

PACKAGING SEAL PLATE HAVING A SHAPED FACE

Technical Field

[0001] The present invention relates generally to the packaging of ophthalmic lenses, and more particularly to seal plates used to cover and seal blister packages during the lens packaging process. The invention also relates to seal plates used to package other goods.

Background of the Invention

[0002] Ophthalmic lenses, such as contact lenses, are often packaged in individual packages, typically known as "blister packages." A blister pack generally consists of a plastic shell defining a concave bowl adapted to house a sterile aqueous solution and at least one lens, and a laminate foil used to cover the plastic bowl and contain the solution and lens therein. Such packaging keeps the lens in a hydrated state before being opened and worn by a user. Often, a lens is contained within a blister package for a significant amount of time while the lens is being shipped and held in storage before use. Therefore, it is important that the aqueous solution be hermetically sealed therein, to ensure that the solution cannot leak out and to prevent contaminants from entering the lens containment area. One method of hermetically sealing the laminate foil to the plastic shell utilizes a heating element, or heated seal plate, to create a heat seal between the foil and the area surrounding the plastic bowl. Heated seal plates presently known and used typically include a flat face that corresponds to the area of the shell surrounding the bowl, such that a heat seal is induced where the flat plate engages and applies pressure and heat against the laminate foil/plastic shell. A known seal plate 10 can be seen in Figure 1, having a flat-face 15 for engaging the laminate foil.

[0003] Unfortunately, under certain conditions a hermetic seal is not formed between the foil cover and plastic shell, which can permit the aqueous solution to leak out of the blister package or contaminants to infiltrate the lens area. For example, droplets or moisture between the cover and seal area can create wrinkles in the foil and/or prevent the foil from properly adhering to the plastic shell. These conditions can create small channels or pathways between the foil and bowl, through which the aqueous solution may escape the blister package.

[0004] Accordingly, needs exist for improvements to ophthalmic lens packaging systems that prevent poor seals from developing between the cover and plastic shell of a blister package. It is to the provision of these needs and others that the invention of present invention is directed.

Summary of the Invention

[0005] In example forms, the present invention relates generally to a seal plate for use in sealing ophthalmic lens blister packages having a laminate foil cover and a plastic shell with a bowl for containing an ophthalmic lens and lens solution therein. The seal plate includes a heated plate body and sealing face. The sealing face protrudes from the plate body and has an irregular shape adapted to engage the laminate foil cover and displace any droplets or moisture present between the foil cover and plastic shell to induce a heat seal therebetween. The irregular shape of the sealing face permits the seal plate of the present invention to displace or "squeegee" any moisture that may be present between the foil cover and shell during the sealing process. Although described herein with reference to contact lens applications, the present invention is also suitable for packaging of food, pharmaceuticals, and/or other products.

[0006] In various embodiments, the shape of the irregular face can take a variety of forms, including with limitation: radiused; angled; having multiple tiers; comprising a grid or mesh-like pattern of raised and/or lowered channels; having recesses bored into the face; having a plurality of tracks, the tracks forming channels therebetween; and/or having one or more chamfered edges.

[0007] These and other forms, features and advantages of the invention will be understood with reference to the drawing figures and detailed description herein, and will be realized by means of the various elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following brief description of the drawings and detailed description of the invention are exemplary and explanatory of preferred embodiments of the invention, and are not restrictive of the invention, as claimed.

Brief Description of the Drawings

[0008] **FIGURE 1** shows a known seal plate configuration used to seal ophthalmic blister packages.

[0009] **FIGURES 2 and 3** show a seal plate according to a first example embodiment of the present invention.

[00010] **FIGURE 4** shows a seal plate according to a second example embodiment of the present invention.

[00011] **FIGURE 5** shows a seal plate according to a third example embodiment of the present invention.

[00012] **FIGURE 6** shows a seal plate according to a fourth example embodiment of the present invention.

[00013] **FIGURE 7** shows a seal plate according to a fifth example embodiment of the present invention.

[00014] **FIGURES 8-9** show seal plates according to additional example embodiments of the present invention.

[00015] **FIGURES 10-11** show seal plates according to still other example embodiments of the present invention.

Detailed Description of Example Embodiments

[00016] The present invention may be understood more readily by reference to the following detailed description of the invention taken in connection with the accompanying drawing figures, which form a part of this disclosure. It is to be understood that this invention is not limited to the specific devices, methods, conditions or parameters described and/or shown herein, and that the terminology used herein is for the purpose of describing particular embodiments by way of example only and is not intended to be limiting of the claimed invention. Also, as used in the specification including the appended claims, the singular forms “a,” “an,” and “the” include the plural, and reference to a particular numerical value includes at

least that particular value, unless the context clearly dictates otherwise. Ranges may be expressed herein as from “about” or “approximately” one particular value and/or to “about” or “approximately” another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another embodiment.

[00017] With reference now to the drawing figures, **Figures 2-11** depict lens packaging seal plates **20** according to example embodiments of a number of variations of the present invention. The seal plates **20** generally include a plate body **22** and a shaped or irregular sealing face **25** for engaging and applying pressure against a lens blister package to form a heat seal between a laminate foil cover and plastic bowl body. The seal plates **20** can be formed/tooled from metals including: steel, steel alloys, iron, aluminum, tin, copper, or other materials.

[00018] It has been found that by utilizing a seal plate **20** having a shaped or irregular face **25**, moisture that is present between the cover and plastic bowl can be displaced away from the seal area to improve contact and sealing between the cover and bowl. Direct contact between the cover and bowl facilitates a proper hermetic heat seal between the same. As previously mentioned, known seal plates **10**, such as shown in **Figure 1**, utilize a flat face **15** to apply heat and pressure to the laminate foil covers of the blister packages, wherein the heat and pressure from the seal face create a heat seal between the cover and plastic bowl. However, known seal plates **10**, because of their flat-faced design, are not able to displace the moisture (e.g. saline solution) that occasionally splashes onto the seal area between the foil cover and plastic shell when the lens and solution is loaded into the package. This moisture can prevent a proper heat seal from developing between the cover and shell.

[00019] In the embodiment shown in **Figures 2 and 3**, the seal plate **20A** includes a face **25A** having a cross-sectional profile incorporating a radius **R** to provide a moisture-displacing surface. In such embodiments, the radius **R** gives the

face a curved profile. The radius **R** can vary as desired by a user, wherein the curvature of the face **25A** increases as the radius decreases. For example, **Figure 3** shows a seal face having a lesser degree of curvature, whereas **Figure 2** shows a greater degree of seal face curvature. During lens packaging, the face **25A** of the seal plate **10** is pressed against the laminate foil cover, which is in turn pressed against the plastic shell, and the apex **30** of the radius **R** becomes the first surface of the face to make contact with the foil cover. As the apex **30** makes contact with the foil cover, pressure is created between the face **25A** and the foil cover against the shell along this initial line of contact. Any moisture, saline, or other aqueous solution that exists between the foil cover and shell is displaced away from the apex **30** and a heat seal is induced at this initial point of contact. As the heat seal process continues, additional pressure may be applied by the seal plate **20A** to the foil cover and shell such that a greater surface area of the face **25A** contacts the cover. Because of the radius **R** of the face **25A**, any droplets of saline or other moisture present between the foil and shell is constantly displaced or "squeegied" away from seal area as pressure is applied. The heat seal area between the foil cover and shell increases as greater pressure is applied and more of the surface of the plate face **25A** comes into contact with the foil cover against the shell. When the desired extent of heat seal has been formed between the foil cover and shell, the user can remove the face **25** from the sealed blister package.

[00020] With reference now to **Figure 4**, a seal plate **20B** according to another example embodiment of the present invention is depicted. The seal plate **20B** includes a sloped face **25B** inclined at a reference angle **A**, as seen in **Figure 4**. Angle **A** can better be defined as the angle of inclination of the contact face **25B** of seal plate **20B** and a reference plane intersecting the rim of the contact face about its periphery. Angle **A** can vary from about 0.5 degrees to about 10 degrees, for example about 1.5 degrees as depicted. The inclination can be inward or outward. The sloped face **25B** of the present embodiment incrementally contacts the laminate foil cover/plastic shell as greater pressure is applied by the heated plate **20B** between the foil cover and shell. As a greater surface area of the face **25B** contacts and applies pressure against the foil cover/shell, any moisture that is present

between the foil cover and shell is displaced or “squeegied” away from seal area, such that a proper hermetic heat seal is induced.

[00021] Another example embodiment of a seal plate **20C** is shown in **Figure 5**. The seal plate **20C** includes a tiered face **25C** having an upper tier **40** and lower tier **42**. In commercial embodiments, each tier **40,42** occupies about one-half of the face's **25** surface area, although in other example embodiments, this percentage can vary. Provision of two or more tiered surfaces **40,42** provides a channel or outlet for any moisture to escape to when the face **25C** is pressed against the laminate foil/plastic shell during the packaging process. For example, when the face **25C** first contacts the laminate foil, only the upper tier **40** is pressed against the foil and a gap exists between the lower tier **42** and the foil. Any moisture that is present between the foil and bowl will be squeezed beyond the seal area or into this gap, ensuring that a heat seal is induced between the foil cover and bowl. As the face **25C** is further pressed against the foil/bowl, any moisture that may have collected within the gap can be squeezed beyond the seal area. Even if all of the moisture is not squeezed out of this gap, a sufficient heat seal will have been induced between the foil cover and bowl along the area first contacted by the upper tier **40** of the face **25C**. In alternative embodiments, the face **25C** can include three or more stepped tiers.

[00022] **Figure 6** depicts still another seal plate **20D** according to an example embodiment of the present invention. In this embodiment, the seal plate **20D** includes a mesh or grid-like sealing face **25D**. The grid-like face **25D** comprises raised grid lines **50** in a cross-hatched pattern that define recessed channels or cavities **52** therebetween. The number of recesses **52** and grid lines **50** can vary. As the seal plate **20D** is pressed against the laminate foil cover a heat seal is induced along the grid lines **50** and any moisture present between the cover and plastic bowl is displaced into pockets formed by the recesses **52**. In this manner, a hermetic heat seal can still be formed between the foil cover and plastic shell, despite any droplets or moisture that may be present between the cover and shell along the seal area.

[00023] Another embodiment of a seal plate **20E** is shown in **Figure 7**. This seal plate **20E** contains a plurality of recesses **60** bored into the face **25E** of the plate. In various embodiments, the recesses **60** can be cube-shaped, as depicted, or can be triangular, rectangular, circular, or otherwise. The recesses **60** trap and collect any droplets or moisture present between the foil cover and plastic shell when the seal plate **20E** is pressed against the same.

[00024] **Figures 8 and 9** depict a seal plate **20F** according to still other example embodiments of present invention. The seal plate **20F** comprises a plurality of seal tracks **70** along the face **25F**, in the form of ridges extending around the periphery of the sealing face. The tracks **70** further define channels recesses **72** therebetween. The number of seal tracks **70** can vary, although in example embodiments, the number of seal tracks **70** per plate **20F** ranges between two and five tracks. The tracks **70** induce multiple heat seal lines between the foil cover and plastic shell, and displace any droplets or moisture that may exist between the two into the recesses or channels, between the cover and shell that correspond to the recesses **72**. The tracks **70** can comprise flat profiles (as seen in **Figure 8**) or rounded profiles (**Figure 9**). In other embodiments, the tracks are pointed, toothed, or otherwise shaped.

[00025] In further embodiments of the present invention, the seal plate **20G** comprises a face **25G** having one or more chamfered edges **80**, as shown in **Figures 10 and 11**. The chamfered edges **80** displace droplets or moisture from the seal are between the foil cover and the plastic shell during the packaging process.

[00026] While the invention has been described with reference to preferred and example embodiments, it will be understood by those skilled in the art that a variety of modifications, additions and deletions are within the scope of the invention, as defined by the following claims.

CLAIMS

1. A seal plate (20D, 20E) for use in sealing ophthalmic lens blister packages having a laminate foil cover and plastic shell defining a bowl for containing an ophthalmic lens and lens solution therein, the seal plate comprising:
 - a heated plate body (22); and
 - a sealing face (25D, 25E) protruding from the plate body (22),wherein the sealing face (25D, 25E) has an irregular shape,
 - wherein the irregular shape includes a plurality of recesses (52,60) in the sealing face (25D, 25E); and
 - wherein the plurality of recesses (52,60) are arranged over the entire width of the sealing face (25D,25E)
 - wherein the sealing face (25D, 25E) engages the laminate foil cover and displaces moisture present between the laminate foil cover and the plastic shell in a sealing area around the bowl to induce a hermetic heat seal therebetween.
2. The seal plate (20D) of claim 1, wherein the irregular shape comprises a cross-hatched grid (25D).
3. The seal plate (20E) of claim 1, wherein the recesses (60) are bored into the sealing face (25E).