(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 329 732 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.06.2011 Bulletin 2011/23

(21) Application number: **10193528.6**

(22) Date of filing: **02.12.2010**

(51) Int Cl.:
A41D 27/26 *(2006.01)* ***A43B 5/04*** *(2006.01)*
A43B 13/20 *(2006.01)* ***A43B 17/03*** *(2006.01)*
B32B 5/26 *(2006.01)* ***A42B 3/04*** *(2006.01)*
A42B 3/12 *(2006.01)* *A41D 13/05* *(2006.01)*
A41D 19/00 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **04.12.2009 IT VR20090212**

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(54) Size fitting device and wearable article including said device

(57) A size fitting device (10, 110, 210, 310, 410, 510, 610) adapted to be associated to a wearable article (3a. 3b, 3c). The size fitting device (10, 110, 210, 310, 410, 510, 610) comprises an inflatable member (2) defining an internal chamber (25), and a plurality of tie members (27) fixed to opposite superficial portions of the inflatable member (2).

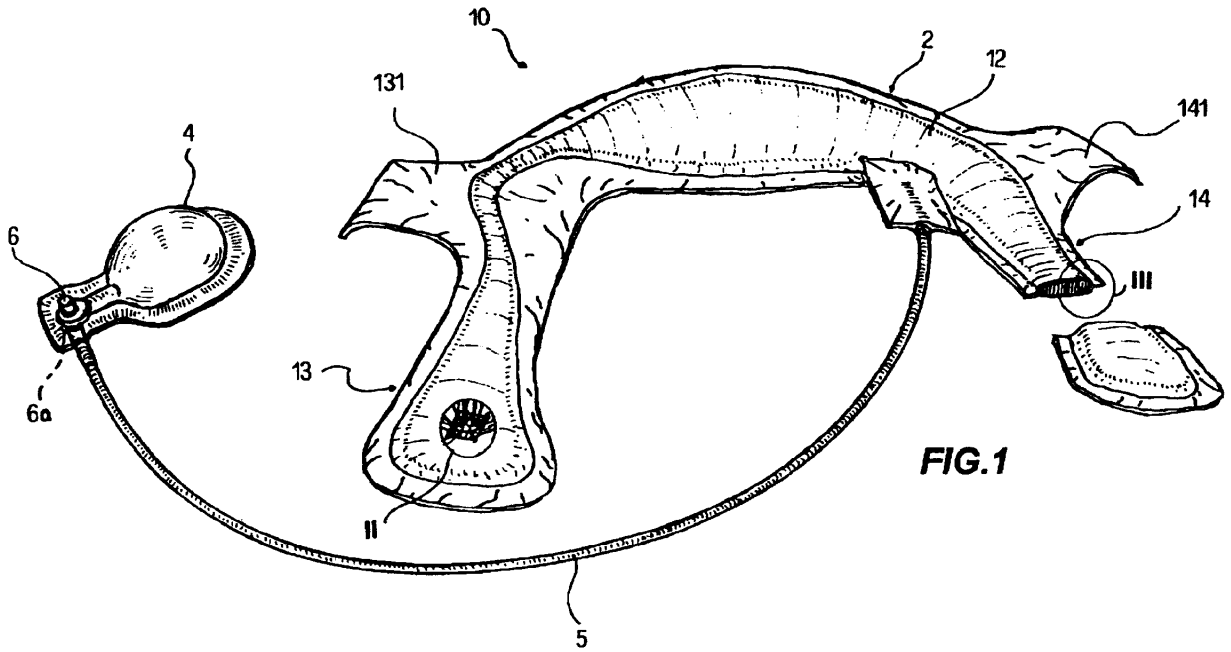

FIG.1

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Description

[0001] The present disclosure generally refers to the clothing sector meant in a broad sense, i.e., including articles and products wearable by a user.

[0002] More particularly, the present disclosure relates to a size fitting device adapted to be associated to a wearable article, like e.g. a garment, a footwear, a glove, a personal protection equipment like a helmet, a back protector or a joint protection device or other wearable article, to fit the size of the wearable article to the shape and the anatomic size of a user's body, thereby improving the wearability thereof.

[0003] In particular, in the clothing sector it is known the need of fitting the size of a wearable article to the body of a user wearing on the article, so as to obtain an optimal adherence of the wearable article to the user's body.

[0004] To meet this need, a way to proceed already adopted in the past in the footwear sector is that of employing an inflatable member which is interposed between a part of the vamp of a footwear and a corresponding part of the user's foot; the inflatable member is then inflated to an extent adequate to compensate for any difference in size between the footwear and the foot, i.e. to compensate for a less than perfect adherence of the footwear to the foot, or parts thereof.

[0005] However, the known inflatable member has scarcely been applied in the clothing field, due to the fact that the inflatable member, in an inflated condition, tends to assume a balloon-like rounded shape, which was scarcely suitable for compensating for small differences in size between wearable article and body part concerned.

[0006] Known inflatable members in an inflated condition form a sort of balloon, rather bulky and with a wide cross section, which is scarcely suitable for covering small interstices occurring between wearable article and body portion concerned; moreover, excessive localized encumbrance and excessive pressure on the body are created, with discomfort to the user.

[0007] A technical problem at the basis of the present disclosure lies in providing a size fitting device adapted to be associated to a wearable article, wherein said device allows to overcome said drawback in connection to the known art and/or to achieve further advantages.

[0008] Such a technical problem is solved by a size fitting device as defined in independent claim 1 and by a wearable article according to claim 18.

[0009] Secondary features of the subject of the present disclosure are defined in the corresponding dependent claims thereof.

[0010] The subject of the present disclosure provides some relevant advantages.

[0011] A first advantage lies in that the inflatable member in an inflated condition may have any shape and size, set a priori during a design stage. In fact, it is possible to adjust a priori the length of the tie members, so that the tie members have a condition of maximum tension and/or maximum extension when the member is inflated. In practice, the shape and size of the inflatable member in an inflated condition can be controlled and set a priori, since the maximum expansion of the inflatable member can be controlled locally by a suitable selection of the length and the maximum extension of the tie members concerned.

[0012] Therefore, by suitably shaping the profile of the inflatable member, and optionally providing different lengths for the tie members according to their location in the internal chamber, it is possible to determine a priori the shape assumed by the inflatable member in an inflated condition (both in terms of distance between the opposite superficial portions of the inflatable member and in terms of perimetral shape of the inflatable member).

[0013] For instance, by utilizing tie members having the same length, it is possible to manufacture an inflatable member having a flattened, plate-shaped, mat-like shape, therefore of constant thickness (even of small thickness), which can be inserted between a user's body and the wearable article, creating a minimal discomfort to the user with respect to known-art devices.

[0014] In other words, the tie members allow a limited expansion of the inflatable member in an inflated condition so as to obtain a reduced encumbrance, and in particular a limited thickness, so as to allow an optimal adherence of the wearable article to the body of the user, with minimal discomfort to the latter.

[0015] Moreover, thanks to the shape control, the inflatable member can easily be coupled to a portion of wearable article having a shape conjugated to that of the inflatable member in an inflated condition.

[0016] A further advantage lies in that, by controlling the shape of the inflatable member, it is possible to control (and in particular to limit) also the amount of air or fluid needed for inflation of the inflatable member, and said advantage is particularly useful in case of manual inflation.

[0017] In one embodiment, the inflatable member includes two opposed walls made of a material impermeable to an inflating fluid; the walls are associated therebetween to form the internal chamber. The inflatable member further includes a textile structure housed in the internal chamber; said textile structure includes two meshes, or two fabrics, opposed therebetween and associated each to a respective wall. The two meshes, or the two fabrics, are connected therebetween by the plurality of tie members.

[0018] By the term "mesh" it is meant, within the scope of the present disclosure, a patch or a cloth, which is porous and has the likeness of a mesh.

[0019] By the term "wall" or "sheet" it is meant, within the scope of the present disclosure, a covering member for a respective mesh, wherein the first and the second wall are perimetrically associated therebetween so as to define a chamber inside which the first and the second mesh, and the tie members connecting the first and the

second mesh, are arranged.

[0020] An advantage of this latter embodiment lies in a high manufacturing simplicity of the device, since a textile structure including the two meshes and the ties connected thereto, wherein said structure is preferably prefabricated, is housed sandwich-like between the two opposed walls, which are then fixed to the respective meshes and sealed along the perimeter.

[0021] A further advantage of this embodiment lies in that each wall can easily be glued to the respective mesh, by interposition of a layer of glue or of glue films, so as to form a single piece with the respective mesh.

[0022] A further advantage of the above-mentioned embodiment lies in a possibility of utilizing inside the same chamber a plurality of textile structures including the two meshes and, optionally, having tie members of different lengths, so as to obtain a dilatation or differentiated expansion of the inflatable member at different parts of the inflatable member itself. Said structures are connected thereamong prior to being inserted in the chamber formed by the impermeable walls.

[0023] The use of a plurality of textile structures is also particularly useful to manufacture size fitting devices wherein the inflatable member has a complex shape, e.g. including many branches or appendages.

[0024] Another advantage of the use of said textile structure lies in that the inflatable member can be folded at an angle in the region of determined zones, and can keep the folding also in an inflated condition. In this connection, prior to inserting the two meshes between the impermeable walls, the two meshes can be connected therebetween in the region of determined folding zones, e.g. by seams. In other words, the seams extend transversally between the two meshes. After the sewing step, the meshes are associated to the respective walls. The presence of said seams, or of similar connections, allows to easily fold the structure formed by the two meshes even when the member is in an inflated condition, among other things without damaging the impermeability of the impermeable walls, as the seams concern only the meshes and not the walls.

[0025] Therefore, there is the possibility of folding the inflatable member in the seams region, and the inflatable member can keep the folded shape even in an inflated condition.

[0026] This possibility is particularly useful to fit the inflatable member to a zone of the user's body requiring the folding of the inflatable member.

[0027] In one embodiment the tie members are threads, made e.g. of polyester or polyamide material. This embodiment allows to distribute a high number of tie members with a relatively high surface density, such as to enable a satisfactory control of the shape of the inflatable member and, if necessary, a sufficient limitation of the expansion of the inflatable member.

[0028] Inflation of the inflatable member may be carried out manually and gradually by a pump, suitably positioned and pneumatically connected with the inflatable member. Alternatively, inflation may be carried out by a microcompressor, e.g. like that utilized in electronic apparatuses for measuring arterial pressure.

[0029] To carry out any deflation of the inflatable member, there may be adopted discharge systems obtained by manually actuated mechanical valves, or by electrovalves electronically controlled by suitable circuits and by control and adjustment systems, or, furthermore, by cannulas having a diameter calibrated depending on preset deflation times.

[0030] In one embodiment, the size fitting device is adapted to be associated to a footwear and, e.g., enables to compensate for any morphological differences between right foot and left foot.

[0031] In one embodiment, the size fitting device includes a band-shaped inflatable member which is adapted to be inserted in the footwear, e.g. at the instep and malleolar zone (at the height of the talus bones).

[0032] More particularly, referring to this latter embodiment, the inflatable member is C-shaped and includes a central portion having a main direction of development, and two side flaps extending along a direction forming an angle with respect to the direction of development of the respective central portion. In particular, the central portion is adapted to be arranged in the region of a front zone of the instep, whereas the side flaps are adapted to be placed in the region of side zones of the instep.

[0033] Once again, it is observed that, thanks to the above-mentioned possibility of providing a substantially flat inflatable member, the inflatable member may be placed in the region of the instep, without any discomfort for the user wearing a footwear, as it occupies, also in an inflated condition, a minimum space.

[0034] The size fitting device may be integrated inside the footwear, i.e. stably inserted between an external vamp of the footwear and an internal lining, or it may be a body structurally independent from the footwear (and optionally removable). In this latter instance, the size fitting device comprises the above-mentioned C-shaped inflatable member, which is connected to a footbed, made of fabric, plastics or other suitable material, to form, with the footbed, a sort of slipper. In particular, at first a user inserts the footbed in the footwear, subsequently wears the size fitting device on the instep, then inserts the foot in the footwear, and finally inflates the inflatable member according to needs.

[0035] The footbed and the size fitting device are to be inserted inside the footwear before wearing on the same, thereby allowing optimal fitting to the footwear.

[0036] This solution enables to make the size fitting device independent of the actual footwear and therefore utilizable on a wider range of footwear.

[0037] In one embodiment, the size fitting device is associated to a garment in order to improve the wearability thereof.

[0038] In another embodiment, the size fitting device is associated to a motorcyclist suit, to allow a fitting of the suit to the motorcyclist body and obtain optimal ad-

herence of the suit, and therefore an improved streamline.

[0039] In one embodiment, the motorcyclist suit includes at least one rigid protection, e.g. a rigid protection made of thermoplastic material and placed in the region of a joint (elbow, knee, ankle) or of a limb (forearm, shin); the size fitting device is placed in the region of said rigid protection, in particular between the latter and the respective part of a users body. Preferably, the size fitting device is arranged so that the inflatable member encircles the rigid protection, so as to act as lateral containment for the rigid protection, and avoid a side displacement, or a displacement along a limb, of the rigid protection in case of a fall, or an alike sudden event.

[0040] Thus, the size fitting device allows to increase the protection capability of the rigid protection, as it improves the adherence and the fastening to the user's body.

[0041] In another embodiment the size fitting device is associated to a back protector, and in particular is interposed between the latter and a user's body. In this case, the size fitting device allows to compensate for any distance between the back protector and a user's back, e.g. due to a wrong size or to satisfy any anatomical needs.

[0042] The size fitting device according to the present disclosure may be utilized also in association to a chest protection device, i.e. interposed between the chest protection device and a user's breast, so as to increase an adherence of the chest protection device to the user's breast.

[0043] The size fitting device according to the present disclosure may be utilized also in association to a helmet in order to improve helmet wearability, increasing comfort and protection, and also preventing any unwanted dislodgment of the helmet off the user's head. The size fitting device according to the present disclosure may also be utilized in association to a glove in order to improve glove wearability.

[0044] In all these instances of applications, the inflatable member may gradually be inflated until reaching the suitable size.

[0045] Other advantages, features and operation steps of the subject of the present disclosure will be made evident in the following detailed description of some preferred embodiments thereof, given by way of example and not for limitative purposes. However, it is evident how each embodiment could have one or more of the advantages listed above; anyhow, it is not required for each embodiment to concurrently have all of the advantages listed.

[0046] Reference will be made to the figures of the annexed drawings, wherein:

- Figure 1 shows a partially sectional perspective view of a size fitting device according to the present disclosure, in an inflated condition;
- Figure 2 shows a sectional view of a detail II of the device of Figure 1, on an enlarged scale;
- Figure 3 shows a sectional view of a detail III of the device of Figure 1, on an enlarged scale;
- Figure 4 shows a bottom plan view of an inflatable member of the size fitting device of Figure 1;
- Figure 5 shows a sectional view along line V-V of Figure 4;
- Figure 6 shows a sectional view along line VI-VI of Figure 4;
- Figure 7 shows a view of a detail VII of Figure 5, on an enlarged scale;
- Figure 8 shows a view of a detail VIII of Figure 5, on an enlarged scale;
- Figure 9 shows a perspective view of a footwear including the size fitting device of Figure 1;
- Figure 10 shows a partially sectional side view of the footwear of Figure 9;
- Figure 11 shows a view of a size fitting device according to a further embodiment;
- Figure 12 shows a partially sectional perspective view of the size fitting device of Figure 11, inserted in a footwear;
- Figure 13 shows a top plan of the view size fitting device of Figure 11, inserted in a footwear;
- Figure 14 shows a front view of a motorcyclist suit including a size fitting device according to the present disclosure;
- Figure 15 shows a perspective view of a size fitting device according to a further further embodiment;
- Figure 16 shows a partially sectional view of a detail XVI of Figure 14;
- Figure 17 shows a partially sectional view of a detail XVII of Figure 14;
- Figure 18 shows a perspective view of a wearable back protection article, partially sectional and associated to a size fitting device according to the present disclosure;
- Figure 19a shows a side view of a wearable back protection article for the back, associated to a size fitting device according to the present disclosure;
- Figure 19b shows a front view of a size fitting device according to a further embodiment;
- Figure 20 shows, in a perspective view, a first step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 21 shows, in a partially sectional perspective view, another step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 22 shows, in a partially sectional side view, yet another step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 23 shows a partially sectional perspective view of a portion of a size fitting device according to the present disclosure, during a seaming step;
- Figure 24 shows a partially sectional perspective view of the portion of Figure 23 after the seaming step, in a subsequent machining step;

- Figure 25 shows a sectional view along line XXV-XXV of the structure of Figure 24;
- Figure 26 shows the structure of Figure 24 in a folded condition;
- Figure 27 shows, schematically and in a perspective view, a first step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 28 shows, schematically and in a perspective view, a second step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 29 shows an enlarged scale view of a detail in a section along line XXIX-XXIX of Figure 28;
- Figure 30 shows a perspective view of a size fitting device according to the present disclosure with detached parts;
- Figure 31 shows a detail XXXI of Figure 30;
- Figure 32 shows, schematically and in a side view, a third step of a method for manufacturing a size fitting device according to the present disclosure;
- Figure 33 shows, schematically and in a side view, a fourth step of a method for manufacturing a size fitting device according to the present disclosure.

[0047] Referring to the annexed figures, by reference numbers 10, 110, 210, 310, 410, 510, 610 size fitting devices according to the present disclosure are denoted, in accordance with respective embodiments, as described hereinafter.

[0048] The size fitting device 10 of the first embodiment (Figures 1-10) and the size fitting device 110 of the second embodiment (Figures 11-13) are adapted to be associated to a footwear 3a. Both size fitting devices 10, 110 of the first embodiment and of the second embodiment include a substantially plane inflatable member 2, band-shaped and having the shape of a C. The inflatable member 2 includes respectively an extended central portion 12 having a main direction of development X, and two side flaps 13, 14 extending along a respective direction Y1, Y2 forming an angle with respect to the direction of development X of the central portion 12 (Figure 4).

[0049] As may be observed from the annexed figures, both of the size fitting devices 10, 110 of the first embodiment and of the second embodiment are intended to be placed in the region of a user's instep, so that the central portion 12 covers a front portion of the instep, and the side flaps 13, 14 respectively cover a left side portion and a right side portion of the instep, at the respective malleolar zone (at the height of the talus bones).

[0050] The inflatable member 2 further includes peripheral hems or lips 131, 141, extending in opposite directions from the inflatable member 2 in the region of a connection zone between the central portion 12 and the side flaps 13, 14.

[0051] Both size fitting devices 10, 110 of the first embodiment and of the second embodiment include a manual inflation member, in the example a conventional pump 4 equipped with a check valve (not shown in the drawings). The pump 4 is pneumatically connected with the respective inflatable member 2 by a cannula 5. Each of the size fitting devices 10, 110 includes a deflation valve, e.g. which can be activated from the outside by a pushbutton 6, to set in fluid communication the inflatable member 2 with an opening 6a opened to the outside environment, and allow a deflation of the inflatable member 2. in the example, the pushbutton 6 sets in fluid communication the cannula 5 with the opening 6a. The cannula 5 is made of Crystal material or of PVC.

[0052] More particularly, the size fitting device 10 of the first embodiment is integrated inside a footwear 3a, whereas the size fitting device 110 of the second embodiment is structurally independent of the footwear 3a, and is removably inserted therein.

[0053] Basically, the size fitting device 10 of the first embodiment is incorporated in the footwear 3a, and permanently inserted as an insert, in the example of Figures 9 and 10 between an external vamp 7 and an internal lining 8 of the footwear 3.

[0054] The size fitting device 110 of the second embodiment is connected to a footbed 9 which, in the example, is made of felt. In particular, the hems 131, 141 are connected, in the example sewn, to the footbed 9: in particular, the footbed 9 has two opposite flanks, to which the hems 131, 141 are connected. Therefore, the size fitting device 110 of the second embodiment assumes a slipper-like shape, and may be inserted in the footwear 3a by a user before wearing on the footwear 3a. The size fitting device 210 of the third embodiment (Figure 15 and Figure 16) is adapted to be associated to a motorcyclist suit 3b (Figure 14) in the region of a rigid protection 212 of a shoulder.

[0055] The size fitting device 310 of the fourth embodiment (Figure 16) is adapted to be associated to a motorcyclist suit 3b (Figure 14) in the region of a rigid protection 312 of an elbow.

[0056] The size fitting device 410 of the fifth embodiment (Figure 16) is adapted to be associated to a motorcyclist suit 3b (Figure 14) in the region of a rigid protection 412 of a forearm.

[0057] The size fitting device 510 of the sixth embodiment (Figure 17) is adapted to be associated to a motorcyclist suit 3b (Figure 14) in the region of a rigid protection 512 of a knee.

[0058] Each one among the size fitting device 210 of the third embodiment, the size fitting device 310 of the fourth embodiment, the size fitting device 410 of the fifth embodiment and the size fitting device 510 of the sixth embodiment is placed below the respective rigid protection 212, 312, 412, 512, i.e. is placed between the latter and a motorcyclist's body. The size fitting device 210, 310, 410, 510 is kept in position by seams connecting the respective inflatable member 2 to the motorcyclist suit 3b.

[0059] Preferably, all size fitting devices 210, 310, 410, 510 include an inflatable member 2 having a substantially

annular shape as illustrated in Figure 15, with a ring size corresponding to the respective size of rigid protection 212, 312, 412, 512 to which they are associated. Basically, each of the size fitting devices 210, 310, 410, 510 perimetrically encircles the respective rigid protection 212, 312, 412, 512 to act as lateral containment of the latter, and prevent a lateral displacement of the rigid protection 212, 312, 412, 512.

[0060] The size fitting device 610 (Figures 18, 19a, 19b) of the seventh embodiment has a pad-like or mat-like shape, in the example substantially rectangular, and is interposed between a back protector 3c and a motorcyclist's body, so as to fill any interstice and optimize the adherence of the back protector 3c.

[0061] All of the size fitting devices 210, 310, 410, 510, 610 comprise the pump 4 and the cannula 5.

[0062] In other words, to carry out the inflation of the inflatable member 2, as anticipated above, a pump 4 is acted onto, which pumps air inside of the inflatable member 2. It is preferable that the pump be of a size such as to find housing without interfering with the aspects of safety and practicality of the wearable article on which it is to be utilized.

[0063] Inflation of the inflatable member 2 may also be obtained by use of a microcompressor, a disposable canister of compressed air, or of any one system generating air compressed to a pressure sufficient to pressurize the inflatable member 2.

[0064] As for any controlled deflation of the inflatable member 2, instead of the above-indicated manually controlled valve 6, miniaturized electrovalves may be utilized.

[0065] Deflation may also be obtained, depending on the cases and applications envisaged, by designing ad *hoc* a mechanic or electronic system to be positioned on preset areas of easy access to the user, who could therefore decide to partially or totally empty the inflatable member 2.

[0066] Alternatively, according to a further embodiment, instead of the deflation valve 6, a deflating cannula coming out of the inflatable member 2 is utilized, having a diameter calibrated depending on a preset deflation time to be obtained.

[0067] According to the present disclosure, when a wearable article 3a, 3b, 3c has a shape or size slightly greater than the actual size or shape of the portion of a user's body, the inflatable member 2 of any one of the above-indicated embodiments is inflated to fill this gap.

[0068] Each one among the size fitting device 210 of the third embodiment, the size fitting device 310 of the fourth embodiment, the size fitting device 410 of the fifth embodiment and the size fitting device 510 of the sixth embodiment, being placed between the motorcyclist's body and the respective rigid protection 212, 312, 412, 512, 3c, allows to keep the latter stationary in case of fall. In fact, should the motorcyclist suit 3b be slightly oversized with respect to the user's body, there might be the risk that, in case of fall, the rigid protection 212, 312, 412, 512 move, leaving exposed the joints it is intended to protect. An analogous advantage is also found for the size fitting device 610 of the seventh embodiment for the back protector 3c. The size fitting devices 10, 110, 210, 310, 410, 510, 610 shown in the figures are exemplary; in fact, it is understood that a wearable article might be provided with only some of said devices, or it might be provided with protection devices having shapes and/or positions different with respect to the ones shown.

[0069] In other words, the size fitting devices 10, 110, 210, 310, 410, 510, 610 are different from each other for the overall shape, or profile, which is selected depending on the type of wearable article to which each of them is associated and according to the region to be protected. As for the remaining aspects, the size fitting devices 10, 110, 210, 310, 410, 510, 610 substantially include the same structural members. For this reason, for simplicity's sake in the disclosure, hereinafter reference will be made only to the size fitting device 10, it being understood that the same description likewise applies also for size fitting devices 110, 210, 310, 410, 510, 610.

[0070] The size fitting device 10 comprises an inflatable member 2, inflatable by a fluid, e.g. air, including two opposed walls 21, 22, in the example of material impermeable to said gas/air, and associated therebetween, in the example fixed in a gas-tight manner, to form an internal chamber 25.

[0071] The inflatable member 2 also includes a textile structure, so-called double-layer structure, denoted by reference number 331, which is housed in the chamber 25. The structure 331 includes two meshes 29, 30, in practice forming two layers, wherein said meshes 29, 30 are opposed therebetween and connected by a plurality of tie members 27.

[0072] In practice, the two walls 21, 22 form a case in which the structure 331 including the two meshes 29, 30 is housed. In particular, each mesh 29, 30 is associated to a respective wall 21, 22, so that the structure 331 is inserted sandwich-like between the two walls 21, 22.

[0073] By the term "tie member" 27 it is meant a member or entity having the function of keeping joined or constrained or stationary two or more portions (in the example the meshes 29, 30) of the inflatable member 2, at least when the latter is in an inflated condition. In particular, when the inflatable member 2 is in an inflated condition, the tie members 27 are tensioned by tensile stress.

[0074] In the example, the tie members 27 are thread, and are flexible and inextensible members. Therefore, they are suitably sized so that, when the inflatable member 2 is in a resting condition, they are preferably not subjected to tensioning and are collapsed in the internal chamber 25, whereas when the inflatable member 2 is in an inflated condition they are subjected to tensile stress, as illustrated by way of example in Figures 5 and 6.

[0075] In a further embodiment, not illustrated in the drawings, the tie members, besides being of thread-shaped type and flexible, are elastic members. Therefore, they are suitably sized so that, when the inflatable

member is in a resting condition, they are preferably not subjected to tensioning, or possibly subjected to a light tensioning, whereas when the inflatable member is in an inflated condition they are tensioned until reaching a greater extension and a greater tensioning.

[0076] In particular, according to the present disclosure it is preferable that the tie members 27 be thickly distributed in the inflatable member 2, e.g. with a density of at least one tie member per each cm^2 of surface of the inflatable member 2, even more preferably, always by way of example, with a density comprised between 1 and 15 threads per each cm^2 of surface of the inflatable member 2, preferably between 4 and 6 threads per each cm^2.

[0077] By observing the sections illustrated in the accompanying figures, it may be noticed that the tie members 27 are distributed substantially homogeneously in the internal chamber 25.

[0078] As anticipated above, in the example the tie members 27 are flexible ties and have the shape of threads, and are made e.g. of polyester or polyamide, of a thickness comprised between about 500 and about 1000 decitex (unit of length of a continuous thread or of a yarn), and have ends 27a, 27b fixed to the respective portions of meshes 29, 30 which they connect. Even more particularly, each thread 27 includes a bundle of continuous torsion-free fibers coming out from a single point of the respective mesh 29, 30.

[0079] In the example illustrated, each mesh 29, 30 has an extension such as to nearly entirely line a respective wall 21, 22.

[0080] The inflatable member 2 includes a prefabricated textile structure 331, or body, including the two meshes 29, 30, or two fabrics, and two walls 21, 22, or sheets, in the example impermeable to gas. A first wall 21 is arranged and stably fixed at the side of a first mesh 29, whereas the second wall 22 is arranged and stably fixed at the side of the second mesh 30.

[0081] The meshes 29, 30 are made of polyester or polyamide material.

[0082] The two walls 21, 22 or sheets, are made of a sheet of soft and gas-tight material, e.g. of polyamide or polyurethane, and are opposed the one with respect to the other, and perimetrically fixed along their perimetral edges 23, 24.

[0083] E.g., the two walls 21, 22 are made of a three-layer material produced by GORETEX® and marketed under the name Jumbo. Alternatively, e.g., a soft and flexible film of polyurethane or polyamide may be utilized, which is provided with a glue layer for the fastening to the meshes 29, 30.

[0084] Again alternatively, any impermeable material, compatible with gluing or heat sealing processes, may be utilized for the gluing to the meshes 29, 30.

[0085] In a further embodiment the walls 21, 22 are made of a laminate (partially visible in Figure 30 and in Figure 31), which is commonly utilized as clothing lining and includes a fabric layer 22a, in the example 100% nylon (representing about 65% b/w of the laminate) and a glue layer 22b, in the example a glue film (representing about 35% b/w of the laminate), e.g. polyurethane glue, distributed on the fabric layer 22a, by roller spreading.

[0086] Even more particularly, each mesh 29, 30 is stably fixed to the surface of the respective wall 21, 22, by a glue film (denoted, e.g., by numbers 15, 16 in Figure 30) or alike fixings.

[0087] In case of use of laminate, the glue film 15, 16 is arranged in contact with the respective glue layer 22b of the laminate.

[0088] The tie members 27 have opposite ends 27a, 27b stably fixed to the respective mesh 29, 30. The fixing at the opposite ends 27a, 27b of the tie members 27 is, e.g., obtained by mere insertion or interlacing of tie members 27 between wefts of the mesh 29, 30 as displayed in Figure 2.

[0089] In practice, in the example illustrated in the figures, the tie members 27 are obtained by a determined number of threads which are fixed, in alternate sections, to the one mesh 29, and consecutively to the other mesh 30. In other words, each thread is threaded below a weft of the first mesh 29, is curved toward the opposite mesh 30, and is connected in the same manner to the opposite mesh 30, and so on.

[0090] Alternatively, the tie members 27 are connected to the mesh 29, 30 by interlacing or by fastening, or alike fixings.

[0091] Alternatively, each tie member 27 is a thread integrally interlaced with, or continuously evolving from, both said first and second mesh 29, 30. In practice, the thread/tie member 27 comes out from one of said first and second mesh 29, 30 and is integrally interlaced with the other one of said first and second mesh 29, 30.

[0092] The set of the two meshes 29, 30 and of the tie members 27 forms a so-called 3D (three-dimensional) or double-knit fabric.

[0093] Moreover, the one mesh 29 is stably fixed to the other mesh 30 by seams, or alike fixings, in the perimeter 281 region of the meshes 29, 30, as illustrated in Figures 3 and 5 to 8.

[0094] Referring to Figures 27 to 31, the hereto-described size fitting device 10 according to the present disclosure is manufactured as follows.

[0095] A structure 331 comprising a pair of meshes 29, 30 in an opposed position and at a preset distance is preliminarily prearranged; to the meshes 29, 30 there are fastened, or otherwise fixed, ends 27a, 27b of the tie members 27, in which the length of said tie members 27 is selected so as to determine a maximum mutual distance D between the meshes 29, 30 corresponding to a maximum local expansion of the inflatable member 2 in an inflated condition.

[0096] In particular, the meshes 29, 30 are suitably cut to size according to the shape of the inflatable member to be obtained. In Figure 27 the structure 331 is illustrated slightly inflated, so as to let understand the presence of the tie members 27, and is indicated with a substantially rectangular profile for simplicity's sake in the explanation.

[0097] However, it is evident that the structure 331 has shape and size substantially equivalent to a respective inflatable member 2 to be obtained; moreover, as mentioned above, the length of the tie members 27 is selected so as to determine a maximum mutual distance between the meshes 29, 30 corresponding to a maximum local expansion of the respective inflatable member 2 in an inflated condition.

[0098] An edge 44 of the mesh 29 is seamed to a respective edge 46 of the mesh 30 facing thereon (seam line denoted by 47 in Figures 28 and 29). In Figures 27 and 28, the seaming operation is exemplified with needles 49, however it is highlighted that the seams 47 may be made by a machine or with other equipment conventional for a person skilled in the art. The seam line 47 substantially follows the perimeter 281 of the structure 331.

[0099] Even more particularly, in the example the seam 47 is a rectilinear seam, made with thread, e.g. of polyamide, and including 2 to 3 stitches/cm (i.e., a seam pitch comprised between about 3 and 5 mm).

[0100] Prior to completing the seam 47, the cannula 5 for connection with the pump 4 is included between the meshes 29, 30.

[0101] In Figure 29 a detail of the seam 47 is illustrated, in which it appears evident how the seam thread transversally crosses the two meshes 29, 30, tightening them into direct mutual contact.

[0102] The structure 331 is enclosed between the sheets or walls 21, 22 of soft and gas-tight material, e.g. of polyurethane or polyamide, or said above-mentioned laminate, in which the walls 21, 22 have a surface extension greater than said structure 331. In the example, the walls 21 and 22 are glued to the respective meshes 29, 30 by means of a glue film, in the example a polyurethane film having a thickness of about 100 μm, denoted by numbers 15, 16, utilizing a hot press 160 (which, e.g., works at temperatures comprised between about 140 °C and 180 °C, preferably at about 150 °C) to foster adhesion and mutual gluing.

[0103] In particular, each glue film 15, 16 is included between a mesh 29, 30 of the structure 331 and the respective sheet 21, 22, as illustrated in Figure 30.

[0104] Even more particularly, each glue film 15, 16 is fixed by hot press 160 to the respective sheet 21, 22 in a first step of the method as illustrated in Figure 32, to form a composite layer 21', 22' (Figure 33). If the above-mentioned laminate is utilized, gluing occurs by arranging the glue film 15, 16 at the side of the glue layer 22b of the laminate.

[0105] At a later stage, the structure 331 (which has already been perimetrically seamed) is included between the two composite layers 21', 22'.

[0106] The two walls 21, 22 have perimetral portions 23, 24 projecting with respect to the meshes 29, 30. In practice, the two walls 21, 22 have a surface extension greater than the respective meshes 29, 30, so that the perimetral portions 23, 24 can be sealingly connected therebetween by the respective glue films 15. 16, so as to glue and lock also the cannula 5. In practice, said perimetral portions 23, 24 are stably and sealingly connected thereamong, e.g. by heat-sealing with the above-mentioned press 160, along the entire perimetral edge 28 so as to contain the structure 331 and make the internal chamber 25 gas-tight.

[0107] As for the cannula 5, it is clear that it may be manufactured of any other material, besides those mentioned above, as long as it be compatible with the materials and adhesives used, so as to ensure tight seal of inflation.

[0108] It has to be noted that the perimetral portions 23, 24 may be suitably shaped to form the above-mentioned hems 131, 141 of the size fitting device 10. Said perimetral portions 23, 24 are further useful to join, e.g., seam, the size fitting device 10 to the wearable article 3a, 3b, 3c to which it is associated.

[0109] Another advantage lies in that the walls 21, 22 may be fixed, e.g. by the above-mentioned hot-press gluing, for a 20-s time (in case of use of the above-mentioned laminate the glue lies, as mentioned, already spread on the layer 22b of the respective wall 21, 22), to the respective meshes 29, 30 with a single pass. In particular, the entire external surface of the meshes 29, 30 is fixed in a single step to the respective wall 21, 22.

[0110] Moreover, it is observed that the seam 47 provides a practical advantage from a manufacturing standpoint as well, since during the machining steps the meshes 29, 30 do not move the one with respect to the other.

[0111] Moreover, it has been found that the use of laminate gives satisfactory results. In particular, the glue film 15, 16 from one side has a high adherence with the laminate (a gluing occurring directly with the glue layer 22b) and from the other side penetrates the meshes 29, 30, so as to fill the pores of the meshes 29, 30.

[0112] Thus, a high impermeability of the inflatable member 2 is guaranteed, without seal loss, thanks to the distribution of the glue film 15, 16 in the pores of the meshes 29, 30.

[0113] In addition, the laminate has a high lightness of weight and, concomitantly, gives high strength to the inflatable member 2. Moreover, the fabric layer 22a of the laminate is an inextensible fabric which opposes any bubble formation during the machining steps.

[0114] The fabric layer 22a, being flexible, moreover adjusts to any mutual displacement occurring between the glue film 15, 16 and the laminate itself during the fixing in the press 160.

[0115] According to an aspect of the present disclosure, referring to Figures 23 to 26, the device may include seams 26 extending transversally between the one 29 of the meshes and the other one 30 of the meshes. Said seams 26 define a seam line L or a seam zone. Thus, along the seam line or zone L the thickness of the structure 331 in an inflated condition is further limited. In practice, the opposite meshes 29 and 30 are seamed or anyhow joined therebetween so as to limit or prevent their

relative movement.

[0116] It follows that in the seam line L region a corned folding is allowed, facilitated by the limited thickness, and concomitantly the free portions 26b allow a diffusion or flow of air/fluid inside the inflatable member 2.

[0117] The seam 26 may be linear, straight, or extend along a closed line, e.g. a closed ring.

[0118] In Figures 24 and 26 subsequent steps of manufacturing of the size fitting device 10 are illustrated, wherein the walls 21, 22 are associated from opposite sides to the structure 331 and subsequently the entire device 10 is folded.

[0119] In practice, the seams 26 enable an inflatable member 2 to fold or rotate according to a set line L (e.g., to enable the size fitting device 10 to adhere to a curved portion of the user's body and to remain folded even in an inflated condition), further fostering wearability and limiting discomfort, e.g. during body motions.

[0120] Likewise, also the other size fitting devices 110, 210, 310, 410, 510, 610 can be manufactured, according to needs, with seams 26 to enable the size fitting device 110. 210, 310, 410, 510, 610 to assume suitable folding even in an inflated condition, so as to arrange itself in the way most effective for size fitting.

[0121] According to another aspect of the present disclosure, as anticipated above, each one of the size fitting devices 10, 110, 210, 310, 410, 510, 610 may easily be made according to any one form or shape, above all in case of complex forms and shapes, including plural portions, or plural branchings, or plural appendages.

[0122] In this connection, initially two textile structures 331 are provided, including each a pair of meshes 29 and 30, 329 and 330 to which there are fastened, or otherwise fixed, ends of tie members 27. Each mesh 29, 30, 329, 330 has shape and sizes substantially equivalent to a portion of the inflatable member 2 to be obtained (in Figure 20 it is illustrated, e.g., the pair of meshes 29, 30 intended to form a first portion/appendage and the pair of meshes 329, 330 intended to form a second portion/appendage); moreover, the length of the tie members 27 is selected so as to determine a maximum mutual distance between the meshes 29 and 30, 329 and 330 of each pair that be corresponding to a maximum local expansion of the respective portion of the inflatable member 2 in an inflated condition.

[0123] An edge 342 of the mesh 29 is seamed to a respective edge 343 of the mesh 329, and likewise the edges 344 and 345 of the respective opposite meshes 30, 330 are seamed (seam line denoted by 346 in Figure 20). Thus, the pairs of meshes 29 and 329, 30 and 330 are joined therebetween, in fact obtaining a single body 331a, equipped with ties 27, having a surface equal to the sum of the surfaces of the meshes 29 and 329, or 30 and 330, respectively. It has to be noted that the ties 27 of the first pair of meshes 29 and 30 might have different lengths with respect to the ties 27 of the second pair of meshes 329 and 330, according to the respective portion of inflatable member 2 to be manufactured and its maximum thickness admitted in an inflated condition.

[0124] Along peripheral or perimetral edges 347 of the single body 331a thus obtained, the mesh 29, 329 of each pair is seamed to the respective opposite mesh 30, 330 (seam lines denoted by 348). In Figure 20, the seaming operation is exemplified with needles 349, however it is evident that the seams 346, 348 may be machine-made.

[0125] The structures 331 forming said single body 331a are enclosed between the walls or sheets 21, 22 (Figure 21) of soft and gas-tight material, e.g. of polyurethane or polyamide, having a surface extension greater than said single body 331a. In the example, the sheets 21 and 22 are glued to the respective meshes 29, 30, 329, 330 by means of a polyurethane glue, utilizing a hot press 360 (which, e.g., works at temperatures of about 150 °C) to foster adhesion and mutual gluing. The peripheral edges 23, 24 of the sheets 21 and 22, at which the meshes 29, 30, 329, 330 forming the single body 331a are not enclosed, are glued the one to the other in a sealed and gas-tight manner. Therefore, an inflatable member 2 is obtained, which comprises both the sheets or walls 21 and 22 as an external sheath, and meshes 29 and 30, 329 and 330 internally adhering to walls 21, 22, respectively.

[0126] The subject of the present disclosure has been described hitherto with reference to preferred embodiments thereof. It is understood that other embodiments relating to the same inventive core may exist, all of these falling within the scope of protection of the claims which are annexed hereinbelow.

Claims

1. A size fitting device (10, 110, 210. 310, 410, 510, 610) adapted to be associated to a wearable article (3a. 3b, 3c), said size fitting device (10, 110, 210, 310, 410, 510, 610) comprising an inflatable member (2) defining an internal chamber (25), wherein said size fitting device (10, 110, 210, 310, 410, 510, 610) includes a plurality of tie members (27) arranged in said internal chamber (25) and fixed to opposite superficial portions (21, 22; 29, 30; 329, 330) of the inflatable member (2).

2. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to claim 1, wherein said inflatable member (2) includes a first wall (21) and a second wall (22) associated therebetween to form said internal chamber (25), and a textile structure (331, 331a) housed in said internal chamber (25), said textile structure (331, 331a) including a first mesh (29; 329) and a second mesh (30; 330) opposed therebetween and associated each to a respective wall (21, 22), wherein said first and second mesh (29, 30; 329, 330) are connected therebetween by said plurality of tie members (27).

3. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to claim 1 or 2, wherein said tie members (27) are of flexible type.

4. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to claim 1, 2 or 3, wherein said tie members (27) are threads.

5. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the claims 2 to 4, wherein each of said first and second mesh (29, 30; 329, 330) is glued to the respective wall (21, 22).

6. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the claims 2 to 5, wherein said tie members (27) are distributed with a surface density of at least one tie member (27) per each cm^2 of surface of the respective mesh (29, 30, 329, 330).

7. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the claims 2 to 6, wherein said tie members (27) have ends (27a, 27b) continuously interlaced respectively with said first mesh and second mesh (29, 30, 329, 330).

8. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the claims 2 to 7, wherein said first mesh (29, 329) and said second mesh (30, 330) are joined therebetween in direct contact along perimetral edges (44, 46, 281, 347) by seam (47, 348).

9. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the preceding claims, wherein said first wall (21) and said second wall (22) have a surface extension greater than the respective mesh (29, 30; 329, 330) and are sealed thereamong along respective perimetral edges (28, 23. 24).

10. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the preceding claims, comprising inflating means (4, 5) pneumatically connected to said inflatable member (2).

11. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to claim 10, wherein said inflating means (4, 5) is adapted to inflate said inflatable member (2) gradually.

12. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the preceding claims, comprising deflating means (6a) pneumatically connected to said inflatable member (2).

13. The size fitting device (10, 110) according to any one of the preceding claims, wherein said inflatable member (2) is band-shaped and is adapted to be inserted in a footwear (3a).

14. The size fitting device (10, 110) according to claim 13, wherein said inflatable member (2) is curved into a C-like shape and includes respectively a central portion (12) having a main direction of development (X), and two side flaps (13, 14) extending along a respective direction (Y1, Y2) forming an angle with respect to the direction of development (X) of the central portion (12).

15. The size fitting device (10, 110) according to claim 14, comprising a footbed (9) connected to said inflatable member (2).

16. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the preceding claims, wherein each one between said first wall (21) and second wall (22) is a laminate including a first layer (22a) and a second layer (22b).

17. The size fitting device (10, 110, 210, 310, 410, 510, 610) according to claim 16, wherein said first layer (22a) is a fabric and said second layer (22b) is a glue layer.

18. A wearable article (3a, 3b, 3c) including a size fitting device (10, 110, 210, 310, 410, 510, 610) according to any one of the claims 1 to 17.

19. The wearable article (3a, 3b) according to claim 18, wherein said wearable article is selected from the group including a footwear (3a), a garment, a motorcyclist suit (3b), a helmet, a glove, a back protector (3c) and a chest protector.

20. The wearable article (3b) according to claim 19, wherein said motorcyclist suit (3b) includes at least one rigid protection (212, 312, 412, 512), and wherein said size fitting device (210, 310, 410, 510) is placed in the region of said at least one rigid protection (212, 312, 412, 512).

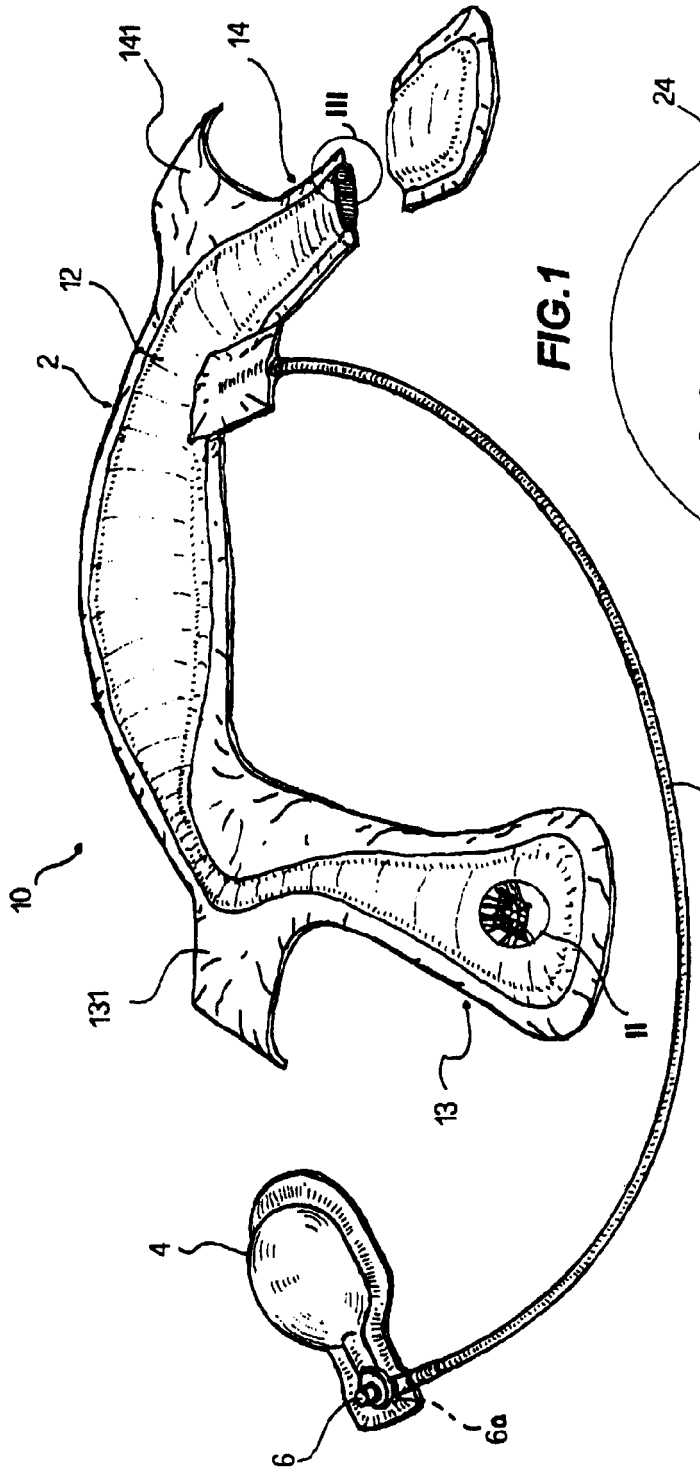


FIG.1

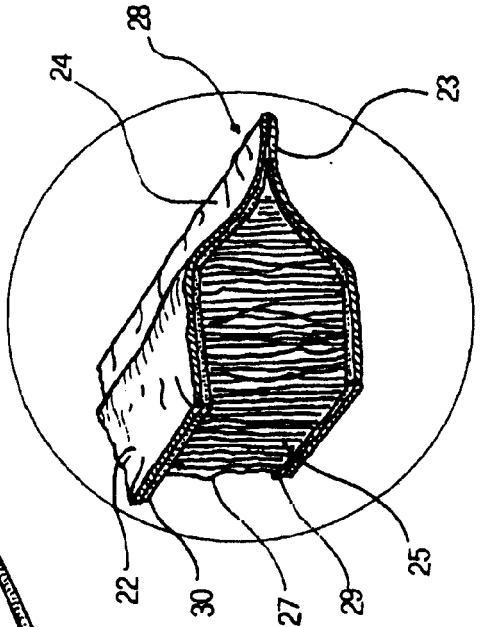


FIG.3

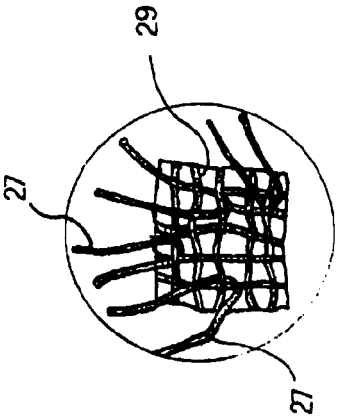


FIG.2

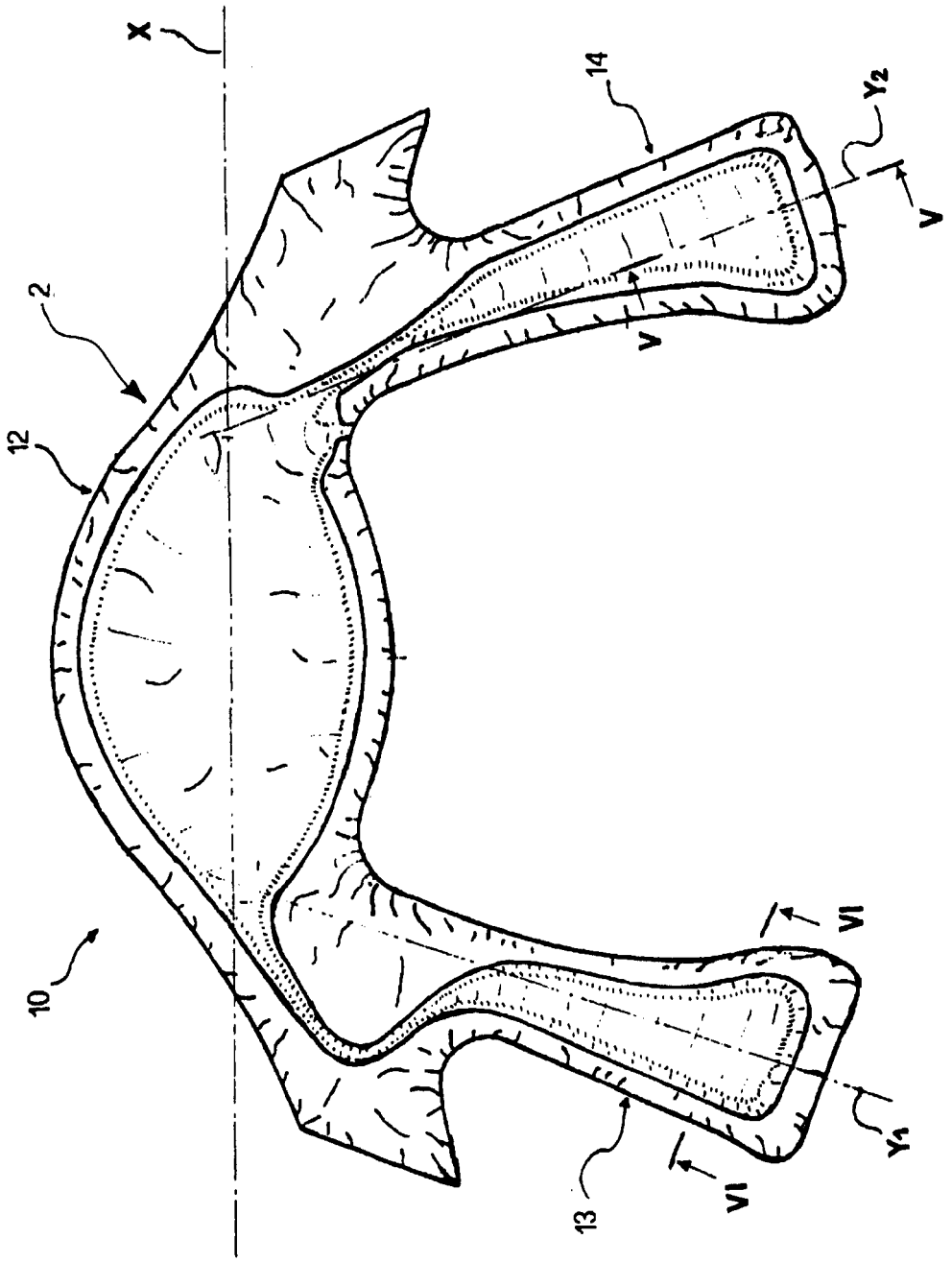


FIG.4

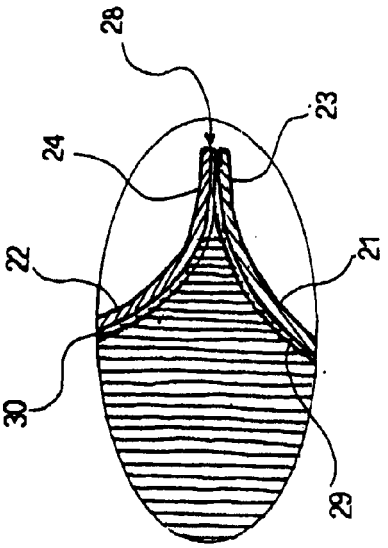


FIG.8

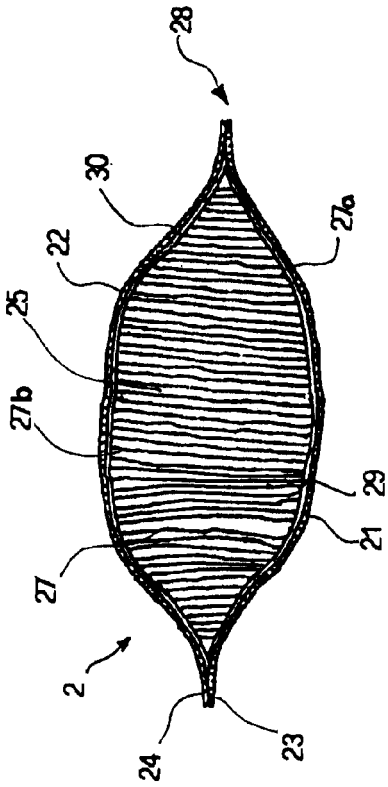


FIG.6

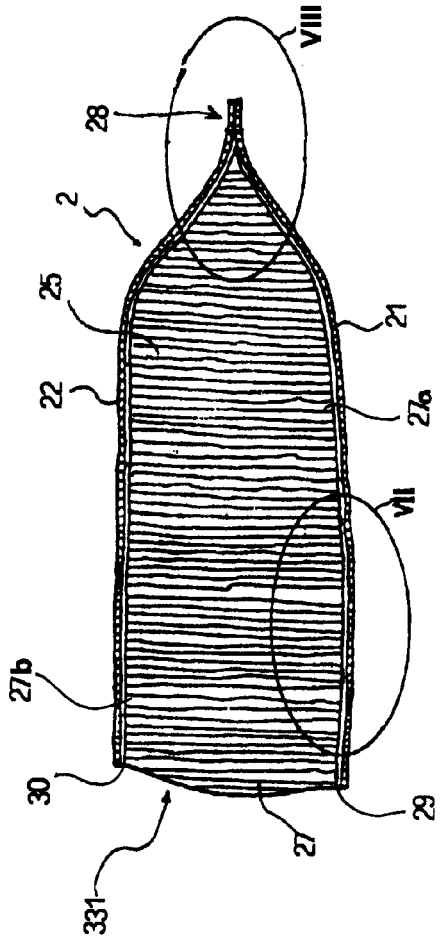


FIG.5

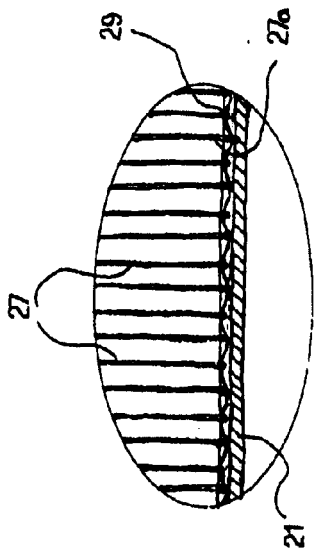


FIG.7

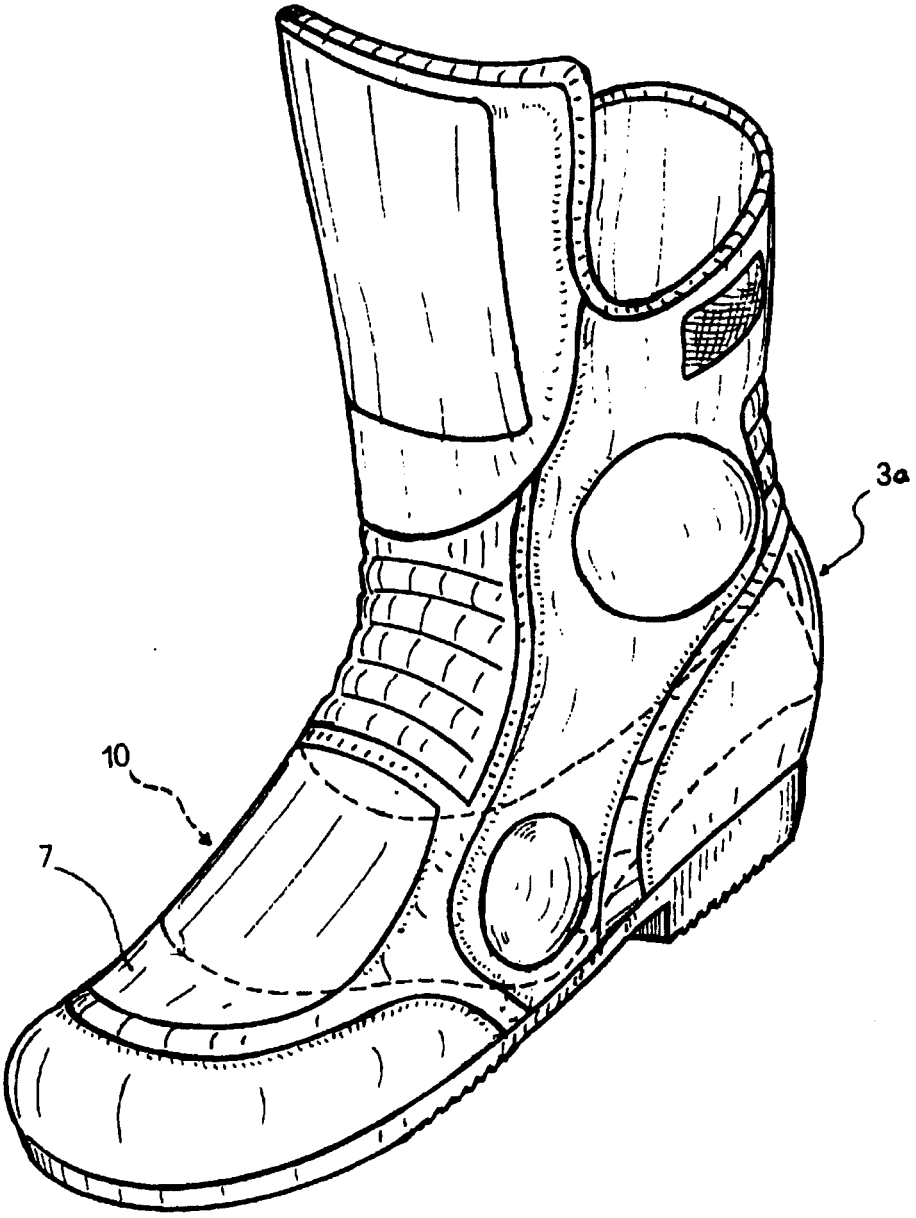


FIG.9

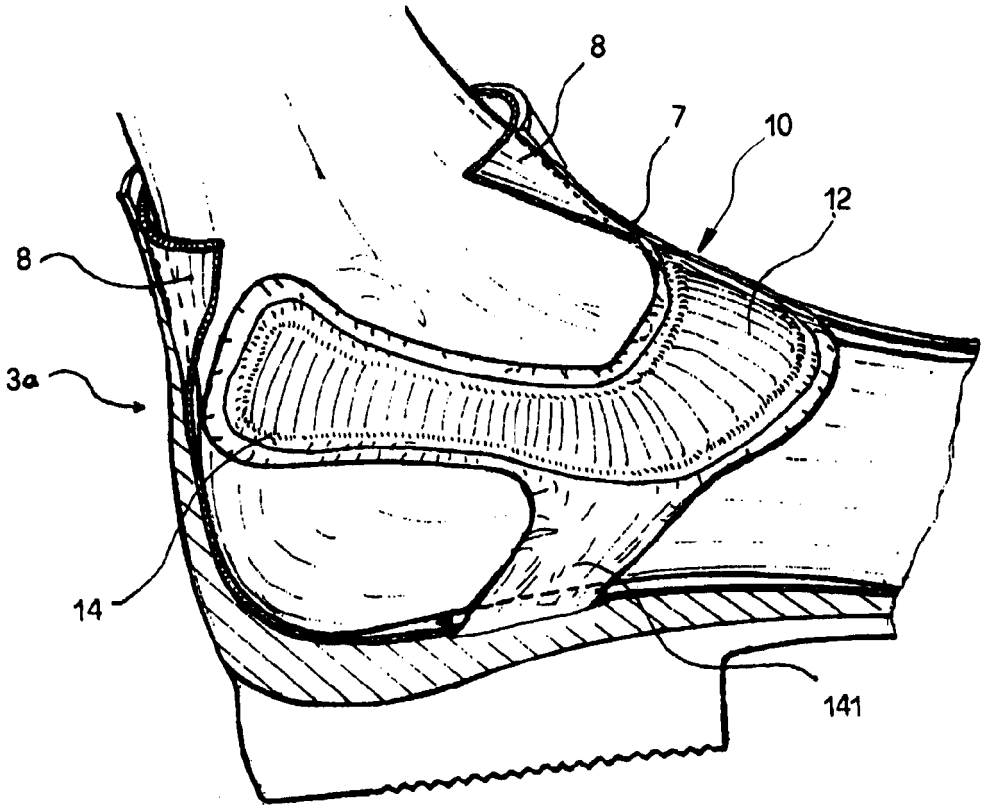


FIG.10

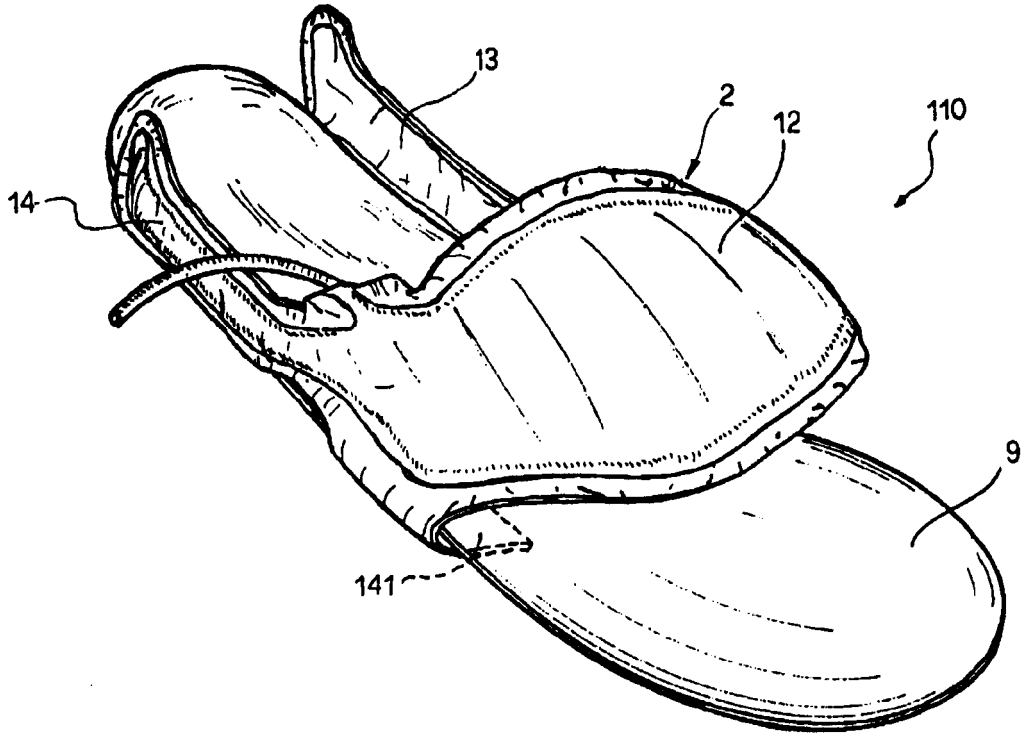


FIG.11

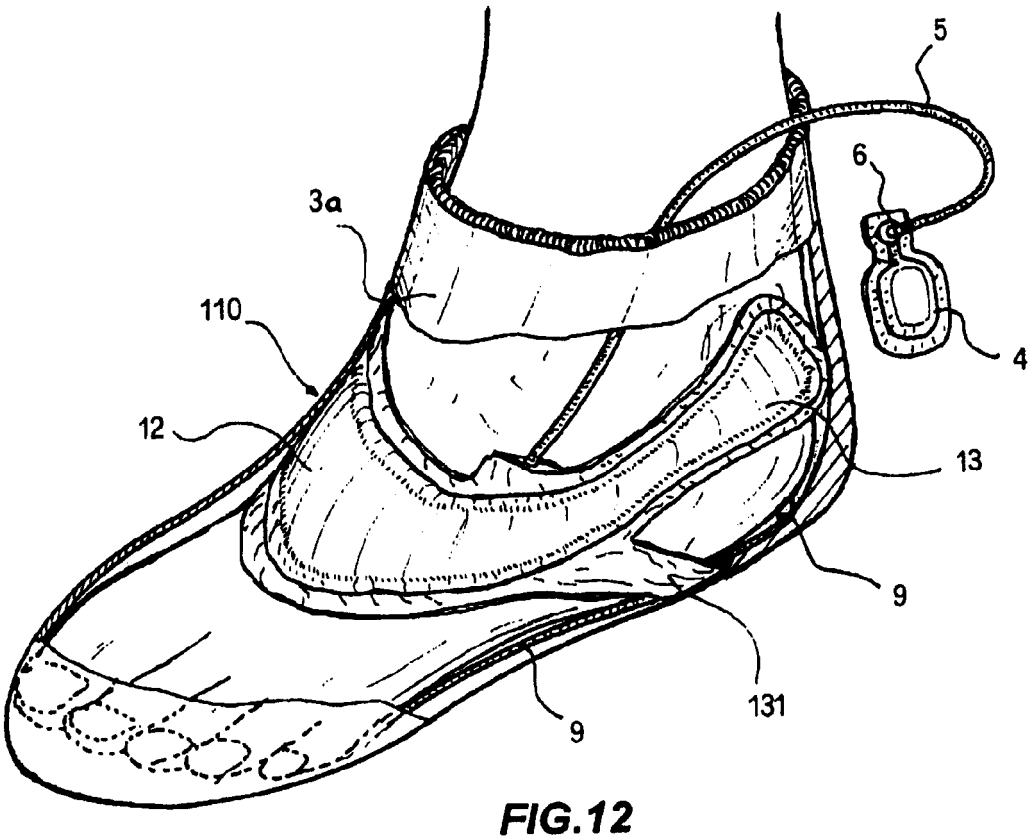


FIG.12

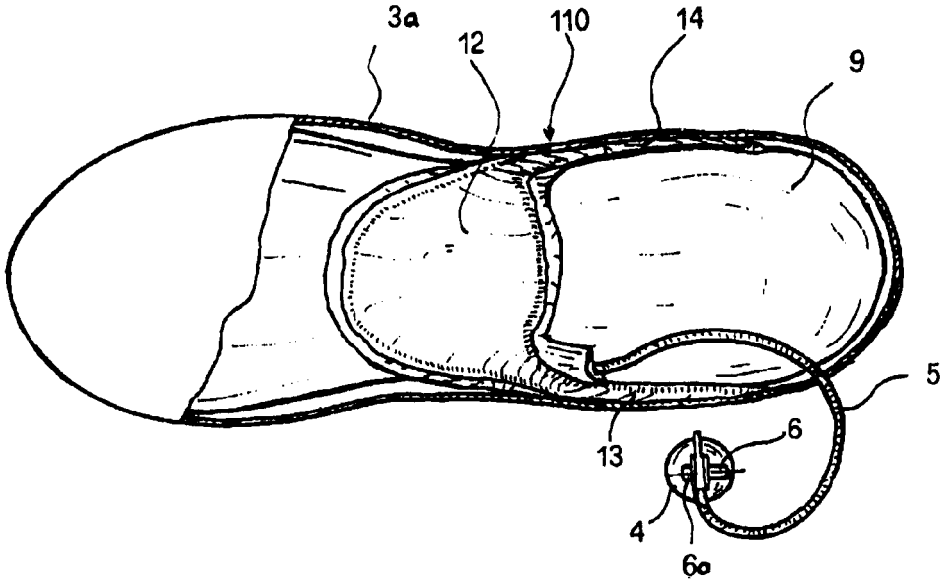


FIG.13

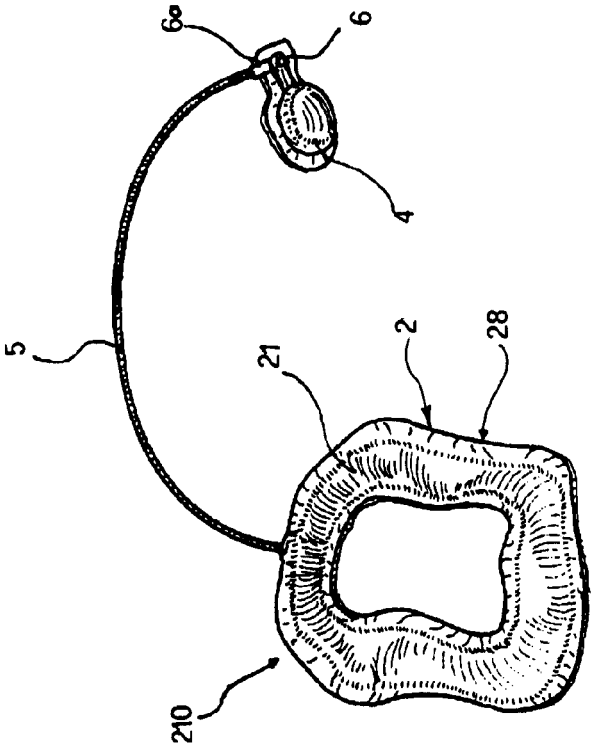


FIG.15

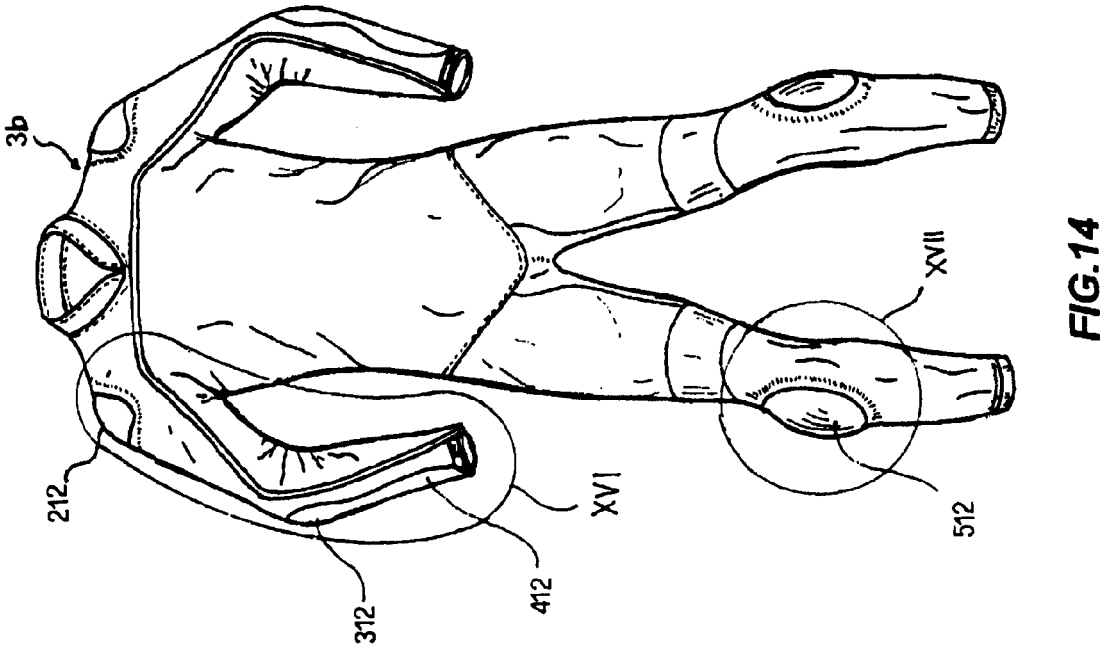


FIG.14

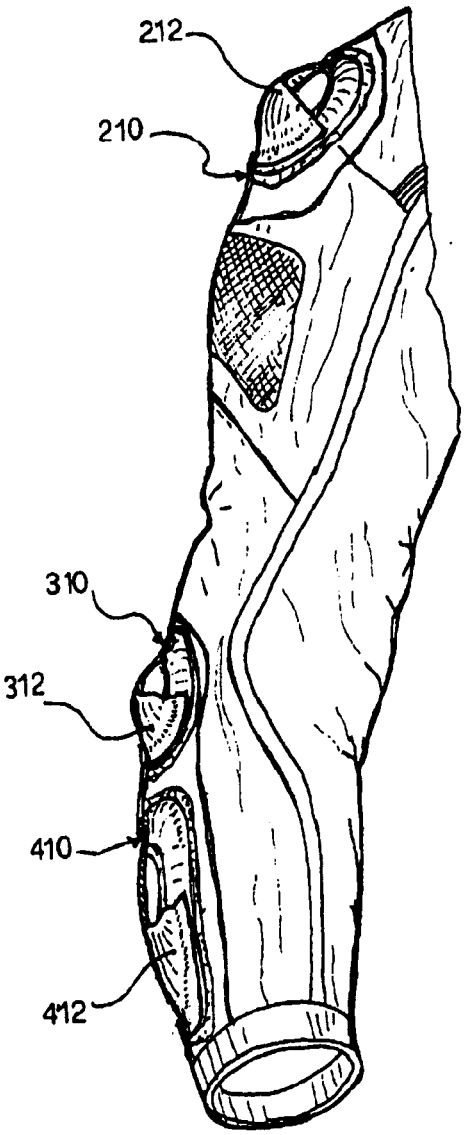


FIG.16

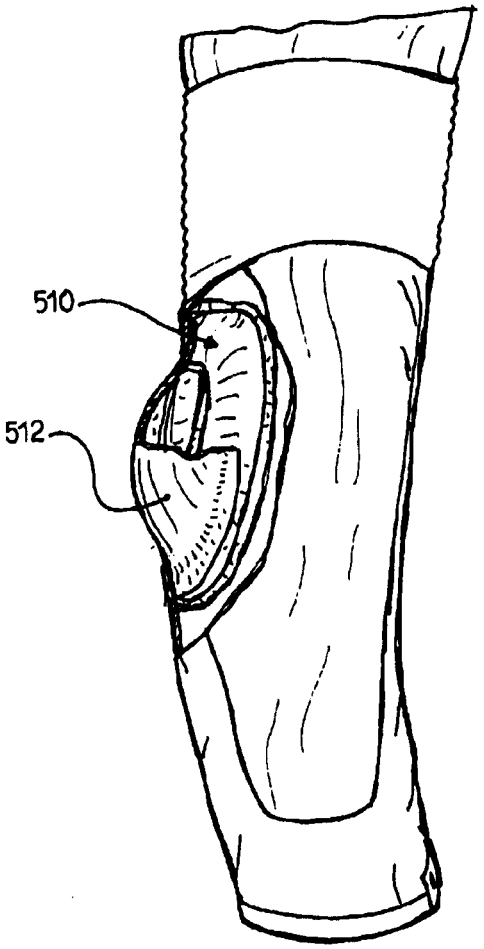


FIG.17

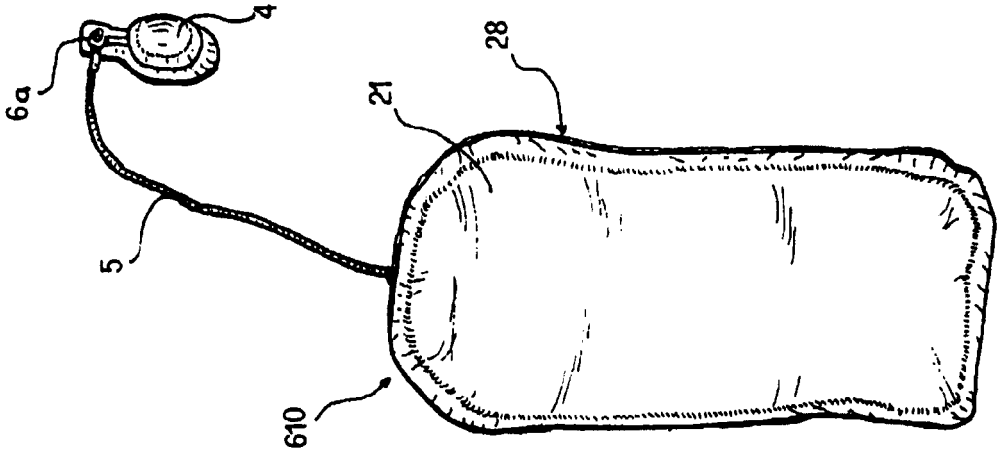


FIG.19B

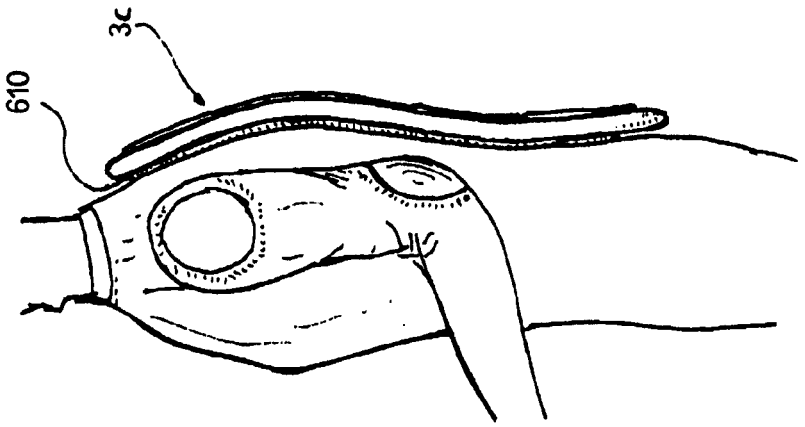


FIG.19A

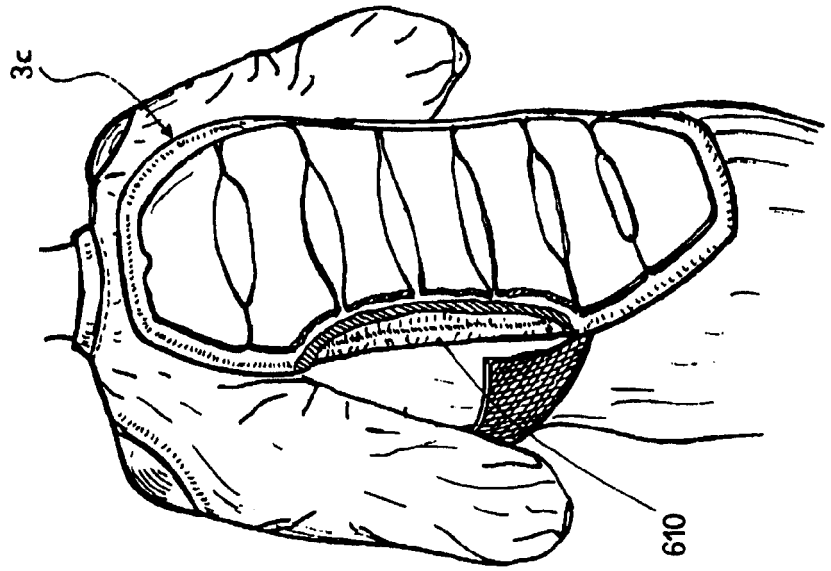
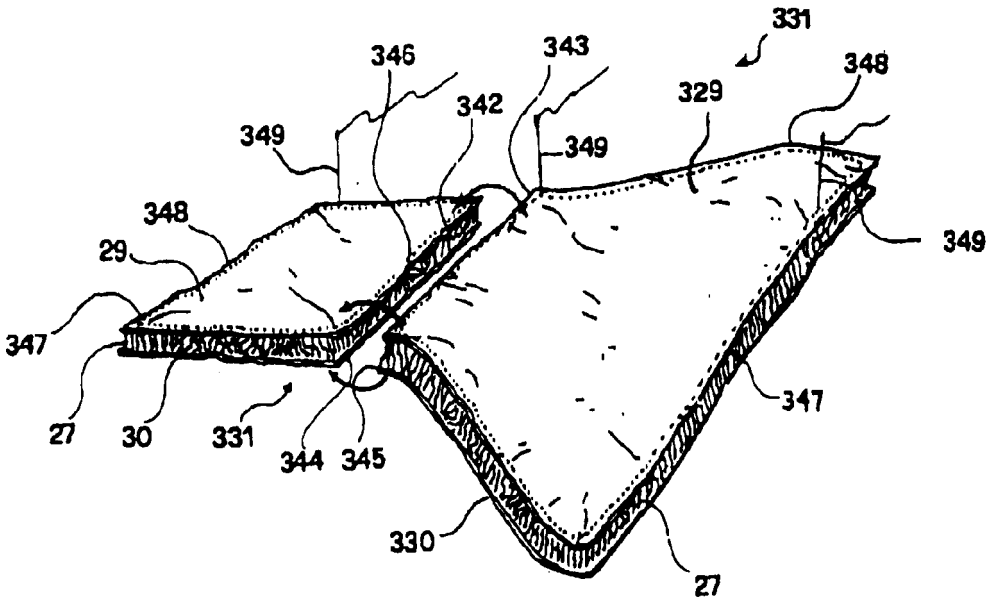


FIG.18


331
346
343
348
329
342
349
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348
349
29
347
347
27
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331
344
345
330
27

FIG.20

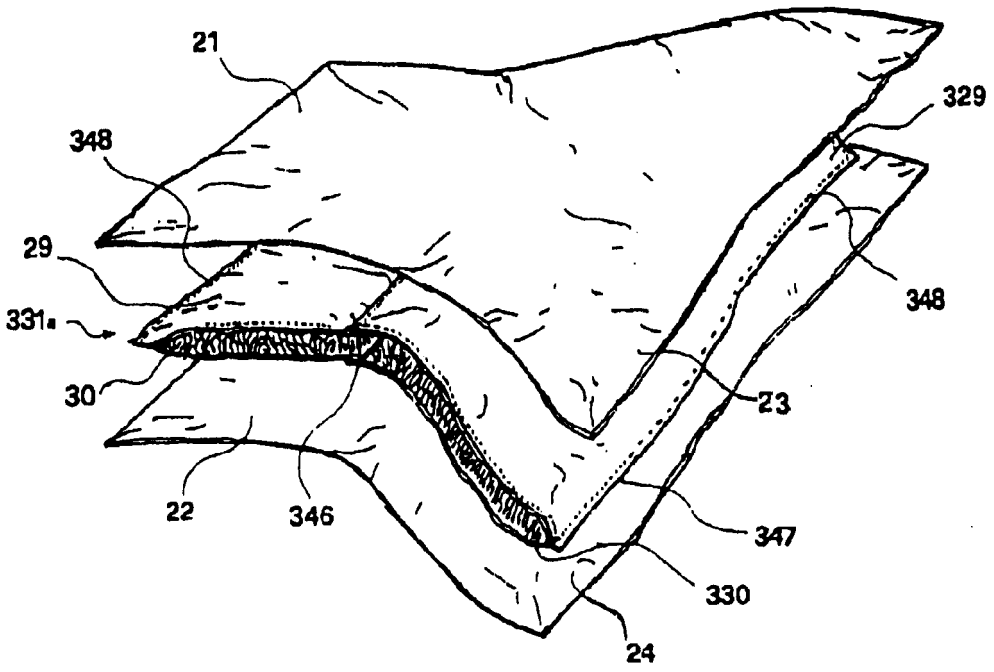
21
329
348
348
29
331a
30
23
22
346
347
330
24

FIG.21

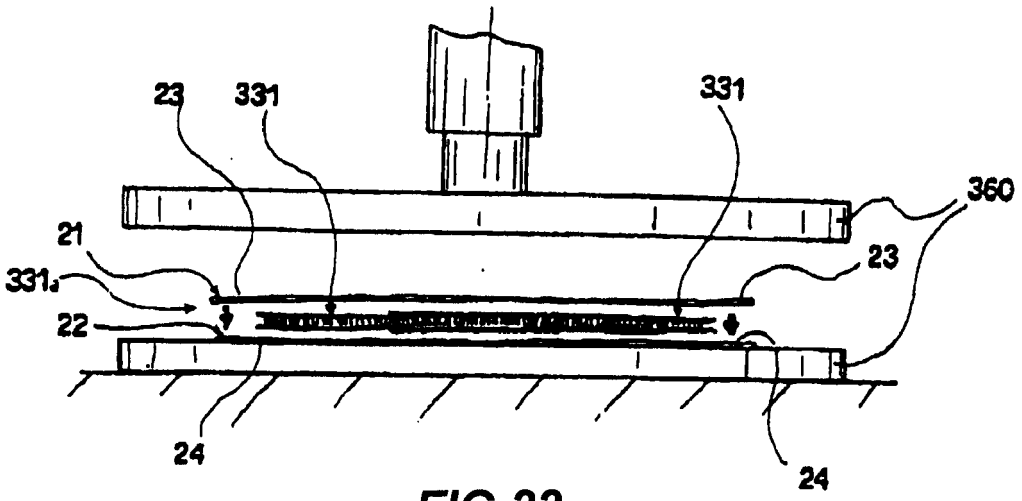

FIG.22

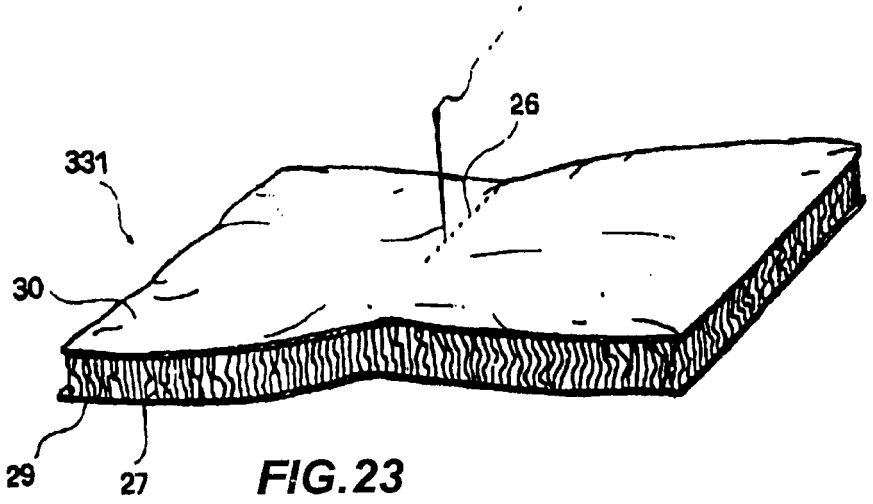

FIG.23

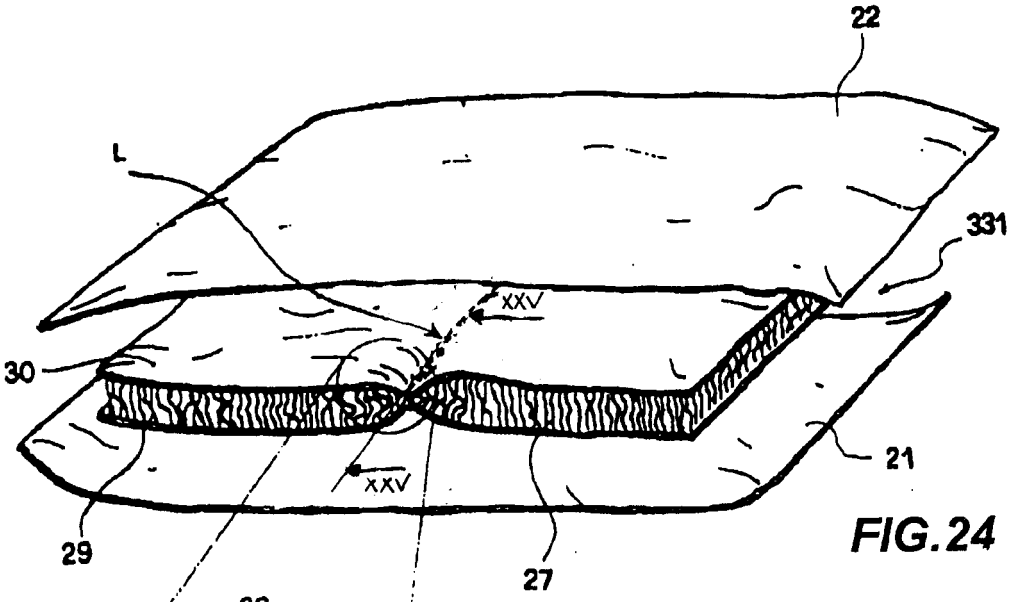

FIG.24

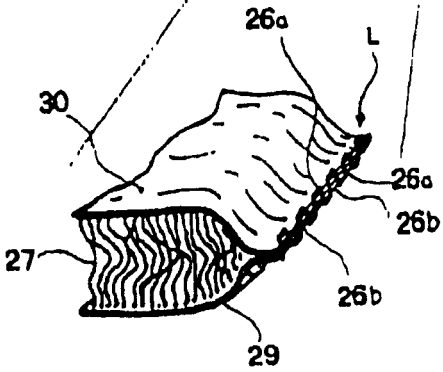

FIG.25

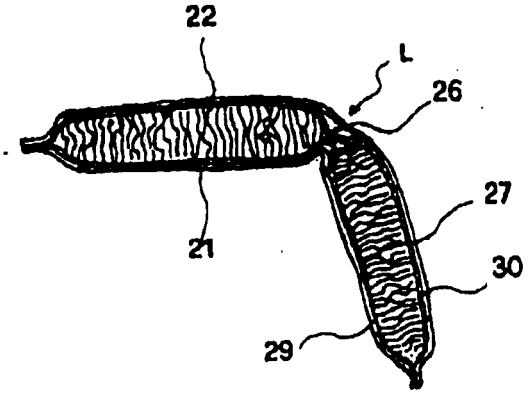

FIG.26

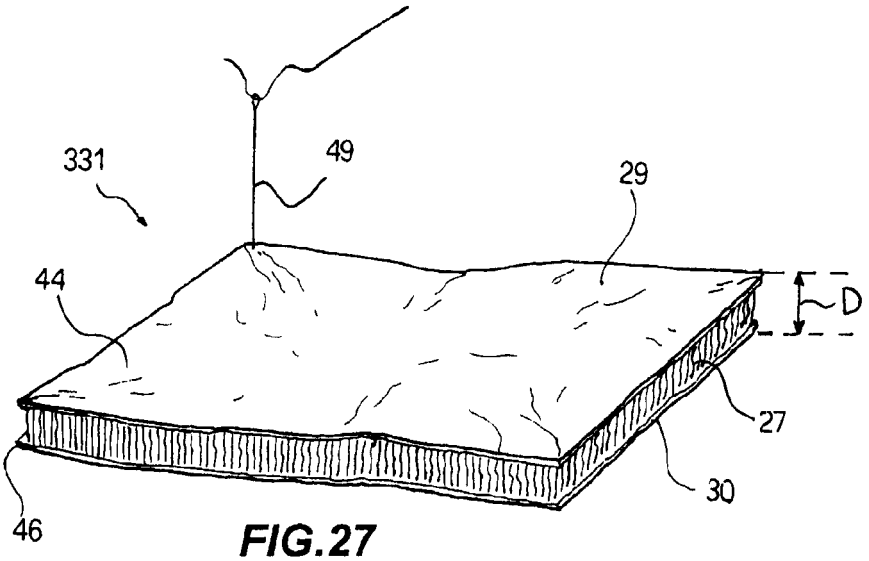

FIG.27

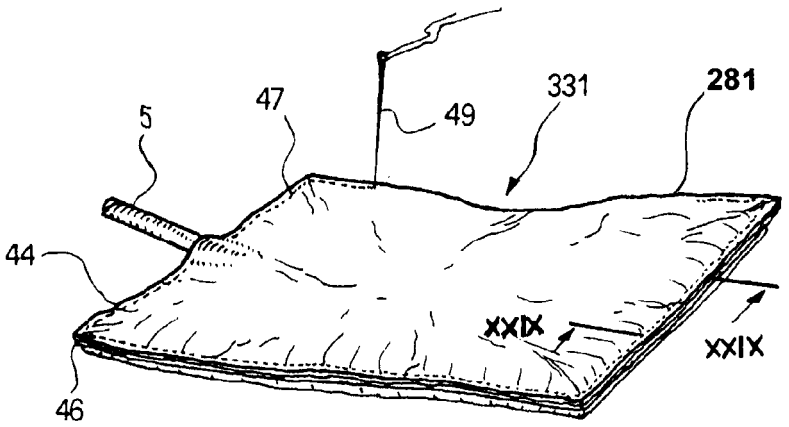

FIG.28

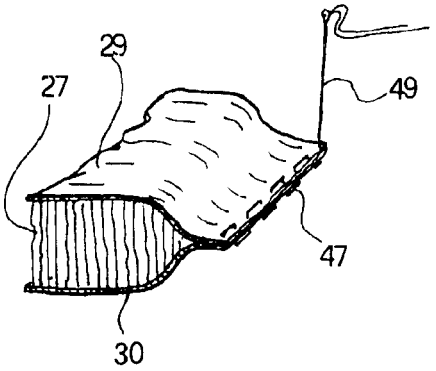

FIG.29

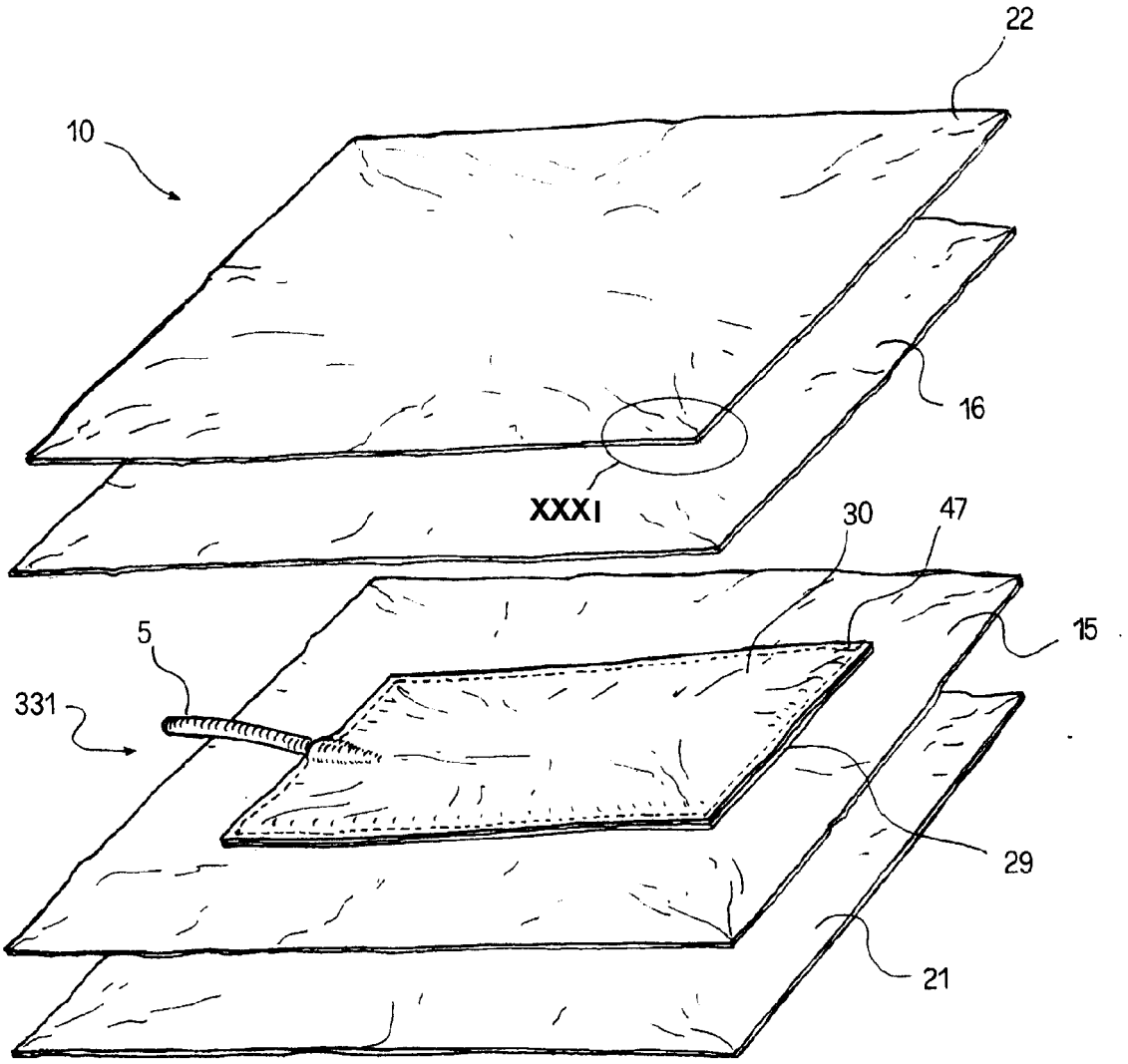

FIG.30

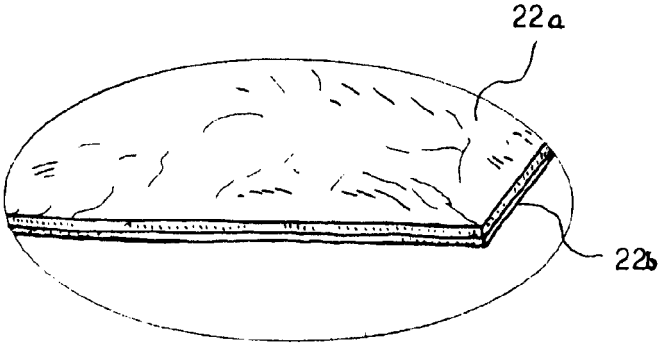

FIG.31

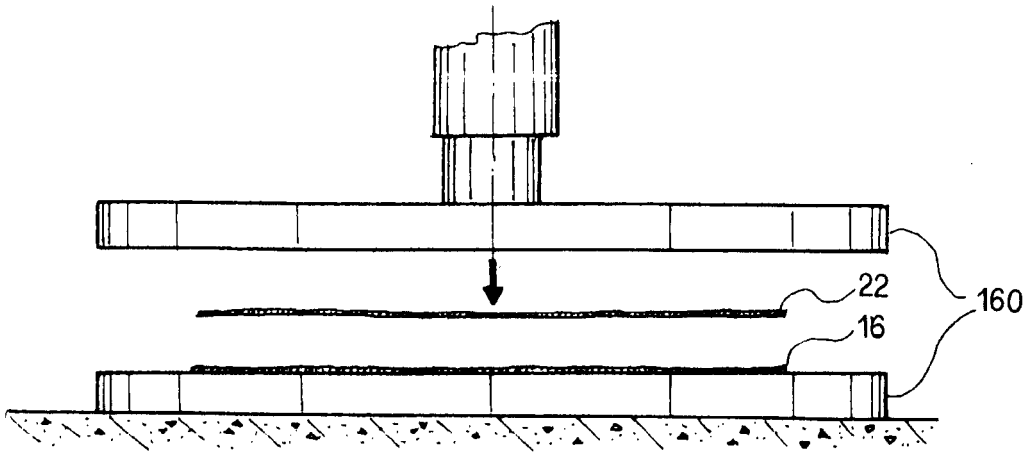

FIG.32

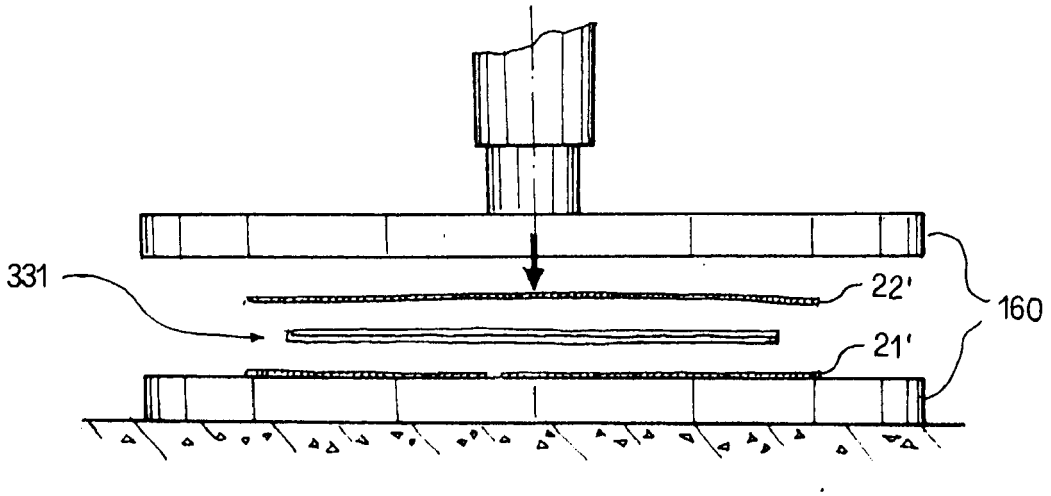

FIG.33