May 22, 1962 W. D. MORTON, JR., ET AL 3,035,573

OXYGEN MASK AND HELMET RETENTION ASSEMBLY

Filed July 21, 1958 2 Sheets-Sheet 1

FIG. 1.

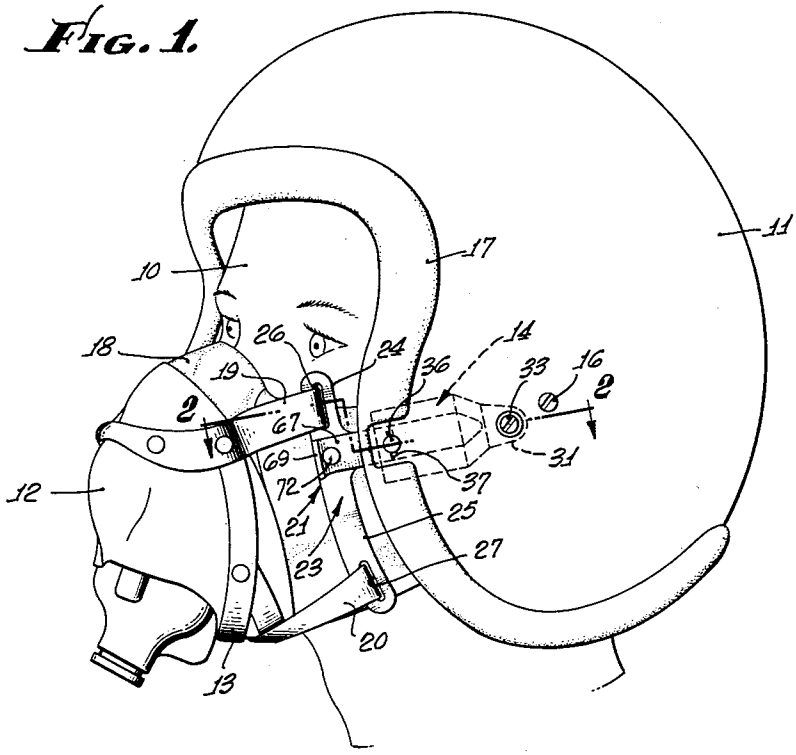
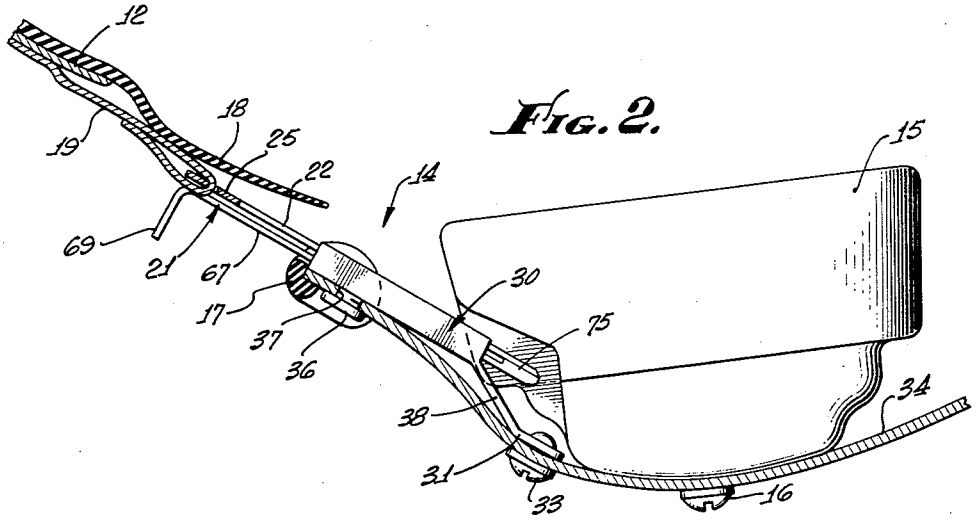


FIG. 2.



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FIG. 3.

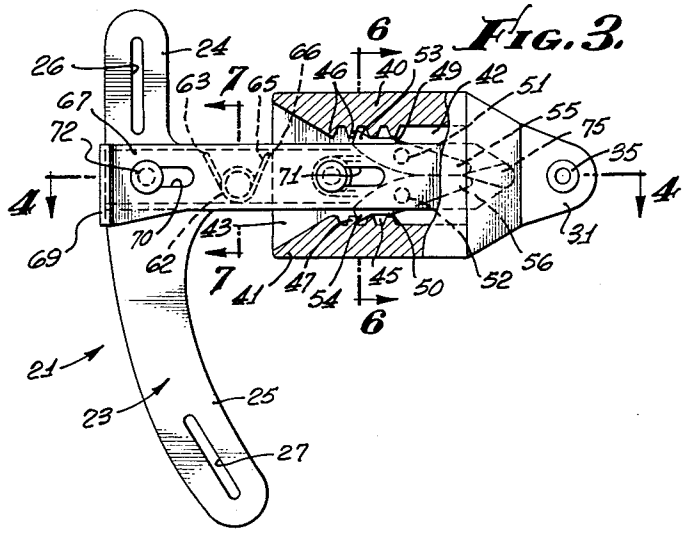


FIG. 6.

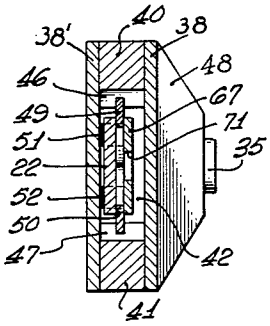


FIG. 7.

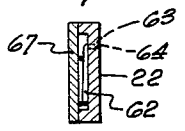


FIG. 4.

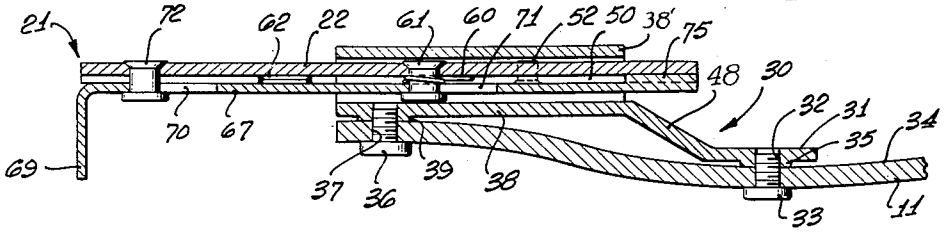


FIG. 5.

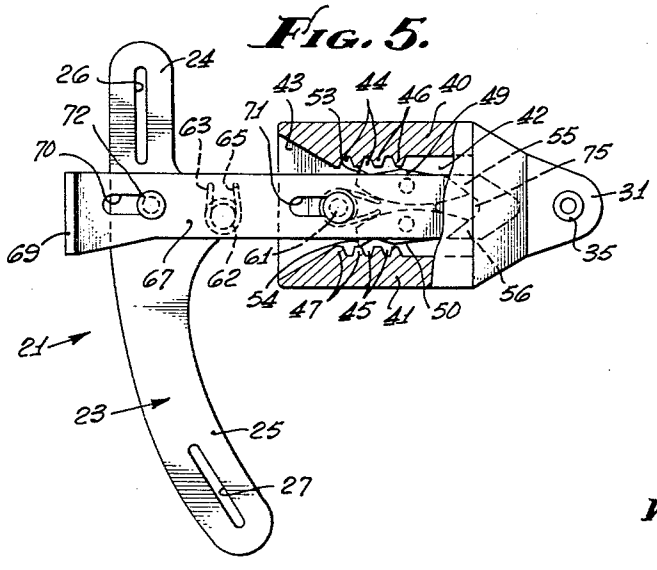
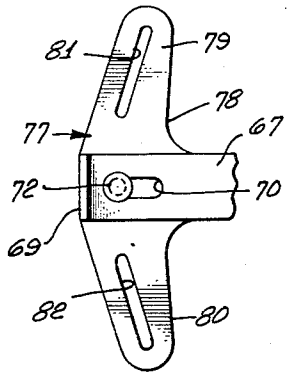


FIG. 8.



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3,035,573

OXYGEN MASK AND HELMET RETENTION ASSEMBLY

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Filed July 21, 1958, Ser. No. 749,871
8 Claims. (Cl. 128—141)

The invention relates to breathing equipment especially effective for high altitude flying and has particular reference to a retention assembly by means of which an oxygen mask is attached to the flier's protective helmet in such fashion that the attachment remains secure at all times while needed but which can be quickly disconnected by the pilot whenever disconnection becomes desirable.

The accelerated interest and activity in connection with high altitude flying brought about by new aircraft designs has focused attention to a greater degree than heretofore on breathing equipment. Although oxygen masks combined with protective helmets have been used heretofore, the attachments and the manner of assembly of these two requisite components of a flier's oxygen equipment has had certain ineffective aspects. Among these has been lack of a releasable connection between the mask and helmet of such type that it can be immediately released at will by the user even though the user's hands might be impaired by the wearing of heavy gloves. When a disconnection between the two becomes necessary or desirable, it sometimes happens under adverse circumstances when there is little time for reflection and consideration with respect to the operation of the interconnection and those releasable attachments which have found favor up until this time have not been sufficiently simple to make the disconnection easy under all circumstances.

Another undesirable feature in equipment of this kind heretofore used has been the relative location such that there has been a tendency to bend or curve the attachment mechanism an amount just sufficient to cause a binding of the movable parts, unsuspected under ordinary circumstances but sufficiently great to dangerously impair a disconnection when it may be most needed.

Still another objectionable feature in existing equipment lies in the inability of the apparatus to retain the mask in proper position under conditions where the helmet might be dislodged due to a blow resulting from extraordinary conditions present in the aircraft.

It is therefore among the objects of the invention to provide a new and improved combination of breathing equipment comprising protective helmet, oxygen mask, and appropriate interconnection which will not be subject to inadvertent dislodgement or maladjustment under extraordinary circumstances and which will maintain a special ease of disconnection or release operable at the will of the pilot under virtually all circumstances.

Another object of the invention is to provide a new and improved combination of breathing equipment elements including helmet, mask and interconnection so constructed that the interconnection can be operated by an easy, natural sweep of the arm and hand of the wearer even though encumbered with a heavy flying glove.

Still another object of the invention is to provide a new and improved set of oxygen breathing appurtenances including helmet, mask and interconnection so interconnected that the mask will adjust itself comfortably in position over the mouth of the wearer and with respect to the helmet even though the same size, type and style of equipment is made use of by wearers having considerably varied size requirements.

Still another object of the invention is to provide a new and improved releasable connection between an oxygen mask and a protective helmet of such construction that inadvertent binding is avoided and of such mechanical operation that the dependability is greatly increased over those heretofore employed and which is usable with dependable effectiveness under more severe conditions.

Still further among the objects of the invention is to provide a new and improved releasable disconnection for interconnecting an oxygen mask with a protective helmet wherein the parts are reduced to a relatively minimum number of moving members connected together in a simple, operable fashion and which, while rugged and dependable, is also light in weight and secure.

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 a protective helmet and breathing mask connected together in operating position upon the head of a wearer.

FIGURE 2 is a fragmentary longitudinal sectional view taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a side elevational view partially broken away showing the releasable interconnection between the mask and the helmet.

FIGURE 4 is a longitudinal sectional view taken on the line 4—4 of FIGURE 3.

FIGURE 5 is a view similar to FIGURE 3 partially broken away and showing the parts in a position of disengagement as contrasted with a position of engagement in FIGURE 3.

FIGURE 6 is a cross-sectional view taken on the line 6—6 of FIGURE 3.

FIGURE 7 is a cross-sectional view taken on the line 7—7 of FIGURE 3.

FIGURE 8 is a fragmentary side elevational view of a modified form of the device.

In an embodiment of the invention chosen for the purpose of illustration there is shown the head 10 of a wearer on whom rests a protective helmet 11 to which is attached a breathing mask 12 by means of a harness 13 in company with a retention assembly 14. One earphone 15 with which the helmet is equipped is shown attached in the customary location by a suitable screw 16. The helmet 11 is provided with a protective cushioned rim 17 and the mask is illustrated as being equipped with a face-contacting washer or cushion 18 of appropriate resilient material.

The harness 13 previously referred to may comprise a pair of upper fabric straps 19 and a pair of lower fabric straps 20, one of each being visible in FIGURE 1.

The retention assembly already indicated generally by the reference character 14 consists of separable elements, one of which comprises a bayonet member 21 which consists of a longitudinal piece 22 and a cross-piece 23. More particularly the cross-piece consists of an upper side 24 and a lower side 25, the lower side being substantially longer than the upper side and curving arcuately outwardly and downwardly. A slot 26 on the upper side is designed to receive the strap 19 and a similar slot 27 on the lower side is adapted to receive the strap 20.

At the opposite end of the retention assembly is a receiver member 30. The receiver member has a free end 31 having a threaded aperture 32 therein receptive of a screw 33 by means of which the receiver member and hence the retention assembly is pivotally secured to the inside face 34 of the side of the protective helmet 11. A washer 35 contributes to the freedom of pivoting of

the retention member with respect to the helmet. It is important to note the location of the screw **33** as being immediately at the area of the ear of the wearer or preferably just forward of the ear at the joint of the jaw with the head.

The receiver member is connected to the helmet at a second location by means of a screw **36**. The screw extends through a slot **37** in the helmet and attaches firmly to a wall **38** of the receiver member, being separated therefrom by a spacing washer **39**. The length of the slot **37** is such that the receiver member is permitted to pivot within a limited range in order to permit a comfortable adjustment of the position of the mask **12** with respect to the helmet and consequently with respect to the face of the wearer. It should be appreciated that this adjustment is important to the comfort of the wearer especially where the equipment is worn for long periods of time, it being true that the head and facial proportions of wearers differ to a degree, making such an adjustment highly advisable.

The receiver member **30** includes spaced parallel flanges or walls **40** and **41** on opposite sides of the wall **38** secured at corresponding locations to a wall **38'** spaced from the wall **38**. The position of the flanges is such as to provide a space **42** therebetween which has a flared approach **43** at the forward end. On the inside faces of the flanges **40** and **41** respectively are pairs of notches **44** and **45**, these being located between teeth **46** and **47**. By providing four pairs of teeth, four positions of adjustment are made possible throughout a range of approximately three-quarters of an inch which is sufficient to accommodate all of the types of wearers who might find it necessary to use the equipment.

Due to the desirability of locating the free end **31** of the receiver member pivotally to the helmet at the location described, the receiver member is specially formed with a bent intermediate section **48** of such form, size and bias that the forward end of the receiver member is adapted to lie substantially parallel to the side of the helmet at a forwardmost position adjacent the rim **17**. The relative location is clearly shown in FIGURES 2 and 4. Located as shown and described the retention assembly is substantially in alignment with the pull of the straps **19** and **20** and hence when in use there will be no tendency to bend any portion of the retention assembly and hence binding of the moving or sliding parts is avoided.

Cooperating with the teeth and notches heretofore described is a pair of upper and lower pawls **49** and **50**. The pawls are pivotally mounted upon the longitudinal piece **22** of the bayonet member **21** by means of pivot pins **51** and **52**. The pawls have outwardly acting ends **53** and **54**, respectively, and opposite ends **55** and **56**.

It is desirable to have the pawls biased in a direction so that they will engage the notches and teeth in the positions illustrated in FIGURE 3. This is accomplished by providing a spring **60** retained in place by a rivet **61**. The opposite ends of the spring bear against appropriate surfaces near the outwardly acting ends **53** and **54** of the pawls and tend normally to push those ends of the pawls into engagement with one pair of teeth or notches.

Another spring **62** has one end **63** engaged in an aperture **64** of the longitudinal piece **22** of the bayonet member. Another end **65** is engaged in an appropriate aperture **66** in a release bar **67**. In the adjusted positions of FIGURE 3 tension in the spring **62** is released.

The release bar **67** has a lug or ear **69** extending laterally outwardly therefrom to provide a handhold for manipulation of the retention assembly. The bar is provided with longitudinally extending slots **70** and **71** by means of which is provided a limited longitudinal movement of the bar with respect to the longitudinal piece of the bayonet member when the parts are retained in connected relationship by a rivet **72** and the previously described rivet **61**.

When the mask is retained upon the face of the wearer **10** by attachment to the helmet, as illustrated in FIGURE 1, the retention assembly is in the adjustment illustrated in FIGURE 3. As there shown, the outwardly acting ends **53** and **54** are pressed outwardly by the spring **60** and engagement of the ends with the notches and the teeth prevents the bayonet member from being pulled forwardly out of its engaging position within the receiver member **30**. When, however, it becomes advisable to disconnect the retention assembly to permit removal of the mask from the helmet, the wearer with one sweeping motion of the hand over the sides of his face engages the handhold **69** on one side with the thumb and on the other side with one or more of the fingers of the same hand sufficiently to pull the bars forward from the position illustrated in FIGURE 3 to the position illustrated in FIGURE 5. The distance which the bar is pulled is limited by the length of the slot **70**.

During this movement a wedge **75** is forced between the ends **55** and **56** of the pawls **49** and **50** against tension in the spring **60**, thereby tilting the pawls about the respective pivot connections until the ends **53** and **54** are withdrawn from engagement with the notches and teeth. During this same movement the spring **62** is contracted when the end **65** is moved outwardly toward the end **63**. This motion just described as it continues physically pulls the bayonet member comprising the longitudinal piece and the release bar clear of the receiver member **30** and the mask is thereupon immediately entirely free from any connection with the helmet.

When the mask is to be reattached, the free or unattached ends of the longitudinal pieces of the bayonet member are inserted respectively into the approaches **43** of the receiver members **30**. Prior to this movement, the springs **62** will have returned the bars **67** to the relative position illustrated in FIGURE 3 wherein the wedge **75** in each case has moved out of engagement with the ends **55**, **56** of the pawls **49** and **50**. Hence, the ends **53** and **54** of the pawls will be in outwardly extending position ready for engagement with the notches and teeth.

As the bayonet member and attached bar in each case is pushed into the receiver member, it will be pushed far enough so that the mask **12** is pressed snugly against the face of the wearer. When it has been pushed far enough, the pawls will engage one or another of the sets of teeth, depending upon how far the bayonet member is pushed into the receiver member. There are enough sets of teeth to accommodate faces of different size comfortably in some one of the four different possible positions.

It should further be noted that in the form of the device herein described, by reason of the fact that the lower side **25** of the cross-piece on the bayonet member is considerably longer than the upper side **24**, should the wearer receive a blow on the rear of the helmet sufficient to tilt the helmet clockwise, as viewed in FIGURE 1, lifting the rear and lowering the rim over the eyes, the action is such that resistance is offered to this dislodgment by the connections comprising screws **33** and **36**, whereby the leverage offered by the long lower side **25** of the bayonet member, acting against the lower strap **20** in each case, prevents the helmet from being moved very far and by the same resistance action inhibits removal of the mask from a proper position over the mouth of the wearer. Further still, the adjustment and fit of the mask on the face is aided by the length of the slot **37** in normal position as well as in the positions of prospective dislodgment of the helmet, permitting a certain flexibility and freedom of movement to a degree which, however, is limited to one which will not impair proper usable adjustment of the essential parts.

Further, because of the fact that the retention assembly is located inside of the mask as close to the face as such mounting permits, there is no bias tension exerted by the straps tending to bend the retention assembly and hence when the mask is to be removed, the parts slip easily out of contact. The handholds **69** are short enough that they

lie generally within the effective protection of the rim of the helmet and are unlikely to be shifted in a positive forward releasing direction by accident resulting from any expected blow on or adjacent the helmet. There is a sufficiently firm grip of the parts emphasized by the rake angle of interlocking parts to make a very positive disengaging operation necessary in order to release the engagement. The arrangement of parts is, however, such that once the required positive disengaging operation is employed, release is immediate.

On those occasions where it may not be necessary to employ a relationship such as to inhibit rotation of the helmet, a bayonet member **77** such as that illustrated in FIGURE 8 is usable. In this form of the device a cross-piece **78** of the bayonet member has an upper side **79** and a lower side **80** identical in length and proportion and provided respectively with strap engaging slots **81** and **82**. The bayonet member thus described is used with the same bar **67** as has previously been described. In this form of device, however, the tension present in the straps **19** and **20** affect the upper and lower sides of the bayonet member to an equal degree and there is hence no tendency either to create or resist a tilting motion in the helmet. The form of the invention in FIGURE 8, however, has the advantage of providing a connection for the straps closer to each other and in some types of equipment may be preferable.

There has accordingly been described and disclosed herein a highly effective retention asesmbly which is important in the use of oxygen masks and protective helmets where conditions are such as to require auxiliary gas for breathing. The simple positiveness of the connecting and disconnecting means built into the structure described is one which gives assurance of proper adjustment and proper operation under all expected conditions.

While we have herein shown and described our invention in what we have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my 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 our invention, what we claim as new and desire to secure by Letters Patent is:

1. A device including an oxygen mask, a harness therefor, a protective head-enclosing helmet and means for releasably securing said mask to the helmet, said helmet having a rim defining a face opening in the helmet, said rim having a forehead portion and antipodal cheek portions extending downwardly from the forehead portion whereby the helmet extends forwardly of the ears of its wearer, said means comprising a retention assembly on each right and left side of the helmet adapted to releasably secure the mask to the helmet, each said retention assembly comprising a bayonet member having a longitudinal piece positioned with one end adapted to extend rearwardly and a cross-piece at the other end of said longitudinal piece having harness-receiving ends on opposite sides of the longitudinal piece, said harness being connected to said ends and to the mask, a receiver member pivotally secured at one end thereof to the inside face of the helmet at a location just forwardly of the ear position in the helmet and in substantial alignment with the hinge joint of the lower jaw of a wearer, releasable connecting means on the inside face of the receiver member receptive of said longitudinal piece, and connection means on the receiver member forwardly of the point of pivotal securement of said receiver member and proximate said cheek portion of the rim and providing a vertically shiftable attachment of said receiver to said helmet whereby to hold the receiver member in adjustable position on the helmet for different positions of the mask relative thereto.

2. A device including an oxygen mask, a harness therefor, a protective head-enclosing helmet and means for releasably securing said mask to the helmet, said means comprising a retention assembly on each right and left side of the helmet adapted to releasably secure the mask to the helmet, each said retention assembly comprising a bayonet member having a longitudinal piece positioned with one end extending rearwardly and a cross-piece at the other end of the longitudinal piece having harness-receiving ends on opposite sides of the longitudinal piece and located forwardly of the adjacent edge of the helmet, a receiver member having a helmet end and a pivotal attachment at the helmet end pivotally secured to the inside face of the helmet at a location in substantial alignment with the hinge joint of the lower jaw of a wearer, releasable connecting means on the inside face of the receiver member receptive of said longitudinal piece, means forming a slot in the side of the helmet in line with the receiver and extending transversely to the receiver on both upper and lower sides thereof, and a button on said receiver slidably mounted in said slot having a portion overlying the helmet whereby to hold the receiver member in adjustable position on the helmet for different positions of the mask relative thereto.

3. A device including an oxygen mask, a protective head enclosing helmet, and a harness therefor adapted to be connected to said helmet and means for releasably securing said mask to the helmet, said means comprising a retention assembly on each right and left side of the helmet adapted to releasably secure the mask to the helmet, each said retention assembly comprising a bayonet member having a longitudinal piece positioned with one end extending rearwardly and a cross-piece at the other end of the longitudinal piece having harness-receiving ends, a receiver member and a pivotal attachment at one end adapted to be secured to the inside face of the helmet at a location in substantial alignment with the hinge joint of the lower jaw of a wearer, releasable connecting means on the receiver member receptive of said longitudinal piece, connection means on said receiver providing a vertically shiftable attachment of said receiver to said helmet whereby to hold the receiver member in adjustable position on the helmet for different positions of the mask relative thereto, a lower side of said cross-piece having a length greater than the upper side and extending arcuately outwardly and rearwardly whereby to inhibit rotation of the mask away from the mouth when the helmet is dislodged and tilted to a position forwardly on the head of a wearer.

4. A device including an oxygen mask, a harness therefor, a protective head-enclosing helmet and means for releasably securing said mask to the helmet, said means comprising a retention assembly on each right and left side of the helmet adapted to releasably secure the mask to the helmet, each said retention assembly comprising a bayonet member having a longitudinal piece positioned with one end extending rearwardly and a cross-piece at the other end of longitudinal piece having harness-receiving ends on opposite sides of the longitudinal piece and located forwardly of the adjacent edge of the helmet, a receiver member having a helmet end and a pivotal attachment at the helmet end pivotally secured to the inside face of the helmet at a location in substantial alignment with the hinge joint of the lower jaw of a wearer, releasable connecting means on the inside face of the receiver member receptive of said longitudinal piece, means forming a slot in the side of the helmet in line with the receiver and extending transversely to the receiver on both upper and lower sides thereof, and a button on said receiver slidably mounted in said slot having a portion overlying the helmet whereby to hold the receiver member in adjustable position on the helmet for different positions of the mask relative thereto, a lower side of said cross-piece having a length greater than the upper side and extending arcuately outwardly and rearwardly whereby to inhibit rotation of the mask away from the mouth when the helmet is dis-

lodged and tilted to a position forwardly on the head of a wearer.

5. A device for securing an oxygen mask and harness therefor to a protective head-enclosing helmet comprising a bayonet member, a longitudinal piece of said member having a rearwardly extending free end and harness connections at the forward end thereof, a receiver member having helmet connecting means thereon, flange means on said receiver member and notches on said flange means, a pawl pivotally mounted on said longitudinal piece, said pawl having an outwardly acting end adapted to engage a selected one of said notches, resilient means engaging said pawl biased to normally press said outwardly acting end into notch-engaging relationship, and a release bar having a limited sliding attachment to said bayonet member, a handhold at a forward end of said bar, a trip on said bar engageable with the other end of the pawl, resilient means acting between said bar and said bayonet member biased to normally move said bar rearwardly to a position of disengagement of said trip with said pawl, said bar being movable forwardly by use of said handhold to a position wherein said trip moves said other end of the pawl to a position whereby to disengage said outwardly acting end from said notch to enable disengagement of the bayonet member and attached mask from the receiver member and the helmet.

6. A device for securing an oxygen mask and harness therefor to a protective head-enclosing helmet comprising a bayonet member, a longitudinal piece of said member having a rearwardly extending free end and harness connections at the forward ends thereof, a receiver member having a helmet connecting means thereon, spaced parallel side flanges on said receiver member and oppositely disposed sets of notches in said flanges, a pair of oppositely acting pawls pivotally mounted on said longitudinal piece, said pawls having outwardly acting ends adapted to engage sets of notches on the respective flanges, resilient means engaging said pawls biased to normally press said outwardly acting ends into notch-engaging relationship, and a release bar having a limited sliding attachment to said bayonet member, a laterally outwardly extending handhold at a forward end of said bar, a trip on said bar engageable with the other ends of said pawls, resilient means acting between said bar and said bayonet member biased to normally move said bar rearwardly to a position of disengagement of said trip with said pawls, said bar being movable forwardly by use of said handhold to a position wherein said trip separates said other ends of the pawls whereby to disengage said outwardly acting ends from said notches to enable disengagement of the bayonet member and attached mask from the receiver member and the helmet.

7. A device for securing an oxygen mask and harness therefor to a protective head-enclosing helmet comprising a bayonet member, a longitudinal piece of said member having a rearwardly extending free end and a cross-piece on the forward end and having harness connections at the ends of said cross-piece, a receiver member having a pivotal helmet connection at a free end thereof and a second helmet connection forward of the first connection, means forming a longitudinal channel in said receiver member having a longitudinal wall and spaced parallel side flanges on said wall, oppositely disposed sets of notches in said flanges, a pair of oppositely acting pawls pivotally mounted on said longitudinal piece, said pawls having outwardly acting ends adapted to engage sets of notches on the respective flanges, resilient means engaging said pawls biased to normally press said outwardly acting ends into notch-engaging relationship, and a release bar having a limited sliding attachment to said bayonet member, a laterally outwardly extending handhold at a forward end of said bar, a wedge at the rearward end of said bar having a tapered approach engageable with the other ends of said pawls, resilient means acting between said bar and said bayonet member biased to normally move said bar rearwardly to a position of disengagement of said wedge with said pawls, said bar being movable forwardly by use of said handhold to a position wherein said wedge separates said other ends of the pawls whereby to disengage said outwardly acting ends from said notches to enable disengagement of the bayonet member and attached mask from the receiver member and the helmet.

8. A helmet assembly for high altitude flying comprising a helmet adapted to cover the head, upper neck and ears of a wearer and having an opening for the face, said helmet at the area over the ears being distended laterally outwardly forming a pocket, an earphone in the pocket attached to the helmet, a breathing mask adapted to occupy a position in front of the opening of the helmet, a harness on said mask having a side element on each side extending toward the respective side of the helmet, and a retention assembly for each side element located inside the helmet and forward of said pocket, said retention assembly having separable members, one of said members having a pivotal attachment to the helmet within said pocket and in the area thereof wherein the jawbone of the wearer pivots, the other of said members being attached to the respective side member of the harness.

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