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Govaars

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[54] **TEMPERATURE PROTECTION SUIT**

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[52] **U.S. Cl.** **2/81,** 2/84

[51] **Int. Cl.** **A41d**

[58] **Field of Search** ..... 2/81, 84, 80, 69.5, 2, 2/79, DIG. 6; 161/150

[56] **References Cited**

UNITED STATES PATENTS

2,008,152	7/1935	Nier	2/79
2,627,072	2/1953	Frommelt et al.	2/81 X
2,717,437	9/1955	De Mestral	2/DIG. 6
2,931,043	4/1960	Achner	2/69.5
3,100,897	8/1963	Langer	2/80
3,695,507	10/1972	Sams	2/2

FOREIGN PATENTS OR APPLICATIONS

1,236,470	6/1971	Great Britain	2/69.5

OTHER PUBLICATIONS

DuPont Technical Information Bulletin S-8, Tyvek, December 1970, E. I. DuPont De Nemours & Co., Wilmington, Del.

Velcro Publication, Velcro Corporation, 681 Fifth Ave., New York, N.Y., 1962.

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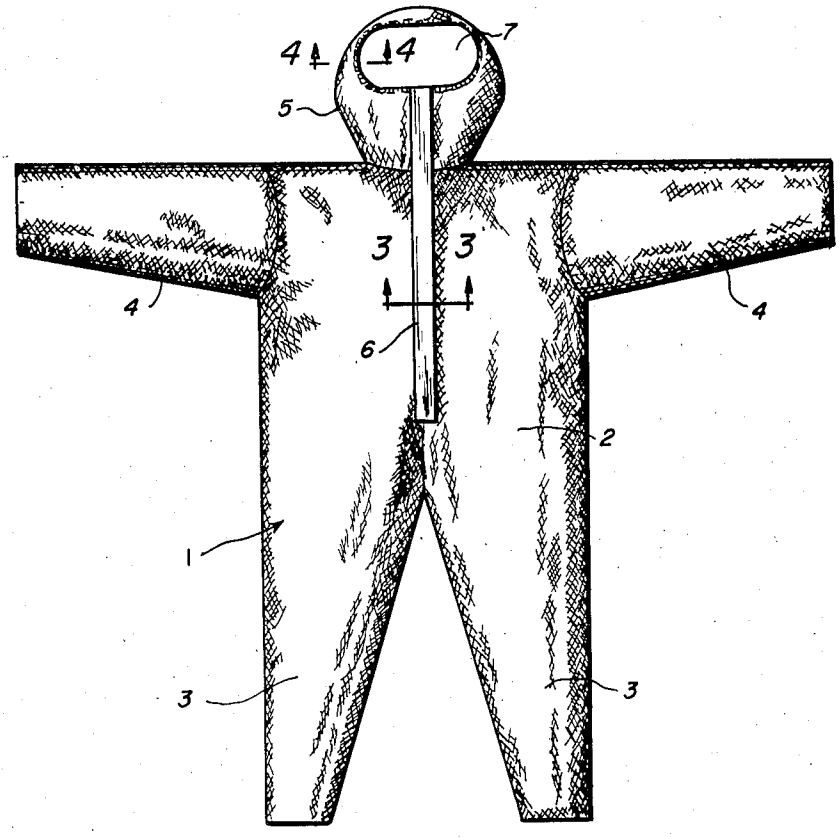
[57] **ABSTRACT**

An extremely lightweight and highly flexible temperature protection suit shown as having a body portion, a hood, arm portions and leg portions is comprised of an inner layer of fabric in the form of a mat composed of non-directional fibers, preferably an artificial spun bonded olefin, covered on both sides by a thin, heat-reflective metallic layer. One metallic layer is shiny and the other dull and the suit is reversible in that it may be turned inside out to protect against heat or cold. Enlarged arm portions at the inner ends thereof facilitate the withdrawal of the wearers arms into the suit.

13 Claims, 5 Drawing Figures



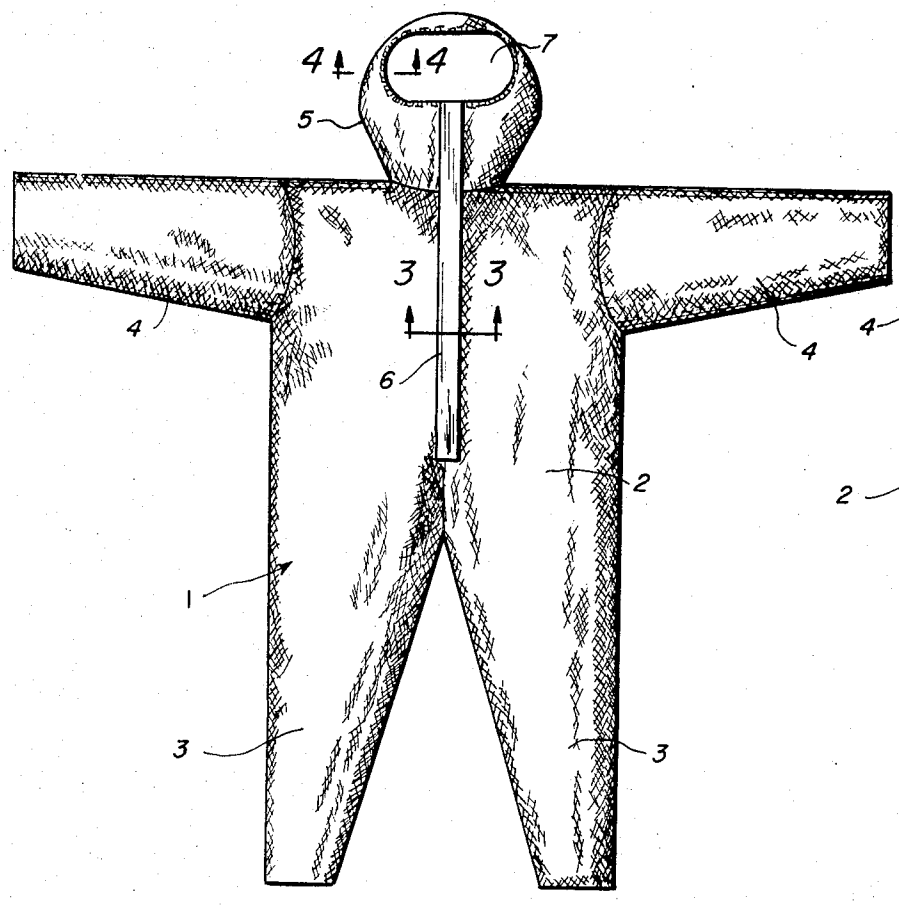


Fig_1

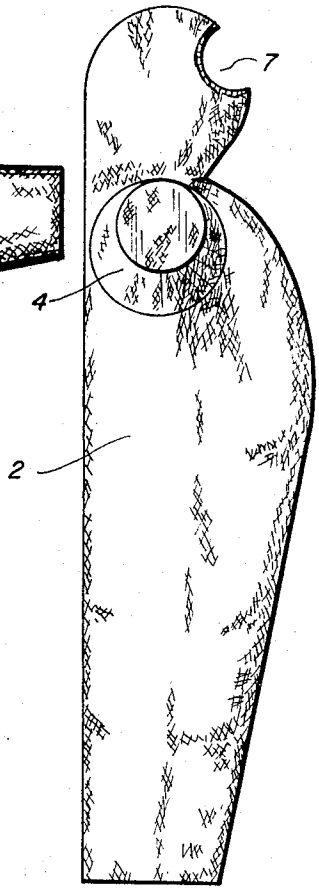


Fig_2

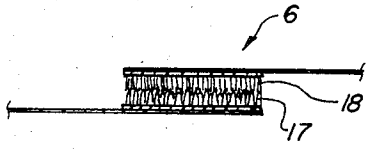


Fig_3

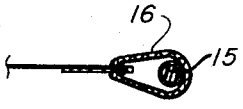


Fig_4

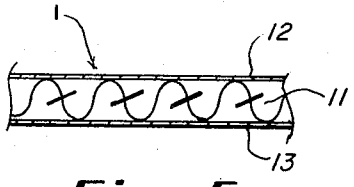


Fig_5

TEMPERATURE PROTECTION SUIT

BACKGROUND OF THE INVENTION

The invention relates to temperature protection garments or suits suitable for heat preservation as well as protection against heat.

Previously known garments or suits for the protection against heat are made generally from thick material, textile or canvas, lined with fur, or plastic and generally consist of five parts (shirt, pants, hood, overshoes, gloves). These suits have the disadvantage of being heavy, and do not give protection for the face, feet and hands, which protrude through the suit. Moreover, it usually takes a considerable amount of time to put on such a suit, and in them the wearer loses his agility and the time element is too long for emergency situations. These prior known garments or suits are therefore not suited to be used for rescue suits in aeroplanes which fly across the poles and deserts. At the same time, with the present number of passengers in aeroplanes and the same number of prior known suits, take up too much space and result in too much weight in an aeroplane.

In emergency landings of aeroplanes, which fly across very cold climates, the passengers are exposed to very low temperatures. In a very short time, the passengers would freeze to death without special protection. At −20°C, the passenger would freeze to death in about 10 minutes and at −40°C freezing will occur in about one minute so that at these temperatures a very special protection is necessary.

SUMMARY OF THE INVENTION

This invention provides a temperature protection suit which is particularly suitable for use in emergency situations where persons are suddenly exposed to great temperature differences. This suit has a relatively light weight, does not impair a persons movements and can be quickly put on with the clothes the person is wearing at that time of the emergency, with or without coat, shoes, etc. The suit can be used as a kind of coverall, which fits almost any passenger regardless of size, although for ages from 5 to 10 years for example, a smaller model may be necessary.

A temperature protection suit according to the present invention in the preferred form shown and described has the feature of using an artificial fiber material, which is aluminized or gold-coated on both sides. A preferred form of applying these outer metallic-reflective layers is by vacuum metallizing.

One form of this temperature protection suit according to the present invention has the feature of being constructed with a shiny side and with a dull side, and according to the desired protection against heat or cold, the shiny side can be worn either inside or outside the suit.

Another feature of the temperature protection suit according to the present invention is that the sleeves and trouser legs may be sealed at the ends. It is also possible to wear extra double gloves at the ends of the arms and legs, for added temperature protection. The armholes in the suit are constructed in a manner, which make it possible to withdraw the arms into the suit.

Yet another feature of the temperature protection suit according to the present invention includes a Velcro-type closure or zipper attached to and extends up into the hood. In another feature of temperature protection suit according to the present invention, the wearer can keep his shoes on, as the legs from the suit are manufactured with large sizes relative to the size of the wearers legs. For example in a typical size the legs are from about 40 cm. to about 45 cm. and end in a sole having a dimension of 18 cm. by 35 cm.

The material from which the suit may be fabricated is of a very light fiber, thermically bonded, with a weight of about 40 g/m². One material found highly effective is sold by Du Pont under the trademark TYVEK which is made from 100 percent high density polyethylene fibers by an integrated spinning and bonding process. The sheet is formed by spinning very fine polyethylene fibers and bonding them together with heat and pressure. No binders, sizes or fillers are used. The aesthetics range from stiff and paper-like to porous, soft and drapeable. The mat or sheet formed consists of a network of minute, polyethylene fibers, each approximately 1/5000 inches in diameter and arranged in a non-directional or random manner.

The total surface of the temperature protection suit is about 6.5 m² and has a total weight of approximately 260 grammes. In an aeroplane with 250 passengers, the total weight of the suits would be about 62.5 kg, instead of approximately 750 kg. to 1000 kg. with the presently available suits. Moreover, the prior known suits take up space which would equal the space of about five passenger seats and such storage requirement makes it necessary that the suits be stored out of immediate reach of the passengers. The material from which the suit is made is almost nonporous, is not transparent, is smooth and compact, water resistant, shrinkage-free, is resistant to most organic or nonorganic chemicals, does not age, anad has a temperature range from −70°C to +130°C.

The temperature protection suit material has a very thin, flexible coating of either aluminum or gold with a thickness of approximately 0.5 micron, which is applied on both sides of the inner layer of the fabric material preferably by use of a vacuum metallizing process.

The most glittering or shiniest side is on the inside for reflecting of the radiating body heat by which the heat is retained inside the suit, and by which heat is built up without being lost through the inner layer fabric material.

If only a heat resisting suit is desired, (for aeroplanes flying across deserts and tropics) then an aluminum-coated suit can be manufactured of the same inner layer fabric material, but with a breathing capability, and therefore it is not completely airtight or is slightly porous.

The aluminum layer on the outside makes radar tracking of lost passengers easier and is also useful in locating lost hunters, etc. In the dark also it will be easy to find lost people by virtue of the light-reflecting capabilities of the metal-coated material. The suit material is very thin and strong enough to hold substantial loads.

The diameter of the armhole is approximately 35 cm. at the inner end, in order to make the withdrawing of the arm into the suit easy. With this arrangement, the possibility exists that something can be held by the hands inside the suit, like a baby by the mother or instruments and valves, but also the wearer is able to put the hands inside to keep them warm by placing them under the armpits, etc.

The closed outer ends of arms and legs can be fitted with extra gloves or bags, in order to give added heat protection by the double material and an air layer in between, to the fingers and feet, which are extra cold sensitive. The outer ends also can be welded ultrasonically or by high frequency instead of being sewn.

The temperature protection suit is so thin and flexible, that if necessary two suits can be worn over each other, if a long stay in the cold becomes unavoidable, or if help does not come quickly, because the air in between the suits gives added protection against cold. This possibility becomes a reality in an aeroplane, having a less than capacity of passengers, or if extra suits are carried. For wounded passengers, this may become very important, particularly if they have to remain on the ice for long periods.

In cold periods, these temperature protection suits are very practical for active work. Here is thought of work in large freeze-warehouses, aboard ships itself, defense such as standing on guard duty, marine work in winter and northern territories, or on the bridge in the cold air, oil-exploration in polar areas (Siberia and Alaska), research in Polar Areas but also for flora and fauna in winter. If the professional uniform should remain seen, (military, airforce, marine e.o.) a fitted suit can be worn under the uniform for either retaining heat or reflecting heat. If the outside is white by coating it with a lacquer, the suit becomes an excellent camouflage suit for winter duty or it may be provided with other colours, for military camouflage.

Since it is simple to withdraw the patient's arms inside the suit, the empty arm sleeves can be used to tie a patient to the carrier or sled, or tied up in a panic-type situations and also for helicopter transport. For special aplications, the suit can be made with open arms and legs, instead of being sealed at the ends. The open ends will have elastic bands to grip around wrists and ankles, in which case, gloves can be worn. The legends can be worn inside the shoes or boots, as the material is thin enough for this.

A suit with average dimensions can be worn over or under the own clothes, like a cold-isolating coverall, for skiing, hunters, fishermen or other winter activities.

The temperature protection suits can be worn inside out, without losing its characteristics, or usefulness, or other functions. This becomes important, if the temperature protection suit is worn for long periods, by which possible condensation could occur inside the suit. Since the temperature protection suit can be delivered in a vacuum sealed bag, shelf life becomes practically unlimited.

The temperature protection suit has the extra advantage, that folded dimensions are very small, (for example 18 cm. × 15 cm. × 3 cm.), while regardless of this, an excellent cold isolation is obtained. These small dimensions make it simple to have the suit within reach of all passengers in an aeroplane.

The invention will be illustrated with drawings in which an example of an embodiment of the temperature protection suit is explained.

FIG. **1** is a front elevation view of the temperature protection suit according to the present invention;

FIG. **2** is a side elevation view of a temperature protection suit according to the present invention;

FIG. **3** is a sectional view taken along lines 3—3 of FIG. **1**;

FIG. **4** is a sectional view taken along lines 4—4 of FIG. **1**;

FIG. **5** is an enlarged sectional view taken through the fabric material of the temperature protection suit shown in FIGS. **1** through **4.**

In FIG. **1**, a temperature protection suit shown generally is designated by numeral **1** comprising of a body part **2**, trouser legs **3**, arms **4**, and hood **5.** The trouser legs, arms, and hood are sewn to the body part. At the front, the body part is split and there is a Velcro-type closure **6**, which can be closed or opened in a panic-type situation without the difficulty sometimes encountered with buttons or zippers. The Velcro-type closure **6**, as shown in FIG. **3** includes a strip of fabric **18** fastened to one part of the fabric material and a strip of loops **17** fastened to the other part of the material at the front slit. The front slit and closure **6** extends up the hood **5** to cover the chin of the wearer. The suit **1** is made of the same material comprised of an inner light-weight, strong fabric **11** coated on both sides by a very thin layer of heat-reflective metal such as aluminum, gold or the like represented at **12** and **13** as shown in FIG. **5.** One material found highly effective is sold by Du Pont under the trademark TYVEK which is made from 100 percent high density polyethylene fibers by and integrated spinning and bonding process. The sheet is formed by spinning very fine polyethylene fibers and bonding them together with heat and range from stiff and paper-like to porous, soft and drapeable. The mat or sheet formed consists of a network of minute, polyethylene fibers, each approximately 1/5000 inches in diameter and arranged in a non-directional or random manner.

While a layer or coating of metal is illustrated on both sides of the fabric material it is understood that for certain applications it need be covered on only one side. For example a garment with aluminum on the inside only may be used to reduce infra-red signature, or in low temperatures to return body heat. A garment with a metallic layer on the outside only with the inner fabric perforated may be used for heat protection or as a radar reflector.

Only a very small opening **7** remains for eyes and nose which may be closed if desired by elastic. This elastic shown in FIG. **4** comprises of a rubber band represented at **15** and sewn to the coated fabric material with stitches **16.** This eye opening **7** may possibly be closed by goggles, snow glasses or the like.

The extremities of arms **4** and legs **3** are completely closed or sealed and totally protect the arms and legs from the outside cold. In the form shown the ends are sewn closed. The inner ends of the arms are enlarged to facilitate the withdrawal of the wearers arms therein into.

In FIG. **2**, the form or profile of the suit can clearly be seen including the concave contour of the opening **7** of the face.

Total length of a preferred form of the suit is approximately 250 cm., the trouser leg length 90 cm., the armhole 35 cm., the arm ends 25 cm., at an arms length of 70 cm. The foot end length is approximately 35 cm. at a width of 18 cm.

It is understood that the above described suit can be changed due to special circumstances, or depending on special wishes, such as double arm ends and double layers for additional cold protection. The suit can also be furnished without hood, if special headgear is essential,

like army hats, safety helmets, etc. and with the legs and arms open.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made by way of example and that changes in details of structure may be made without departing from the spirit thereof.

What is claimed is:

1. In a reversible temperature protection garment for the preservation and protection against heat and cold, the combination comprising:

an upper body portion to cover at least the upper torso of the wearer, said upper body portion having arm portions to cover the arms of the wearer, hood portion extending up from the body portion to cover the head of the wearer, said hood portion having a front part covering a substantial portion of the face of the wearer and an elastic eye opening in the front part of the hood portion;

said upper body, arm and hood portions being made of the same material, said material being comprised of a layer of a very lightweight TYVEK fabric having at least one side coated with a very thin layer of shiny, heat reflective metal and the material is dull on the side opposite the shiny layer to form a very thin, extremely lightweight, strong, soft, drapable composite whereby the shiny layer reflects heat back to the body of the wearer when worn inside for protection against cold and reflects heat away from the body of the wearer when worn outside for protection against heat, said upper body and hood portions being split down the front from the eye opening to the bottom of the upper body portion; and

co-operating reversible releasable sealing fastening means extending along opposite marginal edges adjacent the split of the upper body and hood portions to seal the split closed all the way from the bottom of the body portion up to the eye opening.

2. In a reversible temperature protection garment as set forth in claim **1** wherein said garment has a lower body portion for covering the lower torso of the wearer and leg portions projecting from the lower body portion for protecting the legs of the wearer, said split and fastening means extends down the front part of said lower body portion, said lower body portion and leg portions being of the same composite material as said upper body portion, arm portions and hood portion.

3., In a reversible temperature protection garment as set forth in claim **1** wherein said material has the side of the mat opposite the shiny layer coated with a dull, very thin layer of heat reflective metal.

4. In a reversible temperature protection garment as set forth in claim **1** wherein said composite is slightly porous.

5. In a reversible temperature protection garment as set forth in claim **2** wherein the ends of said arm and leg portions are closed.

6. In a reversible temperature protection garment as set forth in claim **1** wherein the arm portions are enlarged at the inner ends thereof relative to the outer ends to facilitate the withdrawal of the arms of the wearer into the body portion.

7. In a reversible temperature protection garment as set forth in claim **1** wherein said fastening means is a Velcro-type closure.

8. In a reversible temperature protection garment as set forth in claim **1** wherein said garment is water resistant, resistant to organic and nonorganic chemicals and shrinkagefree.

9. In a reversible temperature protection garment as set forth in claim **2** wherein the total weight of said garment is about 260 grammes.

10. In a reversible temperature protection garment as set forth in claim **3** wherein the thickness of said outer layers of metal are about 0.5 micron.

11. In a reversible temperature protection garment as set forth in claim **1** wherein said metal is aluminum.

12. In a reversible temperature protection garment as set forth in claim **1** wherein said metal is gold.

13. In a reversible temperature protection garment as set forth in claim **1** wherein the coated material has a temperature range of about −70°C to about +130°C.

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