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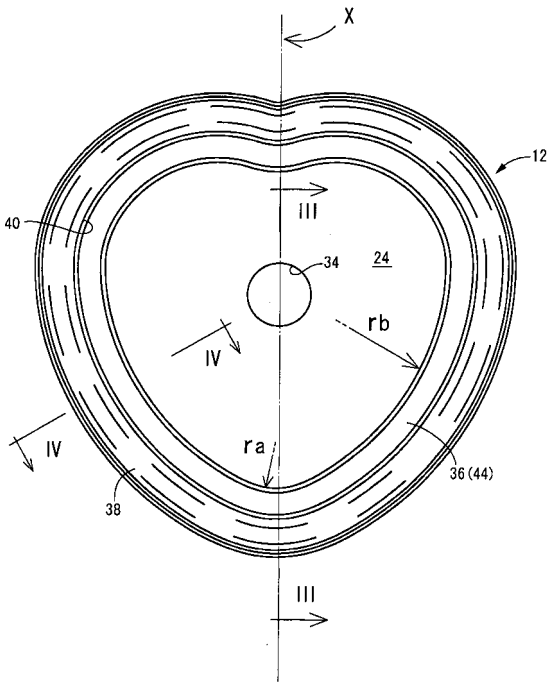
(54) OCULAR LENS CONTAINER AND PACKAGE PRODUCT OF THE OCULAR LENS CONTAINER

(57) The object of the present invention is to provide an ophthalmic lens container of novel structure, whereby without the use of any special utensil, a liquid such as a preserving solution can be drained, while keeping an ophthalmic lens such as a contact lens held in the container. In order to attain the object, an ophthalmic lens container (10) includes a container body (12), wherein a cavity (24) has an opening inside face (28) of generally heart shape in a plane view. A constricted lower end of the lower section of the heart shape in the opening inside face (28) has a circumferential radius of curvature: ra is smaller than a radius of curvature of a front face of the ophthalmic lens (16), and the two side portions of the heart shape in the opening inside surface (28) of the cavity (24) have the radius of curvature: rb in the circumferential direction greater than the radius of curvature of the front face of the ophthalmic lens (16); while a diameter dimension of an inscribed circle in the opening of the cavity (24) is greater than the outside diameter dimension of the ophthalmic lens.

FIG.2



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Description

TECHNICAL FIELD

[0001] The present invention relates to an ophthalmic lens storage container for storing an ophthalmic lens like a contact lens or an intraocular lens with it soaked in a preserving solution, and which is utilized for a variety of purposes e.g., for providing, transporting or storing the ophthalmic lens.

BACKGROUND ART

[0002] A blister package is known as one type of a container for storing a contact lens. JP-A-7-322011 (Reference 1), JP-A-9-23916 (Reference 2), and US Patent NO. 6050398 (Reference 3) disclose known examples of the blister package that includes: a package body having a generally semi-spherical cavity and a flange extending radially outward around the periphery of the cavity; and a cover sheet formed of a plastic film, aluminum foil or the like. The cavity contains the contact lens and a preserving solution, and the cover sheet is stripably sealed to the flange in a sealing zone that extends around the periphery of the cavity, to thereby enclose the cavity.

[0003] In a lens container of this type, it is sometimes necessary to pour off only the liquid contained in the cavity, while keeping the contact lens stored within the cavity. As a specific example, in some instances the contact lens provider, at some point up to the process where a contact lens and a preserving solution are stored in the cavity and sealed with a cover, may employ a procedure of placing the contact lens together with a treatment solution such as a cleaning solution in the cavity and subject it to appropriate treatment, after which the treatment solution only is poured off while leaving the contact lens, followed by injection of preserving solution. Also, in some instances, the user of the contact lens, after peeling off the cover to expose the cavity, may drain off only the preserving solution, and then remove the contact lens remaining in the cavity.

[0004] When a liquid contained in the cavity is to be drained off while keeping the contact lens within the cavity in this manner, there is a need to carry out the procedure easily and reliably. Therefore, it is desirable that without any special utensil, it be possible to detain the contact lens within the lens container when tilted, so that only the liquid can be drained from a particular location along the circumference at the rim of the cavity opening.

[0005] The lens containers of conventional design taught in the patent publications cited hereinabove have not been examined in this regard, as many of them employ a cavity inside shape that is a simply concave spherical shape. While improvements have been proposed, these have consisted simply in providing a slope so as to facilitate removal of the contact lens.

[0006] Accordingly, a problem to date has been that when liquid is poured off from the cavity as described above, the contact lens tends to be carried out together as well, making the procedure difficult.

[0007]

Reference 1: JP-A-7-322011
Reference 2: JP-A-9-23916
Reference 3: US Patent NO. 6050398

DISCLOSURE OF THE INVENTION

OBJECT OF THE INVENTION

[0008] With the foregoing in view, it is an object of the invention to provide an ophthalmic lens container of novel structure, whereby once a contact lens is stored immersed in a liquid, the liquid only may be drained off readily, while keeping the ophthalmic lens positioned therein.

ARRANGEMENT FOR ATTAINING THE OBJECT

[0009] Modes of the invention for solving the aforementioned problems are described hereinbelow. Constituent elements employed in the modes set forth hereinbelow may be combined in any of various possible ways. The modes and technical features of the invention are not limited to those disclosed hereinbelow, and should be appreciated on the basis of the inventive concept disclosed in the description as a whole and the accompanying drawings, or that would be apparent to the practitioner of the art from these disclosures.

(First Mode of the Invention Relating to an Ophthalmic Lens Container)

[0010] A first mode of the present invention relating to an ophthalmic lens container provides (a) an ophthalmic lens container including: a container body having a lens storage portion with a cavity for storing an ophthalmic lens and a preserving solution, and a flange portion integrally formed with the lens storage portion extending radially outward around an opening peripheral portion of the cavity; a covering sheet superposed on the container body for covering an opening of the cavity, wherein the covering sheet is strippably sealed around the entire circumference of the opening of the cavity to provide liquid tight closure to the lens storage portion, the ophthalmic lens container being characterized in that (b) a bottom inside face of the cavity is of generally concave spherical shape, with a radius of curvature in a diametrical direction in a vertical cross section of the bottom inside face of the cavity being greater than a radius of curvature of a front face of the ophthalmic lens; (c) a radius of curvature in a circumferential direction of an opening inside surface of the cavity is varied along the circumferential direction, giving the opening inside surface of the cavity a planar shape generally resembling a heart shape; (d) in a constricted portion of a lower section of the heart shape in the opening inside surface of the cavity of generally heart shape, the radius of curvature in the circumferential direction is smaller than the radius of curvature of the front face of the ophthalmic lens; (e) in the two side portions of the heart shape in the opening inside surface of the cavity of generally heart shape, the radius of curvature in the circumferential direction is greater than the radius of curvature of the front face of the ophthalmic lens; and (f) a diameter dimension of an inscribed circle in the opening of the cavity is greater than the outside diameter dimension of the ophthalmic lens.

[0011] Turning first to an examination of a lens container of conventional design, the inside surface of the concave spherical face of the cavity for storing the ophthalmic lens has over the entirety thereof a radius of curvature that is greater than the radius of curvature: R of the convex spherical front face of the ophthalmic lens stored therein. It was discovered by the inventors that since the front face of an ophthalmic lens stored therein rests with one point at the center thereof constituting the point of contact with the inside face of the cavity, even when the lens container is tilted in order to drain out the liquid from the cavity, and since the ophthalmic lens has point-wise contact at only one point thereof with the inside surface of the cavity, it is therefore difficult to achieve an adequate level of effective frictional force or detaining action, thereby creating an extremely high risk of the ophthalmic lens being discharged from the cavity together with the liquid.

[0012] In the ophthalmic lens container of the present invention, the invention of which was based upon this discovery, the cavity in plan view has a very special shape, i.e. a non-circular, generally heart shape. By so doing, during the procedure of lowering the constricted portion at the lower end of the heart shape downwardly in order to incline the entire container and drain off the liquid, as the ophthalmic lens moves to the lower end of the heart shape, the front face of the ophthalmic lens, which has a greater radius of curvature than the radius of curvature in the circumferential direction of the inside face of lower end of the heart, comes into contact at two points along the circumference, with the inside face of the lower end of the heart shape of the cavity. Especially in case of soft contact lenses, the surface tension of the liquid acts on the narrow space between the two contact points and surrounded by the opposed faces of the ophthalmic lens and the cavity inside face, whereby the ophthalmic lens undergo deformation so as to fit along the cavity inside face. Accordingly, the ophthalmic lens keeps face contact with the cavity inside face over a wider area.

[0013] As a result, detaining force deriving from friction, attraction, etc. of the ophthalmic lens against the cavity inside face, as well as detaining force deriving from abutting force due to the ophthalmic lens being pinched from both sides in the circumferential direction, can be produced effectively so that the ophthalmic lens is easily detained on the cavity inside face, whereby without the use of any special utensil, the liquid only may be drained easily, while keeping the ophthalmic lens held in the container.

[0014] The invention can be implemented regardless of the type or material of the ophthalmic lens stored in the cavity, or of the liquid. The invention is implemented advantageously even in instances where the ophthalmic lens is accommodated in a generally floating state in a liquid, due to generally equal specific gravities of the ophthalmic lens and the liquid. However, when the container is inclined, the liquid will flow out first, and thus the liquid level will drip and a portion of the ophthalmic lens will project above the liquid surface. Since the ophthalmic lens comes into contact in this state with the inside surface of the cavity, abutting force of the ophthalmic lens against the cavity inside face will be assured by the weight of the ophthalmic lens.

[0015] Additionally, since the narrowing tip of the lower end of the heart is utilized in order to drain out the liquid therefrom, it is possible for the easily drained liquid to be drained out at a single, sufficiently narrow location along the entire circumference of the cavity opening. Thus, it is possible to define a fixed location for the liquid to drain from the cavity, making it possible to properly and consistently drain the liquid at the intended location, which also facilitates processes such as recovery of liquid drained from the container, or the like.

[0016] Additionally, since the large radius of curvature of the left and right portions at the two sides of the heart can be utilized to enable removal of the ophthalmic lens, even where the ophthalmic lens is removed by being slid along the cavity inside face, it will be possible to remove the ophthalmic lens in the same manner as with a lens container of conventional design, smoothly and with good operability under low frictional force and detaining force, due to the front

face of the ophthalmic lens contacting the cavity inside face at one point only.

[0017] Additionally, by using in plan view a special shape, i.e. a heart shape, unlike the article disclosed in Reference 1 hereinabove, the cavity is symmetrical shaped on the left and right sides to either side of the line of incline during draining. Thus, added convenience is provided by the fact that, regardless of whether the user is right-handed or left handed, the procedure of draining the liquid and removing the ophthalmic lens can be carried out in the same manner.

[0018] Further, consumers of the contact lenses, for which the ophthalmic lens case pertaining to the invention is commonly used, include large numbers of the elderly and women. For such a stratum of consumers, through the use of a highly favorable heart motif for the entire shape of the article, while at the same time offering the excellent technical advantages described earlier, the invention affords notable features with regard to commercial value taking design and taste into consideration.

(Second Mode of the Invention Relating to an Ophthalmic Lens Container)

[0019] A second mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to the above-indicated first mode, wherein a circumferential radius of curvature: ra of a constricted lower end of the lower section of the heart shape in the opening peripheral portion of the cavity of generally heart shape is established so as to fulfill an equation: $0.2 \leq ra/R \leq 0.4$, with respect to a radius of curvature: R of the front face of the ophthalmic lens.

[0020] With the ophthalmic lens container according to this mode, the overall attractive design of the heart-shaped lens container can be maintained while providing, in the lower portion of the heart, a cavity inside face able to consistently give effective detaining force by means of contact of the ophthalmic lens at two points.

(Third Mode of the Invention Relating to an Ophthalmic Lens Container)

[0021] A third mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to the above-indicated first or second mode hereinabove, wherein in a circumferential radius of curvature: rb of the left and right side portions of the heart shape in the opening peripheral portion of the cavity of generally heart shape is established so as to fulfill an equation: $1.2 \leq rb/R \leq 2.0$, with respect to the radius of curvature: R of the front face of the ophthalmic lens.

[0022] With the ophthalmic lens container according to this mode, the overall attractive design of the heart-shaped lens container can be maintained while providing, in the left and right side portions of the heart, a cavity inside face that is more advantageously formed in terms of being able to easily and smoothly slide the ophthalmic lens in order to remove it.

(Fourth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0023] A fourth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to third modes, wherein a diametrical radius of curvature: rc in a vertical cross section of the bottom inside face of the cavity of generally heart shape is established so as to fulfill an equation: $1.2 \leq rc/R \leq 1.6$, with respect to the radius of curvature: R of the front face of the ophthalmic lens.

[0024] According to this mode, it is possible to advantageously realize, without excessively large size, a lens container wherein with the ophthalmic lens container resting therein in a generally horizontal state, an ophthalmic lens positioned on the bottom of the cavity undergoes no unnatural warping or the like due to localized abutment against the cavity inside face. Here, the cavity bottom face refers to a zone of depth generally equivalent to the axial height dimension of the ophthalmic lens from the deepest point of the cavity; by setting the radius of curvature: R of the cavity inside face of this deep zone in accordance with the equation above, an ophthalmic lens can be advantageously accommodated within the cavity.

(Fifth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0025] A fifth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to fourth modes, wherein the covering sheet sealed to the flange portion around the opening peripheral portion of the cavity has a pull tab extending further outwardly from the portion fixed to the flange portion, at a constricted lower end of the lower portion of the heart shape in the opening peripheral portion of the cavity of the heart shape, the pull tab being gripped in order to strip the covering sheet from the flange portion.

[0026] With the ophthalmic lens container according to this mode, since the initially stripped portion of the covering sheet constricts in conformity with the shape of the lower portion of the heart, the adhesive face extending in the direction orthogonal to the direction of stripping of the covering sheet is provided with small width dimension, so that the peel

strength of the covering sheet may be held to a low level. Thus, ease of unsealing may be improved to make possible smooth unsealing, and shaking or other back action produced in the container body as the covering sheet is stripped when opening the cavity may be suppressed, so as to prevent the preserving solution from spilling out appreciably from the cavity opening, and making it easier to remove the lens.

(Sixth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0027] A sixth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container including: a container body having a lens storage portion with a cavity for storing an ophthalmic lens and a preserving solution, and a flange portion integrally formed with the lens storage portion extending radially outward around an opening peripheral portion of the cavity; a covering sheet superposed on the container body for covering an opening of the cavity, wherein the covering sheet is strippably sealed around the entire circumference of the opening of the cavity to provide liquid tight closure to the lens storage portion, the ophthalmic lens container being characterized in that a bottom inside face of the cavity is of generally concave spherical shape, with a radius of curvature in a diametrical direction in a vertical cross section of the bottom inside face of the cavity being greater than a radius of curvature of a front face of the ophthalmic lens, while over at least a portion on a circumference of an opening inside surface of the cavity, disposed is at least one upright curving portion whose radius of curvature in the diametrical direction in vertical cross section is smaller than the radius of curvature of the front face of the ophthalmic lens.

[0028] With the ophthalmic lens container according to this mode, with the ophthalmic lens container resting in a generally horizontal state so that the ophthalmic lens is stored positioned on the bottom of the cavity, the ophthalmic lens may be stored stably with no localized deformation or the like, within the bottom portion of the cavity of spherical concave shape having a radius of curvature greater than that of the front face of the ophthalmic lens. Meanwhile, in the event that the ophthalmic lens container is tilted in order to drain out the liquid only, when the ophthalmic lens moves together with the liquid towards the opening, the ophthalmic lens will come into abutment at two positions in the diametrical direction (vertical sectional direction) of the cavity at the inside face of the opening of the cavity, which has a radius of curvature smaller than that of the front face of the ophthalmic lens. As a result, detaining force deriving from friction, attraction, etc. of the ophthalmic lens against the cavity inside face, as well as detaining force deriving from abutting force due to the ophthalmic lens being pinched from both sides in the circumferential direction, can be produced effectively so that the ophthalmic lens is easily detained on the cavity inside face, whereby without the use of any special utensil, the liquid only may be drained easily, while keeping the ophthalmic lens held in the container.

(Seventh Mode of the Invention Relating to an Ophthalmic Lens Container)

[0029] A seventh mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to the above-indicated sixth mode, wherein the ophthalmic lens container comprises a structure defined in any one of the above-indicated first to fifth modes, and wherein two upright curving portions are provided at portions circumferentially opposed to each other with the constricted portion in the lower portion of the heart shape interposed therebetween, in the opening inside surface of the cavity.

[0030] With the ophthalmic lens container of structure according to this mode, when the ophthalmic lens container is inclined in order to drain the liquid from the constricted portion in the lower portion of the heart, the ophthalmic lens, moving together with the liquid into proximity with the opening of the ophthalmic lens container, comes into abutment at two circumferential locations thereof with the cavity inside face at the two sides of the latter in the circumferential direction to either side centered on the constricted portion in the lower portion of the heart, as well as coming into abutment in the vertical sectional direction (diametrical direction) at two positions in the upright curving portion. Thus, there is produced both detaining action of the ophthalmic lens within the cavity based on the design taught in the first mode hereinabove, and detaining action of the ophthalmic lens within the cavity based on the design taught in the sixth mode hereinabove, whereby outflow of the ophthalmic lens from the cavity may be prevented more effectively and consistently.

(Eighth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0031] An eighth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to seventh modes, wherein at least a portion in a circumferential direction of the opening peripheral portion of the cavity, over a zone of at least 2 mm in the depth direction from the opening peripheral portion of the cavity, is a sloping face having a slope angle of 45° or more with respect to a plane orthogonal to a center axis of the cavity in vertical cross section.

[0032] In the ophthalmic lens container of this mode, even when inclined by up to 45° when draining the liquid, the inside face of the opening peripheral portion of the cavity will be maintained in either a horizontal attitude or a sloping attitude moving upward from the bottom towards the opening. Thus, at the opening peripheral portion which is still

maintained in a generally horizontal attitude or upward-facing attitude while most of the liquid is being drained from the cavity, the ophthalmic lens can be kept inside the cavity, just as if it were trapped therein. Accordingly, in conjunction with the detaining action produced by abutment at two points in the circumferential direction or two points in the vertical sectional direction as described above, even if the ophthalmic lens should happen to slide into proximity with the cavity opening, it will be detained by the cavity opening, making it possible to prevent it from being carried out.

[0033] In this mode, since the ophthalmic lens can be positively detained and held by being trapped by the opening peripheral portion of the cavity, after the liquid has been drained, the ophthalmic lens can be held with a portion thereof projecting outwardly beyond the cavity opening. By having a portion of the ophthalmic lens project outwardly beyond the cavity opening in this way, when removing the ophthalmic lens from the cavity, it can be picked up without having to slide the ophthalmic lens along the cavity inside face, thereby making is possible to remove the ophthalmic lens from the case container more safely, while avoiding damage to it.

(Ninth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0034] A ninth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to eighth modes, wherein a circular recessed portion having a radius of curvature smaller than the radius of curvature of the front face of the ophthalmic lens is formed at a location in an approximate center of the bottom inside face situated at the deepest portion of the cavity, the circular recessed portion opening into the bottom inside face of the cavity via an opening diameter of φ1 mm -5 mm.

[0035] In the ophthalmic lens container of this mode, with the ophthalmic lens container resting generally on the horizontal so that the ophthalmic lens is positions in the deepest portion of the cavity, the center portion of the front face of the ophthalmic lens is supported in linewise contact about the circumference of a circle against the opening peripheral portion of the circular recessed portion. By so doing, abutment of the front face of the ophthalmic lens at a single point in the center thereof against the cavity inside face while at rest is avoided, and the ophthalmic lens can be support more stably within the container. Additionally, as compared to the case where the ophthalmic lens is supported in pointwise contact at a single point within the container, any outside forces acting on the lens are dispersed by means of linewise contact, and in particular since the ophthalmic lens is supported through in a circular ringwise abutment about the approximate center axis thereof, external force acting on the ophthalmic lens can be made generally uniform about the center axis thereof, thereby avoiding strain and other deformation, and keeping the ophthalmic lens supported in good condition within the cavity.

(Tenth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0036] A tenth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to eighth modes, wherein a generally plane, circular flat portion extending in an axis-perpendicular direction by an outside diameter dimension of φ1 mm -5 mm is formed at a location in an approximate center of the bottom inside face located in the deepest portion of the cavity.

[0037] In the ophthalmic lens container of this mode, even with the ophthalmic lens container stored at rest generally on the horizontal, the contact location of the front face of the ophthalmic lens stored in the cavity against the cavity inside face is readily displaced on the circular flat portion by the application of a low level of external force or the like. Thus, it becomes possible to prevent the ophthalmic lens from continuous contact with a particular region of the cavity for an extended period. Additionally, the circular flat portion provided to the bottom inside face of the ophthalmic lens container is able to readily produce repulsive force by abutment against the ophthalmic lens in comparison with the spherical concave surface. Therefore, even in the case, for example, the ophthalmic lens is pressed onto the bottom surface of the cavity by a temporary application of external force, the repulsive force of the circular flat portion enables the ophthalmic lens to readily float up and be free from deformation. As a result, it is expected that the ophthalmic lens stored in the container is likely to avoid a large deformation.

(Eleventh Mode of the Invention Relating to an Ophthalmic Lens Container)

[0038] An eleventh mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to tenth modes, wherein a surface roughness of the inside face of the cavity has a maximum height: Ry value such that $Ry \leq 5$ μm.

[0039] In the ophthalmic lens container of this mode, the inside face of the container against which the front face of the ophthalmic lens comes into contact is a relatively smooth face, reducing damage to the ophthalmic lens. That is, where, for example, the user when removing the ophthalmic lens from the cavity should happen to slide the ophthalmic lens along the inside face of the cavity while pressing it with a finger, it will nevertheless be possible to effectively prevent damage to the ophthalmic lens surface due to rubbing against the cavity inside face, as well as to remove the ophthalmic

lens smoothly from the relatively smooth cavity inside face.

[0040] If the cavity inside face is made smooth, while it would be difficult to retain the ophthalmic lens within the cavity while draining off the liquid only from the cavity, in the present invention, the specially shaped cavity inside face described above is employed. Therefore, the ophthalmic lens may be effectively detained against the cavity inside face at at least two points, so that while making it possible to detain the ophthalmic lens within the cavity when draining the liquid. It is also made possible to easily remove the ophthalmic lens for use, by sliding it along the smooth cavity inside face.

(Twelfth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0041] A twelfth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-mentioned first to tenth modes, wherein the inside face of the cavity has a surface roughness finer than 800 grid sandpaper.

[0042] In the ophthalmic lens container of this mode, there is afforded a working effect similar to that of the eleventh mode described above.

[0043] In the eleventh or twelfth mode of the invention, in preferred practice, surface roughness of the cavity inside face will have some level of roughness, rather than being excessively smooth. With this arrangement, it becomes possible to achieve a number of advantages, for example, to readily achieve force detaining the ophthalmic lens within the cavity when draining off the liquid, or to be able to avoid the phenomenon of attracting of the ophthalmic lens onto the cavity inside face as can occur with particular combinations of lens materials and case materials.

[0044] Specifically, in preferred practice the surface of the cavity inside face will have wrinkle-like irregularities, the roughness thereof, when measured using the "Form Talysurf " by "Taylor Hobson Ltd." on the mold user to produce the cavity inside face, having an average value of 1.0 μm or above, more preferably 2.0 μm or above, in either the horizontal direction or vertical direction.

(Thirteenth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0045] A thirteenth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to twelfth modes, wherein the container body is fabricated from a transparent resin material having visible light transmissivity of 80% or more in the axial direction of the cavity in the lens storage portion.

[0046] In the ophthalmic lens container of this mode, at some stage in the production process of an ophthalmic lens container product having an ophthalmic lens stored therein, or at some point prior to shipping thereof or subsequent to shipping thereof, for example, it is possible to carry out inspection to verify that the ophthalmic lens is present, whether there are defects, and so on, doing so from the outside through the container either visually or with suitable optical means.

[0047] This mode is particularly favorable used in combination with the above-indicated eleventh or twelfth mode. By so doing, since surface roughness of the cavity inside face is smoothed while preventing the ophthalmic lens from escaping during draining of the liquid, the level of scattering of light rays by the cavity inside face is reduced. That is, according to this mode, in an ophthalmic lens container according to the invention, that effectively presents the ophthalmic lens from escaping, it is possible to avoid hindering the ophthalmic lens escape-preventive function, while also facilitating verification of the presence of the ophthalmic lens from the outside.

[0048] This thirteenth mode is also favorable used in combination with the above-indicated ninth or tenth mode. Particularly in a mode combining the ninth mode with this thirteenth mode, by continuing to retain the ophthalmic lens at a stable position on the bottom portion through contact with the opening peripheral portion of the circular recessed portion, examination or inspection of the ophthalmic lens with a higher level of accuracy is possible. In a combining the tenth mode with this thirteenth mode, since it is possible to readily induce the ophthalmic lens stored in the cavity to undergo displacement on the circular flat portion by means of displacement or shaking by applying a low level of external force to the ophthalmic lens container, for example, in instances where the presence of or defects in an ophthalmic lens are difficult to ascertain optically, the ophthalmic lens may be displaced in order to enable the ascertainment procedure to be carried out easily and accurately.

(Fourteenth Mode of the Invention Relating to an Ophthalmic Lens Container)

[0049] A fourteenth mode of the present invention relating to an ophthalmic lens container provides an ophthalmic lens container according to any one of the above-indicated first to thirteenth modes, wherein in the flange portion, at a location spaced apart by a predetermined distance radially outwardly from the opening peripheral portion of the cavity, a shoulder face that extends bending axially upward in a same direction as an opening direction of the cavity or axially downward in a direction opposite the opening direction of the cavity is formed continuously around an entire circumference in the circumferential direction to constitute an edge cutting portion, and a sealing face of the covering sheet is disposed

at a location to an outer peripheral side of the edge cutting portion.

[0050] In the ophthalmic lens container of this mode, the ophthalmic lens is removed from the cavity serving as the lens storage portion, for example, by sliding the ophthalmic lens towards the opening peripheral portion of the cavity while pressing down on it from above with a finger, and picking it up from the cavity opening to remove it. Here, since the sealing face of the container body and covering sheet is disposed to the outer peripheral side of the edge cutting portion which in turn is located the outer peripheral side of the opening peripheral portion of the cavity, with the sealing face spaced apart from the opening peripheral portion of the cavity and the shoulder portion of the edge cutting portion is situated therebetween, when removing the ophthalmic lens, even if burrs or the like consisting of adhesive, the ophthalmic lens container, the covering sheet, or the like should occur resulting in roughness on the sealing face on the container body side, contact of the lens with the sealing face on the container body side is avoided. Thus, damage to the ophthalmic lens caused by interference by burrs during lens removal can be prevented, so that removal of the ophthalmic lens from the container body can be carried out more easily and safely. In this mode, in preferred practice, the edge cutting portion will be formed by shoulder face that extends bending downward in the direction opposite the opening direction of the cavity, in order to avoid contact of the lens with burrs or the like during removal.

EFFECTS OF THE INVENTION

[0051] As will be understood from the foregoing description, according to the present invention each described in the claims 1 -14, it is possible to realize an ophthalmic lens container of novel structure, whereby the liquid only may be drained off readily from the cavity while keeping the ophthalmic lens positioned therein, as well as the ophthalmic lens can be easy to be removed from the cavity.

[0052] Also, according to the present invention described in the claim 1, namely, the ophthalmic lens container of heart shape, it is possible to realize excellent functions described above and provide a taste of design as well.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053]

FIG. 1 is a perspective view of a container body of a blister package according to a first embodiment of the present invention, where a contact lens is stored;
FIG. 2 is a top plane view of the container body of FIG. 1;
FIG. 3 is a vertical cross sectional view taken along line 3-3 in FIG. 2;
FIG. 4 is a vertical cross sectional view taken along line 4-4 in FIG. 2;
FIG. 5 is a plane view for explaining a shape of a cover sheet in relation to the container body of FIG. 1;
FIG. 6 is a plane view illustrated an example of specific design of the container body shown in FIGs. 1-5;
FIG. 7 is a vertical cross sectional view taken along line 7-7 in FIG. 6;
FIG. 8 is a plane view for explaining a state where a contact lens is stored in the container body shown in FIG. 6;
FIG. 9 is a vertical cross sectional view taken along line 9-9 in FIG. 8;
FIG. 10 is a front elevational view showing a state of the contact lens being detained within a cavity during draining a preserving solution from the container body;
FIG. 11 is a front elevational view showing a state of the contact lens being removed from the container body;
FIG. 12 is a perspective view showing the container body being tilted to drain the preserving solution;
FIG. 13 is an enlarged cross sectional view showing a specific design of a bottom inside face suitable for use in the container body of FIG. 1;
FIG. 14 is a vertical cross sectional view of a container body of a blister package according to another embodiment of the present invention; and
FIG. 15 is a top plane view of the container body of FIG. 14.

DESCRIPTION OF THE REFERENCE NUMERALS

[0054]

10 blister package
12 container body
14 cover sheet
16 contact lens
18 preserving solution
20 lens storage portion

22 flange portion
24 cavity
26 bottom inside face
28 opening inside face
56 upright curving portion

BEST MODE FOR CARRYING OUT THE INVENTION

[0055] There will be described in detail preferred embodiments of the invention while referring to drawings in order to further clarify the invention.

[0056] Referring first to FIGs. 1-4, depicted is a blister package 10 as a contact lens case for a contact lens, by way of one embodiment of the present invention. This blister package 10 includes a container body 12 and a cover sheet 14 serving as the covering sheet. An ophthalmic lens, namely contact lens 16, and a preserving solution 18 are stored in the container body 12, and the cover sheet 14 is strippably sealed to the container body 12 to seal the contact lens accommodated therein, as well as to enable removal when needed.

[0057] More specifically, the container body 12 includes a lens storage portion 20 and a flange portion 22.

[0058] The lens storage portion 20 has a generally hollow half-spherical shape overall, with a cavity 24 formed inside. This cavity 24 constitutes a storage space for the preserving solution 18 and the contact lens 16. Here, the bottom inside face 26 of the cavity 24 is of generally concave spherical shape on the one hand, with the opening inside face 28 thereof having variable radius of curvature: r in the circumferential direction, producing an opening peripheral shape which is generally of heart shape in plan view.

[0059] More specifically, the bottom inside face 26 of the cavity 24, in a zone extending from the deepest section of the center located on the center axis of the cavity 24, to a somewhat small depth portion equal to the axial height dimension of the contact lens 16 stored therein, has an inside face with a radius of curvature: rc in vertical section that is greater than the radius of curvature: R of the front face 30 of the contact lens 16. In preferred practice, it is established so as to fulfill the equation: $1.2 \leq rc/R \leq 1.6$. With this arrangement, when the contact lens 16 is stored within and aligned coaxially with the cavity 24 with downwardly curved state, only the front center portion of the contact lens 16 comes into contact with the inside face of the cavity 24, while there is formed a gap between the peripheral portion of the contact lens 16 and the inside face of the cavity 24.

[0060] By so doing, with the blister package 10 stored resting in a generally horizontal state, the contact lens 16 stored in the cavity 24 contacts with the front face 30 thereof the deepest portion of the inside face (bottom inside face 26) of the cavity 24 at only a single point on the center axis, whereby the contact lens 16 is held stored in a stable manner in the cavity 24, without being subjected to any unnatural strain resulting from localized pressure on its outer peripheral portion.

[0061] On the other hand, the inside face 28 of the opening peripheral portion (portion situated towards the opening portion side from the bottom portion) of the cavity 24 has a circumferential radius of curvature that varies along the circumference, bowed so as to produce a smooth, generally heart shape overall in plan view (see FIG. 2). That is, it is left-right symmetrical in relation to a centerline: X extending in the vertical direction of FIG. 2, with the bottom end in FIG. 2 constituting the constricted portion at the lower portion of the heart shape, and the left and right sides in FIG. 2 forming a pair of bulging heart-shaped side portions.

[0062] In the lower portion of the heart, the circumferential radius of curvature: ra of the inside face is smaller than the radius of curvature: R of the front face 30 of the contact lens 16. In preferred practice, it is established so as to fulfill the equation: $0.2 \leq ra/R \leq 0.4$. In the heart-shaped side portions, on the other hand, the circumferential radius of curvature: rb of the inside face is greater than the of curvature: R of the front face of the contact lens 16. In preferred practice, it is established so as to fulfill the equation: $1.2 \leq rb/R \leq 2.0$.

[0063] As shown in FIG. 5, the size of the opening of the opening peripheral portion (opening edge portion) of the cavity 24 is established such that the diameter dimension: d of an inscribed circle 32 thereof is greater than the outside diameter dimension: D of the contact lens 16. In preferred practice, it will be established such that $1.2 \leq d/D \leq 1.6$. As will be apparent from FIG. 5, in this embodiment, in the opening peripheral portion of cavity 24, the opening peripheral portion of the cavity 24 contacts the inscribed circle 32 at a total of three points, namely, one point at the upper edge of the heart shape, and points in the lower portions of the two sides of the heart shape (or upper portions of the left and right sides of the constricted portion of the lower portion of the heart).

[0064] The opening inside face 28 of-the cavity 24, over an area thereof of predetermined depth dimension: L (see FIG. 3) from the opening peripheral portion in the depthwise direction of the cavity 24, has a slope angle: α of 45° or greater with respect to the horizontal axis in vertical section. The area in which the slope angle: α of the opening inside face 28 of the cavity 24 is 45° or greater may extend around the entire circumference, but at a minimum will be an area in proximity to the predetermined region for draining liquid. In this embodiment, the predetermined region for draining liquid is the constricted portion in the lower end of the heart shape.

[0065] As will be described later, in order to more advantageously assure detaining action of the contact lens 16, the aforementioned L value will preferably be set to 2 mm or greater, more preferably such that $L \geq 5$ mm. Also, the value of α, at least in the predetermined region for draining liquid, will preferably be such that $\alpha \leq 60$, because if it is too large it becomes difficult to drain off the preserving solution.

[0066] In the center of the bottom of the cavity 24, there is formed a circular recessed portion 34 situated in the center of the deepest portion (i.e. on the center axis of the bottom inside face 26 of cavity 24). This circular recessed portion 34 has a concave spherical face and opens into the bottom inside face 26 with a diameter dimension that is sufficiently smaller than the outside diameter dimension: D of the contact lens 16. The radius of curvature: rd of the circular recessed portion 34 is smaller than the radius of curvature: R of the front face of the contact lens 16. In preferred practice, the outside diameter dimension: D of the circular recessed portion 34 is established at about φ1.0 mm -5 mm.

[0067] A specific example of the shape of a cavity established in accordance with the conditions given above is shown in FIGS. 6 -7. The contact lens 16 is shown stored therein in FIGS. 8 -9, by way of reference illustrations. The shape of the container body 12 shown in FIGS. 8 -9 is in accordance with the specific design values given in FIGS. 6 -7. The contact lens 16 shown stored therein has a radius of curvature at the front face 30 of R = 12.5 mm.

[0068] On the other hand, the flange portion 22 is composed of a flat portion 36 extending in the direction orthogonal to the center axis of the cavity 24, and a pedestal portion 38 of skirt shape extending downwardly from the outside peripheral edge of the flat portion 36. The inside and outside peripheral edge portions of the flat portion 36 connect via smooth curving faces (bowed faces) to the opening inside face 28 of the cavity 24 and to the pedestal portion 38, respectively.

[0069] The blister package 10 shown in FIGS. 1 -5 and the structural example shown in FIGS. 6 -9 giving a shape of specific exemplary preferred dimensions are modes that differ slightly in relation of the flat portion 36.

[0070] Specifically, the flat portion 36 shown in either FIGS. 1 -5 and that shown in FIGS. 6 -9, are no different in that they are integrally formed extending to the outside peripheral side from the opening peripheral portion of the cavity 24, at a substantially constant dimension around the entire circumference. On the upper face thereof, the cover sheet 14 for covering the cavity 24 in fluid-tight fashion is hermetically sealed.

[0071] Here, the blister package 10 shown in FIGS. 1 -5 has formed therein a groove-shaped recess 40 extending continuously around the entire circumference in the circumferential direction of the laterally central portion of the flat portion 36. The inside peripheral wall of this groove-shaped recess 40 takes the form of a shoulder face that is spaced apart by a predetermined distance from the opening peripheral portion of the cavity 24, and that extends bending downward in the direction opposite the cavity opening direction, with an edge cutting portion being formed by this shoulder face.

[0072] On the bottom face of the groove-shaped recess 40 there is formed plateau-shaped convex portion 44 shorter than the depth of the groove-shaped recess 40, extending continuously around the entire circumference. A bonding face for the cover sheet 14 is formed by the flat upper surface of this convex portion 44.

[0073] In the blister package 10 shown in FIGS. 6 -9, on the other hand, a circumferential recess 46 extends continuously in the circumferential direction around the entire circumference in proximity to the inside peripheral edge of the flat portion 36. The outside peripheral side of the circumferential recess 46 projects upwardly above the inside peripheral side where the opening peripheral portion of the cavity 24 is situated. By so doing, the inside peripheral wall of the circumferential recess 46 forms a first shoulder face that is spaced apart by a predetermined distance from the opening peripheral portion of the cavity 24, and that extends bending downward in the direction opposite the cavity opening direction. The outside peripheral wall of the circumferential recess 46 forms a second shoulder face that is spaced apart by a predetermined distance from the opening peripheral portion of the cavity 24, and that extends bending upward in the same direction as the cavity opening direction. This first shoulder face and second shoulder face respectively form edge cutting portions.

[0074] The entire circumference of the outside peripheral side of the circumferential recess 46 constitutes an annular convex portion 48 that projects axially upward to a significant degree. A bonding face for the cover sheet 14 is formed by the flat upper surface of this annular convex portion 48.

[0075] The pedestal portion 38 which is formed extending downwardly from the outside peripheral edge of the flat portion 36 has a heart-shaped drum configuration that flares slightly to the outside peripheral side going down from the flat portion 36. The axial length of the pedestal portion 38 is slightly greater than the axial dimension of the lens storage portion 20, so as to cover the lens storage portion 20 in its entirety on the outer peripheral side. The lower peripheral edge of the pedestal portion 38 is reinforced by being made thick around its entire circumference. The lower face of this lower peripheral edge constitutes a support face 48 that extends generally orthogonally to the center axis of the cavity 24, whereby, when this support face 48 is positioned resting on a flat, horizontal surface such as a desktop, the blister package 10 can rest in a stable manner with the cavity 24 open in the vertical direction.

[0076] In consideration of fabrication costs, handling, and so on, the container body 12 of the structure described above comprising the container body 12 and the flange portion 22 will preferably employ synthetic resin materials having excellent strength and chemical resistance, in particular, fluororesins, polyamide, polyacrylate, polyethylene, polyethyl-

ene terephthalate, polyvinyl chloride, amorphous polyolefins, polycarbonate, polysulfone, polybutylene terephthalate, polypropylene, polymethyl pentene, and the like, composites thereof, or multi-layer structure synthetic resins. The container body 12 is advantageously manufactured by integral molding by means of subjecting such resin materials to injection molding, vacuum forming, pressure forming, or the like.

[0077] Here, the inside face of the cavity 24 of the container body 12 will preferably have an appropriate degree of surface roughness, in order to more advantageously realize the procedure for draining the preserving solution from the cavity 24, described later, or for removing the contact lens 16. Surface roughness of this cavity 24 is advantageously achieved, for example, by imparting a suitable level or surface roughness or surface texture to the cavity 24 molding face of the mold for forming the container body 12. Specifically, this may be achieved by subjecting the forming mold surface to an etching, a shot blast, laser irradiation, or other process.

[0078] The surface texture of the inside face of the cavity 24 established in this manner will preferably have wrinkle-like or pear skin-like irregularities. More specifically, selecting from among the four types and twelve finishes specified in "MOLD FINISH COMPARISONS BASED ON THE SPI" (SPI represents Society of the Plastic Industry) which is a standard for indicating surface conditions of molds, one resembling extremely closely a "blast finish sample (DRY BLAST)" will preferably be adopted. More preferably, the valley portions and peak portions of the wrinkle-like or pear skin-like irregularities will have smooth curving surfaces, so as to advantageously avoid attracting of the contact lens 16 onto the inside wall of the container and therefore damage to the surface of the contact lens 16, as well as to suppress scattering of light when optical inspection or verification is carried out with the contact lens 16 stored therein, so that the procedure may be carried out easily.

[0079] In preferred practice, the surface roughness of the cavity 24 over the entirety thereof will be such that that maximum height: Ry value is $Ry \leq 5$ μm. Alternatively, the surface roughness of the cavity 24 may be surface roughness finer than #800 grade sandpaper. As a result of an examination of levels of surface roughness that would be effective in avoiding excessive attraction of the contact lens 16 while avoiding the problem of damage to the contact lens 16 surface and the problem of scattering of transmitted light, for a number of blister packages 10 manufactured as prototypes by the inventors, it was found that three blister packages 10 (specimens) were especially good, measured values for surface roughness of these being given in Table 1 hereinbelow. The surface roughness texture employed was pear skin-like, which is similar to the "blast finish sample" of the "MOLD FINISH COMPARISONS BASED ON THE SPI" cited above. The contact lenses 16 used for the evaluation were hydrophilic soft contact lenses of HEMA (hydroxyethyl methacrylate) and silicone hydrogel material. It is confirmed that the preferred values given here by way of example is not appreciably variable depending on the material of the container body 12 and the surface condition of the cavity 24, as well as the characteristics of the preserving solution used, the material and shape of the contact lens 16, and so on.

[0080]

TABLE 1

unit: microns

Specimen No.	Measuring direction	Mold A	Mold B
NO. 1	horizontal	2.6	2.5
	vertical	3.6	2.7
NO. 2	horizontal	2.3	2.0
	vertical	3.0	2.0
NO. 3	horizontal	3.0	2.3
	vertical	3.5	2.5
average value		3.0	2.3
standard deviation		0.5	0.3

[0081] Where determination of the presence/absence of a contact lens 16 or a pass/fail determination with regard to some defect or characteristic is carried out by means of direct visual observation or an imaging process with rays of light passing through the cavity 24 with a contact lens 16 stored therein, light transmissivity in the cavity 24 forming region of the container body 12 should be evaluated as well. Specifically, in preferred practice, for visible light, which is the type of light employed in such inspections, transmissivity of light in the axial direction (depthwise direction of cavity 24) will be 80% or above.

[0082] The aforementioned cover sheet 14, which covers the opening of the cavity 24 with the preserving solution and a contact lens 16 stored therein, is favorably formed from a laminate sheet of a composite material of aluminum foil

and synthetic resin or the like. The material is of planar configuration larger than the outside perimeter of the upper face of the container body 12, and is superimposed on the upper face of the container body 12, and sealed to the flat portion 36 of the aforementioned flange portion 22 by means of sheet sealing, adhesive, or the like.

[0083] The cover sheet 14 seals the preserving solution and the contact lens 16 within the cavity 24; when using the contact lens 16, it is necessary to grip the cover sheet 14 with the fingers and strip it quickly from the container body 12 to open the cavity 24. Here, in this embodiment, there is formed a pull tab 50 that projects outwardly (downward in FIG. 1) from the constricted portion in the lower portion of the heart shape in the cavity 24. By grasping the pull tab 50 with the fingers, the cover sheet 14 can be peeled away from the leading edge portion in the lower portion of the heart, which has the narrowest width dimension of the bonding face.

[0084] In a blister package 10 comprising a container body 12 of the structure described above, when a user supplied therewith uses the contact lens 16, when removing the contact lens 16 after first stripping the cover sheet 14 from the container body 12 to open the cavity 24, first, the preserving solution only may be drained from the cavity 24. Not only is the contact lens 16 immersed in the cavity 24 difficult to see, but if a finger is inserted into the cavity 24 to lift out the contact lens 16 directly, the preserving solution which substantially fills the cavity 24 may spill out and soil a large surrounding area.

[0085] During liquid drainage (draining the preserving solution from the cavity 24), the container body 12 is held in the hand, and inclined so that the constricted portion which is the lower portion of the heart (the lower portion in FIG. 2) drops vertically downward. Upon so doing, the preserving solution collects at the narrow opening of the lower portion of the heart, whereby the preserving solution can be drained from the cavity 24 via a flow passage of narrow width that prevents spreading out in the circumferential direction. Accordingly, spreading of liquid drainage over a wide area can be prevented, making for easy handling.

[0086] At this time the contact lens 16 which has been soaking in the preserving solution will also attempt to flow out, but since the circumferential radius of curvature of the cavity 24 in the constricted portion of the lower portion of the heart situated vertically below is smaller than the radius of curvature of the front face of the contact lens 16, as shown in FIG. 10, once drawn to the constricted portion of the lower portion of the heart, the front face 30 of the contact lens 16 comes into contact at two points on the circumference with the opening inside face 28 of the cavity 24. As a result, the contact lens 16 comes into abutment with the cavity 24 over a wide area, with the frictional force of this wide area and the surface tension of the preserving solution acting to detain the lens within the cavity 24.

[0087] In this embodiment in particular, since the contact lens 16 is of soft type, as shown in FIG. 10, the action of surface tension of the preserving solution present between the front face of the contact lens 16 and the opening inside face 28 of the cavity 24 leads to the contact lens 16 coming into contact over a wide abutting portion with the opening inside face 28, and the contact lens 16 becomes wedged into the lower portion of the heart and undergoes deformation into a shape pinched from either side in the circumferential direction so that the radius of curvature in the center portion of the lens increases. Accordingly, in conjunction with the surface tension of the preserving solution, the contact lens 16 keeps face contact with the inside face of the cavity 24 over even wider area, thereby providing an effective detaining force.

[0088] Thus, as shown in the illustration of FIG. 12, the operation of draining only the extra preserving solution from the cavity 24 with the contact lens 16 still retained within the cavity 24 can be carried out quickly and easily without the use of any special utensils, by means of the simple operation of tilting the container body 12 while holding it in the hand.

[0089] Additionally, as shown in FIG. 12, during draining of the preserving solution the contact lens 16, together with the preserving solution, is conducted to the opening of the constricted portion in the lower portion of the heart, and is held detained there with a portion thereof projecting outward beyond the opening. Thus, in a state after the liquid has been drained, the contact lens 16 may be grasped with the fingers from the portion thereof projecting outward from the cavity 24, and can be removed very easily. Accordingly, the container body 12 described hereinabove offers significant improvement not only in ease of the draining procedure, but in ease of procedure when picking up the contact lens 16 as well.

[0090] With the contact lens 16 partially projecting out from the cavity 24 in this way, in order to grasp the contact lens 16 so as to remove it, as compared to the case of the removal operation often encountered with blister packages of conventional design, wherein the container body 12 is held on the horizontal while inserting the fingers into the cavity 24, and the contact lens 16 in the preserving solution is pressed, and the contact lens 16 then slid over the inside face of the cavity 24 and removed from the opening peripheral portion of the cavity 24, there is no abrasion of the contact lens 16 by the inside face of the cavity 24, whereby the problem of damage to the contact lens 16 is advantageously avoided.

[0091] Further, in this embodiment, in the circumferential sides of the constricted portion in the lower portion of the heart, with which the contact lens 16 comes into abutment at least during liquid drainage, the slope angle: α of the opening inside face 28 of the cavity 24 is approximately 45°. Thus, even if the container body 12 is inclined by up to 45°, the opening inside face 28 of the cavity 24 will be maintained in a generally horizontal attitude, at least in proximity to the opening peripheral portion. Thus, the contact lens 16 may be prevented from falling out of the cavity 24 due to gravity,

so that outflow of the contact lens 16 can be achieved even more effectively.

[0092] In this embodiment, a circular recessed portion 34 is formed situated in the center of the deepest portion of cavity 24, with the inside face of this circular recessed portion 34 situated a predetermined distance away from the front face 30 of the contact lens 16, whereby with the blister package 10 being transported or stored while disposed on the horizontal, the contact lens 16 is supported at a single point at its center through abutment with the inside face of the cavity 24 may be avoided. By so doing, the force of contact of the cavity 24 inside face against the contact lens 16 can be distributed so as to reduce localized stress, and in particular the force of contact can be distributed evenly and efficiently by means of abutment in a circular configuration. As a result, strain and deformation of the contact lens 16 can be advantageously prevented, and the effect of preventing attraction of the lens onto the cavity 24 inside face can be achieved. Since the inside face of the circular recessed portion 34 does not come into contact with the contact lens 16, it is not necessary to impart surface roughness of the inside face of the circular recessed portion 34.

[0093] Further, in this embodiment, the sealing face of the cover sheet 14 against the container body 12 is situated away to the outside peripheral side from the opening peripheral portion of the cavity 24, and is additionally positioned via the edge cutting portion of shoulder configuration with respect to the opening peripheral portion of the cavity 24, whereby even if burring or the like should occur during stripping of the cover sheet 14, interference with the contact lens 16 by this burring when the contact lens 16 is removed from the cavity 24 is effectively prevented. With this arrangement, the procedure for removing the contact lens 16 from the cavity 24 can be made even easier, and damage to the contact lens 16 caused by contact with burrs or the like can be avoided.

[0094] In the embodiments shown in FIGS. 1 -12 hereinabove, a circular recessed portion 34 is formed in the center of the inside face of the cavity 24, but this circular recessed portion 34 need not necessarily be provided.

[0095] Instead of the circular recessed portion 34, there could be provided a circular flat portion 54 extending orthogonally with respect to the center axis of the cavity 24, as shown in enlarged vertical section in FIG. 13, for example. By forming this circular flat portion 54, the contact lens 16 may readily be induced to undergo displacement in the axis-perpendicular direction on the circular flat portion 54, by means of inputting a slight external force.

[0096] As a result, it is possible to easily avoid a situation where, for example, the contact lens 16 is in continuous contact with a particular location on the inside face of the cavity 24. Also, when conducting inspection or verification of a contact lens 16 in the stored state by means of light as described above, it is possible to induce displacement of the contact lens 16 within the cavity 24 so that the contact lens 16, which can be difficult to discern, can be discerned reliably by means of its edge or the like. From the standpoint of this objective, the circular flat portion 54 will preferably have an outside diameter dimension φda = 1 mm -5 mm.

[0097] In the embodiments hereinabove, the working effects of the invention were described taking the example of removing a contact lens 16 at the time of use, but similar working effects would be afforded also, for example, in the manufacturing process of a blister package 10 in which the contact lens 16 and a preserving solution are sealed within a blister package 10. Specifically, in such a manufacturing process for example, in some instances, prior to sealing in the contact lens 16 and the preserving solution, purified water, a cleaning solution or other process solution is placed in the cavity 24 in order to elute, clean or otherwise treat the contact lens 16. When subsequently draining off the process solution and injecting the preserving solution, where a container body 12 with the structure according to the invention is employed, the process solution can be drained off while keeping the contact lens 16 inside the cavity 24, without the use of any special utensils, thereby effectively providing greater ease in manufacture of the blister package 10.

[0098] In a blister package 10 having a heart-shaped container body 12 as described above, as well as a flange portion 22 whose outside peripheral shape is also heart-shaped, multiple units can be packed into a storage box, and efficiently transported, warehoused, or delivered with excellent efficiency.

[0099] Specifically, in the interior of a storage box, by arranging the blister packages 10 with the heart-shaped left and right side portions of separate blister packages 10 adjacent to one another and with adjacent blister packages 10 opposed to one another vertically, in order to line up a plurality of contact lens containers in the left-right direction, it becomes possible to advantageously provide a package product storing a plurality of blister packages 10. In such a package product, a morphological feature, namely the constricted width of the lower portion of the heart, is utilized skillfully to be able to efficiently store a plurality of blister packages 10 in a small storage box.

[0100] FIG. 14 shows a container body 12 making up a blister package in another embodiment of the invention. To aid in understanding, members and regions having the same structure as in FIGS. 1 -9 have been assigned identical symbols in the drawing.

[0101] With this container body 12, in the opening inside face 28 of the cavity 24, there is provided an area whose radius of curvature: re value in the circumferential direction in vertical section thereof is smaller than the radius of curvature: R of the front face 30 of the contact lens 16. An upright curving portion 56 is formed by this area.

[0102] In preferred practice, the upright curving portion 56 located to the opening side of the bottom inside face 26 of the cavity 24 has a radius of curvature: re that fulfills the following equation.

$$0.5 \leq re/R \leq 0.9$$

[0103] That is, when a container body 12 having a cavity 24 comprising the opening inside face 28 is tilted in order to drain off the preserving solution, as shown in FIG. 14, in the diametrical direction shown in the vertical section, the front face 30 of the contact lens 16 comes into abutment at two points with the inside face of the cavity 24. As a result, as in the embodiments depicted in FIGS. 1 -9, frictional force of the contact lens 16 against the inside face of the cavity 24 and the surface tension of the preserving solution will effectively produce detaining action of the contact lens 16, so that the contact lens 16 may effectively be prevented from being carried out from the cavity 24 when the cavity 24 is being drained.

[0104] The cavity 24 of the container body 12 comprising such an upright curving portion 56 may be provided with a heart-shaped opening peripheral portion like that described above, but is not limited thereto. It would instead be possible for the cavity 24 to be provided with a circular opening peripheral portion which is axially symmetrical about the center axis.

[0105] In an article having the heart-shaped opening peripheral portion shown in FIGS. 1 -9, where the upright curving portion 56 is formed in the circumferential side portions of the constricted portion of the lower portion of the heart, during draining in the manner shown in FIG. 12, it becomes possible for the contact lens 16 to come into abutment with the inside face of the cavity 24 at two points in the diametrical direction in addition to two points in the circumferential direction. By so doing, it is possible to more effectively prevent the contact lens 16 from being carried out of the cavity 24.

[0106] While the embodiments of the invention have been described in detail hereinabove, these are merely exemplary, and the invention is not limited in any way to the specific disclosure of the embodiments herein.

[0107] For example, the specific shape, structure, or size of the flange portion of the container body 12 could be modified appropriately for considerations such as ease of use or of forming.

[0108] The blister package according to the invention can of course be used for soft contact lenses, including disposable types, of various kinds for nearsightedness, farsightedness, astigmatism, presbyopia, or any combination of these as well as various other kinds of ophthalmic lenses such as hard contact lenses and intraocular lenses.

[0109] The blister package according to the invention can be employed as an ophthalmic lens container for supply to the consumer or other end user, or as an ophthalmic lens container for supply from the manufacturer to medical facilities and the like.

[0110] While no detail description is provided for each case, it is also to be understood that the present invention may be embodied with various other changes, modifications and improvements, which may occur to those skilled in the art, without departing from the spirit and scope of the invention defined in the following claims.

Claims

1. An ophthalmic lens container including: a container body having a lens storage portion with a cavity for storing an ophthalmic lens and a preserving solution, and a flange portion integrally formed with the lens storage portion extending radially outward around an opening peripheral portion of the cavity; a covering sheet superposed on the container body for covering an opening of the cavity, wherein the covering sheet is strippably sealed around the entire circumference of the opening of the cavity to provide liquid tight closure to the lens storage portion, the ophthalmic lens container being **characterized in that**:

a bottom inside face of the cavity is of generally concave spherical shape, with a radius of curvature in a diametrical direction in a vertical cross section of the bottom inside face of the cavity being greater than a radius of curvature of a front face of the ophthalmic lens;

a radius of curvature in a circumferential direction of an opening inside surface of the cavity is varied along the circumferential direction, giving the opening inside surface of the cavity a planar shape generally resembling a heart shape;

in a constricted portion of a lower section of the heart shape in the opening inside surface of the cavity of generally heart shape, the radius of curvature in the circumferential direction is smaller than the radius of curvature of the front face of the ophthalmic lens;

in the two side portions of the heart shape in the opening inside surface of the cavity of generally heart shape, the radius of curvature in the circumferential direction is greater than the radius of curvature of the front face of the ophthalmic lens; and

a diameter dimension of an inscribed circle in the opening of the cavity is greater than the outside diameter dimension of the ophthalmic lens.

2. An ophthalmic lens container according to claim 1, wherein a circumferential radius of curvature: ra of a constricted lower end of the lower section of the heart shape in the opening peripheral portion of the cavity of generally heart shape is established so as to fulfill an equation: $0.2 \leq ra/R \leq 0.4$, with respect to a radius of curvature: R of the front face of the ophthalmic lens.

3. An ophthalmic lens container according to claim 1 or 2, wherein in a circumferential radius of curvature: rb of the left and right side portions of the heart shape in the opening peripheral portion of the cavity of generally heart shape is established so as to fulfill an equation: $1.2 \leq rb/R \leq 2.0$, with respect to the radius of curvature: R of the front face of the ophthalmic lens.

4. An ophthalmic lens container according to any one of claims 1-3, wherein a diametrical radius of curvature: rc in a vertical cross section of the bottom inside face of the cavity of generally heart shape is established so as to fulfill an equation: $1.2 \leq rc/R \leq 1.6$, with respect to the radius of curvature: R of the front face of the ophthalmic lens.

5. An ophthalmic lens container according to any one of claims 1-4, wherein the covering sheet sealed to the flange portion around the opening peripheral portion of the cavity has a pull tab extending further outwardly from the portion fixed to the flange portion, at a constricted lower end of the lower portion of the heart shape in the opening peripheral portion of the cavity of the heart shape, the pull tab being gripped in order to strip the covering sheet from the flange portion.

6. An ophthalmic lens container including: a container body having a lens storage portion with a cavity for storing an ophthalmic lens and a preserving solution, and a flange portion integrally formed with the lens storage portion extending radially outward around an opening peripheral portion of the cavity; a covering sheet superposed on the container body for covering an opening of the cavity, wherein the covering sheet is strippably sealed around the entire circumference of the opening of the cavity to provide liquid tight closure to the lens storage portion, the ophthalmic lens container being **characterized in that**:

   a bottom inside face of the cavity is of generally concave spherical shape, with a radius of curvature in a diametrical direction in a vertical cross section of the bottom inside face of the cavity being greater than a radius of curvature of a front face of the ophthalmic lens, while over at least a portion on a circumference of an opening inside surface of the cavity, disposed is at least one upright curving portion whose radius of curvature in the diametrical direction in vertical cross section is smaller than the radius of curvature of the front face of the ophthalmic lens.

7. An ophthalmic lens container according to claim 6, wherein the ophthalmic lens container comprises a structure defined in any one of claims 1-5, and wherein two upright curving portions are provided at portions circumferentially opposed to each other with the constricted portion in the lower portion of the heart shape interposed therebetween, in the opening inside surface of the cavity.

8. An ophthalmic lens container according to any one of claims 1-7, wherein at least a portion in a circumferential direction of the opening peripheral portion of the cavity, over a zone of at least 2 mm in the depth direction from the opening peripheral portion of the cavity, is a sloping face having a slope angle of 45° or more with respect to a plane orthogonal to a center axis of the cavity in vertical cross section.

9. An ophthalmic lens container according to any one of claims 1-8, wherein a circular recessed portion having a radius of curvature smaller than the radius of curvature of the front face of the ophthalmic lens is formed at a location in an approximate center of the bottom inside face situated at the deepest portion of the cavity, the circular recessed portion opening into the bottom inside face of the cavity via an opening diameter of φ1 mm -5 mm.

10. An ophthalmic lens container according to any one of claims 1-8, wherein a generally plane, circular flat portion extending in an axis-perpendicular direction by an outside diameter dimension of φ 1 mm -5 mm is formed at a location in an approximate center of the bottom inside face located in the deepest portion of the cavity.

11. An ophthalmic lens container according to any one of claims 1-10, wherein a surface roughness of the inside face of the cavity has a maximum height: Ry value such that $Ry \leq 5$ μm.

12. An ophthalmic lens container according to any one of claims 1-10, wherein the inside face of the cavity has a surface roughness finer than 800 grid sandpaper.

13. An ophthalmic lens container according to any one of claims 1-12, wherein the container body is fabricated from a transparent resin material having visible light transmissivity of 80% or more in the axial direction of the cavity in the lens storage portion.

14. An ophthalmic lens container according to any one of claims 1-13, wherein in the flange portion, at a location spaced apart by a predetermined distance radially outwardly from the opening peripheral portion of the cavity, a shoulder face that extends bending axially upward in a same direction as an opening direction of the cavity or axially downward in a direction opposite the opening direction of the cavity is formed continuously around an entire circumference in the circumferential direction to constitute an edge cutting portion, and a sealing face of the covering sheet is disposed at a location to an outer peripheral side of the edge cutting portion.

FIG.1

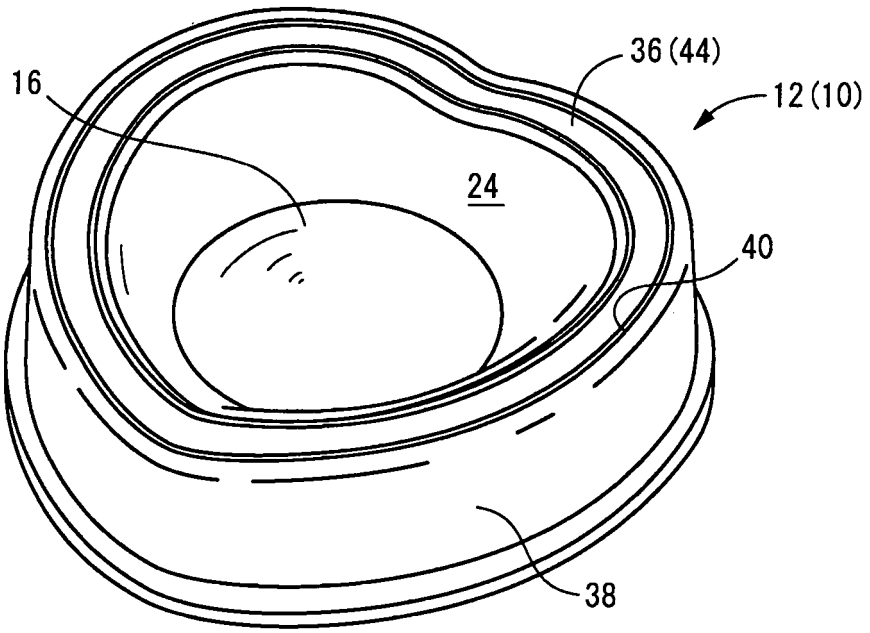


FIG.2

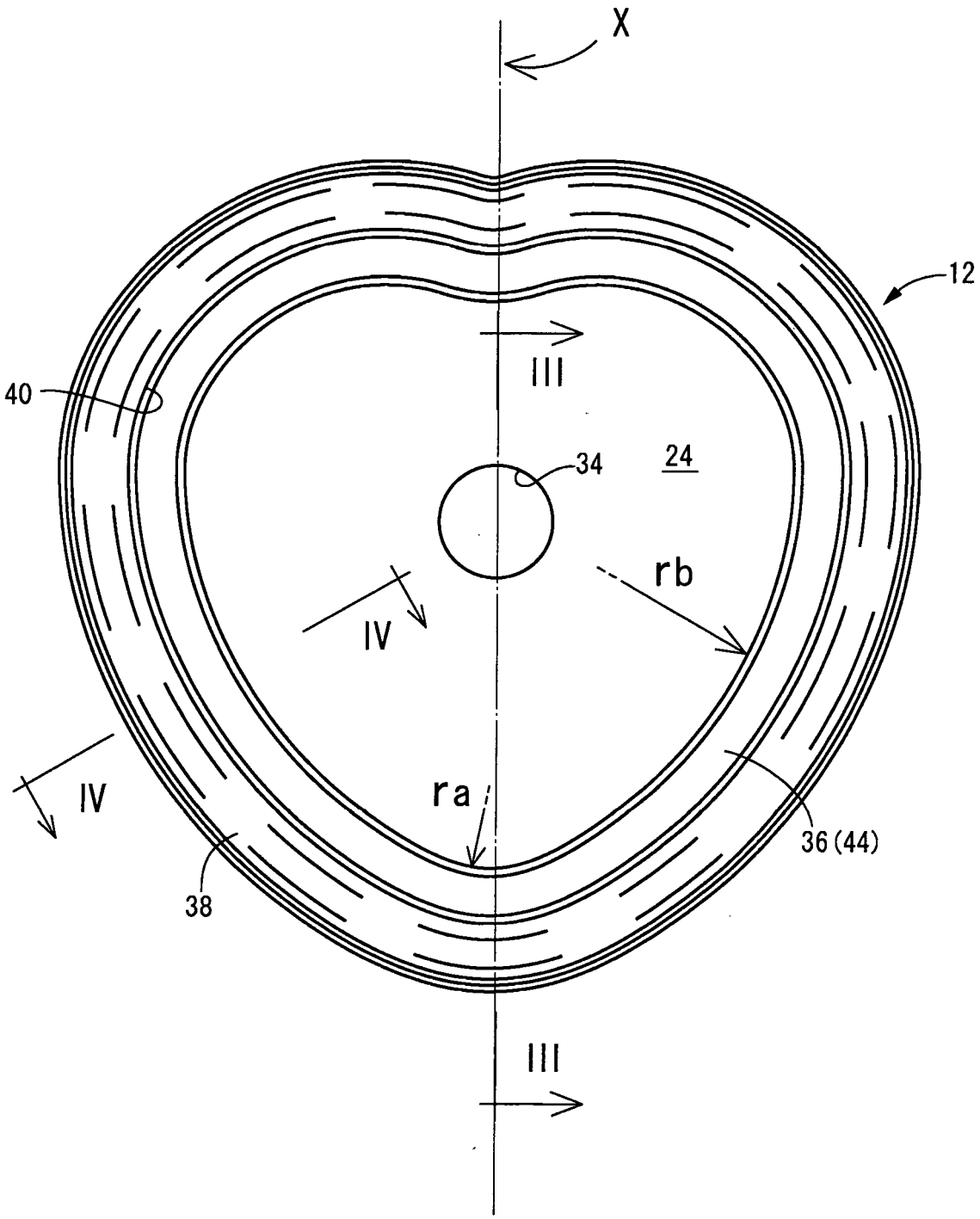
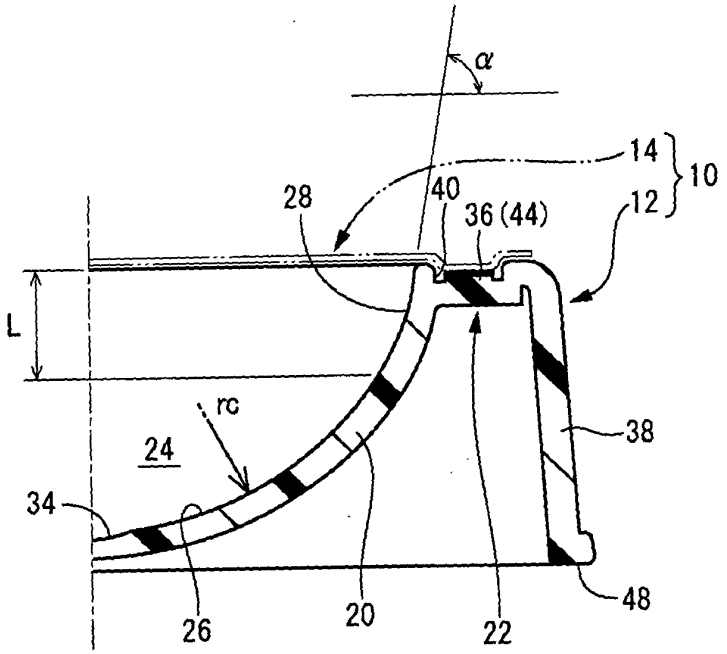


FIG.3


α
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12
28
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36 (44)
L
rc
24
38
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22

FIG.4

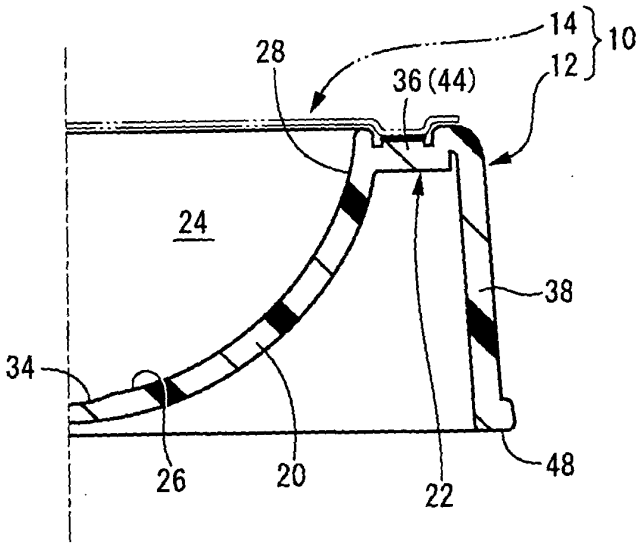
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FIG.5

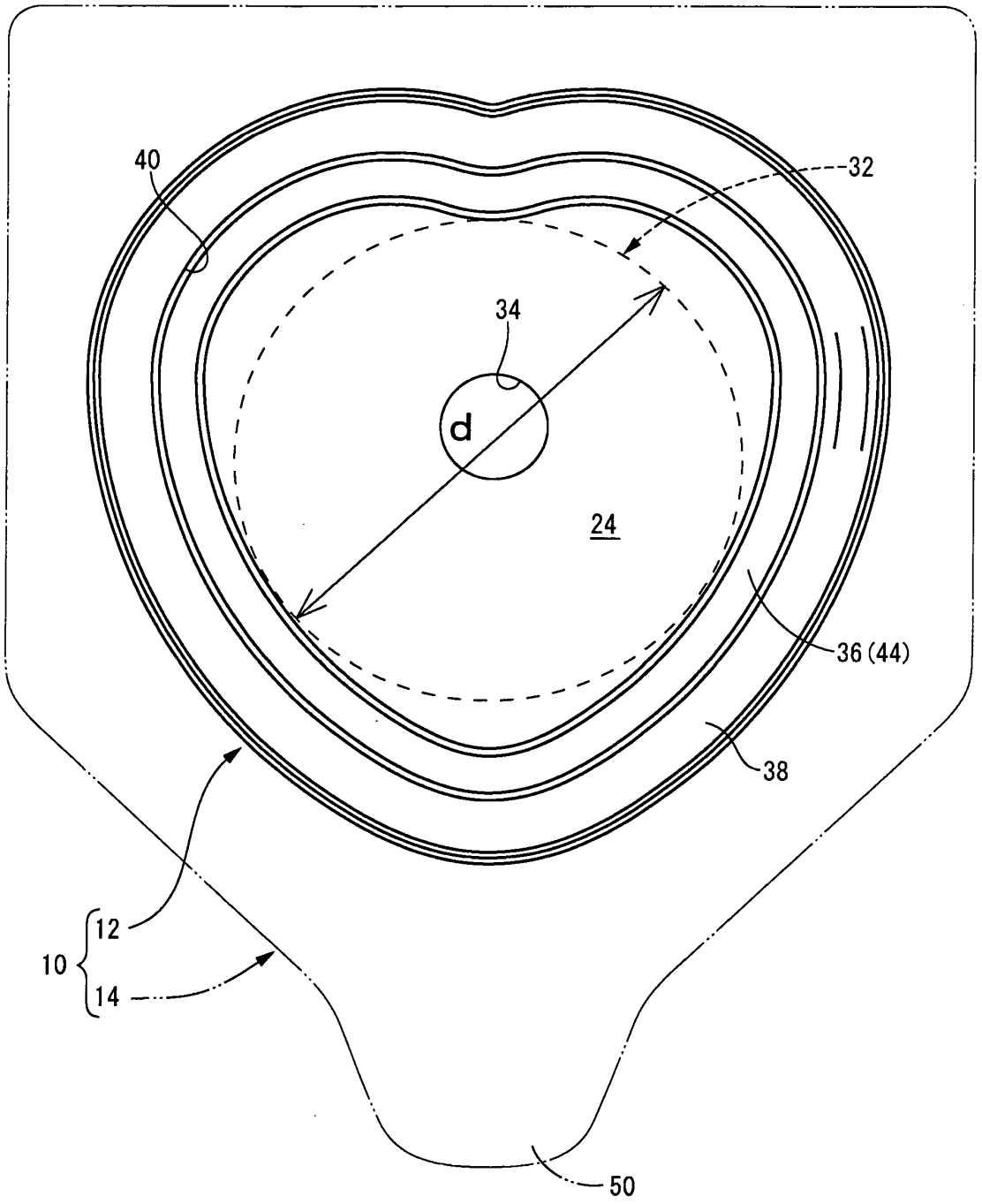


FIG.6

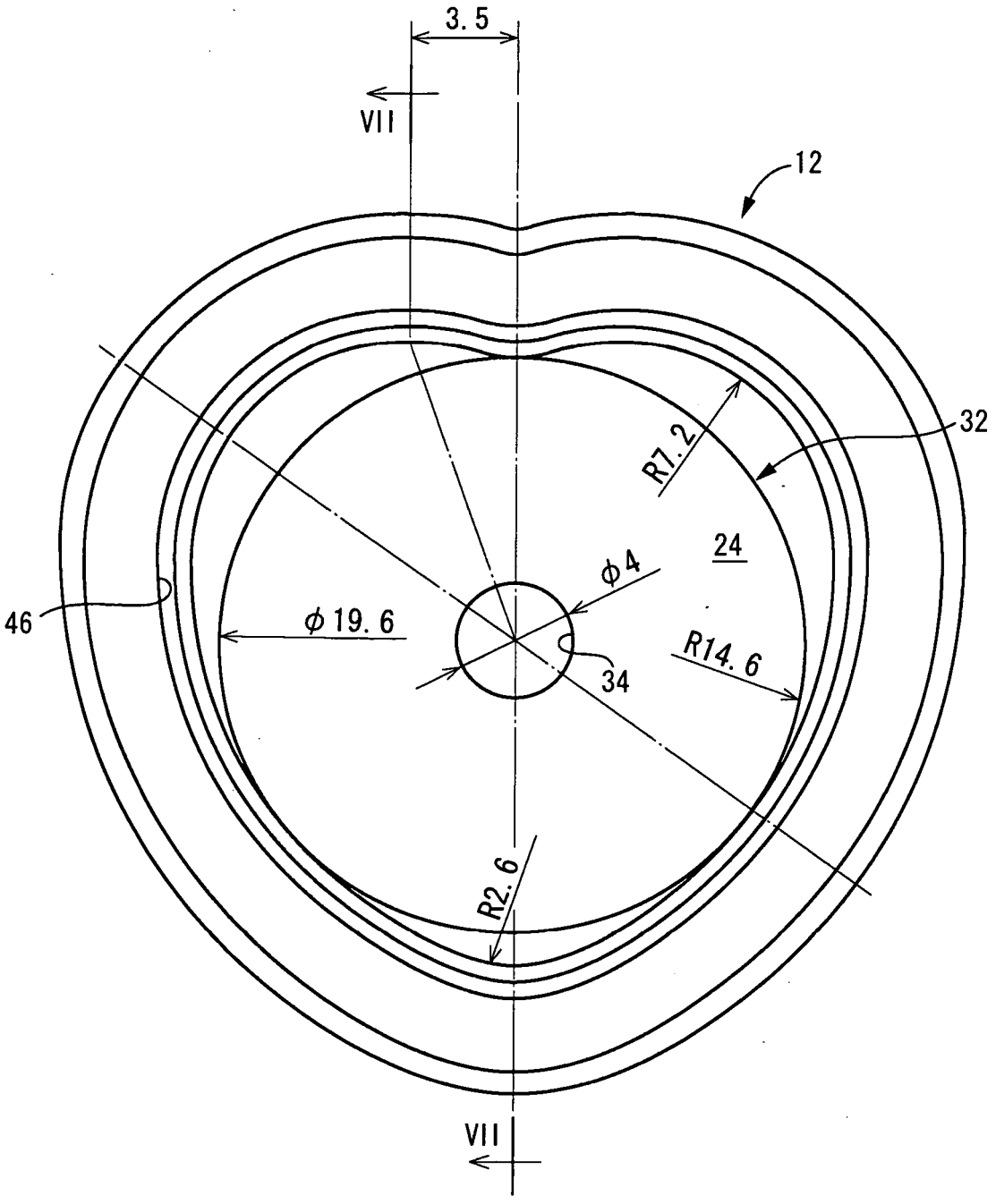


FIG.7

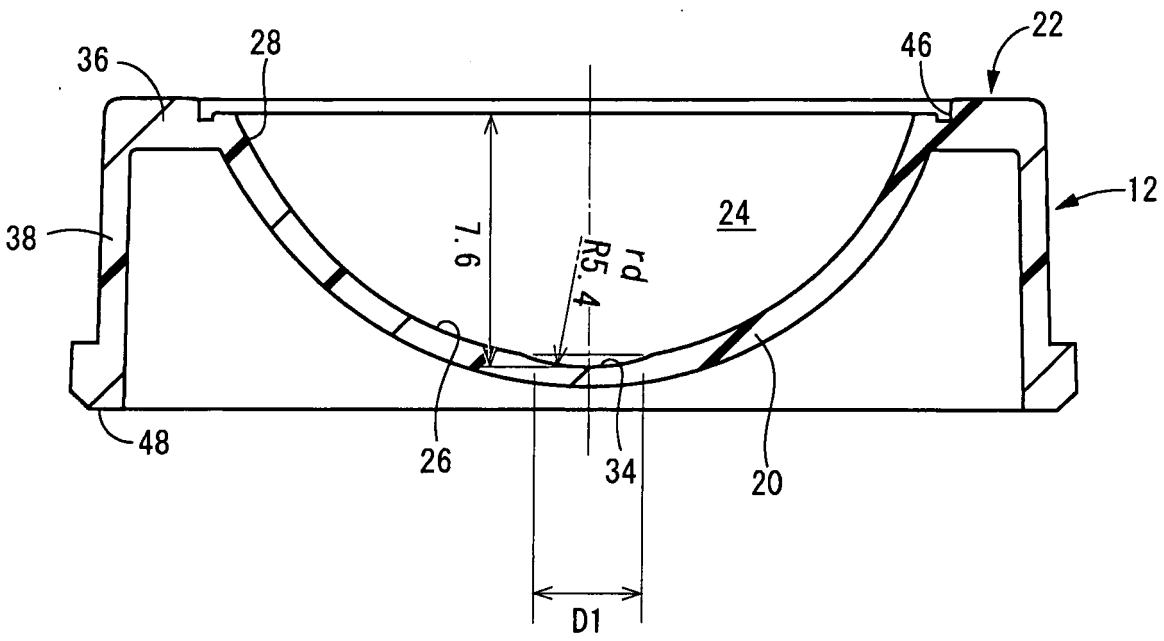


FIG.8

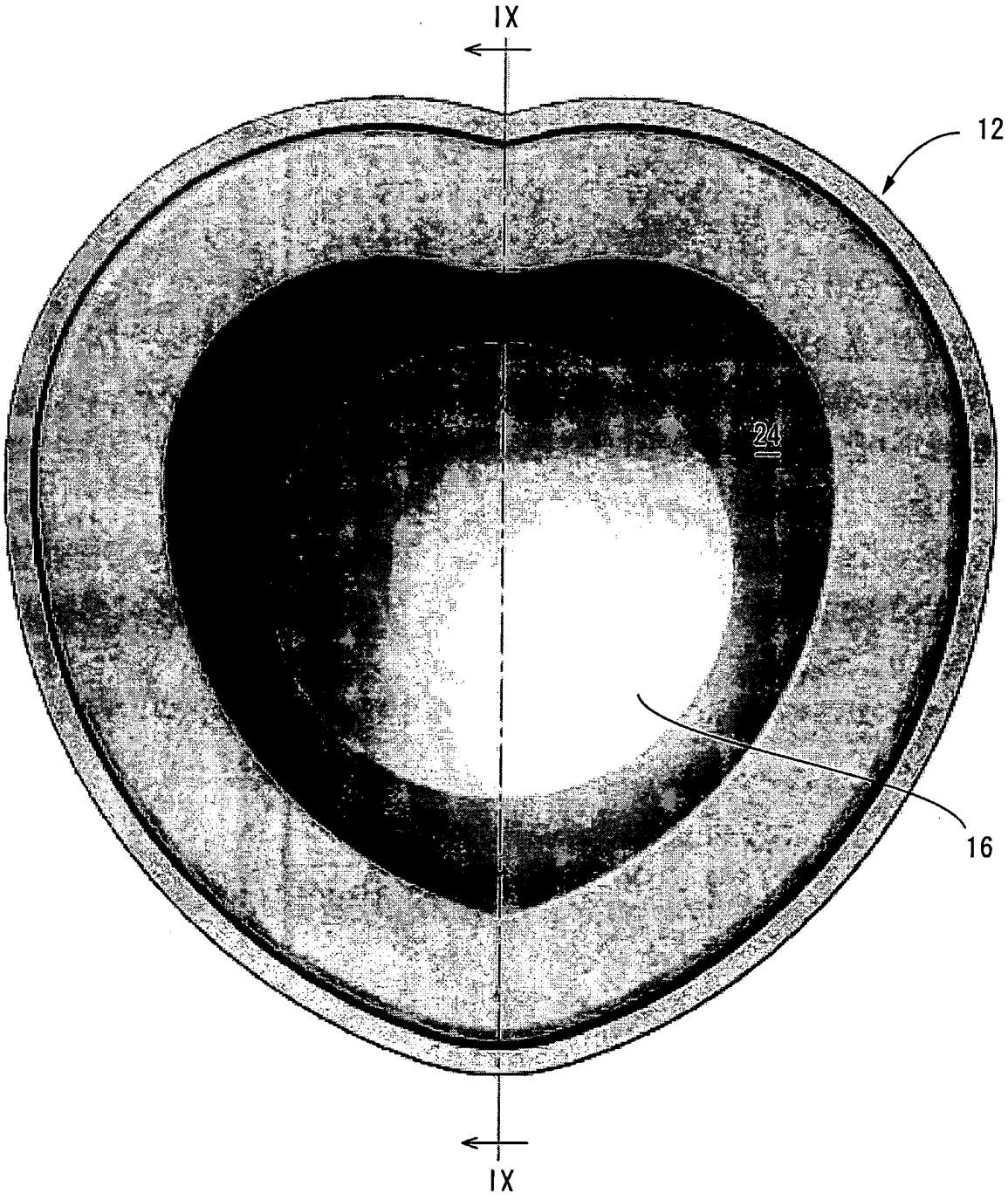


FIG.9

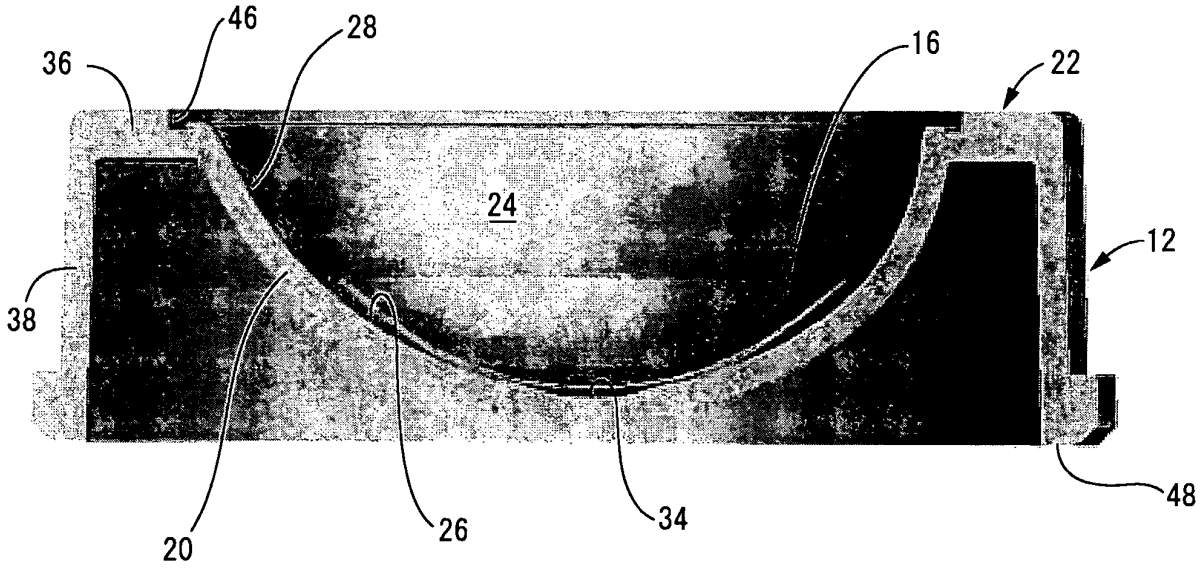


FIG.10

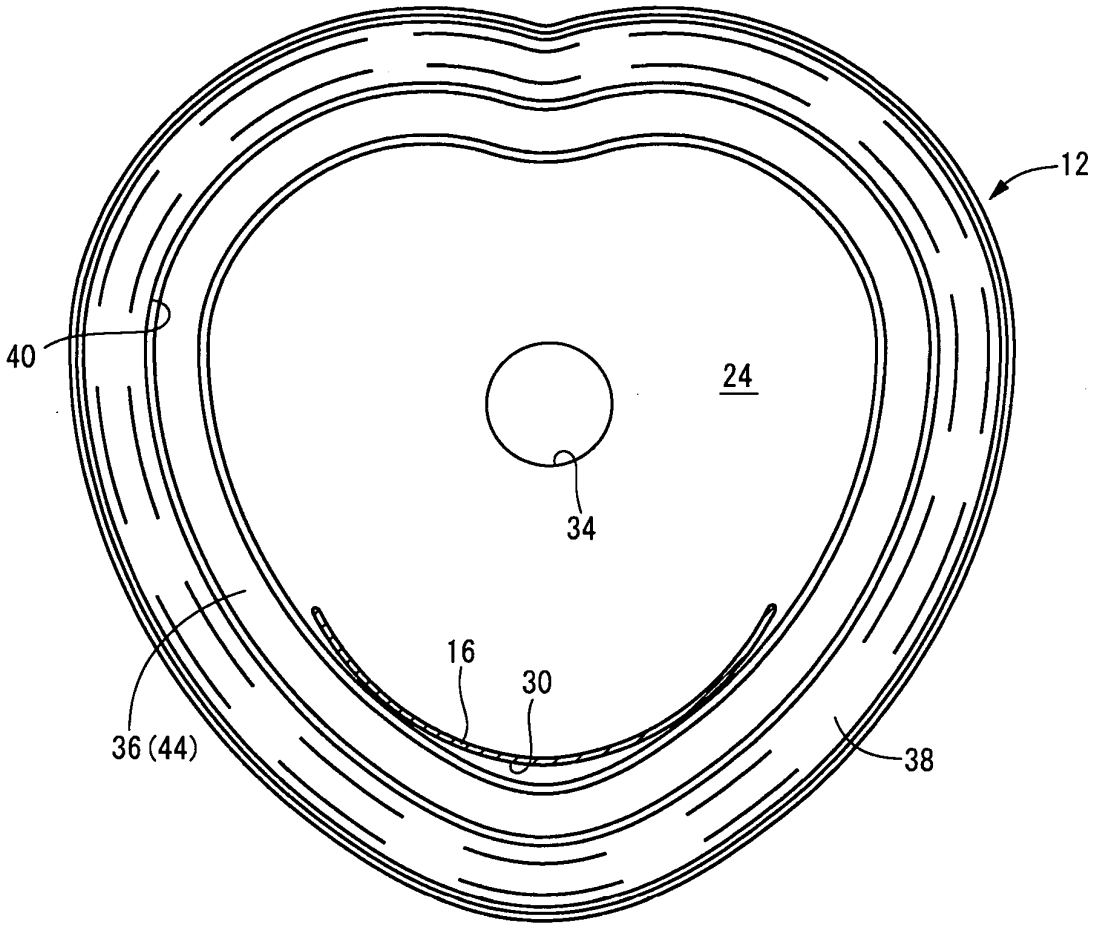


FIG.11

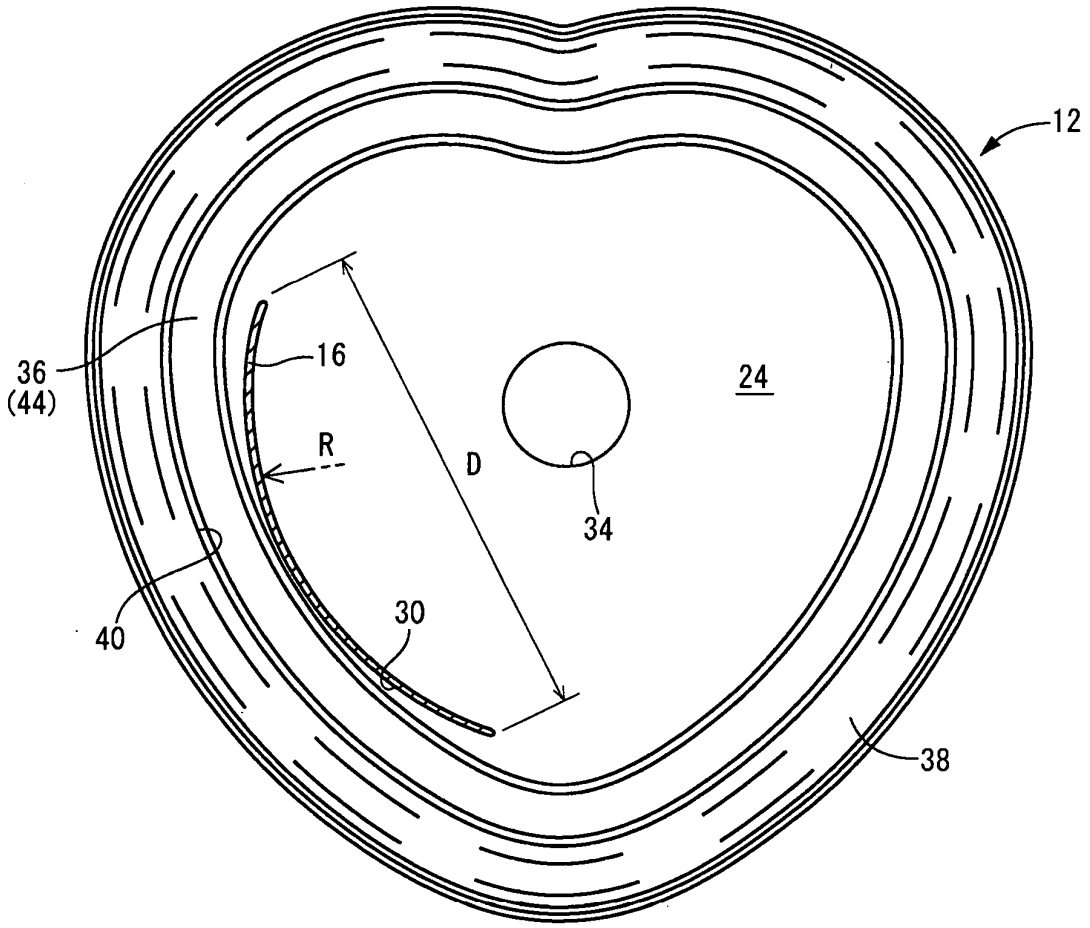


FIG.12

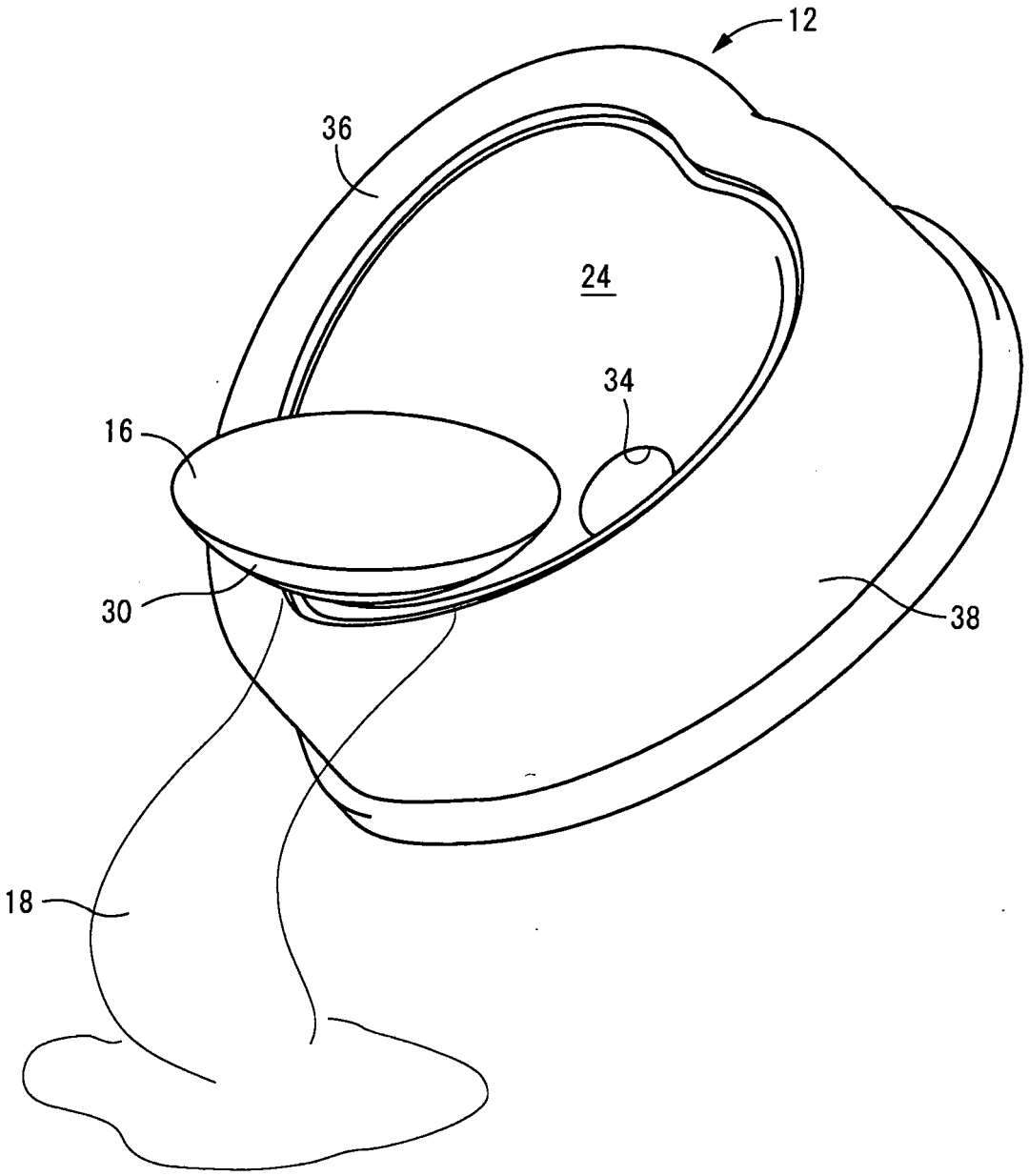


FIG.13

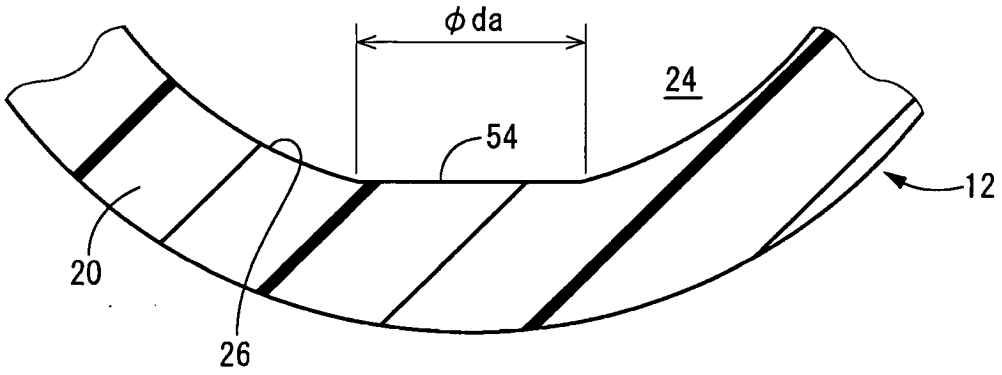


FIG.14

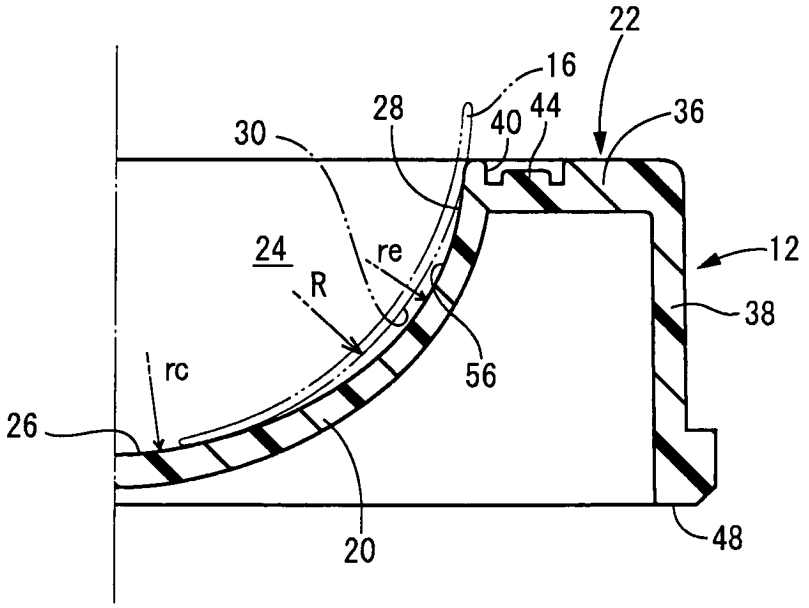
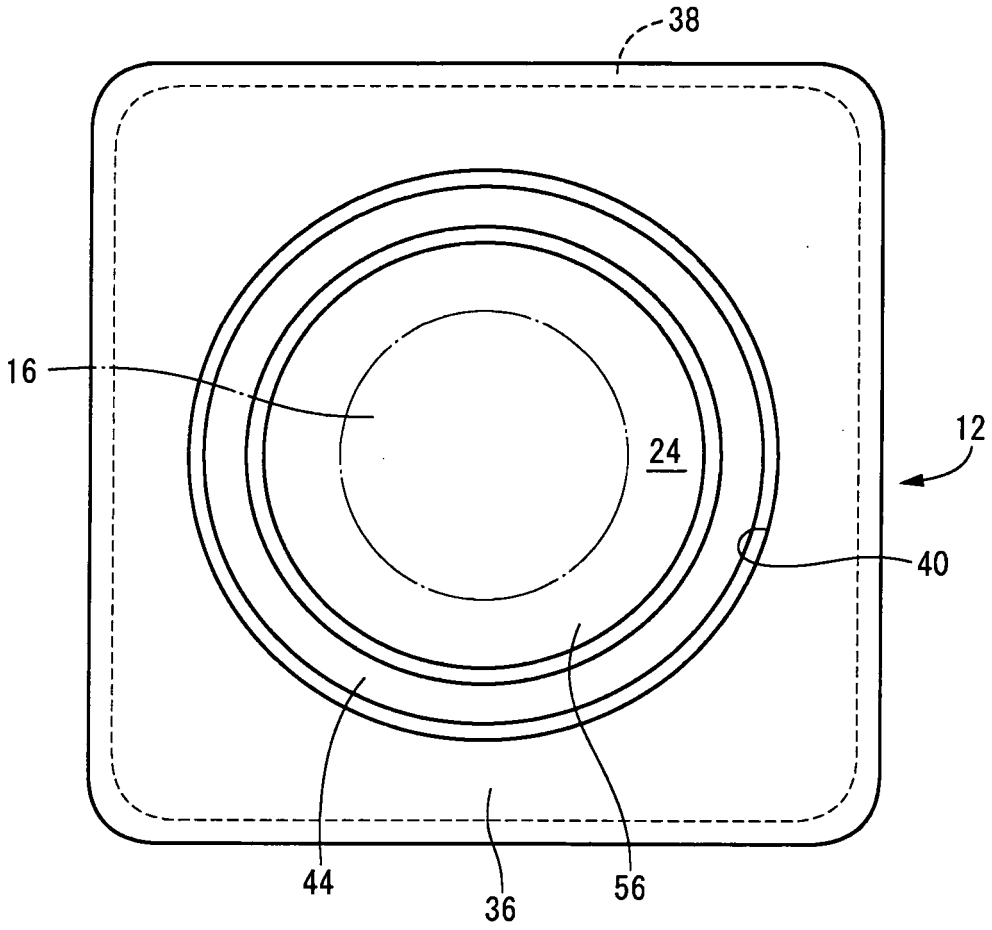


FIG.15



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/018219

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A45C11/04, G02C11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] A45C11/04, G02C11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1940-1996 Toroku Jitsuyo Shinan Koho 1994-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Jitsuyo Shinan Toroku Koho 1996-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2003-24123 A (Menicon Co., Ltd.), 28 January, 2003 (28.01.03), Full text; all drawings & US 2003-57111 A1 & EP 1277416 A2	1-14
A	JP 7-322911 A (CIBA-Geigy AG.), 12 December, 1995 (12.12.95), Full text; all drawings & US 5609246 A1 & EP 680895 A1	1-14

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
08 March, 2005 (08.03.05)	05 April, 2005 (05.04.05)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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Patent documents cited in the description

- JP 7322011 A **[0002] [0007]**
- JP 9023916 A **[0002] [0007]**
- US 6050398 A **[0002] [0007]**