



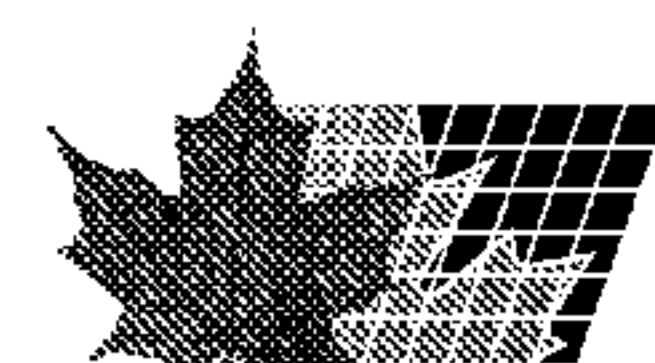
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(54) Title: WATER SOLUBLE CAPSULES

(57) **Abrégé/Abstract:**

A water soluble capsule (1) containing a detergent composition (2), the capsule having four or more walls and characterised in that the capsule comprises a plurality of protruding portions, the or each protruding portion being formed from co-joined end portions of respective three or more walls. In one embodiment the capsule is in the shape of a pyramid.



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(54) Title: WATER SOLUBLE CAPSULES

(57) Abstract: A water soluble capsule (1) containing a detergent composition (2), the capsule having four or more walls and characterised in that the capsule comprises a plurality of protruding portions, the or each protruding portion being formed from co-joined end portions of respective three or more walls. In one embodiment the capsule is in the shape of a pyramid.



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WATER SOLUBLE CAPSULES

This invention relates to water soluble capsule containing a detergent composition.

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Detergent compositions for machine washing of laundry are provided in many forms such as free-flowing powders, liquids. Detergents in the form of compressed powder tablets are also commonly available. These are advantageous in that they do not require measuring they are thus easier to handle and dispense into the wash load and allow for accurate dosing of detergent.

More recently water-soluble capsules of detergent composition in liquid and other forms have been introduced. Water-soluble capsules generally comprise a detergent composition encapsulated with water-soluble film, such as polyvinyl alcohol. Encapsulation allows for handling of the product without direct contact with the detergent composition. This is especially advantageous when the detergent composition includes aggressive cleaning components which would irritate the skin on direct contact.

Encapsulation also offers other advantages over tablets in that it allows for discretising of other forms of detergent, e.g. liquid, gel, paste etc.

However an unexpected problem encountered with certain types of water-soluble capsules such as 'pillow-shaped' capsules (e.g. as shown in figures 3a and 3b of the drawings herein), is that they can be susceptible to "lodging" i.e. the

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capsules become lodged in the rubber of the porthole of the washing machine, primarily at the start of the wash. This happens in particular in machines where the space between the door and the drum is such that it can accommodate a
5 package. Lodging may delay dissolution of the capsule or even prevent it. For instance, the trend in new machines is to reduce the levels of water even to the extent that the level of water is below the porthole; in such machines lodged packages may not be dissolved in the main wash.
10 Merely delaying dissolution will have an effect on performance and is also believed to increase the risk of residues as discussed below.

A further problem is that limited wetting of a lodged
15 package may result in partial dissolution of the package film resulting in a gelatinous/sticky residue which can persist to the end of the wash. This is unpleasant for the user who may then be faced with the task of physically removing any residue which has become adhered to the door
20 seal.

The problem of lodging is compounded by tendency of many users to over load the washing machine with laundry. In this situation, if a water-soluble capsule becomes lodged in
25 the door porthole, the rotating laundry may then prevent the capsule from entering the main wash.

Thus, the benefits offered by encapsulation can be severely compromised by the susceptibility of certain packages to
30 lodging.

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It is an object of the present invention to provide a water-soluble capsule containing a detergent composition, which overcomes at least some of the above mentioned problems. In particular, it is an object of the invention to provide a
5 water-soluble capsule which is less susceptible to lodging.

Accordingly, in one aspect, the invention provides a water soluble capsule containing a detergent composition, the capsule having four or more walls and characterised in that
10 the capsule has one or more protruding portions, the or each protruding portion being formed from co-joined end portions of respective three or more walls.

An surprising advantage of this configuration is that the
15 protruding portions provide a form of 'handles' by which the capsule can, if lodged, be drawn into the rotating laundry load from the door region. This reduces the possibility of the capsule remaining lodged and undissolved throughout the wash.

20

The or each protruding portion may be tapered, preferably to provide one or more pointed protrusions. This provides a capsule having a shape which is easily grabbed by the rotating washing load.

25

In one preferred embodiment the capsule is in the form of a tetrahedron (four-walled polyhedron). The tetrahedron may be regular or irregular i.e. the walls may take the shape of regular or irregular polygons. The tetrahedron shape is
30 advantageous in that it can be a fairly simple structure to manufacture (as compared with other polyhedrons with more

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walls) and at the same time the shape provides four tapered protrusions.

An additional advantage can be obtained, by the provision of capsule walls which are substantially equal in shape and size, so providing a generally regular shape. This can enhance mobility (i.e. rolling motion) of the capsule through the wash which means that the detergent contained therein is more likely to be better distributed throughout the wash and not concentrated in a single location. The latter situation would result in some of the wash load being damaged by contact with concentrated detergent and the rest left unclean due to the low concentration of detergent.

Preferably the capsule walls are regular polygons - that is to say the sides of all the walls are substantially equal in length. This provides a more regular shape and further enhances capsule mobility in the wash.

The water soluble capsule may be in form of a pyramid with four or more triangular walls and a base wall, having five protrusions. This is an alternative to the tetrahedron and provides a high number of protrusions to enable the capsule, if lodged, to be picked up by the wash as it rotates.

Preferably, the walls of the pyramid shaped capsule are all substantially equal in size and/or shape. Further preferably the triangular walls are regular polygons. Whilst this shape is not entirely regular as the base will not be the same shape and/or size as the walls, if the wall portions are kept regular and equal, it increases the

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capsules mobility throughout the wash albeit not as effectively as the regular tetrahedron referred to above.

The water soluble capsule may be made using vertical form
5 fill and seal techniques. With this arrangement, the capsule may be formed into a polyhedron by adapting existing vertical form fill and seal machinery, thereby reducing the costs of producing capsules according to the invention.

10 Thus according to another aspect of the invention there is provided a water soluble capsule containing a detergent composition, the capsule formed from a flexible film disposed in folded configuration and sealed with
a) one or more longitudinal seals; and
15 b) first and second end seals located at opposed ends of the capsule,
characterised in that the first end seal (6) is substantially orthogonal to the or each longitudinal seal (4a,4b,4c) and inclined at an angle to the second end seal
20 (8) so as to provide a capsule in the shape of a tetrahedron having one or more protruding portions, each protruding portion formed from co-joined tapered end portions of three walls.

25 To achieve a more regular shape (which is advantageous as explained above) it is preferred that the relative inclination of first and second end seals (6,8) is between
30 and 90 degrees, and particularly preferred that the first and second end seals are orientated substantially orthogonal
30 relative to each other.

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The transition between adjacent walls may be slightly curved (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) however, this should not effect the working of the invention
5 as long as the protrusions are formed each protruding portion formed from co-joined tapered end portions of three walls.

Whilst not essential, the edges between the capsule walls
10 may be formed with increased sharpness by, for example, arrangement of one or more seals during formation, so that one or more seals are orientated along respective one or more edge portions of the capsule to give more distinct edges.

15 The walls may be substantially flat, however, it this is not essential, indeed the or each wall may have a slight curvature e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material.

20 The capsule may contain any form of detergent: liquid, powder - which may be granulated, gel, paste or the like or combinations thereof. The detergent composition may be a laundry (fabric cleaning/treatment) detergent composition or
25 a dishwashing machines detergent composition and thus is suitable for use in laundry (fabric) washing and dishwashing machines.

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The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings in which: -

5

Figure 1 is a perspective view of a capsule according to another form of the invention;

Figure 2 is a side view of the capsule of Figure 1;

10

Figures 3a and 3b are front and side views of a known pillow shaped capsule containing a liquid detergent;

15

Figure 4 is a view of a capsule according to another form of the invention;

Figure 5 is a view of a capsule according to another form of the invention; and

20

Figure 6 is a view of capsule according to another form of the invention.

Throughout the Figures common numbers are used to designate similar features.

25

Referring to the drawings and in particular figures 1 and 2, a capsule 1 according to one form of the invention is shown, which contains a measured unit dose of flowable detergent composition 2, which may be liquid, granulated powder, gel, paste or a combination thereof. In the example shown in

30

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figures 1 and 2 the detergent is a liquid detergent (as described below).

The capsule is in the form of a tetrahedron, having four walls 10,11,12,13 of the polyhedron being inclined at an angle of relative to each other wall 10,11,12,13.

The capsule is formed from a flexible film disposed in folded configuration and sealed with one longitudinal seal 4a and first and second end seals 6,8 located at opposed ends of the capsule 1. The first seal 6 is substantially orthogonal to the longitudinal seal 4a and further it is substantially orthogonal to the second end seal 8. The capsule has four tapered protruding portions 30,32,34,36. These are formed from the three co-joined tapered end portions of respective three triangular walls 10,11,12,13. The tapered end portions of the capsule each enclose an angle of less than 90 degrees.

The capsule shown in the drawings is formed by a so-called 'vertical form fill and seal' machine (not shown). Using such a machine, a flat web of thermoplastic film is unwound from a roll and formed into a continuous tube in a tube-forming section, by heat-sealing together the longitudinal edges of the web to form a lap seal or a fin seal which eventually forms the longitudinal seal 4a of the capsule 1. The tube thus formed is then pulled down to a filling station. A section of the tube is flattened at a sealing device positioned below the filling station, and the first transverse seal is made, providing the first end seal of the capsule 1 which is a fluid-impervious barrier.

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After the first transverse seal 6 has been made, the tube is then moved down through a predetermined distance, and the jaws of the sealing device are closed. The flowable detergent is then caused to enter the tube, and fill the tube upwardly from the first end seal 6. A second transverse seal is then made at an angle orthogonal to the first transverse seal 6, forming the second end seal 8 of the capsule and trapping the flowable detergent composition inside the capsule. This second end seal 8 is located just above the fill-level in the tube to avoid trapping liquid in the seal which would compromise the seal integrity.

The sealing and severing of successive end seals can be performed by mutually transverse pairs of sealing bars which are motor driven to make successive seals in mutually transverse directions.

The filled package, now in the form of a tetrahedron pouch, is either cut away or left in place. The second transverse seal also forms the bottom seal of the next package, and the process can be repeated to form the next package.

The sealing device for forming the transverse seals is commonly an impulse sealer, wherein an electrical current flows through the sealing element for only a fraction of the sealing cycle. After the current has heated the sealing element and melted the thermoplastic film, there is then a cooling period, during which the seal resolidifies.

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There are many variants on the ways such machines operate. A typical vertical form, fill and seal machine is sold under the trade name GV2K1 by Gainsborough Engineering Company.

- 5 A regular tetrahedron as shown in figure 1 can be formed by adjusting the width of the tube (i.e. length of end seal) to equal the length of the tube (length of the longitudinal seal).
- 10 Referring to figure 4, the capsule 1 shown here is a slightly skewed tetrahedron, whose walls are asymmetrical (no seals shown). It is formed by orienting the first end seal orthogonal relative to the longitudinal seal and inclined at an angle of approximately 70-80 degrees to the
- 15 second end seal. However, despite the skewed shape, this still functions to provide protruding portions.

Referring to figure 5, the capsule shown here is formed with two longitudinal seals 4b and 4c along side edges (26,28) of

20 the capsule during formation. The polyhedron formed has a greater number of distinct edges (22,24,26,28) where the seals (4b,4c,6,8) are located (as compared say with the capsule shown in figs 1 and 2).

- 25 Figures 6 shows another capsule according to the invention (seals not shown). The capsule has five-walls and is configured as a pyramid with 4 walls and a base.

In one embodiment a capsule according to the invention

30 contains a liquid detergent composition. When a liquid detergent composition is used, it is preferred that the

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composition is essentially non-aqueous. However,
compositions may be used which contain substantial amounts
of water, provided that this water is in a form where its
chemical activity is reduced (e.g. as water of
5 crystallisation or in combination with a solvent such that
its vapour pressure is reduced) such that the soluble film
does not dissolve prematurely.

In another embodiment One example of a detergent composition
10 used is as follows:

Raw material	Level (weight percent of total)
Nonionic Surfactant (alcohol ethoxylate)	20.00
Linear Dodecylbenzene Sulphonic Acid	20.00
Fatty acid	17.00
Monopropylene glycol	22.35
Monoethanolamine	9.65
Water, perfume, minor ingredients	11.00

In another embodiment, capsules contain a granular laundry
15 detergent powder as follows:

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Base powder

Linear Dodecylbenzene Sulphonic Acid (Sodium salt) 8.8%

Alcohol ethoxylate (C12 - C13 7 EO) 7.0%

C16 -C18 Carboxylic acid 1.0%

5 Zeolite 29.6%

Anhydrous Sodium Carbonate 10.5%

Moisture, Salts, Minors 4.1%

(All above in a granulated Base Powder)

10 Post-dosed ingredients

Sodium Percarbonate 18.0%

Tetracetyl ethylenediamine 3.5%

Sodium Disilicate 5.5%

Sodium Citrate 2.0%

15 Fluorescer, antifoam, speckles, enzyme, fragrance, minors
10.0%

In use capsules according to the invention can conveniently be placed directly into the wash liquor where the film

20 dissolves, releasing the detergent composition. Dissolution of the capsule, even if lodged initially, is aided by the provision of protruding portions which are 'grabbed' by rotating washing to pull the capsule into and through the washing load. This reduces the possibility of undissolved

25 capsule film persisting throughout the wash.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

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CLAIMS

1. A water soluble capsule (1) containing a detergent composition (2), the capsule having four or more walls and characterised in that the capsule comprises a plurality of protruding portions, the or each protruding portion being formed from co-joined end portions of respective three or more walls.
2. A water soluble capsule (1) according to each claim characterised in that the protruding portions are tapered.
4. A water soluble capsule (1) according to claim 1 characterised in that the end portions are tapered and have an internal angle less than 90 degrees.
5. A water soluble capsule (1) according to any preceding claim characterised in that the capsule is in the form of a tetrahedron with four tapered protrusions.
6. A water soluble capsule according to any preceding claim ^{having} ~~in which~~ the walls are all substantially equal in size and/or shape.
7. A water soluble capsule according to ~~any preceding claim~~ ^{having} ~~in which~~ the walls ^{which} are regular polygons.

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7. A water soluble capsule according to any of claims 1 to 3 characterised in that the capsule is in the form of a pyramid with four or more triangular walls and a base portion and having at least five protrusions.
- 5 8. A water soluble capsule according to claim 7 characterised in that said four or more triangular walls are all substantially equal in size and/or shape.
- 10 9. A water soluble capsule according to claim 7 characterised in that said four or more triangular walls are regular polygons.
- 1 10. A water soluble capsule (1) containing a detergent
15 composition (2), the capsule formed from a flexible film disposed in folded configuration and sealed with
(a) one or more longitudinal seals (4a, 4b, 4c); and
(b) first and second end seals (6, 8) located at
opposed ends of the capsule (1),
20 characterised in that the first end seal (6) is substantially orthogonal to the or each longitudinal seal (4a, 4b, 4c) and inclined at an angle to the second end seal (8) so as to provide a capsule having four protruding portions, each protruding portion formed from
25 co-joined tapered end portions of three respective walls.
- 2 11. A water soluble capsule (2) according to claim 10
30 characterised in that the relative inclination of first and second end seals (6, 8) is between 30 and 90 degrees.

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- 3 ~~12.~~ A water soluble capsule according to claim ~~10~~
characterised in that the first and second end seals
(6,8) are orientated substantially orthogonal relative
to each other.
- 5
- 8 ~~23.~~ A water soluble capsule (1) according to any one of
claims 4 or 5 or 6 characterised in that one or more of
the seals (4b,4c,6,8,) are orientated along respective
one or more edge portions (22,24,26,28) of the
10 polyhedron (1).
- 9 ~~14.~~ A water soluble capsule (1) according to any preceding
claim characterised in that the detergent composition
^{comprises}
(2) ~~is~~ a laundry composition.
- 15
- 10 ~~15.~~ A water soluble capsule (1) according to any preceding
claim characterised in that the detergent composition
^{comprises a}
(2) ~~is in~~ liquid form.
- 20 ~~16.~~ A water soluble capsule (1) according to any preceding
claim characterised in that the detergent composition
^{comprises a}
(2) ~~is in~~ powder form.
- 25 17. A water soluble capsule substantially as hereinbefore
described with reference to and as illustrated in the
accompanying drawings.

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Fig.1.

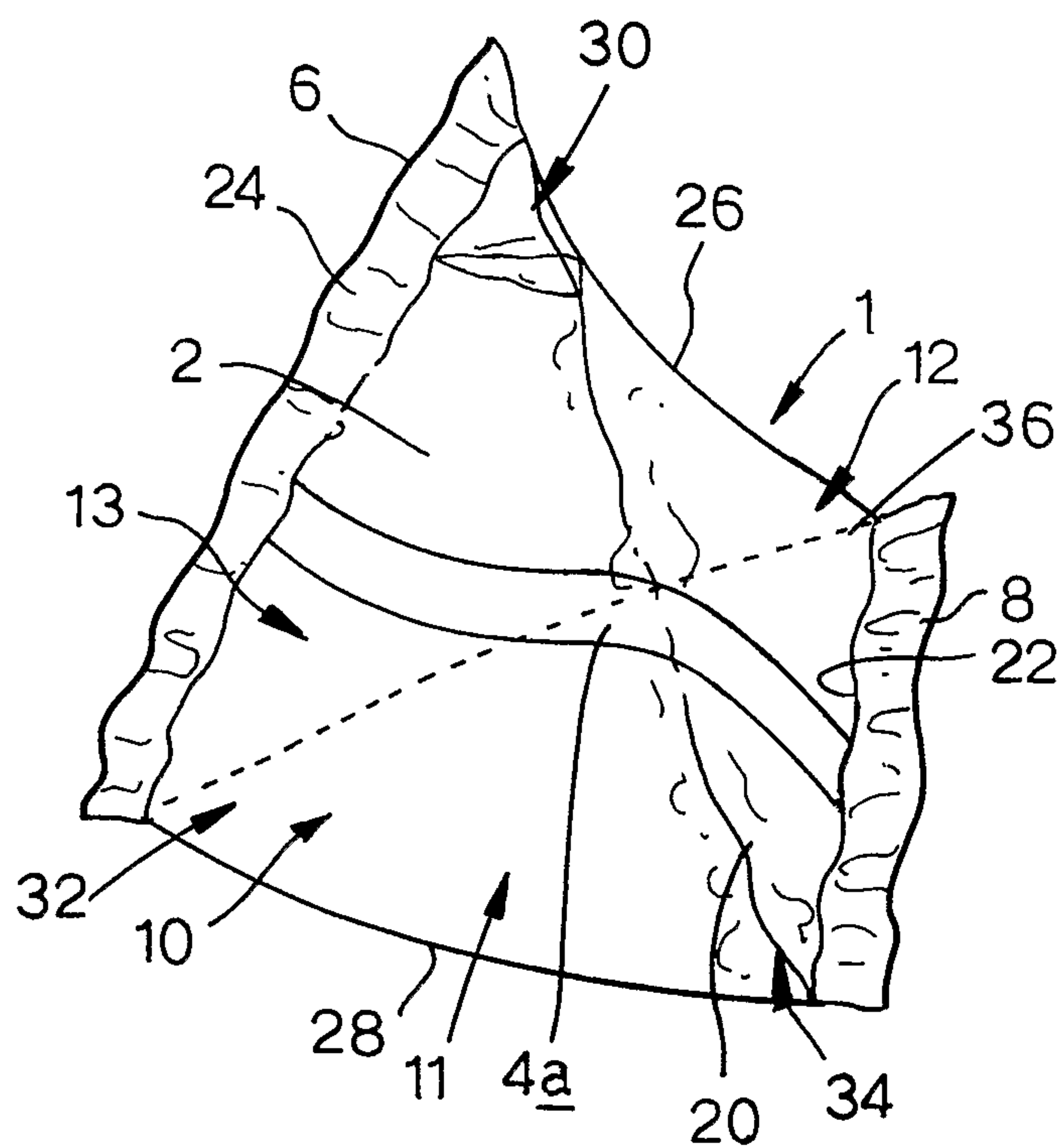


Fig.2.

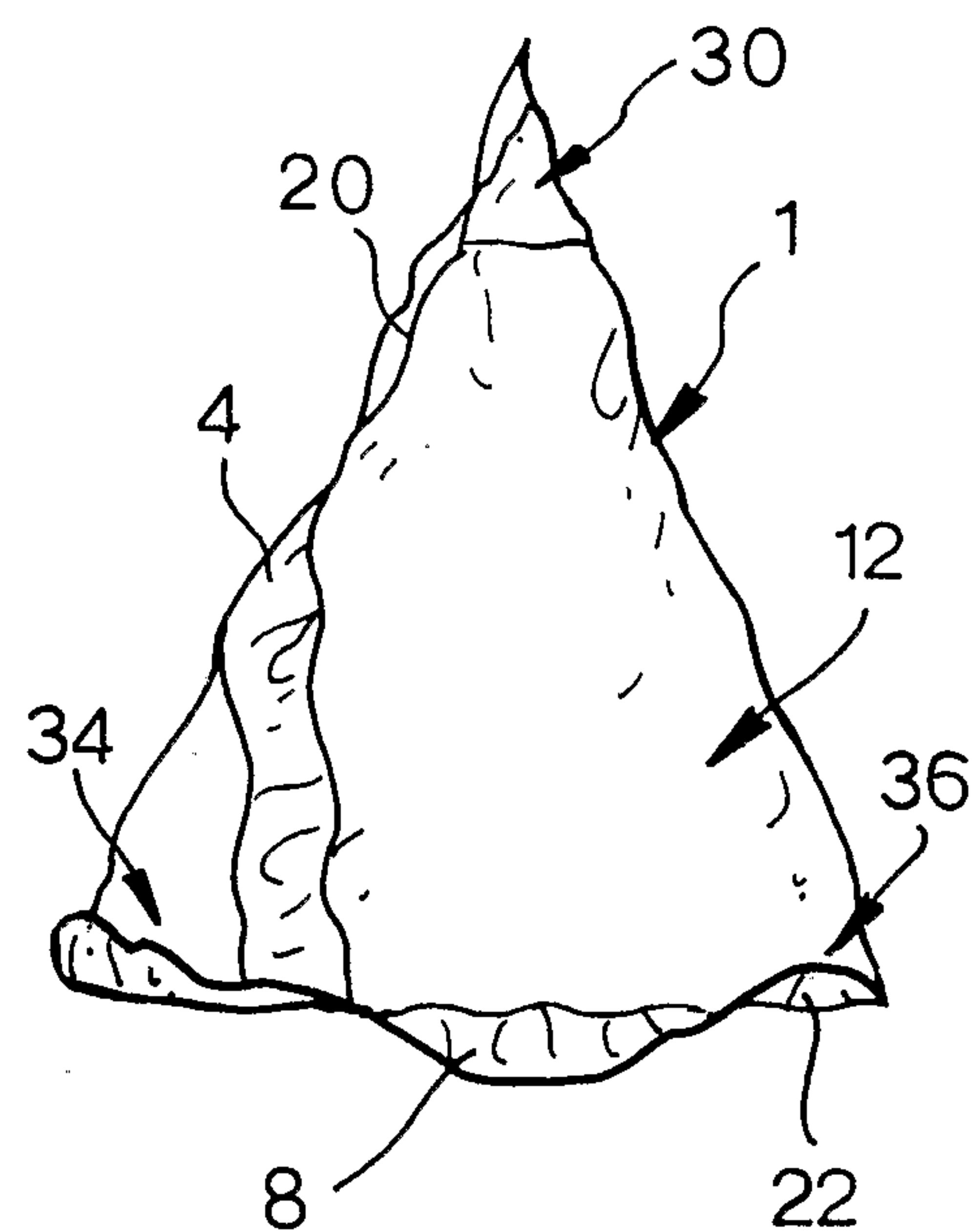


Fig.3a.

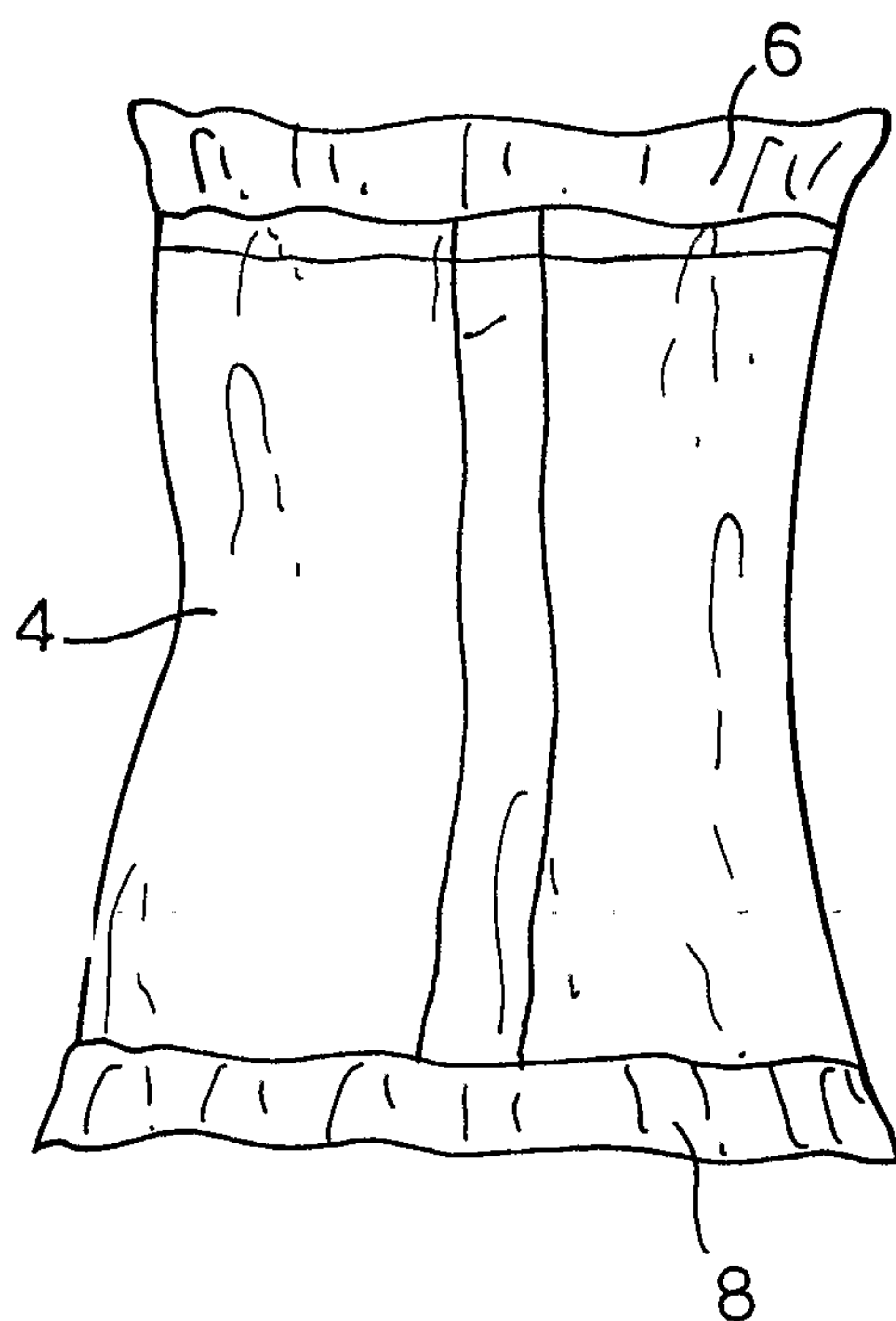


Fig.3b.



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Fig.4.

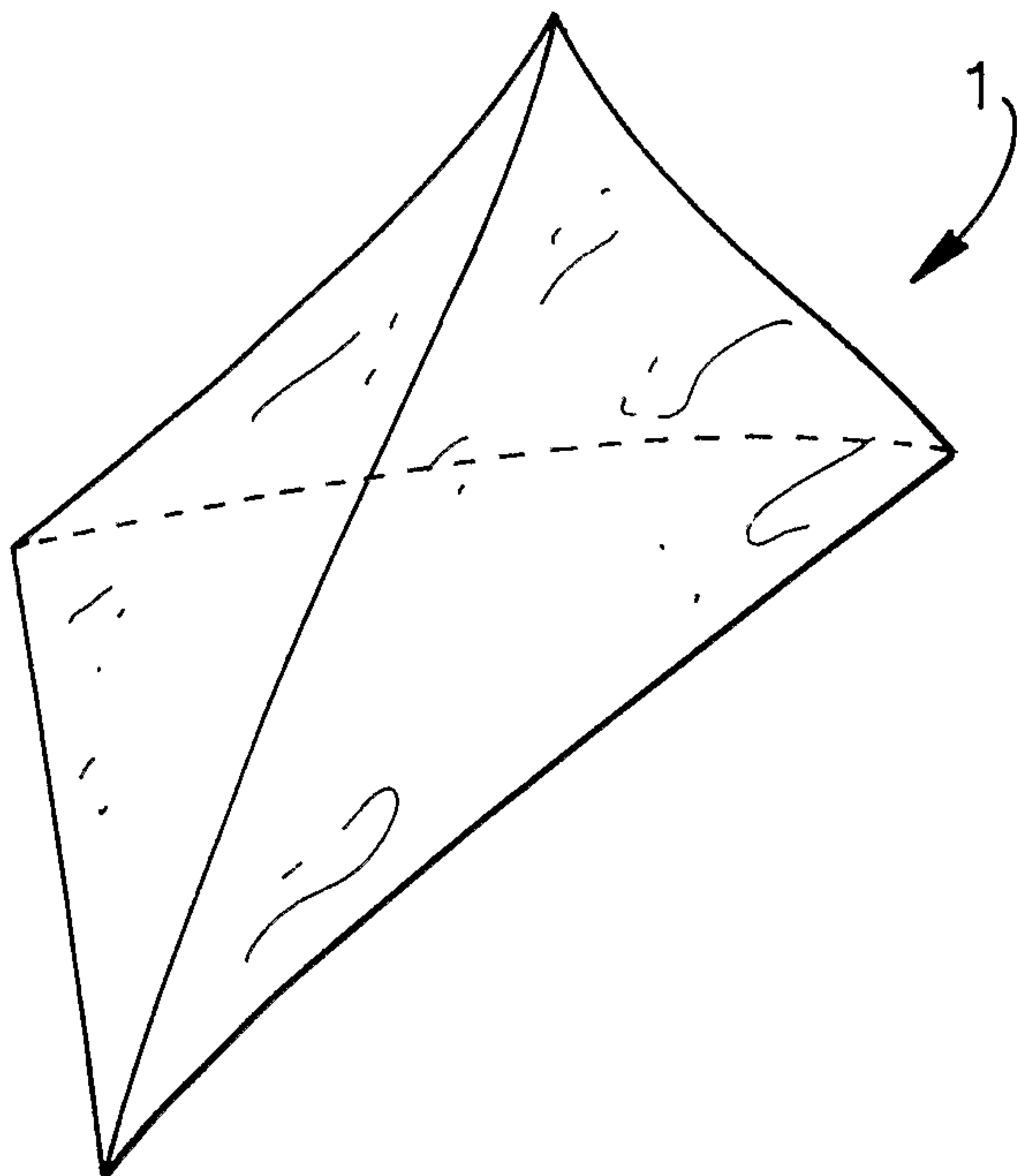


Fig.5.

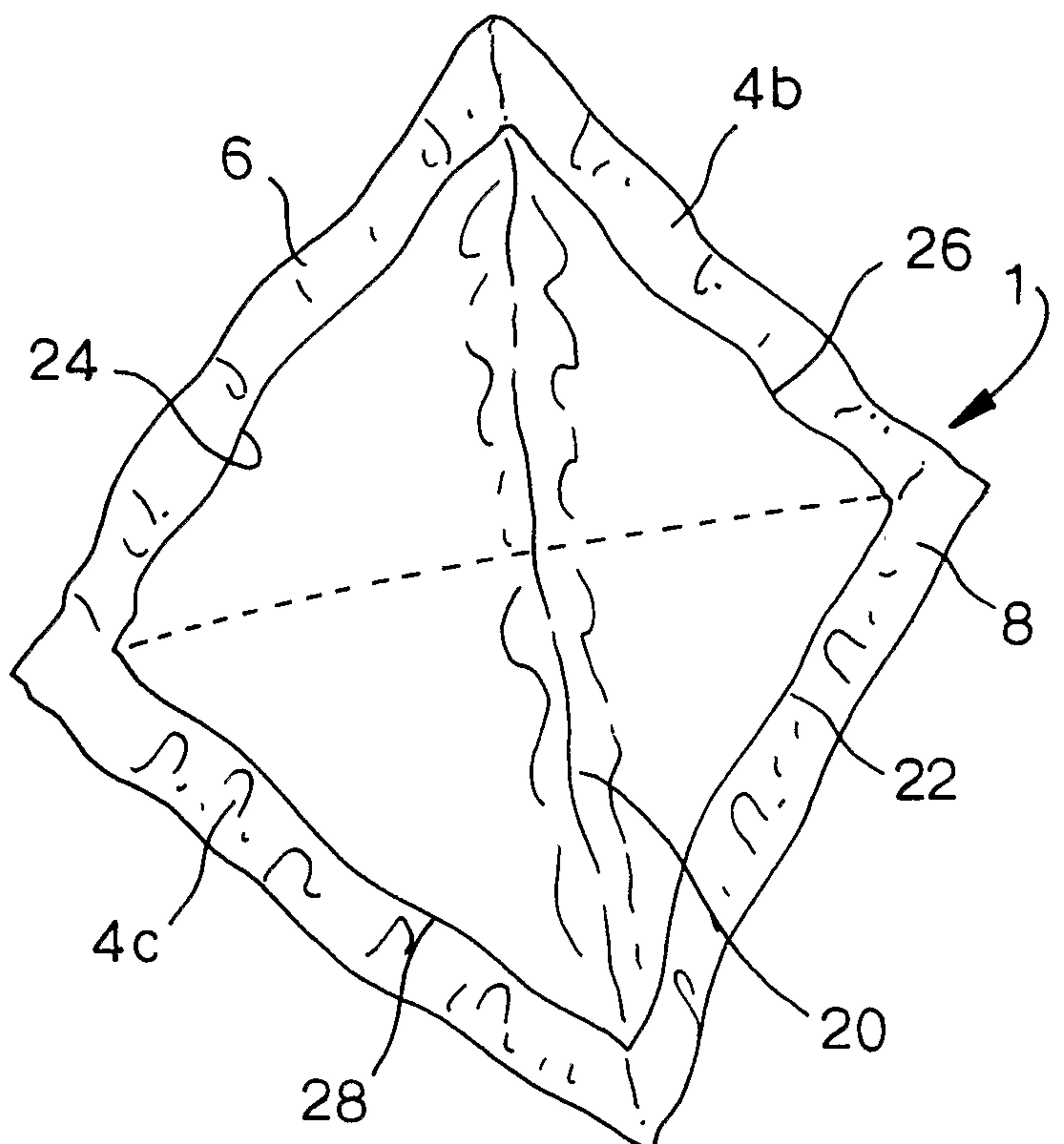


Fig.6.

