June 15, 1971 N. E. BROWN ET AL 3,584,313

HELMET LATCHING AND UNLATCHING MECHANISM

Filed Dec. 20, 1968

FIG. 1

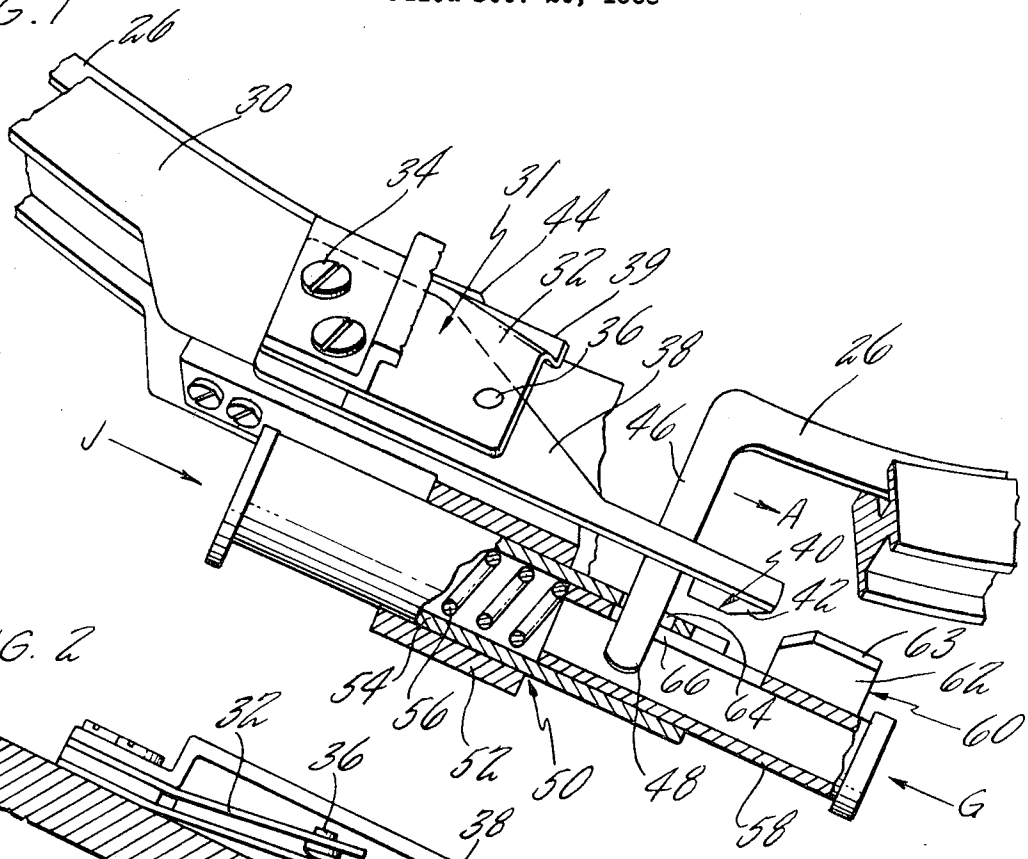


FIG. 2

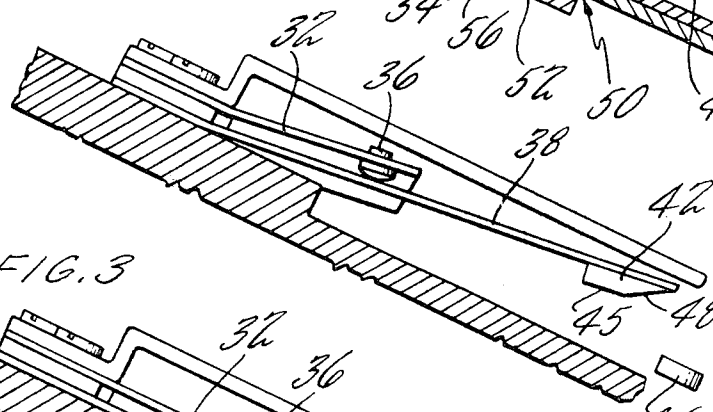


FIG. 3

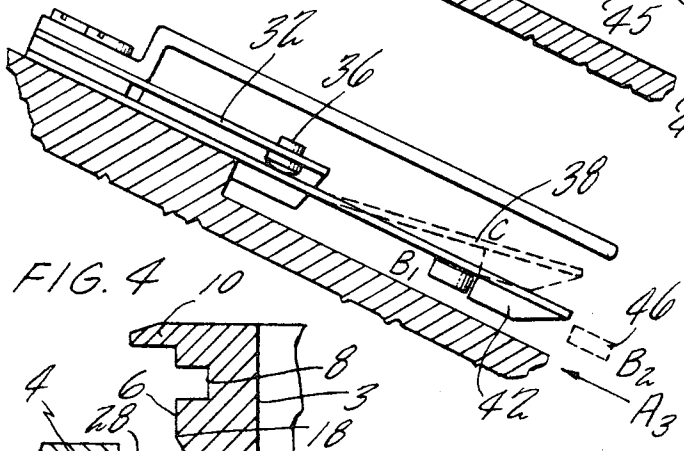


FIG. 4

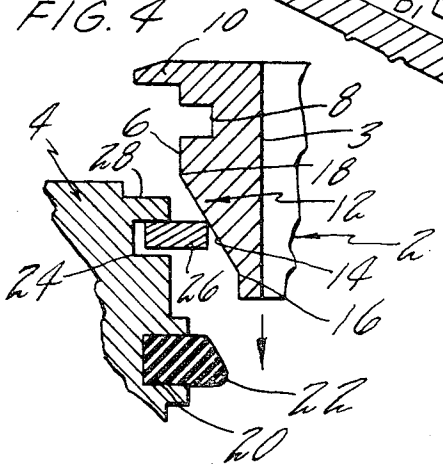
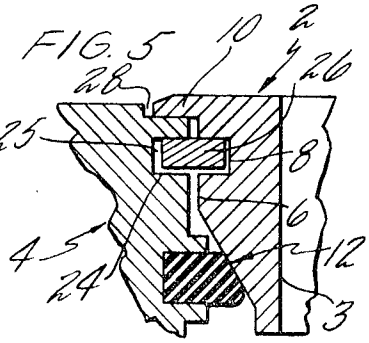


FIG. 5



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HELMET LATCHING AND UNLATCHING MECHANISM

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U.S. Cl. 2—2.1 2 Claims

ABSTRACT OF THE DISCLOSURE

A neck-ring for use with a helmet of the pressurizable type, the neck-ring including an expandable latching ring having a depending member engageably connected to latching and unlatching means, movement of the latching ring being transmitted thereto. Attached to the neck-ring is resilient means for locking the depending member in place and thereafter requiring two contrary movements to unlock the mechanism.

BACKGROUND OF THE INVENTION

The present invention relates to helments adapted to be pressurized and more particularly to improved latching and unlatching mechanism constructions therefor.

The present invention has particular utility in a helmet which is of the type that is to be pressurized and which in all likelihood will be used in either a space environment or an undersea environment. The latching and unlatching mechanism of a helmet utilized in this environment must satisfy three basic requirements, that is, (1) the helmet has to be locked securely into its neck-ring simply by donning the helmet, and no additional manual locking operation by the user is required; (2) the helmet and hence lock cannot be opened accidently or unintentionally; and (3) the mechanism cannot be locked unless the helmet is fully inserted or in place, thereby preventing the user from locking himself out.

The prior art constructions while normally satisfying one, and quite possibly two of the foregoing requirements, have been notably lacking in satisfying all three of the foregoing requirements. As a result, the helmet and latching mechanism utilized have not been of the most safe constructions, and in order to overcome this, the prior art constructions have had to resort to other more complex devices.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a construction whereby a helmet may be locked securely into a neck-ring simply by donning, the construction being such that the helmet cannot be accidentally or unnitentionally removed, and it is impossible for the wearer to lock himself out of the helmet.

The present invention accomplishes the foregoing objective by utilizing a helmet which contains a circumferential groove and a neck-ring which contains an oppositely faced circumferential groove, the two grooves forming an annular groove when the helmet is inserted within the neck-ring. Positioned within the neck-ring groove is a latching ring, the latching ring being expandable radially by actuation means on the helmet. This latching ring contains a depending member or latching ring arm which is engageably connected to what is herein called a latching and unlatching mechanism.

This latching and unlatching mechanism comprises a first or opening tube which is positioned in a housing attached to the neck-ring and is freely slidable therein. Positioned within the first or opening tube is a compression spring which operably opposes a second tube. This second tube or unlocking tube is concentric with and positioned within the first or opening tube and slidable therewithin. The locking tube carries on one end a wedge-shaped flange, the purpose of which will be hereinafter explained.

Positioned on and connected to the neck-ring is a first flexible flange or closing spring means. This first flexible flange carries a pivot means, and is operably responsive to a radially extending flange on the helmet. Positioned below the closing spring means is a second flexible flange, which is operably responsive at different times to the pivot means carried on the first flexible flange and the depending member of the latching ring. Additionally, the second flexible flange contains a locking means which cooperates with the depending member, and which is actuated by the wedge-shaped flange contained on the second tube.

When the helmet is inserted into the neck-ring, the lower part of the helmet, where the actuating means are positioned, will expand the latching ring. Due to this expansion, the depending member will move linearly taking the latching and unlatching assembly with it. When the helmet is completely pushed down into the neck-ring, automatic locking takes place in the following manner.

The flange of the helmet ring pushes down compressing the closing spring. The closing spring of first flexible flange, which carries pivot means in turn compresses the locking spring on second flexible flange downward, both resilient means therby assuming a compressed position. Simultaneously, the latching ring snaps into the helmet ring groove or annular groove, and the depending member moves into or returns to its former position, thereby pushing the latching and unlatching mechanism, hereinbefore described to its former position. While sliding back, the depending arm will lift the locking means flange contained on the second flexible flange upward, hence the second flexible flange and locking means moving about the pivot. The second flexible flange and locking means flange thereon will thereafter return to its down position once the depending member has passed thereunder, thus catching and locking the depending member. The foregoing illustrates the automatic locking feature of the persent invention.

The present invention satisfies the accidental opening or unlocking requirement through the utilization of the first and second tubes hereinbefore noted. To unlock the helmet from the neck-ring, it is necessary first to move the unlocking tube or second tube, thereby sliding it into the opening or first tube and compressing the spring contained therein. As the second tube slides within the first tube, the wedge-shaped flange slides under the locking means on the second flexible flange, the locking means thereby riding up on the straight portion of the wedge-shaped flange. Now, manually holding the second tube all the way in the opening tube, the opening tube has to be pushed in a direction opposite to the direction which the second tube was initially pushed. This movement will thereby move the dependent member in the same direction, thus expanding the latching ring so that it slides out of the helmet ring groove or annular groove. The helmet is now in a position to be removed from the neck-ring, and the spring assembly will thereafter return to its open position. Obviously, the lock cannot be opened accidentally because two contrary movements are necessary to open it as hereinbefore described.

The present invention satisfies the final requirement, that is, the requirement of preventing a possible locking out of the user, because with the helmet off, the mechanism cannot be locked, unles the closing spring is forced down by the helmet, and since the hook will always be in the up position, it cannot catch and lock the depending member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective fragmentary view illustrating the neck-ring and the latching and unlatching mechanism of the present invention.

FIG. 2 is a schematic showing of the first flexible flange and the second flexible flange in its up or open position.

FIG. 3 is a schematic showing of the first flexible flange and the second flexible flange in its down or locked position.

FIG. 4 is a schematic sectional showing of the helmet prior to insertion into the neck-ring.

FIG. 5 is a schematic sectional showing of the helmet positioned in the neck-ring after insertion.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the illustrative embodiment of the preferred embodiment is designed for use in an outer space environment, it is to be understood that the present invention has uses for suits that can be utilized in other environments, as for example, undersea applications, in the atmosphere as for fire fighting and gas protection garments.

It is customary practice in the fabrication of space suits to secure a neck-ring to a rubber-like seal and retaining collar not shown herein, this collar being sewn to the fabric of the suit, also not shown, adjacent to the neck of the wearer. Inasmuch as the invention is concerned with the construction of the neck-ring and its latching and unlatching mechanism for the sake of brevity, details of the foregoing structural elements will not be described.

Referring first to FIGS. 4 and 5, the lower portion of helmet **2** is illustrated in two positions, more specifically, prior to insertion into neck-ring **4** and after insertion into neck-ring **4**. As shown lower portion **3** of helmet **2** is generally conically shaped and defines an annular lip **6**. An annular groove **8** with its opening facing outward with respect to the helmet centerline is formed above lip **6**. Helmet **2** also includes a substantially radially extending flange **10**, flange **10** being positioned above annular groove **8**. Helmet **2** additionally includes actuation means **12** positioned below annular lip **6**. As illustrated, actuation means **12** comprises a camming surface **14** which slopes outwardly from an inward position **16** on helmet **2** to a greater diameter position **18** on helmet **2**. The purpose of actuation means **12** will hereinafter be described.

FIGS. 4 and 5 also illustrate a portion of neck-ring **4** and the portions thereof which are immediately adjacent helmet **2** and cooperate therewith. Neck-ring **4** includes annular slot **20** within which is positioned a suitable seal **22**. It will be noted that the annular face of seal **22** is beveled and complimentary in shape to the camming surface **14** of actuation means **12** thereby providing a continuous seal. Additionally, positioned within neck-ring **4** is circumferential groove **24**, the opening of circumferential groove **24** being oppositely faced to annular groove **8** so that when helmet **2** is positioned within neck-ring **4** they cooperate to form an annular slot or opening **25** extending between the helmet **2** and neck-ring **4**. Positioned within circumferential groove **24** is a flexible latching ring **26**, latching ring **26** being of a split-ring type construction, and is initially loosely positioned within groove **24** and extends partially past the opening of groove **24**. As hereinbefore noted, latching ring **26** is flexible, it being made from a suitable highly resilient material, and, as such, is free to expand or contract radially within groove **24**. It should be noted that the width and length of groove **24** is defined by the permissible movement of latching ring **26**, in order to allow it to be expanded radially into and out of the groove but yet preventing it from falling out. Other details and specifics of latching ring **26** will be hereinafter described in conjunction with the latcing and unlatching mechanism.

In attaching the helmet **2** to neck-ring **4** helmet **2** is inserted into neck-ring **4** in a direction as indicated by the arrow on FIG. 4. As shown, the smallest diameter **16** of

camming surface **14** commences to exert a force on latching ring **26**, tending to expand latching ring **26** radially outward in groove **24**. The helmet is inserted into neck-ring **4** until groove **8** and groove **24** are opposite one another forming annular slot or opening **25**. At this point, latching ring **26** which has been compressed into groove **24** springs radially outward locking the helmet and neck-ring in the position as shown in FIG. 5. Additionally, flange **10** is positioned in a radial step **28** of neck-ring **4** providing a substantially smoth annular contour.

Now referring to FIG. 1, the latching and unlatching portion of the present invention will be described. As illustrated, positioned on the outermost flange **30** of neck-ring **4** is resilient means **31** including first flexible flange or closing spring **32** and second flexible flange **38**. First flexible flange **32** is attached to neck-ring **4** by bolts **34** and carries pivot means **36** at a point remote or distal from the point of attachment. It also includes a small triangular section **39** which extends past the inner diameter of neck-ring **4** approximately as far as the width of step **28**. Therefore, when helmet **2** is inserted, this triangular portion **39** is forced downward by flange **10**, this force being transmitted to the entire flexible member **32** and causes it to be compressed or more specifically move downward in substantially the same plane as the plane of insertion of helmet **2**. Positioned below first flexible flange **32**, and in this embodiment of the present invention, similarly attached to neck-ring **4** by bolts **34** is second flexible flange **38**. Second flexible flange **38**, like first flexible flange **32**, is manufactured from any suitable resilient material and carries on its end remote from its point of attachment to neck-ring **4** an inwardly extending locking means **40**, herein illustrated as flange **42**. Second flexible flange **38** is positioned below first flexible flange **32** such that downward or upward motion occurs around pivot means **36**; in fact, when helmet **2** is being inserted with neck-ring **4**, pivot means **36** exerts a force on second flexible flange **38** causing it to also move downwardly.

As hereinbefore noted, latching ring **26** includes other structural members and features which heretofore have not been described. Again, referring to FIG. 1, latching ring **26** is clearly seen to be of a split construction, one end **44** terminating approximately beneath the first and second flexible flanges. The other end includes an integral depending member **46** which extends outwardly past neck-ring **4**, from the body of latching ring **26**, the free end **48** of depending member **46** being engageably connected within latching and unlatching means **50** hereinafter more fully described.

The latching and unlatching means illustrated by reference character **50** will not be described in connection with the present invention. It includes housing **52** which is connected to neck-ring **4** by any conventional means. Slidably positioned within housing **52** is a first or opening tube **54**, opening tube containing a spring means **56**. Positioned within opening of first tube **54** is second or unlocking tube **58**, tube **58** being slidable within first tube **54**. Positioned on one end of second tube **58**, the end opposite the end normally positioned within first tube **54**, is unlatching means **60**, herein illustrated as a wedge-shaped flange **62**. The first tube and second tube each contain a normally aligned opening, **64** and **66** respectively, through which depending member **46** extends, thus securing together tubes **54**, spring means **56** and second tube **58**.

The latching and unlatching operation will now be described. As hereinbefore described, when helmet **2** is inserted into neck-ring **4**, actuation means **12** causes latching ring **26** to expand radially. Obviously, as the latching ring body **26** expands radially, depending member is going to move, its direction of movement being indicated by reference character A. Since depending member **46** is engageably connected to latching and unlatching means

50, means 50 will move linearly with depending member 46.

As helmet 2 is being inserted into neck-ring 4, flange 10 is compressing or forcing first flexible flange 32 downward and first flexible flange 32 through pivot means 36 is forcing second flexible flange 38 downward or in the direction of insertion of helmet 2. Now when helmet 2 has been completely inserted in neck-ring 4, this position being illustrated as B_2 of FIG. 3 latching ring 26 automatically and simultaneously snaps into the annular slot 25 and therefore depending member 46 will move back to its former position indicated by reference character B_1 of FIG. 3, obviously moving latching and unlatching means 50 back to its former position also. The sliding movement of depending member 46 and means 50 is opposite to that indicated by reference character A on FIG. 1, the direction of movement being indicated by reference character A_3 on FIG. 3.

As depending member 46 slides from its expanded position B_2 to its unexpanded position B_1, it comes in contact with locking means 40 forcing locking means 40 upward, locking means 40 being carried upward around pivot means 36 by second flexible flange 38. Once the depending member has passed locking means 40, it and the second flexible flange will snap back into place, i.e., its down position thereby catching depending member 46 and locking helmet 2 in place.

To unlatch or unlock the helmet, two contrary movements have to be performed. Initially, second or unlocking tube 58 is pushed in a direction as indicated by reference character G on FIG. 1. As a result of this motion, tube 58 will slide within opening tube 54 thereby compressing spring 56. As a further result of motion in this direction, wedge-shaped flange 62 slides under locking means 40 and causes locking means 40 to move upward. Since second flexible flange 38 will flex upward around pivot means 36, locking means 40 will assume the position indicated by reference character C of FIG. 3. In the present embodiment of the present invention, locking means 40, or flange 42 is illustrated as having a complementary bevel portion 43 and straight portion 45, complementary that is to the shape of wedge-shaped flange 62. Therefore, flange 42 will move upward and there slide along straight portion 63 of wedge 62. Now, holding tube 58 all the way into tube 54, tube 54 has to be pushed in the direction U of FIG. 1. This movement will therefore move depending member 46 in the direction A of FIG. 1. This movement will therefore move depending member 46 in the direction A of FIG. 1 thereby expanding latching ring 46 so that it slides out of the annular opening 25 between the helmet and neck-ring and into circumferential groove 24. Helmet 2 is now free to be taken out of neck-ring 4, and the resilient means 31 will return to the open position illustrated in FIG. 2.

The impossibility of "locking out" feature of the present invention should now be clear. With helmet 2 off, the mechanism cannot be locked, because, unless first flexible flange 32 is forced down by flange 10, locking means 40 will always be in the up position and unable to catch depending member 46.

We claim:

1. A pressure suit helmet latching and unlatching mechanism comprising:

a pressure suit body enclosing neck ring defining an opening through which the neck of the wearer may be positioned, said neck ring having a passage extending radially therethrough, said neck ring also having a groove extending completely around the inside annular surface thereof;

a helmet ring engaging coaxially within said neck ring and including a groove extending completely around an outer peripheral surface thereof, said helmet ring having an outside diameter just less than the inside diameter of said neck ring, said groove being positioned on said helmet ring so as to face and form an annular slot with the groove of said neck ring when said helmet ring and said neck ring are mutually engaged;

a resilient latching ring having a cross sectional configuration similar to, but of a smaller radial extent, than the radial extent of said annular slot, said latching ring having a radially extending arm portion extending therefrom, said latching ring disposed in the groove of said neck ring with said arm portion passing through said radially extending passage in said neck ring, said latching ring adapted to resiliently increase in diameter as a result of motion of said arm portion tangential to said ring in a given direction toward the portion of said ring to which it is attached, said helmet ring having a camming surface for opening said latching ring to allow said helmet ring to engage said neck ring;

a resilient latch means disposed on said neck ring and being resiliently urged into a locking position in which it blocks motion of said arm portion in said given direction, said resilient latch means having an unforced rest position in which it does not block the motion of said arm portion in said given direction;

cam means resiliently urging said latch means into said locking position when said helmet ring is in engagement with said neck ring; and

an unlatching means moveably disposed on the outside of said neck ring and in engagement with said arm portion, said unlatching means having a pair of relatively moveable means adapted to be moved relative to each other, irrespective of motion of said unlatching means with respect to said neck ring, for urging said latch means out of said locking position, said unlatching means adapted to be moved with respect to said neck ring by a human operator, for moving said arm portion in said given direction.

2. A helmet latching and unlatching mechanism according to claim 1 wherein said cam means comprises a resilient means having a rest position out of contact with said resilient latching means, said cam means engaged by said helmet ring in response to said helmet ring being positioned in substantially full engagement with said neck ring so as to urge said latch means into said locking position.

References Cited

UNITED STATES PATENTS

1,370,316	3/1921	Houdini	2—2.1
2,394,078	2/1946	Krupp	2—2.1
3,353,534	11/1967	Savoie	2—2.1

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