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(54) **An inflatable bag**

(57) An inflatable bag (10) for providing a cushion or pillow by inflating said bag, which bag comprises two sheets (12,14) of two-layer foil material. The sheets are of substantially identical geometrical shape and define an outer periphery, a peripheral joint extending along the major part of the outer periphery of the sheets, except for a peripheral area which constitutes an inlet opening of the bag. The peripheral joint joins said sheets together in substantially overlapping relationship and defines an inner space (16) within the interior of the bag, and a closable and sealable closure (36) is provided at the opening for allowing an inflation medium to be introduced into the inner chamber through the closable and sealable closure from the environment.

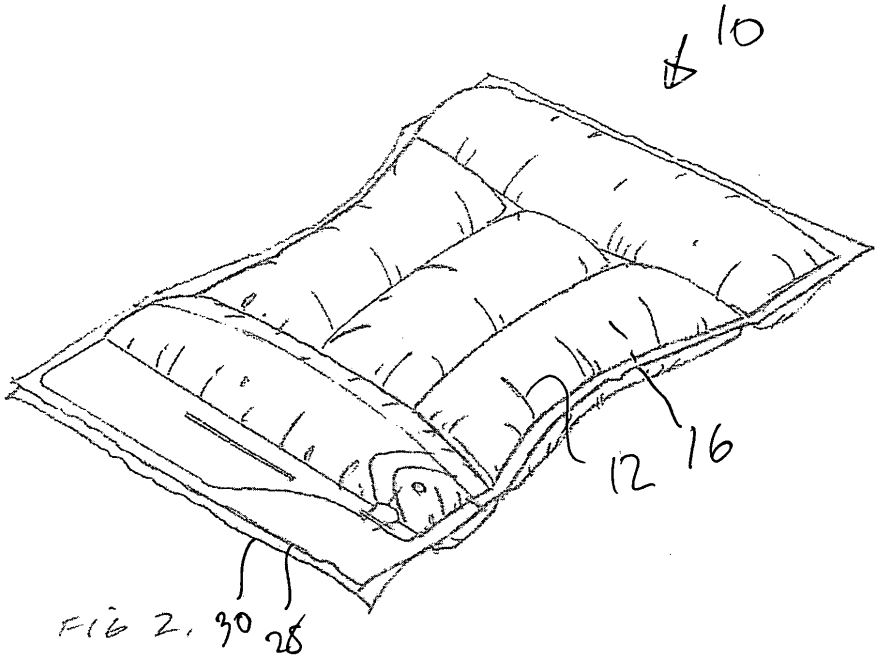


Fig 2.

EP 1 834 546 A1

Description

[0001] The present invention relates to an inflatable bag for providing a pillow or a cushion and further a closure of an inflatable bag.

[0002] Within the technical field of packaging, a particular technique relating to packaging fragile or costly products in air-inflatable and deflatable packages is known, which technique is described in, among others, EP 0 306 204, DE 4007128, FR 2747108, WO98/51585, US 4,155,453, US 4,465,188, US 4,874,093, US 4,882,558, US 4,918,904, US 4,949,530, US 5,263,587, US 5,272,856, US 5,427,830, US 5,588,532, US 5,692,833 and US 5,769,231. Reference is made to the above patent applications and patents and the above US patents are further hereby incorporated in the present specification by reference.

[0003] The commercially available inflatable bags including the bags described in the above-listed patent applications and patents, however, suffer from severe drawbags in relation to the complexity of the structure of the bags and in consequence necessitates the utilization of fairly complex and elaborated production techniques involving separate and distinct assembling processes and the combination of a number of individual components to be assembled into the inflatable bag.

[0004] From EP 1 311 491, an inflatable bag for protecting fragile products is known and further from the published European patent application, an inflatable protective cushion is also known. The technique described in European patent application, publication No. 1 311 491 constitutes the prior art on the basis of which the present inventors have developed the novel inflatable cushion or pillow and the closure of the inflatable bag.

[0005] On the basis of the technique described in published European patent application 1 311 491, a novel application of an inflatable bag has been developed, namely an inflatable bag for use as a cushion or pillow to be used in hospital applications, in transportation appliances or in public events such as sports events allowing a person participating in the sports event as a spectator to use the inflatable bag as a cushion pillow and obtain a more comfortable sitting position and also obtaining a high degree of thermal insulation from the supporting seat, which in numerous instances may e.g. be a concrete, a wooden or steel seat, which in certain periods of the year may be extremely cold and therefore incomfortable to use as a sitting support.

[0006] A particular feature of the present invention relates to a surprisingly high load-bearing capability of the bag according to the present invention, which a load-bearing capability which exceeds the capability which would be expected from the thighs, i.e. the thickness of the foil materials used.

[0007] A particular advantage of the present invention relates to the use of the provision of a self-sealing closure, which includes no protruding parts such as the inflatabel closure pockets which are used in the prior art self-closure bags including self-closure ice cube bags and the inflatable EP 1 311 491. The novel closure according to a particular aspect of the present invention, which provides a highly reliable self-sealing function without using exterior self-closure pockets extending beyond the constriction of the inlet of the bag prevents the inflatable bag, when used as a pillow or cushion from being unintentionally deflated by unintentionally pressing or otherwise manipulating the closure pockets of the prior art self closure bags.

[0008] A further advantage of the present invention as compared to the prior art inflatable bags relates to the improved reliability of the inflatable bag as compared to the prior art multiple component bags, as the simplyfied inflatable bag according to the first aspect of the present invention due to a reduced number of components, is contemplated to be exposed to a reduced failure rate as compared to the more complex multicomponent prior art inflatable bags.

[0009] The inflation medium may in most instances simply be pressurized air or alternatively be a gas or liquid, such as a low or high molecular weight gas e.g. a non-combustible and substantially inert gas, such as nitrogen, carbondioxid, helium or any other low cost gas or alternatively a liquid, such as plain water.

[0010] The above object, the above advantage and the features together with numerous other objects, advantages and features according to a first aspect of the present invention obtained by an inflatable bag for providing a cushion or pillow by inflating said bag, comprising:

two sheets of two-layer foil material, said sheets being of substantially identical geometrical shape and defining an outer periphery,
a peripheral joint extending along the major part of said outer periphery of said sheets, except for a peripheral area constituting an inlet opening of said bag, said peripheral joint joining said sheets together in substantially overlapping relationship and defining an inner space within the interior of said bag, and
a closable and sealable closure being provided at said opening for allowing an inflation medium to be introduced into said inner chamber through said closable and sealable closure from the environment.

[0011] According to the basic teachings of the present invention, the inflatable bag according to the first aspect of the present invention is produced from two-layer foils rather than a single layer foil, which surprisingly provides an increased strength as compared to a bag produced from a single layer foil having the same overall thickness as the two-layer foil used in accordance with the teachings of the present invention.

[0012] Below, measuring results support this highly surprising an unforeseable feature.

[0013] The materials used for the two-layer foil material sheets have, dependent on the actual application and

also the inflation medium used, to comply with certain requirements as to mechanical strength, flexibility, elasticity and also permeability to the air and further the inflation medium. Preferably, materials are made from an integral continuous web or webs of a plastics material substantially impermeable to liquid and/or gas.

[0014] Although the inflatable bag according to the first aspect of the present invention is preferably made from two sheets of two-layer foil material, which sheets are identical and further from sheets of two-layer foil material including two layers of identical materials, different polymer materials may be used for the two layers of one or both sheets characteristic of the inflatable bag according to the first aspect of the present invention. Furthermore, the sheets may each be composed of two, three or four layer sheets constituting individual or alternatively composite or laminated polymer sheets produced from identical or different polymer materials and even including different foil materials, such as aluminum foils etc.

[0015] In the present context, the term bag is to be construed a generic term representing any element of a type allowing inflation of the bag for producing a cushion or pillow, however, the term is by no means to be construed limiting the geometrical configuration of the element in question, as the element may have any configuration differing from the conventional understanding of the term or expression bag

[0016] The closable and sealable closure may be established in any appropriate manner by utilizing specific and dedicated means for allowing the closure to be sealed or closed, e.g. by means of a weld, an adhesive, a separate closure clamp or similar element after the inflation medium has been introduced into the inner space of the bag. According to two advantageously embodiments of the bag according to the first aspect of the present invention, the closable and sealable closure is established in accordance with a self-closure technique well known within the art of freezing mould bags, e.g described in EP 0 264 407, EP 0 574 496, EP 0 616 948 and EP 0 825 122 to which patent applications and patents reference is made or alternatively according to a closure technique including the technique described in US RE 31890 to which reference is made and which US patent is hereby further incorporated in the present specification by reference. According to the first embodiment, the closable and sealable closure is constituted by prolongations of the four sheets, which prolongations define turned-in parts extending into the inner space.

[0017] According to a further refinement of the self-closure valve technique utilized in the above described first advantageous embodiment of the bag according to the first aspect of the present invention, which refinement constitutes a particular and distinct, second aspect of the present invention, the turned-in parts of the prolongations or extensions are joined together by additional joints for permanently maintaining the turned-in parts of the prolongations or extensions in a face-to-face and non-folded state. The additional joints may be constituted by a single joint connecting the one or both turned-in foil parts to one of the foil layers of which the turned-in parts constitute prolongations or extensions. The above-mentioned joint may be constituted by a point or circular weld or similar connection or joint and furthermore, the turned-in parts may preferably be joined together by additional joints joining the turned-in parts together without joining the turned-in parts to the adjacent foil layers which additional joints connecting the turned-in parts together may be configurated as linear joints, bent, curved or any other appropriately configurated joints.

[0018] According to the above-described alternative embodiment having a knot-closure, the two sheets define prolongations or extensions, which are provided with perforations or cuttings defining flaps of the prolongations or extensions for allowing the flaps to be tied together for providing a closure knot for closing off the closable and sealable closure.

[0019] For establishing a permanent and reliable sealing of the closable and sealable closure through the use of a closure knot, an additional material such as an adhesive may appropriately be used in connection with a closure knot as the adhesive is applied between the two prolongations or extensions prior to the tying of the knot thereby glueing or adhering the material of the closure knot together.

[0020] The technique utilized for establishing the joints may, dependent on the material used for the foil material, be welded joints or joints established by means of a glue or an adhesive material or a combination of welded and glued joints.

[0021] The material used for the foil material may, as stated above, be any appropriate material exhibiting adequate properties as to permeability and strength and are further preferably plastics material such as polyethylen, preferably LDPE or HDPE or any other glueable or weldable foil material, preferably plastics or polymer foil material or aluminium foil material or combinations of such foil materials.

[0022] The inflatable bag according to the first aspect of the present invention may, as stated above, have any appropriate configurations, such as a square, a circular, an elliptical, a polygonal or any other geometrical shape, however, according to the presently preferred embodiment of the inflatable bag according to the first aspect of the present invention the sheets of two-layer foil material have rectangular configurations.

[0023] The above object, the above advantage and the features together with numerous other objects, advantages and features according to a second aspect of the present invention obtained by a closure of an inflatable or self-closure bag, comprising:

two foil layers of substantial identical shape and constituting at least part of a pair of walls of said bag, said bag defining an inner space delimited by said pair of walls being joint together by a peripheral joint except for a peripheral area constituting an inlet

opening including said closure,
said foil layers having at said inlet opening foil prolongations defining turned-in parts extending from said inlet opening into said inner space of said bag and defining from said inlet opening a longitudinal extension of said turned-in flaps into said inner space,
a first set of joints extending from said peripheral joint at said inlet transversely to said longitudinal direction, said first set of joints joining said foil layers and said prolongations together at a position along said longitudinal extension, said first set of joints defining a pair of opposite joint ends delimiting the width of said inlet opening,
a second set of joints joining said prolongations defining said turned-in parts together without joining said prolongations or extensions to any of said two foil layers and extending from said joint ends towards said inner space of said bag, said second set of joints defining an inlet channel extending from said inlet opening into said inner space of said bag,
a third set of joints joining each of said prolongations to a respective foil layer at said inlet opening, and
at least one further dot-shaped joint joining said turned-in parts to one of said foil layers for maintaining said turned-in parts in parallel and stretched relationship when said closure pockets are filled with an inflation medium and pressurized as said bag be inflated.

[0024] The closure according to the second aspect of the present invention constitutes a refinement of the closure described in the above-mentioned European patent application EP 1 311 491, as the closure according to the second aspect of the present invention is integrated in the bag and includes no outwardly protruding parts, in particular no exterior closure pockets. Surprisingly, it has been realised by the inventors of the invention described in the above-mentioned European patent application and of the present invention that the second set of joints provided an inlet channel into the inner space of the bag in combination with the at least one further dot shaped joint provides a sufficient self-closure effect provided the first set of joints joining each of the prolongations to a respective foil layer at the inlet opening are provided.

[0025] From the technical field of freezing mold bags or ice cube bags, self-closure valves are known, such as the self-closure valves illustrated and described in EP 0 129 072, and in the above-mentioned patents EP 0 246 407 and EP 0 574 496 to which reference is made. None of the prior art self-closure valves of ice-cube bags, however, describe the provision of the inlet channel defined by a set of joints joining the turned-in valve flaps or foil layers together and a separate joint linking the turned-in parts to one of the two outer walls of the bag exclusively.

[0026] According to alternative embodiments of the closure according to the second aspect of the present invention, the closure may constitute a separate or constitute an integral part of the bag as the two foil layers may constitute two separate foil layers of the bag or alternatively constitute integral parts of the pair of walls of the bag.

[0027] The second set of joints which, as stated above, are characteristic of the closure according to the second aspect of the present invention may, according to alternaitve embodiments, be constituted by linear joints, curved joints, combined linear, bend and/or curved joints, and may define a diverging, converging or tubular inlet channel or a combined diverging, converging and/or straight inlet channel.

[0028] The dot-shaped joint which is, as stated above, characteristic of the closure according to the second aspect of the present invention may, in accordance with alternative embodiments be configurated as a circular, an eliptical, a square, a rectangular, a polygonal or any other configurated joint or a combination of any of the above joints or being composed of a plurality of individual microjoints.

[0029] The closure may, as discussed above, be constituted by a separate component or constitute an integral part of the bag, similarly, the prolongations or extensions of the two-layer foils defining the turned-in parts may, according to alternative embodiments, be constituted by separate single-layer, two-layer or multi-layer foils as the prolongations or extensions may be constituted by integral parts of the two-layer foils or be constituted by separate foil layer parts joined to the two-layer foils.

[0030] The closure according to the second aspect of the present invention may be implemented as a separate component of the bag or as an integral part of the bag, which bag may further have any of the features of the bag according to the first aspect of the present invention.

[0031] The bag according to the first aspect of the present invention and also the closure according to the second aspect of the present invention may dependent of the application and in this context particularly the lifetime of the bag defined as the period of time through which the bag being inflated with an inflation medium, such as pressurized gas, is maintained in its pressurized state for fulfilling its intentional purpose as a packaging and protection bag, be made from polymer foil materials selected from two-layer polymer materials, such as PP, PVC, PV or PE materials being LD, PE, HDPE or MDPE of a thickness varying from 10μm - 100pm or two-layer coextruded or laminated polymer foils exhibiting improved gas impermeability properties. The combined, the coextruded or laminated polymer layers may, apart from PE, include PP, PVC and PU materials. Alternatively, the laminated polymer layers may include three or more layers exhibiting identical outer layers, such as PE layers sandwiching an intermediate layer or intermediate layers of another material or other materials.

[0032] The present invention is now to be further described with reference to the drawings, in which:

Fig. 1 is a schematic and perspective view of a first

side or the upper side of a first and presently preferred embodiment of an inflatable bag according to a first aspect of the present invention, which bag is to be inflated for producing a cushion or pillow and is shown in un-inflated state.

Fig. 2 is a schematic and perspective view similar to the view of fig. 1 illustrating the first and presently preferred embodiment of the inflatable bag in inflated state,

Fig. 3 is a schematic and perspective view similar to the views of figs. 1 and 2 illustrating the inflated bag also shown in fig. 2 from the opposite side or the lower side,

Fig. 4 is a schematic and perspective view of a detail of the inflated bag shown in Fig 3,

Fig. 5 is a vertical sectional view of the inflated bag shown in Figs. 2, 3 and 4,

Fig. 5a is a detail of the vertical sectional view of the inflated bag shown in Fig. 5 illustrating a particular feature of the foil material of the bag, which foil material is constituted by a two-layer foil,

Fig. 6 is a graph illustrating a surprising property of the two-layer foil material of the bag according to the first aspect of the present invention as compared to a single layer foil bag and a foil layer bag having a foil layer of the same thickness as the two-layer foil,

Fig. 7 is a schematic and perspective view of a detail of certain tools for the on-line production of inner weld seams within the inflatable bag,

Fig. 8 is a schematic and perspective view illustrating a presently preferred method of producing the inflatable bag according to the first aspect of the present invention, and

Figs. 9a, 9b, 9c and 9d are schematic views illustrating alternative geometrical designs or configurations of an inflatable bag according to the first aspect of the present invention.

[0033] The present invention relates to a novel technique of providing a cushion or pillow by means of an inflatable bag. In figs. 1, 2 and 3, a first and presently preferred embodiment of an inflatable bag according to the present invention is shown designated the reference numeral 10 in its entirety.

[0034] Generally, the bag 10 includes an inner chamber defined between two outer two-layer foils, which chamber is inflatable through the application of an inflation medium, such as atmospheric air, pressurized air or a non-toxic liquid, such as water into the inner chamber. Preferably, the inflation medium is constituted by a gas, such as atmospheric air or alternatively a non-aggressive or substantially inert or truly inert gas such as nitrogen or alternatively helium.

[0035] In Fig. 1, the bag 10 according to the first aspect of the present invention is shown in an un-inflated state and the inflated bag is shown in Figs. 2 and 3.

[0036] The bag 10 is basically made from a two-layer foil material web, such as a two-layer HDPE, MDPE or LDPE foil, each layer having a thickness of 10 -100μm, such as 15, 25μ or 50μm. The two-layer foil material web is folded into a four-layer structure defining two opposite two-layer walls 12 and 14. Between the walls 12 and 14, an inner chamber 16 is defined.

[0037] The inner layers of the two-layer walls 12 and 14 are provided with extensions or prolongations or extensions 24, 26 shown in greater details in Fig. 8 defining turned-in parts extending into the interior of the chamber 16, as the prolongations or extensions 24 and 26 are folded from the inner layers of the two-layer walls 12 and 14, respectively through folds 28 and 30, respectively. The lower ends of the turned-in prolongations or extensions 24 and 26 are designated the reference numerals 25 and 27, respectively. Alternatively, both layers of the two-layer walls 12 and 14 may in alternative or modified embodiments be used for the prolongations or extensions 24 and 26, respectively.

[0038] As is evident from Figs. 1-3, the two-layer walls 12 and 14 are joined together through a plurality of joints, which may be constituted by glue joints or advantageously weld seams. Two major weld seams 18 and 20 extend parallel with two outer edges 19 and 21, respectively, of the bag 10. Opposite to the folds 28 and 30, a further joint 22 extends parallel with an outer edge 23 of the bag, which joint 22 is joined to the two edgewise positioned joints 18 and 20. Whereas the joint 22 joins the two-layer walls 12 and 14 together, the edgewise positioned joints 18 and 20 also join the three ply two-layer structure generated by the turned-in prolongations 24 and 26 in combination with the outer walls 12 and 14 together along joined sections designated the markings, i.e. along joined sections 18' and 20', respectively. The joined section 18' continues into a transversal minor joint 32 and similary, the joined section 20' continues into a transversal major joint 34. Between the transversal minor joint 32 and the transversal major joint 34, an inlet opening into the interior of the bag 10 is provided. The inlet is designated the reference numeral 36.

[0039] The transversal major joint 34 continues into a further joint 40 extending to a position juxtaposed the folds 28 and 30 and defines a three ply two-layer area, in which a cut 38 is provided, which cut serves as a handle 4 for carrying the bag prior to or after inflation of the bag. The interior of the bag defined between the two two-layer walls 12 and 14 is divided into five compartments defined by two parallel joints 42 and 44 extending parallel with the joints 18 and 20 and further two joints 46 and 48, which are each composed of three straight line segments

and are located adjacent to the joints 22 and 34, respectively. The joints 46 and 48 serve, as is illustrated in Fig. 2, to provide two transversal cushion parts, which may adavantageously support the person sitting on the cushion or pillow along the femurs, whereas the joints 42 and 44 serve to provide three inflated parts providing sitting comfort to the person sitting on the cushion or pillow, as the three cushion parts may adapt to the contour of the posterior of the person sitting on the cushion or pillow.

[0040] The inlet 36 of the bag 10 constitutes a self-closure inlet which, however, as distinct from prior art self-closure inlets, such as prior art self-closure inlets known from the prior art self-closure ice cube bags, such as the ice cube bags described in EP 0 264 407, EP 0 574 496, EP 0 616 948, EP 0 825 122 or US 5,527,012, which US patent is hereby incorporated in the present specification by reference, or alternatively the self-closing inflatable bag known from applicant's published European patent application No. EP 1 311 441 corresponding to published international patent application WO 02/04317 in that no outer closure pockets are provided as the self-closure function is established in the inlet channel itself extending into the interior of the bag 10.

[0041] For providing the self-closure effect in the inlet channel, the inlet channel is provided by two parallel curved joints 48 and 50, which join the prolongations or extensions 24 and 26 together without joining the prolongations 24 and 26 to the opposite two-layer walls 12 and 14. In addition, a dot-weld 52 is provided, which dot-weld 52 joins the two prolongations or extensions 24 and 26 to one of the two opposite two-layer walls 12 and 14, in the embodiment 3 to the wall 12 facing upwardly in Fig. 1. Furthermore, for establishing the self-closure function within the inlet channel delimited by the two curved joints 48 and 50, a pair of transversal joints are further provided, one of which is shown in Fig. 1 and designated the reference numeral 54, which transversal joints, such as the joint 54 join the turned-in prolongation to the adjacent outer two-layer wall, i.e. joining the prolongation or extension 24 to the two-layer wall 12 and similarly joining the prolongation or extension 26 to the two-layer wall 14. In the embodiment shown in Figs. 1-3, the prolongations or extensions 24 and 26 are, as discussed above, constituted by the one layer of each of the two-layer walls 12 and 14, however, in an alternative embodiment of the bag shown in Figs. 1-3, each of the prolongations or extensions 24 and 26 may simply be constituted by separate foil layers or alternatively turned-in parts of the two two-layer walls 12 and 14, respectively.

[0042] As discussed above, the dot weld 52 joins the turned-in parts or prolongations or extensions 24 and 26 to the two-layer wall 12 and serves to provide a self-closure function by causing the air present within the interior of the bag to establish a closure pressure against the prolongations or extensions 24 and 26 and further preventing air from leaking through the passage defined between prolongations or extensions 24 and 26 and defined between the two curved joints 48 and 50.

[0043] In Fig. 4, a detail of the inlet part of the bag is shown in greater details disclosing the sealing off of the inlet by pressing the prolongations 24 and 26 against the inner foil of the two-layer wall 12 through the presence of the dot-weld 52. In addition, Fig. 4 discloses a particular feature of the bag 10, as the turned-in parts of the one-layer, i.e. the inner layer of the two-layer walls 12 and 14 provide two free flaps outside the inlet delimited by the further parallel transversal joints, one of which is shown in Fig. 4 and designated the reference numeral 54, which flaps allow the user to obtain easy access to the inlet 36 by bending the flaps apart and then blowing air through the inlet 36 or alternatively introducing a tube or hose or similar element into the inlet 36 for allowing e.g. pressurised air to be introduced into the inner chamber of the bag 10.

[0044] In Figs. 5 and 5a, a particular feature of the two-layer structure of the bag 10 is illustrated in greater details as in Fig. 5 and also in Fig. 5a, the two individual layers of each of the two-layer walls 12 and 14 are shown highly exagerated for the purpose of illustrating the above feature. In Fig. 5a, a detail of a part of the wall 12 is shown in greater details comprising an outer layer 12a and an inner layer 12b. Due to the bending and stretching of the two layers 12a and 12b and the difference in the length of the two layers when stretched, the outer layer 12a is stretched more than the inner layer 12b as is illustrated in highly exagerated diagrammatic illustration in Fig. 5a by the presence of segments of the two layers 12a and 12b, which segments are illustrating the original unstretched corresponding segments of the two layers. It is contemplated that the difference in stretching and consequently elasticity and strength of the two-layers 12a and 12b provide an improved overall mechanical strength of the two-layer structure as compared to a single layer wall having twice the thickness of one of the two layers 12a and 12b.

[0045] This surprising effect is supported by the measuring results illustrated in Fig. 6, which figure includes a diagram representing measuring results obtained from three different bag embodiments. A total of five samples of each of the three embodiments were tested. All embodiments had the same geometrical configuration, namely the configuration of the bag illustrated in Figs. 1-3.

[0046] The first embodiment was made from a single layer 25 μm PE foil and the measuring results for the five samples are presented by the graph A. Similarly, the second embodiment was made from a single layer 50 μm PE foil and the measuring results are presented by the graph B. Finally, the third sample implemented in accordance with the teachings of the present invention, two-layer PE foil, each layer having the thickness of 25 μm corresponding to a thickness of the first embodiment of graph A, and the measuring results obtained by employing the third embodiment made from the two-layer 2x25 μm PE foil are illustrated by the graph C.

[0047] Each of the five samples of each of the three different embodiments were exposed to a load until the

sample in question exploded or otherwise was destroyed.

[0048] The drafts A, B and C of Figs. 6 demonstrate that a foil having twice the thickness of a thinner foil does not generate twice the strength, whereas a two-layer structure provides a strength at least twice the strength of the corresponding single layer structure.

[0049] In figs. 7 and 8, details of a method of producing the bag 10 is illustrated. In fig. 5, the reference numerals 1, 2, 3, 4, 5, 6 and 7 represent 7 distinct stages of producing the bag.

[0050] In the stage 1, a two-ply web is provided, comprising two two-layer foils 12 and 14, connected through a fold 13.

[0051] In stage 2, turned-in prolongations or extensions 24 and 26 are provided by folding turned-in parts of the two-layer foils 12 and 14 towards the fold 12, and the outer layers of the two-layer foils are cut off at the folded or turned-in parts as indicated by a line 15.

[0052] In stage 3, the parallel weld seams 48 and 60 are provided by means of a welding tool designated the reference numeral 100 in its entirety, which tool is to be described in greater details with reference to fig. 7.

[0053] In stage 4, the transversal weld seam 54 is provided by means of a further welding tool designated 100' and similar to the welding tool 100 used in stage 3 by joining the prolongation or extension 24 to the two-layer wall 12 and a similar weld seam is provided between the prolongation or extension 26 and the two-layer wall 14.

[0054] In stage 5, a separation element 102 is provided for separating the layer 14 from the turned-in protrusion 26 for allowing the dot-shaped weld seam 23 to be established by the application of heat to the three-ply structure including the wall 12 and the two prolongations or extensions 24 and 26.

[0055] In stage 6, the weld seams of the bag 10 are established by means of sandwiching welding tools 110 and 112 which welding tools are preferably operated in a reciprocating operational mode allowing the individual bags 10 to be welded one at a time, e.g. in accordance with a technique described in the applicants published international patent application WO99/32840.

[0056] Finally, in stage 7, the finalised bag 10 is cut from the continuous previously processed bag by means of a vertically operated and reciprocating knife 114 which web has been shifted through the stages 1, 2, 3, 4, 5 and 6.

[0057] In fig. 7, the separation and welding tools used in the stages 3, 4 and 5 are illustrated in greater details. The tool 100 for the welding of the inlet channel delimiting weld seams 48 and 50 is constituted by a substantially L-shaped insulating element 102, which is constituted by an L-shaped insulating element 104 and provided with two printed circuit board terminals 105 and 107, which are connected to an external power source through two electric wires 106 and 108, respectively. The L-shaped insulating element 104 is provided with an enlarged end-part 116 from which two resistor wires having the configuration of the weld seams 48 and 50 are depending from the lower side. The wires are designated the reference numerals 118 and 120 and are interconnected through a short-circuiting printed circuit board connection 121.

[0058] As will be understood, the printed circuit board terminals 105 and 107 together with the short-circuiting printed circuit board connection 121 provide a series connection of the two resistor wires118 and 120 which are powered by the external electric power source connected to the wires 106 and 108. The plate 116 is pressed into contact with the turned-in prolongations or extensions 24 and 26 by the application of pressure from above by means of a pressure plate 122, which is journaled on two linear guides 126 and 128 and which is caused to reciprocate vertically by means of a piston 130. At the lower side of the plate 122, a soft surface padding is provided.

[0059] Opposite the vertically reciprocating plate 122, a separation plate 132 is provided, which separation plate is positioned between the turned-in prolongation 24 and the outer wall 12. It is to be realised that the plate 116 separates the turned-in prolongations or extensions 26 from the inner wall 14 preventing the inner wall 14 from being welded to the turned-in prolongation 26 as the separation plate 132 similarly prevents the turned-in prolongations or extensions 24 from being welded to the outer wall 12.

[0060] Below the separation plate 132, a plate 134 of the frame of the apparatus is positioned.

[0061] From an edge part of the plate 116 opposite to the I-shaped insulating element 104, a teflon band 103 extends, which teflon band is also shown in fig. 4 serving the purpose of separating the wall 14 from the turned-in prolongation 26. The separation element 102 further serves the purpose of separating the wall 14 from the turned-in prolongation 26 for preventing the foil materials of the wall 14 from being welded to the turned-in prlongations 26 and 24 and further the wall 12, as heat is applied from below to the outer surface of the wall 12 by means of a heating tool 124 for providing the dot-shaped weld seam 52 causing the turned-in prolongation 24 and 26 to be welded to the wall 12.

[0062] In Figs. 9a, 9b, 9c and 9d, four alternative embodiments 10', 10", 10"' and 10^{IV} of the inflatable bag according to the first aspect of the present invention are shown, respectively. Generally, the alternative embodiment 10'-10^{IV} of Figs. 9a-9d illustrate the multiplicity of possible alternative configurations of the inflatable bag according to the present invention and since the illustrations are self-explanatory, no detailed discussion of the embodiments are presented here.

Example 1

[0063] A prototype version of the first and presently preferred embodiment of the bag 10 according to the first aspect of the present invention was made from two-layer LDPE foils each layer having a thickness of 25 μm LDPE. The outer walls 12 and 14 measured 570 mm x 370 mm. The turned-in prolongations or extensions 24 and 26 de-

fined a length from the upper edges 28 and 30 of 120 mm.

[0064] Although the present invention has been ascribed above the refernce to specific embodiments of the bag and also specific embodiments of the closure, it is of course to be contemplated that numerous modifications be deduced by a person having ordinary skill in the art and modifications readily perceivable by a person having ordinary skill in the art is consequently to be construed part of the present invention as defined in the appending claims.

Claims

1. An inflatable bag for providing a cushion or pillow by inflating said bag, comprising:

   two sheets of two-layer foil material, said sheets being of substantially identical geometrical shape and defining an outer periphery,
   a peripheral joint extending along the major part of said outer periphery of said sheets, except for a peripheral area constituting an inlet opening of said bag, said peripheral joint joining said sheets together in substantially overlapping relationship and defining an inner space within the interior of said bag, and
   a closable and sealable closure being provided at said opening for allowing an inflation medium to be introduced into said inner chamber through said closable and sealable closure from the environment.

2. The inflatable bag according to claim 1, said two sheets of two-layer foil material being identical and said two-layer foil material including two layers of identical or different polymer materials.

3. The inflatable bag according to any of the claims 1 or 2, said two sheets each being composed of two, three or four foil layer sheets constituting individual or alternatively composite or laminated polymer sheets.

4. The inflatable bag according to any of the claims 1-3, said two-layer foil material being substantially impermeable to liquid and/or gas.

5. The inflatable bag according to any of the claims 1-4, said closable and sealable closure being constituted by a self-closing check valve.

6. The inflatable bag according to claim 5, said self-closing check valve being provided by turned-in prolongations or extensions of one or both layers of foil material of said two sheets.

7. The inflatable bag according to any of the bags 1-5, said one or both layers of material of each of said two sheets defining prolongations provided with perforations or cuttings defining flaps of said prolongations for allowing said flaps to be tied together for providing a closure knot for closing off said closable and sealable closure.

8. The inflatable bag according to any of claims 1-7, said inner chamber being divided into sub-compartments by additional separation joints.

9. The inflatable bag according to any of the claims1-9, said joints being welded joints or joints being established by means of a glue or an adhesive material or a combination thereof.

10. The inflatable bag according to any of the claims 1-9, said two-layer foil material of said two sheets being polyethylene, preferably LDPE or HDPE, or any other glueable or weldable foil material, preferably plastics or polymer foil material or aluminium foil material or combinations of such foil material.

11. The inflatable bag according to claims 5 or 6, said self-closing check valve having any of the features of the closure according to any of the claims 12-17.

12. A closure of an inflatable or self-closure bag, comprising:

    two foil layers of substantial identical shape and constituting at least part of a pair of walls of said bag, said bag defining an inner space delimited by said pair of walls being joint together by a peripheral joint except for a peripheral area constituting an inlet opening including said closure, said foil layers having at said inlet opening foil prolongations defining turned-in parts extending from said inlet opening into said inner space of said bag and defining from said inlet opening a longitudinal extension of said turned-in flaps into said inner space,
    a first set of joints extending from said peripheral joint at said inlet transversely to said longitudinal direction, said first set of joints joining said foil layers and said prolongations together at a position along said longitudinal extension, said first set of joints defining a pair of opposite joint ends delimiting the width of said inlet opening,
    a second set of joints joining said prolongations defining said turned-in parts together without joining said prolongations or extensions to any of said two foil layers and extending from said joint ends towards said inner space of said bag, said second set of joints defining an inlet channel extending from said inlet opening into said inner space of said bag,
    a third set of joints joining each of said prolon-

gations to a respective foil layer at said inlet opening, and

at least one further dot-shaped joint joining said turned-in parts to one of said foil layers for maintaining said turned-in parts in parallel and stretched relationship when said closure pockets are filled with an inflation medium and pressurized as said bag be inflated.

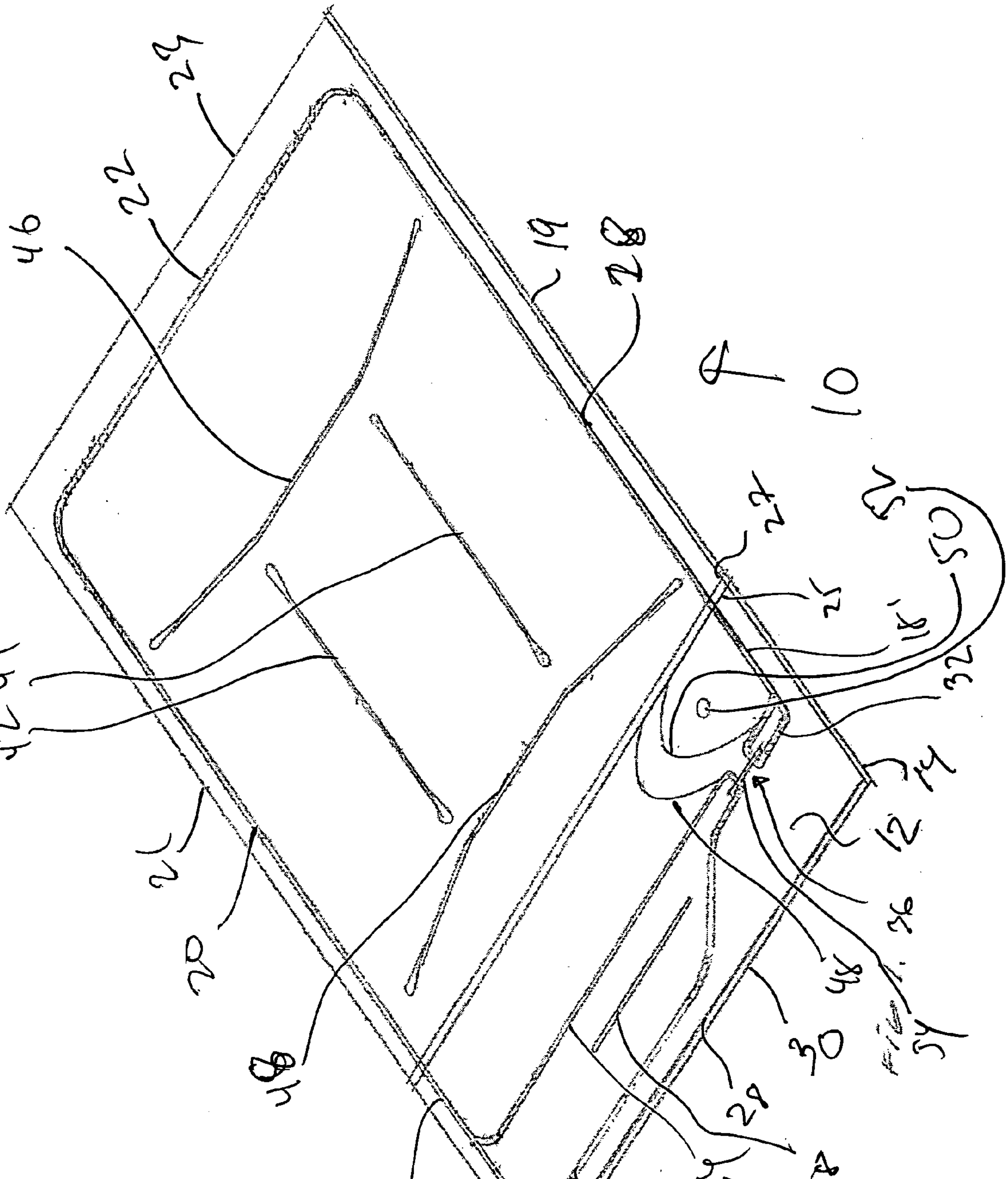
13. The closure according to claim 12, said two foil layers constituting two separate foil layers of said bag or alternatively constituting integral parts of said pair of walls of said bag.

14. The closure according to any of the claims 12 or 13, said second set of joints being constituted by linear joints, curved joints, combined linear, bend and/or curved joints, and defining a diverging, converging or tubular inlet channel or a combined diverging, converging and/or straight inlet channel.

15. The closure according to any other claims 12-14, said dot-shaped joint being configurated as a circular, an eliptical, a square, a rectangular, a polygonal or any other configurated joint or a combination of any of the above joints or being composed of a plurality of individual microjoints.

16. The closure according to any of the claims 12-15, said prolongations being constituted by integral parts of said two foil layers or being constituted by separate foil layer parts joined to said two foil layers.

17. The closure according to any of the claims 12-11, said closure constituting a closure of an inflatable bag having any of the features of the inflatable bag according to any of the claims 1-11.



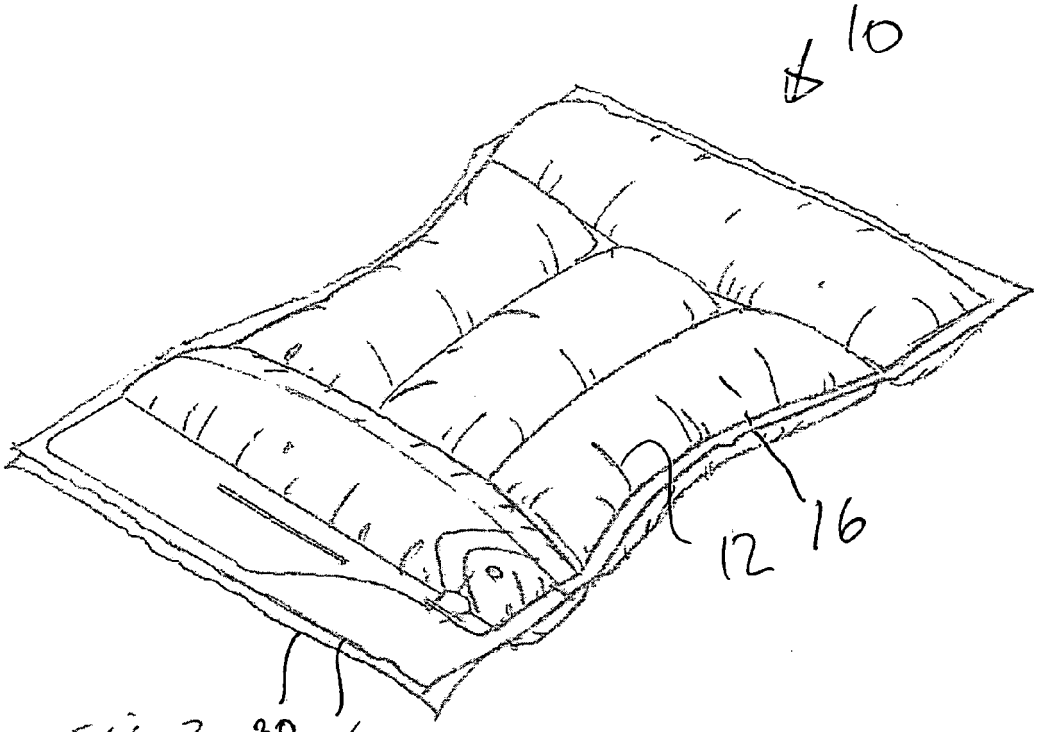


FIG 2.

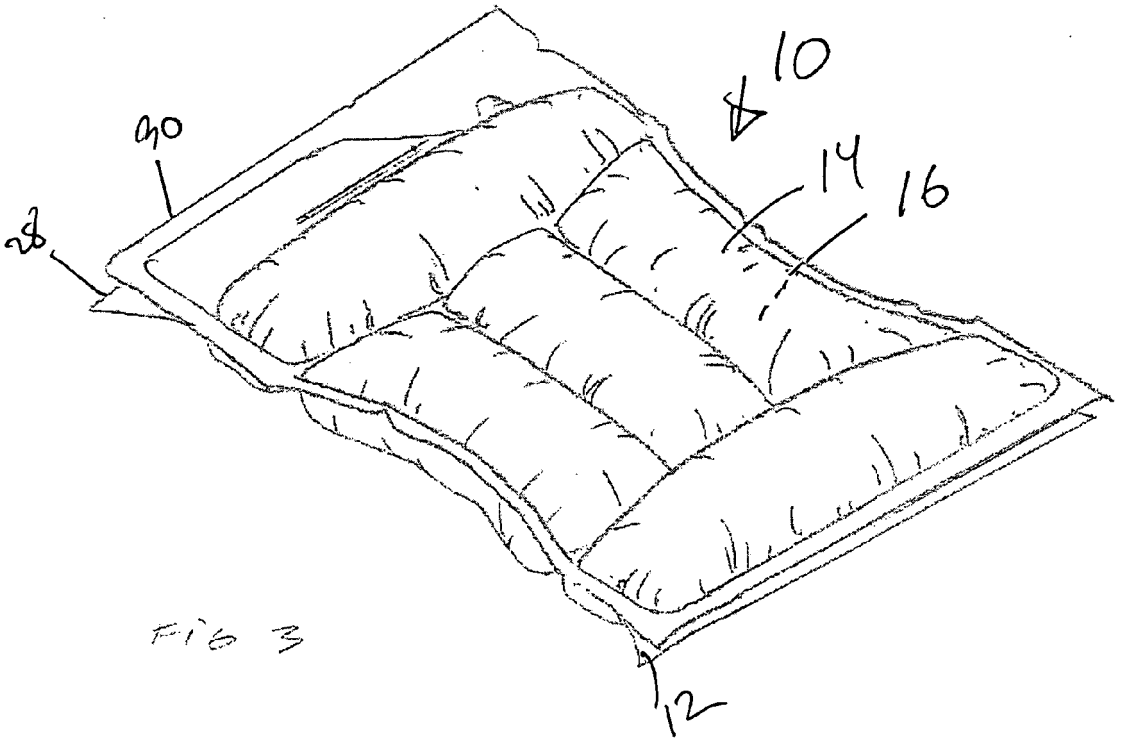
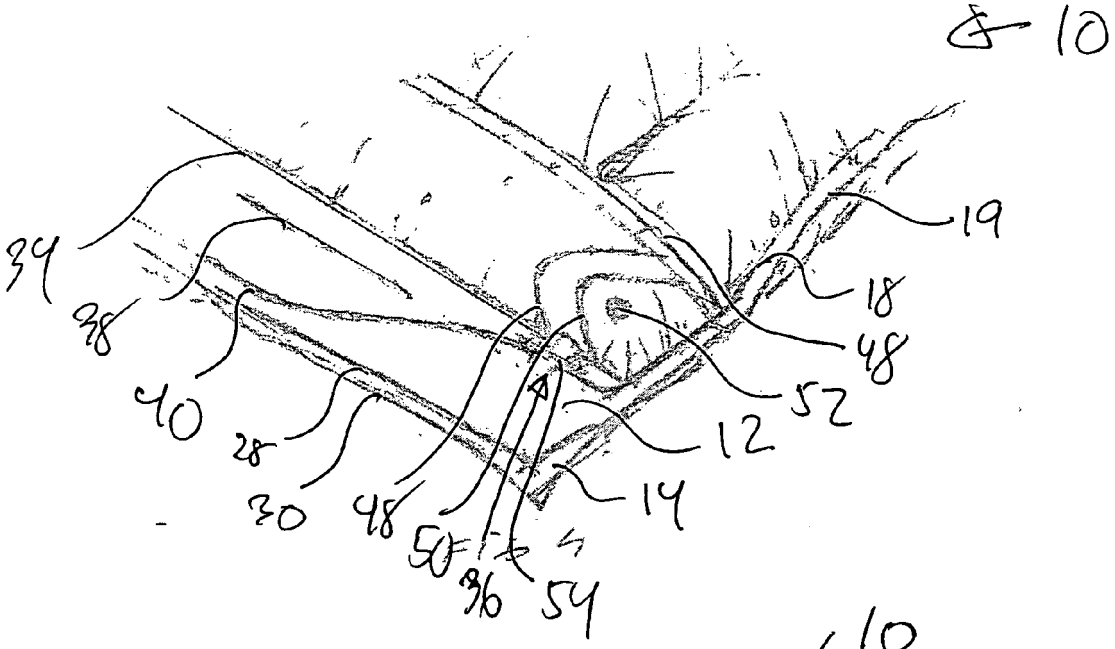


FIG 3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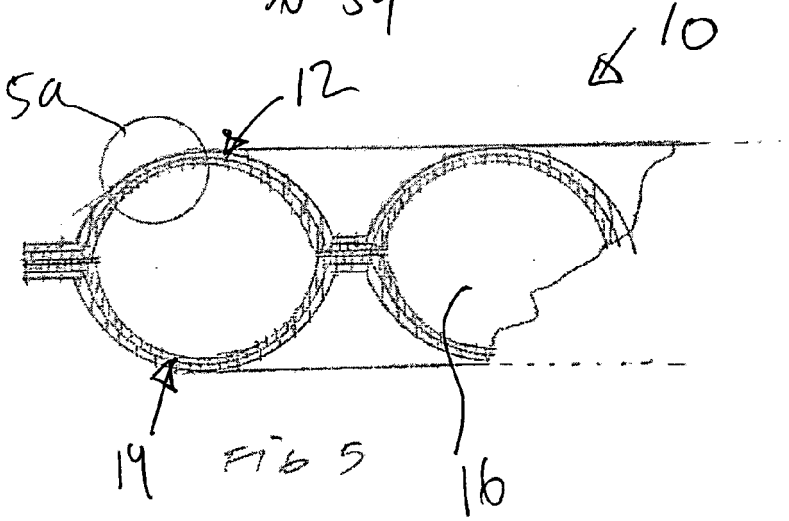
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5a
12
14
16

Fig 5

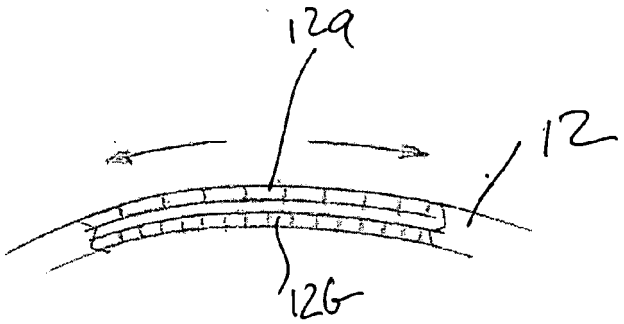
12a
12
12b

Fig 5a

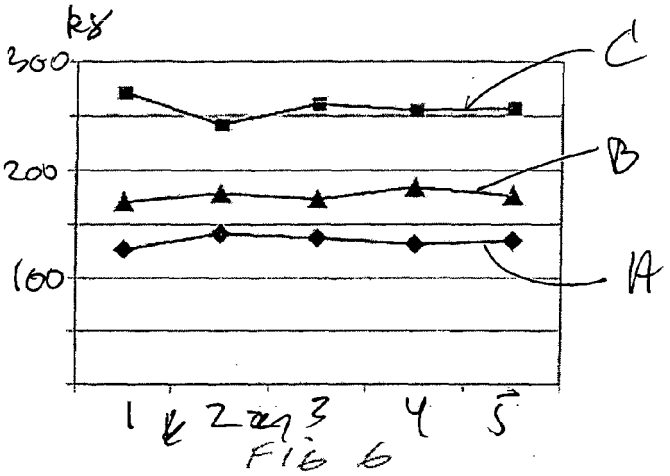
kg
300
200
100
C
B
A
1
2
3
4
5

FIG 6

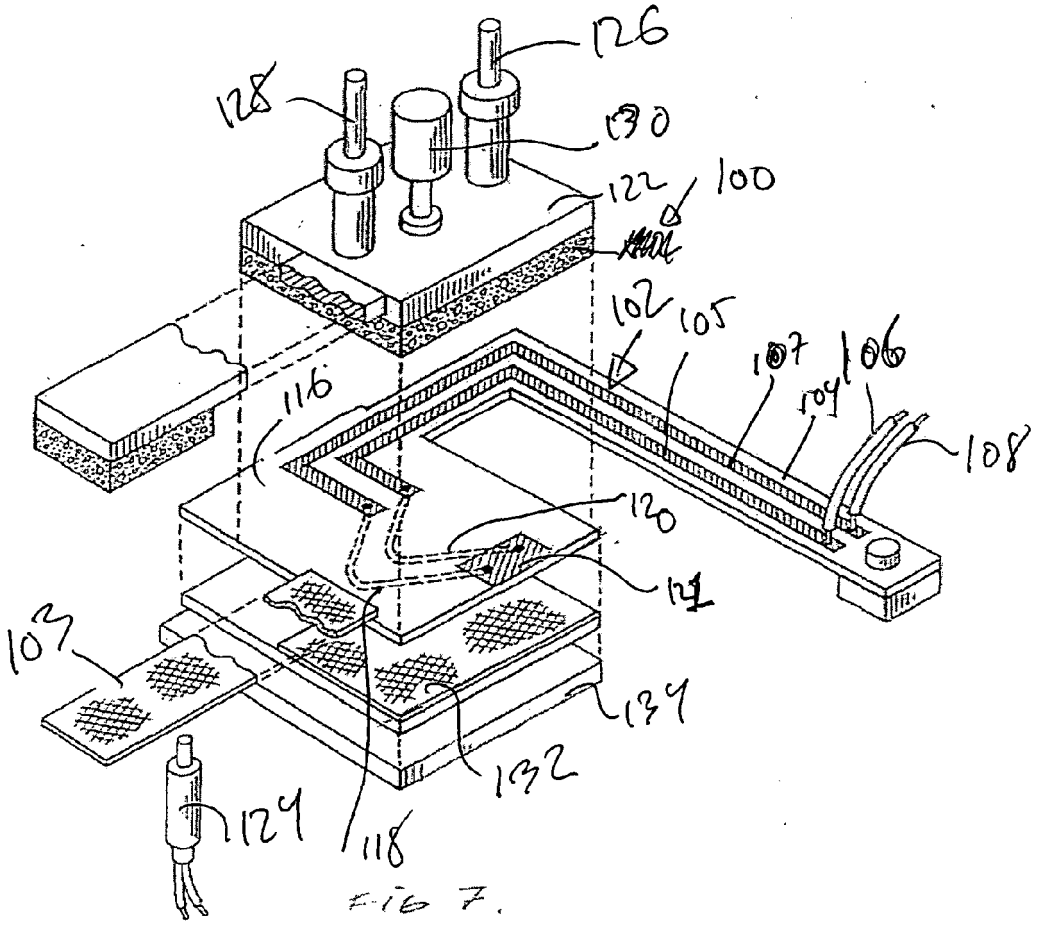
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FIG 7.

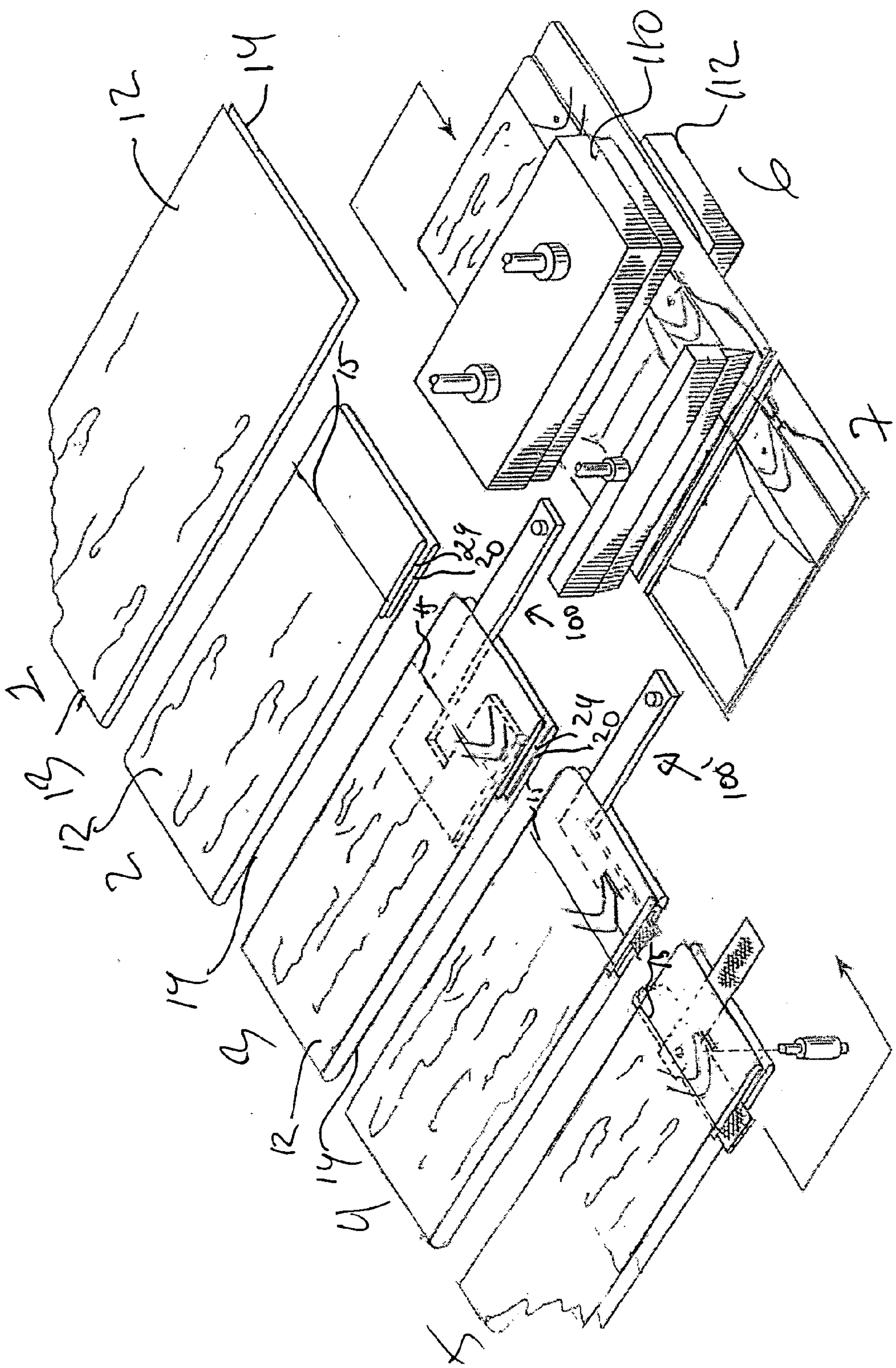

FIG 6.

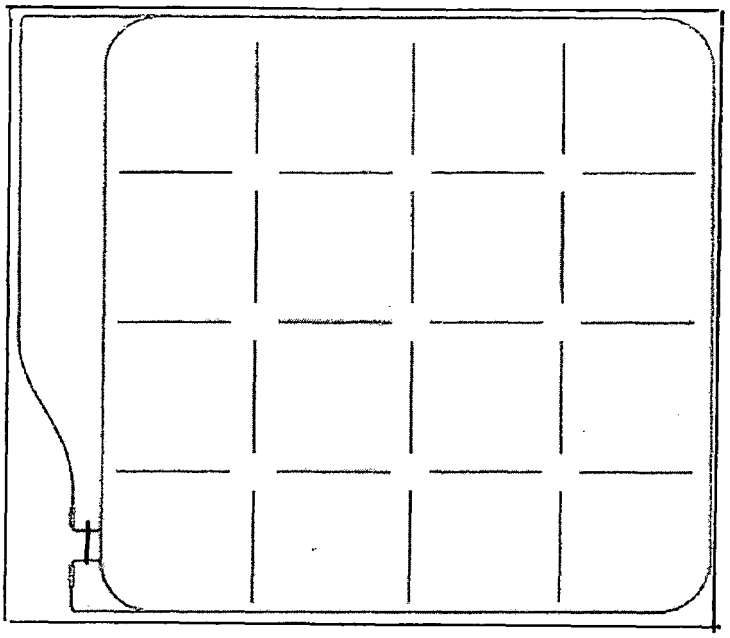

FIG 9a

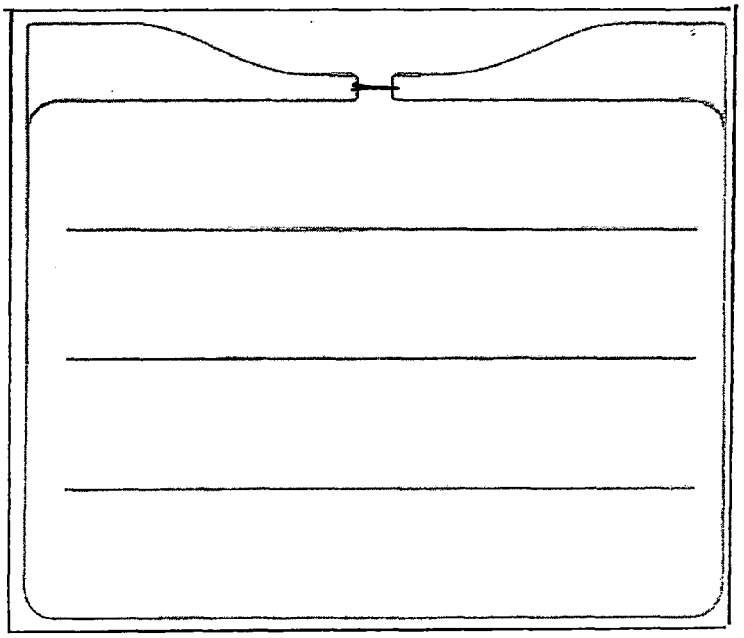

FIG 9b

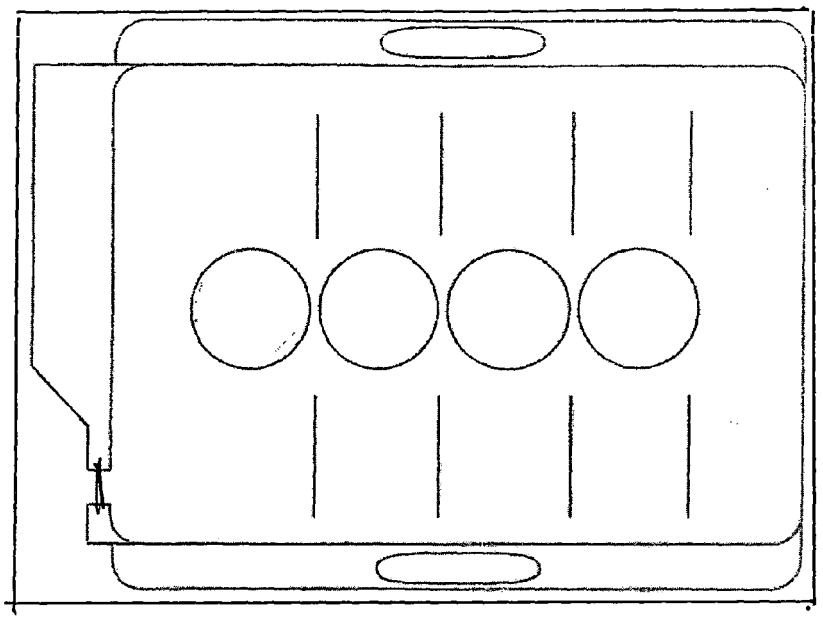

Fig 9c

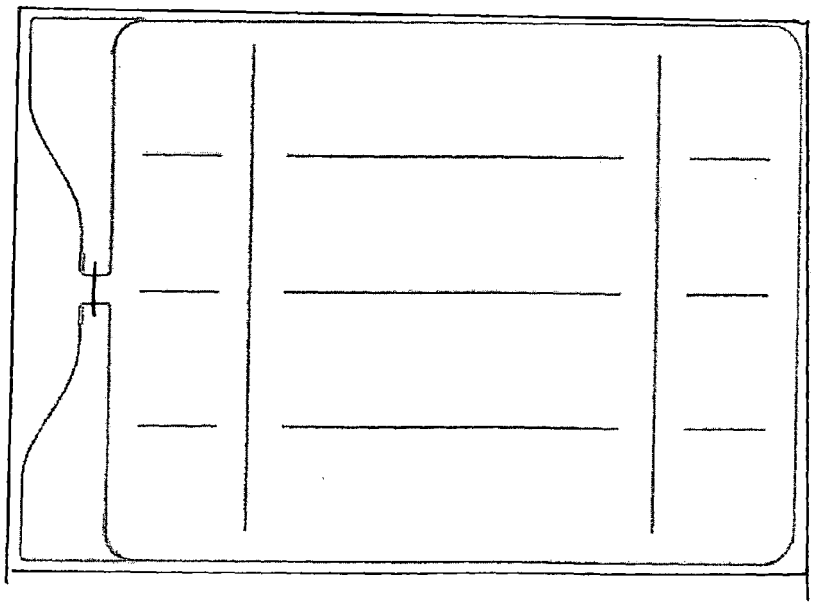

Fig 9d

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 38 8011

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2004/064892 A1 (LEDVINA DAVID M [US] ET AL) 8 April 2004 (2004-04-08) * abstract * * page 2, paragraph 25 - paragraph 26 * * page 3, paragraph 36 - paragraph 40 * * figures 1-9 *	1,4,5,7, 9	INV. A47C4/54
X	US 3 568 227 A (DUNHAM PHILIP N) 9 March 1971 (1971-03-09) * column 2, line 58 - column 3, line 17 * * figures 1-9 *	1	
A	US 5 096 529 A (BAKER ROBERT A [US]) 17 March 1992 (1992-03-17) * abstract; figures *	1-17	
X	EP 1 170 225 A (UNIGREEN INTERNAT A S [DK]) 9 January 2002 (2002-01-09) * abstract * * claims 1-25; figures 1-12 *	1-17	

TECHNICAL FIELDS SEARCHED (IPC)

A47C
A47G
B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 July 2007	MacCormick, Duncan

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EPO FORM 1503 03.82 (P04C01)

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13-07-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004064892 A1	08-04-2004	NONE	
US 3568227 A	09-03-1971	NONE	
US 5096529 A	17-03-1992	NONE	
EP 1170225 A	09-01-2002	AU 7047601 A	21-01-2002
		CA 2415231 A1	17-01-2002
		WO 0204317 A1	17-01-2002
		US 2003139271 A1	24-07-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- EP 0306204 A **[0002]**
- DE 4007128 **[0002]**
- FR 2747108 **[0002]**
- WO 9851585 A **[0002]**
- US 4155453 A **[0002]**
- US 4465188 A **[0002]**
- US 4874093 A **[0002]**
- US 4882558 A **[0002]**
- US 4918904 A **[0002]**
- US 4949530 A **[0002]**
- US 5263587 A **[0002]**
- US 5272856 A **[0002]**
- US 5427830 A **[0002]**
- US 5588532 A **[0002]**
- US 5692833 A **[0002]**
- US 5769231 A **[0002]**
- EP 1311491 A **[0004] [0004] [0005] [0007] [0024]**
- EP 0264407 A **[0016] [0040]**
- EP 0574496 A **[0016] [0025] [0040]**
- EP 0616948 A **[0016] [0040]**
- EP 0825122 A **[0016] [0040]**
- US RE31890 E **[0016]**
- EP 0129072 A **[0025]**
- EP 0246407 A **[0025]**
- US 5527012 A **[0040]**
- EP 1311441 A **[0040]**
- WO 0204317 A **[0040]**
- WO 9932840 A **[0055]**