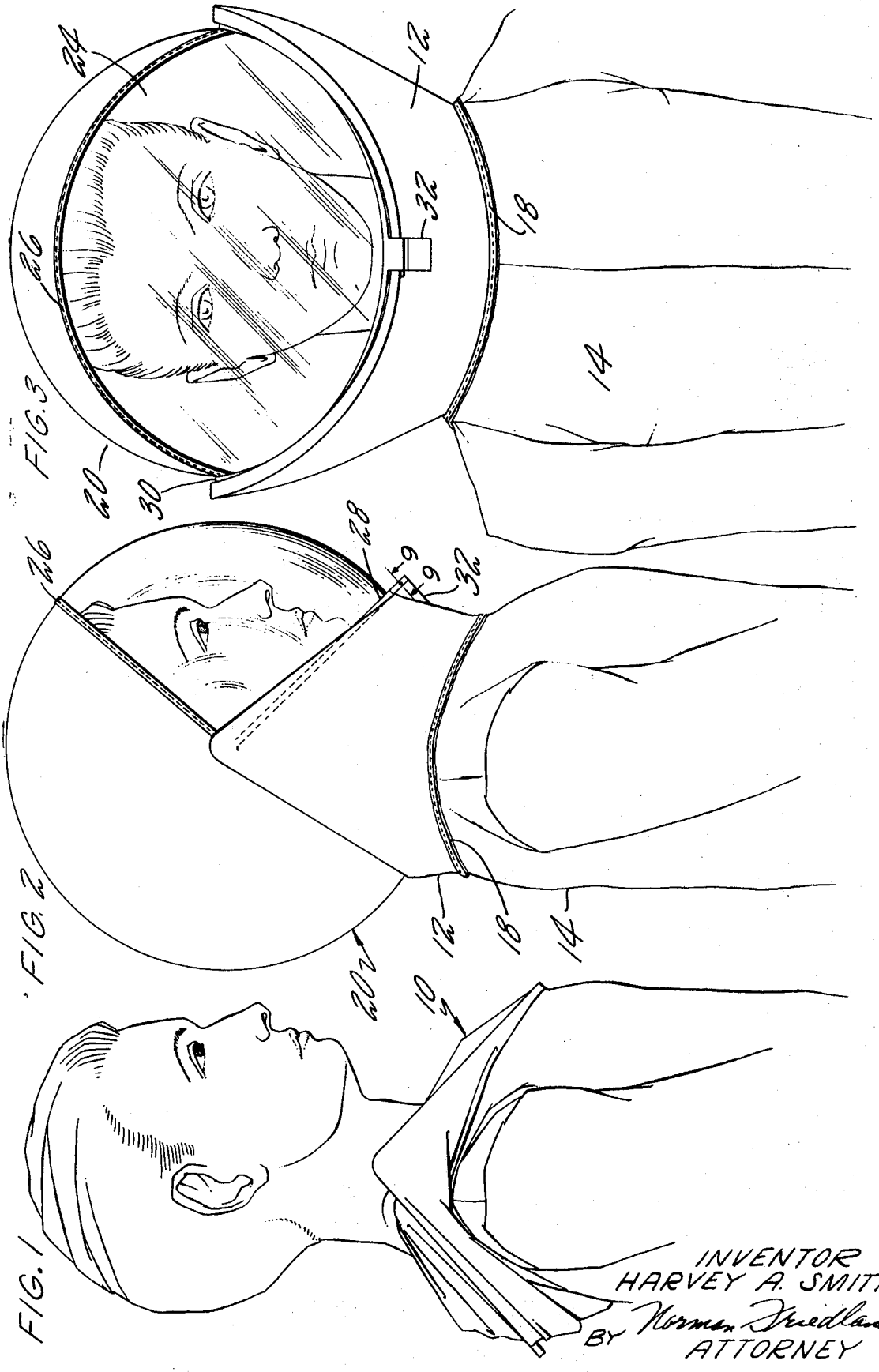
June 2, 1970 H. A. SMITH 3,514,785

EMERGENCY SPACE-SUIT HELMET

Filed Feb. 24, 1966 2 Sheets-Sheet 1



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EMERGENCY SPACE-SUIT HELMET

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FIG. 4

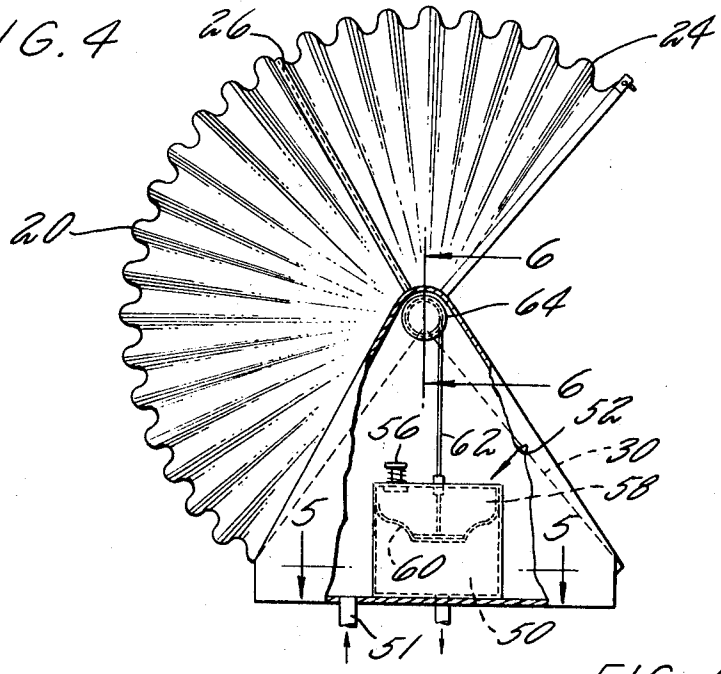


FIG. 8

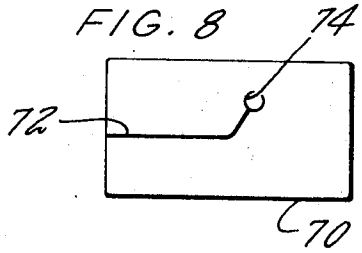


FIG. 5

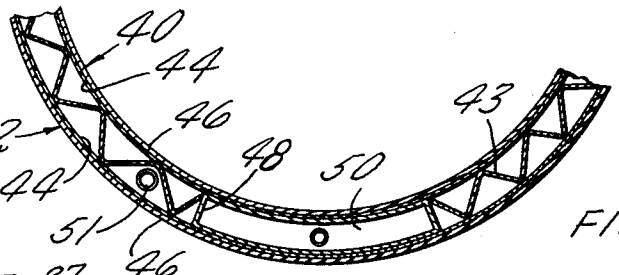


FIG. 9

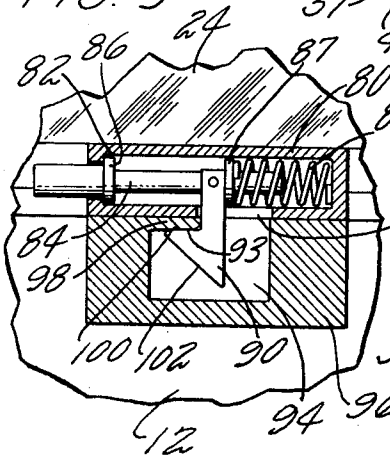


FIG. 7

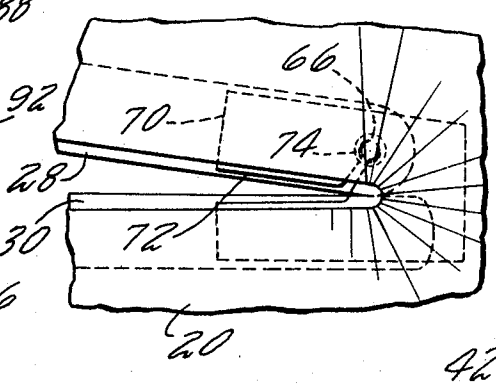
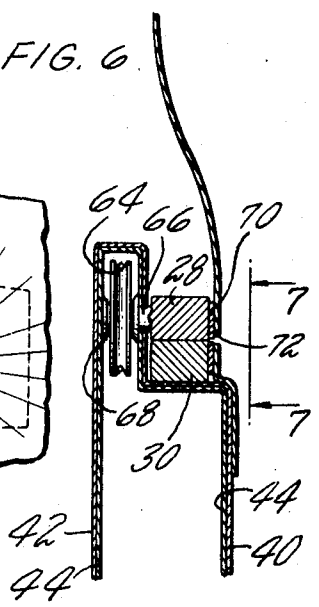


FIG. 6



United States Patent Office 3,514,785 Patented June 2, 1970

3,514,785

EMERGENCY SPACE-SUIT HELMET

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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 shows the helmet generally illustrated by numeral 10 in the retracted position. As can be seen from FIG. 2, the helmet comprises an inflatable type of pylon 12 which when inflated forms a double-peaked cylindrically shaped

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 22 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 journalled 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 preferably is made from a nylon woven fabric bonded to neoprene to make it airtight extends along the rear of the helmet adjacent the inner surface of the pylon 12 where it is bonded thereto.

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 sysem.

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 bifuracted 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 journalled 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.

References Cited

UNITED STATES PATENTS

2,978,708	4/1961	Williams et al.	2—3
3,050,735	8/1962	Newman et al.	2—6
3,284,805	11/1966	Seeler	128—142.5

FOREIGN PATENTS

975,576	11/1964	Great Britain.	

JAMES R. BOLER, Primary Examiner

U.S. Cl. X.R.

2—6; 128—142.5