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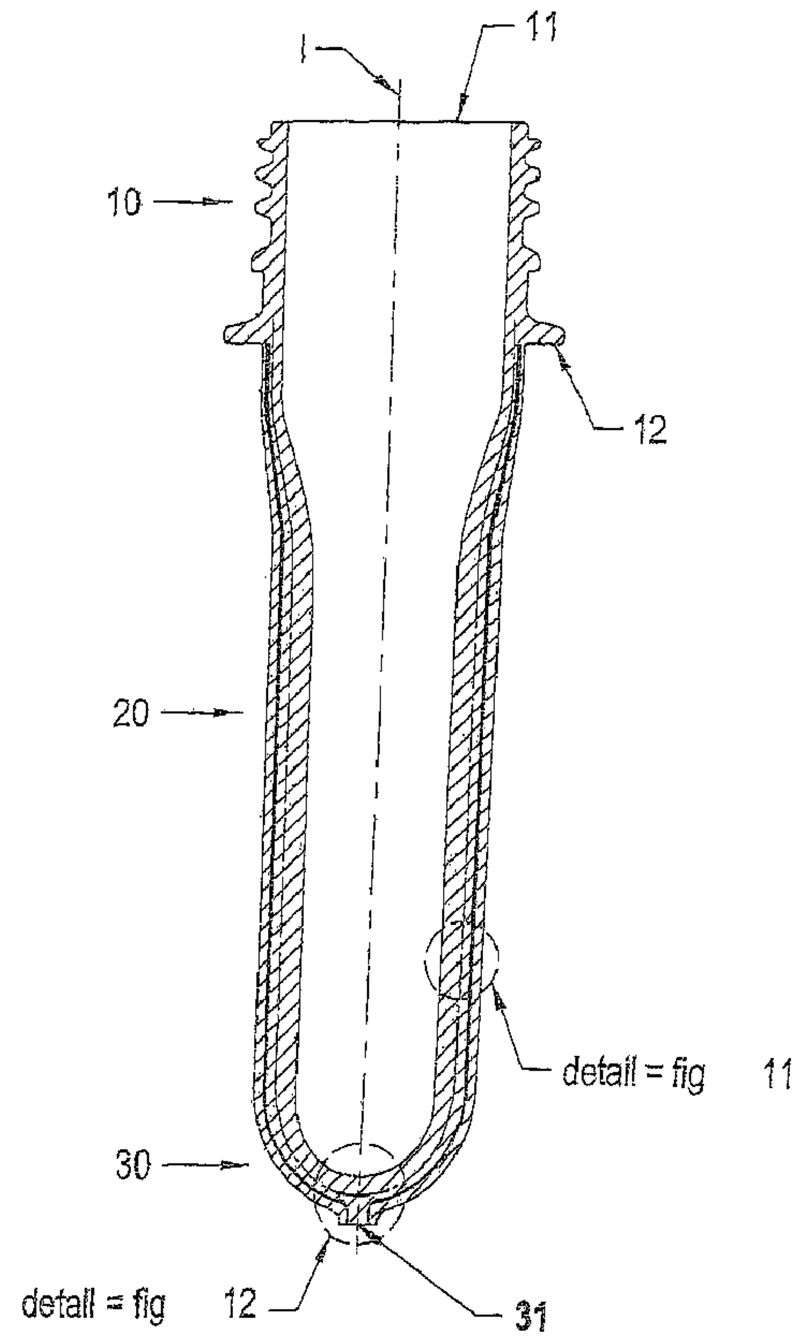
(54) Titre : PREFORME POUR LE MOULAGE PAR SOUFFLAGE D'UN RECIPIENT ET SON PROCEDE DE FABRICATION

(54) Title: PREFORM FOR BLOWING A CONTAINER AND PROCESS FOR MANUFACTURING THEROF



(57) Abrégé/Abstract:
Preform for the blow-molding of a container comprising a neck section (10), an adjoining wall section (20) having a substantially cylindrical shape, with in between a neck ring (12) as a transition region, and further a bottom section (30) which forms the base of

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(57) Abrégé(suite)/Abstract(continued):
the preform, which is composed of a multilayer structure consisting in two surface layers, the one of which (1) is directed outwardly respective the preform and wherein the other (3) is directed inwardly with respect thereto, with in between an intermediate layer (2) which forms a core layer, wherein both surface layers (1, 3) are composed of a primary material and wherein said intermediate layer (2) is composed of a secondary material, remarkable in that the center surface of said intermediate layer (2) is directed outwardly, toward the outer surface, with respect to the center surface of said wall section (20) and in that said primary and secondary materials respectively are mutually different. This invention further relates to a method for producing the aforementioned preform. Microorganismus are mixed into the polymers to improve material properties.

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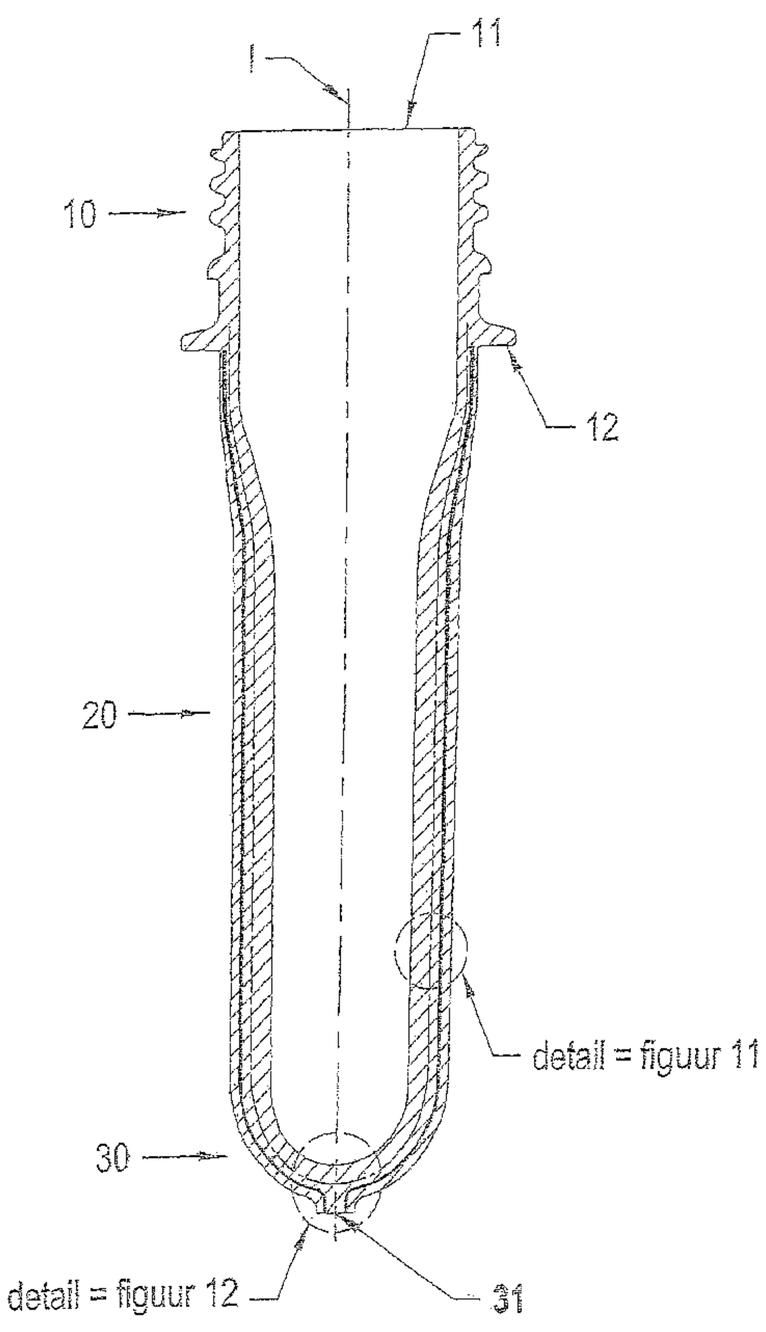
(54) Title: PREFORM FOR BLOWING A CONTAINER AND PROCESS FOR MANUFACTURING THEROF



DETAIL : FIGURE 11, 12

(57) Abstract: Preform for the blow-molding of a container comprising a neck section (10), an adjoining wall section (20) having a substantially cylindrical shape, with in between a neck ring (12) as a transition region, and further a bottom section (30) which forms the base of the preform, which is composed of a multilayer structure consisting in two surface layers, the one of which (1) is directed outwardly respective the preform and wherein the other (3) is directed inwardly with respect thereto, with in between an intermediate layer (2) which forms a core layer, wherein both surface layers (1, 3) are composed of a primary material and wherein said intermediate layer (2) is composed of a secondary material, remarkable in that the center surface of said intermediate layer (2) is directed outwardly, toward the outer surface, with respect to the center surface of said wall section (20) and in that said primary and secondary materials respectively are mutually different. This invention further relates to a method for producing the aforementioned preform. Microorganismus are mixed into the polymers to improve material properties.

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Preform for blowing a container and process for manufacturing thereof

Field of the invention

The present invention relates to a preform for the blow-molding of a container comprising a neck which surrounds a pouring opening, an adjoining body-forming region and, at the opposite end, a region which forms the base, the preform wall having a multilayer structure which extends along the longitudinal axis of the preform, the said preform being composed of a primary material and a secondary material, respectively, the two external layers being formed by the said primary material, and the internal layer, which forms a core layer between the two surface layers, being composed of the said secondary material.

Prior art

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.

Furthermore, EP 0 380 215 discloses a preform likewise comprising a core as described above, which forms a so-called barrier layer. However, this core is composed of a material which is expensive to produce, and consequently this layer needs to be as thin as possible, which in some cases constitutes an unacceptable restriction.

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.

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

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

This object is achieved by solving the above-mentioned problem by providing a novel preform.

Thanks to the particular positioning of the core or secondary layer in the preform wall, one achieves that the inner surface layer made from primary material is thicker. This offers 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 thereby obtained 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.

According to a further embodiment of the preform according to the invention, at least the inwardly facing primary layer is composed of said primary plastics material and 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.

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.

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.

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.

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.

According to a preferred embodiment of the preform according to the invention, said secondary layer is formed by a passive barrier, wherein the secondary 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.

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.

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.

According to one specific embodiment of the preform according to the invention, said secondary intermediate layer is composed of a plastics material which is different from the primary layers.

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.

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.

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, and a method for producing it.

Therefore, the present invention also proposes a method for producing preforms 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.

According to a preferred embodiment of the invention, work is carried out at the working temperature range taken from the temperature interval of which the lower limit is set at virtually 100°C under virtually standard pressure conditions, in particular at virtually one atmosphere.

According to a further 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.

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.

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”.

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 terms 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.

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

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.

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.

The advantages obtained by virtue of the present method are mainly that the biological activity of the organisms incorporated in the PBA produced in accordance with the invention imparts novel, previously unknown properties to the polymer. Said PBA ensures the desired environment for which said PBA was made.

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.

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

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

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.

The preform illustrated is substantially three-layered in form. 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 abovementioned 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 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.

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.

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 4 have been added, as illustrated in figures 5, 6. One example of additives used in this respect is vitamins.

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

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.

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.

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.

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.

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.

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.

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.

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.

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

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.

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.

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.

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.

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.

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.

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.

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.

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 *Saccharomyces* 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.

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.

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

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.

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

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.

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.

CLAIMS

1. A preform for blow-molding a container, the preform comprising a neck section, an adjoining wall section having a substantially cylindrical shape, a neck ring between the neck section and the adjoining wall section, the neck ring forming a transition region, and a bottom section which forms a base of the preform, the perform defining a multilayer structure including two surface layers, one of which is directed outwardly of the preform to form an outer surface layer, and wherein a second one of two surface layers is directed inwardly of the preform to form an inner surface layer, an intermediate layer between the inner and the outer surface layers which forms a core layer, wherein both surface layers are composed of a primary material and wherein said intermediate layer is composed of a secondary material, wherein said primary and secondary materials respectively are mutually different, wherein said intermediate layer is extending underneath said neck section, wherein said intermediate layer has a positioning in the preform wall that is closer to said outer surface layer than said inner surface layer, and wherein said intermediate layer is a barrier layer having a blocking action for counteracting the migration of gas particles in both directions, that is both from the inside outward and from the outside inward of the preform.

2. Preform according to claim 1, characterized in that said primary material contains a predetermined quantity of additives.

3. Preform according to claim 2, characterized in that said additives have a neutralizing action on reagents with an adverse effect on the product to be contained in the container.

4. Preform according to claim 3, characterized in that said additives have a neutralizing action on gas formation, which originates from degradation of said product.

5. Preform according to claim 3, characterized in that said additives have a neutralizing action on degradation materials, which originates from the container itself, in particular acid aldehyde.

6. Preform according to claim 3, characterized in that said additives have a neutralizing action on external radiation, in particular UV radiation, and/or external materials, in particular oxygen and/or carbon dioxide.

7. Preform according to any one of claims 1 to 6, characterized in that said intermediate layer constitutes 5 to 12% of the weight of the preform.

8. Preform according to any one of claims 1 to 7, characterized in that said preform is a closed three-layered base.

9. Preform according to any one of claims 1 to 7, characterized in that said intermediate layer defines a bend toward said base and which extends further to a free end thereof.

10. Preform according to any one of claims 1 to 9, wherein said primary material includes a synthetic PET material, wherein said secondary material includes at least one of a recycled PET material and blends thereof with additives, and wherein the intermediate layer includes a hydrophobic polymers and organisms selected from at least one of cells and cell products worked to aggregates in said polymer to form a polymer-bio aggregate.

11. A method for producing a preform in an injection molding mould, according to any one of claims 1 to 10, wherein a predetermined quantity of a primary synthetic material is injected in a hollow mould space, and a predetermined quantity of secondary material is injected in the injected primary synthetic material in said hollow mould space before the formation of a core, wherein a secondary material is further injected which is different from said primary material, the injection of the secondary material in said hollow mould space is a parallel injection together with a part of said primary material, and wherein when injecting in parallel in the region of the injection aperture of said hollow mould space said secondary material is injected outwardly from said preform and said primary material is injected inwardly with respect to the preform.

12. Method according to claim 11, further comprising adding a predetermined

quantity of additives to said primary material prior to the first and second injection step.

13. Method according to claim 11 or 12, further comprising adding a predetermined quantity of additives to said secondary material prior to the first and second injection step.

14. Method according to any one of claims 12 and 13, characterized in that said additives have a neutralizing action on undesired effects.

15. Method according to claim 14, characterized in that said additives have a neutralizing action on undesired gas formation, which originates from degradation of liquids intended to fill a container to be produced from said preform.

16. Method according to claim 14, characterized in that said additives have a neutralizing action on waste or degradation materials, which originate from said container itself.

17. Method according to claim 14, characterized in that said additives have a neutralizing action on external radiation and/or materials.

18. Method according to any one of the claims 11 to 17, characterized in that said preform is realized with an entirely closed base.

19. Method according to any one of the claims 11 to 17, characterized in that said preform is produced with a base through which the intermediate layer is bended from the free end thereof.

20. Method according to any one of the claims 11 to 19, characterized in that said preform is produced with an intermediate layer composed of hydrophobic polymers.

21. Method according to claim 20, wherein

- a hydrophobic polymer is selected ;
- a set of organisms is selected from among cells and/or cell products ;
- aggregates are formed by working said cells and/or cell products in said

polymers resulting in the formation of a so-called polymer-bio aggregate, wherein a new function of the polymer product is thus performed.

22. Method according to claim 21, characterized in that work is carried out at a working temperature range taken from the temperature interval of which the lower limit is set at substantially 100°C and at a pressure of about one atmosphere.

23. Method according to claim 23, characterized in that said cells are selected from among at least one of cysts cells, cells in an inactive phase and cells in an sleeping phase.

24. Method according to one of claims 21 to 23, characterized in that the cells are selected from among at least one of prokaryotes, bacteria, and eukaryotes.

25. Method according to claim 24, characterized in that the cells are selected from among eukaryotes of at least one of protists, fungi, plants, and animals type.

26. Method according to any one of claims 22 to 25, wherein said cells products include molecules which are biochemically synthesized by organisms.

27. Method according to any one of claims 21 to 25, characterized in that said organisms are unicellular.

28. Method according to any one of claims 21 to 26, characterized in that said organisms are multicellular.

29. Method according to any one of claims 21 to 28, characterized in that the polymers include non-biodegradable polymers.

30. Method according to any one of claims 21 to 29, characterized in that the polymers are polyolefins.

31. Method according to any one of claims 21 to 29, characterized in that the polymers are polyethylenes.

32. Method according to any one of claims 21 to 29, characterized in that the polymers are PET.

33. Method according to any one of claims 21 to 29, characterized in that the polymers are polypropylenes.

34. Method according to any one of claims 21 to 29, characterized in that the polymers are polyesters.

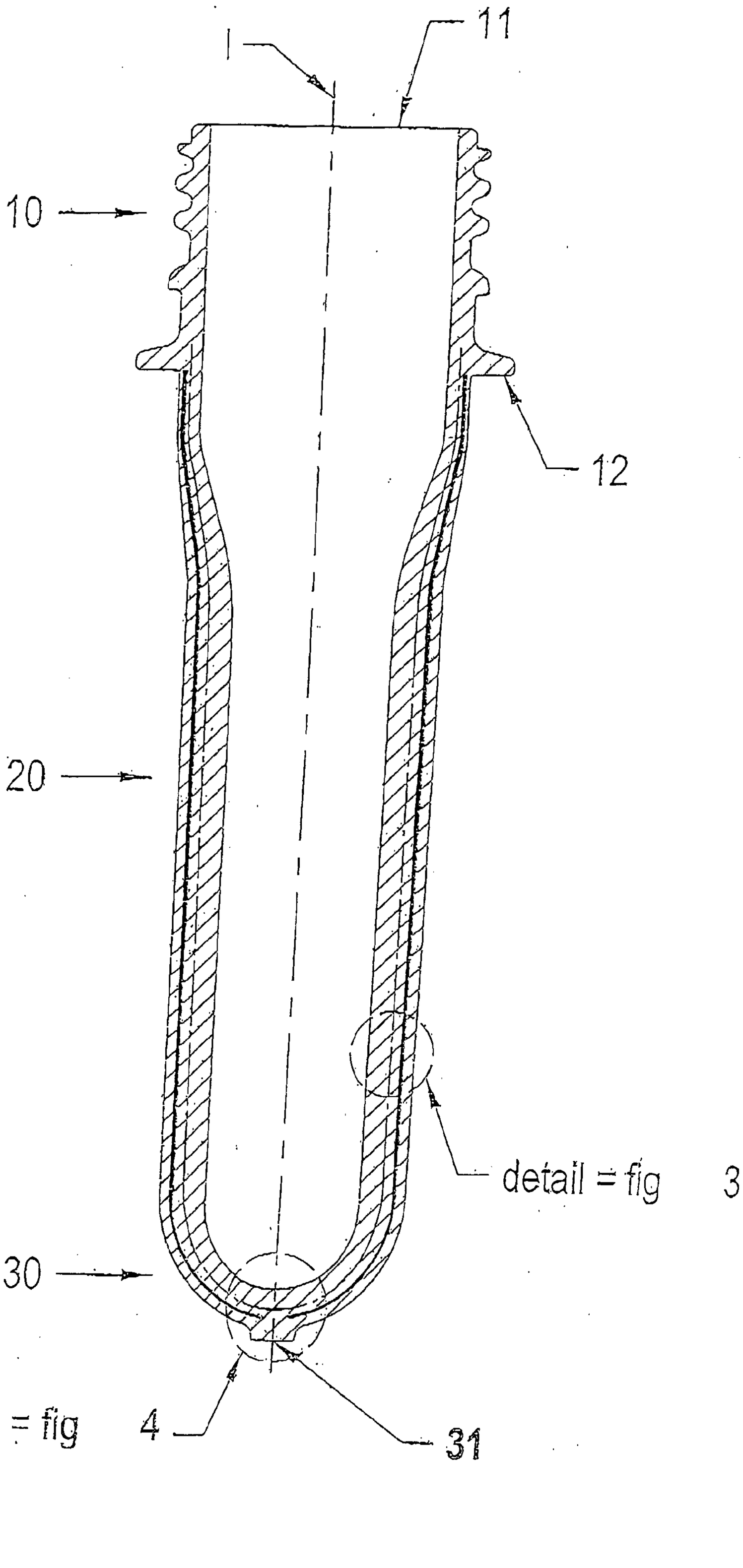
35. Method according to any one of claims 21 to 34, characterized in that at least one of said cells and cell products are imbedded in said polymer.

36. Method according to any one of claims 21 to 35, characterized in that said biopolymer is obtained from bringing up at least one of the cells and cell products while producing the polymer itself, wherein said biopolymer is obtained from a synthesis of said basis products.

37. Method according to any one of claims 21 to 36, characterized in that at least one of said cells and cell products are thermally blended into an existing polymer.

38. Method according to any one of claims 21 to 36, characterized in that at least one of said cells and cell products are blended in an existing polymer and, wherein said blending is performed cold as intermediate layer.

39. Method according to any one of claims 21 to 36, characterized in that at least one of said cells and cell products are blended in an existing polymer and, wherein said blending is performed warm as intermediate layer.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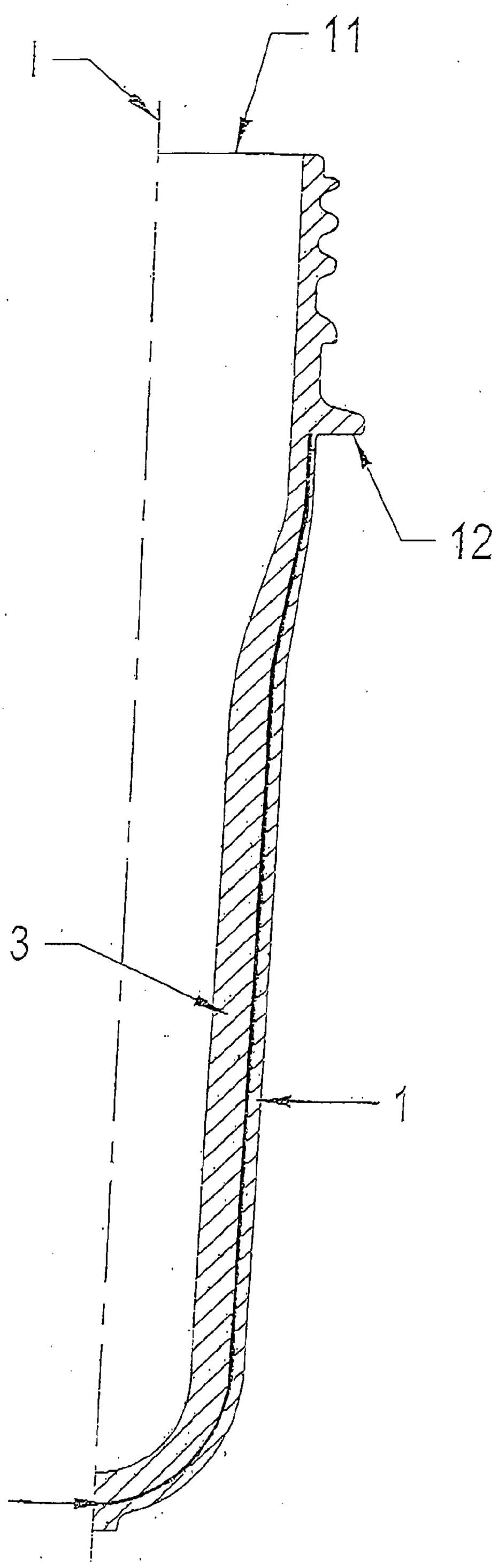
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FIG 3

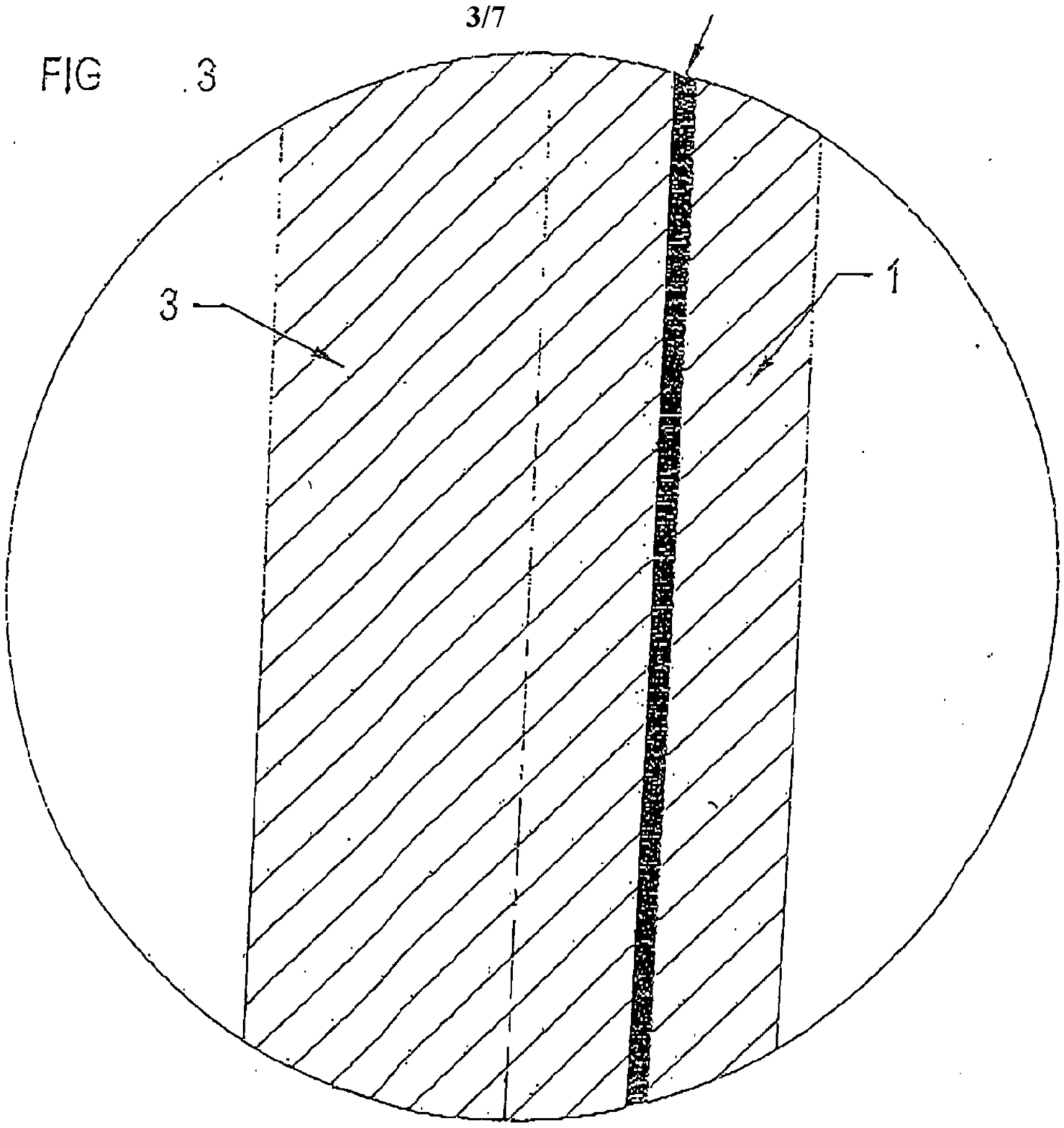


FIG 4

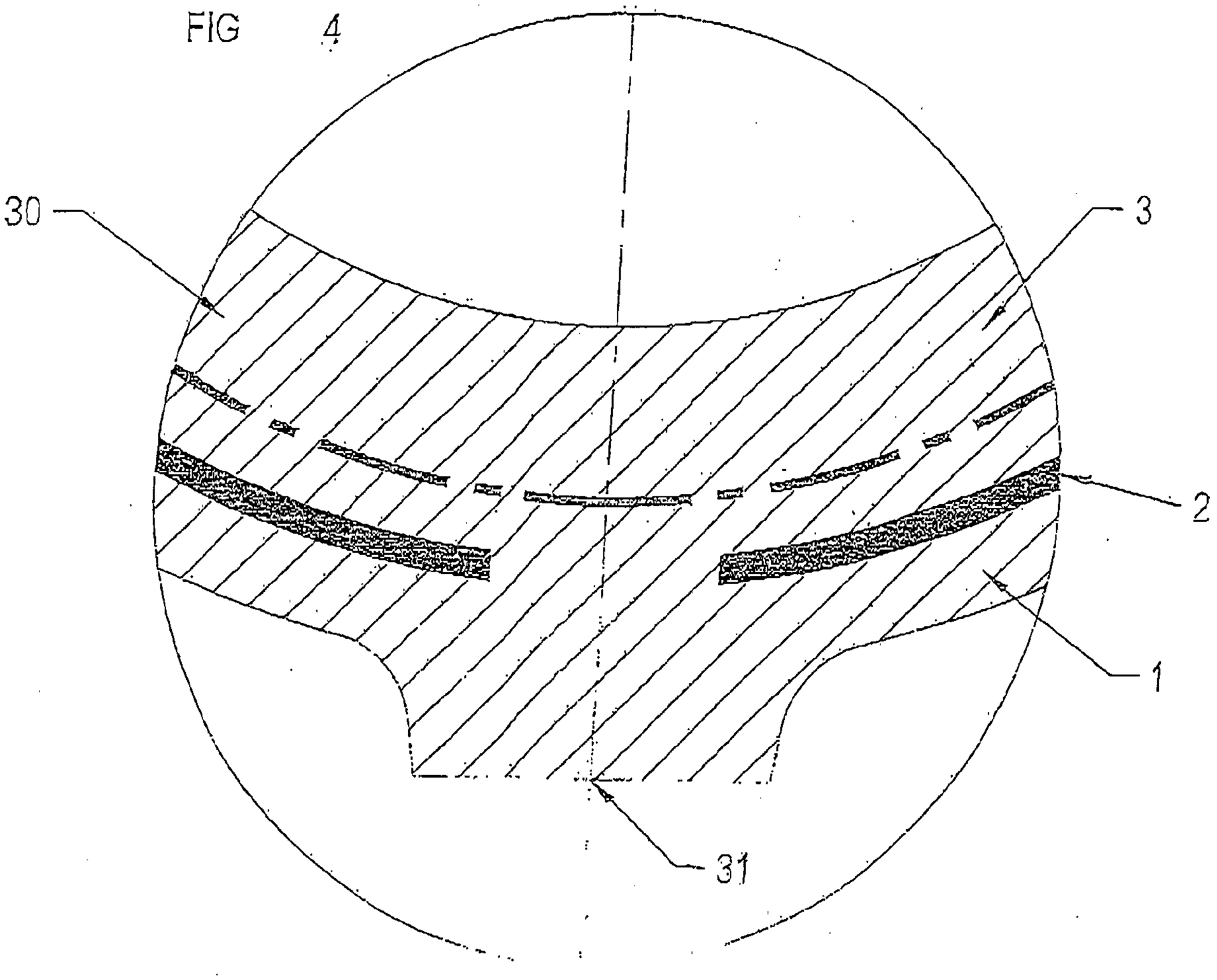


FIG 5

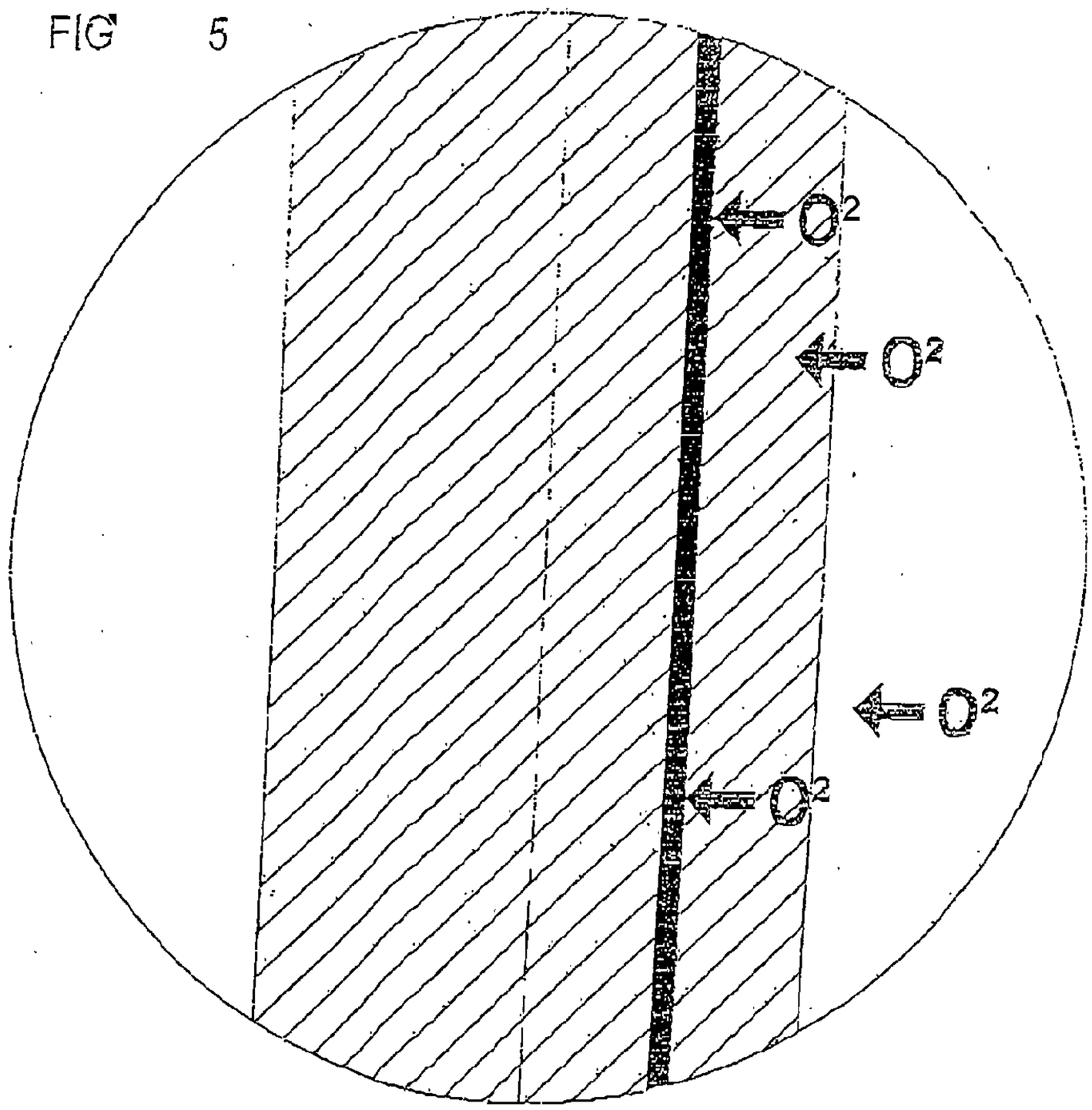
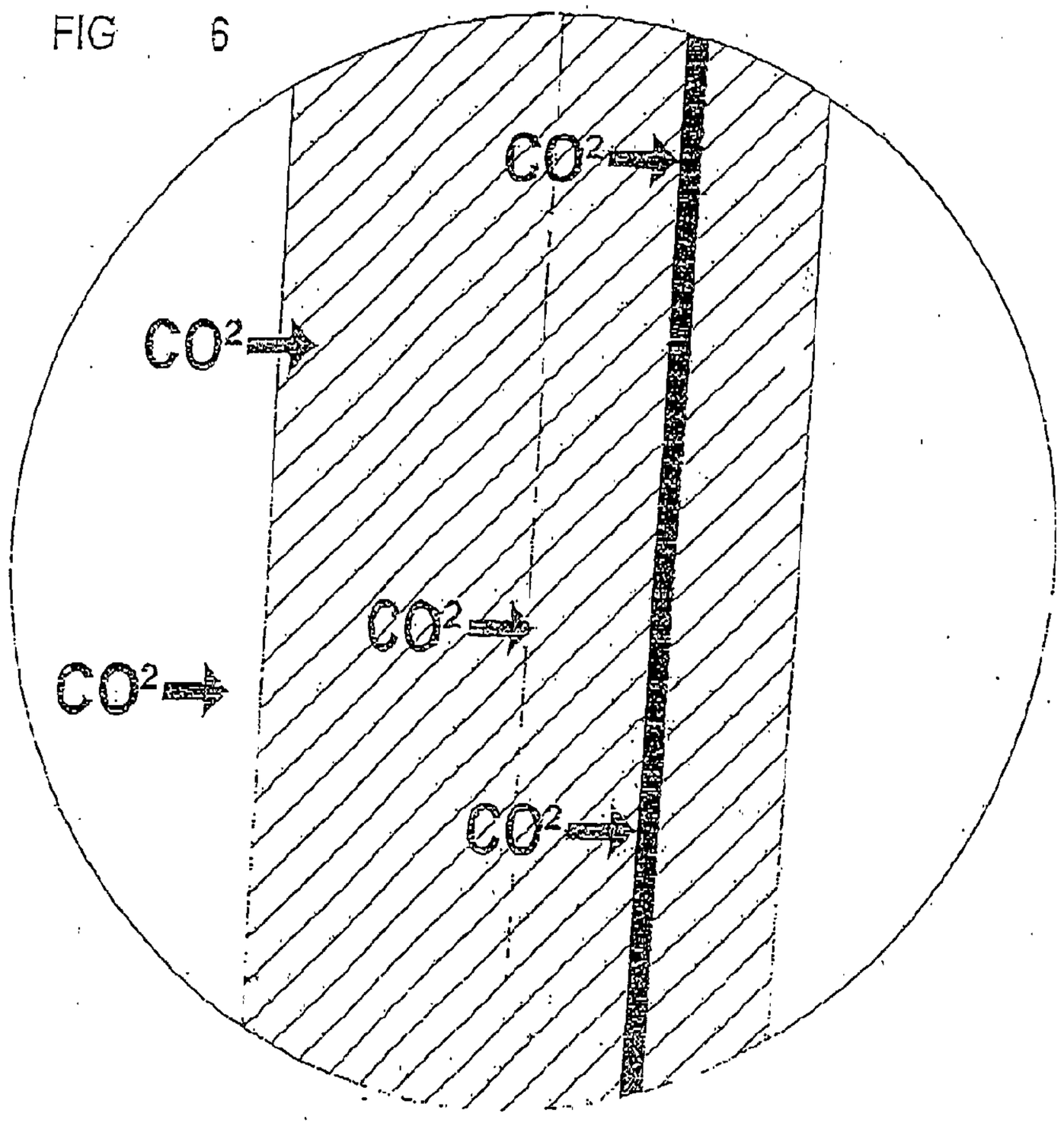


FIG 6



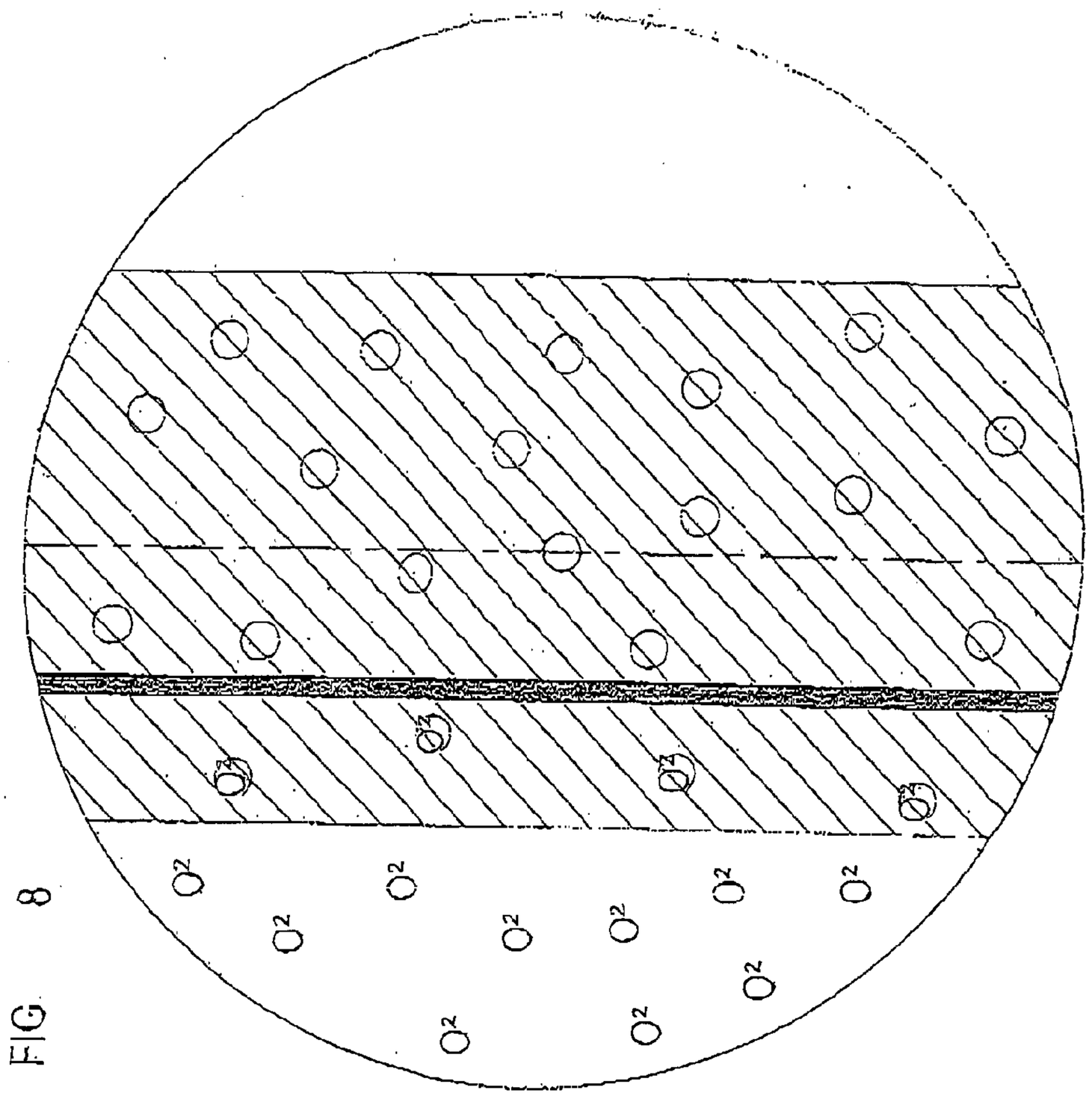


FIG. 8

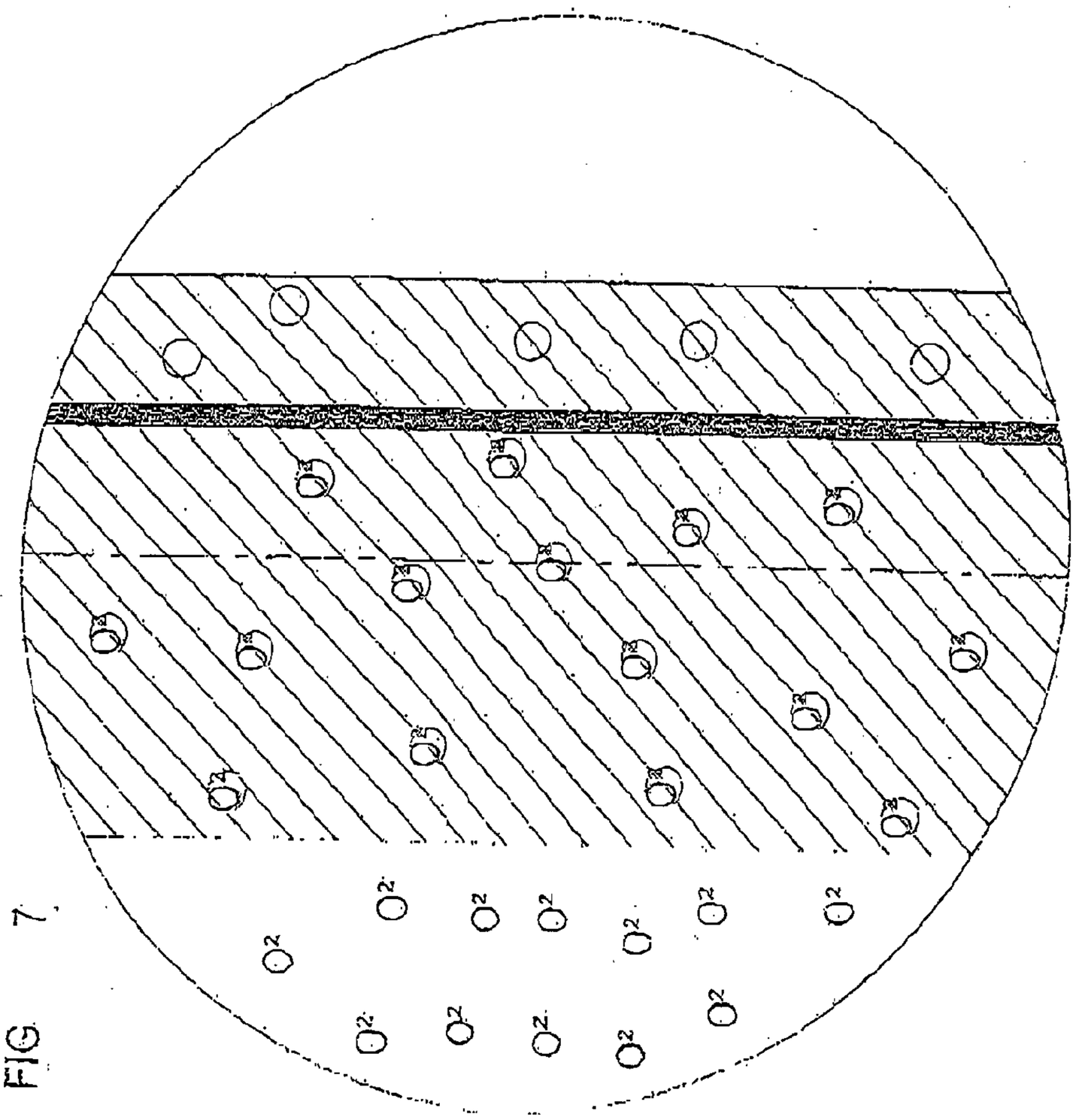


FIG. 7

FIG 9

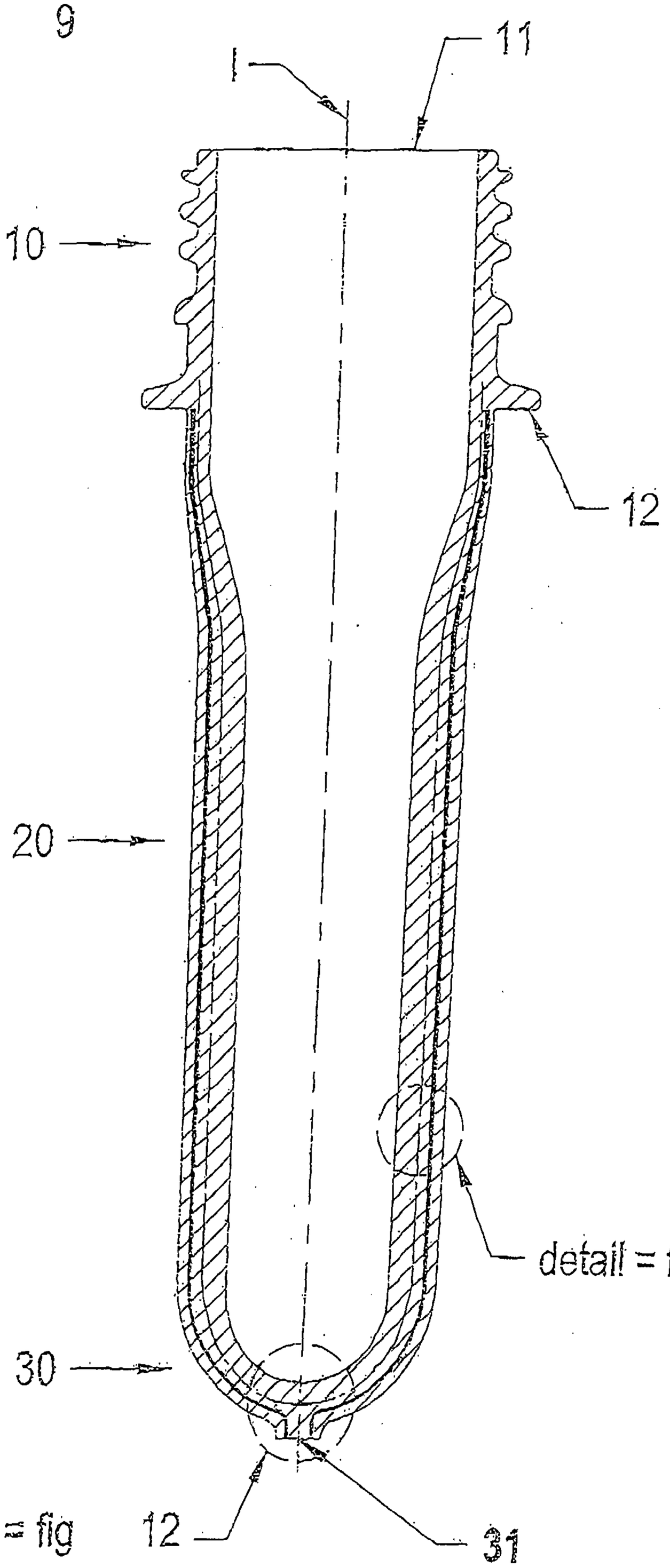


FIG 11

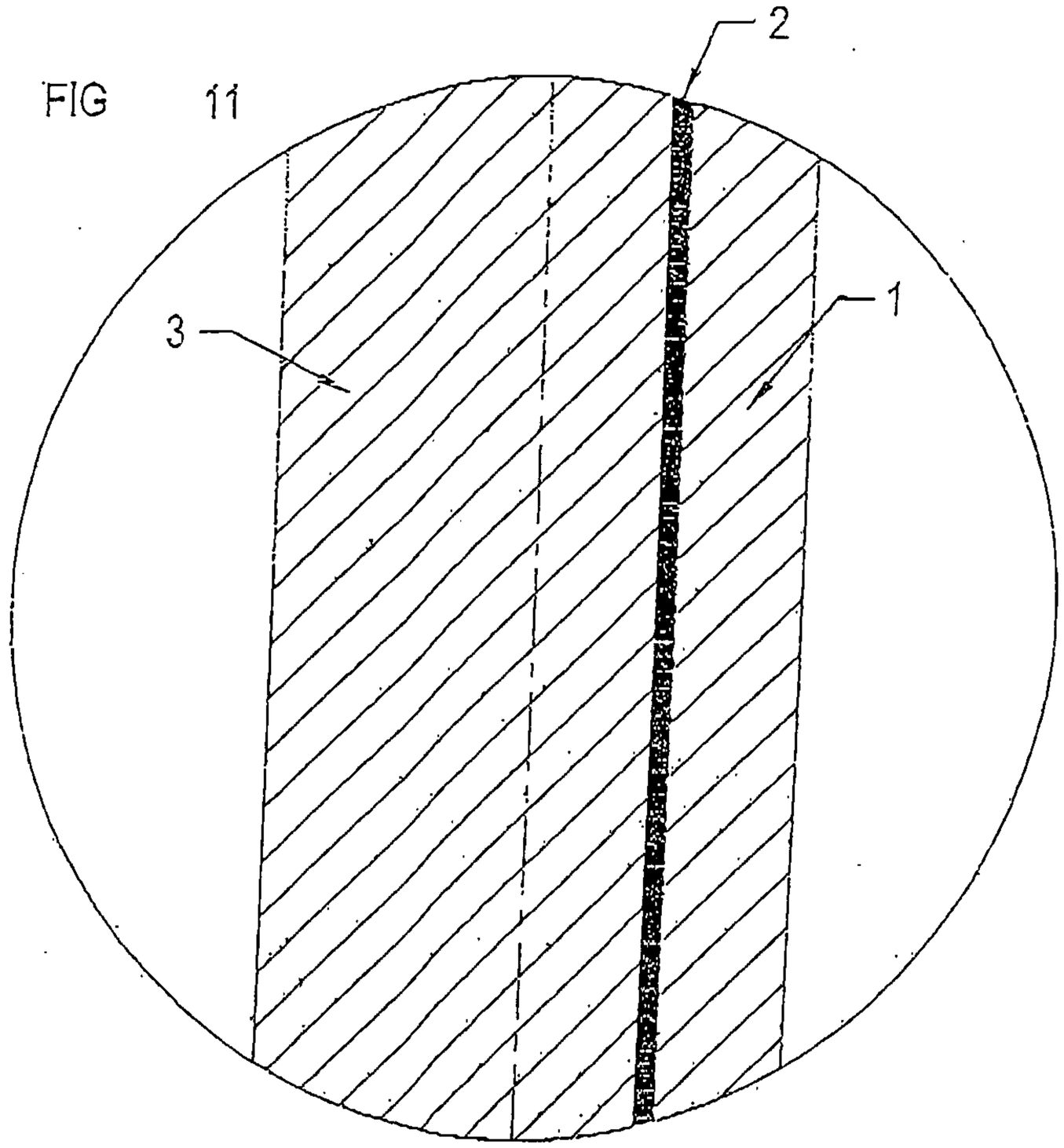
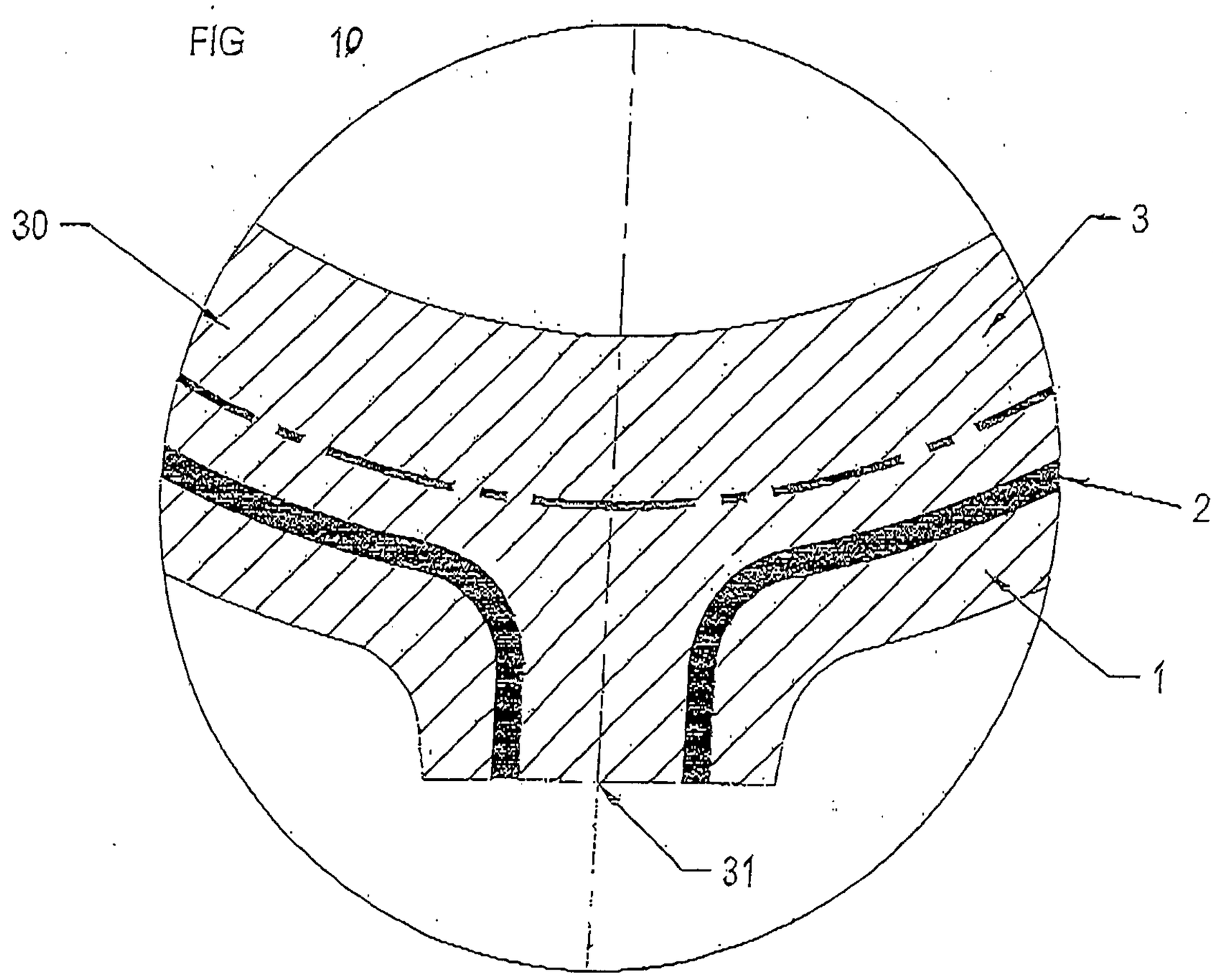
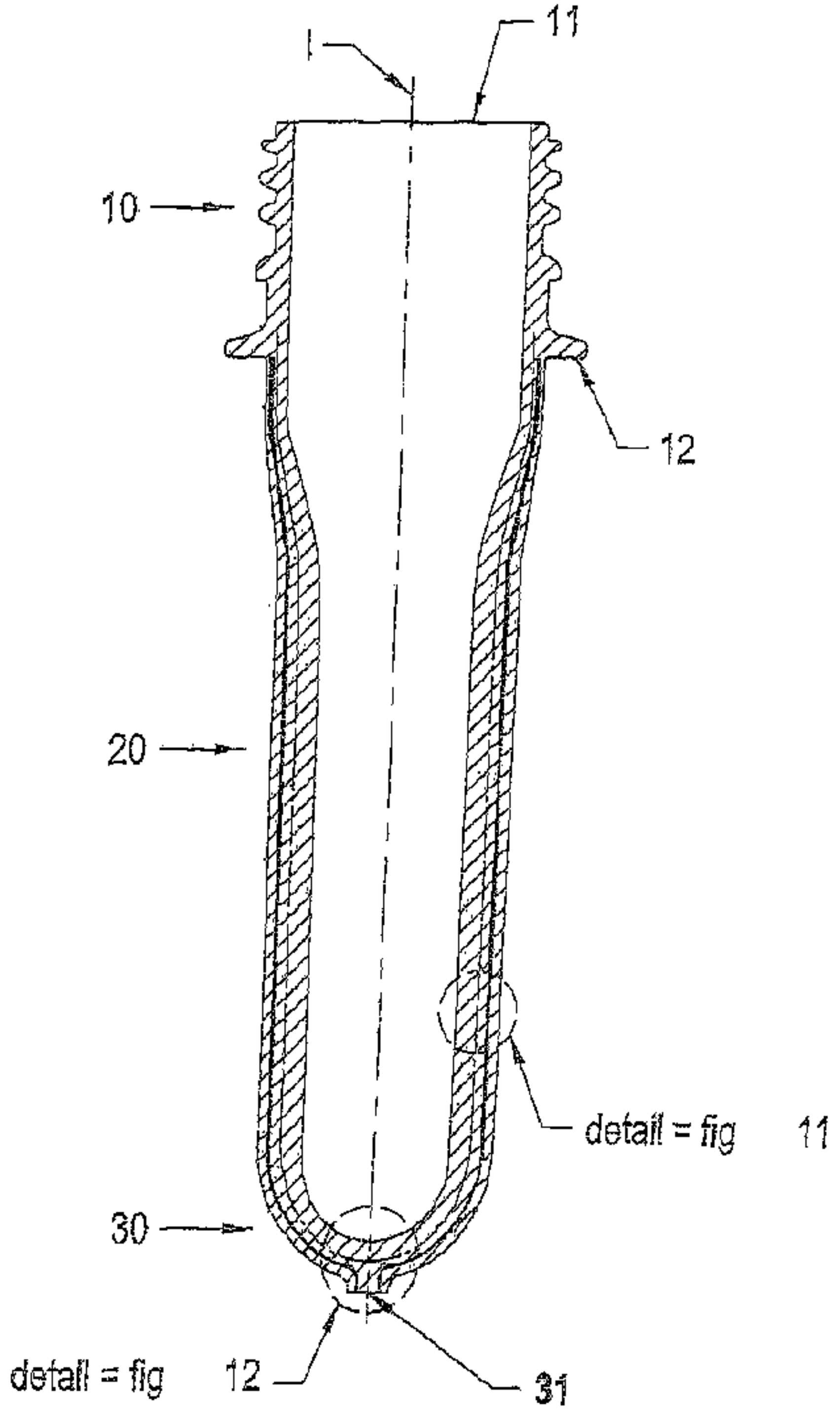


FIG 10

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