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(72) Inventor: **Bulian, Enrico**
36067 San Giuseppe di Cassola (Vincenza) (IT)

(74) Representative: **Riccardi, Elisa et al**
Porta, Checcacci & Associati S.p.A.
Via Trebbia, 20
20135 Milano (IT)

(71) Applicant: **Campagnolo Sportswear S.r.l.**
36100 Vincenza (IT)

(54) **Protection for cycling pants**

(57) The invention concerns a protection (4) for cycling pants comprising both a first deformable solid material (13), selected from the group comprised of foam and elastomers and a second flowable material (14), selected from the group comprised of a gas, a liquid and a gel. A protection is also described wherein, at least in a region thereof, the thickness of the protection comprises

a first flowable material housed in a first chamber made of an impermeable yielding material and a second yielding flowable material housed in a second chamber made of an impermeable yielding material. In case of puncture of the protection and leakage of the flowable material (14), the protection preserves a notable efficiency due to the presence of the deformable solid material (13) or of the flowable material present in the other chamber.

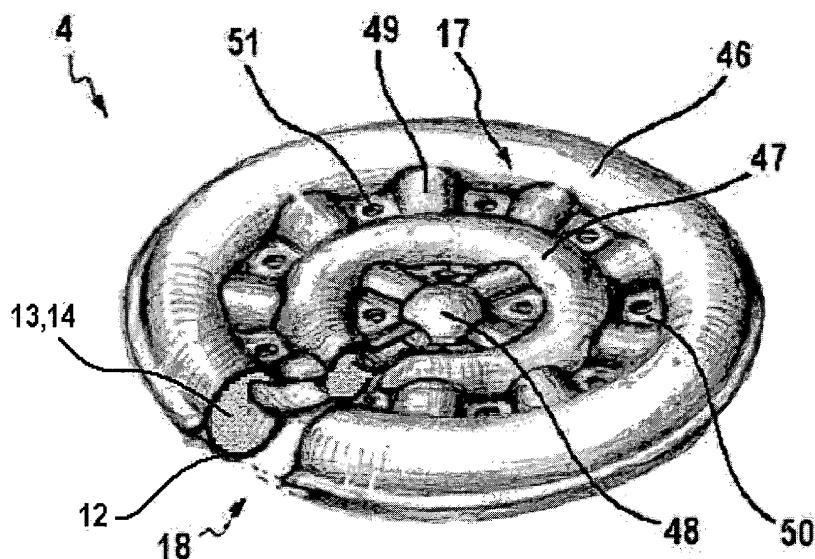


Fig. 13

Description

[0001] The present invention concerns a protection for cycling pants, as well as cycling pants that comprise such a protection.

[0002] In the present description and in the attached claims, under the term "cycling pants", any garment such as shorts, long pants, bibs and tights for bicycles, exercise bikes and gym equipment for spinning are meant.

[0003] The seating surface on a bicycle must be kept small both transversally and parallel to the median plane of the bicycle, in order to contain the weight and transversal size of the bicycle and, above all, to allow the legs to make a pedaling motion. The bicycle saddle therefore has essentially the shape of a narrow isosceles triangle in a plan view.

[0004] Abutment on the saddle, rubbing against it caused by the movement of the legs during pedaling and local overheating, as well as impacts, vibrations and shakes due to unevenness of the ground or in the case of a fall, cause various problems and inconveniences, especially during prolonged or competitive use of the bicycle. Unfortunately, there are common problems both at skin level and at muscular level, such as the formation of blisters, sores, irritations, ulcerations, corns, traumas and micro traumas, bruises and wounds and even blood circulation problems and prostate problems.

[0005] In order to protect the body region that suffers from such problems, cycling pants foresee a seat pad made of a material that has suitable characteristics, namely that is soft, hygienic, resistant to skin pH, breathable, anallergic, anti-bacterial, elastic and heat-regulating.

[0006] In the present description and in the attached claims, under the term "seat pad", an insert or reinforcement extending around the crotch of the pants is meant. The shape of a seat pad is essentially that of a pear or a double lobe.

[0007] Among the materials commonly used for the seat pad, natural or synthetic fabric, mesh, knitted fabric, microfibre or animal hides may be cited.

[0008] In the most recent seat pads, the aforementioned material is present in a double layer coupled with a padding.

[0009] In known seat pads, the padding is essentially uniform, of a size and shape such as to be positioned between the cyclist and the entire bicycle saddle.

[0010] European patent application N. 05425107.9, still unpublished at the date of the first filing of the present application, describes a protection for cycling pants comprising a pair of paddings, each having a peripheral region with a greater thickness than a central region, said peripheral region being suitable for centering around an ischiatic tuberosity.

[0011] Concerning the material, foam paddings, for example PVC, polyurethane, polyester as MTP (molto-prene), are known. The Applicant has however recognized that, owing to use and washing of the pants, the

material of these paddings slowly loses its inherent elastic characteristics.

[0012] Paddings filled with liquid, for example silicon, oil and mixtures thereof, flowable in bags formed, for example by heat-sealing, between two impermeable layers of the seat pad, are also known, e.g. from document U.S. 4,945,571.

[0013] Paddings filled with liquid perform better than the foam ones because they accompany the movement of the legs during pedaling, thus increasing their contact surface with the cyclist. They also better absorb not only the forces perpendicular to the abutment surface of the cyclist, but also the shear stresses.

[0014] The Applicant has recognized that paddings filled with liquid, or gas, have the drawback that the pressure of the filling fluid can decrease owing to the deformation of the bags, or that the liquid can even escape from puncture in the bags, with the consequent loss of efficiency of the protection.

[0015] With the purpose to solve the above mentioned drawback, according to the invention a protection for a cycling pants is provided, comprising both a first deformable solid material selected from the group comprised of foam and elastomers, and a second flowable material.

[0016] With such a protection, in case of breakage of the sheath of impermeable material containing the flowable material, the protection of the invention preserves a notable efficiency because of the presence of the deformable solid material.

[0017] The two materials can be present in different, properly arranged regions of the protection, for example one at the ischiatic tuberosities of the cyclist and the other around them.

[0018] In this way it is also possible to optimize the protection in relation to each area of abutment of the cyclist, by selecting the type of material for the padding which provides the most suitable softness characteristic.

[0019] However, preferably in at least one region of the protection both said first and second materials are present.

[0020] The joined presence of the two materials, especially in the most critical areas of the cyclist abutment on the saddle, allows to exploit the better protective characteristics of the second material, still having at disposal at least the first material even when the second material escapes because of a breakage of the protection.

[0021] More preferably, in said at least one region of the protection, both said first and second materials are housed in a common chamber of an impermeable yielding material.

[0022] In a first embodiment, in said common chamber, said first and second materials interpenetrate.

[0023] In a second embodiment, in said common chamber, said first and second materials do not interpenetrate.

[0024] In this case, preferably said second material forms a layer around said first material.

[0025] In this way, the first material actively intervenes

just in case of leakage of the second material, but a smaller amount of the second material is necessary, reducing damages or inconveniences to the cyclist in case of leakage especially when it is a liquid or a gel.

[0026] Alternatively, in said at least one region of the protection, said first and second materials can be housed in overlapped chambers of an impermeable yielding material, preferably the second material in a proximal chamber and the first material in a distal chamber.

[0027] In the present description and in the appended claims, the terms proximal and respectively distal are used in a wider sense with reference to the protection, to indicate the surface facing towards the human body, and the external surface, facing towards the saddle of the bicycle when the cyclist is positioned, respectively.

[0028] When in at least one region of the protection both said first and second materials are present, the protection according to the invention can comprise at least one second region wherein only one of said first material and said second material is present.

[0029] Preferably, said first material is the polyester moltoprene (MTP).

[0030] The first material can be self-contained or can be loose, for example in the form of little pieces, granulates, pellets, chips or similar.

[0031] Preferably, moreover, when the first material is a foam material, its density ranges between about 10 kg/m³ and about 100 kg/m³, preferably is of about 60 kg/m³.

[0032] When the first material is an elastomer, its compressive elastic modulus is preferably less than 5 MPa.

[0033] Preferably the second flowable material is selected from the group comprised of a gas, a liquid and a gel and more preferably, said second material comprises air. The air or other gas preferably has a pressure up to 1,5 bar.

[0034] Especially in the case in which the two materials are both housed in a common chamber, the air provides a proper protection without added costs.

[0035] Preferably, the protection comprises a pair of paddings, each having a peripheral region with a greater thickness than a central region, said peripheral region being suitable for centering around an ischiatic tuberosity.

[0036] Such protection configuration provides for suitable support and protection of the human body and simultaneously retains a good adherence and balance with the saddle of the bicycle. In fact, the skeleton rests upon the ischiatic bones. When the seating surface is sufficiently large, such as a chair, the human body rests upon a much larger extent, that of the gluteal muscles. Therefore the weight is not relieved (just) on the ischiatic tuberosities, but around them. A high abutment stability follows and also a protection of the thin layer of skin at the ischiatic tuberosities. On the other hand, the human body is not suitable for sitting on a limited surface, as a bicycle saddle is. The above particular configuration of the protection restores the natural seating condition since

the padding adapts to the convex shape of the glutei in the region of the ischiatic tuberosities, increasing the contact surface with the cyclist with respect to a flat padding and therefore improving the cyclist's balance in seated position.

[0037] Moreover, with such preferred configuration a sufficient surface without padding is left, for a good transpiration.

[0038] In an embodiment, each padding comprises a single toroidal element, in other words the central region is hollow. This embodiment is particularly simple and allows a remarkable aeration, thus reducing the problems resulting from excessive perspiration.

[0039] Preferably, however, the material of each padding is also present in the central region.

[0040] In a first variant, the peripheral region of each padding is softer and more deformable than the central region. The protection in such a way becomes analogous to the muscle-adipose mass of the glutei at the ischiatic tuberosities, thus providing a highly anatomic abutment.

[0041] In a second variant, the softness of the central and peripheral regions is selected so that the counter-pressure applied on the cyclist is essentially the same for the entire extent of the padding. In this way a uniform distribution of the cyclist's weight in the entire area of the padding is obtained.

[0042] In a third variant, finally, the peripheral region of each padding is less soft and deformable than the central region and allows a greater cyclist's weight to be relieved exactly in such a peripheral region.

[0043] The change in softness between the peripheral region and the central region can also be achieved, with a same thickness of the peripheral region and of the central region, by a different pressure of the flowable material or by the use of different materials among the flowable material, the deformable solid material and their combination, or also by a combination of difference in thickness and in pressure of the flowable material or by a combination of thickness difference and use of different materials among the flowable material, the deformable solid material and their combination.

[0044] In particular, in each padding, the peripheral region can comprise both said first and second materials and the central region can comprise only said second material.

[0045] Alternatively, in each padding, the peripheral region can comprise only said first material and the central region can comprise only said second material or vice versa.

[0046] Advantageously, in each padding aeration paths are made.

[0047] Advantageously, each padding has a proximal surface with a concave envelope contour, which adapts to the convex shape of the glutei in the region of the ischiatic tuberosities and around them, increasing the contact surface with the cyclist with respect to a padding having a flat proximal surface and therefore improving the balance of the cyclist in seated position.

[0048] The distal surface of each padding can have a concave envelope contour, flat envelope contour or convex envelope contour with a greater radius of curvature than the proximal surface, in such a way increasing the contact surface with the saddle.

[0049] In a particularly preferred way, each padding has a concentric configuration, the concentric elements of the configuration having decreasing thickness towards the centre.

[0050] Such a concentric configuration of rings gives an overall concave shape to each padding, which is well adapted to support the ischiatic bone in an analogous way to the gluteal muscle.

[0051] In an embodiment, each concentric element comprises a single toroidal or circular element.

[0052] The aeration paths comprise at least one through hole, and preferably at least four equally distributed through holes.

[0053] Alternatively or in addition, the toroidal elements are arranged with an aeration clearance between adjacent concentric rings, possibly joined by crosspieces.

[0054] In a different embodiment, at least one intermediate concentric ring comprises a plurality of toroidal elements externally tangent to each other.

[0055] The aeration paths then comprise the gaps between the various toroidal elements, so that it is not necessary to make the aeration channels, although they may still be provided.

[0056] Each padding is preferably made from an impermeable yielding material shaped like at least one bag or circuit.

[0057] Advantageously, said at least one bag is equipped with a filling valve removably connectable to a small inflater. With such a provision, the cyclist can control the pressure of the flowable material, based upon his/her own anatomy and upon whether he/she is amateur or professional, in the first case favoring comfort and in the second case favoring adherence to the saddle.

[0058] When each padding foresees a plurality of concentric elements, the bags consisting of at least two adjacent concentric elements can be in communication, to allow even higher conformability to the body of the individual cyclist, through the passage of the second flowable material between one concentric element and the other.

[0059] Advantageously, in the padding at least two distinct bags are made, one consisting of the peripheral region and one consisting of the central region, each possibly having a respective filling valve. In such a way, it is possible to independently inflate or deflate the peripheral region and the central region of the padding, to shape it optimally for the individual cyclist.

[0060] The corresponding bags of the two paddings provided in a pair of pants can be connected together so as to facilitate a symmetrical pressure of the protection, also during the inflation step.

[0061] Preferably each padding has a transversal size from 4 to 10 cm, more preferably in the order of 6 cm.

[0062] In the various embodiments, the thickness of each padding ranges from about 10 mm in the peripheral region to about 4 mm in the central region.

[0063] Each padding is essentially circular.

5 **[0064]** Alternatively, each padding can be elongate, for example essentially elliptical, the larger dimensions being essentially parallel.

10 **[0065]** In a particularly advantageous embodiment, each padding comprises concentric elements spaced from each other and connected to each other by a plurality of crosspieces.

[0066] Preferably the crosspieces form passages for the second flowable material.

15 **[0067]** Preferably, moreover, in the spaces between the crosspieces, two layers of sheath of said concentric elements are adjacent to each other, in said spaces a plurality of aeration holes being made.

20 **[0068]** Preferably, the protection according to the invention comprises a third padding arranged centrally advanced with respect to the pair of paddings, to provide protection to the cyclist's genital region.

[0069] Preferably, the third padding is softer than the two paddings of the pair.

25 **[0070]** The third padding can also have an overall concave shape and a differentiated softness.

[0071] Advantageously, the peripheral regions of the three paddings merge.

[0072] The various paddings of the protection can be directly associated with the cycling pants.

30 **[0073]** Preferably, however, the protection according to the invention comprises at least one of a proximal seat pad layer and a distal seat pad layer with which they are associated.

35 **[0074]** Advantageously, said at least one seat pad layer is made of a material that is soft, hygienic, resistant to skin pH, transpirable, anallergic, anti-bacterial and/or heat-regulating.

[0075] Said at least one seat pad layer can, for example, be made from natural or synthetic fabric, mesh, knitted fabric, microfibre or animal hides.

40 **[0076]** The two paddings are arranged at an interaxis distance of 8 cm, 10 cm or 6 cm, respectively in a men's version, in a women's version and in a child's version. Such sizes represent the average values of the distance between the ischiatic tuberosities in men, women and children.

[0077] Each padding is preferably removable, for example being housed in an openable pocket of the protection, of the seat pad or of the pants.

50 **[0078]** According to an advantageous aspect of the present invention, the two paddings have an adjustable interaxis distance to adapt to the individual cyclist.

[0079] In an embodiment, the adjustable interaxis distance is obtained through elastic fastening or through a fixing system of the hooks and loops type (VELCRO™) of each padding to said at least one seat pad layer or to the cycling pants.

[0080] In an alternative embodiment, the adjustable in-

teraxis distance is obtained through a pair of pockets formed between the distal seat pad layer and the proximal seat pad layer, or respectively in the cycling pants, each pocket being oversized with respect to a padding, so as to house it with clearance. The provision of pockets that are oversized with respect to the paddings allows them to be moved to position them at the ischium of the individual cyclist. Once correctly positioned, their position can be fixed, for example through sewing.

[0081] In another embodiment, the adjustable interaxis distance is obtained through a device comprising two splines made from a semi-rigid material having a knurled slot, and a pin with disc-shaped heads movable with friction between the overlapping knurled slots. The pin with disc-shaped heads can be free or fixed to the pants or to said at least one seat pad layer.

[0082] Preferably, the two splines extend in converging, essentially radial directions from the two paddings and have a fold that forms two overlapping portions in which the knurled slots are made. In such a way, the pin with disc-shaped heads can be transported into an area of the pants not in contact with the saddle, for example approximately at the height of the waist.

[0083] In a second aspect thereof, the invention concerns a protection for cycling pants, comprising a first flowable material housed in a first chamber of an impermeable yielding material, characterized in that in at least one region thereof, the protection thickness comprises said first chamber and a second flowable material housed in a second chamber of an impermeable yielding material.

[0084] Also in this way, in the case of breakage of the impermeable yielding material at one of the two chambers, the protection preserves a notable efficiency thanks to the presence of the flowable material contained in the other of the two chambers.

[0085] The second chamber can be internal to the first chamber or the two chambers can be overlapped.

[0086] The second flowable material can be equal to or different from the first flowable material, and preferred materials and configurations of the protection are as indicated above.

[0087] In a third aspect thereof, the invention concerns cycling pants comprising a protection as indicated above.

[0088] Characteristics and advantages of the invention shall now be illustrated with reference to embodiments represented as a non-limiting example in the attached drawings, wherein:

- Fig. 1 shows cycling pants according to the invention,
- Fig. 2 shows a partial exploded view of the pants of Fig. 1.
- Fig. 3 shows the pants of Fig. 1 in use,
- Figs. 4 and 5 show a first embodiment of a pair of paddings of the protection according to the invention,

- Figs. 6 and 7 illustrate variants of the embodiment of Figs. 4 and 5,
- Figs. 8-10 show a second embodiment of a padding of the protection according to the invention,
- Figs. 11 and 12 show a third embodiment of a padding of the protection according to the invention,
- Fig. 13 shows a fourth embodiment of a padding of the protection according to the invention,
- Figs. 14 to 17 show other embodiments of a padding of the protection according to the invention,
- Fig. 18 shows another embodiment of a protection according to the invention, having a single padding,
- Fig. 19 shows an embodiment of the protection according to the invention comprising a third padding,
- Fig. 20 shows another embodiment of the protection according to the invention comprising a third padding,
- Fig. 21 shows an alternative embodiment of arrangement of materials within the protection according to the invention,
- Fig. 22 shows another alternative embodiment of arrangement of materials within the protection according to the invention,
- Fig. 23 shows another alternative embodiment of arrangement of materials within the protection according to the invention,
- Fig. 24 shows still another embodiment of a padding of the protection according to the invention,
- Fig. 25 shows still another embodiment of a padding of the protection according to the invention,
- Fig. 26 shows an embodiment of a protection with a pair of removable paddings and if necessary with adjustable interaxis distance, and
- Fig. 27 shows an embodiment of a pair of paddings of the protection according to the invention, with adjustable interaxis distance.

[0089] Cycling pants 1, represented in Fig. 1 of the short type just for illustrative purposes, and made, for example, from LYCRA™, or another elastomer, comprise a seat pad 2 and a protection 3, associated with the seat pad 2, having in the shown embodiment two distinct paddings 4.

[0090] The seat pad 2, as can be seen more clearly in

Fig. 2, forms a reinforcement applied inside the pants 1, extending around the crotch 5 of the pants 1, and is essentially pear shaped or double-lobe shaped.

[0091] As an alternative to the arrangement of Fig. 2, the seat pad 2 can be applied outside the pants 1 or else can form an insert in the material of the pants 1, in other words the material of the pants 1 shall have a hole with a shape matching that of the seat pad 2.

[0092] The seat pad 2 comprises an upper or proximal layer 6 and a lower or distal layer 7, coupled with the pants 1 through sewing, gluing, ultrasound welding or high-frequency welding along the periphery of the seat pad 2.

[0093] The seat pad 2 can, however, comprise just one of the proximal and distal layers 6, 7.

[0094] The seat pad 2 can also be missing, the protection 3 or its pair of paddings 4 being coupled directly with the material of the pants 1 for example through sewing, gluing, ultrasound welding or high-frequency welding or by making two closed pockets, as illustrated in fig. 24 described hereafter.

[0095] The seat pad 2 is made from a material that has suitable characteristics to protect the body region affected by the various problems mentioned above, namely that is elastic, soft, hygienic, resistant to skin pH, transpirable, anallergic, anti-bacterial and/or heat-regulating.

[0096] Suitable materials comprise natural or synthetic fabric, mesh, knitted fabric, microfibre or animal hides.

[0097] The two paddings 4 are circular, with a diameter of about 6 cm, and are arranged at an interaxis distance of 8 cm, 10 cm or 6 cm, respectively in a men's version, a women's version and a child's version of the pants 1.

[0098] The outer diameter of the padding 4 can be less or more than 6 cm, up to about 8 cm in the men's version, up to 10 cm in the women's version and up to about 4 cm in the child's version.

[0099] Therefore, the paddings 4 of the protection 3 amount to a much smaller extent than that of the entire seat pad 2, thus leaving a large surface free of padding, suitable for transpiration and that increases adherence and balance on the saddle.

[0100] Each padding 4 can alternatively be elongate, for example essentially elliptical, the larger dimensions being essentially parallel, in other words extending in the direction of the crotch 5 of the pants 1.

[0101] As illustrated in Fig. 3, the paddings 4 of the protection 3 are arranged at the ischiatic tuberosities T of the cyclist, in other words at the actual abutment point of the skeleton on the saddle S.

[0102] Figs. 4 and 5 illustrate a first embodiment of a padding 4 of the protection 3 according to the invention.

[0103] The padding 4 comprises four concentric elements 8-11, of which three toroidal elements 8-10 and one innermost circular element 11, which could alternatively be also toroidal. The concentric elements 8-11 are formed by an impermeable and deformable sheath 12, for example in PVC, made as a bag.

[0104] In the inner chambers formed by the sheath 12

a first deformable solid material 13 is arranged, preferably selected from the group comprised of foam materials as polyester, polyurethane and PVC and elastomers as silicon, latex and rubbers as neoprene rubber, the polyester moltoprene (MTP) being particularly preferred. Such first material can be self-contained or can be loose, for example in the form of little pieces, granulates, pellets, chips or similar.

[0105] Preferably, when the first material is a foam material, its density ranges between about 10 kg/m³ and about 100 kg/m³, preferably is of about 60 kg/m³.

[0106] When the first material is an elastomer, its compressive elastic modulus is preferably less than 5 MPa.

[0107] In the inner chambers formed by the sheath 12 a second flowable material 14 is also arranged, which can be a liquid, for example water, oil as silicone oil and mixtures thereof, a gel, or a gas, preferably simply air.

[0108] When the second flowable material 14 is air or other gas, it preferably has a pressure up to 1,5 bar.

[0109] The two materials interpenetrate and fill together the inner chambers formed by the sheath 12 contacting the inner walls thereof, namely the first deformable solid material 13 is permeable to the second material 14, air or other flowable material, and is inflated thereby.

[0110] The diameter of the section of the concentric elements 8-11 is decreasing from the outermost toroidal element 8 to the innermost circular element 11.

[0111] In a first solution, the pressure of the second material 14 can be the same for all of the concentric elements 8-11. In this way, since the counter-pressure applied by the concentric elements 8-11 is an inverse function of the diameter of the section of the concentric elements themselves, the peripheral region of the padding 4 is softer and more deformable than the central region, and becomes analogous to the muscle-adipose mass of the glutei at the ischiatic tuberosities, thus providing a highly ergonomic support.

[0112] In a second solution, the pressure of the second material 14 in the toroidal elements 8-11 can be adjusted so that the counter-pressure applied by the concentric elements 8-11 themselves is essentially the same for the entire extent of the padding 4. In this way a uniform distribution of the cyclist's weight in the entire area of the padding 4 is obtained.

[0113] In a third solution, finally, the pressure of the second material 14 in the concentric elements 8-11 can be adjusted so that the counter-pressure applied by the concentric elements 8-11 themselves is greater in the peripheral region with respect to that of the central region of the padding 4 that, therefore, is harder in the peripheral region and allows a greater cyclist's weight to be relieved exactly in such a peripheral region.

[0114] The possibility of changing the pressure of the padding 4 uniformly or independently in the peripheral and central regions of the padding 4 allows the padding 4 itself to be adapted to the needs of the individual cyclist.

[0115] More specifically, the inside of the padding 4 comprises an outer bag made of the two outermost toroi-

dal elements 8 and 9, joined by at least one passage 15, and an inner bag consisting of the penultimate toroidal element 10, each bag being preferably equipped with a respective filling and pressure adjustment valve 16. The inner circular element 11, on the other hand, lacks a valve because of its small size.

[0116] The valves 16 are removably connected to a small inflator P, in order to allow adjusting the pressure of the padding 4 to the needs of the individual cyclist, based on his/her anatomy and to whether he/she is amateur or professional.

[0117] A small tube (not shown) can also be provided from the toroidal element 10 to displace the relative valve 16 at the periphery of the padding 4.

[0118] The padding 4 can be divided into three or more bags or circuits for the liquid or gas or gel, or a single bag can be provided. The corresponding bags of the two paddings 4 can be connected to each other so as to favor a symmetric inflation thereof (see as an example Fig. 20 later described).

[0119] The concentric elements 8-11, having a decreasing diameter of the section as stated, are arranged asymmetrically about the median plane of the padding 4, so as to create a proximal surface 17 of the padding 4 having a concave envelope contour.

[0120] Such a concave shape of the paddings 4 adapts to the convex shape of the glutei in the region of the ischiatic tuberosities, thus increasing the contact surface with the cyclist with respect to a padding having a flat proximal surface and thus improving the cyclist's balance in seated position.

[0121] In fig. 5, the envelope contour of the distal surface 18 of the padding 4 is flat.

[0122] According to variants of the padding 4, the concentric elements 8-11 are arranged so as to create a distal surface 18 having an envelope contour that is convex according to a greater radius of curvature than the concavity of the proximal surface 17 (Fig.6) or even concave (Fig. 7), to increase the contact surface with the saddle S. In Figs. 6 and 7, valves 16 and the passage/s 15 are omitted for simplicity.

[0123] In all three cases, the padding 4 has overall the above mentioned anatomic shape.

[0124] The padding 4 according to the embodiment illustrated in figs. 8-10 also comprises a concentric arrangement of toroidal elements 19-26 and more specifically an outer toroidal element 19, an inner toroidal element 26 and six toroidal elements 20-25 as arranged in a ring between the outer toroidal element 19 and the inner toroidal element 26.

[0125] Also in this case, the diameters of the section of the toroidal elements 19, 20-25 and 26 are selected so as to create a proximal surface 17 of the padding 4 having a concave envelope contour and a distal surface 18 that is convex (Fig. 10) or else that is flat or concave in an analogous way to Figs. 6 and 7.

[0126] In the embodiment of Figs. 8-10, the diameters of the section of the toroidal elements 20-25 and 26 are

the same, but the toroidal element of the inner concentric ring 26 could have a smaller diameter of the section.

[0127] Also in this case, the thickness of the peripheral region is greater than the central region of the padding 4 and therefore, pressure and material being equal, the peripheral region is softer, in an analogous way to the muscle-adipose mass of the glutei at the ischiatic tuberosities.

[0128] A proper transpiration is provided by the hollow spaces inside each toroidal element 19-26 and by the essentially triangular spaces that are formed between the toroidal elements 19, 20-25 and 26.

[0129] The toroidal elements 20-26 could however alternatively be circular.

[0130] Also in the case of the embodiment of figs. 8-10, one or more bags can be provided, joining the inner spaces of some of the toroidal elements 19-26. Each bag can also be equipped with a respective pressure adjustment valve, not shown for simplifying.

[0131] The padding 4 according to the embodiment illustrated in figs. 11-12 also comprises a concentric arrangement of toroidal elements 27-45 and more specifically, from the outside to the inside, an outer toroidal element 27, a concentric ring consisting of ten toroidal elements 28-37 (the toroidal elements 30 and 31 are omitted in fig. 11), a concentric ring consisting of five toroidal elements 38-42, and a concentric ring consisting of three toroidal elements 43-45.

[0132] The diameters of the section of the toroidal elements of the various concentric rings decrease from the outside towards the inside, so as to create a proximal surface 17 of the padding 4 having a concave envelope contour.

[0133] The distal surface 18 is shown with a flat envelope contour in fig. 12, so that the thickness of the peripheral region is greater than the central region of the padding 4, and therefore, pressure and material being equal, the peripheral region is softer.

[0134] Also in the embodiment of Figs. 11-12, the envelope contour of the distal surface 18 could nevertheless be convex or concave with a greater radius of curvature than the proximal surface 17, in an analogous way to Figs. 6 and 7.

[0135] A proper transpiration is provided by the hollow spaces inside each toroidal element 27-45 and by the essentially triangular spaces that are formed between the toroidal elements 27, 28-37, 38-42 and 43-45 of the four concentric rings.

[0136] Some or all of the toroidal elements 28-37, 38-42 and 43-45 could, however, alternatively be circular.

[0137] Also in the case of the embodiment of Figs. 11-12 one or more circuits provided with a respectively filling valve can be provided.

[0138] The padding 4 according to the embodiment shown in Fig. 13 comprises two toroidal elements 46, 47 and one inner circular element 48, that are concentric. The inner element 48 could also be toroidal.

[0139] The diameters of the sections of the three con-

centric elements 46-48 decrease in the order from the external element 46 to the inner element 48, so as to create a proximal surface 17 of the padding 4 having a concave envelope contour.

[0140] The envelope contour of the distal surface 18 could be flat, convex or concave with a radius of curvature greater than the proximal surface 17, analogously to Figs. 5-7.

[0141] The concentric elements 46-48 are spaced from each other and connected to each other by a plurality of crosspieces 49, which advantageously also form paths for the second flowable material 14. All the inner chambers of the sheath 12 of the concentric elements 46-48 are therefore joined to each other by the crosspieces 49.

[0142] The spaces 50 among the crosspieces 49 can be hollow, or, as shown, in such spaces 50 the two layers of the impermeable yielding material constituting the sheath 12 are adjacent to each other, for example heat-sealed. In such a case, advantageously in the spaces 50 a plurality of aeration holes 51 are made. In the embodiment shown there is a hole 51 in each space 50, but there could be present more holes 51 for each space 50 or one or more holes 51 in some of the spaces 50 only.

[0143] Also in the embodiment of Fig. 13 a pressure adjustment valve can be present.

[0144] The number of concentric elements illustrated in the embodiments of the various figures described above should be taken as merely illustrative, it being possible that there is a smaller or greater number of concentric rings and a smaller or greater number of toroidal or circular elements in each concentric ring.

[0145] It should be understood that a single toroidal element with a diameter corresponding to the outer toroidal element 8, 19, 27 or 46 and with the same or a smaller diameter of the section also falls within the scope of the invention.

[0146] Each padding 4 according to the invention can also consist of a single cushion 52 substantially circular, as illustrated in figs. 14-17, or substantially elliptic.

[0147] A plurality of through holes 53 provide for an appropriate aeration.

[0148] In the embodiments of Figs. 14-16, the proximal surface 17 is convex and the distal surface 18 is flat in Fig. 14, it is convex with a radius of curvature greater than that of the proximal surface 17 in Fig. 15 and it is concave in Fig. 16. In all three embodiments, thus, the padding 4 shows the advantageous decrease of thickness from the peripheral region to the central region.

[0149] However, this is not necessary within the scope of the invention. Thus, in Fig. 17 both the proximal surface 17 and the distal surface 18 are flat, and the padding 4 therefore has an essentially constant thickness.

[0150] More generally, it is within the scope of the invention a protection 3 not provided with a pair of paddings 4 as described above, rather with only one padding extended substantially for the entire seat pad, as illustrated in Fig. 18, or having properly arranged padding regions.

[0151] In Fig. 19 for example a seat pad 2 is illustrated with a protection 3 that comprises, in addition to the pair of paddings 4, a third padding 54 arranged centrally advanced with respect to the paddings 4, suitable for providing suitable protection to the genital region of the cyclist, to avoid especially insensibility and sterility problems.

[0152] In the embodiment of protection of Fig. 19, each of the paddings 4 and 54 can be according to any one of the embodiments and variants described above, they being shown as a single cushion just by way of an example.

[0153] Preferably, the third padding 54 is softer than the two paddings 4.

[0154] In Fig. 20 a variant of the protection 3 is illustrated, with a third padding 54 arranged centrally advanced with respect to the paddings 4, wherein the three paddings 4 and 54 are essentially of the concentric elements type, but their outer concentric elements or peripheral regions merge.

[0155] In fig. 20, the sheets of the three peripheral regions of the three paddings 4 and 54 form a single chamber, equipped with a respective filling valve 16 removably connectable to a small inflator P.

[0156] Although not shown, the central regions of the paddings 4, and possibly of the padding 54, could also have a filling valve for each chamber formed in them.

[0157] The third padding 54 of the embodiments of Figs. 19 and 20 can also have an overall concave shape and a differentiated softness as described above with reference to the paddings 4.

[0158] Of course, moreover, the protection 3 of figs. 19 and 20 can also be associated directly with the cycling pants 1, without providing for the seat pad layers 6 and 7.

[0159] Although not shown in figs. 19 and 20, it should be manifest that also in such a protection 3, a suitable number of through holes shall be provided for transpiration.

[0160] Alternatively to what stated above, the first deformable solid material 13 and the second flowable material 14 can not interpenetrate, as shown in Fig. 21 that, merely as an example, is referred to the configuration with four concentric elements of Figs. 4 and 5. Although not shown in Fig. 21, it is understood that there may be the passages 15 for air or other second flowable material 14 between adjacent concentric elements, and one or more valves 16 for adjusting the pressure of the second material 14.

[0161] In the case of materials 13, 14 not interpenetrated, i.e. when the first deformable solid material 13 is essentially impermeable to the second flowable material 14, preferably the second material 14 forms a layer around the first material 13, as shown in Fig. 21.

[0162] In this way, even there being both materials 13, 14 in a same region of the protection 3, the first material 13 actively intervenes only in case of a leakage of the second material 14, but a smaller amount of the second material 14 is necessary, thus reducing the damages or inconveniences to the cyclist in case of a leakage espe-

cially when it is a liquid or gel.

[0163] According to a further alternative, the first deformable solid material 13 and the second flowable material 14 can be housed in distinct and overlapped chambers made in the bag/s of impermeable yielding material 12, as shown in Fig. 22 that, merely as an example, is referred to the configuration as a single cushion 52 of Fig. 14.

[0164] Preferably, as shown in Fig. 22, the second flowable material 14 is housed in a proximal chamber 121 and the first deformable solid material 13 is housed in a distal chamber 122.

[0165] Also in this case, even there being both materials 13, 14 in a same region of the protection 3, the first material 13 actively intervenes only in case of leakage of the second material 14.

[0166] According to a further alternative, in some of the regions of the protection 3 and in particular of the individual paddings 4 there are both the first deformable solid material 13 and the second flowable material 14, while in other regions of the protection 3 and in particular of the individual paddings 4 there is only one of the two materials 13 or 14.

[0167] By way of an example, in Fig. 23 a padding 4 is shown having the configuration of four concentric elements of figures 4 and 5, where the passages 15 for the air and the valves 16 are omitted. In the padding 4 of Fig. 23, in the peripheral region comprised of the outer toroidal element 8 there are both materials 13 e 14, while in the other concentric elements 9-11 there is only the second flowable material 14, preferably air. In this way, in case of leakage of the air or other flowable material 14, there still is a proper protection around the ischiatic tuberosities of the cyclist, provided by the deformable solid material 13 present in the outer toroidal element 8.

[0168] The first and second materials 13, 14 could however be present only in different regions of the protection 3 and in particular of the individual paddings 4, for example with reference to Fig. 23, in the peripheral region formed by the outer toroidal element 8 there could be only material 13, while in the other concentric elements 9-11 there is only the second flowable material 14, or vice versa.

[0169] According to a further alternative, in some of the regions of the protection 3 and in particular of the individual paddings 4, there are two different chambers formed from the sheath material 12 and both containing a fluid material 14, not necessarily the same. The two chambers can be one inside the other or overlapped, so that both contribute to the thickness of the protection 3 and in particular of the padding 4.

[0170] By way of an example, Fig. 24 shows a padding 4 having the configuration of four concentric elements of figures 4 and 5, wherein the passages 15 for the air and the valves 16 are omitted. In each concentric element 8-11 an outer chamber 123 and an inner chamber 124 are defined, each containing a fluid material 14.

[0171] Again by way of an example, Fig. 25 shows a

padding 4 having the configuration of a single cushion 52 with a double chamber of Fig. 22. Both in the proximal chamber 121 and in the distal chamber 122 a flowable material 14 is contained.

[0172] In the above mentioned embodiments, in case of breakage of the impermeable yielding material 12 at one of the two chambers 121, 122 or 123, the protection preserves a notable efficiency thanks to the presence of the flowable material 14 contained in the other of the two chambers 121, 122 or 124.

[0173] When in the protection 3 according to the invention there are the two paddings 4, they are preferably removable, so they can be replaced in case of excessive loss of pressure or leakage of the second flowable material 14. This can be easily obtained by providing a fastening thereof to the seat pad 2 or to the cycling pants 1 for example through a fixing system with loops and hooks of the VELCRO™ type or by providing two pockets 55 in the seat pad 2 or in the pants 1, as shown in Fig. 26.

[0174] If the pockets 55 are oversized with respect to the paddings 4, the interaxis distance between the two paddings 4 also is advantageously adjustable to adapt the protection 3 to the individual cyclist.

[0175] Thanks in particular to the concave configuration of the proximal surface 17 of the paddings 4, they shall automatically centre under the ischiatic tuberosities when the pants 1 are worn.

[0176] Alternatively, Fig. 27 illustrates a device 56 for adjusting the interaxis distance between the two paddings 4, to adapt the protection 3 to the individual cyclist. Such an adjustment device 56 comprises two splines 57 made of a semi-rigid material and having a knurled slot 58, and a pin with disc-shaped heads 59 movable with friction between the overlapping knurled slots 58. The pin with disc-shaped heads 59 can be loose or fixed to the pants 1 or to the seat pad 2.

[0177] More specifically, the two splines 57 extend in converging, essentially radial directions from the two paddings 4 and have a fold 60 that forms two overlapping portions in which the knurled slots 58 are made. In such a way, the pin with disc-shaped heads 59 can be transferred into an area of the pants 1 not in contact with the saddle, for example approximately at the height of the waist.

[0178] In the various embodiments, the thickness of the padding 4 ranges from about 10 mm in the peripheral region to about 4 mm in the central region.

[0179] It is manifest that the invention can be applied not only to bicycles, but also to exercise bikes and gym equipment for spinning.

[0180] A change in softness between the peripheral region and the central region of each padding 4 can also be achieved with the same thickness of the peripheral region and of the central region, using a filling second flowable material at a different pressure or using various combinations of the first deformable solid material 13 and of the second flowable material 14.

[0181] Furthermore, the change in softness between

the peripheral region and the central region can be achieved by a combination of difference in thickness and in pressure or of difference in thickness and in material.

Claims

1. Protection (3) for cycling pants (1) **characterized by** comprising both a first deformable solid material (13), selected from the group comprised of foam and elastomers and a second flowable material (14). 10
2. Protection (3) according to claim 1, **characterized in that** in at least one region of the protection (3), both said first and second material (13, 14) are present. 15
3. Protection (3) according to claim 2, **characterized in that** in said at least one region of the protection (3), both said first and second material (13, 14) are housed in a common chamber made of an impermeable yielding material (12). 20
4. Protection (3) according to claim 3, **characterized in that** in said common chamber, said first and second materials (13, 14) interpenetrate. 25
5. Protection (3) according to claim 3, **characterized in that** in said common chamber, said first and second materials (13, 14) do not interpenetrate. 30
6. Protection (3) according to claim 5, **characterized in that** said second material (14) forms a layer around said first material (13). 35
7. Protection (3) according to claim 2, **characterized in that** in said at least one region of the protection (3), said first and second materials (13, 14) are housed in overlapped chambers of an impermeable yielding material (12). 40
8. Protection (3) according to any of the previous claims 2 to 7, **characterized by** further comprising at least one second region of the protection (3) wherein only one of said first material and said second material (14) is present. 45
9. Protection (3) according to any of the previous claims, **characterized in that** said first material (13) is self-contained. 50
10. Protection (3) according to any of the previous claims, **characterized in that** said first material (13) is loose. 55
11. Protection (3) according to any of the previous claims, **characterized in that** said first material (13) is a foam material having a density ranging between

about 10 kg/m³ and about 100 kg/m³.

12. Protection (3) according to claim 12, **characterized in that** said first material (13) is moltoprene (MTP).
13. Protection (3) according to any of claims 1-10, **characterized in that** said first material is an elastomer having a compressive elastic modulus preferably less than 5 MPa.
14. Protection (3) according to any of the previous claims, **characterized in that** said second flowable material (14) is selected from the group comprised of a gas, a liquid and a gel.
15. Protection (3) according to claim 14, **characterized in that** said second flowable material is a gas of a pressure up to 1,5 bar.
16. Protection (3) according to any of claims 14 or 15, **characterized in that** said second material (14) is air.
17. Protection (3) according to any of the previous claims, **characterized by** comprising a pair of paddings (4), each having a peripheral region with a greater thickness than a central region, said peripheral region being suitable for centering around an ischiatic tuberosity (T).
18. Protection (3) according to claim 17, **characterized in that** in each padding (4), the peripheral region comprises both said first and second materials (13, 14) and the central region comprises only said second material (14).
19. Protection (3) according to claim 17, **characterized in that** in each padding (4), the peripheral region comprises only said first material (13) and that the central region comprises only said second material (14).
20. Protection (3) according to claim 17, **characterized in that** in each padding (4), the peripheral region comprises only said second material (14) and the central region comprises only said first material (13).
21. Protection (3) according to any of claims 17-20, **characterized in that** in each padding (4) aeration paths (13) are made.
22. Protection (3) according to any of claims 17-21, **characterized in that** each padding (4) has a concentric configuration, the concentric elements of the configuration having decreasing thickness towards the centre.
23. Protection (3) according to any of claims 17-22,

characterized in that each padding (4) is made from an impermeable yielding material (12) shaped like at least one bag.

24. Protection (3) according to any of claims 17-23, **characterized in that** each padding (4) comprises concentric elements (46-48) spaced from each other and connected to each other by a plurality of cross-pieces (49). 5
25. Protection (3) according to claim 24, **characterized in that** said crosspieces (49) form paths for the second flowable material (14). 10
26. Protection (3) according to any of claims 17-25, further comprising a third padding (44) arranged centrally advanced with respect to the pair of paddings (4). 15
27. Protection (3) according to any of claims 17-26, **characterized in that** each padding (4) is removable. 20
28. Protection (3) according to any of claims 17-27, **characterized in that** the two paddings (4) have an adjustable interaxis distance. 25
29. Protection (3) for cycling pants (1), comprising a first flowable material (14) housed in a first chamber (121, 123) made of an impermeable yielding material (12), **characterized in that** in at least one region thereof, the thickness of the protection (3) comprises said first chamber (121, 123) and a second flowable material (14) housed in a second chamber (122, 124) made of an impermeable yielding material (12). 30 35
30. Protection (3) according to claim 29, **characterized in that** said second chamber (124) is internal to the first chamber (123). 40
31. Protection (3) according to claim 29, **characterized in that** said first and second chambers (121, 122) are overlapped. 45
32. Cycling pants (1) comprising a protection (3) according to any of the previous claims. 50

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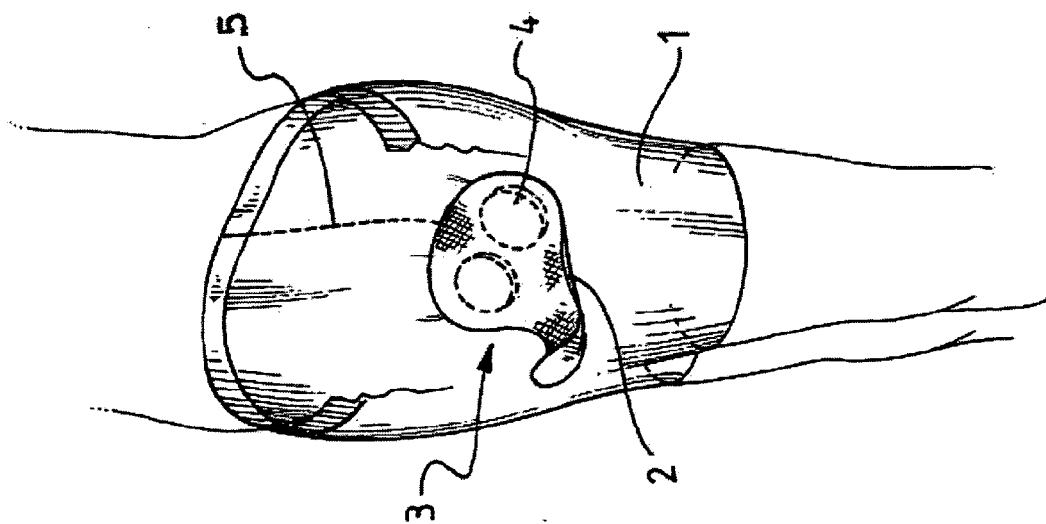


Fig. 1

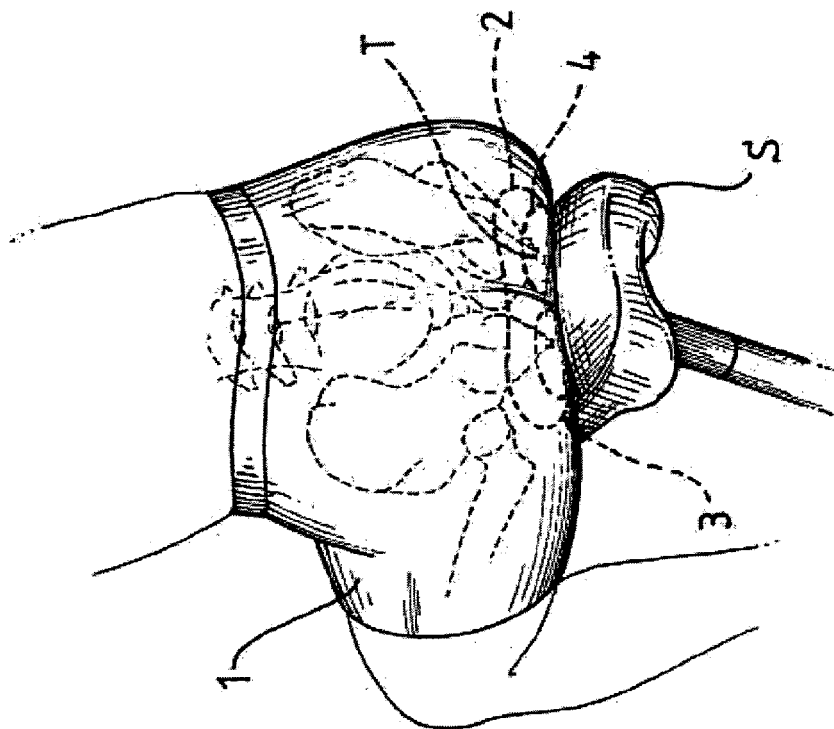


Fig. 3

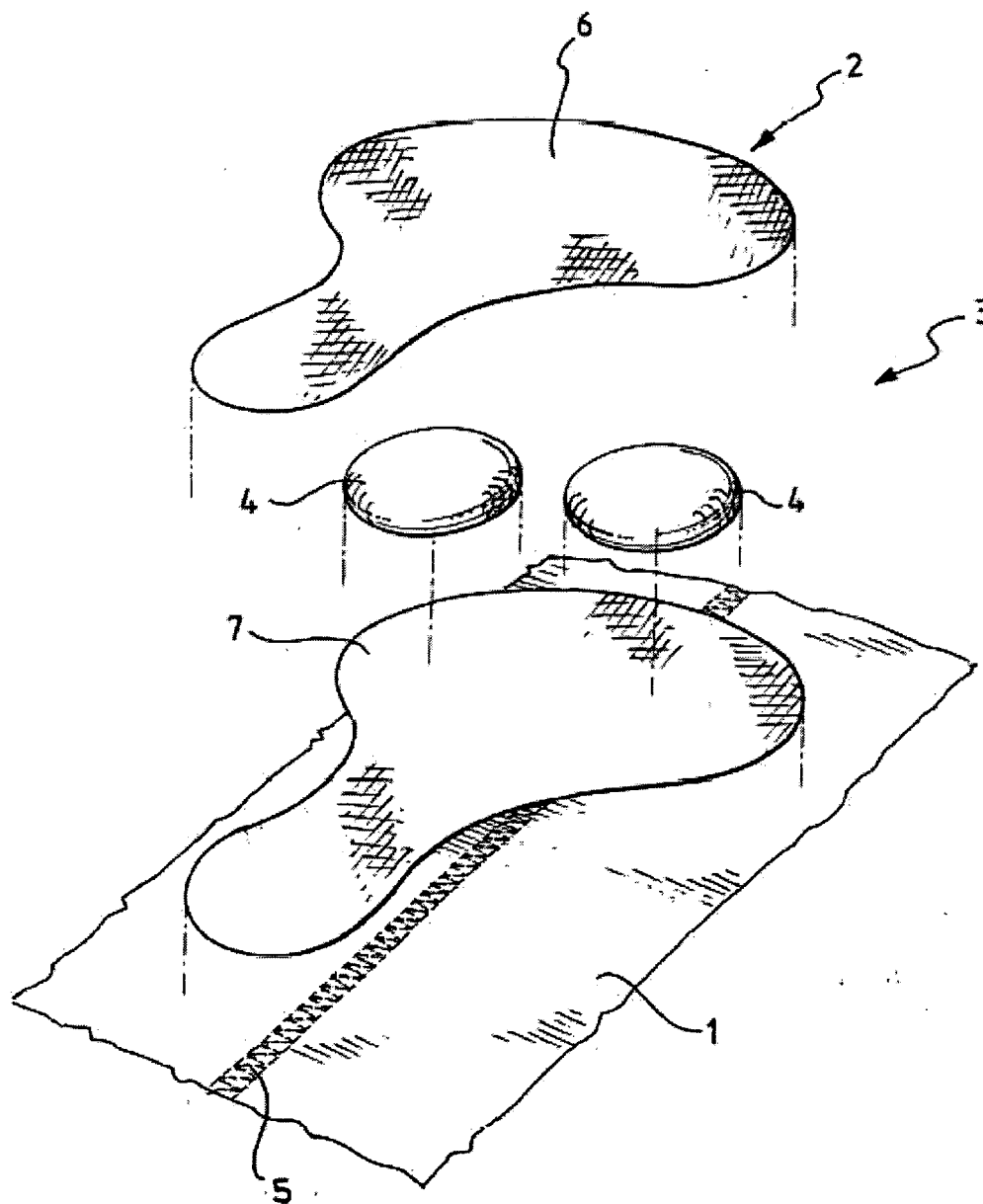


Fig. 2

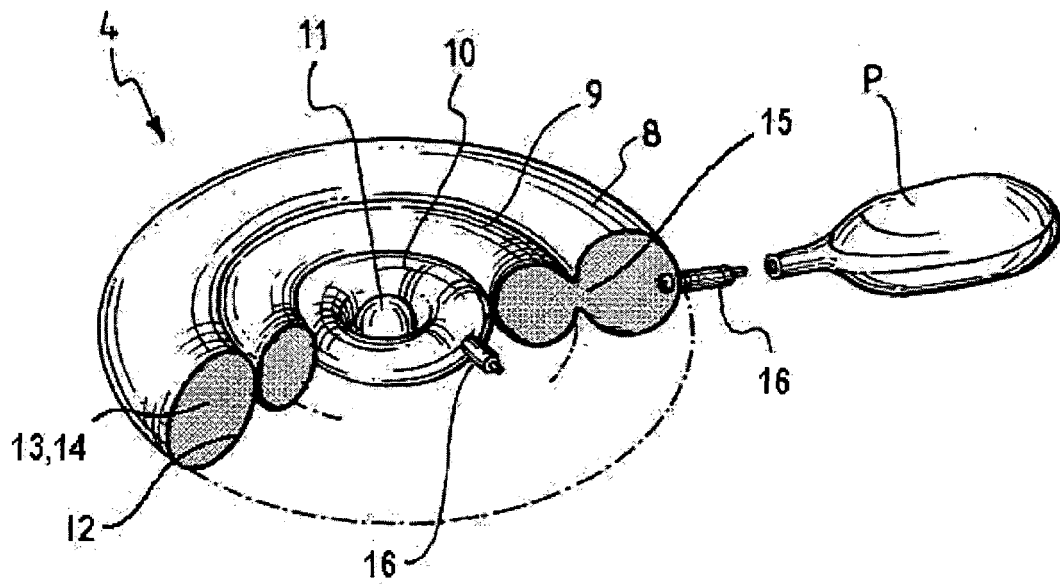


Fig. 4

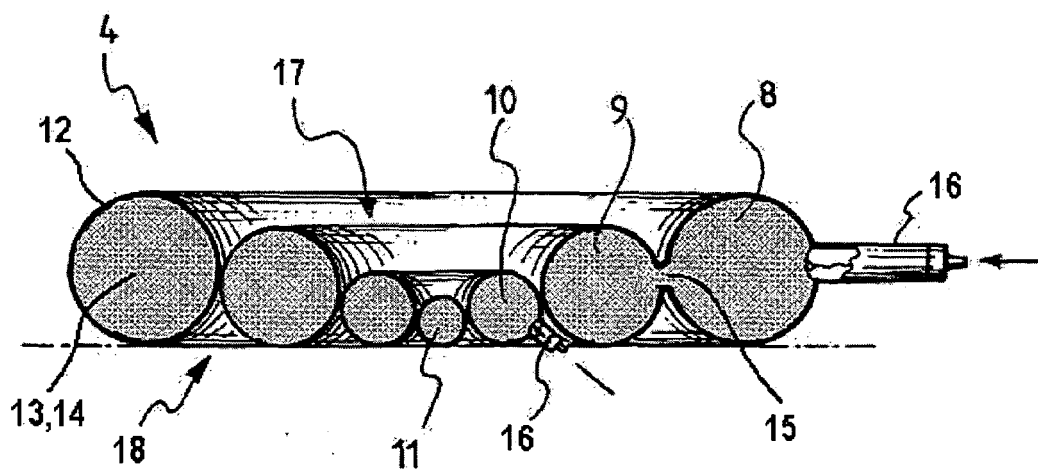


Fig. 5

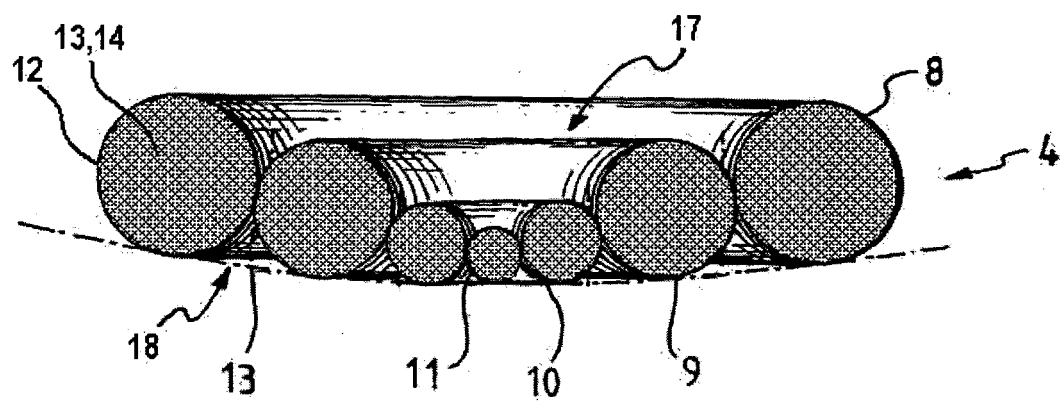


Fig. 6

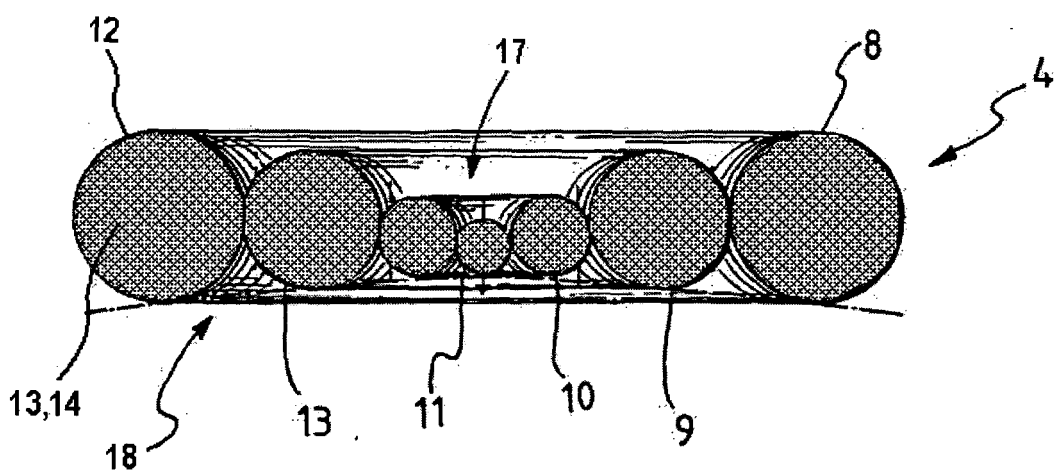


Fig. 7

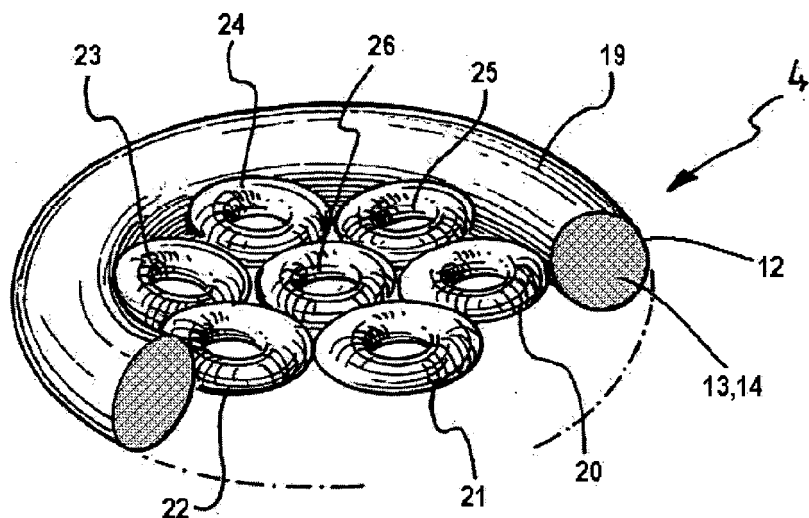


Fig. 8

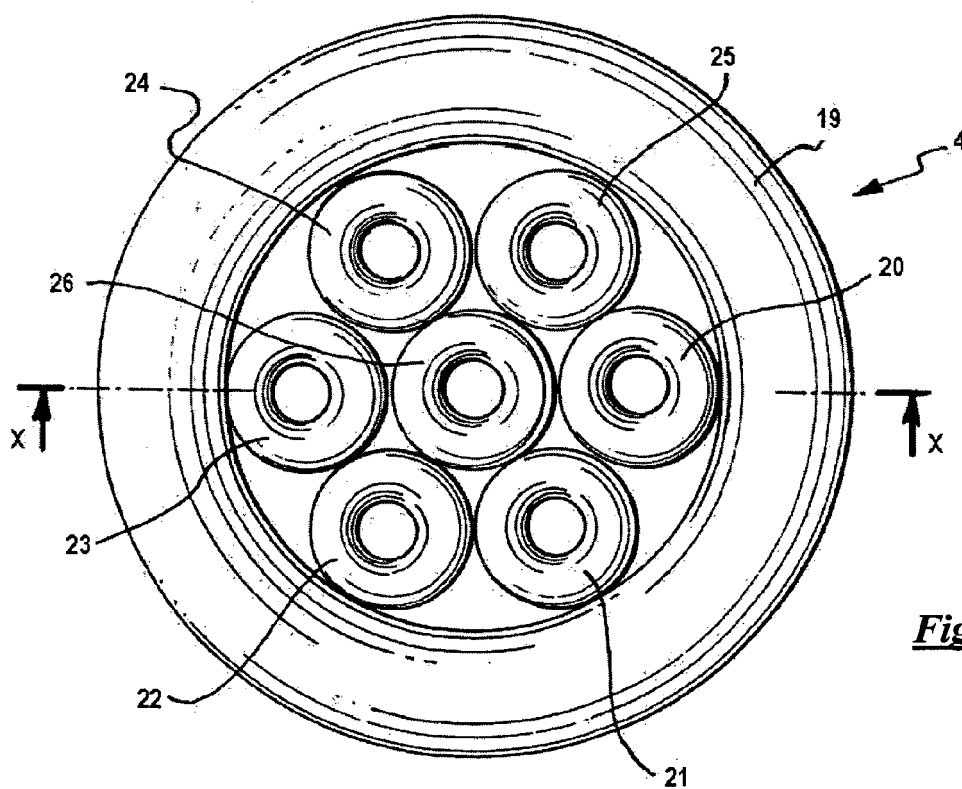


Fig. 9

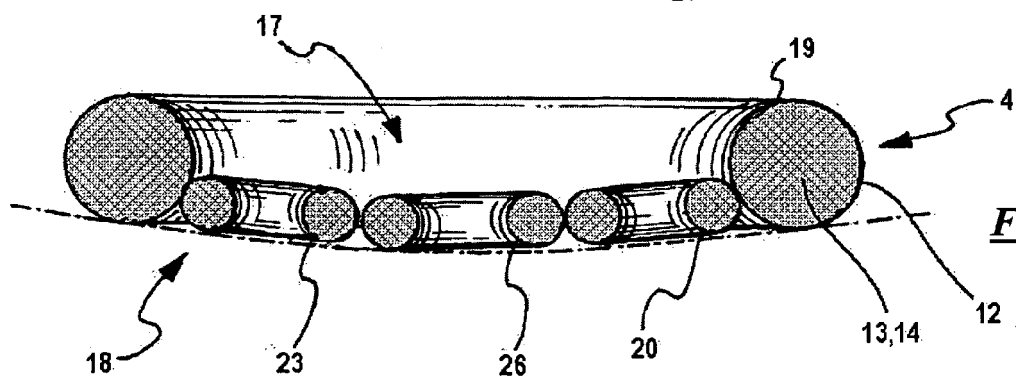


Fig. 10

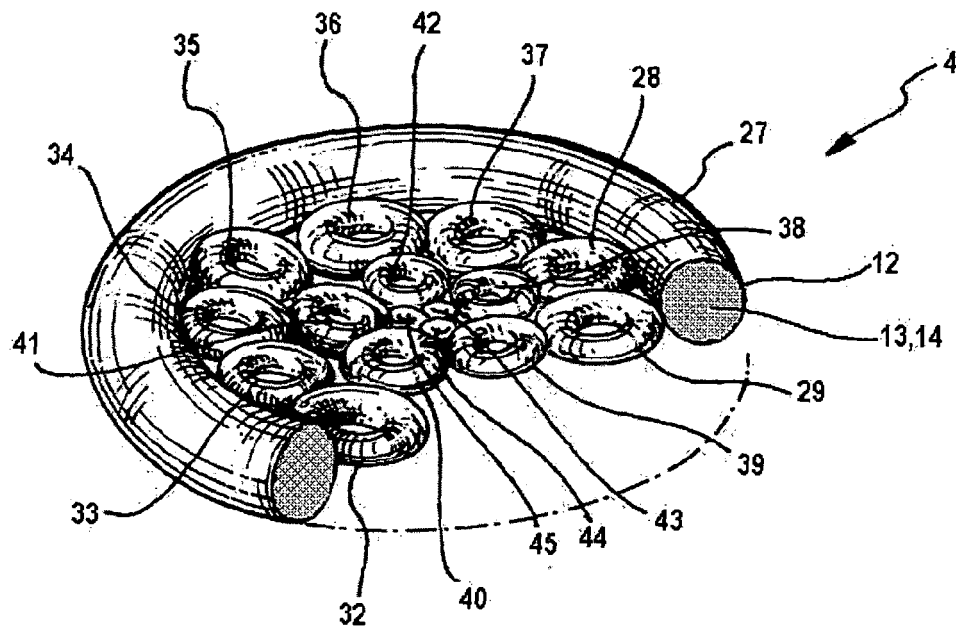


Fig. 11

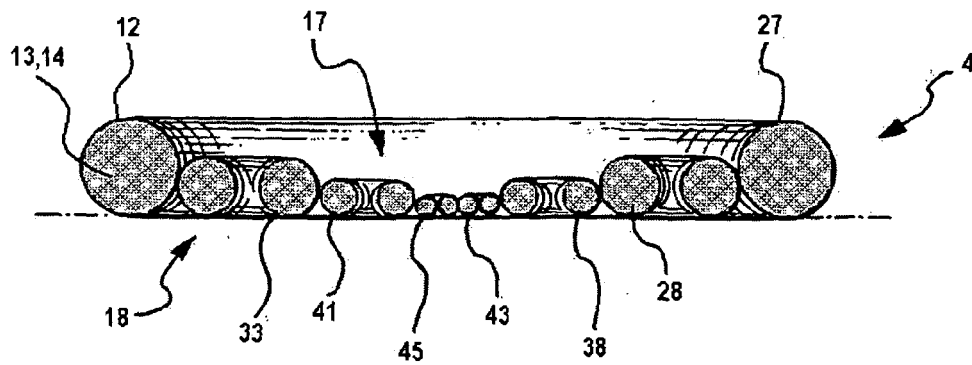


Fig. 12

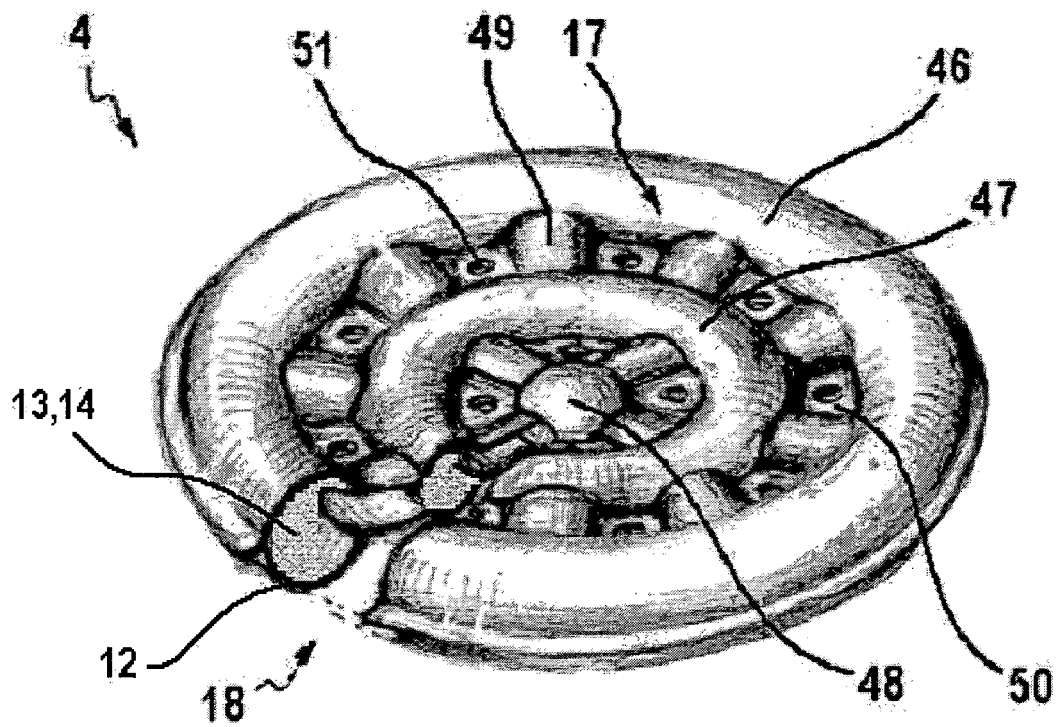


Fig. 13

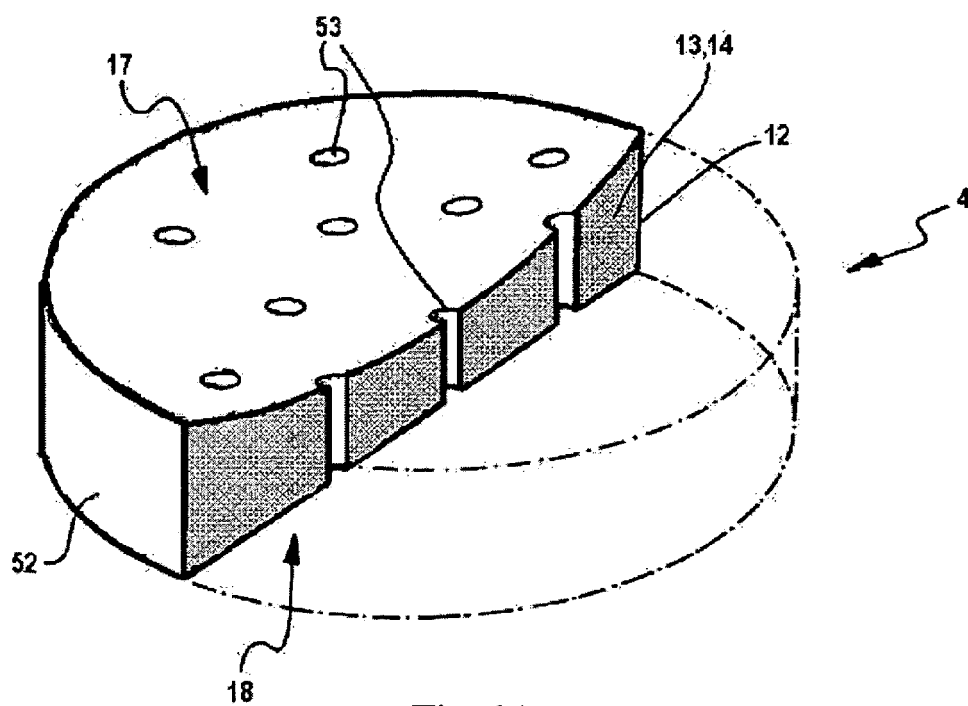


Fig. 14

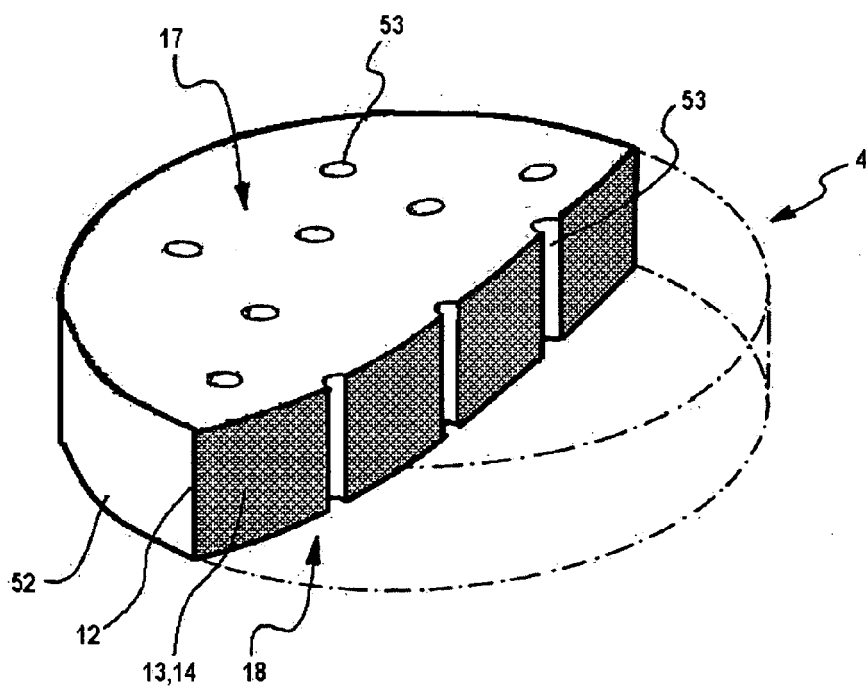


Fig. 15

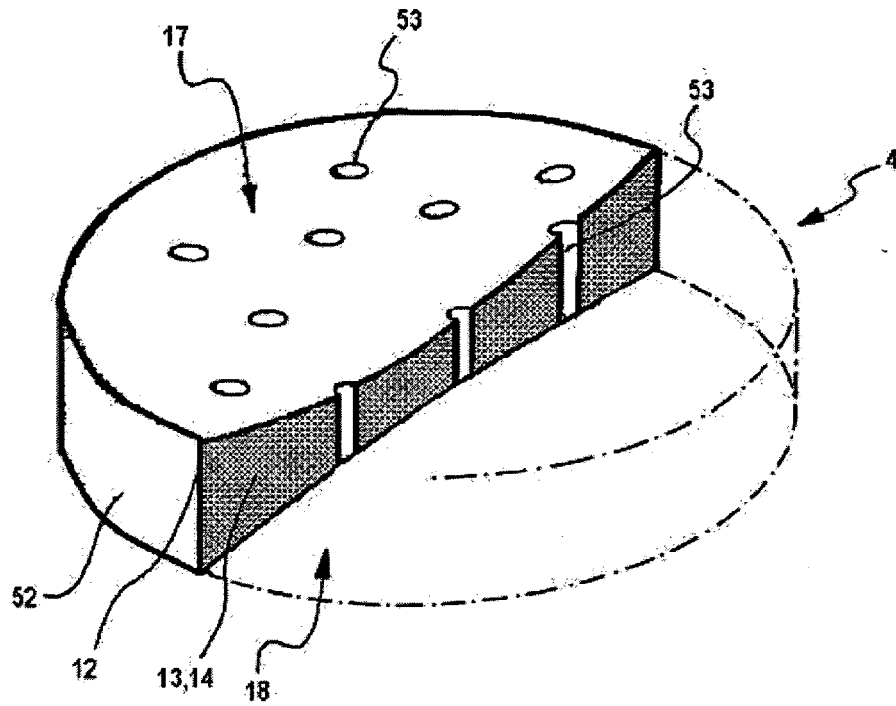


Fig. 16

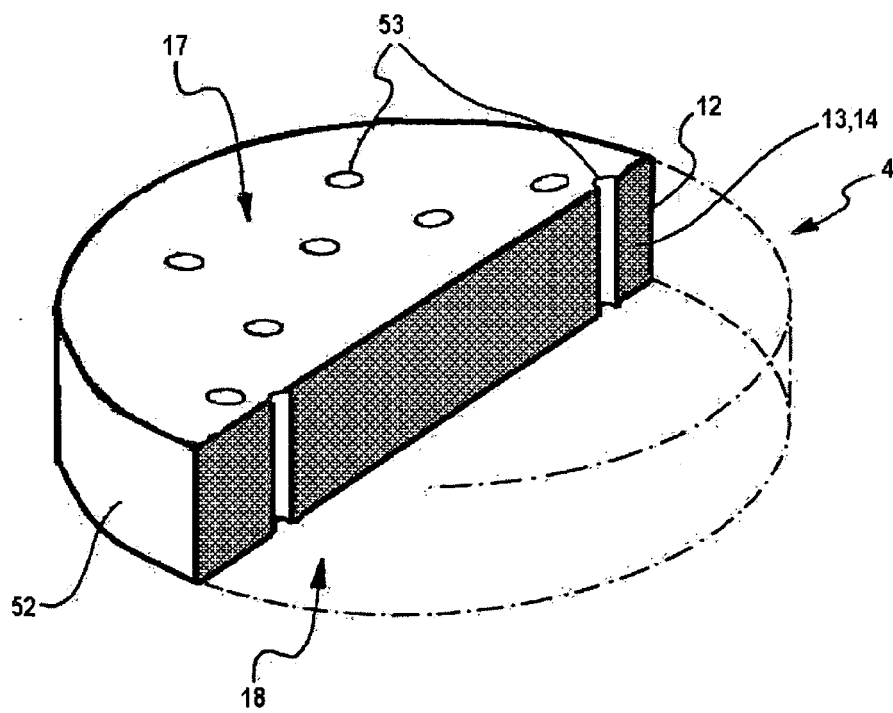


Fig. 17

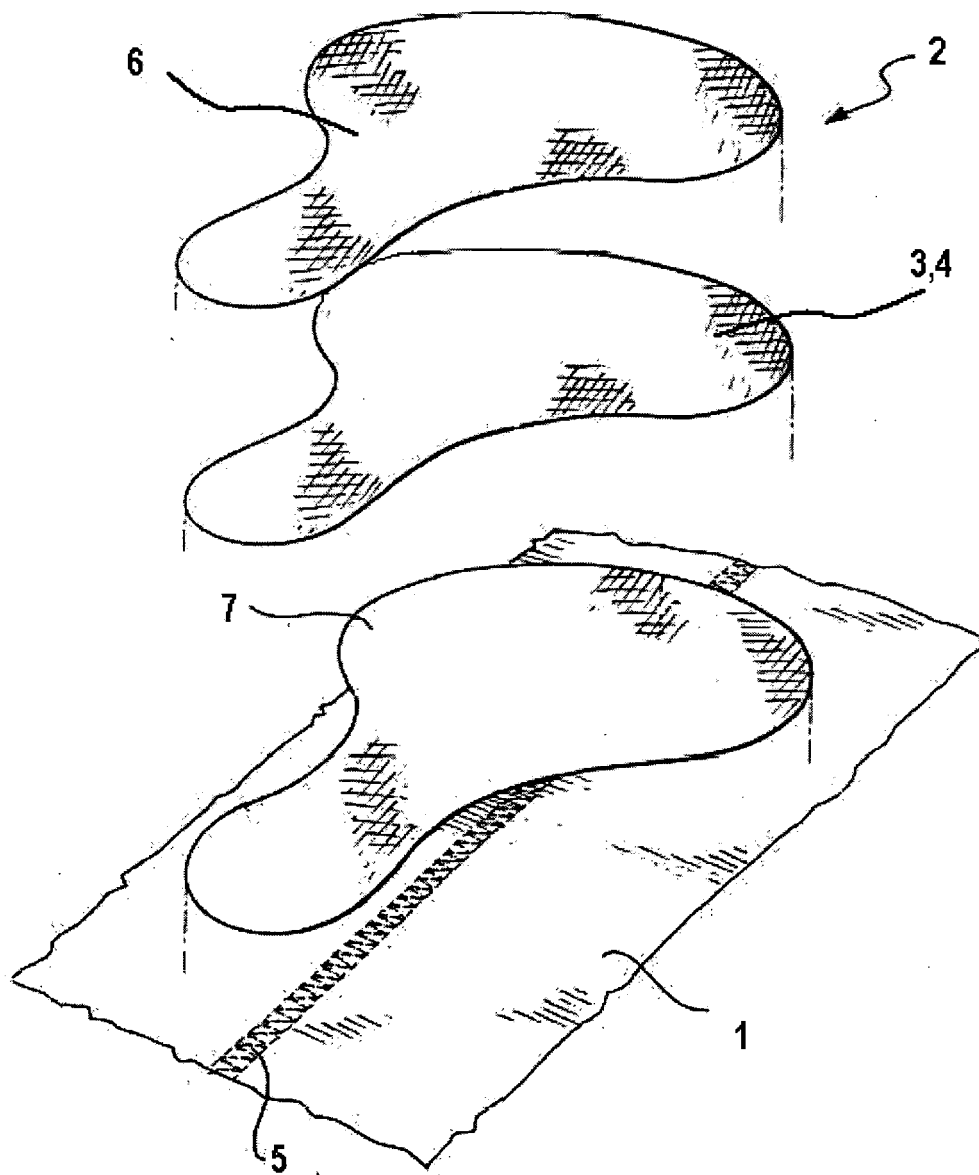


Fig. 18

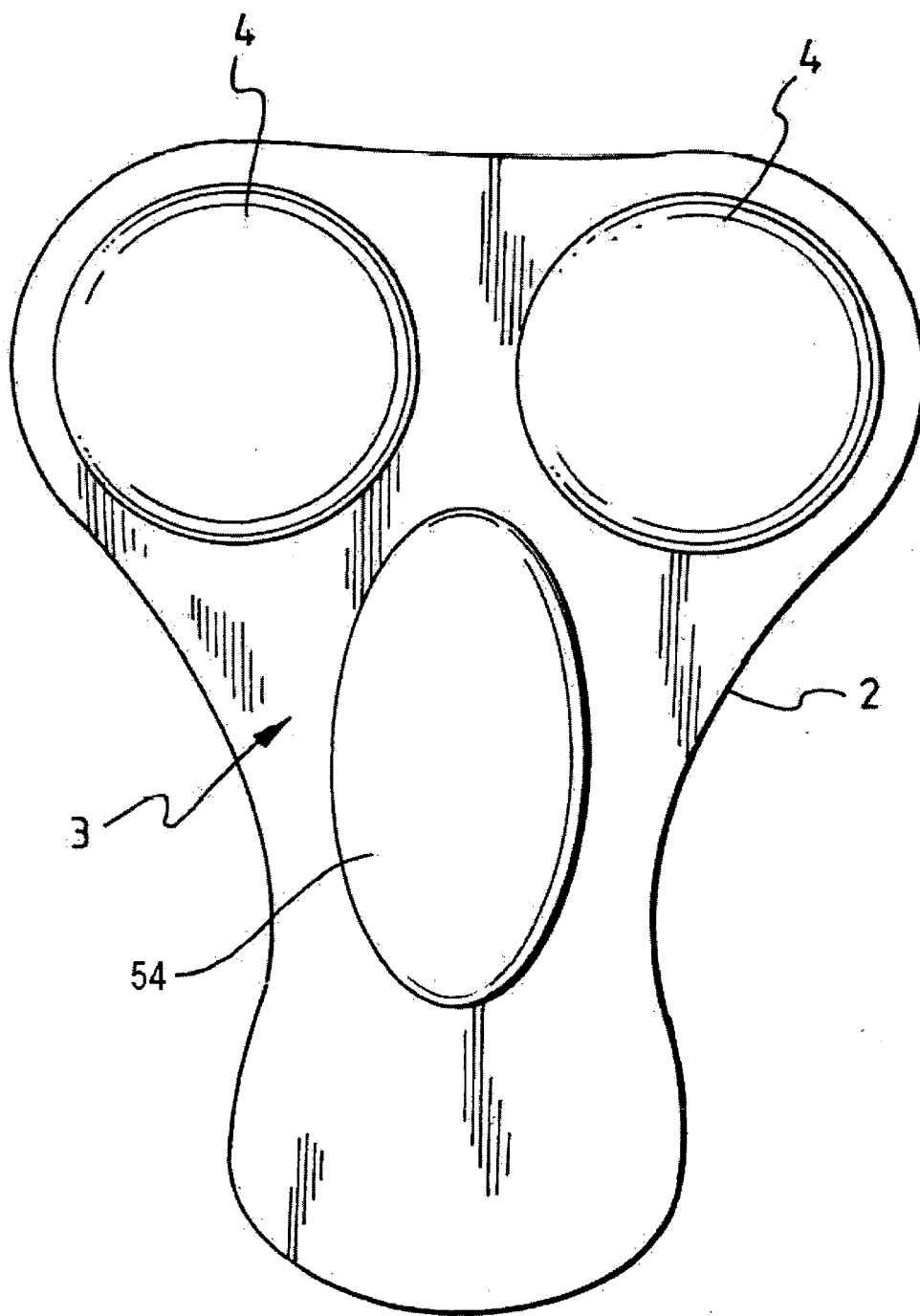


Fig. 19

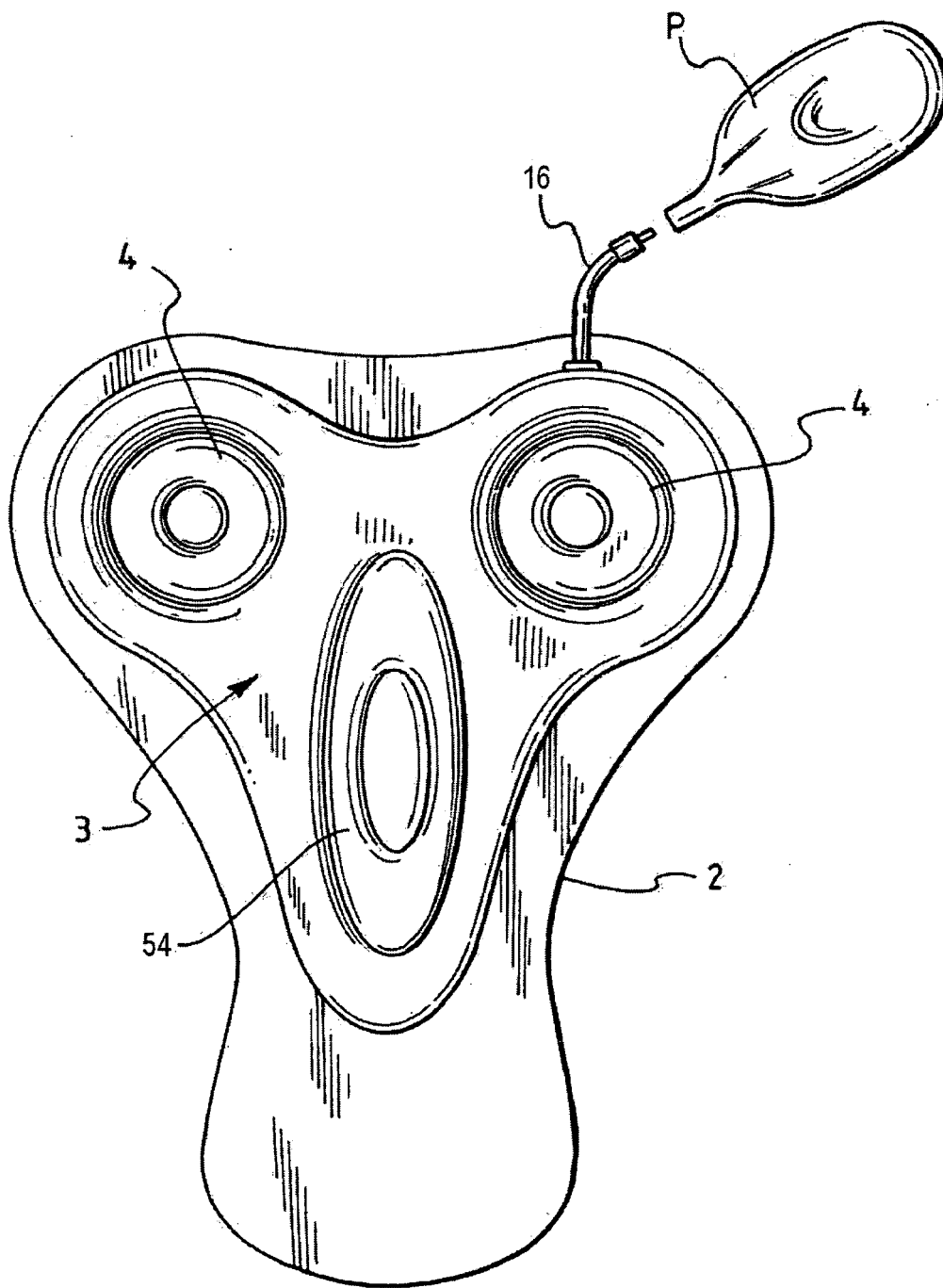


Fig. 20

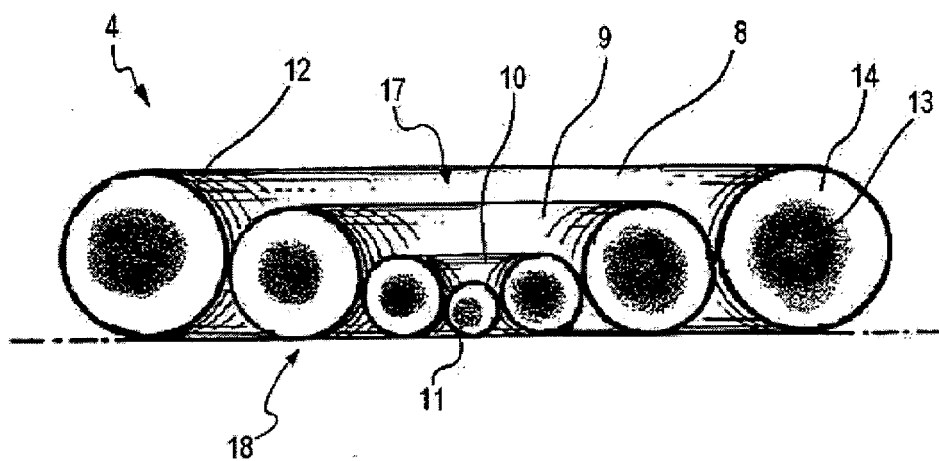


Fig. 21

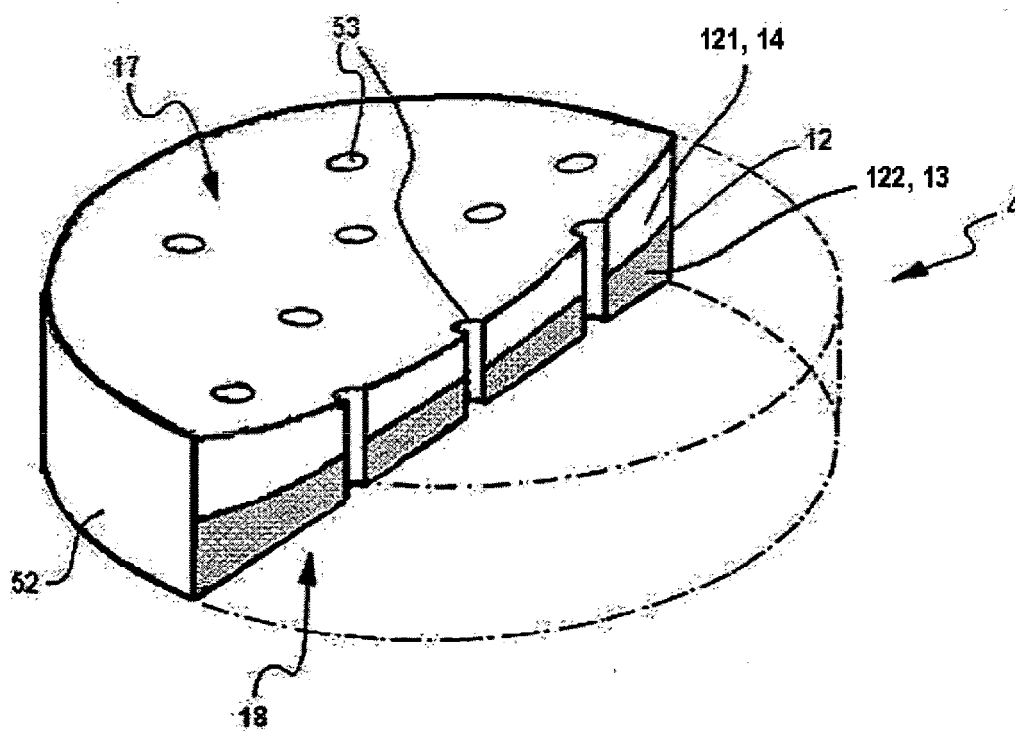


Fig. 22

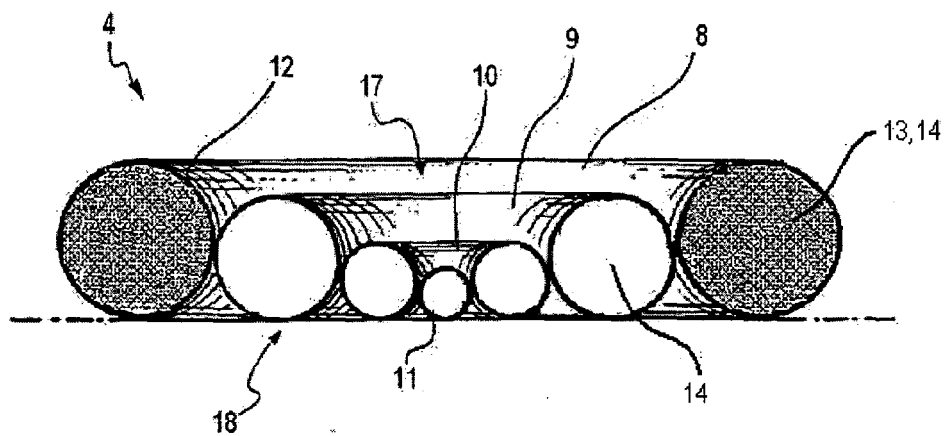


Fig. 23

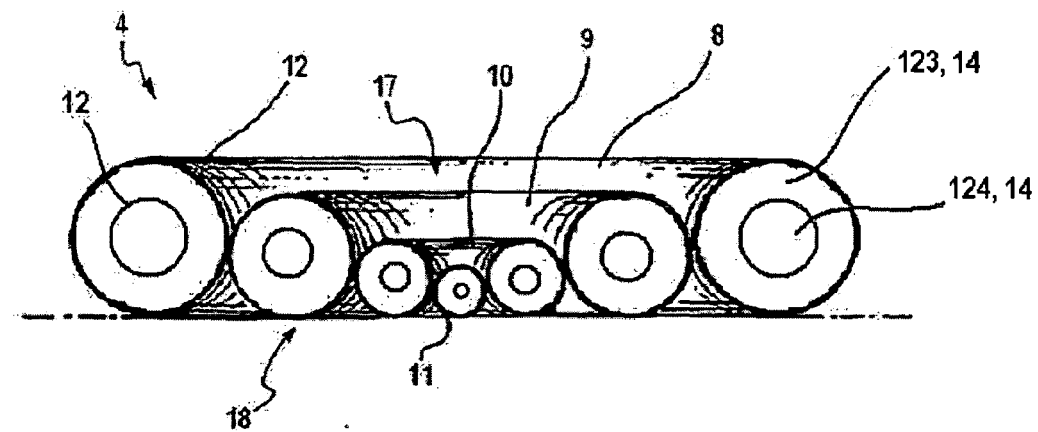


Fig. 24

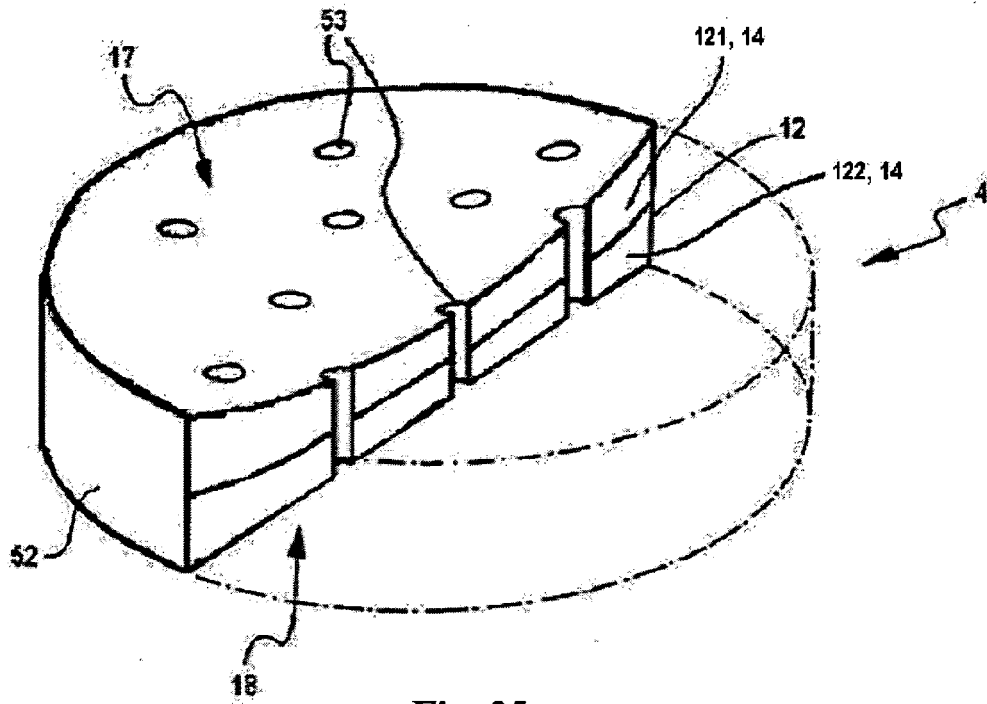


Fig. 25

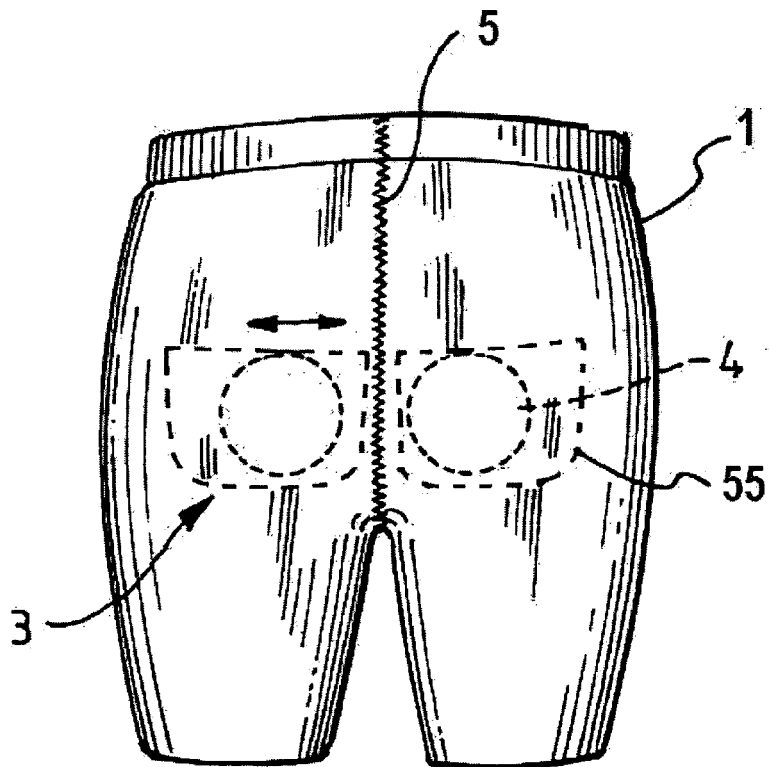


Fig. 26

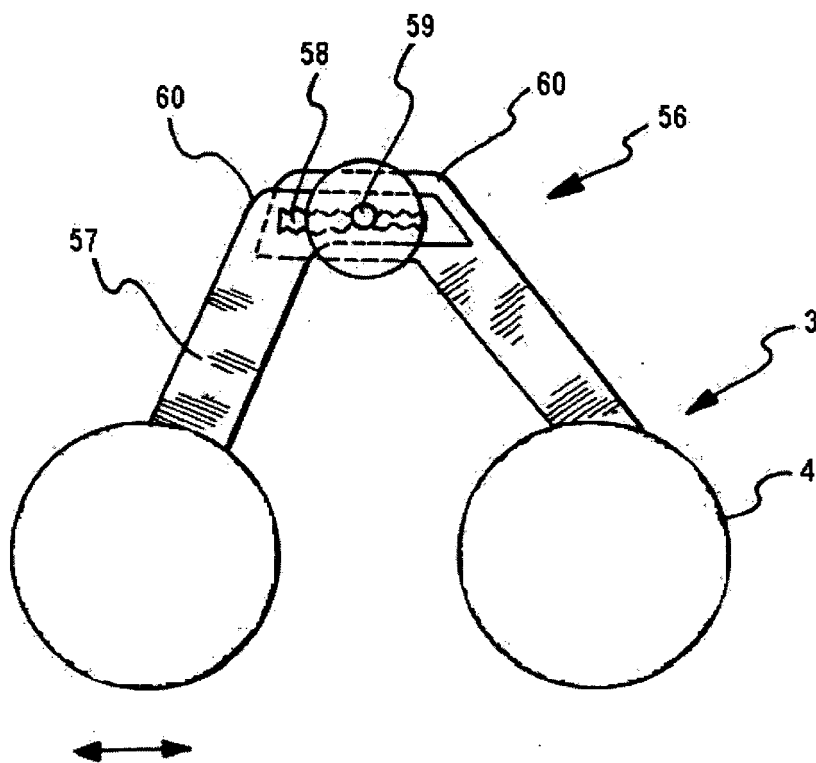


Fig. 27



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5048

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	WO 02/19852 A (CONSTAN-TATOS, PETER, BASIL) 14 March 2002 (2002-03-14) * claim 1; figure 1 *	1,2,9, 11,14, 16,32	INV. A41D1/08
X	DE 89 05 746 U1 (K.W. HOCHSCHORNER GMBH, 8033 MARTINSRIED, DE) 22 June 1989 (1989-06-22) * claim 1 *	1-3,5,9, 14,32	
X	US 2003/079276 A1 (FORSYTH ROBBIN DOUGLAS ET AL) 1 May 2003 (2003-05-01) * column 3, line 19 - line 37 *	1,2,32	
X	US 5 147 685 A (HANSON ET AL) 15 September 1992 (1992-09-15) * column 7, line 13 - line 51; claim 1 *	29-31	
A	DE 40 05 565 A1 (BINDER, HANS JOACHIM, DR., 7100 HEILBRONN, DE) 29 August 1991 (1991-08-29) * claims 1,4,5; figure 1 *	1-3,5, 7-9	
A	US 2005/212337 A1 (LEE DANIEL) 29 September 2005 (2005-09-29) * paragraph [0014] - paragraph [0015]; claims 1,3,4; figures 1,4 *	1-3,5-7, 9,17,26	TECHNICAL FIELDS SEARCHED (IPC) A41D A61F B62J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 July 2006	Examiner D'Souza, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
EPO FORM 1503 03.82 (P04C01)



European Patent
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Application Number

EP 06 42 5048

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 06 42 5048

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-28,32

Protection for cycling pants comprising a first deformable solid material and a second flowable material.

2. claims: 29-31

Protection for cycling pants comprising a first flowable material housed in a first chamber and in at least one region the thickness of the protection comprises a second flowable material housed in a second chamber.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 42 5048

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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27-07-2006

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REFERENCES CITED IN THE DESCRIPTION

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