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(54) Foldable respirator

Faltbare Atemschutzmaske

Respirateur pliable

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Description

1. Field of the Invention

[0001] The present invention relates to a respirator, and particularly to a foldable respirator.

2. Description of the Prior Arts

[0002] Filtration respirators have been widely used to protect wearers' respiratory systems. In general, filtration respirators can be classified into two types, which are cup type and fold-flat type. One of the advantages of fold-flat type respirators is convenience, as a wearer can carry a fold-flat type respirator by storing the respirator into a pocket. When the wearer needs to use the fold-flat type respirator, the wearer just unfolds the respirator. In addition to the ease of carrying, a fold-flat type respirator is more flexible than a cup type respirator, which has a rim configured in a fixed shape. As a result, when wearing a fold-flat type respirator, the fold-flat type respirator fits each particular face structure of different wearers better than a cup type respirator does.

[0003] With improvement in quality and filter efficiency of filter cloth, nowadays the filter efficiency of a respirator is high. According to the NIOSH standards, NIOSH certifies three levels of filter efficiency, which are 95%, 99%, and 99.97%. However, despite the filter efficiency of a respirator reaching a high level, if the fit of a respirator is poor, a wearer still inhales contaminants through the gap between the face and the respirator. Therefore, the fit of a respirator is as important as the filter efficiency of a respirator.

[0004] JP2010063675 discloses a foldable mask for use in the kitchen, with a double fold along the upper and/or the lower edge of the mask, where by the edges of the folds do not overlap.

[0005] U.S. Pat. No.6123077 of 3M Innovative Properties Company discloses a flat-folded personal respiratory protection device, which is one-piece or composed of three individual members; thus the personal respiratory protection device will be a 3d structure after being unfolded. The first member and the second member of the personal respiratory protection device cover nose and chin of a wearer respectively in order to fit the wearer's face tightly. With reference to Fig.9 and Fig.10, when a wearer opens the mouth widely, the distance from the wearer's nose to chin increases from X1 to X2. The personal respiratory protection device 90has a length from top 91 to bottom 92, which is constant and is slightly longer than or equal to X1. When a wearer opens the mouth widely while wearing the personal respiratory protection device 90, the distance from the nose to the chin is X2, which is longer than X1; thus the chin will drag the personal respiratory protection device 90 and may further expose the nose, leading to the poor fit of the personal respiratory protection device 90 with the face, higher leak rate, and reduction of protection efficiency.

[0006] T.W. Pat. No.I1321056B1 also provides a fold-flat type respirator, which is an integral whole, and the integral whole is composed of an upper portion, a central portion and a lower portion. Multiple creases arranged in a step shape are formed on the central portion. When the multiple creases are unfolded, the effective filtration area increases. However, the lack of proper supporting structure for two sides of each crease will cause the central portion to distort and collapse due to some force such as the wearer's breathing airflow. As a result, the distorted fold-flat type respirator still fits the face poorly, leading to higher leak rate and reduction of protection efficiency.

[0007] To overcome the shortcomings, the present invention provides a foldable respirator to mitigate or obviate the aforementioned problems.

[0008] Given that the aforesaid drawbacks of the prior art such as poor fit of the respirator, higher leak rate and reduction of protection efficiency, the main objective of the present invention is to provide a foldable respirator, particularly, a foldable respirator that is not dragged by a wearer's chin when a wearer opens the mouth widely, and therefore avoids exposing the nose. In addition, the foldable respirator does not distort or collapse easily due to force, and thus improves the fit of the respirator with the face, reduces leak rate and has high protection efficiency.

[0009] Accordingly, the foldable respirator of the present invention, which is defined in claim 1, comprises:

a respirator body having an upper part, a lower part, and a central part that is between the upper part and the lower part, and the central part having:

a central region; and
a folded member extending from the central region; and

a band connected to the respirator body.

[0010] According to the aforementioned structure, when the wearer makes mouth movements while wearing the present invention, due to the folded member extending from the central region, the present invention will not be dragged by the chin, and the central region will not distort and collapse while the wearer is breathing, and thus the present invention has a good fit with the face, reduces leak rate and provides high protection efficiency

[0011] Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

IN THE DRAWINGS

[0012]

Fig.1 is a front perspective view of a first embodiment

of the foldable respirator in accordance with the present invention, shown when folded;

Fig.2 is a side view taken along line 2-2 of the foldable respirator in Fig. 1, shown when folded;

Fig.3 is a front perspective view of a second embodiment of the foldable respirator in accordance with the present invention;

Fig.4 a rear perspective view in partial section of the foldable respirator in Fig, 1, shown when folded;

Fig.5 is a perspective view of a third embodiment of the foldable respirator in accordance with the present invention;

Fig.6 is a rear perspective view of the foldable respirator in Fig. 1, shown when unfolded;

Fig.7 is an operational side view of the foldable respirator in Fig. 1 when a wearer closes the mouth while wearing the respirator;

Fig.8 is an operational side view of the foldable respirator in Fig. 1 when a wearer opens the mouth while wearing the respirator;

Fig.9 is an operational side view of a conventional foldable respirator of the U.S. Pat. No. 6123077 when a wearer closes the mouth while wearing the respirator; and

Fig.10 is an operational side view of the conventional foldable respirator in Fig. 9 when a wearer closes the mouth while wearing the respirator.

[0013] With reference to Figs. 1 and 2, a first embodiment of a foldable respirator in accordance with the present invention comprises a respirator body 10 and two bands 20. The respirator body 10 is made of multi-layer non-woven fabric and has a central part 11, an upper part 12, and a lower part 13. The central part 11 is between the upper part 12 and the lower part 13 and is connected to the upper part 12 and the lower part 13. The multi-layer non-woven fabric is spunbond whose basis weight ranges from 16 g/m^2 to 60 g/m^2.

[0014] The respirator body 10 may also have a filtration medium that is melt-blown non-woven fabric.

[0015] The central part 11 has a central region 111 and one folded member extending from the central region 111. The folded member comprises an upper folded member 112 and a lower folded member 113. The upper folded member 112 is formed between the central region 111 and the upper part 12. The lower folded member 113 is formed between the central region 111 and the lower part 13. The central region 111 is flat and comprises an upper end 1111, a lower end 1112 and two binding areas 1113, 1113'. The lower end 1112 is opposite to the upper end 1111. Each of the two binding areas 1113, 1113'is between the upper end 1111 and lower end 1112 and the two binding areas 1113 and 1113' are opposite to each other. The upper folded member 112 is connected to the upper end 1111 and the lower folded member 113 is connected to the lower end 1112.

[0016] With reference to Figs. 1 to 3, the upper folded member 112 has a first upper face 1121, a second upper face 1122 and an upper fold 1123. The outward edge of the first upper face 1121 is connected to the upper end 1111 of the central region 111. The first upper face 1121 and the second upper face 1122 face each other. The outward edge of the first upper face 1121 and the outward edge of second upper face 1122 are opposite to the upper fold 1123, and the outward edge of the first upper face 1121 is parallel with the outward edge of second upper face 1122. The upper fold 1123 is formed between the first upper face 1121 and the second upper face 1122, and the distance from the upper fold 1123 to the outward edge of the first upper face 1121 or to the outward edge of the second upper face 1122 ranges from 3 millimeter (mm) to 60 mm. The first upper face 1121 has an upper left side 1124 and an upper right side 1125 opposite to the upper left side 1124. The second upper face 1122 has an upper left side 1124' and an upper right side 1125' opposite to the upper left side 1124'. The two upper left sides 1124, 1124' are overlapped and the two upper right sides 1125, 1125'are overlapped.

[0017] With reference to Figs. 1 and 4, the upper left side 1124 of the first upper face 1121 and the upper left side 1124' of the second upper face 1122 are joined through fusing and also the upper right side 1125 of the first upper face 1121 and the upper right side 1125' of the second upper face 1122 are joined through fusing. Furthermore, the two upper left sides 1124,1124' are bonded to the central region 111 and the upper part 12, and the two upper right sides 1125,1125' are bonded to the central region 111 and the upper part 12.

[0018] With reference to Figs. 1 to 3, the lower folded member 113 has a first lower face 1131, a second lower face 1132 and a lower fold 1133. The outward edge of the first lower face 1131 is connected to the lower end 1112 of the central region 111. The first lower face 1131 and the second lower face 1132 face each other. The outward edge of the first lower face 1131 and the outward edge of second lower face 1132 are opposite to the lower fold 1133, and the outward edge of the first lower face 1131 is parallel with the outward edge of the second lower face 1132. The lower fold 1133 is formed between the first lower face 1131 and the second lower face 1132 and the distance from the lower fold 1133 to the outward edge of the first lower face 1131 or to the outward edge of the second lower face 1132 ranges from 3mm to 60mm. The first lower face 1131 has a lower left side 1134 and a lower right side 1135 opposite to the lower left side 1134. The second lower face 1132 has a lower left side 1134' and a lower right side 1135' opposite to the lower left side 1134'. The two lower left sides 1134, 1134' are overlapped and the two lower right sides 1135, 1135'are overlapped.

[0019] With reference to Figs. 1, the lower left side 1134 of the first lower face 1131 and the lower left side 1134' of the second lower face 1132 are joined through fusing and also the lower right side 1135 of the first lower face 1131 and the lower right side 1135' of the second lower face 1132 are joined through fusing. The lower left

side 1134 and the lower left side 1134' in Fig.1 are separated as to show the two lower left sides 1134, 1134' clearly. Furthermore, The two lower left sides 1134, 1134' are bonded to the central region 111 and the lower part 13, and the two lower right sides 1135, 1135' are bonded to the central region 111 and the lower part 13.

[0020] With reference to Figs. 2 and 4, the upper part 12 is connected to the central part 11 via the upper folded member 112 and has an upper edge 121 and a front edge 122. The upper edge 121 is connected to the outward edge of the second upper face 1122 and the upper edge 121 is parallel with the upper end 1111 of the central region 111. The front edge 122 is opposite to the upper edge 121.The lower part 13 is connected to the central part 11 via the lower folded member 113 and has a lower edge 131 and a bottom edge 132. The lower edge 131 is connected to the outward edge of the second lower face 1132 and the lower edge 131 is parallel with the lower end 1112 of the central region 111. The bottom edge 132 is opposite to the lower edge 131.

[0021] The two bands 20 are elastic bands. Two ends of each band 20 bind to the two binding areas 1113, 1113' respectively, which makes the respirator a head belt type. In another embodiment of a foldable respirator in accordance with the present invention, the two ends of one band 20 binds to one of the two binding areas 1113, and the two ends of the other band 20 binds to the other binding areas 1113', which makes the respirator an ear belt type. In another embodiment, one of the two ends of one band 20 bonds to one of the two binding areas 1113, and one of the two ends of the other band 20 bonds to the other binding area 1113', and the other ends of each of the two bands 20 are connected through buckles. The method of bonding includes fastening by metal wires or ultrasonic fusing.

[0022] In another embodiment of a foldable respirator in accordance with the present invention, the folded member has a first upper folded member, a second upper folded member and a third upper folded member. The first upper folded member is connected to the upper end 1111. The second upper folded member is connected to the first upper folded member. The third upper folded member is connected to the second upper folded member and to the upper edge 121.The outward edge of the first upper face of the first upper folded member is connected to the upper end 1111. The outward edge of the second upper face of the first upper folded member is connected to the outward edge of the first upper face of the second upper folded member. The outward edge of the second upper face of the second upper folded member is connected to the outward edge of the first upper face of the third upper folded member. The outward edge of the second upper face of the third upper folded member is connected to the upper edge 121.

[0023] In another embodiment of a foldable respirator in accordance with the present invention, the folded member has a first lower folded member, a second lower folded member, and a third lower superposed member. The first lower folded member is connected to the lower end 1112. The second lower folded member is connected to the first lower folded member. The third lower folded member is connected to the second lower folded member and to the lower edge 131.The outward edge of the first lower face of the first lower folded member is connected to the lower end 1112. The outward edge of the second lower face of the first lower folded member is connected to the outward edge of the first lower face of the second lower folded member. The outward edge of the second lower face of the second lower folded member is connected to the outward edge of the first lower face of the third lower folded member. The outward edge of the second lower face of the third lower folded member is connected to the lower edge 131.

[0024] With reference to Figs. 1 and 2, the respirator body 10 has a stiff support 14 that is made of polyester such as polyester fiber. The stiff support 14 is malleable and is fixed in the central region 111 by peripheral seal 15. The stiff support 14 supports the central region 111 and further helps the central region 111 stay in a fixed shape, preventing the central region 111 from distorting and collapsing.

[0025] With reference to Fig. 3, in a second embodiment of a foldable respirator in accordance with the present invention, the upper left side 1124 and the upper right side 1125 of the first upper face 1121 are bonded to the central region 111, and the upper left side 1124' and the upper right side 1125' of the second upper face 1122 are bonded to the upper part 12. The lower left side 1134 and the lower right side 1135 of the first lower face 1131 are bonded to the central region 111, and the lower left side 1134' and the lower right side 1135' of the second lower face 1132 are bonded to the lower part 13.

[0026] With reference to Figs. 2 and 4, the respirator body 10 has a nose clip 17 in the upper part 12 and parallel to the front edge 122 in order to fit the nose tightly. In another embodiment, the nose clip 17 is on a surface of the upper part 12 and is parallel to the front edge 122.

[0027] In another embodiment, the respirator body 10 has foam in the upper part 12 and the foam is parallel to the front edge 122 in order to increase the comfort and provide a good fit with the face for the wearer.

[0028] With reference to Fig. 5, in a third embodiment of a foldable respirator in accordance with the present invention, the respirator body 10 has an exhalation valve 16 mounted thorough the middle portion of the central region 111. The exhalation valve 16 reduces the hot air produced by the wearer's breathing that remains in the respirator of the present invention.

[0029] With reference to Figs. 1 to 4, when the foldable respirator in accordance with the present invention is folded, the upper folded member 112 is overlapped with the central region 111 and the upper part 12. The lower folded member 113 is overlapped with the central region 111 and the lower part 13. The upper part 12 and the lower part 13 are also overlapped with the central region 111. In another embodiment, the upper part 12 is at the

outermost and partially covers the central region 111, the upper edge 121 of the upper part 12 is parallel with the upper end 1111 of the central region 111, and the lower edge 131 of the lower part 13 is parallel with the lower end 1112 of the central region 111.

[0030] With reference to Fig. 6, when the present invention is to be used, first, the upper part 12 and the lower part 13 are expanded toward opposite directions respectively, and thus the present invention becomes a 3D structure, wherein the central part 11, the upper part 12 and the lower part 13 form a space.

[0031] With reference to Figs. 7 and 8, when wearing the present invention, a wearer's nose and mouth are placed in the space formed by the central part 11, the upper part 12 and the lower part 13. The central part 11 faces the mouth, and the upper part 12 covers the wearer's nose, and the lower part 13 covers the wearer's chin. The nose clip 17 in the upper part 12 is used to increase the respirator's fit with the nose bridge. When the wearer closes the mouth, the distance from the wearer's nose to chin is X1, and the upper folded member 112 and the lower folded member 113 are folded. When the wearer opens the mouth widely, the distance from the wearer's nose to chin increases from X1 to X2, and the upper folded member 112 and the lower folded member 113 unfold due to the increase of the length, which is X2 minus X1. At this moment, the first upper face 1121, the second upper face 1122, the upper fold 1123, the first lower face 1131, the second lower face 1132 and the lower fold 1133 are expanded, resulting in a good fit with the wearer's face, reducing leak rate and providing effective protection efficiency.

[0032] Due to the folded member extending from the central region, a wearer can make mouth movements without exposing the nose and the central region 111 will not distort or collapse easily.

[0033] Furthermore, the folded member further has an upper folded member 112 or a lower folded member 113, and as the wearer closes the mouth, the upper folded member 112 or the lower folded member 113 is folded. When the wearer opens the mouth, the respirator body 10 is dragged by the chin, which makes the upper folded member 112 or the lower folded member 113 unfolded, and then expands the first upper face 1121, the second upper face 1122 and the upper fold 1123, or expands the first lower face 1131, the second lower face 1132 and the lower fold 1133. At this time, the central part 11 is totally unfolded.

[0034] Besides, when the upper left side 1124 and the upper right side 1125 of the first upper face 1121, the lower left side 1134 and the lower right side 1135 of the first lower face 1131 are bonded to the central region 111, the upper left side 1124' and the upper right side 1125' of the second upper face 1122 are bonded to the upper part 12, and the lower left side 1134' and the lower right side 1135' of the second lower face 1132 are bonded to the lower part 13, the strength of the folded member increases, which results in maintaining a proper space between the central part 11, the upper part 12 and the lower part 13 and keeping a good fit of the respirator body 10 with the wearer's face.

[0035] Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the invention, the disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A foldable respirator, comprising:

a respirator body (10) having an upper part (12)-, a lower part (13) and a central part (11) that is between the upper part (12) and the lower part (13), and the central part (11) having:

a central region (111) having:

an upper end (1111);
a lower end (1112) opposite to the upper end (1111); and
two binding areas (1113, 1113') between the upper end (1111) and the lower end (1112), the two binding areas (1113, 1113') being opposite to each other; and

a folded member extending from the central region (111); and having:

an upper folded member (112) connected to the upper end (1111) and being between the central region (111) and the upper part (12); and
a lower folded member (113) connected to the lower end (1112) and being between the central region (111) and the lower part (13);

a band (20) connected to the respirator body (10); wherein,
the upper folded member (112) has:

a first upper face (1121) having an upper left side (1124) and an upper right side (1125) opposite to the upper left side (1124);
a second upper face (1122) facing the first upper face (1121) and having an upper left side (1124') and an upper right side (1125') opposite to the upper left side (1124'); and
an upper fold (1123) formed between the

first upper face (1121) and the second upper face (1122); and

the lower folded member (113) has:

a first lower face (1131) having a lower left side (1134) and a lower right side (1135) opposite to the lower left side (1134);
a second lower face (1132) facing the first lower face (1131) and having a lower left side (1134') and a lower right side (1135') opposite to the lower left side (1134'); and
a lower fold (1133) formed between the first lower face (1131) and the second lower face (1132) **characterized in that**:

the upper left side (1124) of the first upper face (1121) and the upper left side (1124') of the second upper face (1122) are overlapped, the upper right side (1125) of the first upper face (1121) and the upper right side (1125') of the second upper face (1122) are overlapped, and an outward edge of the first upper face (1121) and an outward edge of the second upper face (1122) are parallel and are opposite to the upper fold (1123); and the lower left side (1134) of the first lower face (1131) and the lower left side (1134') of the second lower face (1132) are overlapped, the lower right side (1135) of the first lower face (1131) and the lower right side (1135') of the second lower face (1132) are overlapped, and an outward edge of the first lower face (1131) and an outward edge of the second lower face (1132) are parallel and are opposite to the lower fold (1133).

2. The foldable respirator according to claim 1, wherein the outward edge of the first upper face (1121) is connected to the upper end (1111) of the central region (111), and the distance from the upper fold (1123) to the outward edge of the first upper face (1121) or to the outward edge of the second upper face (1122) ranges from 3 millimeters (mm) to 60 mm, and the outward edge of the first lower face (1131) is connected to the lower end (1112) of the central region (111), and the distance from the lower fold (1133) to the outward edge of the first lower face (1131) or to the outward edge of the second lower face (1132) ranges from 3 mm to 60 mm.

3. The foldable respirator according to claim 2, wherein the two upper left sides (1124, 1124') are joined and the two upper right sides (1125, 1125') are joined, and the two lower left sides (1134, 1134') are joined and the two lower right sides (1135, 1135') are joined.

4. The foldable respirator according to claim 3, wherein the two upper left sides (1124, 1124') are bonded to the central region (111) and the upper part (12), and the two upper right sides (1125, 1125') are bonded to the central region (111) and the upper part (12), and the two lower left sides (1134, 1134') are bonded to the central region (111) and the lower part (13), and the two lower right sides (1135, 1135') are bonded to the central region (111) and the lower part (13).

5. The foldable respirator according to claim 4, wherein the upper left side (1124) and the upper right side (1125) of the first upper face (1121) are bonded to the central region (111), and the upper left side (1124') and the upper right side (1125') of the second upper face (1122) are bonded to the upper part (12), and the lower left side (1134) and the lower right side (1135) of the first lower face (1131) are bonded to the central region (111), and the lower left side (1134') and the lower right side (1135') of the second lower face (1132) are bonded to the lower part (13).

6. The foldable respirator according to any one of claims 1 to 5, wherein the upper part (12) has
an upper edge (121) connected to the outward edge of the second upper face (1122) and parallel with the upper end (1111) of the central region (111); and
a front edge (122) opposite to the upper edge (121);
wherein
the lower part (13) has
a lower edge (131) connected to the outward edge of the second lower face (1132) and parallel with the lower end (1112) of the central region (111); and
a bottom edge (132) opposite to the lower edge (131).

7. The foldable respirator according to claim 1, wherein the upper folded member (112) has:

a first upper folded member connected to the central region (111);
a second upper folded member connected to the first upper folded member; and
a third upper folded member connected to the second upper folded member and to the upper part (12); and
the lower folded member (113) has:

a first lower folded member connected to the central region (111);
a second lower folded member connected to the first lower folded member; and
a third lower folded member connected to the second lower folded member and to the lower part (13).

8. The foldable respirator according to any one of claims 1 to 7, wherein the band (20) is an elastic band binding to the binding area (1113, 1113').

9. The foldable respirator according to any one of claims 1 to 8, wherein the respirator body (10) has a stiff support (14), and the stiff support (14) is fixed in the central region (111) and the stiff support is malleable.

10. The foldable respirator according to any one of claims 1 to 9, wherein the respirator body (10) has a nose clip (17) in the upper part (12) or on a surface of the upper part (12).

11. The foldable respirator according to any one of claims 1 to 10, wherein the respirator body (10) has foam in the upper part (12), and the respirator body (10) is made of multi-layer non-woven fabric that is spunbond whose basis weight ranges from 16 g/m^2 to 60 g/m^2, and the respirator body (10) has a filtration medium that is melt-blown non-woven.

Patentansprüche

1. Faltbare Atemschutzmaske, die umfasst:

einen Atemschutzmaskenkörper (10), der ein Oberteil (12), ein Unterteil (13) und ein Mittelteil (11), das zwischen dem Oberteil (12) und dem Unterteil (13) liegt, aufweist, und wobei das Mittelteil (11) Folgendes aufweist:

ein Mittelgebiet (111), das Folgendes aufweist:

ein oberes Ende (1111);
ein unteres Ende (1112), das dem oberen Ende (1111) gegenüberliegt; und
zwei Bindebereiche (1113, 1113') zwischen dem oberen Ende (1111) und dem unteren Ende (1112), wobei die zwei Bindebereiche (1113, 1113') einander gegenüberliegen; und

ein gefaltetes Element, das von dem Mittelgebiet (111) ausgeht und Folgendes aufweist:

ein oberes gefaltetes Element (112), das mit dem oberen Ende (1111) verbunden ist und zwischen dem Mittelgebiet (111) und dem Oberteil (12) liegt; und
ein unteres gefaltetes Element (113), das mit dem unteren Ende (1112) verbunden ist und zwischen dem Mittelgebiet (111) und dem Unterteil (13) liegt;

ein Band (20), das mit dem Atemschutzmaskenkörper (10) verbunden ist; wobei das obere gefaltete Element (112) Folgendes aufweist:

eine erste obere Oberfläche (1121), die eine linke Oberseite (1124) und eine rechte Oberseite (1125), die der linken Oberseite (1124) gegenüberliegt, aufweist;
eine zweite obere Oberfläche (1122), die der ersten oberen Oberfläche (1121) zugewandt ist und eine linke Oberseite (1124') und eine rechte Oberseite (1125'), die der linken Oberseite (1124') gegenüberliegt, aufweist; und
eine obere Faltung (1123), die zwischen der ersten oberen Oberfläche (1121) und der zweiten oberen Oberfläche (1122) gebildet ist; und wobei das untere gefaltete Element (113) Folgendes aufweist:

eine erste untere Oberfläche (1131), die eine linke Unterseite (1134) und eine rechte Unterseite (1135), die der linken Unterseite (1134) gegenüberliegt, aufweist;
eine zweite untere Oberfläche (1132), die der ersten unteren Oberfläche (1131) zugewandt ist und die eine linke Unterseite (1134') und eine rechte Unterseite (1135'), die der linken Unterseite (1134') gegenüberliegt, aufweist; und
eine untere Faltung (1133), die zwischen der ersten unteren Oberfläche (1131) und der zweiten unteren Oberfläche (1132) gebildet ist, **dadurch gekennzeichnet, dass**:

die linke Oberseite (1124) der ersten oberen Oberfläche (1121) und die linke Oberseite (1124') der zweiten oberen Oberfläche (1122) überlappt sind, die rechte Oberseite (1125) der ersten oberen Oberfläche (1121) und die rechte Oberseite (1125') der zweiten oberen Oberfläche (1122) überlappt sind, und ein Außenrand der ersten oberen Oberfläche (1121) und ein Außenrand der zweiten oberen Oberfläche (1122) parallel sind und der oberen Faltung (1123) gegenüberliegen; und die linke Unterseite (1134) der ersten unteren Oberfläche (1131) und die linke Unterseite (1134') der zweiten unteren Oberfläche (1132) überlappt sind, die rechte Unterseite (1135) der ersten unteren Oberfläche (1131) und die rechte Unterseite (1135') der zweiten unteren Oberfläche (1132) überlappt sind und ein Außenrand der ersten unteren Oberfläche (1131) und ein Außenrand der zweiten unteren Oberfläche (1132) parallel sind und der unteren Faltung (1133) gegenüberliegen.

2. Faltbare Atemschutzmaske gemäß Anspruch 1, wobei der Außenrand der ersten oberen Oberfläche (1121) mit dem oberen Ende (1111) des Mittelgebiets (111) verbunden ist und die Entfernung von der oberen Faltung (1123) zu dem Außenrand der ersten oberen Oberfläche (1121) oder zu dem Außenrand der zweiten oberen Oberfläche (1122) in dem Bereich von 3 Millimetern (mm) bis 60 mm liegt und der Außenrand der ersten unteren Oberfläche (1131) mit dem unteren Ende (1112) des Mittelgebiets (111) verbunden ist und die Entfernung von der unteren Faltung (1133) zu dem Außenrand der ersten unteren Oberfläche (1131) oder zu dem Außenrand der zweiten unteren Oberfläche (1132) in dem Bereich von 3 mm bis 60 mm liegt.

3. Faltbare Atemschutzmaske gemäß Anspruch 2, wobei die zwei linken Oberseiten (1124, 1124') zusammengefügt sind und die zwei rechten Oberseiten (1125, 1125') zusammengefügt sind und die zwei linken Unterseiten (1134, 1134') zusammengefügt sind und die zwei rechten Unterseiten (1135, 1135') zusammengefügt sind.

4. Faltbare Atemschutzmaske gemäß Anspruch 3, wobei die zwei linken Oberseiten (1124, 1124') mit dem Mittelgebiet (111) und mit dem Oberteil (12) aneinandergehaftet sind und die zwei rechten Oberseiten (1125, 1125') mit dem Mittelgebiet (111) und mit dem Oberteil (12) aneinandergehaftet sind und die zwei linken Unterseiten (1134, 1134') mit dem Mittelgebiet (111) und mit dem Unterteil (13) aneinandergehaftet sind und die zwei rechten Unterseiten (1135, 1135') mit dem Mittelgebiet (111) und mit dem Unterteil (13) aneinandergehaftet sind.

5. Faltbare Atemschutzmaske gemäß Anspruch 4, wobei die linke Oberseite (1124) und die rechte Oberseite (1125) der ersten oberen Oberfläche (1121) mit dem Mittelgebiet (111) aneinandergehaftet sind und die linke Oberseite (1124') und die rechte Oberseite (1125') der zweiten oberen Oberfläche (1122) mit dem Oberteil (12) aneinandergehaftet sind und die linke Unterseite (1134) und die rechte Unterseite (1135) der ersten unteren Oberfläche (1131) mit dem Mittelgebiet (111) aneinandergehaftet sind und die linke Unterseite (1134') und die rechte Unterseite (1135') der zweiten unteren Oberfläche (1132) mit dem Unterteil (13) aneinandergehaftet sind.

6. Faltbare Atemschutzmaske gemäß einem der Ansprüche 1 bis 5, wobei das Oberteil (12) Folgendes aufweist:

einen oberen Rand (121), der mit dem Außenrand der zweiten oberen Oberfläche (1122) verbunden ist und parallel zu dem oberen Ende (1111) des Mittelgebiets (111) ist; und
einen vorderen Rand (122), der dem oberen Rand (121) gegenüberliegt; wobei
das Unterteil (13) Folgendes aufweist:

einen unteren Rand (131), der mit dem Außenrand der zweiten unteren Oberfläche (1132) verbunden ist und zu dem unteren Ende (1112) des Mittelgebiets (111) parallel ist; und
einen untersten Rand (132), der dem unteren Rand (131) gegenüberliegt.

7. Faltbare Atemschutzmaske gemäß Anspruch 1, wobei das obere gefaltete Element (112) Folgendes aufweist:

ein erstes oberes gefaltetes Element, das mit dem Mittelgebiet (111) verbunden ist;
ein zweites oberes gefaltetes Element, das mit dem ersten oberen gefalteten Element verbunden ist; und
ein drittes oberes gefaltetes Element, das mit dem zweiten oberen gefalteten Element und mit dem Oberteil (12) verbunden ist; und
das untere gefaltete Element (113) Folgendes aufweist:

ein erstes unteres gefaltetes Element, das mit dem Mittelgebiet (111) verbunden ist;
ein zweites unteres gefaltetes Element, das mit dem ersten unteren gefalteten Element verbunden ist; und
ein drittes unteres gefaltetes Element, das mit dem zweiten unteren gefalteten Element und mit dem Unterteil (13) verbunden ist.

8. Faltbare Atemschutzmaske gemäß einem der Ansprüche 1 bis 7, wobei das Band (20) ein elastisches Band ist, das mit dem Bindebereich (1113, 1113') verbunden ist.

9. Faltbare Atemschutzmaske gemäß einem der Ansprüche 1 bis 8, wobei der Atemschutzmaskenkörper (10) einen steifen Träger (14) aufweist und wobei der steife Träger (14) in dem Mittelgebiet (111) befestigt ist und wobei der steife Träger verformbar ist.

10. Faltbare Atemschutzmaske gemäß einem der Ansprüche 1 bis 9, wobei der Atemschutzmaskenkörper (10) in dem Oberteil (12) oder auf einer Oberfläche des Oberteils (12) eine Nasenklemme (17) aufweist.

11. Faltbare Atemschutzmaske gemäß einem der Ansprüche 1 bis 10, wobei der Atemschutzmaskenkörper (10) in dem Oberteil (12) Schaum aufweist und wobei der Atemschutzmaskenkörper (10) aus einem

Mehrschichtvliesstoff hergestellt ist, der ein Spinnvlies ist, dessen Flächenmasse im Bereich von 16 g/m^2 bis 60 g/m^2 liegt, und wobei der Atemschutzmaskenkörper (10) ein Filtermedium aufweist, das ein schmelzgeblasenes Vlies ist.

Revendications

1. Appareil respiratoire pliable comprenant :

un corps d'appareil respiratoire (10) comportant une partie supérieure (12), une partie inférieure (13) et une partie centrale (11) qui se situe entre la partie supérieure (12) et la partie inférieure (13), et la partie centrale (11) comportant :

une région centrale (111) ayant :

une extrémité supérieure (1111) ;
une extrémité inférieure (1112) opposée à l'extrémité supérieure (1111) ; et
deux zones d'attache (1113, 1113') entre l'extrémité supérieure (1111) et l'extrémité inférieure (1112), les deux zones de pliage (1113, 1113') étant opposées entre elles ; et

un élément plié s'étendant à partir de la région centrale (111) et comportant :

un élément plié supérieur (112) connecté à l'extrémité supérieure (1111) et se situant entre la région centrale (111) et la partie supérieure (12) ; et
un élément plié inférieur (113) connecté à l'extrémité inférieure (1112) et se situant entre la région centrale (111) et la partie inférieure (13) ;
une bande (20) connectée au corps d'appareil respiratoire (10) ; dans lequel
l'élément plié supérieur (112) comporte :

une première face supérieure (1121) ayant un côté gauche supérieur (1124) et un côté droit supérieur (1125) opposé au côté gauche supérieur (1124) ;
une deuxième face supérieure (1122) faisant face à la première face supérieure (1121) et ayant un côté gauche supérieur (1124') et un côté droit supérieur (1125') opposé au côté gauche supérieur (1124') ; et
un pli supérieur (1123) formé entre la première face supérieure (1121) et la deuxième face supérieure (1122) ; et

l'élément plié inférieur (113) comporte :

une première face inférieure (1131) ayant un côté gauche inférieur (1134) et un côté droit inférieur (1135) opposé au côté gauche inférieur (1134) ;
une deuxième face inférieure (1132) faisant face à la première face inférieure (1131) et ayant un côté gauche inférieur (1134') et un côté droit inférieur (1135') opposé au côté gauche inférieur (1134') et
un pli inférieur (1133) formé entre la première face inférieure (1131) et la deuxième face inférieure (1132) ; **caractérisé en ce que** :

le côté gauche supérieur (1124) de la première face supérieure (1121) et le côté gauche supérieur (1124') de la deuxième face supérieure (1122) sont superposés, le côté droit supérieur (1125) de la première face supérieure (1121) et le côté droit supérieur (1125') de la deuxième face supérieure (1122) sont superposés, et un bord extérieur de la première face supérieure (1121) et un bord extérieur de la deuxième face supérieure (1122) sont parallèles et sont opposés au pli supérieur (1123) ; et le côté gauche inférieur (1134) de la première face inférieure (1131) et le côté gauche inférieur (1134') de la deuxième face inférieure (1132) sont superposés, le côté droit inférieur (1135) de la première face inférieure (1131) et le côté droit inférieur (1135') de la deuxième face inférieure (1132) sont superposés, et un bord extérieur de la première face inférieure (1131) et un bord extérieur de la deuxième face inférieure (1132) sont parallèles et sont opposés au pli inférieur (1133).

2. Appareil respiratoire pliable selon la revendication 1, dans lequel le bord extérieur de la première face supérieure (1121) est connecté à l'extrémité supérieure (1111) de la région centrale (111) et la distance du pli supérieur (1123) au bord extérieur de la première face supérieure (1121) ou au bord extérieur de la deuxième face supérieure (1122) est dans la plage de 3 millimètres (mm) à 60 mm, et le bord extérieur de la première face inférieure (1131) est connecté à l'extrémité inférieure (1112) de la région centrale (111) et la distance du pli inférieur (1133) au bord extérieur de la première face inférieure (1131) ou au bord extérieur de la deuxième face inférieure (1132) est dans la plage de 3 mm à 60 mm.

3. Appareil respiratoire pliable selon la revendication 2, dans lequel les deux côtés gauches supérieurs (1124, 1124') sont unis et les deux côtés droits su-

périeurs (1125, 1125') sont unis, et les deux côtés gauches inférieurs (1134, 1134') sont unis et les deux côtés droits inférieurs (1135, 1135') sont unis.

4. Appareil respiratoire pliable selon la revendication 3, dans lequel les deux côtés gauches supérieurs (1124, 1124') sont liés à la région centrale (111) et à la partie supérieure (12) et les deux côtés droits supérieurs (1125, 1125') sont liés à la région centrale (111) et à la partie supérieure (12), et les deux côtés gauches inférieurs (1134, 1134') sont liés à la région centrale (111) et à la partie inférieure (13) et les deux côtés droits inférieurs (1135, 1135') sont liés à la région centrale (111) et à la partie inférieure (13).

5. Appareil respiratoire pliable selon la revendication 4, dans lequel le côté gauche supérieur (1124) et le côté droit supérieur (1125) de la première face supérieure (1121) sont liés à la région centrale (111), et le côté gauche supérieur (1124') et le côté droit supérieur (1125') de la deuxième face supérieure (1122) sont liés à la partie supérieure (12), et le côté gauche inférieur (1134) et le côté droit inférieur (1135) de la première face inférieure (1131) sont liés à la région centrale (111), et le côté gauche inférieur (1134') et le côté droit inférieur (1135') de la deuxième face inférieure (1132) sont liés à la partie inférieure (13).

6. Appareil respiratoire pliable selon l'une quelconque des revendications 1 à 5, dans lequel la partie supérieure (12) a
un bord supérieur (121) connecté au bord extérieur de la deuxième face supérieure (1122) et parallèle à l'extrémité supérieure (1111) de la région centrale (111) ; et
un bord avant (122) opposé au bord supérieur (121) ;
dans lequel la partie inférieure (13) a
un bord inférieur (131) connecté au bord extérieur de la deuxième face inférieure (1132) et parallèle à l'extrémité inférieure (1112) de la région centrale (111) ; et
un bord de dessous (132) opposé au bord inférieur (131).

7. Appareil respiratoire pliable selon la revendication 1, dans lequel l'élément plié supérieur (112) comporte :

un premier élément plié supérieur connecté à la région centrale (111) ;
un deuxième élément plié supérieur connecté au premier élément plié supérieur ; et
un troisième élément plié supérieur connecté au deuxième élément plié supérieur et à la partie supérieure (12) ; et
l'élément plié inférieur (113) comporte :

un premier élément plié inférieur connecté à la région centrale (111) ;
un deuxième élément plié inférieur connecté au premier élément plié inférieur ; et
un troisième élément plié inférieur connecté au deuxième élément plié inférieur et à la partie inférieure (13).

8. Appareil respiratoire pliable selon l'une quelconque des revendications 1 à 7, dans lequel la bande (20) est une bande élastique s'attachant à la zone d'attache (1113, 1113').

9. Appareil respiratoire pliable selon l'une quelconque des revendications 1 à 8, dans lequel le corps d'appareil respiratoire (10) comporte un support rigide (14), et le support rigide (14) est fixé dans la région centrale (111) et le support rigide est malléable.

10. Appareil respiratoire pliable selon l'une quelconque des revendications 1 à 9, dans lequel le corps d'appareil respiratoire (10) comporte un pince-nez (17) dans la partie supérieure (12) ou sur une surface de la partie supérieure (12).

11. Appareil respiratoire pliable selon l'une quelconque des revendications 1 à 10, dans lequel le corps d'appareil respiratoire (10) comporte de la mousse dans la partie supérieure (12), et le corps d'appareil respiratoire (10) est constitué d'un tissu non tissé multicouche qui est filé-lié, dont le poids de base est dans la plage de 16 g/m^2 à 60 g/m^2, et le corps d'appareil respiratoire (10) comporte un milieu de filtration qui est non-tissé fondu-soufflé.

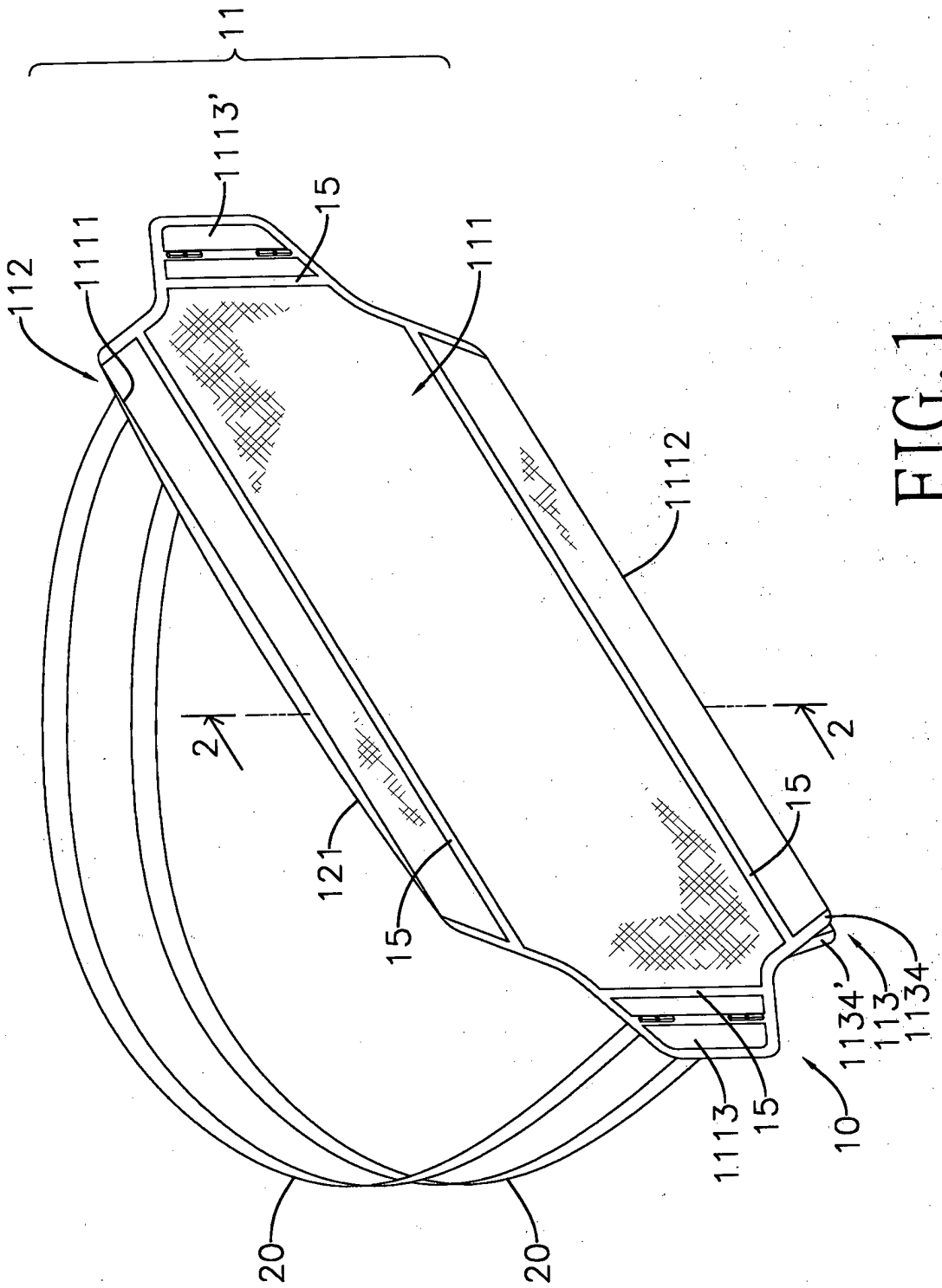
11
1113'
15
112
1111
111
1112
2
2
121
15
15
1134'
113
1134
1113
15
10
20
20

FIG. 1

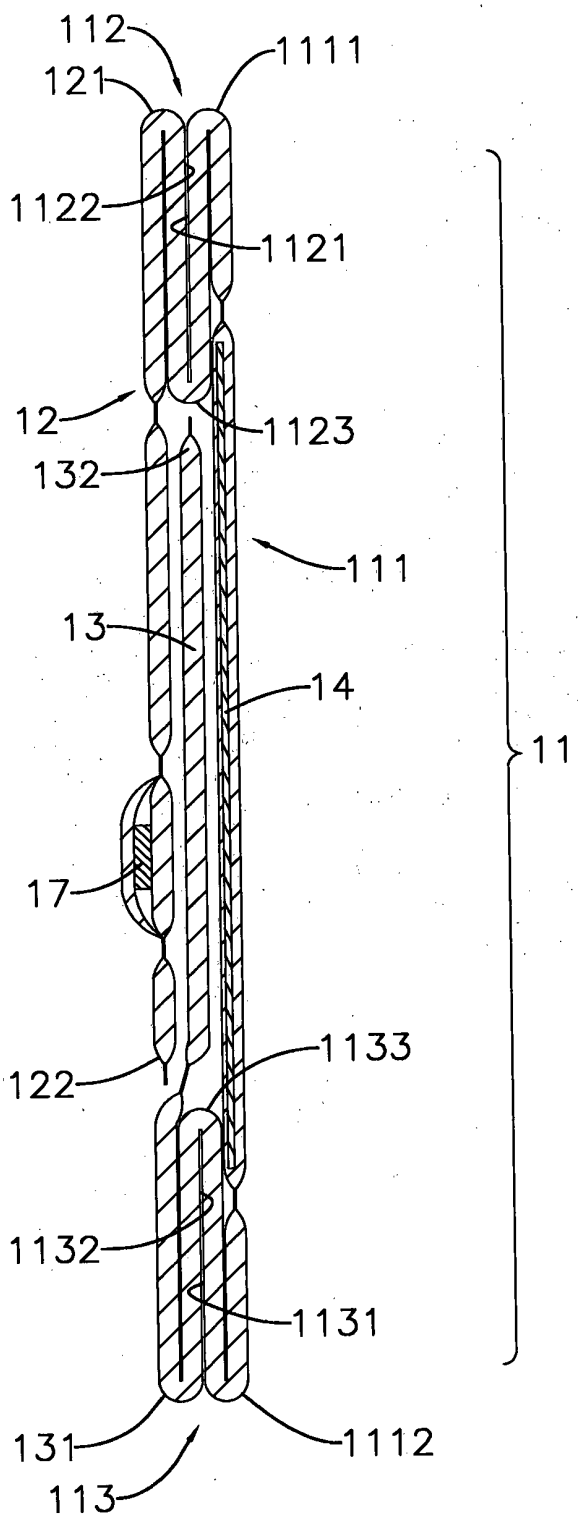
112
1111
121
1122
1121
12
1123
132
111
13
14
11
17
122
1133
1132
1131
131
1112
113

FIG. 2

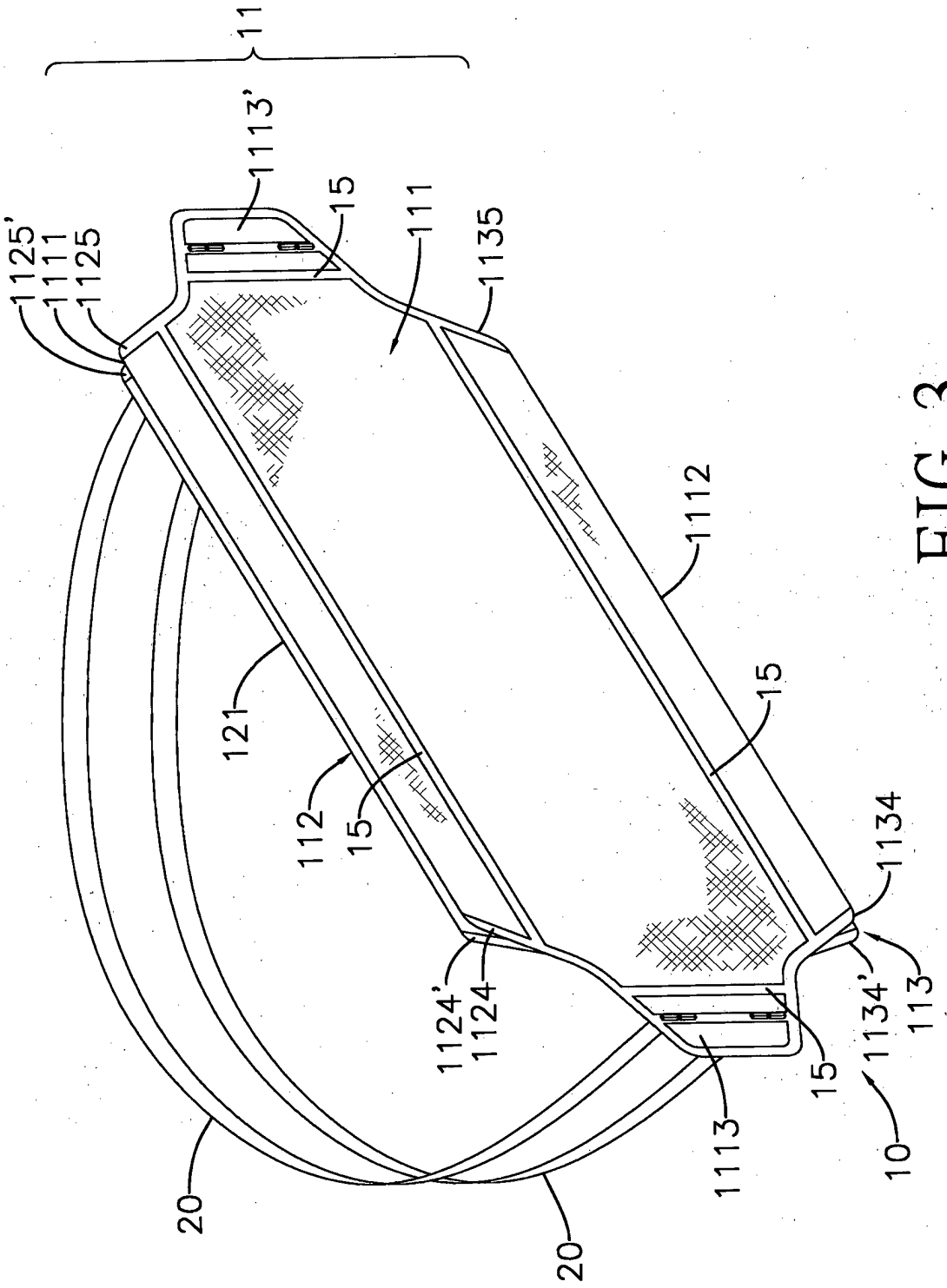
11
1113'
15
111
1135
1125'
1111
1125
1112
121
15
112
15
1134
1124'
1124
1134'
113
15
1113
10
20
20

FIG. 3

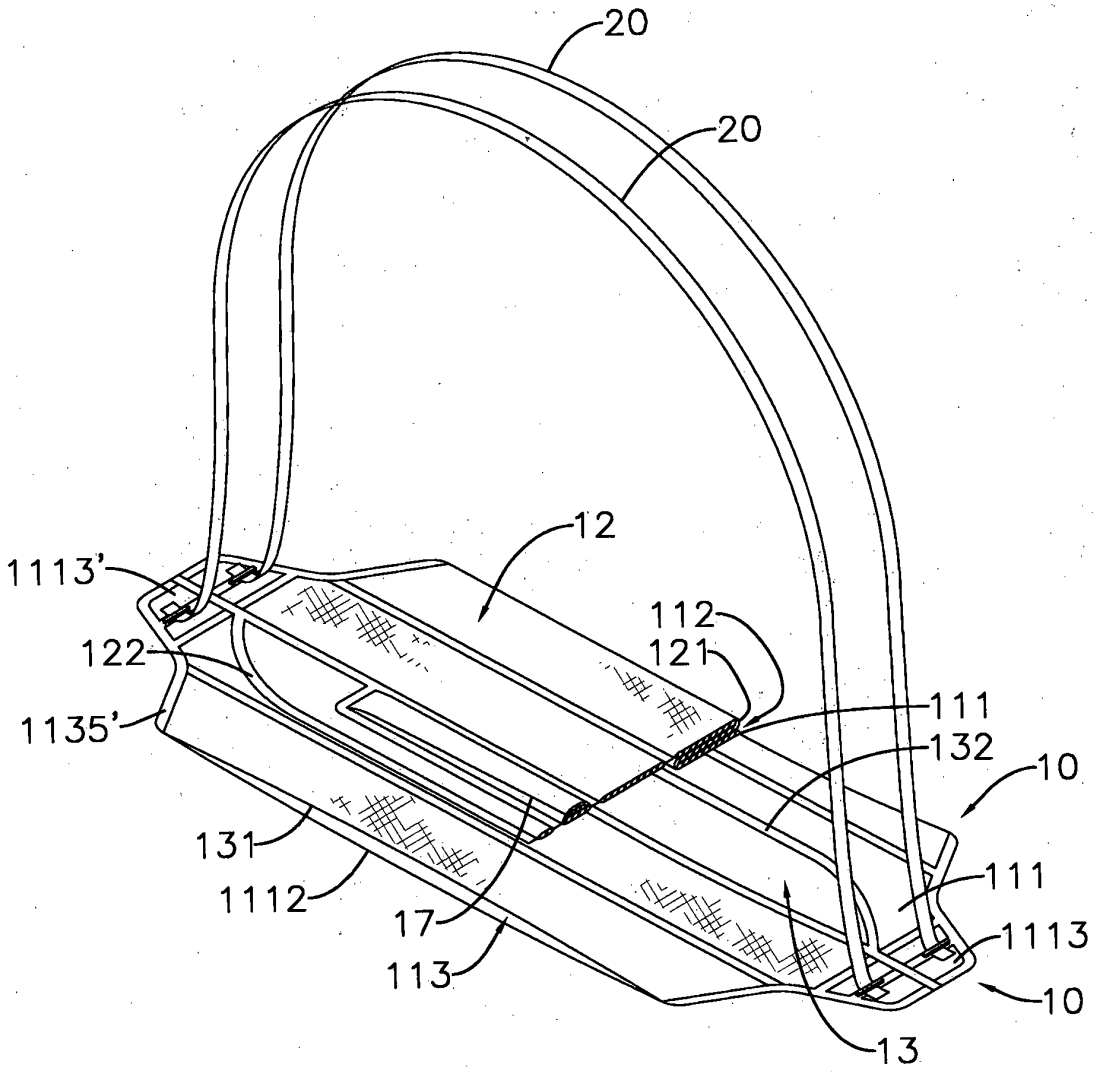
20
20
12
1113'
122
1135'
112
121
111
132
10
131
1112
17
113
111
1113
10
13

FIG. 4

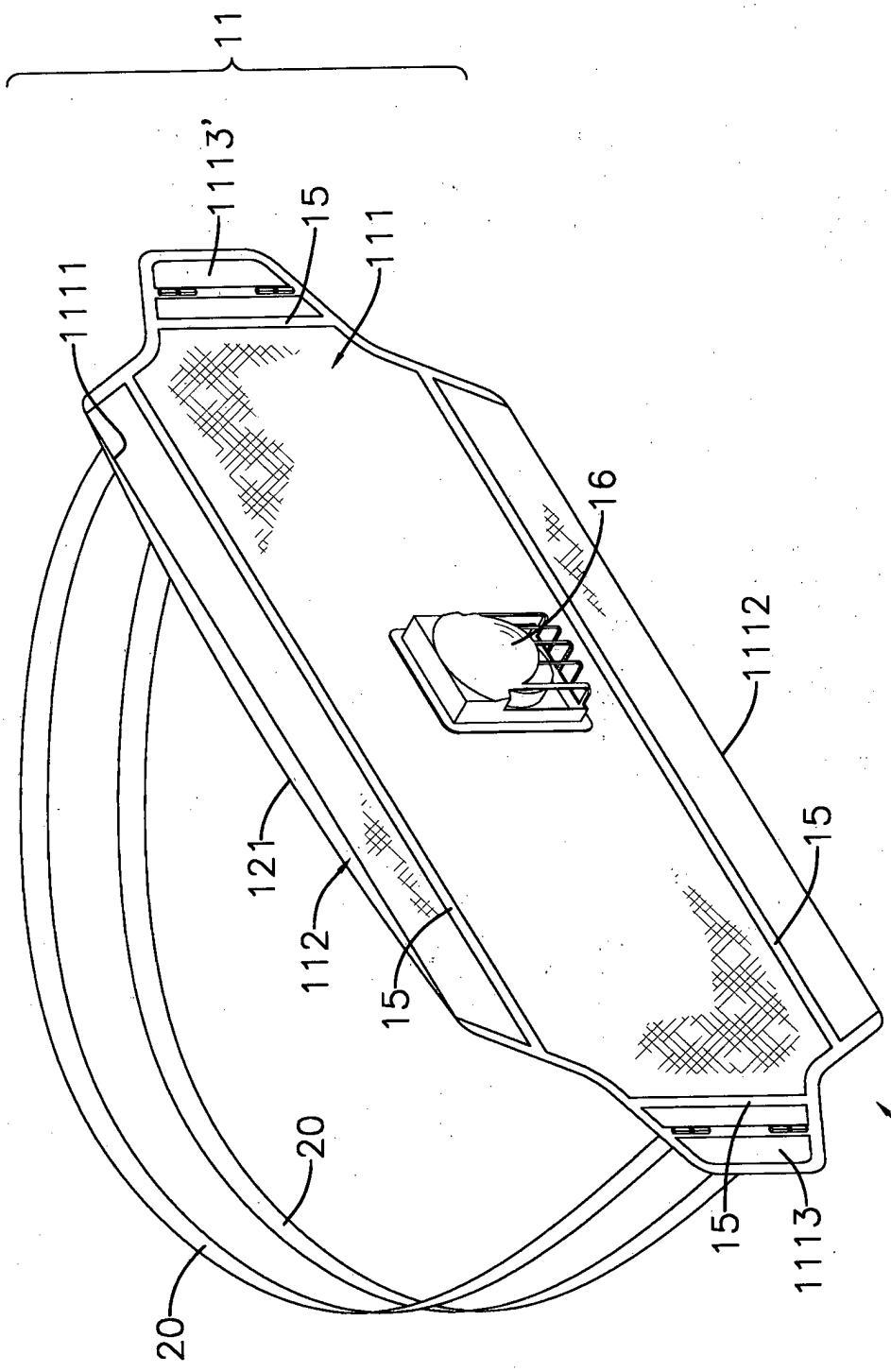

FIG. 5

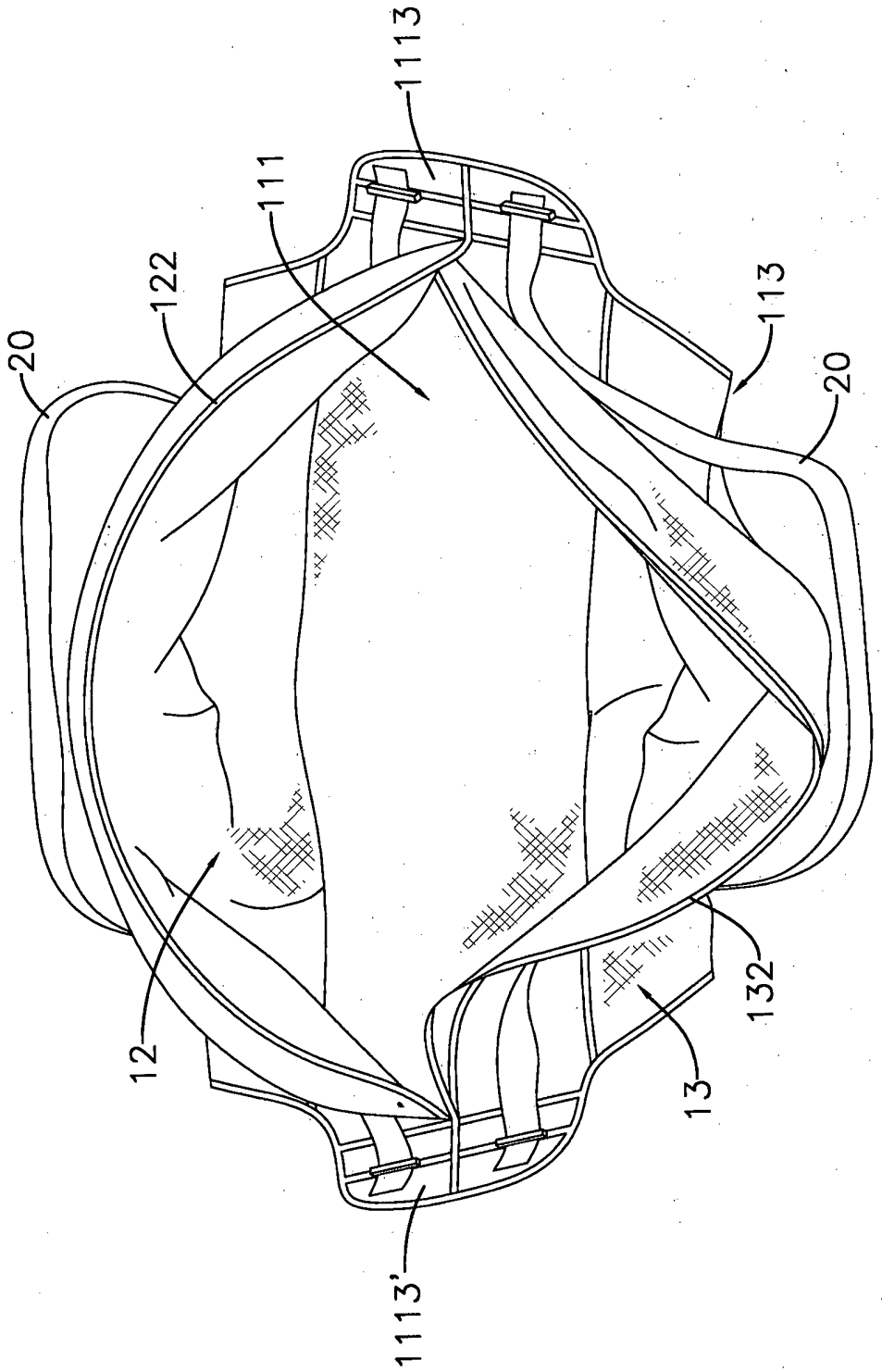

FIG.6

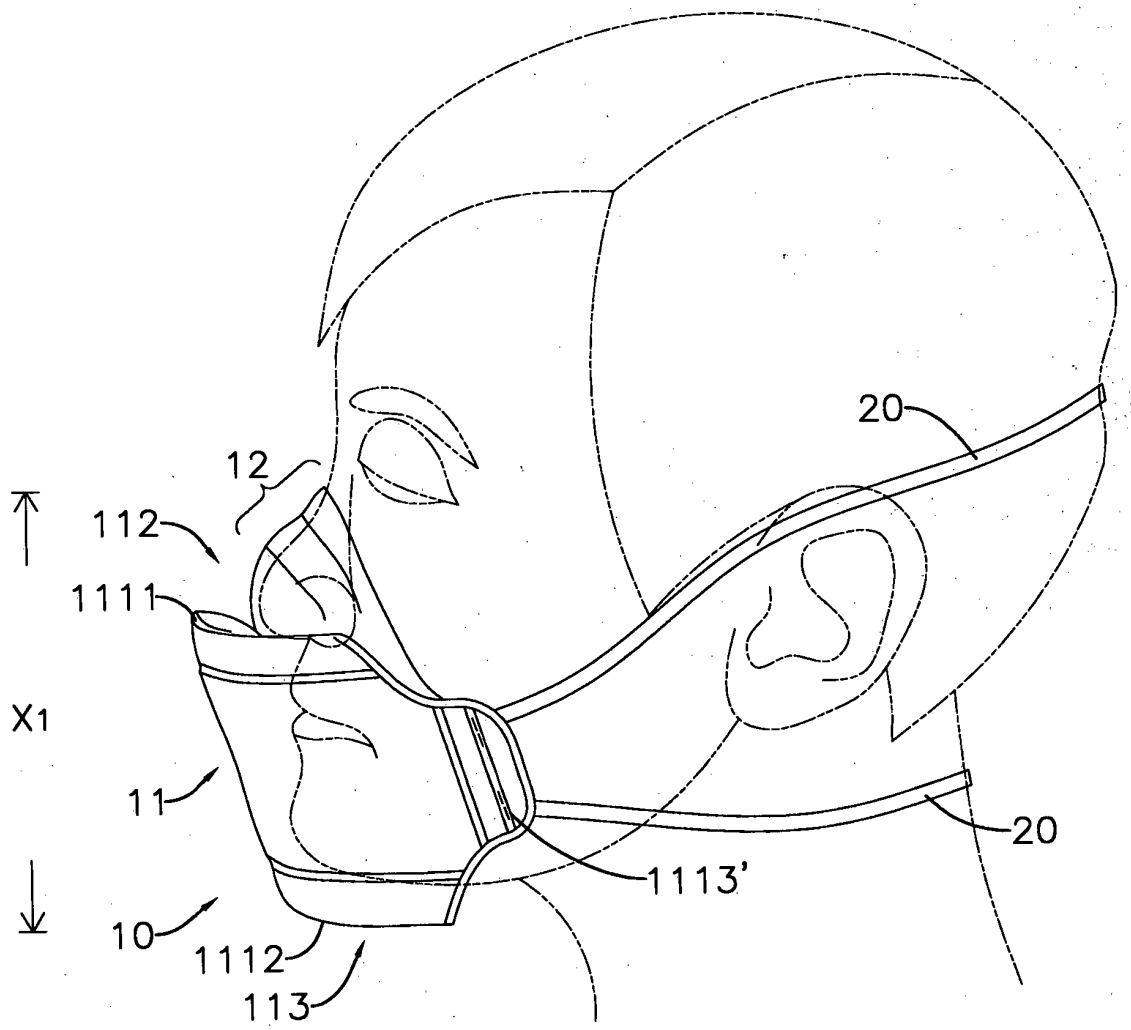

FIG. 7

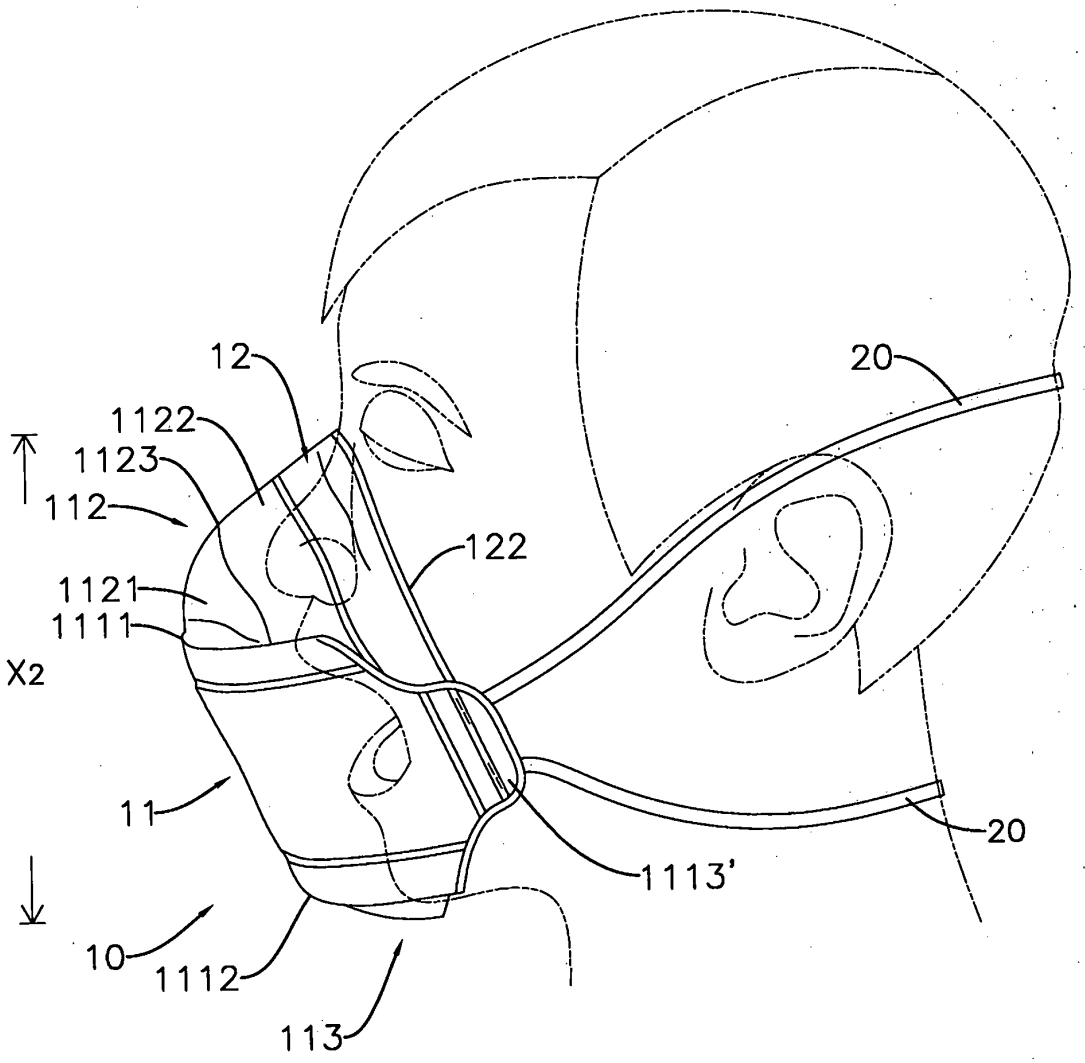

FIG.8

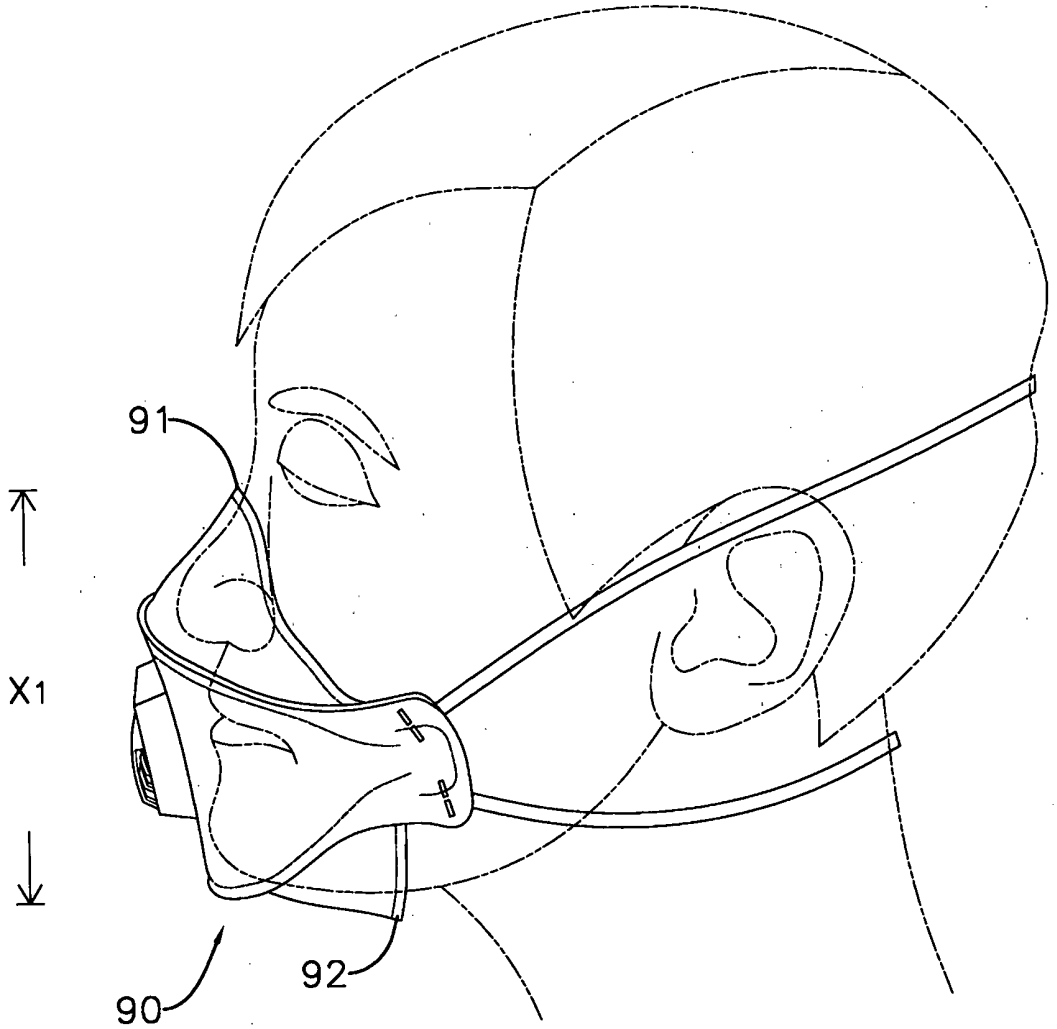

FIG.9
PRIOR ART

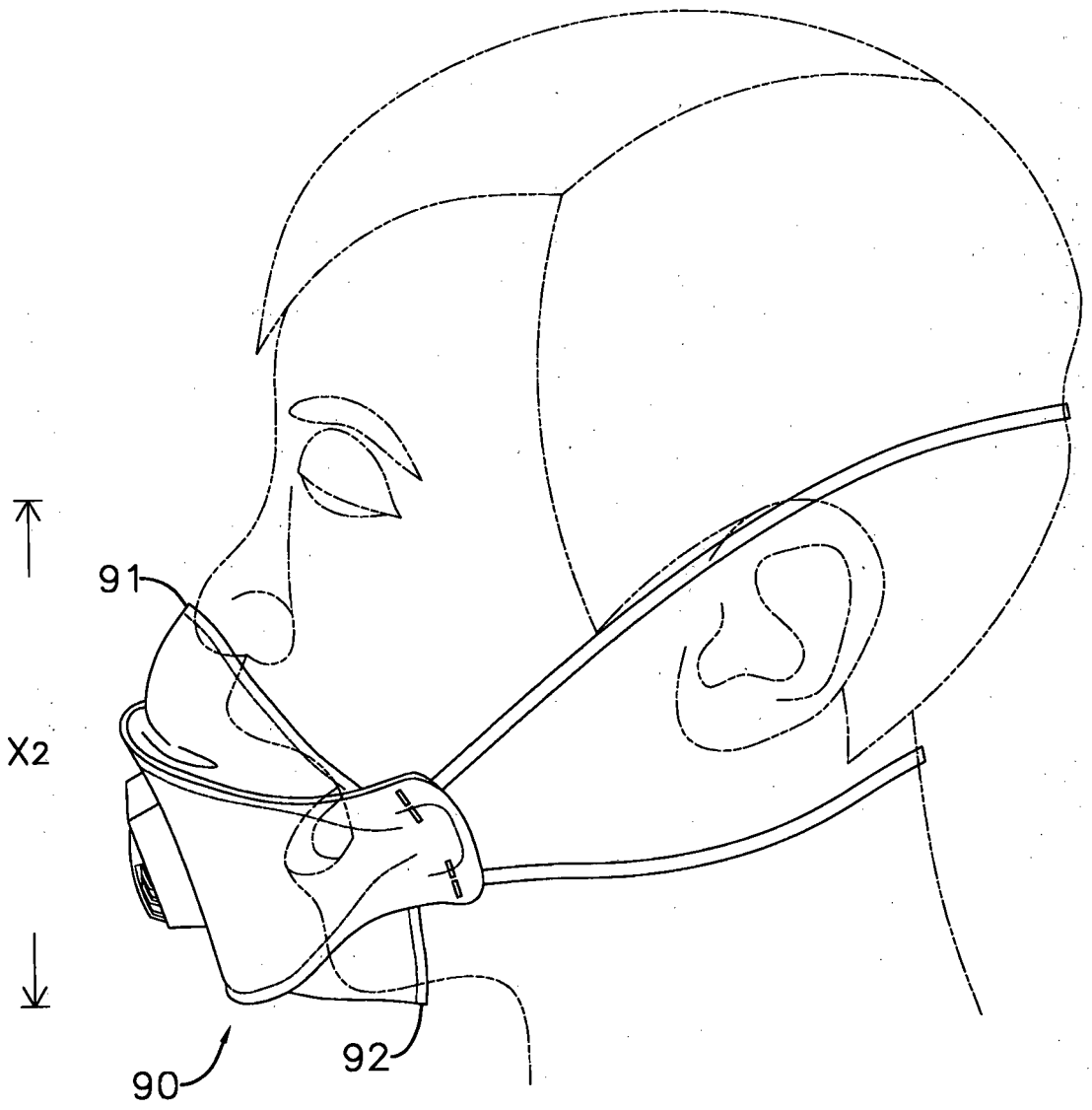

FIG.10
PRIOR ART

REFERENCES CITED IN THE DESCRIPTION

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