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National Aeronautics and
Space Administration
Washington, D.C.
20546

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Reply to Attention of --GP

TO: NHB/Scientific & Technical Information Office
FROM: GP-4/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-4 and Code NHB, the enclosed NASA-owned U.S. Patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U.S. Patent No.

: 3,574,785
United Aircraft Corporation
East Hartford, Conn.

Government or
Corporate Employee

Supplementary Corporate
Source (if applicable)

NASA Patent Case No.

: MSC-10954-1

NOTE - Is this an invention made by a corporate employee of a NASA contractor? YES NO

If "YES" is checked, the following is applicable: 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 ..."

Elizabeth A. Carter

Enclosure

No patent appl.



(NASA-Case-MSC-10954-1) EMERGENCY
SPACE-SUIT HELMET Patent (NASA) 7

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June 2, 1970

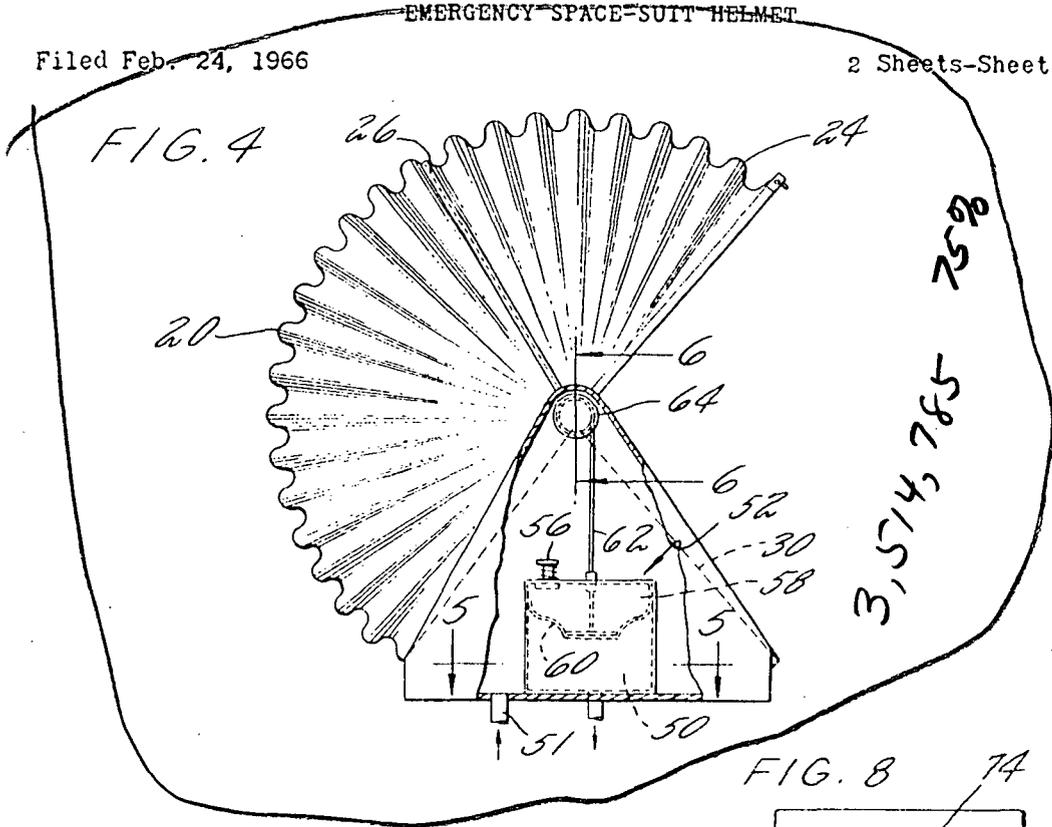
H. A. SMITH

3,514,785

EMERGENCY SPACE-SUIT HELMET

Filed Feb. 24, 1966

2 Sheets-Sheet 2



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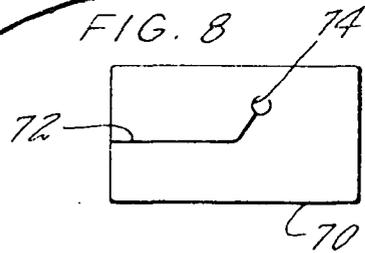


FIG. 5

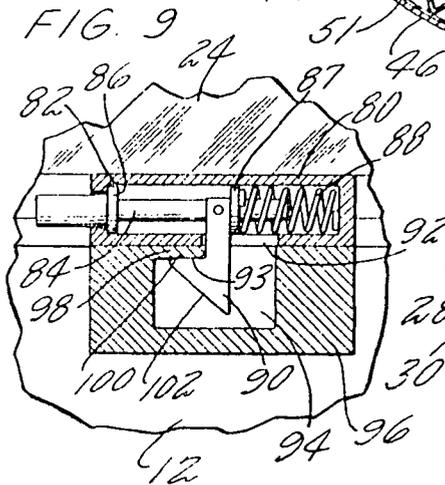
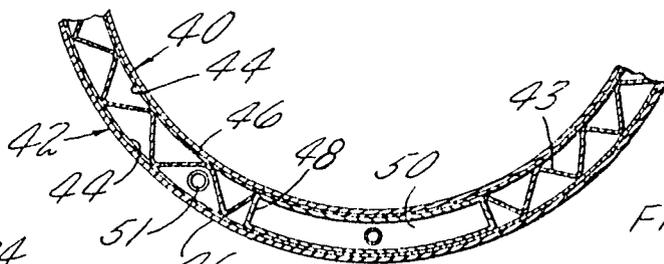


FIG. 7

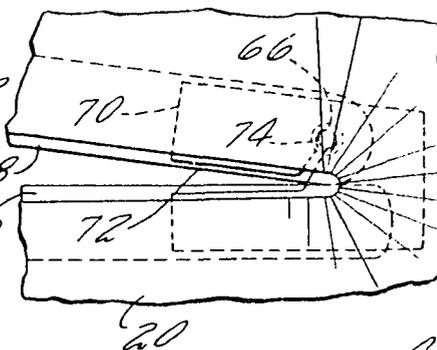
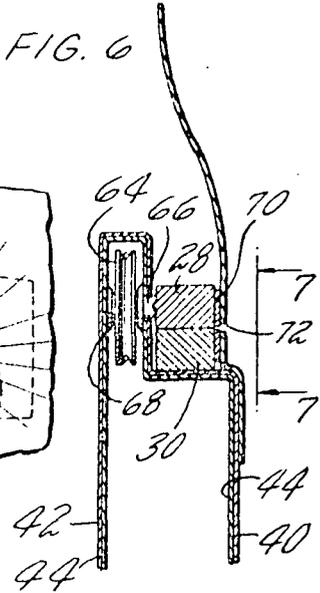


FIG. 6



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3,514,785

EMERGENCY SPACE-SUIT HELMET

Harvey A. Smith, Hampden, Mass., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware

Filed Feb. 24, 1966, Ser. No. 529,884

Int. Cl. B63c

U.S. Cl. 2-2.1

8 Claims

ABSTRACT OF THE DISCLOSURE

A frusto-conically shaped distensible member when inflated encircles a portion of the wearer's head and carries a collapsible member automatically extending over the remaining portion of the head and engages a seat formed by a surface of the distensible member. A pulley arrangement secured between the walls of the distensible member automatically extends and retracts the collapsible member. The unit when deflated is carried on the back of the wearer so as to provide an automatic emergency space-suit helmet.

This invention relates to helmets particularly of the type that envelop the wearer's head so as to be pressurized and that are particularly adapted to be utilized in outer space.

With the advent of outer space exploration the need has arisen for supplying to the astronauts an emergency type of helmet that is deployed, positioned, and closed automatically, and always attached to the wearer so that it will be readily accessible. Thus, the helmet should be collapsible so that it can be carried by the wearer in such a manner that it will not interfere with his normal activities. This invention solves the particular problem by being collapsible, automatically extensible, and suitably and comfortably attached to the wearer's suit in a location that will not interfere with or hinder his normal activities. The helmet is inflatable in such a manner that it can easily be actuated to encapsulate his entire head so as to be pressurized to afford safety to the wearer.

It is therefore an object of this invention to provide an emergency space helmet that snugly fits about the shoulders of the wearer when in the retracted position and is inflatable so as to be formed and positioned in an easy and convenient manner to completely encapsulate the head of the wearer so as to be pressurized.

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

FIG. 1 is a side elevation view showing the helmet in the retracted deflated position mounted on the wearer.

FIG. 2 is a side elevation showing the helmet in its inflated position.

FIG. 3 is a front elevation of the helmet when inflated.

FIG. 4 is a side view partly in section and partly in full showing the details of the invention.

FIG. 5 is a sectional view taken along the line 5-5 of FIG. 4.

FIG. 6 is a sectional view taken along the line 6-6 of FIG. 4.

FIG. 7 is a sectional view taken along the line 7-7 of FIG. 6.

FIG. 8 is an elevated view of the side seal element, and

FIG. 9 is a sectional view taken along line 9-9 of FIG. 2.

Referring now more particularly to FIGS. 1 through 9 which show the details of this invention wherein FIG. 1

member with its apexes terminating adjacent the central side portion of the wearer's head. The lower or bottom extremity of the pylon is suitably attached to the upper garment 14 along seam 18 which seam completely encircles the wearer about the neck. While the disclosure shows the helmet integrally attached to the rest of the suit, it is deemed within the scope of this invention to secure the two by any retractable means such as zippers, fasteners or the like, yet assuring that there is a suitable seal at this point to prevent pressurized air from leaking externally. Secured in a retractable manner to the pylon 12 in a manner to be described hereinbelow is a head-covering generally illustrated by numeral 20. The head-covering, when the pylon is inflated, is rotated about an axis point formed at the apexes of pylon 12 to completely encapsulate the head of the wearer as will be described hereinbelow. A transparent flexible member 24 formed from suitable material such as polyvinylchloride is secured to member 20 along seam 26 and carries a semicircular sealing member 28 at its free end. Sealing member 28 engages complementary lip seal 30 which is attached to the upper front edge of pylon 12. A suitable latch 32 of the type illustrated in FIG. 9 may be provided to assure that the joint remains fixed during pressurization.

As is apparent from FIG. 5, the pylon is constructed with two parallel spaced walls generally illustrated by numerals 40 and 42. Each wall is constructed with an inner layer 44 formed from a closely woven nylon fabric coated with neoprene forming a leak-tight bladder and outer layer 46 formed from a nylon woven fabric. A shape-retention fabric 43 disposed in wave-like fashion between walls 40 and 42 is bonded to the surfaces of the bladder at alternate bends so as to assure that pylon 12 retains its shape when inflated. Inner bladder 48 defining a closed chamber 50 is disposed centrally on one side of pylon 12 for housing the actuating mechanism generally illustrated by numeral 52. Actuation of the helmet is accomplished by admitting pressurized fluid through the opening provided at 51 to enter into the space between walls 40 and 42 exclusive of chamber 50 causing the pylon 12 to inflate and become erect vertically about the neck and face portions as illustrated in the drawings. When the pressure reaches a predetermined value, that is, upon the point where the pylon is fully erected and sufficiently rigid, the pressure overcomes spring loaded valve 56 admitting pressurized fluid into chamber 58 which chamber is formed in chamber 50 by the partition created by the flexible diaphragm 60. Pressure acting in chamber 58 acts on the inner surface of flexible diaphragm 60 for causing it to move downwardly. Cable 62 is suitably attached to diaphragm 60 in any well-known manner which has one end secured to pulley 64 the details of which are illustrated in FIG. 6. Pulley 64 is secured to shaft 66 which is journaled in bushing 68 fixed to bladder 44. The other end of shaft 66 protrudes through the other wall 46 and is secured to the sealing member 28. Sealing member 28 is generally U-shaped and engages lip 30 in the closed position as can best be seen in FIG. 3. Flexible sealing member 70 made from a neoprene material is disposed between the helmet member 20 and the sealing member 28 in proximity to the pulley. As can be seen from FIG. 8, it is slotted along the path shown by reference numeral 72 and terminates in a relief aperture 74. The portion above the slot is bonded to the edge of sealing member 28 and the portion below the slot is bonded to the lip 30. Of course, lip 30 is molded or bonded to the inner surface of the pylon 12. The helmet shell 20 which is formed from a closely woven fabric bonded

As can be seen in FIG. 7, when the helmet is in a position other than the closed position, the edges of seal member 70 adjacent slot 72 will separate. This illustrates how the seal member 70 will not interfere with the retraction of the helmet.

To actuate the helmet pressure applied internally through opening 51 inflates the pylon. Then the valve 56 opens and forces diaphragm 60 to actuate the pulley. The retracted helmet shell consisting of member 20 and 24 which are folded in an accordion pleated manner is carried by pulley 64 and unfolds until the sealing member 28 engages the seal lip 30. The latch 32 automatically engages and locks the helmet in position. Pressure can then be applied internally in any suitable manner to pressurize the helmet. As noted, this system lends itself to be actuated automatically and may be tied in any suitable manner to the overall cabin pressure and sensing system.

As can be seen from FIG. 9, latch 32 comprises housing 80 having opening 82 closed at one end. Plunger 84 projects through opening 82 and one end is accessible to the wearer. Flange 86 formed on plunger 84 bears against the inner wall of housing 80 adjacent opening 82 to prevent the plunger from falling out. Spring 88 abuts the other end wall of housing 80 and collar 87 firmly secured to plunger 84 for urging the plunger leftwardly so that flange 86 is constantly urged toward the end wall. Latch 90 adjacent opening 82 projects through opening 92 formed on the bottom wall of housing 80 and extends into recess 94 formed in housing 96. Housing 96 is suitably secured to the pylon 12. Projection 98 adjacent opening 94 is formed by the top wall of housing 96 to define shoulder 100. This shoulder engages the radial extension 93 of latch 90 for locking member 24 to pylon 12. To open the helmet the wearer merely depresses plunger 84 which moves latch 90 beyond lip or shoulder 98 to retract the latch and allow the two pieces to separate. It will be appreciated that latching is completely automatic. Latch 90 aligns itself with recess 94 and owing to the beveled face forces latch 90 to the right. Spring 88 forces the latch leftwardly and when below lip 98 the radial extension 93 fits into position.

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.

I claim:

1. An emergency type of distensible helmet adapted to encapsulate the head of the wearer and be pressurized, including a frusto-conically shaped distensible member bifurcated at one end such that the apexes of the bifurcated ends are disposed substantially adjacent the central point of the head of the wearer when extended and are in diametrically opposed relationship, said frusto-conically shaped member having spaced side walls being closed at the bottom and top defining a pressure receiving chamber, a rotary member supported in one leg of said bifurcated end about an axis substantially in coincidence with the center of the side of the head of the wearer, a partially spherically-shaped foldable member made from a flexible material connected to said rotary member and having one end attached to the surface of said bifurcated end extending along a distance sufficient to encircle the posterior portion of the head of the wearer and seal means carried by the other end of said foldable member, a seat formed at another surface of said bifurcated end extending along a distance sufficient to encircle the anterior portion of the head of the wearer, said seal means being adapted to extend along said another surface and engage said seat, and actuating means between said spaced side walls for

actuating said rotary member for rotating said foldable member for engaging said sealing means and encapsulating the head of the wearer.

2. An emergency type of helmet as claimed in claim 1 wherein the partially spherically-shaped folded member is made from at least two members, a forward extending member disposed in front of the face of the wearer being made from a flexible type of transparent plastic nonporous material and the other member disposed in the rear of the head of the wearer being made from a flexible nonporous material and being seamed along complementary edges extending from the diametrically disposed apexes of the bifurcated ends substantially adjacent the top of the head of the wearer.

3. An emergency type of helmet as claimed in claim 2 wherein the material of the transparent nonporous material is a polyvinylchloride plastic and the material of the rear extending member is two coextensive layers, the outer layer being a woven nylon fabric and the inner layer being a synthetic rubber material.

4. An emergency type of helmet as claimed in claim 1 wherein said actuating means includes wall means between said spaced side walls defining a subchamber, a valve in an opening formed in said wall means adapted to open when said frusto-conically shaped distensible member is in the extended position, a flexible diaphragm extending to diametrically opposed vertical walls of said wall means and a chord having one end attached to said diaphragm and the other end attached to said rotary means.

5. An emergency type of helmet as claimed in claim 4 wherein said rotary means includes a pulley journaled in one of said spaced side walls of said frusto-conically shaped distensible member and a shaft secured to said pulley and projecting beyond said other spaced side wall and connecting said seal means.

6. An emergency type of helmet as claimed in claim 5 wherein said seal means includes a U-shaped partially hoop-like member pivotally mounted about the apexes of said bifurcated ends.

7. An emergency type of helmet as claimed in claim 6 including a flat plate seal formed from a synthetic rubber material having a slit formed substantially centrally therein and extending axially to a junction point and angularly relative thereto to a point below the edge thereof so as to permit bending of said seal when said spherically-shaped folded member is folded and unfolded, the portion above said slit of said seal being bonded to one leg of said U-shaped member and the portion below said slit being bonded to the seat carried by said frusto-conically shaped distensible member.

8. An emergency type of helmet as claimed in claim 7 including latch means mounted centrally on said U-shaped partially hoop-like member and catch means adapted to receive said latch means mounted on said frusto-conically shaped distensible member.

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JAMES R. BOLER, Primary Examiner

U.S. Cl. X.R.

2-6; 128-142.5