other end is the outer end 12. The underwire is arc-shaped as a whole and the outer end thereof deflects in a direction deviating from the body, as shown in the left side of Figure 3. The underwire starts to deflect gradually towards the outer end 12 starting from the outer side of cup 22 to form an arc-shaped inclined section 13 that shows a smooth transition with other parts of the underwire.

[0024] The steel wire constituting the underwire has a flat structure with a width and the flat steel wire has a certain inclination or slope, the inclination a of a middle part 14 of the underwire (namely, the section of the underwire at the bottom of the cup 23) being 42 degrees, as shown in the sectional schematic view taken along the plane A-A of FIG. 4. The inclination b of the underwire at the outer side of cup 22 is 38 degrees, as shown in the end schematic view taken along plane B of FIG. 5. The inclination c of the underwire at the inner side of cup 21 is 40 degrees, as shown in the end schematic view taken along plane C of FIG. 6. Each part of the underwire with different inclinations is connected with each other in such a manner as to ensure a smooth transition.

Embodiment 2

[0025] Embodiment 2 is similar to embodiment 1. As shown in Figure 7, the difference merely lies in that the inner end 11 and the outer end 12 of the underwire are asymmetric and the outer end 12 of the underwire extends towards the outer side 22 of the cup to form an arc-shaped section that bends outwardly. In addition, the outer end 12 of the underwire extend continuously along the direction of an arc-shaped tangent so as to exceed of 1 cm of the inner end, forming an exceeding section whose length d is 1 cm. Embodiment 2 is identical to the left view of embodiment 1, so it can be seen from Figure 3 that the sides of the exceeding section are slightly curved.

Embodiment 3

[0026] Embodiment 3 is similar to embodiment 1. As shown in Figure 8, the difference lies in that the middle part 14 of the underwire located merely at the bottom 23 of the cup is an inclined section with an inclination of 30 degrees, while the underwire that is located at both sides of the cup has a flat section, which is connected to the inclined section by a transition section. The twist angle

of the transition section is gradually changed starting from the joint with the flat section until the twist angle is identical to the angle of the slope section.

5 Embodiment 4

[0027] Embodiment 4 is similar to embodiment 1. The difference merely lies in that the middle part 14 of the underwire that is located at the bottom 23 of the cup has a flat section with no inclination, meaning that it is parallel to the vertical plane when in use. However, the underwire that is located at both sides of the cup has an inclined section with a certain inclination, the inclination b at the outer side 22 of the cup being of 35 degrees, while the inclination c at the inner side 21 of the cup is of 50 degrees. The way of connecting the flat section with the inclined section is identical to embodiment 3, namely, through transition section.

Claims

1. An arc-shaped bra underwire (11, 12, 14), which is embedded in the lower edge (24) of a bra cup (2) for supporting the breasts, the underwire being arc-shaped as a whole and being provided with an inner (11) and outer (12) end placed respectively towards and away from the middle part (4) of the bra, **characterized in that** at least one end of the outer and inner ends (11, 12) deflects in a direction deviating from the body.
2. An arc-shaped underwire according to Claim 1, **characterized in that** the underwire (11, 12, 14) starts to deflect towards the outer (12) or inner (11)-end gradually from either one of the sides of the cup to form an inclined section that has a smooth transition with other parts of the underwire.
3. An arc-shaped underwire according to Claim 2, **characterized in that** the inclined section is an arc-shaped section that gradually deflects in a direction deviating from the body.
4. An arc-shaped underwire according to any one of claims 1 to 3, **characterized in that** the inner (11) and outer (12) ends of the arc-shaped underwire are asymmetric and the outer end (12) of the arc-shaped underwire extends tangentially to the arc-shaped section, forming an exceeding section extending from 0.5 to 5cm with respect to the inner end.
5. An arc-shaped underwire according to Claim 4, **characterized in that** the length of the exceeding section is 1~2.5 cm.
6. An arc-shaped underwire according to Claim 5, **characterized in that** the exceeding section is

slightly curved.

7. An arc-shaped underwire according to any one of claims 1 to 6, **characterized in that** the inner or outer end of the arc-shaped underwire extends towards both sides of the cup (2) to form an arc-shaped section that bends outwardly. 5
8. An arc-shaped underwire according to any one of Claims 1 to 7, **characterized in that** the arc-shaped underwire is a flat steel wire structure with a width, wherein the flat steel wire of at least one side of the cup (2) has an inclination, the flat steel wire at the bottom of the cup being vertical without slope and the connection between the flat steel wire with slope and the flat steel wire without slope being gradual. 10
9. An arc-shaped underwire according to any one of Claims 1 to 7, **characterized in that** the arc-shaped underwire is a flat steel wire structure with a width, the flat steel wire of at least one side of the cup being vertical without slope, while the flat steel wire at the bottom of the cup has a slope and the connection between the flat steel wire with slope and the flat steel wire without slope is gradual. 15
10. An arc-shaped underwire according to any one of Claims 1 to 7, **characterized in that** the arc-shaped underwire is a flat steel wire structure with a width and a slope. 20
11. A method of obtaining a rapid matching between arc-shaped bra underwires (11, 12, 14) and body curves of a human, comprising: 25
 - embedding the underwire into the lower edge of bra cups (2) for supporting the breasts, the underwires being provided with an inner (11) and an outer (12) end placed respectively towards and away from the middle part (4) of the bra, - making at least one end of the outer and inner ends deflect in a direction deviating from the body. 30
12. The method according to Claim 11, **characterized in that** it comprises the following step : deflecting the outer (12) or inner (11) end of the underwire gradually from the side of the cup (2) to form an inclined section which has a smooth transition with other parts of the underwire. 35
13. The method according to Claim 12, **characterized in that** it comprises the following step: the said inclined section is made arc-shaped and is gradually deflected in a direction deviating from the body. 40
14. The method according to Claim 11, **characterized in that** it comprises the following step: the inner and outer ends of the arc-shaped underwire are made asymmetric, the outer end of the arc-shaped underwire extending continuously tangentially to the direction of the arc-shaped and forming an exceeding section extending from 0.5 to 5 cm out of the inner (11) end. 45
15. The method according to Claim 14, **characterized in that** the length of the exceeding section is comprised between 1 and 2.5 cm. 50
16. The method according to Claim 15, **characterized in that** it comprises the following step: the exceeding section is slightly curved. 55
17. The method according to Claim 11, **characterized in that** it comprises the following step: the inner (11) or outer (12) end of the arc-shaped underwire is extended towards both sides of the cup (2) to form an arc-shaped section that bends outwardly.

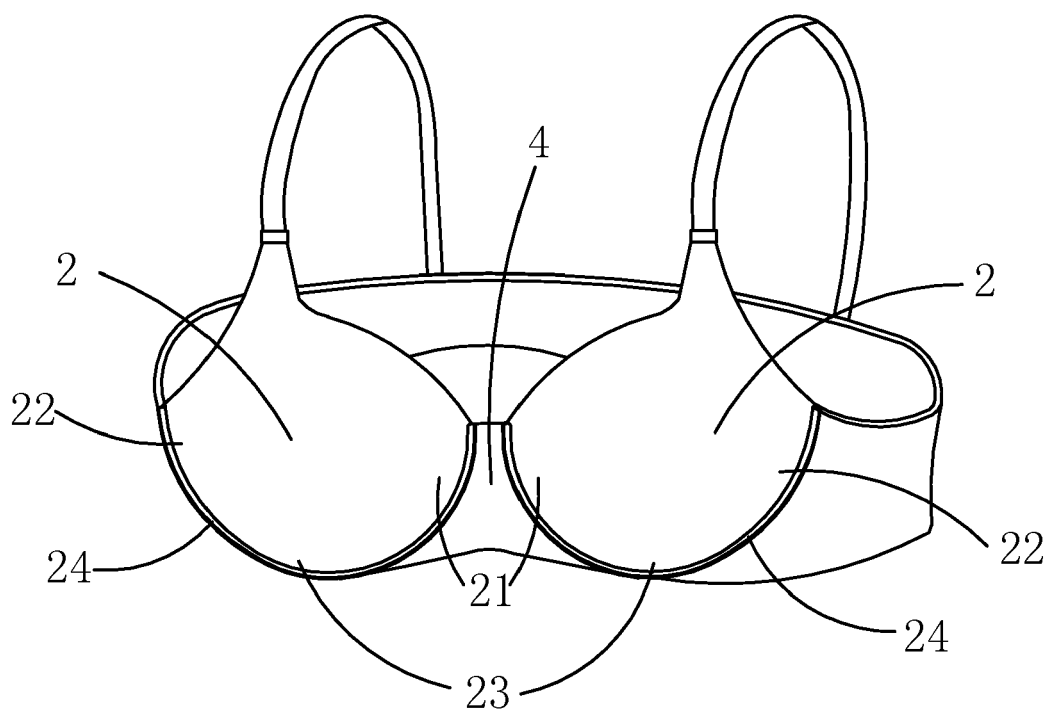


Figure 1

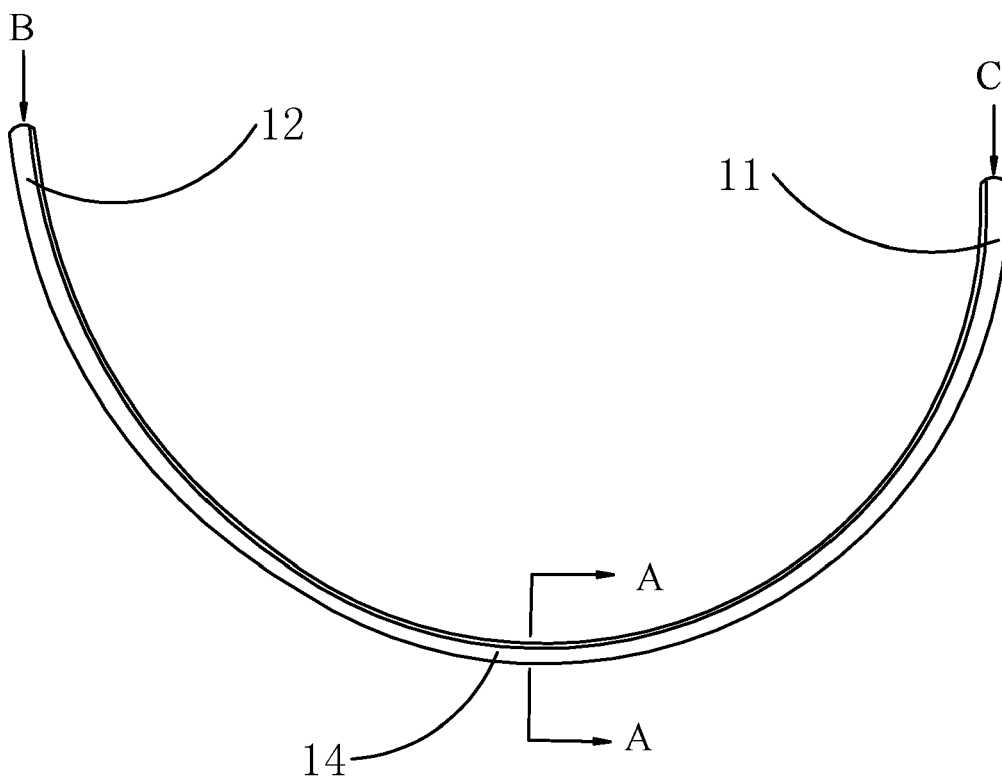


Figure 2

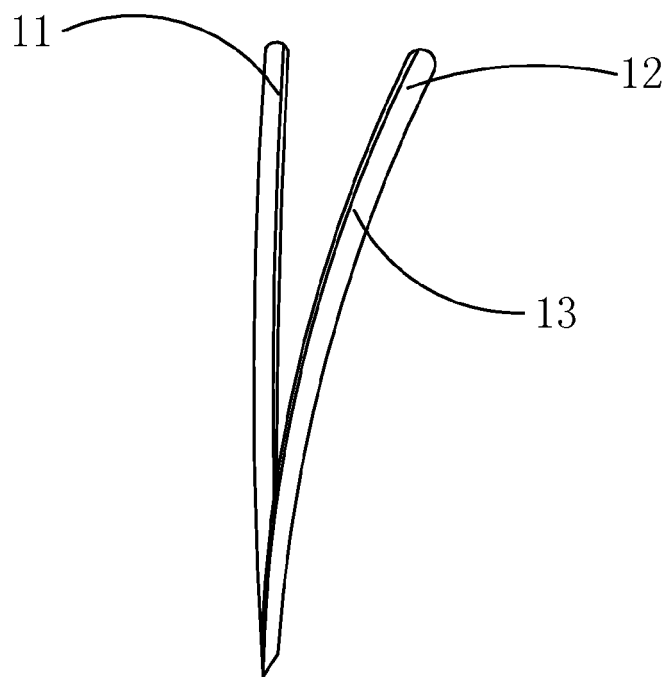


Figure 3

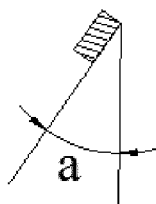


Figure 4

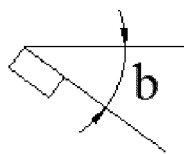


Figure 5

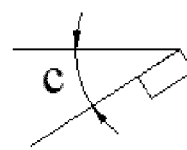


Figure 6

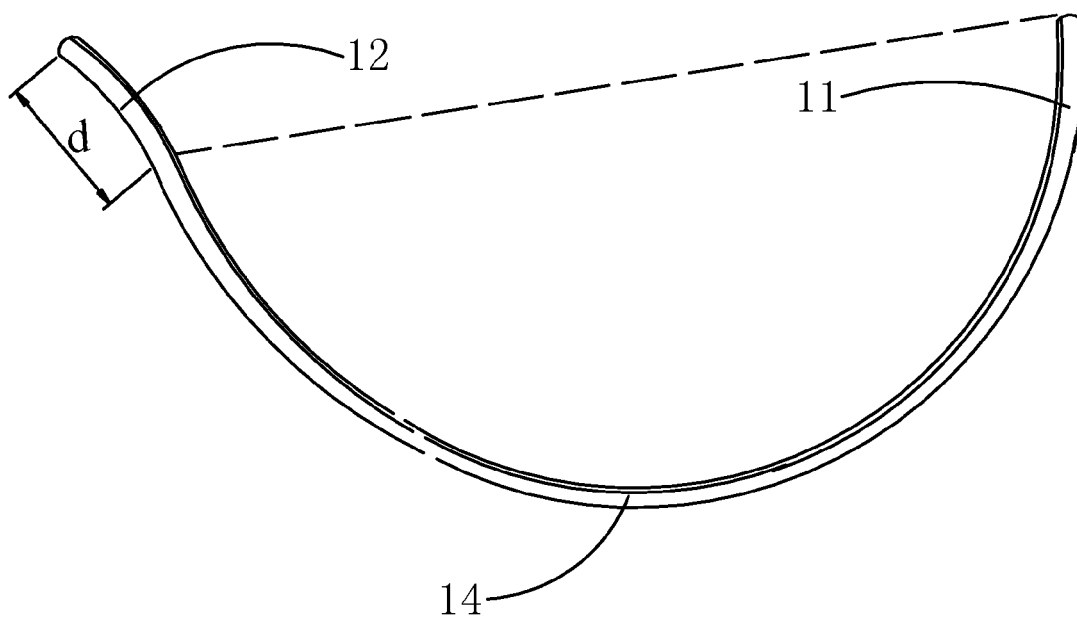


Figure 7

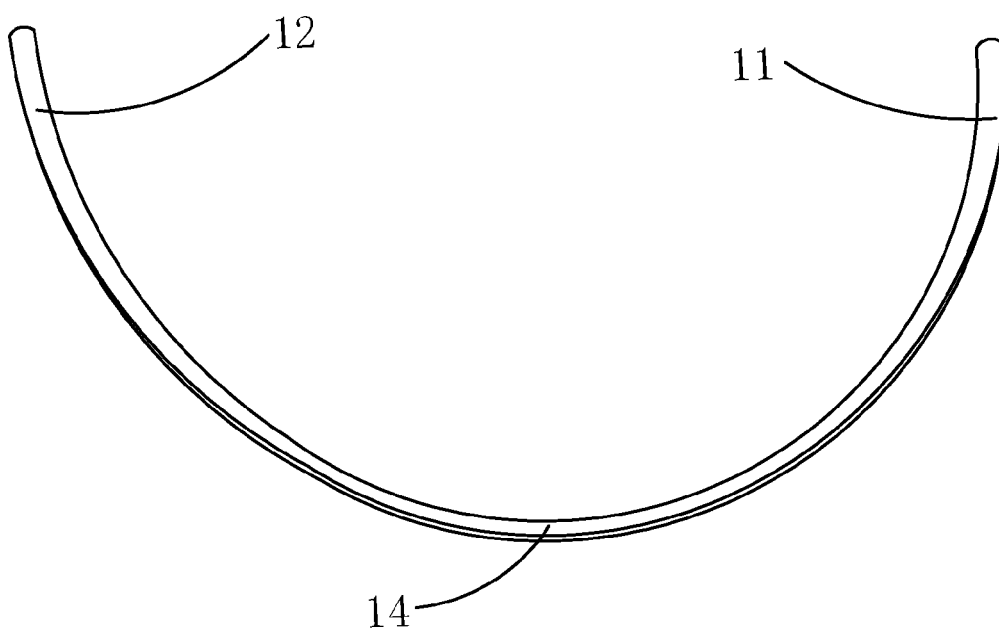


Figure 8



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 6509

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	WO 2009/026753 A1 (KAIPING HUNG HON GARMENT ACCESS [CN]; CHEUNG SUILUNG [CN]) 5 March 2009 (2009-03-05) * abstract; figures *	1,11	
			TECHNICAL FIELDS SEARCHED (IPC)
			A41C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 April 2012	Examiner Fonseca Fernandez, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 6509

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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17-04-2012

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