

FACE MASK INCORPORATING ADJUSTABLE EAR LOOPS

TECHNICAL FIELD

[0001] The present invention relates to a face mask that incorporates a pair of adjustable ear loops.

BACKGROUND

[0002] Face masks that cover the nose and mouth of a wearer are available for various purposes, such as to prevent the spread of germs and/or to filter air. Many designs have been introduced to assist a user in donning and securing face masks. Conventional masks use straps that tie behind the head, adhesive strips or elastic bands that loop behind the head or around the ears ("ear loop designs"). Each design has benefits and drawbacks.

[0003] Ear loop designs are often preferred over designs with adhesive strips. Adhesive strips can be painful when peeled away or otherwise removed from a wearer's skin. Further, designs that loop around one's ears are often preferred over designs that wrap around one's head. The former is usually easier to don on and off and also is less likely to interfere with one's hair.

[0004] Typically, ear loop designs are made of elastic material to accommodate for differences in the sizes of the wearer's head. For example, U.S. Patent No. 4,941,470 discloses a face mask held in place by a pair of ear loops. The ear loops and a fabric panel of the mask are bonded together by heating the juncture of the free ends of the ear loops and the fabric panel. A disadvantage of this conventional "one-size fits all" design is that the mask and ear loops may not fit properly.

[0005] To solve this issue, others have come up with ways to make the ear loops adjustable, as in U.S. Patent Publication No. U.S. 2015/0335080 and U.S. Patent No. 5,819,731. In the former, each of the ear loops can be formed from an elongated member. “Take-up loops” are formed when an intermediate portion of each of the elongated members is threaded through a hole in the panel of the mask. The loop (take-up loop) or a slider along the elongated member can provide adjustability to increase or decrease the size of the ear loops. The latter employs the use of an adjustable band that, after looping around the ear of the wearer, extends to the front of the mask and around the back of the neck.

[0006] Although the above publications and patents have introduced ways to make the ear loops adjustable, the masks require significant effort from a wearer to ensure a proper fit. Moreover, they may require an additional object (i.e. an additional component for use). A need, therefore, exists for a more hassle-free means of an adjustable ear loop, which allows adjustability of the ear loop while minimizing the objects required to achieve this function.

SUMMARY OF THE INVENTION

[0007] The invention recognizes that there exists a need for an ear loop for a face mask that is adjustable so as to accommodate the wearer’s size, thus ensuring comfort as well as a proper seal. Donning the mask should be fast and easy. Further, the mask should be adjustable without requiring additional objects or components. A wearer should be able to put the mask onto his or her face and easily adjust the size of the ear loops so that the mask is both secure and comfortable. While other masks have components that fit over the ears, there does not exist a mask with an elegant or intuitive solution to customize the fit of the mask while not sacrificing the firm fit of the mask on a wearer’s face.

[0008] The following summary is provided to facilitate an understanding of some of the innovative features unique to the disclosed embodiment and is not intended to be a full description. A full appreciation of the various aspects of the embodiments disclosed herein can be gained by taking into consideration the entire specification, claims, drawings, and abstract as a whole.

[0009] The invention relates to a mask with adjustable ear loops made from elastic fabric. Each ear loop can have a precut opening through which a wearer can insert one of his/her ears. In a preferred design, the mask is composed of an elastic fabric that is durable and comfortable for a wearer.

[0010] More specifically, the invention includes a single piece face mask composed of (a) a center portion that filters exhaled and inhaled air, (b) a first ear loop with a tearable region and (c) a second ear loop with a tearable region. The first ear loop and second ear loop flank the center portion and each include an opening for a wearer to secure around an ear. The wearer can increase the size of the first ear loop by tearing or cutting the tearable region of the first ear loop. Further, the wearer can increase the size of the second ear loop by tearing or cutting the tearable region of the second ear loop.

[0011] The tearable regions can be perforated to assist the wearer in increasing the size of the openings by tearing or cutting. Further, the tearable regions can include one or more notches to assist the wearer in increasing the size of the openings by tearing or cutting. The notches can provide feedback to the user by increasing the force necessary to instigate additional tearing from each notch. The fabric material and notches can prevent additional tearing to the tearable regions after the face mask is donned. A portion of the tearable regions can be partially torn to assist a wearer in identifying the tearable regions and decrease the resistance to tearing. In an alternative design, the first ear loop and the second ear loop can be an elastic chord, band, string or yarn.

[0012] The invention also includes a face mask composed of a center air filtering portion and two precut ear loop regions that flank the center air filtering portion. Each ear loop region can include one or more perforated sections. The size of the ear loop region can be increased by tearing or cutting the one or more perforated sections. The two precut loop regions can be square shaped, triangle shaped or oval shaped. Further, a portion of each perforated section can be partially torn assist a wearer in identifying the perforated section and decrease the resistance to tearing. The perforated sections can also include one or more notches to assist the wearer with tearing or cutting.

[0013] The invention also includes a face mask composed of a center air filtering portion, a first ear loop and a second ear loop that flank the center air filtering portion. In this design, each ear loop is comprised of a chord. Each chord includes a midpoint region, a top strand and a bottom strand. The top strand and bottom strand are connected to the center air filtering portion. One or more fused regions are formed at the middle region where strands are fused. A wearer can increase the size of an ear loop by tearing, peeling or cutting the fused regions to separate the upper strand and lower strand from each other. The chord can be comprised of string or yarn.

[0014] Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example, the principles of the invention.

INTRODUCTION

[0015] A first aspect of the invention is a face mask that can be easily adjusted to accommodate for the size of a wearer's head.

[0016] A second aspect of the invention is a face mask with ear loops made from a

fabric material that can be adjusted by tearing or ripping to accommodate for the size of a wearer's head.

[0017] A third aspect of the invention is a face mask with ear loops that include tearable regions with perforations and/or notches.

[0018] A fourth aspect of the invention is a face mask with adjustable ear loops made from a flexible chord that can be adjusted by tearing or ripping its strands apart to accommodate for the size of a wearer's head.

Brief Description of the Figures

[0019] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0020] The summary above, as well as the following detailed description of illustrative embodiments, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the present disclosure, exemplary constructions of the disclosure are shown in the drawings. However, the disclosure is not limited to specific methods and instrumentalities disclosed herein. Wherever possible, like elements have been indicated by identical numbers.

[0021] **FIG. 1A** depicts a face mask with precut, adjustable ear loops and tearable regions, according to an embodiment of the invention.

[0022] **FIG. 1B** depicts a precut ear loop with a tearable region that has notches to assist a wearer in increasing its size, according to another embodiment of the invention.

[0023] **FIG. 1C** depicts a precut ear loop with a tearable region that has perforations to assist a wearer in increasing its size, according to another embodiment of the invention.

[0024] **FIG. 1D** depicts a precut ear loop with a tearable region that has perforations and notches to assist a wearer in increasing its size, according to another embodiment of the invention.

[0025] **FIG. 2A** depicts an alternative-shaped ear loop with a tearable region to assist a wearer in increasing its size, according to another embodiment of the invention.

[0026] **FIG. 2B** depicts an alternative-shaped ear loop with a tearable region to assist a wearer in increasing its size, according to another embodiment of the invention.

[0027] **FIG. 2C** depicts an alternative-shaped ear loop with a tearable region to assist a wearer in increasing its size, according to another embodiment of the invention.

[0028] **FIG. 2D** depicts an alternative-shaped ear loop with a tearable region to assist a wearer in increasing its size, according to another embodiment of the invention.

[0029] **FIG. 3** depicts the ear loop of **FIG. 2C** with a pre-torn tearable region, according to another embodiment of the invention.

[0030] **FIG. 4A** depicts an alternative design wherein ear loops are composed of an adjustable flexible chord with fused regions, according to another embodiment of the invention.

[0031] **FIG. 4B** depicts an alternative design wherein ear loops are composed of an adjustable flexible chord and fused at multiple regions, according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

[0032] Reference in this specification to "one embodiment/aspect" or "an embodiment/aspect" means that a particular feature, structure, or characteristic

described in connection with the embodiment/aspect is included in at least one embodiment/aspect of the disclosure. The use of the phrase "in one embodiment/aspect" or "in another embodiment/aspect" in various places in the specification are not necessarily all referring to the same embodiment/aspect, nor are separate or alternative embodiments/aspects mutually exclusive of other embodiments/aspects. Moreover, various features are described which may be exhibited by some embodiments/aspects and not by others. Similarly, various requirements are described which may be requirements for some embodiments/aspects but not other embodiments/aspects. Embodiment and aspect can be in certain instances be used interchangeably.

[0033] The terms used in this specification generally have their ordinary meanings in the art, within the context of the disclosure, and in the specific context where each term is used. Certain terms that are used to describe the disclosure are discussed below, or elsewhere in the specification, to provide additional guidance to the practitioner regarding the description of the disclosure. For convenience, certain terms may be highlighted, for example using italics and/or quotation marks: The use of highlighting has no influence on the scope and meaning of a term; the scope and meaning of a term is the same, in the same context, whether or not it is highlighted. It will be appreciated that the same thing can be said in more than one way.

[0034] Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein. Nor is any special significance to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for certain terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification including examples of any terms discussed herein is illustrative only, and is not intended to further limit the scope and meaning of the disclosure or of any exemplified term. Likewise, the disclosure is not limited to various embodiments given in this specification.

[0035] Without intent to further limit the scope of the disclosure, examples of instruments, apparatus, methods and their related results according to the embodiments of the present disclosure are given below. Note that titles or subtitles may be used in the examples for convenience of a reader, which in no way should limit the scope of the disclosure. Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure pertains. In the case of conflict, the present document, including definitions, will control.

[0036] The term “isotropic” or “isotropic material” refers to a material that exhibit identical values (e.g. strength and resiliency) when measured along axes in different directions.

[0037] The term “mechanical filter” refers to a respirator that retains particulate matter such as dust primarily by interception and impaction with fibers of the respirator.

[0038] The term “notch” refers to a hole, slit or gap in a material such as the fabric of an ear loop.

[0039] The term “perforation” refers to a series of holes, often made by piercing, that serve to aid in tearing, cutting or ripping.

[0040] Other technical terms used herein have their ordinary meaning in the art that they are used, as exemplified by a variety of technical dictionaries.

Description of Preferred Embodiments

[0041] The invention includes a mask with adjustable ear loops made from flexible and/or elastic fabric. FIG. 1A depicts a mask **100** that includes ear loops according to one aspect of the invention. The center portion (shaded area) can be composed of a

conventional mask material that filters air. In normal use, this portion covers the mouth and nose of a wearer. It can filter inhaled air, to protect a wearer from dust, germs or particulate matter in the air. It can also filter exhaled air to prevent the spread of germs (e.g. bacteria or viruses) from the wearer to others. The mask can be made for single use (i.e. disposable).

[0042] FIG. 1B depicts an ear loop of the mask **100** in greater detail. Each ear loop includes a precut opening **120** to secure over or around the ear of a wearer. The size of each ear loop can be adjusted to accommodate for the size of the wearer's head. In a preferred design a tearable portion that includes notches **110** is adjacent to the precut ear loop. The tearable portion allows a wearer easily increase the size of the ear loops to an appropriate size by tearing or cutting the fabric.

[0043] As shown, notches form the tearable region and extend away from the center of the mask. The notches permit tearing along a pre-determined region (i.e. tearable line). The notches can also prevent further propagation of a tear when force is exerted upon the mask. That is, force from wearing the mask will not further tear the region. Instead, the force will be directed away from the tearable region. This prevents undesired tearing or augmentation of the size of the ear loops during normal wear. It also prevents users from over tearing, (i.e. a "runaway tear") or creating a hole that is larger than needed. It is also possible to reinforce the fabric around each notch, for example, with stitching or thicker fabric.

[0044] The notches on the ear loops can also provide feedback to the wearer when he/she tears to increase the size of the ear loops. This feedback can provide the user with an indication to stop further tearing. More specifically, it halts/seizes the propagation of the tear by redirecting the force away from the tear line.

[0045] For example, the initial tearing may require slight effort from the user. After the tear reaches the first notch, more force is necessary to instigate additional tearing to

the second notch. This pattern continues as the wearer tears from the second notch to the third notch. This feedback is present with both manual tearing and when using a tool to cut the material. The wearer can continue tearing until the mask fits comfortably but is also sufficiently snug so that it stays in place.

[0046] Predetermined sections such as notches on each side of the mask also ensure consistent adjustment when replacing the mask. When a wearer replaces a mask, he/she can quickly adjust the size of the ear loops of the new mask to match those of a mask that had been previously worn. For example, a mask may fit a wearer appropriately when the size of each ear loop is increased to the first notch. The wearer can quickly make the adjustment by tearing each side to the first notch before donning the mask.

[0047] FIG. 1C also depicts an ear loop in greater detail. In this alternative design, a tearable portion that includes perforations **130** is adjacent to the ear loop **120**. FIG. 1D depicts a design with a tearable region that includes both perforations and notches **135**. The tearable region can be marked by, for example, a dashed line to make it more apparent to a wearer.

[0048] In order to increase the size of the ear loop, the wearer tears or cuts along the notches, perforation or aforementioned line, thereby reducing the amount of tension in the ear loops when the mask is donned. This can be done in a stepwise manner, to a point where it is comfortable for the wearer, while at the same time offering the suitable amount of tension appropriate to secure the mask.

[0049] A line can be printed along the tearable region to indicate where the ear loop should be torn. In another embodiment, this line is perforated so as to facilitate the act of tearing the fabric and to control the direction of the tear. In another embodiment, this line is curved. In yet another embodiment, there are two or more sections that can be torn (not shown).

[0050] In an alternative design, the tearable portion can be physically altered (e.g. folded or creased). This can be practical when the mask is constructed with certain types of material. As with notches or markings, the alteration can make the tearable region more apparent to the wearer. Further, the alteration can help maintain a tear along the tearable region so that other regions of the ear loop are not torn.

[0051] The fabric of the ear loop portions of the mask can be made of a thin elastic polymer layer that has high elasticity sandwiched between one or more layers of woven fabric. This fabric may not have as high an elasticity or yield strength as the elastic polymer layer, and can be woven in a way such that it can accommodate stretching. In addition, the elastic fabric can be made from materials and/or designed such that it can be easily torn without use of any cutting tools, but strong enough such that it does not fail (i.e. rip or tear) while the mask is donned.

[0052] The notches can be marked to indicate both the direction of tearing as well as stopping points. The distance between the notches can be large enough so that there is a significant reduction in tension with each tear, while at the same time short enough so as not to hinder the tearing process. The notches **110** can be equidistant from each other or substantially equidistant from each other as depicted in FIG. 1B. In the alternative, they can be spaced appropriately to improve the design and use of the mask. For example, notches that are further from the ear loop can be placed closer together. The first few notches can allow a wearer to quickly adjust the size of the ear loops for use. The remaining notches can allow fine adjustment for maximum comfort (not shown).

[0053] FIG. 2A depicts an alternative-shaped ear loop design with a triangular shape **140**. The precut opening also has a triangular shape **150**. Here, the tearable region has perforations and notches **135**. The tearable region extends horizontally, away from the center of the mask. The wearer can tear along the tearable region to increase the size of the ear loops. The shape can be preferred over conventional

shapes for comfort and an improved fit.

[0054] FIG. 2B depicts an ear loop **160** with a curved shape that can be more ergonomic to a wearer. Here, the precut ear loops extend from horizontal to an approximately 45 degree angle from horizontal. The precut opening **165** is similarly shaped. The tearable region **135** follows the angle of the precut opening (at approximately 45 degrees from horizontal). This can be a preferred design for a user based on the size of a wearer's head, his/her facial features and whether he/she prefers to wear a mask at a lower angle than a normal wearer. As with other designs, the wearer can tear along the tearable region **135** to increase the size of the ear loop. Here, the tearable region **135** includes perforations and notches. In this design, the size of the ear loops increase at an angle, rather than horizontally.

[0055] FIG. 2C depicts an alternative-shaped ear loop **170** with a precut region of elliptical shape **180**. FIG. 2D depicts an ear loop of similar design **190** with a tapered elliptical shaped precut region **210**. In both designs, the tearable region **135** includes perforations and notches for tearing.

[0056] With the designs that have notches (as depicted in the FIG. 1D – 3), a wearer can tear along a marked (dashed) line to the first notch to increase the size of the ear loop. If the mask feels tight, he/she can tear along the line further to increase the size of the ear loops further. Although three notches are present in the figures, the designs can include additional or fewer notches.

[0057] FIG. 3 depicts the ear loop of FIG. 2C with a partially pre-torn tearable region **145**. A pre-torn region provides at least two advantages. First, it presents a conspicuous starting point for a wearer to tear the mask. As the region is already partially torn, it will be more intuitive to continue tearing along the notched, marked or perforated line. Second, the precut sections cause the elastic fabric to fold over when it is worn over the ear. This increases the surface area of the elastic fabric that is in

contact with the ear, thus reducing the amount of pressure on that surface. Ultimately, this means that the user will be able to don the mask for longer periods of time without having to adjust or remove the mask due to discomfort to the ears. Such pre-torn regions can be marked or unmarked.

[0058] In an alternative embodiment, the mask **200** can include ear loops made from a chord, string, yarn or a similar elastic or flexible material as depicted in FIG. 4A. In a preferred design, the ear loops are made of a single elastic string **220** that is joined at two or more points **225** to a side of the center portion of a mask. One or more portions of the string are “fused” together **230**. The user can increase the length of the string (and size of ear loops) by tearing regions at one or more fused points **230**.

[0059] Points on the string that are fused together function as tearable regions. A wearer dons the mask by inserting an ear through the ear loop which results in a tension in the string. Each of the fused points in the string can be broken or torn, with or without the aid of tools, to increase the size of the ear loop. Thus, the user can effectively increase the length of the chords (and size of the ear loops) by breaking or tearing the fused points from one another. The user can do so until the mask is comfortable while maintaining sufficient tension to firmly secure the mask to his/her face. Although two fused points **230** are depicted on the chord **220** in FIG. 4A, the ear loop can include more than two fused points. In an alternative design, the chord can have a single fused point (now shown). The fused point can extend substantially along the length of the ear loop. The user can peel the strands apart to increase the size of the ear loop.

[0060] FIG. 4B depicts a similar ear loop design **200** made from a chord, string, yarn or a similar elastic or flexible material **220**. The ear loops are joined at two points **225** to the center portion of a mask. In a preferred design, they are joined at an upper point and a lower point. Points on the string are fused together **230** to function as tearable regions. Here, there is an upper fused point (a first tearable region) and a

lower fused point (a second tearable region). The user can increase the length of the string (and size of ear loops) by tearing these regions. This design can permit adjustment to accommodate a wearer's head, his/her facial features and whether he/she prefers to wear a mask at a higher/lower angle.

WORKING EXAMPLE

Use of the invention to improve the fit of a disposable mask

[0061] In typical use of the invention, a wearer inserts his or her ear into a first ear loop. If necessary, the wearer can increase the size of the ear loop by tearing along a tearable section adjacent to the ear loop. More specifically, predetermined sections of the ear loops (i.e. tearable regions) can be torn or cut to effectively increase the size of the ear loop opening, thereby reducing the tension from the ear loops. The tearable region can include notches and/or a perforated region. The wearer can increase the size of the ear loop by tearing the tearable region to accommodate the size of his/her head.

[0062] The wearer can then insert his or her other ear into the second ear loop. The second ear loop also include a tearable region. As above, the wearer can increase the size of the second ear loop by tearing as described above.

[0063] After the mask is placed around both ears, the wearer can make additional adjustments (i.e. further increase the size of one or both ear loops by tearing). The wearer can adjust the ear loop size so that the mask fits comfortably and firmly over his/her face. The wearer can continue to increase the size of the ear loops so that the mask is both comfortable and sufficiently tight for use.

[0064] In a preferred design, the masks are intended for single use (i.e. disposable). Thus a wearer can become familiar with the number of notches torn on each side for ideal fit. This allows one to quickly and easily adjust the size of each ear loop to a

preferred size for each use.

[0065] It will be appreciated that variations of the above disclosed and other features and functions, or alternatives thereof, may be combined into other systems or applications. Also, various unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

[0066] Although embodiments of the current disclosure have been described comprehensively, in considerable detail to cover the possible aspects, those skilled in the art would recognize that other versions of the disclosure are also possible.

What is claimed is:

1. A single piece face mask composed of
 - a) a center portion that filters exhaled and inhaled air;
 - b) a first ear loop with a tearable region; and
 - c) a second ear loop with a tearable region,wherein the first ear loop and second ear loop flank the center portion and each includes an opening for a wearer to secure around an ear;
wherein the size of the opening of the first ear loop is increased by tearing or cutting the tearable region of the first ear loop;
wherein the size of the opening of the second ear loop is increased by tearing or cutting the tearable region of the second ear loop,
wherein the tearable region of the first ear loop and the tearable region of the second ear loop include one or more notches to assist the wearer in increasing the size of the openings by tearing or cutting; and
wherein the one or more notches prevent additional tearing to the tearable regions after the face mask is donned.
2. The single piece face mask of claim 1, wherein the tearable region of the first ear loop and the tearable region of the second ear loop are perforated to assist the wearer in increasing the size of the openings by tearing or cutting.
3. The single piece face mask of claim 1, wherein the notches provide feedback to the user by increasing the force necessary to instigate additional tearing from each notch.
4. The single piece face mask of claim 1, wherein the single piece face mask is comprised of a fabric material.

5. The single piece face mask of claim 1 or 2, wherein the tearable region of the first ear loop and the tearable region of the second ear loop are partially torn to assist a wearer in identifying the tearable regions and decrease the resistance to tearing.
6. The single piece face mask of claims 1, wherein the center portion is composed of an elastic fabric, and
wherein the first ear loop and the second ear loop are composed of an elastic chord, band, string or yarn.
7. A face mask composed of a center air filtering portion and two precut ear loop regions that flank the center air filtering portion,
wherein each precut ear loop region includes one or more perforated sections,
wherein the size of a precut ear loop region is increased by tearing or cutting said one or more perforated sections, and
wherein the one or more perforated sections include one or more notches to assist the wearer with tearing or cutting, wherein the notches prevent undesired tearing of the perforated sections by directing forces away from the perforated sections after a wearer dons the face mask.
8. The single piece face mask of claim 7, wherein the two precut loop regions are the shape of at least one of a slit, square, triangle, oval or cylinder.
9. The single piece face mask of claim 7, wherein a portion of each perforated section is partially torn to assist a wearer in identifying the perforated section and decrease the resistance to tearing.
10. The single piece face mask of claim 7, wherein the notches provide feedback to the user by increasing the force necessary to instigate additional tearing from each notch.
11. The single piece face mask of claims 7, wherein the center air filtering portion and the two precut ear loop regions are composed of an elastic fabric.

12. A face mask composed of a center air filtering portion, a first ear loop and a second ear loop that flank the center air filtering portion,

wherein each ear loop is comprised of a chord;

wherein each chord has a middle region, a top end and a bottom end, such that said top end and said bottom end are connected to the center air filtering portion;

wherein one or more portions of the chord are fused in the middle region to form one or more fused points that function as tearable regions; and wherein the size of the first ear loop and the size of the second ear loop can be increased by tearing the one or more fused points.

13. The face mask of claim 12, wherein the chord is comprised of string or yarn.