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(54) **FLAT FOLDING N95 MASKS**

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(57) **ABSTRACT**

The present invention provides mask capable of enabling the mask to be folded into a flat package before use or unfolded into a three dimensional configuration when placed on the face of the wearer.

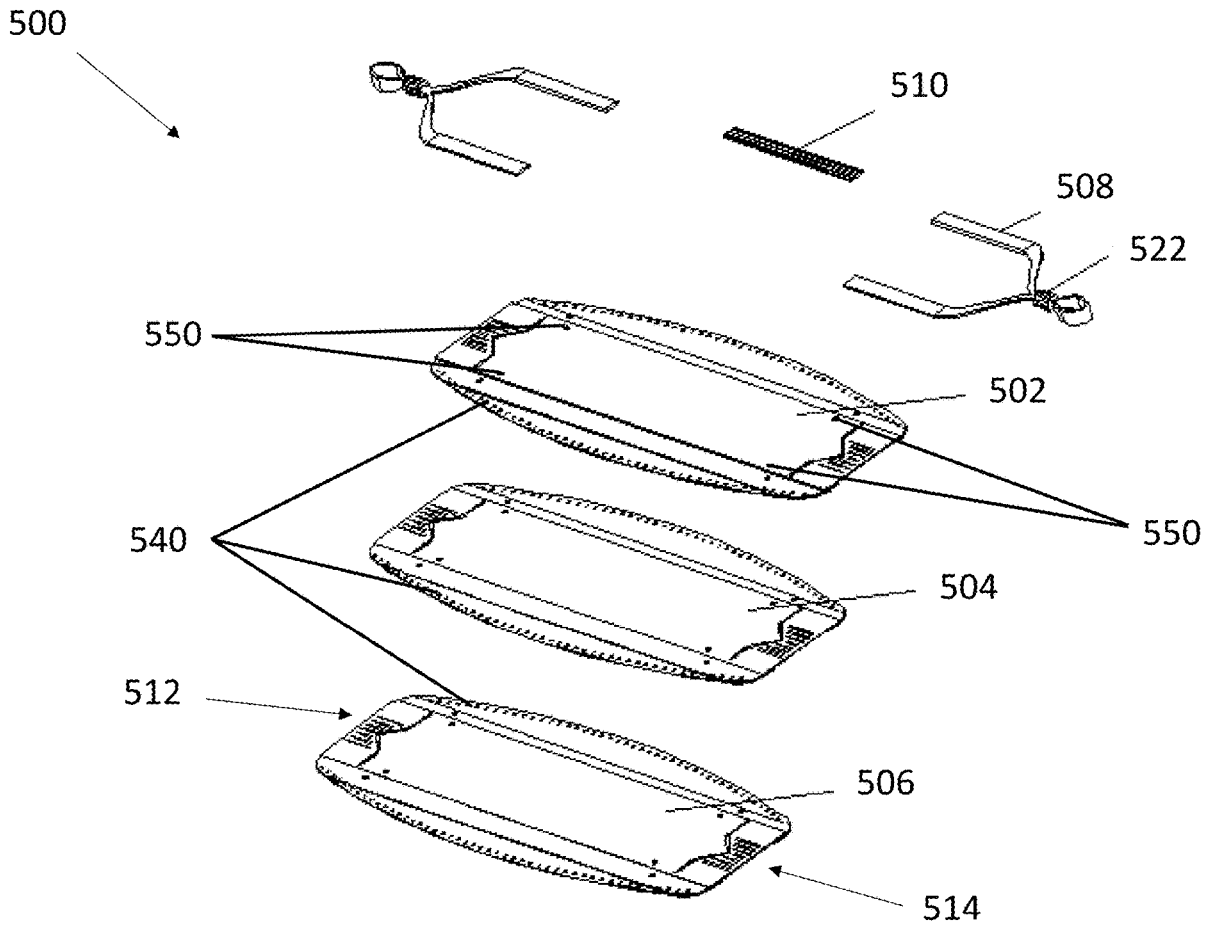
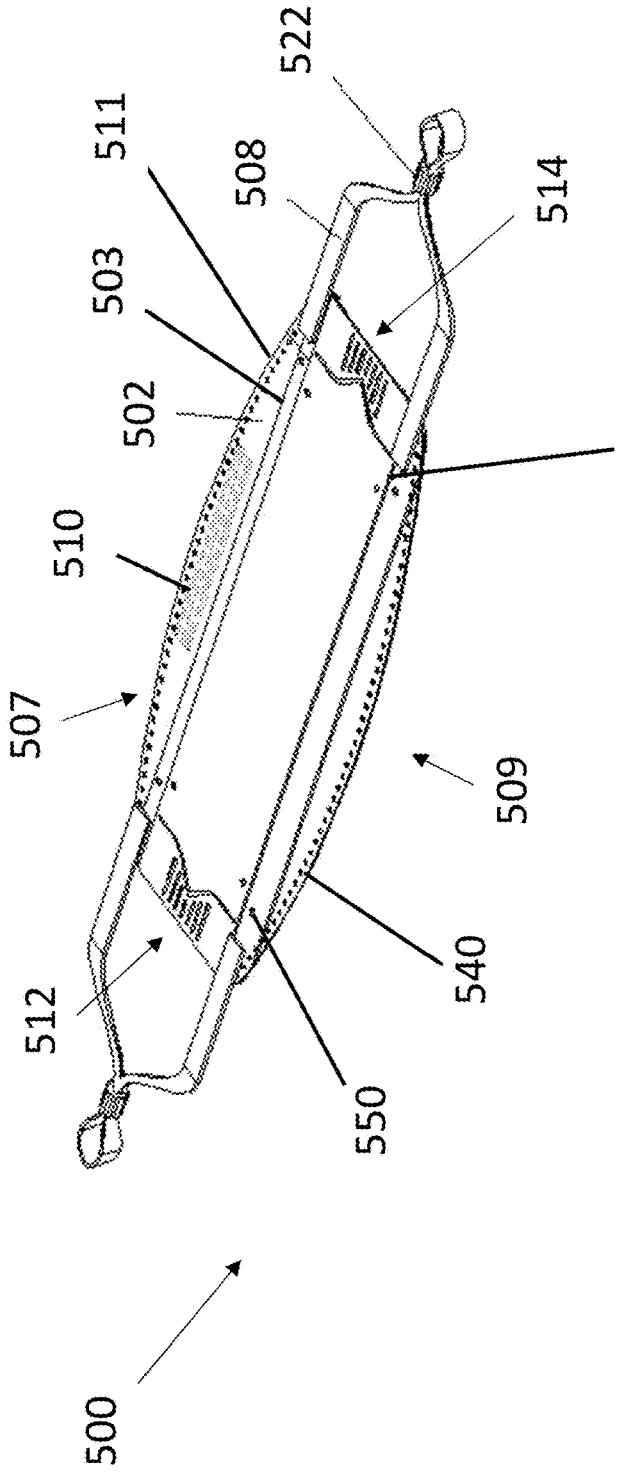


Fig. 1A


500
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502
503
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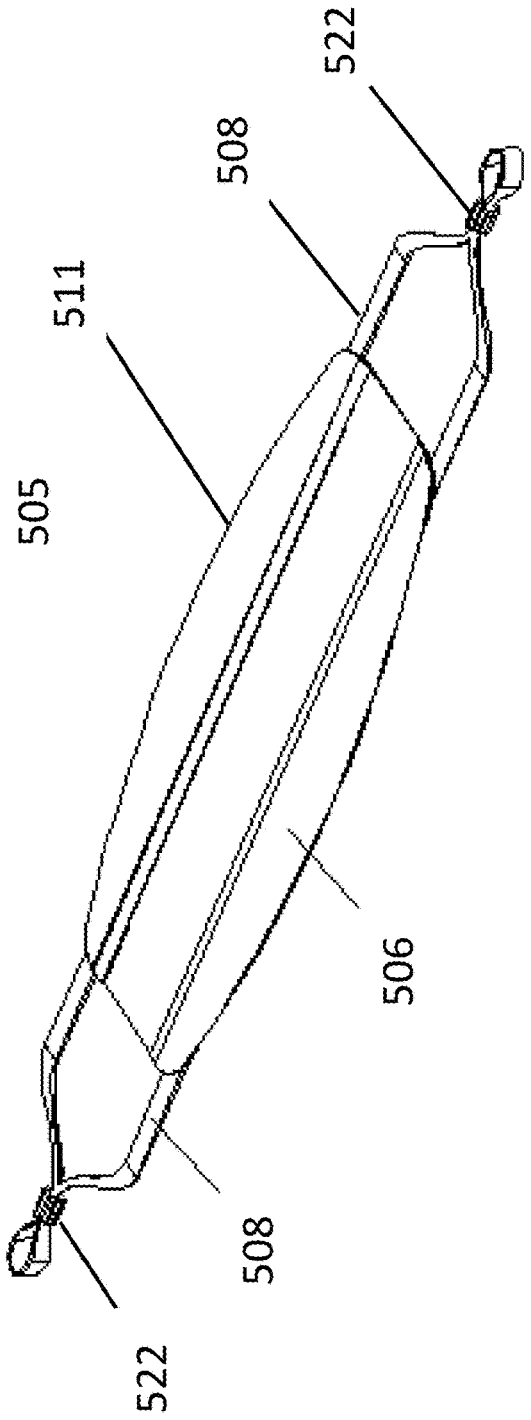
550

Fig. 1B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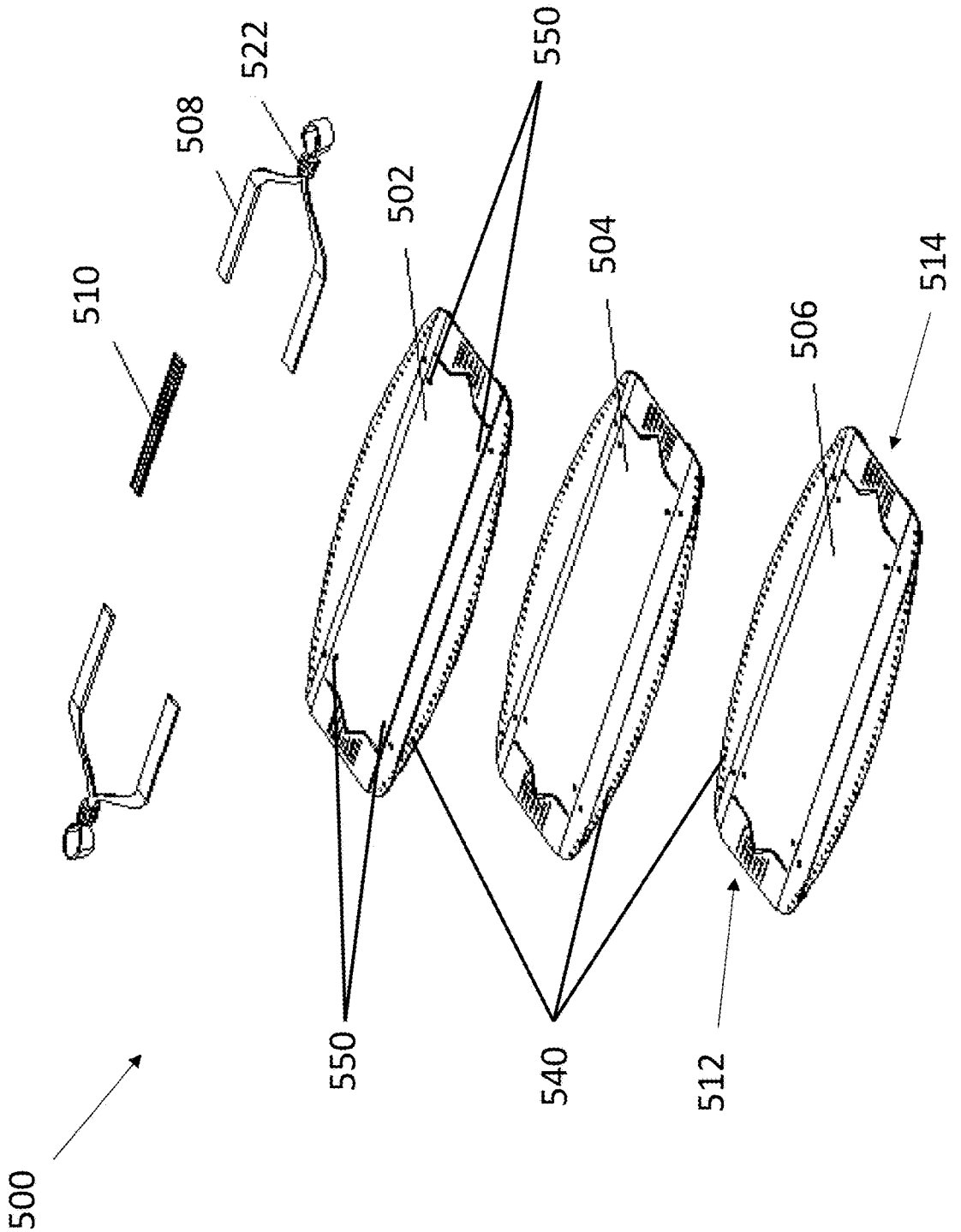


Fig. 2

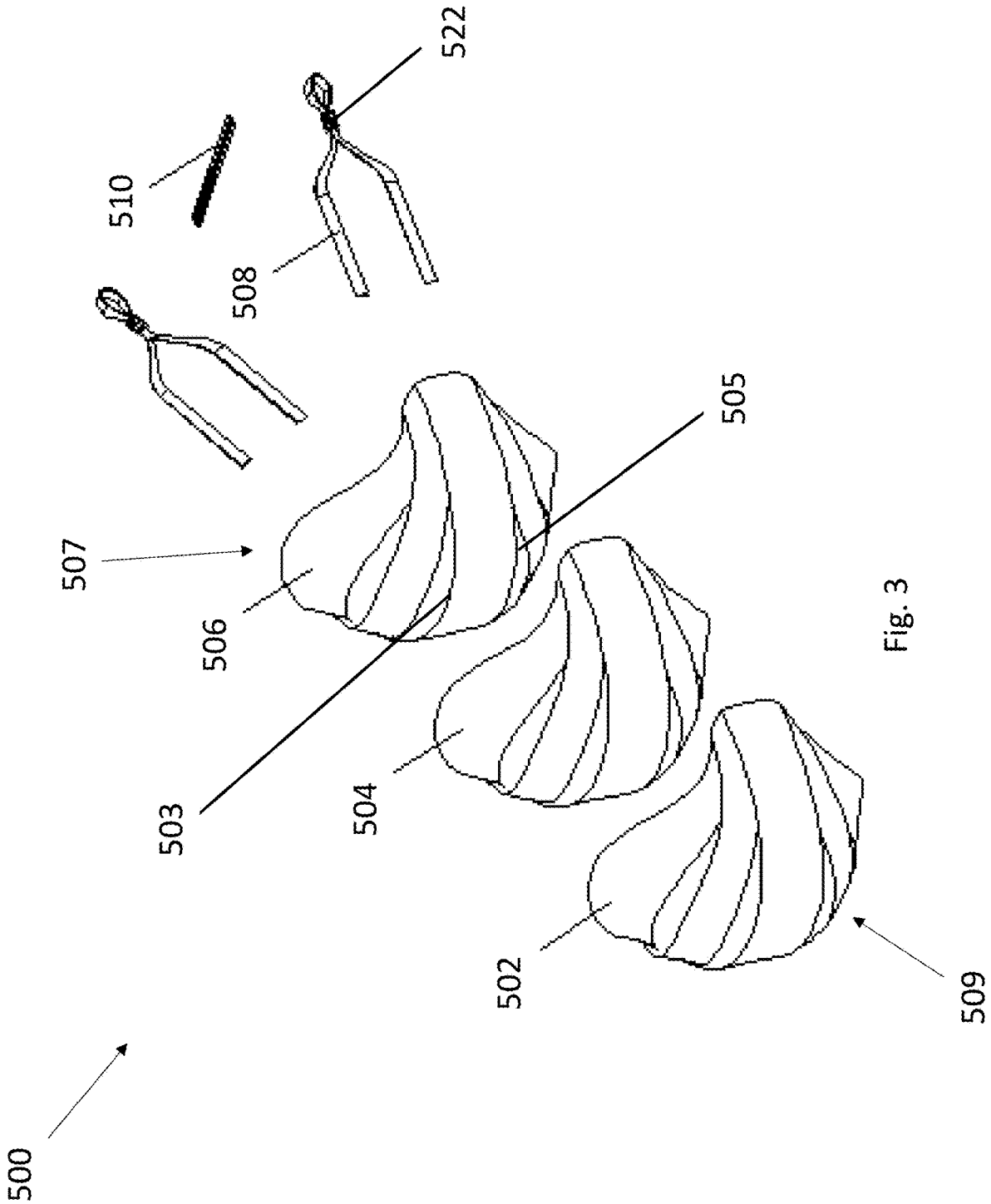


Fig. 3

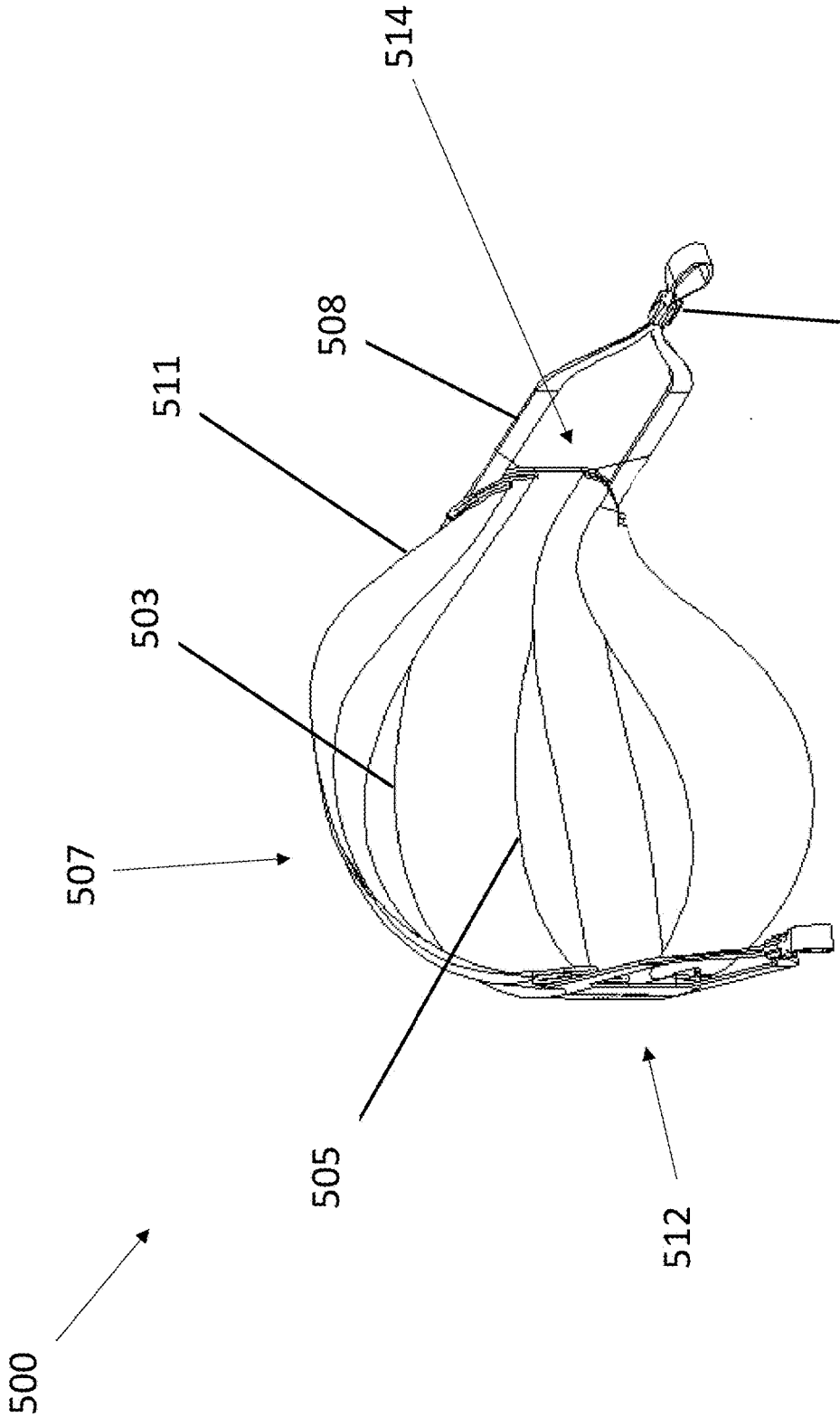


Fig. 4

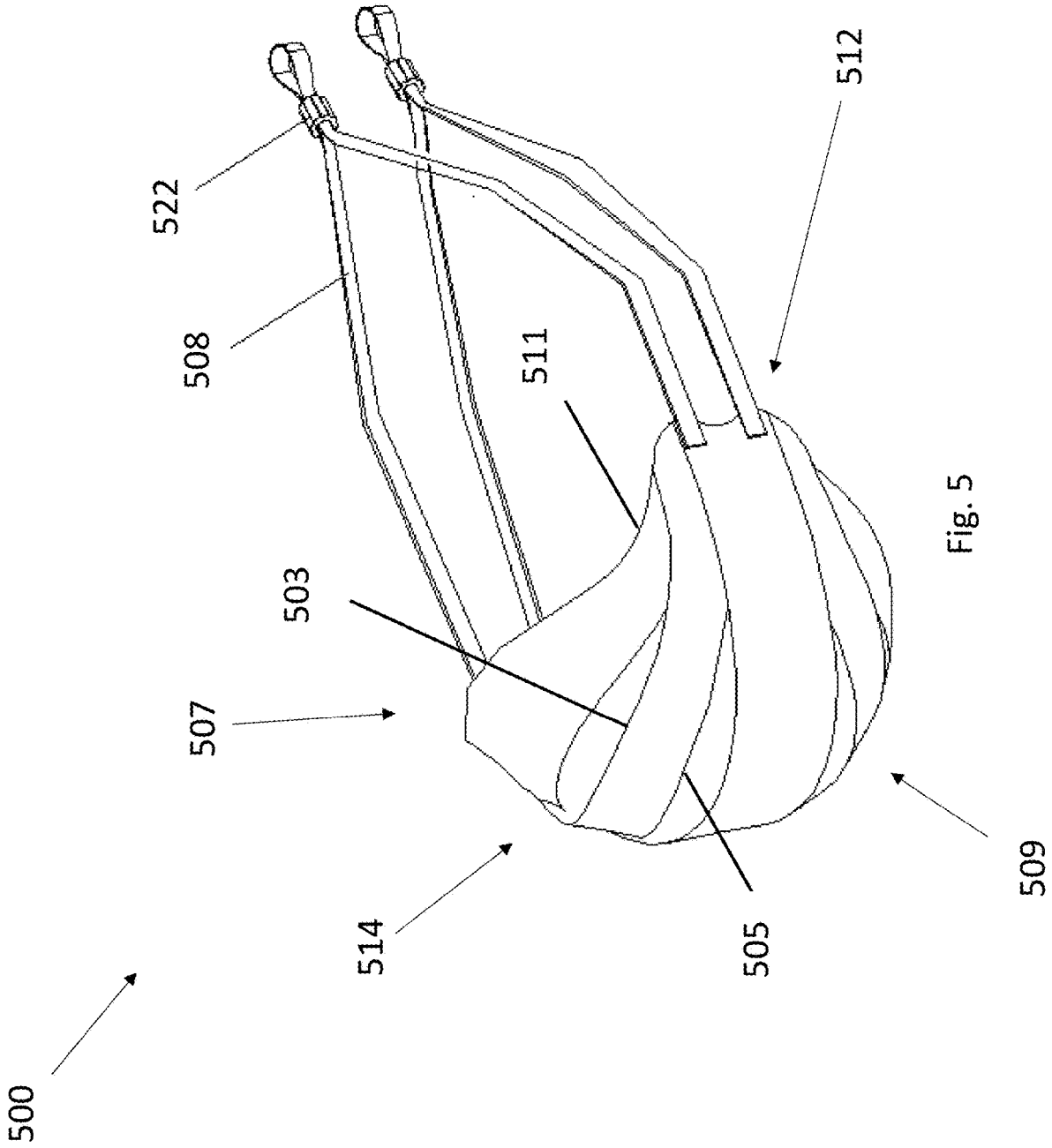


Fig. 5

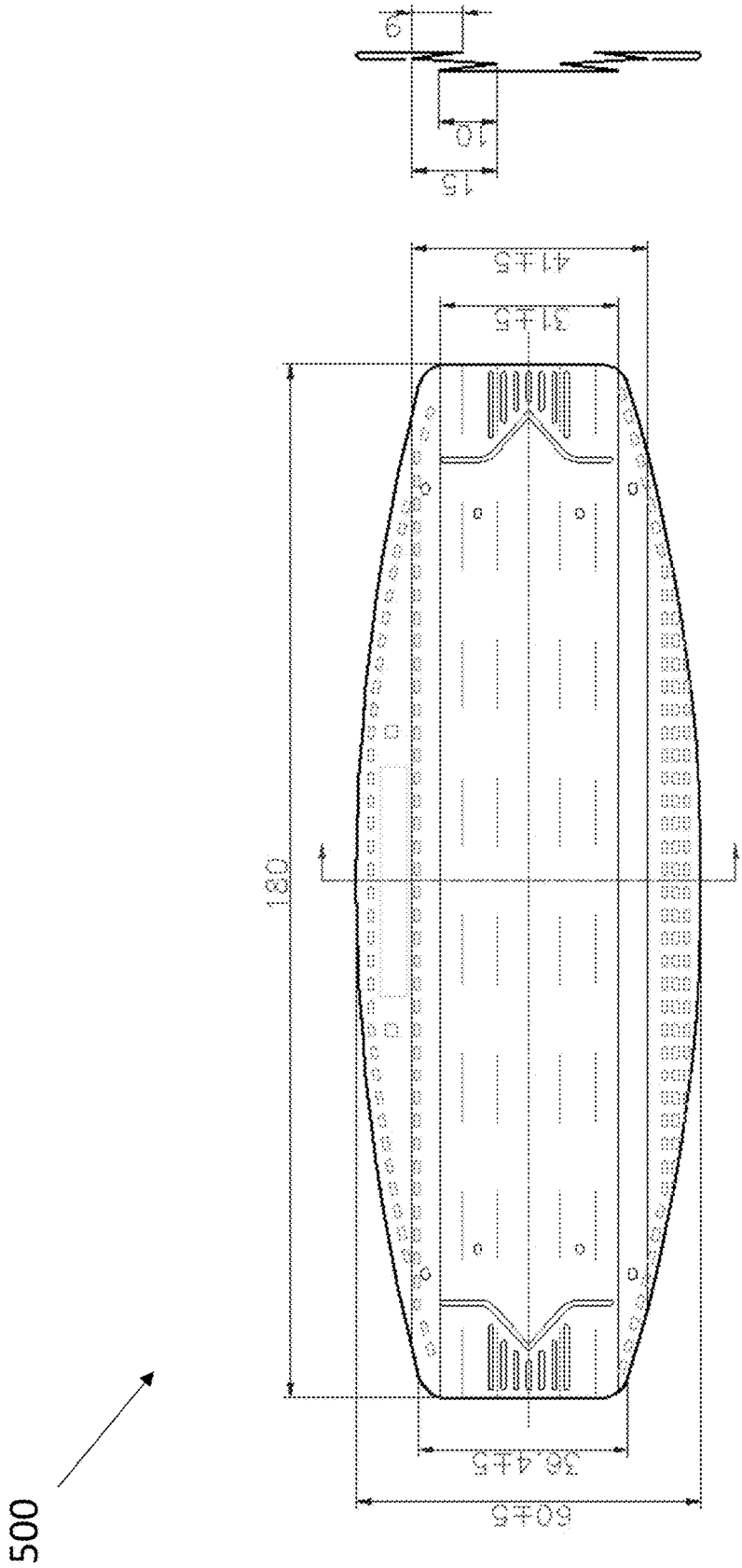


Fig. 6

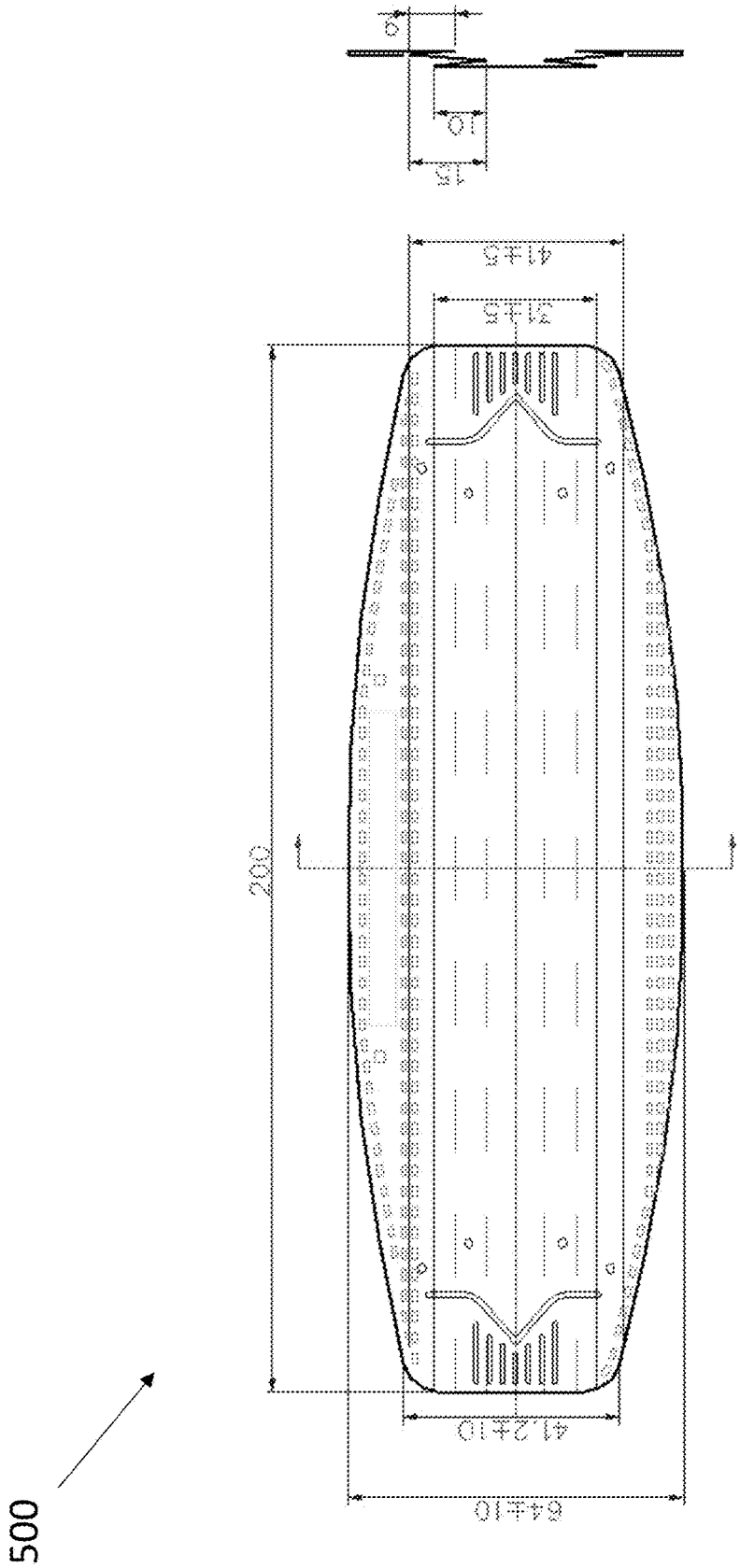


Fig. 7

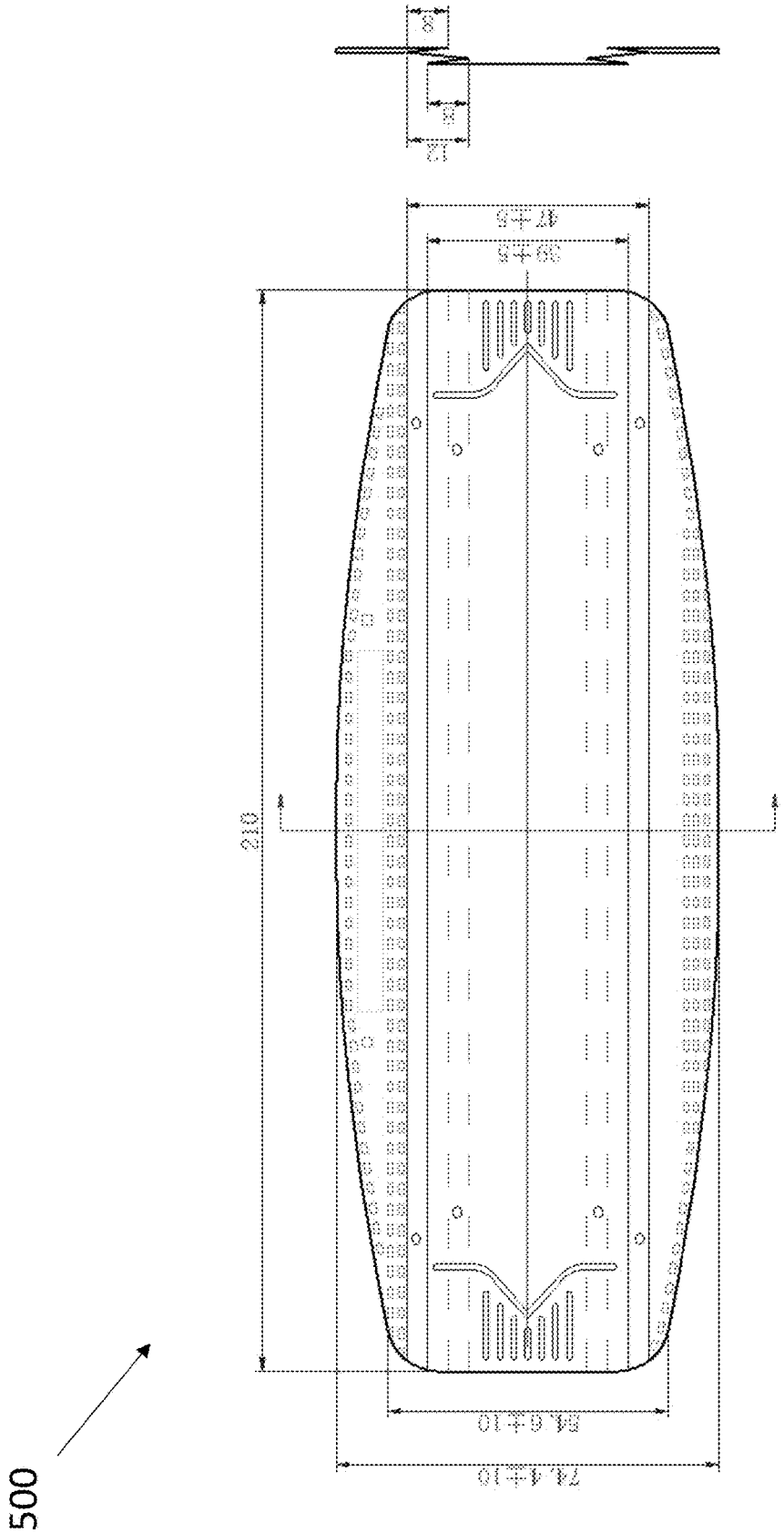


Fig. 8

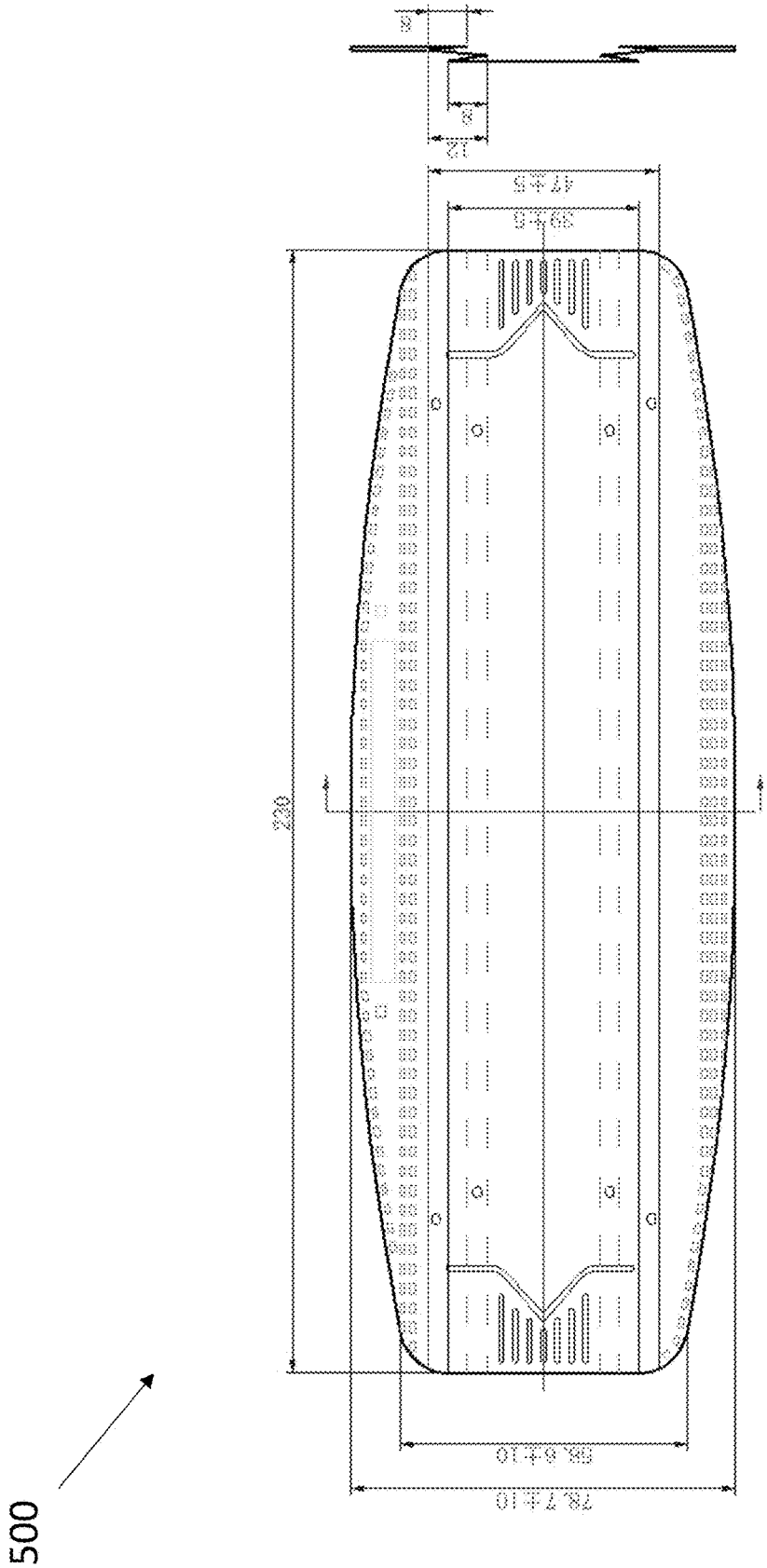
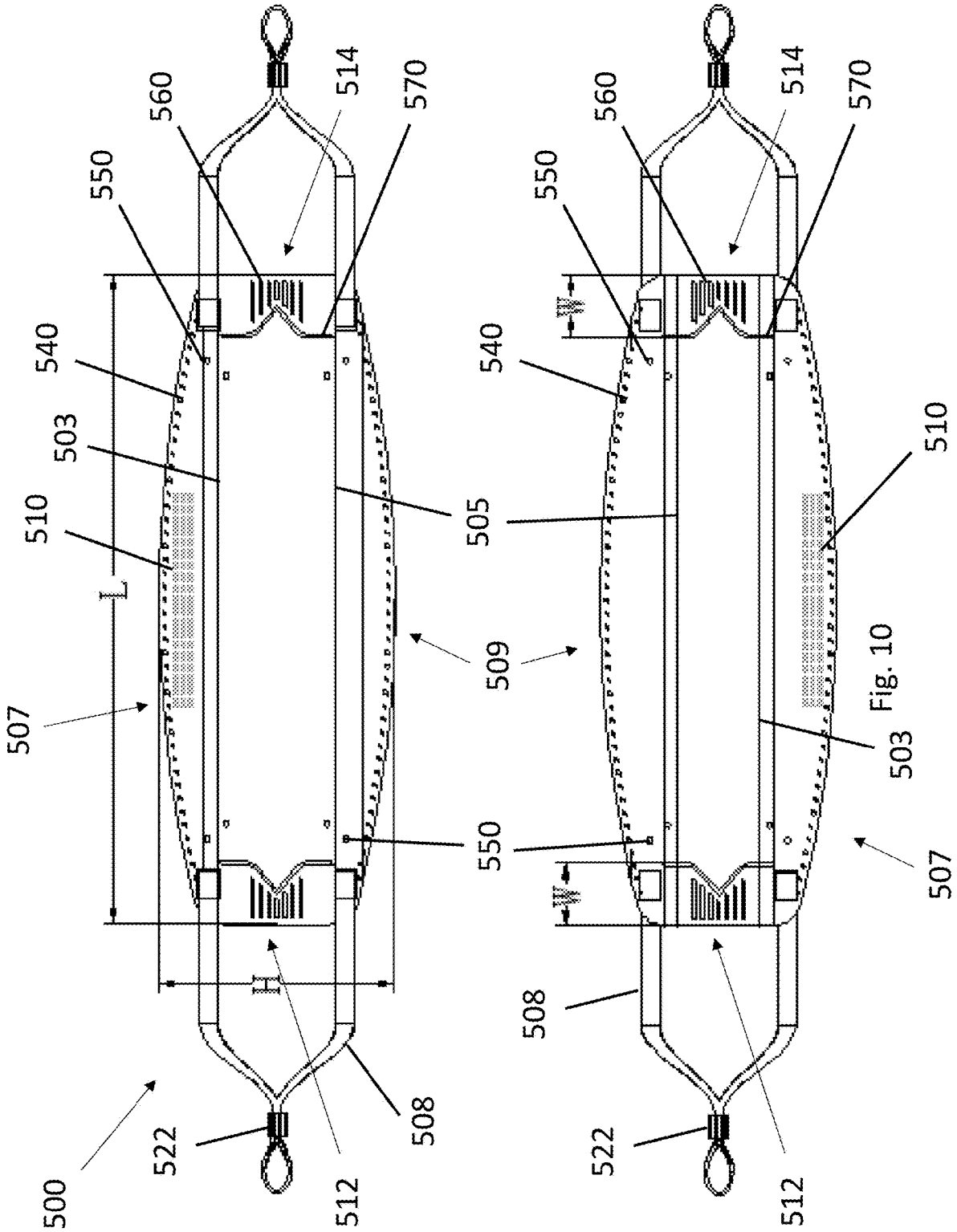


Fig. 9


500
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L
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540
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570
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505
W
Fig. 10

FLAT FOLDING N95 MASKS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 63/087,161, filed Oct. 2, 2020, and U.S. Provisional Application No. 63/122,058, filed Dec. 7, 2020, the contents of each of which are hereby incorporated by reference herein in their entirety.

BACKGROUND OF THE INVENTION

[0002] Face masks are used in a wide variety of applications to protect a wearer's respiratory system from particles suspended in the air or from unpleasant or noxious gases. Face masks are typically designed to be worn over the nose and the mouth to protect the wearer from undesirable material suspended in the air.

[0003] A flat mask is an essential item for daily use and is particularly desirable, as it allows protection, comfort and easy storage for the wearer. The current structure of flat masks has a poor sealing effect that causes air leakage at both sides of the mask (near the ear straps), thus resulting in ineffective protection for the users. Additionally, the structure of the flat mask causes the mask to collapse when the wearer is inhaling, thus causing discomfort and unwillingness to wear the mask for an extended period of time.

[0004] Thus, there is a need in the art for the development of a flat mask that is capable of being flat folded, yet provides a superior respiratory seal and is comfortable to wear. The present invention meets this need.

SUMMARY OF THE INVENTION

[0005] In one aspect, the present invention provides a face mask comprising: at least one layer forming a body with a top end, a bottom end, a lateral first end, a lateral second end; at least one upper pleat positioned above a center of the body, at least one lower pleat positioned below the center of the body, each pleat extending laterally between the first end and the second end; a first press weld at the first end and a second press weld at the second end, wherein the press welds secure the mask on a wearer's face; at least two spot welds positioned at the first end and the second end, wherein the spot welds secure each pleat to the body of the mask to create a rigid panel when the mask is on a wearer's face; at least one strap, wherein the at least one strap is welded to each of the first press weld and the second press weld; and a nose clip positioned near at the top end, wherein the nose clip is configured to bend the mask over the wearer's nose to create a seal above the nasal area. In one embodiment, the nose clip comprises at least one over-mold metal core strip or wire embedded in a plastic strip, configured to bridge the nose gap and provide strength of seal. In one embodiment, the nose clip comprises at least three over-mold metal core strip or wire embedded in a plastic strip, configured to bridge the nose gap and provide strength of seal. In one embodiment, the nose clip is a plastic strip having at least three over-mold metal cores embedded within, and wherein each metal core is arranged in parallel in the plastic strip. In one embodiment, the nose clip has a memory function. In one embodiment, the at least one strap comprises a soft rubber adjuster to allow a tight seal when mask is placed on the face of the wearer. In one embodiment, the at least one strap forms a loop configured to wrap around a wearer's head. In one embodiment, the at least one strap forms a loop configured to wrap around a wearer's ear. In one embodiment, the strap, the nose clip and the adjuster combine to create a tight seal on the wearer's face. In one embodiment, the at least one layer comprises an outer layer and an inner layer. In one embodiment, the at least one layer further comprises at least one middle layer positioned between the outer layer and the inner layer. In one embodiment, an outer perimeter of the outer layer, at least one middle layer and the inner layer are welded together. In one embodiment, the mask further comprises a horizontal flat pleat free area created between the at least one upper pleat and the at least one lower pleat in the center of the body configured to form an air chamber. In one embodiment, the horizontal flat pleat free area lands across a center line between the bottom of the wearer's nose and top of the wearer's mouth. In one embodiment, the mask is fully sealed to the wearer's face, when the first press weld and the second press weld end are pulled to tighten by the at least one strap.

[0006] In one aspect, the present invention provides a face mask comprising: an outer layer; one or more middle layer; and an inner layer; wherein each layer comprises a body having a substantially oval shape with a top end, a bottom end, a first end, a second end, and comprises at least one upper pleat positioned laterally above a center of the body, at least one lower pleat positioned laterally below the center of the body, wherein a horizontal flat plea-free area is created between the at least one upper pleat and the at least one lower pleat in the center of the body configured to form an air chamber; a first press weld at the first end and a second press weld at the second end, wherein both welded ends are rigid and configured to prevent the first end and the second end of the mask from being deformed when the mask is pulled and placed on a wearer's cheeks; at least two spot welds positioned at the first end and the second end, wherein the spot welds secure each pleat to the body of the mask to create a rigid panel when the mask is on a wearer's face; at least one strap, wherein the at least one strap is welded to each of the first press weld and the second press weld; wherein at least one strap comprises an adjuster to allow a tight seal when mask is placed on the face of the wearer; and a nose clip positioned near at the top end, wherein the nose clip is configured to bend the mask over the wearer's nose to create a seal above the nasal area; and wherein the body of the mask is fully sealed to the wearer's face, when the first press weld and the second press end are pulled to tighten by the at least one strap; and wherein an outer perimeter of the outer layer, one or more middle layer and inner layer are welded together.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The following detailed description of invention will be better understood when read in conjunction with the appended drawings. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities of the embodiments shown in the drawings.

[0008] FIG. **1** comprising FIG. **1**A through FIG. **1**B depicts an exemplary flat folding N95 mask of the present invention. FIG. **1**A depicts a back view of an exemplary flat folding N95 mask of the present invention. FIG. **1**B depicts a front view of an exemplary flat folding N95 mask of the present invention.

[0009] FIG. **2** depicts an exploded view of an exemplary flat folding N95 mask of the present invention in flat state.

[0010] FIG. **3** depicts an exploded view of an exemplary flat folding N95 mask of the present invention, forming a 3 dimensional structure while in use.

[0011] FIG. **4** depicts a back view of an exemplary flat folding N95 mask of the present invention, forming a 3-dimensional structure while in use.

[0012] FIG. **5** depicts a perspective view of an exemplary flat folding N95 mask of the present invention, forming a 3 dimensional structure while in use.

[0013] FIG. **6** depicts a front view of an exemplary small size flat folding N95 mask of the present invention.

[0014] FIG. **7** depicts a front view of an exemplary medium size flat folding N95 mask of the present invention.

[0015] FIG. **8** depicts a front view of an exemplary large size flat folding N95 mask of the present invention.

[0016] FIG. **9** depicts a front view of an exemplary extra-large size flat folding N95 mask of the present invention.

[0017] FIG. **10** depicts a front view of an exemplary flat folding N95 mask of the present invention in flat state.

DETAILED DESCRIPTION

Definitions

[0018] It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the present invention, while eliminating, for the purpose of clarity, many other elements typically found in the art. Those of ordinary skill in the art may recognize that other elements and/or steps are desirable and/or required in implementing the present invention. However, because such elements and steps are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements and steps is not provided herein. The disclosure herein is directed to all such variations and modifications to such elements and methods known to those skilled in the art.

[0019] Unless defined elsewhere, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, the preferred methods and materials are described.

[0020] As used herein, each of the following terms has the meaning associated with it in this section.

[0021] The articles "a" and "an" are used herein to refer to one or to more than one (i.e., to at least one) of the grammatical object of the article. By way of example, "an element" means one element or more than one element.

[0022] "About" as used herein when referring to a measurable value such as an amount, a temporal duration, and the like, is meant to encompass variations of ±20%, ±10%, ±5%, ±1%, and ±0.1% from the specified value, as such variations are appropriate.

[0023] Throughout this disclosure, various aspects of the invention can be presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the invention. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6, etc., as well as individual numbers within that range, for example, 1, 2, 2.7, 3, 4, 5, 5.3, 6, and any whole and partial increments there between. This applies regardless of the breadth of the range.

[0024] Flat Folding N95 Mask

[0025] The present invention provides a flat folding N95 face mask configured to solve the problems of ineffective protection of flat masks resulting from air leakage on both sides, while offering comfort when worn for an extended period of time. In one embodiment, the present invention is configured to provide a pleated flat mask which fully seal the wearer's face, conforming to N95 standards, whereas the traditional pleated flat masks do not fully seal the wearer's face.

[0026] Referring now to FIG. **1**A and FIG. **1**B, an exemplary flat N95 mask **500** is shown. Flat folding N95 mask **500** comprises at least one layer **501**, at least one strap **508**, a nose clip **510**, a first end **512** and a second end **514**.

[0027] Referring now to FIG. **2** and FIG. **3** an exploded view of an exemplary flat N95 mask **500** is shown. In one embodiment, at least one layer **501** comprises an outer layer **502** and an inner layer **504**, wherein outer layer **502** is the farthest from a wearer's face and inner layer **506** is closest to the wearer's face. In one embodiment, at least one layer **501** further comprises one or more middle layer **504** positioned between outer layer **502** and inner layer **506**. In one embodiment, outer layer **502** and inner layer **506** are made from a material including but not limited to a fabric. In one embodiment, outer layer **502** and inner layer **506** may be a non-woven material. In one embodiment, fabric may be a woven material. In one embodiment, middle layer **504** is made from a filtering material including but not limited to a sheet, a cloth, a film, a web, a woven material, a non-woven material, and combinations thereof. In one embodiment, the non-woven materials may include but are not limited to wet laid fibers, dry laid fibers, spun-laced fibers, spun-bond fibers, melt-blown fibers, spunbonded-melt blown-spunbonded (SMS) fibers, carded fibers, thermoplastic fibers, regenerated fibers, and bicomponent fibers such as sheath-core fibers. These non-woven materials may include, but are not limited to, polyolefins such as polyethylene and polypropylene, polyesters such as PET, natural fibers, and cellulose materials. The non-woven materials forming one or more middle layer **504** of flat N95 mask **500** may comprise mixtures of two or more of the foregoing fiber types.

[0028] In one embodiment, one or more middle layers **504** may comprise one or more webs of fine inorganic fibers (such as fiberglass) or polymeric synthetic fibers. In one embodiment, one or more middle layers **504** may comprise melt-blown fabrics. In one embodiment, the melt-blown fabrics adopt an electrostatic electret treatment process using an electret master-batch to increase the electrostatic adsorption area of the melt blown cloth while reducing its ventilation resistance. This allows for an increase in the protective mask's filtration capacity, thus extending the life of the protective mask.

[0029] Outer layer **502**, one or more middle layers **504**, and inner layer **506** each comprise a top end **507**, a bottom end **509** and a body **511**. Each layer comprises at least one upper pleat **503** at top end **507** and at least one lower pleat

505 at bottom end **509**, wherein each pleat comprises a first fold followed by a second back fold, thereby forming a two-fold structure (FIG. **4**). In one embodiment, the interior fold opening of at least one upper pleat **503** is opposite to the internal fold opening of at least one lower pleat **505**. When viewed from the back side, at least one upper pleat **503** faces downward whereas the internal fold opening of at least one lower pleat **505** faces upward. As such when mask **500** is unfolded, since the folding direction of the internal folds of at least one upper pleat **503** is opposite to the folding direction of the internal folds of at least one lower pleat **505**, at least one upper pleat **503** unfolds upward and at least one lower pleat **505** unfolds downwards. After unfolding, the mask body **511** assumes a three-dimensional cup shape, so that the two sides of mask **500** effectively seals against the face.

[0030] In one embodiment, each of the at least one upper pleat **503** and at least one lower pleat **505** are held together by a heat weld. In one embodiment, mask **500** may comprise two pleats at top end **507** and bottom end **509**, wherein the width between the pleats at top end **507** and a center position on body **511** ranges approximately between 2.5-4.5 cm. In one embodiment, two pleats at top end **507** and bottom end **509** are folded into three layers. As such, when viewed from the back, mask **500** has four creases.

[0031] A horizontal pleat-free surface is formed in the middle of body **511**, landing across the center line between the bottom of the nose and the top of the mouth. This creates a wide air chamber left and right, which prevents the mask from collapsing when breathing. This effectively reduces the resistance when breathing and allows the wearer to continuously wear the mask for an extended period of time.

[0032] Body **511** at top end **507** and bottom end **509** has a substantially oval shape, wherein the middle is the widest and narrows when move towards first end **512** an second end **514**. After the mask is worn and opened, the width completely covers the wearer's nose and chin, while the face of the wearer is sealed completely on both sides. After the mask is opened and worn, body **511** of the mask completely covers a wearer's face from the bridge of the nose at top end **507** to the chin at bottom end **509**, while the cheeks of the wearer are sealed completely on both sides.

[0033] In one embodiment, mask **500** further comprises a nose clip **510** positioned on top end **507** of inner layer **506**. In one embodiment, nose clip **510** comprises at least one over-mold metal core strip or wire embedded in a plastic strip. In one embodiment, nose clip **510** comprises three or more over-mold metal core strip or wire embedded in a plastic strip. In one embodiment, nose clip **510** comprises four or more over-mold metal core strip or wire embedded in a plastic strip. In one embodiment, nose clip **510** is a plastic strip having four over-mold metal cores embedded within, each metal core being arranged in parallel in the plastic strip. In one embodiment, over-mold metal core strip or wire embedded in a plastic strip are configured to produce 4-5 time of clamping force to keep mask **500** fully seal on the nose. Nose clip **510** can be fabricated using an integrated molding process configured to embed the metal cores within the plastic. In one embodiment, nose clip **510** has a memory function. In one embodiment, nose clip **510** meets the ISO 10993 standard and is non-irritating to the skin. As the bending and shaping strength of nose bridge **510** is greater than the rebound tension of the three-layer mask material, adjusting nose bridge **510** allows mask **500** to fully seal on the nose and sides of the face. In one embodiment, nose clip **510** can be shaped to fit different wearers.

[0034] In one embodiment, straps **508** may be ear-looped (FIG. **4**). In this configuration, two straps **508** are used, wherein at least one strap **508** is attached to first end **512** and at least one strap is attached to second end **514**, wherein a first and second end of each strap **508** forms a loop for looping around the ear of the wearer. In one embodiment, the at least one strap **508** may further comprise a soft rubber adjuster **522** to allow adjusting the seal when mask **500** is placed on the face of the wearer. For example, moving adjuster **522** along strap **508** adjusts the size of the loop formed by strap **508**. Wearers can move adjuster **522** to form a loop that is comfortable around the ears of the wearer, and adjuster **522** can be moved to decrease the size of the loop in each strap **508** to increase the seal of mask **500** against the face of the wearer. In one embodiment, the at least one strap **508** is elastic. In one embodiment, the at least one strap **508** can be made from any material known to one skilled in the art including but not limited to thermoplastic elastomer, resilient polyurethane, poly-isoprene, acetylene-styrene co-polymers, etc.

[0035] In one embodiment, the at least one strap **508** is attached to outer layer **502** at first end **512** and second end **514**. In one embodiment, at least one strap **508** may form a loop configured to wrap around a wearer's head (FIG. **5**). In this configuration, the at least one strap **508** is attached to first end **512** at one end and to second end **514** at the other end and the at least one strap **508** may be tied, clasped, or stretched such that the at least one strap **508** encircles the head of the wearer bringing the face mask in sealing engagement with the face of the wearer. In one embodiment, mask **500** comprises two straps **508** that form a loop configured to wrap around a wearer's head.

[0036] In one embodiment, the at least one strap **508** may be non-elastic bands. In one embodiment, the at least one strap **508** may be made from materials including but not limited to non-woven materials formed by both wet-laid or dry-laid processes and consisting of rayon, polyester or like fibers, calendared spun-bonded webs of polypropylene, polyethylene or polyester and reinforced paper.

[0037] In one embodiment, at least one strap **508** is configured to wrap around a wearer's head to enhance sealing of the mask against a wearer's face to reach the N95 mask standard. In one embodiment, at least one strap **508** configured to loop around the ear of the wearer to enhance sealing of the mask against a wearer's face to reach the standard of a level one or a level two surgical mask.

[0038] In one embodiment, the combination of at least one strap **508**, a nose bridge **510** and soft rubber adjuster **522** creates a tight seal capacity, allowing mask **500** to be eligible for N95 certification offering better protection.

[0039] In one embodiment, outer layer **502**, one or more middle layer **504** and inner layer **506** are cut and welded together, allowing the entire mask to be in a flat state before use. For example, an outer perimeter of outer layer **502** is welded to an outer perimeter of one or more middle layer **504**.

[0040] In one embodiment, mask **500** may further include peripheral weld points **540** and at least two spot weld points **550**. In one exemplary embodiment, mask **500** may have eight spot weld points. In one embodiment, at least two spot weld points **550** are configured to secure each pleat to the body of the mask to create a rigid panel when mask is

opened and placed on the wearer's face. Additionally, mask **500** may include generally horizontal weld lines **560** and generally vertical weld lines **570** near lateral sides of mask **500**. Welding embossed lines near lateral sides of mask **500** are configured to strengthen the two sides of the body **511** while allowing it to be smoother and creating a close seal against the wearer's face. In one embodiment, the width of horizontal weld lines **560** and generally vertical weld lines **570** is about is 2 cm. In one embodiment, the height of the welded area at lateral sides of mask **500** varies depending on the size of the mask. In one embodiment, for a small size mask, the height at the widest center is approximately 50-70 mm (FIG. **6**). In one embodiment, for a small size mask, the width is approximately 180 mm (FIG. **6**). In one embodiment, for a small size mask, the height of lateral sides is approximately 26-46 mm (FIG. **6**). In one embodiment, for a medium size mask, the height at the widest center is approximately 54-74 mm (FIG. **7**). In one embodiment, for a medium size mask, the width is approximately 200 mm (FIG. **7**). In one embodiment, for a medium size mask, the height of lateral sides is approximately 31-51 mm (FIG. **7**). In one embodiment, for a large size mask, the height at the widest center is approximately 64-84 mm (FIG. **8**). In one embodiment, for a large size mask, the width is approximately 210 mm (FIG. **8**). In one embodiment, for a large size mask, the height of lateral sides is approximately 44-64 mm (FIG. **8**). In one embodiment, for an extra-large size mask, the height at the widest center is approximately 68-88 mm (FIG. **9**). In one embodiment, for an extra-large size mask, the width is approximately 230 mm (FIG. **9**). In one embodiment, for an extra-large size mask, the height of lateral sides is approximately 48-68 mm (FIG. **9**).

[0041] In one embodiment, both welded ends are rigid and prevents mask **500** ends from being deformed when the mask is pulled and placed on the cheek. In one embodiment, the pressed ends, when pulled to tighten by at least one strap **508**, allows the body of mask **500** to be fully sealed to the face.

[0042] These items work collectively to create a tight seal for the users. For all masks, a tight seal is necessary to protect the users. However, regular 3-ply masks generally have an opening either at the nose bridge region or on the ear strap region which causes ineffective protection against droplets. The curved line at the top and bottom of the weld lines allow the mask itself to be curved when pulled open, thus limiting the opening on the sides of the masks. For example, the **8** spot weld points **550** on the mask keep the shape of the mask so that when the wear expands the mask, it is not overly expanded, which would prevent a tight seal on the mask.

[0043] Referring now to FIG. **10**, in one embodiment, the height of body **511** is approximately 50-105 mm at the widest center. In one embodiment, mask **500** narrows from middle to first end **512** and second end **514**.

[0044] In one embodiment, mask **500** has a top end **507** and a bottom end **509** with curved contours, with each curvature having a specific arc, that when unfolded, flat N95 mask **500** appears to be formed by 9 pieces or facets (FIG. **5**), wherein each piece or facet is a face of a fold in body **511**. In one embodiment, arc of body **511** at top end **507** and bottom end **509** are asymmetrical. This asymmetrical design is due to the relationship between the size and distance of the nose and mouth of different group of people. This configuration allows the mask to achieve a tight seal even when worn by different people.

[0045] In one embodiment, mask **500** is configured to filter the air entering into the wearer's nose and mouth and to prevent harmful gases, odors, and droplets from entering and exiting the wearer's nose and mouth.

[0046] In one embodiment, mask **500** may be manufactured with a traditional flat mask machine, and it may enter the mass production stage. In one embodiment, mask **500** can be manufactured at less labor cost, so that mask can be affordable to general public.

[0047] The disclosures of each and every patent, patent application, and publication cited herein are hereby incorporated herein by reference in their entirety. While this invention has been disclosed with reference to specific embodiments, it is apparent that other embodiments and variations of this invention may be devised by others skilled in the art without departing from the true spirit and scope of the invention. The appended claims are intended to be construed to include all such embodiments and equivalent variations.

What is claimed is:

1. A face mask comprising:

at least one layer forming a body with a top end, a bottom end, a lateral first end, a lateral second end;

at least one upper pleat positioned above a center of the body, at least one lower pleat positioned below the center of the body, each pleat extending laterally between the first end and the second end;

a first press weld at the first end and a second press weld at the second end, wherein the press welds secure the mask on a wearer's face;

at least two spot welds positioned at the first end and the second end, wherein the spot welds secure each pleat to the body of the mask to create a rigid panel when the mask is on a wearer's face;

at least one strap, wherein the at least one strap is welded to each of the first press weld and the second press weld; and

a nose clip positioned near at the top end, wherein the nose clip is configured to bend the mask over the wearer's nose to create a seal above the nasal area.

2. The face mask of claim **1**, wherein the nose clip comprises at least one over-mold metal core strip or wire embedded in a plastic strip, configured to bridge the nose gap and provide strength of seal.

3. The face mask of claim **1**, wherein the nose clip comprises at least three over-mold metal core strip or wire embedded in a plastic strip, configured to bridge the nose gap and provide strength of seal.

4. The face mask of claim **1**, wherein the nose clip is a plastic strip having at least three over-mold metal cores embedded within, and wherein each metal core is arranged in parallel in the plastic strip.

5. The face mask of claim **1**, wherein the nose clip has a memory function.

6. The face mask of claim **1**, wherein the at least one strap comprises a soft rubber adjuster to allow a tight seal when mask is placed on the face of the wearer.

7. The face mask of claim **1**, wherein the at least one strap forms a loop configured to wrap around a wearer's head.

8. The face mask of claim **1**, wherein the at least one strap forms a loop configured to wrap around a wearer's ear.

9. The face mask of claim **1**, wherein the strap, the nose clip and the adjuster combine to create a tight seal on the wearer's face.

10. The face mask of claim **1**, wherein the at least one layer comprises an outer layer and an inner layer.

11. The face mask of claim **10**, wherein the at least one layer further comprises at least one middle layer positioned between the outer layer and the inner layer.

12. The face mask of claim **11**, wherein an outer perimeter of the outer layer, at least one middle layer and the inner layer are welded together.

13. The face mask of claim **1**, wherein the mask further comprises a horizontal flat pleat free area created between the at least one upper pleat and the at least one lower pleat in the center of the body configured to form an air chamber.

14. The face mask of claim **13**, wherein the horizontal flat pleat free area lands across a center line between the bottom of the wearer's nose and top of the wearer's mouth.

15. The face mask of claim **1**, wherein the mask is fully sealed to the wearer's face, when the first press weld and the second press weld end are pulled to tighten by the at least one strap.

16. A face mask comprising: an outer layer; one or more middle layer; and an inner layer; wherein each layer comprises a body having a substantially oval shape with a top end, a bottom end, a first end, a second end, and comprises at least one upper pleat positioned laterally above a center of the body, at least one lower pleat positioned laterally below the center of the body, wherein a horizontal flat plea-free area is created between the at least one upper pleat and the at least one lower pleat in the center of the body configured to form an air chamber; a first press weld at the first end and a second press weld at the second end, wherein both welded ends are rigid and configured to prevent the first end and the second end of the mask from being deformed when the mask is pulled and placed on a wearer's cheeks;

at least two spot welds positioned at the first end and the second end, wherein the spot welds secure each pleat to the body of the mask to create a rigid panel when the mask is on a wearer's face;

at least one strap, wherein the at least one strap is welded to each of the first press weld and the second press weld; wherein at least one strap comprises an adjuster to allow a tight seal when mask is placed on the face of the wearer; and

a nose clip positioned near at the top end, wherein the nose clip is configured to bend the mask over the wearer's nose to create a seal above the nasal area; and

wherein the body of the mask is fully sealed to the wearer's face, when the first press weld and the second press end are pulled to tighten by the at least one strap; and

wherein an outer perimeter of the outer layer, one or more middle layer and inner layer are welded together.

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