Feb. 15, 1966 W. D. MORTON, JR 3,234,940

RETENTION FOR QUICK DONNING MASK

Filed Sept. 17, 1962 2 Sheets-Sheet 1

Fig. 1

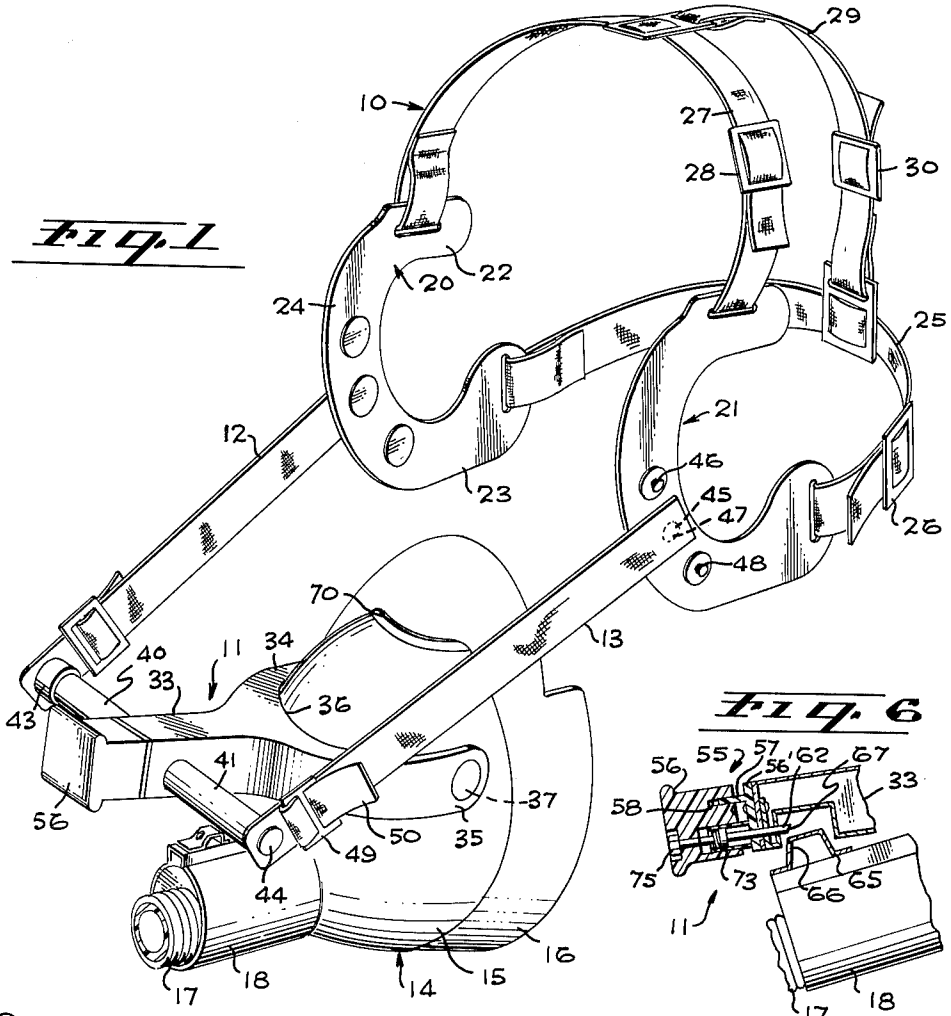


Fig. 6

Fig. 5

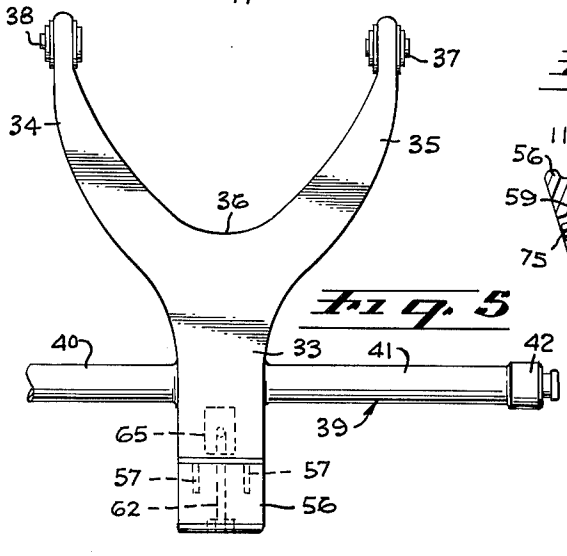
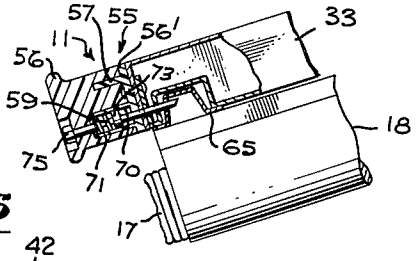


Fig. 7



INVENTOR.
WILLIAM D. MORTON, JR.
BY
Beehler & Shanahan
ATTORNEYS

Feb. 15, 1966 W. D. MORTON, JR 3,234,940

RETENTION FOR QUICK DONNING MASK

Filed Sept. 17, 1962 2 Sheets-Sheet 2

Fig. 2

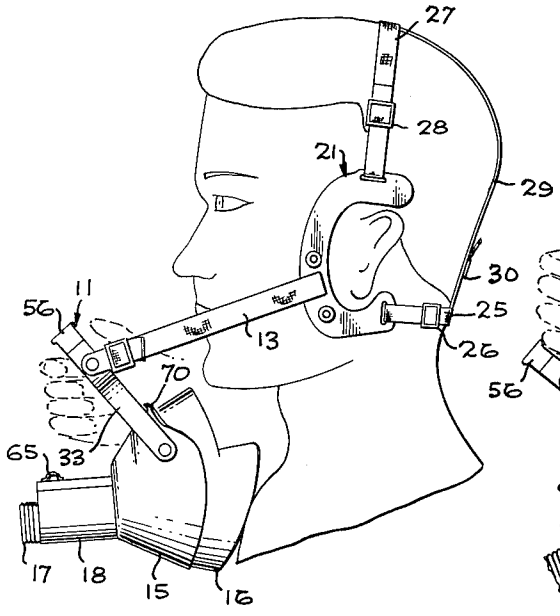


Fig. 3

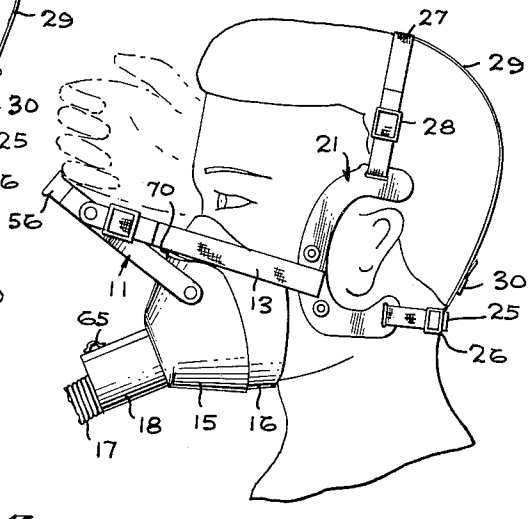


Fig. 4

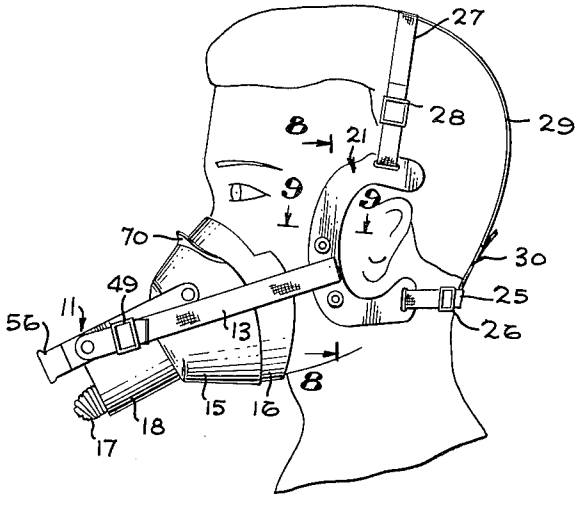


Fig. 8

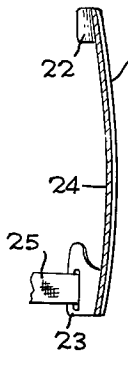
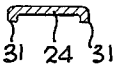


Fig. 9



WILLIAM D. MORTON, JR.
INVENTOR.

BY

Beehler & Shanahan

ATTORNEYS

United States Patent Office

3,234,940

Patented Feb. 15, 1966

3,234,940

RETENTION FOR QUICK DONNING MASK

William D. Morton, Jr., Arcadia, Calif., assignor to Sierra Engineering Co., Sierra Madre, Calif., a corporation of California

Filed Sept. 17, 1962, Ser. No. 224,139

11 Claims. (Cl. 128—146)

This is a continuation-in-part of copending application, Serial No. 52,129, filed August 26, 1960.

The invention relates to mask suspensions for breathing equipment with particular reference being made to a composite of the mask and a head harness coupled with an overcenter locking device connecting the two together in a special fashion functioning in one manner when the mask is in operative position on the face and in another manner when the mask is carried upon the chest in a position of readiness.

Mask harnesses and mask suspensions have undergone considerable development in recent years due to the requirements of high altitude breathing equipment. It has been widely recognized that because of the prevailing use of pressurized cabins, it is not necessary for the pilot or other officers of an airplane to wear oxygen breathing equipment continuously. Occasions arise, however, when the oxygen mask needs to be applied quickly to the face. Such a condition might comprise an explosive decompression of the interior of the airplane or perhaps might arise from the physical condition of the user, or for any one of a number of other reasons. Because the user is usually manipulating some form of control mechanism at the time, it is highly desirable to be able to apply the oxygen mask using only one hand. It may be just as important also to be able to remove the mask from a breathing position with equal ease. Furthermore, because of the fact that for a great portion of the time the mask must be carried on the chest in readiness but nevertheless with its weight supported by the user's head with the aid of a harness, it is important that during this last described position the mask will not be a burden either physically or as a matter of discomfort or annoyance to the user despite long periods of such circumstances. This is especially true because for reasons of safety the wearer may be under considerable tension and there should be no impediment to the full functioning of his reflexes both with respect to his regular duties as well as to the operation needed to instantly don the mask at a moments notice.

It is therefore among the objects of the invention to provide a new and improved quick donning breathing mask assembly which can be comfortably held in a position of readiness at a fixed and dependable location upon the chest and in such position that it can be applied to the face at a moments notice.

Another object of the invention is to provide a new and improved quick donning mask assembly wherein certain portions of the assembly employed on the one hand to steady the mask in a position of rest upon the chest are likewise effective and influential in making the mask easy to don in wearing position and as well to make the mask assembly comfortable in wearing position until the need arises to remove the mask with equal readiness.

Still another object of the invention is to provide a new and improved quick donning mask assembly which

besides feeling secure not only while at rest but while in breathing position, also is in fact secure to the extent that it cannot be easily dislodged or shifted from its desired position thereby to impair its dependability.

Still another object of the invention is to provide a new and improved quick donning mask assembly the sundry parts of which are so constructed and mounted with relation to each other that there is no undue or burdensome bearing or pressure of the sundry parts upon the person of the user in any position of use, the parts further being of such construction that they can be easily and readily grasped and manipulated with one hand if need be and even under circumstances where the hand might be heavily gloved.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side perspective view of all of the parts of the mask assembly shown alone but in the approximate positions they would occupy when in use part way between a position of rest and a breathing position.

FIGURE 2 is a side elevational view of the mask assembly as it is being lifted from a position on the chest to a position on the face.

FIGURE 3 is a side elevational view somewhat similar to FIGURE 2 but showing the mask in breathing position on the face and the locking device about to be lowered into position

FIGURE 4 is a side elevational view similar to FIGURES 2 and 3 but showing the mask assembly in breathing position and locked in place.

FIGURE 5 is a bottom view of the locking bar taken alone.

FIGURE 6 is a fragmentary partially sectional view of the locking bar just prior to being snapped into locked position.

FIGURE 7 is a view similar to FIGURE 6 showing the locking bar in locked condition.

FIGURE 8 is a vertical sectional view of one of the ear pieces taken on the line 8—8 of FIGURE 4.

FIGURE 9 is a cross-sectional view of one of the ear pieces taken on the line 9—9 of FIGURE 4.

In an embodiment of the invention chosen for the purpose of illustration, the quick donning mask assembly may be described as constituting in general four parts, namely, a head harness indicated by the reference character 10, a locking bar assembly indicated generally by the reference character 11, connecting straps indicated by the reference characters 12 and 13, and the mask assembly itself indicated by the reference character 14. In the usual type of construction, the mask assembly comprises a stiff portion 15 often termed a hard shell which has attached to it a sealing gasket 16. An oxygen supply hose 17 connects to the assembly within a sleeve 18.

The head harness 10 comprises a pair of ear pieces 20 and 21, one, namely the ear piece 20, for the right side of the head and the other for the left side. Except for right and left hand arrangement, each ear piece is the same and consists of an upper relatively horizontal end 22, a lower substantially horizontal end 23, and a forward connecting section 24 which connects the two

together in the form of a greatly enlarged C. The ear pieces in each instance are substantially rigid in that they are designed to hold their shape although they should not be without some degree of resiliency. The upper end toward the rear is preferably contoured slightly inwardly so as to conform to the shape of the head at a location above the ear. Similarly the lower end is contoured toward the rear so as to hug the neck of the wearer but without exerting any appreciable degree of pressure against the neck. It is preferable also to have the free rearward extremity of the lower end 23 elevated sufficiently so that a neck strap 25 incorporating an adjustable buckle 26 will rest at the nape of the neck in comfortable position.

To further improve the comfort which the ear pieces provide, flanges 31 are provided at the edges so as to round the edges on the side where they engage the face. The ear pieces may also be given a slight degree of curvature from top to bottom as viewed in FIGURE 8 so as to further conform to the contour of the face.

A head strap 27 is attached at one end to the upper end 22 of the ear piece 20 and at the other end of the strap to a corresponding end of the ear piece 21. An adjusting buckle 28 comprises part of the head strap. To complete the head harness, there is provided a rear strap 29 including an adjusting buckle 30 mounted so that one end of the rear strap is attached at a mid-portion of the head strap 27 and the other end is attached at a mid-portion of the neck strap 25.

The locking bar assembly 11 comprises a number of elements, the main element consisting of a substantially rigid locking bar element 33. The locking bar element includes legs 34 and 35 which include a crotch 36 at the junction of the two. The locking bar element and the legs consist of one integral bar-like piece of substantial breadth and thickness but which may be cored to preserve a lightness of construction. A pivot connection 37 pivotally secures the leg 35 to the mask hard shell 15 and a pivot connection 38 similarly pivotally secures the leg 34 to the hard shell 15.

Adjacent the forward end of the locking bar element is a transverse rod 39 having the general appearance of a cross-tree. The rod consists of a right-side portion 40 and a left-side portion 41 as these portions are designated from the point of view of the wearer. The rod is, of course, rigidly attached to the locking bar element and in effect is integral with it. Attention is directed expressly to the lengths of the respective right and left-side portions as is readily apparent from an examination of FIGURE 5 taken in conjunction with FIGURE 1. Having reference, for example, to the left-side portion 41, it will be noted that its extremity 42 lies well outside of the end of the leg 35 and well outside of the entire portion of the leg. The length of the left-side portion is made long enough so that the extremity, when in use, will be approximately in line with the connecting section 24 of the respective ear piece 21. The same circumstance holds true with respect to the extremity 43 of the right-side portion 40.

To connect the locking bar assembly to the head harness, the connecting strap 13 for the left side is provided with a swivel detachable snap 44 which is preferable directional so that it can be snapped and unsnapped in only one position of rotation. This position is selected as one which will never normally be assumed by the parts with relationship to each other when in normal use. A similar directional snap 45 at the other end of the strap 13 is connected to one or another of snap elements 46, 47, and 48 of the ear piece 21. In the example shown, the connection is to the centrally located snap element 47. An adjusting buckle 49 is included in the connecting strap 13, the connecting strap having a loose free end 50 long enough to extend outwardly relative to the buckle so that it can be readily grasped by the user in order to adjust the length of the strap when the mask assembly is in breathing position on the face. The same general arrangement is made in all respects for the connecting strap 12 which forms the connection between the right-side ear piece 20 and the right-side portion 40 of the rod 39.

In order to securely fasten the locking bar to the hard shell in breathing position as shown in FIGURE 4, the locking bar assembly is built with a locking device 55, details of which are shown in FIGURES 6 and 7. The locking device includes a separate section 56 of the locking bar element 33. This section may have the same width and breadth as the forwardmost end of the locking bar element thereby to form a movable end for that element.

For slidably mounting and guiding the section 56 with respect to the locking bar element 33, there are provided guide pins 57. These pins may be integral with or in any event rigidly secured to a plate 56' and received slidably in bores 58 in the locking bar element. In order to draw the section into locked position as shown in FIGURE 7, compression spring 59 is provided in suitable bore 70 formed in a hollow projecting portion of the plate 56'. The spring acts against an enlarged diameter 73 of a pin 62 to urge the pin to the right as viewed in FIGURE 7. The left end of the pin is secured by a lock nut 75 in a recess formed in an outer end face of the separate section 56.

The locking pin 62 is adapted to extend far enough so as to protrude into a recess on the underside of the bar element having a form and depth adapted to receive a catch 65 on the sleeve 18. The catch 65 has an opening 66 at the forward end adapted to receive the locking pin 62. A beveled face 67 of the pin helps the pin slide into locked position and also, as shown in FIGURE 6, helps shift the locking pin temporarily outwardly when the locking bar assembly is snapped into position.

In use, it can be assumed that the mask assembly is resting upon the chest of the wearer at a location somewhat lower than that shown in FIGURE 2. To keep the mask assembly and the operating parts in a position of readiness, the hard shell 15 is provided with an outwardly projecting rim 70 at the upper central portion the rim being of substantial length in a transverse direction. The legs 34 and 35 when assembled are so mounted that the crotch 36 lies close to the surface of the hard shell so that in uppermost tilted position close to the position shown in FIGURE 2, the crotch will bear against the rim and limit movement of the locking bar assembly to that extent. This will assure the locking bar extending outwardly far enough so as to be in a position easy to grasp when the wearer needs to don the mask. Further still, by reason of the long length of the rod 39 the respective right- and left-side portions will extend outwardly and make certain that the mask always lies in position on the chest with the mask facing the wearer and with such assurance that it will not fall out of position as the wearer moves about.

When it comes time to don the mask, the rod is also helpful together with the locking bar element in providing structure substantial in size which can be grasped by one hand of the wearer thereby to elevate the mask assembly itself into position in front of the nose and the mouth. This is the position shown in FIGURE 3. Once in position, the wearer can, with the butt of either hand, press downwardly upon the locking bar element at the area adjacent the section 55 until it is pushed overcenter to a location where the lock pin is forced into camming engagement with the catch as shown in FIGURE 6 and thence a slight distance further until the locking pin snaps into position of locked engagement with the catch. The compression spring 59 will project the locking pin 62 inwardly and make certain that the pin stays in engagement with the catch. This is the position shown in FIGURE 4.

When it comes time to remove the mask, the wearer merely grasps the section 55 pulling it outwardly far

enough to disengage the locking pin from the catch after which the locking bar element is tilted upwardly to the positon of FIGURE 3 either by movement of the hand or because of some slight tension in the connecting straps after which the weight of the mask assembly itself pulls it downwardly away from the face to its removed position, again on the chest of the wearer.

Although the rod **39** has been described as helpful in keeping the mask in proper position on the chest, it is equally helpful in holding the connecting straps **12** and **13** clear of engagement with the wearer's face when the mask is in breathing position. This adds considerably to the comfort of the mask when in breathing position and prevents any prospect of chafing should the mask be worn for long periods of time. At the same time, the rod is of assistance in making a comfortable even adjustment of the straps **12** and **13** and moreover so that once adjusted to proper balance, the broad support will help maintain the mask assembly in its desired position on the face. Pulling as they do on the relatively rigid ear pieces, the connecting straps spread and support of the weight of the mask through the oversize ear pieces to virtually all portions of the head harness both during the time when the mask is in position at rest upon the chest and also while being worn on the face. The overall assembly therefore is one which aids materially in minimizing fatigue for the wearer at all times.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of Letters Patent is:

1. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including substantially rigid ear pieces located when in use one adjacent each ear, each ear piece comprising an upper end, a lower end, and a connecting section between said ends located forward of the ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, an extension in fixed transverse position adjacent the other end of said bar element, free ends of said extension on each side of the bar element extending to a location substantially in alignment with the respective ear pieces, a flexible connection on each side having at one end a removable pivotal attachment to the ear piece and at the other end a removable pivotal connection to the respective free end of said extension, a projection on the mask, said bar element at the junction of said legs bearing against said projection when the mask is at rest on the chest whereby with the guidance of said extension to maintain the position of said mask on the chest, and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position comprising a separate section at the forward end of said bar element, a lock element on said section, tension means acting between said section and said bar element adapted to draw said section into engagement with said bar, and a catch element on said mask in a position of releasable engagement with said lock element.

2. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask having an oxygen supply line connected thereto, a head harness including substantially rigid ear pieces located when in use one adjacent each ear, each ear piece comprising an upper end adapted to be located above the ear, a lower end adapted to be located below the ear, and a connecting section between said ends located forward of the ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a rod in fixed transverse position adjacent the other end of said bar element, free ends of said rod on each side of the bar element extending to a location substantially in alignment with the respective ear piece, a flexible connection on each side having at one end a removable pivotal attachment to the connecting section of the ear piece and at the other end a removable pivotal connection to the respective free end of said rod, an outwardly projecting rim on the upper central portion of said mask, said bar at the junction of said legs bearing against said rim when the mask is at rest on the chest whereby with the guidance of said rod to maintain the position of said mask on the chest, and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position comprising a separate section forming a forward end of said bar element, said bar element having a recess on the underside adjacent said section, a lock pin on said section extending into said recess, a guide pin on said section extending slidably into said bar element and tension spring means acting between said section and said bar element adapted to draw said section into engagement with said bar element, and a catch on said mask receivable in said recess in a position of releasable engagement with said lock pin.

3. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use, said assembly comprising a mask, a head harness including substantially rigid ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, an extension in fixed transverse position adjacent the other end of said bar element, free ends of said extension respectively extending to locations substantially in alignment with the respective ear piece, a flexible connection on each side having at one end a removable pivotal attachment to the ear piece and at the other end a removable pivotal connection to the respective free end of said extension, and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position comprising a separate section at the forward end of said bar element, said bar element having a recess on the underside adjacent said section, a lock element on said section extending into said recess, a guide means on said section having a guiding engagement with said bar element, and means acting between said section and said bar element adapted to draw said section into engagement with said bar element, and a catch on said mask in a position of releasable engagement with said lock element.

4. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask, said legs having ends adjacent the mask and a first pivotal connection between said mask and said ends of the legs, a rod in fixed transverse position on the bar element adjacent the other end of said bar element, free ends of said rod on respective sides of the bar elements spaced from each other a distance greater than the distance between said ends of the legs and substantially equal to the distance between outermost edges of said mask and extending to locations sub-

stantially in fore and aft alignment with the respective ear piece, a flexible connection on each side having at one end a removable pivotal attachment to the respective ear piece and at the other end a removable pivotal connection to the respective free end of said rod, said rod and the flexible connections on each side being adapted to maintain the position of said mask on the chest.

5. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a flexible connection on each side having at one end a removable pivotal attachment to the ear piece and at the other end a removable pivotal connection to the bar element and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position comprising a separate section at the forward end of said bar element, a lock element on said section, guide means respectively on said section and said bar element, and a catch on said mask having a releasable engagement with said lock element.

6. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a flexible connection on each side having at one end a removable pivotal attachment to the ear piece and at the other end a removable pivotal connection to the bar element, and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position comprising a separate section forming a forward end of said bar, said bar having a recess on the underside adjacent said section, a lock pin on said section extending into said recess, a guide means on said section having a guiding engagement with said bar, a catch on said mask receivable in said recess in a position of releasable engagement with said lock pin and tension means acting between said section and said bar element adapted to draw said lock pin into engagement with said catch.

7. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a locking bar assembly at least partially overlying said mask and having at one end of said bar assembly a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a flexible connection on each side having at one end a removable pivotal attachment to the respective ear piece and at the other end a removable pivotal connection to the bar assembly, an outwardly projecting rim on the upper central portion of said mask, the length of said legs between the first pivotal connection and the remaining portion of the bar assembly being less than the distance between said first pivotal connection and the rim and said bar assembly at the junction of said legs having a bearing against said rim when the mask is at rest on the chest whereby to maintain the position of said mask on the chest.

8. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including substantially rigid ear pieces located when in use one adjacent each ear, each ear piece comprising an upper end contoured to the head of a wearer above the ear, a lower end having a rounded rearward extension contoured to the head below the ear and a connecting section between said ends fitting the head at a location forward of the ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, an extension in fixed transverse position on the bar element adjacent the other end of said bar element, free ends of said extension having positions fixed with respect to the bar element in all locations of said bar element, said free ends being spaced apart from each other a distance substantially equal to the distance between outermost edges of said mask and extending respectively to locations substantially in alignment with the respective ear pieces, and a flexible connection on each side having at one end a removable pivotal attachment to the connecting section of the ear piece and at the other end a removable pivotal connection to the respective free end of said extension.

9. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask, ends of said legs being located adjacent the mask and a first pivotal connection between said mask and said ends of the legs, a rod in fixed transverse substantially horizontal position on the bar element adjacent the other end of said bar element, free ends of said rod on respective sides of the bar element having positions fixed with respect to the bar element and spaced from each other a distance greater than the distance between said ends of the legs and substantially equal to the distance between outermost edges of said mask and extending to locations substantially in fore and aft alignment with the respective ear piece when in use, and a supporting connection on each side having at one end a swivel connection to the respective ear piece and at the other end a swivel connection to the respective free end of said rod, said rod and the supporting connections being adapted to maintain the position of said mask on the chest.

10. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a substantially rigid locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a flexible connection on each side having one end attached to the ear piece and the other end attached to the bar element, and a locking assembly for releasably securing the other end of said bar element to the mask when mounted in breathing position, said locking assembly comprising mutually engageable and releasable spring actuated lock members, one of said members being at the forward end of said bar element, and the other of said members being on said mask.

11. An individually fitting quick donning mask assembly for breathing masks adapted to be carried in part by the head and chest when not in use for breathing, said assembly comprising a mask, a head harness including ear pieces located when in use one adjacent each ear, a locking bar element at least partially overlying said mask and having at one end of said bar element a pair of legs straddling said mask and a first pivotal connection between said mask and said legs, a rod fixed in transverse substantially horizontal position adjacent the end of said bar element opposite said legs, a flexible connection on each side having at one end a removable attachment to the respective ear piece and at the other end a removable connection to respective free end of said rod, an outwardly projecting

rim on the upper central portion of said mask, the length of said legs between said first pivotal connection and the junction of said legs with the bar element being less than the distance between said first pivotal connection and said rim and said bar element at the junction of said legs having a bearing against said rim when the mask is at rest on the chest whereby said bar element, said rod, said projecting rim and said harness serve to maintain the position of said mask on the chest.

References Cited by the Examiner

UNITED STATES PATENTS

3,056,402	10/1962	Dickinson	128—141
3,079,917	3/1963	Pate	128—146
3,092,105	6/1963	Gabb	128—146
3,117,574	1/1964	Replogle	128—146

RICHARD A. GAUDET, *Primary Examiner.*

LOUIS R. PRINCE, *Examiner.*