July 3, 1945. H. K. SHAW 2,379,498

BUOYANT UTILITY SUIT

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Fig. 1.

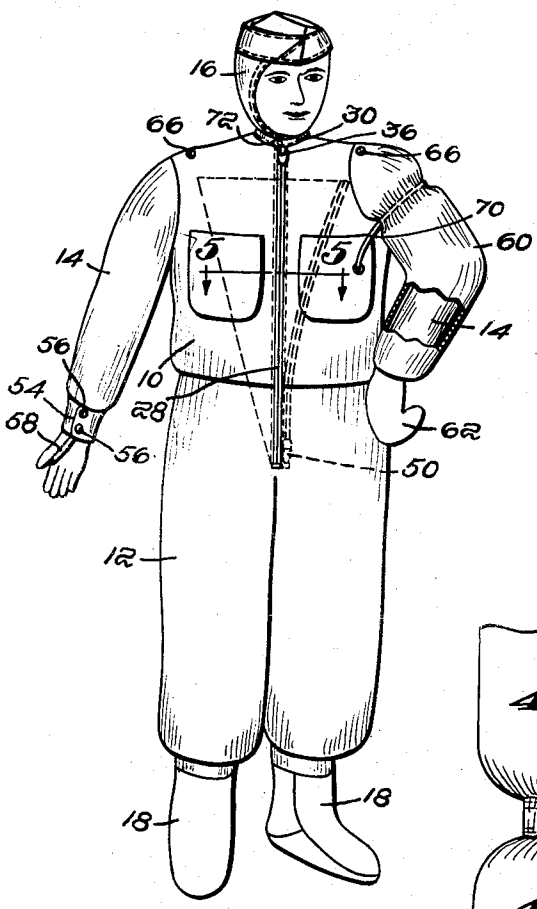


Fig. 2.

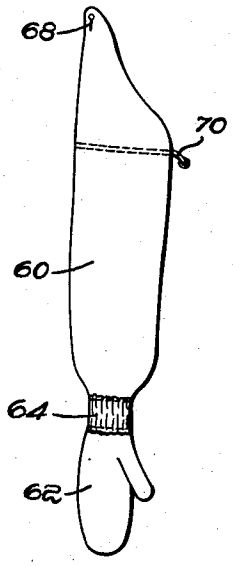


Fig. 3.

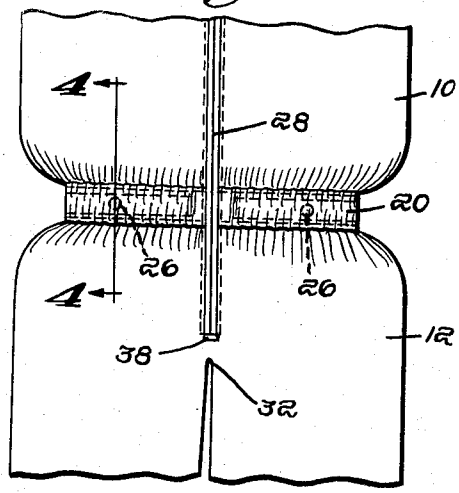
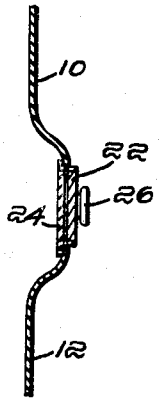


Fig. 4.



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Fig. 5.

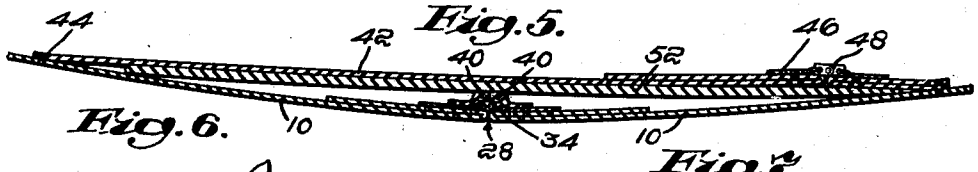


Fig. 6.

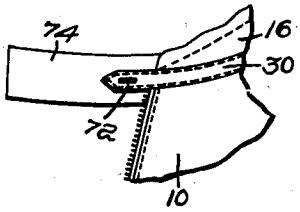


Fig. 7.

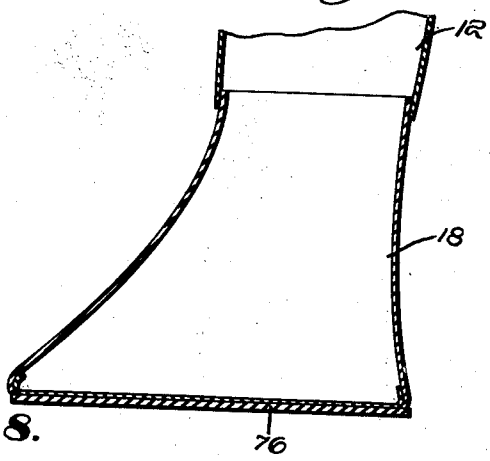


Fig. 8.

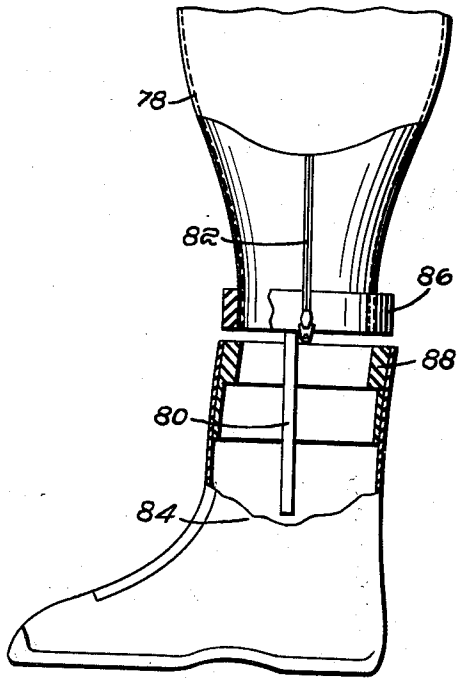
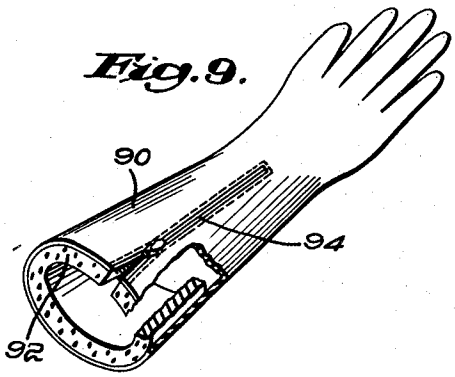


Fig. 9.



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UNITED STATES PATENT OFFICE

2,379,498

BUOYANT UTILITY SUIT

Hubert K. Shaw, Boston, Mass.

Application April 6, 1943, Serial No. 482,038

4 Claims. (Cl. 2—82)

In the form of a buoyant utility suit (or "exposure-suit") this invention relates to improvements in safety-apparel of the general character commonly called lifesaving suits. My invention is designed for use as a "continuous-wear suit," principally by aviators who would wear it as a flying-suit, and by seamen, who have expressed the need for a combined weatherproof and buoyant coverall for wear on deck, and for possible emergency use.

Experiences in many sea disasters have proved that there may not be sufficient time for putting on lifesaving suits before abandoning ship, especially in time of war, when a ship may go "up" before it goes down. It has been claimed that the usual types of lifesaving suits sometimes hamper the action of the crew members, particularly to combat personnel, due to the weight and bulk of the leaded suits. Operators of combat vessels and aircraft have consistently emphasized, with such reasons as these, the fact that the previous varieties of protective suits, being both heavy and bulky, are not sufficiently practical for standard use.

It is an object of the present invention to disclose an improved type of protective buoyant suit which will combine the features necessary for practical use as a sleeping suit, work suit, combat suit and floating swim suit.

It is a further object of my invention to provide a suit of the general character described which has detached gloves without requiring excessive tightening of the cuffs of the sleeves around the wrists of the wearer to prevent the entrance of water.

It is a further object of my invention to provide in a suit of the character described an elastic belt at the waistline which serves to separate the entrapped air within the suit into chambers at the top and bottom portions of the suit thereby maintaining a higher degree of buoyancy in the water.

A particular improvement in the design of my suit resides in the provision of a double slide fastener closure in the front of the garment, one of the slides opening from the top while, the other slide opens from the bottom. This arrangment permits opening the lower front of the garment while maintaining the closure of the upper part.

Fig. 1 is a front elevation of the suit showing the garment closed in the front and around the neck, but with one of the oversleeves removed;

Fig. 2 is an enlarged view showing one of the oversleeves;

Fig. 3 is a fragmentary front elevation on enlarged scale showing the waist band;

Fig. 4 is a sectional view taken on the plane 4—4 in Fig. 3;

Fig. 5 is a horizontal section taken through the front of the jacket on the plane indicated 5—5 in Fig. 1;

Fig. 6 is a fragmentary view showing the collar portion and sealing flap;

Fig. 7 is a vertical section taken through one of the attached foot portions;

Fig. 8 is an elevation partially shown in vertical section of a modified form of trouser leg in which the foot is shown detached from the trouser leg for clearness in illustration; and

Fig. 9 is a perspective view partially in broken section showing a modified form of detachable glove.

As shown in Fig. 1, the suit consists of a jacket 10, trousers 12, sleeves 14, hood 16, and boots or foot portions 18. The parts of the suit may be separately cut but are joined together by stitched and cemented seams to make an integral, one-piece garment. The material used is preferably cotton drill or sheeting coated with any suitable waterproofing material such as a synthetic, -resin or -rubber coating, for example, neoprene. The seams are made water-tight by cementing, and strapping. Certain portions of the garment such as the seat of the trousers may be reinforced to withstand wear.

I prefer to make the garment as light in weight as possible, consistent with the ability to withstand wear in ordinary usage. The garment may be provided with either a belt or an elastic waist band section 20. The suit is designed to closely fit around the waist of the wearer and to trap air in the trouser portions of the garment. The belt or waist band also serves to hold the trousers in position, while the jacket portion is sufficiently roomy to blouse over the waist band as shown in Fig. 1. In Fig. 3 the jacket has been pulled up to expose the waist band. The construction of the waist band may be as shown in Fig. 4, in which the opposed margins of the jacket 10 and trousers 12 are joined by an elastic tape 22 applied to the inside face of the garment. A strip of coated fabric may be applied over the outer face of the joint, the tape 22 and strip 24 being suitably stitched and cemented in place to make a watertight connection. Buttons or straps 26 may be affixed to the inside face of the elastic tape 22. These buttons or snaps 26 may conveniently be attached to suspenders if desired to aid in holding the trousers in position.

The front of the garment is provided with an entrance opening 28 extending from the collar 30 to a point just above the trouser crotch 32. This entrance opening is provided with the usual slide fastener closure 34 which may be of the fabric covered type which when closed conceals the metal of the slide fastener. The slide 36 of the fastener is pulled downward to open the garment and pulled upward to a point adjacent the collar 30 to close the entrance opening 28. The usual

stop 38 may be provided at the bottom of the opening 28. The fabric covering of the slide fastener may be coated with a suitable waterproofing and flame proofing compound. As a modification, a two-opening slide-closure may be substituted for the combination of separate slide-closures on the front of the suit; i. e., substituting the type of slide-closure having slides which open from opposite ends (top and bottom) toward the center, at which point or at any point above and below, both slide handles will meet when pulled from opposite directions. To further assist in sealing the slide fastener closure, expanded cellular rubber strips 40 may be attached to the inside face of each margin of the jacket 10 over the slide fastener elements. The strips 40 are designed to be pressed together when the slide fastener is closed. Although it may be difficult to make a perfect watertight seal in this manner, the sealing will be substantially effective if the wearer of the suit is in a supine position in the water. As hereinafter pointed out, there are certain advantages in the supine position as contrasted with the semi-vertical position, either of which can be maintained easily and interchangeably.

In order, however, to further ensure against the entrance of water into the garment and to aid in permitting opening the front of the suit for ventilation or sanitary purposes, the suit is constructed as shown in Fig. 5 with a V-shaped gusset 42 attached along its right hand margin as at 44 to the inside face of the jacket 10. The left hand margin 46 of the gusset piece 42 may be detachably fastened to the left hand side of the jacket 10 by a slide fastener closure 48 of a type similar to that of the slide fastener 28 except that the fastener 48 is of the separable type. The slide 50 is designed to open by pulling upward and to close by pulling downward. The closed position of the slide 50 is just inside the bottom of the outer entrance opening 28.

As shown in Fig. 5, I may provide an attached buoyant filler piece 52 which is cut in a V-shape and placed in the pocket formed between the gusset 42 and the outer portion of the jacket 10. This filler piece is preferably made of light weight expanded cellular material, which will add to the buoyancy of the suit and at the same time will tend to restrain the seepage of water into the suit through the slide fastener closures.

In my suit, the integral sleeves 14 may be provided with separate hand coverings. If so the ends of the sleeves are preferably provided with buoyant elastic wrist portions 54 adapted to snugly but not too tightly engage the wrists of the wearer. The buttons 56 may be provided to permit opening of the wristlet when the suit is being put on or when sleeping in the suit while on ship. A strap 58 is attached to the lower end of the sleeve and is adapted to extend over the thumb of the hand to hold the sleeve down. In case it becomes necessary to abandon ship, oversleeves 60 such as illustrated in Fig. 2 may be slipped on. The oversleeves may conveniently be carried in pockets formed on the back of the suit over the hips. The oversleeves have integral hand coverings 62 which may be in the shape of mittens or provided with fingers to fit like a glove. Elastic wrist portions 64 may be provided adapted to engage the wristlet 54 on the inner sleeve 14 to prevent the entrance of water. The oversleeve is intended to extend the full length of the arm and is arranged to be fastened at or near the shoulder 66 of the suit. Snap fasteners may be used. Suitable means may be provided for tightening the upper part of the sleeve around the arm, such as the pull strap 70, which may be tightened to gather the material as shown in Fig. 1. For warmth, a woolen, cotton or leather glove may be worn underneath the oversleeve. The neck band or collar 30 may be provided with a strap 72 to close the collar of the suit around the neck of the wearer immediately above the top of the slide fastener 28. Also, I prefer to use a buoyant flap 74 of expanded cellular rubber attached to one side of the collar and adapted to be wrapped under the chin to make a tight seal around the neck. As shown, a hood 16 may be integrally attached to the neck band 30.

The usual types of life saving suits have integral foot members which are weighted; for example, it is customary to add three pounds of lead to the weight of the boots which ordinarily weigh four pounds per pair before the extra weight is added. The weighted boots are intended to assist in keeping the wearer of the suit in a semi-vertical position. For protection from exposure to cold (and from concussion due to underwater blasts, such as depth charges, bombs, mines, etc.), the supine position in the water offers far greater safety than the semi-vertical position. When the wearer is floating on his back in a prone position, the suit provides increased warmth, particularly around the legs, since the material is loose and permits circulation of air. Furthermore, it is often necessary to quickly move away from an abandoned ship and the speed of propulsion in supine position is much greater than that in the semi-vertical position. Also, the supine position keeps the front closure safely out of water and tends to prevent leakage of water into the suit. For all of these reasons, I do not provide any weights in my foot coverings. I make my foot portions 18 of the same light weight material as the rest of the suit, shaped to readily fit over ordinary shoes. It may be preferred to wear the suit without inner shoes and in such case it is desirable to apply a sole 76 which may be of sponge rubber. The sole 76 is cemented to the bottom of the foot covering 18.

In certain cases it may be desirable to have replaceable boots instead of integral foot coverings and I have shown a modified construction in Fig. 8 in which the legs 78 of the trousers terminate at the ankles, a strap 80 being provided to fit under the foot and serving to hold the trouser leg down. The trouser leg may have a vertical opening arranged to be closed by a slide fastener 82. In order to provide a watertight seal between the separate boot 84 and the trouser leg 78, I may provide at the lower end of the trouser leg a buoyant band 86 of expanded cellular material and a similar band 88 around the top of the boot on the inside thereof. It will be apparent that the boot will be pulled over the trouser leg to bring the band 88 above the band 86, thus when the boot is fastened, the bands 86 and 88 will be snugly engaged to prevent the entrance of water.

Instead of using the oversleeves such as used in Fig. 2, I may provide either attached or detachable glove members 90, as shown in Fig. 9 which are made similar to the boots 84 with a buoyant cellular-material band 92 around the inner portion of the glove at the wrist thereof. A slide fastener closure 94 may be provided to tighten the wrist of the glove around the inner sleeve of the suit. The inner sleeve of the suit may be provided with a cellular-material band similar to that shown at the end of the trouser leg. The slide

fastener is of the locking type which may be closed to a point where the arm is snugly engaged and the slide may be then locked to hold it in position.

My suit is designed for the requirements of those in the armed forces. It is much lighter and less bulky than previous lifesaving suits and may be worn comfortably and conveniently as a general utility suit on deck and even for sleeping. On deck, the suit provides weather protection, and in addition, protection from waves sweeping over the decks in rough seas—conditions under which the usual type of foul-weather clothing does not keep the feet and hands dry and warm. The suit may readily be opened for ventilation and yet be ready for instant use as an immersion-suit, in case the wearer is washed overboard or is forced to abandon ship.

The purpose of the buoyant inserts in the sleeves, leg-coverings, gusset-pocket, and neck-band, is not only to restrain seepage wherever slide-fasteners or draw-strap closures are utilized; but also (either with or without these methods of closure) to provide a safety margin of built-in buoyancy, in the event that the entrapped air is forced out of the suit due to prolonged water pressure, concussion, puncture, or other causes. If additional buoyancy is desired, a separate life-preserver may be worn inside the suit, though the suit itself, by virtue of its unusual lightness (from 1¾ to 4¾ lbs. total weight) is self-buoyant.

Addenda

This combination utility-and-safety garment accomplishes the following purposes, each of which is regarded as of prime importance from the standpoints of combat-operations, troop-transports, etc.:

1. *Elimination of excess weight* (long acknowledged by Navy officials to be one of the most adverse factors associated with the weighted suits when originally used by gun-crews aboard merchant vessels). This is most important wherever ship-complements run high.

2. *Elimination of excess bulk.*—Lack of sufficient stowage space has been another reason consistently advanced by Navy equipment chiefs as a fundamental cause for not issuing immersion-suits to combat and transport craft. This was my reason for designing a suit which could serve as a protective coverall on deck, and thus be a replacement for certain of the present foul-weather garb; and at the same time a suit that would serve to keep the wearer protected in the water and aboard rafts of Carley-floats.

The provision of self-fabric foot-coverings permits wearing sea-boots with moccasin-type innersoles, outside the foot-coverings; and the suits can be rolled or folded compactly, occupying very little space compared with the heavy-booted, weighted suits.

3. Increased production output is another of the purposes achieved by omitting the usual attached boots or rubber-shoes, since the suits of my design being made of the same material throughout (including foot-coverings) obviates the difficulties encountered when cementing one kind of synthetic rubber or resin to a different type, and the difficulty in obtaining deliveries of boots from the footwear manufacturers, during wartime.

4. "Unsinkable" is an exceedingly important characteristic of my suit, since any suit (regardless of weight) may become "flooded" if a bullet or jagged splinter punctures it. Since every combat crewman is conditioned to "expect the worst," he knows that a weighted suit might become a serious handicap, and would certainly become a tragic hazard if he had no life-preserver in addition to the suit, and if water replaced the air-spaces within the suit.

5. Increased propulsion-speed and easy maneuverability in the water. (Also important for underwater-swim-suits in shallow-water salvage operations is my feature of soft, self-fabric foot-coverings enabling the wearer to attain any position in the water.) (Used without buoyancy inserts, for diving purposes; and with attached diving helmet-mask, oxygen tank, etc.)

6. Protection from concussion due to underwater blasts. The entrapped air within the suit will "give," reducing the blast pressure against the abdomen, which has been the cause of countless cases of internal ruptures, etc. The supine, surface-flotation position serves to minimize blast injury from expoding depth-charges, and explosives dropped from planes, such as bombs and torpedoes.

I claim:

1. A buoyant immersion suit made of lightweight waterproof material and comprising a jacket portion, arm portions, leg portions and unweighted foot portions, all of said portions being of similar material secured together to form a watertight garment and a band of buoyant material secured to the leg portions adjacent the region where the leg portions join said foot portions.

2. A buoyant immersion suit made of lightweight waterproof material and comprising a jacket portion, arm portions, leg portions and unweighted foot portions, all of said portions being of similar material secured together to form a watertight garment, glove members secured to the arm portions in a watertight manner and a band of buoyant material around the inner portion of the glove adjacent the wrist thereof.

3. A buoyant immersion suit made of lightweight waterproof material and comprising a jacket portion, arm portions, leg portions and unweighted foot portions, all of said portions being of similar material secured together to form a watertight garment, an entrance opening extending from the collar of said jacket portion to a point adjacent the crotch, means for closing said opening and said suit being provided with a substantially V-shaped insert of buoyant material behind said opening, said insert adding to the buoyancy of the suit and tending to restrain the seepage of water through said opening when closed.

4. A buoyant immersion suit made of lightweight waterproof material and comprising a jacket portion, arm portions, leg portions and unweighted foot portions, all of said portions being secured together to form a watertight garment, an entrance opening extending from the neck to a point below the waistline, a slide-fastener closure for said opening, a V-shaped gusset attached to the inner side of the suit at a point below the entrance opening and along the sides to points near the shoulders to form a pocket open at the upper end, said gusset having an entrance opening extending from the top of the pocket at one side thereof to the bottom of the pocket, a second slide-fastener closure for the entrance opening in said gusset, and a protective filler piece attached to said pocket to cover both of said slide-fastener closures.

HUBERT K. SHAW.