



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
WASHINGTON, D.C. 20546



REPLY TO  
ATTN OF GP

APR 24 1979

NST-44  
TO: ~~KXX~~/Scientific & Technical Information Division  
Attn: Miss Winnie M. Morgan

FROM: GP/Office of Assistant General  
Counsel for Patent Matters

SUBJECT: Announcement of NASA-Owned U.S. Patents in STAR

In accordance with the procedures agreed upon by Code GP and Code KSI, the attached NASA-owned U.S. Patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U.S. Patent No. :

3, 488, 771

Government or  
Corporate Employee :

United Aircraft Corp.  
E. Hartford, CT.

Supplementary Corporate  
Source (if applicable) :

NASA Patent Case No. :

W-1005 - XMS-4670

NOTE - If this patent covers an invention made by a corporate employee of a NASA Contractor, the following is applicable:

YES

NO

Pursuant to Section 305(a) of the National Aeronautics and Space Act, the name of the Administrator of NASA appears on the first page of the patent; however, the name of the actual inventor (author) appears at the heading of column No. 1 of the Specification, following the words "...with respect to an invention of ..."

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Enclosure

Jan. 13, 1970

E. W. CHASE ETAL

3,488,771

HELMET LATCHING AND ATTACHING RING

Filed March 17, 1966

2 Sheets-Sheet 1

FIG. 1

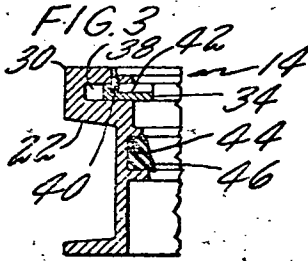
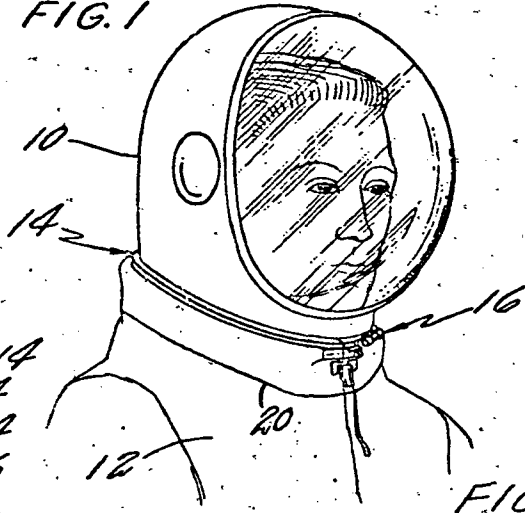


FIG. 2

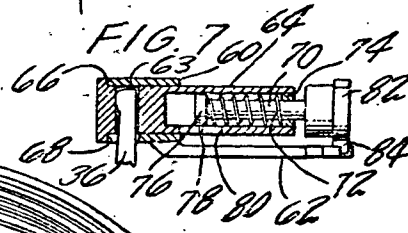
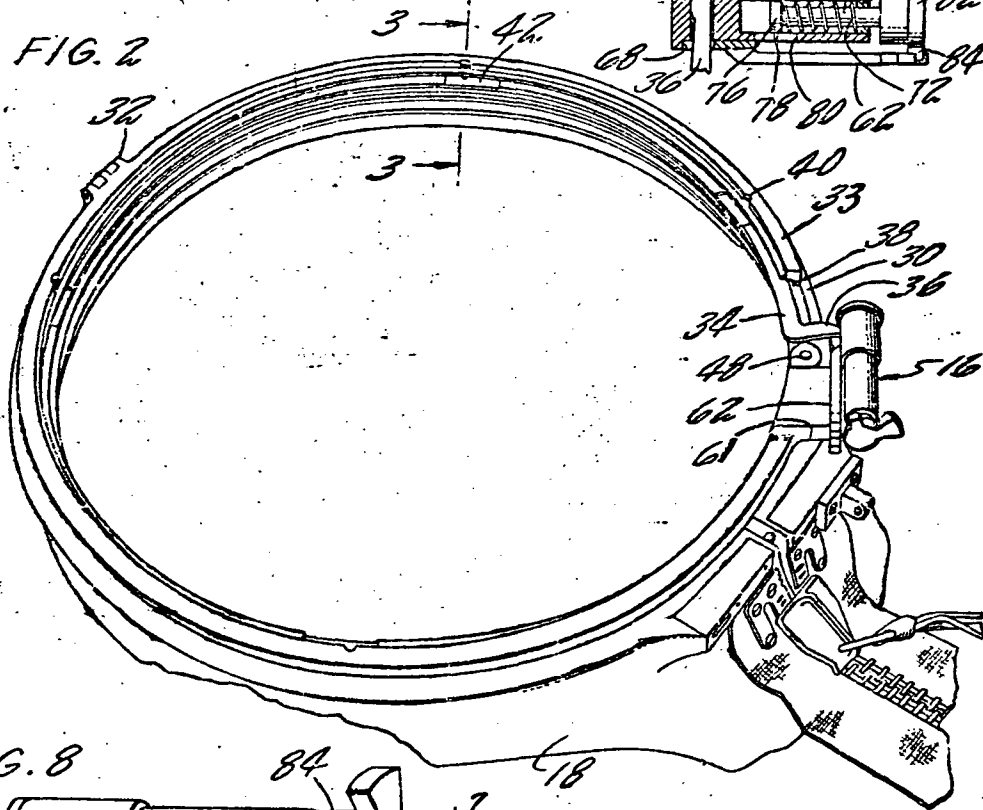
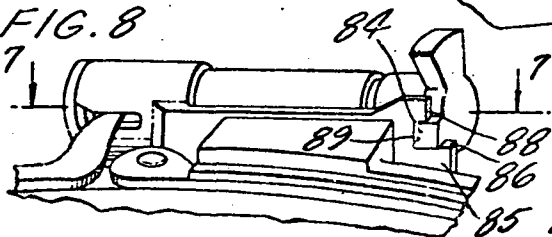


FIG. 8



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Jan. 13, 1970

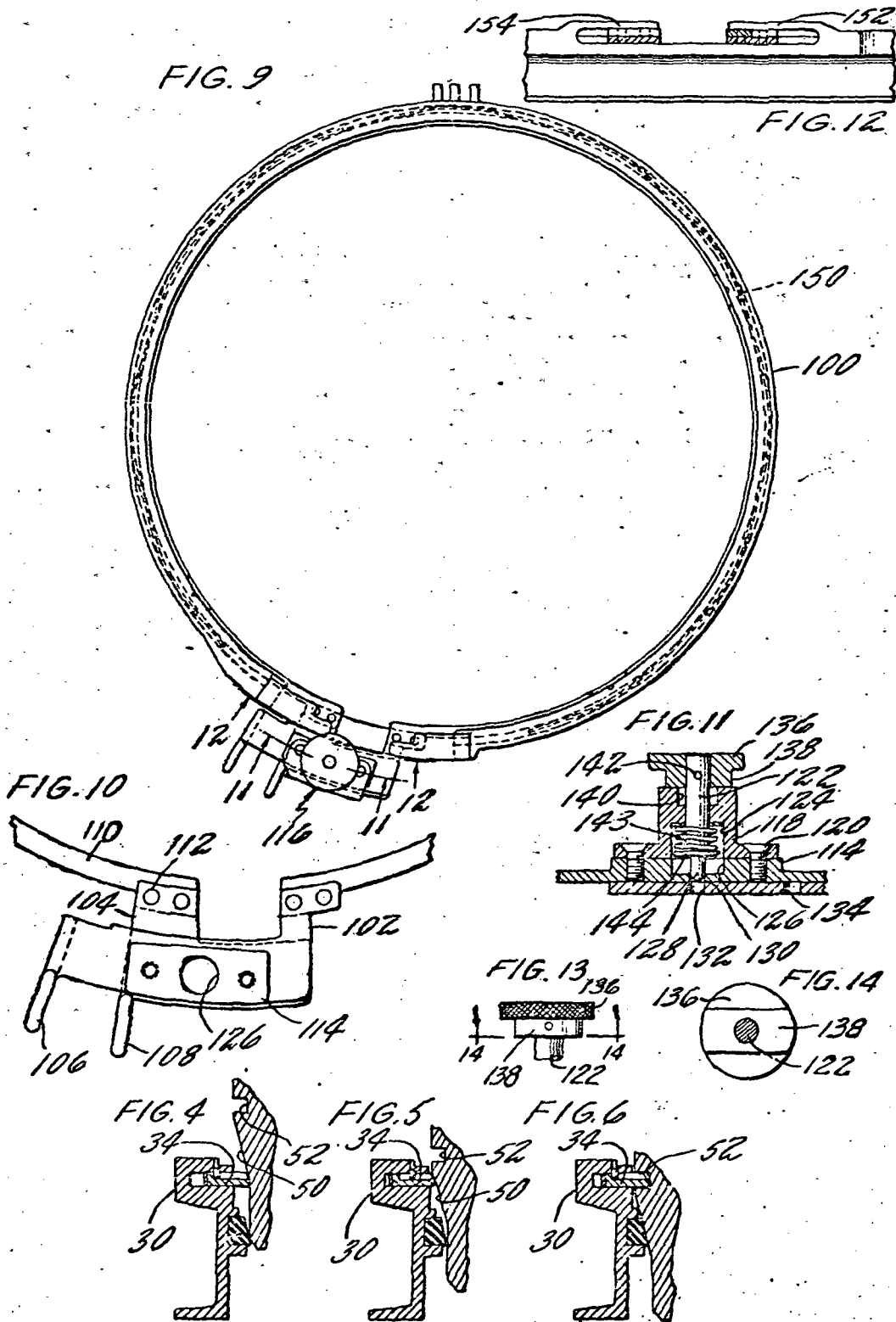
E. W. CHASE ETAL

3,488,771

HELMET LATCHING AND ATTACHING RING

Filed March 17, 1966

2 Sheets-Sheet 2



1

2

3,488,771

**HELMET LATCHING AND ATTACHING RING**  
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U.S. Cl. 2—2.1 5 Claims

## ABSTRACT OF THE DISCLOSURE

A neck ring releasably secured to a pressurized garment carries an open-ended ring normally in the engagement position fitted into an annular groove and adapted to fit into a complementary annular groove formed in a helmet. Camming means formed on the inner surface at the end of the helmet engages the open-ended ring to retract the same and allow for one motion donning even when the garment is pressurized. A projection on the end of the split ring is engageable to physically retract the split ring.

## ORIGIN OF THE INVENTION

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85-568 (72 Stat. 435; 42 U.S.C. 2457).

This invention relates to helmets adapted to be pressurized and particularly to the attaching and latching means therefor.

An object of this invention is to provide means for allowing a wearer of a pressurized garment to don a helmet in the quickest possible time, say 5 seconds, while assuring that no leakage occurs, once engaged.

Another object of this invention is to provide helmet attaching means for a helmet as described that allows the wearer to attach the helmet in a single motion and to provide positive locking means therefor.

A still further object of this invention is the provision of an open-ended ring which secures a helmet to a pressurized suit that puts the engaging ring in shear over nearly the entire circumference.

Other features and advantages will be apparent from the specification and claims and from the accompanying drawings which illustrate an embodiment of the invention.

FIGURE 1 is a perspective view illustrating a typical helmet attached to a typical pressurized suit.

FIGURE 2 is a perspective view showing the neck ring attached to the collar.

FIGURE 3 is a sectional view taken along the lines 3—3 of FIGURE 2.

FIGURE 4 is a sectional view of the neck ring and a partial sectional view of the helmet illustrating one position of the two relative to each other.

FIGURE 5 is identical to FIG. 4 showing the neck ring and helmet in another relative position.

FIGURE 6 is identical to FIG. 4 showing the neck ring and helmet in still a further position which is the attached position.

FIGURE 7 is a sectional view taken along lines 7—7 of FIG. 8.

FIGURE 8 is an enlarged perspective view of the unlatching and locking mechanism identical to the one shown in FIG. 2.

FIGURE 9 is a plan view of another embodiment of this invention.

FIGURE 10 is an enlarged partial plan view illustrating the gripping mechanism.

FIGURE 11 is a sectional view taken along lines 11—11 of FIG. 9.

FIG. 12 is a partial elevated and partial sectional view taken along lines 12—12 of FIG. 9.

FIG. 13 is a side elevation view of the handle of the locking mechanism shown in FIGS. 9 and 11.

FIGURE 14 is a view taken along line 14—14 of FIG. 13.

While the helmet describing the preferred embodiments of this invention is designed for outer space use, it is to be understood that the invention has uses for suits that can be utilized in other environments, as for example, under water, in the atmosphere as for fire fighting and gas protection garments.

Referring now to FIG. 1 showing the helmet generally illustrated by numeral 10 as being attached to a pressurized suit (partially shown) illustrated by numeral 12 by neck ring 14. Neck ring 14 and latching mechanism 16 forming the important features of this invention serve to receive, attach and positively lock the helmet to the suit in sealed relationship.

It is customary practice in the fabrication of space suits to secure the neck ring to a rubber-like seal and retaining collar illustrated by numeral 18 which is sewn to the fabric of the suit adjacent the neck of the wearer. This collar made from a neoprene material is sewn at the bottom extremity to the suit along seam 20. The collar carries a latching and locking mechanism which can best be seen in FIG. 2 that serves to hold the ring in position for receiving the helmet. Insofar as the details of the collar locking mechanism do not form a part of this invention, for the sake of convenience and clarity, a description thereof is omitted herefrom.

For an understanding of this invention suffice it to say that an annular radially extended rib on the inner diameter of the collar 18 fits into complementary annular groove 22 formed in neck ring 14 and the collar locking mechanism retains the ring in sealed relationship.

Inasmuch as the invention is concerned with the construction of the neck ring and its locking mechanism the next portion of this description will describe the details thereof.

As can best be seen from FIG. 2 the ring is formed from an annular element 30 which completely circumscribes the neck of the wearer and the diameter thereof being sufficiently large to receive the head of the wearer. The ring may carry a hinge element 32 which mates with a complementary hinge element carried by collar 18 (as best can be seen in FIG. 2) which permits the ring to pivot about the head of the wearer when the collar securing mechanism is released.

The neck ring consists of an annular element 30 which has an upstanding grooved element 33 which is contiguous thereto and terminates adjacent the front side portion thereof. It being noted that the ends of upstanding element 33 are spaced in order to permit the end of open-ended ring 34 to protrude radially outward and extend in front of annular element 30. Thus, as seen from FIG. 2, the extending portion 36 of open-ended ring 34 extends beyond the ring and is accessible to the wearer. In accordance with this invention open-ended ring 34 is made from a suitable flexible and highly resilient material and fits into groove 38 of upstanding element 33. Of course, upstanding element 33 may be integral with ring 30 and the opening for receiving extension 36 may be milled-out therefrom.

A plurality of pins 40 circumferentially spaced about upstanding element 33 extend into the groove and terminate in proximity to a milled-out slot 42 formed in the top surface of open-ended ring 34. The width and length of the slot is defined by the permissible movement of open-ended ring 34 in order to allow it to be extended

radially into and out of the groove but yet preventing it from falling out. The pin may best be seen by referring to FIG. 3.

A second annular groove 44 judiciously spaced downward from the first annular groove is formed in the inner diameter of the upstanding element 33 for retaining an annular seal 46 which seal serves to engage the outer periphery of the lower lip portion of helmet 10. In one embodiment one end of open-ended ring 34 is pinned to annular element 30 in any suitable manner, as by rivet 48, which serves to retain the ring yet permitting it to be flexed radially.

In order to secure the helmet to the ring, the helmet is merely inserted into the ring when the latching mechanism generally illustrated by numeral 16 is in the unlocked position as shown in FIG. 2. A beveled face formed on the lip of helmet 16 engages the inner diameter of open-ended ring 34 and urges it radially outward to permit the lip of helmet 10 to be inserted further into the ring. The helmet then is inserted until an annular groove formed therein registers with the annular ring and the inherent spring force of open-ended ring 34 causes the ring to contract radially and fit therein for securing the helmet to the ring.

The attaching operation can best be seen by referring to FIGS. 4, 5 and 6. As noted, the lower portion of helmet 10 is generally conically shaped for defining an annular lip 50. An annular groove 52 is formed adjacent the widest portion of annular lip 50 which groove is adapted to receive the open-ended ring 34. As shown in FIG. 4 the helmet is in the position where it is first inserted into the ring. It thereupon engages the smallest diameter of the conical shape of annular lip 50 and commences to urge open-ended ring 34 radially outward. As shown in FIG. 5 as the helmet is inserted further into annular element 30, the bottom portion of lip 50 commences to bear against the seal 46. Then, as seen in FIG. 6, the final position of helmet 10 is where the groove 52 aligns with split ring 34 which is inherently returned back to its radial position to fit into the groove and hold the helmet in position. It will be noted that the face of annular seal 46 is beveled to be complementary in shape to the conical face of lip 50 of helmet 10. Thus the helmet is attached to the ring by a single movement made by the wearer.

The latching and locking mechanism illustrated by numeral 16 will now be described in connection with this invention. Obviously, in space application it is necessary to assure that the helmet does not inadvertently become disengaged. This is accomplished by the combined unlatching and locking means generally illustrated by numeral 16. In this embodiment as shown in FIG. 7 the combined unlatching and locking means comprises a hollow cylinder 60 which carries bracket 62 which may be attached to boss 61 of ring 30 by any suitable means. A sliding plunger 64 is slidably mounted in cylinder 60 and is opened on one end and closed on the other. Flange 66 at the left end butts against the end of cylinder 60 to prevent the piston from moving rightwardly when in the position shown. Through passage 63 formed in sliding plunger 64 registers with slot 68 formed in the end of cylinder 60. Slot 68 and passage 63 are adapted to receive the end of the radial extending portion 36 of open-ended ring 34.

Stem 70 is inserted in the hollow end of sliding plunger 64 and is urged in one position by spring 72 which abuts against spring retaining collar 74. The free end of spring 72 abuts against a flange 76 formed on the end of stem 70. This urges the stem 70 to the left in the drawing shown in FIG. 7. A pin 78 extends radially from flange 76 and fits into slot 80 formed in the side wall of plunger 64. Obviously, the extent of translation of stem 70 is controlled by the length of slot 80. Handle 82 is mounted on the end of stem 70 and carries lug 84. This lug fits into a complementary grooved element 85 fixed to the ring and serves to lock the piston ring in position. In the unlocked position plunger 64 and stem 70 and hence, lug 84 will be

in a position which is to the left of slot 85 provided in element 85.

In order to lock the ring, the plunger in the relaxed position is in the position shown in FIG. 7 where end flange 66 abuts against the end of cylinder 60. The handle 82 and attached lug will be located to the left of shoulder 88 of element 85. Stem 70 must then be moved rightwardly where it will compress spring 72. This allows the stem and handle and hence lug to move to the right and beyond the shoulder 88 of locking element 85. The handle is then rotated counterclockwise until the lug fits into the slot 86. The spring then forces the lug against the inner side wall 89 of the recess formed in element 85. In this position the split ring being positioned by the unlatching mechanism 16 is translated in a manner to reduce its diameter and hence urge open-ended ring 34 radially inwardly and hence in position to lock the helmet to the ring and prevent the ring to increase its diameter so as to be retracted into its groove.

In order to disengage the helmet from the ring it is necessary to move the latching mechanism to the right, turn it in the opposite direction, that is clockwise, permitting the lug to escape from the retaining element 85 and allow it to move toward the left. The wearer then has to insert the plunger by pressing in handle 82 leftwardly causing the split ring by action of extension 36 to be axially displaced from its end for increasing the diameter thereof and hence extending the split ring radially outwardly and permitting the helmet to be withdrawn.

FIGURE 9 is another exemplary showing of a preferred embodiment of this invention and merely differs from the first embodiment in the attachment for the split ring and in the unlatching and locking mechanism. As can be seen by FIG. 9, ring 100 is substantially identical to ring 30 shown in FIG. 2 save for the design of the front portion which receives the unlatching and locking mechanism. Instead of pinning one end of the open-ended ring to the ring itself both ends of the ring are free. Attached to each end as can be seen by FIG. 10 are a pair of flat plates 102 and 104 which are in sliding relationship to each other. Grips extending outwardly and downwardly therefrom identified by numerals 106 and 108 project beyond the ring and in front thereof and are accessible to the wearer for squeezing the two together for enlarging the diameter of open-ended ring 110 and hence, positioning it radially outwardly. These gripping elements may be suitably attached to the end of split ring 110 by rivets illustrated by numeral 112.

Boss 114 projecting upwardly from the top surface of plate 102 is adapted to receive the locking mechanism generally indicated by numeral 116. This locking mechanism can best be illustrated by reference to FIG. 11 which shows a casing 118 secured to boss 114 by bolts 120. Plunger 122 centrally mounted in cavity 124 projects through opening 126 formed in boss 114. The reduced diameter portion 128 projects through opening 130 and is adapted to fit into complementary openings 132 or 134 formed in plate 102 depending on the relative position of plates 102 and 104. Thus, when split ring 110 is in its relaxed condition, namely, when its ends are closest to each other wherein the ring is at its smallest diameter, 132 will register with slot 130. Insertion of the end 128 of plunger 122 will lock the ring in this position and prevent plates 102 and 104 from moving relative to each other. This is accomplished by rotating handle 136 half of a revolution and permitting projection 138 to fit in recess 140. Obviously, handle 136 is pinned to plunger 124 by pin 142 for carrying the plunger therewith. Spring 143 mounted in cavity 124 surrounds plunger 122 bottomed against the top wall thereof. The free end of spring 143 abuts spring retaining collar 144 which is firmly secured to plunger 122, thus urging plunger 122 downwardly.

The wearer merely squeezes the two grips 106 and 108 together when plunger 122 is retracted forcing ring 110 to spread apart for increasing its diameter so that it will

retract into the groove similar to the one shown in connection with FIGS. 2 through 6.

In order to keep the piston ring centered, a wave spring 150 may be incorporated which wave spring abuts against the outer periphery of the open-ended ring 110 and the inner wall of the groove formed in the ring.

To stabilize and offer support to the unlatching and locking mechanism the top surface adjacent the opening of ring 100 may be bossed as can best be seen in FIG. 12 and terminated in a bifurcated end 152 and 154. Thus, a portion of the plates 102 and 104 fits into the bifurcated portion and is supported thereby.

It is contemplated within the scope of this invention that the wearer will be able to ascertain when the helmet is securely engaged. This is an especially important consideration particularly in outer space application. Both embodiments afford this advantage since the wearer is capable of viewing from the inside the position of the unlatching mechanism. It has also been found through actual use that there is a certain "feel" that the wearer gets when the open-ended ring 34 engages the helmet slot.

It should be understood that the invention is not limited to the particular embodiments shown and described herein, but that various changes and modifications may be made without departing from the spirit or scope of this novel concept as defined by the following claims.

We claim:

1. In combination, a helmet adapted to encapsulate the head of the wearer and capable of being pressurized including an annular generally conically shaped lip portion formed on the lower extremity of the helmet and a first annular groove formed adjacent to the widest portion of the conically shaped lip, an annular ring encircling the neck of the wearer and anchored to a garment worn by the wearer, said ring having a flexible open-ended ring element mounted in a second annular groove formed in the inner diameter of the annular ring, said open-ended ring element being normally in a contracted position so as to engage said conically shaped lip of the helmet so as to be extended radially to pass beyond the lower extremity of said helmet and contract into said first annular groove so that a portion extends into said first annular groove of said helmet for nearly the entire circumference of said helmet, and means connected to said annular ring adapted to retract said open-ended ring from said first annular groove.

2. A combined latching, unlatching and locking means for a helmet of the type that is adapted to be pressurized including an annular ring having axially spaced annular grooves, a circumferential sealing element mounted in one of said grooves, open-ended ring-like flexible element loosely mounted in said other groove, a pair of flat plates mounted in sliding relation relative to each other each having a radially extending portion projection transversely through a recess formed on the top surface of said annular ring and secured to the respective ends of said ring-like flexible element, means attached to said flat plates extending therefrom adapted to be engaged externally of said ring for positioning said plates relative to each other, and locking means carried by one of said plates for preventing relative movement therebetween, said locking means including a housing attached to the top surface of one of said flat plates, a retractable plunger supported by said housing in transverse relation to the top surface of said plate, complementary openings formed in said plunger adapted to communicate with the end of said plunger when said openings are in register with each other.

3. A combined latching, unlatching and locking means as claimed in claim 2 wherein spring means in said housing urge said plunger toward said flat plates.

4. A combined latching, unlatching and locking means as claimed in claim 3 including a handle attached to an end of said plunger projecting through a top opening in said housing.

5. A combined latching, unlatching and locking means as claimed in claim 4 wherein the top of said housing is recessed and said handle carries a depending member complementary in shape to said recess member in but one circumferential position.

#### References Cited

#### UNITED STATES PATENTS

2,394,078 2/1946 Krupp 2-21

RICHARD J. SCANLAN, JR., Primary Examiner

U.S. CL. X.R.

69-71