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COMPARTMENTED BUOYANT MATERIALS

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Fig. 1.

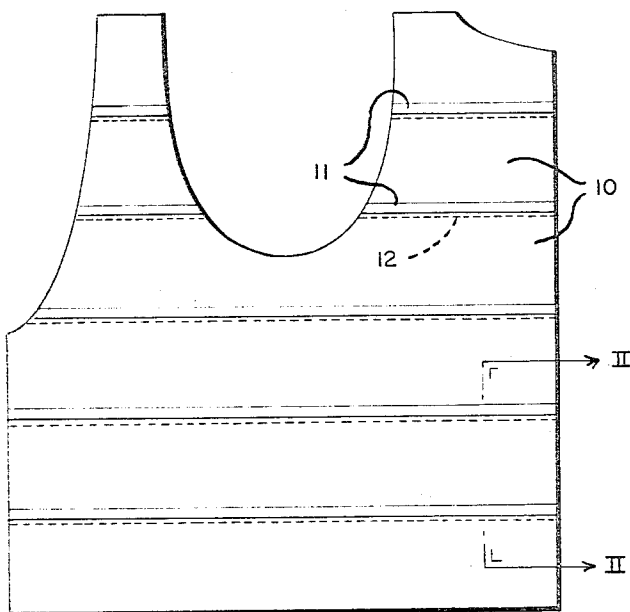
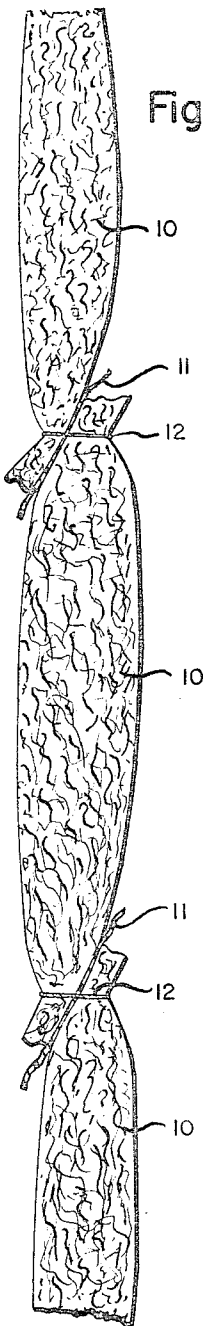


Fig. 2.



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COMPARTMENTED BUOYANT MATERIALS
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This invention relates to compartmented buoyant materials and particularly to a fibrous batt material having remarkable buoyancy combined with thermal insulating properties and to some degree ballistic protective abilities. Fibrous materials such as polyester resins, acrylic resins and the like have long been recognized to have a limited degree of buoyance if properly formed into batts by carding with or without needling. The buoyance effect was recognized to be relatively short lived in most such fibers and no satisfactory method of increase the buoyancy effect was known although much effort has been expended in attempts to devise some means of increasing their buoyancy.

I have discovered that the buoyancy effect of fibrous materials can be markedly enhanced by properly compartmenting the materials. I have found that by forming a fibrous material into parallel segments of controlled height separated by a water impermeable film that I can increase the buoyancy effect as much as 50% and retain the buoyancy effect over much extended periods of time. I have discovered that the maximum height of each segment is about 9.5 inches and preferably less than six inches. Preferably the fibrous materials are treated with a hydrophobing agent such as a silicone and crimped or otherwise treated to provide maximum bulk from staple fibers.

In the foregoing general description I have set out certain objects, purposes and advantages of my invention. Other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which:

FIGURE 1 is an elevational view of a segment of jacket liner according to my invention; and

FIGURE 2 is a section of the line II—II of FIGURE 1.

Referring to the drawings I have illustrated a front quarter liner for a buoyant, thermal jacket made up of parallel strips of polyester resin fiber batt 10, each approximately 6" high separated by a polyethylene film 11 and stitched together by stitching 12 to form a single liner segment.

Various fibers were prepared and tested to determine the effectiveness of the practice of my invention. Examples of these tests are set out hereafter.

Example I

Two 12" x 18" fiber batts of 1.0 d.p.f. Orlon (3.0") were treated with 4% Decetex-104 brand of silicone water repellant and needled to a center cloth of cotton. One of these batts was cut into three 12" x 6" segments and reassembled with polyethylene film strips between top and bottom of each adjacent strip and stitched as in FIGURES 1 and 2. Each sheet was immersed in water with the results set out in Tables I and II.

TABLE I.—BATT WITHOUT COMPARTMENTATION
[Fill wt.=44.3 g.; Cotton cloth=58.6 g.]

Frame wt.+ cover cloth in H ₂ O	Immersion time (min.)	Wt. (g.)	Grams	Buoyancy	
				g./total (102.9)	g./fill (44.3)
659 g.	0.5	331	328	3.13	7.40
	5	421	238	2.31	5.37
	10	443	216	2.10	4.87
	20	461	198	1.92	4.47
	30	473	186	1.80	4.20
	60	487	172	1.57	3.88

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TABLE II.—BATT WITH COMPARTMENTATION ACCORDING TO INVENTION
[Fill wt.=48.1 g.; Cotton cloth=63.7 g.]

Frame wt.+ cover cloth in H ₂ O	Immersion time (min.)	Wt. (g.)	Grams	Buoyancy	
				g./total (111.8)	g./fill (48.1)
684 g.	0.5	177	487	4.35	10.12
	5	273	391	3.49	8.13
	10	290	374	3.34	7.77
	20	306	358	3.19	7.44
	30	318	346	3.01	7.19
	60	340	324	2.89	6.74

Example II

Two 12" x 18" fiber batts of 1.0 d.p.f. Orlon (3.0") were treated with 4% Decetex-104 brand of silicone water repellant and formed into a 10 oz./yd.² needled batt. One of these batts was cut into three 12" x 6" segments and reassembled with polyethylene film strips as in FIGURES 1 and 2. Corrected to identical weights the buoyancy effect appears in Table III.

TABLE III

Immersion Time, (min.)	Buoyancy (lb./lb. of fiber)	
	Non-Compartmented	Compartmented
0.5	3.8	10.7
5	6.9	9.3
10	6.4	8.8
20	6.0	8.2
30	5.6	8.0
60	5.5	7.5

Example III

Two 12" x 18" fiber batts of 1.0 d.p.f. Acrilan staple crimped (3.0") were treated with 4% Decetex-104 as a 10 oz./yd.² needled batt. One batt was cut into three 12" x 6" segments and reassembled with polyethylene film strips as in FIGURES 1 and 2. Corrected to identical weights the buoyancy effect appears in Table IV.

TABLE IV

Immersion Time, (min.)	Buoyancy (lb./lb. of film)	
	Non-Compartmented	Compartmented
0.5	7.8	9.3
5	6.6	8.5
10	6.1	8.1
20	5.9	8.0
30	5.8	7.9
60	5.7	7.6

Example IV

Example III was repeated using 15 oz./yd.² Acrilan batts treated as there described. The buoyancy effect appears in Table V.

TABLE V

Immersion Time, (min.)	Buoyancy (lb./lb. of fiber)	
	Non-Compartmented	Compartmented
0.5	8.9	11.4
5	7.6	11.0
10	7.1	10.8
20	7.0	10.4
30	6.9	10.2
60	6.8	10.0

All of the batts of the foregoing examples had excellent thermal insulating properties as might be expected. In addition there was no penetration of shot when a 12 gauge shotgun was fired at full choke from a distance of 20 yards into the batts.

I have found that the greatest buoyancy effect is achieved when the fibers are quite fine preferably smaller than about 10 to 12 microns in diameter. This, however, is not essential to my invention although desirable for maximum effectiveness.

The invention is incorporated in garments such as jackets, coats, suits and the like for buoyancy and thermal protection, particularly for mariners where the garment acts as a life saving device.

In the foregoing specification I have set out certain preferred practices and embodiments of my invention. It will be understood, however, that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. A buoyant fibrous material to be used in a vertical configuration and being buoyant in the unenclosed condition comprising a plurality of side-by-side batts of fiber one above another with their marginal edges overlapping, a waterproof film between and separating the overlapping edges, and means securing said marginal edges and said film together.

2. The method of making a buoyant fibrous material to be used in a vertical configuration and being buoyant in the unenclosed condition comprising the steps of forming such material into batt segments, assembling a plurality of said batts in parallel lengthwise relation one above another with their marginal edges overlapping, placing a waterproof film between the adjacent edges of said segments and securing said marginal edges and said film together.

3. A buoyant fibrous material to be used in a vertical configuration and being buoyant in the unenclosed condition comprising a plurality of side-by-side one above another batts of fiber less than about 9.5 inches in width with their marginal edges overlapping, a waterproof film between and separating the overlapping edges, and means securing said marginal edges and said film together.

4. The method of making a buoyant fibrous material to be used in a vertical configuration and being buoyant in the unenclosed condition comprising the steps of forming such material into batt segments less than 9.5 inches in width, assembling a plurality of said batts in parallel lengthwise relation one above another with their marginal edges overlapping, placing a waterproof film between the adjacent edges of said segments and securing said marginal edges and said film together.

5. A buoyant fibrous material as claimed in claim 1 wherein the side-by-side batts are about 6 inches in width.

6. The method of claim 2 wherein the segments are about 6 inches in width.

7. A buoyant fibrous material to be used in a vertical configuration and being buoyant in the unenclosed condition comprising a plurality of side-by-side batts one above another of fiber less than about 9.5 inches in width with their marginal edges overlapping, a waterproof film between and separating the overlapping edges, and means securing said marginal edges and said film together, said fiber having been crimped and treated with a hydrophobing agent.

8. The method of making a buoyant fibrous material comprising the steps of carding said material, forming said carded material into batt segments less than 9.5 inches in width, assembling a plurality of said batts in parallel lengthwise relation with their marginal edges overlapping, placing a waterproof film between the adjacent edges of said segments and securing said marginal edges and said film together.

9. A buoyant garment comprising a plurality of side-by-side one above another parallel batts of fibrous material vertically one above the other, said batts having a vertical height less than 9.5 inches with their marginal edges overlapping, a waterproof film between and separating the overlapping edges, and means securing said marginal edges and said film together.

10. A buoyant garment as claimed in claim 9 in which the side-by-side batts are positioned with the top of one overlapping the bottom of the next adjacent higher batt, said batts and film being stitched together at the overlap.

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