

FINISHED SILICONE CONTACT LENSES

This application is a continuation-in-part of my pending application Ser. No. 650,997, filed Jan. 21, 1976 and now abandoned, which was copending with application Ser. No. 666,591, filed Mar. 17, 1976, now U.S. Patent No. 3,996,189, which was a continuation-in-part of application Ser. No. 572,788, filed Apr. 29, 1975, now U.S. Patent No. 3,996,187.

Contact lenses, both hard and soft, are manufactured by casting or molding techniques producing a lens blank which must be subsequently machined to produce the final prescription lens having the proper lens surface. The technique of machining the soft contact lens blank, especially the cutting, grinding, and polishing of the lens, is such that a relatively smooth lens surface is difficult to obtain.

Conventional methods of edge finishing silicone lenses involve mechanical grinding. A number of procedures, grinding materials, and devices have been developed for edge finishing. These basically involve the mounting of the lens upon a chuck which rotates while either a cutting tool engages the edge of the lens to cut the lens to the desired shape, or a grinding tool rotating at high speed in opposite direction to the chuck, grinds the edge to the desired configuration.

These conventional methods all result in rather rough surfaces causing a great deal of rejection because of microtears or scratches on the lens. The various polishing techniques which have been developed are usually slow and not wholly satisfactory.

I have now found that it is possible to coat this rough, previously ground edge with a liquid which will fill the microtears and scratches and yet will not affect the optical properties of the lens.

The liquid coating should preferably be of the same or similar composition as the silicon lens; the ratio of phenyl to methyl groups in the coating liquid and the silicon lens should be similar for best adhesion and optical properties; the coating liquid should be easy to polymerize, cure or dry.

A wide range of transparent, low viscosity silicone liquids that cure to form rubber-like tough transparent solids may be used. Two such liquids, 615 and 655, have the following physical characteristics:

	RTV-615	RTV-655
<u>Uncured</u>		
Viscosity	40 Poises	5000 centipoises
Specific gravity	1.02	1.07
Refractive Index at 20° C	1.418	1.435
<u>Cured</u>		
Specific Gravity	1.02	1.07
Tensile strength (psi)	925	850 - 1000
ASTM-D-676 Durometer, Shore A	35	35

Generally, a copolymer of an aryl siloxane and an alkyl siloxane containing about 12 mole percent of the aryl groups will have a refractive index which will substantially match that of a fume silica filler, making the elastomeric product transparent or substantially transparent. In one specific case, a copolymer of diphenyl siloxane and dimethyl siloxane containing about 12 mole percent of the diphenyl groups with a balance of dimethyl groups produces a product which will be essentially transparent with a fume silica filler. Also, a copolymer of phenyl-methyl siloxane (about 24 mole percent) with dimethyl siloxane produces a copolymer

(containing about the same proportion of phenyl and methyl groups) product having a refractive index which will match that of the fume silica filler. Other co- or ter-polymers, containing the same proportion of phenyl and methyl groups will produce products which are transparent with the fume silica fillers. Minor variations in the composition of the polymers have a slight effect upon optical clarity.

Preferably, the contact lens includes:

- A. A polymer of
 1. dimethyl siloxane,
 2. diphenyl siloxane or phenyl-methyl siloxane or both, and
 3. vinyl siloxane,
 which contains a small amount of platinum catalyst in solution;
- B. A polymer of
 1. dimethyl siloxane,
 2. diphenyl siloxane or phenyl-methyl siloxane or both, and
 3. a siloxane having (R)₂HSi—O— groups, or —O—SiHR—O— groups or both, wherein R is methyl or ethyl, and preferably methyl; and
- C. 5 to 20% fume silica.

This preferred composition is substantially free of Si atoms which do not have an organo group bonded thereto.

The A and B polymers must each have 6 to 16 mole percent phenyl groups and each contain no Part 3 of the other. Since it is difficult to find a commercially available polymer having the proper percentage of phenyl groups to closely match the index of refraction of the filler, as well as having the other required properties, the index of refraction in the elastomer can be closely matched by selecting a mixture of polymers so that their blend has an index of refraction the same as the index of refraction of the filler. As noted above, care must be taken to avoid mixing polymers having widely differing amounts of phenyl groups. I have found that within the range of 6 to 16 mole percent phenyl the effect on transparency, due to unequal amounts of the phenyl groups, is not significant.

The selection of a catalyst is within the skill of the art. The preferred catalysts are organo platinum compounds such as those disclosed in U.S. Pat. Nos. 2,823,218 and 3,159,601. Many commercial silicone polymers useful in formulating the vulcanizate of the present invention contain catalytic amounts of such organo platinum compounds. Catalytic materials such as organotin compounds and amines should generally be avoided due to their known toxicity. Although not essential, it is preferable that the resulting vulcanized product be extracted to remove impurities, e.g., unreacted starting materials. Suitable solvents are, for example, aliphatic, aromatic or chlorinated hydrocarbons. These include, for example, hexane, toluene, methylene chloride, chloroform, and carbon tetrachloride.

EXAMPLE 1

A two-part silicone potting resin (General Electric RTV 615) was mixed with fume silica filler so that the final mixture contained 100 part of Part A, 10 parts of Part B and 11 parts of fume silica filler (all parts by weight). Part A of this resin is a copolymer of dimethyl siloxane and about 0.3 mole percent of a vinyl siloxane.