National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of GP

FEB 23 1978

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. : 3,490,074

Government or Corporate Employee : United Aircraft Corporation
East Hartford, CT 06108

Supplementary Corporate Source (if applicable) :

NASA Patent Case No. : MSC-13054

NOTE - Is this an invention made by a corporate employee of a NASA contractor? YES [X] 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

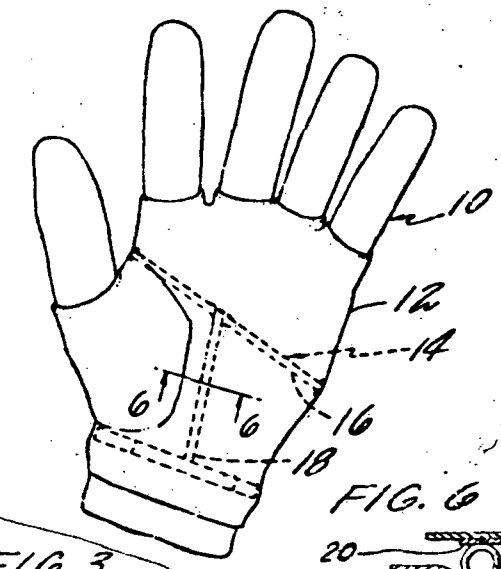
Enclosure

Jan. 20, 1970 J. C. HARDY 3,490,074

RESTRAINING MECHANISM

Filed Oct. 6, 1966

FIG. 1 3,490,074 50% FIG. 2



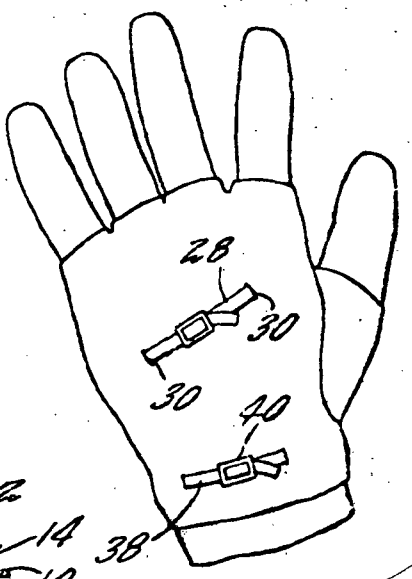


FIG. 6

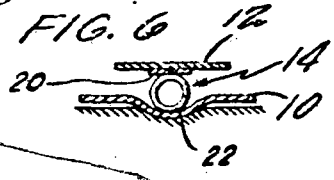


FIG. 3

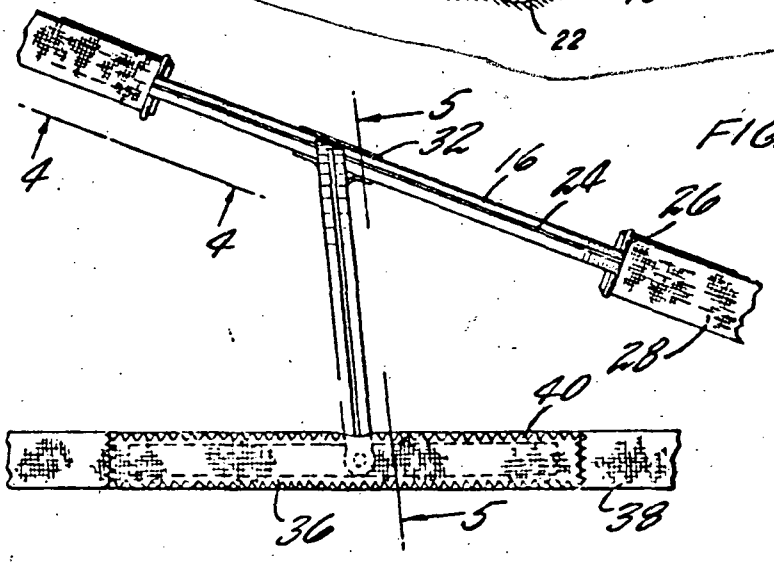


FIG. 5

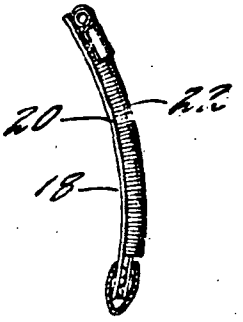
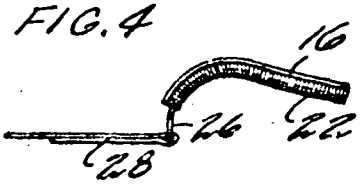


FIG. 4



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(NASA-Case-MSC-13054) RESTRAINING MECHANISM N78-17677
Patent (NASA) 3 p CSCL 05H

Unclas
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United States Patent Office 3,490,074 Patented Jan. 20, 1970

3,490,074

RESTRAINING MECHANISM

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Filed Oct. 6, 1966, Ser. No. 585,217
Int. Cl. A41d 19/00
U.S. Cl. 2—161 9 Claims

ABSTRACT OF THE DISCLOSURE

A helically wound spring bonded at its outer periphery to an elongated flat plate permitting the elongated flat plate to bend in a single direction and is attached to an inflatable glove on the palm side for restraining the glove from ballooning when inflated.

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 restraining mechanism and particularly to means for restraining a pressurized garment so as to limit its ballooning effect.

The consequence of pressurizing a garment is that the internal pressure causes the garment to extend in an axial direction and balloon in a normal direction to the body. In order to design a suitable pressurized suit, therefore, it is necessary to provide restraining members to limit or prevent the garment from extending and ballooning as much as possible while doing so in such a manner as to absorb the load so as not to interfere with the mobility and comfort of the wearer while taking into consideration manufacturing and economic aspects. While this invention will describe a restraining member for limiting the ballooning effect for a pressurized glove, it is not however limited thereto but as will be obvious to those skilled in the art the restraining mechanism to be described herein could have utility for other applications.

It is common practice in the heretofore known gloves to restrain ballooning around the palm by incorporating rigid stiff wires across the palm of the hand. This is inadequate for the reason that when unpressurized the glove is rigid in the palm and therefore has limited palm flection, finger apposition, and reduced palm tactile sensitivity. When the glove is pressurized, not only are these disadvantages present but also the glove surface becomes very hard and is extended away from the palm making it difficult for the wearer to close the palm.

It is therefore an object of this invention to obviate the problems enumerated above by providing a small, lightweight, unidirectional, restraint member which is placed in a preformed bladder glove beneath the axial restraint layer of the glove and along the natural fold of the hand. Instead of being a rigid restraint, this member is rigid only in the outward direction of the pressure loads and completely flexible in the direction of palm closure.

From test results conducted to date this invention has afforded the following advantages over the heretofore known prior glove restraint members:

(1) It is light, bulkless and comfortable both in the pressurized and unpressurized conditions.

(2) The restraint is so pivoted within the glove palm adjacent the wrist that it can be positioned to the natural fold of the palm skin.

(3) It affords continuous inward bending across the palm without localized body contact points.

(4) Ballooning is minimized during pressurization since outward bending is limited.

(5) The restraint is circumferentially adjustable across the palm and around the wrist for comfort and conformity while being independent of the axial glove restraint layer.

(6) It affords natural palm flection and little finger apposition both pressurized and unpressurized by having breaking lines in the glove coincident to the natural skin folds of the palm and thumb.

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 an elevation view showing the palm of of the left hand.

FIGURE 2 shows the backside of the left hand in elevation.

FIGURE 3 is a view in elevation showing the restraint mechanism.

FIGURE 4 is a side view taken along line 4—4 of FIG. 3, and

FIGURE 5 is a side view taken along line 5—5 of FIG. 3, and

FIGURE 6 is a sectional view taken along the line 6—6 of FIG. 1.

As can be seen by referring to FIG. 1, the glove comprises a bladder generally illustrated by numeral 10 completely encapsulating the wearer's hand and an axial restraint glove portion 12 extending from the wrist, and terminating adjacent to the roots of the fingers and thumb and the restraint mechanism generally illustrated by numeral 14. Restraint mechanism 14 is disposed between the bladder 10 and the restraint portion 12. The outer restraint layer 12 serves to take up the plug load which tends to extend the bladder in an axial direction. The restraint mechanism 14 serves to take up the ballooning load which tends to cause the glove to separate from the hand when pressurized. As noted, the members 16 and 18 of the restraining mechanism are disposed in the hand in such a manner so as to coincide with the natural folds of the skin of the wearer's palm.

From the sectional view shown in FIG. 6, it therefore can be seen that the glove is made up of bladder 10, restraining mechanism 14 consisting to spring 22 and flat band-like member 20, and the outer restraint layer 12. The bladder may be made from a suitable impervious material such as nylon fabric coated with a neoprene rubber. The spring 22 and band 20 may be made from highly flexible and resilient stainless steel. The outer restaint portion 12 may be made from a non-stretchable type of material such as nylon fabric, having either the fill or warp yarns oriented to take up the plug loads.

Looking at the details of the restraining member as can be seen from FIGS. 3–5, members 16 and 18 are identically constructed from a relatively thin, highly resilient and flexible band 20 welded to the outer periphery of the coils of spring 22. Preferably the two are welded along seam 24 by an electron beam welder. In fabricating this unit the band is slightly bent to be convex as shown in FIG. 5 so that there is a slight spacing between the coils of the helical wound spring 22. Thus, when the preformed unit is inserted in the molded recess in the bladder, the spring lies adjacent to the bladder. Thus it is apparent that when the bladder is pressurized, the restraint member tends to straighten and the adjacent coils of spring 22 abut against each other preventing further bending. This then serves to prevent the bladder from separating further away from the palm and hence, prevents ballooning. Since the bend is in the direction of

the palm closure, the restraint member is flexible in this direction.

Band receiving eyelets are suitably attached to either end of restraint member 16 for receiving a suitable strap 28 which extends through openings or slots 30 on the back-side of the hand in the outer restraint member. A T connection 32 suitably supports bands 18 and 16 and may be welded or secured by any other well-known means to rigidly secure each in the desired position.

The free end of member 18 is pivotally connected to a flat plate-like member 36 sewn to strap 38 and as can be seen from FIG. 1 terminates just prior to the wrist of the wearer. The strap passing through slots in the restraining portion 12 is likewise secured on the backside of the hand as shown in FIG. 2 by a suitable buckle 40 for supporting the restraint mechanism in the proper position. By virtue of the pivot between members 18 and 36 the restraint member can be adjusted to coincide with the natural folds of the skin of the palm. As can be seen form FIG. 4, the restraint member 16 is bent outwardly to conform to the curvature at the extremity of the palm for affording comfort to the wearer of the glove.

It should be understood that the invention is not limited to the particular embodiments shown and described herein, but the 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. Restraining means comprising an elongated, relatively thin flexible band-like element and a plurality of resilient, flexible spaced annular members all of said flexible spaced members being bonded along the face of said flexible band-like element and being susbtantially coextensive therewith whereby said restraining means is flexible in one direction transverse to the axis of said flexible spaced annular members and restrained in the opposite direction by the abutting action of adjacent spaced annular members.

2. Restraining means as claimed in claim 1 wherein said flexible band-like element is metallic.

3. Restraining means comprising an elongated, relatively thin and narrow flexible band-like element and a helical wound spring, all of the coils of said spring being bonded to the face of said band-like element wherein said restraining means is flexible in one direction transverse to said spring axis and restrained in the opposite direction by the abutting action of adjacent coils.

4. In combination, a flexible glove encircling the hand of the wearer and adapted to be pressurized, an impervious sheath enclosing the wearer's hand and fingers, a restraining fabric member fitted over said sheath and terminating adjacent the roots of the fingers defining openings through which said sheath extends over the fingers, for restraining the sheath in an axial direction, balloon restraining means for preventing the sheath from extending in a radial direction, said restraining means including flexible means flexible in a unidirection which direction is toward the fold of the wearer's hand, and said balloon restraining means mounted between said sheath and said restraining fabric.

5. The combination as claimed in claim 4 wherein said balloon restraining means are mounted so as to be coincident with the natural skin folds of the wearer's hand.

6. The combination as claimed in claim 5 wherein said restraining means includes a flexible band and a helical wound spring bonded to the face of said band.

7. In combination, a flexible glove encircling the hand of the wearer and adapted to be pressurized, said glove including an impervious sheath conforming to the wearer's hand, a restraining member mounted adjacent said sheath, said restraining member including first and second unidirectional flexible elements, said first element mounted in coincidence with one of the natural skin folds of the palm, the end of said second element rigidly connected to said first element and extending toward the wrist of the wearer but terminating adjacent thereto, a support element pivotally attached to the other of said second member permitting adjustment thereof to align the restraining member so that both first and second elements coincide with the natural skin folds of the palm.

8. The combination as claimed in claim 7 wherein said first and second unidirectional flexible elements comprise a relatively thin, narrow band and a helically wound spring bonded to a face of said band.

9. The combination as claimed in claim 7 wherein said bond includes an electron beam weldment.

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U.S. Cl. X.R.

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