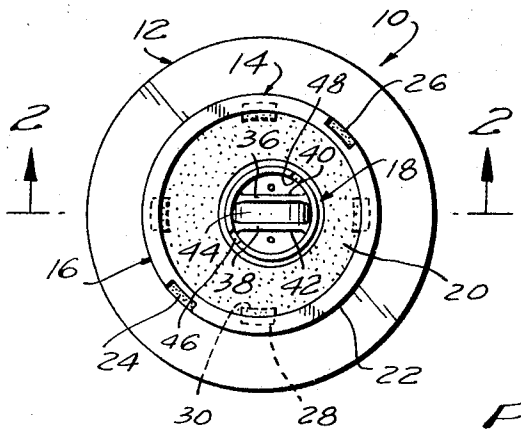
May 19, 1970 M. O. RUDD ET AL 3,512,310

TWO-PIECE RING BLOCK FOR LENS BLANKS

Filed Nov. 10, 1966 2 Sheets-Sheet 1

FIG. 1



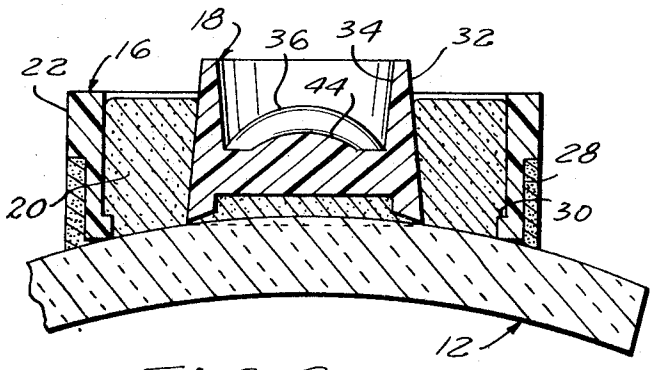
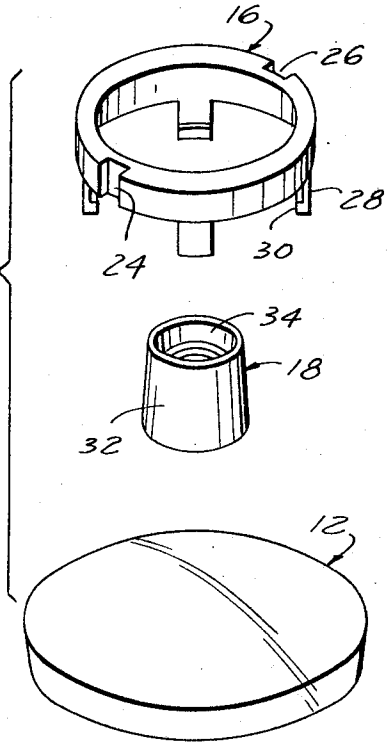


FIG. 2

FIG. 5



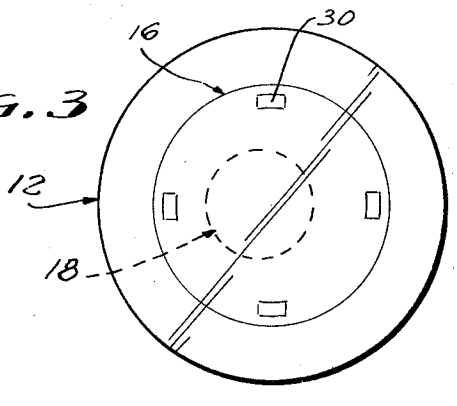


FIG. 3

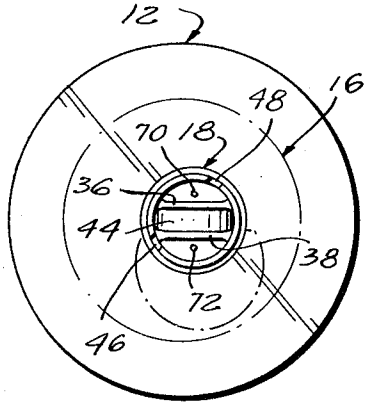


FIG. 4

INVENTORS
MILO O. RUDD
WILLIAM M. CATRON
BY
Kane, Dalsimer, Kane & Smith
ATTORNEYS

May 19, 1970 M. O. RUDD ET AL 3,512,310

TWO-PIECE RING BLOCK FOR LENS BLANKS

Filed Nov. 10, 1966 2 Sheets-Sheet 2

FIG. 6

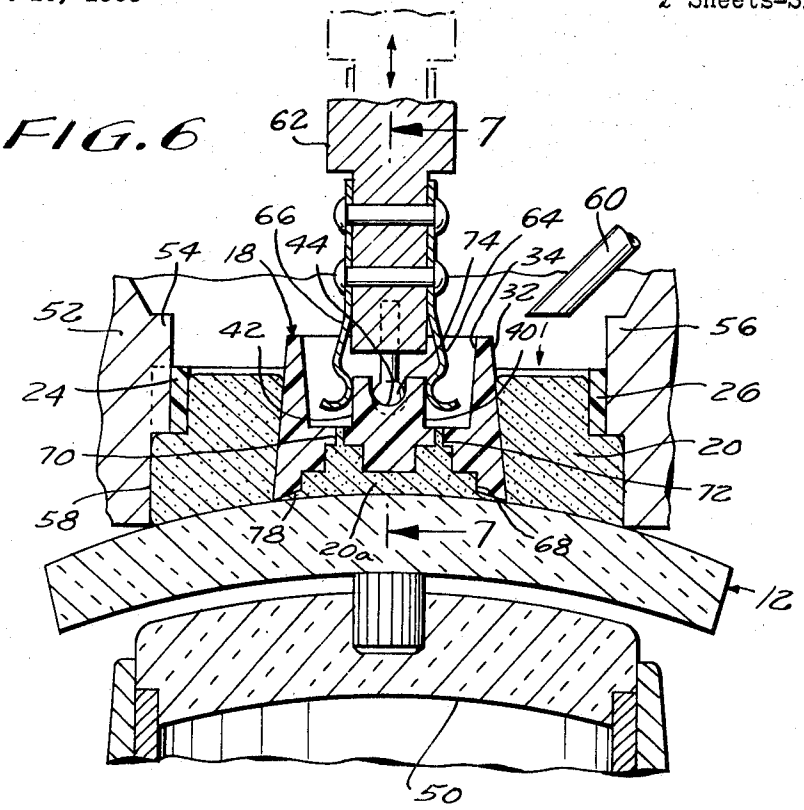


FIG. 8

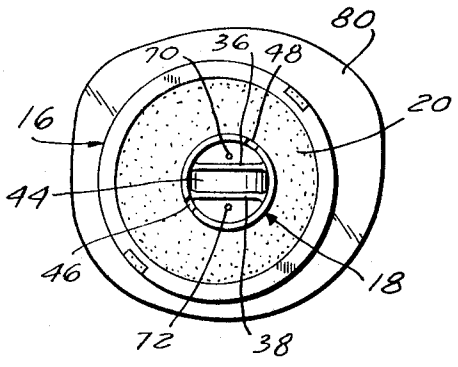


FIG. 7

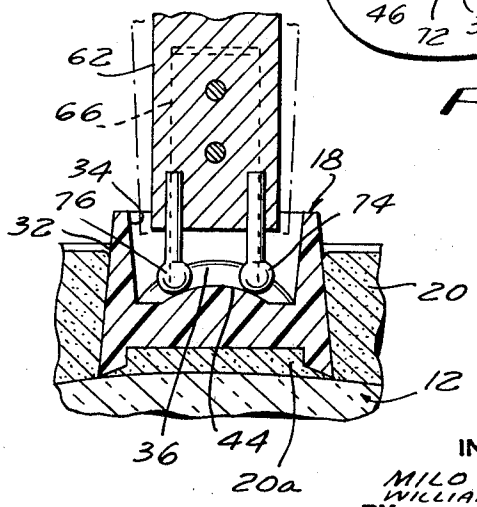


FIG. 10

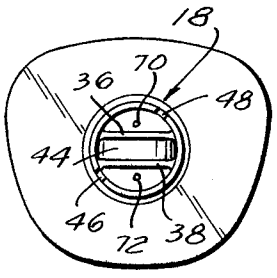
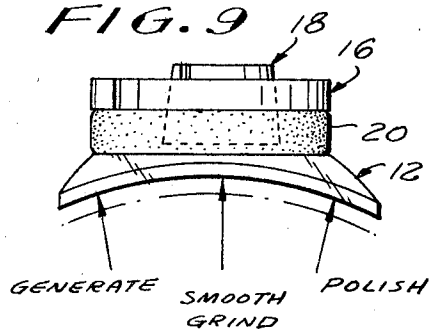


FIG. 9



INVENTORS
MILO O. RUDD
WILLIAM M. CATRON
BY
Kane, Dalsimer, Kane & Smith
ATTORNEYS

United States Patent Office 3,512,310
Patented May 19, 1970

3,512,310

TWO-PIECE RING BLOCK FOR LENS BLANKS

Milo O. Rudd, Fort Lauderdale, and William M. Catron, Plantation, Fla., assignors to Univis, Inc., Fort Lauderdale, Fla., a corporation of Ohio

Filed Nov. 10, 1966, Ser. No. 593,433
Int. Cl. B24b *1/00; 19/00*
U.S. Cl. 51—277 10 Claims

ABSTRACT OF THE DISCLOSURE

A multiple piece ring block is provided for generating and polishing the prescribed optical surface on a lens blank wherein the outer ring is adapted to be readily and independently removed from the block so that the inner ring can be employed for edging operations.

The present invention relates to the manufacture of ophthalmic lenses and, more particularly, to blocking these lenses so that they can be processed in apparatus for generating and polishing their surfaces and for edge grinding the lenses according to prescription. More specifically, this invention relates to lens manufacture as well as blocking of the type disclosed in the copending and commonly assigned applications Ser. No. 430,315, filed Feb. 4, 1965, now Pat. No. 3,431,688, dated Mar. 11, 1969, and Ser. No. 531,302, filed Mar. 2, 1966. A block, as commonly understood, is a rigid holder which is temporarily fastened to the surface of a lens for purposes of holding and positioning the lens while it undergoes further processing.

The desirability of performing a single blocking operation for purposes of generating, grinding and polishing prescribed ophthalmic lens surfaces and for edge grinding and finishing has been established in the above referenced applications. In Pat. No. 3,431,688, radially outwardly disposed portions of the block that would ordinarily interfere with the final edging operations were deliberately removed. In application S.N. 531,302, the block was cast in two pieces such that the outer portion could be readily and independently removed from the inner portion prior to the formation of the final edge contour on the blank.

With the foregoing in mind, it is a principal object of this invention to provide a two-piece ring block for generating and polishing the prescribed optical surface on the lens blank whereupon the outer ring is adapted to be readily and independently removed so that the inner ring can be employed for the final edging operations.

Another object is to provide a method for producing a two-piece ring block of this type which also takes advantage of the use of low melting point metallic alloys found to be extremely advantageous in the blocking of ophthalmic lenses.

In accordance with an exemplary and somewhat preferred embodiment of the invention, a two-piece ring block is secured to the finished side of a lens blank through the employment of modified apparatus of the type disclosed in the above identified applications. The individual rings are preferably premolded from a suitable resinous material and following the association of the pair of companion rings on the selected lens blank according to the prescribed alignment, a low melting point alloy is then introduced for purposes of securing the rings to the blank in this relationship. The outer ring is annolar in conformation and includes an outer surface referenced to the ultimate optical center of the finished lens together with a pair of diametrically opposed slots formed in this surface and oriented for purposes of serving as a reference for the prescribed cylinder axis. Under

the circumstances, the outer ring is capable of being employed for generating the prescribed optical surface on the unfinished side of the lens blank. The inner ring is provided with an inner annular surface referenced to the ultimate mechanical center of the finished lens. In addition, the inner ring is provided with a pair of parallel walls each of which are parallel to the ultimate horizontal axis of the finished lens; and in the case of a bifocal lens, these walls will be parallel to the segment line. An annular groove interposed between these parallel walls cooperates with surfaces of a ring holder of the blocking apparatus to provide a universal connection between these parts. Accordingly, tilting of the ring is advantageously provided while positioning and aligning this ring on the lens blank prior to the ring securing operation. A cylinder axis reference in the form of two milled slots in the side walls of the inner ring is also provided so that the optical surface may be finely ground and polished. Thereafter, the inner ring may be used for providing the final edge contour on the lens.

Other objects and advantages will become apparent from the following detailed description which is to be taken in conjunction with the accompanying drawings illustrating a somewhat preferred embodiment of the invention and in which:

FIG. 1 is a top plan view of a bifocal lens having secured to one face thereof a two-piece ring block in accordance with the teachings of this invention;

FIG. 2 is an enlarged fragmentary cross-sectional view of this lens blank and block taken along the line **2—2** of FIG. 1;

FIG. 3 is a bottom plan view thereof;

FIG. 4 is another top plan view showing the relationship of the inner ring to the bifocal segment with the outer ring shown in phantom and the interposed alloy bonding material removed;

FIG. 5 is an exploded perspective view of the lens blank and inner and outer rings;

FIG. 6 is a fragmentary sectional view of the mechanism for forming the two ring block on the lens blank;

FIG. 7 is a sectional view taken along the line **7—7** of FIG. 6, with tilting of the holder shown in phantom;

FIG. 8 is a top plan view of the blocked lens following the pre-edging operation for preforming the lens blank around its optical center using the inner ring;

FIG. 9 is a side elevational view partly in section depicting the rough grinding or generating of the prescribed optical surface on the unfinished side of the lens blank and the subsequent fined grinding and polishing operations; and

FIG. 10 is another top plan view with the outer ring and interposed alloy bonding material removed after which the final edge contour is introduced on the lens blank.

In the drawings, a blocked lens assembly **10** is shown comprising a typical semi-finished lens blank **12** and a two-piece ring block **14** secured thereto. Then lens blank **12** is shown in the general condition in which it is received from the supplier by the optical laboratory. As previously explained, the lens blank **12** may assume one of a number of other forms and the finished lens similarly could be selected from a wide variety of lenses known to the industry. For exemplary purposes, the blank **12** may be taken to be a bifocal blank having the main portion of one index of refraction and a bifocal segment of a different index of refraction. In addition, the front or outer surface of the blank, which would ordinarily be on the exterior of the finished spectacles, is finished to a predetermined contour, usually spherical. The rear surface will, after further processing, possess the prescribed optical surface in accordance with the necessary optical correc-

tions for the individual eyes of the ultimate wearer of the spectacles.

With respect to the two-piece ring block **14**, an outer ring **16** and inner ring **18** are secured to the finished face of the lens blank **12** by means of a suitable bonding material which may preferably be in the nature of a low melting point alloy **20**. A suitable type of bonding alloy, which provides the requisite adherence to the lens surface as well as the rings **16** and **18**, is an antimony-lead compound (or the like) having a melting point of around 158° F. This bonding material is initially poured in a molten state in a manner to be described and hardens relatively rapidly, for example, in about thirty seconds.

A wide range of materials may be selected for the rings **16** and **18**. The rings are preferably molded from a suitable resinous material. Representative materials include polystyrene, high heat polypropylene, Celcon (a thermoplastic consisting essentially of ethylene cellulose and plasticizers), and polyallomer (a crystalline thermoplastic polymer produced from two or more different monomers of saturated hydrocarbons).

The rings **16** and **18** of the block **14** will provide the desired and selected optical and geometrical references of the prescribed finished lens. In this connection, the outer substantially annular ring **16** includes an external surface **22** which serves at the optical center reference with the axial center line of the optical center reference containing the ultimate optical center of the finished lens. Preformed slots **24** and **26** which are diametrically opposed are suitably oriented prior to the introduction of the bonding material **20** according to the prescribed cylinder axis of the lens. Under these circumstances, slots **24** and **26** are cylinder axis references employed for generating the optical surface on the unfinished side of the lens blank **12**. One of the edges of the ring **16** is provided with radially inwardly disposed legs **28** adapted to space the ring **16** from the lens blank **12** and, at the same time, secure and anchor this ring **16** to the bonding material **20**. Towards this end, shoulders **30** on each of the legs **28** operate as mechanical interlocks to supplement the bonding affinity between the bonding material **20** and the material of the ring **16**.

Referring now to the inner ring **18**, it will be noted that this member includes an outer substantially conical surface **32** and an inner inverted conical surface **34**. The inner surface **34** serves as the mechanical center reference. Interiorly of the cavity defined by the inner conical wall **34** is a pair of substantially parallel walls **36** and **38** the outer faces **40** and **42**, respectively, of which are similarly parallel and arranged substantially parallel to the horizontal axis of the finished lens. In the case of a bifocal lens, the horizontal axis reference will be substantially parallel to the top segment line of the bifocal segment. The inner face of the walls **36** and **38** merge into an arcuate groove **44** which cooperates in providing a universal connection between the inner ring **18** and a holder therefor which is deployed for purposes of positioning and orienting the inner ring **18** properly and according to prescription on the lens blank **12**. The manner in which this is accomplished will be described shortly. At least one in the case of the illustrated embodiment, a pair of diametrically opposed slots **46** and **48** are milled into the outer edge of the inner ring **18** and serve as cylinder axis references for the inner ring.

Reference is now made to FIG. 6 illustrating the assembly for receiving and holding the lens blank **12** and rings **16** and **18** in the desired and prescribed relationship and for securing these parts together by means of the bonding material **20**. The illustrated assembly forms part of blocking apparatus of the type disclosed in the companion patent applications identified in the above. Thus, the technician initially positions the blank **12** between a lower support **50** and an external rotatable mold **52**. Thereafter, the blank is clamped therebetween after it is accurately aligned and the cylinder axis reference is introduced by turning the mold **52** an appropriate amount relative to the horizontal axis which, in the case of a bifocal lens, will be parallel to the segment line. The cylinder axis will bisect the projections **54** and **56** which are adapted to be conveniently received by the external slots **24** and **26** of the outer ring **60**. In this connection, the outer ring may be inserted into the external mold member **52** following the clamping operation or at a suitable time prior thereto. It will be noted that for all intents and purposes, the legs **28** will be completely embedded in the bonding material **20**. In this manner, the annular external surface **58** of the bonding material **20** may be deployed for purposes of efficiently forming a vacuum seal for chucking purposes when the prescribed optical surface is rough ground on the unfinished face of the blank **12** by the generating apparatus.

Initially the inner ring **18** is held in a raised position at the start of the pouring of the bonding material **20** from the valve controlled pouring spout **60**. The inner ring **18** is held by the holder **62** and specifically, the spring clamps **64** and **66** directly engage with the parallel wall surfaces **40** and **42**, respectively. When the inner ring is so held in this manner, the parallel surfaces **40** and **42** will be disposed parallel to the horizontal axis of the finished lens blank.

Immediately following the pouring of the bonding material **20**, the holder **62** and, consequently, the held inner ring **18** is lowered into position on the lens blank **12**. Bonding material **20***a* will be trapped in the inner ring cavity **68** with the entrapped air in the cavity being forced out through the vent openings **70** and **72**. The desired alignment of the inner ring **18** is maintained following the lowering of the inner ring into engagement with the lens blank **12** by means of the universal connection provided by the arcuate groove **44** and the pair of spaced downwardly projecting ball members **74** and **76** of the holder **62**. This universal connection permits the inner ring **18** to tilt relative to the holder **62** on the lens blank **12** about an axis disposed relatively close to the finished surface of the blank. It will also be noted that an optimum and increased surface area contact between the bonding material **20***a* and the surfaces of the inner ring **18** defining the cavity **68** is provided. In this connection, beveled edge **78** is provided on the base of the ring **18** such that at best only substantially hair-line contact exists between the inner ring **18** and the finished face of the blank **12** and, for all intents and purposes, the inner ring **18** is spaced therefrom by means of the intermediate bonding material **20***a*. Upon completion of the molding cycle and the setting of the bonding material **20** and **20***a*, the holder **62** is retracted and the lens and block assembly **10** eventually removed from the blocking apparatus.

Inasmuch as the inner ring **18** is employed for purposes of finish grinding and polishing the optical surface generated on the unfinished side of the blank **12**, a cylinder axis reference is introduced before this ring is placed in the blocker and positioned on the holder **62**. This is simply accomplished by milling the cylinder axis reference slots **46** and **48** in the outer edge of the inner ring **18**. As will be appreciated by those skilled in the art, the cylinder axis referencing at this stage of the blocking operation is a relatively simple matter and may be accomplished by apparatus capable of taking advantage of the existing horizontal axis reference on the inner ring **18**.

In the processing of lens blank **12**, the lens blank and block assembly **10** is thereafter mounted in an edge grinding or contouring apparatus which operates to form a peripheral contour edge **80** on the blank **12**, one suitable type of which is shown in FIG. 8. The chucking means of this apparatus is adapted to engage with the conical inner face **34** of the inner ring **18** which provides the mechanical center reference and the parallel horizontal alignment reference surfaces **40** and **42** of this ring. Thus, the desired edge contour **80** is formed on the blank **12** referenced to both the mechanical center and the horizontal axis of the

finished lens and in this manner, the blank is shaped to a balanced condition around the ultimate mechanical center and the size of the semifinished blank is significantly reduced.

Following this contouring operation, the assembly **10** is mounted in a conventional toric or spherical surface generating machine for rough grinding the prescribed optical surface on the unfinished side of the blank **12**. During this operation, the optical center reference surface **22**, together with the cylinder axis key slots **24** and **26** therein, are employed in mounting and locating the assembly **10** in the chucking means of the generator. As mentioned in the foregoing, the substantially uninterrupted circular surface **58** is adapted to conveniently mate with vacuum sealing means of a vacuum type of chucking means of the generator. Under these circumstances, the described optical or toric surface will be generated on the lens blank and will be properly oriented thereon according to the particular prescription.

Once the toric surface is generated on the blank **12**, it may be fine ground and polished using conventional surfacing machines. Exemplary equipment of this type is disclosed in Pat. No. 3,431,688 identified in the above. The chucking means of these surfacing machines are adapted to engage with the mechanical center reference surface **34**, together with the cylinder axis reference slots **46** and **48**. Although the present invention contemplates fine grinding and polishing subsequent to removal of the outer ring **16** and interposed bonding material **20** and even following final edging, it is, nevertheless, preferred that the finishing of the generated optical surface be done prior to the removal of the outer ring **16** and bonding material **20**.

At this stage of the process, the outer ring **16** and interposed bonding material **20** are removed from the lens blank **12** and the inner ring **18** is left remaining thereon and secured thereto by means of the interposed layer of bonding material **20***a*. The removal of the outer ring **16** and bonding material **20** may be easily accomplished by clamping inner ring **18** firmly to the lens blank and then knock the outer ring **16** and adjacent low melting point metal loose from the lens by a suitably directed sharp impact. This has the effect of cleanly removing the ring **16** and bonding material **20** from the lens blank **12** independent of the inner ring **18**.

The final edge contour is formed on the blank **12** to produce the article illustrated in FIG. 10. In this connection, the assembly is placed in conventional final edging apparatus with the chucking means thereof adapted to engage with the mechanical center reference surface **34** of the inner ring **18** and the horizontal alignment reference surfaces **40** and **42**. Accordingly, the ultimate edge contour is formed on the finished lens about the mechanical center while referenced to the horizontal alignment. The inner ring **18**, together with the interposed layer of bonding material **20***a*, may now be readily removed by squeezing the ring with a pliers, thereby distorting the bonding material and freeing the inner ring **18** and bonding layer **20***a* from the finished lens.

Thus, among others, the several aforenoted objects and advantages are most effectively attained. As, for example, both mechanical center and optical center references are provided on the single block with the outer separable ring aligned with the optical center of the finished lens and having the prescribed cylinder axis reference thereon. The inner ring, on the other hand, is aligned with the mechanical center of the finished lens and is also provided with references for both the horizontal alignment and prescribed cylinder axis of the finished lens. In addition to the above, another important advantage resides in the ability of the assembly **10** to be pre-edged before grinding and polishing, using the mechanical center and horizontal axis references provided on the inner ring. This has the effect of placing the block **14** essentially in the geometric center of the pre-edged lens blank. The area of the lens blank extending beyond the edge of the block **14** on all sides thereof is then essentially the same. This permits uniform grinding and polishing pressures to be applied to all portions of the underside or grinding surface of the lens blank, which in turn prevents the optical center from drifting away from its initial and prescribed location. This elimination of the tendency of the optical centers to drift away from its initial prescribed location is of extreme importance.

Although a single somewhat preferred embodiment of the invention has been disclosed and described in detail herein, it should be understood that the invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

We claim:

1. A blocked lens blank comprising a lens blank having a prescribed optical center, mechanical center and cyclinder axis, and a multiple piece ring lens block secured thereto comprising a centrally disposed ring for adherence to one side of a lens blank for holding said blank in an edging apparatus for edging the lens blank, an outer ring spaced outwardly from the central ring for adherence to the same side of the blank for holding the blank during a previous step in the manufacture of the lens and being removable from the blank independently of the central ring, the outer ring being provided with a number of spaced legs extending from one side of the ring, the free end of each leg being adapted to engage with the said one side of the lens blank, and bonding material being between the rings temporarily securing one to the other and for temporarily securing the rings to the blank.

2. A blocked lens blank in accordance with claim **1** wherein each of the legs is provided with an inwardly extending shoulder adjacent the free end, and the bonding material and shoulders providing a mechanical interlock for interconnecting the outer ring with the lens blank.

3. A blocked lens blank in accordance with claim **1** wherein each of the legs includes an outer side face and the outer ring includes an outer circumferentially extending peripheral surface disposed radially outwardly more than the outer surface of the legs.

4. A blocked lens blank comprising a lens blank having a prescribed optical center, mechanical center and cylinder axis and a multiple piece ring lens block secured thereto comprising a centrally disposed ring adhering to one side of a lens blank for holding said blank in an edging apparatus for edging the lens blank, the inner ring being generally circular in cross section and having an axis aligned with the ultimate mechanical center of the finished lens, an outer ring spaced outwardly from the central ring adhering to the same side of the blank for holding the blank during a previous step in the manufacture of the lens and being removable from the blank independently of the central ring, and the outer ring having circumferential inner and outer surfaces, the outer surface being an optical center reference surface and being circular in cross section and having an axis aligned with the ultimate optical center of the finished lens, said outer surface having keying means therein for cooperating with the chucking means of a generator for forming the prescribed optical surface on the other side of the lens blank and this keying means being related to the prescribed cylinder axis of the lens, bonding material between the rings temporarily securing one to the other and for temporarily securing the rings to the blank and said bonding material between the rings and the outer ring being removable for edging the lens blank by utilizing the inner ring.

5. A blocked lens blank comprising a lens blank having a prescribed optical center, mechanical center and cylinder axis and a multiple piece ring lens block secured thereto comprising a centrally disposed ring adhering to one side of a lens blank for holding said blank in an edging apparatus for edging the lens blank, an outer ring spaced outwardly from the central ring for adherence to the same side of the blank for holding the blank during

a previous step in the manufacture of the lens and being removable from the blank independently of the central ring, the outer ring being circular in cross section and having an axis aligned with the ultimate optical center of the finished lens, and the inner ring being provided with a mechanical center reference surface and being circular in cross section and having an axis aligned with the ultimate mechanical center of the finished lens and having a horizontal axis reference surface aligned with the horizontal axis of the lens and a cylinder axis reference related to the cylinder axis of the lens, bonding material being between the rings temporarily securing one to the other and for temporarily securing the rings to the blank, and said bonding material between the rings and the outer ring being removable for edging the lens blank by utilizing the inner ring.

6. A blocked lens blank in accordance with claim 5 wheerin the inner ring has a radial outward and inner surface with the inner surface providing the mechanical center reference surface, the inner ring provided with a pair of parallel walls extending across the opening defined by the inner surface and a groove disposed between the parallel walls with the groove and walls providing the horizontal axis reference and the inner ring being provided with at least one milled slot in its outer edge and providing the cylinder axis reference.

7. A blocked lens blank as defined in claim 5 wherein the inner ring has an outer end adapted to be spaced from the one side of the lens blank and an inner end adapted to be proximate the said one side of the lens blank, the inner end of the inner ring being formed with an enlarged cavity for providing bonding surfaces for the bonding material which cooperates in adhering the inner ring to the one side of the lens blank and the inner end of the inner ring being tapered to provide a substantial knife edge such that a substantial hair-line contact is approached upon adherence of the inner ring to one side of the lens blank by the bonding material.

8. A blocked lens blank in accordance with claim 7 wherein at least one vent opening is provided in the inner ring for permitting escape of air from within the cavity upon the disposition of the bonding material therein.

9. A multiple piece ring lens block for use in the manufacture of a lens comprising an inner centrally disposed ring adhered to one side of a lens blank for holding said blank in an edging apparatus for edging the lens blank, an outer ring spaced outwardly from tthe central ring and adhered to the same side of the blank for holding the blank during a previous step in the manufacture of the lens and being removable from the blank independently of the central ring, the rings being formed of a molded organic resinous material; the outer ring being provided with a number of spaced legs extending from one side of the ring, the free end of each leg being adapted to engage with the said one side of the lens blank, each of the legs being provided with an inwardly extending shoulder adjacent the free end, each of the legs including an outer side face and the outer ring including an outer circumferentially extending peripheral surface disposed radially outwardly more than the outer surface of the legs, the outer ring having radially inner and outer surfaces, the outer surface being an optical center reference surface aligned with the ultimate optical center of the finished lens, said outer surface having keying means therein for cooperating with the chucking means of a generator for for forming the prescribed optical surface on the other side of the lens blank and this keying means being related to the prescribed cylinder axis of the lens; the rings being adhered to the lens blank by a material selected from the group consisting of low melting point metallic alloys, the bonding medium engaging the outer ring for adhering the outer ring to the lens blank, the bonding medium and shoulder providing a mechanical interlock for connecting the outer ring with the lens blank; and the inner ring has an outer end adapted to be spaced from the one side of the lens blank and an inner end adapted to be proximate the said one side of the lens blank, the inner end of the inner ring being formed with an enlarged cavity receiving a portion of the bonding material and for providing bonding surfaces for the bonding material which cooperates in adhering the inner ring to the one side of the lens blank, the inner end of the inner ring being tapered to provide a substantial knife edge such that a substantial hair-line contact is approached upon adherence of the inner ring to the one side of the lens blank by the bonding material, at least one vent opening being provided in the inner ring for permitting escape of air from within the cavity upon the disposition of the bonding material therein, the inner ring being provided with a mechanical center reference surface aligned with the ultimate mechanical center of the finished lens and having a horizontal axis reference surface aligned with the horizontal axis of the lens and a cylinder axis reference related to the cylinder axis of the lens, the inner ring having a radial outward and inner surface with the inner surface providing the mechanical center reference surface, the inner ring being provided with a pair of parallel walls extending across the opening defined by the inner surface and a groove disposed between the parallel walls with the groove and walls providing the horizontal axis reference, and the inner ring being provided with at least one slot in its outer edge for providing the cylinder axis reference.

10. A blocked lens blank comprising a lens blank having a finished side and an unfinished side, a multiple piece ring lens block for use in the manufacture of a finished lens comprising a centrally disposed ring adhered to the finished side for holding said blank in an edging apparatus for edging the lens blank, an outer ring being spaced outwardly from the central ring and adhered to the same side of the blank for holding the blank during a previous step in the manufacture of the lens and being removable from the blank independently of the central ring, bonding material being between the rings temporarily securing the rings to the blank, the block having a substantially circular mechanical center reference surface having a center aligned with the ultimate mechanical center of the finished lens and a substantially circular optical center reference surface having a center aligned with the ultimate optical center of the finished lens and one of said rings being adapted to be removed independently of the other ring, said other ring having reference means related to the horizontal alignment of the finished lens, said surfaces being so constructed and arranged that the lens blank can be accurately and operatively mounted during processing of the lens blank into a finished lens by forming the prescribed optical surface on the unfinished side of a lens blank with respect to the optical center reference surface and following the removal of the said one of said rings and bonding material between the rings by forming the edge contour of the finished lens with respect to the mechanical center and horizontal alignment surfaces on the block.

References Cited

UNITED STATES PATENTS

3,118,198	1/1964	Prunier	51—277 X
3,226,887	1/1966	Rudd et al.	51—277

LESTER M. SWINGLE, Primary Examiner

U.S. Cl. X.R.

51—284