METHOD FOR FINISHING CONTACT LENSES

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ABSTRACT OF THE DISCLOSURE

A suction-type, motor driven, lens holder rotated on the lens axis and exposing the concave face and periphery of the edge of the lens to a finishing pad during lens rotation. A motor-driven finishing pad reciprocating in the plane of the lens axis against the edge of the spinning lens and, while reciprocating, being bodily moved in the lens axis plane and around the edge from the convex to the concave surface of the lens.

Background and description

This invention relates generally to means and methods for polishing lenses and more particularly to means and a method for polishing the edge portions of contact lenses to obtain the optimum comfort for the wearer.

At the present time, the difficulty, if not impossibility, of obtaining an accurate measurement or indication of the precise contours of the cornea of the human eye makes the proper fitting of contact lenses more of an art than a science. Yet a quick achievement of a correct and comfortable fit of contact lenses is an important object of those working in the art, and of this invention.

A further object of the invention is to provide a method whereby the edges of contact lenses can be finished to such a degree that they can be fitted more satisfactorily to the individual wearer, and so that the time which is required by the wearer to become accustomed to the use of contact lenses is minimized.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

Fig. 1 is a top plan view illustrating the apparatus in use according to the method of this invention.

Fig. 2 is a section taken along the line 2—2 in Fig. 1 and viewed in the direction of the arrows.

Fig. 3 is an enlarged section through the lens itself showing typical cross sectional features thereof and showing a polishing member of greater relative proportion than that of Figs. 1 and 2.

Fig. 4 is a fragmentary section taken and viewed as Fig. 2 but representing a different type of polishing member and motion.

Referring now to the drawings in detail, a contact lens is mounted by means of suction to the upper end of a rubber lens holder 13, secured in a frame 14 mounted to a spindle 16 driven by a motor 17. By first collapsing the bulb portion 18 of the holder before setting the lens on the upper end thereof, and then setting the lens thereon and releasing the bulb portion, the pressure differential across the lens caused by the tendency of the bulb to return to its original configuration, serves to hold the lens securely on the holder. Thereupon the lens is rotated on the vertical axis 19 of the spindle 16 and a speed at which this is typically done is 1550 r.p.m., although other speeds may also be used. For purposes of example it can be assumed that the spindle is rotating in the counterclockwise direction when viewed above as indicated by the arrow 21, Fig. 1. It is desirable, although not absolutely necessary, that the focal axis of the lens be colinear with the axis 19, as illustrated.

In order to contain spray and prevent loss of a lens in the event it should become detached from the holder accidentally, a sort of spin chamber 20 is provided by an outwardly opening cup 21 of material softer than the material of the lens. An absorbent foam or other material 22 may be provided in the bottom of the cup if desired to absorb any excess of the liquid usually used with the polishing compound applied to the lens during polishing. A suitable shaft seal 23 may be employed at the bottom center of the cup 21.

According to the present invention, the lens is spun on the axis 19 by the motor 17 and a polishing member 24 is applied to the edge 26 of the lens as it is spun. Independent oscillating action in the direction of the arrow 27 in a plane 28 containing the axis of rotation of the lens is produced in the polishing member 24 driven by an electric motor 31. This polishing member 24 may consist of a chamois, cloth or other material 32 having a resilient backing material 33 such as sponge rubber, for example, secured the shaft or arm 34 driven by the motor 31 having a switch 36 connected thereto for operation thereof. As the motor 17 drives the lens on the vertical axis, the motor 31 oscillates the polishing member, which is usually wetted, and a polishing compound may be applied to the spinning lens or to the polishing member by application from a squirt bottle or by other means. The sponge backing of the surface material 32 will permit some degree of conformity of the polishing member with the edge of the lens as the lens spins. The extent to which the polishing can be accomplished is virtually unlimited because the polishing member can be moved in an arc as indicated by the arrow 37 in Fig. 2, so as to polish the inside of the edge of the lens 38 (Fig. 3) where the polishing member is located as indicated by the dotted outline 24-A, and can be applied completely around to the outer surface 39 when the polishing member is located as indicated by the dotted outline 24-B. So it is seen that the extent of polishing which can be attained is virtually unlimited. In actual practice it is usually desirable to use a polishing head 25 much larger than the lens itself (as in Fig. 3), preventing access of the polishing head to the base curve of the lens, if the desired inward extent of polishing does not require a small polishing head such as shown in Figs. 1 and 2. In either event, oscillation is as indicated by arrow 27, and travel is as indicated by arrow 37.

The ability to polish the outer surface around the area 39 in this way is particularly beneficial because it provides considerably more comfort to that portion of the eyelid moving over this portion of the lens. This is because the direction of polishing action is transverse to the usually predominant direction of grinding or polishing marks resulting from standard grinding and polishing procedures.

The oscillating motion of the polishing member can be attained by any suitable mechanism converting a motor rotation to an oscillating drive. Such a mechanism is present in an electric toothbrush which is now well known and readily available. The motor of such a device is in the handle whereby it can be conveniently gripped by an operator's hand 41 for obtaining any desired movement through the arc 37.

If in some instances it is desirable to use a steady rotary motion at 90° to the direction of movement of the edge of the lens, a polishing wheel 42 connected to a shaft 43 and driven by a motor can be applied to the edge of the lens. This is illustrated in Fig. 4. Here the action of the polishing surface 44 is circular with respect to an axis perpendicular to the plane 28 and thus always parallel to the axis of rotation of the lens. The wheel can be moved in an arc such as arc 37 to obtain polishing completely around the edge from the convex portion of the lens to the concave portion thereof.
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The method of the present invention provides superior results, enabling comparatively rapid production of lenses which minimize the time required for adjustment of the patient to the wearing of the contact lenses.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A method of finishing a contact lens and comprising the steps of:
   - applying a pressure differential across a lens to secure it to a support member with the concave face of said lens facing upwardly and the focal axis of said lens extending vertically;
   - spinning said lens on a vertical axis colinear with the focal axis;
   - applying polishing compound to a portion of said lens using a liquid vehicle to carry the compound onto said lens;
   - applying a pad to the edge of said lens with a force directed toward said axis and of a magnitude sufficient to cause said compound to polish the said edge but insufficient to dislodge said lens from said support member;
   - oscillating said pad about an axis and keeping the oscillation axis normal to a plane containing the said vertical axis to obtain action on said lens edge in a direction perpendicular to the direction of movement of said lens at the area of contact of said pad with said lens edge;
   - and while oscillating said pad, moving the oscillating pad in a path lying in said plane so that said pad engages said edge where said edge meets the convex surface of said lens while said lens is spinning on said vertical axis, and so moving said pad from the point where it meets said convex surface of said lens to the point where the lens edge meets the concave surface of said lens, whereby the entire outer edge from said convex surface to said concave surface is polished by abrasive action in a direction different from tangents to said edge which are perpendicular to said plane containing said axis.

2. A method of finishing a contact lens and comprising the steps of:
   - spinning a contact lens on the focal axis thereof;
   - applying a polishing compound to said lens during the spinning thereof;
   - applying a polishing member to the edge of said spinning lens to cause the compound to work on the edge of said lens, and oscillating said polishing member back and forth in a plane containing said axis and at the point of application of said member to said edge and in a direction providing a rubbing action of said compound in a direction perpendicular to lines which are tangent to said edge and which are normal to a plane containing said axis.

3. A method of finishing a contact lens and comprising the steps of:
   - spinning a contact lens on an axis;
   - applying a polishing compound to said lens during the spinning thereof;
   - applying an external force to the edge of said lens to cause the compound to work on the edge of said lens, and oscillating the applied force back and forth at the point of application of said force to said edge and in a direction providing a rubbing action of said compound in a direction perpendicular to lines which are tangent to said edge and which are normal to a plane containing said axis.

4. A method of finishing a contact lens and comprising the steps of:
   - spinning a contact lens on an axis;
   - applying a polishing compound to said lens during the spinning thereof;
   - and applying an external force to the edge of said lens to cause the compound to work on the edge of said lens, and oscillating the applied force back and forth at the point of application of said force to said edge and in a direction transverse to the direction of motion of said lens at the point of application of said force to said edge while said lens is spinning.

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