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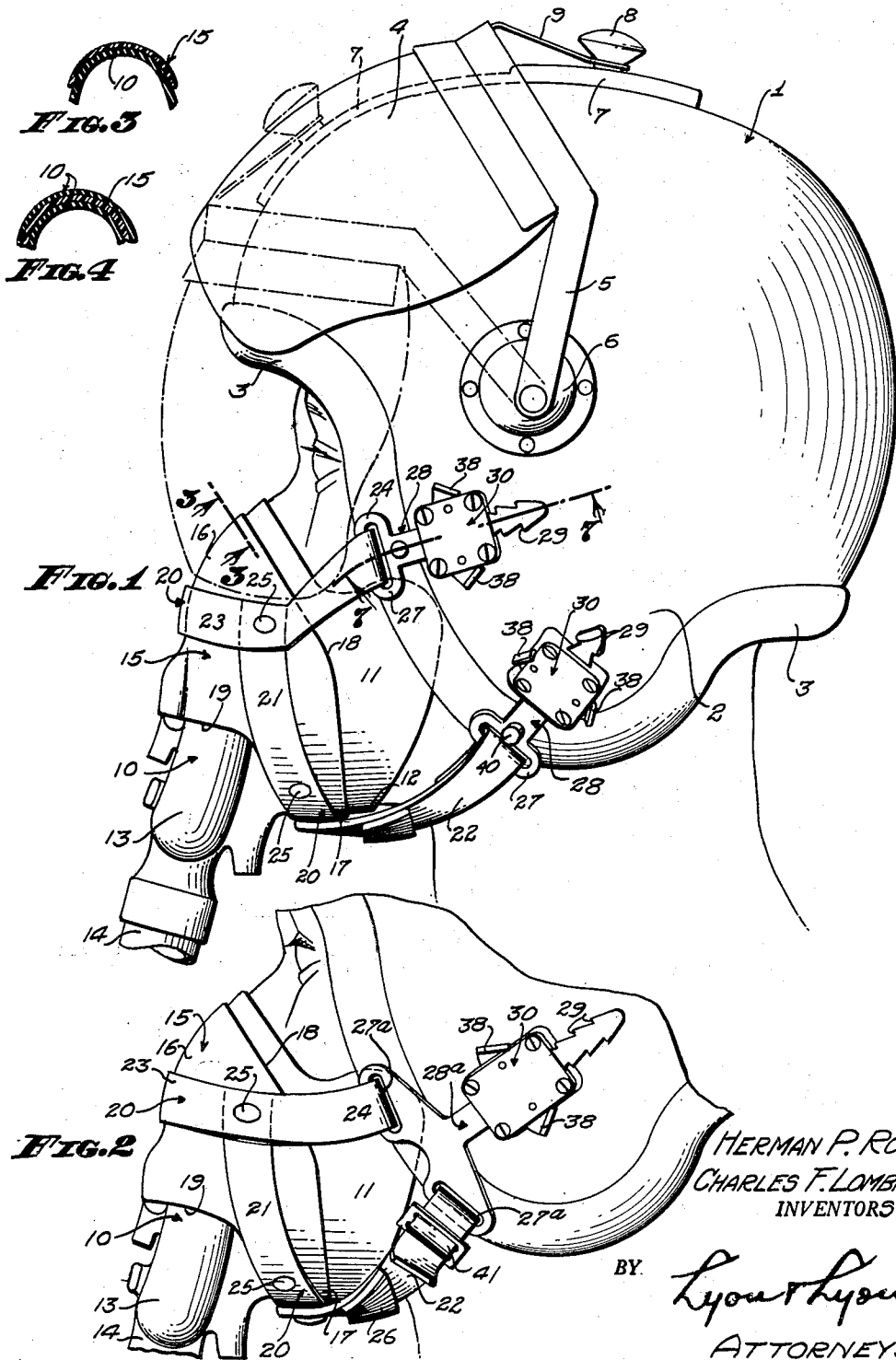
H. P. ROTH ET AL

2,867,812

RETAINING MEANS FOR HELMETS AND FACE MASKS

Filed Oct. 10, 1955

2 Sheets-Sheet 1



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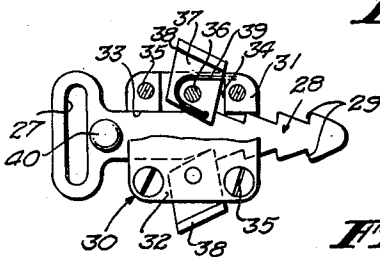
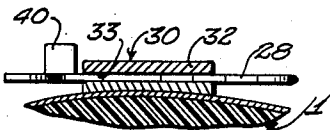
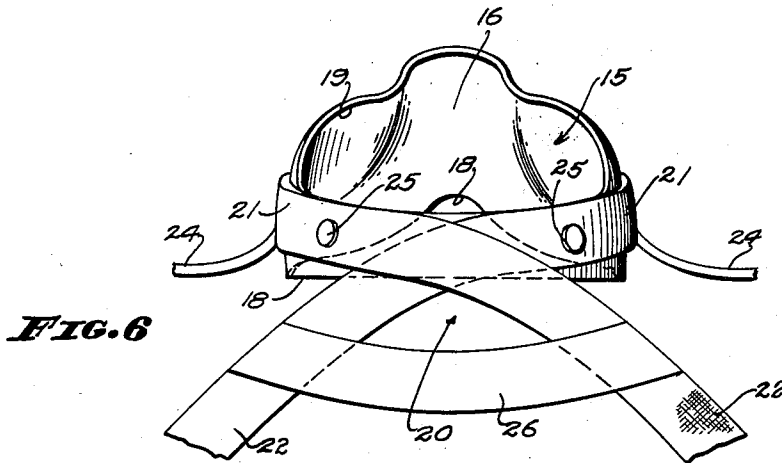
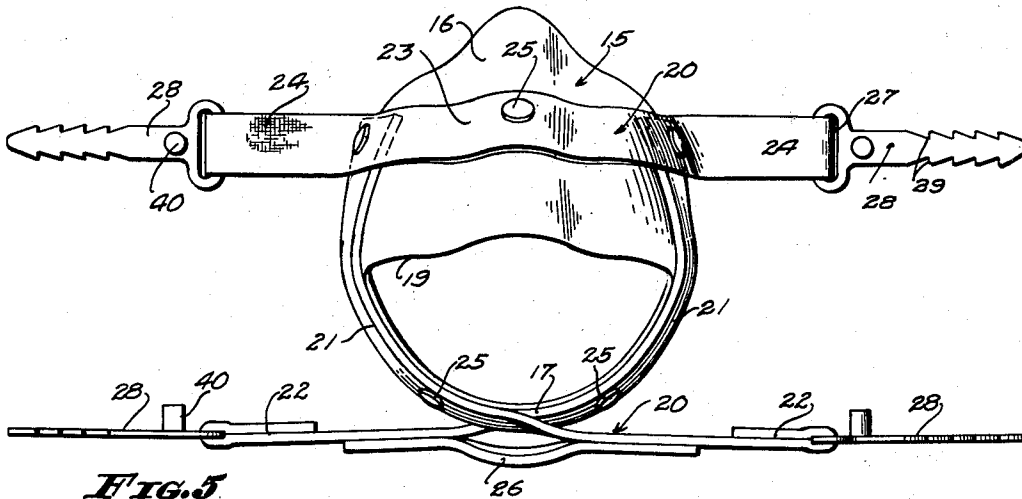
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RETAINING MEANS FOR HELMETS AND
FACE MASKS

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Application October 10, 1955, Serial No. 539,618

7 Claims. (Cl. 2—6)

This invention relates to retaining means for helmets and face masks, and included in the object of this invention are:

First, to provide a retaining means which is particularly designed to maintain both the crash helmet and oxygen face mask in place on the head and face of an aviator, even under the extreme conditions of bail-out from an aircraft traveling at supersonic speeds.

Second, to provide a device of this class which may be adapted to conventional crash helmets and face masks without materially altering the face mask and by the addition of latch units on the crash helmet, or which may be incorporated integrally in a face mask of special design, or especially adapted for use with the type of crash helmet disclosed in Patent No. 2,625,683, issued January 20, 1953.

Third, to provide a retaining means of this class which incorporates connecting straps and special latch units for coupling the face mask and helmet, wherein the face mask may be held loosely or tightly in place and wherein the angular relation of the face mask and helmet may be readily adjusted.

Fourth, to provide a retaining means of this class which, though dependably connecting the helmet and face mask, is yieldable to movement of the wearer's jaw.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawings in which:

Figure 1 is a side view of an aviator's crash helmet and oxygen face mask shown secured in place by the retaining means;

Fig. 2 is a fragmentary side view similar to Fig. 1, showing a modified form of retaining means;

Fig. 3 is a fragmentary sectional view through 3—3 of Fig. 1, showing a portion of the face mask and retaining means;

Fig. 4 is a fragmentary sectional view similar to Fig. 3, but showing the retaining means molded integrally with the face mask;

Fig. 5 is a front view of the retaining means with the retaining straps extended;

Fig. 6 is a bottom view of the retaining means with the straps shown fragmentarily;

Fig. 7 is a fragmentary sectional view through 7—7 of Fig. 1, showing particularly one of the latch units; and

Fig. 8 is a partial sectional, partial elevational view of one of the latch units.

An aviator's crash helmet 1, suitable for the purposes of the present invention, is shown in Figs. 1 and 2. The helmet may be of the type disclosed in Patent No. 2,625,683, issued January 20, 1953.

The helmet 1 covers the head of the wearer and is open at its forward side to expose the face. The sides of the helmet include downwardly projecting ear-covering portions 2. The open under and forward sides of the helmet are bordered by a padded rim 3.

An eye shield 4 is movable into position to cover the eyes and upper portion of the user's face. Arms 5 ex-

2

tend from the eye shield 4 to pivot mountings 6 provided at opposite sides of the helmet. For the purposes of the present invention, the eye shield may be considered as conventional.

5 A guide track 7 extends forwardly and rearwardly along the crown of the helmet 1. A latch means having a latch handle 8 rides in the guide track and is connected to the eye shield 4 by a spring arm 9.

The retaining means constituting the present invention utilizes a conventional oxygen face mask 10 molded of rubber and having suitable passages, not shown, for communication with the mouth and nose of the wearer.

10 The face mask 10 includes cheek flaps 11 which cover the cheeks of the wearer. The face mask also includes a portion 12 which extends under the chin of the wearer. The forward portion of the face mask is directed downwardly to form a tubular snout 13 which is joined to a suitable supply tube 14.

15 The retaining means comprising the present invention includes a reinforcing saddle 15 having a nose-bridging portion 16 extending over the upper forward portion of the face mask and a chin web 17 extending under the chin portion 12 of the face mask.

20 The reinforcing saddle 15 is provided with a back opening 18 which permits the face mask 10 to project rearwardly therefrom and is provided with a front opening 19 through which the tubular snout 13 of the face mask extends. The reinforcing saddle 15 is preferably formed of plastic material reinforced with glass cloth or other high strength material, or may be made of metal.

25 The reinforcing saddle 15 may be arranged to be slipped over the supply tube 14 into position on the face mask 10, and is contoured to conform closely to the irregularities of the face mask. Alternatively, the reinforcing saddle may be molded integrally with the face mask, as indicated in Fig. 4. In either case, it is desirable that the reinforcing saddle cover the valve elements, not shown, which are located within the face mask within the area embraced by the nose-bridging portion 16.

30 The reinforcing saddle 15 is connected to the helmet 1 by a harness structure 20. The harness structure includes a pair of chin straps 21 which extend downwardly from each side of the reinforcing saddle and cross under the chin web 17. The chin straps include extended portions 22 which are adapted to be directed toward the lower extremities of the ear-covering side portions 2 of the helmet 1. The harness 20 also includes a nose strap 23 which extends substantially horizontally around the nose-bridging portion 16.

35 The nose strap 23 includes a pair of extended portions 24 which reach to the sides of the helmet 1 at levels above the chin-strap extended portions 22. The harness 20 is secured to the reinforcing saddle 15 by rivets 25, or other suitable securing means. The extended portions 22 of the chin straps 21 are preferably joined near their point of crossing by a cross strap 26, which underlies the chin of the user, preferably rearwardly of the rearward edge of the chin web 17.

40 Each of the four extremities of the extended portions 22 and 24 is folded upon itself to form a loop which receives an eye 27 of a latch bolt 28. Each latch bolt is in the form of a flat metal strap having pairs of notches 29 along its lateral margins.

45 Each latch bolt 28 is adapted to be inserted in a latch keeper housing 30. Each latch keeper housing includes a base member 31, the under side of which is contoured to conform to the region of the helmet 1 in which the keeper housing is placed.

50 The base member 31 receives a top plate 32. Between the base member and the top plate there is defined a latch bolt guideway 33 and laterally directed latch lever slots 34. Suitable securing means 35 extend downwardly

3

through the top plate and base member for securing each keeper housing to the helmet 1.

Pivotaly mounted on a pin 36 in each latch lever slot 34 is a latch lever 37. There is thus provided a pair of latch levers in each keeper housing. One extremity of each latch lever is arranged to engage the notches disposed along the corresponding margin of a latch bolt 28. The opposite ends of the latch levers 37 protrude to form handles 38. Springs 39 urge the latch levers into engagement with the notches 29.

The notches 29 are so shaped that the latch bolts 28 may be readily pushed into their respective latch keeper housings, but are normally restrained against removal by the pair of latch levers in each housing. In order to release a latch bolt 28, it is necessary to engage simultaneously the handle ends 38 of the pair of latch levers 37. By reason of this construction the latch bolts may be readily released from the latch keeper housing when desired, but they are safe against accidental operation of either latch lever.

Operation of the retaining means is as follows:

The reinforcing saddle 15 and harness 20 are fitted on the oxygen mask 10 as a permanent attachment, or as indicated in Fig. 4 the oxygen mask is mounted with the reinforcing saddle as an integral part. The helmet 1 is placed on the wearer's head in the conventional manner and the oxygen mask is brought into place. The four latch bolts 28 are inserted in their respective latch keeper housings 39, and by reason of the series of notches 29 the mask may be fitted loose or tight as desired. Also the mask may be rotated about a horizontal axis to the best suited position by forcing inward or partially releasing the latch bolts connected respectively with the chin strap extensions 22 or the nose strap extensions 24. Lateral adjustment may also be made.

In actual practice, the face mask 10 is not forced to its tightest position during normal conditions of use, but in the event of an impending emergency the user may merely push on the respective latch bolts 28 to tighten the mask. To facilitate engagement with the latch bolts 28, small knobs 40 or other projecting members may be provided adjacent the eyes 27 of the latch bolts.

The cross strap 26 which underlies the chin of the wearer is yieldable, and is normally worn to permit some movement of the wearer's jaw. However, it may be arranged to fit snugly when the straps are tightened, as in the event of an impending emergency. In the event of impact on the front of the mask 10 or its reinforcing saddle 15, cross strap 26, being of non-rigid material, does not constitute a danger to the wearer's throat, as would be the case if the chin web 17 extended rearwardly to serve the anchoring function of cross strap 26.

Reference is now directed to Fig. 2. In the construction here illustrated, the chin strap extension 22 and corresponding nose strap extension 24 on each side of the mask 10 are joined to a common latch bolt 28a. Each latch bolt 28a is provided with a pair of spaced eyes 27a which receive the strap extensions. In the use of a single latch bolt for each side of the retaining means, it is preferred to provide additional means for adjustment of the strap extensions. Thus the chin strap extensions 22 may be provided with adjustment buckles 41.

While the eye shield 4 has been referred to as conventional, it should be observed that its lower margin is trimmed or shaped to conform to the upper portion of the reinforcing saddle 15.

Tests have been conducted utilizing the helmet, mask, and retaining means substantially as shown in Fig. 1. A dummy was equipped with the helmet, mask, and retaining means and placed in an ejection seat on a rocket sled. The seat was ejected when the sled was traveling in excess of 600 knots at a Mach number in excess of .9. The mask and helmet remained in place and in functioning position on the dummy.

A helmet and mask held in place by conventional

4

means have proven to be completely unsatisfactory under the conditions of bail-out at or near supersonic speeds. Loss of helmets during bail-outs and crash landings has left the head unprotected, with resulting severe and fatal injuries in most cases.

It should be observed that the strap extensions 22 not only pull downwardly on the ear-enclosing portions of the helmet, but also by reason of the chin strap 26 draw the ear-enclosing portions toward each other, so that these portions may press lightly against the sides of the wearer's head.

The side-gripping action of the ear-covering portions supplements the action of the face mask 10 and reinforcing means in retaining the helmet in place, and distributes the load so that it is not taken entirely by the wearer's chin. This is accomplished by the aid of the chin strap 26 without causing the chin strap to press against the throat of the wearer.

While particular embodiments of this invention have been shown and described, it is not intended to limit the same to the exact details of the constructions set forth, and it embraces such changes, modifications, and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

We claim:

1. The combination with a helmet having a rigid shell adapted to fit over the head of the wearer and having ear-covering side portions, and a face mask having a forward portion adapted to fit over and enclose the nose and mouth, and an under portion adapted to fit under and engage the chin of the wearer, of a retaining means, comprising: a rigid saddle member of substantially the same configuration as and being carried by said face mask and engaging portions of said mask at said forward and under portions thereof; a pair of upper straps and a pair of lower straps extending from fixed laterally spaced points on the forward and under portions of said saddle member to the side portions of said helmet; and means readily adjustably securing said straps to the side portions of said helmet at spaced points in fixed relation to each other and to said helmet, said means anchoring said straps to prevent pivotal movement of said face mask relative to said helmet.

2. A retaining means as set forth in claim 1, wherein: said rigid saddle member is disposed externally of said face mask and is removable therefrom.

3. A retaining means as set forth in claim 1, wherein: said rigid saddle member is joined integrally with said face mask and is disposed between the inner and outer surfaces thereof.

4. A retaining means as set forth in claim 1, wherein: said securing means includes a latch bar at the extremity of each strap, and a keeper housing for each latch bar secured to the sides of said helmet at said spaced fixed points thereon.

5. A retaining means as set forth in claim 1, wherein: said securing means includes a latch bar common to the upper and lower member of each pair of straps, and a keeper housing for each latch bar secured to a corresponding side of said helmet, said straps of each pair being secured to spaced portions of said latch bar at said spaced fixed points.

6. A retaining means as set forth in claim 1, wherein: said securing means includes a keeper housing secured to the sides of said helmet, dual latch levers pivotally mounted in each housing, and latch bars connected to said straps, each having a series of dual catch notches for engagement by said dual latch levers.

7. The combination with a helmet having a rigid shell adapted to fit over the head of the wearer and having ear-covering side portions, and a face mask having a forward portion adapted to fit over and enclose the nose and mouth, and an under portion adapted to fit under and engage the chin of the wearer, of a retaining means, comprising: a rigid saddle member of substantially the

5

same configuration as and being carried by said face mask and engaging the major area of said mask at said forward and under portions thereof; a nose strap bridging the nose-covering portion of said face mask and having end portions extending toward the side portions of said helmet; a pair of chin straps extending downwardly from said nose strap under the chin of the wearer and crossing to form end portions extending toward the side portions of the helmet below said nose strap; a cross strap extending under the chin of the wearer and joined to said chin straps; and means readily adjustably securing said straps to the side portions of said helmet at spaced points

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in fixed relation to each other and to said helmet, said means anchoring said straps to prevent pivotal movement of said face mask relative to said helmet.

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