

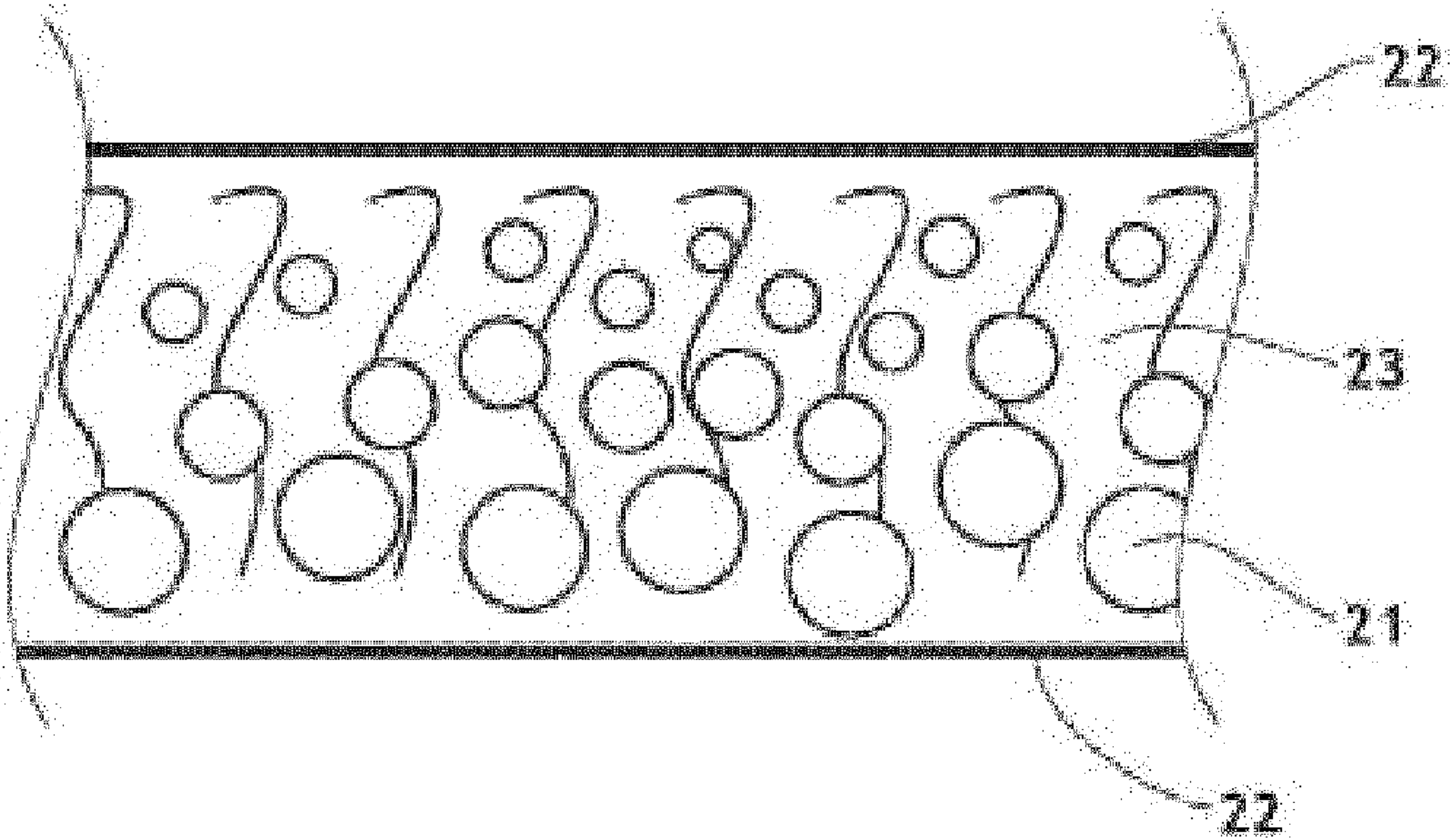


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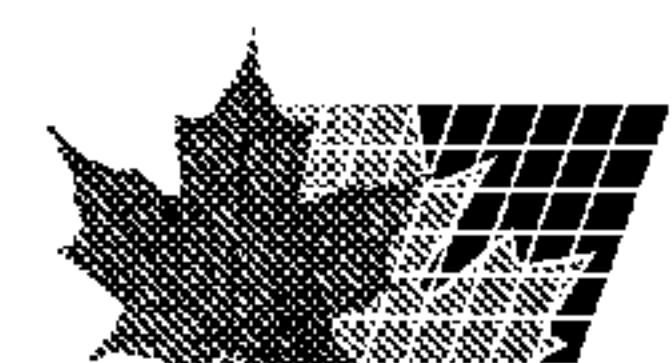
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AND DISPERSION LAYER FOR ABSORBENT ARTICLES

Fig 11

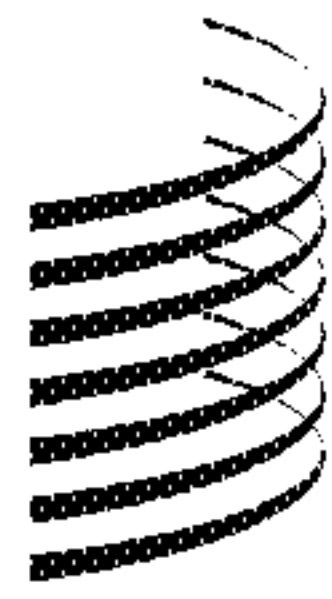


(57) **Abrégé/Abstract:**

The present invention relates to a unitary absorbent structure and method thereof wherein said unitary absorbent structure comprises an absorbent core (5) and/or an acquisition and dispersion layers (2) (3) and comprising at least one non- woven fibrous substrate layer (23) having a void volume suitable to be penetrated by super absorbent particles. The super absorbent particles are dispersed in the substrate layer (23) according to a size distribution gradient by vacuum (8') and vibration along the depth direction or z-direction of said absorbent core (5) and/or acquisition (2) and dispersion (3) layers, the smaller particles are placed on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles.



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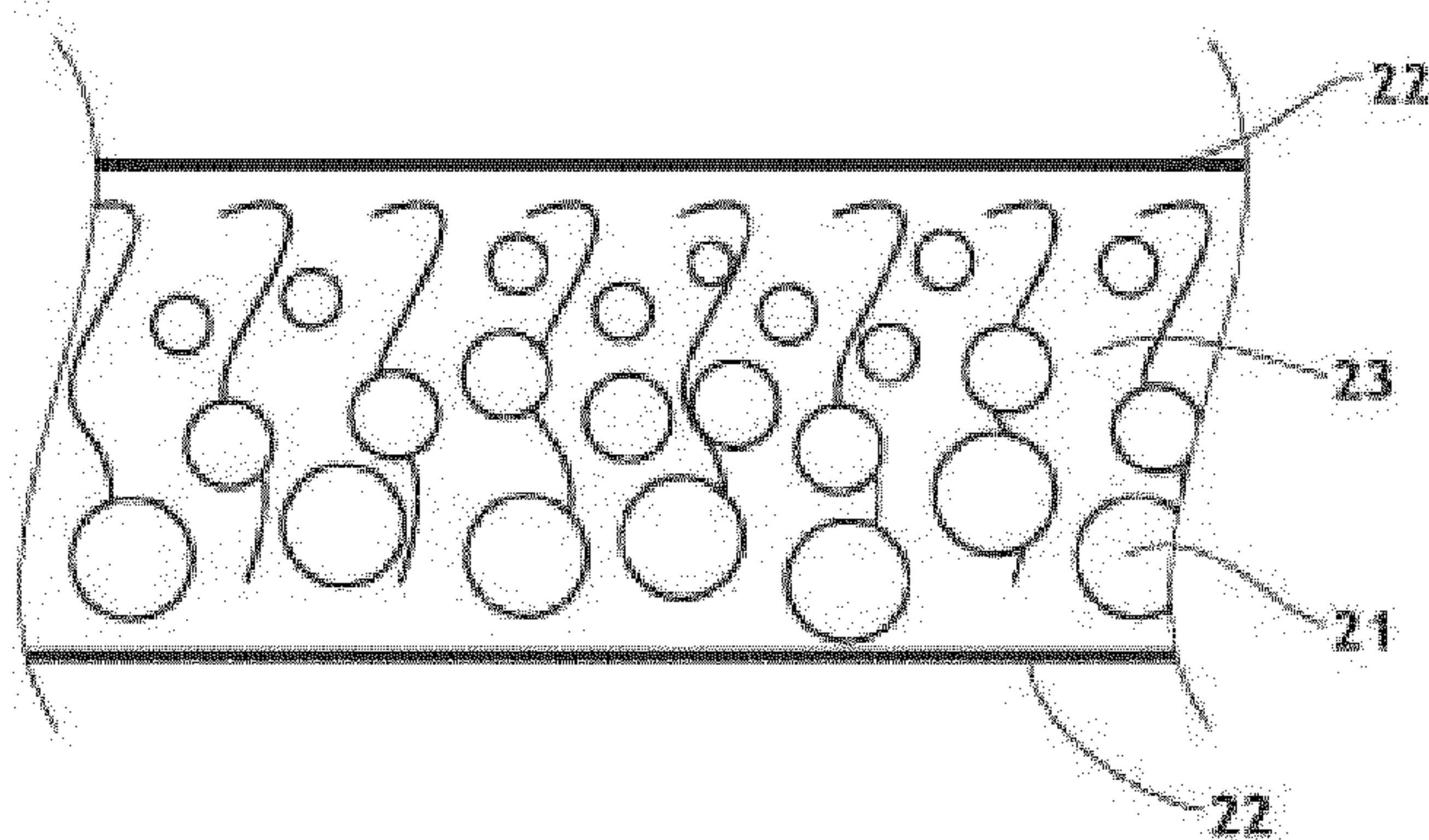
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Fig 11



(57) Abstract: The present invention relates to a unitary absorbent structure and method thereof wherein said unitary absorbent structure comprises an absorbent core (5) and/or an acquisition and dispersion layers (2) (3) and comprising at least one non- woven fibrous substrate layer (23) having a void volume suitable to be penetrated by super absorbent particles. The super absorbent particles are dispersed in the substrate layer (23) according to a size distribution gradient by vacuum (8') and vibration along the depth direction or z-direction of said absorbent core (5) and/or acquisition (2) and dispersion (3) layers, the smaller particles are placed on the bodyside of th e absorbent articles and the larger particles are located on the opposite side of the absorbent articles.

**Unitary absorbent structures comprising an absorbent core
and/or an acquisition and dispersion layer for absorbent
articles**

5

Field of the invention

The present invention relates to absorbent structures comprising a stratum of dispersed super absorbent particles within the absorbent cores and/or acquisition and dispersion
10 systems. The invention also relates to absorbent articles comprising said absorbent structures, the absorbent article is preferably a disposable absorbent article such as sanitary napkins, panty liners, baby diapers, incontinence pads, training pants, sweat pads, medical wound bandage and the
15 like.

Background of the invention

Conventional absorbent articles are manufactured by combining a liquid permeable or pervious, hydrophilic or semi
20 hydrophilic topsheet (1), a fibrous material, an absorbent core (5) and a liquid impermeable or impervious material backsheet (6). Topsheet (1) and backsheet (6) referring to the relative position of said sheets with respect to the absorbent core (5).

25 Absorbent cores are generally composed of fluff and super absorbent polymer (SAP) particles (21).

Multi-layered absorbent articles may comprise an additional acquisition (2) and dispersion layers (3, 4) (ADL), or conventional ADL (19), having at least 3 functions. The top
30 layer is an acquisition layer (2), which is suitable to rapidly acquire the liquid and transmit it to the distribution layers (3, 4) placed underneath the acquisition layer (2). Said distribution layers allow the liquid to migrate away from

the user. A third function is to prevent rewetting by the liquid.

A multilayered ADL is disclosed in Belgian patent BE 1 018 052
5 which relates to an improved multilayered ADL system comprising a 3 layers acquisition (2) and distribution layers (3, 4) improving the distribution of the liquid (Figure 2).

Acquisition layers (2) are generally composed of coarse hydrophilic or hydrophobic fibers that quickly transmit the
10 liquid by capillarity to the dispersion layers. Said dispersion layers generally comprise hydrophilic material and fibers suitable in hygiene articles such as profiled or shaped multilobal fibers ranging from 0.7 to 30 dtex and preferably from 1.5 to 7 dtex wherein 1 dtex represents 1 gram per 10000
15 meters of fiber.

SAP particles

Typical SAP particles (21) are composed of crosslinked hydrophilic polymers chains capable of absorbing about a 10
20 time water uptake based on the weight of the dried particles. Hydrophilic polymers are either natural or synthetic polymers or a mixture of both types. Common natural polymers include cellulose-based polymer such as cellulose or starch eventually modified by additional hydrophilic functions for example
25 carboxylates, phosphonate or sulfoxylate. Synthetic hydrophilic polymers are generally a polyether or a polyacrylate based polymer.

SAP particles (21) can advantageously be coated or partially coated. The additional coating improves or provides additional
30 properties to the SAP particles (21) such as a better body fluid absorbing capacity, a better adhesion of the particles to the surrounding, an improved capacity for transportation of liquids or better mechanical properties.

Absorbent cores

Absorbent cores generally comprise a mixture of SAP particles (21) and a substrate (23) such as fibers, layers, fluff or any combination thereof.

5 When the absorbent core is wetted, the SAP particles (21) are able to absorb a large amount of liquid; however wet SAP particles (21) are subject to swelling thus forming a gel with the adjacent swollen SAP particles (21). Said gel formation can block the liquid transmission into the interior of the
10 absorbent core.

As consequence, gel blocking leads to potential leakage and/or rewettability issues. To prevent gel blocking and to improve the fluid absorbent capacity of the absorbent core, individual SAP particle (21) have to be sufficiently distant from one
15 another. This is generally obtained by mixing the SAP particles (21) with cellulose-based fluff.

Thinner absorbent core can also be obtained by reducing the amount of fluff used in the composition of the absorbent core. For examples, US 5,763,331 discloses a fluffless absorbent
20 core comprising SAP granular material such as acrylate or a biodegradable material firmly bonded to a support layer such as paper or non-woven fabric. The adhesive used to glue the superabsorbent granular component to the main support layer is applied by spraying.

25 It is known from US 2009/0087636 an absorbent structure comprising a fibrous substrate and a dispersion of SAP particles however the SAP particles are simply held within the substrate structure and the distribution of the particles is
30 not consistent especially for smaller particles which may move from there location. US 5,294,478 discloses an absorbent structure comprising a fibrous substrate and a gradient dispersion of SAP, however the larger particles are placed on the bodyside and the smaller particles are placed on the

opposite side. None of these documents discloses a gradient in which the smaller particles are on the bodyside and the larger particles are on the opposite side.

5 It is known from US 2003/175418 and US 2002/0090453 a method to prevent particle loss and agglomeration. These patents disclose a process for stably affixing SAP powder onto substrates such as a sheet, film, foam or fiber treated with a curable liquid resin or solution of curable resin such as a
10 thermoplastic resinous powder. SAP powder is applied to the surface of a polymeric material and coated with a curable liquid resin and then cured, by heating. The absorbent film obtained has reduced particle agglomeration and particle loss. Alternatively, the SAP powder is coated with a resinous
15 material and applied to the surface of a polymeric material and cured. Absorbent film obtained accordingly can be interposed between sheets to form an absorbent core.

WO 03/092757 also discloses a method to prepare a fluffless
20 absorbent core composed of sheets of SAP particles and plasticizer. The plasticizer is sprayed onto the SAP particles followed by a thermal pressing. The plasticizer improving the flexibility and structural integrity to the sheet without imparting the rewettability and the acquisition rates of the
25 absorbent core. The method disclosed also facilitates the manufacturing of absorbent articles.

It is also known from US 4,232,674 a liquid absorbent device wherein superabsorbent polymer particles are deposit in
30 predetermined patterns, such as parallel stripes to leave uncovered areas for capillary flow of liquid from saturated to unsaturated areas of the layer.

To improve the liquid retention of absorbent articles, it is also known to prepare a multilayered absorbent core. For example, US 2003/135178 discloses an absorbent laminate core comprising an upper and a lower layer and inner layers wherein one of the inner layers is a central fibrous layer such as tow fibers containing SAP. The other inner layer is a layer selected from an acquisition layer, a distribution layer, an additional fibrous layer optionally containing SAP, a wicking layer, a storage layer, or combinations and fragments thereof.

Multilayered absorbent core may also be obtained from the combination of an absorbent layer or storage layer with a conventional ADL (19) in a unitary structure to form an absorbent core. Unitary absorbent core also generally have a reduced thickness and facilitate the processing of absorbent articles.

Some examples of unitary absorbent cores are disclosed in WO 92/11831. It is known from this document an absorbent article comprising a liquid pervious topsheet, a liquid impervious backsheet and a multi-layered absorbent core positioned between the topsheet and the backsheet. Said absorbent core comprising a multi-layered absorbent body comprising acquisition/distribution layers and a storage layers positioned subjacent each acquisition layer and comprising an absorbent gelling material. A wrapped multi-layered absorbent body is obtained by wrapping the multi-layered absorbent with fluid transporting wrapping.

WO 91/11163 discloses an absorbent structure having an ADL comprising binding means and chemically stiffened cellulosic fibers, preferably curled and a fluid storage layer positioned beneath each ADL comprising SAP particles with an average

diameter of 400 to 700 microns and carrier means for the SAP particles.

WO 00/41882 discloses a 2 plies absorbent structure, each ply
5 comprises SAP particles in different concentration and dispersed either homogeneously within a matrix of fibers and binder or placed in discrete locations or zones such as lanes within the structure.

Each ply is composed of several stratum in liquid
10 communication. The different density of the 2 plies creating a capillary tension gradient between the plies.

US 2008/312625, US 2008/312632 and US 2008/3126621 disclose a substantially cellulose free absorbent core comprising 2
15 absorbent layers each having a substrate comprising SAP particles and thermoplastic adhesive covering the SAP particles. The 2 absorbent layers are jointed together such that a portion of the thermoplastic adhesive of the 2 absorbent layers is in contact. The 2 absorbent layers being
20 combined together such as the respective patterns of absorbent particulate polymer material are offset from one another.

It is known from US 2007/027436 a thin, conformable and flexible absorbent article comprising a fluid permeable
25 topsheet, a backsheet joined to said topsheet about a periphery of said absorbent article and a core disposed between said topsheet and said backsheet, said core comprising a storage layer containing superabsorbent material and an acquisition/storage layer containing superabsorbent material.

30

With regard to the cited prior art there is a need to improve unitary absorbent structures which provide comfort to the users, a higher absorption ability, mechanical stability,

thinness, low rewettability and which are easy to process in an absorbent article.

Summary of the invention

5 The present invention is related to an improved unitary absorbent structure comprising at least one non-woven material such as a fibrous substrate (23) layer having a void volume suitable to be penetrated with super absorbent particles (SAP particles) (21), and adhesives, and said super absorbent
10 particles are dispersed in the substrate layer (23) according to a size distribution gradient along the depth direction or z-direction of said absorbent core (5) and/or acquisition (14) and dispersion (16) unitary layer. Such as the smaller particles are located on the bodyside of the absorbent
15 articles and the larger particles are located on the opposite side of the absorbent articles. The substrate layer comprising the dispersion of SAP particles is used within an absorbent core (5) having a permanent liquid holding capacity and/or an acquisition and dispersion layer (14, 16) having a temporary
20 holding liquid capacity. Figures 9, 10, 11, 21, 22 and 23 illustrate different embodiments comprising a distribution of SAP particles (21) in a substrate (23).

In a second aspect, the invention relates to a method for producing said absorbent core and/or ADL.

25 It is an object of the invention to reduce the thickness of absorbent articles by reducing the amount of fluff generally used in absorbent core, generally comprised in the range of 40 to 60 wt.%, without imparting the body fluid absorbing
30 capacity, uptake speed and rewettability of the absorbent core. Further, the absorbent structures according to the invention is fluffless; wherein by fluffless it should be understood that the layer comprises less than 4 wt. % fluff, advantageously the absorbent structures does not comprise any

fluff at all and wherein fluff refers to a cellulose fluff.

In a further aspect, the invention relates to an absorbent
5 structure having a high body fluid absorbent capacity without being subject to gel blocking issue.

In a further aspect, the invention relates to an absorbent structure that includes an ADL to form an improved
10 multilayered absorbent core wherein the ADL and the absorbent layer are unitary and integrated.

In a further aspect the invention relates to absorbent structures or multilayered absorbent structures combined with
15 an additional conventional ADL (19) with or without a fluid holding capacity.

It is a further object of the invention to provide an integrated ready to use absorbent structure able to be
20 directly incorporated in absorbent articles.

Description of the drawings

Figure 1: is a cross-sectional view of a typical absorbent article comprising from top to bottom a liquid pervious
25 topsheet (1) and a liquid impervious backsheet (6), an acquisition and distribution system (2, 3 and 4), an absorbent core (5) generally composed of a mix of fluff and SAP; typically, the amount of SAP range from between 0 to 60 wt.%.

Figure 2: is a cross-sectional view of a 3 layered
30 conventional ADL (19) comprising from top to bottom an acquisition layer (2) and 2 distribution layers (3) and (4).

Figure 3: is a cross-sectional view of a substrate comprising from top to bottom a triple layer acquisition (14), rewet (15) and distribution (16) layers.

Figure 4: is a cross-sectional view of a substrate comprising triple layer acquisition (14), distribution (16), rewet (15) layers.

Figure 5: is a cross-sectional view of a substrate comprising
5 from top to bottom a triple layer acquisition (14) and rewet (15) layers.

Figure 6: is a cross-sectional view of a substrate comprising from top to bottom a triple layer acquisition (14), distribution (16) and rewet (15) layers with the third layer
10 partly hydrophobic.

Figure 7: is a cross-sectional view of a substrate comprising from top to bottom a triple layer acquisition (14), distribution (16) and absorption (17) layers.

Figure 8: is a cross-sectional view of a substrate comprising
15 from top to bottom a triple layer blend of polyester and polyolefin defining a void volume gradient (18a, 18b, 18c).

Figure 9: is a cross-sectional view of a substrate comprising from top to bottom an acquisition and dispersion top layer (19), an rewet layer of smaller void volume space structure
20 preventing the loss of SAP particles (21) and a bottom layer having very large void volume space comprising SAP particles (21) and a covering layer coating the bottom section of the absorbent core.

Figure 10: is a cross-sectional view of a triple layer
25 substrate wherein the fibers defining a void volume distribution gradient (18a, 18b, 18c) partly filled with SAP particles (21), and the bottom of the structure is covered by an additional layer.

Figure 11: is a cross-sectional view of SAP particles (21)
30 fully penetrated in a substrate having a void volume distribution gradient (18a, 18b, 18c). The core is covered by non-woven layers on top and bottom part (22).

Figure 12: is a cross sectional image of SAP particles (21) partially penetrated in a substrate having a void volume

distribution gradient (18a, 18b, 18c).

Figures 13 and 13bis : are schemes of a method of a structure production according to the invention.

Figure 14: is a scheme of a dosing system for the SAP particles (21), illustrating the deposit of the SAP particles (21) along the y-direction, or lateral dimension, of the non-woven substrate.

Figure 15: is a cross sectional view of a discontinuous application of SAP particles (21) on a substrate for the production of multiple absorbent cores. The core is covered by a hot melt adhesive and a core covering layer (11). The cutting line for the formation of individual core is also indicated.

Figure 16: is a cross sectional image of 3 individual profiled absorbent cores.

Figure 17: is a detail view of the supply roll used for the powder scattering of SAP particles (21) to create a profiled core.

Figure 18: is a cross sectional image of a profiled absorbent core along the x-direction or longitudinal dimension.

Figure 19: is a top view of a patterned absorbent core layer in the x-y plan.

Figure 20: illustrates the deposit of SAP particles (21) on a non-woven substrate prior to the dispersion step.

Figure 21: illustrates an ADL comprising SAP particles (21) dispersed according to the invention, said ADL is positioned on top of a conventional absorbent core.

Figure 22: illustrates an absorbent structure according to the invention coated by a covering layers (22).

Figure 24: is a top view of a body shaped absorbent article.

Figure 26: illustrates the sealing (24) process of individual core by a core wrap material (25).

Detailed description of the invention

A liquid according to the invention comprises, but not limited to, any body fluid such as urine or blood.

The inventors have developed a fluffless absorbent structure comprising a unitary absorbent structure comprising an
5 absorbent core (5) and/or an acquisition and dispersion layers (2, 3), comprising at least one non-woven fibrous substrate (23) layer having a void volume suitable to be penetrated by super absorbent particles, the non-woven fibrous substrate may
10 either be hydrophilic or hydrophobic and said super absorbent particles (21), having a size distribution, are dispersed within the substrate layer (23), according to their particle size distribution gradient along the depth direction or z-direction. The smaller particles are located on the bodyside and the larger particles are located on the opposite side of
15 the absorbent articles. Said fibrous substrate comprising the SAP particles can be integrated in an absorbent core and/or an ADL structure.

The absorbent structure obtained is further coated by a
20 covering layer (22) such as a spunbond, PE film, PET film, polyolefin, multilayer films, coextruded films, carded non-woven or any suitable material and maintained to the core with adhesive.

25 In addition to the high body fluid holding capacity and the slimness of the absorbent article, there are some other advantages to use the absorbent structure of the invention such as a better conversion, improve performance and reliability due to the dispersion of SAP particles (21) on
30 specific part of the absorbent structure and the absence of fluff. It is also economical advantageous to use such core and/or ADL as fluff is no longer required and extra method steps such as hammer milling to prepare the fluff is

unnecessary, additionally, warehousing and packaging cost is reduced as well as the transport cost.

Advantageously, an absorbent structure according to the invention is a multilayers structure comprising a top layer ensuring a good acquisition and distribution of the liquid; an intermediate layer suitable to prevent the liquid to return to the surface, said intermediate layer is non-porous, wherein non-porous is defined by a void volume value ranging from about 10 to about 600 cm³ of void volume per m² of substrate (23). The absorbent structure also comprises a porous fibrous bottom layer, wherein porous according to the invention is defined by a void volume ranging from about 0.1 to 20000 cm³ of void space/m² of substrate (23), preferably from about 600 to about 6000 cm³ of void space/m² of substrate (23). Said fibrous bottom layer comprising coated or uncoated SAP particles (21) thus forming a SAP stratum beneath the intermediate layer. SAP particles (21) composing the SAP stratum are dispersed within the bottom layer, based on the SAP particle (21) size distribution gradient, wherein the smaller SAP particles (21) are located deeper into the bottom layer and the larger particles remain on the external part of the bottom layer such as the smaller SAP particles are placed on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles. A suitable non-porous core covering layer (22) having a void volume value ranging from about 10 to about 600 cm³ of void volume per m² of substrate (23) is used to prevent the release of the SAP particles (21), said core covering layer material (22) is maintained to the absorbent structure by adhesive means, ultrasonic welding and/or any suitable method (Figure 26).

Absorbent structures of the invention comprise SAP particles (21) wherein at least 90%, preferably 95%, and more preferably

98 % of the SAP particles (21) have a particle size diameter ranging from about 45 to about 850 μm , preferably from about 100 to about 800 μm and more preferably from about 200 to about 500 μm . Smaller size SAP particles (21) are able to
5 penetrate deeply, i.e. along the z direction, into the inner part of the substrate (23) while the larger size SAP particles (21) remain on the outer part of the substrate (23) or remain on the surface of said substrate (23), thus forming an absorbent stratum based on the SAP particle (21) size
10 gradient. The substrate is reversed such as the smaller particles are located on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles.

Absorbent structure of the invention comprising a SAP
15 particles (21) stratum fully integrated within the absorbent core and/or ADL, allows the preparation of thinner absorbent articles than conventional absorbent cores known by the inventors as said cores generally require a fluff absorption distribution layer or other cellulose based fiber system, for
20 instance curly fibers or a standard ADL system (19) in combination with a fluff holding core.

It has been found that absorbent cores according to the invention have an excellent liquid acquisition property and low rewettability. It is supposed that the SAP particles (21)
25 dispersed in the substrate (23) with a size distribution gradient, wherein the smaller particles are located on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles, are able to prevent the gel formation when the SAP particles
30 (21) are in a swollen state.

Super absorbent particles

According to the invention, SAP particles (21) are either uncoated, partially or totally coated.

Commercial available uncoated SAP particles (21) suitable for the invention are Ecotec EK-X EN 67 polymer grade, which is generally used in absorbent cores comprising SAP and fluff in a ratio up to 80 wt.% SAP loadings; Evonik: Favor SXM 10000, Favor 9155.

Advantageously, the SAP particles have a spherical shape such as Aquakeep SA55SX or Sumitomo SA60F from Arkema.

SAP particles (21) can either be incorporated in the absorbent layer or in the ADL or in both the absorbent layers and the ADL.

Absorbent core

An absorbent core according to the invention can be obtained by fully penetrating a non-woven substrate (23) with SAP particles (21), thus an additional conventional ADL (19) should be used, as illustrated in Figure 23.

A substrate (23) fully penetrated with SAP particles (21) according to the invention comprises up to 1000 g/m² of SAP, preferably about 300 to about 500 g/m² of SAP particles (21) depending on the body fluid holding capacity.

To avoid gel blocking, the swollen SAP particles (21) have to be sufficiently distant to be permeable enough to allow liquids, such as body fluids, to go through the absorbent layer. This was obtained by the inventors by distributing the SAP particles (21) within the substrate (23) based on the SAP particles size gradient. Without being bound to any theory, it is believed that only smaller SAP particles (21) penetrate deeply into the substrate (23), along the z-direction, while larger SAP particles (21) remain on the outer part of the substrate (23). Reversing the structure, the smaller particles are on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles. As smaller SAP particles (21) are sufficiently distant from one another, it does prevent gel blocking issue,

while larger SAP particles (21) are able to progressively absorb the excess of body fluids.

Preferably, the absorbent structure of the invention can be combined with a conventional ADL (19).

5 Figure 23 illustrates an absorbent core according to the invention comprising a non-woven substrate (23) and a dispersion of SAP particles (21) within the substrate (23), depending on the SAP particles (21) size gradient. The absorbent core is further combined with a conventional ADL
10 (19) on top of the absorbent core.

Figure 12 also illustrates an absorbent article according to the invention using a 3 layers ADL structure with SAP particles (21) in a swollen state after liquid uptake.

15 **Acquisition, dispersion, layers (ADL)**

In a second embodiment a specific amount and size of SAP particles (21) is dispersed, based on their size dispersion gradient, in a substrate (23) comprising an ADL structure, such as the substrate (23) is partly penetrated with the SAP
20 particles (21). The substrate is used such as the smaller particles are located on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles. Figures 9 and 10 illustrate this second embodiment.

25 According to the invention, an ADL comprising a sufficient amount of SAP particles (21) to absorb liquids or body fluids can be directly used as a unitary absorbent structure (Figures 9 and 22), said structure comprising an ADL section and an absorbent section comprising the dispersed SAP particles (21).

30 Generally up to 1000 g/m², preferably from about 300 to about 500 g/m² of SAP particles (21) is sufficient to combine in one element an ADL and an absorbent core.

The ADL can also comprise low amount of SAP particles (21) which serve as a temporary storage or surge layer (20) (Figure

21). Generally between 0.1 to 300 g/m², preferably from about 100 to about 200 g/m² is considered as a low amount of SAP particles (21). In the latter case, an additional absorbent core has to be combined with an ADL. Suitable ADL should
5 absorb water or liquids and slowly releasing it to the absorbent core.

Typically, ADL are multi-layer structures comprising an acquisition layer (2) and dispersion layers (3, 4). In a preferred mode, the ADL comprising a dispersion of SAP
10 particles (21) is a 3 layers structure composed of one acquisition layer (2) and 2 diffusion (3) layers.

In a particular embodiment, a triple layers ADL according to the invention can comprise an acquisition layer (14), a rewet layer (15) and a distribution layer (16) are illustrated in
15 Figure 3.

The top layer is a very porous acquisition layer (14) allowing fluids to easily penetrate the structure.

The intermediate layer is a non-porous diffusion layer preventing the fluid from going back to the top surface. By
20 non-porous according to the invention is defined by a void volume ranging from about 10-600 cm³ of void space / m² of substrate (23). The diffusion layer is also very hydrophilic, so that the liquid is spread over the core.

The bottom layer comprises profiled, or multilobal, fibers to
25 improve the liquid distribution over the absorbent core. Non limiting examples of commercially available multilobal fibers are 4DG 6dn, 4T 3dn, trilobal 6dn, pentalobal 6dn, quadfill 7dt, preferably, the fiber is a trilobal 6dn or pentalobal 6dn fiber and other shapes.

30 In another embodiment according to the invention, a triple layers ADL comprising an acquisition (14), distribution (16) and rewet (15) layers, as illustrated in Figure 4.

The top layer is a very porous acquisition layer (14) thus
35 allowing fluid to penetrate into the absorbent core.

The intermediate layer is a dispersion layer comprising profiled fibers, thus improving the distribution of the liquid to the bottom layer.

5 The bottom layer is a non-porous layer comprising very fine fibers, preventing liquid from going back to the surface. It is also very hydrophilic, so that the liquid is spread over the core.

10 In another embodiment according to the invention, a triple layers ADL comprising 2 acquisitions layers (14) and a rewet layer (15) is illustrated in Figure 5.

The top layer is a very porous acquisition layer (14) allowing fluid to penetrate into the absorbent structure.

15 The intermediate layer is also an acquisition layer (14) that is semi porous, wherein semi porous according to the invention is defined by a void volume ranging from about 300 to about 500 cm³ of void volume/m² of substrate (23), however said intermediate layer is characterized by a void volume distribution gradient (18a, 18b, 18c) thus creating a funnel
20 for the liquid transport towards the core.

The bottom layer is non-porous, and composed of very fine fibers preventing liquid from going back to the surface. Preferably, the bottom layer is calendered, to even more reduce the void volume on the surface, preventing the liquid
25 of the core returning to the surface. Said bottom layer is preferably hydrophilic, allowing the liquid to spread over the core.

30 In another embodiment according to the invention, the absorbent structure comprises a triple layers ADL also comprising an acquisition (14), distribution (16) and rewet (15) layers, as illustrated in Figure 6.

The top layer is a very porous acquisition layer (14) suitable to allow body fluids to penetrate into the absorbent structure.

5 The intermediate layer is a layer suitable for the distribution and spreading of the liquid to the bottom layer and to the core.

The bottom layer is a non-porous layer composed of a blend of fine hydrophilic and hydrophobic fibers, blocking the liquid from going back to the surface.

10

In another embodiment according to the invention, the absorbent structure comprises a triple layer, acquisition (14), distribution (16) and absorption (17) layers as illustrated in Figure 7.

15 The top layer is a very porous acquisition layer (14) allowing body fluids to penetrate into the absorbent core.

The intermediate layer is a distribution layer (16) comprising fibers to ensure the whole surface of the distribution layer (16) is used.

20 The bottom layer comprises a blend of fibers including viscose absorbing fibers, to temporarily store the liquid in said bottom layer, thus creating a buffer before the liquid is transferred to the absorbent core.

25 In another embodiment illustrated in Figure 8 the triple layer ADL comprises a blend of polyester and polyolefins fibres defining a triple layer system defining a void volume gradient (18a, 18b, 18c) of 3000, 1000 and 300 cm³ of void volume / m² of substrate surface (23), said void volume gradient (18a, 30 18b, 18c), creating a funnel for the liquid. This results in a higher liquid uptake speed.

The fibers used give a good resiliency and resistancy to pressure, creating a distance between core and top of the diaper, resulting in a dry surface.

ADL suitable for the invention are fluffless and ensure a fast liquid uptake, and good rewet properties, so that liquid is prevented from going back to the surface and maintain the top surface dry. It also makes sure the liquid is well spread and distributed, so that the total core is used to its maximum.

Absorbent structures

An absorbent structure according to the invention can combine an absorbent section and an acquisition (14) and dispersion (16) section. In these specific embodiments, illustrated in Figure 22, the absorbent structure is composed of a mono or multi layered non-woven fibrous substrate (23) such as polyester or poly polyethylene terephthalate (PET), polyethylene (PE), polypropylene (PP), coPP, PET/PE, PET/PP, PET/cop, PP/PE, PLA, PLA/PP, PVA, viscose, cotton, wool, PET/coPET, acetate, PTE, PVC, Bamboo, PBT, PA, Acryl, Modacryl, and/or regenerated fibers forming an interpenetrating network and SAP particles (21) and from about 0.1 to 50 g/m², preferably from 0.7 to 25 g/m² and more preferably from about 2 to 7 g/m² of adhesive. Preferably the absorbent structure does not comprise fluff at all. It is possible to incorporate a high quantity of SAP particles (21) within the absorbent layer because of the fibrous nature which allows the absorption of liquids without being subject to gel blocking due to swelling of the SAP particles (21). In a preferred embodiment of the invention, the absorbent structure comprises from about 25-300g/m², but preferably from about 60 to 150g/m² of ADL and/or substrate (23); from about 0.1 to 1000 g/m² of SAP particles (21), a preferred quantity of SAP particles (21) for baby diapers or adults incontinence ranges from 100 to 500 g/m², from 10 to 200 g/m² in feminine care products and from about 200-400g/m² for wound dressing. Generally, the absorbent

structure comprises from about 10 to 60 g/m² of a core covering layer (22).

Examples of commercially available fibers suitable to make the non-woven substrate (23) are Acryl Amicor 3.0n; Asota L10D; Eastlon SN-3450CMP1 4.0dn; Fibervisions ES-C Cure 2.2dt; Fibervisions ES-DELTA REPEAT II 5.7 dt 40mm; Grisuten 22 3.3 dt 60mm; Huvis LMF U16 6dn 51mm; Huvis LMF V16 4dn 51mm; Huvis OEPO1 N215 2.0dn; Ingeo PLA SLN2660E2 6.0dn; Invista 295 6.0dn; Meraklon PP Blend PH/HW 4.4dt; PES Greenfiber 6.7dt; Tesil 84M 6.7dt; Trevira 200 6.0dt; Viscocel 3.3 dt 40mm; Wellman H1295 7dt; Wellman T0745 17dt 60mm; Wellman H7112 12dt; Wellman H8015 7dt 60mm.

An absorbent structure according to the invention has a lateral dimension ranging from 0.1 to 800 mm but not limited to these dimensions. Depending on the different application, said absorbent structure typically has a lateral dimension of 50 to 180 mm for baby diaper products; from 30 to 250 mm for adult incontinence products; from 30 to 90 mm for feminine care products and from 100 by 100 mm² or 200 by 300 mm² for wound dressing.

Preferably, the non-woven fibrous substrate (23) is a triple layer substrate (23) comprising a top layer, which has an acquisition (14) and dispersion (16) functions for a fast liquid acquisition and a good distribution of the liquid over the total surface of the intermediate layer. The intermediate layer is preferably very hydrophilic so that the liquid is able to spread over the core. Said intermediate layer is also non-porous, to prevent the fluid to return to the top surface and to maintain the SAP particles (21) within the bottom layer during application, but also during the use of the absorbent article, once the SAP particles (21) are swollen by liquid.

The bottom layer is a very porous structure suitable for being penetrated with SAP particles (21), said bottom layer serves as a storage layer (20) (Figure 9).

5 In another embodiment, SAP particles (21) penetrate the void volume gradient (18a, 18b, 18c) of fibers network. Smaller particles will penetrate deeper than bigger particles due to the void volume gradient of fibres (18a, 18b, 18c). After flipping the structure, the top side of the fibrous structure
10 will be substantially free of SAP particles (21) and can further serve as acquisition (14), distribution (16) and rewet (15) layer.

In a further embodiment, SAP particles (21) can completely
15 penetrated a monolayer or multilayers, preferably dual or triple layer structure. The top and bottom part of the structure being covered by a covering layer (22) such as a spunbond, non-woven, spunlace or a film of polypropylene, polyethylene or PET, to prevent said SAP particles (21) from
20 transferring to the outside of the absorbent.

In a preferred embodiment, the multilayers substrate (23) has a porous top layer suitable to allow the penetration of the SAP particles (21) within the substrate (23) while the bottom
25 layer, or one of the intermediate layer, is non-porous to prevent the loss of SAP particles (21) by transfer through the substrate (23). Advantageously, at least one additional covering layer (22) is used to prevent any loss of SAP particles (21). In order to have more coverage additional 2
30 layers can be used.

If 2 layers are used, the edges of said covering layers (22) are glued to seal the structure. If one structure covering layer (22) is used, said layer is fold to wrap the structure and the edges are glued to seal the structure. The most ideal

is to wrap the structure on a C shape (C-wrap) but not necessary (Figure 26).

Method to prepare an absorbent structure

5

A method to prepare an absorbent structure suitable for the invention is illustrated in and comprises the step of:

10

- Unwinding (11) the fibrous substrate (7), and eventually perform a mechanical opening of the substrate which can be applied before or after the deposition of the SAP particles.

15

- Covering the substrate (7) with the SAP particles (21) by powder scattering (8); drum formation, through vacuum technology (8') of a standard diaper line; gravity feed; high pressure spray gun (air pressure cannon).

20

The SAP particles (21) are then dispersed in the substrate (7) by means of vibrations and/or the use of a vacuum table (8'). From 0 bar to 150 bars; preferred below 10 bars The SAP particles (21) are maintained in the fibrous substrate (7) by entrapment or entanglement and/or after an optional binding step wherein the SAP particles (21) are bonded to the non-woven fibres by the addition of glue which can be applied prior or after the deposition of the SAP. Preferably the glue is applied by a spray gun.

25

- Winding the absorbent structure (13).
- Optionally, calendering the product to create a channel structure in the longitudinal direction.

30

Preferably, the coated or uncoated SAP particles (21) are glued to the fibers of the ADL layers. None limitative bonding method include powder coating and thermo bonding, heat treatment, spray coating, powder scattering, reactive glue (activation and curing) or any combination thereof.

The SAP dispersion is preferably done by the combination spray gun and vacuum table.

After the step of covering and dispersing SAP particles onto the substrate, the substrate is preferably covered with an additional covering layer by:

- Unwinding (11) a core covering layer material (22).
- Applying an adhesive (10) on the inner face of the core covering layer (22) and/or the substrate surface (7).
- 10 • Covering the substrate (7) with said core covering layer material (22).
- Ensuring the adhesion by pressure (12).

Suitable device (see Figure 13 and 13 bis)

15 The devices (Figures 13 and 13 bis) suitable to prepare the absorbent structure of the invention can be employed either in line or off line of an ADL and/or core production line or of a diaper or feminine care production line.

20 Figures 13 and 13 bis also illustrate an optional precutting step (26) of the substrate indeed the cutting can be performed after the addition of SAP particles.

SAP particles

25 SAP particles (21) of diameter ranging from about 45µm to about 850µm, preferably from about 100 to about 800µm and more preferably from about 200 to 500µm and having an average diameter size of about 300 to 600µm are preferred as the small particles effectively penetrate the ADL while larger size
30 particles remain on the outer side of the diffusion layer thus forming a storage stratum (20). Advantageously SAP particles (21) of different size specification can be successively dispersed into the substrate. Smaller size specification SAP particles (21) can be dispersed in a 1st step and in a 2nd step

larger size specification SAP particles (21) can be dispersed within the substrate.

Adhesive

5 Suitable glue according to the invention has to provide a good adhesion, has to be permeable to liquids in order to allow the liquids to reach the absorbent layer and has to have an elongation at break of at least 100%, preferably of 600 to 1800 % in order to prevent gel blocking issue when the SAP
10 particles (21) are swollen by body fluids. Preferred glue are water based glue and solid powder glue, which are pulverized to bond the SAP particles (21). Suitable commercially available adhesives are, but not limited to, Bostik H4245; Bostik H20028; Bostik H4322 or Füller Full-Care 8400A or Henkel
15 Euromelt 357.

Method to produce multiple absorbent cores and/or ADL

A method to produce an absorbent structure comprising an absorbent core and/or an ADL according to the invention is
20 described in Figures 13 and 26.

Advantageously, said method can be adapted to produce profiled absorbent core and/or an ADL.

The unwinding substrate layer (7) has to be sufficiently wide
25 to process several absorbent structures in parallel. It is therefore possible to scattering and supply SAP particles (21) in a discontinuous manner over the width or lateral dimension or y direction of the substrate (7), as illustrated in Figure 14.

30

The method comprises the step of:

- Unwinding the fibrous substrate (7). Depending on the void volume distribution of the substrate (7), the substrate

(7) can be maintained upwards during the process in order to prevent the loss of SAP particles (21).

- Partially deposit an amount of SAP particles (21) on the substrate (7) over the lateral, or y-direction, of the substrate (7) by powder scattering (8), by a vacuum drum (8'), by gravity feed (8), or by a high pressure system such as spray gun or air pressure cannon (Figure 13 bis).
- Glue can be added to the substrate prior of after the SAP deposition step. Preferably the glue is applied on the substrate by a spray gun.
- Applying vibrations and vacuum (8') to the substrate to ensure a distribution of the SAP particles (21) within the substrate (7), said SAP particles (21) are maintained in the fibrous substrate (7) by entrapment or entanglement and/or after an optional binding step wherein the SAP particles (21) are bonded to the non-woven fibres by the addition of glue.
- Applying a hotmelt adhesive (10) on the substrate (7) surface and/or on the core covering layer (22).
- Unwinding (11) a core covering layer material.
- Covering the substrate (7) with said core covering layer (22). Where the SAP particles (21) are present, the hotmelt adhesive will bond the covering layer (22) to the substrate (7), binding the SAP particles in the totality (21). Where the substrate (7) is free of particles the adhesive will bond the core covering layer (22) material to the substrate layer (7) on part of the substrate (7) essentially free of SAP particles (21) thus sealing the absorbent core. Preferable with sealing; as the sealing prevents SAP particles (21) from falling out when this cutting occurs and prevents the SAP particles (21) from moving to the sides.

Cutting the layer where substrate (7) essentially free of SAP particles (21) to obtain individual cores as illustrated in Figure 15.

5 Further, to prevent sideways migration of the SAP particles, it is advantageous to add pressing barriers obtained by heating, pressurizing or ultrasonically.

Advantageously a SAP particles (21) distribution profile can be obtained along the length or longitudinal dimension or x-
10 direction of the absorbent structure. Said distribution profile is done by creating a profile in the supply roll used to deposit the SAP particles (21) on the substrate (7) by a powder scattering step. Figure 17 illustrates a supply roll according to the invention wherein the front, middle and back
15 sections of the substrate (7) will receive a specific amount of SAP particles (21).

The transition between the sections of different concentrations will be homogenized upon applying vibrations and vacuum (8') during the dispersion step.

20 As illustrated in Figure 18, a profiled absorbent structure along the longitudinal dimension (x-direction) can be obtained, using said supply roll, said structure comprising a higher amount of SAP particles (21) at the front and the middle, and a lower amount of SAP at the back of the diaper.

25 The profiled absorbent structure obtained accordingly comprises an absorbent part comprising SAP particles (21) partially penetrated in a nonwoven substrate (23) and an upper part serving as an ADL covered with a covering layer (22). The
30 covering layer (22) may be maintained by a hot melt adhesive. Thus the profiled absorbent structure can be directly used in absorbent articles.

Preferably, the deposit of SAP particles (21) on the non-woven substrate (23) has a lateral and a longitudinal profile as illustrated in Figure 25. As after the dispersion of the SAP particles (21) by applying vacuum (8') and/or vibration to the substrate, the absorbent structure obtained will have an optimized absorbing ability due to the amount of SAP particles (21) dispersed within the substrate (23) according to the x, y and z-direction gradient dispersions.

In a preferred embodiment, the SAP particles (21) are also dispersed in discrete zones along the x-direction and/or y-direction of the substrate (23), each discrete zone being separated from one another (Figure 19). Following the dispersion step, the resulting absorbent core and/or ADL comprises, different motifs such as bands, or channels free of SAP particles (21) thereby facilitating the flow and wicking of the fluid (Figures 19 and 20).

The absorbent structure can be used as a ready to use absorbent structure for absorbent articles (Figure 26) and can easily fitted in body shaped absorbent articles (Figure 24).

Examples

Examples of SAP particles (21) suitable for the invention are FAVOR SXM 10000 and FAVOR SXM 9155 from Evonik.

FAVOR SXM 10000 is a partially neutralized cross-linked sodium polyacrylate polymer having a size dispersion of approximately:

Particles size (µm)	%
SAP > 850 µm	< 1%
600 µm < SAP < 850 µm	20- 45%
300 µm < SAP < 600 µm	30-60%
150 µm < SAP < 300 µm	5-25%
45 µm < SAP < 150 µm	< 3%
SAP < 45µm	< 1%

FAVOR SXM 9155 is a cross-linked sodium polyacrylate polymer having a size dispersion of approximately:

Particles size (µm)	%
SAP > 850 µm	< 1%
600 µm < SAP < 850 µm	~ 35%
300 µm < SAP < 600 µm	~ 44%
150 µm < SAP < 300 µm	~ 16%
45 µm < SAP < 150 µm	~ 3%
SAP < 45µm	< 1%

5

Other examples of SAP particles suitable for the invention are BASF E2535-12

Particles size (µm)	%
SAP > 560 µm	~ 8%
400 µm < SAP < 560 µm	~ 51%
300 µm < SAP < 400 µm	~ 23.5%
220 µm < SAP < 300 µm	~ 9%
SAP < 220µm	< 8.5%

10

15

ARKEMA AQUAKEEP SA55SX

Particles size (μm)	%
SAP > 560 μm	~ 30%
400 μm < SAP < 560 μm	~ 41%
300 μm < SAP < 400 μm	~ 24%
200 μm < SAP < 300 μm	~ 4%
100 μm < SAP < 200 μm	~ 0.5%
SAP < 100 μm	< 0.5%

ARKEMA SUMITOMO SA60F

Particles size (μm)	%
SAP > 560 μm	~ 12%
400 μm < SAP < 560 μm	~ 30%
SAP < 400 μm	~ 58%

5 The SA55SX is coarser than the SA60F = 30%>560 μm for the SA55SX vs 12%>560 μm for the SA60F.

10 The most adapted particles size for support impregnation should be below 500 μm . In this regard the references Aquakeep SA60F and BASF ones are the most adapted for the impregnation. However Evonik types can be made with the same distribution and when we take a particle size cut in the Gauss distribution curve. We can also impregnate as well all the other SAP types.

15

ADL insertion or substitution

Commercial absorbent articles are compared to a same product wherein the ADL, if any, is substituted by an ADL of the invention. Insertion of a new ADL is performed as follow:

20

- The top sheet of the diaper is cut and carefully opened along the ADL, if any is present in the diaper. To prevent any damage to the absorbent core, the front part of the diaper must remain intact, in order not to affect the leakage.

- The ADL is carefully removed and its position is indicated on the topsheet using pins.
- A new ADL to be tested is then placed into the diaper.
- The diaper is then sealed and glued if necessary.

5

Spreading and absorption capacity measurements

Spreading represents the distribution in length of liquid in the absorbent device.

- 10 Absorption capacity represents the amount of liquid which can be hold by the absorbent device before leakage occurs.

Diapers

- 15 Prior to the measurement, the diapers are removed from their packaging for at least 1 hour to fully reloften the diaper.

The thickness of the diaper is measured under a load of 0.5 kPa at 3 different positions: front, center and back area.

20

Absorption before leakage test (ABL)

The acquisition capacity and spreading measurement method is based on a method developed by Courtray. For each test runs 4
25 samples are measured.

Spreading value is measured as the total length of the dispersion of the liquid and absorption capacity of diapers were measured on mannequins using an automatic dosage system which determines the doses and times.

- 30 When a leakage occurs, the leak is detected by the controlling system and a signal is sent to the monitoring system which records the absorption capacity of the absorbing device. absorption capacity recorded is then compared to the absorption capacity of an original diaper.

The system is calibrated prior to any test, or after every three series of tests.

A saline solution is used as a test fluid. The amount of test fluid used depends on the mannequin sizes and diaper types.

Type	Weight category (kg)	Mannequin size	Amount per doses of NaCl solution (ml) at 0,9%
Mini	< 6	1 (5 kg)	30
Midi	4 - 9	1 (5 kg)	45
Maxi	8 - 18	2 (7kg)	60
Maxi plus	10 - 20	2 (7kg)	65
Junior	12 - 25	3 (9 kg)	70

The diapers are weighted and the thickness is measured at the 3 different zones.

If necessary, the ADL is replaced as previously mentioned.

10 The diaper is placed and adjusted on the mannequin.

The mannequin is laid on its back or its abdomen depending on the measurement to be performed.

Test fluid is applied to the diaper by at least 3 consecutive doses. The flow of the test fluid for each dosing is of 200 ml/min (+/- 5 ml/min) and each dosing is spaced by an interval of 5 min. The first dose is applied to the abdomen, the second dose is applied on the back and the third and other doses are applied to the abdomen.

20 The method can also be adapted to simulate a boy or a girl.

The absorption capacity is calculated as the weight of the wet diaper minus the weight of the dry diaper. The spread is measured as the total length of the dispersion of the liquid.

25 **Acquisition time and rewet measures of absorbent devices.**

The acquisition time is the time required for the test liquid to penetrate the test sample.

The rewet is the amount of liquid absorbed by filter paper on the surface of the diapers at a certain load.

5

The apparatus comprises test plates with a tube and weighting 2 x 4.00kg; a cushion is used as a support; a 140 x 190mm filter plate obtained from S & S under the reference Type 604; Test liquid is obtained from Kanga under the reference LMT-10 003.

The test is performed either on commercial diapers or specific samples.

Hygiene diapers

15

METHOD

The tests are based on the Hy-Tec method.

20 Five samples are tested in parallel. The diapers are weighted and the thickness of the diaper is measured, under a load of 0.5 kPa, at 3 different zones: the front, the mid and the back of the diaper.

If required, an ADL originally present in the diaper may be substituted by a new ADL of the invention as previously described.

25 The center point of the diaper is marked and the pee-point is determined as being positioned 2.5 cm forward relative to the center point.

30 The diaper is laid flat on a cushion using weights and plates. The test plate is positioned parallel to the diaper and leveled, ensuring that the center of the tube is on the pee-point. The leg cuffs are pulled from under the sheet so that it is located next to the plate and any small leaks can

absorb. The weights are placed on the plate on both sides of the tube.

The quantity of test liquid is measured with the automatic dispensers and added through the tube within the weight plate, thus simulating a pee point. The amount of liquid depends on the type and size of the diapers (see Table).

Type	Weight category (kg)	Load on diaper (kg)	Amount of 0,9% NaCl solution (ml)	Load on the filter papers (kg)
Newborn		2 x 4	30	2 x 4
Mini	< 6	2 x 4	40	2 x 4
Midi	4 - 9	2 x 4	50	2 x 4
Maxi	8 - 18	2 x 4	70	2 x 4
Maxi plus	10 - 20	2 x 4	70	2 x 4
Junior	12 - 25	2 x 4	70	2 x 4

The samples are compared to an original diaper which was not manipulated and remained intact and to a reference diaper for which the ADL has been removed and reinserted as previously described.

After the liquid is fully incorporated into the 3rd diaper a timer built with a waiting time of 5 min

The acquisition time is measured.

After 5 min, a new dose entered and the acquisition time is record.

This is repeated twice. A total of 4 doses are added so that 4 acquisition times are obtained.

From about 20 to 30 g of filter papers are weighted. 5 min after the last addition of the fluid, the filter paper is placed on the first diaper. The center of the filter paper must be in line with the center of the diaper and the paper is below the leg cuffs. Weights are added on the plates for 15 seconds (such as acquisition time).

During these 15 seconds a 2nd filter paper is placed on the 2nd diaper. During the 15 seconds wait for the 2nd diaper, the filter paper of the 1st diaper is removed and weighed.

The rewet is repeated for the 3rd and so on. So as the diapers are measured in pairs.

The rewet (R) is calculated as the weight of the filter after measurement (NW) minus the initial weight of the filter (VW),

$$R = NW - VW$$

10 Apparatus

The product weight is measured at +/- 0.1g, and the filter weights (rewet) is measured +/- 0.01g.

Results

15

Absorbant structure comprising an unitary absorbent core composed of a nonwoven layer and SAP particles up to 400 g/m².

Sample	Type ADL	SAP (g/m ²)	Type SAP	Glue (g/m ²)	Glue location
1	15-352	400	FAVOR SXM 10000	15	On the covering layer
2	15-395K	400	FAVOR SXM 10000	12	On the covering layer
3	15-216	400	FAVOR SXM 10000	20	On the covering layer
4	15-396	400	FAVOR SXM 10000	15	On the covering layer
5	15-216	400	FAVOR SXM 10000	5	On the substrate

20

Absorbent structure comprising an ADL and an absorbent core composed of a nonwoven layer and up to 400 g/m² of SAP particles.

Sample	Type ADL	SAP (g/m ²)	Type SAP	Glue(g/m ²)	Glue location
6	15-352	400	FAVOR SXM 10000	15	glue on covering layer
7	15-307	400	FAVOR SXM 10000	20	glue on covering layer
8	15-395K	400	FAVOR SXM 10000	12	glue on covering layer
9	15-396	400	FAVOR SXM 10000	15	glue on covering layer
10	15-216	400	FAVOR SXM 10000	5	glue on substrate

Weight

	Libero n° 4	Libero n° 5	Dry Max n° 4	Dry Max n° 5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Wet diaper (g)	213.255	214.507	211.243	216.78	201.273	202.003	206.23	207.47
Dry diaper (g)	34.1633	35.4767	31.1567	35.7167	27.4667	27.7967	30.5567	30.3633

Fluid capacity (g)	179,0917	179,0303	180,0863	181,0633	173,8063	174,2063	175,6733	177,1067
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From this table it is apparent that for a similar fluid capacity, the sample 9 (glue Bostik and Fuller) with a C fold C-wrap system are the lightest diapers. Making their suitable for comfortable diapers.

Thickness (mm) at 0.5 kPa

	Libero n°4	Libero n°5	Dry Max n°4	Dry Max n°5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Front	6.20	5.70	2.45	3.49	3.66	3.36	3.79	3.61
Middle	9.26	8.44	7.69	7.33	5.13	4.44	4.98	5.12
Back	3.42	4.17	1.17	1.13	3.52	2.91	3.58	3.63

While Dry Max diapers are thin at the front and the back region, their thickness are not homogenous and are particularly thick in the middle section, whereas sample 9 diapers remain thinner throughout the whole diaper length.

5

Inlet time

	Libero n°4	Libero n°5	Dry Max n°4	Dry Max n°5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Inlet time 1	44.01	67.29	26.837	27.12	49.66	46.41	47.35	45.43
Inlet time 2	80.60	110.52	50.20	37.07	98.38	83.58	99.39	95.66
Inlet time 3	143.52	164.35	54.50	46.95	116.36	92.66	128.66	103.71

37

Dry Max diapers provide the fastest inlet time. However samples 9 and 7 materials demonstrate satisfactory inlet time which are similar or better than the Libero samples. From the samples of the invention, Sample 9 Glue fuller C-wrap gives good inlet time, particularly after the 3rd inlet.

10

15

Rewet

	Libero n° 4	Libero n° 5	Dry Max n° 4	Dry Max n° 5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Rewet 1	0.18	0.12	0.17	0.10	0.14	0.19	0.10	0.20
Rewet 2	0.13	0.15	0.16	0.13	0.15	0.15	0.27	0.21
Rewet 3	0.14	0.17	0.16	0.13	5.9	5.50	2.78	1.92

Spreading

	Libero n° 4	Libero n° 5	Dry Max n° 4	Dry Max n° 5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Spreading (cm)	22.67	25.33	23.83	24.67	26.67	26.00	26.00	27.67

5

“Spreading of liquid after the Kanga test is all quite similar.”

Spreading

	Libero	Libero	Dry	Sample 9	Sample 9	Sample 9	Sample 7
	Libero	Libero	Dry	Sample 9	Sample 9	Sample 9	Sample 7

	n° 4	n° 5	Max n° 4	Max n° 5	Glue Bostik C-wrap	Glue fuller C-wrap	Glue fuller Envelop wrap	Glue fuller
Spreading (cm)	20.25	21.83	25.00	26.50	25.38	24.50	21.38	26.33

Dry Max n°5 obtains excellent spreading. The sample 9 type diapers also demonstrate good spreading ability, comparable to the Dry Max products.

5 Amount of absorbed fluid

	Libero n° 4	Libero n° 5	Dry Max n° 4	Dry Max n° 5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Absorbed fluid (g)	193.50	168.53	226.45	216.53	172.70	160.20	185.23	176.87

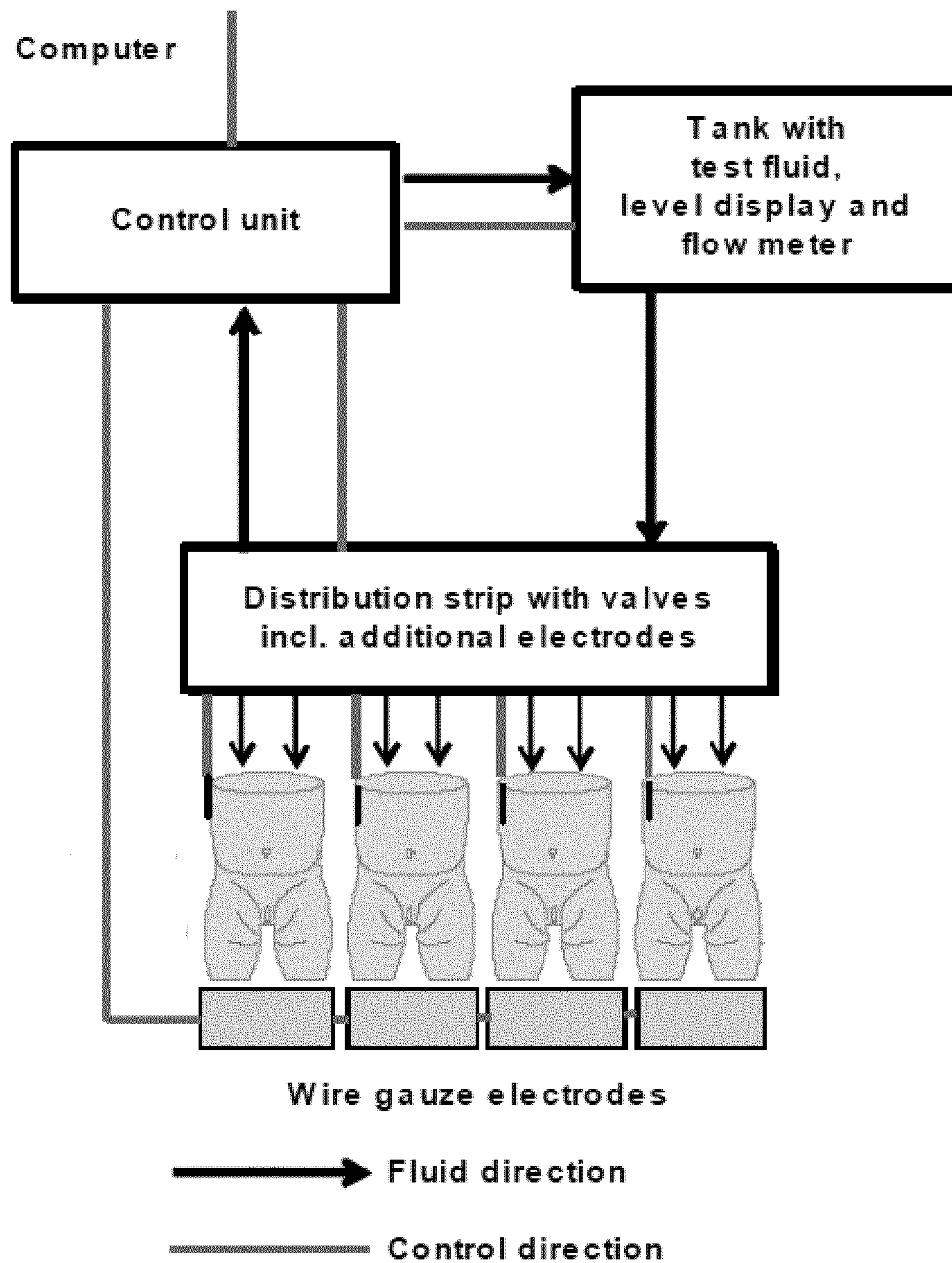
Absorbed fluid amount is best for Dry Max. Sample 9 Glue Bostik C-wrap, Sample 9 Glue Fuller Envelop wrap and Sample 7 Glue fuller score better than Libero n°5.

Time before leakage

	Libero n° 4	Libero n° 5	Dry Max n° 4	Dry Max n° 5	Sample 9 Glue Bostik C-wrap	Sample 9 Glue fuller C-wrap	Sample 9 Glue fuller Envelop wrap	Sample 7 Glue fuller
Time before leakage _(s)	1061.23	964.13	1214.53	1174.63	963.176	894.20	1040.73	1000.70

The times before leakage tested on the samples are excellent, particularly for the Dry Max and the sample 9 glue Fuller envelop wrap and Sample 7 glue Fuller.

From these test it is apparent that sample 9 glue Fuller C-wrap and sample 9 glue Fuller envelop wrap demonstrate excellent overall results.



Diaper acquisition and spread method

Claims

1. A unitary absorbent structure comprising an absorbent core (5) and/or an acquisition (2) and dispersion (3) layers, comprising at least one non-woven fibrous substrate (23) layer having a void volume suitable to be penetrated by super absorbent particles, said super absorbent particles are dispersed in the substrate layer (23) according to their particle size distribution gradient along the depth direction or z-direction of said absorbent core (5) and/or acquisition (2) and dispersion (3) layers, characterized in that the smaller particles are located on the bodyside of the absorbent articles and the larger particles are located on the opposite side of the absorbent articles.
2. Absorbent structure according to claim 1, wherein that said substrate layer penetrated by the super absorbent particles is part of the absorbent core (5) and/or the acquisition (2) and dispersion (3) layers.
3. Absorbent structure according to claims 1 or 2, wherein in that said absorbent structure is free of fluff.
4. Absorbent structure according to any previous claims 2, wherein in that super absorbent particles size dispersion, is ranging from about 45 to about 850 μm , preferably from about 100 to 800 μm .
5. Absorbent structure according to any previous claims, wherein in that said substrate layer (23) have a void volume ranging from about 0.1 to 20000 cm^3/m^2 of substrate (23) surface, preferably from about 10 to 6000 cm^3/m^2 of substrate (23) surface.

6. Absorbent structure according to any previous claims, wherein in that said substrate layer (23) is a multilayer substrate (23).

5 7. Absorbent structure according to claim 6, wherein in that said substrate layer (23) comprises an acquisition (14) and dispersion (16) layers.

8. Absorbent structure according to claim 6 or 7, wherein that
10 said substrate layer (23) is a triple layer comprising a top acquisition (14) and dispersion (16) layers and an intermediate layer, said intermediate layer having a void volume value ranging from about 10 to about 600 cm³ per m² of substrate (23) and a bottom layer having a void volume ranging
15 from about 10 to about 600 cm³ per m² of substrate (23).

9. Absorbent structure according to any previous claims, wherein in that the non-woven fiber is select from the group of polyester or polyethylene terephthalate (PET), polyethylene
20 (PE), polypropylene (PP), coPP, PET/PE, PET/PP, PET/cop, PP/PE, PLA, PLA/PP, PVA, viscose, cotton, wool, PET/coPET, acetate, PTE, PVC, Bamboo, PBT, PA, Acryl, Modacryl regenerated fibers.

25 10. Absorbent structure according to any previous claims, wherein in that the super absorbent particles are polyacrylate polymers.

11. Absorbent structure according to any previous claims,
30 wherein in that the super absorbent particles are deposited depending on a profile along the longitudinal dimension or x-direction of said absorbent structure.

12. Absorbent structure according to any previous claims, wherein in that the super absorbent particles are deposited depending on a profile along the lateral direction or y-direction of said absorbent structure.

5

13. Absorbent structure according to any previous claims , wherein the super absorbent particles are dispersed in discrete zones on the substrate (23) separated from one another, thereby facilitating the flow and wicking of the fluid along the x-direction and/or y-direction of said absorbent structure.

10

14. Method to prepare an absorbent structure as defined in claims 1 to 13 comprising the step of:

15

- unwinding the fibrous substrate (7);
 - covering, at least partially, the substrate (7) with the super absorbent polymer particles;
 - Disperse the SAP particles (21) in the fibrous substrate (7) by applying vibrations and vacuum (8') by a vacuum table,
- 20
- unwinding (11)a core covering layer material (22),
 - applying an adhesive on the inner face of the core covering layer material (22) and/or the substrate (7) surface,
- 25
- covering the substrate (7) with said core covering layer material (22),
 - ensuring the adhesion by pressure.

15. The method of claim 14, wherein the dispersion step of the SAP particles (21) in the fibrous substrate is additionally dispersed by the means selected among a spray gun or gravity.

30

16. The method of claim 14 or 15 comprising the step of:
Cutting the layer where said substrate (7) is essentially free
of super absorbent particles to obtain individual cores.

5 17. Method according to claim 14 or 16 characterized in that
the step of covering substrate (7) surface with super
absorbent particles is performed by the use of powder
scattering; drum formation through vacuum technology (8');
gravity feed (8) or high pressure spray gun (8).

10

18. Device suitable to perform the method of claim 14 or 17
characterized in that the device is in line or off line of an
ADL and/or core production line or of a diaper or feminine
care production line.

15

19. Absorbent article comprising an absorbent structure as
define in claim 1 to 12.

20. Absorbent article according to claim 19 comprising:

20

- (a) a liquid pervious topsheet;
- (b) a liquid impervious backsheet;
- (c) an absorbent structure positioned between (a) and (b)

21. Absorbent article according to claim 20 comprising an
25 additional acquisition (2) and dispersion (3) layers
positioned on top of said absorbent structure.

22. Absorbent article according to claim 21 comprising an
additional absorbent core positioned underneath said absorbent
30 structure.

23. Absorbent article according to claim 19 comprising at
least 2 absorbent structures as defined in claim 1.

24. Absorbent article according to claim 19 to 23 characterized in that said absorbent article is body shaped.

25. Absorbent article according to claim 19 to 24
5 characterized in that said article is selected from the group consisting of diaper, a light and/or heavy incontinent pad, a feminine care sanitary napkin and panty liner or a wound dressing.

10 26. Diaper or light and/or heavy incontinent pad according to claim 25 characterized in that said absorbent article comprising from about 0.1 to about 1000 g/m², preferably from about 100 to about 500 g/m² of super absorbent particles.

15 27. Feminine care sanitary napkin or panty liner according to claim 25 characterized in that said absorbent article comprising from about 0.1 to about 1000 g/m² of super absorbent particles, preferably from about 10 to about 200 g/m² of super absorbent particles.

20

28. Wound dressing according to claim 25 characterized in that said absorbent article comprising from about 0.1 to about 1000 g/m² of super absorbent particles, preferably from about 100 to about 700 g/m² and preferred from about 200-400g/m² of
25 super absorbent particles.

Fig 1

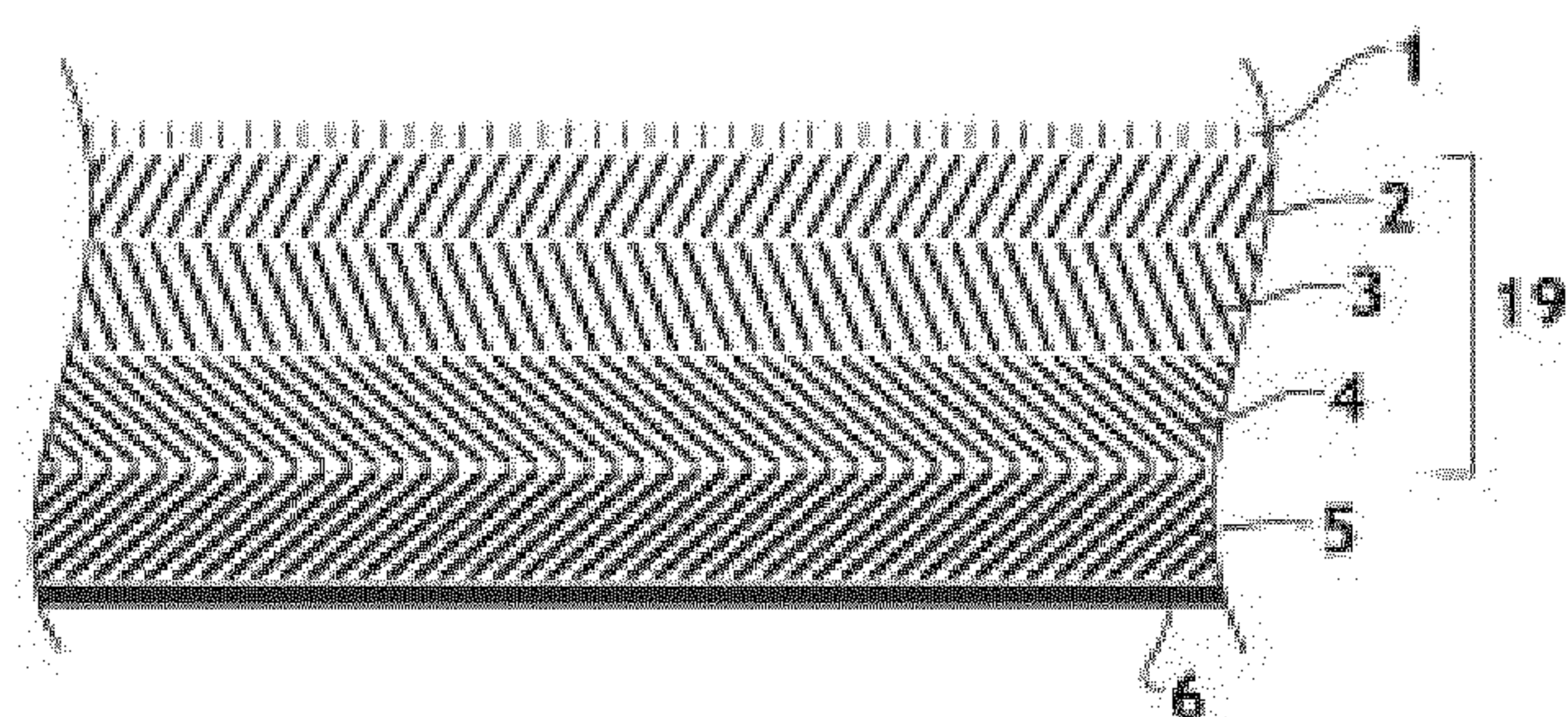


Fig 2

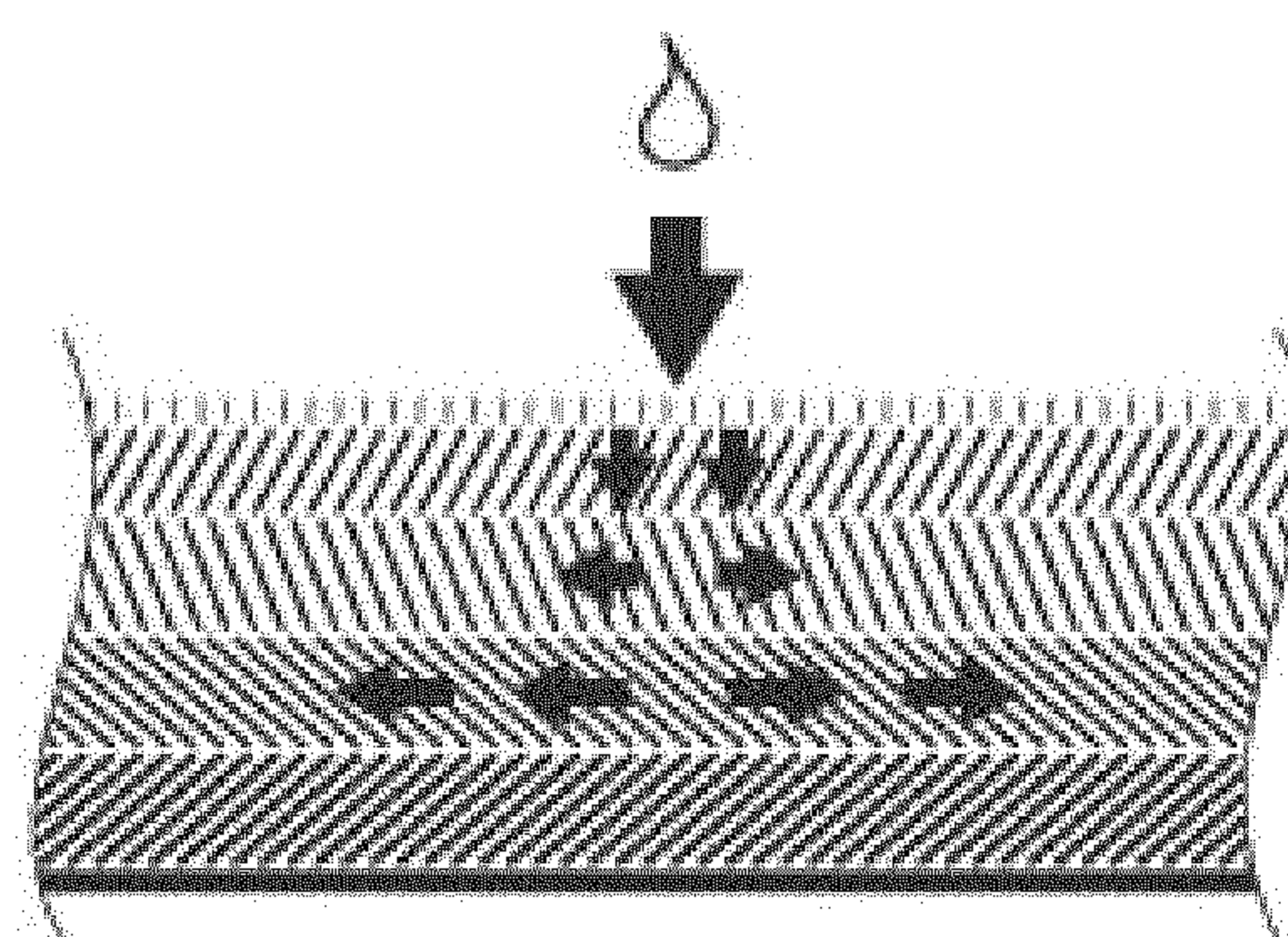


Fig 3

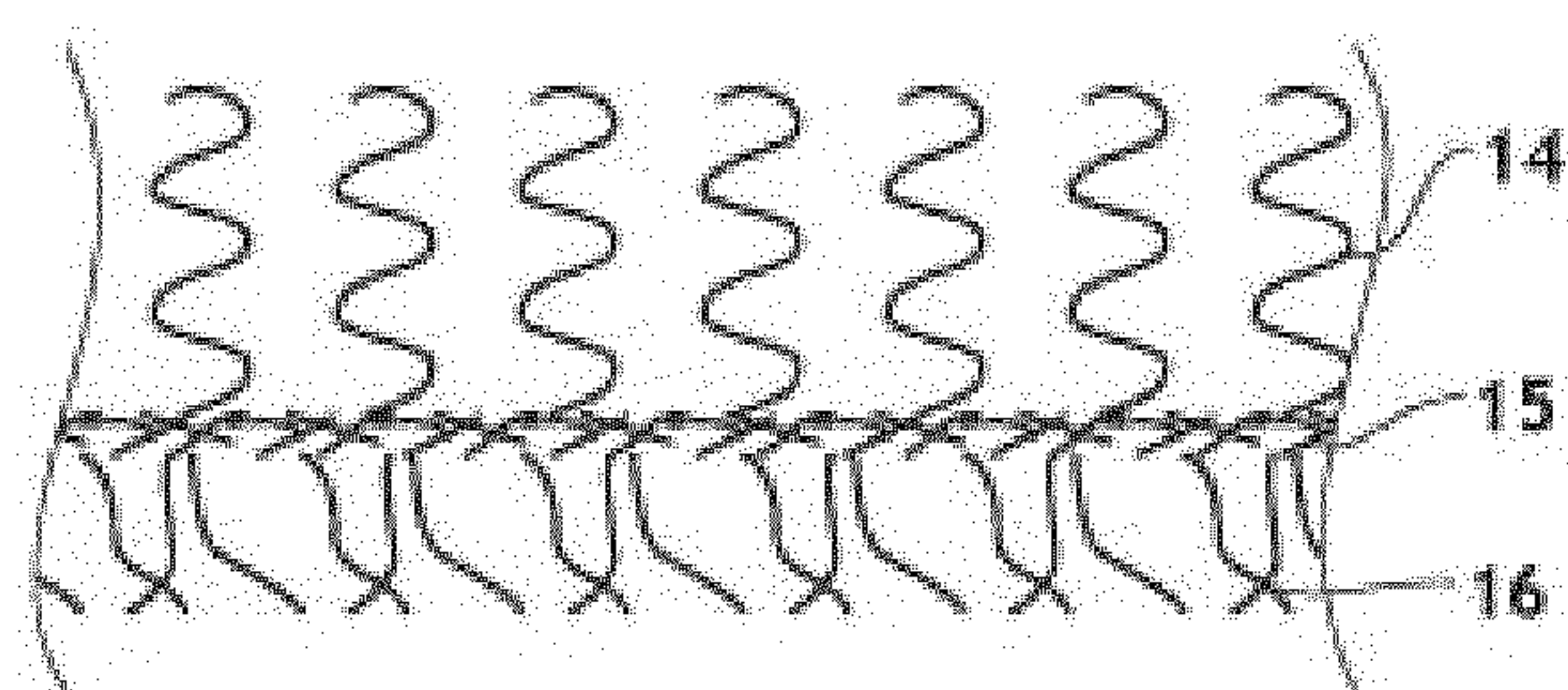


Fig 4

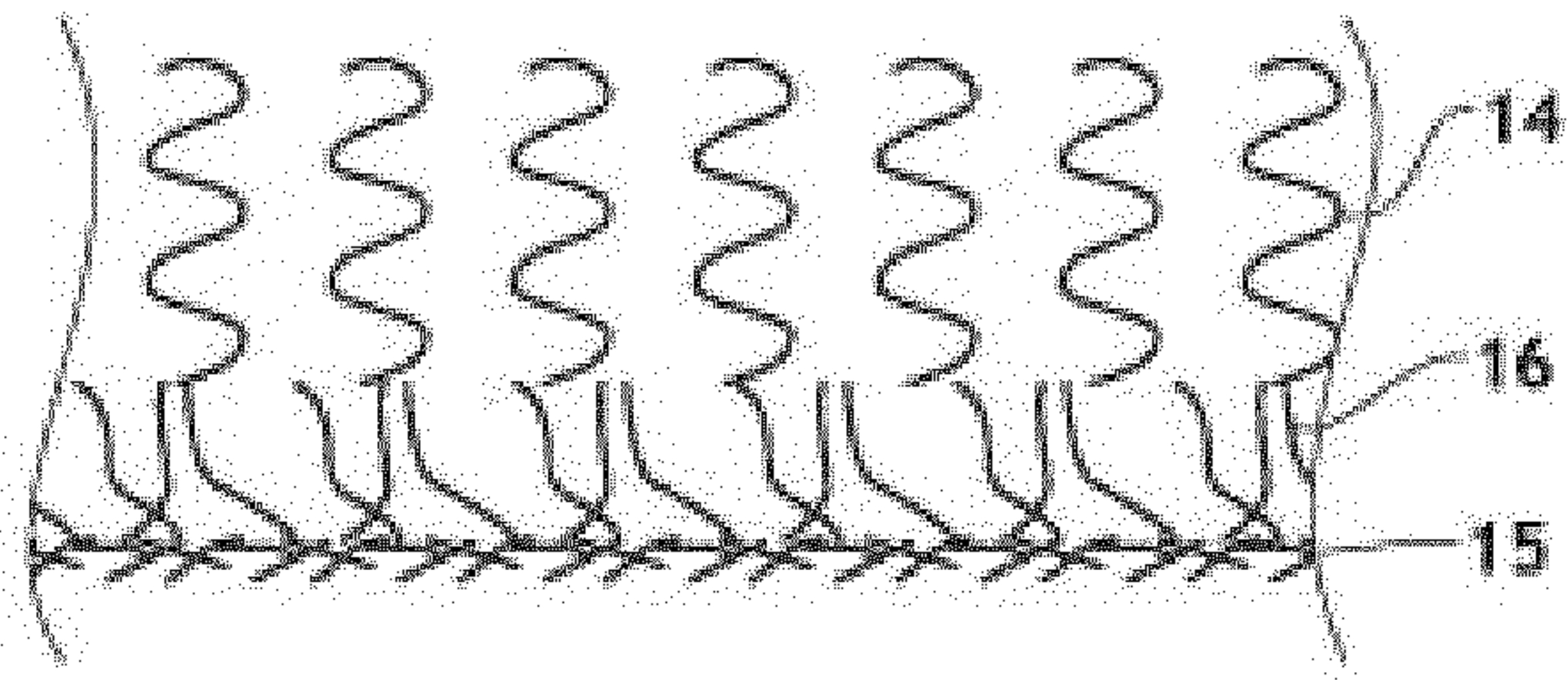


Fig 5

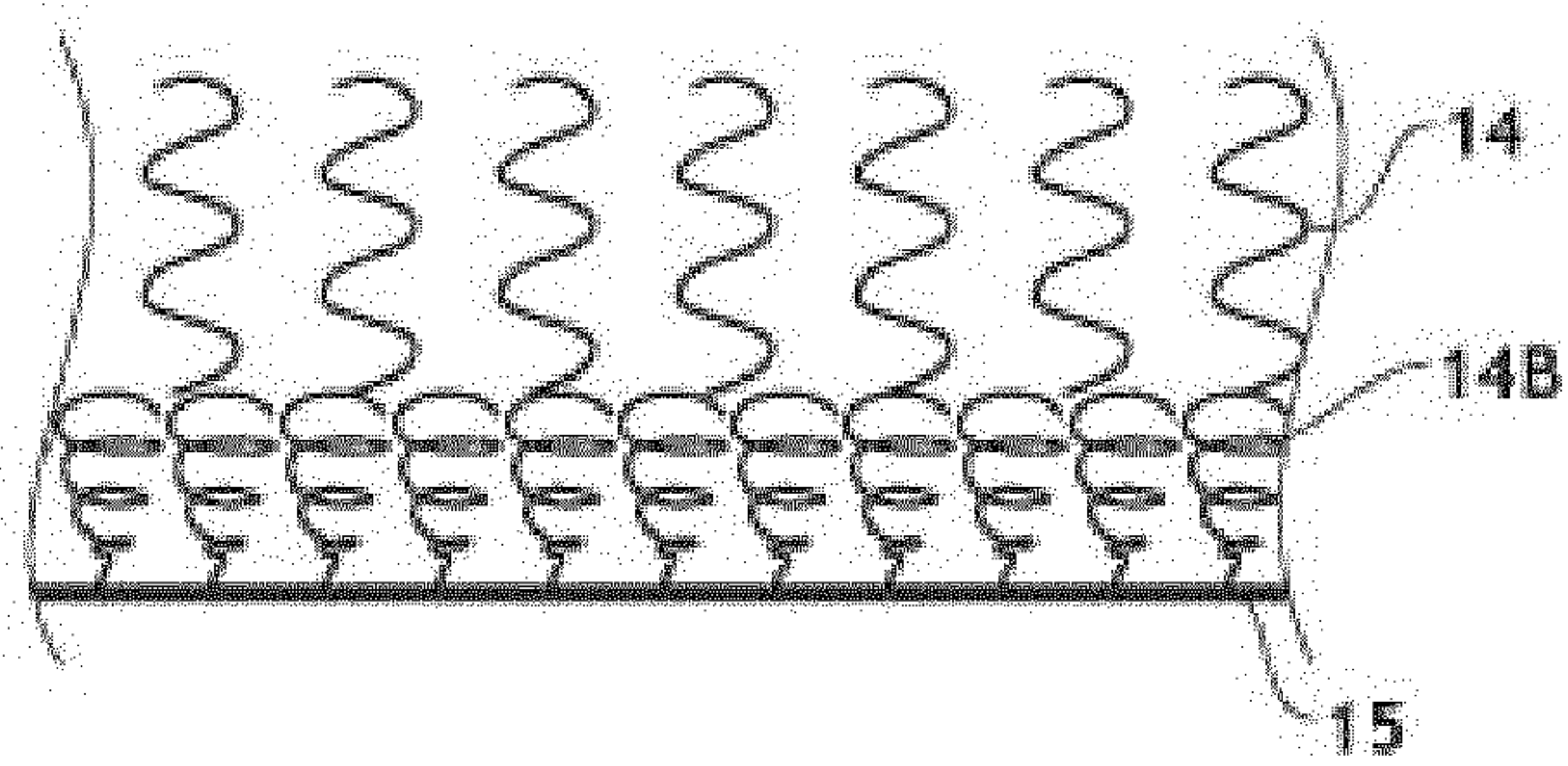


Fig 6

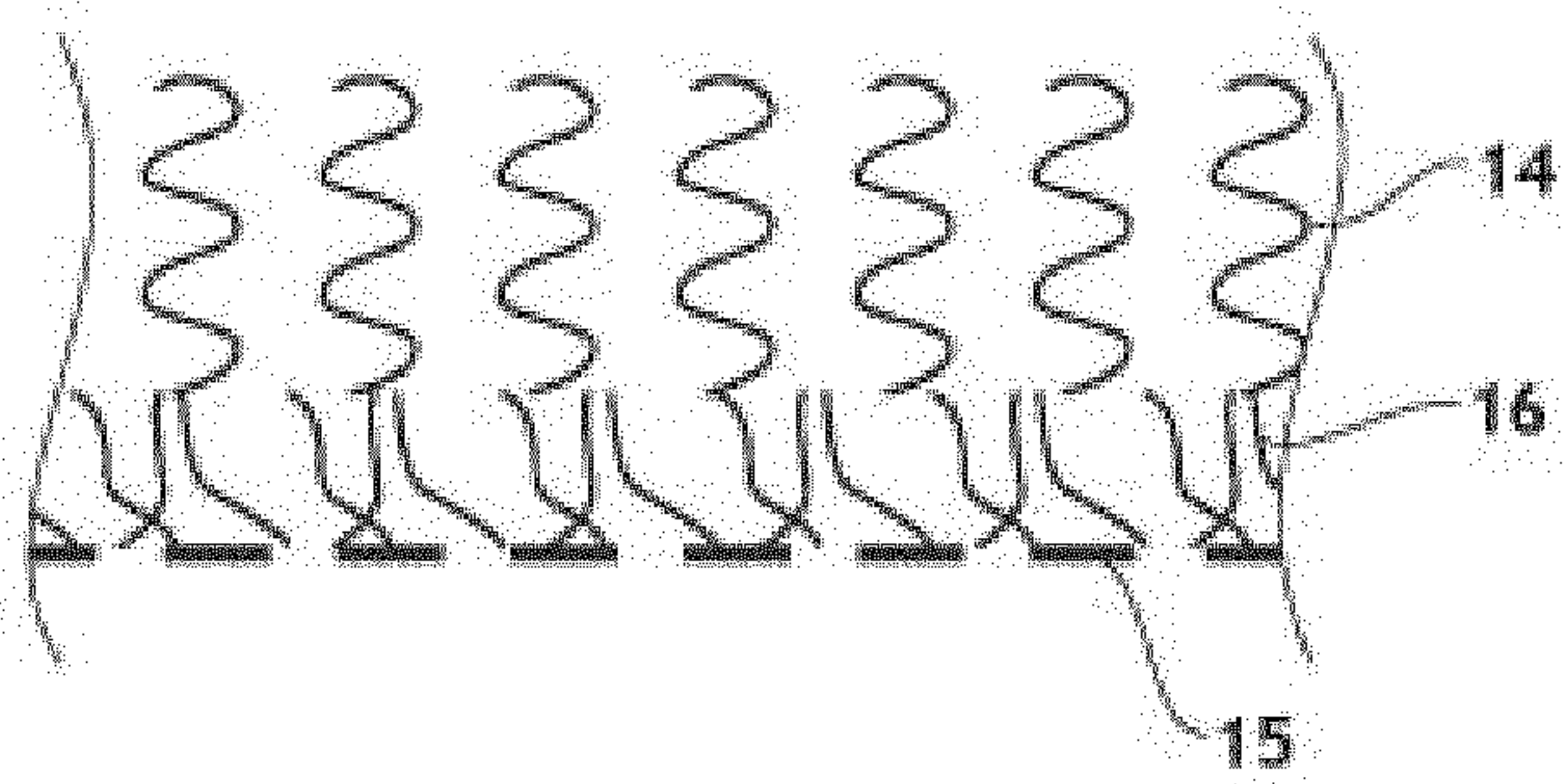


Fig 7

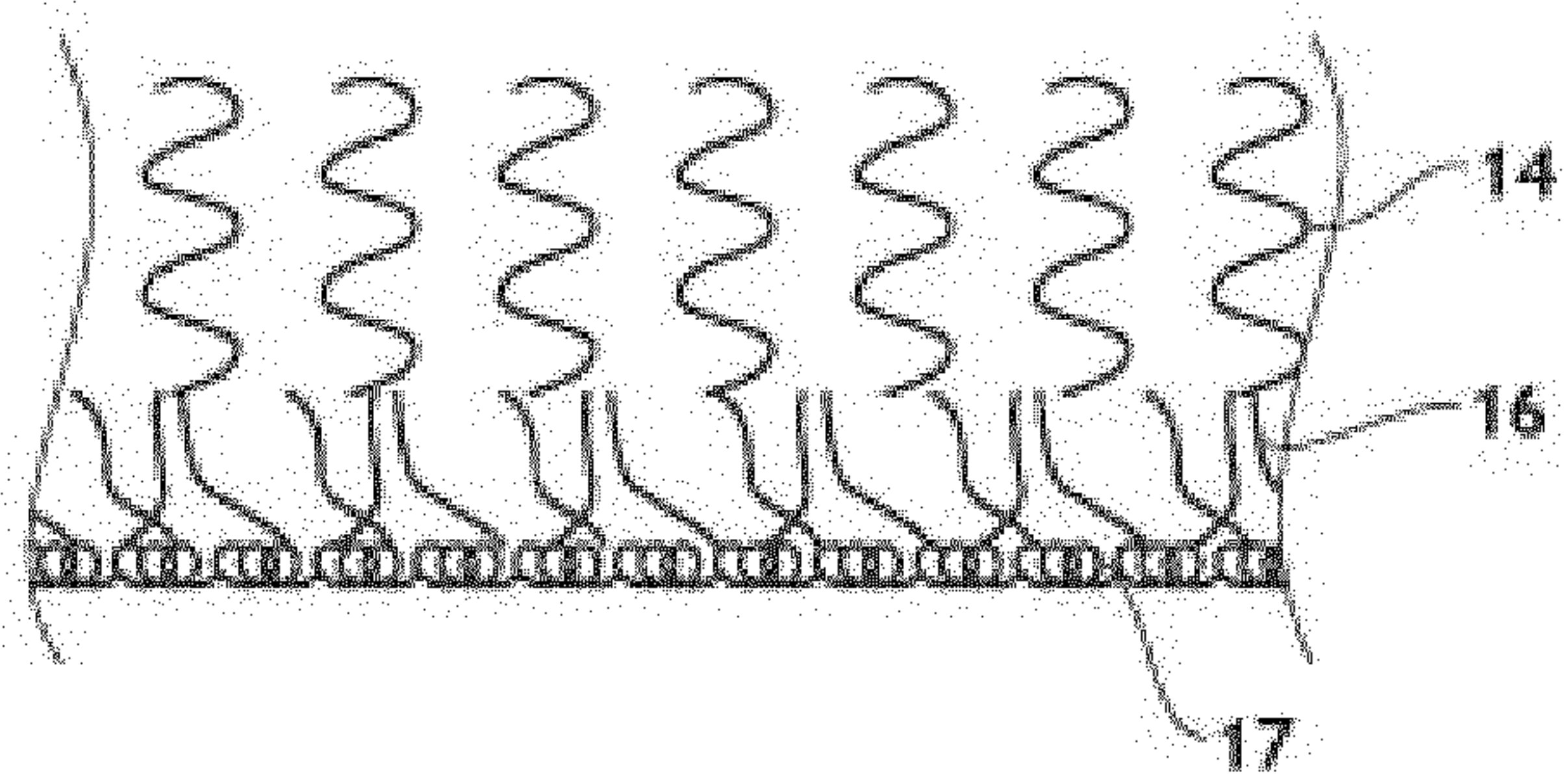


Fig 8

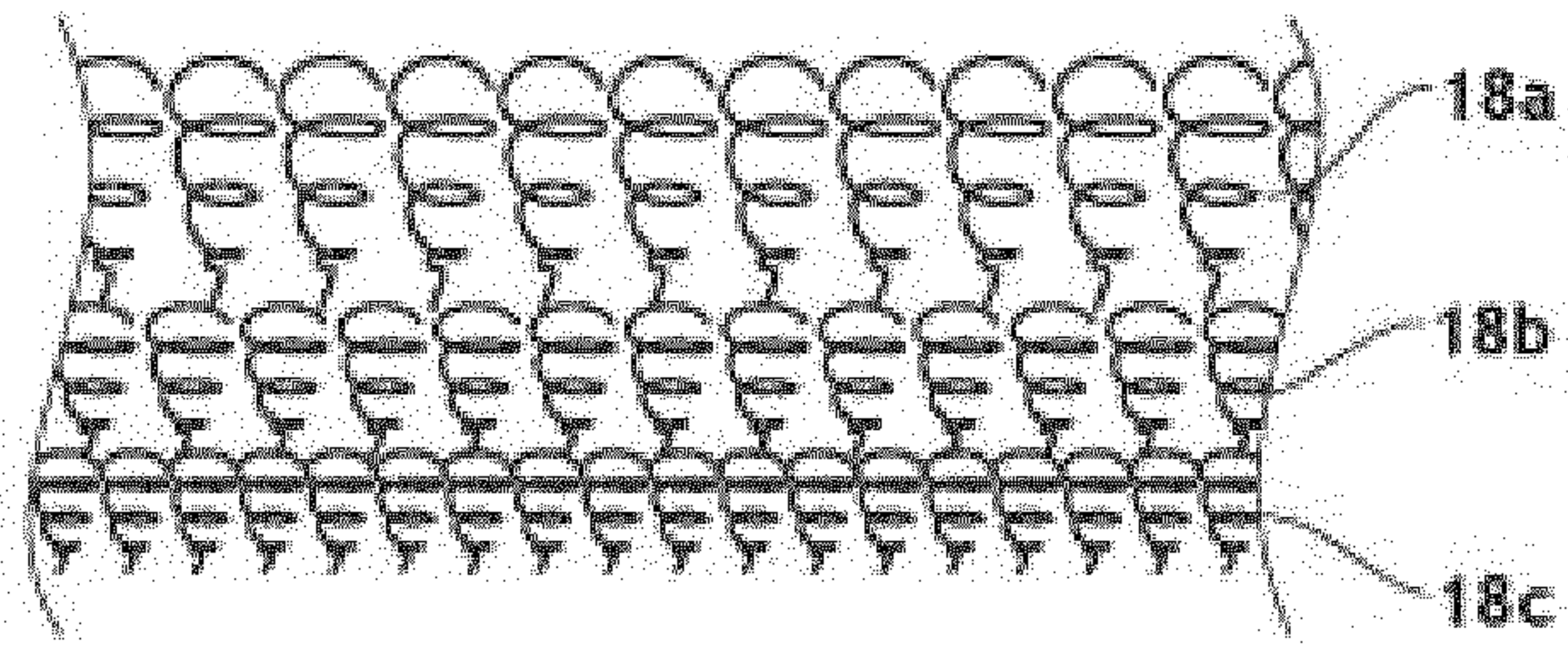


Fig 9

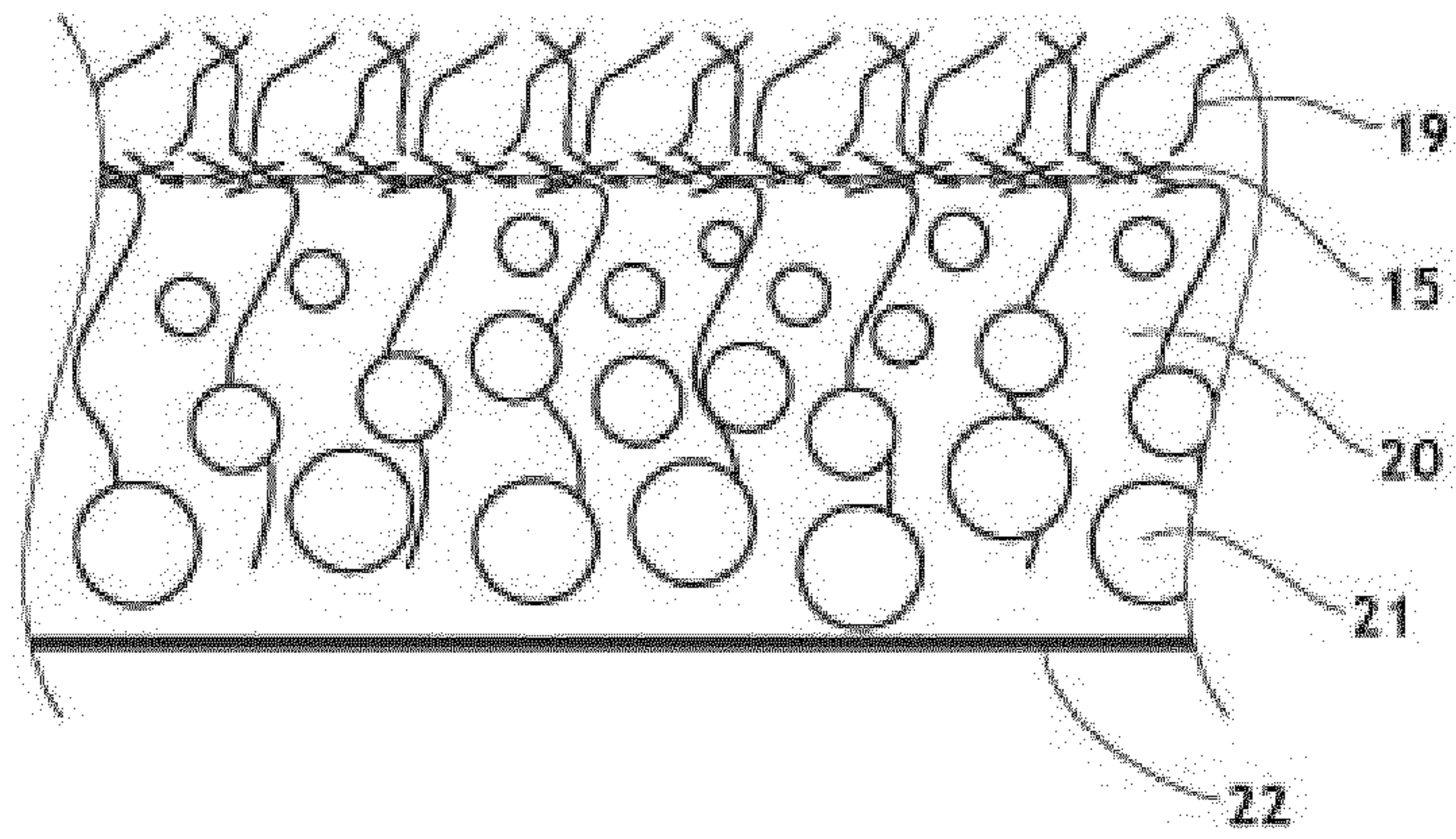


Fig 10

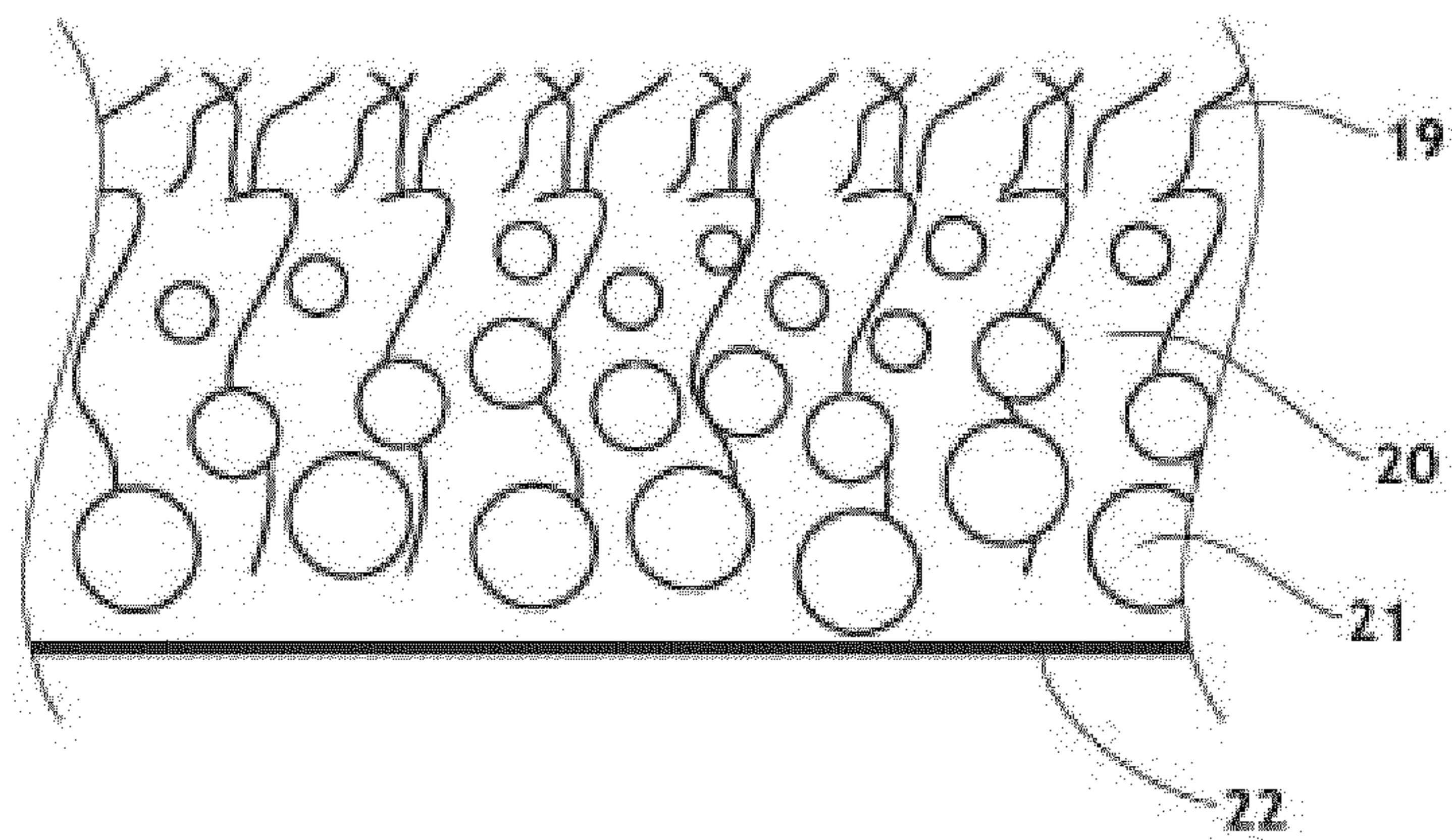


Fig 11

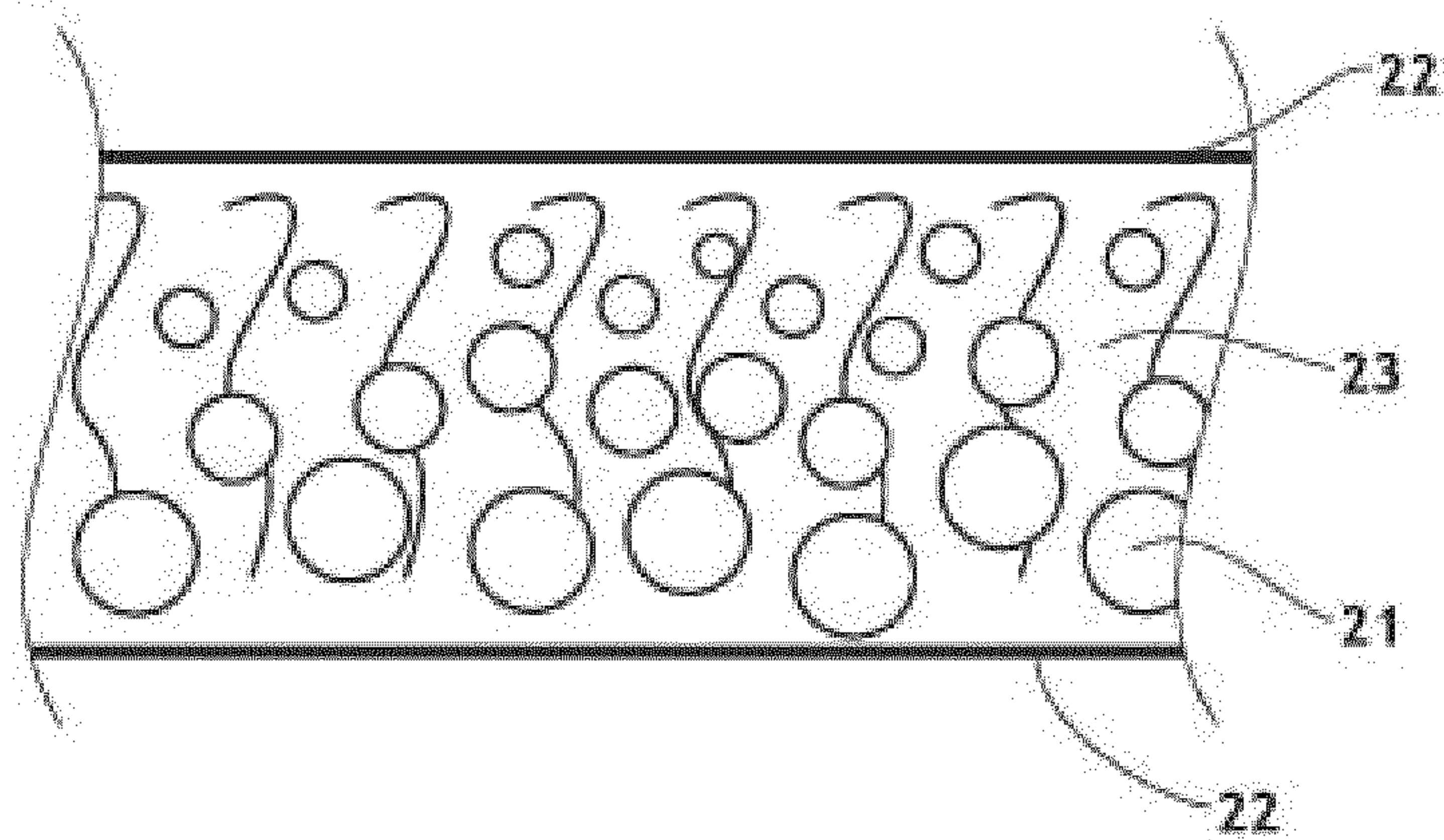
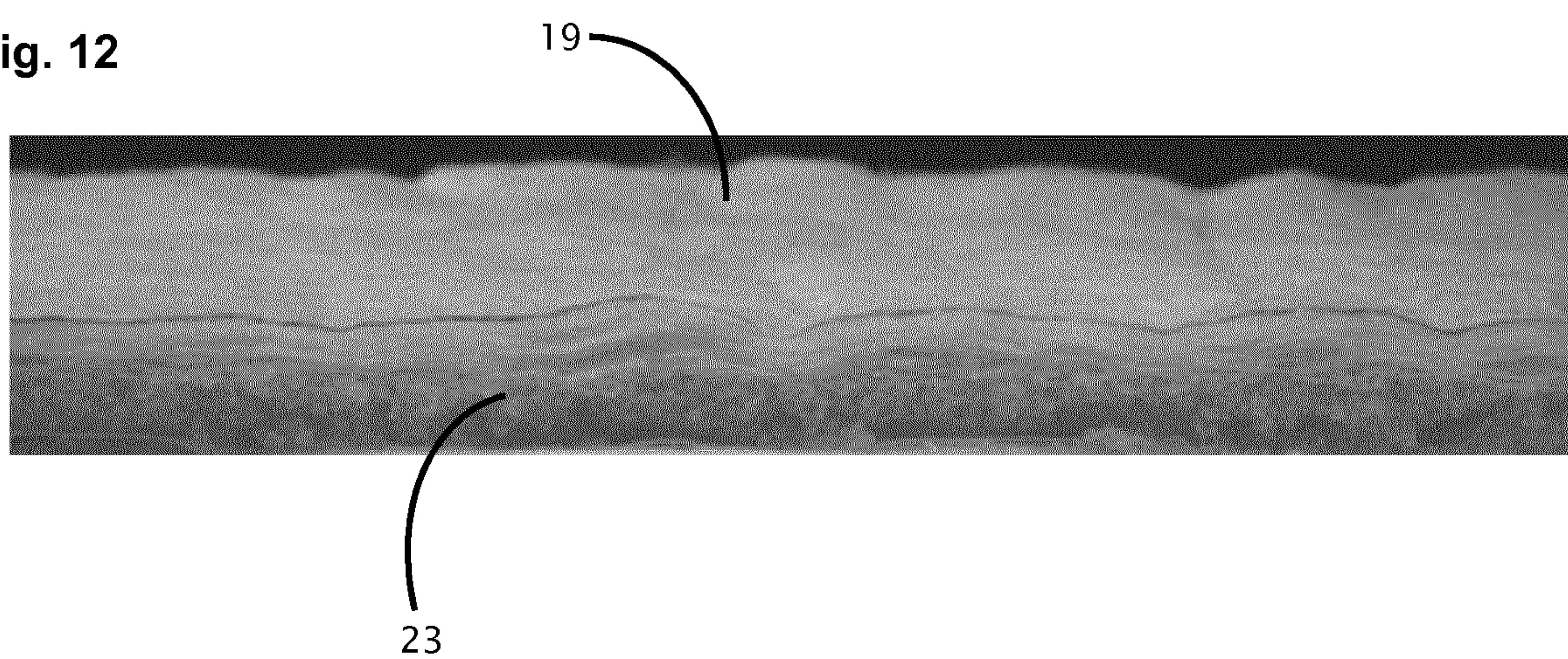


Fig. 12



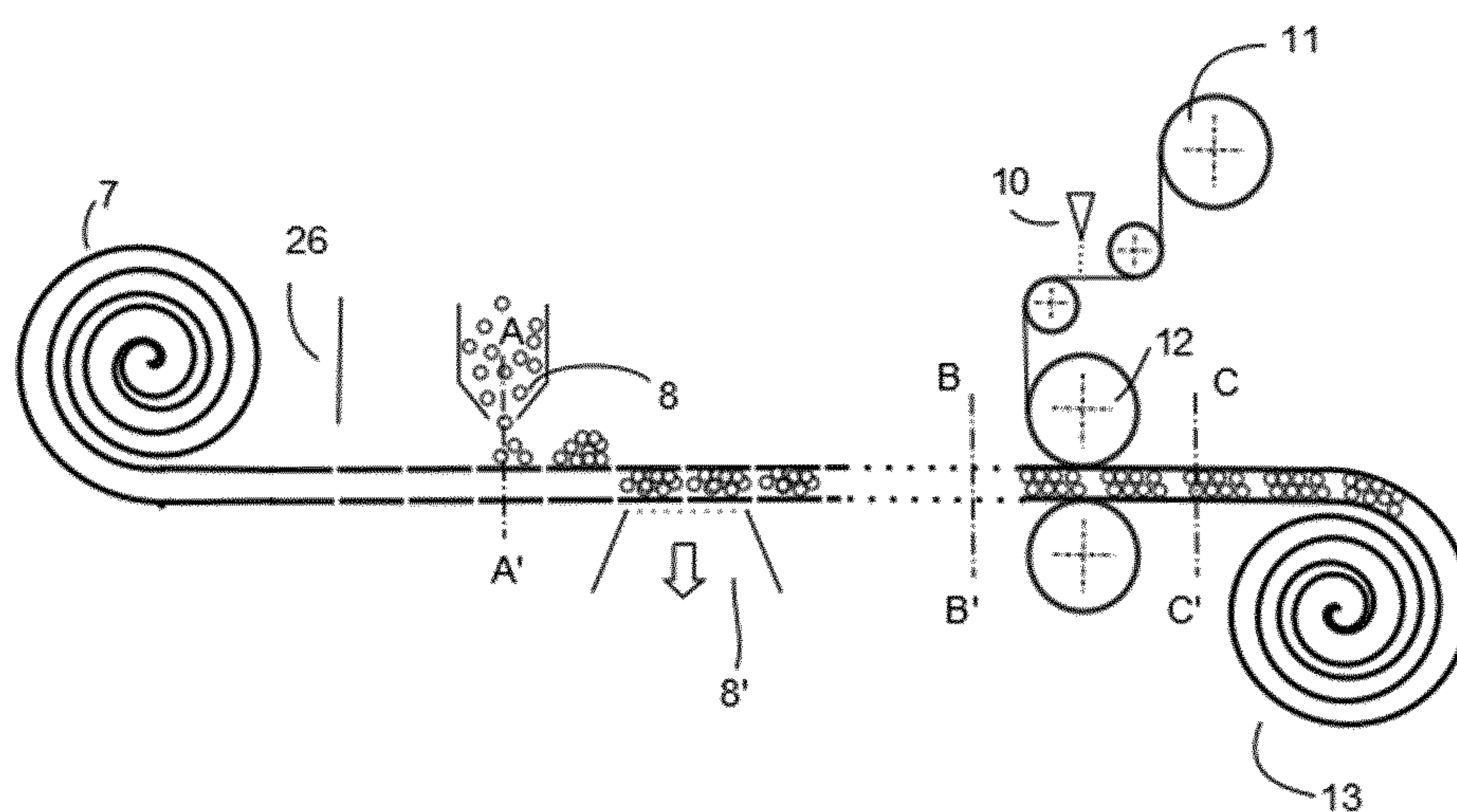


Figure 13

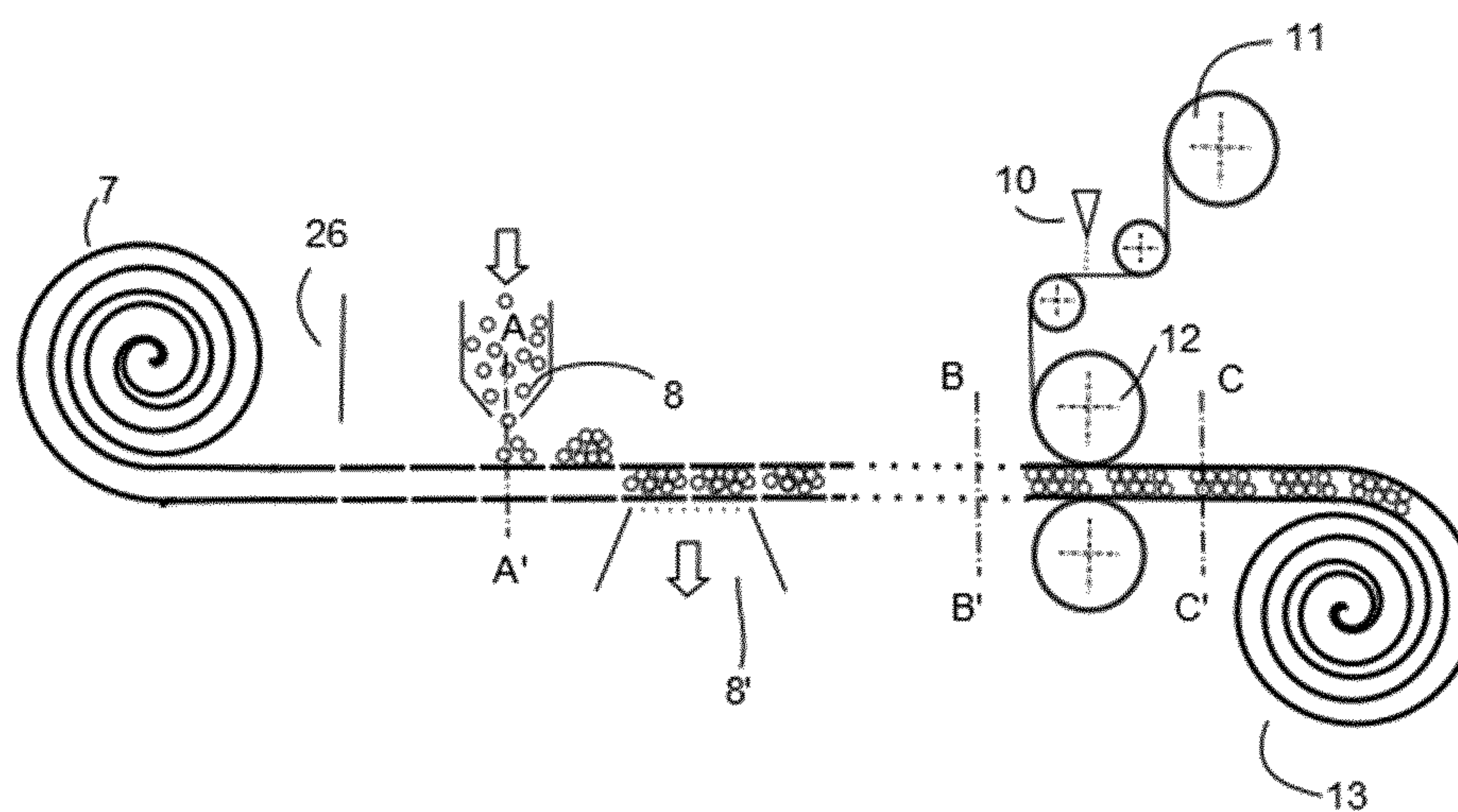


Figure 13 bis

Fig 14

AA'Cut

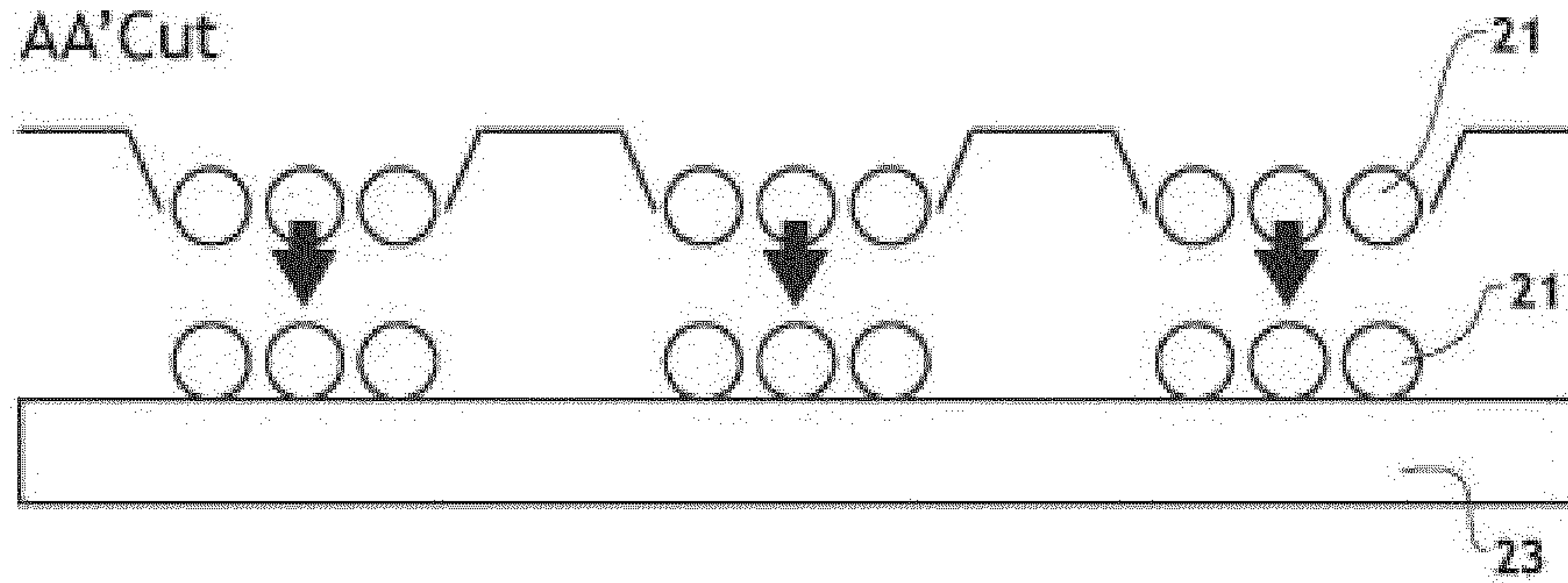


Fig 15

BB'Cut

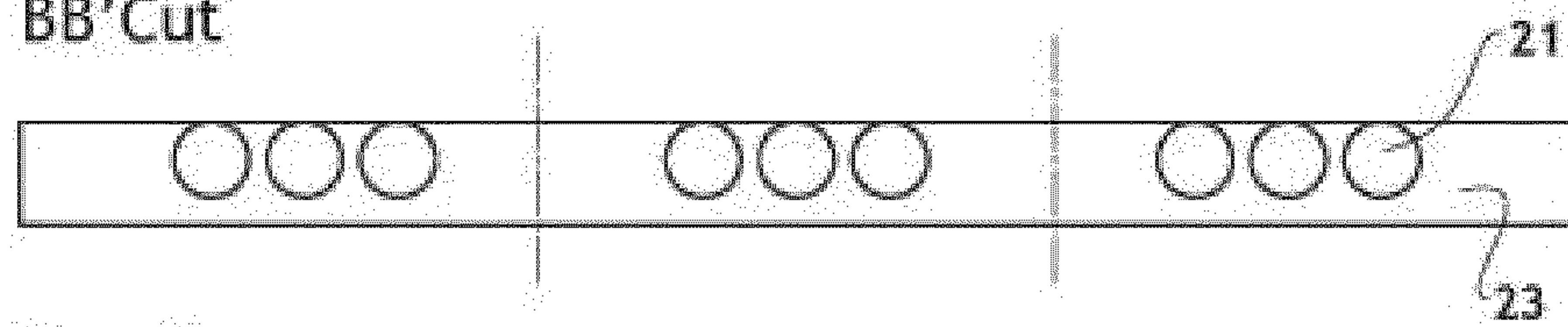
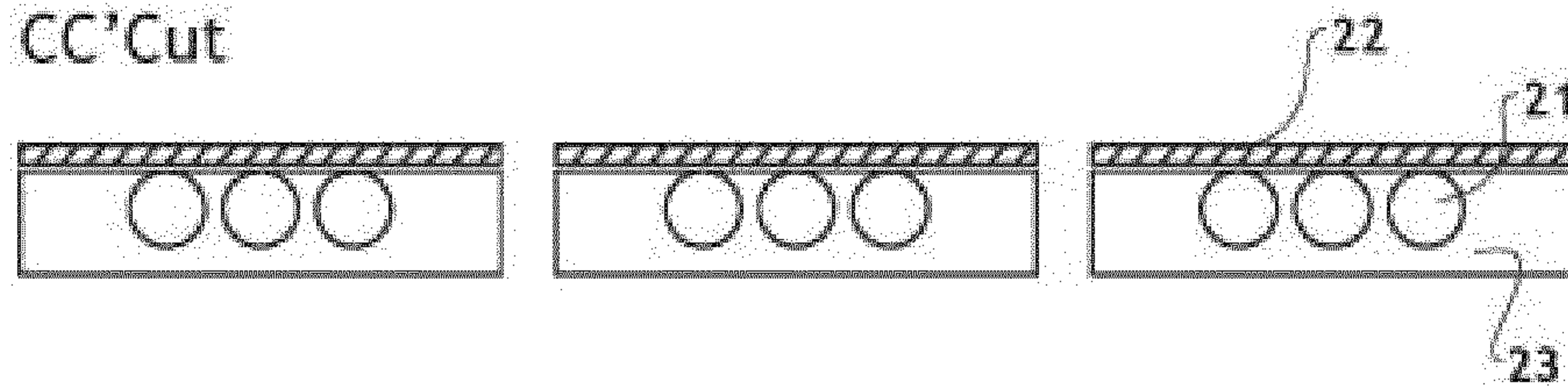


Fig 16

CC'Cut



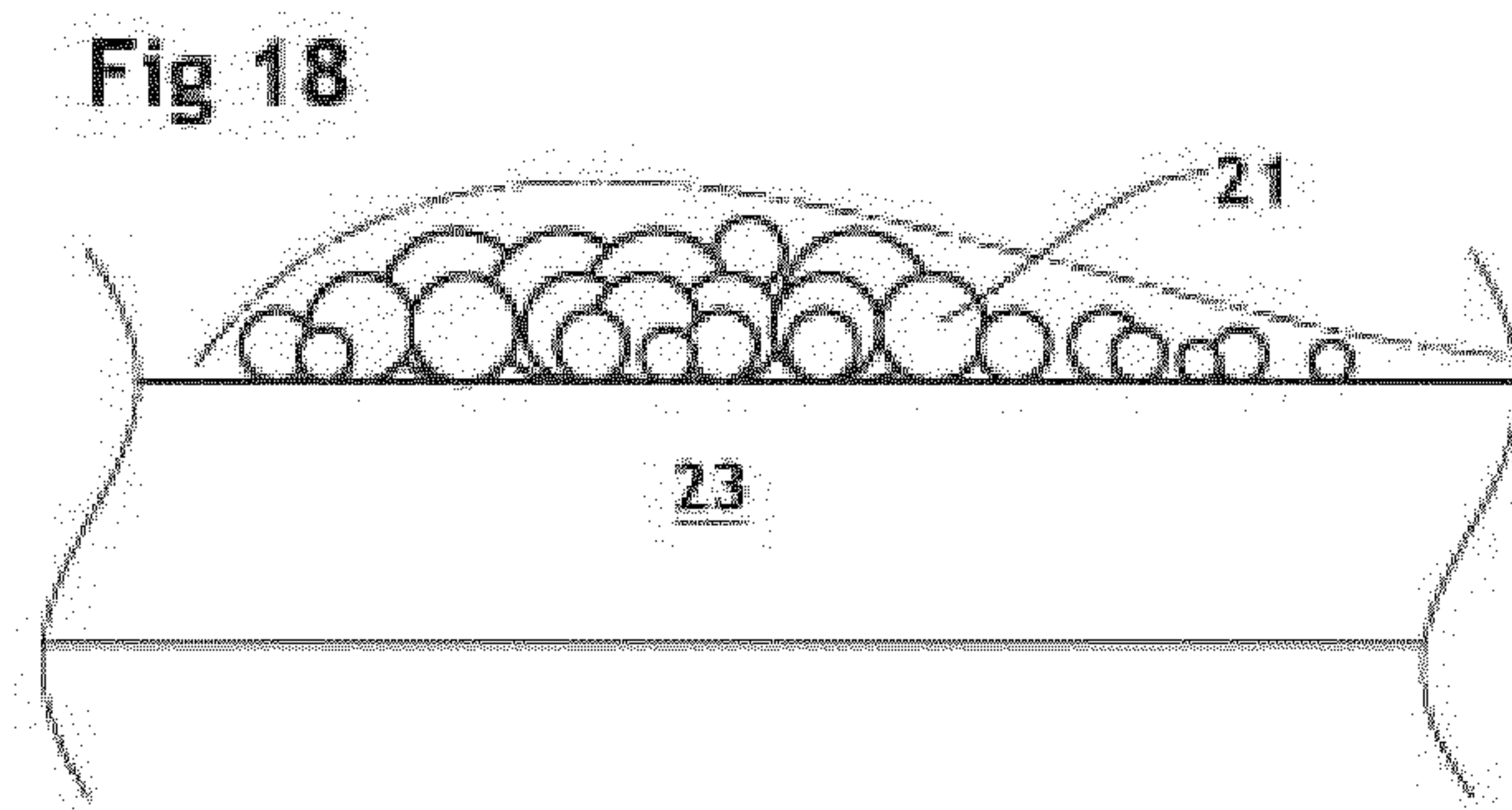
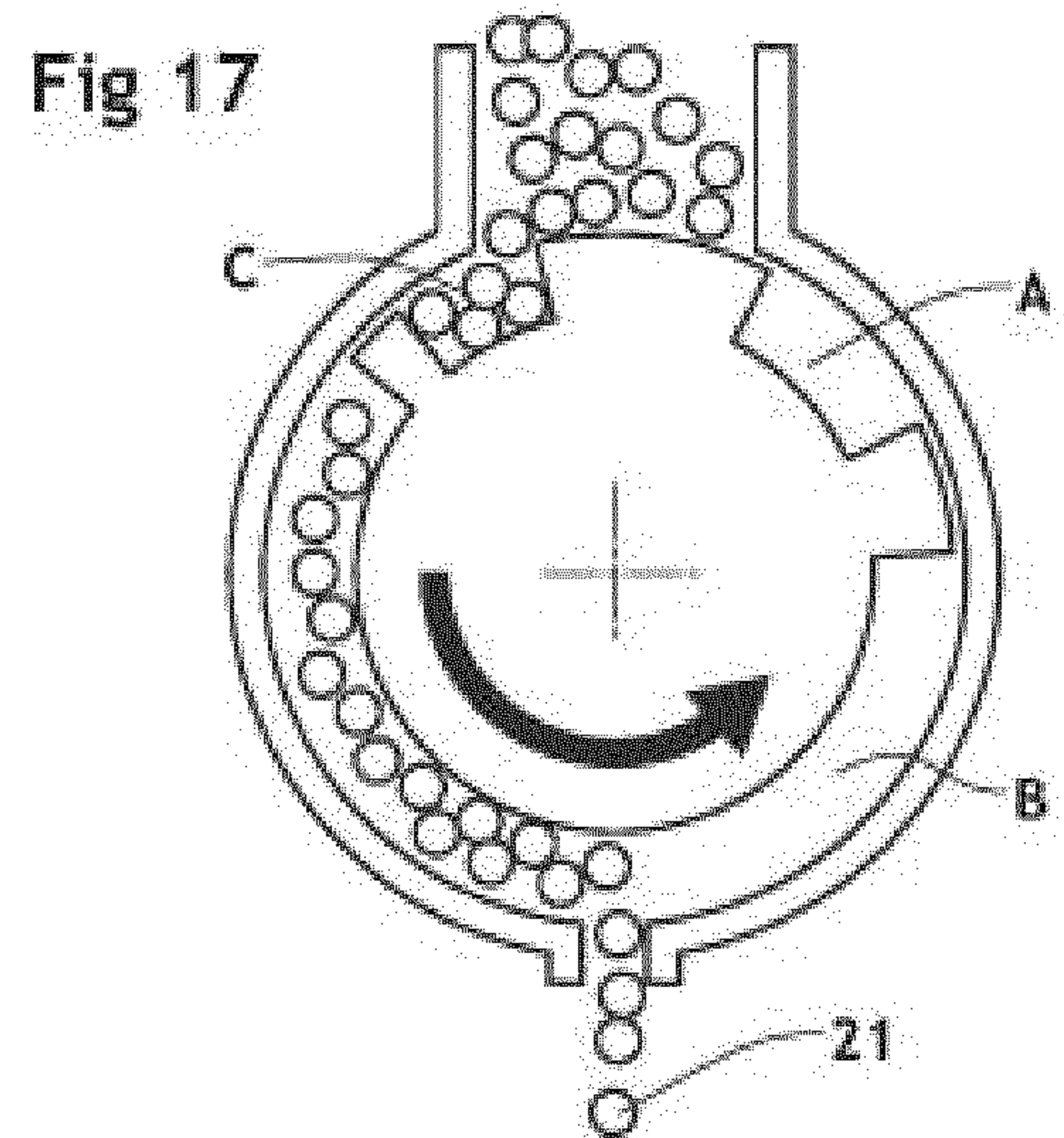


Fig 19

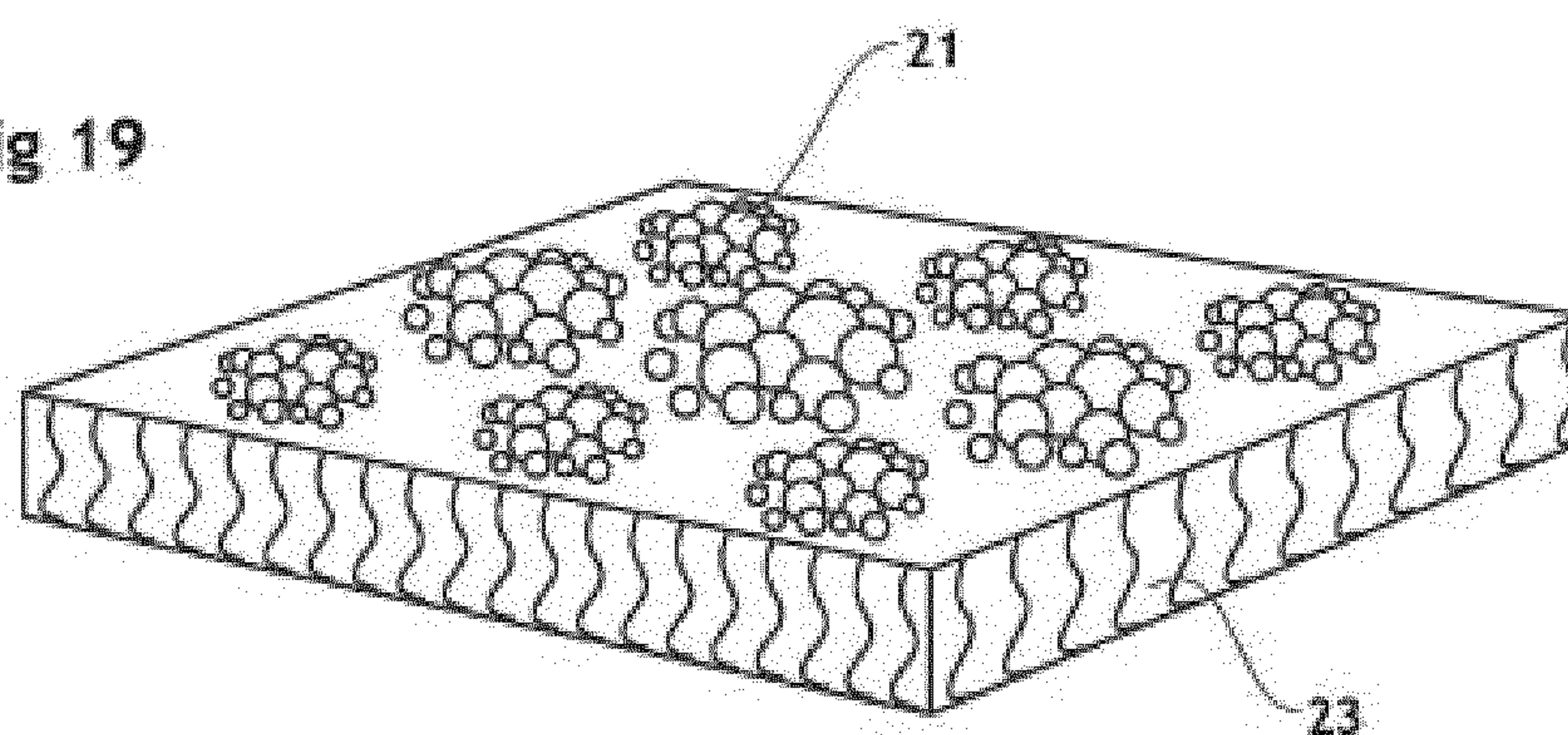


Fig 20

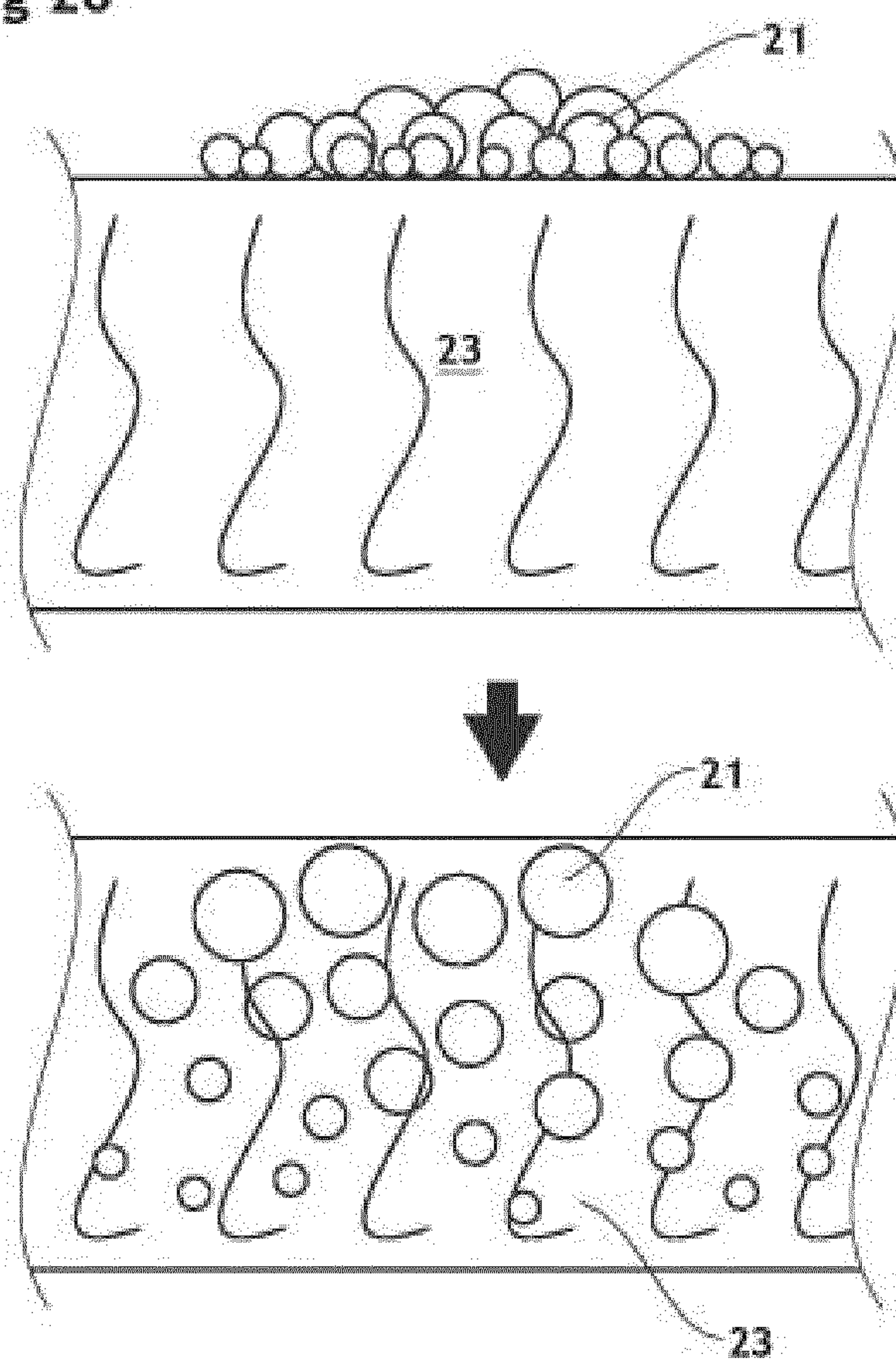


Fig 21

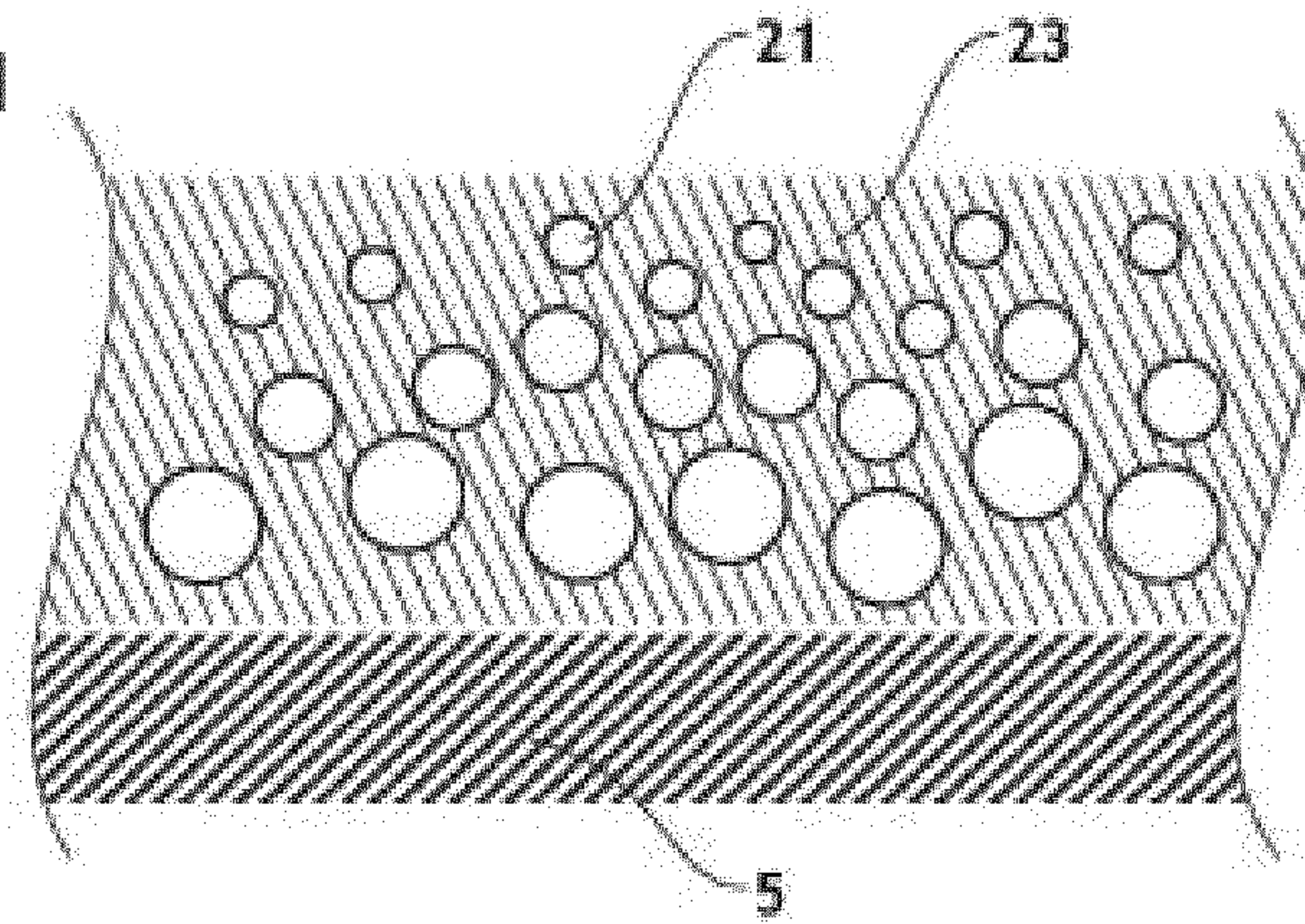


Fig 22

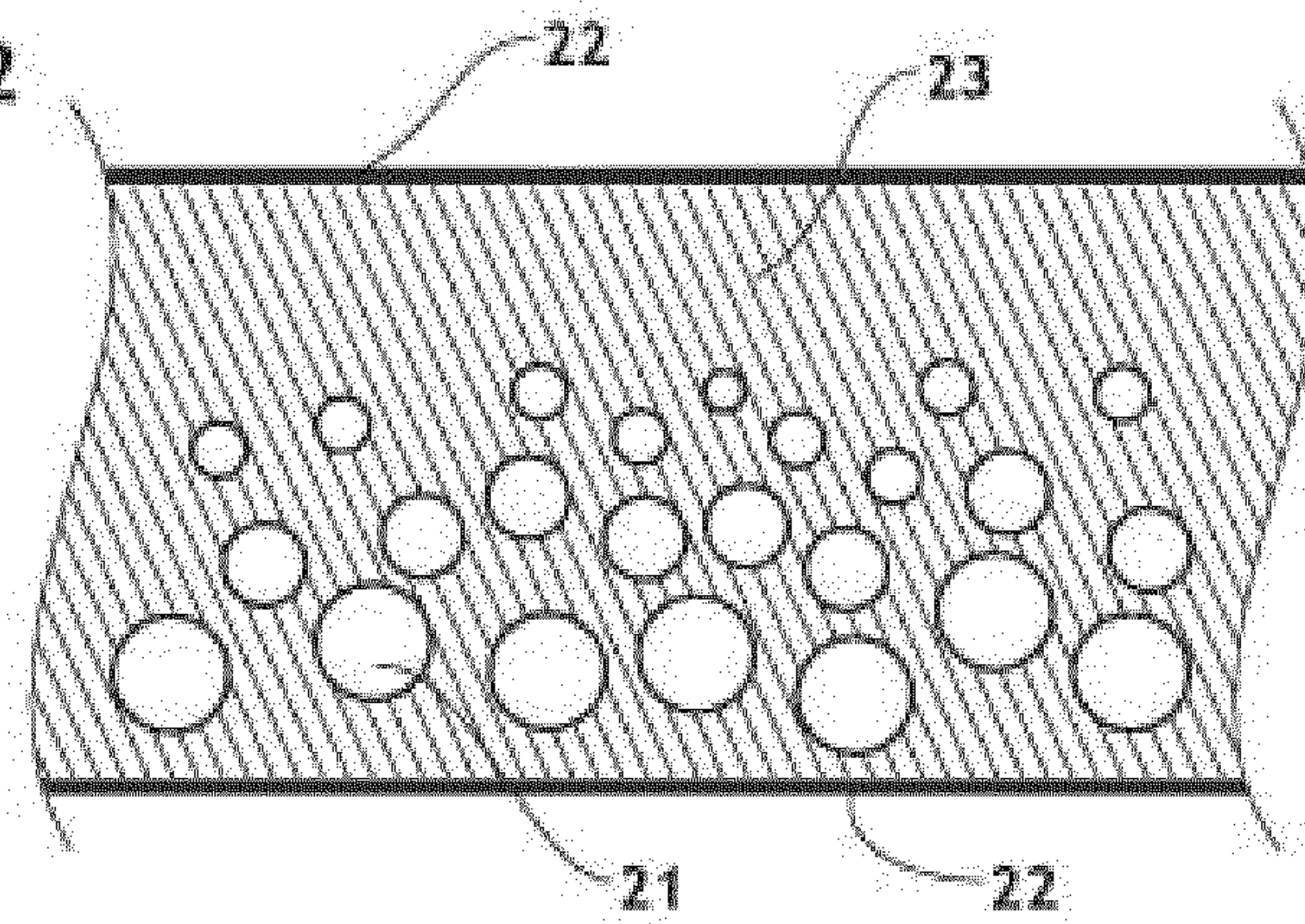


Fig 23

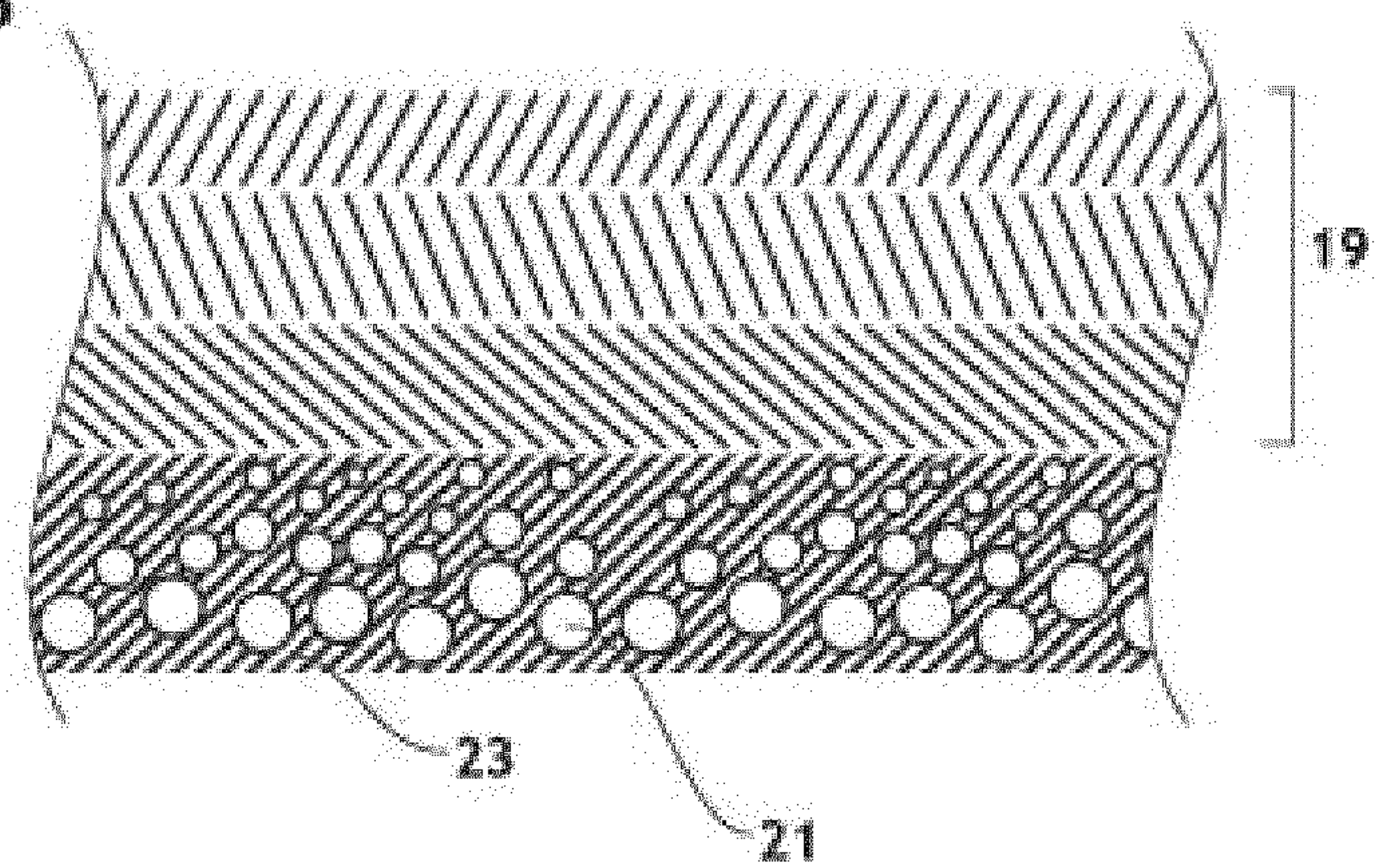


Fig 24

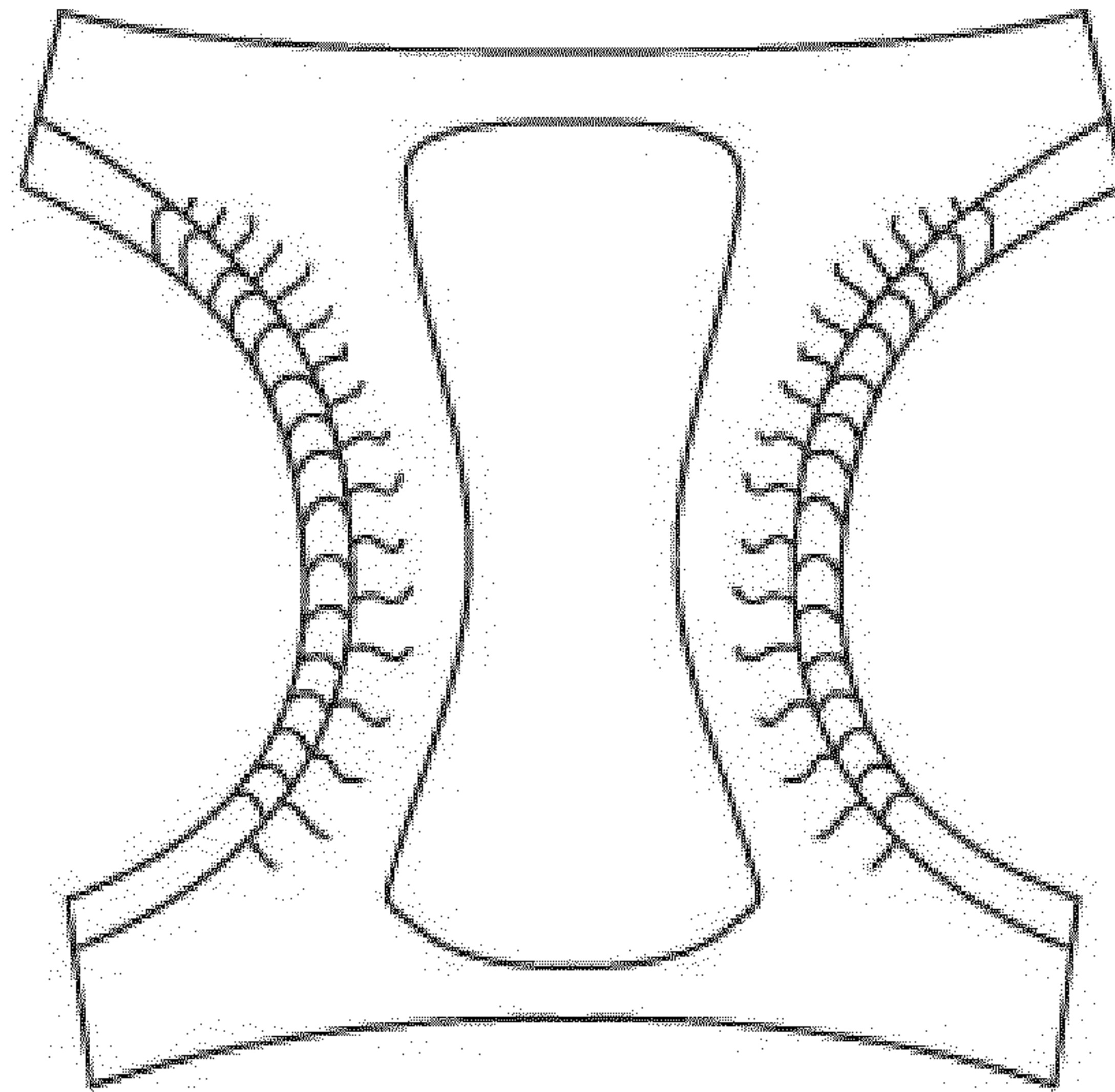


Fig 25

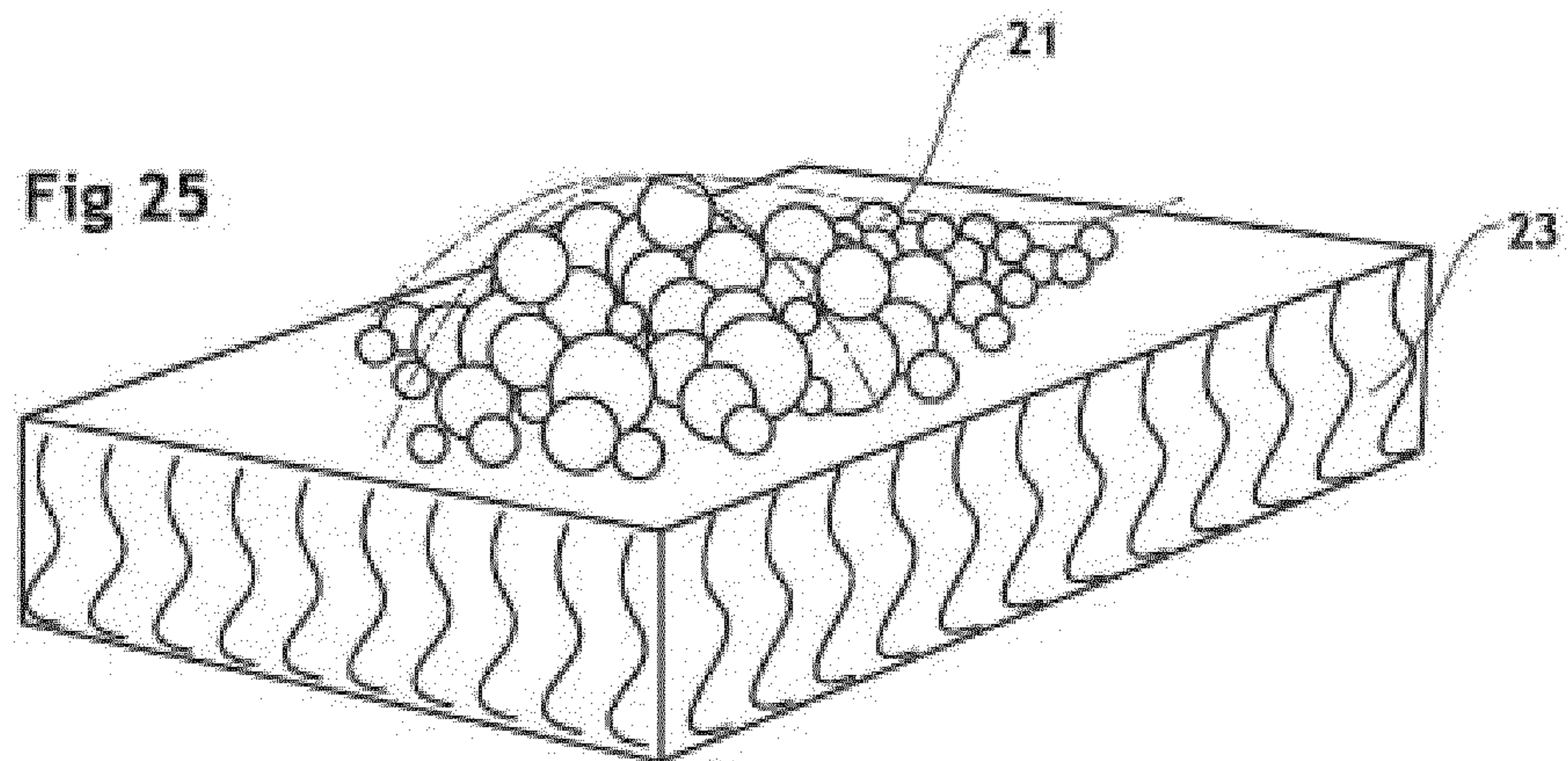


Fig 26

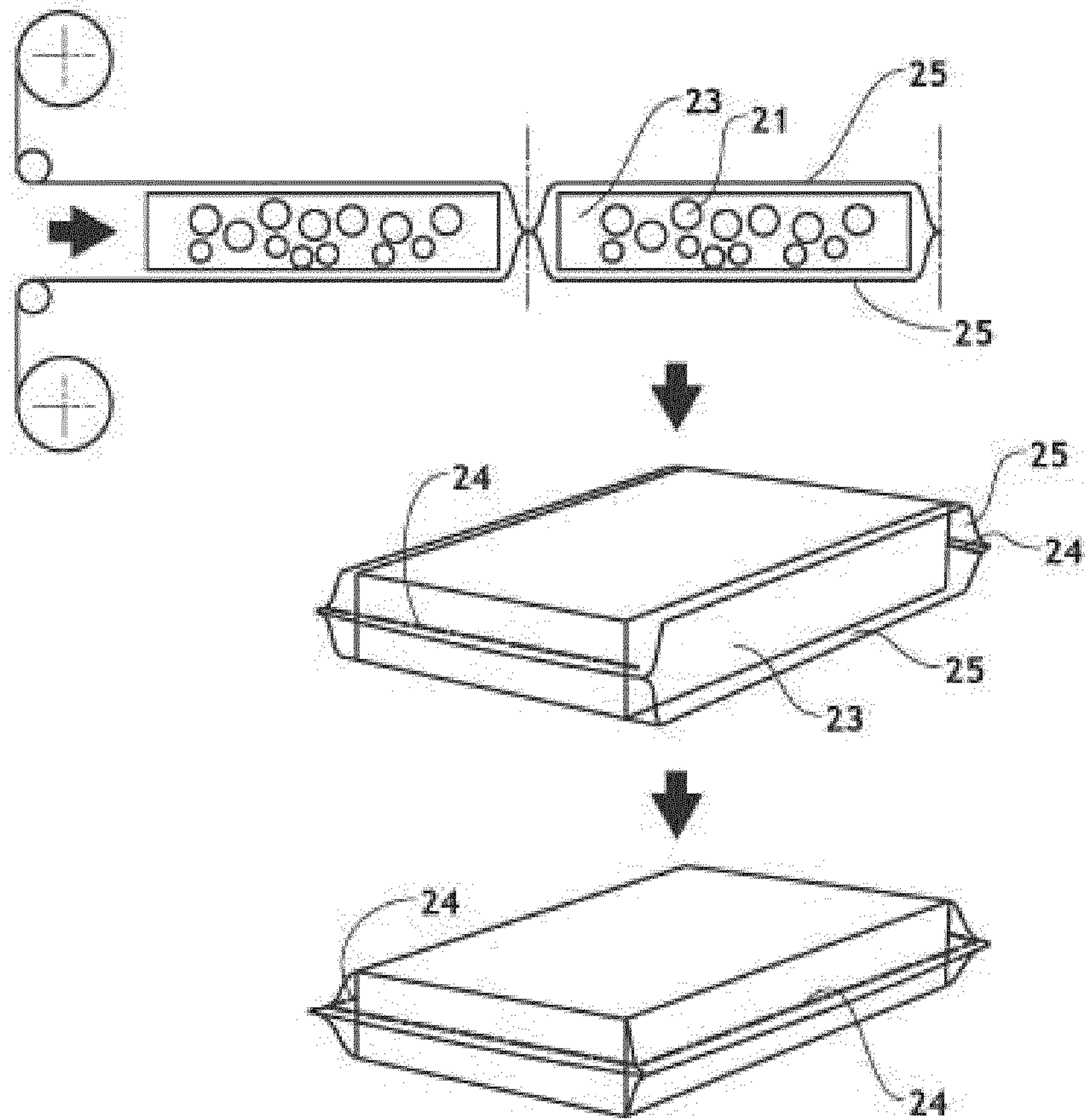


Fig 11

