March 10, 1970 R. J. McCALL 3,499,253

LENS BLOCK WITH SHIELD PLUG

Filed Dec. 6, 1966 2 Sheets-Sheet 1

Fig. 1

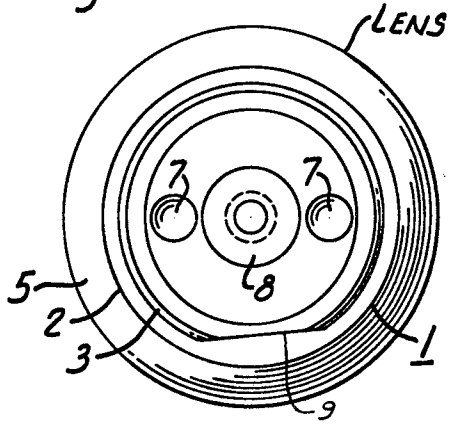


Fig. 2

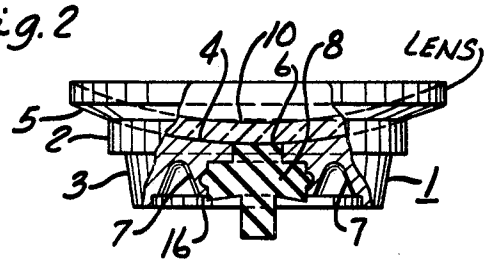


Fig. 3

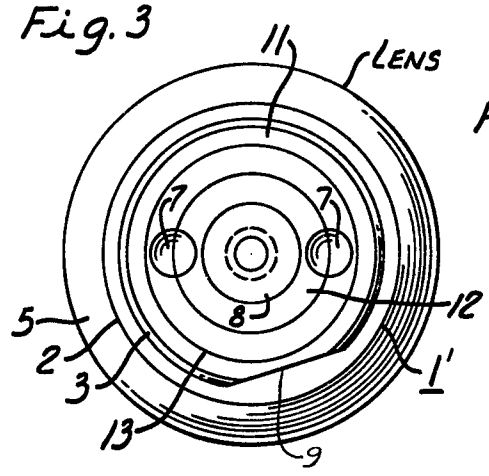
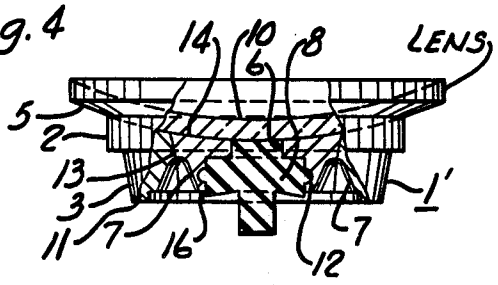


Fig. 4



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LENS BLOCK WITH SHIELD PLUG

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Fig. 5

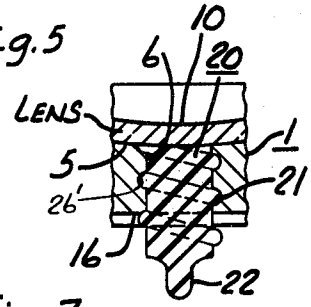


Fig. 6

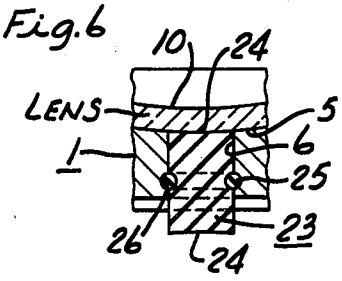


Fig. 7

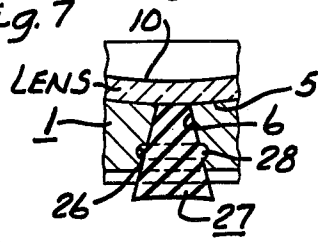


Fig. 8

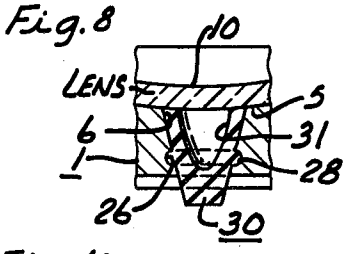


Fig. 9

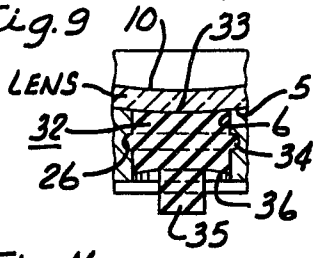


Fig. 10

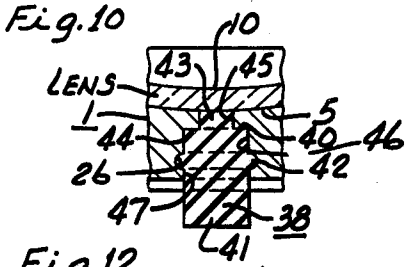


Fig. 11

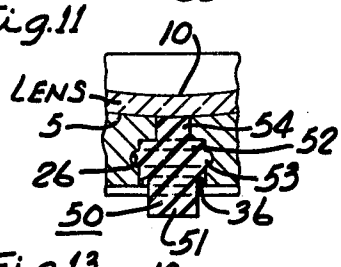


Fig. 12

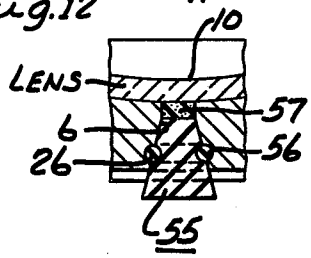
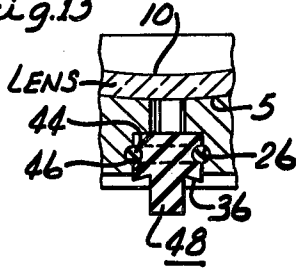


Fig. 13



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United States Patent Office 3,499,253 Patented Mar. 10, 1970

3,499,253

LENS BLOCK WITH SHIELD PLUG

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Filed Dec. 6, 1966, Ser. No. 599,591
Int. Cl. B24b *19/00*
U.S. Cl. 51—277 10 Claims

ABSTRACT OF THE DISCLOSURE

A lens mounted on a lens block having a central opening closed by a removable shield plug sealing the ocular vertex surface area against abrasives when generating and finishing the lens. The shield plug is removable to check the power and prism for correction before removing the lens block.

In a conventional process for manufacturing spectacle lenses a semi-finished lens blank of molded material, such as glass or plastic, is finished on its forward or outer surface. The outer surface of this semi-finished blank is usually convex and has been generated and finished for use in a predetermined prescription range. The blank is sold to an optical laboratory for purpose of generating and polishing the inner concave unfinished surface of the semi-finished blank to complete the prescription. For convenience the semi-finished lens is secured to a lens block which is adapted to be chucked in a machine for the purpose of generating and polishing the unfinished inner concave lens surface in accordance with the prescription.

Lens blocks may be made of hard or very soft metals, the latter having a low temperature melting characteristic. Some of these lens blocks are provided each with a central opening to permit the gauging of the thickness of the lens blank while mounted on the lens block. These openings need only be very small for this purpose.

The principal object of this invention is the provision of a shield plug that will fit the central opening in a lens block to seal the ocular vertex surface area of the lens and prevent this surface from becoming abraded or otherwise scratched by the abrasive materials during the generating and polishing of the lens. The shield is preferably made of flexible material so that it may be removed, by flexing, for the purpose of checking the power and the prism of the generated lens and to permit correction of the same before the lens block is removed. The shield plug may be reinserted to permit regenerating or refinishing of the surface to correct any inaccuracy found in the power or prism of the lens.

In each of the present lens blocks, even those that are provided with a central opening such as disclosed in Patent 3,271,912 and the patents from which this patent is a division, it is impossible to make a check of the power and the prism of the lens while it is attached to the lens block; and there is no teaching in the published art or practice to perform such a check before removal of the lens block from the lens. It is only after the lens block has been removed and the lens is checked for power and prism in accordance with the prescription that it may be found to be slightly off the prescription or at times considerably incorrect. Under these conditions, it is practically imposible to reblock the lens so that the lens is precisely in the same position on the new lens block, in which the former surfaces were generated and polished.

Under these conditions, if the lens is glass, one may

endanger the prescription by trying to regenerate the same on the old and mistakenly ground lens. Thus it is frequently deemed advisable to employ a new blank and go through the same process originally performed before the error in the prescription was found, which takes considerable time.

If, on the other hand, the material of the lens is a plastic, it is difficult, upon reblocking, not only to properly position the second lens block, but where the heat of the low temperature melting metal employed to produce the lens block is sufficiently destructive to the previously ground lens to cause it to warp or otherwise destroy the lens so that it is no longer of any use and must be discarded.

The principal object of this invention is to provide removable and replaceable shield plug that prevents the ocular vertex surface of the semi-finished lens from being damaged by abrasives during the operation of generating and polishing the lens, and also to provide for the ready removal of the plug to permit the power and the prism to be checked for accuracy and reground and polished, if necessary, after the shield is replaced, and without disturbing the original lens block. This not only saves time in the process of generating and polishing the lenses but permits one to very accurately reproduce the prescription with the use of only one lens block per lens blank.

Another object is the provision of a shield plug having uniformity so that when one shield plug is employed during the casting of the lens block on the semi-finished lens, the shield plug may be removed and another shield plug may be readily inserted to seal the surface exposed by the central opening in the lens block.

Another object is the provision of a shield plug molded of an elastomer material having a spherical cup shaped surface on the lens engaging end to spread over the surface of the lens and to be enclosed by a low temperature blocking metal, when fluid, to provide a backup surface to retain the plug in position. The elastomer is sufficiently flexible to permit withdrawal and reinsertion of the plug.

Another object of this invention is the provision of a shield plug having a body section with an intermediate annular flange to provide a shoulder with a projection forming an ocular vertex seal on the lens and a projection in the opposite direction forming a pull stem for the removal and reinsertion of the plug.

Another object is the provision of an elastomer shield plug having an anular rib which produces a complementary grove in the molded lens block to function as an inner lock as well as a labyrinth seal remotely from the lens for the purpose of sealing the shield plug regardless of whether the latter is in physical engagement with the ocular vertex surface area of the lens which is unnecessary when reinsertion of the shield plug is made.

Other objects and advantages appear hereinafter in the following description and claims.

The accompaying drawings show for the purpose of exemplification without limiting the invention or claims thereto, certain practicable embodiments illustrating the principles of this invention wherein:

FIG. 1 is a bottom plan view of a lens block and a removable shield plug therefore made in accordance with one embodiment of this invention and mounted on a lens.

FIG. 2 is a view partly in section and partly in elevation illustrating the members shown in FIG. 1.

FIG. 3 is a bottom plan view of a modified lens block with shield plug mounted on a lens.

FIG. 4 is a view partly in section and partly in elevation of the members shown in FIG. 3.

FIG. 5 is a fragmentary sectional view illustrating

in section another modification of shield plug and lens block.

FIGS. 5 to 13 are fragmentary sectional views similar to FIG. 5, but illustrating, respectively, still further modifications of this block.

FIG. 6 is a sectional view of a modified generally cylindrical shield plug with cup shaped ends mounted in a lens block.

FIG. 7 is a view in section of a frusto-conical shield plug having recessed ends, a portion of the lens block being shown in section holding the small end of the shield plug in engagement with the lens.

FIG. 8 is a view in section of a frusto-conical shield plug having recessed ends and of a portion of the lens block showing the large end of the inverted frusto-conical plug held in engagement with the lens by the lens block.

FIG. 9 is a view in section of a shield plug lens, and lens block, the shield plug having an enlarged body portion with an outwardly extending pull stem held in place by a portion of the lens block.

FIG. 10 is a similar sectional view in showing a shield plug having an inwardly extending seating lug smaller in diameter than the body section of the shield plug similar sectional.

FIG. 11 is a view in elevation showing a shield plug having an inwardly extending seating lug smaller in diameter than the body section of the shield plug and a pull stem smaller than the body section extending in the opposite direction.

FIG. 12 is a similar sectional view of a shield plug having a body section made of relatively dense material and an ocular vertex sealing surface made of a flexible material.

FIG. 13 is a similar view of a shield plug without a lens surface engagement section.

Referring to FIGS. 1 and 2 of the drawing the lens block **1** illustrated is made from soft metal molded on the exterior surface of the lens which may be first coated with plastic material or a tape when the molding material of the lens block is not provided with an ingredient that will permit it to adhere directly to the surface of the lens. The lens illustrated may be a glass lens or a lens molded of plastic material. The plastic coating, or the tape, or the metal at low melting temperature will have an affinity to grip the lens surface, and must of course be impervious to both the surface of the glass or the surface of the plastic lens so that it will not score or otherwise warp or injure the lens.

The lens block **1** is provided with a cylindrical head portion **2** having a frusto-conical shank portion **3** projecting therefrom and terminating in a circular flat surface that is normal to the axis of the lens block **1**.

When the lens block is initially poured from material having a low melting point, a ring may be inserted in the mold to provide a flat gauge surface **9** for checking the prism. The flat **9** is parallel to the original horizontal axis layout or reference line of the lens to provide a reference point so that the bottom of the lens is known at all times while the lens is blocked. This flat **9**, thus, acts as a gauging surface so that the prism of the lens may be readily checked on a vertometer while the lens block is still on the lens. This horizontal gauge surface or flat **9** on the lens block is indicated as such in FIGS. 1 and 3 and represents a gauge surface from which the optical or mechanical center of the lens may be determined.

The surface **4** of the lens block is molded on the exterior surface **5** of the lens. This exterior surface is preferably generated and finished to the proper prescription and the lens itself is considered as a semi-finished lens blank, the convex surface **5** being the finished surface of the lens blank. The surface **4** attaches itself to the coating on the face **5** of the lens or directly to the lens itself depending upon the capability of the low melting material employed to form the lens block.

The inner face of the lens block encircled by the frusto-conical shank portion **3** is preferably provided with an aligned series of three holes. The center hole **6** is formed by the shield plug **8**, which has been removed in FIG. 1; and the dome shaped holes indicated at **7**, one on each side of the center hole **6**, terminate within the material from which the lens block is made, but are sufficiently deep to be employed in securing the lens block in a machine for grinding and polishing the inner surface **10** of the lens, and may be used for chucking the blank in machines employed to measure the power and prism of the lens, generally described as vertometers before the complete finishing of the lens, and before the lens block is removed from the lens.

The low melting point metal employed to mold the lens block is an electrically conductive alloy comprising a mixture of bismuth, lead, tin, indium and cadmium in desirable proportions for the purpose of creating an alloy having a low melting point of approximately 136 degrees F. Such a lens block may be molded by the use of a mold adapted specifically for this purpose, such as that illustrated in U.S. Patent 3,049,766, in which a ring for forming the gauge surface **9** is inserted, and in which the shield plug **8** is inserted before the lens block is molded so that the block one will be accurately molded around the shield plug **8**, and at the same time the mold will accurately form the transverse, flat surface on the outer end of the frusto-conical shank **3**, as well as the spaced dome holes **7**. After the lens block has been molded and cooled, the shield plug **8** may be removed to expose the hole **6**.

Referring now to FIGS. 3 and 4, lens block **1'** is illustrated to be made in two parts **11** and **12**, the outer portion **11** of the lens block being provided with the cylindrical head portion **2** and the frusto-conical shank portion **3** projecting axially of the axis and having a chordal flat gauge surface **9**.

As in FIG. 1, the lens block **1'** shown in FIG. 3 has a central section **12** which is preferably made of a material of low temperature melting point but not as low as the material from which the outer section **11** of the lens block is constructed. This inner portion **12** of the lens block is provided with a frusto-conical surface **13** over which the outer portion **11** is molded for the purpose of supporting the same.

The inner portion **12** of the lens block contains the central opening **6** for receiving the plug **8**. However, the balance of the inner surface **14** of the inner lens block **12** is in surface contact with the lens or the coating of the lens for the purpose of supporting the same.

The two dome shaped holes **7** are formed half in the inner plug **12** and half in the outer part **11** of the block, and are in alignment with each other and with the center of the opening **6**. The axes of these three aligned holes are positioned in the molding machine for producing the lens block in alignment with the axis layout line of the lens which is painted on inner surface **10** of the lens itself and is oriented in accordance with the prescription. The lens block is then poured and molded to the surface of the lens. The rotation of the lens in the molding machine affixes the prescribed power axis orientation and the finished center of the lens for the purpose of generating the same.

As shown in FIGS. 2 and 4 the shield plug **8** illustrated is somewhat similar to that shown in FIG. 11. However, other forms of this shield plug are illustrated in the remainder of FIGS. 5 to 13, inclusive.

Referring to FIG. 5 the shield plug **20** may be made of any suitable material, such as nylon, or Teflon, or may be of the acrylic family or of other plastics either thermosetting or thermoplastic. Here the plug **20** is held in place in the machine which molds the lens block **1** around it; and the surface of the plug is sufficiently resilient to enable it to properly engage and shield its engagement on the lens surface **5**. However, the plug is sufficiently long to extend beyond the surface **16** of the lens block and is

provided with a finger grip **22** so that the plug **20** may be unscrewed by turning the grip and thereby permitting its threads **21** to merely follow the helical groove **26'** molded in the opening **6** in the axial center of the molded plug.

If the nylon or Teflon does not give a sufficient flexibility in seating directly on the face **5** of the lens, the same may be coated with a softer material for this purpose. However, Teflon is sufficiently pliable to effect the proper result.

Referring now to FIG. 6, the plug **23** has its opposite ends dished as indicated at **24** and is preferably made of soft rubber that is sufficiently pliable to be inserted or withdrawn from the opening **6**. The plug **23** protrudes enough beyond to permit the plug to be grasped to withdraw the same. As an interlock the plug is provided with an O-ring **25** which fits in an annular groove or socket **26** in the lens block which is formed by pouring the soft metal around the plug in the same manner as that in any of the plugs herein shown. Thus, either end of the plug, having a slightly dished surface **24**, may be employed to engage the convex surface **5** of the lens and the opposite end may be employed as a finger pull. The O-ring **25** will simply collapse with the stretching of the rubber when the plug is withdrawn, but may be reinserted to seal the hole **6** after the lens powers have been checked, following the polishing process, if it is again necessary to seal the hole **6** and remount the lens to polish the same on another angle.

Referring to FIG. 7, the plug **27** is frusto-conical with the small end engaging the lens. This plug is provided with an integral, circumferential rib **28** and when molded in place produces the same annular proove **26** in the lens block as that produced by the O-ring in FIG. 6. Here again a soft rubber or soft pliable elastomer may be employed as a plug.

In FIG. 8 the plub member **30** is frusto-conical but the large end is inserted against the convex surface of the lens. This plug has a central opening **31** and is provided with the same integral rib **28** and forms the same type of groove **26** in the soft metal when the latter is molded therearound.

When pressure is placed on the plug **30** during the molding operation and the mold is closed to form the outer surface of the lens block, there is a slight tendency for this plug to extend over a somewhat wider surface than that depicted by the plug in its natural state. However, when withdrawn the plug will collapse and readily come out of the smaller end of the opening **6**. This plug may be readily collapsed and reinserted, if desired.

Referring to FIG. 9, the plug **32** shown is provided with an enlarged body that has a cup shaped surface **33** that engages the convex surface of the lens and the body is also provided with an integral, circumferential rib **34** and an axially extending finger pull tab **35**. When the plug body is enlarged as illustrated in FIG. 9 as well as in FIGS. 2 and 4, the outer surface of the plug surrounding the pull tab **35** is dished as indicated at **36**. This dish provides strength against the surface of the molten metal and provides extra strength in the forming of the hole **6**. This same form of the outer face of the plug is also found in FIGS. 11 and 13 as well as in FIGS. 2 and 4.

In the plug **38** shown in FIG. 10 the body plug **38** is substantially cylindrical, and has a shoulder **40**, which as in the structures illustrated in FIGS. 2 and 4, provides an additional seal. The cylindrical body portion **41** carries an annular rib **42** that forms the annular groove **26** and has sufficient length to permit its lower end to be grasped to withdraw the whole of the plug from the block, including the inner sealing lug section **43**.

The shoulder **40** forms a complementary shoulder **44** in the metal lens block to form a flange. These shoulders provide radial and axial surfaces at each end which function in terms of a labyrinth in the same manner as that of the groove **26** that interrupts this portion of the opening **6**. Thus the shoulder **44** and the three cylindrical sections **45**, **46** and **47** form interrupted axial surfaces, one interrupted by a right angle between **44** and **45** and another by the corner between the shoulder **44** and the cylindrical surface **46** which together with the arcuate groove **26** form labyrinth bands to aid in sealing the opening **6** when the plug is reinserted, for the purpose of maintaining the lens surface dry from the abrasives that are employed in generation and polishing of the lens surface **10**.

These same surfaces appear in the structures of FIGS. 11 and 13. However, the structure of FIG. 13 is intended simply as a replug. Here the plug member **48** has no sealing lug adjacent the lens because the shoulders between the surfaces **44** and **46**, together with the groove **26** formed by the annular rib, are sufficient to seal the opening **6**; and it is not necessary to put a complete plug, or the same plug, in the opening **6** that was employed to form the same unless it is expected to undergo considerable grinding after the lens inspection, in which case it would be desirable to replace the original plug rather than the plug **48**.

In the structure shown in FIG. 11, the plug **50**, has the same general structure as the plug **38** of FIG. 10 with the exception that the outer pull stem **51** is made smaller in diameter than the body **52** of the plug. In this structure also the rib **53** in the center of the body section **52** is approximately one-half the length of the body section **52**. This plug design is also provided with the dished portion **36** and is also provided with the inner extending sealing lug section **54**. With the body section short and the pull stem **51** smaller than the body section, this plug is readily removable and any rocking action on the pull stem is readily transmitted to the body **52** to compress and release the same from the opening **6**. However, this plug may be more readily inserted than some of the other designs because of the relatively short body section and it provides the same sealing properties as that illustrated with regard to FIGS. 10 and 13.

FIG. 12 shows a plug **55** which may be made of any suitable hard metal such as brass, copper or hard thermosetting plastic. In view of the hardness of the plug **55** it is provided with a soft rubber O-ring **56** that is seated in the annular groove **26** of the opening **6** and the inner end of the plug is provided with a sponge type rubber or plastic elastomeric material **57** which will readily seat itself on the lens and slightly bulge upon being compressed in the opening **6**. This small seal **57** may be cemented or otherwise secured to the inner end of the plug **55**.

I claim:

1. A block for mounting a lens blank,

said block having thereon a curved surface against which a correspondingly curved surface of the lens blank seats, and having therethrough a central opening, which opens at one end on said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end against said curved surface of the lens blank, thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening,

said plug being made of a resilient material and having a peripheral sealing element integral with it which engages in a surrounding groove in said block.

2. A block for mounting a lens blank,

said block having thereon a curved surface against which a correspondingly curved surface of the lens blank seats, and having therethrough a central opening, which opens at one end of said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end

against said curved surface of the lens blank thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening.

said plug having an annular rib intermediate its ends which engages in an annular groove in the lens block to retain said plug in position.

3. A lens block as defined in claim **1**, wherein said sealing element extends in a helical path axially around said plug and said groove is a corresponding helical groove.

4. A block for mounting a lens blank,

said block having thereon a curved surface against which a correspondingly curved surface of the lens blank seats, and having therethrough a central opening, which opens at one end on said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end against said curved surface of the lens blank, thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening,

said plug and said opening being generally cylindrical in configuration and equal in diameter,

said plug having a curved, resilient surface at its inner end to engage the registering surface area on the lens blank, when the plug is mounted in said opening, and

said plug having a height slightly greater than the depth of said opening so that it projects outwardly beyond the outer end of said opening for ready gripping to remove the plug from the opening.

5. A block as defined in claim **4**, wherein

said plug has first and second reduced diameter portions at opposite ends thereof, respectively,

one of said reduced diameter portions projects out of the outer end of said opening to define said gripping portion, and

the other of said reduced diameter portions has thereon said curved surface that is engageable with said registering surface on the lens blank.

6. A block for mounting a lens blank,

said block having thereon a curved surface against which a corespondingly curved surface of the lens blank seats, and having therethrough a central opening, which opens at one end on said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end against said curved surface of the lens blank, thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening,

said plug and said opening being of corresponding truncated conical configuration, and

said plug having at its inner end a resilient surface which is engageable with said registering surface on the lens blank, when the plug is mounted in said opening.

7. A block as defined in claim **6**, wherein

the larger end of said truncated conical opening is the inner end and opens on said curved surface of said blank,

said plug is resilient and has a recess in said larger end thereof to allow the plug to collapse upon being withdrawn or inserted through the smaller end of said opening.

8. A block as claimed in claim **7**, wherein the smaller end of said plug seats against said registering surface on the lens blank when the plug is mounted in said opening.

9. A block for mounting a lens blank,

said block having thereon a curved surface against which a correspondingly curved surface of the lens blank seats, and having therethrough a central opening which opens at one end on said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end against said curved surface of the lens blank, thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening,

said plug having an intermediate body section which is larger in diameter than the opposite end portions of said plug, so as to define shoulders between said body portion and the end portions of said plug, and

the underside of said shoulder being engaged by said block.

10. A block for mounting a lens blank,

said block having thereon a curved surface against which a correspondingly curved surface of the lens blank seats and having therethrough a central opening, which opens at one end on said curved surface of the lens blank, and

a plug solid in cross section sealingly and removably mounted in said opening to seat at its inner end against said curved surface of the lens blank, thereby operatively to shield and seal the registering ocular vertex surface area of the lens blank, otherwise exposed by said central opening,

opposite ends of said plug being concavely dished.

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JAMES L. JONES, Jr., Primary Examiner