

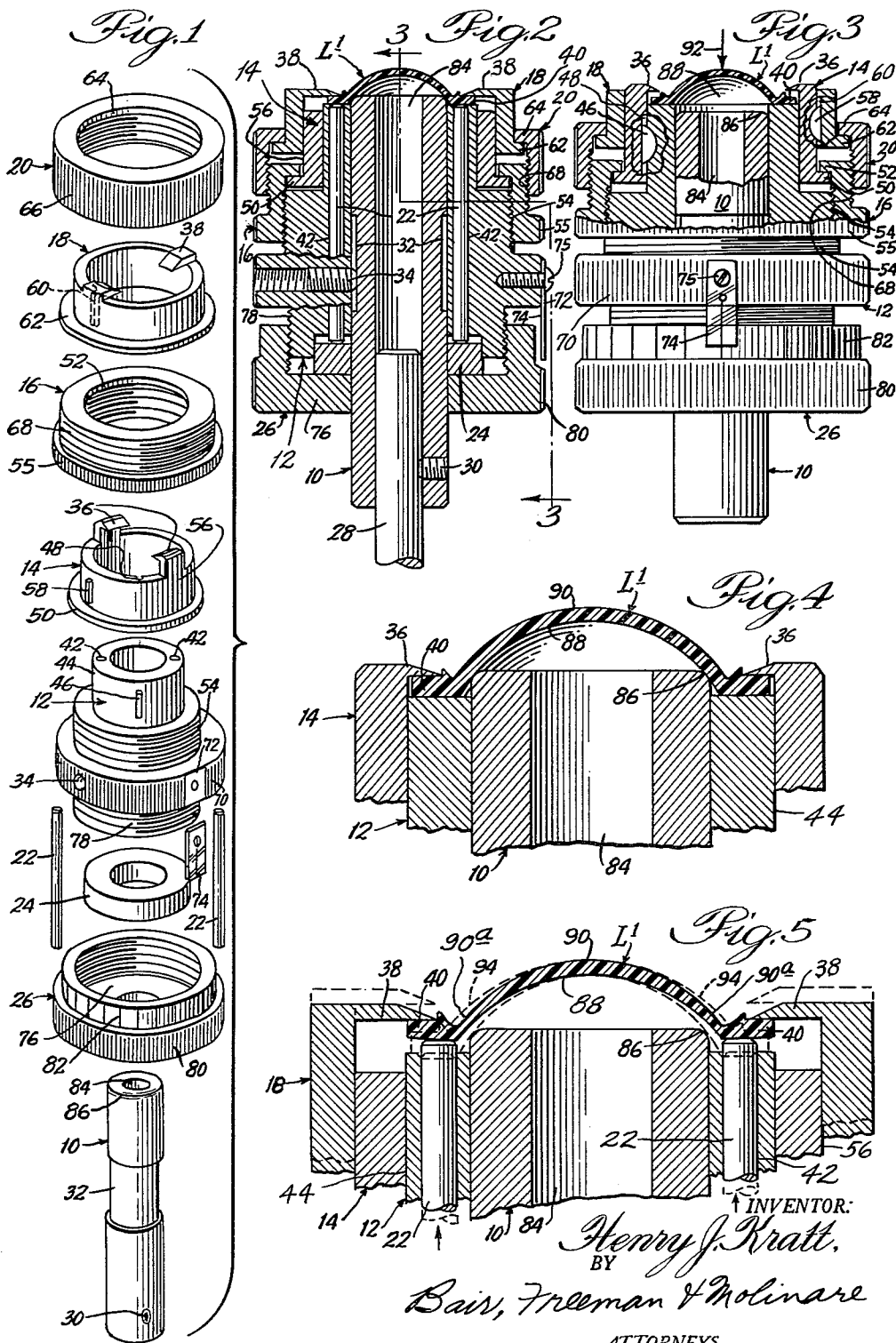
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TORIC LENS TOOL

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TORIC LENS TOOL

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This invention relates to a tool for holding a lens blank in such manner that spherical grinding and/or polishing of a surface of the blank will result in a final surface which is toric in shape.

One object of the invention is to provide a toric lens tool having means to hold a lens blank in such manner that two opposite peripheral portions thereof are held in a different plane than two other opposite peripheral portions thereof at right angles to the first portions, whereby the lens blank is warped; and thereupon by grinding and/or polishing a surface of the lens blank to spherical shape that surface will be toric in shape when the lens blank is released from the tool.

Another object is to provide a lens blank holding tool having means to accurately align a lens blank so that a finished and polished base curve of the blank has its optical axis accurately aligned with the axis of rotation of the tool.

Still another object is to provide separate means for holding the edge of the lens blank at two pairs of diametrically opposite points, one pair of points being crosswise of the other, and the pairs of points being in different planes so as to warp the lens blank before a finishing operation on one surface thereof, whereby when that surface is finished to a spherical shape the surface will return to a toric shape when released from the edge holding means.

A further object is to provide means of calibration to indicate the adjustment of the tool for toric surfaces of different dioptric spread between the major and minor curvatures of the toric lens surface.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my toric lens tool whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view of the parts forming my toric lens tool;

FIG. 2 is an enlarged vertical sectional view thereof;

FIG. 3 is a similar sectional view at right angles to FIG. 2, a portion of the tool being shown in side elevation;

FIG. 4 is a further enlarged sectional view similar to a portion of FIG. 3 showing the parts in a different position; and

FIG. 5 is a further enlarged sectional view similar to a portion of FIG. 2 also showing the parts in a different position.

On the accompanying drawing I have used certain reference numerals to indicate in general the parts that form my toric lens tool as follows: 10 to indicate a base shaft; 12 a tool body; 14 a primary sleeve; 16 a primary sleeve nut; 18 a secondary sleeve; 20 a secondary sleeve nut; 22 a pair of warping pins; 24 a warping pin follower; and 26 a warping pin nut. The base shaft 10 is adapted for mounting on a drive shaft 28 as shown in FIG. 2 by a set screw 30. The drive shaft 28 may be driven by an electric motor or the like (not shown) at a suitable speed for grinding and/or polishing the upper surface of a lens L^1 shown in FIG. 2. The base shaft 10 has an undercut section 32 adapted for engagement by a set screw 34 carried by the tool body 12 for a purpose which will hereinafter appear.

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The primary sleeve 14 has a pair of primary jaws 36 and the secondary sleeve 18 has a pair of secondary jaws 38, all four jaws for engagement with a holding flange 40 of a lens blank from which a lens L^1 is being formed.
5 A blank of this character and tools for forming a lens therefrom are shown and claimed in my copending applications Serial No. 24,473 filed April 25, 1960, and Serial No. 48,126 filed August 8, 1960.

The present invention has to do with a lens holding tool so designed that a surface can be ground and/or polished with cylinder and therefore has a toric shape. This is accomplished by warping the lens blank. The tool body 12 is provided with a pair of vertical holes 42 therethrough in which the warping pins 22 are slidable for this purpose. It also has a cylindrical surface 44 over which the primary sleeve 14 is slidable but nonrotatable by reason of a key 46 and a keyway 48 in the body 12 and sleeve 14 respectively. The sleeve 14 has a flange 50 with which an internal flange 52 of the primary sleeve nut 16 is adapted to coact, the nut being threaded on threads 54 of the body 12 just below the cylindrical surface 44 thereof. To facilitate rotation of the nut 16 relative to the body 12 it is provided with a knurled section 55, the body itself being also knurled as indicated at 70.
20 The primary sleeve 14 is also provided with a cylindrical surface 56 over which the secondary sleeve 18 is slidable and nonrotatable by reason of a key 58 and a keyway 60. The sleeve 18 has a flange 62 with which an internal flange 64 of the secondary sleeve nut 20 is adapted to coact. The nut 20 is also knurled as indicated at 66 and is internally threaded to cooperate with threads 68 of the primary sleeve nut 16.

At one point around the circumference of the body 12 the knurled portion 70 thereof is flat as indicated at 72 and a transparent pointer 74 is secured to the body 12 by a screw 75. The warping pin nut 26 has a flange 76 to coact with the warping pin follower 24 as in FIG. 2 to slide the warping pins 22 upwardly when the nut is screwed on to the lower end of the body 12, the body being threaded at 78 for this purpose. The nut is also provided with a micrometer scale 82 to coact with a hairline on the pointer 74 for a purpose which will hereinafter appear.
30 The base shaft 10 is provided with a bore 84 longitudinally therethrough, both to receive the shaft 28 and for the purpose of checking the dioptric power of the lens while held in the tool. The upper edge of the base shaft 10 is rounded as indicated at 86, the radius being sharper than the sharpest base curve radius of any lens that will be held in the tool.

Practical Operation

My toric lens tool is shown fully assembled in FIGS. 2 and 3. To hold the lens blank L^1 therein the upper four elements (primary sleeve 14, primary sleeve nut 16, secondary sleeve 18, and secondary sleeve nut 20) shown in FIG. 1, are removed by successively unscrewing 20, removing 18, unscrewing 16, and then removing 14. The upper end of the body 12 is now exposed so that the lens blank L^1 can be laid thereon as in FIG. 3, the set screw 34 being loose and the base shaft 18 in lowered position as shown in relation to the body 12.

It may here be mentioned that the lens blank L^1 has a base curve 88 that has been cut or ground and polished, and the curve 88 is, therefore, a finished surface of the lens. The base curve 88 must now be aligned concentric to the axis of rotation of the tool, and this is accomplished by holding the lens blank L^1 against the upper end of the body 12 by finger pressure as indicated by the arrow 92 in FIG. 3, and then sliding the base shaft 10 upwardly until its rounded upper edge 86 contacts

the base curve 88 and shifts the lens laterally if it is not axially aligned with the tool. When there is a full ring of contact between the curved upper edge 86 of the base shaft 10 and the base curve 88, then the operator is assured that the base curve is concentric to the axis of rotation of the tool. Because of the shaft 10 thus contacting the base curve 88 and serving as an accurate means to align the optical axis of the curve 88 with the tool, I call the shaft 10 a "base" shaft. The base shaft may now be locked in position by tightening the set screw 34.

Next, the primary sleeve 14 is slid over the cylindrical surface 44 of the body 12 and the primary sleeve nut 16 is screwed into position for drawing the primary jaws 36 down against the flange 40 of the lens blank L^1 as shown in FIG. 4. FIG. 3 shows these jaws in an upper position before being drawn down by the nut 16. In the final position of FIG. 4 two diametrically opposite portions of the flange 40 are obviously held in contact with the upper end of the tool body 12.

The secondary sleeve 18 may now be slid downwardly over the cylindrical portion 56 of the primary sleeve 14 to the dotted position shown in FIG. 5, following which two other diametrically opposite portions of the lens blank flange 40 may be sprung upwardly by upward movement of the warping pins 22 from the position of FIG. 2 to the position of FIG. 5 by screwing the warping pin nut 26 onto the threads 78, thus elevating the follower 24. This will warp the lens at right angles to the portions of the flange 40 shown held in FIG. 4 by the jaws 36, the warpage being from the dotted base curve shape 88 of the lens blank shown in FIG. 5 to the full line base curve shape thereof. Next the secondary jaws 38 may be brought into contact with the two opposite points of the flange 40, which points of course are 90 degrees from the points engaged by the primary jaws 36, to rigidly hold the corresponding portions of the flange in opposition to the warping pins 22. Actually in FIG. 5 the degree of warping is somewhat exaggerated, as but a few thousands of an inch movement is all that is required. If the degree of movement to obtain the toric surface is only .002" or .003" the secondary jaws 38 may be tightened as in FIG. 2 before dialing the warping pin nut 26, and the micrometer scale 82 can be calibrated as desired in either thousandths of an inch or diopters of difference.

Now that the lens is warped as shown in FIG. 5 its upper or power surface curvature 90 may be spherically ground and/or polished and actually this operation will remove the material of the blank from the dotted line 94 to the solid line 90^a to make 90—90^a the same radius as 90 in FIG. 4, yet at the same time maintains the curve 90 in FIG. 4. Accordingly, the curvature 90^a will be sharper than the curvature 90 when the blank is released from the tool and thereupon returns to its original shape. Thus a certain dioptric difference to produce a toric curvature or cylinder has been formed into the anterior surface of the lens without disturbing the base curve 88. In this connection attention is again called to the dimensions being exaggerated in FIG. 5 and the thickness of the lens therefore seemingly cut down considerably adjacent the flange 40 for the curvature 90^a, whereas in practice the difference is very little. As the polishing operation proceeds the power of the lens may be checked optically in the usual manner through the bore 84.

From the foregoing specification it will be obvious that I have provided a tool for holding lens blanks in such manner that a surface of the blank can be spherically polished, yet when the blank is released from the tool that surface will be toric in shape. At the same time the dioptric difference between the major and minor curvatures of the toric surface may be micrometrically adjusted and conveniently indicated as to such adjustment by cooperation of the pointer 74 with the micrometer scale 82 of the warping pin nut 26.

Some changes may be made in the construction and arrangement of the parts of my device without departing

from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a toric lens tool of the character disclosed, a body, a base shaft slidable therein and having an end provided with a rounded edge to engage the base curve of a lens blank while the periphery of the blank contacts an end of said body, means for locking said base shaft relative to said body, primary and secondary sleeves slidable on said body and each having a pair of diametrically opposed jaws, the jaws of said primary sleeve being at substantially right angles to the jaws of said secondary sleeve, warping pins slidable through said body in alignment with one pair of said jaws for engaging two opposed peripheral portions of the lens blank and warping them away from said body, means for sliding said warping pins relative to said body, and micrometric indicating means for the degree of such sliding.

2. In a toric lens tool, a body, a base shaft slidable therein and having an end provided with a rounded edge to engage the base curve of a lens blank while the periphery of the blank contacts an end of said body, means for locking said base shaft relative to said body, primary and secondary sleeves slidable on said body and each having a pair of diametrically opposed jaws, the jaws of said primary sleeve being circumferentially spaced from the jaws of said secondary sleeve, warping pins slidable through said body in alignment with one pair of said jaws for engaging two opposed peripheral portions of the lens blank and warping them away from said body, and means for sliding said warping pins relative to said body.

3. In a toric lens tool, a rotatable body, a base shaft slidable therein and having a circular end to engage the base curve of a lens blank to shift it to a position concentric to the axis of rotation of said body while the periphery of the blank contacts an end of said body, primary and secondary sleeves slidable on said body and each having a pair of diametrically opposed jaws, the jaws of one sleeve being at substantially right angles to the jaws of the other sleeve, and lens warping means slidable through said body in alignment with one pair of said jaws for engaging two opposed peripheral portions of the lens blank and warping the same.

4. In a toric lens tool, a body, a base shaft slidable therein and having a circular end to engage the base curve of a lens blank, means for locking said base shaft relative to said body, primary and secondary sleeves slidable on said body and each having a pair of diametrically opposed jaws, the jaws of the primary sleeve being at substantially right angles to the jaws of the secondary sleeve, primary and secondary sleeve nuts for drawing said jaws into contact with the periphery of the lens blank, warping means slidable through said body and terminating adjacent one pair of said jaws for engaging two opposed peripheral portions of the lens blank and warping them away from said body, and a warping pin nut threaded on said body for sliding said warping means relative thereto.

5. A toric lens tool comprising a rotatable body, a base shaft slidable therein and having an end provided with a rounded edge to engage the base curve of a lens blank for centering the same relative to the axis of rotation of said body, primary and secondary sleeves slidable relative to said body and each having a pair of diametrically opposed jaws which are at substantially right angles to each other, primary and secondary sleeve nuts for drawing said jaws into contact with the periphery of the lens blank, warping pins slidable through said body and terminating adjacent one pair of said jaws for engaging peripheral portions of the lens blank and warping them away from said body, a warping pin nut threaded on said body for sliding said warping pins relative thereto, and micrometric indicating means for said last nut.

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6. A toric lens tool of the character disclosed comprising a body, a base shaft slidable therein and having an end provided with a rounded edge to engage the base curve of a lens blank while the periphery of the blank contacts an end of the body, means for locking said base shaft relative to said body, primary and secondary sleeves each having a pair of diametrically opposed jaws, the jaws of the primary sleeve being circumferentially spaced from the jaws of the secondary sleeve, primary and secondary sleeve nuts for drawing said jaws into contact with the periphery of the lens blank, warping pins slidable through said body and engaging two opposed peripheral portions of the lens blank to warp them away from said body, and a warping pin actuator for said warping pins.

7. In a lens tool for holding a lens blank so that a toric surface can be formed thereon, a body member, a base shaft slidable therein and having an end provided with a rounded edge to engage a base curve of the lens blank while the periphery of the blank contacts an end of said body member, thereby aligning the optical axis of said base curve relative to said tool, a primary sleeve slidable on said body member, a primary sleeve nut threaded on said body member to effect sliding of said primary sleeve thereon, a secondary sleeve slidable on said primary sleeve, a secondary sleeve nut threaded on said primary sleeve nut for sliding said secondary sleeve relative to said primary sleeve, said primary and secondary sleeves being each provided with a pair of lens blank periphery engaging jaws, the jaws of one being at substantially 90° to the jaws of the other, a pair of warping pins slidable through said body member in alignment with the jaws of said secondary sleeve, and screw threaded means for sliding said warping pins relative to said body member.

8. In a lens tool for holding a lens blank so that a toric surface can be formed thereon, a body member, a base shaft slidable therein and having a circular end provided with a rounded edge to engage a base curve of the lens blank while the periphery of the blank contacts an end of said body member, a primary sleeve slidable on said body member, a primary sleeve nut threaded on said body member to effect sliding of said primary sleeve thereon, a secondary sleeve slidable on said primary sleeve, a secondary sleeve nut threaded on said primary sleeve nut for sliding said secondary sleeve relative to said primary sleeve, said primary and secondary sleeves being each provided with a pair of lens blank periphery engaging jaws, warping means slidable through said body member, and means for sliding said warping means to warp the lens blank and for locking the same in warped position while forming a surface of the lens to spherical shape.

9. A rotary tool for holding a lens blank so that a

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toric surface can be formed thereon comprising a body member, means for optically aligning a base curve of the lens blank with the axis of rotation of said tool, a primary sleeve slidable on said body member, a primary sleeve nut threaded on said body member to effect sliding of said primary sleeve thereon, a secondary sleeve slidable on said primary sleeve, a secondary sleeve nut threaded on said primary sleeve nut for sliding said secondary sleeve relative to said primary sleeve, said primary and secondary sleeves being each provided with a pair of lens blank periphery engaging jaws, the jaws of one being at substantially 90° to the jaws of the other, a pair of warping pins slidable through said body member in alignment with the jaws of said secondary sleeve, and screw threaded means for sliding said warping pins relative to said body member.

10. A rotary tool for holding a lens blank so that a toric surface can be formed thereon comprising a body member, means for optically aligning a base curve of the lens blank with the axis of rotation of said body member, a first means for supporting a pair of opposite peripheral portions of the lens blank relative to said body member, and a second means for supporting another pair of opposite peripheral portions of the lens blank relative to said body member, said second means being circumferentially intermediate and acting in an axially opposite direction relative to said first means to thereby hold the blank warped during a surface forming operation thereon.

11. In a toric lens tool, a rotatable body, a base shaft slidable therein and having a circular end to engage the base curve of a lens blank to shift it to a position concentric to the axis of rotation of said body while the periphery of the blank contacts an end of said body, a sleeve slidable on said body and having a pair of diametrically opposed jaws, and a pair of lens-warping elements slidable through said body and located circumferentially intermediate said pair of jaws, said jaws and warping elements engaging two pairs of axially opposed portions of the lens blank and warping the same.

References Cited in the file of this patent

UNITED STATES PATENTS

1,022,761	Stvanek	Apr. 9, 1912
1,412,170	Dixon	Apr. 11, 1922
1,455,438	Hill	May 15, 1923
2,301,035	Golderer	Nov. 3, 1942
2,443,895	Day et al.	June 22, 1948
2,872,198	Motz	Feb. 3, 1959
2,918,291	Plantas	Dec. 22, 1959

FOREIGN PATENTS

601,326	Great Britain	May 4, 1948
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