

(19)



(11)

**EP 1 967 459 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:

**04.04.2012 Bulletin 2012/14**

(51) Int Cl.:

**B65D 30/06** *(2006.01)*

(21) Application number: **06841734.4**

(86) International application number:

**PCT/ES2006/000682**

(22) Date of filing: **13.12.2006**

(87) International publication number:

**WO 2007/074183 (05.07.2007 Gazette 2007/27)**

(54) **BAG FOR FRUIT AND VEGETABLE PRODUCTS**

BEUTEL FÜR OBST- UND GEMÜSEPRODUKTE

SAC POUR PRODUITS HORTICOLES

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI  
SK TR**

(30) Priority: **26.12.2005 ES 200503189**

**05.12.2006 ES 200603114**

(43) Date of publication of application:

**10.09.2008 Bulletin 2008/37**

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**US-A1- 2002 088 735**

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**EP 1 967 459 B1**

## Description

**[0001]** The present invention refers to a bag for fruit and vegetable products which has appreciable characteristics of novelty and inventive step compared with the bags intended for said application that are currently known.

**[0002]** The marketing of fruit and vegetable products such as fruit and vegetables of various types has become widespread in recent years, using individual bags with a specific weight which are capable of being easily filled and sealed by industrialised methods, therefore permitting easy marketing to the final user, who acquires complete bags of product and for whom they are easy to handle and transport.

**[0003]** Said bags are customarily manufactured in the form woven mesh or of extruded type mesh (DE 87 15 985 U1 ; CH 380 637 A ; ES 1 027 802 U). In the first case, the bags are made from a woven web forming an open mesh with broad eyes, showing plastic filaments which have sufficient strength to support the planned weight of the fruit and vegetable products for which the bag is intended, and which allow easy observation of the product by the purchaser, said bags customarily being associated with labels indicating the brand of the product or certain characteristics thereof.

**[0004]** Another type of known bag are those in which the mesh has been obtained by extrusion and expansion of a continuous sheet-like element of plastics material in which, during manufacture, a multiplicity of openings are produced which, after a process of stretching or extending the sheet-like element are transformed into openings separated by bridges, having an appearance and function similar to the woven type of mesh.

**[0005]** One of the problems which arise with the bags for fruit and vegetable products of the type mentioned that are currently known is the closure of the ends together with the fixing of the label thereto. In fact, in order to achieve greater economy, it is necessary for the welding of the end of the bag, the fixing of the label by the same weld, and the cut which has to correspond to one end of the bag, to be carried out in one operation. Welding is customarily done in substantially flat form by gripping the end of the mouth of the bag together with one end of the label, thereby ideally producing a flat welded area which involves both the bag and the label superposed on the edges of same.

**[0006]** The problems which currently arise with said bags relate especially to the evenness and strength of the weld and to the satisfactory fixing of the label. In fact, evenness of the welded area is difficult to achieve because of the high operating speed of the present automatic machines and because of the inherent irregularity of the area immediately adjacent to the mouth of the bag, the structure of which is not very even. As a result, the weld also turns out uneven, so that at some points of the welded area the weld is of good quality, whilst at others the material is not properly welded, so that the strength

characteristics are frequently not very satisfactory. In this respect, one of the defects customarily observed in said welded closures is that of their breakage in the longitudinal or transverse direction. That is to say, given the irregularities of the welded area, the weight of the products contained in the bag produces a concentration of forces at the weak points, which succeeds in breaking the welds longitudinally or transversely. Likewise, the fixing of the label turns out to be unsatisfactory, being able to become detached in some cases, especially if it is used momentarily to hold the bag by the purchaser who picks it from the place where the bags are stacked in the sales establishment.

**[0007]** The present invention is intended to remedy the drawbacks mentioned previously, by disclosing a bag for fruit and vegetable products in which the welded join of the ends of the bag makes it possible to obtain a very high strength preventing the breakage of the weld by the actual weight of the bag, and obtaining strong and reliable fixing of the end of the label.

**[0008]** In order to achieve its aims, the bag of the present invention, which is a mesh bag preferably of the woven type, is characterized in that one of the closure mouth portions of the ends of the bag is intimately associated, in enveloping form, with an appendage of the hanging label of the bag, the assembly consisting of the mouth portion of the bag and the appendage of the label being welded with the formation of ribbed structures on the faces of the closure mouth portion, from the actual molten material of the bag and which cover the entire width of the mouth portion, preventing the longitudinal and transverse breakage of the welded mouth. The production of transverse ribs in the mass of the molten mesh takes place during welding, and they extend transversely with respect to the longitudinal axis of the bag, having a transversely continuous structure and covering by means of their length, in a single length or by overlapping sections, the entire width of the flattened mouth portion of the bag.

**[0009]** The number of transverse ribs will be variable according to the material used, the dimensions of the bag, etc., being customarily between one and four, and more preferably two or three. Said ribbed structure may also be arranged unevenly on one or the other of the two faces of the flat welded area of the mouth portion of the bag. With regard to the precise shape of the ribbed structure, it may be any which fulfils the essential characteristic of the present invention, i.e., that the ribbed structure, formed by melting of the material of the bag at the time of the welding of the closure and of the label, extends to, i.e. covers, the entire width of the flat weld area, preferably on both faces. With regard to the actual shape of the ribbed structure, it will be understood that it allows any type of variant, such as straight, curved, undulating, or zigzag ribs, in network form or overlapped sections, etc.

**[0010]** The present invention, in one embodiment, provides for the closed mouth portions of the bag to assume

a generally flat structure, and optionally for one of the mouth portions to be folded back on itself, forming two wings which contain within them the appendage of the label.

**[0011]** Provision is also made in the present invention, as a complement to the previous embodiment, that the welded appendage of the hanging label assumes a folded arrangement with two faces which coincide respectively with the inner faces of the folded wings of the mouth portion of the bag.

**[0012]** Likewise, the present invention, in another embodiment, provides that the mouth portions of the bag completely surround the appendage of the label, and, in another additional embodiment, that the mouth portions of the bag are completely surrounded by the appendage of the label.

**[0013]** With regard to the welded and cut edge of the mouth portions, this may present a short end zone without welding, the end therefore remaining in a "frayed" arrangement which can soften the contact of the welded edge with the pieces of fruit, avoiding damage, or alternatively it may present a simple complete weld as far as the cut edge.

**[0014]** In another version, the present invention provides for carrying out continuous welding of the bags on the mouth portions of same, with a simple prior accumulation of the tubular material of the bags at the weld point, without applying other external elements to the weld area and carrying out the welding by means of substantially transverse ribs on the flattened area corresponding to the mouth portions. Then, cutting is carried out through a middle area of the weld, producing two welded ends, an upper and a lower end, of two consecutive bags. Since the number and precise arrangement of the ribs may be variable within specific limits and since, in addition, there is no increase in cost due to the fact that the weld has a greater number of ribs, it is possible to carry out the welding action on the machine in such a way that the welding of the ends of the bags is sufficiently strong, without the need for applying any external element.

**[0015]** This variant of the invention may be applied especially to mesh bags, it being preferable for the bags to be relatively dense, i.e., with sufficient application of material in the areas of compression and welding between every two bags. In order to facilitate the welding, it has been observed that better results are obtained if the number of weld ribs is inversely proportional to the density of the mesh bag.

**[0016]** This variant is of appreciable economic advantage, since it greatly simplifies the manufacture of bags for fruit and vegetable products from a continuous type tubular mesh element.

**[0017]** For greater understanding thereof, some drawings of preferred embodiments of the present invention are appended by way of non-limiting example.

Figure 1 shows a diagrammatic front view of a bag produced according to the present invention.

Figures 2 and 3 show respective front views, on an enlarged scale, of two alternative forms of embodiment of the transverse ribs of the weld zone of the bag.

Figure 4 shows a diagrammatic cross-section of the mouth portion of the bag according to the invention. Figure 5 shows a cross-section of a mouth portion of the bag according to the present invention, in a flattened version.

Figure 6 shows a cross-section of a mouth portion of a bag according to the present invention in which the material of the label is shown enveloping the bag on the outside.

Figure 7 shows a version in which the bag completely envelops the label arranged inside it.

Figures 5, 6 and 7 show cross-sections of three exemplary embodiments of the closed mouth portion of the present invention with the join to the label.

Figure 8 shows diagrammatically a cross-section of an additional exemplary embodiment of the closed mouth portions of the present invention in which the appendage of the label is semi-enveloping with respect to the intermediate zone between two bags.

Figure 9 shows a continuous assembly of bags, according to a variant of the invention.

Figure 10 shows a detail of a weld of the variant of Figure 9.

Figure 11 shows a longitudinal section of a weld.

Figure 12 shows a variant of the weld.

**[0018]** As can be seen in the drawings, the bag of the present invention is a mesh bag with a body 1 and upper 3 and lower 2 end closure mouths with welding on the lower mouth 2 of a label 4 by means of an appendage 5.

**[0019]** According to the present invention, the end mouth portions 2 and 3 may be produced in one of their versions with a generally flat structure of the mesh material, preferably forming an ample fold with two layers superposed on each other as can be seen in Figure 4, in which they have been indicated by the numbers 6 and 7. Between the flat areas 6 and 7 of the mouth portion of the bag the hanging label of the bag is introduced, in particular the arm or appendage 8 with which it is customarily provided, preferably folded longitudinally, as can be seen in Figure 4, which shows on a much larger scale the two sheet-like elements 9 and 10 which result from the folding of the appendage 8 of the label, and which fit one upon the other.

**[0020]** Figure 5 shows diagrammatically and on an enlarged scale a cross-section of the closed mouth portion of a bag in a flat arrangement in which the sides of the label 9 and 10 can be seen enveloped by the faces 6 and 7 of the bag, all corresponding to Figure 4 of those accompanying it.

**[0021]** Figure 6 shows a version of the invention in which the bag 18, which has been shown diagrammatically, gathered without any special organisation, being enclosed inside the label 17, which acts as an envelope.

[0022] Figure 7 shows a third version of the closed mouth portion in which the label 19, which may or may not be in a flattened arrangement, is completely enveloped by the mesh bag 20, which has been shown very diagrammatically as in the previous figures.

[0023] In the form of embodiment shown in Figure 8, the mesh bag 21 assumes a general substantially flattened structure, of folded type or simply by gathering of the bag without specific organisation, receiving in semi-enveloping form the appendage 22 of the label which extends for the whole of one of the major sides of the flattened bag 21 and also at the ends or lateral zones of same, forming the short appendages 23 and 24.

[0024] The bag is completed by a plurality of ribbed elements arranged on the flat areas of the closure mouths, produced in the actual molten mass at the time of closure welding of the mesh bag. Said ribbed structure, arranged transversely, covers the entire width of the mouth portion of the bag, and is of widely varied shape, for example, the straight ribs 11, 12 and 13 shown in Figure 2, or the gently curved ribs 14, 15 and 16 of Figure 3, or any other ribbed structure arrangement which fulfils the essential characteristic of extending over the entire width of the mouth portion of the bag, covering same transversely, for example undulating or zigzag arrangements or combining a plurality of discontinuous transverse ribbed structures overlapped or in the form of a network, etc.

[0025] Preferably, the ribbed structures will be arranged on both faces of the flattened mouth portion, as shown in Figure 4, in which can be seen the ribs which have been indicated by way of example by the numbers 11, 12 and 13 in Figure 2, and other similar ribbed structures 11', 12' and 13' arranged on the other face. As is clear, it is not indispensable for the ribbed structures of one face to be at the same height as those of the other, nor for them to be the same in number.

[0026] The variant of Figures 9 to 12 provides for the manufacture of mesh bags for fruit and vegetable products continuously from a tubular mesh element, as shown in Figure 9 with the bags 101 and 102, which in a known manner are filled with suitable amounts of fruit and vegetable products, and are afterwards subjected to welding and cutting between every two bags. Thus, for example, in the intermediate zone 103, between the bags 101 and 102, the accumulation and squashing of the material of said bags and the welding of the material of same, take place, followed by cutting, by means of which the mesh bags filled with the desired products are separated from each other.

[0027] According to the present invention, the zone 103, as shown in greater detail in Figures 10 and 11, receives a transverse weld in the shape of multiple ribs, such as 104, 105, 106 and 107, sufficient in number to permit satisfactory fixing of the mouth portions of bags opposed to one another, corresponding to the bags 101 and 102, without other elements in the weld. As may be foreseen, the number of weld ribs will depend on the den-

sity of the mesh, since with a greater density of fibres of same it is possible to obtain greater strength of the weld with a lesser number of ribs. However, the number of ribs of the weld, which by way of example has been shown as four, will not substantially alter the cost of manufacture.

[0028] As will be observed in Figure 11, the different filaments, such as 108, 108', 108" of the bag 101, and those shown by the numbers 109, 109', 109" in the bag 102, will be grouped together in the intermediate zone 103 in which, by welding, the ribs are produced, for example, 104, 105, 106 and 107. After welding, cutting will be carried out, for example through the trace line X-X', shown in Figure 11.

[0029] In the embodiment of Figure 12, the arrangement of ribs distributed in two groups has been shown, for example the ribs 110 and 111 for the upper bag and the ribs 112 and 113 for the lower bag, being distributed in equal or different number for the upper bag 114 and for the lower bag 115, and leaving an intermediate surface of greater width 116 in which the cut X-X' will be made.

[0030] By means of the embodiments shown, important advantages are obtained compared with the currently known bags for fruit and vegetable products because of the greater strength obtained in the mouth portions of the bag, avoiding fortuitous breakage thereof and obtaining much greater strength in the fixing of the labels.

[0031] Preferably, the bag of the present invention will be made of polyethylene, although other weldable materials are not ruled out.

[0032] Although the invention has been described according to preferred embodiments thereof, it will be understood that any expert in the field, at sight of the description, claims and drawings, may introduce numerous variants which will be included in the present invention if they come within the scope of the following claims.

## Claims

1. A bag for fruit and vegetable products, of the type which comprises a mesh bag body (1) of thermoplastic material with two and closure mouths intended to contain the fruit and vegetable products, **characterized in that** one of the closure mouth portions (2,3) of the ends of the bag is intimately associated, in enveloping form, with an appendage (5) of a thermoplastic hanging label (4) of the bag, the assembly consisting of the mouth portion and the appendage of the label (4) being welded with ribbed structures being formed on the faces of the closure mouth portion, from the actual molten material of the mesh and the label (4), which cover the entire width of the mouth portion, preventing the longitudinal and transverse breakage of the welded mouth.
2. A bag for fruit and vegetable products, according to claim 1, **characterized in that** one of the closed

mouth portions of the bag is folded back on itself, forming two wings which contain within them the appendage of the label (4), which is joined to the mouth portion of the bag during the actual welding of same.

3. A bag for fruit and vegetable products, according to claim 2, **characterized in that** the welded appendage of the hanging label (4) assumes a folded arrangement with two faces which coincide respectively with the inner faces of the folded wings of the flattened mouth portion of the bag. 10
4. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the mouth portions of the bag completely surround the appendage of the label (4). 15
5. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the mouth portions of the bag are completely surrounded by the appendage of the label (4). 20
6. A bag for fruit and vegetable products, according to claim 1, **characterized in that** one of the mouth portions of the bag is gripped in semi-enveloping form by the appendage of the label (4), which is adapted to one face of the intermediate zone of the bag with a generally flattened structure and on the lateral edges of same. 25
7. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the ribbed structures are constituted by straight transverse ribs (11,12,13). 30
8. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the ribbed structures consist of curved transverse ribs (14,15,16). 35
9. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the ribbed structures are of undulating shape. 40
10. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the ribbed structures are in the shape of zigzag lines. 45
11. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the ribbed structures are grid-like in shape. 50
12. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the edge of the mouth portions presents a short end zone without weld. 55
13. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the edge of the mouth portions is welded as far as its cut end.

14. A bag for fruit and vegetable products, according to claim 1, **characterized in that** the number of weld ribs is inversely proportional to the mass density of the tubular element from which the bags are manufactured. 5

15. A bag for fruit and vegetable products, according to claim 14, **characterized by** the arrangement of the transverse weld ribs in two groups separated by a free intermediate zone, intended to receive the cut separating consecutive bags. 10

#### Patentansprüche

1. Beutel für Obst- und Gemüseprodukte des Typs, welcher einen Netzbeutelkörper (1) aus thermoplastischem Material umfasst, mit zwei Endverschlussmündungen, welcher dazu vorgesehen ist, die Obst- und Gemüseprodukte zu beinhalten, **dadurch gekennzeichnet, dass** einer der Verschlussmündungsteile (2, 3) der Enden des Beutels mit einem Fortsatz (5) eines thermoplastischen Hängeetiketts (4) des Beutels in umschließender Weise eng verbunden ist, wobei die aus dem Mündungsteil und dem Fortsatz des Etiketts (4) bestehende Anordnung mit gerippten Strukturen verschweißt ist, welche auf den Flächen des Verschlussmündungsteils gebildet sind, aus dem tatsächlich geschmolzenen Material des Netzes und des Etiketts (4), und welche die gesamte Breite des Mündungsteils bedecken, so dass das Längs- und Querreißen der verschweißten Mündung vermieden wird. 35
2. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** einer der verschlossenen Mündungsteile des Beutels auf sich selbst zurückgefaltet ist, so dass zwei Flügel gebildet sind, welche in ihnen den Fortsatz des Etiketts (4) beinhalten, welches an den Mündungsteil des Beutels während des tatsächlichen Verschweißens desselben angefügt wird. 40
3. Beutel für Obst- und Gemüseprodukte nach Anspruch 2, **dadurch gekennzeichnet, dass** der verschweißte Fortsatz des Hängeetiketts (4) eine gefaltete Anordnung mit zwei Flächen annimmt, welche sich entsprechend mit den inneren Flächen der gefalteten Flügel des abgeflachten Mündungsteils des Beutels überschneiden. 50
4. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mündungsteile des Beutels den Fortsatz des Etiketts (4) vollständig umgeben. 55
5. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mündungsteile des Beutels den Fortsatz des Etiketts (4) vollständig umgeben.

zungsteile des Beutels vollständig von dem Fortsatz des Etiketts (4) umgeben sind.

6. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** einer der Mündungsteile des Beutels in halb umschließender Weise von dem Fortsatz des Etiketts (4) gegriffen ist, welches an eine Fläche des Zwischenbereichs des Beutels mit einer im Allgemeinen abgeflachten Struktur und an den seitlichen Rändern desselben angepasst ist. 5
7. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die gerippten Strukturen durch gerade Querrippen (11, 12, 13) gebildet sind. 10
8. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die gerippten Strukturen aus gekrümmten Querrippen (14, 15, 16) bestehen. 15
9. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die gerippten Strukturen von gewellter Form sind. 20
10. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die gerippten Strukturen in der Form von Zick-Zack-Linien sind. 25
11. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die gerippten Strukturen in ihrer Form gitterartig sind. 30
12. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** der Rand der Mündungsteile einen kurzen Endbereich ohne Verschweißung darstellt. 35
13. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** der Rand der Mündungsteile bis zu seinem abgeschnittenen Ende verschweißt ist. 40
14. Beutel für Obst- und Gemüseprodukte nach Anspruch 1, **dadurch gekennzeichnet, dass** die Anzahl von Schweißrippen umgekehrt proportional ist zu der Massendichte des schlauchförmigen Elements, aus dem die Beutel hergestellt werden. 45
15. Beutel für Obst- und Gemüseprodukte nach Anspruch 14, **gekennzeichnet durch** die Anordnung der Querschweißrippen in zwei Gruppen, die **durch** einen freien Zwischenbereich getrennt sind, der dazu vorgesehen ist, den Schnitt aufzunehmen, der aufeinanderfolgende Beutel trennt. 50

## Revendications

1. Sac pour produits horticoles, du type qui comprend un corps de sac en maille (1) de matériau thermoplastique avec deux embouchures de fermeture d'extrémité prévu pour contenir les produits horticoles, **caractérisé en ce que** l'une des parties d'embouchure de fermeture (2, 3) des extrémités du sac est intimement associée, sous forme enveloppante, à un appendice (5) d'une étiquette thermoplastique suspendue (4) du sac, l'ensemble se composant de la partie d'embouchure et de l'appendice de l'étiquette (4) étant soudé avec des structures nervurées qui sont formées sur les faces de la partie d'embouchure de fermeture, à partir du véritable matériau en fusion de la maille et de l'étiquette (4), qui couvre toute la largeur de la partie d'embouchure, empêchant la rupture longitudinale et transversale de l'embouchure soudée.
2. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** l'une des parties d'embouchure fermées du sac est repliée sur elle-même, formant deux ailes qui contiennent en leur intérieur l'appendice de l'étiquette (4), qui est assemblé à la partie d'embouchure du sac pendant le véritable soudage de ce dernier.
3. Sac pour produits horticoles selon la revendication 2, **caractérisé en ce que** l'appendice soudé de l'étiquette suspendue (4) adopte un agencement plié avec deux faces qui coïncident respectivement avec les faces internes des ailes pliées de la partie d'embouchure aplatie du sac.
4. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** les parties d'embouchure du sac entourent complètement l'appendice de l'étiquette (4).
5. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** les parties d'embouchure du sac sont complètement entourées par l'appendice de l'étiquette (4).
6. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** l'une des parties d'embouchure du sac est saisie sous une forme semi-enveloppante par l'appendice de l'étiquette (4), qui est adapté à une face de la zone intermédiaire du sac avec une structure généralement aplatie et sur les bords latéraux de cette dernière.
7. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** les structures nervurées sont constituées par des nervures transversales droites (11, 12, 13).

8. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** les structures nervurées se composent de nervures transversales incurvées (14, 15, 16). 5
9. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** les structures nervurées ont une forme ondulée. 10
10. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** les structures nervurées se présentent sous la forme de lignes en zigzag. 15
11. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** les structures nervurées ont une forme de grille. 20
12. Sac pour produits horticoles, selon la revendication 1, **caractérisé en ce que** le bord des parties d'embouchure présente une zone d'extrémité courte sans soudure. 25
13. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** le bord des parties d'embouchure est soudé au fur et à mesure jusqu'à son extrémité découpée. 30
14. Sac pour produits horticoles selon la revendication 1, **caractérisé en ce que** le nombre de nervures de soudure est inversement proportionnel à la densité de masse de l'élément tubulaire à partir duquel les sacs sont fabriqués. 35
15. Sac pour produits horticoles, selon la revendication 14, **caractérisé par** l'agencement des nervures de soudure transversales en deux groupes séparés par une zone intermédiaire libre, prévue pour recevoir la coupe séparant les sacs consécutifs. 40

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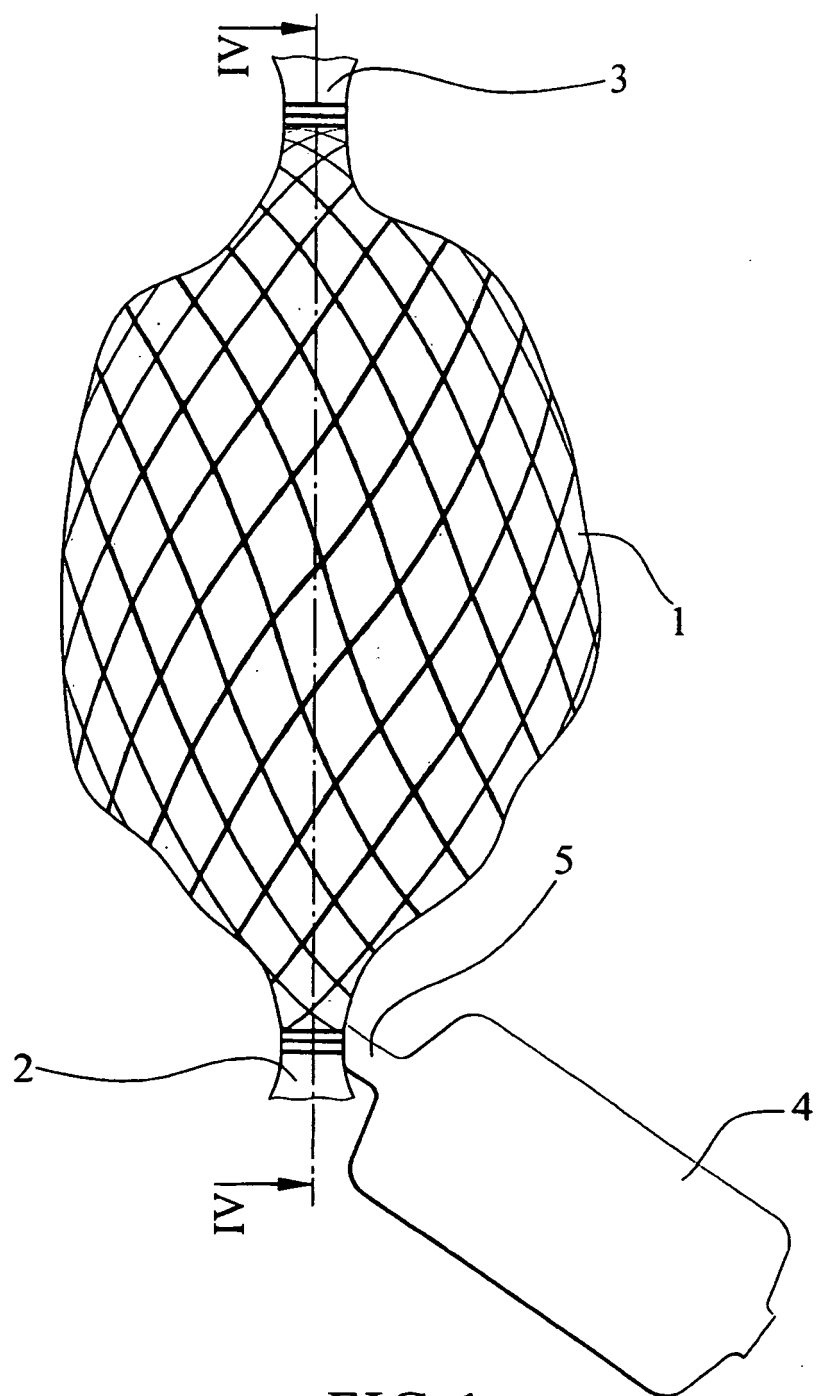


FIG.1

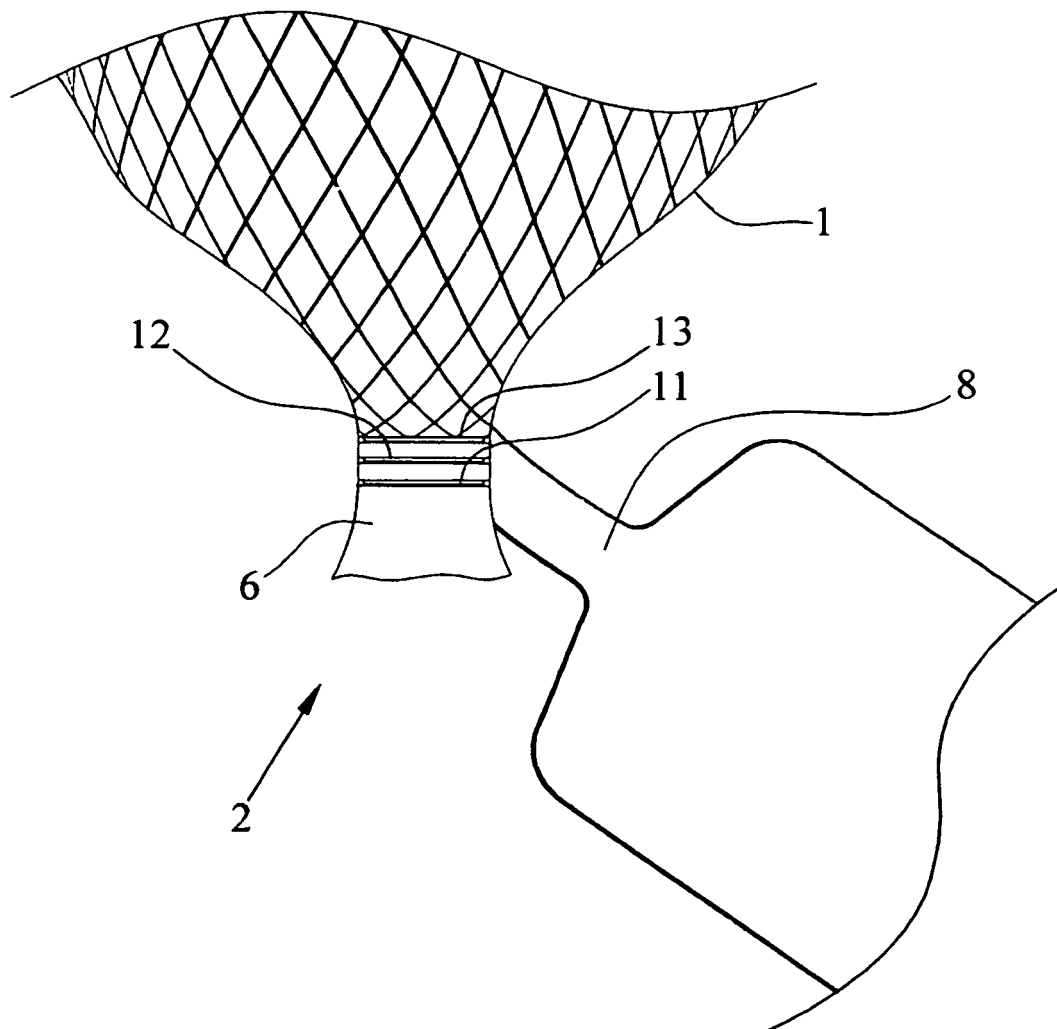


FIG.2

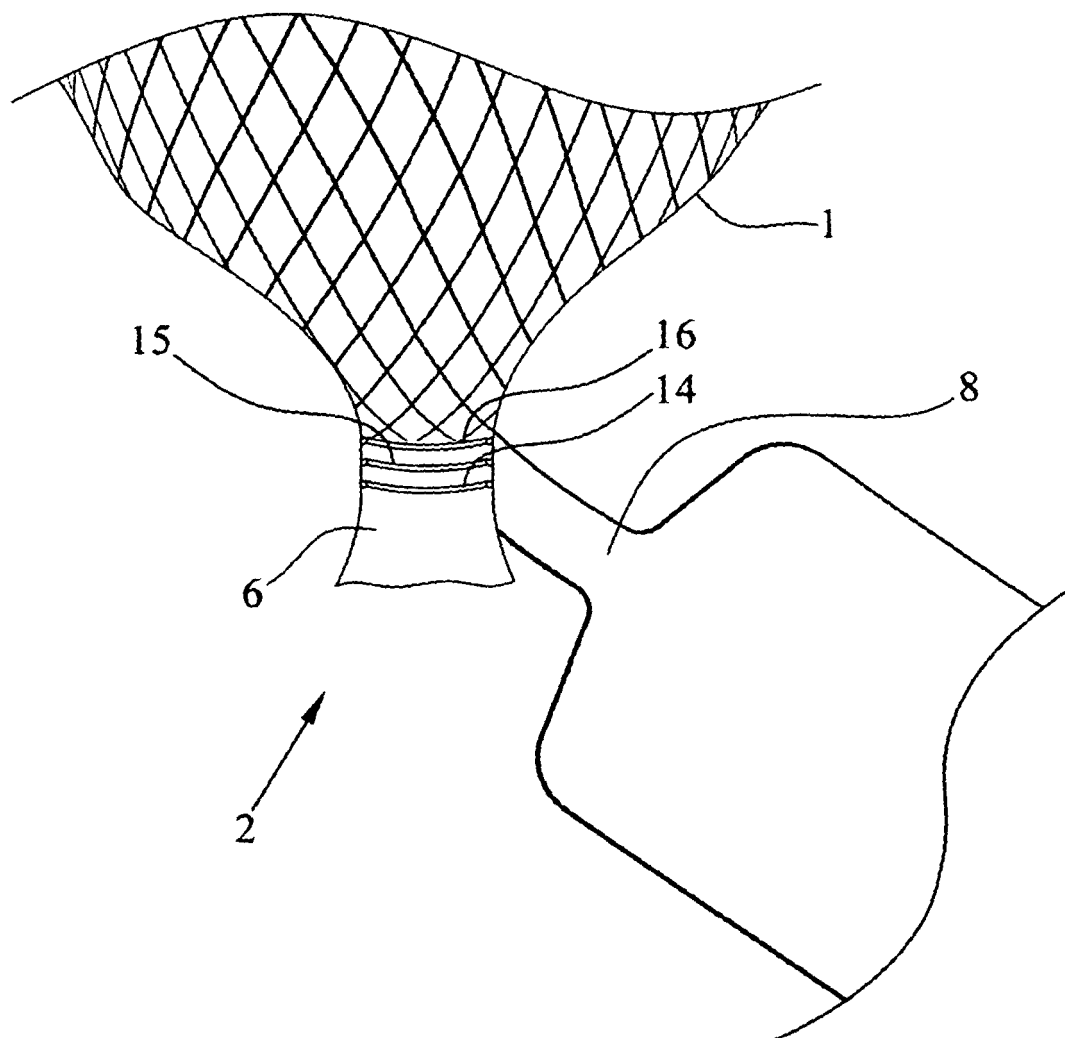


FIG.3

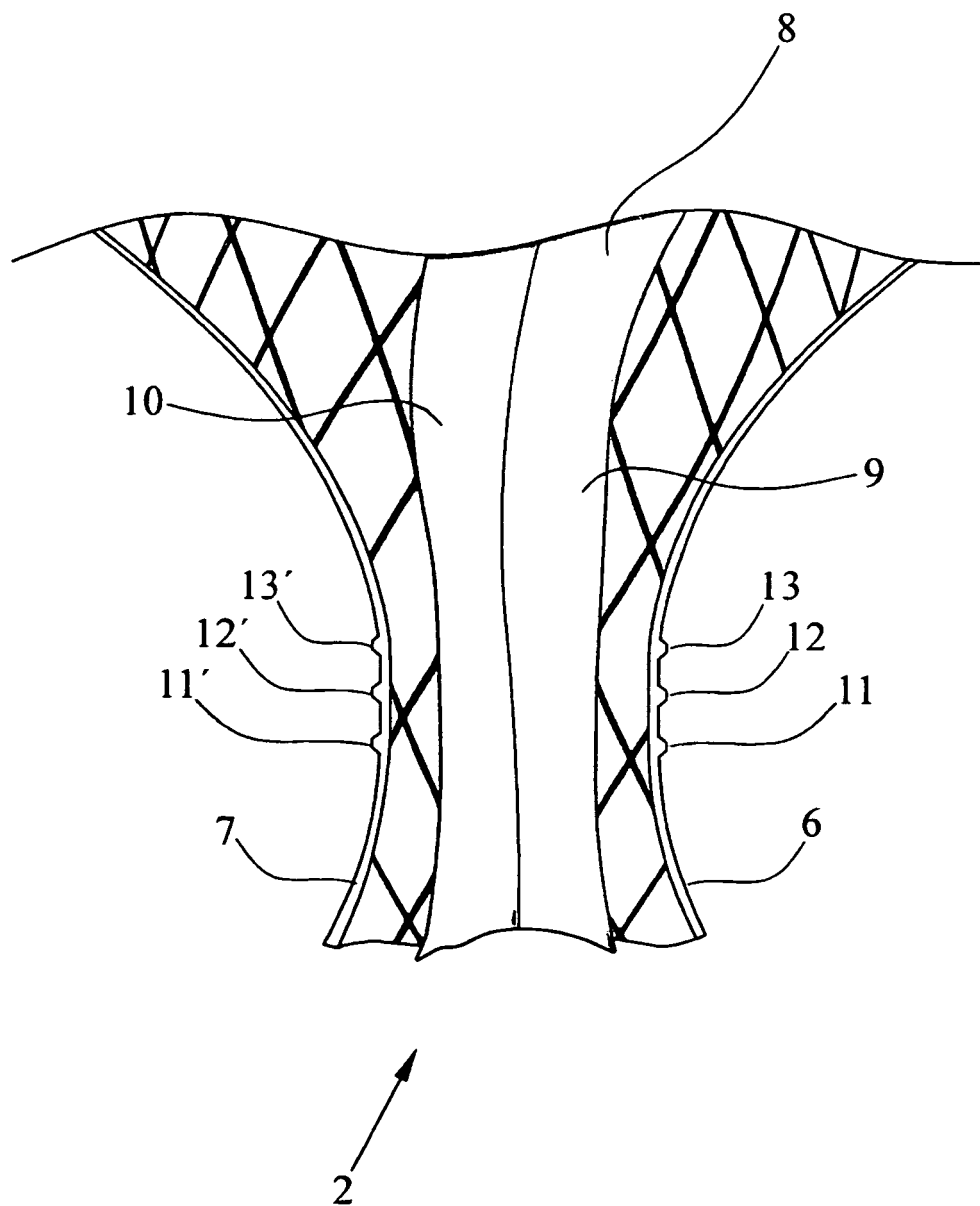


FIG.4

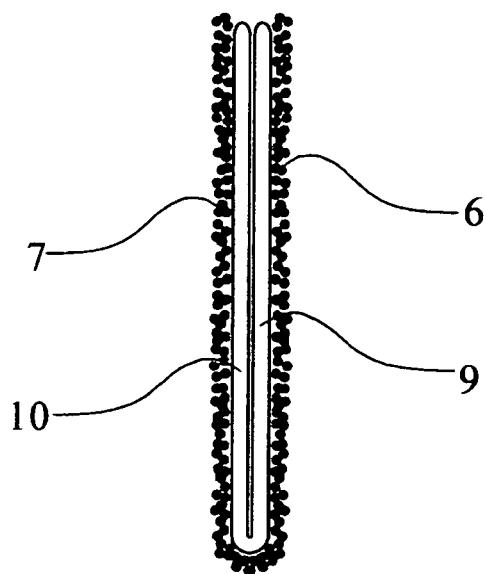


FIG. 5

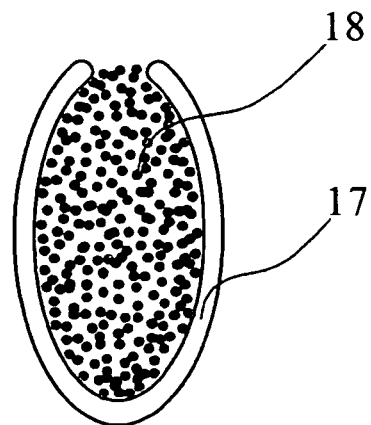


FIG. 6

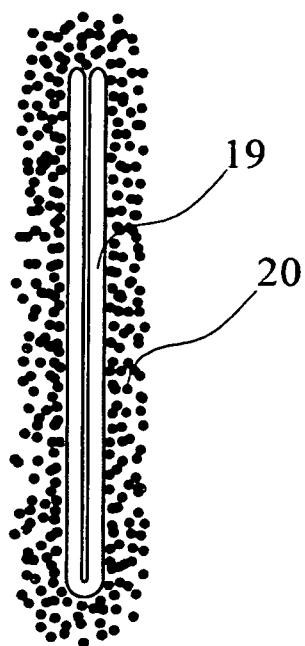


FIG. 7

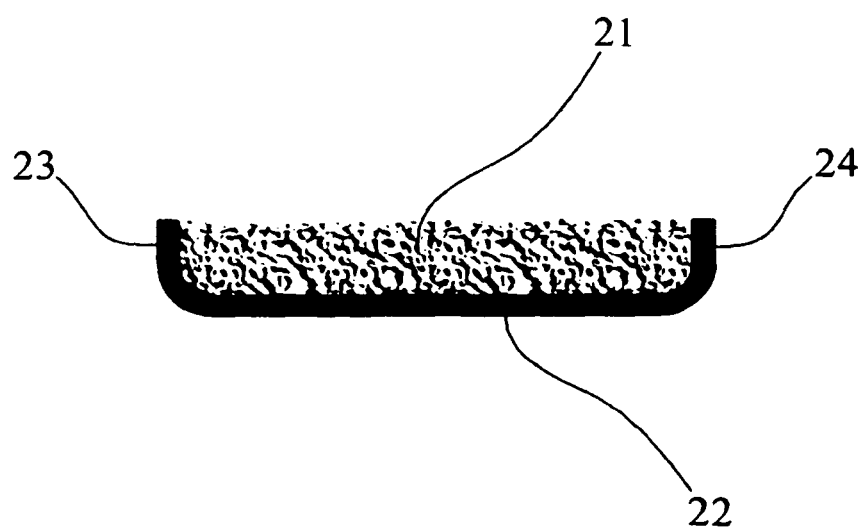


FIG.8

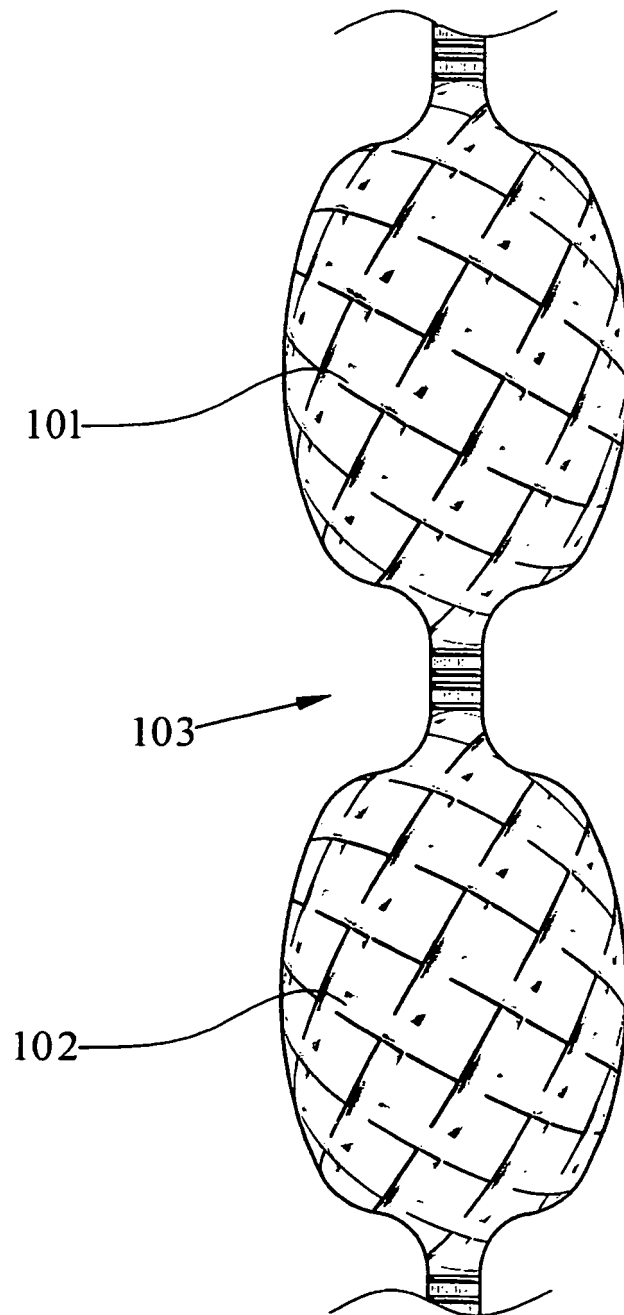


FIG. 9

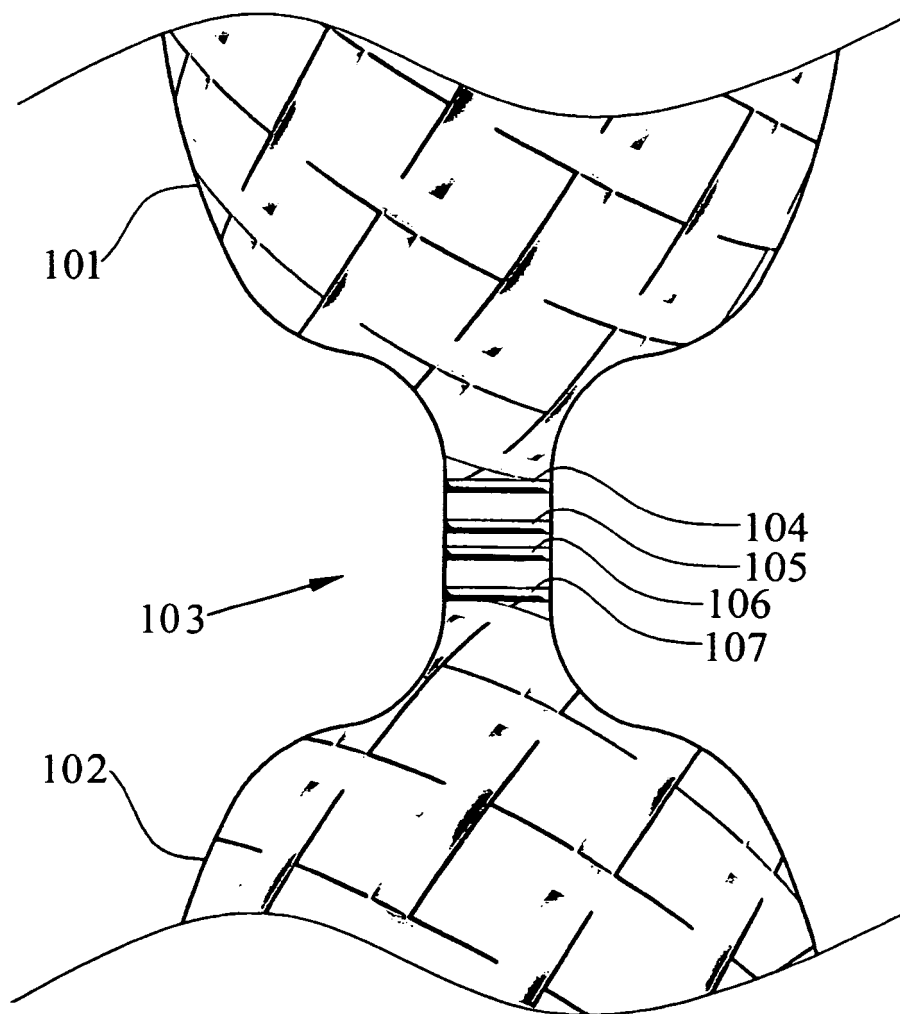


FIG. 10

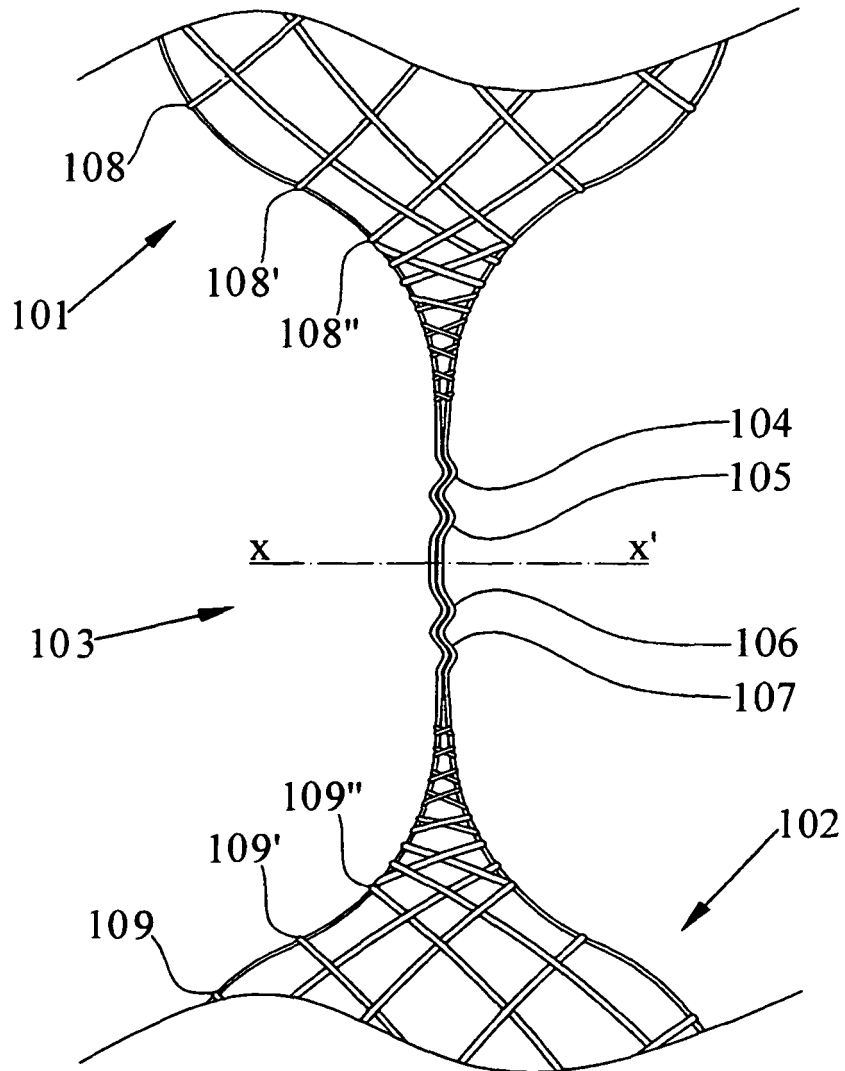


FIG. 11

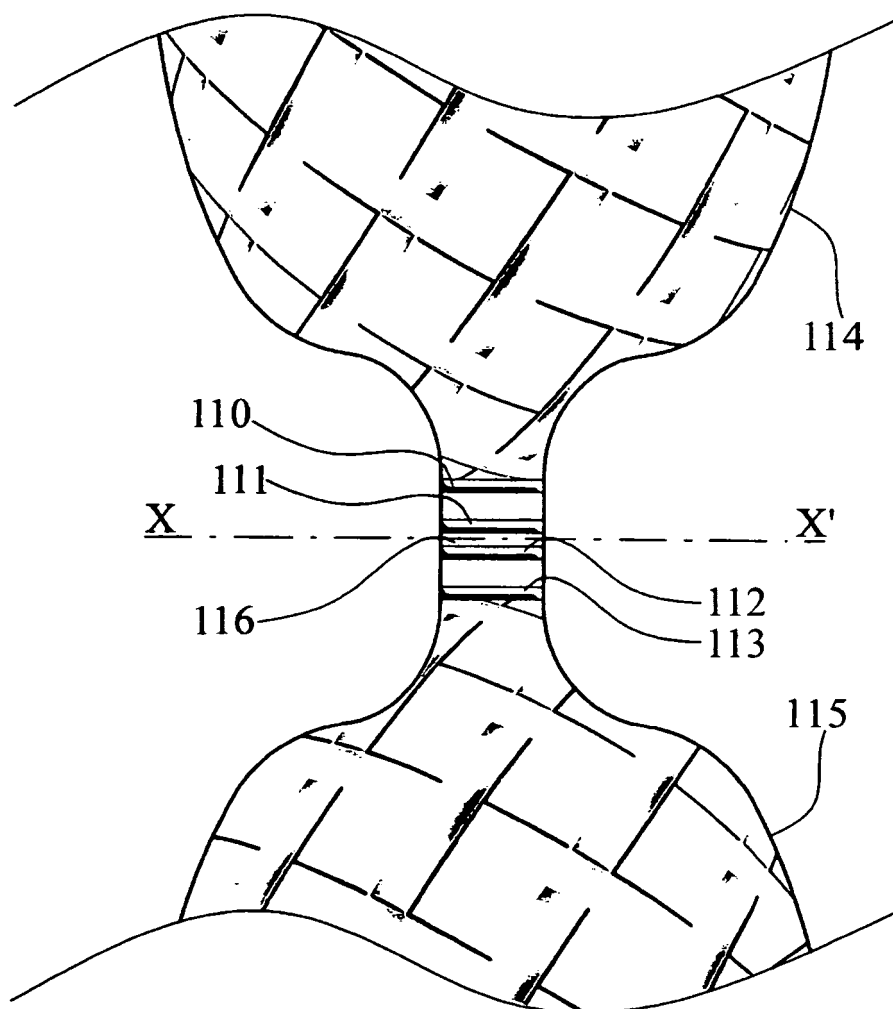


FIG.12

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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