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DISPOSABLE MASK, AND PROCESS FOR MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a disposable mask which is excellent in a wearing feel and which is inexpensive and highly mass-producible, and a process for manufacturing the disposable mask.

Related Art

The prior art relating to the disposable mask is exemplified by Unexamined Published Japanese Patent Application No. 2-74053, 3-254762, 7-275384 or the like.

In the disclosure of Unexamined Published Japanese Patent Application No. 7-275384, the mouth portion of the mask is fused at its center in such a curved shape that the mask may be stereoscopic when used. This shape raises the ratio at which the unnecessary portions occupy when the masks are individually cut off. Moreover, the trimming loss of the material increases for finishing the final shapes of the masks cut off. As a result, there arises problems that the working efficiency is so low as to make the mass-productivity poor, and that the cost for the material is wasted.

On the other hand, the unnecessary portions are disposed of to raise another problem that the resources are not effectively exploited. As disclosed in the Application,

moreover, the manufacture process tends to be complicated to raise the cost thereby to invite another problem that the mask is not suited for the disposable use.

In the mask of Unexamined Published Japanese Patent Application No. 2-74053, on the other hand, the ear-worn portions are formed by forming cuts in a rectangular plate-shaped foamed elastic member. In the mask of Unexamined Published Japanese Patent Application No. 7-275384, the ear-worn portions are formed by forming U-shaped cuts in a stretchable nonwoven fabric. By forming the ear-worn portions merely of the elastic member or the stretchable nonwoven fabric, however, they impose such a heavy load on the ears of the mask wearer as to pain the ears after a long use.

In the mask of Unexamined Published Japanese Patent Application No. 3-254762, moreover, the mass-productivity is lowered by employing rubber members for wearing the mask on the ears. In addition, the process for manufacturing it tends to be complicated to manufacture defective products easily. Moreover, the rubber members also impose a serious load on the ears to pain the ears after a long use.

SUMMARY OF THE INVENTION

An object of the invention is to provide a disposable mask which can be massively manufactured at a low cost by reducing the trimming loss involved, and a process for

manufacturing the disposable mask.

Another object of the invention is to provide a disposable mask which can be formed with a sufficient length of the portions to be worn on the ears of a mask wearer, although the sheet material used has a small area.

According to a first aspect of the invention, there is provided a disposable mask comprising: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of the mouth-applied sheet and having cuts or holes to be worn on the ears of the wearer, wherein, when the direction in which the mouth-applied sheet and the ear-worn sheets are jointed is taken in a horizontal direction whereas the direction perpendicular to the horizontal direction is taken in a vertical direction, the ear-worn sheets have upper edges extending linearly in the same direction as that of the mouth-applied sheet and have edge lines (L3) to form side edges of the mask, each of which is formed by cutting into such a shape as is generally symmetric with respect to a point in the horizontal direction and in the vertical direction.

For example, if a vacant region (A) is defined by: a virtual line (L1) extended in the horizontal direction from the lower end of the ear-worn sheet; a virtual line (L2) extended in the vertical direction from the horizontal ending point of the ear-worn sheet; and the edge line (L3) of the

ear-worn sheet, the shape of the vacant region (A) and the shape of the ear-worn sheet are generally symmetric with respect to a point in the horizontal direction and in the vertical direction.

According to the invention, a complete disposable mask can be obtained merely by cutting a sheet material for the ear-worn sheets into a predetermined shape. Since two ear-worn sheets are cut off point-symmetrically from one sheet material, the sheet trimming loss can be reduced in the mask cutting work to enhance the yield of the material. Moreover, the ear-worn sheets in the cut-off shape have their upper edges aligned with the upper edge of the mouth-applied sheet so that they can be easily worn on the right and left ears of the mask wearer. Thus, the flat sheet-shaped disposable mask can be formed with less trimming loss and in an easily wearable shape so that it can be high in the working efficiency and excellent in the mass-productivity.

According to a second aspect of the invention, there is provided a disposable mask comprising: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of the mouth-applied sheet, wherein, when the direction in which the mouth-applied sheet and the ear-worn sheets are jointed is taken in a horizontal direction, the ear-worn sheets are provided with: generally U-shaped or generally C-shaped cut lines having their curved portions or

linear portions directed toward the center of the mask in the horizontal direction; and cut lines formed outside of the generally U-shaped or generally C-shaped cut lines in the horizontal direction and extending to the edge portions on the horizontal sides, so that the portions enclosed by the generally U-shaped or generally C-shaped cut lines can be folded outwardly in the horizontal direction.

According to a third aspect of the invention, there is provided a disposable mask comprising: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of the mouth-applied sheet and having cuts or holes to be worn on the ears of the wearer, wherein, when the direction in which the mouth-applied sheet and the ear-worn sheets are jointed is taken in a horizontal direction whereas the direction perpendicular to the horizontal direction is taken in a vertical direction, the ear-worn sheets are provided with: comb-shaped cuts each having a main-cut line extending in the horizontal direction or in the vertical direction and a plurality of branch-cut lines continuing from the main-cut line and intersecting the main-cut line; and cut lines each extending from the edge portion of the ear-worn sheet between the branch-cut lines, so that the portions enclosed by the individual cut lines can be expanded in the horizontal direction.

In the invention, the rubber members or the like to be

worn on the ears need not be attached at the mask manufacturing time. Moreover, the ear-worn portions are formed either by folding back the portions, as enclosed by the cut lines formed in the ear-worn sheets, when the disposable mask is to be used, or by expanding those portions in the horizontal direction, so that the ear-worn portions can be extended sufficiently long in the horizontal direction to reduce the load on the wearing ears, although the entire sheet material has a small area.

In the constructions thus far described, the ear-worn sheets are preferably made more stretchable in the horizontal direction than the mouth-applied sheet.

For example, the ear-worn sheets may be made of a stretchable nonwoven fabric or a member prepared by adhering a stretchable film to a nonwoven fabric.

Alternatively, the disposable mask may be made of a single, entirely stretchable sheet, and the entirely stretchable sheet may be pressed at its central portion to lower its stretchability so that the stretchability-lowered central portion is used as the mouth-applied sheet whereas the two side portions are used as the ear-worn sheets. In this case, the pressing treatment is executed by the embossing method, for example.

In the constructions, moreover, the ear-worn sheets and the mouth-applied sheet are preferably jointed by one of the heat embossing adhesion, the ultrasonic adhesion and the hot

melt type adhesive.

According to a fourth aspect of the invention, there is provided a process for manufacturing a disposable mask including: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of the mouth-applied sheet, the direction in which the mouth-applied sheet and the ear-worn sheets are jointed being taken in a horizontal direction, and the direction perpendicular to the horizontal direction being taken in a vertical direction, comprising: a first step of cutting a sheet to a predetermined length to form a mouth-applied sheet; a second step of cutting a sheet to a predetermined length to form a rectangular sheet; a third step of forming a jointed sheet by jointing the mouth-applied sheet and the rectangular sheet, alternately; a fourth step of cutting the rectangular sheet of the jointed sheet into ear-worn sheets having equivalent shapes, to separate into individual masks; and a step of forming cuts or holes to be worn on the ears of a mask wearer, at the portions of the ear-worn sheets simultaneously with the fourth step or before or after the fourth step.

In the aforementioned process, at the fourth step, the rectangular sheet is preferably equivalently cut to make the ear-worn sheets generally symmetric with respect to a point in the vertical direction and in the horizontal direction.

According to the manufacture process, the trimming loss

of the ear-worn sheets can be reduced to improve the yield of the material and to simplify the manufacture process.

According a fifth aspect of the invention, there is provided a disposable mask manufacturing process comprising: a first step of forming a jointed sheet in which a band-shaped second sheet is interposed between and jointed to two band-shaped first sheets; a second step of cutting the jointed sheet along a cutting line extending in a direction perpendicular to a delivery direction, to form a structure in which the ear-worn sheets cut off from the first sheet are jointed to the two sides of the mouth-applied sheet cut off from the second sheet; and a step of forming cuts or holes to be worn on the ears of a mask wearer, in the ear-worn sheets simultaneously with the second step or before or after the second step.

In the aforementioned manufacture processes, it is preferred that the sheet for the ear-worn sheets and the sheet for the mouth-applied sheet are each made of a nonwoven fabric, and that the nonwoven fabric for the ear-worn sheets is more stretchable than that for the mouth-applied sheet.

As a result, the load (or pressure) to be imposed on the ears can be lightened to cause no pain to the user for a long time of use.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top plan view showing a disposable mask according to a first embodiment of the invention;

Figs. 2A, 2B and 2C are first, second and third sections of the disposable mask of Fig. 1;

Figs. 3A, 3B, 3C, 3D, 3E, 3F and 3G are top plan views showing modifications of the shapes of ear-worn portions of the disposable mask;

Figs. 4A, 4B, 4C, 4D, 4E, 4F and 4G are top plan views showing other embodiments of the shapes of the ear-worn portions;

Fig. 5A is a top plan view showing one preferred embodiment of the disposable mask of the type shown in Figs. 4A to 4G, and Fig. 5B is a diagram showing the used state of the disposable mask of Fig. 5A;

Fig. 6 is a diagram showing a first disposable mask manufacturing process (according to a longitudinal method) comprising a first step (I), a second step (II), a third step (III), a fourth step (IV) and a fifth step (V);

Figs. 7A, 7B and 7C show a second disposable mask manufacturing process (according to a transverse method), and are a side elevation showing a first step (I), a side elevation showing a second step (II) and a top plan view showing a step of manufacturing the entire mask; and

Fig. 8 is a diagram illustrating the results of the using tests employing a load (or pressure) on the ears as a parameter.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will be described with reference to the accompanying drawings.

Fig. 1 is a top plan view showing a disposable mask according to a first embodiment of the invention; Figs. 2A, 2B and 2C are first, second and third sections showing the disposable mask of Fig. 1; Figs. 3A, 3B, 3C, 3D, 3E, 3F and 3G are top plan views showing modifications of the shapes of ear-worn portions of the embodiment shown in Fig. 1; Figs. 4A, 4B, 4C, 4D, 4E, 4F and 4G are top plan views showing other embodiments of the shapes of the ear-worn portions; and Figs. 5A and 5B are top plan views showing an embodiment in which the ear-worn portions can be folded outward to the right and left.

A mask 1, as shown in Fig. 1, is the so-called "disposable mask", which is used only once in a food processing factory or a lightly dusty working site, for example, and then disposed of.

The disposable mask shown in Fig. 1 is constructed to include a mouth-applied sheet 2 at the center of the mask 1 and ear-worn sheets 3 and 3 on the two sides of the mouth-applied sheet 2. The ear-worn sheets 3 and 3 are provided with cuts 5 and 5 having cut lines for forming the ear-worn portions. The mask 1 may have a variety of structures, as shown in Figs.

2A, 2B and 2C.

In a disposable mask 1A having a sectional shape of Fig. 2A, the mouth-applied sheet 2 and the ear-worn sheets 3 and 3 on the two sides of the former sheet 2 are individually made of different materials. One disposable mask 1A is formed by jointing the ear-worn sheets 3 and 3 to the two sides of the mouth-applied sheet 2.

In the aforementioned construction, the mouth-applied sheet 2 is preferably made of a nonwoven fabric of a low stretchability (as will be called the "nonstretchable nonwoven fabric") such as a nonwoven fabric bonded by the needle punching method or the water jet method, a spun-bonded nonwoven fabric or a thermally self-bonded nonwoven fabric. The ear-worn sheets 3 are preferably made of a nonwoven fabric having a higher stretchability than that of the mouth-applied sheet 2 (as will be called the "stretchable nonwoven fabric") such as a nonwoven fabric in which fibers are interlaced by the needle punching method or with a high-pressure water flow and made stretchable by a heat treatment or the like, or a nonwoven fabric in which the fibers themselves are self-fused by the spun-bonding method or the like so that they are made stretchable.

The stretchable nonwoven fabric is preferably made of stretchable fibers such as crimped fibers.

Alternatively, the ear-worn sheets 3 may also be prepared

by adhering a stretchable film to a nonwoven fabric. In this case, the nonwoven fabric is preferably exemplified by a stretchable nonwoven fabric or a highly stretchable nonwoven fabric, and the stretchable film is preferably made of urethane, rubber, ester or olefin. And, the adhering method is preferably exemplified by the laminating method or the partial heat bonding method. On the other hand, the means for jointing the mouth-applied sheet 2 and the ear-worn sheets 3 is preferably exemplified by the heat embossing method, the ultrasonically adhering method or the adhering method employing an adhesive such as the HMT (Hot Melt).

As in a disposable mask 1B shown in Fig. 2B, on the other hand, a sheet 2A of a lower stretchability may be jointed to the center of one stretchable sheet so that the portion having the sheet 2A jointed thereto may be used as the mouth-applied sheet 2 whereas the two side portions not having the sheet 2A jointing thereto may be used as the ear-worn sheets 3. As in a disposable mask 1C shown in Fig. 2C, alternatively, the entire mask may be made of a single, highly stretchable sheet, in such a manner that: the mouth-applied sheet 2 is formed by subjecting the center portion of the mask to a pressing treatment such as an embossing treatment to lower the stretchability; and the ear-worn sheets 3 having a higher stretchability than that of the mouth-applied sheet 2 are formed by subjecting the two side portions of the mask not to the pressing treatment or to a

lighter pressing treatment than that for the center portion.

In the embodiments shown in Fig. 1, 3A to 3G and 4A to 4G, the ear-worn sheet 3, the mouth-applied sheet 2 and the ear-worn sheet 3 are jointed in a horizontal direction, to which a vertical direction is taken perpendicularly. The shown upper side is worn by the nose of a mask wearer, and the lower side is worn by the jaw of the wearer. However, the disposable mask can be worn upside down.

In the disposable masks shown in Fig. 1 and Fig. 3A to 3G, the upper edge of the mouth-applied sheet 2 and the upper edges of the ear-worn sheets 3 and 3 on the two sides are aligned with each other. On the other hand, the ear-worn sheets 3 are cut away to have edge lines L3, the shape of which is symmetric or generally symmetric with respect to a point(or point-symmetric) in the vertical direction and in the horizontal direction. In other words, the shape of the edge line L3 is rotationally symmetric. Especially in the masks shown in Fig. 1 and Figs. 3A to 3F, in the rectangular shape defined by the upper edge and the inner side edge of the ear-worn sheet 3 and virtual lines L1 and L2, the plane occupied by the ear-worn sheet 3 and a vacant region A are symmetric with respect to a point in the vertical direction and in the horizontal direction. In these embodiments, therefore, the trimming loss of the sheet can be substantially eliminated, as will be described in the following manufacturing process. This

description likewise applies to the embodiment shown in Fig. 3G.

In the embodiments shown in Fig. 1 and Figs. 3A to 3G, since the upper edge of the mouth-applied sheet 2 and the upper edges of the ear-worn sheets 3 are aligned with each other, and more of the ear-worn sheets 3 and 3 is located in the upper side of the disposable mask, moreover, the ear-worn sheets 3 and 3 have such a shape as can be easily worn on the right and left ears of the wearer by extending the cuts 5 formed in the ear-worn sheets 3 and 3.

In the embodiments shown in Figs. 4A to 4G, the ear-worn sheets 3 are made rectangular so that the jointed structure of the ear-worn sheet 3, the mouth-applied sheet 2 and the ear-worn sheet 3 is formed into a band shape in the horizontal direction. These disposable masks shown in Figs. 4A to 4G also have little trimming loss in the sheets being manufactured, so that they can improve the yield for the materials, as will be described in the following manufacturing process.

The cuts 5 to be formed in the ear-worn sheets 3 can take a variety of shapes. For example, the cuts 5 of the disposable masks shown in Figs. 1, 3E to 3G and Fig. 4G are shaped to include: comb-shaped cuts each having a main-cut line 5c extending in the horizontal direction or in the vertical direction and a plurality branch-cut lines 5d intersecting (at a right angle) the main-cut line 5c; and cut lines 5e each

extending from the edge portion of the ear-worn sheet 3 between the branch-cut lines 5d.

Even with the ear-worn sheets 3 having a small area, the disposable mask having these cuts 5 is enabled to form sufficiently long ear-worn portions by expanding the portions, as enclosed by the cut lines, to the right and left. As a result, the disposable mask can have a small area, while being unemployed, to minimize the sheet material to be employed, and can impose little load on the ears when employed. Here, the cuts of the mask shown in Fig. 4A have comb-shaped cuts similar to the aforementioned ones.

A disposable mask 1', as shown in Fig. 5A, can be manufactured by a process similar to that for those shown in Figs. 4A to 4G. In this disposable mask 1', the rectangular ear-worn sheets 3 and 3 are disposed on the two sides of the mouth-applied sheet 2. These ear-worn sheets 3 and 3 are formed to include: generally C-shaped cut lines 5a having their linear portions directed toward the center of the mask (or toward the mouth-applied sheet 2); and cut lines 5b disposed outside of the cut lines 5a and extending in the horizontal direction (or in the direction X1 - X2, as shown). As shown in Fig. 5B, moreover, ear-worn portions 6 and 6 are formed and protruded outward (i.e., in the direction X1 and X2) from the mouth-applied sheet 2 by folding the portions, as enclosed by the cuts 5 and 5 (or the cut lines 5a), individually to the

surface side or the back side of the ear-worn sheets 3. Here, the cut lines 5a may also be formed generally into a shape of letter "U".

Thus, in the disposable mask, when the generally C-shaped cut lines 5a or the generally U-shaped cut lines are formed, and the portions enclosed by these cut lines are made outwardly foldable, the disposable mask can have a small entire area while being unemployed, and can elongate the substantial size in the horizontal direction when employed so that it can be easily worn on the ears of the mask wearer.

Moreover, the disposable masks shown in Figs. 4A and 4D are also enabled like that of Fig. 5 to form the ear-worn portions by folding the portions, as enclosed by the cut lines, to the two horizontal sides.

In the disposable masks shown in Figs. 3A, 3B, 3C and 3D and in Figs. 4B, 4C, 4E and 4F, on the other hand, the ear-worn portions can be easily worn on the ears by making the ear-worn sheets 3 of the sheet which is highly stretchable in the horizontal direction.

Here will be described the process for manufacturing the disposable mask.

Fig. 6 shows a first process for manufacturing the disposable mask (according to a longitudinal method), and sections (I), (II), (III), (IV) and (V) show first, second, third, fourth and fifth steps, respectively. Here in Fig. 6,

the first step (I) and the second step (II) up to cutting means C1 and C2 are shown in side elevations, and the subsequent steps are shown in top plan views.

At the first step (I) shown in Fig. 6, a band-shaped nonstretchable nonwoven fabric 11 is fed rightward of the drawing from a rolled raw fabric 11A by feeding means R1 and is cut by the cutting means C1 to form the mouth-applied sheet 2 having a predetermined length. Likewise, at the second step (II), a band-shaped stretchable nonwoven fabric 12 is fed rightward of the drawing from a rolled raw fabric 12A by feeding means R2 and is cut by the cutting means C2 to form a rectangular sheet 12a having a predetermined length for the ear-worn sheet. Here, the first step (I) and the second step (II) are executed in parallel.

At the third step (III), the mouth-applied sheets 2 and the sheets 12a, as formed at the first step (I) and at the second step (II), are alternately arranged with their edge portions being overlapped and are conveyed to jointing means B1 by conveying means such as a conveyor. The overlapped portions of the mouth-applied sheets 2 and the sheets 12a are portions 13 to be jointed. At these jointed portions 13, the mouth-applied sheets 2 and the sheets 12a are jointed by the jointing means B1 such as the heat embossing adhesion, the ultrasonic adhesion or the hot melt type adhesion. As a result, there is formed the jointed sheet S1 in which the mouth-applied

sheets 2 and the sheets 12a are alternately jointed in the feeding (or longitudinal) direction.

At the fourth step (IV), the sheets 12a of the jointed sheet S1 is cut by cutting means C4 to separate the ear-worn sheets 3 and 3 equivalently from the sheets 12a to the right and left so that the jointed sheet S1 is separated into the individual disposable masks.

These cutting behaviors will be described in connection with the disposable mask 1 of Fig. 1.

At the third step (III), the jointed sheet S1 is formed by jointing the mouth-applied sheets 2 and the sheets 12a with their upper edges being aligned with each other. At the fourth step (IV), the ear-worn sheets 3 and 3 are so equivalently cut off from the sheet 12a to the right and left that the shape of each ear-worn sheet 3 may be point-symmetric with the shape of its corresponding region A, which is defined by: the virtual line L1 extending from a starting point P1 at the lower end of the ear-worn sheet 3 in the horizontal direction (or in the direction X1 - X2); the virtual line L2 extending at a right angle with respect to the horizontal direction from a horizontally ending point P2 of the upper edge of the ear-worn sheet 3; and the edge line L3 (i.e., a generally S-shaped curved cut line extending from the starting point P1 to the ending point P2). Therefore, the ear-worn sheets 3 for the previously cut disposable masks 1 has the upside-down shape

of the ear-worn sheets 3 for the subsequently cut disposable masks 1 so that all the disposable masks 1 cut at the fourth step (IV) can be given the identical shape. Therefore, the cutting work of the cutting means C4 has little trimming loss of the sheets 12a so that the yield can be improved by eliminating the waste of the sheet materials.

At the fifth step (V) shown in Fig. 6, moreover, the cuts 5 of the predetermined shape are formed in the ear-worn sheets 3 by cut forming means C3 dedicated thereto. Here, the cuts 5 may also be formed either simultaneously as the ear-worn sheets 3 are separated by the cutting means C4 or at a step preceding the cutting work by the cutting means C4.

By thus cutting the region A and the ear-worn sheet 3 into the point-symmetric shapes, the disposable masks shown in Fig. 1 and Figs. 3A to 3F can be continuously manufactured.

When the ear-worn sheets 3 and 3 are cut off along crank-shaped cutting lines from the sheets 12a by the cutting means C4, on the other hand, it is possible to manufacture the disposable mask having the ear-worn sheets 3 cut generally point-symmetrically, as shown in Fig. 3G, with little trimming loss.

When the right and left ear-worn sheets 3 are separated by cutting the sheets 12a at the center along the linear cutting lines perpendicular to a delivery direction (or Machine Direction: MD) of the jointed sheet S1 by the cutting means

C4 shown in Fig. 6, on the other hand, it is possible to manufacture the disposable masks, as shown in Figs. 4A to 4G and Figs. 5A and 5B.

In the masks formed by the cutting methods thus far described, the ear-worn sheets 3 are cut point-symmetrically from the sheet 12a so that the unnecessary portion to be disposed of is not formed. Further, the areas occupied by the ear-worn sheets 3 can be enlarged to form the various cuts 5, as shown in Figs. 3A to 3G and in Figs. 4A to 4G, in the ear-worn sheets 3.

Here, where the ear-worn sheets 3 are made of a laminated sheet which is prepared by adhering a stretchable film to a nonwoven fabric, the aforementioned laminated sheet is employed as the sheet 12 fed from the raw fabric 12A at the second step (II).

Where the sheet 2A of a low stretchability is jointed to form the mouth-applied sheet 2, as shown in Fig. 2B, on the other hand: the sheet 2A is cut at the first step (I) from the sheet 11 of the low stretchability; the sheet 12 of the high stretchability is not cut but fed at the second step (II); and the sheets 2A are jointed to the sheet 12 at an interval at the third step (III) to form the mouth-applied sheets 2 at the jointed portions of the sheets 2A. Then, the sheet 12 is cut by the cutting means C4 of the fourth step (IV) at the portions where the sheet 2A is not jointed, to separate the ear-worn

sheets 3.

Where the embossed portion is used as the mouth-applied sheet 2, as shown in Fig. 2C, on the other hand, the first step (I) is omitted, and the stretchable sheet 12 is fed at the second step (II) without being cut. At the third step (III), the sheet 12 is embossed at an interval to form the embossed portion 3a by providing embossing means but not providing the jointing means B1.

Figs. 7A, 7B and 7C show a second process for manufacturing the disposable mask (according to a transverse method) and present a side elevation of a first step (I), a side elevation of a second step (II) and a top plan view showing the step of manufacturing the entire mask, respectively. Moreover, (I), (II), (III) and (IV) of Fig. 7C indicate the first, second, third and fourth steps, respectively.

At the first step (I) shown in Fig. 7A, a first sheet 21 made of a stretchable nonwoven fabric is fed to the right of the drawing from a rolled raw fabric 21A by feeding means R3. Midway of this feeding route, there is disposed a slitter C5 for splitting the first sheet 21 from the center into two halves in the direction perpendicular to the feeding direction, as shown in Fig. 7C, to form first ribbon-shaped sheets 21a and 21a.

At the second step (II), as shown in Fig. 7B, a second sheet (for the mouth-applied sheet) 22 made of a nonstretchable

nonwoven fabric is fed to the right of the drawing from a rolled raw fabric 22A by feeding means R4 into the spacing between the first sheets 21a and 21a. Then, the first sheets 21a and 21a and the second sheet 22 are bonded at their overlapped portions 23 by jointing means B2 such as the heat embossing adhesion, the ultrasonic adhesion or the hot melt type adhesion. That is, as shown in Fig. 7C, there is formed a jointed sheet S2 in which the first sheets 21a and 21a are jointed to the two ends of the second sheet 22 in the direction (i.e., in the longitudinal direction) perpendicular to the feeding direction.

At the third step (III), the jointed sheet S2 is cut to a predetermined length by cutting means C7 into the individual disposable masks. In each disposable mask thus manufactured, the central second sheet 22 provides the mouth-applied sheet 2, and the first sheets 21a and 21a are jointed to the two ends of the second sheet 22 to form the ear-worn sheets 3 and 3.

Next, at the fourth step (IV), the cuts 5 of a predetermined shape for the ear-worn portions 6 are formed in the first sheets 21a and 21a on the two ends by cut forming means C6.

Here, the fourth step (IV) for forming the cuts 5 may be executed either after the end of the third step (III), as described above, or upon the jointed sheet S2 after the end of the second step (II). Alternatively, the fourth step (IV)

may be executed simultaneously as the individual disposable masks are cut at the third step (III).

According to this second manufacture process, the direction to form the cuts 5 is common between the previously cut disposable masks and the subsequently cut disposable masks so that they can be formed at all times by the common cut forming means C6. Where the individual disposable masks are to be cut off, on the other hand, what is necessary is to cut the jointed sheet S2 at the predetermined width size so that the manufacture process can be simplified.

According to this manufacture process, it is possible to manufacture mainly the disposable masks shown in Figs. 4A to 4G and the disposable masks shown in Figs. 5A and 5B.

According to the first and second manufacture processes, moreover, no trimming loss is involved in the mouth-applied sheet or the ear-worn sheets after the cutting of the individual disposable masks. Therefore, the sheet material cannot be wasted to enhance the yield.

The disposable masks are preferable to have less load upon the user (or less pressure when the masks are worn) for a long time of use.

For the disposable masks thus far described, therefore, the allowable range of the load (or pressure) on the ears has been examined, as its results will be presented in the following.

Fig. 8 is a diagram illustrating the results of the using tests of the disposable masks having a variety of structures, by employing a load (or pressure) on the ears as a parameter. In the following using tests, eighteen monitors tested the disposable masks for five days by using them for six hours and thirteen minutes on an average per day.

Here, the loads (or pressures) upon the ears were measured by using a tensile tester (or an auto graph: Shimazu AG-5000B). This tensile tester holds the two ends of the article to be measured, with chucks. The tensions to be established between the two chucks are measured when the distance between the chucks is increased at a constant rate.

[Method of Measuring the Loads (or Pressures) on the Ears]

(1) The arcuate length W below the nose between the tragi (i.e., the actual length from the tragus on one side to the tragus on the other side through the subnasal point) of a monitor is measured.

(2) The two chucks of the tensile tester are set at their distance to 230 mm to hold a cylindrical jig, and the right and left ear-worn portions of the mask are worn on the cylindrical jig.

(3) The distance between the chucks is increased at a rate of 200 mm/min. to the value of the arcuate length W below the nose between the tragi + 70 mm. After this, the tensile force when the chuck distance is returned to a value of W + 30 mm

is measured by assuming it as the pressure upon the ears.

[Evaluation Method by Monitors]

There are prepared a plurality of masks which are different in the natural length r of the worn width of the ear-worn portions when the masks are flattened, and the wearing feels of the monitors of those masks are evaluated at five stages. These evaluation results are illustrated in Fig. 8. In the evaluation results of Fig. 8, the ordinate indicates the pressure, which was measured by the method, as specified by the items (1) to (3).

With the measured result of the arcuate length below the nose between the tragi of one monitor being W = 300 mm, for example, the tensions are measured by the tensile tester when the mask or the measured sample (having a variety of values for natural length r) is enlarged to 370 mm at the maximum and returned to 330 mm. The measured values are deemed as the "pressures" upon the monitors wearing those masks. The wearing feels when the monitors wear the masks actually are evaluated at the five stages such as the "too tight to use". In Fig. 8, the ordinate indicates the values of the "pressures" when the masks were measured by the tensile tester, and the abscissa indicates the evaluation results of the five stages of the wearing feels.

In view of the results of Fig. 8, the good masks are conditioned by forming such cuts in the ear-worn sheets as

confine the loads (or pressures) to be imposed on the ears of the mask wearer, within a range of 16 mN to 250 mN.

By preferably setting the range from 25 mN to 200 mN, moreover, the loads (or pressures) upon the ears can be lightened to reduce the pains for the user to fees at the ears.

According to the invention thus far described in detail, the trimming loss when the individual masks are cut from the sheet can be reduced to eliminate the waste of the sheet materials thereby to improve the yield. Therefore, the working efficiency can be raised to effect an excellent mass-productivity.

Moreover, the load (or pressure) on the ears of the mask wearer can be lightened to provide a disposable mask having an excellent wearing feel.

Although various exemplary embodiments have been shown and described, the invention is not limited to the embodiments shown. Therefore, the scope of the invention is intended to be limited solely by the scope of the claims that follow.

WHAT IS CLAIMED IS:

1. A disposable mask comprising: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of said mouth-applied sheet and having cuts or holes to be worn on the ears of the wearer,

wherein,

when the direction in which said mouth-applied sheet and said ear-worn sheets are jointed is taken in a horizontal direction whereas the direction perpendicular to the horizontal direction is taken in a vertical direction,

said ear-worn sheets have upper edges extending linearly in the same direction as that of said mouth-applied sheet and have edge lines (L3) to form side edges of the mask, each of which is formed by cutting into such a shape as is generally symmetric with respect to a point in said horizontal direction and in said vertical direction.

2. The disposable mask as set forth in Claim 1,

wherein, if a vacant region (A) is defined by: a virtual line (L1) extended in said horizontal direction from the lower end of said ear-worn sheet; a virtual line (L2) extended in said vertical direction from the horizontal ending point of said ear-worn sheet; and the edge line (L3) of said ear-worn sheet, the shape of said vacant region (A) and the shape of said ear-worn sheet are generally symmetric with respect to

a point in said horizontal direction and in said vertical direction.

3. The disposable mask as set forth in Claim 1,

wherein said ear-worn sheets are made more stretchable in said horizontal direction than said mouth-applied sheet.

4. The disposable mask as set forth in Claim 3,

wherein said ear-worn sheets are made of a stretchable nonwoven fabric or a member prepared by adhering a stretchable film to a nonwoven fabric.

5. The disposable mask as set forth in Claim 3,

wherein said disposable mask is made of a single, entirely stretchable sheet, and

wherein said entirely stretchable sheet is pressed at its central portion to lower its stretchability so that the stretchability-lowered central portion is used as said mouth-applied sheet whereas the two side portions are used as said ear-worn sheets.

6. The disposable mask as set forth in Claim 5,

wherein said pressing treatment is executed by the embossing method.

7. The disposable mask as set forth in Claim 1,

wherein said ear-worn sheets and said mouth-applied sheet are jointed by one of the heat embossing adhesion, the ultrasonic adhesion and the hot melt type adhesive.

8. A disposable mask comprising: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of said mouth-applied sheet,

wherein,

when the direction in which said mouth-applied sheet and said ear-worn sheets are jointed is taken in a horizontal direction,

said ear-worn sheets are provided with: generally U-shaped or generally C-shaped cut lines having their curved portions or linear portions directed toward the center of the mask in said horizontal direction; and cut lines formed outside of said generally U-shaped or generally C-shaped cut lines in said horizontal direction and extending to the edge portions on the horizontal sides, so that the portions enclosed by said generally U-shaped or generally C-shaped cut lines can be folded outwardly in said horizontal direction.

9. The disposable mask as set forth in Claim 8,

wherein said ear-worn sheets are made more stretchable in said horizontal direction than said mouth-applied sheet.



10. The disposable mask as set forth in Claim 9,

wherein said ear-worn sheets are made of a stretchable nonwoven fabric or a member prepared by adhering a stretchable film to a nonwoven fabric.

11. The disposable mask as set forth in Claim 9,

wherein said disposable mask is made of a single, entirely stretchable sheet, and

wherein said entirely stretchable sheet is pressed at its central portion to lower its stretchability so that the stretchability-lowered central portion is used as said mouth-applied sheet whereas the two side portions are used as said ear-worn sheets.

12. The disposable mask as set forth in Claim 11,

wherein said pressing treatment is executed by the embossing method.

13. The disposable mask as set forth in Claim 8,

wherein said ear-worn sheets and said mouth-applied sheet are jointed by one of the heat embossing adhesion, the ultrasonic adhesion and the hot melt type adhesive.

14. A disposable mask comprising: a mouth-applied sheet to

be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of said mouth-applied sheet and having cuts or holes to be worn on the ears of the wearer,

wherein,

when the direction in which said mouth-applied sheet and said ear-worn sheets are jointed is taken in a horizontal direction whereas the direction perpendicular to the horizontal direction is taken in a vertical direction,

said ear-worn sheets are provided with: comb-shaped cuts each having a main-cut line extending in said horizontal direction or in said vertical direction and a plurality of branch-cut lines continuing from said main-cut line and intersecting said main-cut line; and cut lines each extending from the edge portion of said ear-worn sheet between said branch-cut lines, so that the portions enclosed by the individual cut lines can be expanded in said horizontal direction.

15. The disposable mask as set forth in Claim 14,

wherein said ear-worn sheets are made more stretchable in said horizontal direction than said mouth-applied sheet.

16. The disposable mask as set forth in Claim 15,

wherein said ear-worn sheets are made of a stretchable nonwoven fabric or a member prepared by adhering a stretchable

film to a nonwoven fabric.

17. The disposable mask as set forth in Claim 15, --

wherein said disposable mask is made of a single, entirely stretchable sheet, and

wherein said entirely stretchable sheet is pressed at its central portion to lower its stretchability so that the stretchability-lowered central portion is used as said mouth-applied sheet whereas the two side portions are used as said ear-worn sheets.

18. The disposable mask as set forth in Claim 17,

wherein said pressing treatment is executed by the embossing method.

19. The disposable mask as set forth in Claim 14,

wherein said ear-worn sheets and said mouth-applied sheet are jointed by one of the heat embossing adhesion, the ultrasonic adhesion and the hot melt type adhesive.

20. A process for manufacturing a disposable mask including: a mouth-applied sheet to be applied to the mouth of a mask wearer; and ear-worn sheets jointed to the two sides of said mouth-applied sheet, the direction in which said mouth-applied sheet and said ear-worn sheets are jointed being taken in a

horizontal direction, and the direction perpendicular to the horizontal direction being taken in a vertical direction, comprising:

a first step of cutting a sheet to a predetermined length to form a mouth-applied sheet;

a second step of cutting a sheet to a predetermined length to form a rectangular sheet;

a third step of forming a jointed sheet by jointing said mouth-applied sheet and said rectangular sheet, alternately;

a fourth step of cutting said rectangular sheet of said jointed sheet into ear-worn sheets having equivalent shapes, to separate into individual masks; and

a step of forming cuts or holes to be worn on the ears of a mask wearer, at the portions of said ear-worn sheets simultaneously with said fourth step or before or after said fourth step.

21. The disposable mask manufacturing process as set forth in Claim 20,

wherein at said fourth step, said rectangular sheet is equivalently cut to make said ear-worn sheets generally symmetric with respect to a point in said vertical direction and in said horizontal direction.

22. The disposable mask manufacturing process as set forth

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in Claim 20,

wherein the sheet for said ear-worn sheets and the sheet for said mouth-applied sheet are each made of a nonwoven fabric, and

wherein the nonwoven fabric for said ear-worn sheets is more stretchable than that for said mouth-applied sheet.

23. A disposable mask manufacturing process comprising:

a first step of forming a jointed sheet in which a band-shaped second sheet is interposed between and jointed to two band-shaped first sheets;

a second step of cutting said jointed sheet along a cutting line extending in a direction perpendicular to a delivery direction, to form a structure in which the ear-worn sheets cut off from said first sheet are jointed to the two sides of the mouth-applied sheet cut off from said second sheet; and

a step of forming cuts or holes to be worn on the ears of a mask wearer, in said ear-worn sheets simultaneously with said second step or before or after said second step.

24. The disposable mask manufacturing process as set forth in Claim 23,

wherein the sheet for said ear-worn sheets and the sheet for said mouth-applied sheet are each made of a nonwoven fabric,

and

wherein the nonwoven fabric for said ear-worn sheets is more stretchable than that for said mouth-applied sheet.--