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(54) Benævnelse: **Præform til blæsning af en beholder**

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PATENT ABSTRACTS OF JAPAN vol. 1998, no. 06, 30 April 1998 (1998-04-30) & JP 10 034807 A (TOYO INK MFG CO LTD), 10 February 1998 (1998-02-10)

Description

Field of the invention

[0001] The present invention relates to a preform for the blow-molding of a container comprising a neck section, an adjoining wall section having a substantially cylindrical shape, with in-between a neck ring as a transition region, and further a bottom section which forms the base of the preform. It is composed of a multilayer structure consisting of two surface layers, the one of which is directed outwardly the preform to form an outer surface layer, and wherein the other is directed inwardly to form an inner surface layer, with in between an intermediate layer which forms a core layer. Both surface layers are composed of a primary material and said intermediate layer is composed of a secondary material, wherein said primary and secondary materials are mutually different.

Prior art

[0002] US-A-5 804 016 discloses a multilayer container resistant to elevated temperatures and pressures, and also a method of making the same, that are intended for pressurized products which may be expose to elevated temperatures and pressures, with the aim of providing multiple layers that are resistant to layer separation during pasteurization e.g., like in hotfill e.a. This document is essentially directed to meet the need for a plastic container that is able to withstand the elevated temperatures and pressures of pasteurization and other high temperature applications, without significant creep and which is commercially cost-effective, wherein the barrier issue or function of one of the layers of the container is not an issue, and neither is the geometry of the layers, particularly the core layer. It addresses possible manufacturing problems of the container and it proposes to solve the problem of undesired layer separation, also known as delamination. Besides, it discloses a three layer container structure, with an intermediate layer that is right in the middle of an outer layer and an inner layer 44, with same thickness resulting in that the core layer is exactly located in the middle of the total wall of the preform.

[0003] WO-A-0 134 378 yet discloses a multi-layer preform that is provided with an inner layer which is removed in the base area. Likewise, there is shown a multilayer profile section wherein the core layer is comprised in between an outer layer and an inner layer, each having the same thickness, resulting again in that the core layer is located exactly in the middle of the overall preform wall. All its figures actually show a similar embodiment of layer profiles, with the core layer always being comprised between outer and inner layers with the same thickness resulting again in that the core layer is located exactly in the middle of the preform wall, respectively bottle wall.

[0004] EP-A-1 433 587 discloses a three layered preform, whereby in order not to waste material, the intermediate barrier layer is extending underneath the neck portion. However, a precise positioning between the outer and inner layer is not disclosed.

[0005] Besides, multilayer preforms of the abovementioned type are known. For example, there is known a preform from EP-B-0 376 469 in which the part which forms the base is built up as a five-layer structure.

[0006] Furthermore, EP 0 380 215 discloses a preform likewise comprising a core as described above, which is composed however of a material that is expensive to produce, and consequently this layer needs to be as thin as possible, which in some cases constitutes an unacceptable restriction.

[0007] The aim of the abovementioned barrier layer is to counteract the migration of undesirable gas particles through the preform wall, both from the inside outward and from the outside inward.

[0008] The problem in particular is that the container is intended to contain a specific product, the intention being for this product to retain its characteristics and properties as far as possible and in the process to remain as stable as possible over the course of time.

[0009] The problem in particular is that the container is intended to contain a specific product, the intention being for this product to retain its characteristics and properties as far as possible and in the process to remain as stable as possible over the course of time.

Object of the invention

[0010] The object of the present invention is to provide a preform of the abovementioned type which optimizes the blocking action of the core layer as a barrier layer, counteracting the migration of gas particles in both directions, i.e. both from the inside outward and from the outside inward.

Summary of the invention

[0011] This object is achieved by solving the abovementioned problem by providing a preform according to the invention as defined in the main claim 1. Thanks to the particular positioning of the core or secondary layer in the preform wall, one achieves the option of allowing a larger quantity of active constituents to come into contact with the product, which is to be accommodated in the container. The main advantage that is obtained therewith is that any possible migration of undesirable constituents through the preform wall would be counteracted, in both directions, i.e. both from the outside toward the interior of the container and vice versa. This advantage is of great importance since the product stored in the container consequently retains its characteristics and properties extremely well and is therefore not subject to degradation over the course of time as a result of undesirable interactions with the outside world or even of internal origin.

[0012] According to a further embodiment of the preform according to the invention, said primary plastics material contains a predetermined quantity of additives. The presence of additives means that any constituents which migrate

from outside the container toward its interior are bound and thus neutralized, so that said constituents cannot reach the product contained in the container.

[0013] Conversely, the additives in the primary layer ensure that constituents which are disadvantageous for the product stored in the container are also bound, so that these internal constituents also cannot cause degradation to the product contained in the container.

[0014] According to one specific embodiment of the preform according to the invention, said primary layer contains additives with a neutralizing action with respect to external radiation, in particular UV radiation. This offers an advantage for products such as milk which mainly degrade under the influence of light, in particular the vitamins which are present in the milk.

[0015] According to yet another embodiment of the preform according to the invention, the primary layer comprises additives with a neutralizing action on undesirable gas formation, in particular oxygen, which originates from degradation of the contents of the container and is present inside the container together with the contents, in particular in a space above the filling level of the container, where there are no contents of the beverage type, for example. This makes it possible to prevent oxidation of a beverage packaged in the container.

[0016] According to yet another embodiment of the preform according to the invention, the primary, inwardly facing layer comprises additives with a neutralizing action on disadvantageous reagents which originate from the container itself and are formed in the plastic base material, in particular PET, during production of the preform in the injection-molding machine, in particular acid aldehyde. This measure counteracts the migration of acid aldehyde constituents out of the wall of the bottle to the product contained in the bottle, making it possible to prevent changes in the taste of said product in the container.

[0017] According to a preferred embodiment of the preform according to the invention, said secondary layer is formed by a passive barrier, wherein the sec-

ondary material from which the secondary layer is produced is at least less pervious, and preferably impervious, to a substance which could migrate through it, such as oxygen, carbon dioxide or the like. The presence of a barrier layer of this type blocks the abovementioned constituents which may migrate, preventing them from migrating through the wall of the container. The blocking action of said barrier layer is bidirectional, which means that the penetration of undesirable constituents, such as oxygen for example, into the container is counteracted if the container contains products which would be oxidized or deteriorate, go off or suffer some other drop in quality under the influence of said gaseous constituents.

[0018] Conversely, said barrier layer also prevents any gaseous constituents which are desirable from starting to migrate from the product contained in the container through the wall of the container from the inside outward, for example in the case of water or beverages, such as a soft drink or beer, for example, enriched with additional oxygen or carbon dioxide.

[0019] According to a further additional embodiment of the preform, the said secondary material of the core layer has an affinity for said undesirable substances which is such that the secondary material reacts with them and will thus retain the undesirable substances in the wall of the container itself, with the result that the undesirable constituents cannot escape further or enter the interior of the container.

[0020] According to an even more specific embodiment of the preform according to the invention, said secondary intermediate layer also comprises additives with the same function as a migration stopper for both undesirable gas constituents and radiation.

[0021] According to a particularly preferred embodiment of the preform according to the invention, the preform is composed of between 88 and 95% by weight of primary material, on the one hand, and approximately 5 to 12% by weight of secondary material, on the other hand.

[0022] Furthermore, the present invention relates to a preform comprising a core or intermediate layer consisting of hydrophobic polymers incorporating living organisms and/or cell products.

[0023] Therefore, the present invention also proposes a preform comprising an intermediate layer which includes hydrophobic polymers, in which case a hydrophobic polymer is selected, and furthermore a set of organisms are selected from among cells and/or cell products. It is remarkable that aggregates are then formed by processing said cells in said polymer, with the result that what is known as a polymer-bio aggregate is formed, producing a new function of the polymer product formed in this way.

[0024] According to a preferred embodiment of the invention, the abovementioned cells are selected from the category of what are known as cysts and/or in a phase of inactive or sleeping stages. A quite significant number of types of organisms or microorganisms can change from an active life form to what is known as a quiescent stage or spore, known as cysts. Said spores are able to withstand extreme environmental fluctuations in a latent form. In this form of anabiosis, they are able to withstand extremely dry conditions and temperatures well above 100°C.

[0025] Under suitable biotechnology conditions, these types can not only be cultivated but also converted, in controlled culture conditions, known as encysting, into usable spores for bio-encapsulation in a polymeric matrix.

[0026] During the production process of an industrial product, such as packaging material or the like, said spores and the polymer are agglomerated within a short period of time during which the polymer is liquid, namely at a temperature above its melting point. This produces what is known as a polymer-bio aggregate, referred to below as "PBA".

[0027] As long as the product is not in use, the organisms of the bio-component

in said PBA remain inactive. As soon as the living conditions become favorable, coinciding with the product starting to be used in association with an environment which is suitable for life in therms of temperature and relative humidity, the spores change into active, metabolizing cells under these favorable ambient conditions. For this period, the biologically active form will perform its intended function. As soon as the optimum conditions return to conditions which are less than optimum, the active form returns to the spore.

[0028] The process remains reversible in accordance with a feedback mechanism which is controlled by the living environment of the organism in said PBA.

[0029] Thus, according to a particularly preferred embodiment of the invention, said cell products are selected from the category of what are known as metabolites, i.e. the molecules which are biochemically synthesized by organisms under the abovementioned temperature working conditions.

[0030] According to yet another preferred embodiment of the present invention, the polymers are selected from non-biodegradable polymers. Reliable, slow and prolonged diffusion of organic molecules out of polymers into a moist or fluctuating environment can be realized without degradation of the polymer.

[0031] The advantages obtained are mainly that the biological activity of the organisms incorporated in the PBA produced imparts novel, previously unknown properties to the polymer. Said PBA ensures the desired environment for which said PBA was made.

[0032] A further advantage consists in the standardized release of very specific biomolecules from a polymeric matrix, such as granules and the like, without said polymeric matrix being lost in a variable environment as a result of climatological instabilities, for example.

[0033] Further details are set out in more detail below in some exemplary embodiments of the invention with reference to the appended drawings.

Brief description of the drawings

[0034]

Figure 1 is a diagrammatic representation of a cross section virtually on a center plane of a preform according to the invention.

Figure 2 is a partial view of a preform according to the invention as illustrated in figure 1.

Figure 3 is a detail view of part of the wall of the preform according to the invention illustrated in figures 1 and 2.

Figure 4 is a further detail view of a further part of the preform according to the invention illustrated in figures 1 and 2.

Figure 5 diagrammatically depicts the functional operation of an essential component of the preform according to the invention.

Figure 6 shows a further diagrammatic depiction of a further functional operation of an essential component of the preform according to the invention.

Figure 7 shows a similar functional illustration to that shown in the previous figure of a further embodiment of the preform according to the invention.

Figure 8 shows a comparative illustration analogous to that shown in the previous figure.

Figures 9 to 11 illustrate a variant of the preform according to the invention corresponding to similar representations illustrated in figures 1, 3 and 4, respectively.

Description

[0035] In general terms, the present invention relates to preforms produced from plastics material which substantially comprise a neck section, which forms the pouring spout, the actual wall section, which is intended to be blown to form a container, and a bottom section which forms the base. The neck section 10 of the preform surrounds a pouring opening 11 on one side and merges into the said body section 20 of the preform in a neck ring 12. The base 30 of the preform has a sprue point 31 of the preform, along which primary and secondary

material can be injected into an injection mold provided for this purpose, which is not shown. The preform extends along its longitudinal axis ℓ.

[0036] The preform illustrated is substantially three-layered. This particular, specific three-layer structure is an essential feature. Therefore, the layer 1 which faces toward the outside of the preform is made from said primary material, more particularly from the same material as the layer 3 which faces toward the interior of the preform. Between the two above mentioned layers 1, 3 there is an intermediate layer 2 which forms a core layer and is made from a secondary material. In this context, it is important that the center surface of the intermediate layer 2 is disposed toward the outside with respect to the center surface of the wall of the preform. Referring to the cross section shown in figure 1, the above means that the center axis of said intermediate layer 2 is offset outward, toward the outer surface of the preform, wherein the intermediate layer 2 is thus located in the half of the preform wall which is located on the outside with respect to the center axis thereof.

[0037] This particular structure is illustrated on a larger scale in figure 2, from which it clearly appears that said intermediate layer 2 is directed toward the outer surface of the preform.

[0038] A detailed illustration of a fragment of the preform wall is shown in fig. 3. Said primary plastics material is preferably polyethylene terephthalate, or PET for short. Furthermore, the primary material may also be formed by plastics material to which additives have been added, as illustrated in figures 5, 6. One example of additives used in this respect is vitamins.

[0039] If appropriate, it is also possible for the primary material to be composed of a mixture of recycled plastics and additives.

[0040] More particularly, additives which bind the undesirable oxygen which starts to migrate inward from outside the bottle can be added to said primary plastics material, so that this oxygen cannot reach the product inside the bottle.

[0041] This additive can also ensure that the oxygen which is present in the bottle together with the beverage, in particular in a space above the filling level of the beverage, is bound, so that this oxygen likewise cannot cause oxidation.

[0042] It is also possible to add an additive which keeps UV rays outside the bottle, since products such as milk, and in particular the vitamins in the milk, primarily degrade under the influence of light.

[0043] Another additive is a substance which binds acid aldehyde or AA. AA is a substance which forms in PET during production of the preform in the injection-molding machine. If AA migrates out of the wall of the bottle to the product in the bottle, it can cause the flavor to change, in particular in the case of carbonated water.

[0044] The above text demonstrates how essential the correct positioning of the secondary layer in the preform is. This is because if the secondary layer is toward the outer side of the preform, this means that the PET layer in which additives are present is thicker. If the primary PET contains additives, this permits more active constituents to be in contact with the product. In this way, for example, more oxygen from the bottle can be bound, as shown in figs 7 and 8.

[0045] The secondary material in the preform, which forms the intermediate layer, is, for example, a barrier layer intended to block oxygen seeking to migrate through the wall of the bottle. The penetration of oxygen into the bottle needs to be avoided if the bottle contains products which are oxidized or broken down, go off or lose quality under the influence of oxygen, for example fruit juice or milk, as shown in figure 5.

[0046] This oxygen barrier layer is also important if the bottle contains water to which additional oxygen has been added. In this case, the layer prevents the oxygen from migrating through the wall from the inside outward, which would cause the water to lose quality.

[0047] A barrier layer as shown in figure 6 is intended to retain carbon dioxide seeking to migrate through the wall of the bottle from the inside outward. The loss of carbon dioxide from the bottle needs to be avoided if the bottle contains, for example, a soft drink or beer. That is because in this case the loss of CO_2 means a loss of quality in the beverage.

[0048] The barrier layer forms approx. 5 to 12% of the preform weight, depending on the use.

[0049] Furthermore, a barrier comprising PET or another plastics layer with additives added to it can perform the same function of stopping the migration of oxygen or carbon dioxide or UV rays.

[0050] Each of these barrier layers may form both an active barrier and a passive barrier, in the sense that in the case of a passive barrier the secondary material is impervious or less pervious to a specific substance, such as O_2, CO_2 and the like, and blocks this substance.

[0051] In the case of an active barrier layer, on the other hand, the secondary material will react with a specific substance and in this way retain harmful and/or undesirable substances in the wall, so that they cannot escape or penetrate any further.

[0052] Figure 9 shows a variant of the preform in which the preform has a bottom 30 in which said intermediate layer 2 has a bend 29 toward said bottom and extends further through the free end 31 thereof. This is illustrated in more detail in figure 10.

[0053] This latter embodiment is particularly recommended if said barrier layer 2 is closer to the outer side of the preform wall, as shown in figure 9. A non-limiting example of a composition of said barrier layer consists of EVOH, or if appropriate a different polymer.

[0054] In one specific variant embodiment of the preform, at least one barrier layer or intermediate layer thereof consists of hydrophobic polymers incorporating living organisms and/or cell products. A number of specific use examples are described below.

[0055] In the feed packaging sector which employs oxygen barriers, a PBA layer is arranged as an intermediate layer in multi-layer packaging material for foodstuffs, such as PET bottles for beverages, such as beers or fruit juices for example. The polymer component of the PBA is in this case PET, while the PBA bio component is a type of yeast with a dry spore, such as for example *Saccharomyces,* which is able to withstand the high temperatures of the production process. The PBA remains inactive until the PET bottle has been filled. When the package is filled with fruit juices or beer, for example, the internal environment of the PBA becomes water-saturated, with the result that the spores are activated to form respiring cells which consume all the oxygen present inside the bottle. As a result, all the oxygen is withdrawn from the contents under the influence of what is known as the O_2 scavenger. Also, all the external oxygen which can diffuse through the wall is captured by the yeast cells for respiration, which results in an efficient oxygen barrier.

[0056] A further example of a use consists in the action as a UV blocker, which works in a similar way to the above example. Instead of yeast cells, the PBA incorporates a type of alga, such as for example *Haematococcus,* the spores of which very intensively block UV light. A continuous layer of *Haematococcus* cells, hematocysts with a high concentration of astaxanthin, makes the PBA opaque to UV light. This fact is utilized in moisture-resistant UV-proof films and polymer coverings.

[0057] A further use consists in the combined application of the two examples mentioned above in connection with food packaging with an oxygen barrier and a UV blocker which is suitable for PET bottles as packaging for beers and fruit juices and the like. The PBA bio component is a calibrated mixture of *Saccha-*

romyces and *Haematococcus.* Said oxygen scavengers, such as yeast cells for example, represent a permanent oxygen barrier, while the UV blocker, such as a type of alga, for example, prevents photochemical degradation of the filling.

[0058] Yet another possible application consists in the absorption of energy from sunlight with a cooling effect which is similar to the example above relating to the so-called UV blocker. Instead of *Haematococcus,* the PBA incorporates a type of alga such as for example *Chlorococcus,* the active form of which, in the presence of a high degree of moisture, participates very intensively in photosynthesis, consuming high-energy rays of the sunlight. A continuous layer of cells will provide the PBA with an energy-absorbing function, resulting in a non-heating, in other words cooling, effect at the bottom of the polymer. The above effect is utilized in moisture-resistant films and polymer coverings for sun-shielding purposes.

[0059] Possible examples relating to slow diffusion of cellular components and at least partially hydrophobic biomolecules in a moist environment are presented below.

[0060] In a variant on the UV blocker from the above example, the active metabolite, astaxanthin, which very intensively blocks UV light, is incorporated in the PBA instead of the *Haematococcus* cells. As an alternative to the expensive component astaxanthin, it may be possible to use less expensive UV blockers. The diffusion rate of the UV blocker from the PBA in the middle layer of the polylamellar film to the periphery is regulated at a low to very low diffusion rate, depending on the quality and requirements. This fact is exploited in moisture-resistant UV-repellent films and polymer coverings, as well as for packaging material for food products.

[0061] The polymer must in this case be durable and must not deteriorate in moist conditions.

[0062] The biological activity of the organisms incorporated in the PBA gives

the polymer new properties which were not previously known. The PBA ensures the desired environment for which the PBA was made, such as for example an anaerobic environment, complete oxygen barrier, energy absorption of solar radiation, controlled release of metabolites and the like.

[0063] The interaction and exchange of various types of organisms or microorganisms and/or molecules in the bio component of the PBA can also yield a large number of possible applications.

Patentkrav

1. Præform til blæsestøbning af beholder med en halsdel (10), en tilgrænsende vægdel (20) med en i hovedsagen cylindrisk form, og hvor der i et overgangsområde mellem disse dele er anbragt en halsring (12), og hvor præformen yderligere har en bunddel (30) til dannelse af præformens basis, hvilken basis er opbygget af en flerlagsstruktur, som består af to overfladelag, hvoraf det ene vender udad i forhold til præformen og danner et yderlag, medens det andet lag er rettet indad til fastlæggelse af et inderlag, og hvor der mellem disse to lag findes et mellemste lag (2), som danner et kernelag, og hvor begge lagene (1, 3) er opbygget af et primært materiale, medens det mellemste lag (2) er opbygget af et sekundært materiale, og hvor det primære materiale og det sekundære materiale er forskellige fra hinanden, **kendetegnet ved, at** det mellemste lag (2) strækker sig nedenunder halsdelen (10), og at det mellemste lag (2) har en sådan stilling i præform-væggen (20), at det befinder sig nærmere ved det ydre overfladelag (1) end ved det indre overfladelag (3), og **at** det mellemste lag (2) er et barrierelag, som har en blokerende virkning, der kan modvirke gennemtrængning af gaspartikler i begge retninger, det vil sige både indefra og udefter, og udefra og indefter.

2. Præform ifølge det foregående krav, **kendetegnet ved, at** det primære materiale indeholder en i forvejen bestemt mængde tilsætningsstoffer.

3. Præform ifølge det foregående krav, **kendetegnet ved, at** tilsætningsstofferne har en neutraliserende virkning på reaktanter med en uheldig indflydelse på det produkt, som skal indeholdes i beholderen.

4. Præform ifølge det foregående krav, **kendetegnet ved, at** tilsætningsstofferne har en neutraliserende virkning på gasdannelse hidrørende fra nedbrydning af det nævnte produkt.

5. Præform ifølge krav 3, **kendetegnet ved, at** tilsætningsstofferne har en neutraliserende virkning på nedbrydningsprodukter, som stammer fra beholderen selv, især aldehydsyre.

6. Præform ifølge krav 3, **kendetegnet ved, at** tilsætningsstofferne har en neutraliserende virkning på ydre stråling, især UV-stråling og/eller ydre materialer, især oxygen og/eller carbondioxyd.

7. Præform ifølge et af de foregående krav, **kendetegnet ved, at** det mellemste lag (2) udgør 5 til 12 vægt% af præformen.

8. Præform ifølge et af de foregående krav, **kendetegnet ved, at** præformen har en lukket basis (30) og i sær er tre-laget (1, 2, 3).

9. Præform ifølge et af kravene 1 til 7, **kendetegnet ved, at** det for præformens basis (30) gælder, at det mellemste lag (2) har en bøjning (29) hen mod bunden og strækker sig yderligere hen mod en fri ende (31).

10. Præform ifølge et af de foregående krav, **kendetegnet ved, at** det primære materiale udgøres af et syntetisk materiale, især PET, og/eller at det sekundære materiale udgøres af recirkuleret materiale, især PET og/eller blandinger heraf med tilsætningsstoffer, og/eller hvor mindst et mellemste lag (2) er sammensat af hydrofobiske polymerer og et sæt organismer, som er opbygget af celler og/eller celleprodukter, der er behandlet til dannelse af tilsætningsstoffer til det nævnte polymer, så at der dannes et såkaldt biopolymer-aggregat.

11. Præform ifølge et af de foregående krav, **kendetegnet ved, at** det sekundære materiale omfatter en i forvejen bestemt mængde tilsætningsstoffer.

12. Præform ifølge krav 10, **kendetegnet ved, at** cellerne er opbygget af såkaldte cyster og/eller i en inaktiv fase eller en sovende fase.

13. Præform ifølge et af kravene 10 eller 12, **kendetegnet ved, at** cellerne er opbygget af prokaryoter, især bakterier og/eller eurkaryoter.

14. Præform ifølge et af de foregående krav, **kendetegnet ved, at** cellerne er opbygget af eukaryoter af typen protister, svampe, planter og/eller dyr.

15. Præform ifølge et af kravene 11, 13 eller 14, **kendetegnet ved, at** de nævnte celleprodukter er opbygget af såkaldte metabolitter, det vil sige molekyler, som er biokemisk syntetiseret ved hjælp af organismer.

16. Præform ifølge krav 10 eller 12 til 14, **kendetegnet ved, at** de nævnte organismer er encellede.

17. Præform ifølge et af kravene 10 eller 12 til 15, **kendetegnet ved, at** organismerne er flercellede.

18. Præform ifølge et af kravene 10 til 17, **kendetegnet ved, at** polymererne er opbygget af ikke-bionedbrydelige polymerer.

19. Præform ifølge et af kravene 10 til 18, **kendetegnet ved, at** polymererne er opbygget af gruppen polyolefiner.

20. Præform ifølge et af kravene 10 til 18, **kendetegnet ved, at** polymererne er opbygget af gruppen af polyethylener.

21. Præform ifølge et af kravene 10 til 18, **kendetegnet ved, at** polymererne er opbygget af PET.

22. Præform ifølge et af kravene 10 til 18, **kendetegnet ved, at** polymererne er opbygget af gruppen af polypropylener.

23. Præform ifølge et af kravene 10 til 18, **kendetegnet ved, at** polymererne er opbygget af gruppen af polyestere.

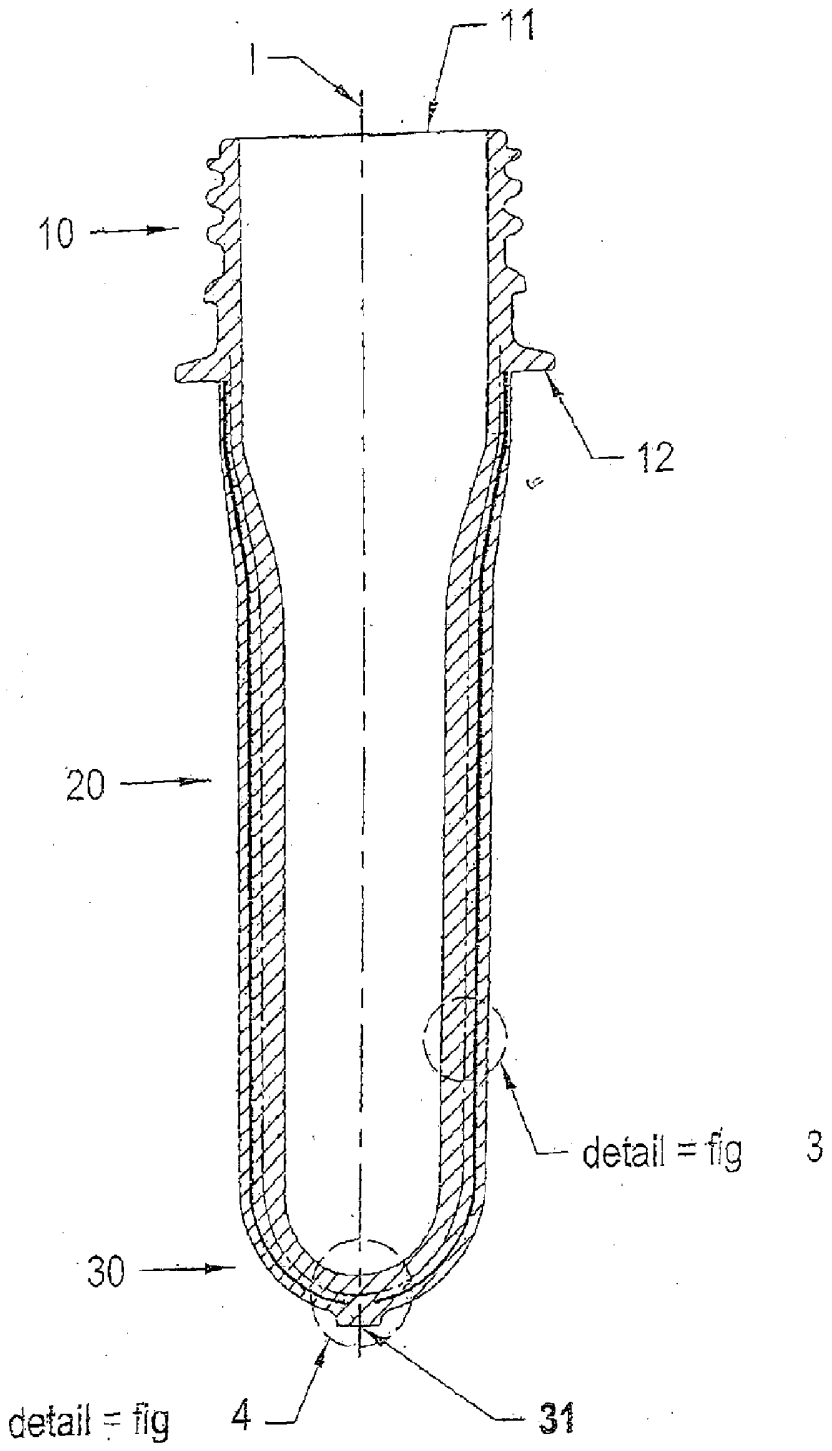
24. Præform ifølge et af kravene 10 eller 12 til 23, **kendetegnet ved, at** cellerne og/eller celleprodukterne er indlejret i den nævnte polymer.

25. Præform ifølge et af kravene 10 eller 12 til 24, **kendetegnet ved, at** det nævnte biopolymer-aggregat som en biopolymer omfatter celler og/eller celleprodukter, der er tilvejebragt ved fremstilling af selve polymeren, og at biopolymeren består af en syntese af basisprodukter, der selv består af de nævnte polymerer og organismer.

26. Præform ifølge et af kravene 10 eller 12 til 25, **kendetegnet ved, at** biopolymer-aggregatet som en biopolymer består af en blanding af de nævnte celler og/eller celleprodukter i en eksisterende polymer – under termisk blanding.

27. Præform ifølge et af kravene 10 eller 12 til 25, **kendetegnet ved, at** biopolymer-aggregatet består af en blanding af de nævnte celler og/eller celleprodukter i en eksisterende polymer som en kold blanding – og indgår i mellemlaget.

28. Præform ifølge et af kravene 10 eller 12 til 25, **kendetegnet ved, at** biopolymer-aggregatet består af en blanding af de nævnte celler og/eller celleprodukter i en eksisterende polymer som en varm blanding – og indgår i mellemlaget.


11
1
10
12
20
detail = fig 3
30
detail = fig 4
31

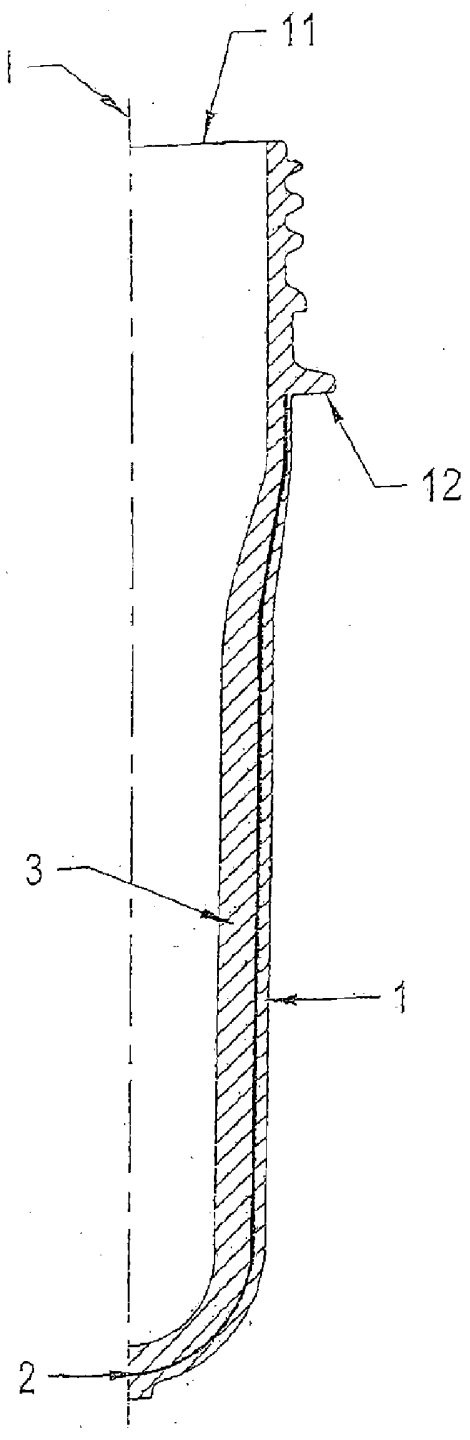

11
1
12
3
1
2

FIG 3

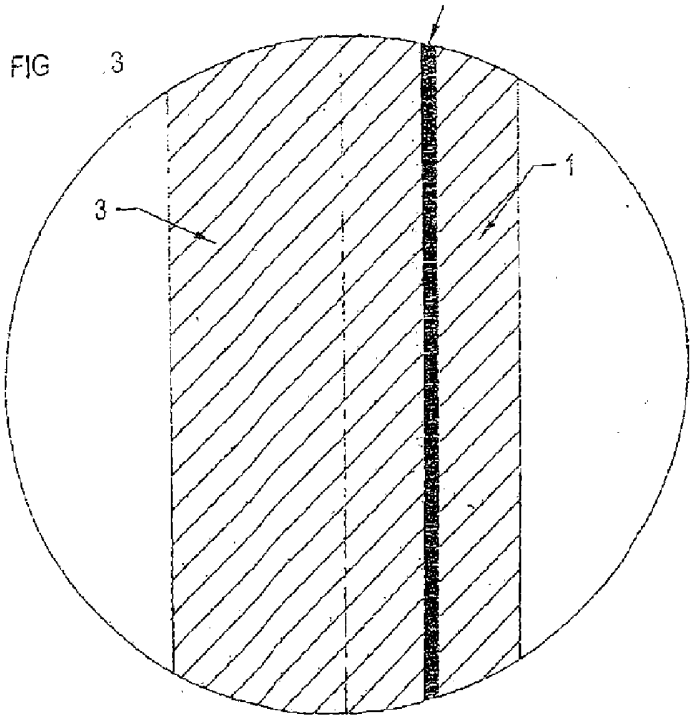


FIG 4

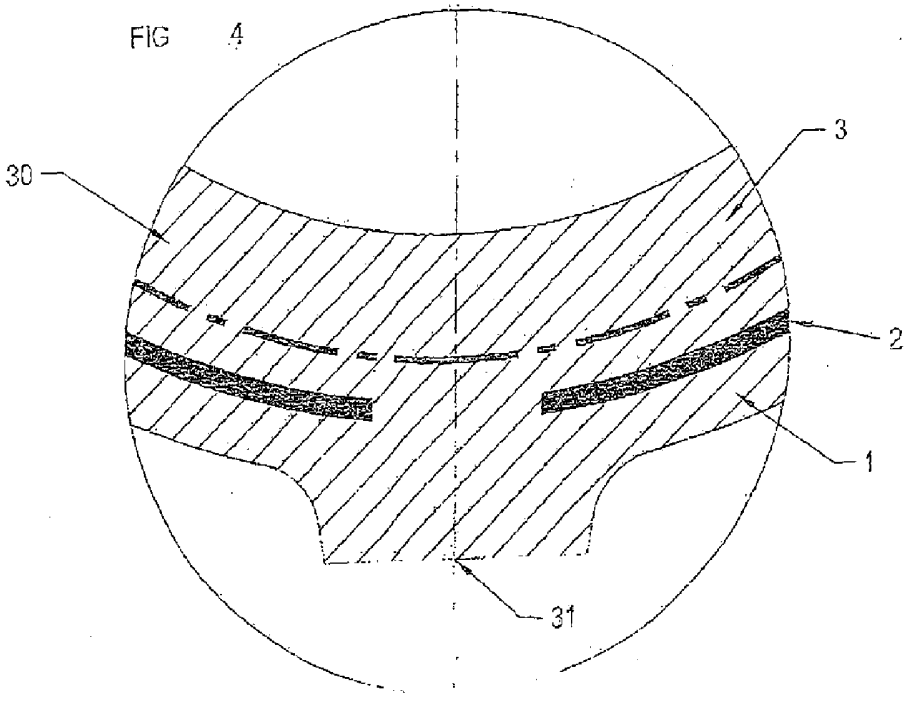


FIG 5

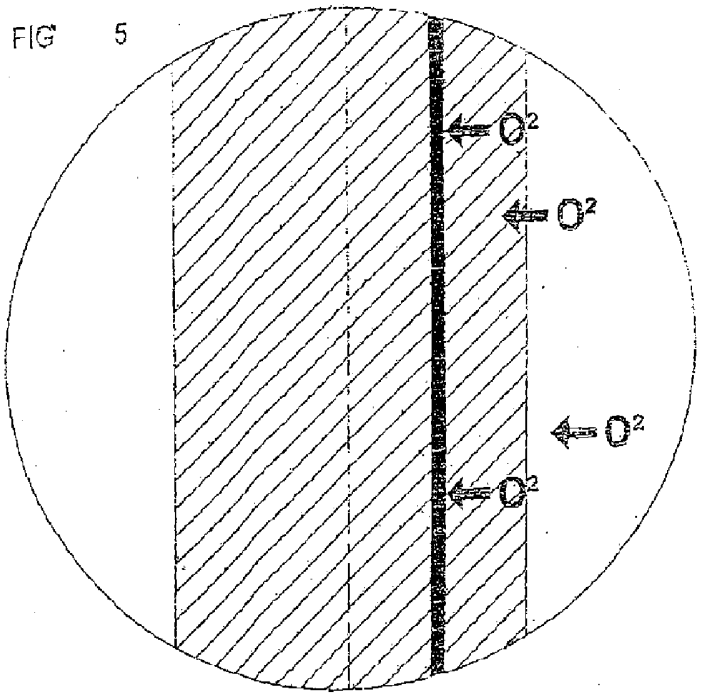
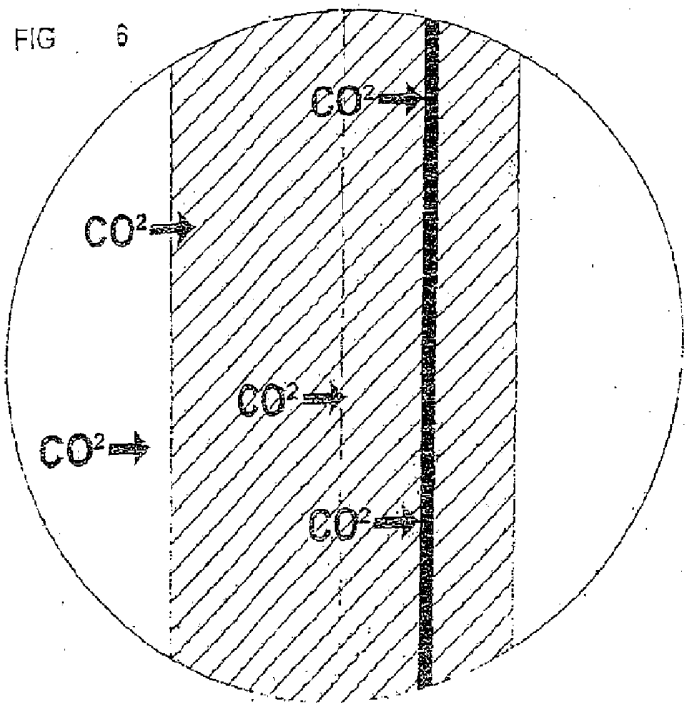


FIG 6



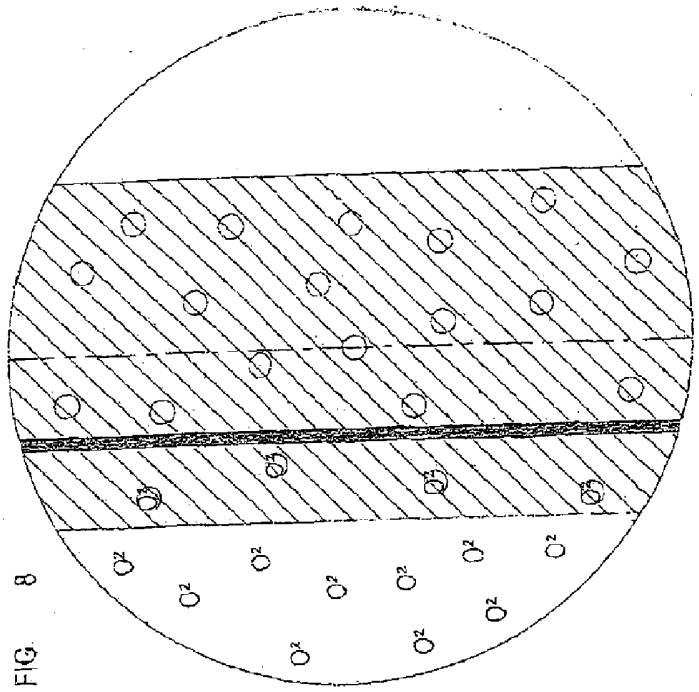


FIG. 8

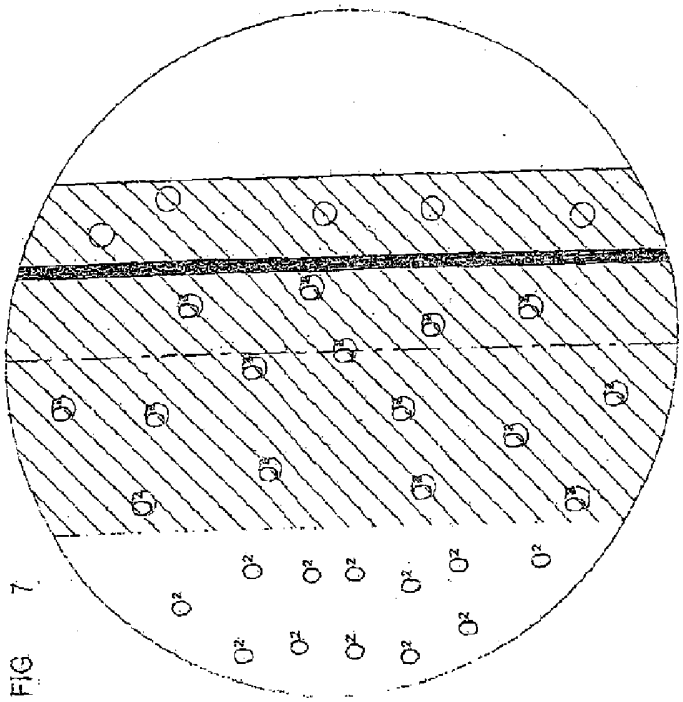


FIG. 7

FIG 9

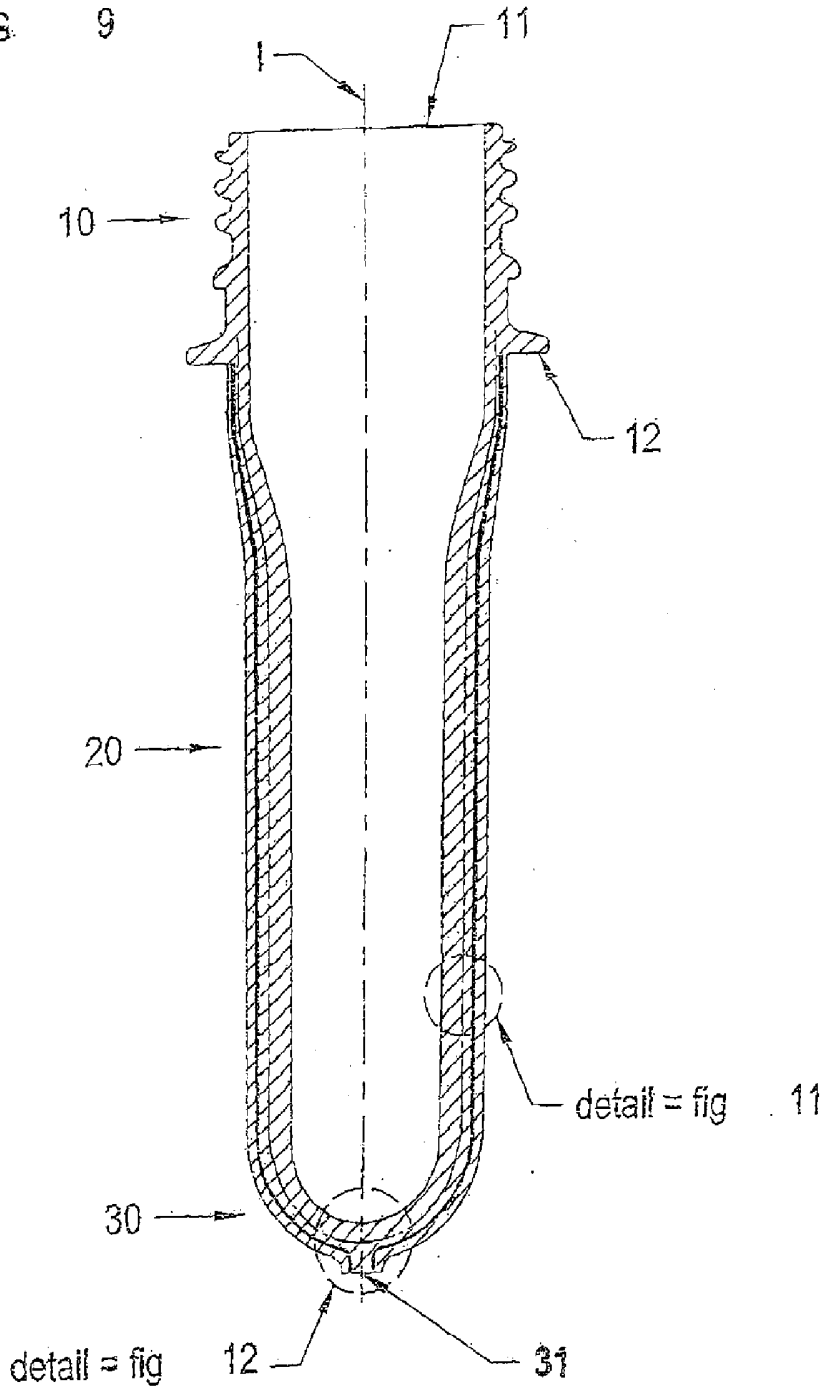


FIG 11

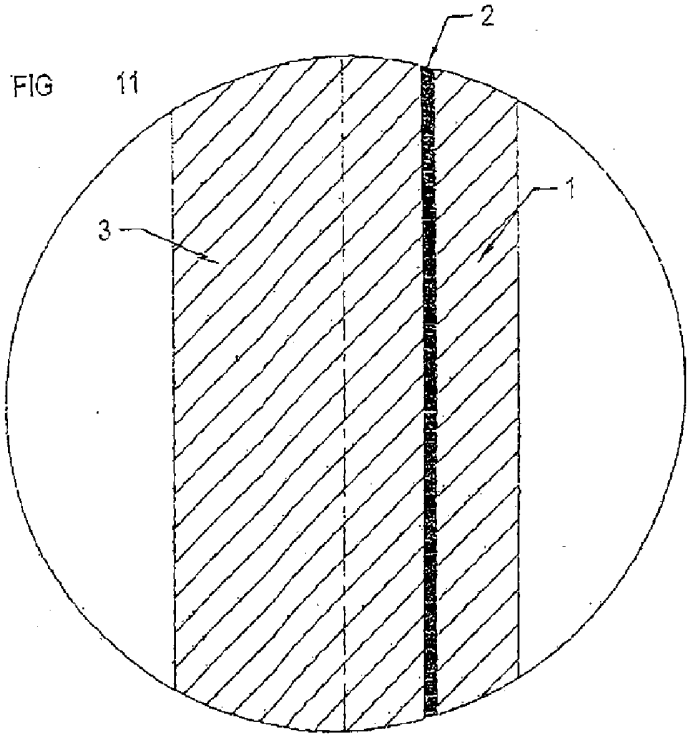


FIG 10

