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Ulmer et al.

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[54] **SOFT CONTACT LENS CASE**

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[52] **U.S. Cl.** **206/5.1,** 134/137, 206/205

[51] **Int. Cl.** **A45c 11/04,** B08b 3/04

[58] **Field of Search** ..... 206/5 A, 38 V, 56 C; 134/137

[56] **References Cited**

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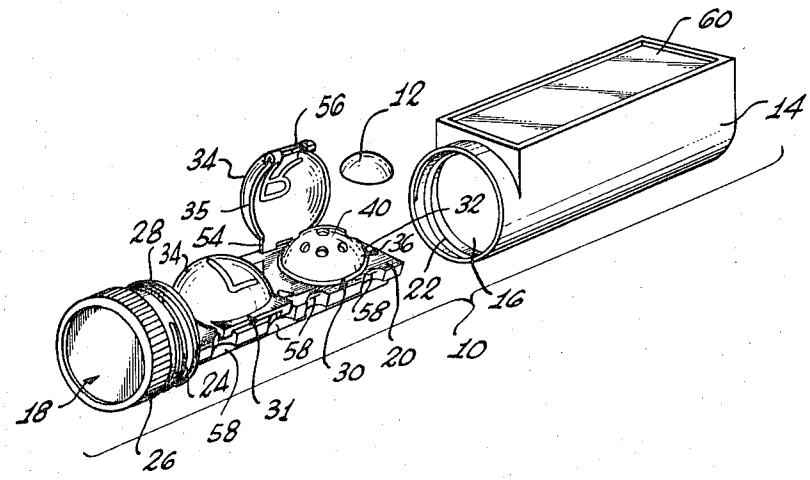
Primary Examiner—Leonard Summer

[57] **ABSTRACT**

A case for storing soft contact lenses, usually in a liquid which cleans and sterilizes the stored lenses, comprising a container having a threaded, fluid-tight closure cap, a base plate on the cap insertable in the container as the cap is placed on the container, and two upwardly opening compartments in the base plate for receiving two lenses, each compartment containing a perforated hemispherical lens support that is mounted in the compartment for movement between a lowered, retracted position and a raised, extended position. A hinged cap covers each compartment and is releasably latched in a closed position over the lens support, which is movable to the raised position by means of a push button extending through the underside of the base. A lost-motion connection limits the back and forth motion of each lens support, and the cover cups are held in spaced relation with the base and with the lens supports, when closed, to prevent damage to lenses on the supports.

12 Claims, 7 Drawing Figures



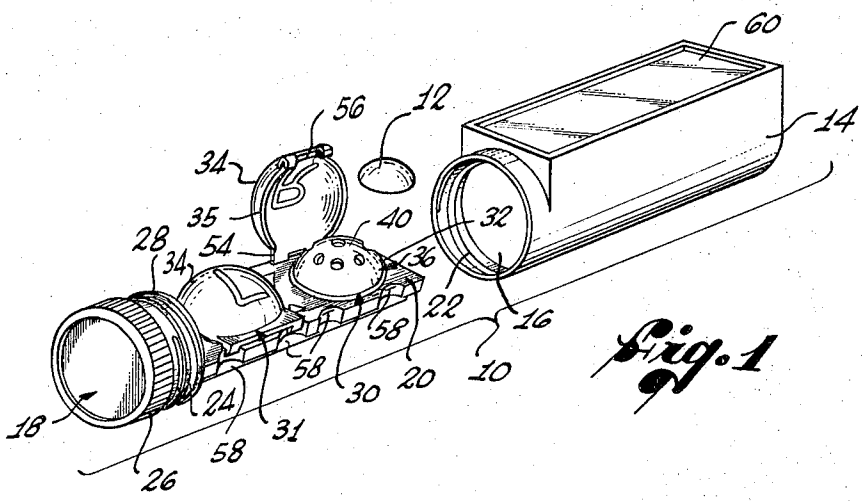


Fig. 1

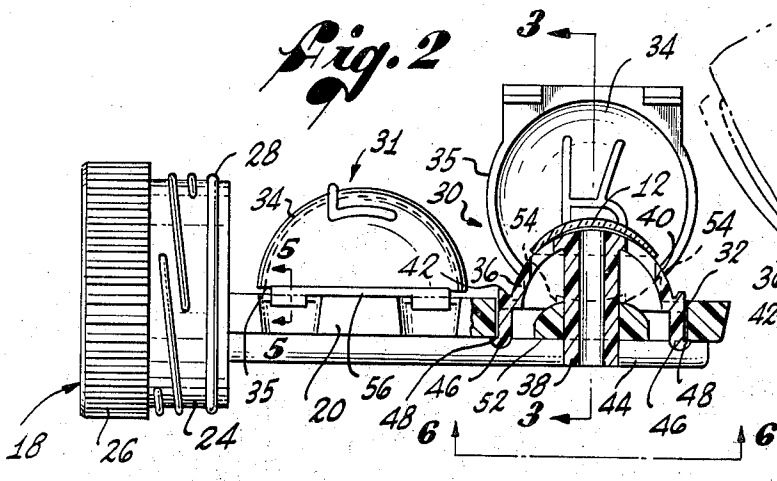


Fig. 2

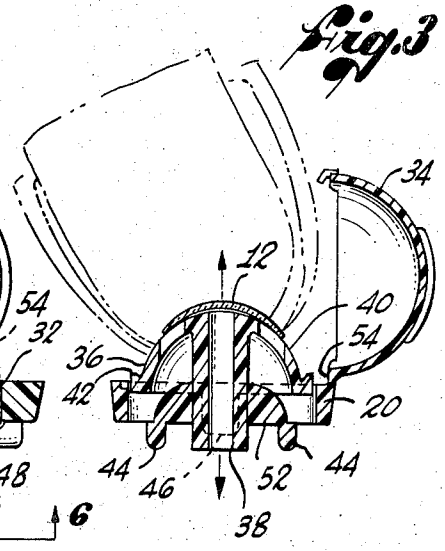


Fig. 3

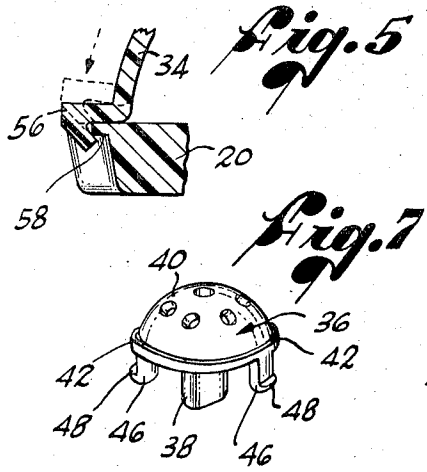


Fig. 5

Fig. 7

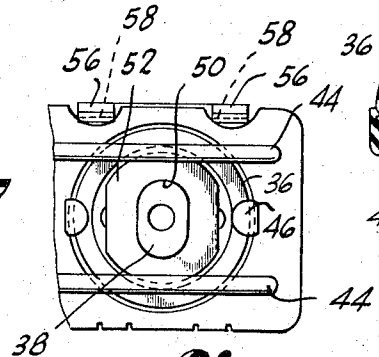


Fig. 6

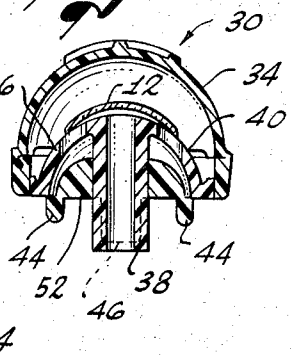


Fig. 4

SOFT CONTACT LENS CASE

BACKGROUND OF THE INVENTION

This invention relates to a case for storing contact lenses, and more particularly to a storage case that is specially designed to hold plastic hydrophilic contact lenses, popularly referred to as "soft" lenses.

Many different types of cases have been available for the storage of "hard" contact lenses, and typically have provided two covered pockets or recesses in which two lenses can be stored. In some instances, there has been a common cover for the two pockets, and in others, the pockets have had individual covers.

One conventional storage case shown in U.S. Pat. No. 3,025,950 has two compartments that are formed by recesses spaced apart along an elongated plate, and two covers that are connected to the plate by hinge straps permitting the covers to swing between open and closed positions and to be latched against the plate in the closed positions. The plate is insertable in a cup-shaped container, and is carried by a base for closing the open end of the container.

This general approach is well suited for use with soft contact lenses, which should be stored in cleaning or sterilizing liquid that can be held in the container. One of the problems with soft lenses, however, is their susceptibility to damage. There is a danger of inadvertent pinching of the lenses by the covers of the compartments as the latter are closed, and also a danger of damage during removal of the lenses from the compartments. Moreover, such removal can be difficult because of the slippery and difficult to grip nature of soft lenses.

Another special problem with soft lenses is their characteristic property of absorbing relatively large amounts of the soaking or sterilizing solution, and the resulting tendency to concentrate compounds from the solution. If the solution tends to dissolve coloring matter from the case, or the material of the case itself, these substances can be concentrated in quantities by the lenses, even though the concentration in the solution may be non-toxic.

SUMMARY OF THE INVENTION

The present invention provides a lens storage case that avoids the foregoing problems by storing the lenses in covered compartments which eliminate the danger of pinching of the lenses, make it possible to grasp each lens quickly and easily for removal from its compartment, and is composed of material which is non-discoloring and non-toxic, even after prolonged exposure to cleaning and sterilizing fluid.

For these purposes, the storage case of the invention, as illustrated in the preferred embodiment shown herein, comprises a container with a fluid-tight closure, and a base in the form of a plate that is insertable in the closure and has two recesses that normally are closed by hinged covers, and in which two lens supports are mounted for limited movement relative to the base plate between lowered, retracted positions and raised, extended positions. Each lens support is shaped to hold a lens in a retracted position inside the recess when the support is retracted, and to shift the lens out of the compartment into an easily accessible position when the support is extended, and is movable to the extended position by means accessible from outside the compartment.

When closed, the covers are spaced from the lens supports far enough to prevent damaging contact between the covers and the lenses even if a support should be extended inadvertently while the cover is closed, and are mounted on and latched to the base in a manner which leaves an annular gap between the cover and the base. This gap prevents pinching of a lens that might slip into a position between the edge of the cover and the base.

More specifically, the lens supports are formed with hemispherical supporting surfaces which support the lens in a substantially physical stress-free condition; a lens may be easily removed therefrom when a support is extended. The supports are mounted with close sliding fits in holes of circular cross-section in the base plate and retained in the holes by a lost-motion connection which determines the raised and lowered positions. A pin extends downwardly through the base plate from each support and is exposed on the lower side thereof to serve as a push-button actuator for each support.

Extending around the periphery of each support is an annular reatining groove that is bounded by an upstanding annular lip for preventing lenses from slipping off the support. The supports are perforated to cooperate with the cover gaps in providing a high degree of circulation of liquid through the compartment for proper sterilization and to facilitate cleaning and act to prevent the lenses from possibly adherring to the upper surfaces of the supports due to surface tension.

Suitable non-toxic, non-discoloring materials for the case are olefin polymers such as high-density polyethylene and polypropylene. A seal ring preferably is provided between the container and the closure, and also should be composed of non-toxic, non-discoloring material. Suitable materials for sealing rings include neoprene elastomers (polymers of 2-chlorobutadiene-1,3), certain silicones and teflon, although other materials also may be used.

Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of a lens case embodying the novel features of the invention, the case being shown with the closure and the base plate removed from the container with one lens cover in the open position and the associated lens support raised, and with a representative lens overlying the raised support;

FIG. 2 is an enlarged side elevational view of the closure and the base plate, partly broken away and shown in cross-section;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 3 with the cover closed and the lens support lowered to the retracted position;

FIG. 5 is an enlarged fragmentary cross-section taken along line 5—5 of FIG. 2;

FIG. 6 is a fragmentary bottom plan view taken from the direction of line 6—6 of FIG. 2; and

FIG. 7 is a perspective view of one of the lens supports.

DETAILED DESCRIPTION

As shown in the drawings for purposes of illustration, the invention is embodied in a case **10** for holding a pair of contact lenses when the lenses are not in use, and for soaking the lenses in a cleaning or sterilizing solution as an incident to such storage. In general, the case comprises a container **14** having an open end **16**, a cap **18** for closing and sealing the open end, and a lens-supporting base plate **20** mounted on the cap for insertion in and removal from the container as an incident to the closing and opening of the container.

In this instance, the container **14** has an internally threaded neck **22** defining the open end **16**, and the cap **18** has an externally threaded, generally cylindrical plug **24** which fits snugly into the neck **22**, and a knurled head **26** with which the cap is gripped and held. An O-ring **28** is carried in a groove around the plug to provide a fluid-tight seal between the plug **24** and the neck **22**.

The base plate **20** is joined at one end to the inner end of the plug **24** and projects into the container from the plug when the latter is in the neck. The plate is generally parallel to the axis of the plug, and is offset somewhat to one side of this axis, downwardly as viewed in the drawings.

To support a contact lens **12** on the base plate, the latter has two longitudinally spaced compartments **30** and **31**, each comprising a recess **32** in the base plate, a cover **34** overlying the upper side of the recess and movable relative thereto between open and closed positions, and a lens support **36** in the recess for holding a lens therein. Each of the covers is an inverted, preferably hemispherical cup which is joined to the top of the base plate along one side thereof by a hinge, and has a latch on the opposite side for holding the cover releasably in a closed position over the associated recess.

In accordance with a primary aspect of the present invention, each lens support **36** is shaped and mounted to hold a lens **12** in a protected and secure position within the compartments **30, 31**, and at the same time, to facilitate the removal of a lens from one of the compartments in a quick and easy manner. For these purposes, each support is movable in the associated recess between a lowered, retracted position in which the lens **12** is held well below the cover **34**, and a raised, extended position in which the lens is held well above the top of the base plate so as to be easily removed from the support when the cover is open. A lost-motion connection between the base and the lens support permits limited lowering and raising motion while retaining the support in the recess, and the support is moved by means of a pin **38** which projects through the base plate **20** and is accessible from the underside thereof.

As shown most clearly in FIGS. **2** through **7** the recesses **32** herein are circular in cross-section and extend completely through the base plate **20**, and the lens supports **36** are inverted cups that are fitted in the recesses with close sliding fits. The supports have convex hemispherical upper surfaces **40** for receiving and holding the lenses **12**, in the manner shown in FIGS. **2** through **4**, preferably are perforated in the areas beneath the lenses, for liquid circulation and to avoid any chance of sealing of a lens to the support, and have upturned annular lips **42** around the periphery of the surfaces **40** defining grooves for catching and holding a lens that might slip off the central area.

A pair of laterally spaced, longitudinal bars **44** are secured to the underside of the base plate to extend across the open sides of the lower sides of the recesses. These bars form stops for limiting downward motion of the supports, and thus determine the retracted positions.

Extending downwardly along the wall of the recess **32** from the underside of the lower peripheral edge of each support are plurality of fingers **46**, herein two, which have outwardly turned tabs **48** on their lower ends. These tabs are spaced from the underside of the base plate when the support is in the retracted position, as shown in FIG. **4**, and engage the underside as the support is raised, as shown in FIG. **2**. Thus, the fingers and the bars form the lost-motion connection between each support **36** and the base plate **20**.

The pin **38** of each lens support **36** is joined to the underside of the latter at the center, and projects downwardly therefrom a distance substantially greater than the radius of the support, to project well below the base plate **20** and the bars **44** when the support is in the retracted position. To stabilize the lens support, the pin is non-circular in cross-section and is guided for up-and-down sliding in a non-circular hole **50** in a washer **52** that extend between and is secured to the two bars **44**. The pin **38** is preferably hollow to provide for improved communication of lens fluid to the lens.

For economical manufacture, each lens support may be made of suitable plastic as a one-piece molding including the hemispherical cup, the fingers **46** and the hollow pin **38**; the plug **24**, the base plate **20**, the covers **34** and the bars **44** and the washers **52** also may be molded in one piece. Assembly of the lens supports **36** into the recesses **32** is accomplished simply by fitting each support into the top of the recess, aligning the pin **38** with the guide hole **50**, and pressing the support downwardly into place. The lower ends of the fingers **48** are rounded so as to be deflected inwardly during assembly, and to snap resiliently outwardly after passing the bottom of the base plate.

Another feature of the present invention is the manner of mounting the covers **34** on the base plate for movement between the open and closed positions to minimize the danger of pinching the edge of a lens that accidentally slips into the area beneath the lower edge **35** of the cover, despite the presence of the retaining lip **42**. To this end, the edge **35** of each cover is spaced above the top of the base plate when the cover is closed, and both the hinge and the latch are positioned as far as is practical from the edge of the support.

More specifically, the hinge comprises two integral straps **54** that are spaced apart longitudinally of the base and thickened on the undersides (when the cover is closed) to form pads that are offset downwardly from the edge of the cover. These pads engage the base plate while the edge is spaced from the base plate.

Similarly, the latch is formed by two integral hooks on the side of the cover opposite the hinge, and each hook comprises a pad **56** that is disposed below the edge **35**, as shown most clearly in FIGS. **2, 3** and **5**, and a resilient latch finger that is downwardly and inwardly inclined from the free end of the pad. As the cover is closed, the latch fingers engage the top of the base plate adjacent two semi-circular notices **58** in the edge of the plate, and yield to pass over the edge and into the notches. Then, after the ends of the fingers clear two thin ribs extending across the tops of the notches, they

snap back to their normal condition in interlocked relation with the ribs.

Since both the hinge straps and the latch hooks are spaced apart longitudinally of the base plate, and their engagement with the base plate is limited to the area of the pads **54**, and **56**, the possibility of pinching a lens between the cover and the base plate is limited. This factor, combined with the retaining lip **42** on each lens support, makes it highly unlikely that a displaced lens could be damaged by pinching.

To prevent discoloration or other injury to the lens as well as to prevent the lens from harming the eye of the wearer, it is important that the lens case be made from materials which will not release toxic materials which could concentrate in the lens. We have found that the contact lens cases made from olefin polymers such as high density polyethylene, e.g., "Marlex" available from Phillips Petroleum Co. are satisfactory. The preferred embodiment employs a sealing ring to insure a fluid-tight seal. It has been found that the selection of sealing rings must be carefully made because of their tendency to discolor the lens and also render the lens toxic to the eye of the user. For example, we have found that sealing rings made from certain medical grade Buna and silicone rubbers both cause corneal damage and conjunctival irritation to the eyes of test rabbits and that a sealing ring made from Buna-N rubber stains the soft lenses. We also have found that sealing rings made from neoprene elastomers (polymers of 2-chlorobutadiene-1,3) and teflon are non-discoloring and non-toxic. Additionally, sealing rings made of Buna-N rubber previously extracted from chloroform have been found to be non-staining and non-toxic. Other materials may also be used.

Further additions and modifications for convenience include adapting a portion of the outside surface of container **14** to hold a mirror **60** to facilitate insertion of the contact lens into the eye of the wearer. The visible portions of covers **34** also may be provided with marking indicia R and L for distinguishing between right and left lenses; color indicia also may be used.

The foregoing contact lens carrying case provides a convenient pocket size means for storing contact lenses and especially soft contact lenses in such a manner as to allow them to be cleaned and sterilized while being safely stored in covered compartments which eliminate the danger of pinching of the lenses. Features provided by the carrying case make it possible to grasp each lens quickly and easily for removal from its compartment. Finally, the carrying case may be composed of material which is non-discoloring and non-toxic, even after prolonged exposure to cleaning and sterilizing fluid.

While one form of the invention has been shown, it is apparent that changes therein will readily suggest themselves to those skilled in the art without departure from the spirit and scope of the present invention.

We claim:

1. A contact lens case for use in cleaning and storing soft contact lenses and having, in combination:

a hollow container having an open end;

a closure for said container attachable to said open end in fluid-tight relation therewith;

an elongated base mounted on said closure and extending into said container, said base having at least two longitudinally spaced, generally cylindrical recesses formed in one side thereof in side-by-side relation;

a hemispherical cup disposed over each of said recesses;

a hinge between one side of each cup and said base, pivotally securing the cup to the base for swinging into and out of a closed position;

a latch for releasably securing each cup to said base in said closed position;

a lens support disposed in each of said recesses and having a convex hemispherical side facing toward the cup to receive and hold a lens, each of said lens supports having a circular peripheral edge fitting slidably in a recess, and being movable between a lowered position within the recess and a raised position in which said hemispherical side projects out of the recess;

a lost-motion connection between each lens support and said base limiting sliding motion; and

means accessible from the side of said base opposite said covers for manually moving each lens support to said raised position for removal of a lens on the lens support.

2. The contact lens case of claim **1** wherein each lost-motion connection comprises at least two fingers on each of said lens supports extending through the recess of the opposite side of said base, first abutments on said fingers engageable with said base to stop motion of the lens supports in said raised position, and second abutments on said base engageable with the lens supports to stop motion of said lens supports in said lowered position.

3. The contact lens case of claim **1** wherein said accessible means are pins on said lens supports extending through said base and beyond said opposite side thereof when the supports are in said lowered positions.

4. The contact lens case of claim **1** wherein a substantial portion of the leading peripheral edge of the hemispherical cup is recessed such that a substantial portion of said edge does not contact the base when said cup is latched.

5. The contact lens case of claim **1** wherein the hollow container has a partially mirrored outside surface.

6. A storage case for contact lenses having, in combination:

a hollow container having an open end;

a closure for said container attachable to said open end in fluid-tight relation therewith;

an elongated base plate secured at one end to said closure and disposed in said container when said closure is attached to said open end, said base plate having two longitudinally spaced holes of generally circular cross-section therethrough;

a hemispherical cover disposed over each of said openings and having a circular edge;

two flexible hinge straps joining said cover to said base plate along one longitudinal edge thereof, said hinge straps being spaced apart longitudinally of said base plate and having first pads thereon offset from said circular edge to hold the latter in spaced relation with the base plate when the cover is closed;

two resilient latch hooks on the side of said cover opposite said hinge straps, said latch hooks being spaced apart longitudinally of said base plate and having second pads thereon offset from said circular edge to cooperate with said first pads in holding

the circular edge in sapced relation with the base plate; said base plate having notches in one edge for receiving said hooks, and latching ribs over said notches for interfitting with said hooks to latch the cover in the closed position;

a hemispherical lens support disposed in each of said holes with a close sliding fit, and having a convex supporting surface facing toward the associated cover, a plurality of fingers depending from each said support and extending through the base plate away from the cover and having abutments for engaging the base plate to limit sliding of the lens support toward the cover, and a pin secured to the support and extending through the recess and beyond the base plate;

stop bars extending across the end of each recess opposite the cover to limit sliding of the lens support away from the cover;

and guides carried by said stop bars and having holes therein through which said pins project, said guides and said stop pins being non-circular to stabilize said lens supports in said recesses.

7. The storage case of claim **6** in which said closure, said base plate, said covers, said hinges, said latch hooks, said stop bars and said guides are formed as an integral, one-piece plastic molding.

8. The storage case of claim **7** in which each lens support, including said fingers and said pin, is formed as an integral one-piece plastic molding.

9. The storage case of claim **6** wherein the closure includes a sealing ring, said sealing ring comprising a non-toxic, non-lens-coloring polymer.

10. The storage case of claim **6** wherein the hollow container comprises a non-toxic, non-lens-coloring polyolefin.

11. The storage case of claim **10** wherein the closure includes a sealing ring, said sealing ring comprising a nontoxic, non-lens-coloring neoprene elastomer.

12. The storage case of claim **6** wherein the hollow container has a partially mirrored outside surface.

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