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(54) Flotation platform.

(57) A bifacial inflatable flotation platform (10) for use as a life raft, comprises a pair of stacked inflatable open-centered squares (12,14) each formed by four elongate tubular inflatable side sections joined together end-to-end, and a floor web (16) sandwiched between the squares. The squares (12.14) are angularly-offset by 45° in plan view so that each of the apexes (34-48) of each square protrudes from a side section of the other square in register with the centre of that side section, thus defining eight crotches (18-32) between adjacent apexes all of which crotches are equally usable as boarding stations irrespective of which face of the floating platform is uppermost. Triangular slack webs (54) spaced from the floor web (16) at the four corners of each square form seal ballast and sea anchor means. Boarding straps (52) are secured end-to-end around the periphery of the platform.

In use, at each crotch boarding station (18-32) the underlying square co-operates with the upper square to define a boarding step or crawlway between two adjacent apexes for entering the platform from the sea.

FIG 1

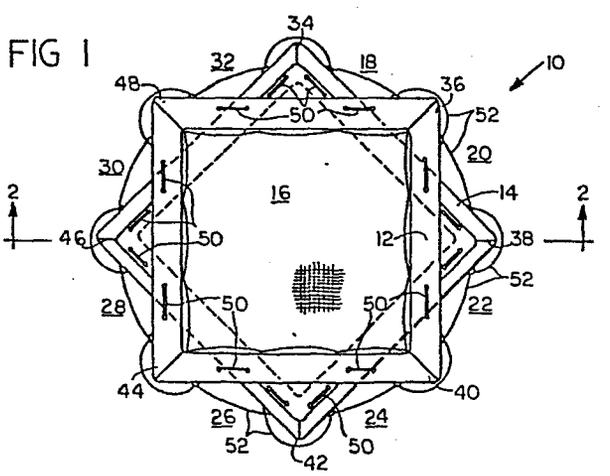

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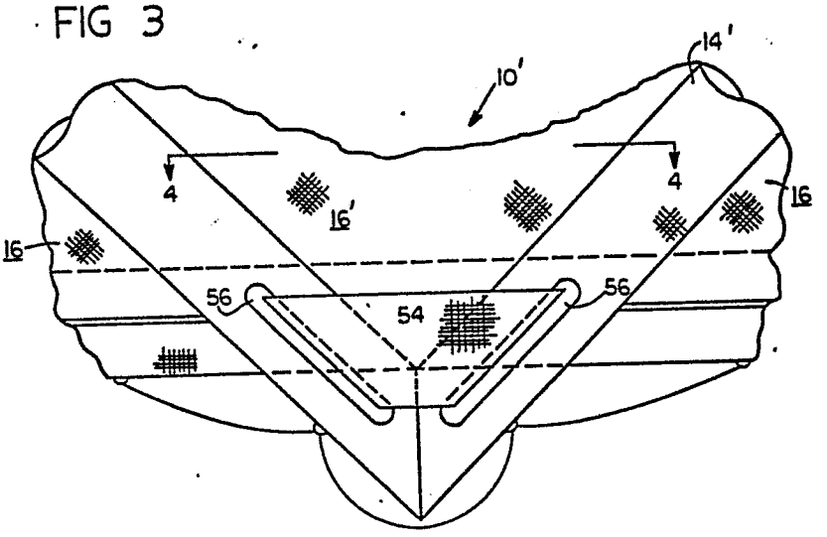
FIG 3



FLOTATION PLATFORM

The present invention relates to flotation platforms, particularly, although not exclusively of the inflatable variety for use as life rafts and to methods of making and using such flotation platforms. In one form the invention may provide a preferably bifacial species of preferably inflatable life raft presenting a multitude of boarding stations by which a person such as an evacuee from an aircraft or other vessel, may enter the raft from the water, unassisted, and which also provide purchase for able-bodies evacuees aboard the platform to assist an injured or otherwise disabled person to board the raft.

Coventional inflatable life rafts are known which are bifacial. That is, the life raft when inflated and upon the surface of the sea presents substantially the same utility and serviceability with either side up. Further, a conventional bifacial life raft is known which presents a pair of boarding stations whereat evacuees may conveniently leave the sea and board the raft. For example, a life raft of such character is known according to U.S. Patent 2,933,739 issued 26th April, 1960 to R.L. Miller et al (referred to as Miller et al) wherein the life raft is composed essentially of a stacked pair of open-centered inflatable ellipses sandwiching a panel of fabric therebetween. The fabric panel defines a floor for the raft. The ellipses are rotated relative to one another and secured together so that the major axes of the ellipses are disposed perpendicularly to one other. The raft thus defines four boarding stations; a pair of which are usable with one face of the raft upward, and another separate pair of which are usable

with the other reverse face of the raft upward. An inflatable step is provided at each board station.

Life rafts constructed according to the teaching of Miller, et al, are believed to have many deficiencies. For example, the raft has only a pair of boarding stations which are usable at one time. This feature of the Miller et al., raft limits the rate at which the potential occupants may leave the sea and board the raft. After a ship wreck or airplane crash, there may be a multitude of persons in the sea, many of whom may be injured and capable of only short endurance. A delay in boarding an available life raft may mean death for injured or weakened persons who simply cannot struggle for life or tread water long enough while waiting for help or for their turn to board the raft. In the confusion and fear surrounding such tragedies, weakened or injured persons may simply slip beneath the waves and their loss go unnoticed at the time.

Further a life raft according to the Miller et al., teaching is believed to be comparatively bulky and heavy with a plurality of seams. Such is the case because the ellipses of the raft body are in fact defined by plurality of relatively short, straight tubular sections which are jointed to one another. Thus, each of the straight tubular sections must define a seam with each of its neighbouring adjacent tubular sections. Such a multitude of seams adds both weight and bulkiness to the raft, and each seam presents the risk of

a leak in the raft. The bulk and weight of a raft according to Miller, et al's teaching is increased still further by the inflatable step section provided at each of the four boarding stations. These step sections are four in number, although only two of the steps may be utilised at a time dependent upon which side of the raft is upward. Thus, the other two unused step sections are truly superflous bulk even though they are necessary with the life raft of Miller et al.

Yet another shortcoming of the Miller,et al., life raft is believed to be its considerable difficulty of construction. That is, the life raft of Miller et al., requires a plurality of straight tubular segments to be formed and jointed with a plurality of seams therebetween. Thus, a large number of separate pieces of body fabric must be cut, fitted to one another, and jointed by leak-proof seams to construct a life raft according to the conventional teaching. All in all, the life raft of Miller et al., is believed to be inherently intensive of both labour and materials.

Further,a basic need has been recognised for a new type of life raft. This new species of life raft is herein referred to as a flotation platform. The principal use envisaged for flotation platforms is aboard aircraft, even though they may also be used aboard other craft. At present,

aircraft which fly over bodies of water and more than 150 miles from shore are required to carry conventional life rafts and survival gear. However, aircraft which fly over water but never more than 150miles from shore are required only to carry flotation assistance equipment, such as buoyant seat cushions and inflatable life vests.

However, experience has shown that aircraft passengers placed into the cold sea by an aircraft wreck with only flotation assistance equipment have a very poor chance of survival because of exposure and hypothermia. Even though rescue equipment and assistance may require only a few minutes to reach the scene of the aircraft wreck or ditching,passenger survival rates may be very low. Thus there has been recognised a need for a flotation platform which is relatively light in weight and low in deflated package size and bulk. Such a flotation platform may be carried aboard aircraft not designed to carry more than flotation assistance equipment,such a buoyant seat cushions. Such a flotation platform need not provide facility for long-term occupancy. That is, water and food need not be provided, and extensive environmental sheltering for those aboard the platform need not be provided.

Further, it is recognised that a optimised flotation platform will allow able-bodied evacues to leave the sea and board the platform quickly. Additionally, such a platform should provide purchase for those able-bodied evacuees already aboard the platform to assist other evacuees

in the sea. who may be suffering from injury or hypothermia, toboard the platform. Still further, such platform should include bifacial sea ballast structure which will assist in stabilising the platform to increase occupant comfort and safety.

In view of the many deficiencies of conventional life raft, only a few of which have been pointed out above, it is a principal object for this invention toprovide a preferably bifacial life raft which is both relatively light in weight and relatively easy to construct while providing as large a number of boarding stations as talent and human ingenuity can achieve and which through aspects of its conformation minimises the number of seams required in its construction and the risk of leakage presented in use.

Yet another object of the present invention is to provide a life raft of the above-recited character which is comparatively light in weight and of no greater bulk in its deflated, folded condition than is dictated by the constraints of currently available materials used in its construction.

Yet another object of the present invention is to provide a life raft of the above-cited character which provides sea anchor and stability augmentation structure preferably also of a bifacial nature, and which structure does not interfere with the utility and passenger comfort provided by the raft.

In view of the above, it is a further object of this invention to provide a flotation platform of the above-described character which allows evacuees to quickly leave the sea and board the platform. According to a particularly disclosed preferred embodiment of the invention set forth herein this objective is fully met by the provision of eight boarding stations presented to evacuees regardless of the facial orientation of the platform upon the sea.

Each boarding station may be defined by a crotch between adjacent structural members forming the periphery of the platform, the crotch providing a re-entrant region for boarding the platform.

In one form the present invention comprises a bifacial and gas-distensible flotation platform having a pair of oppositely-facing platform faces providing a floor area on each face for receiving passengers, and having a peripheral structure of elongate inflatable members or sections defining a plurality of boarding stations which are all equally usable for the boarding of the platform by passengers leaving the water irrespective of which face of the platform is directed upwardly when the platform is gas-distended and floating on a body of water.

In such an arrangement the peripheral structure of the platform defines at each boarding station a crotch between a pair of adjacent elongate members or sections disposed at an angle to one another, one member or section of each pair overlying the other so as to form therewith a step-like crawlway leading to the passenger receiving floor area of the upper face of the platform.

In a preferred embodiment of the invention, the peripheral structure comprises a pair of superimposed open-centred generally planar buoyancy polygons formed by the said elongate members or sections, the polygons being stacked one on the other and secured together and to a web extending across their open centres to form a floor for the platform, the two superimposed polygons being angularly-offset in plan relative to one another so as to define the said crotches between adjacent side members respectively belonging to the two polygons.

The sides of the two polygons may be formed by a plurality of substantially-straight elongate inflatable tubular sections or members joined together at their adjacent ends to form the apexes of the polygons.

Preferably the two polygons are similar in number of sides and are of equal dimensions, and are angularly-offset so that each apex of each polygon is in register with the centre of a respective side member or section of the other polygon and protrudes outwardly of that member or section.

The platform in any of its forms may include sea ballast means arranged to trap a quantity of water to aide stabilisation of the platform. The sea ballast means may also act as sea anchor means.

The sea ballast means may comprise at least one substantially-triangular slack web of fabric

intersecured with one of the polygons at an inside corner thereof and spaced outwardly from the floor web to define therewith an open mouth leading into a water receiving basin. There may be a plurality of such substantially-triangular slack webs respectively secured to each inside corner of each polygon at both faces of the platform.

From another aspect, the present invention comprises a bifacial flotation platform formed of an intersecured pair of stacked open-centred buoyancy polygons sandwiching a web therebetween which defines a floor for said platform, the two polygons being so disposed relative to one another as to define a plurality of boarding station crotches spaced circumferentially around the platform at the perimeter thereof.

From yet another aspect, the invention comprises a flotation platform for use as a life raft, characterised by a pair of open-centred stacked buoyancy polygons formed by elongate tubular side members or side sections whose adjacent ends define the apexes of the polygons, the two polygons being secured together and carrying extending across their own centres means forming a floor of the platform, and the two polygons being so disposed relative to one another in plan as to define together a plurality of crotches between their respective adjacent side members, said crotches being distributed around the peripheryt of the platform and providing boarding stations for passengers to enter the platform from the water.

The sides of each of the polygons are preferably formed by substantially elongate tubular inflatable members whose adjacent ends are secured together to provide gas communication between members and to define the apexes of the polygon.

From yet another aspect, the invention provides a bifacial life raft comprising a stacked pair of flexible gas distensible and open-centered similar polygons secured to one another and to a panel of fabric sandwiched therebetween, the panel defining a floor for the raft. The open-centered polygons are preferably secured to one another with an apex of each substantially congruent with (in register with) the centre of a side of the other so that a crotch or crevice is defined between each adjacent pair of apexes. Each of the crotches defines a boarding station for the life raft whereat the underlying polygon inherently co-operates with the upper of the pair of polygons to define a boarding step or step-like crawlway by which passengers may board the raft from the sea.

Further between each adjacent pair of boarding stations, an apex of one of the polygons protrudes outwardly beyond the adjacent side of the other of the pair of polygons. Each such protruding apex provides an area of purchase where at passenger already aboard the raft may conveniently assist a person in the sea at one of the adjacent boarding stations to board the raft. A particularly beneficial aspect of this feature is that each crotch, each boarding station, is in fact disposed between a

pair of protruding adjacent apexes. Thus, a pair of passengers may work from the pair of apexes to assist a weakened or injured person in the crotch therebetween to board the life raft.

A preferred disclosed embodiment of the invention comprises a pair of stacked open-centered squares sandwiching a panel of fabric therebetween. The open-centered squares are substantially identical and each comprises flexible tubular gas distensible structure which is substantially circular in cross section. The open centered squares are secured to one another and to the floor panel therebetween with the apexes of each substantially congruent with the side centres of the other. A plurality of straps and hand holds are secured to the tubular structure so as to provide equal facility for passengers to leave the sea and board the raft irrespective of which side thereof is upwardly facing.

Additionally, a particularly disclosed preferred embodiment of the invention presents bifacial sea anchor structure comprising a substantially triangular web of fabric slackly spanning each inside corner of each open-centered square. In other words, on each fact of the flotation platform are four slack triangles of water-holding fabric which each co-operate with the remainder of the platform to define a pocket for trapping sea water. Because the fabric webs are slack, the four webs on the upward face of the platform may lie loosely in the corners of the platform without interfering with use of the corners of the platform by evacuees.

Further to the above, a method of making a life raft according to the invention and a method of using the inventive life raft are disclosed. Additional objects and advantages of the present invention will be apparent in light of the following detailed description of preferred embodiments of the invention.

The invention may be carried into practice in various ways, but two specific and preferred embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings in which:-

FIGURE 1 is a top plan view of a preferred square-on-square embodiment of the invention;

FIGURE 2 is a fragmentary exploded cross sectional view taken along line 2-2 of FIGURE 1, and with some features omitted for clarity of illustration;

FIGURE 3 depicts a fragmentary view of the underside of an alternative embodiment of the invention having sea anchor structure included; and

FIGURE 4 depicts a fragmentary view taken along line 4-4 of FIGURE 3.

FIGURE 1 depicts an inflatable flotation platform constituting a particularly preferred embodiment of the invention, shown in its inflated condition as it would appear upon the surface of the sea when viewed from directly overhead. The flotation platform 10 will quickly be seen to appear as an octagonal star having eight points and sixteen sides. However, closer examination of the platform 10 will reveal that it comprises

two substantially identical open-centered gas-inflatable squares 12 and 14, which are stacked and secured to one another. The squares 12 and 14 are each defined by four substantially straight tubular inflatable sections of flexible air-proof fabric. The tubular sections have a generally circular cross-section. Each of the tubular sections of each square 12 and 14 is in gas communication with its adjacent tubular sections at the mitered corners of the squares 12,14. The squares 12 and 14 are secured to one another in relative orientations displaced by 45° from one another in plan view, so that the apexes of each square protrude in substantially congruence with (i.e. are substantially in register with) the centres of the sides of the other square.

Sandwiched between the squares 12,14, and secured to each, is a web 16 of flexible fabric defining a floor for the platform 10. The web 16 defines at its perimeter an octagonal star shape so as to span fully the centre of each square 12,14.

Further inspection of the platform depicted by FIGURES 1 and 2 will reveal that the platform defines eight crotches or boarding stations 18-32. Each of the eight boarding stations 18-32 is usable regardless of which face of platform 10 is upward. The boarding stations are defined between adjacent protruding apexes 34-48 of the squares 12.14. Each face of the platform 10 further includes a number of similarly disposed relatively short straps 50 (only one set of which is visible) which define hand holds for

use by evacuees in boarding the platform. Similarly, a single set of relatively longer straps 52 circumscribes the perimeter of the platform 10. The straps 52 may be used both as hand holds and as stirrups by evacuees boarding the platform.

The structure of platform 10 having been described, attention may now be directed to the use of the platform. Consideration of FIGURE 1 will immediately make clear how able-bodied evacuees may make use of the eight boarding stations 18032. That is, an evacuee at a boarding station may use the straps 50 and 52 to haul himself from the sea and partially onto the platform 10. From such a position, an evacuee can complete boarding of the platform by placing one knee or a foot upon the protruding apex of the underlying one of the squares (as illustrated, on square 14) to scramble aboard the platform.

The platform 10 provides particular advantage when injured or otherwise disabled evacuees are to be brought aboard the platform. Viewing FIGURE 1 once again, it will be seen that each boarding station 18-32 is bracketed between an adjacent pair of the apexes 34-48. Thus, an able-bodied evacuee aboard the platform 10 may take a position at one of the protruding apexes 34-48 in order to assist disabled evacuees from the sea at an adjacent boarding station 18-32. Further, a pair of able-bodied evacuees may take positions at a pair of adjacent apexes in order to assist disabled evacuees to board the platform 10 at

the boarding station therebetween. For example, a pair of able-bodied evacuees at apexes 34 and 36 may together assist a disabled evacuee at boarding station 18 to leave the sea and board the platform.

FIGURE 3 and FIGURE 4 depict an alternative embodiment of the invention wherein reference numerals used in FIGURES 1 and 2 and having a prime added indicate similar or analogous structure. Flotation platform 10' includes a substantially triangular web of fabric 54 which spans an apex of one of the open centered squares 12,14. By way of example, as shown, web 54, spans a corner of square 14'. When 54 is secured to tubular section 14' as by a seam 56. The web 54 is spaced from the floor fabric 16 and includes sufficient slack that it may bow downwardly as depicted in FIGURE 4. According to this preferred embodiment of the invention, a flotation platform as depicted in FIGURE 1 further includes a web 54 at each inside corner of each of the squares 12,14. Thus, irrespective of which face of the platform is upward, four of the webs 54 will be on the downward face of the platform to receive sea water therein. As seen in FIGURE 4 the webs 54, because of their slack, define pockets or basins within which sea water may be received to add ballast weight and stability to the platform 10. Conversely, the webs 54 on the upwardly disposed face of the platform 10' also because of teir slack, may lie limply in the corners of the platform. Thus, the webs 54 on the upward face of the platform do not interfere with the use of the platform corners by evacuees.

While the present invention has been depicted, described, and defined by reference to particularly preferred embodiments thereof, no limitation upon the invention is implied by such reference and none is to be inferred.

CLAIMS

1. A flotation platform (10) for use as a life raft, characterised by a structure constructed and arranged so that a plurality of boarding stations (18-32) for passengers are inherently defined by the platform structure itself.

2. A platform as claimed in Claim 1 which is bifacial and gas-distensible, having a pair of oppositely-facing platform faces providing a floor area (16) on each face for receiving passengers, and having a peripheral structure (12,14) of elongate inflatable members or sections defining a plurality of boarding stations (18-32) which are all equally usable for the boarding of the platform by passengers leaving the water irrespective of which face of the platform is directed upwardly when the platform is gas-distended and floating on a body of water.

3. A platform as claimed in Claim 2 in which the peripheral structure defines at each boarding station a crotch (18-32) between a pair of adjacent elongate members or sections disposed at an angle to one another, one member or section of each pair overlying the other so as to form therewith a step-like crawlway leading to the passenger receiving floor area (16) of the upper face of the platform.

4. A platform as claimed in Claim 3 in which the peripheral structure comprises a pair of superimposed open-centred generally-planar buoyancy polygons (12,14) formed by the said elongate members or sections, the polygons being stacked one on the other and secured together and to a web (16) extending across their open centres to form a floor for the platform, the two superimposed polygons (12,14) being angularly-offset in plan relative to one another so as to define the said crotches (18-32) between adjacent side members respectively belonging to the two polygons.

5. A platform as claimed in Claim 4 in which the sides of the two polygons (12,14) are formed by a plurality of substantially-straight elongate inflatable tubular sections or members joined together at their adjacent ends to form the apexes (34,48) of the polygons.

6. A platform as claimed in Claim 4 or Claim 5 in which the two polygons (12,14) are similar in number of sides and are of equal dimensions, and are angularly-offset so that each apex (34,48) of each polygon is in register with the centre of a respective side member or section of the other polygon and protrudes outwardly of that member or section.

7. A platform as claimed in any one of Claims 1 to 6 including sea ballast means (54) arranged to trap a quantity of water to aid stabilisation of the platform.

8. A platform as claimed in Claim 7 in which the sea ballastmeans (54) is also arranged to act as sea anchor means.

9. A platform as claimed in Claim 7 or Claim 8 in each case when dependent on one of Claims 4 to 6, in which the sea ballast means comprises at least one substantially-triangular slack web (54) of fabric intersecured with one of the polygons (12,14) at an inside corner thereof and spaced outwardly from the floor web (16) to define therewith an open mouth leading into a water receiving basin.

10. A platform as claimed in Claim 10, having a plurality of the said substantially-triangular slack webs (54) respectively secured to each inside corner of each polygon (12,14) at both faces of the platform.

11. A bifacial flotation platform (10) characterised by an intersecured pair of stacked open-centred buoyancy polygons (12,14) sandwiching a web (16) therebetween which defines a floor for said platform, the two polygons being so disposed relative to one another as to define a plurality of boarding station crotches (18-32) spaced circumferentially around the platform at the perimeter thereof.

12. A flotation platform (10) for use as a life raft characterised by a pair of open-centred stacked buoyancy polygons (12,14) formed by elongate tubular side members or side sections whose adjacent ends define the apexes (34-48) of the polygons, the two polygons being secured together and carrying extending across their own centres means (16) forming a floor of the platform, and the two polygons being so disposed relative to one another in plan as to define together a plurality of crotches (18-32) between their respective adjacent side members, said crotches being distributed around the periphery of the platform and providing boarding stations for passengers to enter the platform from the water.

13. A platform as claimed in Claim 11 or Claim 12 wherein the two polygons (12,14) are equilateral polygons of similar dimensions.

14. A platform as claimed in Claim 11 or Claim 12 or Claim 13 in which the two polygons (12,14) are disposed in angularly-offset relationship in plan such that each apex (34-48) of each polygon is in register with the centre of a respective side of the other polygon, and protrudes outwardly of that side .

15. A platform as claimed in any one of Claims 11 to 14 in which the sides of each of the polygons (12,14) are formed by substantially-elongate tubular inflatable members whose adjacent ends are secured together to provide gas communication between members and to define the apexes (34 -48) of the polygon.

16. A platform as claimed in any one of Claims 11 to 15 in which each polygon (12,14) has four sides.

17. A platform as claimed in any one of Claims 11 to 16 which includes elongate straps (52) each secured at opposite ends to the platform (10) for providing purchase to assist passenger boarding of the platform.

18. A platform as claimed in Claim 17, having a plurality of the said straps (52) secured end-to-end to the platform in a disposition circumscribing its perimeter.

19. A platform as claimed in any one of Claims 11 to 18 provided with sea ballast means (54) arranged to trap a quantity of water to aid stabilisation of the platform.

20. A platform as claimed in Claim 19 in which the sea ballast means (54) also acts as sea anchor means.

21. A platform as claimed in Claim 19 or Claim 20 in which the sea ballast means comprises at least one substantially triangular slack web (54) of fabric intersecured with one of the polygons (12,14) at an inside corner thereof and spaced outwardly from the floor means(16) to define therewith an open mouth leading into a water receiving basin.

22. A platform as claimed in Claim 21 having a plurality of the said substantially triangular slack webs (54) respectively secured to each inside corner of each polygon (12,14) at both faces of the platform.

23. Life raft apparatus having a pair of intersecured tubular fluid distensible sections which are disposed at an angle relative to one another to define an inside corner, said apparatus further comprising sea ballast structure including a slack web of fabric spanning said inside corner to define a water receiving basin in co-operation with said pair of tubular sections and an opening from said basin for receiving water therein.

FIG 1

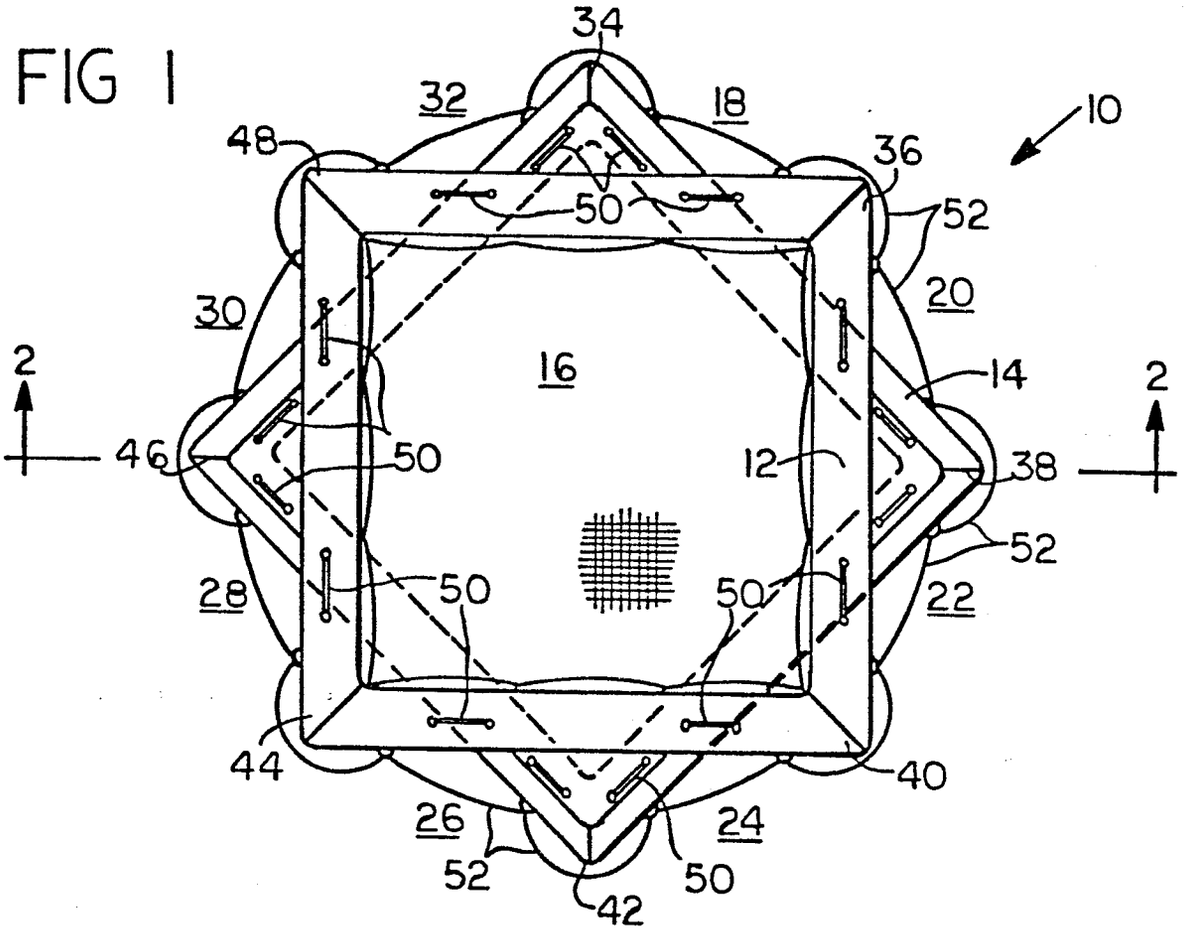

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FIG 2

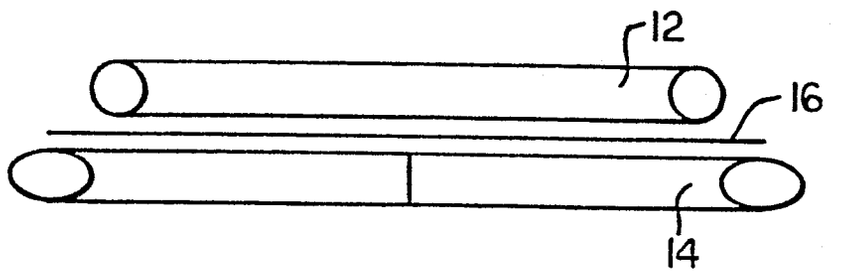
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FIG 3

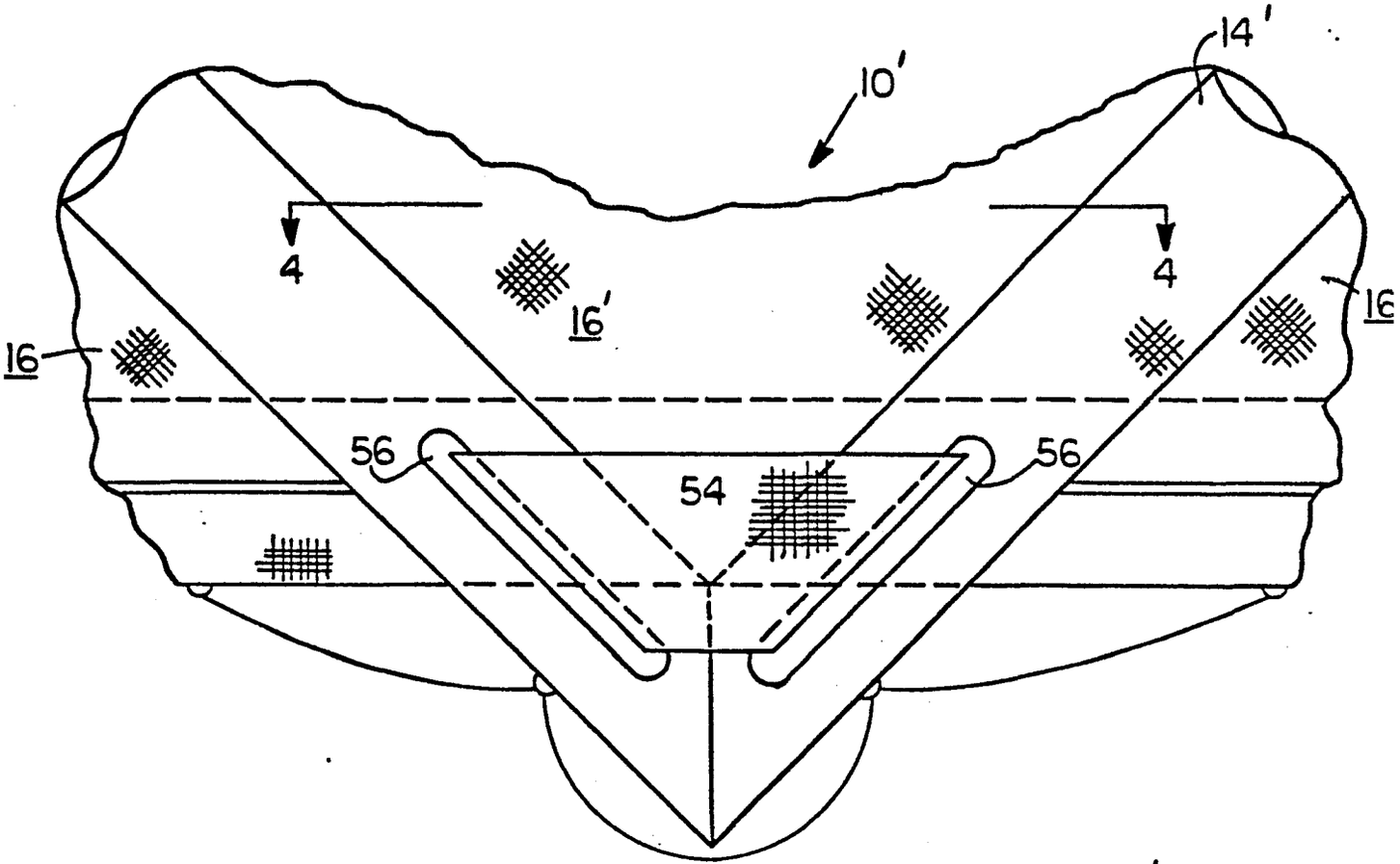
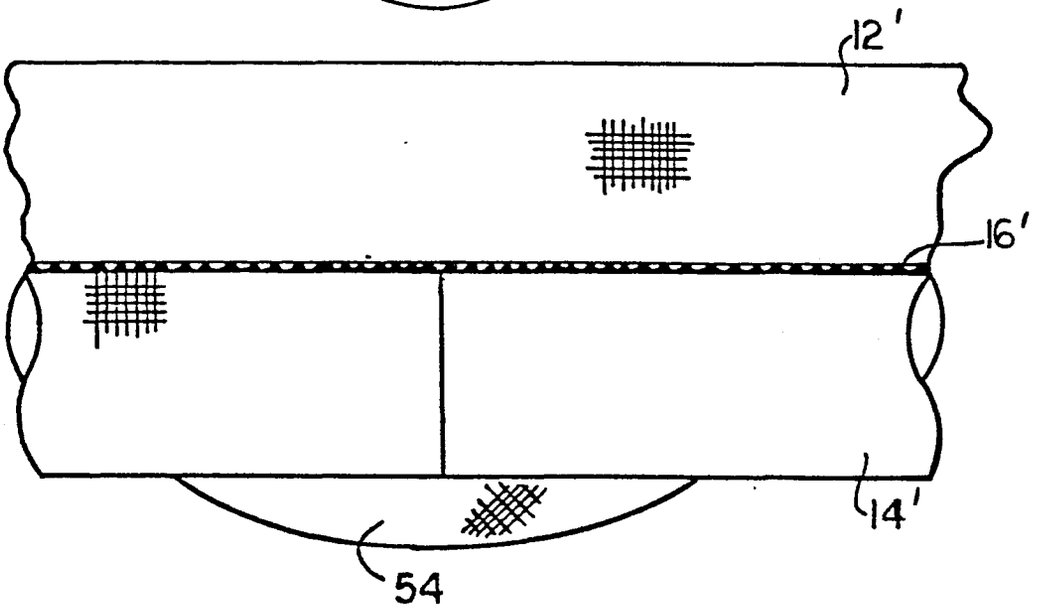


FIG 4



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EUROPEAN SEARCH REPORT

0140501
Application number

EP 84 30 5509

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,X	US-A-2 933 739 (MILLER) * column 1, lines 50-65; column 2, lines 9-62; figures 1,2 *	1,2	B 63 C 9/04
Y		3,7,11,12	
A		4-6,14,15,23	

Y	GB-A- 740 709 (BADEN SHAW) * page 1; page 2, lines 13-100; page 3, lines 15-30; figures 4-5 *	3,11,12	
A		1,2,23	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
	---		B 63 C B 63 B
Y	GB-A- 807 081 (GARRETT) * page 1, lines 60-94; page 2, lines 54-87; page 3, lines 120-123; figures 1-3 *	7	
A		1,9,19,21,23	
	--- -/-		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-12-1984	OFFMANN P.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-1 127 362 (FEST) * page 1, right-hand column; figure 4 *	1,2,4-6,8,10-13,15,16,20,22	
A	GB-A-2 077 207 (BURGESS) * page 1, lines 1-79; page 3, lines 5-20; figure 5 *	7-9,19-21	
A	FR-A-2 040 867 (ANGEVINIERE) * page 2, lines 1-10; figure 1 *	17,18	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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