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# (54) MASK HAVING LV STRUCTURE AND DEVICE THEREOF

(57) A mask having an LV structure and a device thereof are provided. A V-shaped structure is fixed to an upper portion of a mask body (9), i.e., a half of the V-shaped structure is provided at the upper portion of each edge of the mask body, the V-shaped structure is arranged downwards from the corner of each edge and towards left and right middle lines of the mask, and the left and right corners of the upper portion of the mask are slidably connected to the V-shaped structure; and left and right end portions of the V-shaped structure at two corners of the mask can be extended or fixed to the face or head of a person by means of a connecting component. In dozens of years, the structure of the mask is changed into two parts from original three parts, and the mask serves as a medical mask and a protective mask, and can greatly promote the effects of energy saving, environmental protection, and small innovation. The structure of the mask body (9) is not changed, and the mask body is suitable for large-scale production of an existing epidemic situation. An existing tableting machine can be used, such that the mask having three parts being replaced with two parts is truly realized on the basis of the existing industry. The device is very simple in structure and low in cost, and can quickly produce the mask.

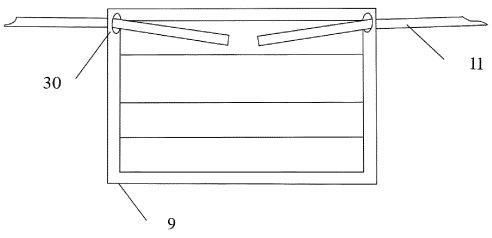


FIG. 9

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## Description

### TECHNICAL FIELD

**[0001]** The present disclosure relates to the technical field of masks, the technical field of protective articles, or the technical field of medical care, and more particular to a mask having an LV structure and a device thereof.

### BACKGROUND

**[0002]** The patent laws and regulations of all countries in the world stipulate that when a new invention can still play the same effect or even better effect after one component, material or parts is reduced compared with the original one, it is a technical breakthrough, and invention patent can be granted.

**[0003]** The standards in all countries in the world require medical masks and protective masks to have nose bridge strips. The present application is to break through these national standards.

**[0004]** The existing invention which is doing addition is not suitable for energy crisis and environmental crisis, while the present disclosure is doing subtraction to get better results with the least number of things, which is the direction that human inventions should admire in the future. Many things can be done by subtraction, but many people insist on doing addition. It could have been peaceful, but one more thing is always insistently done to cause fighting, for example, some people may intentionally ignore the following to deny this patent application.

**[0005]** In global epidemic prevention, a mask body, i.e., a main structure, of the mask remains unchanged, and the nose bridge strip is removed, that is, the material of the nose bridge strip is not added, which is beneficial to not changing the structure of the mask body, because any change of structure may involve energy consumption.

**[0006]** In the present application, three parts in the existing mask are reduced to two. Certainly, the structure of the existing mask body is not changed, because once the structure of the existing mask body is changed, many troubles and problems, including production, and a machine device, may be caused.

**[0007]** Moreover, even if the structure of the mask body is not changed, the mask body is also suitable for large-scale production of an existing epidemic situation. An existing tableting machine can be used, such that the mask having three parts being replaced with two parts can be truly realized on the basis of the existing industry, which is suitable for the high-speed production of the high-speed mask industry, and the structure must be the simplest and the material used should be the least.

**[0008]** Due to scientific advancement, the masks provided by many embodiments of the present application have been tested by many testing institutions and are qualified, and have air tightness much better than that of similar masks, and have test reports issued. For example, No. NHTT22090032, which can be viewed in official website, and is omitted here to save space.

**[0009]** The NHTT22090032 has been put into the market and won a lot of praise, including large users, and has won awards for inventions, including those issued by some international intellectual property organizations, which are all displayed on the official website: www.hosya.com.

**[0010]** During epidemic, human beings put used discarded masks capable of producing microplastics pollution into nature every day. In the present application, the absence of nose bridge strip is conducive to the environmental recovery and melting reuse of the discarded masks, and thus there is no need to manufacture and purchase an additional device.

**[0011]** In the present disclosure, the nose bridge strip of great significance is omitted. The nose bridge strip is made of a steel wire, and the steel wire needs to be coated with resin. The rusting of the steel wire leads to the increase of the cost of warehouse management. In terms of safety, the nose bridge strip on the mask is like a knife on the face. Therefore, the present disclosure is a significant invention, and is also a great invention of mankind.

**[0012]** In terms of production device: The device capable of producing such a mask, i.e., a mask with slidable fixing points, is not available at present, and the production device capable of producing the mask provided by the present disclosure at a high speed is available after the failure of various schemes, The device capable of producing the mask can be completed by replacing and adding some innovative components. The device is of a great significance in large-scale epidemic prevention.

**[0013]** Existing mask is composed of a mask body, a nose bridge strip, and fixing bands. At present, the mask used by most people in the market leak has air leakage when worn, that is to say, the exhaled air or the outside air is able leak or enter through the periphery of the mask. The simplest test is to exhale vigorously into the mask when wearing the mask, and the air leakage can be detected from the periphery of the mask. As people speak, movement or a leak may occur even to N95 mask.

### SUMMARY

**[0014]** For the disadvantages in the prior art, an objective of the present disclosure is to provide a mask having an LV

structure, and a device thereof. The mask has the functional advantages of better protection. Moreover, great technical effects can be achieved by adopting small changes as much as possible.

**[0015]** The technical solution of the present disclosure is achieved as follows: various mechanics are sufficiently utilized, Alternatively, structures of "L" and "V" and their mechanics principles can be seen from FIG. 16 and FIG. 17. When a section of straight mask strap is bent into an "L", a force will be produced.

**[0016]** An approximately V-shaped structure is fixed to an upper portion of a mask body, which is called V-shaped structure or V shape for short, and can be made of various materials. For example, the middle of the V shape can be fixed to an outer surface of the mask, that is, the upper portion has a half of the V-shaped structure when viewed from each of left and right sides of the mask body, and left and right corners of the upper portion of the mask are slidingly connected to the V-shaped structure, and thus in the process of wearing the mask, the left and right corners of the upper portion can slide and move downward along the V-shaped structure towards left and right middle lines of the mask. Taking a left mask body as an example, a half of the V-shaped structure is obliquely fixed to the mask body from an upper left corner to the lower right of the mask body. In the process of wearing the mask, under the action of force, e.g., there is a force to arch a mouth-nose area in the middle of the mask body every time a person exhales, the upper left corner of the mask body drives an upper edge and a left edge of the mask to move towards the mouth-nose area in the middle, so as to be make the mask body to tightly fit the human face; and more and more mask cloth in the mouth-nose area is arched to form a breathing space in the mouth-nose area. With the wearing of the mask, such an effect is continued, which is equivalent to the trend of active defense. Left and right end portions of the V-shaped structure at two corners of the mask can be extended and fixed to the face or head of a person, fixed to the face or head of a person by connecting other parts, or fixed to glasses, for example, by other connectors. According to such a structure, the effect is much better when the mask body is made without a nose bridge strip. Similarly, an approximately inverted V-shaped mask strap is fixed to a lower portion of the mask body. For N95 series masks with an opened main body similar to a bowl-shaped container, as there is a protruding portion in a bridge of the nose area at the upper portion of the mask body, an approximately inverted V-shaped structure is fixed to the upper portion of the mask body. The V-shaped structure may be an approximate structure or other structures with similar principles, for example: the V-shaped structure is originally composed of left and right sections, and then a vertical section structure is connected in the middle of the V shape to form a structure similar to an upward trident, or the V shape at the upper portion of the mask and the inverted V shape at the lower portion are spliced together to form an X-shape structure. These structures may employ approximate shapes or incomplete shapes. For example, the V-shaped structure may employ: a V shape with bending and deformation, an incomplete V shape, etc. The V-shaped structure and other structures may be made of various materials, e.g., rubber, plastic, mask straps.

**[0017]** For a three-dimensional mask, for example, as shown in FIG. 8, when the mask is opened for wearing, it can be seen from the front that the mask strap between the two sliding fixing points on the upper portion of the mask is spliced into an inverted V shape, and the use of the mask strap in mechanics is relatively small. Therefore, in order to achieve better effect, the shape of the three-dimensional mask can be optimized.

**[0018]** The V-shaped structure are located at left and right end portions of the two corners of the mask, and thus the V-shaped structure can be extended or fixed to the face or head of a person by connecting other components. As shown in the figure, the V-shaped mask strap between the sliding fixing points penetrates through the sliding fixing points to be extended to form a whole and complete mask strap.

**[0019]** The present disclosure has the beneficial effects that the mask has been greatly changed, and in dozens of years, the structure of the mask is changed into two parts from original three parts, and the mask serves as a medical mask and a protective mask, and can greatly promote the effects of energy saving, environmental protection, and small innovation. The structure of the mask body is not changed, and the mask body is suitable for large-scale production of an existing epidemic situation. An existing tableting machine can be used, such that the mask having three parts being replaced with two parts is truly realized on the basis of the existing industry. The device is very simple in structure and low in cost, and can quickly produce the mask.

**[0020]** Finally, a device with simple structure and low cost is further designed to produce the mask with diverse and powerful functions.

**[0021]** Due to the absence of nose bridge strip, the cost is reduced, and the leak proofness is greatly improved. The absence of the nose bridge strip is conducive to the environment-friendly recovery of discharged masks. The reduction of these auxiliary things also reduces the risk of accidental injury to eyes and face of the human, which is a great progress. The mask is especially suitable for children. Due to the absence of the nose bridge strip, the process costs are greatly saved in production, the materials and energy consumption are both greatly reduced.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0022]**

FIG. 1 is a structural schematic diagram of a mask with a sticking and fixing point site;
FIG. 2 is a structural schematic diagram of a mask with an elastic material;
FIG. 3 is a structural schematic diagram of another embodiment of a mask according to the present disclosure;
FIG. 4 is a structural schematic diagram of another embodiment of a mask according to the present disclosure;
FIG. 5 is a structural schematic diagram of a mask without a nose bridge strip;
FIG. 6 is a structural schematic diagram of a mask with a new fixing point site according to the present disclosure;
FIG. 7 is a structural schematic diagram of another embodiment of a mask according to the present disclosure;
FIG. 8 is a structural schematic diagram of another embodiment of a mask according to the present disclosure;
FIG. 9 is a structural schematic diagram of another embodiment of a mask according to the present disclosure;
FIG. 10 is a schematic diagram of an embodiment of a method and device for producing a mask according to the present disclosure;
FIG. 11 is a structural schematic diagram of a manipulator (mask machine gripper) according to the present disclosure;
FIG. 12 is a structural schematic diagram of another embodiment of a manipulator (mask machine gripper) according to the present disclosure;
FIG. 13 is a structural schematic diagram of another embodiment of a manipulator (mask machine gripper) according to the present disclosure;
FIG. 14 is a structural schematic diagram of another embodiment of a manipulator (mask machine gripper) according to the present disclosure;
FIG. 15 is a part of a mask strap processed by a device provided with a manipulator (mask machine gripper) of FIG. 14;
FIG. 16 is a picture showing an L structure of the present disclosure;
FIG. 17 is a picture showing an V structure of the present disclosure.

**[0023]** In the drawings: 7-device for fixing mechanical mask strap, 8-tableting device, 9-mask body, 11-fixing band, 12-cutting place, 17-sticking structure, 24-leak-proof ring, 25-inner edge of leak-proof ring, 26-small mask body, 27-upper edge of small mask, 30-fixing hole, 31-ring-shaped structure; 129-elastic part; 101-manipulator (mask machine gripper); 102-fixed section; 103-chuck; 104-chuck; 105-manipulator (mask machine gripper); 106-fixed section; 107-chuck; 108-support sheet; 109-manipulator (mask machine gripper); 110-fixed section; 111-chuck; 112-chuck; 113-support sheet; 114-fixed section; 115-chuck; 116-chuck; 117-chuck; 118-manipulator (mask machine gripper).

## DETAILED DESCRIPTION OF THE EMBODIMENTS

**[0024]** The technical solution of the present disclosure is described clearly and completely in conjunction with specific embodiments, but those skilled in the art may understand that the embodiments described below are a part than all of the embodiments of the present disclosure, and are merely used to illustrate the present disclosure, and should not be regarded as limiting the scope of the present disclosure. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present disclosure without creative efforts shall fall within the protection scope of the present disclosure. But it should be understood that the features described with respect to one embodiment may also be combined with other embodiments. However, for the same reasons, one or more features of any described embodiment should not be regarded as essential to every embodiment of the present disclosure, this is because these features may be omitted from other embodiments of the present disclosure.

**[0025]** Unless otherwise indicated, it should be understood that all numbers used herein to express quantities, dimensions and the like are modified by the term "about" in all cases. In the present disclosure, the use of the singular includes the plural, unless otherwise specified, the use of the terms "and" and "or" means "and/or ". Moreover, the use of terms "include" and other forms, for example, "include" and "comprise" should be regarded as non-exclusive.

**[0026]** In the description of the present disclosure, it needs to be understood that the orientation or positional relationship indicated by terms "center", "top", "bottom", "left", "right ", "vertical", "horizontal", "inside" and "outside" is based on the orientation or positional relationship shown in the drawings only for convenience of description of the present disclosure and simplification of description rather than indicating or implying that the device or element referred to must have a particular orientation, be constructed and operate in a particular orientation, and thus are not to be construed as limiting the present disclosure. Furthermore, the terms "first" and "second" are used for descriptive purposes only and are not to be construed as indicating or implying relative importance.

**[0027]** In the present disclosure, unless expressly specified and limited otherwise, the terms "install", "connect", "couple", "fix", and the like should be understood broadly, e.g., may be either a fixed connection or a detachable connection, or a connection in one piece; may be a mechanical connection or an electrical connection; may be a direct connection or an indirect connection through an intermediate medium, may be an internal communication between the two elements or interactions between the two elements For those of ordinary skill in the art, the specific meanings of the above terms in the utility model can be understood on a case-by-case basis.

**[0028]** In the present disclosure, unless otherwise specified and limited, the first feature above or below the second feature may include that the first feature is in direct contact with the second feature, or may include that the first feature and the second feature are in contact with each other through other features therebetween rather than direct contact. Moreover, the first feature is "above", "on" and "over" the second feature, including that the first feature is above and at an inclined top of the second feature, or only indicating that a horizontal height of the first feature is higher than that of the second feature. The first feature "under", "below" and "underneath" the second feature includes that the first feature is directly below and obliquely below the second feature, or just means that a horizontal height of the first feature is smaller than the second feature. The terms "vertical", "horizontal", "left", "right", "top", "bottom" and similar expressions are for the purpose of illustration only, rather than indicating or implying that the device or element referred to must have a particular orientation, be constructed and operate in a particular orientation, and thus are not to be construed as limiting the present disclosure.

**[0029]** For the sake of brevity, "preferred embodiment" is not repeated, but the paragraph describing the implementation of the structure generally includes one embodiment.

**[0030]** The mask protection articles in the present disclosure refer to masks, related parts on masks, mask-related articles, or respiratory-related articles, including small masks for nose and large masks including masks.

**[0031]** Active ingredients and functional ingredients referred to in the present disclosure are functional substances.

**[0032]** The N95 mask in the present disclosure may refer to a N95 mask folded in half left and right, i.e., a three-dimensional mask, and also refers to various masks having an opened main body similar to a bowl-shaped container, such as a KF94 mask, a PFF2 mask and a duckbill mask.

**[0033]** In the present disclosure, the fixing band is a mask strap, which is a structural component for fixing the mask to the human face. The mask cloth also includes surface materials or materials of various masks. According to the present disclosure, a special mask rope fixing device that adds a section of mask rope to the mask surface is referred to as a device for fixing mask rope for short.

**[0034]** The mask machine gripper and the chuck may also be called manipulators in the present disclosure.

**[0035]** In the preferred embodiments of the present disclosure, devices capable of manufacturing the following embodiments or similar embodiments are provided.

**[0036]** The present disclosure is further described below in detail with reference to accompanying drawings and embodiments.

**[0037]** In the present disclosure, the mask strap is called a mechanical mask strap. In addition, as the method provided by the present disclosure involves mechanics, the fixing band is called mechanical mask strap (mechanical fixing band). The leaks of the mask are reduced by studying mechanics and improvement. The purpose of the mechanical mask strap is to reduce or eliminate the leaks between the mask and face, reduce a tensile force of the mask strap (pulling force on ears), study the force on everywhere of the mask. The reduction or elimination of the leaks between the mask and face is mainly achieved by utilizing the mask straps (fixing bands) made of various materials and changing fixing points or fixing ways of the original mask straps. The mask strap is connected to the fixing point, which changes the original force and also embodies mechanics, so the mask strap is called mechanical mask strap. The present disclosure is also embodied in assisting to fix the mask by utilizing and mining and utilizing various positions on the mask strap (fixing band) and various forces on the various positions. Certainly, the mask structure involves mechanics. The following is the specific embodiment.

**[0038]** A starting point of the method provided by the present disclosure is to study the influence of different material thicknesses of the mask and the different material thicknesses of nose bridge strips, etc. The leakage problem of the mask is solved by using the mechanical mask strap and the fixing point, it is found that when there is no nose bridge strip, the effect is better, and the problem of leakage in the later period is solved, this is because the optimal fixing points sometimes cannot solve the leakage problem caused by the nose bridge strip in the later period. As the nose bridge strip has plasticity, after the mask is caused to move when people speak, the nose bridge strip is no longer in fit with the moved position of the mask, leading to an obvious leak. When there is no nose bridge strip, the excellent effect can be achieved.

**[0039]** As the initial method, or starting point, of the present disclosure is to find the minimum leak of the mask and the minimum pulling force of the mask strap, it is found that the adding of auxiliary fixing points is good. Meanwhile, it is found that there is really no big breakthrough if the existing mask body cannot be changed, and the removal of the nose bridge strip is a big breakthrough, which is important for realizing the minimum leak of the mask and the minimum pulling force of the mask strap, especially for achieving no leak at first. After the nose bridge strip or an equivalent structure is removed, as there is no need to fix a hard thing, the pulling force of the mask strap is greatly reduced. One section of the mask strap is used to push the mask cloth to concave holes on both sides of the bridge of the nose of the face, thus replacing the nose bridge strip. The comfort of wearing the mask is greatly improved.

**[0040]** According to the present disclosure, the force on various points on the mask body is studied through various methods. By utilizing the force sites on the mask body, an adhesive material or elastic material is added to the force sites to make cloth of the mask body more fit the face. Moreover, the force sites with excellent situations are directly

used as new fixing points of the mask strap.

**[0041]** The second invention is that, according to different shapes of the masks, the masks with the same shape but different materials, different elasticity of fixing bands, different materials, strength, plasticity, deformability of the nose bridge strips, the difference of the size, or the difference caused by the presence or absence of the nose bridge strip, each type of mask is tested to find out a fixing point with small pulling force of the fixing band in a case that there is no leak between the edge of the mask and the face, or to only select two fixing points at the upper portion of the mask.

**[0042]** No leak here sometimes means that there is basically no leak, which is different from the obvious leak of most existing masks.

**[0043]** This third invention point is that there is still a lot of potential in the fixing band of the mask that has not been tapped, and various positions on the fixing bands and various forces at various positions are used to assist in fixing the mask.

**[0044]** That is, the pulling force of the existing mask strap on the four fixing points of the existing mask is changed, and at least one end of the mask strap is not fixed to the original four fixing points of the existing mask.

**[0045]** The principle of the method provided by the present disclosure is described in detail below:

**[0046]** In the second invention point is that, over the years, several fixing points of the mask have always remained the same. Different people have different facial forms, so it is unreasonable to keep the fixing points of the mask unchanged. The mask bodies have different thicknesses and are made of different materials, and the nose bridge strips are made of different materials and different in size, so it is unreasonable to keep the fixing points of the mask unchanged.

**[0047]** An existing mask, especially the four fixing points at four corners of a planar mask, is unreasonable, positions of optimal fixing points for the mask, which can achieve the optimum in all aspects by testing, should be found again.

**[0048]** One of the principles is as follows: As the ears of the human are much higher than the upper edge of the mask, the mask strap may have an upward pulling force on the mask after the mask is put on, but the fixing points at the upper portion of the existing mask are at the outermost side of the upper edge of the mask, the upward pulling force is weakened greatly, which may cause forces having an adverse effect in other directions on the contrary; and the large pulling force in other directions will lead to the leakage. Therefore, the existing mask will fall down during use, especially when people speak. According to the test, the two fixing points at the upper portion of the mask can be moved towards the lower portion and the middle of the mask body, and the downward movement is preferably not more than 30 mm, especially the planar mask.

**[0049]** The mask strap has an upward pulling force, the force for straightening the nose bridge strip is reduced, and the upward pulling force is increased, and thus the pulling on the side edge of the mask body is enhanced, and the leakage on the side edge is reduced. The upward pulling of the middle part of the mask is increased, and thus the leakage on the upper edge of the mask is reduced.

**[0050]** According to the test, the selected optimal positions of the two fixing points at the upper portion of the mask may further be located in a bridge of the nose area, or an area near the bridge of the nose. However, the movement of the fixing points to the middle of the mask is large, so auxiliary fixing points can be arranged at the edge of the mask, which may be called semi-fixing points. Moreover, the optimal positions of the two fixing points at the lower portion of the mask are mostly moved upwards by a certain distance compared with the existing mask.

**[0051]** The bridge of the nose area refers to a bridge of the nose area corresponding to the average size of the bridge of the nose of the people in a certain region due to the fact that the size of nose is different.

**[0052]** In this way, the change is minimal, the influence is minimal, the cost is almost unchanged, and the tightness and comfort are greatly improved. Only by greatly improving the protective force without increasing the cost can the epidemic prevention level be improved on a large scale under the condition of virus variation and serious global epidemic situation.

**[0053]** The third great invention point is that: the fixing band of the mask (mask strap, fixing strap) are actually not simple, but important, and there are still many potentials that have not been dug out (it is also found later that by cooperating with other structures on the mask, the leak of the mask can be automatically reduced, which is similar to automatic function), and various force at various positions on the mask strap can be fully utilized. Alternatively, the middle of the side edge of the mask may also be connected to the fixing band.

**[0054]** Specific embodiments of the method are as follows:

According to the acting force of the face on the mask through the mask strap, four new fixing points of the fixing bands or two new fixing points of the fixing bands at the upper portion of the mask are found on the mask body, such that the tightness between the mask and the face is good, and the pulling force of the fixing band is small. According to the methods of the experiment, the two fixing points at the upper portion of the mask can be moved downwards from the upper edge of the mask, and the fixing points at the upper portion of the mask can be moved from left and right edges of the mask to the middle.

1. Moving inwards and outwards:

**[0055]**

(1). For the two fixing points at the upper portion of the mask, as the upper edge of the mask is not a rigid structure, the two fixing points needs to be moved a little towards the bridge of the nose, so as to enhance the lifting effect, and the movement amount is preferably 0.5 cm to 3 cm. When the two fixing points are moved inwards, the edge of the mask can be pressed by the mask strap. But if the fixing points are moved too much, especially to the bridge of the nose area, it is best to provide an auxiliary fixing point at the edge of the mask.

(2). If the two fixing points are moved to the middle and reach the bridge of the nose or an area near the bridge of the nose, an auxiliary fixing point needs to be provided on the outer side of the mask.

2. Moving upwards and downwards:

**[0056]** The two fixing points at the upper portion of the mask can be moved a little downwards, thus enhancing the lifting force, but cannot be moved downwards too much, the reason is that the mask is soft, too much downward movement of the two fixing points will lead to the top of the mask to be loose. At present, the N95 mask, which accounts for a large proportion of the market, can be folded from a left face and a right face for storage, and can be opened by pulling the left and right faces apart when in use, e.g., a N95 mask shown in FIG. 8. For such a mask, the downward movement of the tow fixing points at the upper portion is excessive compared with the uppermost edge in the middle of the bridge of the nose, and thus easy to cause the upper portion to be loose. Therefore, the upper two fixing points of such a mask should be moved upwards, or moved up to within 4 cm from the uppermost edge of the mask. Scientifically, the two fixing points should be moved upwards vertically, and if possible, the two fixing points can be moved to the position of the bridge of the nose, and it is best to find a position that is neither too upper nor too lower. The mask fixing band exerts pressure on the periphery of the mask, or the movement amount of the two fixing points at the upper portion of the N95-shaped mask is 1 to 4 cm compared with the uppermost edge in the middle of the bridge of the nose, that is, it is best for the two fixing points to move up vertically to the positions 1 to 4 cm away from the uppermost edge, but if the two fixing points are moved up vertically to the edge of the mask, the upward movement should be stopped. As the cloth is soft, the downward movement of the two fixing points of a disposable mask or planar mask is 1 to 3 cm, or 0.5 to 2.5 cm. The distance here refers to perpendicular distance.

**[0057]** For the planar mask, it is best to move the fixing point inwards to the Y axis while moving inwards to the X axis, such that the mask strap can press the edge of the mask more and better. The inward movement of the fixing point towards the middle line of the mask can reduce the looseness of the middle of the mask, and the mask strap can definitely press the edge of the mask when the fixing points of the mask strap are moved inward, which is similar to adding the auxiliary fixing point. The other force of the mask strap on the mask is increased, and the mask strap is sufficiently utilized. The purpose of large technical effect by small change is achieved.

**[0058]** The fixing points of the mask are moved towards the middle of the edge of the mask by 5 to 30 mm, and the fixing points of the mask for children are moved towards the middle of the edge of the mask by 5 to 20 mm as permanent fixing point, which refers to that the original fixing points of the mask are moved to get new fixing points and then fixed. On the one hand, this movement improves the internal fixation of the mask, and meanwhile, the mask strap is used to press the edge of the mask, and thus the edge is not loose. However, if the fixing points are moved too much, the auxiliary fixing points can be added on the edge.

**[0059]** In the existing N95 and other masks with an opened main body similar to a bowl-shaped container, as the bridge of the nose area of the mask protrudes upwards, the middle of the upper edge of the mask is away from two fixing points at the upper portion of the mask, which is easy to cause the top of the mask to be loose. The upward movement of the two fixing points at the upper portion of the mask is conducive to close to the middle of the upper edge.

**[0060]** An approximately V-shaped structure is fixed to an upper portion of a mask body, which is called V-shaped structure or V shape for short, and can be made of various materials. For example, the middle of the V shape can be fixed to an outer surface of the mask, that is, the upper portion has a half of the V-shaped structure when viewed from each of left and right sides of the mask body, and left and right corners of the upper portion of the mask are slidingly connected to the V-shaped structure, and thus in the process of wearing the mask, the left and right corners of the upper portion can slide and move downward along the V-shaped structure towards left and right middle lines of the mask. Taking a left mask body as an example, a half of the V-shaped structure is obliquely fixed to the mask body from an upper left corner to the lower right of the mask body. In the process of wearing the mask, under the action of force, e.g., there is a force to arch a mouth-nose area in the middle of the mask body every time a person exhales, the upper left corner of the mask body drives an upper edge and a left edge of the mask to move towards the mouth-nose area in the middle, so as to make the upper edge and left edge to tightly fit the human face; and more and more mask cloth in the

mouth-nose area is arched to form a breathing space in the mouth-nose area. With the wearing of the mask, such an effect is continued, which is equivalent to the trend of active defense. Left and right end portions of the V-shaped structure at two corners of the mask can be extended and fixed to the face or head of a person, fixed to the face or head of a person by connecting other parts, or fixed to glasses, for example, by other connectors. According to such a structure, the effect is much better when the mask body is made without a nose bridge strip. Similarly, an approximately inverted V-shaped mask strap is fixed to a lower portion of the mask body. For N95 series masks with an opened main body similar to a bowl-shaped container, as there is a protruding portion in a bridge of the nose area at the upper portion of the mask body, an approximately inverted V-shaped structure is fixed to the upper portion of the mask body. The V-shaped structure may be an approximate structure or other structures with similar principles, for example: the V-shaped structure is originally composed of left and right sections, and then a vertical section structure is connected in the middle of the V shape to form a structure similar to an upward trident, or the V shape at the upper portion of the mask and the inverted V shape at the lower portion are spliced together to form an X-shape structure. These structures may employ approximate shapes or incomplete shapes. For example, the V-shaped structure may employ: a V shape with bending and deformation, an incomplete V shape, etc. The V-shaped structure and other structures may be made of various materials, e.g., rubber, plastic, mask straps.

**[0061]** The above embodiments may also be further implemented in conjunction with the followings:
The selected positions of the two fixing points at the upper portion of the mask may further be located in the bridge of the nose area, or an area near the bridge of the nose, and the auxiliary fixing points are arranged on the edge of the mask.

**[0062]** Similar to FIG. 9, two fixing points at the upper portion of the mask are located at the bridge of the nose area or an area near the bridge of the nose, so there is no need of a nose bridge strip. Some fixing points can be found through test, in general, the fixing points are close to the left and right middle lines of the mask to cooperate with the mask cloth, therefore, there is no need of the nose bridge strip or such auxiliary things, and then the auxiliary fixing points are arranged on the edge of the mask. The mask strap replaces the nose bridge strip or an equivalent structure thereof at the same time. The upper and lower positions, for example, may be selected to next to an original position for fixing the nose bridge strip.

**[0063]** It is the best for the fixing points to close to the left and right middle lines of the mask, because the fixing points, especially the welded fixing points, of the mask straps are big, even if the most front ends are next to the left and right middle lines of the mask, the whole fixing points are located in the bridge of the nose area.

**[0064]** The concept provided by the present disclosure generally refers to an average value. For example, there are differences in the size of the bridge of the nose between people, and the bridge of the nose area is an area of the mask corresponding to the bridge of the nose when the mask is put on, where the bridge of the nose refers to that with average size obtained according to different people in each region. A length and a width of the area near the bridge of the nose herein does not exceed that of a main body.

**[0065]** N95 and other masks with an opened main body similar to a bowl-shaped container may also adopt the above embodiment.

**[0066]** Further, a connection is added between the fixing band and the edge of the mask, for example, the connection employs a buckle, adhesive or clamping structure; or after the mask is put on and adjusted, the fixing band and the edge of the mask are fixed; or the fixing band is slidably connected to the edge of the mask; or during production, a crack or hole penetrating through the mask is directly formed in the edge of the mask, and the fixing band passes through the crack or hole.

**[0067]** The mask is provided with two or four auxiliary fixing points, and the fixing bands is connected to the mask through the fixing points, respectively. The dense arrangement of the fixing points can increase the fit of the mask and the face, and thus there is no need for too much pulling force of the fixing band, and the pulling on the ear or the head is reduced. A branch is connected to the fixing band to connect the auxiliary fixing point on the mask.

**[0068]** Another embodiment (similar embodiment in which the two fixing points at the lower portion of the mask are moved upwards compared with the original existing ones) is as follows:
As shown in FIG. 3, an upper fixing band 11 and a lower fixing band 11 are connected to each of left and right sides of the mask body 9. When the mask is put on, the upper and lower fixing bands are placed over the same ear, and thus the middle of the side edge of the mask can be pulled tightly to fit the face to prevent a leak or gap from forming between the side edge of the mask and the face. Mask cream or mask liquid can still be applied on both sides of the nose above the mask to prevent the mask from forming a gap with the face. The principle is that more fixing points are added on the side edge of the mask body, for example, three fixing points are adopted. Similarly, as shown in FIG. 4, one end of a strip-shaped fixing band is fixed to a position nearby the middle of the side edge of the mask body 9, and the other end of the strip-shaped fixing band is fixed to the original fixing band 11 of the mask, and the strip-shaped fixing band is tightened after being fixed by the original fixing band, thus tightening the middle of the side edge of the mask against the face. The original mask body 9 is tied to the head by upper and low fixing bands 11, at least one fixing band is added between the original upper and lower fixing bands of the mask body. The fixing point of the fixing band added on the side edge of the mask is preferably located at the middle of the side edge of the mask.

**[0069]** Certainly, this also has the advantage that the pulling force for fixing the mask is dispersed on multiple fixing bands, thus reducing the binding force on the face, ears, head and the like, and the damage to the skin. In addition, as long as the fixing bands at the lower portion of the left and right edges are placed over the ears upside down (the strap above the ear is turned to the bottom of the ear, and the strap below the ear is turned to the top of the ear), a lower half portion of the mask may also cover the nose but expose the mouth for activities such as drinking water. In order to facilitate identification, the upper and lower fixing bands can be distinguished by different colors or patterns. Similar, the upper half portion of the mask may also cover the mouth but expose the nose.

**[0070]** The problem of ear skin pain caused by wearing the mask for a long time and the problem of leakage on the side edge of the mask have not been solved can be solved. This structure kills two birds with one stone, and unexpectedly has other functions, such as being able to expose the mouth for driving water and eating, or expose the nose for scratching.

**[0071]** In order to strengthen the leakage proofness on the side edge of the mask with the structure of the fixing band, if the mask strap is a wide fixing band, a section of short fixing band is added, one end of which is connected to the middle of the side edge of the mask and the other end is connected to the fixing band. As a middle fixing band, the fixing band in the middle and the fixing band fixed to a lower side of the mask can be made wider (or replaced with the middle and upper fixing bands), so as to be connected together, that is, the fixing band in the middle and the fixing band fixed to the lower side of the mask form a whole piece of elastic cloth, the width of which is narrowed from the edge of the mask when getting closer to the ear. The trouble for connecting the fixing band in the middle and the middle section of the fixing band together is saved at the same time. In fact, the design essence of such a leakage proofness on the side edge is that as long as the middle of the side edge can be connected to the fixing band, the side edge leakage proofness can be basically achieved.

**[0072]** The two fixing points at the lower portion of the mask may be moved upwards by 5-20 mm or 5-25 mm than the existing ones, and can be moved upwards more if the material is thicker, which is conducive to preventing the middle of the side edge from leaking.

**[0073]** A unidirectional moving surface material can be used to reduce or prevent the leakage of the side edge of the mask. There are various surface materials at present, such as tiny particles lying to a fixed edge, which allow two objects to make relative unidirectional movement, and when the two objects move towards the other direction, the tiny particles will be held up to hinder the relative movement of the two surfaces. The two fixing points at the lower portion of the mask are arranged on the mask body within the edge of the mask, and the mask strap is pressed at the lower edge of the mask and then fixed to the ear or head. The side edge of the lower portion of the mask is provided with a surface material capable of moving unidirectionally relative to the mask strap, such that the lower portion of the mask can only move downwards relative to the mask strap, and the side edge is straightened downwards to prevent the two side edges of the mask from leaking.

**[0074]** It is found that the leaks on the side edge of the mask can be reduced by moving the two fixing points at the lower portion of the mask upwards.

**[0075]** Preferably, the positions of the fixing points of an elastic material are moved downwards along the bridge of the nose. Because the uppermost edge of the ear of the human is above the uppermost edge of the mask, the fixing band still has an oblique pulling force on the fixing point, and the oblique pulling force makes the cloth on the upper edge of the mask more fit the face. Therefore, the pulling force of the fixing band can be correspondingly reduced, which makes the mask more comfortable to wear. For example, the fixing point may also be arranged below the position for fixing the nose bridge of the original mask, the effect is good, and this position has been about 15 mm away from the upper edge of the mask.

**[0076]** The structure adopted by the present disclosure, for example, when two left and right fixing points or a wide fixing point equivalent to the left and right fixing points is adopted in the middle of the elastic material, can achieve the following: 1. An area of the mask cloth at the bridge of the nose is free of arching. 2. There are two forces on both left and right sides of the bridge of the nose at the upper edge of the mask: a component force for pulling the mask cloth outwards from the nose bridge, and a force for pushing the mask cloth inwards from an outer edge (the auxiliary fixing point), which are act on the mask cloth between the two forces better to fill large concave holes on both sides of the bridge of the nose. In the mask with the nose bridge strip, these two forces will always promote the nose bridge strip and the mask cloth on both sides of the bridge of the nose to bend into an arc like the large concave hole during wearing, so as to keep fit with the face. But if the mask is not provided with the nose bridge strip, there is no need to pinch the nose bridge strip, and a certain automation is achieved.

**[0077]** The upper and lower fixing bands are used to tie the mask body to the head, and the fixing band itself is inelastic, so the elastic material for fixing the upper edge of the mask may also be replaced with an inelastic material.

**[0078]** When a fixing hole or a ring-shaped structure is made into a long oval or groove shape, and is provided vertically, the long fixing band can move up and down in the groove in addition to passing through the hole or ring, such that the corresponding mask body can change its position relatively to the fixing band by a small margin, and thus can be adjusted to fit the facial form and reduce leakage. Further, structures capable of being used for temporarily locking and fixing, such as adhesives or buckles, can be fixed to the fixing band, the fixing hole or the ring-shaped structure, and the relative

positions of the fixing band and the fixing hole or the ring-shaped structure can be locked and fixed after the position of the mask body is adjusted well.

**[0079]** As shown in FIG. 6, a section of elastic material 129 is arranged on the upper side of the mask on each of both sides of the nose, both ends of the elastic material are respectively fixed to the mask, and thus a connection point of the fixing band on each edge of the mask is not fixed to the mask body 9, but is respectively connected to one end, close to the outside, of the elastic material 129 on each edge of the mask, and the end, close to the outside, of the elastic material 129 is not fixed to the mask. Alternatively, it may be that a long fixing band is disconnected at the nose bridge, and the two disconnected ends are respectively fixed to the bridge of the nose area of the mask body.

**[0080]** The above structure is certainly suitable for N95 and other masks. As shown in FIG. 8, a ring-shaped structure 31 is fixed to the mask body 9, and an end of the fixing band 11 is fixed to the mask body after passing through the ring-shaped structure 31.

**[0081]** A more optimized method is provided by summarizing the previous embodiments.

**[0082]** The important problem during implementation is as follows:

If the structure using a whole long mask strap is not provided with a nose bridge strip, and the long mask strap straddles the bridge of the nose, the mask cloth is easy to form an arch at the bridge of the nose area because there is no pull from both sides, even if there is a fixing point at the center point. That is, the mask is not in fit with the bridge of the nose, and thus the leakage proofness effect is poor. It is the same for the case of the presence of the nose bridge strip. The mask straps at the left and right edges of the upper portion of the mask are extended to be fixed to the bridge of the nose area, because welding points of the mask straps on the left and right sides of the bridge of the nose are pulled outwards towards the face by the mask straps, the upper edge of the mask can fit the bridge of the nose well here. It may be implemented as follows: in the middle of the long mask strap, two fixing points, or a fixing point with the width equal to the width of the two points, are provided on the mask, and the side edge of the bridge of the nose area can be pulled obliquely downward by the mask strap on each edge from the fixing point to the auxiliary fixing point.

**[0083]** The fixing points and the auxiliary fixing points make the left and right fixing bands and the cloth of the mask body on both sides of the bridge of the nose to be separated front and back, the farther apart, the closer the cloth of the mask body to the face to fill the concave holes on both sides of the bridge of the nose. However, such an effect cannot be achieved if only a strip-shaped object is used to be attached to the mask, or the fixing band is fixedly attached to the surface of the mask.

**[0084]** This design fundamentally changes the situation that the fixing points of the mask remain unchanged for decades, whether a planar mask or other masks such as N95. Therefore, the mask can be in tight fit with face by the mask strap without the force of strangling the ear.

**[0085]** Such a design also has a huge function that the person wearing the mask is easy to get the middle point of the upper portion of the mask, such that the upper portion of the mask can be bent to form an arch to cover the bridge of the nose and the mask cannot be worn askew. Most of existing masks do not have this structure, and are easy to be worn askew, resulting in uneven force on the left and right to cause deformation, which may affect the protection effect of the mask. Moreover, askew wearing and slant wearing will affect the image of the wearer.

**[0086]** The following content and embodiments are continuously obtained by summarizing the above embodiments.

**[0087]** The positions of the two fixing points at the upper portion can be moved downwards along the bridge of the nose, and the downward movement should not be too much, and cannot exceed 30 mm. The advantages are as follows: Because the uppermost edge of the ear of the human is above the uppermost edge of the mask, the fixing band still has an oblique pulling force on the fixing point, and the oblique pulling force makes the cloth on the upper edge of the mask more fit the face. Therefore, the pulling force of the fixing band can be correspondingly reduced, which makes the mask more comfortable to wear.

**[0088]** According to above embodiments, the connection between the fixing band and the edge of the mask body may be achieved using a buckle, adhesive or clamping structure, and after the mask is put on and adjusted, the fixing band is fixed. Alternatively, the fixing band may be slidably connected to the edge of the mask body.

**[0089]** Other embodiments are as follows:

In one embodiment, the mask further includes a fixing band 11, and a fixing structure for fixing the fixing band 11 to a mask body 9. The mask body 9 is provided with a fixing hole or a fixing groove. In this embodiment, the fixing hole or fixing groove is long-striped, and the fixing structure is arranged on the mask body 9. In a case that the fixing band 11 is fixed to the mask body 9 by the fixing structure, an end portion of the fixing band 11 is fixedly arranged in the fixing hole or the fixing groove. In a case that a fixation state between the fixing band 11 and the mask body 9 is released by the fixing structure, the end portion of the fixing band 11 slides in the fixing hole or the fixing groove.

**[0090]** In one embodiment, the fixing structure is a buckle or a magnetic tape.

**[0091]** In one embodiment, the mask body 9 is provided with a long-striped through hole, after the end portion of the fixing band 11 passes through the through hole, an outer surface of the fixing band 11 is abutted against with an inner wall of the through hole.

**[0092]** In order to solve the problem of leakage on the side edge of the mask, in one embodiment, the mask strap is

a fixing band with a wide surface, that is, the fixing band 11 is a flat fixing strap.

**[0093]** In one embodiment, the mask further includes a short fixing band, one end of the short fixing band is connected to the middle of a side edge of the mask body 9, and the other end of the short fixing band is connected to the fixing band 11.

**[0094]** In one embodiment, the fixing band 11 includes elastic cloth, and a mask strap. One end of the elastic cloth is arranged on the mask body 9, the other end of the elastic cloth is fixedly connected to one end of the mask strap, and the other end of the mask strap is arranged on the mask body 9. Specifically, a middle fixing band is added, the middle fixing band and the fixing band fixed to the lower side of the mask can be made wider (or replaced with the middle and upper fixing bands 11), so as to be connected together, that is, the middle fixing band 11 and the fixing band 11 fixed to the lower side of the mask form a whole piece of elastic cloth, the width of which is narrowed from the edge of the mask when getting closer to the ear. The trouble for connecting the middle section of the middle fixing band and the upper or lower fixing band 11 together is saved at the same time. In fact, the design essence of such a leakage proofness on the side edge is that as long as the middle of the side edge can be connected to the fixing band 11, the side edge leakage proofness can be basically achieved.

**[0095]** In one embodiment, the mask body 9 is provided with multiple auxiliary fixing points, and the fixing band 11 is provided with multiple auxiliary fixing bands which are fixedly connected to multiple auxiliary fixing points in one-to-one correspondence, thus playing a leak-proof role on the expanded side edge.

**[0096]** In one embodiment, the mask includes: a fixing band 11, a mask body 9, and a leak-proof structure for preventing droplets from entering or splashing out of the mask body 9. The fixing band 11 is arranged on the mask body 9. The leak-proof structure is arranged on an inner surface of the mask body 9.

**[0097]** Alternatively, the two fixing points of the fixing bands at the lower portion of the mask of the original mask are moved upwards by 5-20 mm, or moved upwards by 5-25 mm when the material of the mask is thick, that is, the fixing points are moved upwards to the optimal fixing points, so as to control the leaks at the side edge.

**[0098]** The important content is as follows: (the fourth invention point)

**[0099]** The automation is specifically achieved as follows:

This is a qualitative leap, another major discovery in the implementation process of the present disclosure, and a pushing structure for a mask is provided. The existing mask, especially a disposable mask, leaks more and more during use, and the mask strap of the existing mask pull cloth of a mask body to move to both sides. On the contrary, the mask provided by the present disclosure has multiple pushing effects. For example, because the ears are high, the mask strap turns up from the auxiliary fixing point to the ear, the upward turning may have a pushing effect on the auxiliary fixing point, in particular, the mask cloth of the mask body without the nose bridge strip can move more freely, and during the use of the mask, the cloth of the mask body at the upper edge of the mask body can move towards the middle to fill gaps on both sides of the bridge of the nose. Certainly, the better the flexibility of the cloth of the mask body, the better the effect. If the mask body is made of a soft and thin material, it is easy to cause wrinkles, and if the mask body is made of a hard and thick material, it is difficult to bend and move.

**[0100]** Therefore, when the mask without a nose bridge strip is put on the face, the mask strap is placed over the ear after being pulled by the hand. During the process of upward pulling and releasing the mask strap, the upward pulling has been analyzed in above. Because the mask strap, when pulled upwards and turned upwards, will push the auxiliary fixing point, and the acting force at this time should be the largest. The releasing is that the mask strap, when placed over the ear, will return to its original position and contract to play a role of driving, the auxiliary fixing point, under the push of the mask strap, pushes the mask cloth to bend to concave holes on both sides of the bridge of the nose, just like to pinch the nose bridge strip by self when the mask with the nose bridge strip is used. The effect of automatically pinching the nose bridge strip can be enhanced by strengthening the pushing effect. The earliest embodiment of the present disclosure is as follows: during production, a semi-sliding and semi-fixed through crack is directly pressed against each of the left and right side edges of the upper edge, that is, the crack is tiny, only for the fixing band (mask strap) to pass through. Such a mechanical mask strap has a large friction force on the mask cloth. Alternatively, by increasing the friction force between the mask strap and the pushed mask cloth, the cloth of the mask body is promoted to be in tight fit with the face from the auxiliary fixing point during the wearing of the mask. Such designs can enhance the pushing effect of the releasing the mask strap, but weakens the pushing effect of the ear loop in upward pulling and at ordinary, the friction force can just be used for thin mask cloth which does not require a large pushing force, otherwise, the mask cloth is prone to arching and leakage in the process of pushing. The mask cloth, if too thin, is prone to arching and leakage during pushing, and thus the auxiliary fixing point can be moved a little towards left and right middle lines of the mask.

**[0101]** The face breadth herein may simply refer to an interface at the front and sides of the face, the width between the auxiliary fixing points corresponds to the face breadth should be smaller than the face breadth, e.g., less than 2 cm, as long as the comprehensive effect is better. That is, there is little influence when the mask strap at the auxiliary fixing point pushes the cloth of the mask body to fill the leaks. Moreover, during the wearing of the mask, the situation that the cloth mask is easy to arch because the mask cloth is too long or the pushing force is large can be avoided. In comparison, the crack has better effect than the hole or ring.

**[0102]** No matter which auxiliary fixing point is implemented, such as hole, crack or the use of the ring structure, as long as the sliding connection can be achieved. It is important that the auxiliary fixing points should be located at the left and right positions of the face breadth or within the face breadth, so as to have a good pushing force on the mask cloth to the middle of the mask, and the implementation of the auxiliary fixing point should ensure that: the mask strap no longer presses the mask cloth outside the auxiliary fixing point, the pressing of the mask strap against mask cloth here will cause greater moving friction resistance. According to the design and mask in the prior art, in order to fix the mask, the whole mask is fixed by pressing the outermost edge on the side edge of the mask. Therefore, the friction force between the mask and the face is large, the pushing effect is poor. Moreover, if the auxiliary fixing point is too far outside, and the cloth to be pushed is too long, it is easy to cause arching, especially when the mask strap is placed over the ear.

**[0103]** The embodiments are as follows: for the mechanical mask strap, the two auxiliary fixing points on the left and right side edges of the mask are provided as holes or cracks, the pushing effect is excellent if the width between the auxiliary fixing points is just equal to or less than the face breadth, and the mask cloth is reduced from being pressed by the mask strap. Different from the existing mask, the width of the mask is stipulated to be wider than the face breadth due to the consideration of protection. The most important embodiment of the auxiliary fixing point is to form a crack or hole in the side edge of the mask, which is generally 5-15 mm away from the side edge, and is the width between the cracks or holes is just close to the face breadth of most people after the mask is put on, and most of the mask cloth is suitable. Therefore, the mask in the embodiment itself has an excellent effect, and in addition with the dynamic action of the mechanical mask straps, when the whole mask is put on the face, the longer time the mask is worn, the better the air tightness, and the stronger the protective force.

**[0104]** Under the cooperation of the dynamic mask strap and the auxiliary fixing point, the mask is turned into an adaptive active defense mask, and a mask capable of automatically and continuously reducing the leaks on the upper edge of the mask during use. There is the pushing effect during the wearing of the mask. As the droplets move parabolically, it is more important to prevent the upper edge of the mask from leaking, and the glasses can be prevented from fogging due to leakage. However, during the wearing of a normal mask, the leak at the upper edge gets bigger and bigger.

**[0105]** This effect phenomenon is also similar to an artificial intelligence mask. The mask is adjusted at the beginning of wearing, just like teaching the mask how to reduce the leakage. Afterwards, the mask will continuously reduce the leakage in the whole wearing process as taught.

**[0106]** The mask with such a structure is of a great significance and effect, this is because many people in the world do not know how to pinch the nose bridge strip to reduce the leaks at the upper edge of the mask when wearing the mask, and there is a risk of leakage in the existing disposable mask. For example: the children and lazy person do not know or want to pinch the nose bridge strip often to reduce the leaks at the upper edge; and there are still some backward places where people with poor health protection education do not pay attention to these important details. The mask provided by the present disclosure can reduce the risk of leakage of these people. Frequent pinching of the nose bridge strip will touch the mask, which may cause cross infection.

**[0107]** There are holes or cracks on the left and right side edges of the upper edge of the mask body, which are formed in the mask body at positions within the face breadth of a person wearing the mask. In order to prevent corners of the mask from warping, the holes or cracks may be formed can be at positions within 3 cm of the face breadth. Further, it can be implemented as follows: cracks are formed in the left and right side edges of the upper edge of the mask body, and each crack extends inward from the side edge, and the crack does not to penetrate through the mask body, such that the wearer can tear the crack towards the middle line of the mask body according to the face breadth to penetrate through the mask body. Like the foregoing embodiment, the auxiliary fixing point may be provided as a long groove, and the length of the groove can be adjusted by buckling, tightening, pasting, etc., and thus the distance between auxiliary fixing holes of the left and right mask straps can be adjusted as close as possible to the face breadth. The mask made of the material much thicker than that of the normal mask can also enhance the effect. For example, the mask cloth which is around the auxiliary fixing point and in contact with the face is made to have a smooth surface, even the mask cloth in contact with the mask strap is made to have a smooth surface. For example, an outer surface of the mask in the direction from the periphery of the hole or crack at the auxiliary fixing point to the middle line of the mask body is provided with a surface material capable of moving unidirectionally relative to the mask strap. There are many types of surface materials at present, such as tiny particles lying to a fixed edge, which allow two objects to make relative unidirectional movement, and when the two objects move towards the other direction, the tiny particles will be held up to hinder the relative movement of the two surfaces. When lodging surfaces of the tiny particles are facing away from the middle line of the mask, the mask cloth is allowed to move towards the middle line of the mask relative to the mask strap. Similarly, the surface material capable of moving unidirectionally can be used to reduce or prevent the leakage on the side edge of the mask. The two fixing points at the lower portion of the mask are arranged on the mask body within the edge of the mask, and the surface material capable of moving unidirectionally relative to the mask strap is arranged at the lower edge of the mask, and thus the mask cloth can only move downward relative to the mask strap to prevent both side edges of the mask from leaking.

**[0108]** Certainly, if the mask is made of a memory material, a more perfect effect can be achieved.

**[0109]** The face breadth refers to the breadth of the face, generally referring to a distance between the highest points of two cheekbones. The face breadth refers to the average face breadth of wearers in the use region. The auxiliary fixing point is arranged at the face breadth position, indicating the position, corresponding to the face breadth, of the mask after the mask is put on the face. The holes or cracks may be moved towards the middle line of the mask, but cannot be moved too much, thus ensuring that the corners at the upper portion of the mask made of this material are prevented from warping as the corners are not pressed by the straps. The auxiliary fixing points are arranged at the average face breadth, which certainly may be deviated a little outward or inward, for example, within 5 mm, but the effect will be worse. That is, the auxiliary fixing points are provided within the range of plus or minus 5 mm at the face breadth corresponding to the left and right sides of the face.

**[0110]** Hole or crack formation may also be implemented in this way. A ring is provided for instead, a structure similar to or equivalent to the ring is provided at a position, close to the upper edge, of each of both sides of the upper edge of the mask, and the mechanical mask strap passes through the ring. As the mask strap has reached the upper edge of the mask, the ear loop is upwards placed over the ear obliquely after passing through the similar ring or equivalent ring, without pressing the mask cloth on the outer side of the similar ring or equivalent and forming the resistance, which is beneficial to the mechanical mask strap to push the cloth on both side edges of the mask to move towards the middle by pushing the ring.

**[0111]** The small details discovered by the present disclosure have a great effect, i.e., a great technical effect. The adopted design can reduce a situation that the movement of the mask is affected as the mask cloth is pressed, and is convenient for the mask strap to push the mask cloth to move towards the middle line of the mask and to fit the skin of the face. This structure can fill the leaks of the mask, and also can reduce the leaks at the side edge.

**[0112]** In the wearing process, the leak between the mask and the face becomes smaller and smaller. The mask can be driven to the front of the face regardless of breathing or talking, and the mask cloth is thus promoted to move forward to the nose and mouth, which is similar to the pushing of the mechanical mask strap. Therefore, the mask cloth on the upper edge of the mask constantly fills the gaps on both sides of the bridge of the nose, and the cloth on the two side edges of the mask continuously move forwards and towards the middle to be in fit with the face.

**[0113]** The automation of the mask is also embodied. The important discovery and invention put forward by the present disclosure are that the mask cloth can be moved continuously to fit the face under the action of the mask strap or the action of facial movement. An auxiliary fixing point is arranged on the mask, and a structure capable of reducing or avoiding a situation that the movement of the cloth of the mask body is affected due the pressing of the mask strap is employed. Under the action of the mask strap or the facial movement of a person, the cloth of the mask body moves close to fit the face skin from the auxiliary fixing point relative to the mask strap. The present disclosure can be implemented as follows: the auxiliary fixing points are arranged on the left and right side edges of the upper edge of the mask body, the auxiliary fixing points are arranged to close to the face breadth of the wearer or less than the face breadth of the wearer, and starting from the auxiliary fixing points, the mask straps leave the mask and go behind the ears or head of the person. The holes or cracks are easy to form. If the auxiliary fixing points adopt a ring-shaped structure, the mask strap has to press a little mask cloth after passing through the ring, and the leaves the mask and goes behind the ear or head of the person, and then can be moved a little towards the middle of the mask.

**[0114]** This structure can fill the leak and reduce the leak on the side edge of the mask. For the existing mask, because the nose supports forwards and upwards, and the chin moves downward, the mask body on the side edge will be pulled up and down, and when the mask is pulled seriously, there may be leaks. In the present disclosure: under action of the mechanical mask strap, the auxiliary fixing point and no nose bridge strip, the auxiliary fixing points at the upper portion of the mask can be more flexible, and the leak on the side edge becomes smaller and smaller according to the multi-dimensional movement of the human face, thus achieving automatic adjustment. Moreover, the upper edge of the existing mask is provided with the nose bridge strip, the nose bridge strip almost occupies the width of the whole mask, the transverse movement of the side edge of the mask is limited, and the longitudinal movement of the side edge of the mask is also limited. This folded structure is in well fit with the absence of the nose bridge strip.

**[0115]** In conclusion, in the process of wearing the mask, the leaks between the mask and the face can be actively reduced.

**[0116]** Because this structure has such an effect, it may also be used in other positions of the mask. An auxiliary fixing point is arranged at the edge of the mask, and the auxiliary fixing point is slidably connected to the mask strap. The mask strap is moved to the middle of the mask in the abscissa and/or ordinate after passing through the auxiliary fixing point, and then is fixed to a new position as the fixing point. The auxiliary fixing point employs a structure capable of reducing or avoiding a situation that the movement of the cloth of the mask body is affected due the pressing of the mask strap, or the auxiliary fixing point employs a structure capable of reducing or avoiding a situation that the movement of the cloth of the mask body for filling the leaks under the push of the mask strap. In this structure, the cloth of the mask body is moved towards the fixing point relative to the mask strap at the auxiliary fixing point under the action of the mask strap or the facial movement of a person, and the fixing point is close to the middle of the human face relative to the

auxiliary fixing point, and also moves towards the skin of the human face.

**[0117]** The important discover and implementation are as follows: (the fifth invention point)

**[0118]** A shape beneficial to the bridge of the nose is created on the mask, including using means such as folding in half.

**[0119]** For a planar mask, e.g., a disposable mask, has never been folded in half in left and right along the middle line, which is the reason that the mask is called planar mask. According to the present disclosure, the planar mask, including the disposable mask, are folded in half, that is, the mask is folded from the left edge to right edge along the middle line, and the inner surface of the mask is folded inside by the outer surface. It is found that the folding in half of the planar mask has great technical effects: the use is convenient, and there is no need to be afraid that the mask is worn askew and to look for the center. Another advantage of folding in half is that when the mask is put on, the cloth in the middle is able to stand up to be away from the nose and mouth of the human, that is, the cloth is free of making contact with wet lips. Moreover, the mask is convenient to store and occupies a small space. When the planar mask folded in half is put on, the left and right edges of the mask tend to lean against the left and right sides of the face to reduce the leaks on the side edges of the mask.

**[0120]** The existing N95-shaped mask is generally folded in half left and right, as shown in FIG.8, without a gap therebetween, and the middle of the nose bridge strip is folded at an angle close to 0 degree, and thus the mask does not fit the bridge of the nose after being put on the face.

**[0121]** Another important discovery of the present disclosure is that when the mask is folded in half, that is, the left and right edges are put together, angles and radians are left at the bending part of the nose bridge strip to form a gap between the left and right folded edges of the mask, for example, a gap of about 5 mm or a gap of 3 to 8 mm can be left. In this way, the angles and radians at the bending part have many advantages, for example: due to the presence of the radian in the middle of the nose bridge strip, the nose bridge strip can fit the bridge of the nose easier when the mask is put on the face, so as to reduce the leak. Moreover, the existing planar mask, such as a disposable mask, especially a mask which adopts the mechanical mask strap provided by the present disclosure and has no nose bridge strip, has greater technical effects: after the mask is folded in half, the radian is kept by the material at the middle line of the mask during storage, such that the mask can fit the bridge of the nose easier after being put on the face, and the left and right sides of the mask folded in half tend to protect the bridge of the nose. Meanwhile, under the pushing of the mechanical mask strap, the cloth at the upper edge of the mask can fill the leaks on both sides of the bridge of the nose easier. That is, the fold-in-half is to create the shape of the bridge of the nose for the mask at the middle line. The disposable mask provided by the present disclosure can achieve the following technical effects: there is no need to pinch the nose bridge strip during the wearing of the mask, and the mask can automatically fill the leaks on both sides of the bridge of the nose when put on the face, it is equivalent to helping the wearer to pinch the nose bridge to prevent leakage, and the wearing is simple. It is equivalent to an intelligent mask capable of performing adaptive adjusting according to the face and nose of the wearer, and the function of filling the leak is continuous during the whole process of wearing the mask, so the mask is also an active defense mask. Specific production may also be implemented as follows: in addition to directly folding a single mask in half, a certain number of masks, such as several masks, can be stacked together and then folded in half to form gaps between the two sides of the masks folded in half, and then packaged and subjected to other processing.

**[0122]** That is, at least one end of the mask strap is not fixed to the original fixing point of the existing mask, and in cooperation with a structure for pushing the mask cloth to face, there is no need to pinch the nose bridge strip during the wearing of the mask, and the leaks on both sides of the bridge of the nose can be automatically filled when the mask is put on the face, which is equivalent to helping the wearer to pinch the nose bridge to prevent leakage, and the wearing is simple. Compared with the existing mask with the nose bridge strip, the mask provided by the present disclosure more fits the curve of the face when put on the face.

**[0123]** Further, from top or bottom view, the fold-in-half is to fold the mask into a V shape, with a folded corner in the middle in the same direction as a nasal tip. The mask may also be folded into a W shape, with a folded corner in the middle in the same direction as the nasal tip, and folded corners on both sides falling into cavities between both sides of the bridge of the nose and the cheekbones, respectively, and thus the mask can more fit the face. Moreover, after being folded into the W shape, the length of the mask is reduced much, and thus the carrying and storage are more convenient.

**[0124]** The mask is pre-shaped into the face curve including the bridge of the nose under the eyes of adults, mainly by pre-shaping the upper edge of the mask into a shape with three peaks, and when the mask is put on the face, the three peaks respectively cover on the left cheekbone, the bridge of the nose and the right cheekbone, respectively. The mask is shaped in at least one link of production, processing, packaging, transportation, storage and the like. The upper edge of the mask is shaped with an auxiliary frame with three peaks during the storage of the mask.

**[0125]** The mask may also be made of a memory material, so as to create the mask into a shape beneficial to the bridge of the nose under the same conditions of temperature and humidity of the human face, and then the conditions are changed to flatten the mask. When the mask is put on the face, the temperature and humidity of the human face will restore the mask to a shape beneficial to the bridge of the nose. There are many material similar to the memory

material in the prior art, and thus will not be described in detail here.

**[0126]** Shaping the mask into the shape beneficial to the bridge of the nose in advance has also produced great technical effects and greatly promoted the automation of the mask. When the auxiliary fixing point is pushed by the mask strap and then to push the mask cloth against the face, if the mask cloth is made of a too-thick material, the mask cloth may hold still, and when the mask is shaped into the shape beneficial to the bridge of the nose in advance, the mask cloth at the bridge of the nose will be bent to form many tiny creases. The mask cloth, when holding still, may be bent to close to the human face due to these creases. This is the reason that the fold-in-half of the mask emphasized by the present disclosure is different from the existing fold-in-half of the mask, and it is emphasized that there should be a certain degree of curvature and arc at the folding place, and gaps should be left on the left and right sides of the mask, thus making the mask cloth have a larger area of tiny creases. Therefore, if the mask is not shaped in advance, the upper edge of the mask, especially the mask cloth corresponding to the bridge of the nose and both sides of the bridge of the nose, should be bent or kneaded in advance to form many tiny creases or small wrinkles, and the lines will follow the mask up and down.

**[0127]** This is a major technical progress of masks, especially disposable masks. It is of great significance to backward regions, groups with poor awareness of protection, and groups not wear masks well.

**[0128]** Certainly, if the mask cloth is cooperated with materials with special properties, the mask may have better and more effects.

**[0129]** The further embodiment is as follows:

This embodiment is also a particular important embodiment of such structures of the present disclosure, because the air tightness gets better and better during the use mask provided by the present disclosure, in order to achieve comfort wear and make the mask widely accepted, the mask requires a supporting structure at an area corresponding to the lips, thus preventing the mask from making contact with the lips. Thus, the ventilation area at the mouth and nose is large.

**[0130]** Because most of the existing planar masks have folding wrinkles at the lips, for a planar mask, the mask is folded in half left and right along the middle line, and the inner surface of the mask is folded inside by the outer surface. The wrinkles of the mask are not located at an area corresponding to the lips when the mask is opened, but are located above and below the lips. Because from the bottom of the nasal tip to the chin, the lower lip is most likely to protrude and touch the mask, or at least at an area where the mask faces the lower lip, a horizontal height of the whole folding wrinkles, closest to the lower lip, of the mask should not be higher than that of the upper lip, and thus even if the folding wrinkles are at the height of the lower lip, the mask cannot touch the lower lip after the middle of the mask is unfolded. The cloth in the middle is away from the mouth and nose of the person when the mask is put on, that is, the cloth is free of touching the wet lips, especially the mask without the nose bridge strip.

**[0131]** The mask is folded in half left and right along the middle line, and a mouth-nose area is supported by a middle bulge of the transverse folding wrinkles of the planar mask. The folding in half during temporary use is ineffective, and the best effect is to form creases at the middle line of the folding. The transverse folding wrinkles are preferably more than 4.

**[0132]** Further, in order to enhance the effect, no matter whether the mask is folded in half or not, a platy object or a strip-shaped object can be transversely arranged in a middle area of the mask, and the length of the platy object or strip-shaped object should be long enough, which is the same as the length of the folding wrinkles, that is, there is no empty position (the technical effect cannot be achieved because of the empty position in the prior art), that is, the platy object or strip-shaped object can make contact with the ends of the folding wrinkles (the side edge pressure welding place) on the left and right side edges of the mask.

**[0133]** The most important thing about a support bar is that the two end points must be in contact with the ends of the folding wrinkles on the left and right side edges of the mask, that is to indirectly support the human face, because only in this way can it play a supporting role, responding to the key points provided by the present disclosure again. As this problem is not found in the prior art or product, the technical effects cannot be achieved. The problem that the platy object or the strip-shaped object will be welded when the side edge is welded in the production is not solved, and thus there is no way for the existing production device to implement.

**[0134]** The platy object or the strip-shaped object can be clamped into the innermost wrinkle, corresponding to a position below the lower lip, on the inner surface of the mask, and thus is not easy to loosen and move. When the mask is folded in half, the platy object is also folded in half. When the left and right edges of the mask are opened for use, as the middle of the mask is propped up by the platy object, both edges of the mask tend to close, and thus both edges of the mask are promoted to close to the face on both sides, especially when the platy object is made of a plastic or memory material. The platy object is folded in half for shaping, and then opened for use, the left and right edges of the platy object still have tendency to close. The platy object may be replaced with the strip-shaped object.

**[0135]** Further, the plate may employ a paperboard, different materials or different treatment processes are used on the front and back of the paperboard, such that the paperboard tends to bend to one side at ordinary times. When fixed to the mask, an inner arc of the paperboard faces inwards to opposite to the face, and a reverse arc faces outward, thus facilitating to support the mask material away from the face. Even if the mask is folded in half for storage and then opened for use, the paperboard is kept in an arc shape. This is the use of materials science. After being folded in half, the

paperboard is convenient to open at various angles when opening. Similarly, the paperboard may also be replaced with other materials with different materials or different treatment processes on the front and back, thus making the material bending to one side at ordinary times.

**[0136]** The leakage proofness of the side edge is promoted while the leakage proofness of the upper edge of the mask are overall promoted. Because the platy object or the strip-shaped object can push the mask away from the mouth to prevent the mask from being contaminated by lipstick, the folding or unfolding state before use may also be used for the existing mask.

**[0137]** In addition to adding the mask cloth, for such masks such as N95 and KF94 with an opened main body similar to a bowl-shaped container, in order to keep the mask from touching the mouth when people speak and breath, a platy object or a strip-shaped object is transversely fixed at an area between the bridge of the nose and the mouth, or one or several transverse welding lines are welded transversely area between the bridge of the nose and the mouth by pressure welding to play a supporting role and keep the three-dimensional space structure of the mask unaffected. Especially the mask without the nose bridge strip, the mask cloth on both sides of the bridge of the nose cannot collapse to the large concave holes on both sides of the bridge of the nose after being pushed, thus keeping the three-dimensional space structure of the mask unaffected.

**[0138]** Other important embodiments are as follows:

The planar mask is provided with several transverse folding wrinkles, and the cloth of the uppermost folding wrinkle should be outside the mask, rather than inside the mask, i.e., without blocking between the rest mask cloth at the upper portion of the mask connected thereto and the face, which is conducive to the rest mask cloth at the upper portion of the mask to move to the human face to fill the concave holes on both sides of the bridge of the nose.

**[0139]** Similarly, at other positions of the mask, for example, the lower edge is also provided with a connection structure similar to that at the upper edge, which can also have an effect. Specifically, the fixing point at the lower portion of the mask strap is fixed at a chin area, and an auxiliary fixing point is arranged at the lower portion of the side edge of the mask, and thus the mask cloth on both sides of the chin can more fit human face.

**[0140]** N95, KF94 and other masks with an opened main body similar to a bowl-shaped container may further be implemented as follows: for better effect, the mask cloth can be added to the mask at the bridge of the nose area, as shown in FIG. 8. On the right side of the mask, there are three sections of welding cutting lines, which are respectively an upper welding cutting line, a middle welding cutting line, and a lower welding cutting line. There are more pieces of mask cloth to fill the holes on both sides of the bridge of the nose by increasing an included angle between the upper welding cutting line and the middle welding cutting line. Or the mask is provided with a thinner and smaller nose bridge strip, which is smaller than the existing one, and thus the mask is skin-friendly and more suitable for the bridge of the nose. At a selected site, a very thin nose bridge strip can be used even if the nose bridge strip is required, and thus the injury can be reduced, the cost can be reduced, and the softness and comfort of the mask are increased. The addition of the mask cloth to the bridge of the nose area of the present disclosure is obviously more than that of the existing mask, or the average length of the upper edge of the mask where the bridge of the nose area is located for adults is 16 mm longer than that of the existing similar masks.

**[0141]** For N95, KF94 and other masks with an opened main body similar to a bowl-shaped container, it is easier for the chin to drive the mask to move down when people speak, which is easier to make the mask move, the nose bridge strip needs to be reshaped when moving to a new position, inevitably leading to air leakage and fail to achieve technical effects. The leak has a great influence on aerosol protection. Therefore, whether the mask is provided with or without the nose bridge strip, the key to achieve the technical effect is to prevent the mask from sliding during wearing. This is also based on the great discovery of the present disclosure that on the contrary, the nose bridge strip will cause leakage after the mask is displaced. Such structures are particular important, so it is necessary to provide a material with high friction resistance at a position where the face or the bridge of the nose comes into contact. The mask can be prevented from moving when in conjunction with the material with high friction. Additional materials with high surface friction, such as cloth or paper with rough surface and sponges with fine materials, are arranged at the area where the mask contacts the facial skin, or at the area where the inner surface of the mask is opposite to the bridge of the nose, and the surface of the material of the original mask corresponding to this part can be made rough (this embodiment is different from the prior art in that sponge strips are simply attached to the inner surface of the mask, first, the material requirements are different; and second, the functions and uses are different. In the prior art, the sponge strips are used to fill the leaks on both sides of the bridge of the nose, and thus a long and thick sponge strip is required, which is easy to produce small leaks at the end of the sponge, makes people uncomfortable in hot weather; more importantly, the sponge material itself has a large gap, and has poor filterability to viruses, aerosols, etc. Too thick and too many sponges are equivalent to relatively large leaks). The key of the present disclosure is as follows: an area capable of truly producing the friction force for preventing the upper edge of the mask from sliding down is mainly in a small area right in front of the bridge of the nose. Therefore, the preferred embodiment is that the direct front area of the mask in contact with the bridge of the nose is processed as a rough surface, or is provided with an additional structure with large surface friction force. Areas of an inner surface of the mask opposite to the bridge of the nose and on both sides of the bridge of the nose can also

be provided with moisture-absorbing additional materials, thus preventing the fogging problem of glasses. These may also be arranged on the planar mask and other masks.

**[0142]** In addition, as N95, KF94 and other masks with an opened main body similar to a bowl-shaped container, besides forming holes and cracks, ring-shaped structures may be fixed to both sides of the upper edge of the mask as auxiliary fixing points, and the extended mask strap passes through the auxiliary fixing points.

**[0143]** The structure adopted by the method provided by that present disclosure is that there are two forces on both left and right sides of the bridge of the nose at the upper edge of the mask: a component force for pulling the mask cloth outwards from the nose bridge, and a force for pushing the mask cloth inwards from an outer edge (the auxiliary fixing point), which are act on the mask cloth between the two forces better to fill large concave holes on both sides of the bridge of the nose. In the mask with the nose bridge strip, these two forces will always promote the nose bridge strip and the mask cloth on both sides of the bridge of the nose to bend into an arc like the large concave hole during wearing, so as to keep fit with the face. But if the mask is not provided with the nose bridge strip, there is no need to pinch the nose bridge strip, and a certain automation is achieved.

**[0144]** Many embodiments of the present disclosure can be used for the mask with the nose bridge strip. However, when various similar embodiments are applied to an ultra-thin mask, there may be an arch at a position of the upper edge of the mask without the nose bridge strip under the action of the mask strap, leading to the leakage. Therefore, a new structure of extending the nose bridge strip to the auxiliary fixing point is adopted.

**[0145]** Alternatively, in many embodiments, a nose bridge strip made of a U-shaped elastic material can be adopted, a circular arc in the middle of the U-shaped nose bridge strip is placed over the bridge of the nose of the human, and there is elasticity on both sides of the U shape to press the leak holes on both sides of the bridge of the nose, thus overcoming the problem of leaks caused by a situation that the plastic nose bridge strip cannot fit the displaced position after the mask moves when people speak.

**[0146]** Alternatively, an inner surface of the mask is provided with a bag-like structure, an opening of the bag faces the mouth-nose area, and the opening is in an open state. A bag wall with simple type or the bag-like structure is also provided with a moisture absorbent storage area, and/or a metal filament line is connected into the bag. The bag with the bag-like structure is filled with various functional substances and effective ingredients as required, such as drugs, and plant extracts.

**[0147]** Finally, the implementation responding to the method provided by the present disclosure is as follows:

**[0148]** That is, the effect at different sites will still be different, and there is a problem of optimal fixing point, which also involves the core method of the present disclosure, and is also the problem of site fixing point or fixing point area mentioned throughout the present disclosure, whether the earliest found fixing point for glue paste or the fixing point for elastomer and fixing belt found later; for or example, the two fixing points at the upper portion of the mask should be moved downwards. In the actual test, it is also found that if the two fixing points at the upper portion of the mask are too close to the upper edge of the mask and located above the original position for fixing the nose bridge strip of the mask, there are small leaks between the upper edge of the mask and the human face. But if the fixing points are moved downwards and are located below the original position for fixing the nose bridge strip of the mask, there will be no small crack. The fixing point is located below the auxiliary fixing point on the side edge. In this embodiment, similar to FIG. 9, two sections of mask straps at the upper portion of the mask are not in a straight line, but is in the shape that the middle fixing point is low, and the auxiliary fixing points at both sides are high. Moreover, in this embodiment, the mask trap is inclined, the auxiliary fix point moves along the direction of the mask strap, and the mask cloth is pushed to the mouth-nose area in the middle of the mask, automatically achieved: the periphery of the mask fits the face more, and the leaks is smaller. This problem exists in both cases with and without nose bridge strip.

**[0149]** According to the principle of the present disclosure, the structure of the present disclosure can be applied not only to existing masks, but also to novel masks, masks made of new materials, and masks with new structures.

**[0150]** In the preferred embodiments of the present disclosure, a device capable of manufacturing the following embodiments or similar embodiments are provided.

**[0151]** The mask machine gripper is also called a manipulator, including a manipulator with a pulling structure or a manipulator with multiple chucks, which is used to clamp a section of straight mask strap to the mask surface. Generally, the manipulator (mask machine gripper) with left and right separated is that a left sheet and a right sheet are connected to a driving mechanism of a mask machine to form a gripper. The driving mechanism drives the manipulator (mask machine gripper). When the left sheet and the right sheet are closed, the chuck clamps the mask strap. When the driving mechanism drives the left and right sheets to be separated from each other by a certain distance, the mask strap is released.

**[0152]** As shown in FIG. 12, a manipulator (mask machine gripper) 105 with the pulling structure is that a support sheet 108 is arranged at a tail portion of a mask strap clamping manipulator, as shown in FIG. 12, or a support sheet 113 shown in FIG. 13. After a chuck 107 of the manipulator clamps the mask strap, in the process of transferring the mask strap onto the mask, the support sheet 108 at the tail portion supports the middle section of the mask strap. By setting the position and shape of the support sheet, a tail portion of the support sheet is provided with a notch, the middle

section of the mask strap falls into the notch, and the mask strap is pulled to a required position by a movement trajectory of the notch of the support sheet during the rotation of the manipulator, such as pulling into a crack at the edge of the mask. A fixed section 106 of the manipulator (mask machine gripper) 105 is fixed to the mask machine.

**[0153]** Alternatively, as shown in FIG. 11, the manipulator (mask machine gripper) 101 with multiple chucks is that multiple chucks for clamping the mask strap are arranged on the mask strap clamping manipulator at intervals, such as a chuck 103 and a chuck 104 shown in FIG. 11, a chuck 107 shown in FIG. 12, and a chuck 111 and a chuck 112 shown in FIG. 13. After the chuck of the manipulator clamps the mask strap, the mask strap clamped by the chuck keeps straight, and after the manipulator rotates to the mask, several sections of straight mask straps are clamped to the surface of the mask. A fixed section 102 of the manipulator (mask machine gripper) 101 is fixed to the mask machine.

**[0154]** Alternatively, as shown in FIG. 13, a manipulator (mask machine gripper) 109 which is also called a manipulator is that a support sheet 113 is arranged at a tail portion of the mask strap clamping manipulator, the chuck 111 and the chuck 112 of the manipulator clamp the mask strap, in the process of transferring the mask strap onto the mask, the support sheet 113 at the tail portion supports the middle section of the mask strap. By setting the position and shape of the support sheet, a tail portion of the support sheet is provided with a notch, the middle section of the mask strap falls into the notch, and the mask strap is pulled to a required position by a movement trajectory of the notch of the support sheet during the rotation of the manipulator, such as pulling into a crack at the edge of the mask. A fixed section 110 of the manipulator (mask machine gripper) 109 is fixed to the mask machine.

**[0155]** Then, the mask strap is connected to the mask. In order to facilitate the welding of a welding device, the clamping manipulator can be kept upright or inclined at an angle.

**[0156]** Another embodiment of a novel mask manufacturing device is as follows, the mask manufacturing device is provided with a simultaneous-rotating manipulator mechanism, the simultaneous-rotating manipulator mechanism is provided with a simultaneous-rotating manipulator, and the simultaneous-rotating manipulator is provided with a chuck, and a guiding fixing structure, or the simultaneous-rotating manipulator is provided with more than two chucks.

**[0157]** The simultaneous-rotating manipulator is also called a mask machine gripper. The mask machine gripper includes a mask machine gripper body, which is provided with a fixed section, a chuck, and a guiding fixing structure, and the mask machine gripper is connected to the mask machine through the fixed section. The guiding fixing structure is a chuck, or a support sheet, or a chuck and a support sheet.

**[0158]** As shown in FIG. 14, the manipulator, the chuck 115 and chuck 117 at the front and rear ends of the manipulator, i.e., the mask machine gripper 118, can play the role of fixing the mask strap, and the chuck 116 in the middle of the manipulator inclines to a side edge, thus playing a role of clamping and fixing a short material. The fixed section 114 plays a role of connection. When the new mask manufacturing device works, the simultaneous-rotating manipulator is rotated by the simultaneous-rotating manipulator mechanism to the mask strap, the chucks at front and rear ends of the manipulator are used to clamp the mask strap, the chuck in the middle of the manipulator is used to clamp the short material, and the simultaneous-rotating manipulator is rotated to a position above the mask, and the mask strap and the short material are welded to the mask by a welding head, and sliding fixing points on the mask shown in FIG. 15 are processed. The chuck 116 for clamping and fixing the short material may not be located between other chucks, while the chuck 115 is located between the chuck 116 and the chuck 117, and on the same simultaneous-rotating manipulator mechanism, FIG. 14 is a case where one sliding fixing point is processed, and a processing device capable of fixing multiple sliding fixing points is provided, for example, there are multiple chucks for fixing the short material.

**[0159]** In additional embodiments, the mask manufacturing device is provided with a simultaneous-rotating manipulator mechanism, and the simultaneous-rotating manipulator mechanism is that the same rotating mechanism is provided with at least two manipulators. Meanwhile, the simultaneous-rotating manipulator mechanism may also be provided with a manipulator capable of moving or rotating relative to the simultaneous-rotating manipulator mechanism.

**[0160]** Further, the manipulator can keep inclined with the horizontal plane, which can prevent the collision with a descending welding head and help the welding head move downwards in advance.

**[0161]** Preferably, the short material is not perpendicular to the long mask strap. With the left upper corner of the mask as an example, the short material rotates clockwise at an angle greater than 0 and less than 90 degrees, and the short material is inclined at a small angle, which is beneficial to the mechanical action of the mask strap, i.e., the action of the force on the sliding fixing point.

**[0162]** Whether the same manipulator is used or not, the manipulator must be on the same rotating part and rotate to the mask side at the same time. Therefore, many problems can be solved, for example, rotating together can prevent from motion interference with the lifting welding head, and the manipulator and the welding head can be evacuated together a little earlier.

**[0163]** This embodiment brings at least two technical effects. First, the problem of fixing the mask strap with a sliding structure during high-speed production is solved, especially the situation that the left and right sides of the upper portion of the mask do not employ the same mask strap, but employ the own respective mask straps, which is more capable of high-speed production. 2. For the welding, an ultrasound device can be shared by these welding, which greatly reduces the cost and simplifies the machine.

**[0164]** The other parts of the mask strap are fixed or transported by pulling and positioning by the support sheet or by using multiple chucks. The fixation and transportation occur in the original process of grasping movement and moving and fixing, such that the production is more energy-saving and emission-reducing, and the produced mask has more functions. For example, the mask strap can be fixed to the fixing point on the bridge of the nose of the mask, an auxiliary fixing point can be provided on the edge of the mask, and various mask straps can be fixed to the mask.

**[0165]** The principle is that, by taking fixation of the mask strap of the planar mask as an example, on the production line, an upper manipulator and a lower manipulator (mask machine gripper) are arranged on the left and right sides of the mask body. The upper manipulator clamps the mask strap to be welded to the fixing point at the upper portion of the mask body, and the lower manipulator clamps the mask strap to be fixed to the fixing point at the lower portion of the mask body. The upper and lower manipulators (mask machine grippers) hold both ends of a section of strap and rotate in opposite directions, and thus the middle section of the rope can be pulled. As long as the tensioning can be achieved, this pulling may also be used in the case of only one clamp, and can also be used to fix other components.

**[0166]** Then, the mask strap is connected to the mask. In order to facilitate the welding of the welding device, the clamping manipulator can be kept upright or inclined at an angle.

**[0167]** A novel mask manufacturing method includes the following steps: a tableting link, and a link for fixing a mask strap. In the tableting link, if no nose bridge strip is required in the production, the production device and production process for fixing the nose bridge strip can be omitted; or the device and production process for the conventional nose bridge strips or nose bridge strips with new structures are retained. In the link of fixing the mask strap, according to the determined positions of the mask strap fixing points, various small devices are arranged on the production device. If a long mask strap is required, the link of fixing the mask strap includes the following links: cutting the long mask strap, fixing the long mask strap to the mask, providing an auxiliary fixing point on the edge of the mask, and fixing the long mask strap to the auxiliary fixing point. The method may also include the steps of fixing the mask strap and the mask body in sliding connection.

**[0168]** The fixing of the mask strap is achieved using a device for fixing the mask strap. The device for fixing the mask strap mainly includes a conveying device, a clamping manipulator device, a cutting device, and a welding device. The manipulator for clamping the mask strap at the upper end of the mask is changed to be long enough to clamp one end of the cut mask strap and then transfer the mask strap to the mask body. The welding machine welds this end of the mask strap to the mask body. There is also the processing of the auxiliary fixing point of the mask edge: a section of short material is placed on the mask strap at each of the left and right side of the mask by the manipulator, and the short material can be made into a U shape, and the welding machine welds both ends of this section of short material to the mask body, and thus the mask body and the short material together form a ring and are sleeved on the mask strap as an auxiliary fixing point of the mask strap. Nailing may be adopted, there are various types of nails, gaps are left for the mask strap, and thus the mask strap can move forward and backward, and thus be nailed to the mask surface to form the gap with the mask surface.

**[0169]** Alternatively, the mask strap is fixed by a manipulator with a pulling structure or a manipulator with multiple chucks.

**[0170]** The manipulator with the pulling structure is that the tail portion of the mask strap clamping manipulator is provided with a support sheet; after the chuck of the manipulator clamps the mask strap, the support sheet at the tail portion supports the middle section of the mask strap in the process of transferring the mask strap to the mask, and the section of the mask strap at the manipulator is tensioned into a straight line. After the manipulator rotates to the mask, a section of straight mask strap is clamped onto the surface of the mask. By providing the position and shape of the tensioning support sheet, during the rotation of the manipulator, the mask strap is pulled downwards into the crack on the edge of the mask, and then the cracks on both sides are repaired, leaving holes for accommodating the mask strap. Alternatively, the multi-chuck manipulator is a mask strap clamping manipulator, which is provided with multiple chucks for clamping the mask strap, and after the manipulator rotates on the position above the mask, multiple sections of straight mask straps are clamped onto the surface of the mask, then the places needing to be welded are welded by a welding machine.

**[0171]** Then, the mask strap is connected to the mask. In order to facilitate the welding of the welding device, the clamping manipulator can be kept upright or inclined at an angle.

**[0172]** Alternatively, fixing the mask strap is as follows: the device for fixing the mask strap mainly includes a mask body conveying device, a clamping manipulator device, a cutting device, and a welding device. By adopting a puncture processing method, the manipulator that clamps the mask strap at the upper portion of the mask is changed into a slender one, and after clamping one end of the cut mask strap, the manipulator rotates to the mask body, and a crack or hole is formed in the edge of the mask body as an auxiliary fixing point of the mask strap, and the manipulator clamps one end of the cut mask strap to pass through the crack or hole. This end of the mask strap is fed to a position close to the middle line and the upper edge of the mask body, and then is welded to the mask body by the welding machine. Finally, the manipulator passes through the crack to return to the original position.

**[0173]** Alternatively, the method for fixing the mask strap is as follows: a whole strip of mask strap that is cut well is

directly fixed by the manipulator and moved to the upper side of the mask body, and positioned, and then the places to be welded are welded by the welding machine, and auxiliary fixing points are processed along the edge of the mask.

**[0174]** Alternatively, the fixing of the mask strap is as follows: during tableting, i.e., when processing the mask body, at an original rolling device, a fixture and a fixing structure are provided to convey a whole cut mask strap to the process of rolling welding several layers of filter materials. When pressing the upper edge of the mask, the cutting device is provided to cut off a section of short material protrusion from a flanged material at the middle line and both side edges of the mask, and then three sections of short materials are pressed against the mask strap in a straddling manner, and then both ends of these three sections of short materials are welded to the mask body. The mask body and the three sections of short materials are combined to form three rings sleeved on the mask strap. Both ends of the mask strap are fixed to the lower portions of both side edges of the mask body, and more than three segments of short materials can be adopted when necessary.

**[0175]** Alternatively, the fixing of the mask strap is the fixing of a mechanical mask strap, which is as follows: a whole cut mask strap is directly fed to above the upper edge of the mask body by the manipulator, and the cut short materials is placed on the mask strap in a straddling manner, and both ends of the short material are rolled and fixed to the upper edge of the mask by welding or roller pressure welding. The material of the mask body and the short material are integrated together to form a ring, which is sleeved on the mask strap. Finally, the both ends of the mask strap are fixed to the lower portions of two side edges of the mask body.

**[0176]** Alternatively, the fixing of the mask strap is as follows: a sliding connection portion of the mask strap and the mask body is that: the cloth to be flanged at the edge of the mask is cut into holes or grooves with corresponding shapes, the flanged cloth covers the mask strap fixed by the manipulator, and then the flanged cloth is welded to the mask. Alternatively, the manipulator directly straddles the mask component on the mask strap, and both ends of the mask part straddling the mask strap are fixed to the mask. Alternatively, cracks or holes are formed in the edge of the mask at intervals, and the manipulator enables the mask strap to pass through the cracks or holes in turn.

**[0177]** Alternatively, an auxiliary fixing point is arranged for fixing the mask strap, and the crack is formed in the edge of the mask by a tool, and the crack extend inwards from the edge of the mask to the middle line of the mask and the width of the cracks at different positions is unchanged or changed. The mask strap is pulled into the crack from the edge of the mask by the manipulator, and then the crack at the edge of the mask is welded, repaired, or adhered; or both sides of the crack opening are connected by nailing, stuck, or the two sides of the crack opening at the edge of the mask are connected by nails. Alternatively, a mask edge covering device is provided to covering the crack opening at the edge of the mask. Alternatively, the edges of the mask are placed on arc platforms where the materials on both sides of the crack at the edge of the mask are overlapped and then welded. Alternatively, the small materials on both sides of the cracks on the edge of the mask are pushed to move to the large materials, such that the materials on both sides of the cracks overlap, and then weld. Alternatively, a small material of the materials on both sides of the crack at the edge of the mask is pushed to a big material, and thus the materials on both sides of the crack are overlapped and then welded. Alternatively, an auxiliary fixing point is added, a crack is formed in the edge of the mask body, and the crack becomes a hole if being opened continuously into the mask body, partial periphery of the hole is kept from cutting, and is partially connected to a material in the cut hole. The mask strap fixing mechanism or guiding mechanism is used to pull the mask strap from the edge of the mask into the crack, and then into the hole. The material in the hole is pushed by the mask strap to move along the edge of the mask body, the material is stacked on the crack, and at this time, the crack is welded using this material.

**[0178]** Alternatively, a head-mounted mask includes an upper long mask strap and a lower long mask strap. Both ends of each mask strap are fixed to left and right-side edges of the mask, and the long mask strap can be clamped and fed by the manipulator.

**[0179]** If the mask strap and mask body are connected by other means such as pasting, nailing, riveting and sewing instead of welding, the welding machine is correspondingly replaced with other devices accordingly.

**[0180]** The position or shape of each small device is slightly adjusted. This device is also suitable for N95 masks (three-dimensional masks) and other masks with main bodies opened similar to bowl-shaped containers, leaf-shaped masks (KF94 masks), fish-shaped masks, duckbilled masks and so on. Generally, the tableting link of the N95 mask also includes the subsequent folding, welding, cutting and forming process, and the tableting device also includes folding, welding, cutting and other devices.

**[0181]** The forming of hole or crack can also be done together in the tableting link, such that a structure of forming the hole or crack is added in the rolling conveying process. Alternatively, a tool for forming the hole or crack in the mask body is simultaneously arranged on a press roller for cutting two adjacent mask bodies.

Use and evaluation

**[0182]** The mask provided by the present disclosure has just been introduced, but no one who has used the mask has denied its functional effect, including drivers of the top ten taxi companies and the medical staff of several 3A hospitals

in Guangdong Province, all have records to check,, and the hospitals include Guangdong Provincial Hospital of Traditional Chinese Medicine, the Fifth Affiliated Hospital of Guangzhou Medical University, Cancer Center of Guangzhou Medical University, and the Second Affiliated Hospital of Shantou University. The use opinions given by many doctors in each hospital are affirmative: the idea is particular good, and the mask can play a role of protection as an ordinary mask; the bridge of the nose place can be automatically tightened, and there is no need to pinch the nose bridge strip.

**[0183]** Listed below are some representatives.

| Taxi company | License plate number | Whether the mask is a disposable mask without nose bridge strip or not | Whether the tightness and protection of the mask is improved or not | Whether the mask is comfortable than other masks or not | Whether there is no need to pinch the bridge of the nose and the leak can be eliminated automatically |
|---|---|---|---|---|---|
| Guangjun | YUE AD44284 | Yes | Yes | Yes | Yes |
| Guangdong Guolv | YUE ADC8953 | Yes | Yes | Yes | Yes |
| Deshan | YUE ADZ5289 | Yes | Yes | Yes | Yes |
| Fanyun | YUE ADL7950 | Yes | Yes | Yes | Yes |
| Baiyun | YUE ADM6092 | Yes | Yes | Yes | Yes |
| Guangzhou Traffic group | YUE ADN5596 | Yes | Yes | Yes | Yes |
| Suigang | YUE A7A4F0 | Yes | Yes | Yes | Yes |
| Xianfu | YUE ADF5423 | Yes | Yes | Yes | Yes |
| Mingtong | YUE ADD3362 | Yes | Yes | Yes | Yes |
| Longde | YUE A8W2E1 | Yes | Yes | Yes | Yes |

**[0184]** The above includes a variety of large-scale embodiments and a variety of small-scale embodiments, and the technical features of the above-mentioned embodiments can be arbitrarily combined. In order to make the description concise, not all possible combinations of the technical features in the above embodiments are described. However, it should be considered that these combinations of technical features fall within the scope recorded in this specification provided that these combinations of technical features do not have any conflict.

**[0185]** The foregoing embodiments only describe several implementations of the present disclosure, and their description is specific and detailed, but cannot therefore be understood as a limitation to the patent scope of the present disclosure. It should be noted that for those of ordinary skill in the art, several deformations and improvements can be made without departing from the concept of the present disclosure, all of which fall within the scope of protection of the present disclosure.

## Claims

1. A mask having an LV structure, wherein a V-shaped structure is fixed to an upper portion of a mask body, that is, a half of the V-shaped structure is provided at the upper portion of each edge of the mask body, the V-shaped structure is arranged downwards from a corner of each edge and towards left and right middle lines of the mask, and the left and right corners of the upper portion of the mask are slidably connected to the V-shaped structure; left and right end portions of the V-shaped structure at two corners of the mask are able to be extended and fixed

to the face or head of a person, or fixed to the face or head of a person by means of a connecting component.

2. A mask having an LV structure, wherein a V-shaped structure on a mask body is replaced with an inverted V-shaped structure, and the inverted V-shaped structure is fixed to an upper portion of a mask body;

or a bent, deformed or incomplete V-shaped structure is fixed to the upper portion of the mask body, a half of the V shape is provided at the upper portion of each edge of the mask body, the V shape is arranged upwards from a corner of each edge and towards left and right middle lines of the mask, and the left and right corners of the upper portion of the mask are slidably connected to the V shape;
left and right end portions of the V shape at two corners of the mask are able to be extended and fixed to the face or head of a person, or fixed to the face or head of a person by means of a connecting component.

3. The mask having an LV structure according to claim 1 or 2, wherein the V-shaped structure is formed by a mask strap, and the whole mask is only composed of two components, namely, a mask body and the mask strap, and the mask strap with the V-shaped structure is extended to be used as an ear loop, or a mask strap placed over the head; and/or
the V-shaped structure on the mask body is replaced with a trifurcate structure, or an X-shaped structure.

4. A mask having an LV structure, wherein a leak-proof design of a mask is that at least one end of any mask strap of the mask is not fixed to an existing fixing point of an original mask, but is fixed to a new position as a fixing point after being moved towards the middle of the mask or a bridge of the nose in the abscissa and/or ordinate, an auxiliary fixing point is provided at an area at the edge of the mask after the fixing point is moved, and the auxiliary fixing point is in sliding connection, and for a medical mask or a particle particulate respirator, two fixing points at an upper portion of the mask are moved to an area of the mask corresponding to the bridge of the nose; or
the fixing points are fixed after being moved to an area position obtained by measuring the movement of fixing points of masks put on many people; for side edge leakage, two fixing points at a lower portion a planar mask are moved upwards by 5-20 mm; or two fixing points at a lower portion of the mask are moved upwards by 0.5-2.5 cm, and two fixing points at a lower portion of a mask for children are moved upwards by 0.5-3 cm; for upper edge leakage, two fixing points at an upper portion of the planar mask are moved downwards and towards the middle by 0.5-3 cm, and two fixing points at an upper portion of the mask for children are moved by 0.5-2 cm; or for upper edge leakage, two fixing points at an upper portion of a N95 mask are vertically moved upwards to positions which are 1-4 cm away from the uppermost edge of the mask simultaneously, and the two fixing points at the upper portion of the mask for children are vertically moved upwards to positions which are 1-3 cm away from the uppermost edge of the mask simultaneously; and meanwhile, an edge of the mask is pressed by means of the mask strap.

5. The mask having an LV structure according to claim 1, 2 or 4, wherein the mask body is provided with a nose bridge strip; or the mask body is provided with a nose bridge strip, and the two fixing points at the upper portion of the mask are fixed to an area of the upper side of the mask outside an area corresponding to the bridge of the nose.

6. The mask having an LV structure according to claim 1, 2, or 4, wherein for a three-dimensional mask, more protruding mask cloth is left than an existing mask when mask cloth is cut at left and right upper corners or at four corners, or more protruding mask cloth is left than the existing mask when an upper edge of the mask is cut, and two sliding fixing points at the upper portion of the mask are moved upwards; and/or

the mask cloth is added at a nose of bridge area of the mask; and/or
the cloth at the bridge of the nose area of the mask is softened by reducing the pressure-welded pattern; and/or transverse welding lines are produced on the mask cloth at an area between the bridge of the nose and the mouth by transverse pressure welding, and the transverse welding lines are connected to mask strap fixing points or auxiliary fixing points at left and right edges of the mask.

7. The mask having an LV structure according to claim 1, 2 or 4, wherein for the three-dimensional mask, an included angle at the nose of bridge area of the mask expands outwards and becomes larger; and/or

the upper edge of the mask is originally a straight line, and is made into an arc to protrude; and/or
the upper edge of the mask is lengthened by a section.

8. The mask having an LV structure according to claim 1, 2 or 4, wherein the auxiliary fixing points are as follows: the auxiliary fixing points are arranged at positions corresponding to an average face breadth of corresponding wearers;

starting from the auxiliary fixing point, the mask strap goes from the mask to the back an ear or head of a person; the auxiliary fixing points are arranged within the range of plus or minus 5 mm at positions of corresponding face breadths of left and right sides of the face; or a structure for increasing a force for pushing the mask cloth by the mask strap is arranged at the auxiliary fixing point; or a structure for increasing a friction force between the mask strap and the auxiliary fixing point is arranged at the auxiliary fixing point; or holes or cracks are formed in left and right side edges of the upper edge of the mask body, and the holes or cracks are formed in positions, corresponding to the face breadth of the wearer, on the mask body; or the auxiliary fixing points are arranged within the range of plus or minus 5 mm at positions of corresponding face breadths of left and right sides of the face; the cracks are formed in the left and right side edges of the upper edge of the mask body, each crack extends from the side edge to a middle line of the mask and does not completely penetrate through the mask body, and the wearer is able to tear the crack towards the middle line of the mask to penetrate through the mask body according to the face breadth of the wearer; each hole or crack is able to be replaced with a ring, and a structure equivalent to the ring is arranged at a position, close to the upper edge, of each of the two side edges of the upper edge of the mask, and the mask strap penetrates through the ring; or a structure capable of reducing or avoiding a situation that the filling of leaks by the cloth of the mask body under the pushing of the mask strap is affected is adopted at the auxiliary fixing point, and the mask strap is connected to the auxiliary fixing point; left and right sides of the upper edge of the mask body are provided with grooves with adjustable lengths; an outer surface of the mask at the periphery of the hole or crack of the auxiliary fixing point is provided with a surface material for promoting the mask strap to make unidirectional movement; or during production, a semi-sliding and semi-fixed through crack is directly pressed on each of the left and right side edges of the upper edge of the mask, that is, the crack is tiny and only for a fixing band; and
the mask strap passes through the hole, the crack, or the ring.

**9.** The mask having an LV structure according to claim 1, 2, or 4, wherein one end of a section of fixing band is fixed to the middle of a side edge of the mask body, and the other end of the section of fixing band is fixed to an original fixing band placed around the ear of the mask; or in the original mask, a mask body is tied to the head by upper and lower fixing bands, and a fixing band is added between the original upper and lower fixing bands of the mask body; or

the mask strap is a flat fixing band and serves as a middle fixing band; the middle fixing band and a fixing band fixed to a lower side of the mask are made wider so as to be connected together, that is, the middle fixing band and the fixing band fixed to the lower side of the mask form a whole piece of elastic cloth; or the middle fixing band and the fixing band at an upper side of the mask form a whole piece of elastic cloth; or
the two fixing points of the original mask fixing band at the lower portion of the mask are moved upwards by 5-25 mm; or the two fixing points at the lower portion of the mask are arranged on the mask body within a lower edge of the mask, and the lower edge of the mask is provided with a surface material capable of moving unidirectionally relative to the mask strap, that is, the lower edge of the mask is provided with a surface material which enables the mask cloth to only move downwards relative to the mask strap; or
the upper and lower fixing bands are connected to each of the left and right side edges of the mask body, and the upper and lower fixing bands are both placed around the same ear during the wearing of the mask.

**10.** The mask having an LV structure according to claim 1, 2 or 4, wherein

the fixing band is slidably connected to the edge of the mask; or
the fixing band is connected to the edge of the mask by a buckle structure, an adhesive structure, or a clamping structure, and after the mask is put on and adjusted, the fixing band and the edge of the mask are fixed; or
the auxiliary fixing point is slidably connected, the crack or hole penetrating through the mask is directly pressed on the edge of the mask, and the fixing band passes through the crack or hole; or
the mask is provided with two or four auxiliary fixing points, and the fixing bands is connected to the mask through the fixing points, respectively; or a branch is connected to the fixing band to connect the auxiliary fixing point on the mask; or
the left and right side edges of the upper edge of the mask correspond to positions of the face breadth, or the auxiliary fixing point is provided within the face breadth; or
the mask strap is slidably connected to the edge of the mask, that is, a fixing hole or a ring-shaped structure is made into an oval or groove shape, or the fixing hole or the ring-shaped structure is made into an oval or groove shape, and a fixing structure is fixed and locked on the fixing band, the fixing hole or the ring-shaped structure.

**11.** The mask having an LV structure according to any one of claims 1, 2 and 4, wherein the mask is shaped to be beneficial to the bridge of the nose; for the planar mask, the mask are folded from a left edge to a right edge along

the middle line, an inner surface of the mask is folded inside by an outer surface, and a folded sharp corner in the middle is in the same direction as a nasal tip; for a mask which is originally folded in half, when the mask is folded from the left edge to the right edge, angles and radians are left at a bending part of the nose bridge strip to form a gap between the left and right edges folded in half; or a plurality of masks are stacked together, and then the masks are folded from the left edges to the right edges along the middle lines; or for the planar mask, the mask is folded from left edge to the right edge along the middle line, then the two edges are respectively folded again, and thus when viewed from the top or bottom, the mask is folded into a W shape, and the folded sharp corner in the middle is in the same direction as the nasal tip; or the upper edge of the mask is shaped with three peaks in advance, and after the mask is put on the face, the three peaks respectively cover a left cheekbone, the bridge of the nose, and a right cheekbone, and the mask is able to be shaped in at least one of production, processing, packaging, transportation and storage links; or the mask is shaped by fixing the upper edge of the mask with an auxiliary frame with three peaks; or by adopting a memory material, the mask is shaped into a shape conducive to the bridge of the nose in advance; or
the mask cloth at the upper edge of the mask is treated to have a plurality of tiny creases or small wrinkles.

**12.** The mask having an LV structure according to any one of claims 1, 2 and 4, wherein for the planar mask, a platy object or a strip-shaped object is transversely arranged in a middle area the mask, the length of the platy object or strip-shaped object enables the platy object or strip-shaped object to be able to make contact with ends of folding wrinkles on the left and right side edges of the mask; or the platy object or the strip-shaped object is transversely arranged in a middle area the mask, the length of the platy object or strip-shaped object enables the platy object or strip-shaped object to be able to make contact with the ends of folding wrinkles on the left and right side edges of the mask or to be supported to the face; the platy object or strip-shaped object is made to have different materials or different treatment processes on the front and back, which leads to the material bending to one side at ordinary times; or the platy object or strip-shaped object is transversely fixed at an area between the bridge of the nose and the mouth of the mask; or transverse welding lines are transversely produced on the mask cloth in the middle or at an area between the bridge of the nose and the mouth of the mask by pressure welding; and the fixed platy object, strip-shaped object and the welding lines are supported to the face when the mask is worn.

**13.** The mask having an LV structure according to any one of claims 1, 2 and 4, wherein an area, in contact with a direct front portion of the bridge of the nose, of the mask is treated into a rough surface, or is provided with an additional material with a large surface friction force; and/or
the two fixing points at the lower portion of the planar mask are moved upwards by 0.5-2.5 cm, or a fixing point is added at the middle of the side edge of the mask.

**14.** The mask having an LV structure according to any one of claims 1, 2 and 4, wherein the planar mask has a couple of transverse folding wrinkles, and the uppermost folding wrinkle needs to be located outside the mask, without blocking between the rest mask cloth at the upper portion of the mask connected thereto and the face.

**15.** A device, comprising a tableting device, and a fixing device for adding a section of mask strap on a surface of a mask;

wherein a device for fixing the mask strap includes a device for cutting a long mask strap, a device for fixing the long mask strap to the mask, a device for arranging an auxiliary fixing point or a sliding fixing point on the mask, and a device for fixing the long mask strap to the auxiliary fixing point, and the devices are distributed on a mask conveying line; or
the device for fixing the mask strap comprises that: a mask manufacturing device is provided with a simultaneous-rotating manipulator mechanism, the simultaneous-rotating manipulator mechanism is provided with a simultaneous-rotating manipulator, and the simultaneous-rotating manipulator is provided with a chuck, and a guiding fixing structure, or the simultaneous-rotating manipulator is provided with more than two chucks, wherein the guiding fixing structure is a chuck, or a support sheet, or a chuck and a support sheet; or the mask manufacturing device is provided with a simultaneous-rotating manipulator mechanism, the simultaneous-rotating manipulator mechanism is provided with a simultaneous-rotating manipulator, and the simultaneous-rotating manipulator is provided with a chuck for clamping the mask strap, and is also provided with a chuck for clamping a short material; or the mask manufacturing device is provided with a simultaneous-rotating manipulator mechanism, and a simultaneous-rotating manipulator is that the same rotating mechanism is provided with at least two manipulators; or
the device includes a device for fixing the mask strap, which is that, during tableting, a manipulator is arranged at a rolling device for processing the mask body, a cutting device and a pressure welding device are arranged at a working position where an upper edge of the mask is pressed.

**16.** The device according to claim 15, wherein the device for fixing the mask strap mainly comprises a device for fixedly conveying a mask body, which is provided with a manipulator device for clamping, and a welding device; a manipulator for clamping a mask strap at an upper portion of the mask is changed into a long one, an auxiliary fixing point at an edge of the mask is processed by the following components: a manipulator and a welding device for clamping or supplying the short material at the same time are arranged at left and right side edges of the mask; or a nail driving device is provided; or

the device for fixing the mask strap is that: the device for fixedly conveying the mask body comprises a manipulator and a welding device at the same time, a manipulator for clamping the mask strap at the upper portion of the mask is changed into a slender one, and a device for fracturing a crack or hole is arranged at a position of a welding point on the upper portion of the original mask strap of the mask body; or instead of providing a tool for fracturing the crack or hole, the most front end of the manipulator is made into a sharp shape; or
the device for fixing the mask strap is that: when the mask strap is a mask rope with a whole structure, and the device for fixedly conveying the mask body is also provided with a cutting device, a manipulator for clamping the mask strap, and a welding machine.

**17.** The device according to claim 15, wherein the device for fixing the mask strap is changed into a device for machining an auxiliary fixing point, which comprises a device for fracturing a crack and/or a hole on the edge of the mask, wherein the crack internally extends from the edge of the mask towards a middle line of the mask, a mask strap fixing mechanism and guiding mechanism for pulling the mask strap into the crack from the edge of the mask, and a device for welding, repairing, sticking or nailing a crack opening on the edge of the mask, a mask edge covering device for covering the crack opening at the edge of the mask, an arc-shaped platform for bearing materials on both sides of the crack at the edge of the mask and a welding device for welding the crack opening, or a pushing mechanism for pushing a small material of the materials on both sides of the crack at the edge of the mask to a big material and a welding device for welding the crack opening.

**18.** The device according to claim 15, wherein the fixing of the mask strap is as follows:

a nailing structure is used in place of enabling the mask strap to pass through the hole or crack, a nailing structure is used in place of the auxiliary fixing point, after a nail is nailed on a mask body, the shape of the nail after nailing is that left and right nail feet form a small nail hook; or a ring-shaped structure protrudes from a side edge of the nail; or after the nail is nailed on the mask, the mask is pressed by the left and right nail feet, and a width of an unpressed portion of the mask between the two nail feet is not less than a diameter of the mask strap or a slender object that is not the mask strap nailed between the nail and the mask cloth; or
a threading and ringing machine is used for instead, a line of the threading and ringing machine is knotted into a ring at the periphery of the mask strap after passing through a material of the mask; or
a transverse line at an upper half portion of an I-shaped line is twisted with a machine to form a straight line with the upper half portion connected thereto, the straight line is inserted into the mask body and passes through the mask body, and then is twisted back, and thus the transverse line at the upper portion of the I-shaped line is stuck on the surface of the mask and cannot go back, and so is the lower portion; the middle section of the I-shaped line straddles the mask strap or the slender object that is the non-mask strap to form a ring in cooperation with the mask body; or
a ring-shaped structure is provided, and a mechanism for supplying a short material is arranged at a welding rod mechanism and is mechanically linked with a moving part of the welding rod mechanism or connected to an electric appliance; the head of a welding rod is made into an inverted U shape or two spaced rod heads, which straddle the mask strap during welding; and the short material is placed on the mask strap or the slender object that is not the mask strap, and both ends of the short material are welded to the mask body by the welding rod.

**19.** The device according to claim 15, 16, 17, or 18, further comprising the following devices: for the production of a planar mask folded in half, a fold-in-half machine is added to the conveying line; and/or

for a N95 mask with an opened main body similar to a bowl-shaped container, a cutting device is provided, through which more protruding mask cloth is left than an existing mask when mask cloth is cut at left and right upper corners or at four corners, or more protruding mask cloth is left than the existing mask when an upper edge of the mask is cut; and/or
a device for fixing a platy object or a strip-shaped object having a length equal to that of a folding wrinkle in the middle of the mask is provided; or a device for transversely producing transverse welding lines by pressure

welding on the mask cloth in the middle or at an area between the bridge of the nose and the mouth of the mask is provided, wherein the transverse welding lines are connected to mask strap fixing points or auxiliary fixing points on the left and right edges of the mask; or a device for fixing a strip-shaped object having a length equal to that of the folding wrinkle in the middle of the mask is provided, comprising a device for fixing the strip-shaped object into an interlayer of the mask, and a gap is arranged in the pattern on a welding roller or a welding plate rod for welding a press-fitting position of the side edge of the mask; and/or

a device for shaping the upper edge of the mask into a shape with three peaks is provided; and/or a device for bending or kneading the upper edge of the mask to make small wrinkles is provided; and/or

a device for conveying an additional surface with rough surface and a fixing device for fixing the additional material to the mask are arranged beside a conveying device; or a machine for scraping and grinding an inner surface of the mask is arranged beside the conveying device; and/or

a device for arranging the additional material with large surface friction force in an area of the mask which is right in front of and makes contact with the bridge of the nose is provided with a manipulator for fixing the material with large friction force to a place, in contact with the bridge of the nose, of the inner surface of the mask; or comprises a cutting component, a manipulator or mechanism, and a press-fitting component, wherein the cutting component is used to cut out the outermost material at an end, close to the bridge of the nose, of the mask, the manipulator or mechanism is used to flange the extra outermost material to cover the innermost material, and the press-fitting component is used to fix the extra outermost material to the innermost material at the bridge of the nose by press fitting.

**20.** The device according to claim 15, 16, 17, or 18, wherein trays for carrying the mask body are fixed to left and right chains or belts of the conveying device, each tray is made into left and right halves, with a space left in the middle, and a welding machine is arranged in a space left in the middle of the conveying device; and/or

the manipulator for clamping the mask strap is provided with a latch hook for hooking the mask strap; and/or

at the fixing point, the mask strap and the mask body are connected by a non-welding way instead of welding, and the welding machine is correspondingly replaced with a non-welding connecting device; and/or

when the hole or crack is formed in a tableting link, a mechanism for forming the hole or crack is added in the tableting device; or a tool for forming the hole or crack in the mask body is simultaneously arranged on a press roller for cutting off two adjacent mask bodies; and/or

the tray for carrying the mask body on the conveying device is provided with a clamp for fixing the mask body on the tray, and the clamp employs an electric structure or a mechanical structure; and/or

a manipulator with a pulling structure is that a tail portion of a mask strap clamping manipulator is provided with a support sheet; or a manipulator with a plurality of chucks is that a plurality of chucks for clamping the mask strap are arranged on the mask strap clamping manipulator at intervals; and/or

a press for pressing the mask and/or a bracket for pulling the mask strap into the crack at the edge is fixed at a welding rod moving up and down of the welding device; or the press for pressing the mask and the bracket for pulling the mask strap into the crack at the edge are separately arranged together; and/or

during the use of the mask, an area of the mask corresponding to lips is not provided with the folding wrinkles of the mask, while an area outside the area of the mask corresponding to the lips is provided with the folding wrinkles; or during the use of the mask, an area of the mask corresponding to an upper lip is not provided with the folding wrinkles of the mask, and an area outside the area of the mask corresponding to the upper lip is provided with the folding wrinkles; or the original folding wrinkles remain unchanged, and an existing planar mask is rotated by 180 degrees along a plane, with a lower portion as an upper portion and an upper portion as a lower portion;

for the planar mask, the mask is folded from a left edge to a right edge of along a middle line, and the inner surface of the mask is folded inside by the outer surface; and/or

a platy object or a strip-shaped object is transversely arranged in a middle area of the mask, or transverse welding lines are transversely produced by pressure welding, the welding lines, the platy object or the strip-shaped object has the same length as the folding wrinkles; and after the mask is put on the face, both end portions of the welding lines, the platy object or the strip-shaped object are supported to the face.

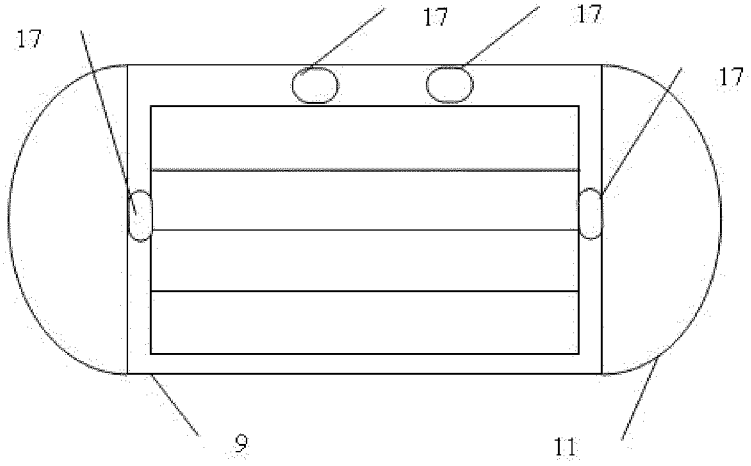


FIG. 1

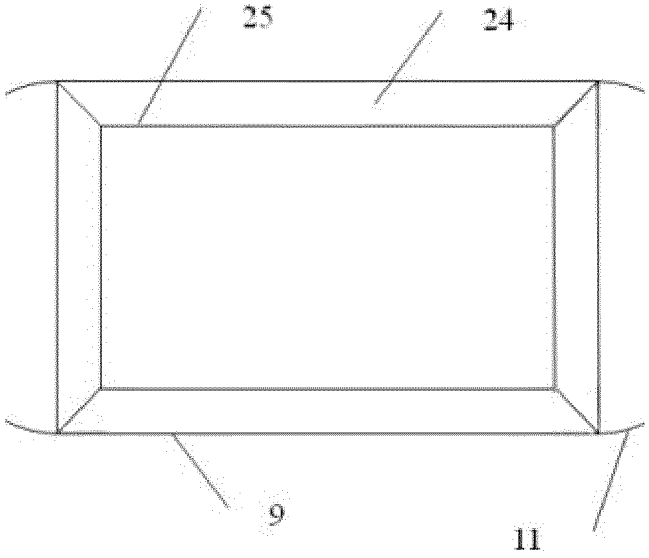


FIG. 2

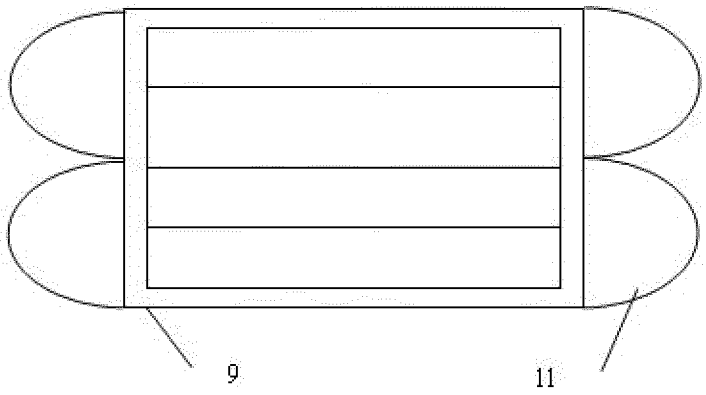


FIG. 3

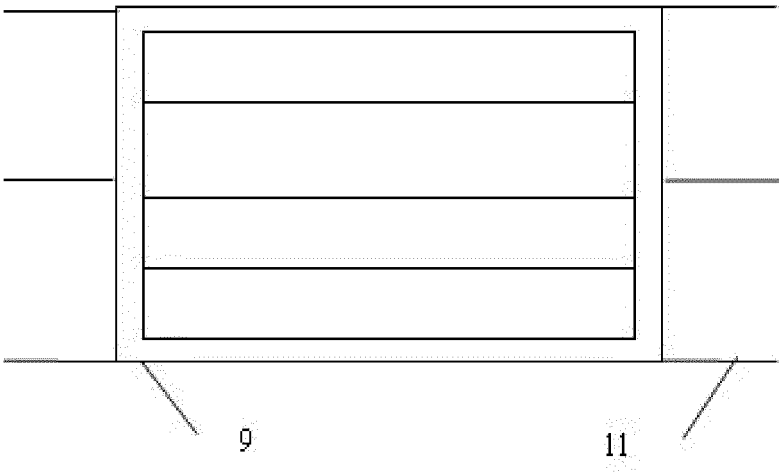


FIG. 4

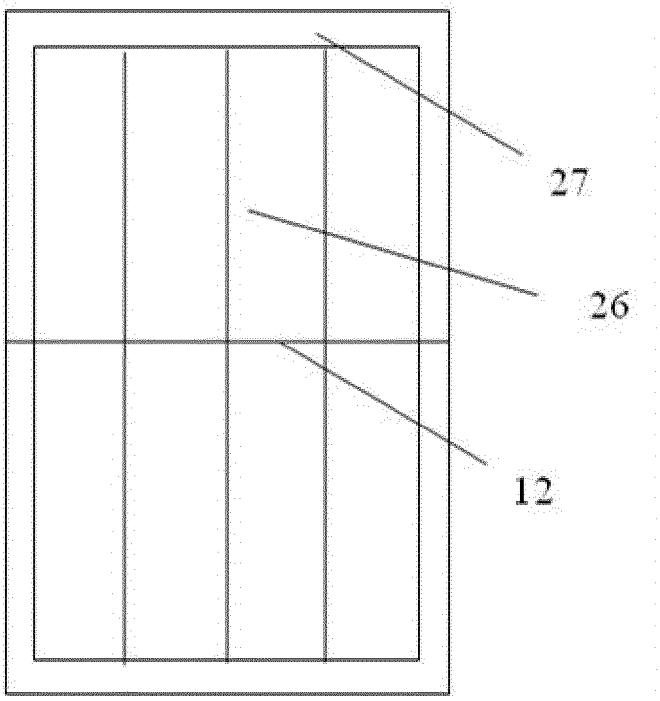


FIG. 5

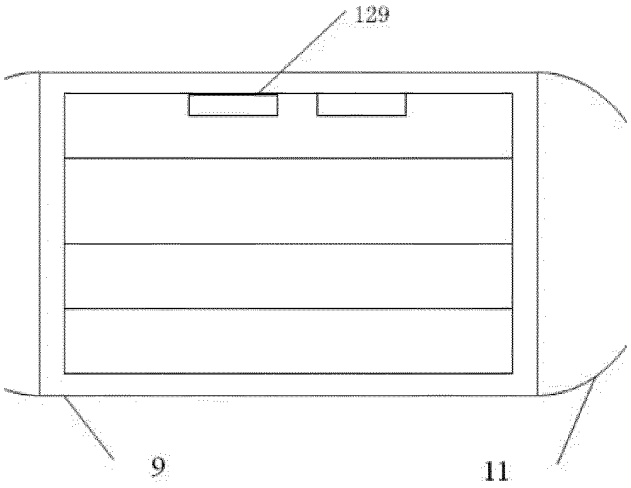


FIG. 6

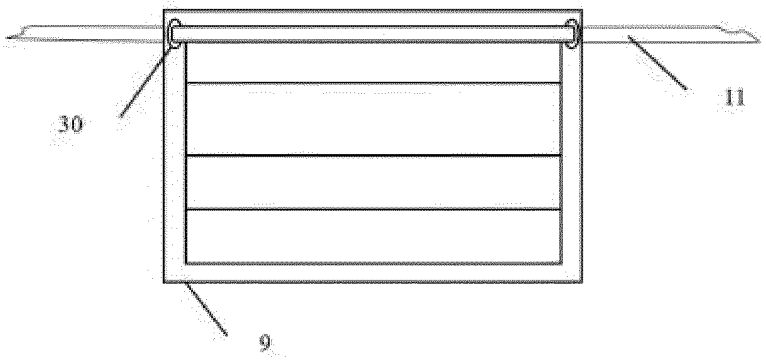


FIG. 7

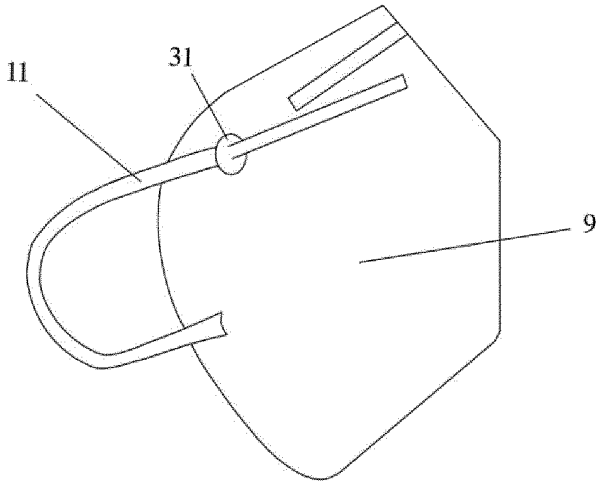


FIG. 8

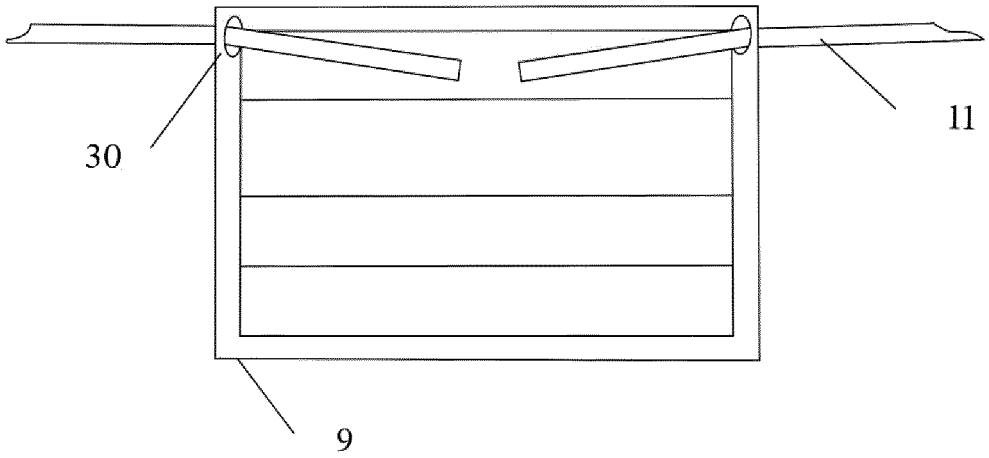


FIG. 9

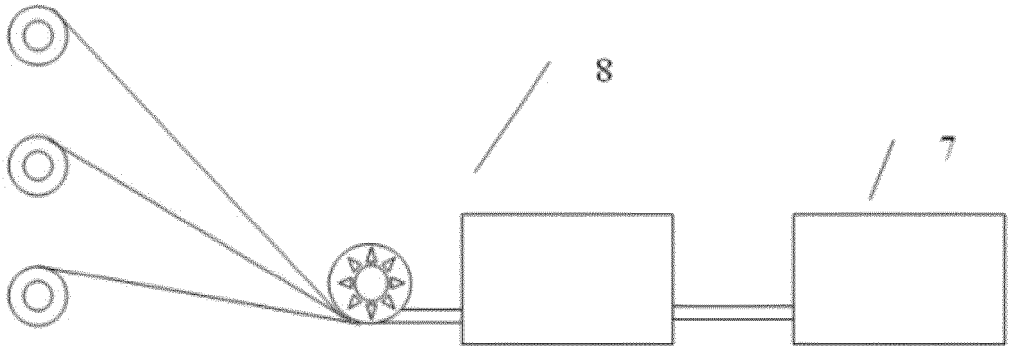


FIG. 10

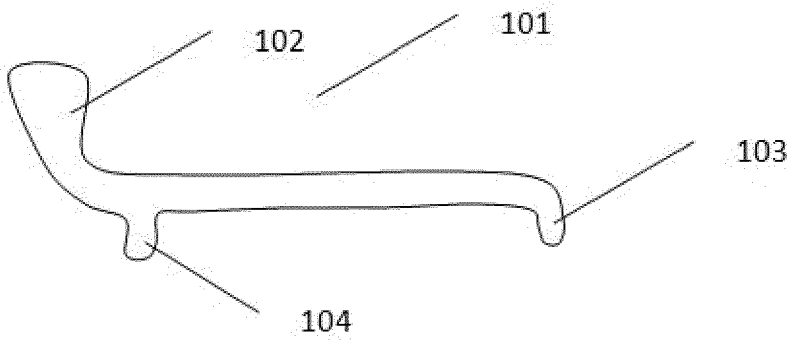


FIG. 11

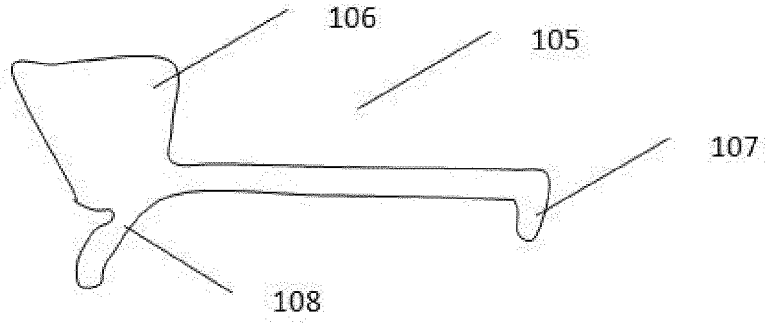


FIG. 12

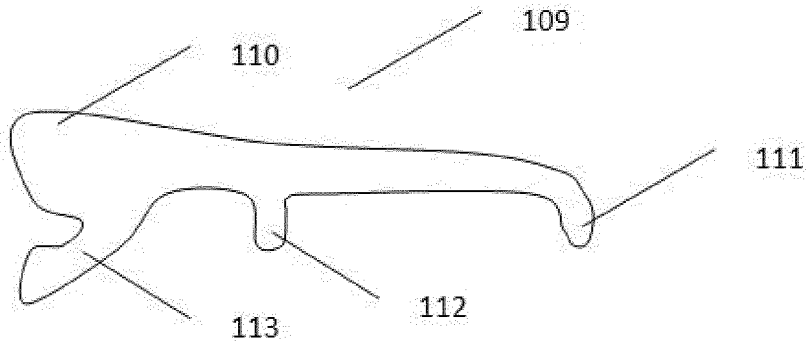


FIG. 13

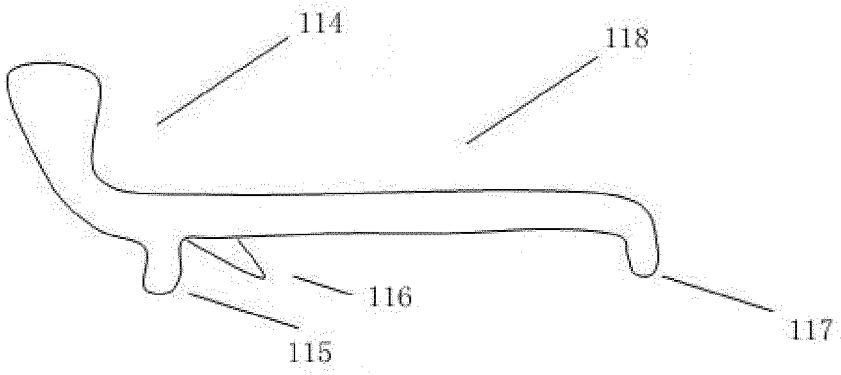


FIG. 14

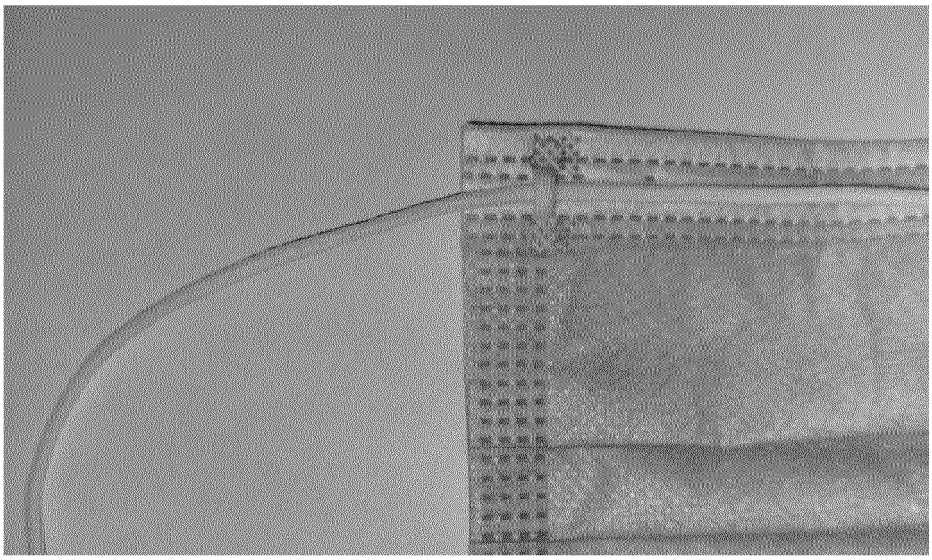

FIG. 15

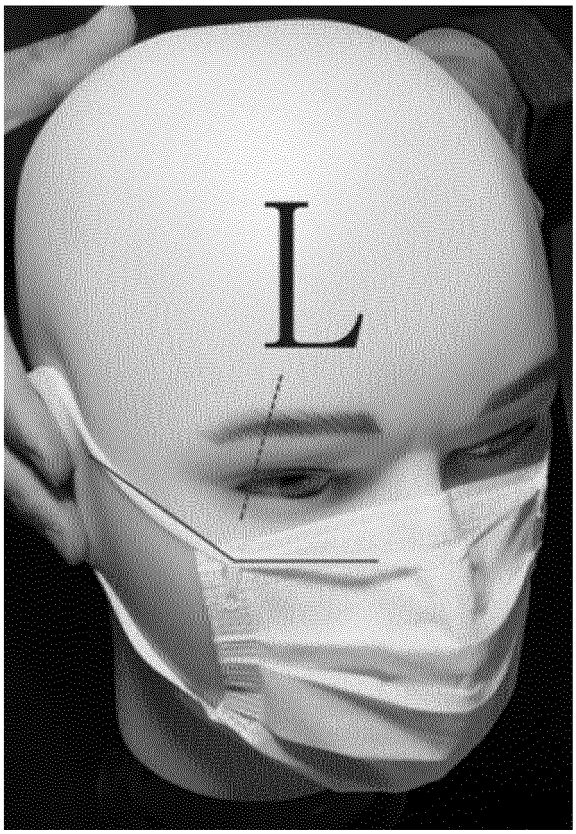


FIG. 16


FIG. 17

# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2022/133031**

**A. CLASSIFICATION OF SUBJECT MATTER**

A41D 13/11(2006.01)i

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A41D 13/11, A62B 9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNABS, WPABSC, VEN, CNKI: 口罩, 密封, 鼻梁, 固定, 带, 绳, 滑动, 拉力, respirator, mask, airproof, nose, fix+, strap?, slip+, pull+

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | CN 205285076 U (ZHAO XINDE) 08 June 2016 (2016-06-08)<br>description paragraphs 22 to 26, and figures 1-6 | 1-14 |
| X | CN 111955818 A (TAN XUJUN) 20 November 2020 (2020-11-20)<br>description, paragraphs 28-44, and figures 1-8 | 1-14 |
| X | CN 112273761 A (RONG XUANPING) 29 January 2021 (2021-01-29)<br>description, paragraphs 7-25, and figures 1-20 | 1-14 |
| X | DE 202020002861 U1 (HALE HOLGER et al.) 25 August 2020 (2020-08-25)<br>description, paragraphs 2-7, and figures 3-4 | 1-14 |
| X | CN 212708114 U (HENAN SUPER ASIA MEDICAL EQUIPMENT CO., LTD.) 16 March 2021 (2021-03-16)<br>description, paragraphs 5-12 | 15-20 |
| PX | CN 307007126 S (FIRE-PROVINCE SHEEP BIOTECHNOLOGY (GUANGZHOU) STOCK LTD. CO. et al.) 14 December 2021 (2021-12-14)<br>brief description and appearance design pictures | 1-14 |

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **15 February 2023** | **17 February 2023** |
| Name and mailing address of the ISA/CN<br>**China National Intellectual Property Administration (ISA/CN)**<br>**China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**<br>Facsimile No. **(86-10)62019451** | Authorized officer<br>Telephone No. |

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**INTERNATIONAL SEARCH REPORT**

International application No.
**PCT/CN2022/133031**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| PX | CN 307297425 S (FIRE-PROVINCE SHEEP BIOTECHNOLOGY (GUANGZHOU) STOCK LTD. CO. et al.) 26 April 2022 (2022-04-26)<br>brief description and appearance design pictures | 1-14 |
| PX | CN 307596461 S (FIRE-PROVINCE SHEEP BIOTECHNOLOGY (GUANGZHOU) STOCK LTD. CO. et al.) 14 October 2022 (2022-10-14)<br>brief description and appearance design pictures | 1-14 |
| A | CN 111345528 A (ZHANG HANWEN) 30 June 2020 (2020-06-30)<br>entire document | 1-14 |
| A | US 2020163392 A1 (DAIO SEISHI KK) 28 May 2020 (2020-05-28)<br>entire document | 1-14 |

Form PCT/ISA/210 (second sheet) (July 2022)

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/CN2022/133031**

| Patent document cited in search report | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|---|---|---|---|
| CN 205285076 U | 08 June 2016 | None | |
| CN 111955818 A | 20 November 2020 | None | |
| CN 112273761 A | 29 January 2021 | None | |
| DE 202020002861 U1 | 25 August 2020 | None | |
| CN 212708114 U | 16 March 2021 | None | |
| CN 307007126 S | 14 December 2021 | None | |
| CN 307297425 S | 26 April 2022 | None | |
| CN 307596461 S | 14 October 2022 | None | |
| CN 111345528 A | 30 June 2020 | None | |
| US 2020163392 A1 | 28 May 2020 | WO 2018180414 A1 | 04 October 2018 |
| | | EP 3603429 A1 | 05 February 2020 |
| | | EP 3603429 A4 | 23 December 2020 |
| | | JP 2018162546 A | 18 October 2018 |
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Form PCT/ISA/210 (patent family annex) (July 2022)