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(54) **Semirigid boat for use as a service watercraft**

Halbsteifes Boot für Benutzung als Beiboot

Bateau semi rigide pour utilisation comme bateau de service

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Description**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to a semirigid boat, which has been specifically designed for operation as a service watercraft.

[0002] More specifically, the semirigid boat according to the present invention can be used as a service watercraft for short and middle range navigation, and for disembarking and embarking tourists and passengers onto/from cruise and pleasure vessels.

[0003] As is known, in recent years, multiple requirements both of pleasure boaters and professional users, have favored a broad diffusion and development of semirigid boats, substantially comprising a rigid bottom and dunnage, perimetrically encompassed by floating pneumatic tubular elements.

[0004] The above mentioned requirements were particularly related to the shape stability, center of mass position which, in these boats is advantageously arranged at a lower level, high floating characteristics, a larger payload, the size being the same with respect to those of other boats, a high navigation comfort, in addition to a greatly facilitated hauling capability, without damages.

[0005] Commercially available semirigid boats, while they partially meet the above mentioned requirements, are however affected by some disadvantages or drawbacks.

[0006] In fact, the pneumatic tubular elements can be damaged both during the navigation and in hauling operations, and as the boat is hauled to a dry condition.

[0007] In particular, possible holes of a comparatively large size can greatly reduce the floating capability of the boat, up to prevent the latter from stably floating and, accordingly, could negatively affect the navigation quality and safety, and, in serious events, to cause the boat to sink.

[0008] Moreover, also small holes cause a lot of remarkable drawbacks, both due to the requirement of frequently recovering the proper pressure in the tubular elements, and for the time necessary for the recovering or repairing operations.

[0009] Moreover, the above mentioned pneumatic tubular elements are negatively affected by the atmospheric agents, thereby they can prematurely age, with respect to conventional types of boats.

[0010] Moreover, their inner width is smaller, the size being the same, than that of a rigid boat having the same outer dimensions.

[0011] The height of the sidewalls, and then of the free edge thereof, is in fact related to the diameter of the pneumatic tubular elements and, consequently, is necessarily limited.

[0012] This drawback involves, as a further disadvantage, a low level walking surface, with respect to the water surface.

[0013] The document EP-A-0945336 discloses sub-

stantially the preamble of claim 1.

SUMMARY OF THE INVENTION

[0014] Accordingly, the aim of the present invention is to provide such a semirigid boat, specifically designed for use as a service watercraft, adapted to overcome the above mentioned drawbacks affecting the prior art, and in which the floating tubular elements can be easily assembled and disassembled without using complex clamping tools and fittings.

[0015] Within the scope of the above mentioned aim, a main object of the present invention is to provide such a semirigid boat, specifically designed as a service watercraft for a short and middle range navigation, for disembarking and embarking tourists and passengers onto/from cruise and pleasure vessels, which has a novel construction which is very reliable in the time.

[0016] Yet another object of the present invention is to provide such a semirigid boat having enhanced payload capabilities.

[0017] Yet another object of the present invention is to provide such a semirigid boat which provides a very high navigation comfort.

[0018] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a semirigid boat, for a service watercraft use, according to claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limitative, example in the accompanying drawings, where:

Figure 1 is a partially cross-sectioned front view illustrating the subject construction in an operating step preceding the assembling of the semirigid boat; Figure 2 is a side view of some floating elements included in the boat according to the present invention; Figure 3 is a top view of the same floating elements; Figure 4 is a partially enlarged side view illustrating the connection of two of said floating elements; Figure 5 is a partial top plan view illustrating the connection shown in figure 4; Figure 6 is a partially cross-sectioned front view of the semirigid boat; Figure 7 is a cross-sectioned front view of a floating element included in the subject semirigid boat; Figure 8 is a front view of a tie-rod element used in the semirigid boat according to the invention; Figure 9 is a cross-sectioned front view of the element shown in figure 7, to which the tie-rod shown

in figure 8 has been applied;

Figure 10 is a partially exploded side view of the semirigid boat;

Figure 11 is a top plan view of an element included in the semirigid boat according to the invention;

Figure 12 is a cross-sectioned view of the boat, with an inner tubular element molded in a mold and connected to the boat bottom according three configurations;

Figure 13 is a partially cross-sectioned view of the boat with the tubular element welded to the boat bottom at two points, with a polyurethane joint;

Figure 14 is an enlarged view of the detail of figure 13;

Figure 15 is a partially cross-sectioned view of the boat with the tubular element welded to the boat bottom at a point, with a triple polyurethane joint covering element;

Figure 16 is an enlarged view of the detail shown in figure 15;

Figure 17 is a partially cross-sectioned view of the boat with the tubular element structurally welded in a "A"-shape profile to the boat bottom; and

Figure 18 is an enlarged view of the detail of figure 17.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] With reference to the number references of the above mentioned figures, the semirigid boat, according to the present invention, which has been generally indicated by the reference number 1, comprises a rigid boat bottom 2, preferably made by using composite fibrous materials with a thermosetting polymeric matrix.

[0021] A boat deck 3, overlaying the boat bottom 2, comprises perimetrically a plurality of ridges or profiles 4 having a trapezoidal cross-section.

[0022] The trapezoidal profiles 4 are preferably made in the boat deck molding operation, and on said profiles of ridges 3 are provided a housing for semirigid floating elements 5.

[0023] Each of the above mentioned elements comprises a closed cell polyurethane foam core, providing a great shape stability.

[0024] The semirigid floating element 5, in particular, can be made, for example, by extrusion or mold injection starting from closed cell polyurethane foam.

[0025] This material, even after periods of months, does not absorb water and has a very high wear and atmospheric agent resistance.

[0026] The used foam material is advantageously provided with such mechanical characteristics as to have a resilient performance, similar to that of air enclosed in conventional floating tubular elements, with a larger cushioning effect and a larger strain resistance.

[0027] More specifically, the tubular element is preferably fully made of closed cell foamed polyethylene, coated by polyurethane, thereby assuring anti-sinking capabilities even in a case of breakages or cuts, as can occur

because of impacts against other boats or other articles having rough surfaces, or cutting parts.

[0028] The above mentioned tubular elements is provided with a lot of advantageous characteristics.

5 [0029] In fact, the high elasticity of the foamed polyethylene provides a high energy or power absorption, and a small reaction force, which would be essential for preventing the risk of possible damages.

10 [0030] To provide a good binding of the polyurethane coating and foamed polyethylene, a specifically designed type of foam material has been used, including a polyethylene component having very good binding characteristics for binding it to polyurethane polymers.

15 [0031] More specifically, foamed polyethylene is coated by a high thickness polyurethane elastomeric layer, allowing a very good wear and breaking resistance, thereby assuring a long duration even in heavy use condition.

20 [0032] Such a material is conventionally used for making conveyor belts in granite quarries and it has a very high wear resistance.

25 [0033] From a lot of tests, it has been found that this material is adapted to resist against to 80% compressions, without any damages and with a substantially immediate recovery of its original size.

30 [0034] The shape or configuration of the floating elements 5 provides an approximatively "H"-shape cross-section, which, accordingly, is different from the conventional cross-section of prior circular cross-section pneumatic floating elements, since the used polyurethane foam has a self-supporting or peculiar shape, which is defined in designing the pneumatic floating elements.

35 [0035] Thus, it is possible to overcome the size limits which, in prior semirigid boats, limit the inner width and the height of the free edge thereof.

40 [0036] Moreover, the polyurethane based coating of each element 5 allows to obtain a perfect proofing and wear resistance, against both atmospheric agents and accidental tearings or cuts.

45 [0037] Each floating element is patterned with a vertical extension variable cross-section which comprises, for a disassemblable embodiment, at least two recesses, i.e. a bottom recess 6 and a top recess 7 having a trapezoidal cross-section.

50 [0038] Said recesses allow to provide a connection with one of the above mentioned profiles 4 provided on the boat deck and a profile 8 applied on a top element 9 having the same perimetrical plan as that of the deck 3.

55 [0039] The mentioned top element 9, which is preferably made by a molding method, comprises a plurality of profiles 8 which correspond to the plurality of profiles 4 provided on the boat deck 3.

[0040] Moreover, said top element 9 is anchored to the boat deck 3 by adjustable tie-rod elements 10, designed for pressing and holding in a set position the mentioned semirigid floating element 5.

[0041] The above mentioned tie-rod elements 10 are preferably made of a rigid round material or of a stainless

steel flexible cable, and are advantageously provided with threaded end portions to allow simple clamping and adjusting operations to be quickly performed.

[0042] More specifically, the tie-rod elements 10 connect each profile 4 of the boat deck 3 with a corresponding profile 8 of the top element 9, by passing through a floating element 5 which is preliminarily perforated inside the two recesses 6 and 7.

[0043] The holes 11 are advantageously coated by a polyurethane layer.

[0044] The above mentioned tie-rod elements 10 can be adjusted by a series of circular cross-section openings 12, including a respective plug elements, and formed on the top element 9.

[0045] Said tie-rod elements are moreover the single connection to the rigid part of the boat 1.

[0046] Thus, the above mentioned top element 9 is prevented from moving on a horizontal plane only due to the corresponding rigidity of the broadsides.

[0047] Such an approach would be particularly advantageous since it would allow to reduce the stresses on the above mentioned top element 9 which, accordingly, could have a construction optimized with respect to its weight.

[0048] The side connection of the semirigid floating elements 5, each connected by a tie-rod element 10 to a profile 4 and a profile 8 as respectively provided on the boat deck 3 and top element 9, is carried out substantially by a plug-in operation.

[0049] This latter is preferably performed by a strip 13 made of a material like that of the outer coating of each float element 5.

[0050] The above mentioned strip 13, in particular, is glued, at the rear end portion of the floating element 5 nearer to the bow, by causing the exceeding portion to project, thereby providing a resilient lip to be overlapped, during the assembling operation, onto the corresponding end portion of the floating element 5 nearer to the stern.

[0051] Thus, it should be advantageous to provide each floating element 5, at an end portion thereof, with a narrowed portion 14 adapted to properly receive the hull, in order to reduce the resistance to forward movement and provide a more aesthetic aspect.

[0052] Preferably, the above mentioned strip 13 or projecting lip is made, as the coating is assembled, by using an extension-mold of the floating element 5, to provide finishings and better mechanical characteristics with respect to the side tightness of said floating elements 5.

[0053] Under static conditions, the tie-rods 10 provide a position limit, so as to vertically press each semirigid floating element 5 during the navigation.

[0054] In a case of side stresses, the top element 9 and floating element 5 assembly will resiliently react, since with the overall side displacement a compression of the floating element 5 is associated.

[0055] The elasticity of the floating elements 5 and the specifically designed connection between the boat deck 3 and top element 9 provide a boat which is generally

resilient, having a performance to the navigation stresses and accidental impacts like that of conventional pneumatic floating elements.

[0056] The solution shown in the preceding figures, with separated cross-sections, allows to replace the tubular element in a very quick and easy manner, for example if it would be used in heavy conditions, such as in off-shore oil platforms.

[0057] According to the invention, a further embodiment provides to use a full tubular element, molded in a mold, as it is schematically shown in figure 12, and connected to the boat bottom in at least three patterns as respectively shown in figures 13-18.

[0058] More specifically, figures 13 and 14 show a tubular element 5 welded at two points or spots to the boat bottom 2 with a polyurethane joint.

[0059] Figures 15 and 16 show a tubular element 5 welded at a spot to the boat bottom 2 by a triple joint covering element 55 made of polyurethane or other high strength materials.

[0060] Figures 17 and 18 show a tubular element 5 structurally welded in a "A"-shape profile, generally indicated by the reference number 66, to the boat bottom 2.

[0061] From the above disclosure it should be apparent that the semirigid boat, specifically designed as a service watercraft for short and middle range navigation, for disembarking and embarking tourists and passengers from/onto cruise and pleasure vessels, provides a lot of important advantages.

[0062] In fact, the boat according to the invention represents an "unsinkable" boat, since it cannot be practically perforated.

[0063] A further advantage consists of the enhancement of the inner width, the projected width being the same, thereby increasing the passenger comfort and the payload volume, as it is clearly shown in figure 12.

[0064] Furthermore, the semirigid boat according to the present invention provides an increase of the free edge without substantially raising its center of mass, which allows to bring to a higher level the walking deck, thereby allowing the possibility of forming a static self-emptying well, as is clearly shown, in particular, in figure 12.

[0065] In practicing the invention, the used materials, as well as the contingent size and shapes can be any, depending on requirements and the status of the art.

Claims

1. A semirigid boat (1), designed for operating as a service watercraft, comprising a rigid boat bottom (2), a boat deck (3) and floating means mutually associated with one another, said floating means comprising one or more semirigid floating elements (5) made of a synthetic material, **characterized in that** each said floating element (5) comprises one or more pairs of trapezoidal recesses (6, 7) respectively a

bottom recess (6) and a top recess (7), to each bottom recess (6) corresponding a respective top recess (7), said recesses (6, 7) communicating through a hole (11).

2. A semirigid boat according to claim 1, **characterized in that** said floating elements (6, 7) are made by extruding or mold injecting profile elements of a foamed polyurethane material and by coating said profile elements with a mold-formed polyurethane material.
3. A semirigid boat according to claim 1, **characterized in that** said floating elements (6, 7) are coupled, at a bottom thereof, to said deck (3) and, at a top thereof, to a top element (9) having a perimetrical plan analogous to that of said deck (3).
4. A semirigid boat according to claim 3, **characterized in that** said floating elements are coupled to said deck (3) and to said top element (9) by plugging in said bottom recesses (6) into a corresponding plurality of profile elements (4) provided on said deck (3), and said top recesses (7) onto a corresponding plurality of profile elements (8) provided on said top element (9), each said profile element (4) of said boat bottom (2) being mechanically coupled with a corresponding profile element (8) of the top element (9) by a tie-rod (10) passing through said hole (11).
5. A semirigid boat according to claim 4, **characterized in that** said top element (9) comprises, near each said profile element (8), an opening closed by a plug.
6. A semirigid boat according to claim 1, **characterized in that** each said floating element (5) comprises an astern position, a strip (13) made of the same outer coating material as that of said floating element (5) and, and, toward a bow of said boat a corresponding narrowed portion (14) to provide a plug-in and side connection thereof.
7. A semirigid boat according to claim 6, **characterized in that** said strip (13) is directly made as said outer coating is formed by using an extended mold of each floating element.

Patentansprüche

1. Halbsteifes Boot (1), gestaltet zum Betrieb als ein Wartungswasserfahrzeug, umfassend einen steifen Bootboden (2), ein Bootdeck (3) und Auftriebsmittel, welche miteinander verbunden sind, wobei die Auftriebsmittel eines oder mehrere halbsteife Auftriebsselemente (5) umfassen, die aus einem synthetischen Material hergestellt sind, **dadurch gekennzeichnet, dass** jedes der Auftriebsselemente (5) ein

Paar oder mehrere Paare von trapezoiden Vertiefungen (6, 7), jeweils eine Bodenvertiefung (6) und eine Oberseitenvertiefung (7) umfasst, wobei zu jeder Bodenvertiefung (6) eine jeweilige Oberseitenvertiefung (7) gehört, wobei die Vertiefungen (6, 7) durch ein Loch (11) in Verbindung stehen.

2. Halbsteifes Boot gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Auftriebsselemente (6, 7) durch Extrudieren oder Spritzgießen von Profilelementen aus einem geschäumten Polyurethanmaterial und durch Beschichten der Profilelemente mit einem gussgeformten Polyurethanmaterial hergestellt sind.
3. Halbsteifes Boot gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Auftriebsselemente (6, 7) an einem Boden davon an das Deck (3) und an einer Oberseite davon an ein Oberseitenelement (9) gekuppelt sind, welches eine Umkreisebene aufweist, die analog zu jener des Decks (3) ist.
4. Halbsteifes Boot gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die Auftriebsselemente an das Deck (3) und an das Oberseitenelement (9) durch Einstecken der Bodenvertiefungen (6): in eine entsprechende Mehrzahl von Profilelementen (4), die auf dem Deck (3) vorgesehen sind, und der Oberseitenvertiefungen (7) auf eine entsprechende Mehrzahl von Profilelementen (8), die auf dem Oberseitenelement (9) vorgesehen sind, gekuppelt sind, wobei jedes Profilelement (4) des Bootbodens (2) mechanisch mit einem entsprechenden Profilelement (8) des Oberseitenelements (9) durch eine Zugstange (10) gekuppelt ist, welche durch das Loch (11) hindurch gestreckt ist.
5. Halbsteifes Boot gemäß Anspruch 4, **dadurch gekennzeichnet, dass** das Oberseitenelement (9) nahe jedem Profilelement (8) eine Öffnung umfasst, die durch einen Stopfen geschlossen ist.
6. Halbsteifes Boot gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jedes Auftriebsselement (5) an einer achternen Position einen Streifen (13), welcher aus dem selben äußeren Beschichtungsmaterial wie das des Auftriebsselements (5) hergestellt ist, und in Richtung eines Buges des Bootes einen entsprechenden verengten Abschnitt (14) umfasst, um ein Hineinstecken und seitliche Verbindung davon bereitzustellen.
7. Halbsteifes Boot gemäß Anspruch 6, **dadurch gekennzeichnet, dass** der Streifen (13) direkt, wenn die äußere Beschichtung ausgebildet wird, durch Verwenden einer ausgeweiteten Gussform an jedem Auftriebsselement hergestellt wird.

Revendications

1. Bateau semi-rigide (1), conçu pour être utilisé comme une embarcation de service, comprenant un fond de bateau rigide (2), un pont de bateau (3) et des moyens de flottaison, associés les uns aux autres, lesdits moyens de flottaison comprenant un ou plusieurs éléments de flottaison semi-rigides (5) constitués d'un matériau synthétique, **caractérisé en ce que** chacun desdits éléments de flottaison (5) comprend une ou plusieurs paires d'évidements trapézoïdaux (6, 7), respectivement un évidement inférieur (6) et un évidement supérieur (7), un évidement inférieur (6) correspondant à chaque évidement supérieur (7), lesdits évidements (6, 7) communiquant par l'intermédiaire d'un trou (11). 5 10 15
2. Bateau semi-rigide selon la revendication 1, **caractérisé en ce que** lesdits éléments de flottaison (6, 7) sont réalisés en extrudant ou en moulant par injection des éléments profilés constitués d'un matériau de type mousse de polyuréthane et en revêtant lesdits éléments profilés d'un matériau de type polyuréthane moulé. 20 25
3. Bateau semi-rigide selon la revendication 1, **caractérisé en ce que** lesdits éléments de flottaison (6, 7) sont couplés, au niveau de leur partie inférieure, audit pont (3) et, au niveau de leur partie supérieure, à un élément supérieur (9) ayant un plan périmétrique analogue à celui dudit pont (3). 30
4. Bateau semi-rigide selon la revendication 3, **caractérisé en ce que** lesdits éléments de flottaison sont couplés audit pont (3) et audit élément supérieur (9) en insérant lesdits évidements inférieurs (6) sur une pluralité correspondante d'éléments profilés (4) disposés sur ledit pont (3) et lesdits évidements supérieurs (7) sur une pluralité correspondante d'éléments profilés (8) disposés sur ledit élément supérieur (9), chacun desdits éléments profilés (4) dudit fond du bateau (2) étant couplé mécaniquement avec un élément profilé correspondant (8) de l'élément supérieur (9) à l'aide d'un tirant (10) traversant ledit trou (11). 35 40 45
5. Bateau semi-rigide selon la revendication 4, **caractérisé en ce que** ledit élément supérieur (9) comprend, à proximité de chacun desdits éléments profilés (8), une ouverture fermée par un bouchon. 50
6. Bateau semi-rigide selon la revendication 1, **caractérisé en ce que** chacun desdits éléments de flottaison (5) comprend, à l'arrière, une bande (13) constituée du même matériau de revêtement externe que celui dudit élément de flottaison (5) et, en direction de la proue dudit bateau, une portion rétrécie correspondante (14) qui permet l'insertion et la

fixation latérale de celle-ci.

7. Bateau semi-rigide selon la revendication 6, **caractérisé en ce que** ladite bande (13) est réalisée directement comme ledit revêtement externe à l'aide d'un moulage étendu de chaque élément de flottaison.

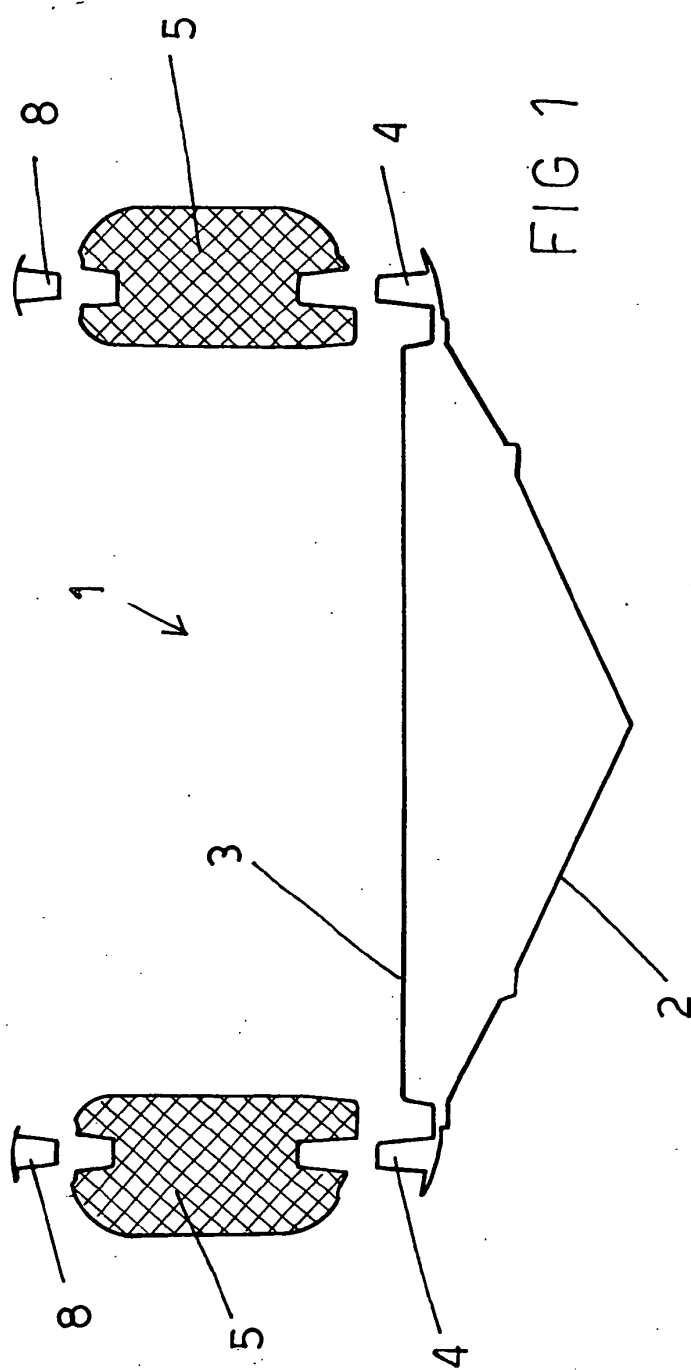


FIG 1

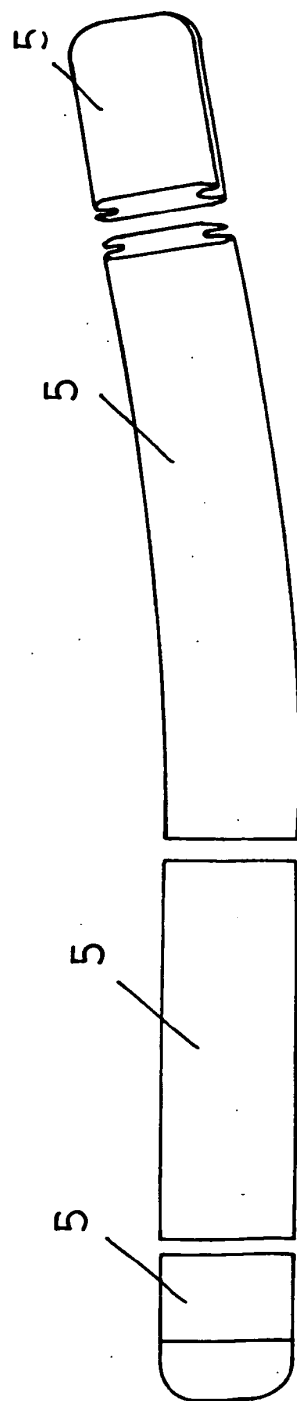
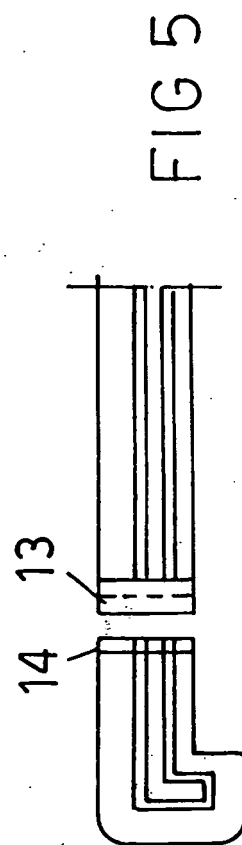
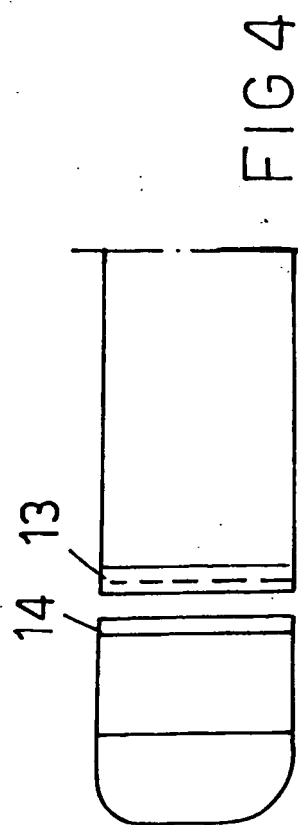
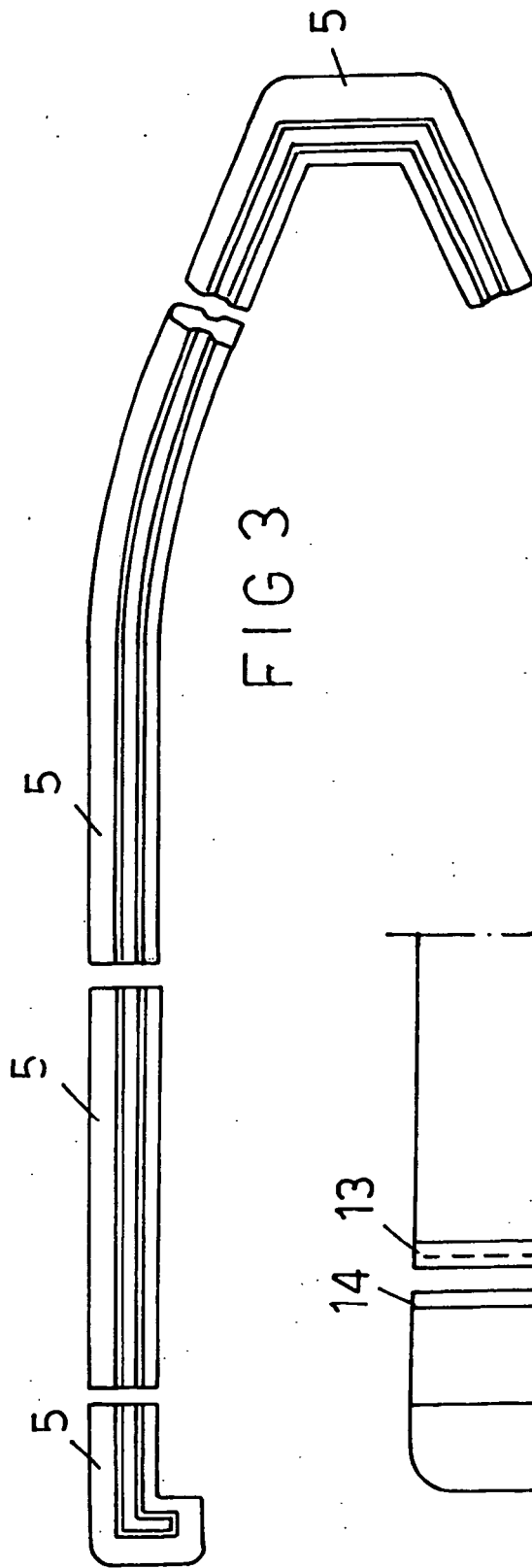
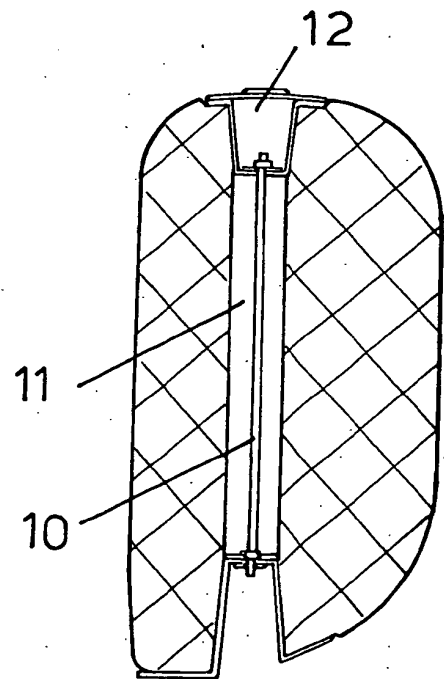
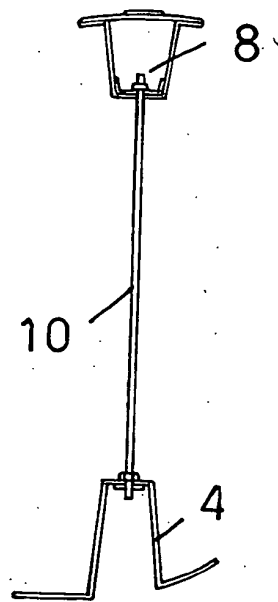
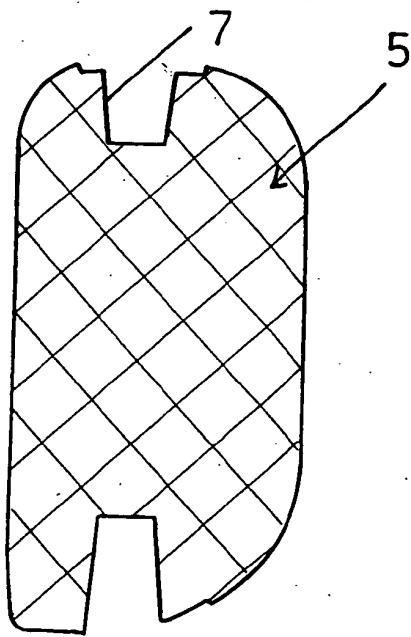
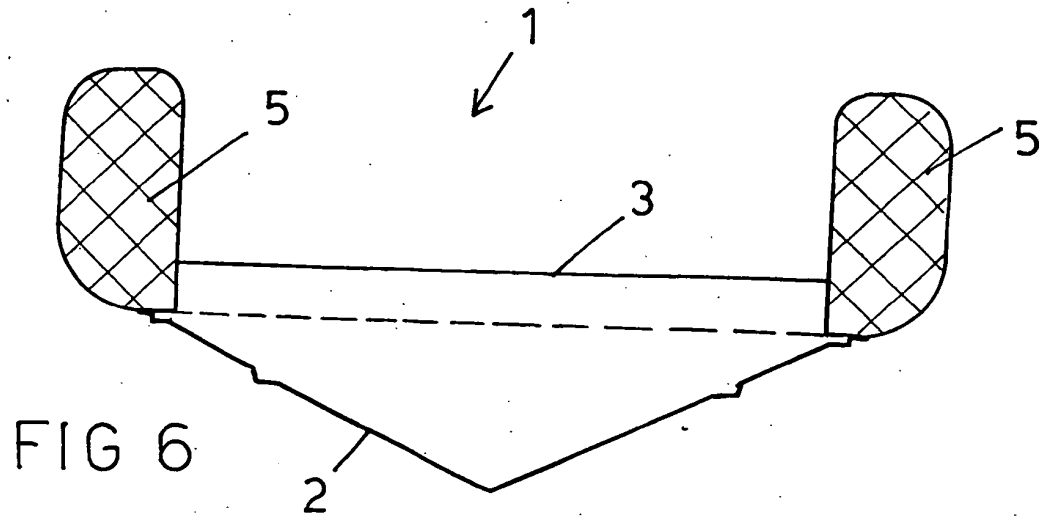


FIG 2





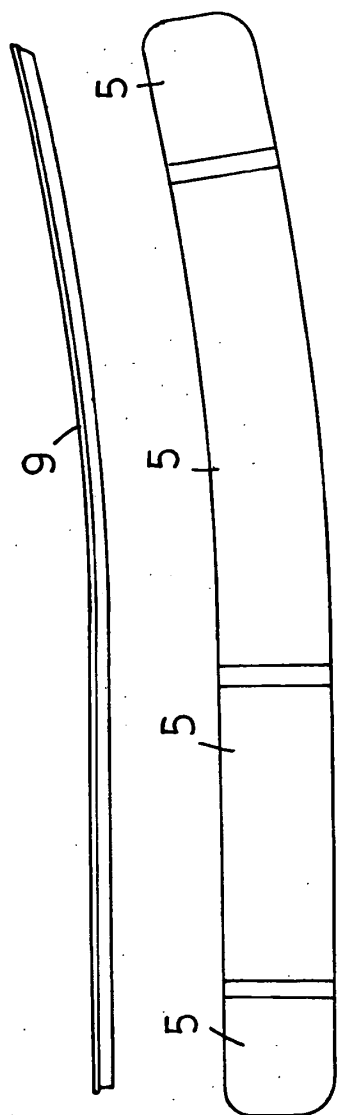


FIG 10

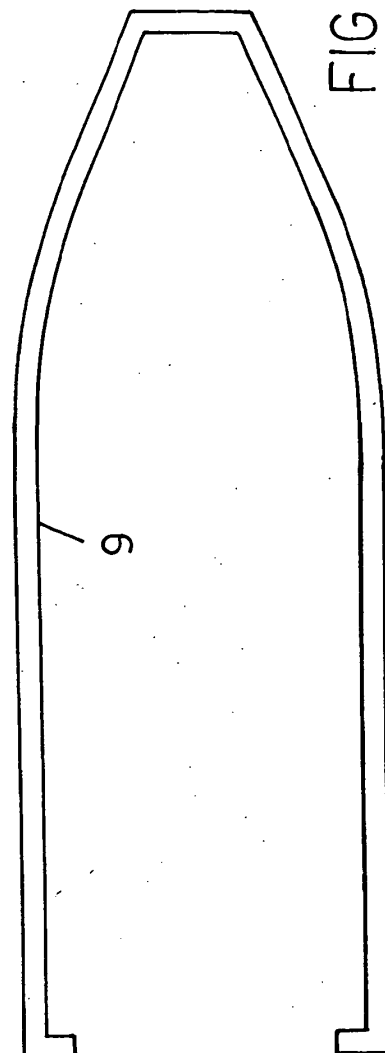
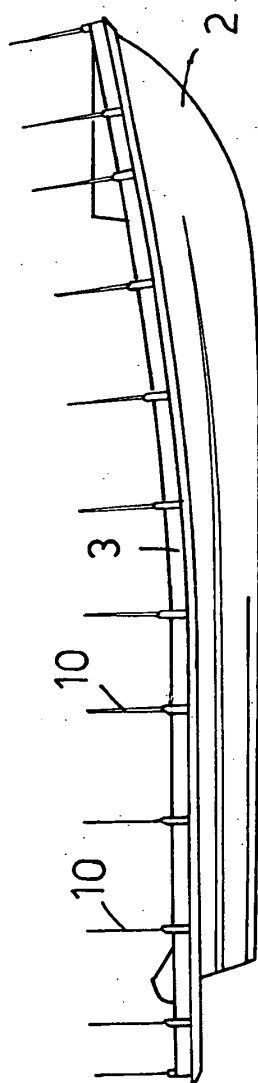


FIG 11

FIG 12

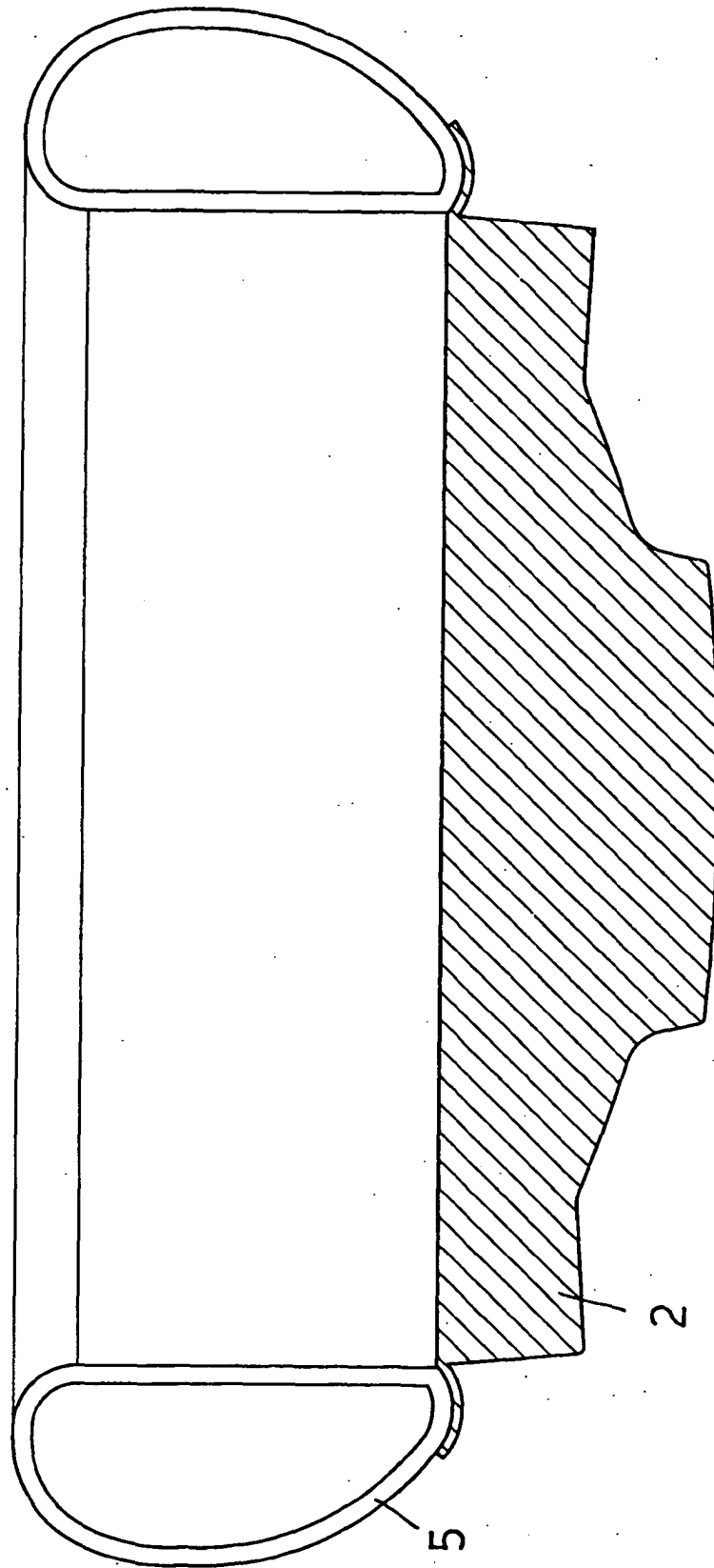


FIG 13

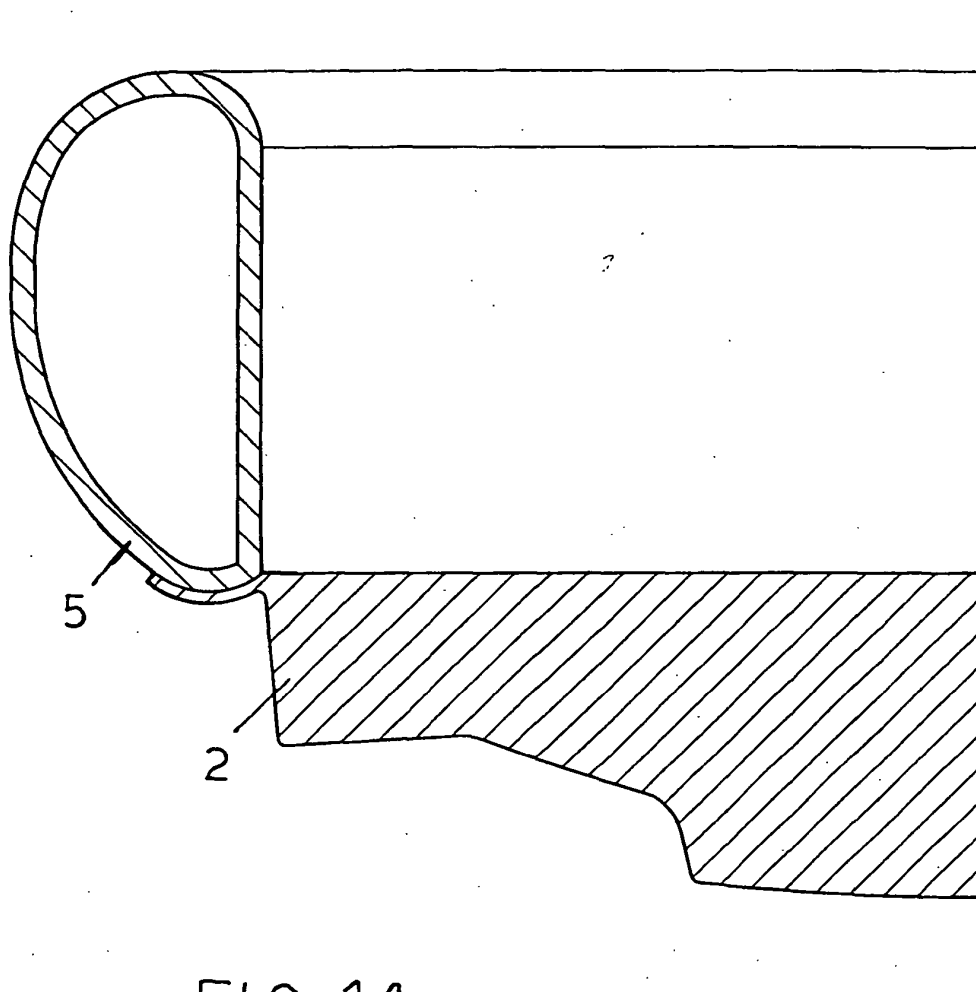
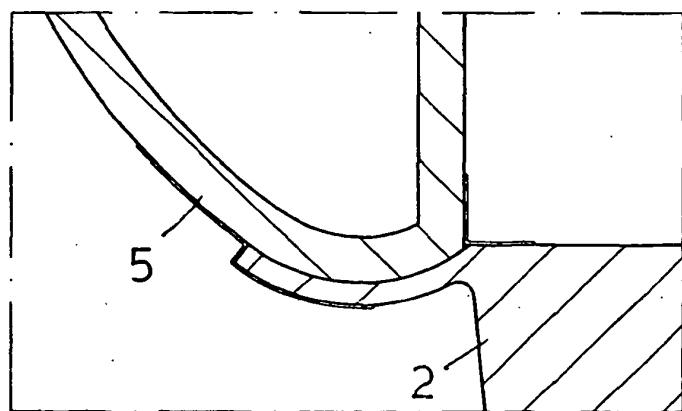


FIG 14



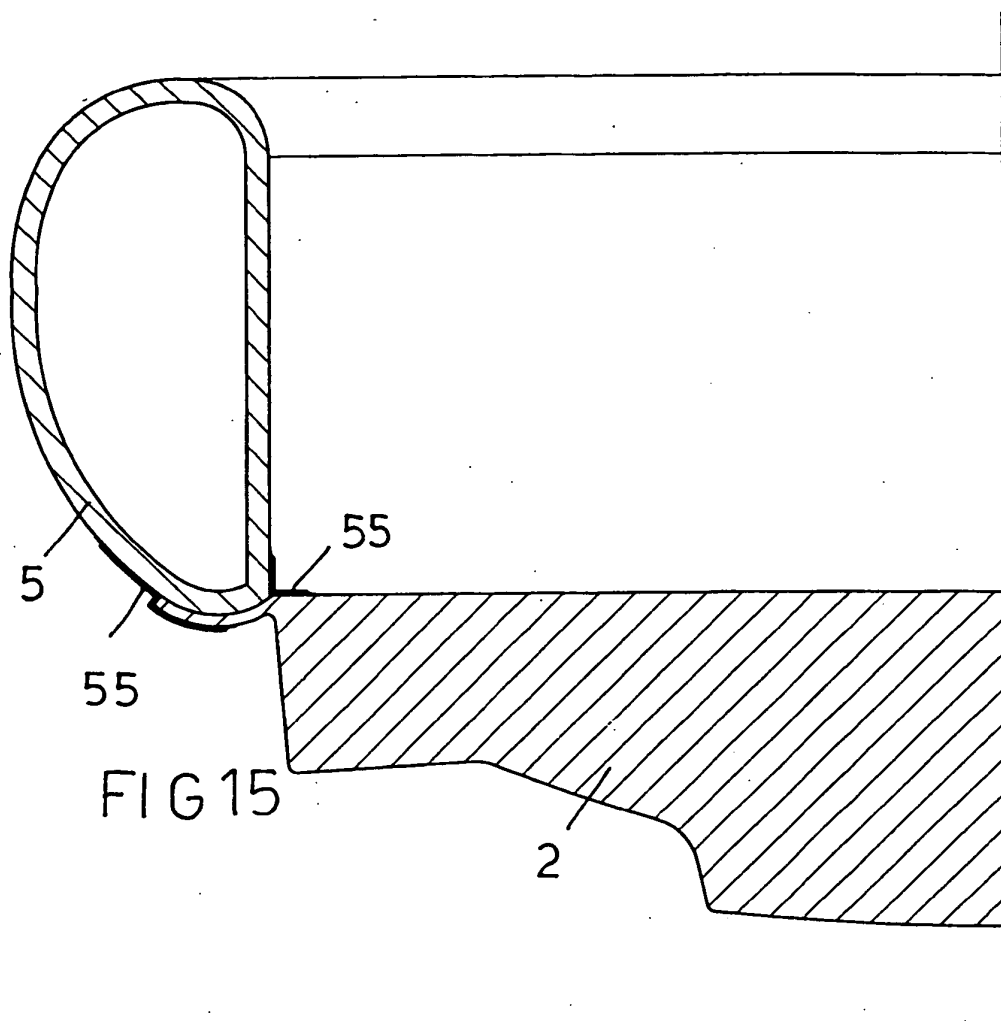
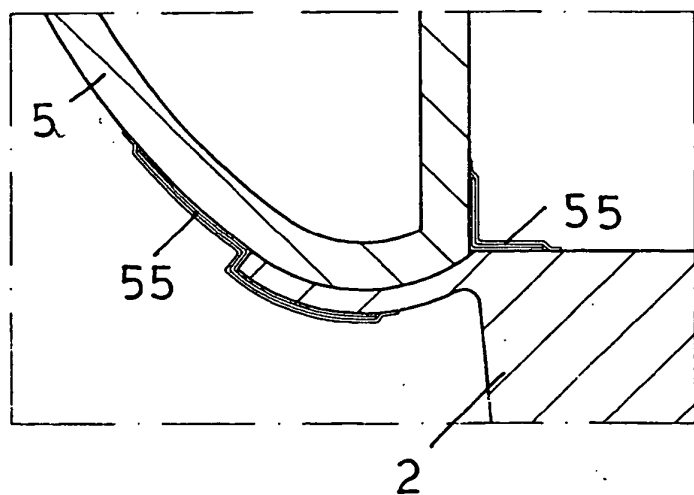


FIG 16



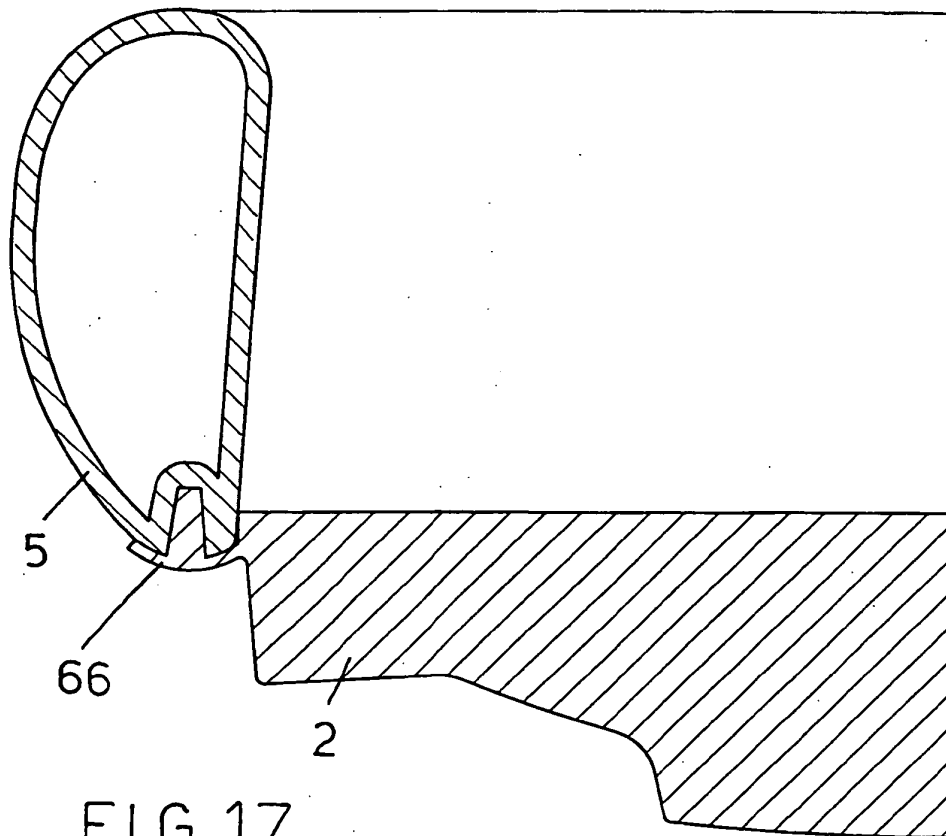


FIG 18

