



(43) International Publication Date
25 September 2014 (25.09.2014)

- (51) International Patent Classification:
A62B 18/08 (2006.01) *A62B 23/02* (2006.01)
- (21) International Application Number:
PCT/US2014/027026
- (22) International Filing Date:
14 March 2014 (14.03.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/783,366 14 March 2013 (14.03.2013) US
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- (81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

- (84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: QUICK DON HEAD HARNESS

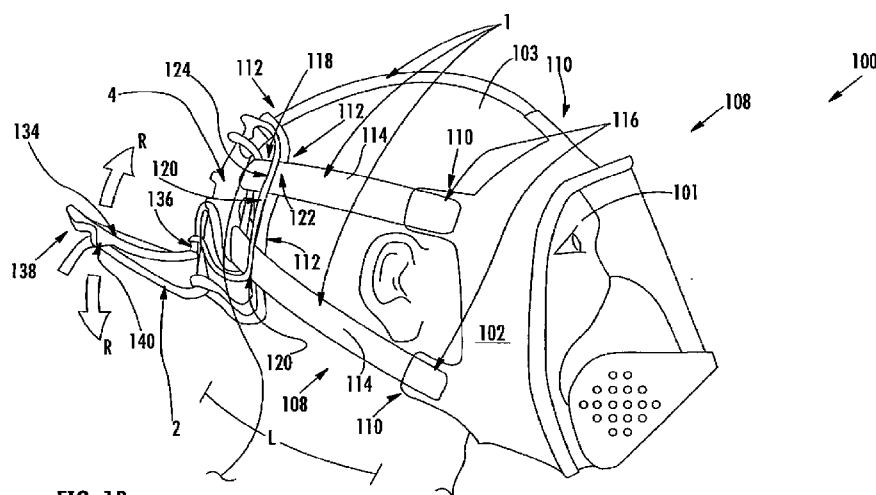


FIG. 1B

(57) Abstract: A head harness is provided for securing a face shield to a user's face. The head harness includes a plurality of restraining straps configured to secure a face shield to a user's head. The restraining straps extend from the face shield to the back of the user's head. Each of the restraining straps have a first end and a second end. The first end is attached to the face shield. The second end extends to the back of the user's head and partially backtracks to the first end to form a strap loop. The strap loop defines an opening. The head harness also includes a tightening cord. A portion of the tightening cord passes through the openings of each of the restraining straps. The tightening cord defines a loop length through the openings. The tightening cord is configured to impart movement of the restraining straps based on the loop length such that restraining straps contract radially inward as the loop length is reduced.

QUICK DON HEAD HARNESS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a non-provisional application that claims priority to and the benefit of the filing date of U.S. Provisional Application No. 61/783,366, filed on March 14, 2013, and entitled “QUICK DON HEAD HARNESS,” which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] The subject matter described and/or illustrated herein relates generally to head harnesses, and more particularly, to head harnesses for respiratory protection face pieces.

[0003] Typically head harness for respiratory protection face pieces employ the tightening of multiple straps of the head harness system to affect a seal of a face piece seal to a face of a user. Tightening multiple straps can be time consuming and undesirable when trying to respond quickly to a situation. It is desirable that the user could quickly tighten the face piece through the use of a single motion.

[0004] Several methods of adjustment of the straps and different strap configurations are known in an effort to speed donning of the facemask. Typically the method most often seen in the field is multiple straps with multiple tightening points. Typically efforts result in increased complexity of the head harness which can also result in a decrease in fit performance as the user is not able to tighten the harness properly.

SUMMARY

[0005] In accordance with one embodiment, a head harness is provided. The head harness includes a plurality of restraining straps configured to removably secure a face shield to a head of the user. The restraining straps extend from the face shield to the back of the user's head. Each of the restraining straps have a first end and a second end. The first end is attached to the face shield. The second end extends to the back of the user's head and partially backtracks to the first end to form a strap loop. The strap loop defines an opening therein. The head harness also includes a tightening cord. A portion of the tightening cord passes through the

openings of each of the restraining straps. The portion defines a loop length. The tightening cord is configured to impart movement of the restraining straps based on the loop length such that the restraining straps contract radially inward as the loop length is reduced.

[0006] In certain embodiments, the head harness further comprises a head harness carrier configured to engage a portion of the restraining straps at the second end. The head harness may include a tightened configuration wherein the loop length of the tightening cord is reduced to reduce a strap length between the head harness carrier and the face shield, and a loosened configuration wherein the loop length is increased to elongate the strap length between the head harness carrier and the face shield. The restraining straps cause the face shield to create a uniform pressure seal with the user's face when the head harness is in the tightened configuration.

[0007] In certain embodiments, the head harness carrier comprises a non-rigid structure. The tightening cord includes a first end and a second end. The first end is secured to a head harness carrier. The second end has a pull-tab secured thereto. The pull-tab is configured to be grasped by the user. The tightening cord may extend through an orifice providing a friction fit to maintain the loop length of the tightening cord.

[0008] In certain embodiments, the head harness further comprises a center lever coupled to the tightening cord. The center lever is configured to change the loop length. The first and second ends of the restraining straps define a strap length therebetween. The strap length is adjustable based on the loop length. The tightening cord is configured to concurrently adjust a length of each of the restraining straps.

[0009] In an embodiment, a facemask respirator is provided. The facemask respirator includes a face shield configured to at least partially cover a portion of a face of a user. The facemask respirator also include a plurality of restraining straps configured to removably secure the face shield to a head of a user. The restraining straps extend from the face shield to a back of the user's head. The restraining straps each have a first end and a second end. The first end is attached to the face shield. The second end terminates at the back of the user's head. The second end at least partially backtracks toward the first end forming a strap loop defining an opening therein. The facemask respirator includes a head harness carrier configured to engage a

portion of the restraining straps at the second end. The facemask respirator also includes a tightening cord. A portion of the tightening cord passes through the openings of each of the restraining straps. The tightening cord defines a loop length through the openings. The tightening cord is configured to impart movement of the restraining straps based on the loop length such that restraining straps contract radially inward as the loop length is reduced.

[0010] In certain embodiments, the head harness carrier is shaped to conform to the shape of a head of the user. The head harness may include a tightened configuration wherein the loop length of the tightening cord is reduced to reduce a strap length between the head harness carrier and the face shield, and a loosened configuration wherein the loop length is increased to elongate the strap length between the head harness carrier and the face shield. The restraining straps cause the face shield to create a uniform pressure seal with the user's face when the head harness is in the tightened configuration.

[0011] In certain embodiments, the head harness carrier comprises a non-rigid structure. The tightening cord includes a first end and a second end. The first end is secured to a head harness carrier. The second end has a pull-tab secured thereto. The pull-tab is configured to be grasped by the user. The tightening cord may extend through an orifice providing a friction fit to maintain the loop length of the tightening cord.

[0012] In certain embodiments, the head harness further comprises a center lever coupled to the tightening cord. The center lever is configured to change the loop length. The first and second ends of the restraining straps define a strap length therebetween. The strap length is adjustable based on the loop length. The tightening cord is configured to concurrently adjust a length of each of the restraining straps.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Figure 1A is an illustration of a front perspective view of a facemask respirator formed in accordance with an embodiment.

[0014] Figure 1B is an illustration of a side perspective view of a facemask respirator formed in accordance with an embodiment.

[0015] Figure 2 is an illustration of a back perspective view of a loosened head harness of a facemask respirator formed in accordance with an embodiment.

[0016] Figure 3 is an illustration of a back perspective view of a tightened head harness of a facemask respirator formed in accordance with an embodiment.

DETAILED DESCRIPTION

[0017] The subject matter described herein includes a head harness for a full facemask respirator that tightens quickly using a single action or motion to tighten a plurality of restraining straps that are connected to the facemask respirator. The subject matter described herein employs the use of a cord to feed through each restraining strap of the harness to simultaneously pull each of the restraining straps tight using a single motion. This allows a user wearing the facemask respirator to quickly tighten the harness using one motion. As such, this speeds the donning time from having to adjust several straps individually.

[0018] Figure 1A is an illustration of a front perspective view of a facemask respirator 100 for protecting a user from environmental elements. First responders, firefighters, rescue workers, and/or others working in environments where contaminants may be present may wear the facemask respirator 100. A user may don the facemask respirator 100 to protect at least a portion of a face 101 of the user's head 103 from physical debris and/or to provide breathable air. The facemask respirator 100 may be used for any of a number of applications, such as self-contained breathing apparatus (SCBA) applications, air purification respirator (APR) applications, and/or the like. The facemask respirator 100 provides a seal with the user's face 101 that meets the requirements of one or more category of respirator for convertibility to each of the environments in which the user may embark.

[0019] The facemask respirator 100 includes a face shield 102 configured to cover at least a portion of the user's face 101. In the illustrated embodiment, the face shield 102 holds a lens 104 and an air-purifying cartridge 106. The face shield 102 may also be referred to as a "facepiece" herein. The facemask respirator 100 is configured to be secured to the user's head 103 by a head harness 108 (also shown in Figure 1B) having a plurality of restraining straps 1 and a tightening cord 2 (shown in Figure 1B) such that the facemask respirator 100 may be quickly and removably secured to the user's head 103 using one motion by pulling the tightening

cord 2. For example, the facemask respirator 100 may be tightened or loosed using one-handed operation.

[0020] The facemask respirator 100 may be adapted to provide breathing gas to the user and/or to filter breathing air for the user, which includes air that has been filtered or otherwise treated so that airborne contaminants are removed therefrom. In the illustrated embodiment, the facemask respirator 100 includes the air purifying cartridge 106 to serve as a respirator, however, the facemask respirator 100 may alternatively include attachments for hoses for delivering breathable gas from a gas cylinder (not shown), as well as adapters to accept hoses, filters and/or regulators specific to particular duties or to be used in particular environments.

[0021] The facemask respirator 100 may cover the eyes, nose and mouth of the user for protecting the user from airborne contaminants. In the illustrated embodiment, the facemask respirator 100 is shown as a full facemask (e.g., constructed to cover the eyes as well as the mouth and nose), however, in other embodiments, other configurations are possible. For example, the facemask respirator 100 may be a half facemask (e.g., constructed to cover the mouth and nose but not the eyes) or a quarter mask (e.g., constructed to cover the nose and mouth but not extend under the chin), or the mask may be another type of face covering.

[0022] Figure 1B is an illustration of a side perspective view of the facemask respirator 100 donned on the user's head 103. The facemask respirator 100 includes the head harness 108 having the plurality of restraining straps 1 configured to removably secure the face shield 102 to the user's head 103. In the illustrated embodiment, the head harness 108 includes two restraining straps 1 on each side of the head 103, but the head harness 108 may include any number of restraining straps 1. For example, the head harness 108 may include three, four, or five restraining straps 1 that at least partially extend around the head 103. As illustrated, one of the restraining straps 1 extends above an ear of the user, while another restraining strap 1 extends below the ear of the user, and yet another restraining strap 1 extends over the top of the head 103. The restraining straps 1 extend from the face shield 102 to the back of the head 103. The restraining straps 1 each have a first end 110 attached to the face shield 102, and a second end 112, or endpoint, which terminates at the back of the user's head 103. The restraining straps 1 have a body 114 extending from the first end 110 to the second end 112. The first end 110 is attached to a portion the face shield 102. In the illustrated embodiment, buckles 116 are used to

secure the first end 110 to the face shield 102, however, in other embodiments, other fastening means may be used. For example, ladder style clips, clasps, buckles, fasteners (e.g., Velcro) or the like may be used. The second end 112 at least partially backtracks towards the first end 110 forming a loop defining an opening 118 therein. For example, a portion of the restraining strap 1 may be folded at the second end 112. The restraining straps 1 may be made of any flexible material, such as a plastic material (e.g., nylon).

[0023] The head harness 108 may include a head harness carrier 4 configured to engage a portion of the restraining straps 1 at the second end 112. The head harness carrier 4 may be referred to herein as the “carrier” or “harness carrier.” The carrier 4 includes a plurality of ladder locks 120 configured to movably hold each of the restraining straps 1 such that the restraining straps 1 can move relative to the ladder lock 120, but the restraining straps 1 cannot be removed from the carrier 4. For example, the second end 112 of one of the restraining straps 1 may be threaded through, or enter, a first slit 122 in the ladder lock 120. The restraining strap 1 may then exit out of a second slit 124 and wrap around or backtrack toward the first end 110. The first end 110 and the second end 112 of the restraining straps define a strap length L of the body 114. As such, the strap length L may be a distance between the face shield 102 and the carrier 4. The strap length L may be adjusted by backtracking more of the body 114 at the second end 112. Alternatively, the strap length L may be based on a loop length as described below.

[0024] The carrier 4 may be configured to protect the user’s head 103 from the restraining straps 1 and/or the tightening cord 2. For example, the carrier 4 may be positioned between the straps 1 and the user’s head 103 to prevent movement of the restraining straps 1 from interfering with the user’s head 103 (e.g., entangling the restraining straps 1 with hair and/or pinching skin on the back of the head 103). Additionally, the carrier 4 may be made of a non-rigid, deformable material, such as a plastic material. The carrier 4 may be shaped to conform to the contour of the user’s head 103. For example, the carrier 4 may be concave or bowl-shaped to fit on the back of the head 103.

[0025] The head harness 108 includes a loosened configuration, or expanded state, for loading operation. In the loosened configuration, the strap length L between the head harness carrier 4 and the face shield 102 is elongated, or increased. The head harness 108 also includes a tightened configuration, or contracted state. In the tightened configuration, the strap length L is

reduced, or decreased. In operation, the user dons the head harness 108 in the loosened configuration. Once situated on the user's head 103, the user pulls the tightening cord 2 to enter the tightened configuration to secure the head harness 108 to the user's head 103.

[0026] Figure 2 is an illustration of a back perspective view of the head harness 108 in the loosened configuration. The tightening cord 2 includes a first end 126 and a second end 128. The first end 126 is be securely fixed to the carrier 4 such that the first end 126 is restricted to the carrier 4. In the illustrated embodiment, the first end 126 is secured to the carrier 4 by extending through a first orifice 130 (e.g., a hole) in the carrier 4. The first end 126 is then secured (e.g., tied in a knot) to prevent the tightening cord 2 becoming released from the carrier 4. The second end 128 may be unconstrained such that the second end 128 is free to move. Optionally, the carrier 4 may include a second orifice 132 configured to retain the tightening cord 2 proximate to the second end 128 to the carrier 4. In other embodiments, the second orifice 132 may be a channel or a groove in which the tightening cord 132 lies. As yet another option, as discussed below, the second end 128 may include fixtures attached thereto that are configured to allow the user to quickly grasp the tightening cord 2.

[0027] The tightening cord 2 loops to and through each of the openings 118 of the restraining straps 1. The tightening cord 2 is configured to impart movement of the restraining straps 1. When the tightening cord 2 is loose, the tightening cord 2 allows the restraining straps 1 to pull out further from the carrier 4 allowing the head harness 108 to be quickly donned on the user. As such, the strap length L (shown in Figure 1B) is elongated or increased when the loop length is increased. The strap length L, or distance between the harness carrier 4 and the face piece, is selectively chosen (e.g., maximized) when the tightening cord 2 is in relaxed. Conversely, the strap length L is shortened when the tightening cord is pulled and the loop length is shortened. When the tightening cord 2 is pulled tight, the tightening cord 2 pulls all of the restraining straps 1 together closer to one another causing the face shield 102 to form a seal against the face 101 of the user. In this manner, the tightening cord 2 provides a single tightening point to simultaneously tighten each of the restraining straps 1.

[0028] A portion of the tightening cord 2 defines the loop length. The loop length, as used herein, may be the amount of tightening cord 2 that travels through each of openings 118 of the restraining straps 1. The loop length may govern the movement of the tightening straps 1.

The tightening cord 2 may form a round loop held in a circular or semi-circular shape. However, in other embodiments, other shapes may be used that variously surround a center. The loop has a first diameter D1 when in the tightening cord 2 is loose. Pulling on the tightening cord 2 changes the loop length, and the first diameter D1, to impart movement of the restraining straps 1 such that restraining straps contract radially inward as the loop length is reduced. The size, or circumference, of the loop varies as the as the loop length varies. For example, tightening cord 2 causes the loop to have a shorter loop length in the tightened configuration (shown in Figure 2) as compared to the loosen configuration. The tightening straps 1 move axially along the body 114 such that the second ends 112 of each restraining straps 1 move toward one another when the loop length is caused to be shortened. As such, in the tightened configuration, the loop length is reduced to reduce strap length L (shown in Figure 1B) and draw the carrier 4 closer to the face shield 102 (shown in Figures 1A and 1B). Conversely, in the loosened configuration, the loop length is increased to elongate or increase the strap length L. As shown in Figure 3, in the loosened configuration, the tightening cord 2 may be substantially captured by the carrier 4. The first end 126 may be secured to the carrier 4 by the first orifice 130. The second end 128 may be captured by the second orifice 132 such that the tightening cord 2 may not extend further into the openings 118. In other words, the second orifice 132 limits the loop length.

[0029] The second orifice 132 may provide a friction fit with the tightening cord 2 to maintain the loop length of the tightening cord 2. As another option, the tightening cord 2 may include another retaining member in addition to, or in place of, the second orifice 132 to adjust and/or maintain the loop length. For example, the retaining member may include, but is not limited to, a cord lock, buckle, ladder clip and/or the like.

[0030] Figure 3 is an illustration of a back perspective view of the head harness 108 in the tightened configuration. As shown in Figure 3, the tightening cord 2 is pulled in the direction P such that the loop length has been reduced to cause the restraining straps 1 to be drawn close to one another. In other words, when the tightening cord 2 is pulled, the restraining straps 1 contract or move radially inward in the direction Q. In the tightened configuration, the loop has a second diameter D2 that is smaller than the first diameter D1 shown in Figure 2. The tightening cord 2 extends to and through each of the openings 118 of the restraining straps 1. As such, tightening the tightening cord 2 imparts concurrent movement of each of the restraining

straps 1 such that the second ends 112 of each of the restraining straps 1 move toward one another substantially in unison. In this manner, the restraining straps 1 causes the face shield 102 to be secured to the user's head 103 and create a uniform pressure seal with the user's face 101 (shown in Figure 1A) when the head harness 108 is in the tightened configuration. The single tightening cord 2 allows quick tightening and loosening of the head harness 108 so that the use may quickly don the facemask respirator 100.

[0031] Seal of the face shield 102 against the face 101 may be desirable (e.g., to keep harmful elements in the environment out of the facemask respirator 100). Comfort in the fit of the facemask respirator 100 to the face 101 also may affect fit factor. For example, if one or more of the restraining straps 1 move relatively more than another, uneven wear may result on one or more locations on the face shield 102 resulting in discomfort. Additionally, the user may improperly don and tighten the facemask respirator 100 in an attempt to avoid such discomfort. By concurrently tightening each of the restraining straps 1, (e.g., shortening the strap length) such uneven wear and discomfort may be avoided.

[0032] The tightening cord 2 may include fixtures attached thereto that are configured to allow the user to quickly grasp the tightening cord 2. Once grasped, the tightening cord 2 allows head harness 108 to be tightened using a single motion (e.g., a pulling motion). The user may pull the fixture to change the loop length. For example, in the illustrated embodiment, the tightening cord 2 includes a pull tab 3 configured to be quickly grasped by the user. The pull tab 3 is securely affixed to the tightening cord 2 proximate to the second end 128. As shown, the pull tab 3 is securely fixed to the tightening cord 2 by extending through an opening in the pull tab 3. However, any means may be used to secure the tightening cord 2 to the pull tab 3, such as, a knot, a fastener, an adhesive, and/or the like. The pull tab 3 may be sized and shaped to allow the user to pull or tightening cord 2 using one-handed operation. In the illustrated embodiment, the pull tab 3 is sized and shaped to be grasped by a finger, however, the pull tab 3 may be any shape and shape. For example, the pull tab 3 may be a handle, a dowel, or the like.

[0033] Returning to the discussion of Figure 1B, the head harness 108 may include a center lever 134 coupled to the tightening cord 2. The center lever 134 may be referred to herein as an "over center cam lever." The center lever 134 is configured to change the loop length to tighten or loosen the tightening cord 2. When the center lever 134 is flipped up, the loop length

of the tightening cord 2 reduces. Flipping the center lever 134 pulls the restraining straps 1 and translates to a force acting upon the face shield 102 or a face seal. In the illustrated embodiment, the center lever 134 is fixed to the carrier 4 at a proximal end using a threaded fastener 136 (e.g., a screw). However, any fastening means may be used. The center lever 134 may be fixed to the carrier 4 using any securing means, such as an adhesive. The center lever 134 includes a finger grip 138 at a distal end. The finger grip 138 is configured to receive the finger of the user to allow the user to quickly grasp and pull the center lever 134. The center lever 134 may be actuated in either direction R to tighten the tightening cord 2. The tightening cord 2 may be threaded through a ratcheting mechanism 140 in the center lever 134 to allow the tightening cord 2 to remain substantially tightened when the center lever 134 is actuated. For example, the ratcheting mechanism 140 may be configured to allow the tightening cord 2 to travel only in one direction. Optionally or alternatively, the center lever 134 may include a release mechanism (not shown) to allow the tightening cord 2 to relax.

[0034] In various embodiments, the head harness 108 may use any means to tighten or loosen the tightening cord 2. Similarly, the head harness 108 may use any means to encourage the head harness 108 to remain in the tightened or loosened configuration. For example, the tightening cord 2 may include a cord lock (not shown) having an engagement member (not shown) that is selectively engageable with the tightening cord 2 to clamp the cord lock to the tightening cord 2 and thereby maintain a position of the cord lock along the tightening cord 2 (thereby maintaining the tightness of the tightening cord 2). Optionally, the restraining straps 1 and/or the tightening cord 2 may be elastic to facilitate maintaining a tightened configuration.

[0035] Although the head harness 108 includes the restraining straps 1 and the tightening cord 2 in the embodiments described herein, the head harness 108 may include any suitable structure, mechanism, means, and/or the like that enables the head harness 108 to be tightened and loosened using a single cord engagement mechanism. For example, a single pull cord, an over center cam lever, a neckband and ratchet assembly for adjusting the loop length, a buckle, and/or the like may be used.

[0036] A technical effect of embodiments described herein is a respirator that can be donned using a single motion.

[0037] It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments (and/or aspects thereof) may be used in combination with each other. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope. While the dimensions, types of materials and coatings described herein are intended to define the parameters of the invention, they are by no means limiting and are exemplary embodiments. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means – plus-function format and are not intended to be interpreted based on 35 U.S.C. § 112 (f), unless and until such claim limitations expressly use the phrase “means for” followed by a statement of function void of further structure.

CLAIMS

WHAT IS CLAIMED IS:

1. A head harness comprising:
 - a plurality of restraining straps configured to removably secure a face shield to a head of a user, the restraining straps extending from the face shield to a back of the user's head, the restraining straps each having a first end and a second end, the first end attached to the face shield, the second end terminating at the back of the user's head, the second end at least partially backtracking toward the first end forming a strap loop defining an opening therein;
 - a portion of a tightening cord passing through the openings of each of the restraining straps; the portion of tightening cord defining a loop length;
 - wherein the tightening cord is configured to impart movement of the restraining straps based on the loop length such that restraining straps contract radially inward as the loop length is reduced.
2. The head harness of claim 1, wherein the tightening cord provides a single tightening point to simultaneously tighten each of the restraining straps.
3. The head harness of claim 1, further comprising a head harness carrier configured to engage a portion of the restraining straps at the second end.
4. The head harness of claim 3, wherein the head harness includes a tightened configuration wherein the loop length of the tightening cord is reduced to reduce a strap length between the head harness carrier and the face shield, and a loosened configuration wherein the loop length is increased to elongate the strap length between the head harness carrier and the face shield.
5. The head harness of claim 4, wherein the restraining straps cause the face shield to create a uniform pressure seal with the user's face when the head harness is in the tightened configuration.
6. The head harness of claim 3, wherein the head harness carrier comprises a non-rigid structure shaped to conform to the head of the user.
7. The head harness of claim 1, wherein the tightening cord includes a first end and a second end, the first end secured to a head harness carrier, the second end having a pull-tab secured thereto, the pull-tab configured to be grasped by the user.

8. The head harness of claim 7, wherein tightening cord extends through an orifice providing a friction fit to maintain the loop length of the tightening cord.

9. The head harness of claim 1, further comprising a center lever coupled to the tightening cord, the center lever configured to change the loop length.

10. The head harness of claim 1, wherein the first end and the second end of the restraining straps define a strap length therebetween, the strap length being adjustable based on loop length.

11. A facemask respirator comprising:
a face shield configured to at least partially cover a portion of a face of a user;
a plurality of restraining straps configured to removably secure the face shield to a head of a user, the restraining straps extending from the face shield to a back of the user's head, the restraining straps each having a first end and a second end, the first end attached to the face shield, the second end terminating at the back of the user's head, the second end at least partially backtracking toward the first end forming a loop defining an opening therein;
a head harness carrier configured to engage a portion of the restraining straps at the second end; and
a tightening cord passing through the openings of each of the restraining straps; the tightening cord defining a loop length through the openings;
wherein the tightening cord is configured to impart movement of the restraining straps based on the loop length such that restraining straps contract radially inward as the loop length is reduced.

12. The facemask respirator of claim 11, wherein the tightening cord provides a single tightening point to simultaneously tighten each of the restraining straps.

13. The facemask respirator of claim 11, wherein the head harness includes a tightened configuration wherein the loop length of the tightening cord is reduced to reduce a strap length between the head harness carrier and the face shield, and a loosened configuration wherein the loop length is increased to elongate the strap length between the head harness carrier and the face shield.

14. The facemask respirator of claim 13, wherein the restraining straps cause the face shield to create a uniform pressure seal with the user's face when the head harness is in the tightened configuration.

15. The facemask respirator of claim 11, wherein the head harness carrier comprises a non-rigid structure shaped to conform to the head of the user.

16. The facemask respirator of claim 11, wherein the tightening cord includes a first end and a second end; and a pull-tab secured to the second end of the tightening cord, the pull-tab configured to be grasped by a user.

17. The facemask respirator of claim 16, wherein tightening cord extends through an orifice providing a friction fit to maintain the loop length of the tightening cord.

18. The facemask respirator of claim 11, further comprising a center lever coupled to the tightening cord, the center lever configured to change the loop length.

19. The facemask respirator of claim 11, wherein the first end and the second end of the restraining straps define a strap length therebetween, the strap length being adjustable based on loop length.

20. The facemask respirator of claim 19, wherein the tightening cord is configured to concurrently adjust a length of each of the restraining straps.

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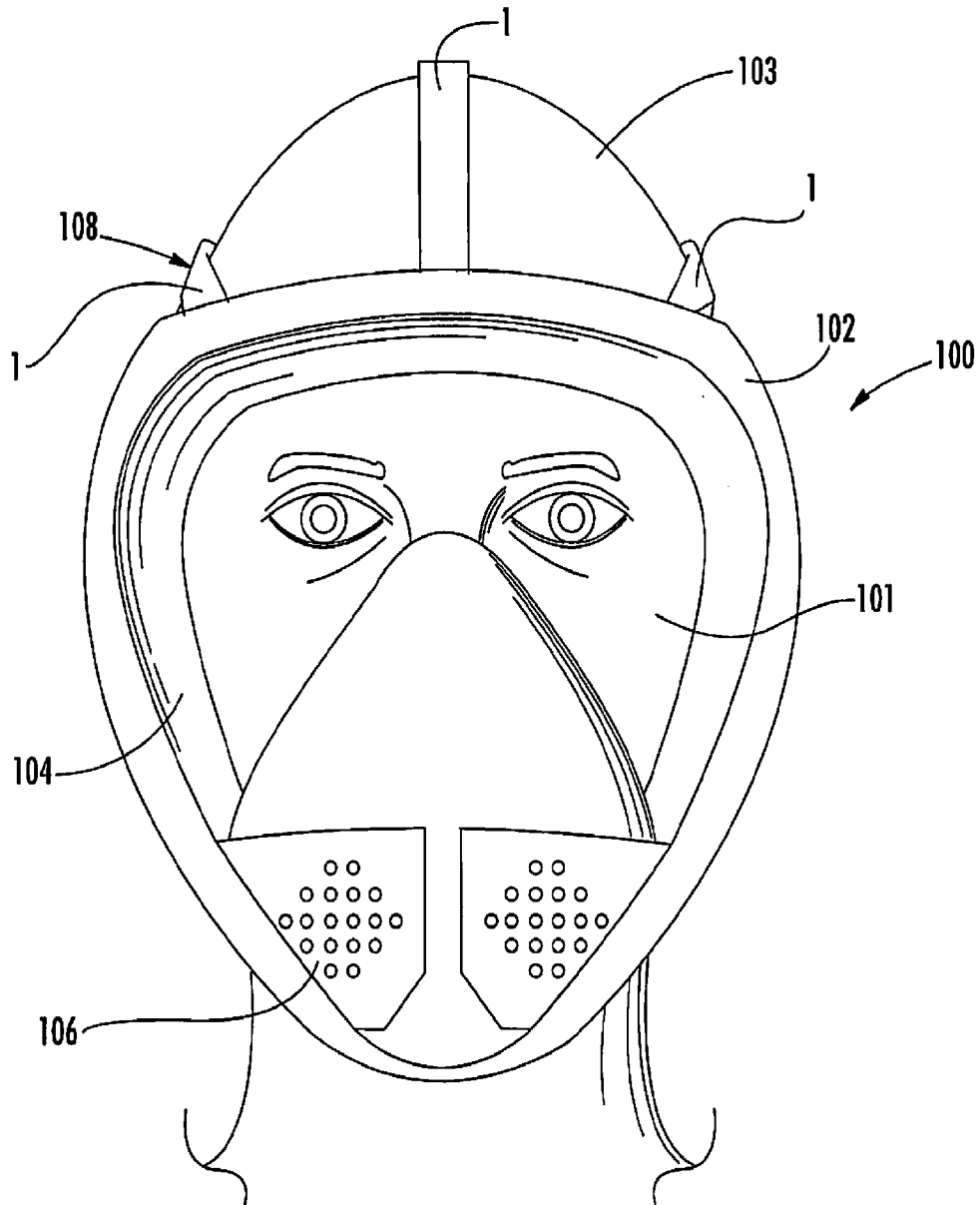


FIG. 1A

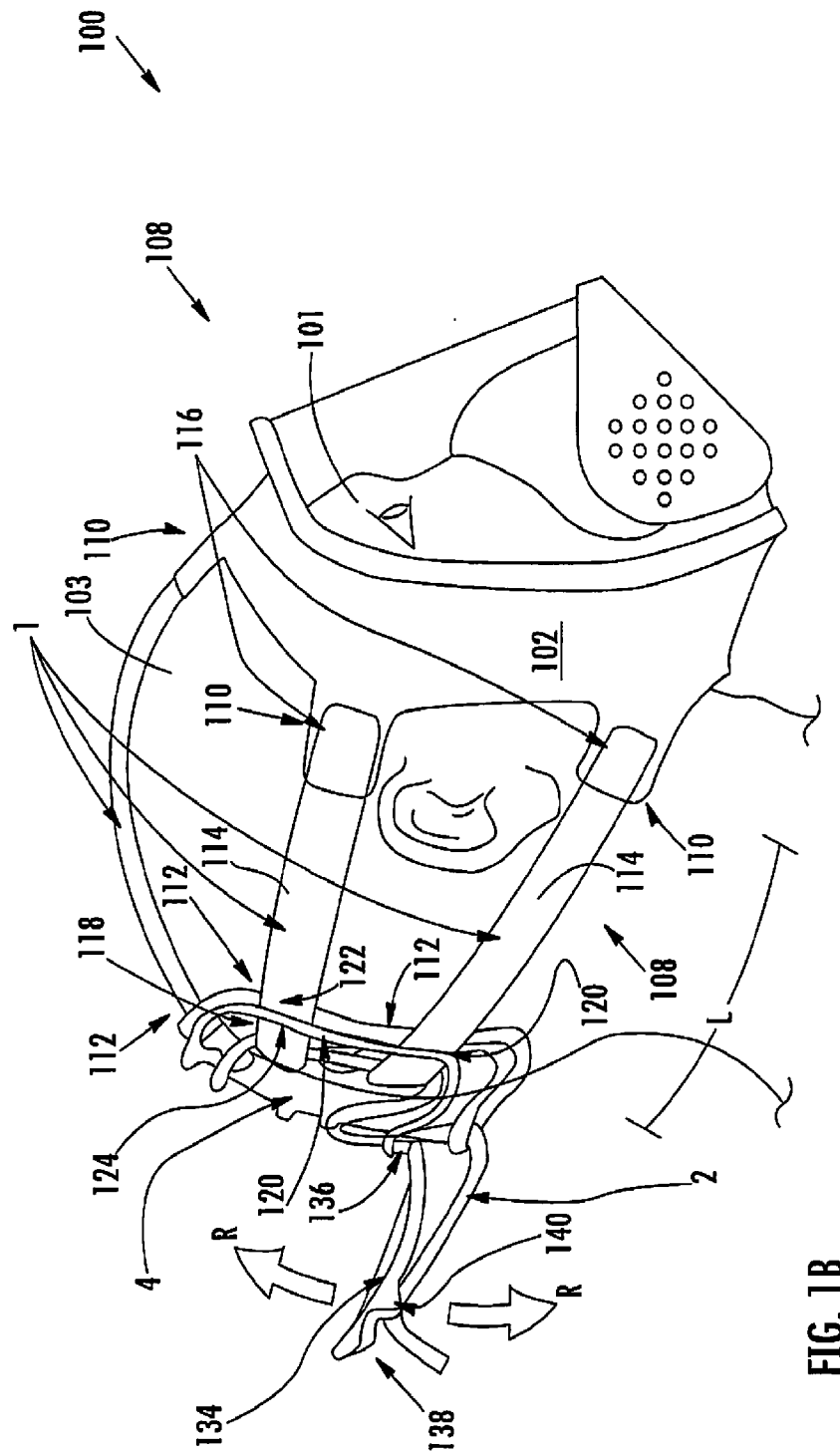
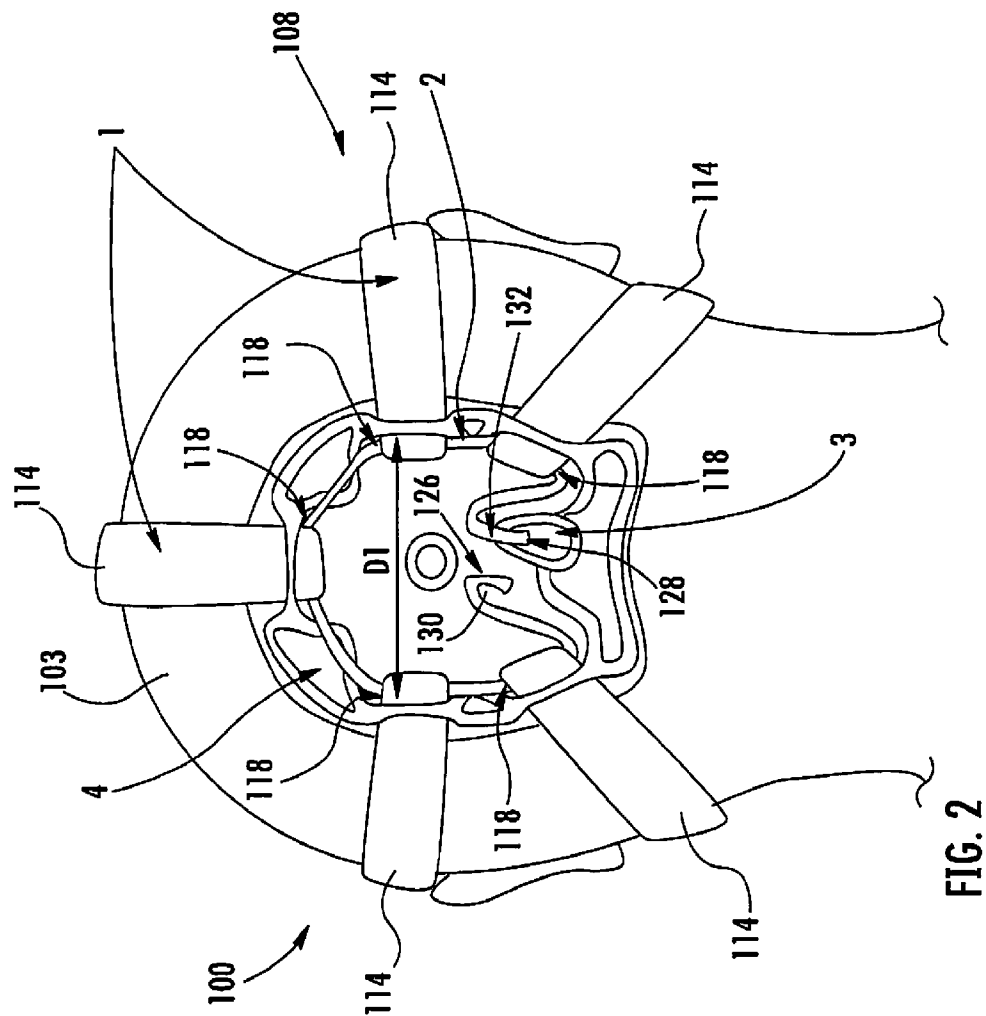
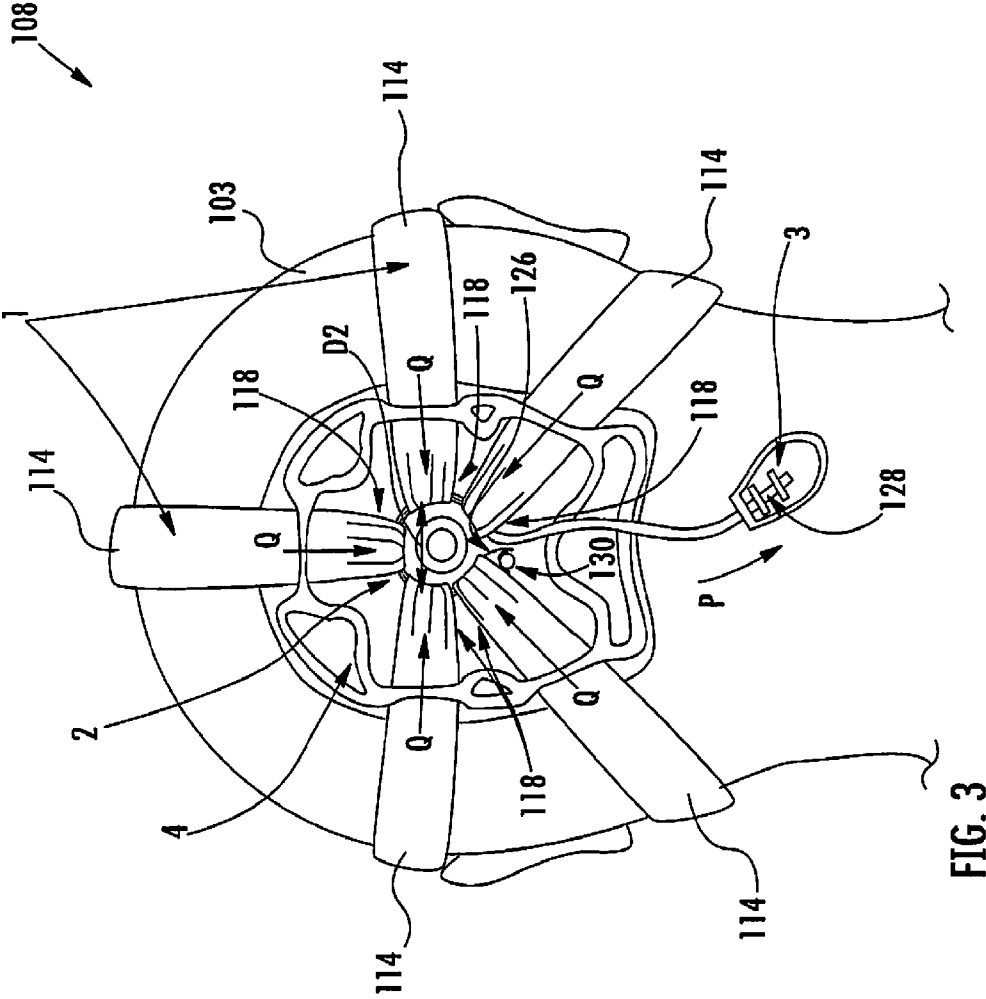


FIG. 1B





INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/027026**A. CLASSIFICATION OF SUBJECT MATTER****A62B 18/08(2006.01)i, A62B 23/02(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)

A62B 18/08; A62B 7/00; A61F 9/02; A43B 5/16; A43B 5/04; A41D 25/02; A62B 23/02

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: harness, restraining strap, face shield, tightening cord, facemask, respirator

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5069205 A (URSO) 3 December 1991 See abstract; claim 1; figures 1-3.	1-20
A	US 6536435 B1 (FECTEAU et al.) 25 March 2003 See abstract; claim 1; figures 1-4.	1-20
A	US 5313671 A (FLORY) 24 May 1994 See abstract; claim 1; figures 1-3.	1-20
A	US 4408403 A (MARTIN) 11 October 1983 See abstract; claim 1; figure 1.	1-20
A	US 3955217 A (LEVY) 11 May 1976 See abstract; claim 1; figures 12-16.	1-20



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

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"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

18 June 2014 (18.06.2014)

Date of mailing of the international search report

19 June 2014 (19.06.2014)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/027026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5069205 A	03/12/1991	None	
US 6536435 B1	25/03/2003	AU 2000-74100 A AU 765478 B2 BR 0005011 A BR 0005011 B1 CA 2328419 A1 CA 2328419 C CN 1294527 A DE 60024533 D1 DE 60024533 T2 EP 1071495 A1 EP 1071495 B1 IL 138984 A IL 138984 D0 IL 172238 A JP 2002-537078 A NZ 507519 A TW 436304 B US 6338342 B1 WO 00-50122 A1 ZA 200005614 A	14/09/2000 18/09/2003 02/01/2001 11/08/2009 31/08/2000 15/07/2008 09/05/2001 12/01/2006 06/07/2006 31/01/2001 07/12/2005 05/10/2006 25/11/2001 15/05/2007 05/11/2002 26/09/2003 28/05/2001 15/01/2002 31/08/2000 13/07/2001
US 5313671 A	24/05/1994	US 6158590 A	12/12/2000
US 4408403 A	11/10/1983	CA 1167254 A1 DE 3131555 A1	15/05/1984 01/07/1982
US 3955217 A	11/05/1976	None	