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J. F. MCCARTHY ET AL

2,603,922

LENS BLOCKING DEVICE

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FIG. 1

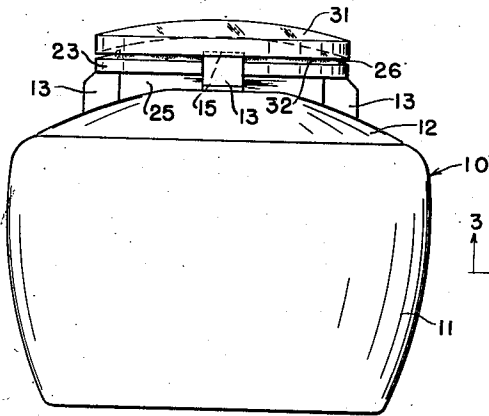


FIG. 2

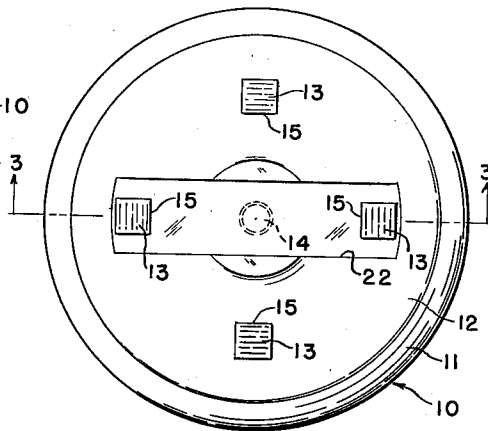


FIG. 3

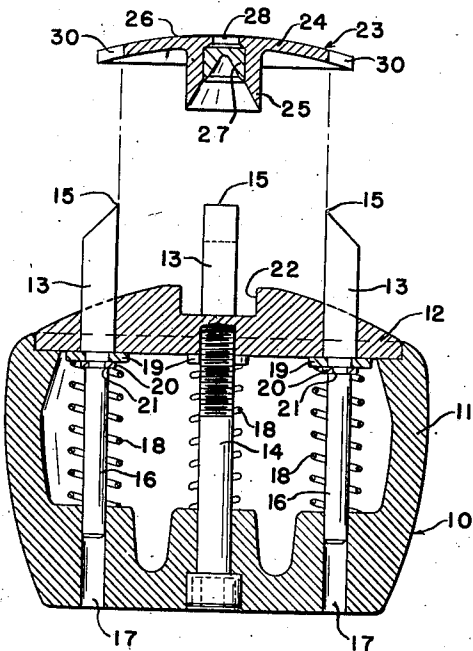


FIG. 4

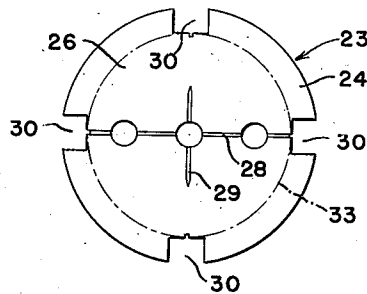
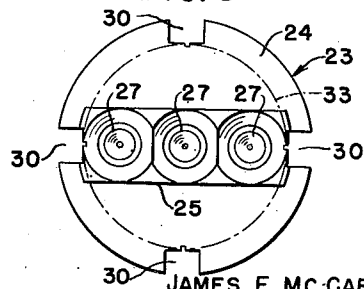


FIG. 5



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LENS BLOCKING DEVICE

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6 Claims. (Cl. 51-277)

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This invention relates to lens blocking devices and has particular reference to improved means for blocking ophthalmic lenses.

In the conventional manufacture of ophthalmic lenses, a lens blank of molded glass is ground and polished on each of its two sides to carefully controlled curved surfaces, the shapes and spatial relation of the two curved surfaces resulting in the optical refraction desired. In the various grinding and polishing operations to which the blank is subjected, it is customary to secure the blank by means of an adhesive, such as molten pitch, to a lens block which serves as a handle or coupling means by which the blank may be held and controlled. This operation is called "blocking." Lens blocks usually consist of a head, having an outer surface substantially conforming to the surface of the blank opposite to that on which it is desired to work, and a shank, generally rectangular in shape. The block is fixed in position in the surfacing machine by means of the shank, so that the blocked lens blank bears a predetermined relation to the rest of the machine.

The real problem in blocking arises in connection with a semi-finished lens, which is a lens blank one surface of which has already been ground and polished. The semi-finished lens must be affixed to the lens block with its finished surface against the head in a known relation to the block, in order that the unfinished outer surface of the blank may be so finished as to bear the desired relation to the first finished surface. For this purpose, it is customary to mark the finished surface of the semi-finished lens in a suitable marking device, preparatory to blocking the lens. The marking usually consists of a center dot inked on the finished surface of the semi-finished lens, together with a pair of dots or short lines on either side of the center dot. The center dot indicates the optical center of the lens, and the row of dots indicates the cylindrical axis of the lens. A marking device of this character is disclosed in Lockhart Patent 2,290,566, issued July 21, 1942.

The blocking operation proper follows the above-described marking of the semi-finished lens. Various ingenious and complicated blocking devices are known, in which the blank is held by gripping means which permit the operator to adjust the blank manually until the ink marks are visually aligned with indicia on the blocking device. The blocking device is also provided with means for holding a lens block in known relation to these indicia, and with means for swing-

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ing the gripped lens blank to the held block or vice versa. After the lens blank has been visually aligned, the operator coats the block with molten pitch, and then manipulates the swinging means to bring the blank and the block together. These may be called transfer-type blocking devices, and, although they are widely used, they are subject to a number of disadvantages.

The blocking device of the present invention is simple, compact, inexpensive and easy to operate. By the use of indicia on the head of the lens block and transparent pitch, all transfer mechanism is eliminated, and the visual aligning is done directly on the block itself. Means are provided for excluding the pitch from certain areas of the lens blank, in order to maintain clear areas for use as caliper points and for other purposes to be described.

It is a principal object of this invention to provide a blocking device of simple construction that may readily be kept free of undesirable pitch accumulations.

Other objects and advantages of this invention will be apparent from the following description, taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevation of a blocking device according to this invention, having inserted therein a lens block carrying a blocked lens blank;

Figure 2 is a plan view of the blocking device alone;

Figure 3 is a transverse section of the blocking device, with a lens block shown above the device in position for insertion therein;

Figure 4 is a top plan of a lens block especially adapted for use with the blocking device of this invention; and

Figure 5 is a bottom plan of the lens block of Figure 4.

Referring more particularly to the drawings, the blocking device or blocking head 10 comprises a body portion or base 11, a lens block-receiving portion or top plate 12, and four vertically projecting, yieldingly-mounted fingers or pins 13. The base 11 may conveniently be of the shape illustrated, and is hollowed out for the reception of parts to be described later. The top plate 12 may be retained in position on the base 11 in any convenient manner such as by bolt 14.

The pins 13 are mounted for vertical sliding movement with respect to the top plate 12 and base 11, and are equally spaced from each other and about the central vertical axis of base 11. The upper ends of the pins 13 are preferably

square as shown, to prevent rotation of the pins, and have their extremities chamfered to form sharp, straight line edges 15. The square ends of the pins 13 fit snugly for smooth sliding movement in correspondingly shaped holes in the top plate 12. The lower ends or stems 16 of pins 13 may be cylindrical as shown, and are slidably mounted in holes 17 in the base 11. A compression spring 18 is coiled about each of the stems 16, and serves to yieldingly maintain the pin 13 in its extreme upward position shown in Figure 3. To limit the upward movement of the pins 13, a stop washer 19 is mounted on each pin abutting against the shoulder formed between its square upper end and its cylindrical lower end, and is retained in that abutting position by a snap washer 20 fitting in a groove 21 on the stem 16 in conventional manner.

The top plate 12 is provided with a transverse groove or slot 22, preferably formed by milling for accuracy, of such width as to just accommodate snugly the shanks of the lens blocks to be used in connection with the blocking head 10. The slot 22 is aligned with two of the pins 13, and cooperates with the pins to center a lens block inserted in the head, so that the central vertical axis of the lens block is aligned with the central vertical axis of the blocking head 10. The pins 13 serve also to exclude pitch from the under surface of the blocked lens blank, as will be described hereinafter.

According to this invention, the top plate 12 and the pins 13 are made of oil-impregnated, porous metal such as that sold under the trademark "Oilite." Such porous metal parts are made by a process involving five major steps. First, powdered metals, for example, powdered copper and powdered tin, are mixed in the desired proportions. Second, the powdered metal compound is compressed to the desired shape and size in a briquetting die. Third, a sintering heat treatment transforms the fragile briquet into strong, porous metal. Fourth, the part is sized by pressing to finished dimensions in a sizing die. Fifth, the porous metal part is impregnated with non-gumming lubricating oil by immersion in a bath of oil, the porous metal absorbing the oil by capillary action just as a sponge absorbs water.

We have found that molten pitch such as is used in blocking ophthalmic lenses, will not adhere, upon cooling, to parts made from oil-impregnated, porous metal of the character just described. Accordingly, by making the parts of our blocking device that are exposed to contact with molten pitch of this porous metal, our blocking device may easily be kept clean, and clogging of the free-floating pins 13 is prevented. Any molten pitch that may accidentally come in contact with the top plate 12 and pins 13 may be removed without difficulty, the oil present in the metal preventing adherence of the pitch to the metal part. Contact with molten pitch tends to remove the oil from the metal parts, and it is therefore necessary, from time to time, to replace the oil. This may readily be done by cleaning the parts, applying to them a liberal coating of a suitable non-gumming lubricating oil, such as SAE 20 motor oil, and allowing this coating to remain on overnight. After continued use, such overnight soaking with oil may not suffice to replace the lost oil, in which case the top plate 12 and the pins 13 may be completely recharged with oil by disassembling the device and soaking the top plate and the pins in a bath of such oil at 140° F. for half an hour.

It will be apparent that the base 11 could also be made of such oil-impregnated metal, but the expense of this product argues against this, and it is unnecessary to do so as the base 11 will seldom have pitch spilled on it and the presence of pitch adhering to the base 11 would not interfere with the proper operation of the blocking device, as it would on the top plate 12 and the pins 13.

A type of lens block especially suitable for use with the blocking head 10, is shown in detail in Figures 3, 4 and 5. The lens block 23 of these figures comprises a head 24 and a shank 25. As will be understood by those skilled in the art, the upper surface 26 of the head 24 is shaped to conform to the surface of a particular semi-finished lens blank, a variety of lens blocks being employed to take care of different kinds of lens blanks. Since the conventional semi-finished ophthalmic lens blank is 50 mm. in diameter, the head 24 may conveniently be made of this diameter, although, obviously, it may be of any desired size. The shank 25 is generally rectangular in shape, and is of such width as to fit easily but snugly in the slot 22 of the blocking head 10, so that the lens block 23 may be placed in the blocking head 10 in only one of two positions reversed 180° one from the other. The lens block 23 is provided with three hardened steel inserts 27 having conical recesses therein and pressed into shank 25. The inserts 27 facilitate the use of the block 23 in connection with oscillating grinding or polishing machines such as described in United States Patents 1,569,194 and 2,159,620 to E. M. Long.

As thus far described, the lens block 23 is conventional except for its rather large diameter. In addition, the lens block 23 is provided with milled cross lines 28 and 29, intersecting at right angles at the central vertical axis of the lens block 23, and with four substantially rectangular recesses 30 at its periphery, which are aligned with the cross lines and are adapted to receive the pins 13 of the blocking head 10. The cross line 28 is disposed vertically above the longitudinal axis of the shank 25, and is preferably made longer than the cross line 29 to visually indicate the location of the shank to an operator looking down on the top of the lens block 23, thus facilitating the insertion of the lens block in the blocking head 10.

In using the blocking head 10, the operator is provided with a semi-finished lens blank such as the lens blank 31 shown in Figure 1, suitably marked as above described, and a matching lens block 23. These are first warmed on hot plates to appropriate temperatures in the customary manner. The operator then picks up the lens block 23, holds it so that its line 28 is in alignment with the slot 22, and inserts it in the blocking head. The pins 13 then project up through the recesses 30 in the lens block, and cooperate with the slot 22 as above described to center the lens block 23 with respect to the blocking head 10. The operator then pours a small quantity of molten transparent pitch on the upper surface 26 of the lens block, the operator readily becoming sufficiently skilled to employ a quantity of the molten pitch which is just sufficient to substantially cover the lens block when the lens is pressed down on the molten pitch. The operator then picks up the marked lens blank 31, and holds it over the lens block. By looking directly down on the assembly, the operator may readily visually align the ink marks on the blank 31 with the cross lines 28 and 29

on the block. When the operator observes that the center dot of the lens blank is aligned with the intersection of the cross lines 28 and 29, and the lens blank axis is aligned with the cross line 28, he presses the lens blank 31 down on the molten pitch, and holds the lens blank in that position until the pitch cools and hardens to form a bond between the lens blank and the lens block, as indicated at 32 in Figure 1. The blocked lens and lens block may then be removed from the blocking head 10 for further operations in the appropriate surfacing machine. When the operator gently presses the lens blank 31 down on the lens block 23 as above described, the sharp upper edges 15 of the pins 13 engage the under surface of the lens blank before the blank contacts the molten pitch, and the continued downward movement of the lens blank as the blank is firmly seated on the block, carries the yielding pins 13 down with it. The sharp edges 15 thus continuously engage the under surface of the lens blank during the blocking operation, and prevent the pitch from flowing on to the areas of the lens blank under surface that are co-extensive with the recess 30. The molten pitch on the surface 26 flows around the pins 13 to the edge of the block head 24, and if too much pitch is used, the excess may drop onto the top plate 12. It has been found that pins provided with straight line, sharp upper edges 15 as illustrated in Figure 3, will successfully exclude pitch from the areas above described when used with lens blanks the under surfaces of which vary from plano to plus or minus 16 diopters. This is sufficient to accommodate the blanks normally found in practice. For extreme sizes of lens blanks, the upper edges 15 of pins 13 could of course be shaped to correspond to the blanks.

It has been found that very little pitch adheres to the top plate 12 and pins 13 when they are made of oil-impregnated, porous metal. What little pitch does adhere to these parts may be easily and completely broken away by the operator's fingers as soon as the blocked lens and lens block have been removed from the blocking head 10. All surfaces that may come into contact with the lens block 23 and the lens blank 31 may therefore easily be maintained free from minute spots of pitch which would, if present, interfere with the accuracy of the blocking head 10.

Although the above-described lens block 23 is the preferred form for use with our blocking head, it will be apparent that other forms may successfully be used. Shank 25 may be formed in any desired irregular shape so long as the slot 22 is shaped to conform with it. Although desirable, the recesses 30 are not essential, and, in lieu thereof, the lens block may have a circular periphery such as to fit within the pins 13, as indicated by the broken line 33 in Figures 4 and 5.

The above-described operation requires the use of transparent pitch, but our blocking head may be used, if desired, with ordinary opaque pitch. In that case, a conventional transfer type of blocking device may be used in connection with our blocking head to obtain the necessary alignment of the lens blank with respect to the lens block held in the blocking head.

In the above-described blocking operation, no provision has been made for introducing prism into the blocked lens blank. This is not necessary in many cases, as even where the finished lens

is to have prism, the prism may be introduced by suitable adjustment of the surfacing machine in which the blocked lens blank is to be mounted. With some types of surfacing machines, however, it is necessary to introduce the desired amount of prism in connection with the blocking operation. This may be accomplished by using our blocking head together with a transfer type of blocking device such as above described.

The pitch-free areas on the under surface of the lens blank 31 are useful as calipering points to determine lens thickness during processing of the blocked lens in surfacing machines. Edge calipering is generally preferred, but certain types of surfacing machines are so designed as to require calipering at the center of the lens blank through a central hole provided in the lens block. Our blocking head may readily be adapted for use with such lens blocks by providing it with a central, cylindrical, resiliently mounted finger, functioning similarly to the fingers 13, to keep a central spot on the under surface of the lens blank free from pitch.

The pitch-free areas produced by the pins 13 are so located as to permit the use of the blocked lens in lens chucks of the type having four registering pins located at opposite ends of crossed diameters of the chuck. The registering pins of such chucks require the under surface of the blank at the four points at which they engage, to be free from pitch and other accumulations, in order to maintain accuracy of registration of the blocked lens in the chuck. Our blocking head is therefore especially useful for blocking lenses to be mounted in such chucks.

It will be observed that our blocking head, when used with transparent pitch as above described, reduces blocking practically to the bare essential of visually aligning the marked lens blank with indicia on the lens block. Since a comparable visual alignment is necessary even with the much more complicated transfer type blocking device, our simple blocking head suffers not at all in comparison with prior devices so far as accuracy in operation is concerned.

While the hereindescribed blocking device is an illustrative embodiment of the invention in its preferred form, it is to be understood that the invention is not limited thereto but may comprehend other arrangements of parts, details and features without departing from the spirit of the invention. We desire to be limited, therefore, only by the scope of the appended claims.

We claim:

1. A device for centering and axially aligning a lens blank on a lens block supported in the device while securing the blank to the block with molten adhesive deposited on the lens block, comprising a block-receiving portion, and means associated with said block-receiving portion for centering the block with respect to the device, said portion and said means being made of sintered porous metal and being impregnated with oil so as to be easily cleaned of said adhesive.
2. A device for centering and axially aligning a lens blank on a lens block while securing the blank to the block with molten adhesive deposited on the lens block, comprising a block-receiving portion and a finger-like member slidably and resiliently mounted therein and adapted to project past the lens block to yieldingly contact and mask from said adhesive a portion of the under surface of the lens blank to be secured to the block, said block-receiving portion and member being made of sintered porous metal and being

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impregnated with oil so as to be easily cleaned of said adhesive.

3. A device for centering and axially aligning a lens blank on a lens block while securing the blank to the block with molten adhesive deposited on the lens block, comprising a block-receiving portion and finger-like members slidably and resiliently mounted therein and adapted to project past the lens block to yieldingly contact and mask from said adhesive portions of the under surface of the lens blank to be secured to the block, said block-receiving portion and members being made of sintered porous metal and being impregnated with oil so as to be easily cleaned of said adhesive.

4. In a lens blocking device, a supporting base having an upper portion adapted to receive a lens block, a plurality of finger-like members slidably and resiliently mounted in and projecting above said base and adapted to extend beyond the lens block and within the margin of a lens blank centered above the block, whereby said fingers yieldingly contact the under surface of a lens blank centered on the block and serve to mask portions of such under surface from the adhesive used to secure the lens blank to the block, and said block-receiving portion and members being made of sintered porous metal and being impregnated with oil so as to be easily cleaned of said adhesive.

5. In a lens blocking device, a supporting base having an upper portion recessed to receive the shank of a lens block, a plurality of finger-like

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members slidably mounted in said base, spring means for normally projecting the finger-like members above said base, said members being so located as to engage the periphery of a lens block inserted in the device to center the block with respect to the device, and said members being of such length as to extend beyond the thus-centered lens block and yieldingly contact the under surface of a lens blank centered on the block to mask portions of such under surface from the adhesive used to secure the lens blank to the block.

6. A lens blocking device as claimed in claim 5 in which said upper portion of the supporting base and said finger-like members are made of sintered porous metal and are impregnated with oil, whereby any of said adhesive contacting said upper portion and members may be readily removed therefrom.

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