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Crockford

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[54] **BUOYANCY GARMENT**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **9/341**

[51] **Int. Cl.** **B63c 9/08**

[58] **Field of Search** 9/329, 316, 337, 9/343, 311, 340, 341, 342

[56] **References Cited**

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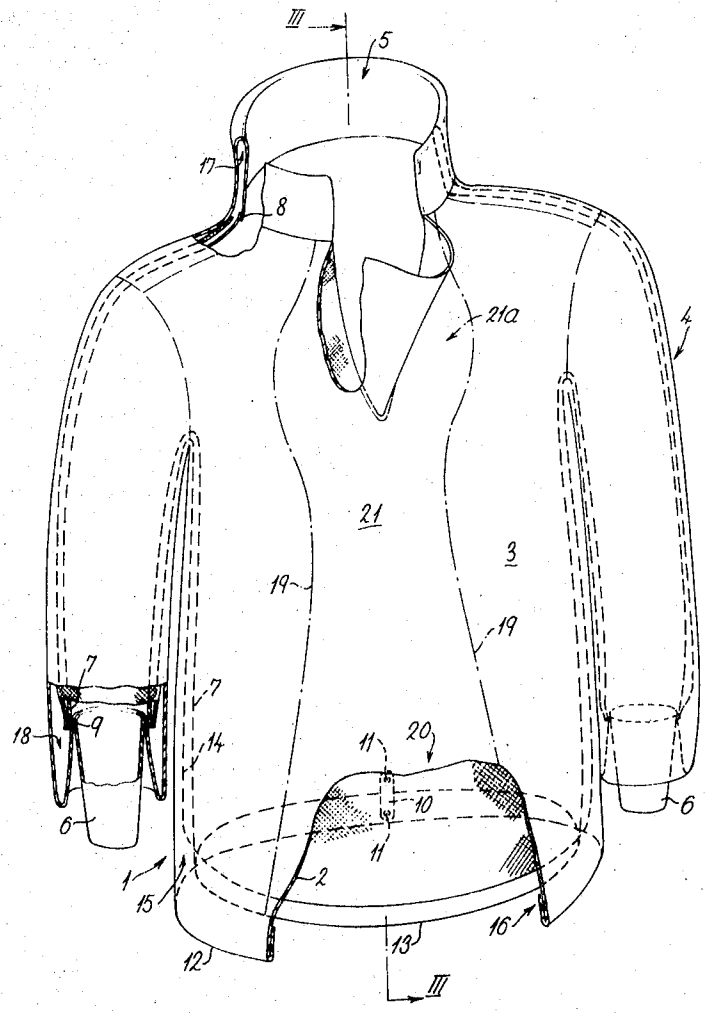
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[57] **ABSTRACT**

A buoyancy garment, e.g., a sailor's jacket, smock, or duck suit, containing pockets located so as to admit and retain air if the wearer falls into the water. Preferably the pockets catch air that will be displaced by the water from within the garment, especially from the wearer's normal clothes.

4 Claims, 5 Drawing Figures



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Fig. 1.

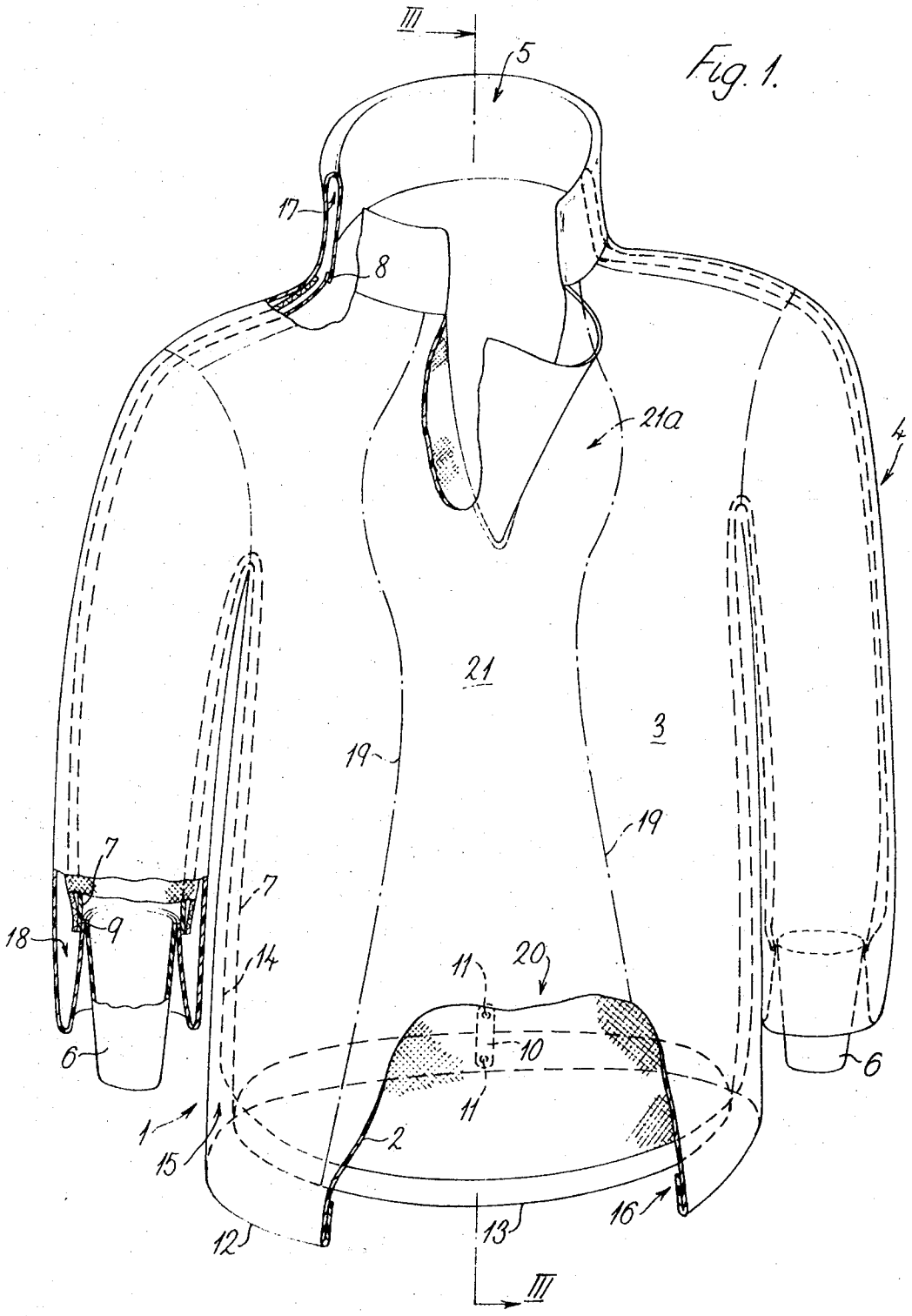


Fig. 2.

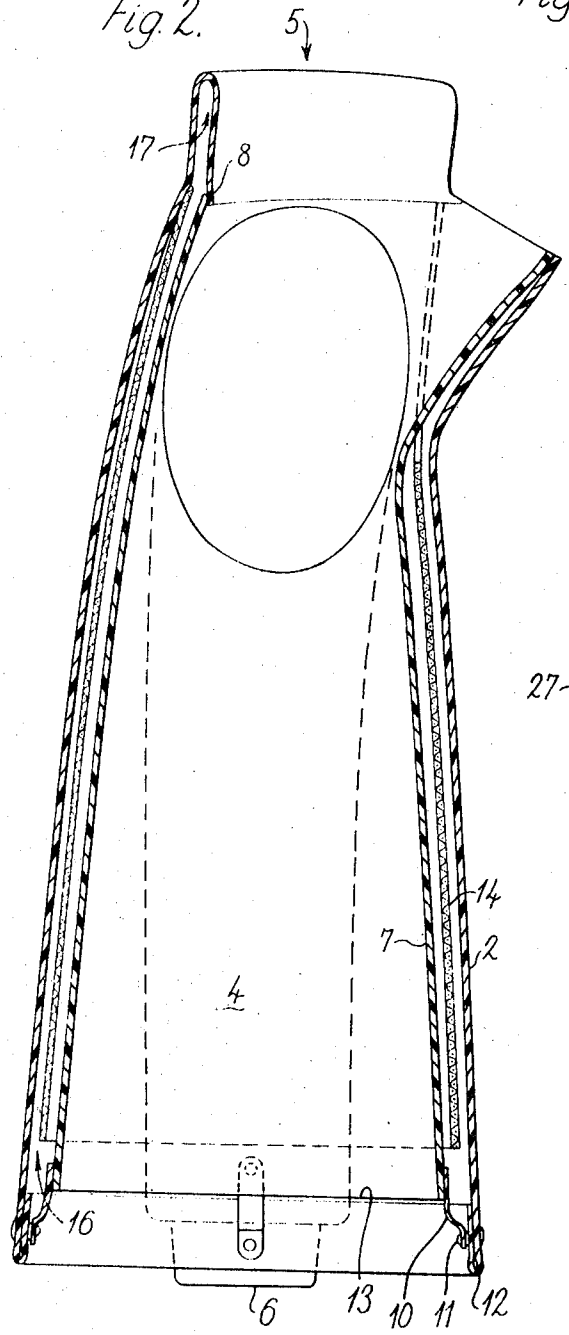
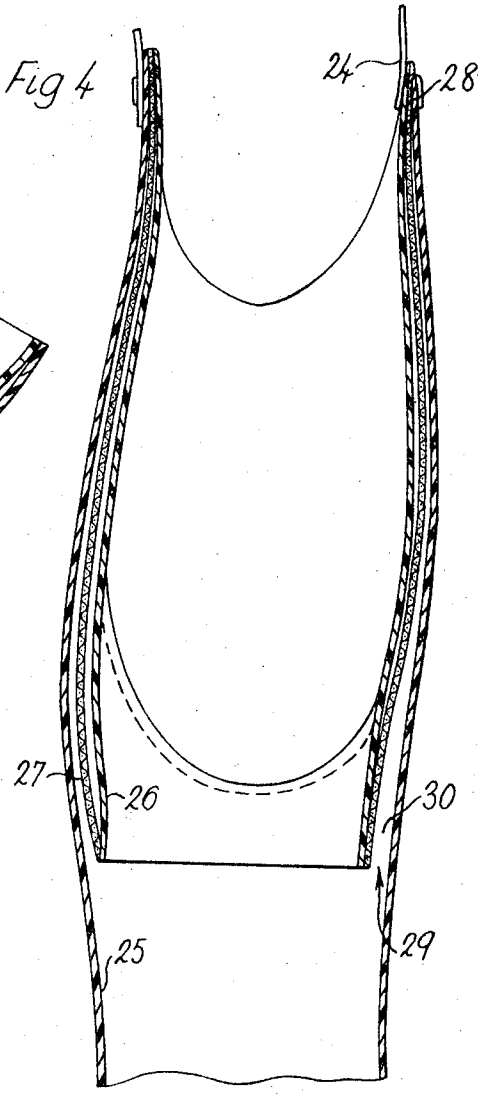


Fig 4



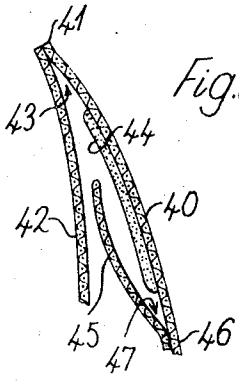


Fig.5.

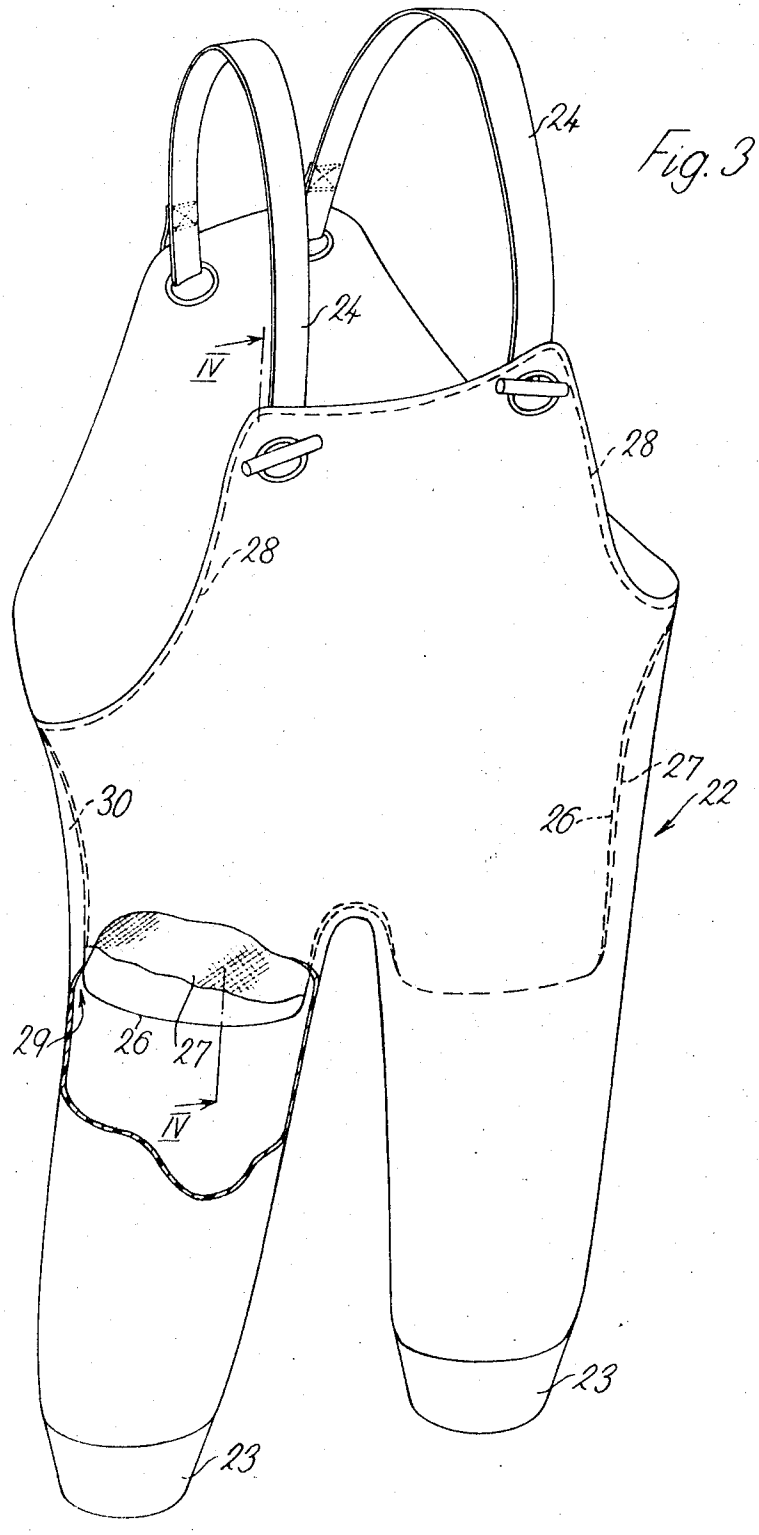


Fig. 3

BUOYANCY GARMENT

This invention relates to buoyancy aids, and is to be applied to protective garments for sailors, for example smocks, duck suits and the like. Hitherto, such garments have usually been negatively buoyant, and have contributed to the death by drowning of a number of sailors who have worn them. It is known to incorporate sealed, air-tight pockets within garmets for sailors, or to incorporate in such garments pieces of sealed-cell expanded plastics material, which in effect constitute such pockets in themselves. It is also known to provide a garment with pockets made of air-tight material and having small mouths facing downwards; these mouths have been covered by known material of a kind that is air-permeable when dry but air-tight when wet. If the wearer of such a garment falls feet first into water the mouths of such pockets will quickly become air-tight, thus trapping whatever air is already within the pocket. This air naturally helps to make the garment more buoyant.

However, the buoyancy of all garments so far described may be termed "passive;" that is to say, it relies upon air that was either incorporated in the garment when made or that has accumulated gradually within it during normal use. Such buoyancy is unsatisfactory; if it is to be sufficient to keep the wearer afloat in an emergency, the garment is bound to be bulky and to impede the wearer as he goes about his normal and often strenuous business on ship.

An object of the present invention is to provide a garment that shows an "active" buoyancy effect, that is to say a garment that will gain in buoyancy and become positively buoyant if the wearer falls overboard, but which will not be substantailly more bulky than the known negatively buoyant garments before this misfortune happens. The invention is defined by the claims at the end of this specification and buoyancy aids according to it will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a duck suit jacket unit;

FIG. 2 is a section on the line II—II in FIG. 1;

FIG. 3 is a perspective view of a duck suit trousers unit;

FIG. 4 is a section on the line IV—IV in FIG. 3, and

FIG. 5 is a section through a detail of an alternative construction.

The jacket unit 1 of FIG. 1 has an air-and water-tight exterior made of heavy duty PVC sheet 2, with water-tight heat-sealed seams as required. It has a trunk portion 3, sleeves 4, a neck opening 5, and elasticated cuffs 6 intended to overlap the water-proof gloves which the wearer will probably be using. Within the jacket is an inner lining 7, basically of similar shape to the jacket, of air-tight material such as a lighter duty PVC-coated woven fabric. The lining is sealed to the jacket in air-tight manner around the neck at 8 and close to the cuffs at 9. Straps 10 secured by press studs 11 join the bottom edges 12 and 13 of sheet 2 and lining 7 respectively and prevent one of these riding up relative to the other. Between the exterior and the lining 7 lies a third member 14, of similar general shape to 1 and 7. This member acts as a spacer or separator, to ensure that the lining and the jacket cannot be pressed into air-tight contact with each other. Member 14 may, for instance, be a vest-like garment of open-weave nylon fabric. PVC sheet 2 and lining 7 thus define an air-tight pocket 15

with an unobstructed mouth 16 lying between edges 12 and 13 and facing downwards relative to the wearer. Mouth 16, like jacket unit 1, encompasses the trunk of a wearer.

When a wearer of this jacket unit has fallen overboard and is floating head uppermost in the water, air that was already in pocket 15 between the jacket exterior and the lining 7 before the accident will have been trapped there and will have been forced upwards into the region 17 close to the neck opening 5, there creating a buoyant pocket. This air will have been joined by air which has been driven by the rising water out of the man's pockets, trousers etc., and which has risen to enter the pocket by way of mouth 16. Since the jacket relies heavily for its buoyancy upon this extra rising air, it is essential that the mouth 16 should be as large as possible and unobstructed, and that the surfaces of the jacket exterior and lining 7 that define it should be flexible and capable of movement so that entry of the rising air tends if anything to widen the mouth 16 and enlarge the pocket 15 by "parachute" effect rather than the reverse. Should the wearer be floating in the water with his hands above his head, the buoyancy effect of air trapped within pocket 15 will not be lost since this air will tend to accumulate in the regions 18 between jacket and lining 7, close to seals 9.

If jacket exterior and lining 7 are sealed together along extra lines, such as those represented by dot-and-pick lines 19 in FIG. 1, the comparatively wide mouth 20 of the sub-pocket 21 so formed may serve to concentrate the admitted air to a particular region close to the top of the pocket, such as 21a, where extra buoyancy may be desirable to ensure for instance that the wearer takes up a particular attitude in the water.

The main purpose of spacer 14 is to ensure that lining 7 and sheet 2 are never pressed into such intimate contact that air is prevented from flowing between them. This might happen if the wearer entered the water to such a depth that the hydraulic pressure at once exerted on the outer face of the exterior sheet 2 and on the inner face of the lining 7 pressed the adjacent faces of these members together, expelled all air from between them and prevented any other from entering. Expanded flexible plastics foam is one possible alternative to the open weave material already suggested for spacer 14. Polyurethene would be a typical suitable base for such foam, and open-cell foam would be preferable to closed cell because it is more flexible and thus less restraining in normal use.

FIGS. 3 and 4 show the trousers unit 22 that would go with the jacket unit 1 of FIGS. 1 and 2. They include elasticated cuffs 23 (similar to items 2 and 3) to make a snug fit over the walls of sea boots. They also include braces 24 and an outer skin 25, lining 26 and spacer 27 similar in nature and operation to their obvious equivalents 2, 7 and 14 in the jacket unit. Lining 26 and skin 25 are sealed together along line 28 which follows the top edge of the trousers unit and 29 represents the mouth of the air-tight pocket 30 formed between skin 25 and lining 26, the equivalent of 16 in FIGS. 1 and 2.

It will be apparent that air expelled by water from the wearer's socks and the lower part of his trousers, i.e., those parts of his ordinary clothing below the level of mouth 29 of pocket 30, will tend to enter that pocket and enhance the buoyancy of unit 22. However, air expelled from the upper part of the wearer's trousers will

be unable to reach that pocket but will instead tend to reach pocket **15** in the jacket unit **1** by way of mouth **16**, provided some part of the top edge of the trousers unit lies below the level of edge **13**. This illustrates one reason for having edge **13** above edge **12**, since clearly edge **12** must cover the entire top edge of the trousers to protect the wearer against the weather. Another more important reason for separating **12** and **13** is so that the wearer, as he falls into the water, may easily grab edge **12** and flap it in the water, thus generating bubbles which may themselves carry air into pocket **15**. If edges **12** and **13** lay alongside each other the wearer would be in danger of grabbing them both together and so closing mouth **16**.

The linings and pockets of the jacket and trousers units so far described are arranged on the assumption that even if the wearer falls overboard and enters the water head first, he will soon adopt a head uppermost position, after which the gathering buoyancy in the pockets **15** and **30** of both units will help him to float. FIG. **5** shows a detail of another garment which may be better able to ensure the accumulation of some buoyancy even if the wearer may possibly remain head downwards for a considerable period. Here the outer skin of the garment is shown at **40**. The top edge **41** of a first lining **42** is sealed to skin **40** to define a pocket **43**, and a spacer **44** serving the same purpose as **14** and **27** is attached to the inner surface of skin **40**. A second lining **45** is sealed to skin **40** along its bottom edge **46**, to define a second pocket **47** with its mouth facing upwards, and the two linings overlap so that pockets **43**, **47** form parts of a common enclosed cell. If now the wearer floats head uppermost, air expelled by the water from his clothes will enter pocket **43** by way of the gap between linings **42** and **45**, and will gather in the top end of the pocket close to edge **41**. If however the wearer spends some time in the water head downmost, air that has already got into this part of the pocket will not wholly escape but some of it will transfer to pocket **47** by passing between lining **45** and skin **40**.

I claim:

1. A buoyancy aid comprising a garment having:
- a jacket part;
- an air-tight outer skin to said jacket part;
- an air-tight inner lining perimetrically secured to said outer skin at the neck and sleeve ends of each;
- a first pocket defined between said skin and said lining;
- a first free bottom edge to said outer skin;
- a second free bottom edge to said inner lining;
- said second free bottom edge being disposed above the level of said first free bottom edge;
- a trousers part made of air-tight material;
- an upper edge to said trousers part;
- said trousers part co-operating in use with said jacket part whereby said upper edge lies entirely above the level of said first free bottom edge, and at least part of said upper edge lies below the level of said second free bottom edge.

2. A buoyancy aid comprising a garment having:
- two sleeves;
- a trunk fitting portion;
- an air-tight outer skin;
- an air-tight inner lining perimetrically secured to said air-tight outer skin at the neck and sleeve ends of each;
- a first pocket extending within both said trunk fitting portion and said sleeves and defined between said secured lining and skin;
- a free bottom edge of said lining within said trunk portion;
- a free bottom edge of said air-tight outer skin at the lower end of said trunk portion, and
- a single downward-facing opening to said first pocket, defined between said two free bottom edges.

3. A buoyancy aid according to claim **2** having a second air-tight inner lining secured to said air-tight outer skin, a second pocket defined between said secured outer skin and second lining, an opening and a blind end to said second pocket which are respectively uppermost and downmost relative to the wearer during use, and in which the first and second air-tight inner linings overlap to form a single cell including both first and second pockets.

4. A buoyancy aid comprising:
- a jacket including a trunk encircling portion with a neck opening at the top and an open lower end and further including sleeves, said jacket being constituted by an outer shell and a lining each formed of air-tight material; means seaming the shell and lining to one another in an air-tight manner at the neck and at the distal extents of the respective sleeves; the lower extent of the lining being disposed above the lower extent of the shell and there being perimetrically inextensive means joining the lining near the lower extent thereof to the shell near the lower extent of the shell to prevent the lining from riding up with respect to the shell while leaving an entrance to the mouth defined between the lower extents of the lining and shell relatively unobstructed;
- an intermediate liner including a trunk encircling portion with a neck opening at the top and an open lower end and further including sleeves, said intermediate liner being fabricated of one of open mesh fabric and open cell flexible plastic foam and being disposed within the pocket defined between the shell and lining so as to have its lower extent near said mouth, its sleeves extending within the jacket sleeves and its neck;
- air tight seam means joining the shell to the liner along two laterally spaced generally vertical lines extending upward from said mouth to said neck on the front of the jacket, these lines bulging away from one another near the jacket neck to provide a sub-pocket of such shape as to predispose the wearer to float right end up and face up when air is trapped in the sub-pocket.

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